STEADICAM®

Ultra 2

Operating Manual

p/n LIT-800000

Ultra²

Ultra²™ S E R I E S

Operating Manual

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Table of Contents

This manual is written for experienced Steadicam operators.
If you are new to Steadicam operating, or if you have never taken an intensive Steadicam workshop, we strongly urge you to take one of our five or six day workshops. For more information on professional workshops worldwide, contact The Tiffen Company.

Overview

The Tiffen Company takes great pride in producing the world's most advanced Steadicam®, the

Ultra²

We are committed to excellence, innovation and service, and the Ultra² is a system that will evolve with you. Each component of the Ultra² 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 Ultra² to be easily modified, upgraded, maintained, and serviced.

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

The integral tilt head tilts +/– 20º 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 Ultra² gimbal is the smoothest, most precise gimbal ever made, with heavy duty, high precision bearings and an ergonomic yoke, and it's easy to take apart for cleaning. It comes with its own tool – The Blue Whale -– which operators use to precisely center the gimbal in the field, even after years of hard knocks.

Four section, carbon fiber telescoping post extends the sled from 26 to 72 inches — or anywhere in between — for short to long mode shooting. The post, monitor, and gimbal clamps are either open and free, or positively locked with the clamp levers ergonomically recessed into the clamp bodies.

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 the flip-to-low-mode dovetail mount is both quick and positive.

Modular Electronics — A "backplane" system replaces the traditional wiring harness and supports user-replaceable circuit boards. Microprocessors are software upgradeable. Quick access to the most commonly used functions – framelines, level, brightness, and contrast.

UltraBrite 2™ monitor — 8.4 inch, 1400 nits, advanced AR coating, and HDSDI, HD component, and analog composite direct inputs. Its unique design lets it run cool without a fan. On the front is an LED artificial horizon display, and two built-in, pre-wired tally lights.

Structural Dovetail Base — solidly mount gyros, antlers, and other accessories. Includes positive latches for the battery rods and a pull out mounting plate for 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 new tilting battery mount creates more options for balancing and inertial control.

The innovative ***stiffening system*** creates extra rigidity whenever violent moves, a rough ride, or a very long post configuration requires some help.

The Ultra² vest is the best fitting and strongest vest we've ever made. Lightweight and ergonomic, the vest works perfectly with the new generation of G-series arms.

The G–70 arm is amazing, lifting from 12 to 70 pounds. The unique "Geo" feature, which changes the spring tension as you boom up and down, makes the G-70 the smoothest arm ever, with an astounding boom range of 32 inches.

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

The Ultra²™ continues the Ultra™ tradition – it's the most versatile and user-friendly Steadicam® ever made.

The Ultra² Sled

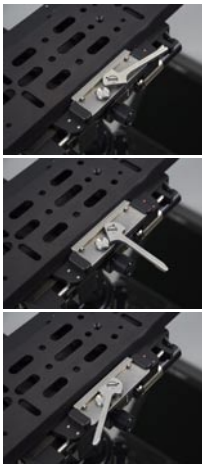
Post #1 - connected to tilt head
Post #2 - carries the gimbal
Post # 3 - carries the upper monitor mount
Post #4 - carries the lower monitor mount, electronics modules, battery rods, lower dovetail, and accessory shelf.

All post clamps are blue.

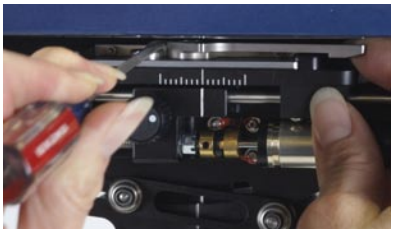

Camera mounting platform
Side to side adjustment knobs
Stage electronics
Tilt head and clamps
Gimbal
Docking ring
Gimbal clamp
Transmitter for motorized stage (removable)
Monitor bracket
PowerCube™ Batteries
STEADICAM
Electronics module
Integral dovetail base
Battery rods

Stage mechanics and adjustments

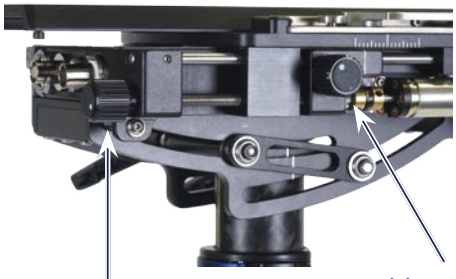
The dovetail clamp lever has three positions: forward and locked, 90º for adjustments, and 60º back for mounting or removing the dovetail plate. A safety button must be pushed to move the lever to the unlocked position; the same button holds the lever fully open, making flips to low mode and back a bit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



Even with a very wide camera, the clamp lever can always be accessed, but the safety release button might require a thin screwdriver.



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.



The Ultra[2] 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. 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.

The stage connectors

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

- Camera power connector. 3 pin Lemo, +28, +14, and ground.
- HDSDI in. This connector has no connection to the distribution amplifiers or DA's. BNC
- HD component video in. 6 pin Lemo
- Standard definition (PAL/NTSC) composite video in. BNC

At the front (nosebox), left to right:

- Power for focus motor receiver/ amplifiers. 3 pin Lemo (+28, +14, and ground)
- Stubby black antenna (no connection, just thought you'd like to know what it was)
- Tally light connector (additional functions possible)

Nosebox starboard side:

- Pot to adjust Tally sensor sensitivity
- Rotary switch to set remote channel (0-8)

Forward, flanking the stage:

- Starboard side:+12VDC (regulated) and video in. 4 pin HRS.

- Port side: +14VDC and video out. 4 pin HRS.

Note: Visit the appendix, page 74 for pin outs and technical descriptions of the connectors.

Posts and clamps

The four sections of the telescoping post are adjusted by releasing one or more of the clamps at the top of each section. Be sure to support all sled portions that will be freed before you release the clamp.

Do not extend any section beyond the point where the yellow alignment line becomes red. Note: There is no safety line inside the posts to keep them from separating, but there are electrical wires inside the post that will keep the rig parts together. The longer the rig, the more these wires will act like a safety line, but don't rely on them.

Do not twist the bottom section more than 180 degrees from the top section as this will also twist the internal cables. If you think you may have inadvertently twisted the internal cables, remove the camera and battery and make the rig as short as possible. Release the clamp and slide the bottom section (the electronics) completely off. Examine the curly cord. The two rubber tubes that support the wires should be parallel and not twist. Rotate the bottom section until the rubber tubing is not twisted, and put the sled back together.

Locking the post clamps

The Ultra^2's post clamps are positive locking. They are either fully open or closed, and they snap shut with a healthy, positive click.

Do not force the lever further open than shown, as this can damage the mechanism.

Give the rig a good spin and a quick stop to be sure nothing shifts.

The clamps are easily adjusted with a small Allen wrench. Adjust the screws with the lever closed — and go slowly — 1/8th of a turn or less at a time. Adjust both screws equally, so the clamp remains parallel to the housing. If the screws are over-tightened, the lever may not open or close. Test the clamp strength and lever action frequently as you adjust the tension.

Accessing the Post 2 to 1 clamp

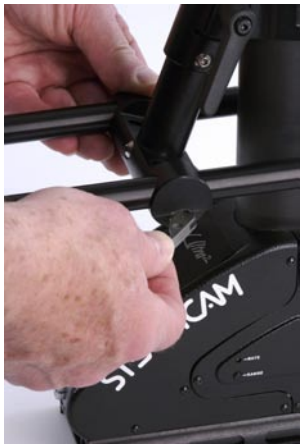
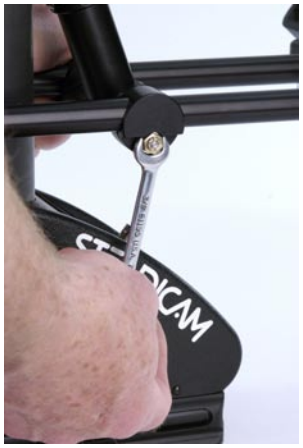
Sometimes it's difficult to get a finger between the tilt head and the clamp lever if the upper post is fully collapsed. In order to get the sled to its absolute minimum length – fighting for every inch – we decided to allow the clamp to ride up "into" the tilt head, where it just fits.
You can always tilt the head fully upwards to get at the clamp, or, as it takes very little force to open the lever, use a small wooden or plastic tool to pry open the lever. An assistant's orange stick or a small plastic screwdriver works well.



However, unless the camera is very heavy or you need the sled as short as possible, we suggest that you normally set up the Ultra^2 with the upper post extended about a half inch or so, which makes the clamp lever accessible with your finger.

Maintenance

The Ultra^2 uses several different toolfree clamps. Although they all come pre-adjusted at the factory, they will have to be adjusted from time to time. The key thing is to tighten the clamps a little at a time; a small change in a clamp's adjustment can produce enormous changes in the pressure on the parts. In general, the clamps should be just tight enough to work.


Use a 3/8ths inch open end wrench to tighten or loosen the lock nut for the monitor rods clamp.
Tighten or loosen in 1/8th of a turn or smaller increments, testing often both for the clamp's holding strength and for the action of the lever.

Monitor mounts

There are two monitor mounts on the Ultra^2, one on post four (the bottom post) and one on post three. The two mounts are identical, and permit a large vertical range of monitor positions. The second monitor mount can be used for securely mounting a gyro, recorder, second monitor, etc.


Inserting the monitor mount

Align the parts parallel and squarely to each other. Note that the bracket is inserted half-way to start, rather than from above and trying to slide down the whole way from the top. The safety pin automatically retracts as you align the parts, and clicks to lock when the parts are aligned. Tighten the Kipp handle hard to secure the monitor bracket.



Smart Motorized Stage

Why the motorized stage is so important for precise operating

This is a crew member's view of the Steadicam operator adjusting the precise balance of the sled using the wireless transmitter — a 3 second exposure! Really!!

Before operators had the Ultra's reliable and precise motorized stage, trimming the Steadicam had to be done before the shot, and the Steadicam's balance was fixed. As Garret Brown has often said, it was a situation akin to that of an airplane pilot landing his plane to adjust the flaps. For precise work, so much depends on the Steadicam's balance. With the motorized stage, that balance can be instantly altered to suit the shot's changing requirements.

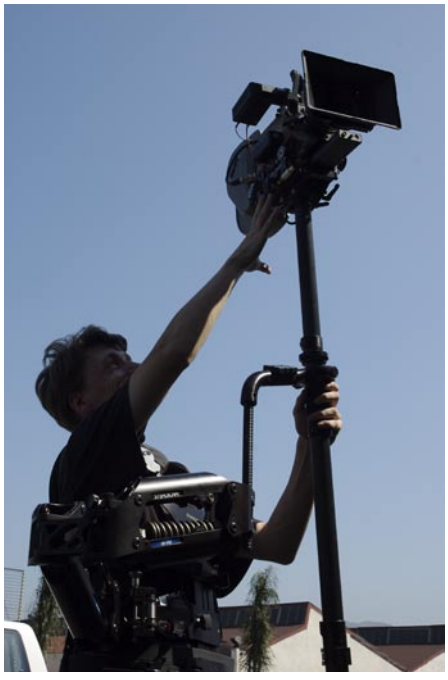
In addition, it is far easier to push a button to tweak the Steadicam's balance than it is to reach up, twist a knob, and wait for the Steadicam to settle to a new attitude. The easier it is to tweak the sled's balance, the more likely it is that the operator actually will take the time to precisely balance the sled.

Some situations where the Ultra^2's motorized stage really helps:

• Anytime you want to trim precisely and quickly, with no change in posture or grip. Includes 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 dangerous to let the sled go with one hand to adjust the sled's balance.



Removing the remote

Whenever you want to hand the remote off to your assistant (or charge the remote's battery), unscrew the knurled ring.

The remote is held in place by two sets of pins. The forward set of pins slips into two small holes, and the rear set of pins are captured in a groove in the knurled ring.

When returning the remote to the handle, insert the pins carefully and do not force anything.

If you want, you can remove the pins and just Velcro the remote to the handle. A "half moon" filler plate is supplied with gimbal so that if the remote is removed, the filler can take its place.

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 any one of the three 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.

Ergonomics

regular

The remote control is ergonomically designed, and it rotates to any angle for your comfort, whether you operate normally or goofy-footed.

goofy

Low mode: Typically, the remote is upside down in low mode. With the Ultra2 you can orient the remote for better low mode operation.

To angle the remote, loosen the small set screw in the curved handle of the gimbal.

Orient the remote by screwing the curved handle in or out. If the handle is too far in, you can't easily remove the remote via the black knurled ring, and you might have to back the handle off one full turn. Loosening the setscrew a lot further and unscrewing the handle is also how you access the "tilt" bearings and shaft for cleaning.

For goofy foot operators, the remote can be inserted upside down keeping the go-to buttons on the "thumb side." You might, however, prefer accessing the go-to buttons with your index finger: i.e., orient the remote as you wish.

"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 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 movement of film in some magazines.

Programming the go-to buttons is a snap. 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...

Note that both fore-aft and side to side positions are programmed via the go-to buttons. Trimming fore and aft may slightly alter your precise 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.

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. 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.

The Tilt Head

The integral, low profile head is designed to alter the lens angle plus or minus 20 degrees 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 Steadicam'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 as much as a few degrees. For example, operators routinely trim their sleds for headroom. This action puts the rig out of both static and dynamic balance.

With the Ultra^2, 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 40).

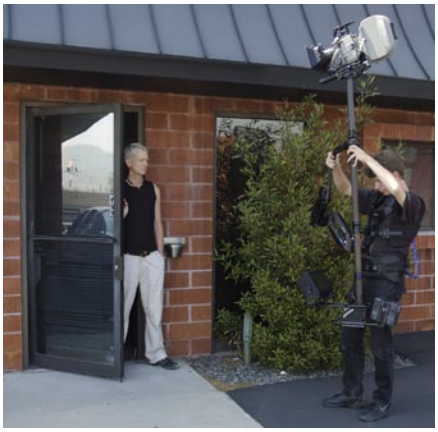
The Tilt Head — General Operating

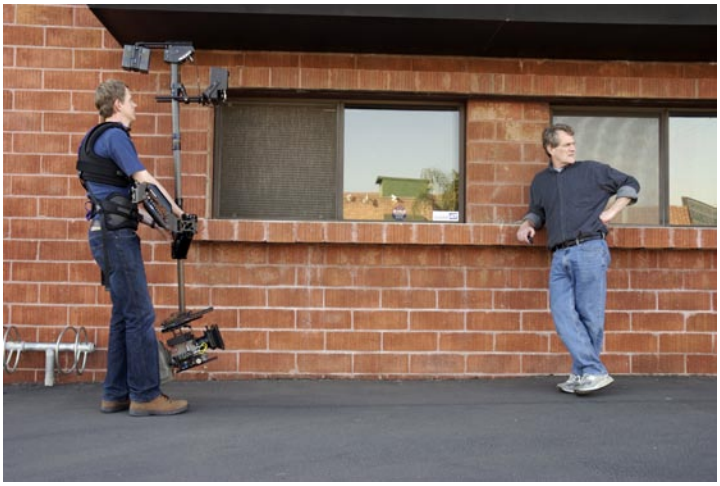
Even if the Steadicam is slightly out of perfect dynamic balance, it's a whole lot easier to hold the post vertical than at any other angle, especially when panning and accelerating - which we tend to do a lot when operating a Steadicam. The tilt head keeps the post vertical in many situations, making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





Maintaining Lens Height — Long Modes

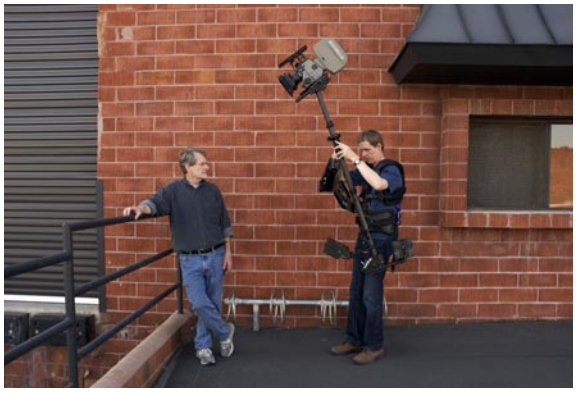
As the operator tilts the sled, the precious super-high (or super-low) lens height gained with an extended telescoping post quickly disappears. The more one tilts, the more rapidly the lens height is lost.

Example 1:
Without a tilt head.

Example 1: Same shot, with a tilt head.
Note that the post is vertical, the lens is higher, and the monitor is in a much better viewing condition.

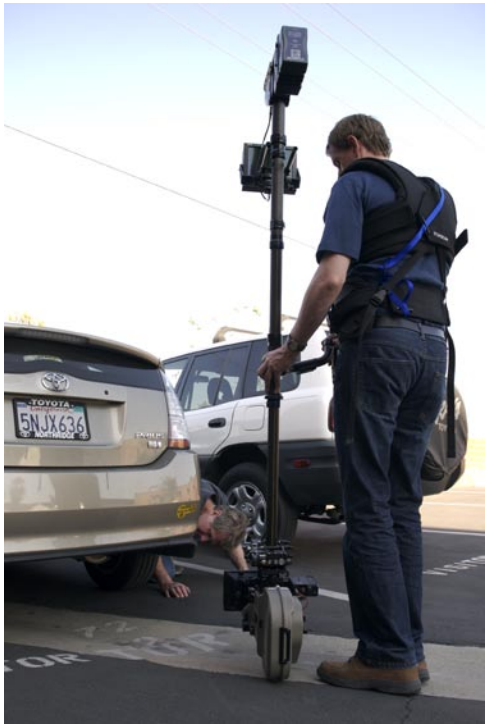
Example 2:
Without a tilt head. The monitor is in a really awkward position now; it even degrades the operator's form.

Example 2: Same shot, with a tilt head.
Again, the lens height is greater with the tilt head.



Other Applications

One of the more unusual applications of the tilt head is to angle the sled and its components relative to the desired position of the lens. Moving the sled relative to the lens might avoid casting shadows into the shot, seeing one's own feet, or prevent the sled from hitting something on the set.



The gimbal

The Ultra^2 gimbal has been completely redesigned with higher-precision, high load bearings. The gimbal body, yoke, and handle are strong and precisely registered to each other. The yoke's new shape and contoured edges extends the range of motion without interference and promotes a better operating grip over a wider range.

The operator can easily center the gimbal in the field – useful if you've taken apart the gimbal for cleaning, taken a really bad bump, etc.

Centering the gimbal

• Place the gimbal on the docking stud (as you would for normal balancing), give yourself a four second drop time (2 or more seconds), and aim the camera along a line through the two bearings in the yoke, as shown in the left photo.

• Balance side to side and fore-aft as precisely as you can to get the post vertical. We recommend you use a bubble level on the stage, and be sure that the tilting head is set 90° to the post (horizontal). Rotate the sled 90° so that the camera is aimed at along the axis of the yoke handle, as shown in the right photo, above. Tweak the fore-aft balance as precisely as you can, then do not touch the stage adjustments for the rest of the procedure.

• Rotate the sled 90 degrees again, as shown below, and test for level. Rotate 180 degrees and test for level. If the sled is level, great. If not, use the "blue whale" tool to loosen one of the two end caps 1/16 of a turn or so, and tighten the other one to the same degree.

• If the sled does not hang perfectly level, move the whole sled "uphill" with the yoke bearings.

• If it gets worse, you chose the wrong one to loosen! If it gets better, keep going until it is perfect. Do not rebalance fore and aft with the stage.

Adust the yoke bearings equally – i.e. loosen one and tighten the other the same amount - and do it in small increments.

Tip: We urge you to test your gimbal's centering with a normal drop time, and then with progressively longer drop times. Go slowly and follow the procedure closely, rebalancing carefully and testing everything as you go. Before you adjust anything, be sure it's not your balancing technique that is causing the problem, or a dangling cable, anything loose on the sled, or the wind. With long drop times, the sled is very sensitive to these shifts and influences.

Blue Whale Tool

A small warning: do not over-tighten the caps against the bearings, as this will cause binding. Just tighten each cap down to touch the bearing. If the bearing starts to bind, just back off one of the two end caps until the gimbal is free again. The blue whale tool also makes it easy to take apart and clean the gimbal if this ever becomes necessary.

The base connectors

- Top center: HDSDI, direct connection to HDSDI connector in stage; no connection to the video DA's. BNC. If your video DA fails, you can use this for a direct connection to the monitor.
- Top left: RCA video in/out for a video recorder. The small slide switch sets in or out.
- Top right: Video out and +14 VDC. 4 pin HRS.
- Monitor connector: power, component video, and communication line. 8 pin Lemo.
- HD component video (RGB). 6 pin Lemo.
- DC Power plug, adjustable +4.5 to +9.5 VDC. Remove plastic cap and use small screwdriver to adjust. Factory set at 7.2 volts.

At the bottom center is the auxiliary 28 and 14 volt, 3 pin Lemo, good for powering gyros or other accessories. The connector can also be used as a power input connector.

If you are not using the HDSDI and/or the HD component lines, you may use them for other purposes, such as a microphone line down the post or speaker wires up the post. However, only use the red or blue component BNC inputs; the green line shares wiring with the standard composite BNC input and is connected to the video distribution amplifier.

Video Matrix and the Frameline generator

The "Video Matrix"

Your analog video in and video out signals — and the superimposed framelines — can be routed in various ways via two switches on the front of the electronics module.

The Matrix has three possible video sources: the camera, the output of the frameline generator (FLG), and the RCA connector if set to "IN."

The Matrix routes a video source to the frameline generator and to any or all of four outputs. The four "final" outputs are the Hirose output connector on the stage, the RCA connector if set to "OUT," the output to the monitor, and the Hirose output on the base.

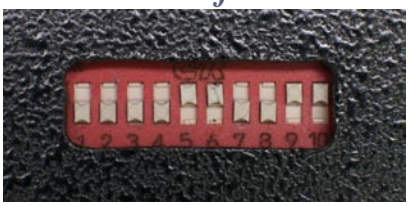
The "In/Out" switch for the RCA jack determines which signal is the main input – either the signal from the camera or from the on-board recorder (or other device) connected to the RCA jack. This switch (called "S2") is the only switch you will normally use.

The other switch, "S1" is a rarely accessed, ten-position DIP switch under the Ultra2 logo on the top of the electronics. Remove the four screws on the panel to access the switch. This group of ten switches allows you to choose which source feeds each "output" – including routing a source signal through the frameline generator, and/or which outputs are terminated.

It's a bit confusing – there are many choices. For most people, the factory defaults will be fine. The engineering matrix follows, but read this text first.

The factory default settings:
0000 1100 11 or
Modes 1, 3a, 4, C or 6, and 7.

What these defaults mean



When the "In/Out" switch is set to OUT, the signal from the camera is sent to the RCA out, the Hirose output on the stage, the Hirose output on the lower electronics, and to the frameline generator. The output from the FLG (i.e., the camera signal and the overlaid framelines) is sent to the monitor; thus only the monitor will display the framelines.

When the "In/Out" switch is set to IN, the signal from the on-board recorder is routed to the monitor only and not sent to other outputs. This restricts your playback of your shots to your monitor. The camera continues to feed the two Hirose outputs. The RCA out is defeated (it's the input!!)

Choices, choices — It's time to look at the video matrix

The default settings are 0000 1100 11 or Modes 1, 3a, 4, C or 6, and 7. Both Hirose outputs and the RCA output are terminated. These settings route the sources to the outputs as explained above, depending on the position of the RCA IN/OUT switch.

When the RCA switch set to OUT, you have five choices (and many combinations of those choices) – "modes" 1 – 8 on the chart. It is possible to send the signal from the camera directly to any combination of the four outputs, or via the FLG (i.e., with framelines added), to any or all of the four outputs as you wish.

If the RCA switch is set to IN, you have four other choices (Modes A, B, C (the default), and/or D), where you can choose to send the RCA input signal directly to the monitor, to either or both Hirose connectors, and/or to those outputs via the FLG with added framelines. Your choice.

Some modes are mutually exclusive. Other modes can "toggle" as you change the "In/Out" switch from in to out. Again, it's your choice.

An alternate for the dip switch settings, 1010110011, enabling modes 2, 3b, 4, 6 or C (via S2), and 7.

Some alternate, "typical" ways to use the Video Matrix:

With the In/Out switch set to OUT:

- **If you do not want framelines on the signal going to the monitor,** turn switch S1-5 to "0" or OFF (mode 5). The default for this switch is "1" or ON (mode 6). Modes 5 and 6 are mutually exclusive.

- **If you want to send your framelines to "video village" while shooting**, you will want the camera signal to output to the FLG (S1-4 OFF, the default) and switches S1-1 and S1-7 to ON (modes 2 & 8). The defaults for S1-1 and S1-7 are OFF (modes 1 & 7). Modes 1 and 2 are mutually exclusive, as are modes 7 and 8.

- **If you want framelines added to your recording via the RCA output**, turn switch S1-3 ON (mode 3b). The default is S1-3 OFF (mode 3a). Modes 3a and 3b are mutually exclusive.

With the In/Out switch set to IN, modes A, B, C, and/or D become available.

- **Mode C (and only mode C) is the default, with Switch S1-6 set to ON. Mode C sends the signal from the RCA input only to the monitor.** Depending on the position of switch S1-5, the C mode will toggle between mode C and mode 5 (S1-5 OFF) or mode C and mode 6 (S1-5 ON). Mode C and mode 6 is the default combination.

- **It is unlikely that you would use mode "B" – routing the RCA input through the FLG, but it's possible – with switch S1-4 set to ON.** Suppose you were running an HDSDI signal directly to the monitor, and chose to have a downconverter mounted near the monitor. Then with the RCA jack set to IN, you might want to send the signal to your video transmitter and/or to a recorder, and you might want to add framelines to those signals. Modes B and 4 are mutually exclusive. Mode 4 is the default, with the signal from the camera feeding the FLG.

- **Mode A is slightly more likely to be used (S1-2 set to ON).** The input signal from the RCA jack is sent directly up the post to the stage's Hirose output. Mode 1 is the default (S1-1 OFF).

- **Mode D sends the RCA input signal to the Hirose connector on the electronics (S1-8 ON).** Mode 7 is the default (S1-7 OFF).

Note: Without the FLG installed, modes 2, 3b, 4, B, 6, and 8 are not available – i.e., you can't send a signal to a non-existant FLG and then on to any output.

800-0004 VIDEO SWITCHING MATRIX

S1-1	S1-2	S1-3	S1-4	S1-5	S1-6	S1-7	S1-8	S2	MATRIX SWITCHED	Comments
0	0							IN / OUT	1	
0	1							IN	A	See Note 1.
0	1							OUT	n/a	
1	0							IN / OUT	2	
1	1							IN	n/a	
1	1							OUT	n/a	
		0						OUT	3a	See Note 1.
		1						OUT	3b	See Note 1.
			0					IN / OUT	4	
			1					IN	B	See Note 1.
			1					OUT	n/a	
				0	0			IN / OUT	5	
				0	1			IN	C	See Note 1
				0	1			OUT	5	
				1	0			IN / OUT	6	
				1	1			IN	C	
				1	1			OUT	6	
						0	0	IN / OUT	7	
						0	1	IN	D	See Note 1.
						0	1	OUT	n/a	
						1	0	IN / OUT	8	
						1	1	IN	n/a	
						1	1	OUT	n/a	

VIDEO SWITCH MATRIX

VIDEO OUTPUTS

VIDEO SOURCES	STAGE VID OUT (HIROSE)	RCA OUT (VIA S2)	FLG IN	MONITOR OUT	BASE VID OUT (HIROSE)
STAGE VID IN	1	3a	4	5	7
FLG OUT	2	3b		6	8
RCA IN (VIA S2)	A		B	C	D

DEFAULTS HIGHLIGTED IN YELLOW
OPTIONS HIGHLIGHTED IN GREEN
N/A OPTIONS HIGHLIGHTED IN BROWN

S1-1 and S1-2 control modes 1, 2, and A

S1-3 controls modes 3a and 3b

S1-4 controls modes 4 and B

S1- 5 and S1-6 control modes 5, 6, and C

S1-7 and S1-8 control modes 7, 8, and D

S1-9 controls termination of Stage video

S1-10 controls termination of RCA video

S2 controls "IN/OUT" of RCA connector

Notes:
1: Modes 3a or 3b cannot be active at the same time as modes A, B, C, or D.
2: S1-9 = STAGE VID OUT 75ohm termination switch. Default = ON = terminated.
3: S1-10 = RCA VID 75ohm termination switch. Default = ON = terminated.
4: Factory default switch positions are 0000110011.
I.e. modes 1, 3a, 4, 6 or C (via S2), and 7

How to set up your frameline generator

The four buttons on the frameline generator control the framelines, crosshairs, on-screen horizon position, and battery indicator position, as well as the frameline style, crosshair style, graphic brightness, graphic elements on or off, and two stored frameline and graphic presets.

We suggest you print out print out these pages (or the two "FLG instruction" PDF files on the Ultra^2 CD) and keep them with the Ultra^2 at all times.

	Frameline Mode Descriptions	MODE ENTRY REQUIREMENTS				KEY FUNCTIONS WHILE IN MODE			
#	MODE	UP	DOWN	LEFT	RIGHT	UP	DOWN	LEFT	RIGHT
1	Recall Frameline Position #1	>2 sec.							
2	Store Frameline Position #1	>4 sec.							
3	Recall Frameline Position #2				>2 sec.				
4	Store Frameline Position #2				>4 sec.				
5	FLG On/Off			>1 sec.					
6	Graphics On/Off		>1 sec.						
7	Cross Hair position			>1 sec.	>1 sec.	Move UP	Move DOWN	Move LEFT	Move RIGHT
8	Horizon position			>2 sec.	>2 sec.	Move UP	Move DOWN	Move LEFT	Move RIGHT
9	Battery position			>3 sec.	>3 sec.	Move UP	Move DOWN	Move LEFT	Move RIGHT
10	Graphics Brightness	>1 sec.		>1 sec.				DECREASE all	INCREASE all
12	Lower & Left Frameline position		>1 sec.	>1 sec.		Move UP	Move DOWN	Move LEFT	Move RIGHT
13	Upper & Right Frameline position	>1 sec.			>1 sec.	Move UP	Move DOWN	Move LEFT	Move RIGHT
14	Frameline style select		>1 sec.		>1 sec.	Style #1	Style #2	Style #3	Style #4
15	Cross Hair style select		>2 sec.		>2 sec.	Style #1	Style #2	Style #3	Style #4
16	EXIT	X	X						
17	Factory Reset	X	X						

The charts tell you how it all works — here's one example. Suppose you want to move the position of the horizon display. You enter the horizon position mode by simultaneously pushing down the left and right buttons for about two seconds. The horizon graphic will pulse on and off. You move the graphic UP, DOWN, LEFT, or RIGHT by pushing the appropriate button.

If no buttons are pressed for several seconds, the FLG will exit the horizon position mode. You could also press the up and down buttons simultaneously to exit the programming mode.

You can store the current settings for the framelines, crosshair, horizon, and battery by holding down the UP button for about four seconds. "SET #1" will be displayed on the screen for one second. If you change something and want to return to these settings, just push the UP button for about 2 seconds — "PRESET #1" will be displayed on screen for one second. Note the little "1" symbol by the upper button.

The second preset is controlled by the RIGHT button — it's also marked "2."

	Frameline Mode Descriptions	IN-MODE INDICATION DISPLAYED ON SCREEN	MODE EXIT REQUIREMENTS	COMMENTS
#	MODE	"*" displayed in top center of screen while in any mode		
1	Recall Frameline Position #1	"RCL 1" confirmation displayed on screen for 1 sec.	n/a	All position #1 settings recalled and displayed for Frameline, Cross Hair, Horizon, and Battery
2	Store Frameline Position #1	"SET #1" confirmation displayed on screen for 1 sec.	n/a	All position #1 settings stored for Frameline, Cross Hair, Horizon, and Battery
3	Recall Frameline Position #2	"RCL 2" confirmation displayed on screen for 1 sec.	n/a	All position #2 settings recalled and displayed for Frameline, Cross Hair, Horizon, and Battery
4	Store Frameline Position #2	"SET #2" confirmation displayed on screen for 1 sec.	n/a	All position #2 settings stored for Frameline, Cross Hair, Horizon, and Battery
5	FLG On/Off	Frameline display is toggled on and off	n/a	Frameline OSD is toggled on and off.
6	Graphics On/Off	Horizon, Cross Hair, and Battery OSD's are toggled on and off.	n/a	Horizon, Cross Hair, and Battery OSD's are toggled on and off.
7	Cross Hair position	Cross Hair graphic pulses on and off	Timed-out if no buttons pressed or activate EXIT mode	Cross Hair graphic can be moved anywhere on screen.
8	Horizon position	Horizon graphic pulses on and off	Timed-out if no buttons pressed or activate EXIT mode	Horizon graphic can be moved anywhere on screen.
9	Battery position	Battery graphic pulses on and off	Timed-out if no buttons pressed or activate EXIT mode	Battery graphic can be moved anywhere on screen.
10	Graphics Brightness	Entire frameline graphics pulses on and off	Timed-out if no buttons pressed or activate EXIT mode	Brightness adjustment of OSD graphics.
12	Lower & Left Frameline position	Lower and Left frameline graphic line pulses on and off	Timed-out if no buttons pressed or activate EXIT mode	Framelines can be moved anywhere on screen.
13	Upper & Right Frameline position	Upper and Right frameline graphic line pulses on and off	Timed-out if no buttons pressed or activate EXIT mode	Framelines can be moved anywhere on screen.
14	Frameline style select	A selection of frameline styles will be shown on the screen.	Frameline style changes to selected pattern after button press.	Selection between 1 of 4 pre-determined Frameline line graphics.
15	Cross Hair style select	A selection of cross hair styles will be shown on the screen.	Cross Hair style changes to selected pattern after button press.	Selection between 1 of 4 pre-determined Cross Hair graphics.
16	EXIT	n/a	n/a	Exit all modes and returns to main display.
17	Factory Reset	n/a	n/a	With both buttons pressed at power up, system is reset to factory default settings.

Volt/amp meter

When either a 12V or 24V low battery condition is detected a small battery symbol on the backlight voltmeter will flash, and the LED's on battery mount will blink when the user set low battery threshold is reached.

The volt/amp meter has four different viewing modes selected by the "MODE" button on the port side of box. The meter will automatically change the information shown on each mode when you change from 24 to 12 volt operation.

For 24V operation, including setting the low battery threshold:

Mode 1 or "V1" (the top LED) will display 24V battery voltage. Alternately it will display what the low voltage threshold is set to via the user accessible pot marker "24T" on the rear of the box. The 24V low voltage threshold display is selected by being in mode 1 and switching the user accessible switch on the back of the box to the "24T" position and adjusting the pot. The 24 volt low battery threshold is factory set to 29.6 volts.

You might want to set this higher if running a high amperage draw camera like the Arri 435 ES running at high speeds; see page 32 for details on your batteries.

Mode 2 or "A1" will show the current (amps) being drawn from both batteries.

Mode 3 or "V2" will show the voltage from the DC-DC converter. (Typically around 14.4 to 14.6VDC)

Mode 4 will show what ever is selected on the voltage switch select switch.

For 12V single or dual battery operation, including setting the low battery threshold:

Mode 1 or "V1" (top LED) will display the 12V battery voltage.

Mode 2 or "A1" will show the current being drawn from the 12V supply.

Mode 3 or "V2" will show the voltage from the front panel accessory voltage supply.

Mode 4 will show what ever is selected on the voltage switch select switch.

The Voltage Select Switch (for Mode 4):

"ACC. V" = Voltage from front panel accessory connector.

"12T" = low voltage threshold for 12V. Set via the "12T" pot on rear of box.

"12V" = Voltage from DC-DC converter in 24V mode, or the voltage directly from battery in 12V mode.

"12A" = Current (amps) from DC-DC converter in 24V mode or the current directly from battery in 12V mode.

The Artificial Horizon

Adjustments, and displays

The Ultra^2 artificial horizon has three controls – a button and two rotary switches. The button on the top of the electronics base controls the zero offset, direction, type of display, and horizon on/off. The switches are accessible via holes on the port side of the base. One switch controls the "range" of the display and the other the "rate."

The button on top

Pushing the button for less than 1 second will reset the sled level (sets the "zero offset").

Place a small bubble level on a surface parallel to the bottom frame of your camera (usually the dovetail plate works well). Angle and hold the sled until this bubble reads level, then push and release the horizon button quickly. The display should now read "level."

Pressing the button for more than one second but less than three will flip the display direction – useful for going to low mode and back. The center two LED's on display will flash to confirm that a mode change has occurred. Be sure to re-set the zero offset when going to low mode and back.

Pressing the button for three to five seconds will switch the LED display from bar graph mode to "night rider" dot mode. Again, the center two LED's on the display will flash to indicate that a mode change has occurred.

Pressing the button for five to thirty seconds turns horizon system off or on. All LED's will be off.

Pressing button for more than 30 seconds resets everything to default values.

Level

Off-level, "Night-Rider" mode

Off-level, "Normal" mode

Choosing a Range

The range switch sets the sensitivity of the display. The smaller the range, the more sensitive the display will be. The default setting is “0” or +/– 5 degrees. We suggest you experiment with settings 1 through 6. The range choices beyond 5 degrees might be useful if one wanted to hold a specific Dutch angle. Setting “F (15)” is the full range of the sensor.

Range Choices

Setting	+/- Degrees
0 (default)	5
1	2
2	2.5
3	3
4	3.5
5	4
6	4.5
7	5
8	5.5
9	6
A (10)	6.5
B (11)	7
C (12)	8
D (13)	9
E (14)	10
F (15)	180

The range switch interacts with the rate switch. Typically, the smaller the range, the less integration you will need. Ranges or rates significantly larger than the default values are not typically used.

Setting a Rate

The rate switch sets the integration (or averaging) time. The longer the integration time (the lower the frequency or Hz), the slower the system responds. A longer integration time avoids the big, erroneous signals as you accelerate or decelerate. The faster the integration time, the more the indicator will jump around. Experiment and pick the “rate” you like.

There are sixteen positions, from zero to nine, and A through F. The default setting is “0” which equals 5Hz, a good compromise. Position one (.75Hz) has the most integration and slowest response. Position F has the least integration and fastest response.

Rate Choices

Low Pass filter settings (6-Pole IIR filter)

Setting	Hz
0 (default)	5
1	0.75
2	1
3	2
4	3
5	4
6	5
7	6
8	7
9	8
A (10)	10
B (11)	12
C (12)	13
D (13)	16
E (14)	18
F (15)	40

PowerCube™ batteries and rotating mount

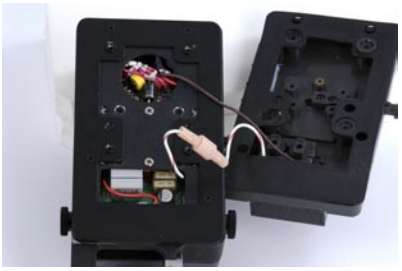
The PowerCube batteries are6.0 Ah, 14.8V. Please read the literature that comes with each battery and charger for details.

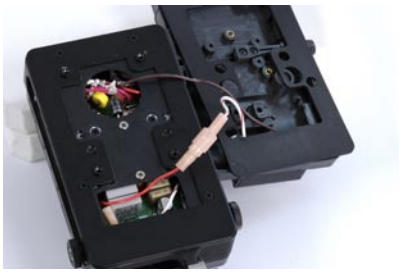
Generally we use the battery in pairs, generating (nominally) 29.6VDC. It's best to use batteries that are roughly equally charged. Both batteries power the 14.4 volt DC to DC converter nestled between the batteries.

The on-off switch has two positions, 12 and 24 volts. In the 12 V position, only the rear battery is connected and the DC-DC converter is disconnected. For a lightweight, 14 volt running rig, you might want to remove the forward battery, and/or use one Endura 7 battery. (Use two 7's for a lightweight 24 volt rig).

For use with the Panavision® Genesis® (a 12 volt, high amp draw camera), it's possible to change a jumper so that both batteries provide power to the camera.

Remove four screws that hold the forward battery mount.





Normally, the red stripe wire is connected to the other red stripe wire (for 24 volts and 14 volts via the converter or 12 volts via the rear battery). Carefully pull apart the connectors, and pull out the solid red wire. Connect the solid red wire to the red stripe wire. This will connect the two batteries in parallel and disconnect the converter from the circuit. 24 volts is not possible with only two batteries in this mode.

However, if you also want 24 volts in this 12 volt/parallel mode, a third PowerCube battery can be added via an accessory IDX battery plate and special plug for the auxiliary power connector.

The LEDs on the battery mount will blink when the low battery threshold is reached. This feature will only work when FLG/Voltmeter box is installed (see page 28). The circuit breakers in battery mount are the standard automotive type.

The battery mount pivots approximately 180º to facilitate static and dynamic balancing, 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.

Discharge rate

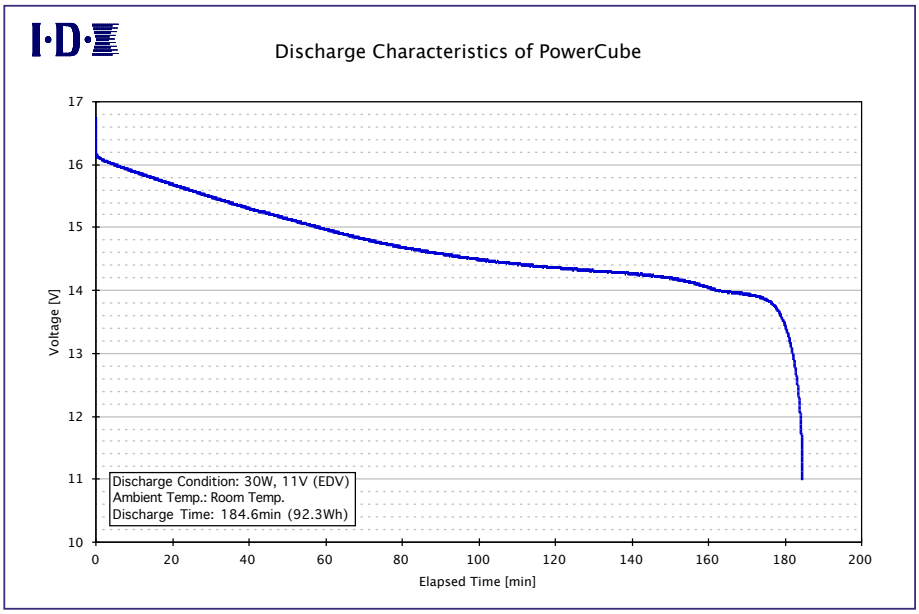
As your Lithium-Ion PowerCube™ batteries are used, the voltage drops at a fairly regular rate. However, the sample 30 watt discharge chart shows some interesting information. Hot off the charger, a single battery will read 16.8 volts, but within a minute drops to 16.1 volt when under load. This is normal, 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.

Based on this discharge curve, we suggest you set the Ultra's battery warning at 13.8 volts if your total load is about 30 watts and 8 minutes is enough warning time.

If you are working with 24 volt film cameras, where the load changes when the camera runs, you might set the battery warning higher, to 28.2 or more volts for the two batteries in series, again depending on the load, how much warning you need, etc. 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. See page 28 to see how to set the battery warning.

When running electrically noisy, or high current draw cameras or accessories, low voltage indicators may briefly appear. Voltage sag due to the large loads or excessive noise spikes on the power lines may surpass the threshold settings.



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.

If you have two of the VL-4S chargers, split the batteries equally between the chargers. Although 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.

Supplied Accessories

	part number
Camera mounting dovetail	252-7410
Blue Whale gimbal tool	800-7114
Gimbal transmitter	800-7150
Gimbal battery recharging cable	800-0101
Hard Case for sled	011-0355

8.4” UltraBrite HD monitor	800-7500-01
Power/Video cable for HD monitor	800-0102
Monitor Hood	252-7565

Ultra^2 vest	800-7800-02

Soft vest bag	078-5237
Hard case (vest and arm)	011-0330

G-70 arm	800-7800-02
Soft arm bag	078-5236
G-70 anti-backlash tool	802-7265
T-handle 1/4” Allen wrench	MSC-093260
G-70 operating manual	LIT-800720

Docking bracket	752-7910
6 PowerCubeTM Batteries	FFR-000035
IDX VL-4S battery charger	FFR-000008
Battery hard case	011-0368
Stabilizing system: VectranTM line	

3 ft video cable	078-4122-01
12v accessory cable	250-0045
24v Power cable, open end	250-0046
Ultra^2 product guide	DVD-200502
Bag, tool kit	FFR-000013
Pot adjust tool	MSC-104213
Allen wrench pocket tool	MSC-150890
Screwdriver	MSC-191115
Saddle bag/sand bag	FFR-000014
Steadicam logo cap	FFR-000021
Spare ratchets with hardware	
Camera mounting screws, 1/4-20 and 3/8 - 16	

Recommended Cables and Accessories

Spare power/video cable for HD monitor 800-0102
Spare gimbal battery recharging cable 800-0101
Spare 3 ft video cable 078-4122-01
2 spare 12 ft video cables
Spare 12v accessory cable 250-0045
2 each of all camera power cables you will use various

2 HD component cables, camera to sled
2 HD component cables, sled to monitor

Slanted F-bracket and safety pin 252-7906
Low mode handle clamp 078-7393-02
12 inch long arm post 252-7202-2
5 inch long arm post 252-7202-4

Camera mounting dovetail 252-7410
Ultra^2 rod weights 800-7617
Follow focus rod mounting hardware and rods 250-7915

IDX VL-4S battery charger FFR-000008
Tape measure
Many spare 1/4-20 and 3/-16 camera screws 078-1121/078-1122

monitor fuse
Mitchell mount adaptor 800-7902
Triax adaptors
Fisher 250-7837-01
Kings 250-7837

Also:

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

Cases & packing

When repacking the sled into the case, Insert the monitor first, with the rods angled up. Be sure that the sled length and gimbal position are properly set so that the sled drops freely into place, then rotate the monitor rods down into their final position.

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.

The hard sled and vest cases have wheels and a retractable handle.

Soft bags are provided for the arm and for the vest, but you should also use the hard case when shipping your gear. Many other accessories are shipped in the battery case. Most operators have several other cases for their accessories, tools, low mode brackets, video recorders, video transmitters, diversity receivers, remote focus equipment, etc.

Attaching the Camera

The basic idea: We want to position the camera's center of gravity about .75 inch 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 39.

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 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.

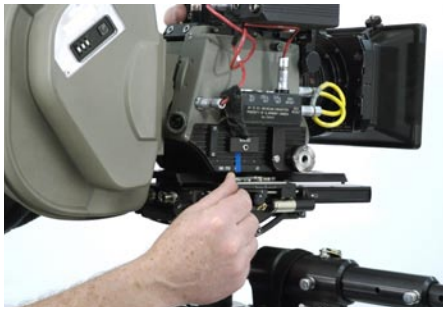
Place the camera above the camera mounting platform. Be sure the locking lever is fully open. Angle the left edge of the dovetail into the holder. Be sure to keep everything parallel. Lower the right side into the holder.

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 behind the centerline of the telescoping posts. Post #2 is 1.580 in diameter, so you can use the back of the post as a guide for placing the camera c.g.

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.

Push firmly.

The dovetail locking lever has three positions (see page 8): 60º 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, but it cannot be released. All the way forward is the locked position.

Sliding the camera with the locking lever at 90 degrees. With the locking lever in this position, the dovetail can slide but cannot be removed.

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, Velcro, 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.

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

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

Static Balancing

First, extend the posts and position the monitor where you want it, then find the proper position for the battery and camera for static and dynamic balance.

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. The gimbal should be near the top of its post.

First we must position the monitor to the best possible advantage. We want to be able to see the image and we want it to create the proper balance and inertia for the shot.

Extend the monitor horizontally to increase pan inertia.

Bring the monitor closer to the post for a quicker, “hand-held” feel.

Lower the monitor and/or extend the posts to balance a heavy camera, gain lens height, and/or to increase tilt and roll inertia (or all three!!).

The posts and the monitor bracket should all be properly aligned. Check the index marks on the posts. Release the proper clamp and rotate any section that is out of alignment.

For normal operating

Mount the gimbal on the balancing stud. Even if your C-stand has plenty of sand bags, it’s a good idea 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.

With the camera and monitor set, release the two battery rod clamps and pull out the battery until the sled balances upright. Balance as best you can with the battery – do not move the camera or monitor – then tighten the battery rod clamps.

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 1/2 inch and lock the gimbal.

Now let the sled rotate (drop) through vertical and note the time. A two second drop time is a good starting point. 2 to 4 seconds is typical. Raise or lower the gimbal slightly to get a faster or slower drop time. (Again, only release the gimbal clamp when the rig is horizontal!!) A different drop time is required for long mode shooting. See pages 52-53 for details.

To fine tune fore-aft and side to side balance, use the knobs on the camera mounting stage, or use the remote control.

When the sled is very bottom heavy, it has a quick drop time and it will require bigger movements of a weight (camera or battery) to properly balance the sled. When the sled is nearly neutrally balanced top to bottom, very slight movements of any component will have a large effect on balance.

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

Working with a Very Light Camera

With a fully compressed sled and a very light camera, the gimbal can get very low, causing the arm to hit the electronics module.

Tip one: You can raise the gimbal by raising the monitor while leaving the sled length the same. Release the clamps at the top of posts three and four and slide post three up to the gimbal. Lock post three in place, and then lock post four to maintain the minimal sled length. Move the upper monitor mount to the top of post 3, and attach the monitor.

Re-balance top-to bottom.

An alternative solution (tip two): Raise the c.g. of the sled – and therefore the gimbal – by raising post number one. This makes the whole sled a little longer and raises the lens height slightly. Either way, the gimbal moves away from the electronics module.

Tip three: Add weight to the top of the camera.

Tip: To speed up the process of side to side and fore-aft balancing, hold the sled vertical with your operating hand on the gimbal. Hold the gimbal the same way you would do while operating. 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 remote) until you feel no pressure on your operating hand, and the sled will be in static balance.

Dynamic Balancing

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 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.

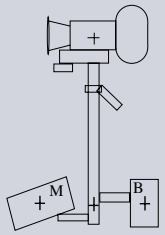
Dynamic balance can easily and quickly be achieved by the trial and error method. You can also use the Dynamic Balance Spreadsheet on your computer.

In all cases, when a sled is in dynamic balance, both the camera's c.g. and the battery' 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.

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. Position the camera so that its c.g. is about .75 inches (19mm) behind the center post. The center post is 1.580 inches in diameter, so you can use the back of the post as a guide.

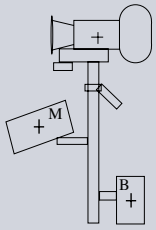
Three figures to study for understanding dynamic balance

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.



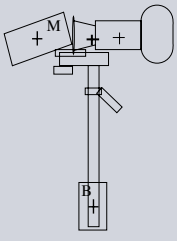
The second figure has the monitor raised a bit. This looks like most Steadicam configurations, high or low mode. Note that the battery c.g. is closer to the post, and the camera c.g. has moved to the rear. Why?? See the third figure.

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 Ultra^2 (and most Steadicams), the monitor is always raised above the battery. Therefore camera is always to the rear of the centerpost.

It typically works out that the camera c.g. is pretty close to .75 inch 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.



Next, static balance with the battery so the sled hangs perfectly vertical fore and aft. Use a slow drop time (3-4 seconds).

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. Double check that the post is perfectly vertical. Give the sled several careful test spins. Very important: do not spin the rig very fast – certainly not any faster than your usual panning speed.

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 – not the monitor or camera! – 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.

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 to the sled 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 Dynamic Balance Primer and play with the Dynamic Balance Spreadsheet included on the Ultra^2 CD, or available at www.steadicam.com..

Three tips:

- The monitor pivots close to its center of gravity, so changing the angle of the monitor will not affect dynamic balance.
- The tilting head nearly preserves the camera's center of gravity, so tilting the camera also has very little effect on dynamic balance.
- Changing lenses or adding accessories to the camera (or even changing cameras) will not mess up your dynamic balance. Just re-balance statically (rack the camera) and you will be back in dynamic balance.

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

Spinning a bit wobbly. Looking good!

Inertial control

Always remember to make the Steadicam's balance and inertia work for you, not against you.

All Steadicam sleds work (in part) because various masses are added to and mounted away from the camera, which slows down the camera's angular response to external forces.

Our primary tool for inertial control is extending or compressing the centerpost and/or the battery, monitor, and other components. The "moment of inertia" generated by each component is a function of its mass (weight) times the square of its distance to the center of rotation (the gimbal). Doubling the distance creates four times the inertia.

Positioning masses away from the gimbal will increase inertia, while bringing them closer to the gimbal (the point of rotation) will reduce inertia.

In general, the "bigger" the sled is, the slower its rotation and the more stable it will feel.

Extending the center post will slow down the rig's angular response in tilt and roll, while extending the battery and/or monitor will slow down the rig's response in tilt and pan.

Reducing the length of the post or bringing in the battery and monitor will make the rig rotate more quickly on those same axes.

If you want a quick, fast panning and tilting rig, bring the masses in as close as possible to the gimbal. If you want a slow rig, or need the shot to be as stable as possible, spread the masses far apart. Every time you move one component, other things happen with static and dynamic balance and with viewing and clearances and stability.

Ultra^2 at maximum horizontal extension.

To get one effect or benefit you may have to sacrifice performance in some other area. For instance, changing the post length also will have some effect on the lens height (although a lot less than the post extension), and the position of the gimbal relative to the camera mounting stage or the electronics module.

Experiment to become familiar with all that happens as you move components around. Although the sled is stabilized in all three axes, the sled is most stable or inert in the tilt axis. This is the consequence of an important, early design consideration, which was to get the Steadicam close to the body and to make panning the Steadicam as easy as possible.

Some actual numbers

The monitor and yoke weighs approximately 4.8 pounds. The two batteries, the mount and the converter weigh 4.6 pounds.

In the maximum configuration, the monitor's c.g. is extended 17 inches, the battery pack's c.g. is extended 16 inches, creating a total of about 2,564 pound inch^2 in the pan axis.

In the minimum configuration, as shown, the monitor is extended 5 inches and and battery 5.5 inches, creating only 259 pound inch^2 — almost 10 times less angular resistance in the pan axis. We love the square law!!

If you remove one battery for a 12 volt rig, flip the battery down, and push the battery pack all the way in, you can reduce the pan inertia even further - to 139 pound inch^2!

Ultra^2 at minimum horizontal extension.

Minimum pan inertia with one battery.

Lens height and the telescoping post

Just how high or low a lens height can you get?

As a rough estimate, in high mode you should be able to get a lens height of about 7.5 feet. If you are tall or using a light camera, a lens height of 8.5 to 9.5 feet is not impossible.

Maximum lens height

To get the maximum possible lens height with any camera:

- Extend the bottom two sections (posts #3 and #4)
- Fully lower the monitor all the way down on its section (post #4).
- Position the gimbal at the top of its section (post #2).
- Raise the camera from the gimbal by extending the upper section (post #1) until the rig is in static balance. The lighter the camera, the more you can extend it from the gimbal and raise the lens. An assistant is useful for this operation, or grab the battery with your legs as shown.

To gain additional gimbal and lens height, use one of the provided long arm posts in the arm and also position the socket block as high as you can on your vest.

If you can carry additional weight, add it to the bottom of the sled via the integral dovetail. Then raise and rebalance the camera.

This arrangement of components creates the maximum distance between the counterweights (battery, electronics, and monitor) and the gimbal (the pivot or balance point), which enables you to push the camera c.g. as far as possible from the gimbal.

But how high can one get the lens?

Alas, the answer isn't easy. The exact lens height you can achieve with the Ultra^2 depends on your height, the camera weight, and how much additional weight you are willing to carry at the bottom of the sled.

A useful accessory: specially made stainless steel rods that fit perfectly inside the battery rods. The two rods weigh .75 pounds and screw tightly into place. The low position help keep the sled shorter (or the gimbal lower) and the battery in slightly as well.

Lens Height – Camera Weight and the Facts of Life

Using a heavy camera makes it hard to gain a lot of additional lens height via the telescoping posts. Using a BL IV or similar very heavy camera will be frustrating. And it's heavy!

If you want to get a really high or low lens height, you must use a lighter camera.

The maximum theoretical lens height that one can achieve with the Ultra^2 is about 48 inches (122 cm) up from the gimbal. You first set the gimbal at the bottom of post 2 with the rig fully expanded. Place the monitor as low as it can go and flip the battery downwards. This gimbal placement generates a lens height of about ten feet 5 inches (320cm), but it requires a very, very light camera, and/or a very heavy counterweight, and/or a clever use of Antlers™ as an additional counterweight as shown in the photo (with an original Ultra).

Establishing the primary gimbal height range with the shortest post in the arm.

Note that the operator can reach higher with his operating hand, but the arm can't reach any higher. Do this with the arm attached to the socket block at its lowest practical point on the vest, and with the shortest possible arm post. This will generate your primary range of gimbal heights. You may find it useful to have someone measure this range of lens heights.

Lens Height — High Mode

Normal range for high mode with short arm post. Range is different if operator is taller or shorter.

The range of the G-70 arm is 32 inches. If, while wearing the rig, you stretch up a bit while booming up and scrunch a little while booming down, the boom range is about 34-35 inches.

You can change your lens heights in many ways

The basic tools are: raising the socket block, using longer arm posts, using an F-bracket, making the sled shorter or longer, flipping to low mode, and any combination of these techniques. Each technique has its advantages and disadvantages; it's up to you to decide which technique works best for the shot.

One easy way to shift the arm's boom range is to raise the socket block on the vest. It's not a big change (3.5"), but it might be just enough and there's no real operating penalty or compromise.

Another easy way to raise lens heights is to use a different length post in the arm. The longest post you should use is 12 inches. A longer post will put huge stresses on the arm, and you can't reach higher and operate at the gimbal anyway.

You can also extend the telescoping post and balance the rig with the camera further from the gimbal. How much of an increase in lens height you get depends on how heavy the camera is, and how much weight you are willing to add to the bottom of the sled. This mode is often called “super-high mode” or “long high mode.” It depends on the level of hype you want to use.

Heavy cameras in long mode (high or low) will be disappointing. There is very little additional lens height for a huge increase in sled length. Light cameras are Steadicam friendly in many, many ways.

Sleds longer than 6 feet are impractical to carry, don’t fit through doorways, limit boom ranges, and are hard to control.

Low high mode

We can use the F-bracket in high mode to lower the range of lens heights. It’s sometimes called “low high mode.” How low we go is often a function of how low we can reach.

Lens Height — Low Mode

Low mode and long low mode radically change the range of lens heights we achieve.

We typically use the F-bracket to bring the arm back into a proper relationship with the sled so we can pan, tilt, and make switches without hitting the camera. A longer post from the F-bracket to the gimbal is impractical. Even with the shortest possible post, one cannot reach the gimbal at the bottom of the G-70 arm’s range. A longer post only lowers the maximum height you can reach.

In low mode, we typically raise the socket block and add longer posts to raise the range of heights and restore the full boom range of the arm. If we don’t use these techniques while in low mode, we cannot reach the gimbal at the bottom end of the arm’s range, and therefore we are wasting precious boom range.

A long post in “normal length” low mode may make the arm interfere with the sled again, so you must test how long a post you can use.

Very long low mode configurations don’t require an F-bracket for clearance. Not using an F-bracket is just another easy way of raising the range of lens heights.

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 optional slanted F-bracket (P/N 252-7906) to the gimbal.
- Rebalance the sled, both statically and dynamically.
- Re-set the electronic level.
- You also might change the 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 252-7410) to the top of the camera.

A low mode handle clamp (P/N 078-7393-02) 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 mags or any other camera functions.

Remove the monitor mount and flip to low mode

Always support the monitor. Loosen the Kipp handle, depress the safety button, and slide the monitor bracket straight up or down. To replace, engage the monitor bracket with the dovetail squarely and slide it down until the safety clicks in. Tighten the Kipp handle. The monitor will be square to the post.

By design, the monitor flips on its c.g., preserving dynamic balance — if the sled's length isn't changed.

Balance the Steadicam

The sled can be balanced the same as in high mode. Hang the rig by its gimbal on the balancing spud. 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 move the gimbal toward the ***electronics*** to achieve a proper drop time.

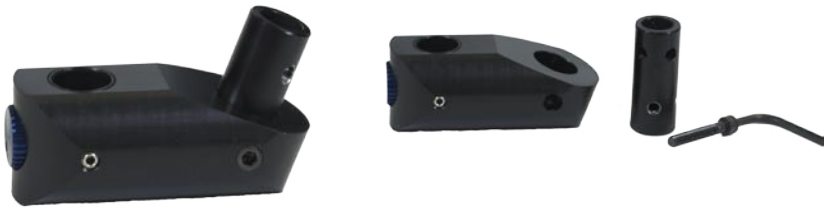
Cautionary Tip: When in low mode and grossly adjusting the camera position by sliding the dovetail, be sure to: 1) support the camera, and 2) lock the dovetail by pushing the lever forward. Balance as you would for high mode.

Adjust the electronic level

Place a spirit level on the camera. Hold the sled level and push the level button quickly. Pushing the "level" button on the sled for less than 1 second will set the level; pushing and holding the level button for 1-3 seconds will alter the direction for low mode. (See pages 30-31 for a full description of the Artificial Horizon.)

The slanted F-bracket

There are two positions for the F-bracket, one for regular side operating and one for goofy-foot. Be sure to angle the F-bracket away from you (about 45 degrees forward) when standing in the Missionary position.



regular operating

goofy foot operating

The F-bracket brings 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. Switches are impossible and operating is severely limited.

with f-bracket

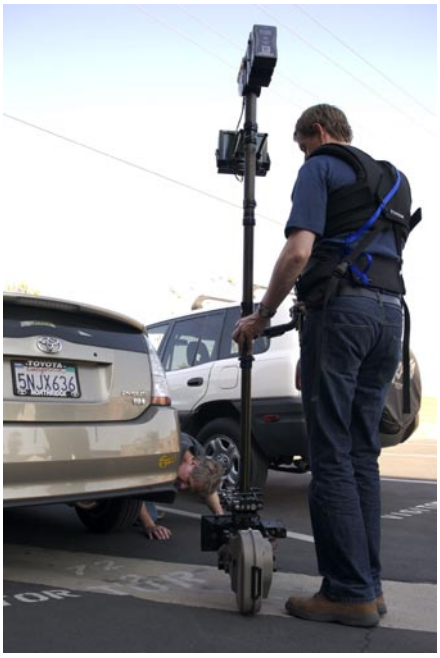
without f-bracket

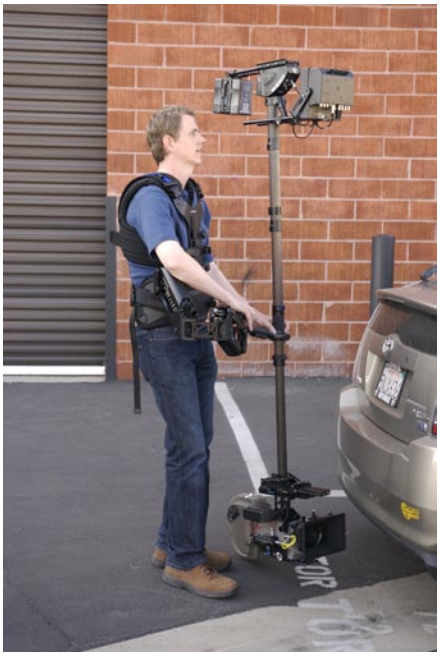
Tip: In very long and low mode operating, the F-bracket can be omitted, as there is plenty of room for the arm.

The Ultra^2's unique slanted F-bracket has several advantages over the original straight F-brackets. With the new bracket, the gimbal-to-centerpost angle is changed, increasing the gimbal yoke's clearance to the centerpost. The operating hand-to-arm hand differential is reduced, which makes it easier to operate and is less fatiguing. The new bracket also wastes about three fewer inches of the arm's boom range than the old style F-bracket.

A useful trick

The range of low mode lens heights can be lowered by making the rig more bottom heavy. With this trick – and the unique design of the Ultra's telescoping post – even a very heavy camera can kiss the ground. In fact, if one didn't care at all about bottom heaviness, the top of the camera could be almost four feet below the gimbal – which might be great for a trench or grave shot or working off scaffolding.





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.

To make low mode operating easier and more precise:

Use the tilt head to keep the post more vertical and to make viewing the image easier. Use the new F- bracket to reduce the hand height differential and to have fewer clearance issues with the post. Use the telescoping post system and different arm posts to set the proper lens height range and to restore the full boom range of the arm.

Be sure to rebalance dynamically as well as statically. Dynamic balancing is often ignored because it's next to impossible to spin balance in low mode, but dynamic balance is critical for precise work.

Fortunately, the Ultra^2 is easier to get in dynamic balance in low mode than any other Steadicam. If the operator does not change the length of the sled or the monitor position, the sled remains in dynamic balance. (Remember, the monitor tilts and flips on its center of gravity.)

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.

Long Mode Operating

Long mode operating presents some wonderful opportunities and hazards. Unusual lens heights, both high and low, is the principal allure of long mode operating.

The Ultra^2's tool-free clamps make it easy to extend or compress the integral post system, and also to configure the monitor and battery to best advantage for the shot. The tilt head makes long mode operating practical.

Most operators are used to working with relatively short sleds. As the telescoping posts are extended, new factors must be taken into consideration. Viewing, clearances, increased inertia, inertial imbalances, static and dynamic balance, and flexing are key issues.

Increasing the lens height by extending the telescoping post may be the only way to get the lens height you need. It may also get you better viewing of the monitor or a needed increase in tilt and roll inertia – or all three!

The standard "drop time test" that is typically used to determine bottom heaviness should be ignored.

Instead of using a drop test, tilt the Steadicam with your operating hand and note how much force is required to tilt the sled. Compare this force to your normal length sled's feel. Accelerate the rig and note the pendular action. Again, adjust the bottom heaviness accordingly, depending on the requirements of the shot.

The operator dynamically balances a long sled using the same procedures as with a shorter sled. The trial and error method is fairly quick. However, because there are so many possible configurations with the Ultra^2, spin balancing for each one can be time consuming and unproductive. Use the Ultra^2 Dynamic Balance Spreadsheet to virtually discover how to get your rig into dynamic balance under various conditions.

Very long sleds have a lot of inertia in tilt and roll. It takes time and effort to tilt or roll — and time and effort to stop a movement you've started. Although the sled may be harder to get off-level, it's also harder to get it back to level once you've strayed.

With the monitor fully in — which might be desirable for quick panning — the pan axis will feel very light compared to the tilt or roll axis. To make the sled feel more "normal" (or inertially balanced in all three axes), extend the monitor fully and extend the battery for dynamic balance. Extending the monitor and battery adds a lot of inertia in the pan axis.

A long post configuration adds lots of inches to the bottom of the sled. Operators tend to pay attention to the lens, and they may be surprised when that other part of the sled strikes something on the set. Panning the camera when a long sled is angled up or down requires that both ends of the sled move in great arcs. This spatial translation of masses is very hard to control.

The uselfulness of any long mode sled is greatly enhanced by the addition of an integral tilt head and a motorized stage. Use the tilt head to keep the rig more vertical, reducing the spatial translations, and, at the same time, reducing clearance problems between the sled and objects on the set.

Use the tilt head to keep the sled in dynamic balance — always a plus.

In the most expanded high mode, the bottom of the sled can be as much as 46 inches below the gimbal.

The operator also needs to get used to the increased distance from the monitor to the lens.

Tip: Avoid violent moves with long sleds. The stresses can be very large.

Attempting a long mode pan:

with a tilt head

without a tilt head

Without a tilt head and the lens angled up or down, precise panning becomes nearly impossible, due to the huge and odd spatial translations of the sled. The faster the pan, the worse it gets.The camera is tilted 20 degrees up in both cases.

The Stiffening System

Any long post Steadicam sled, whether single or multi-section, suffers from increased flexing. The longer a post, the more it flexes — unfortunately by the cube law. Doubling the post length makes the rig eight times more flexible!

The carbon fiber telescoping post is very stiff, but it will need extra rigidity under certain situations. The heavier the camera or the more violent the moves, the more help is required.

The stiffening system consists of attachment points on the monitor, the battery mount, the bottom of the sled, and just underneath the tilt head; and a length of lightweight Vectran™ line.

Vectran is a polymer cable that is as strong as steel, but it has one-fifth the weight and is much more flexible.

The Vectran line is laced from one side of the battery mount down around a pin at the base of the sled, up around the spreader on the monitor, further up to a hook just under the tilting head, and down the other side, around the pin at the bottom of the sled, and back up to the battery where the line is tensioned and secured under a special washer.

The Vectran line is given its final tension by extending the telescoping posts slightly, pulling out the monitor rods as shown, and/or by tilting the sled horizontal with the monitor down and retightening the line.

The stiffening system is very useful with normal length sleds when the shot has violent moves or high stresses, such as during a vehicle shot on rough roads.

The Ultra² Vest

Note: The vest must be properly adjusted for the emergency release system to work. The emergency release line (blue) should be taught and both cross back straps disconnected.

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.

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

Lastly, snug up the cross back straps. This will prevent the vest from slipping as well as reduce side loading.

Tips:

- If the cross back straps are overtightened, they will cause the vest to improperly ride up on your shoulders.
- If the cross back straps don't cross your back, they won't work to support the side loads. Be sure they cross your back as shown.

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

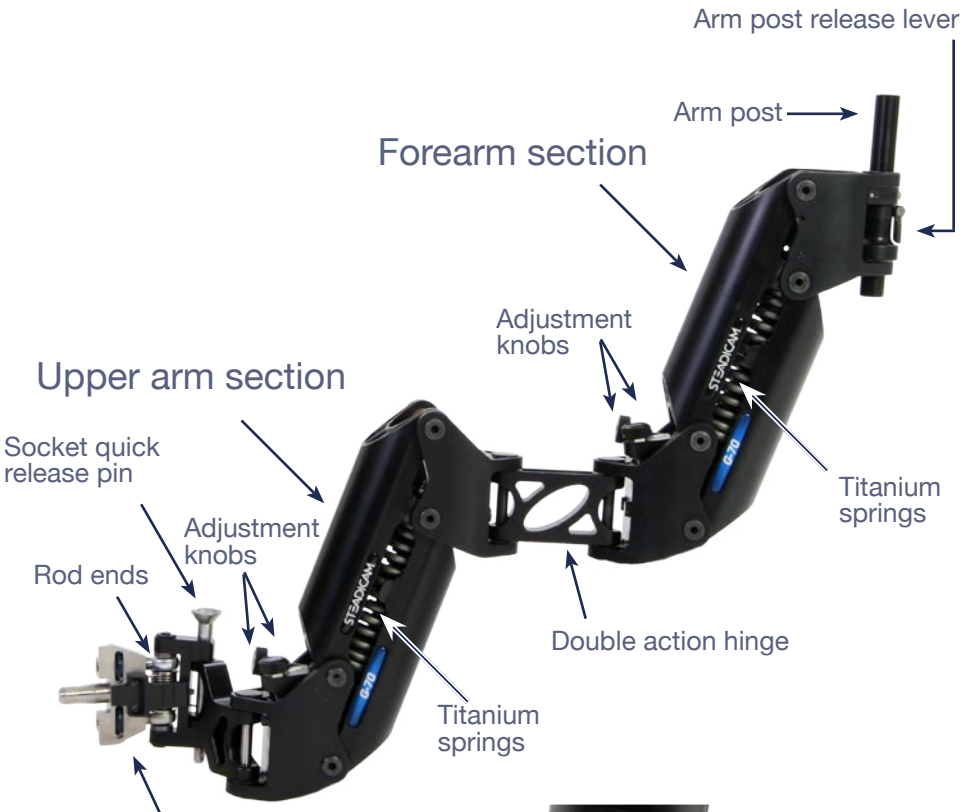
Available options: a compact vest, and longer chest, hip, and cross back straps.

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).

For goofy foot operating (Steadicam on your right) the socket block is easily flipped upside down and retightened on the vest spar.

The G-70 Arm

The G-70 arm has a total lifting capacity of 12 to 70 pounds and a 32” boom range. The arm also incorporates a ride control, a quick post change mechanism, an arm post drag control, and a kickback link.



The G-70 arm socket is inserted into the socket block on the vest.

Adjusting the arm lift angle

Setting 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.

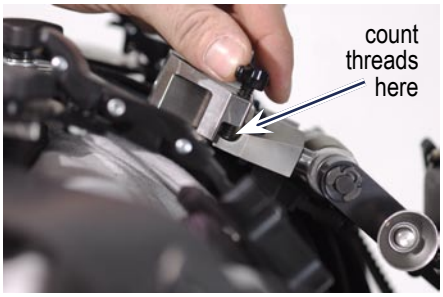
Side to side

For almost all operators, regardless of body type, the typical adjustment for the "side to side" screws (the rod ends in the arm) is 2 to 2.5 turns out on the top screw and ALWAYS all the way in on the bottom screw.

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 to prevent binding.

In and out

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



The "in-out" adjustment on the socket block varies greatly by the operator's body type. If you have big 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.

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

Goofy foot

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

On the vest, loosen the socket block height adjustment screws. You may have to tap the plate hard with your fist to get everything to release. Flip the plate and retighten the clamp. Be sure the dovetail clamp properly mates with the beveled retainer.

On the arm, pull the "parachute pin," flip the mating block, and reinsert the parachute pin with the kick back link rotated (see page 64). Note that the mating block is now reversed; the upper side to side adjusting screw is now the lower screw and vice versa.

To set your threads, first dial the lower 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 left side operating.

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.

Basic adjustments: Ride and Lift

Each arm segment has two adjusting knobs:

The **Ride** knob alters iso-elasticity from a hard ride to an ultra-effortless iso-elastic ride — just shy of locking up at top and bottom.

The **Lift** knob dials lifting power continuously from 12 lbs to 70 lbs.

Adjustment of Ride

Ride is a new feature and it takes a few minutes to understand how it works, and how to make it work for you. In the field, it only takes a few seconds to get the exact performance you want from the G-70 arm.

If you can, preset Ride close to the desired level of iso-elasticity in both arm sections before picking up the sled and adjusting Lift.

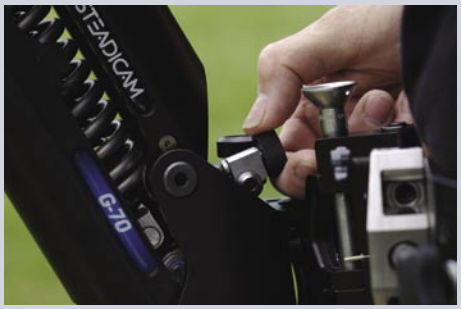
Start by presetting the Ride knob to the middle of its travel (about 20 threads visible). Once you get the iso-elastic feel you like, make a note of the threads and the camera weight for future reference.

Ride can only be adjusted when the arm segment is raised to its highest, unloaded position, so it is easiest to adjust before you pick up the sled. It can also be adjusted when flying the sled by booming up fully.

The G-70 arm becomes progressively less iso-elastic as the arm's lift is increased. Heavier loads will require a counterclockwise adjustment of the Ride knob to obtain – or maintain – the desired iso-elasticity. Lighter loads will require a clockwise adjustment of the Ride knob to decrease iso-elasticity.

Turning the Ride knob also has a slight effect on the lifting power of the arm. So preset the Ride as best you can and then adjust the arm's lift.

The stops at both ends of travel of the Ride knob should not be forced.



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.

Adjustment of Lift:

All lift adjustments must be done while wearing the rig, so pick up the Steadicam. Stand in the classic Missionary position and properly set your threads before proceeding.

Adjust the "forearm" section first (the arm section closest to the gimbal). Hold the arm segment slightly above level. When the coaxial springs are perpendicular to the adjusting mechanism, the spring force is neutral — neither up nor down — reducing the effort needed to turn the knob.

Slightly raise or lower the arm segment to find the sweet spot. Adjust the arm's lifting power so that the arm section seeks a position slightly above horizontal.

When the forearm section is set correctly, adjust the upper arm section to follow (track with) the upper arm section as you boom fully up and down. Do not worry if the arm tends to lock up or down at this point.

Note that the Lift knob has a range of adjustment of 32 turns. This means that each turn of the Lift knob will add or subtract about 1.5 pounds of lift.

Re-adjust the Ride knob for the desired iso-elastic response

With the arm set to carry the load, you can micro-adjust Ride for any given load.

In general, most operators will want the most iso-elastic possible ride. To adjust the arm for maximum iso-elasticity at any given lift, turn the ride knob counterclockwise until the arm section begins to "lock" up or down at the extremes of travel. Then turn the ride knob clockwise a couple of turns. This will keep the arm from locking up or down. Test and micro-adjust the lift and ride knobs as necessary.

Typically, the arm is very forgiving of less than "perfect" adjustments of lift and ride. Some operators will set the arm sections at a higher nominal angle (+20º or more), to minimize any lifting required with heavier cameras and/or high boom heights. Pushing down is easier than lifting fully with the extended boom range possible with the G-70.

The arm can also be adjusted to hang lower than normally for shots with low boom heights, with very little penalty in performance. Minor changes in sled weight (+/- several pounds) do not require adjustment of the ride knob.

Some operators prefer a more centered ride (like a IIIA arm with a less than maximum load), or a more centered ride when hard-mounted on rough terrain. Experiment and use the arm the way you like it.

Some adjustment tips:

When adjusting from a light load to a heavy load: It helps to have an assistant independently control the height of the upper arm and make his lift adjustment at the same time as you adjust the forearm lift.

It also helps if you raise your docking stand so you can stand next to it and insert the arm post into the gimbal yoke of your docked sled with your heavy camera aboard. As you and your assistant adjust the lift of both arm segments, they will gradually pick up the weight until it floats free of the dock.

When adjusting from a heavy load to a light load: Leave the heavy load aboard if possible, and with the sled on the stand, remain adjacent to the stand while you lighten the lift of both arm sections at the same time. Then remove the heavy weight and rebalance the sled for the light camera and then see if the lift needs further adjustment.

Lift can be altered by forcefully holding the arm segments at the correct angle while adjusting, but be prepared for some exertion! You might be shocked how energetic the springs feel if you are raising or lowering the lift by 30 pounds!

Working with arm posts

Changing arm posts

To change posts, rotate the mechanism to expose the release lever. Raise the lever to horizontal to unlock the post. Note: the mechanism will remain in place. Replace post with desired length post, leaving at least 1.125 inches protruding above the arm. Clamp by rotating lever back to vertical.

Rotational drag

To set the rotational drag, turn the drag knob clockwise to increase drag and counterclockwise to decrease drag. Changing a post does not affect the drag setting.

General uses

In general, use the shortest possible post in the arm. This avoids possible clearance problems below the arm.

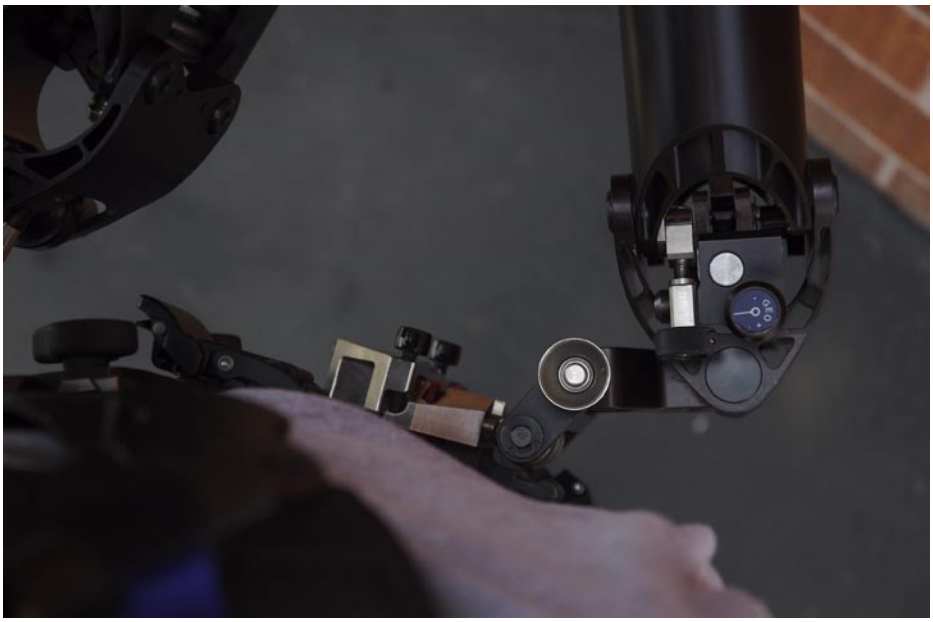
The quickest way to increase lens height is to use a longer post in the arm and to raise the socket block on the vest. This increase in gimbal height (and therefore lens height) - up to eleven and a half inches - puts the gimbal about as high as one can comfortably reach with the operating hand. A longer arm post could be used, but one can't reach the gimbal and do the most precise work.

Be aware that using a long arm post can exert enormous torque on the arm bearings and bones. The heavier the camera is, the shorter the arm post should be. If you want a very high or low lens height, get a light camera!!

Remember, a long arm post alters the height of all the components equally, which may make viewing the monitor more difficult or annoying. Check to see what works; every situation is a little different. The ability to quickly change arm posts or to adjust the height of the socket block on the vest, and/or to extend the sled components, (all without tools!) gives the operator many choices to achieve a given range of lens heights and viewing options.

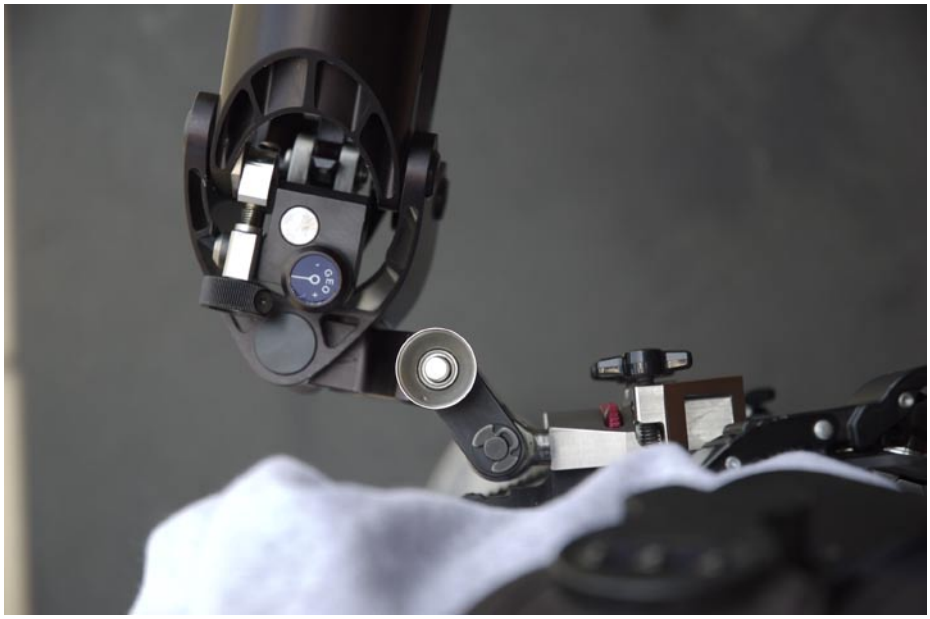
The G-70 “kick back” element

To accommodate both regular and goofy-foot operators, the two mating parts held by the “parachute” pin can fit together in two ways. The design intent is to “kick back” the upper arm segment as shown in the photos. The parts need to be set one way for regular operating, and the opposite way for goofy foot operating.



Regular

Goofy-foot



With a back mounted vest

Operators with “back mounted” vests should also orient the connection to send the arm to the inside.

When using a back mounted vest, set the kickback link inwards as shown in the photo. This is the opposite direction from the kickback link’s use in a front mounted vest. The idea is to get the socket block both closer to the body and to the Steadicam. Why? See the next tip.

When using any back mounted vest, all arms are more extended from the load (the sled) to the attachment point (the socket block). Additionally, the “end block” nearest the body is pointing fore and aft. With a normal, front-mounted vest, the arm extension is less and the end block is oriented sideways to the load.

Extending any arm makes it more likely to go over centers and lock up.

When you lean back with a back mounted vest, the upper arm section’s end block leans back in line with the upper arm section. (With a front mount vest, the end block rotates perpendicular to the upper arm section as you lean back). With a back mounted vest, this leaning back puts the end block in a more iso-elastic position, making the upper arm section more likely to go over centers and lock up.

All arms behave this way, but the consequences become evident with an extended range (+/- 70 degree) and very iso-elastic arm like the G-70 or G-50. The travel in most other arms is restricted to +/-50 degrees, and this effect occurs above that angle.

The solution is to have about one-half the “iso” help (1/2 the threads) in the upper arm section that one has in the forearm section. You fine tune the adjustment the same way as described on page 61, increasing the iso-elastic response until the arm starts to lock up, then dialing it back in a few turns.

Walking with a back mounted vest also “activates” the socket block more than with a front mounted vest; it rocks back and forth in line with the upper arm section, again with consequences for the arm’s response. It may require an even smaller “less iso” link.

If you leave the forearm fully iso, it has the “helper torque” throughout its range, low to high, and when the arm is extended, it tends to force the upper arm over centers. Consequently, you should not only reduce the iso for the upper arm link with a back mounted vest, but also reduce the iso for the forearm. That way when raised, the operator is lifting a little, the torque is reduced correspondingly and the transferred torque is likewise reduced – hence a smaller tendency for the upper arm section to go over centers. Even with the iso dialed down, the G-70’s response in the +/- 50 degree range is more iso-elastic than other arms.

Tiffen HD UltraBrite²™ Monitor

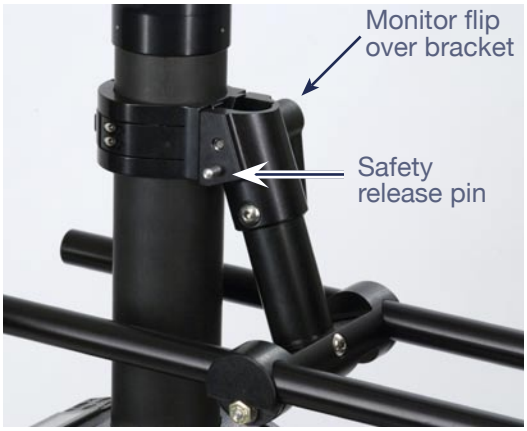
The HD UltraBrite²™ is built for today's demanding needs for versatility and flexibility. With the ever-increasing demand for HD video monitoring, and the ever-present need for Composite video monitoring, the HD UltraBrite²™ will serve your every need.

The new HD UltraBrite²™ 8.4" TFT color monitor is the brightest and only HD/SD SDI (SMPTE 259,274/292/296), DVI, Y/C, PC VGA and Composite video monitor available today that has been exclusively designed for Steadicam® and field production use. With 1400 nts (cd/m2) of brightness and the use of a proprietary bonded AR glass coating, the HD UltraBrite²™ can be viewed under the most extreme lighting conditions.

4-pin XLR 12 or 24 volt input

2nd tally light input

Artificial Horizon and menu navigation controls



Monitor flip over bracket

Safety release pin

Controls for the FLG built into the monitor. Not all monitors have these framelines installed

Tally Light

UltraBrite² On Screen Display

To turn on the OSD menu:	Press the MENU button
Move to next icon:	Press the MENU button
Select options within icon menu:	Use △▽◁▷ buttons.
Increase/decrease setting:	Use ◁▷ buttons
Move selection left/right:	Use ◁▷ buttons, the selected option is in green
To confirm the selection:	Use ▷ button

Picture :

Brightness 	Increase/decrease panel brightness level, total: 100 steps
Contrast 	Increase/decrease panel contrast level, total: 100 steps
Saturation 	Increase/decrease saturation, total: 100 steps
Hue ** 	Increase/decrease Hue level, total: 100 steps
Sharpness* 	Increase/decrease sharpness, total: 30 steps

Move the image position:


upward


downward


to the left


to the right

Aspect Size 4

- Fill Screen : Enable full screen expansion for lower resolution Image

- Fill to Aspect Ratio: Enable fill screen expansion for lower resolution image according to aspect ratio
- 4 : 3 : scaling format in 4:3
- 16 : 9 : scaling format in 16:9
- 16 : 10 : scaling format in 16:10
- 2.35 : 1 : scaling format in 2.35:1
- 2 : 1 : scaling format in 2:1
- 1 : 1 : Display the exact image resolution on the screen without image expansion.
- Custom Sizing* :
    - Normal Size
    - Underscan
    - Custom 4
    - H Size 
    - V Size 
    - H Pan 
    - V Pan 

Blue Only 4 ON / OFF : Turn off the “Red” & “Green” channel (i.e output all zero to Red & Green channel) [This function will display on OSD menu when JP4 – 5-6 closed]

* : DISPLAY IN VIDEO MODE ONLY
** : FUNCTION IN VIDEO NTSC / HD COMPONENT MODE ONLY
# : DISPLAY IN ARGB / DVI MODE ONLY
: FUNCTION IN ARGB MODE ONLY
: DISPLAY WHEN VIDEO ADD-ON BOARD CONNECTED

Input

Select the input video signal

- HD/SD SDI 1
- HD/SD SDI 2***
- VGA
- DVI
- HD Component
- Composite
- S-Video
- SD Component
- PIP Source 4
- OFF / HD/SD SDI 1 / HD/SD SDI 2 / VGA / DVI / HD Component / Composite / S-Video / SD Component

*** DISPLAY WHEN SETTING ON UNDER SETUP → AUTO SOURCE SEEK

Utilities

Setup 4

Auto Picture Setup#: Auto adjust the image position, phase and size

Auto Color Gain##: Auto Color Calibration

Wide Screen Mode detection# 4 : Recognize the wide screen mode coming from ARGB port

- Normal
- 1280x768
- 1366x768

Manual Clock## :  Adjust the image horizontal size

Manual Phase# :  Fine tune the data sampling position (adjust image quality)

Auto Source Seek :

- Setup4 Selection for the corresponding input sources detection

HD/SD SDI 1
HD/SD SDI 2
VGA
DVI
HD Component
Composite
S-Video
SD Component

The corresponding input port name display on OSD menu will disappear once setting “OFF”.

- ON – Auto source select always enable
- OFF – Disable auto source select function

De-interlacing Mode* 4

- AFM: Auto Film Mode
- TNR: Temporal Noise Reduction
- MADI: Motion Adaptive De-interlacing
- LADI: Low Angled De- interlacing

Auto Power : OFF / ON

- ON – Enable soft power off function if absence of input signals
- OFF – Disable soft power function

Video Standard (SD)* :

- Auto / NTSC / NTSC 4.43 / PAL / PAL M / SECAM

Image Orientation :

- Normal / Horizontal flip / Vertical flip / Rotate

Gamma : 1.0 / 1.6 / 2.2

OSD 4

OSD position :

- H POS: Move the OSD menu image horizontally
- V POS: Move the OSD menu image vertically

OSD Timeout (sec) : 0 – 60 :

- Adjust the OSD menu timeout period in a step of 5 seconds (max 60 seconds)
  0 = Continuous to display OSD menu.
  60 = 60 seconds later will turn off the OSD menu.

Language : English / Chinese:

- Select OSD menu language display

Transparency : ON / OFF : Set OSD transparency

Color Temperature 4

- 5000K
- 6500K
- 8000K
- 9300K
- User setting :
  USER Red :
  USER Green :
  USER Blue :
  Default : Resume to the default values

Hot Key 4

Hot key 1 :

- Volume / Brightness / Contrast / Input / Aspect / PIP Size / PIP Swap / Image Orientation

Hot key 2 :

- Volume / Brightness / Contrast / Input / Aspect / PIP Size / PIP Swap / Image Orientation

PIP 4

PIP Size : OFF / Small / Medium / Large / PBP

4 possible input groups that can be mixed for PIP :
a) VGA/HD-component
b) DVI
c) HD-SDI
d) Composite/S-Video/SD-component
Selecting a signal source from the same group for PIP is not allowed.

Move the PIP Position :


upward


downward


to the left


to the right

PIP Swap :
• Swap between the main window and PIP window

Monochrome Mode 4

• Color
• Red Monochrome
• Green Monochrome
• Blue Monochrome

Reset to Factory Defaults

* : DISPLAY IN VIDEO MODE ONLY
# : DISPLAY IN ARGB MODE ONLY
: DISPLAY IN ARGB / HD COMPONENT MODE ONLY

Connectors, Pin-outs and Jumpers

The following table is a listing of all back panel connectors associated with the UltraBrite2™.

Connector Type	Connector Label	Pin #	Symbol	Description/Function	Comments
BNC	G/Y			HD COMPONENT INPUT, GREEN ANALOG	
BNC	B/Pb			HD COMPONENT INPUT, BLUE ANALOG	
BNC	R/Pr			HD COMPONENT INPUT, RED ANALOG	
HIROSE HR10-7R-4S	VID/PWR	1		PWR GND	
HIROSE HR10-7R-4S	VID/PWR	2		VIDEO GND	
HIROSE HR10-7R-4S	VID/PWR	3		COMPOSITE IN	See Note 2
HIROSE HR10-7R-4S	VID/PWR	4		11-36Vdc	See Note 1
LEMO EGG.1B.308.CLL	VID/PWR	1		PWR GND	
LEMO EGG.1B.308.CLL	VID/PWR	2		11-36Vdc	See Note 1
LEMO EGG.1B.308.CLL	VID/PWR	3		COMPOSITE IN	See Note 2
LEMO EGG.1B.308.CLL	VID/PWR	4		VIDEO GND	
LEMO EGG.1B.308.CLL	VID/PWR	5		RX-data	
LEMO EGG.1B.308.CLL	VID/PWR	6		TALLY	
LEMO EGG.1B.308.CLL	VID/PWR	7		11-36Vdc	See Note 1
LEMO EGG.1B.308.CLL	VID/PWR	8		TX-data	
BNC	HD/SDI 1			HDSDI/SDI VIDEO INPUT #1	
BNC	HD/SDI 1 LOOP			HDSDI/SDI VIDEO LOOP THRU #1	
BNC	HD/SDI 2			HDSDI/SDI VIDEO INPUT #2	
BNC	HD/SDI 2 LOOP			HDSDI/SDI VIDEO LOOP THRU #2	
DVI-I	DVI-I/RGB/YPbPr	1	/RX2	TMDS Data 2-	
DVI-I	DVI-I/RGB/YPbPr	2	RX2	TMDS Data 2+	
DVI-I	DVI-I/RGB/YPbPr	3	GND	Digital Ground	
DVI-I	DVI-I/RGB/YPbPr	4	NC	No connection	
DVI-I	DVI-I/RGB/YPbPr	5	NC	No connection	
DVI-I	DVI-I/RGB/YPbPr	6	DCC_CLK	DDC Clock	
DVI-I	DVI-I/RGB/YPbPr	7	DDC_DAT	DDC Data	
DVI-I	DVI-I/RGB/YPbPr	8	VS_IN	Analog vertical Sync	
DVI-I	DVI-I/RGB/YPbPr	9	/RX1	TMDS Data 1-	
DVI-I	DVI-I/RGB/YPbPr	10	RX1	TMDS Data 1+	
DVI-I	DVI-I/RGB/YPbPr	11	GND	Digital Ground	
DVI-I	DVI-I/RGB/YPbPr	12	NC	No connection	
DVI-I	DVI-I/RGB/YPbPr	13	NC	No connection	
DVI-I	DVI-I/RGB/YPbPr	14	DDC_5V	+5V power supply for DDC (optional)	
DVI-I	DVI-I/RGB/YPbPr	15	GND	Ground (+5, Analog H/V Sync)	
DVI-I	DVI-I/RGB/YPbPr	16	NC	No connection	
DVI-I	DVI-I/RGB/YPbPr	17	/RX0	TMDS Data 0-	
DVI-I	DVI-I/RGB/YPbPr	18	RX0	TMDS Data 0+	
DVI-I	DVI-I/RGB/YPbPr	19	GND	Digital Ground	
DVI-I	DVI-I/RGB/YPbPr	20	NC	No connection	
DVI-I	DVI-I/RGB/YPbPr	21	NC	No connection	
DVI-I	DVI-I/RGB/YPbPr	22	GND	Digital Ground	
DVI-I	DVI-I/RGB/YPbPr	23	RXC	TMDS Clock+	
DVI-I	DVI-I/RGB/YPbPr	24	/RXC	TMDS Clock-	
DVI-I	DVI-I/RGB/YPbPr	C1	R	Red or Pr	
DVI-I	DVI-I/RGB/YPbPr	C2	G	Green or Y	
DVI-I	DVI-I/RGB/YPbPr	C3	B	Blue or Pb	
DVI-I	DVI-I/RGB/YPbPr	C4	HS_IN	Analog horizontal sync	
DVI-I	DVI-I/RGB/YPbPr	C5	GND	Ground	
DVI-I	DVI-I/RGB/YPbPr	C6	NC	No connection	

Connector Type	Connector Label	Pin #	Symbol	Description/Function	Comments
HDB-15	VGA/RGB	1	PCR	Red, analog	
HDB-15	VGA/RGB	2	PCG	Green, analog	
HDB-15	VGA/RGB	3	PCB	Blue analog	
HDB-15	VGA/RGB	4	ID2	Reserved for monitor ID bit 2 (grounded)	
HDB-15	VGA/RGB	5	DGND	Digital ground	
HDB-15	VGA/RGB	6	AGND	Analog ground red	
HDB-15	VGA/RGB	7	AGND	Analog ground green	
HDB-15	VGA/RGB	8	AGND	Analog ground blue	
HDB-15	VGA/RGB	9	DDC_5V	+5V power supply for DDC (optional)	
HDB-15	VGA/RGB	10	DGND	Digital ground	
HDB-15	VGA/RGB	11	ID0	Reserved for monitor ID bit 0 (grounded)	
HDB-15	VGA/RGB	12	DDC_SDA	DDC serial data	
HDB-15	VGA/RGB	13	HS_IN	Horizontal sync or composite sync, input	
HDB-15	VGA/RGB	14	VS_IN	Vertical sync, input	
HDB-15	VGA/RGB	15	DDC_SCL	DDC serial clock	
4-PIN Mini DIN	SVHS	1	GND	Ground (Y) Luminance	
4-PIN Mini DIN	SVHS	2	GND	Ground (C) Chrominance	
4-PIN Mini DIN	SVHS	3	Y	Intensity (Luminance)	
4-PIN Mini DIN	SVHS	4	C	Colour (Chrominance)	
BNC	VIDEO			COMPOSITE IN	See Note 3
HR212-10R-8SD(73)	TALLY	1		PWR GND	
HR212-10R-8SD(73)	TALLY	2		REGULATED +12V	
HR212-10R-8SD(73)	TALLY	3		N/C	
HR212-10R-8SD(73)	TALLY	4		TALLY 1 IN	APPLY 12V FOR OPERATION
HR212-10R-8SD(73)	TALLY	5		N/C	
HR212-10R-8SD(73)	TALLY	6		TALLY 2 IN	APPLY 12V FOR OPERATION
HR212-10R-8SD(73)	TALLY	7		TALLY 1 SENSOR IN	
HR212-10R-8SD(73)	TALLY	8		N/C	
4-PIN XLR	11-36Vdc	1		PWR GND	
4-PIN XLR	11-36Vdc	2		N/C	
4-PIN XLR	11-36Vdc	3		11-36Vdc	See Note 1
4-PIN XLR	11-36Vdc	4		11-36Vdc	See Note 1

*****CAUTION***** , all power sources are tied together. Apply only one power source at a time!
i.e. a 12V input on one connector will result in a 12V output on all other connectors; a 24V input on one connector will result in a 24V output on all connectors.

Note 1:

Note 2: - Composite video lines from both Hirose and LEMO connectors are connected together.

- Video input into these connectors will pass through the built-in frame line generator if present.

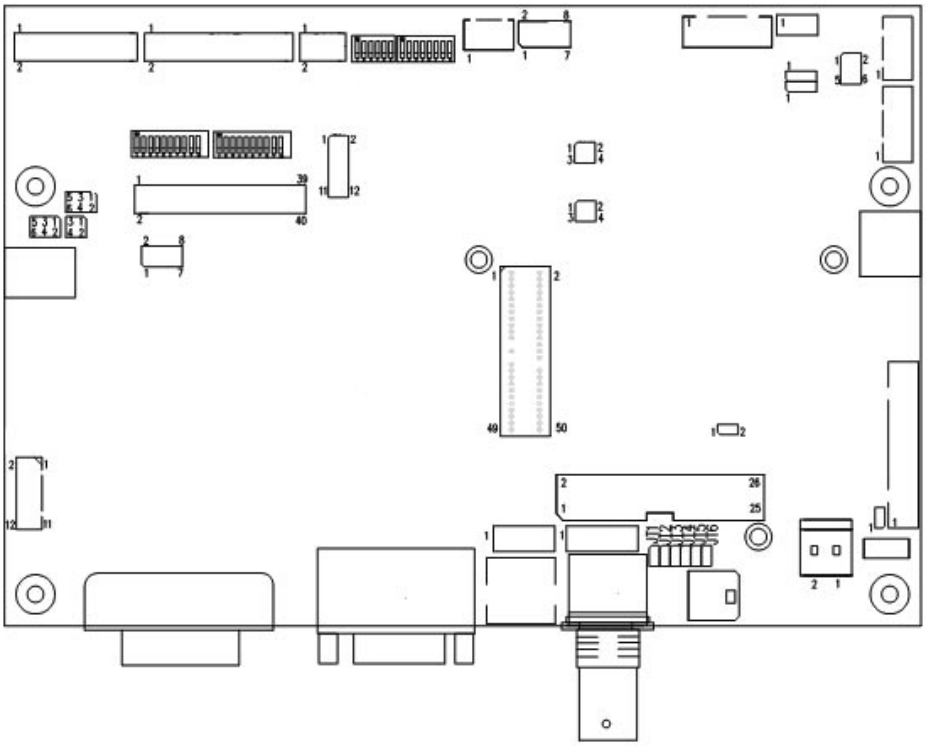
Note 3: - Composite video input into this connector will not pass through built-in frame line generators if present.


G/Y
B/Pb
R/Pr
VID/PWR
VID/PWR
HD/SDI 1
DVI-I/RGB/YPb
VGA/RGB
SVHS
VIDEO
HD/SDI 2


A TIME
LEVEL
TALLY
11-36Vdc

Termination Jumper Settings

The factory default setting for all 75Ω termination jumpers for Composite, S-Video and Component inputs is set to on, or terminated.



Jumper		
JT1	Composite video-in terminator enable	Open = composite video input is not terminated Close = composite video input is terminated with 75Ω. "Only applies to video signals input via the Video BNC connector or via the 4-pin Hirose and 8-pin Lemo connectors when optional frameline generator is not installed.)
JT2	S-Video luma-in terminator enable	Open = S-video luma input is not terminated Close = S-video luma input is terminated with 75Ω
JT3	S-Video chroma-in terminator enable	Open = S-video chroma input is not terminated Close = S-video chroma input is terminated with 75Ω
JT4	Component luma-in terminator enable	Open = component luma input is not terminated Close = component luma input is terminated with 75Ω
JT5	Component Cr-in terminator enable	Open = component Cr input is not terminated Close = component Cr input is terminated with 75Ω
JT6	Component Cb-in terminator enable	Open = component Cb input is not terminated Close = component Cb input is terminated with 75Ω

Tally LED's

Integrated into the HD UltraBrite^{2}™ is a 8-pin Hirose connector that can be used to input 12Vdc to directly drive the front panel Tally LED's. In addition, a 800-7930 Tally Sensor can be plugged in to drive one of the Tally LED's whenever light is detected at the sensor. This can be useful for sensing the status of a tally LED on a camera and displaying the status on the front of the monitor. A LEVEL adjustment potentiometer is located on the rear of the monitor to adjust the sensitivity of the sensor if required.

Frameline Generator

If equipped, the UltraBrite^{2}™ monitor will be able to overlay moveable zebra striped frame lines on to composite NTSC/PAL video feeds. Note that the frameline circuitry will only overlay frame lines on those signals input via the 4-pin Hirose or 8-pin LEMO Power/Video connectors. Video input via the Video BNC connector will not have frame lines super imposed on to the image. Adjustment of the individual frame lines, and overall frameline brightness, is accomplished via the 5 positional pots located on the back of the monitor cover.

Horizon Display

Integrated into the front bezel of the monitor is a unique LED based electronic horizon display. Coupled with a serial communications generated by a compatible Steadicam® system this display is used to indicate the systems relative attitude and display operator feedback to horizon related functions. There are no user controls for this display within the UltraBrite^{2}™. The horizon display can be useful if operators wish to have maximum viewability of an image without the clutter of horizon data on the screen or if horizon monitoring is required for video signals that cannot be overlaid with OSD horizon information.

Features

- Selectable Color Temperature (9300K / 8000K / 6500K / 5000K).
- Brightness/Contrast/Color/Tint/Sharpness/Gamma Adjustable.
- Portrait/Landscape Image Rotation.
- Vertical and Horizontal Image Flip Capabilities.
- Adjustable Image Scaling, 4:3, 16:9, 2.35:1 Anamorphic, Under scan and more.
- Control settings stored in non-volatile memory.
- Automatic video format switching.
- Isolated video inputs.
- Picture-in-picture (PIP).
- Non volatile memory storage of monitor settings.
- Dimmable dual Tally light indicators for studio applications.
- Selectable OSD Menu Language Support.
- AR Glass for Direct Sunlight Viewability.
- Standard _-20 and 3/8-16 tripod screw mounting holes, and optional yoke with rod mounts.
- Mounting screws located on back cover for mounting of external V-loc battery adapter.
- Front panel LED power indicator.
- Programmable Direct Access Menu Buttons.
- Fully software upgradeable for special applications or future options.
- Optional built-in frameline generator, mounting yoke.
- Instant on feature that powers up monitor without pressing additional buttons.
- Integrated 10-LED horizon display.
- Wide support of SDI, HDSDI, RGB, YPbPr, YCbCr, SVHS, Composite NTSC/PAL/SECAM, DVI-D, and RGB video formats.
- Unique dual chamber aluminum case design to help dissipate internal heat and keep electronics cool without the use of a fan.
- Ergonomic cable connection layout to help prevent cable snags by placing connectors

Specifications

Model #:	800-7500-XX
Screen Brightness:	Sunlight viewable 1400 nits with bonded AR coating
Screen Size:	8.4” TFT
Contrast Ratio:	250:1
Display Resolution:	800 (W) x 600 (H)
Power Consumption:	36W max. @ 24V (15W typ. with brightness at min.)
Operting Voltage:	11-34Vdc (reverse polarity protected)
CCFL Backlight Life:	40,000 to 45,000 hours typical
Power Connectors:	4-pin XLR
Video/Power Connectors:	4-pin Hirose 8-pin PRO® compatible Lemo
Video Connectors:	3 x 75_ BNC HD Analog Y(G)Pb(B)Pr(R) 1 x 75_ BNC Composite 1x SVHS 1x DVI-D 1x ANALOG RGB 4x 75_ BNC Looping HDSDI
Tally:	8-pin Hirose
Dimensions:	8.2”W x 7.5”H x 4”D approx
Weight:	5.0 lbs. with yoke & FLG
Supported Video Formats:	HDSDI: 720 50p, 720 59.94p, 720 60p, 1080 23.98i, 1080 24i, 1080 25i, 1080 29.97i, 1080 30i, 1080 23.98p, 1080 24p, 1080 25p, 1080 29.97p, 1080 30p Composite NTSC, PAL, SECAM VESA VGA, SVGA, XGA, SXGA, UXGA DVI input support up to 1920x1200 60Hz input signals.
Storage temperature limits:	-40°C to +70°C
Operating temperature limits:	0°C to +50°C
Environmental	RoHs Compliant

Accessories

- 252-7565 Monitor Hood
- 800-7930 Tally Sensor
- FGS-900093 Rain/Dust Cover

Operating Tips

To reduce the power consumption of the monitor when in "Stand-by" mode, the screen brightness can be reduced. By turning down the brightness instead of turning off the monitor, the monitor can be quickly brought back up to with waiting for the monitor to re-initialize.

To increase the viewability of the monitor from a 6 o'clock viewing angle, the video image can be flipped vertically and the monitor inverted.

When operating in dim lighting conditions the Tally light brightness can be reduced by setting the Brightness switch to the LO position, or inversely to the HI position for brightly lit operating conditions.

For best monitor performance, set the video setting to the display format that you are currently using (Composite, HDSDI -1 etc.) and disable the video formats that you will not be using through the Auto Source Seek set-up menu.

When operating video transmitters or video converters with the monitor, power from the monitors 4-pin Hirose or 4-pin XLR power connectors can be used to power the external equipment. Take note that the maximum input current cannot exceed 4A including monitor current. Also take note that "The input voltage will be the same as the output voltage. If the monitor is run from 24V, all the other power connectors will have 24V present."

If connecting a video transmitter or other external device to the HD UltraBrite^{2}™ that requires a composite video feed, make sure to remove the 75_ termination from the external device to avoid double terminating the video signal.

To make quick access of Aspect, PIP, or other menu selections, the front control panel buttons can be programmed as "Hot Keys" to get instant selection without wading through menus.

The best way to clean your LCD panel and remove finger prints and dirt is to use a mild dish soap and a soft damp cloth.

When operating the monitor in extremely cold conditions, it may be helpful to turn the monitor on under room temperature conditions and allow the monitor to warm up before operating it in the extreme cold.

Try to keep the monitor out of the direct sun while not in use, this will help to keep the monitor casing and internal components cooler.

When operating in damp or wet set locations, make sure to keep the monitor covered with a rain hood.

CAUTION!

Connect only **one** power source to the monitor at a time.
FAILURE TO DO SO MAY CAUSE MONITOR OR EQUIPMENT DAMAGE.

Limited Warranty

The Tiffen Company warrants each UltraBrite^{2} monitor manufactured by Tiffen to be free from defects in workmanship and materials under normal conditions of use and service for a period of one (1) year parts and (6) months labor from the date of purchase provided no modifications have been made to the product. Tiffen's obligation under this warranty is limited at its option to either repair or replace the defective product. If the product has been superceded, warranty replacement can be made with a current model of the same quality performing the equivalent function. This warranty does not cover cosmetic refurbishment on any model. This warranty does not apply to any product that is subject to misuse, abnormal service, or handling or which has been modified or changed in design or construction. LCD panel defects are warranted up to ISO 13406-2 class-2 specifications. Warranty claims must be submitted to the factory for verification or to an authorized distributor designated by the Tiffen Company. Repairs by un-authorized parties will void this warranty. ALL IMPLIED WARRANTIES ARE LIMITED TO THE TIME PERIOD SET FORTH HEREIN. The Tiffen Company shall not be liable for incidental or consequential damages. All shipments of Tiffen equipment must be insured during the warranty period.

Limitation of liability

Specifications subject to change without notice.

The manufacturer's liability for damages to customer or others resulting from the use of any product supplied hereunder shall in no event exceed the purchase price of said product.

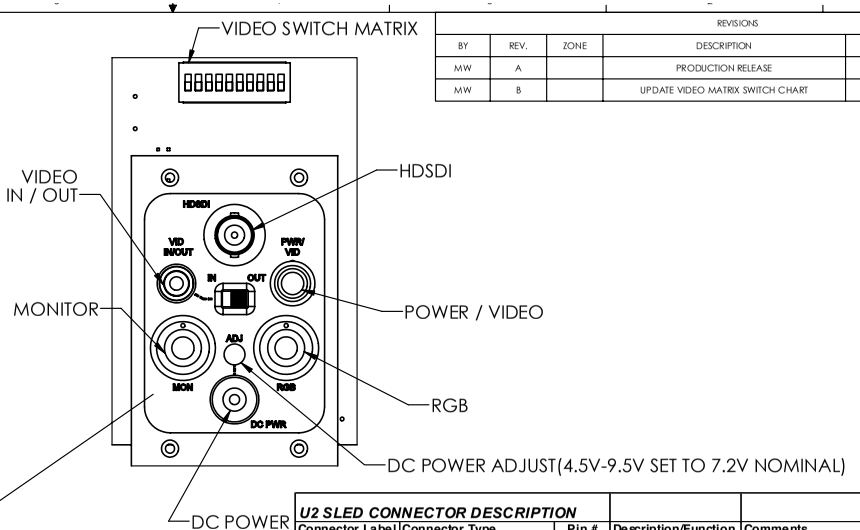
Disclaimer

There is no implied or expressed warranty regarding this material. Specifications subject to change without notice.

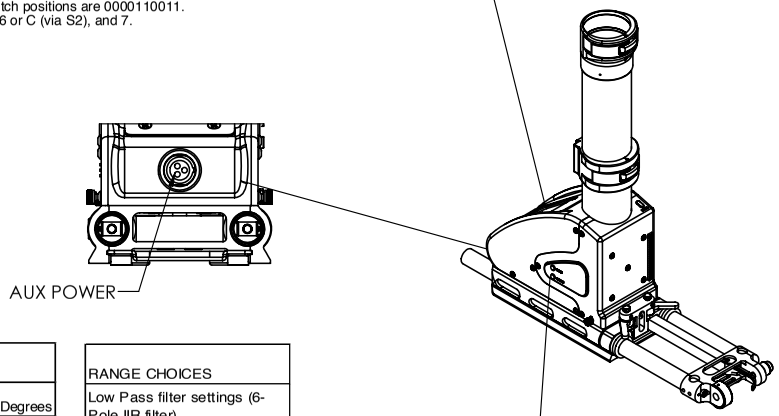
DIP SWITCH SETTINGS										
S1-1	S1-2	S1-3	S1-4	S1-5	S1-6	S1-7	S1-8	S2	MATRIX SWITCHED	Comments
0	0							IN/OUT	1	
0	1							IN	A	See Note 1.
0	1							OUT	N/A	
1	0							IN/OUT	2	
1	1							IN	N/A	
1	1							OUT	N/A	
		0						OUT	3a	See Note 1.
		1						OUT	3b	See Note 1.
			0					IN/OUT	4	
			1					IN	B	See Note 1.
			1					OUT	N/A	
				0	0			IN/OUT	5	
				0	1			IN	C	See Note 1.
				0	1			OUT	5	
				1	0			IN/OUT	6	
				1	1			IN	C	
				1	1			OUT	6	
						0	0	IN/OUT	7	
						0	1	IN	D	See Note 1.
						0	1	OUT	N/A	
						1	0	IN/OUT	8	
						1	1	IN	N/A	
						1	1	OUT	N/A	

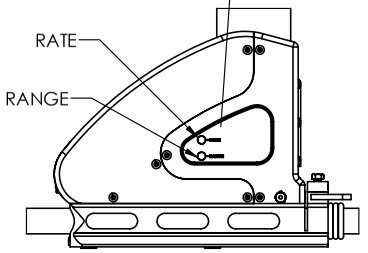
	VIDEO SWITCH MATRIX					
		VIDEO OUPUTS				
		STAGE VID OUT (HIROSE)	RCA OUT (VIA S2)	FLG IN	MONITOR OUT	BASE VID OUT (HIROSE)
VIDEO SOURCES	STAGE VID IN	1	3a	4	5	7
	FLG OUT	2	3b		6	8
	RCA IN (VIA S2)	A		B	C	D

REVISIONS					
BY	REV.	ZONE	DESCRIPTION	DATE	APPROVED
MW	A		PRODUCTION RELEASE	11/9/04	
MW	B		UPDATE VIDEO MATRIX SWITCH CHART	5/17/07	



Notes:
1. Modes 3a or 3b cannot be active at the same time as modes A,B,C,or D.
2. S1-9 = STAGE VID OUT 75ohm termination switch. Default = ON = terminated.
3. S1-10 = RCA VID 75ohm termination switch. Default = ON = terminated.
4. Factory default switch positions are 0000110011.
   i.e. Modes 1, 3a, 4, 6 or C (via S2), and 7.





U2 SLED CONNECTOR DESCRIPTION				
Connector Label	Connector Type	Pin #	Description/Function	Comments
AUX POWER	LEMO ECG.2B.303	1	PWR GND	See Note 4
AUX POWER	LEMO ECG.2B.303	2	+12V BATTERY	See Note 1
AUX POWER	LEMO ECG.2B.303	3	+24V BATTERY	See Note 2
HDSDI	BNC MALE	n/a	HDSDI VIDEO	Direct coax connection to HDSI BNC on stage rear. Isolated Video gnd.
PWR/VID	HIROSE HR10-7R-4S	1	PWR GND	See Note 4
PWR/VID	HIROSE HR10-7R-4S	2	VIDEO GND	See Note 4
PWR/VID	HIROSE HR10-7R-4S	3	VIDEO	See Note 3
PWR/VID	HIROSE HR10-7R-4S	4	+12V BATTERY	See Note 1
VID IN/OUT	RCA	N/A	VIDEO IN or OUT	Video Input or Output function selected by IN/OUT selector switch. See Note 3,5.
MON	LEMO EYG.1B.308	1	PWR GND	See Note 4
MON	LEMO EYG.1B.308	2	+12V BATTERY	See Note 1
MON	LEMO EYG.1B.308	3	VIDEO	See Note 3
MON	LEMO EYG.1B.308	4	VIDEO GND	See Note 4
MON	LEMO EYG.1B.308	5	RX-data	
MON	LEMO EYG.1B.308	6	TALLY	
MON	LEMO EYG.1B.308	7	+24V BATTERY	See Note 2
MON	LEMO EYG.1B.308	8	TX-data	
RGB	LEMO EYG.1B.306	1	COMP/GRN	Direct coax connection to RGB pin-1, VID IN BNC, and VID 1N/12V pin-3 on stage. See Note 6.
RGB	LEMO EYG.1B.306	2	VIDEO GND	See Note 4
RGB	LEMO EYG.1B.306	3	RED VIDEO	Direct coax connection to RGB connector on stage rear.
RGB	LEMO EYG.1B.306	4	VIDEO GND	See Note 4
RGB	LEMO EYG.1B.306	5	BLUE VIDEO	Direct coax connection to RGB connector on stage rear.
RGB	LEMO EYG.1B.306	6	VIDEO GND	See Note 4
DC PWR	2.5mm DC POWER JACK	PIN	+4.5 TO +9.5VDC	Voltage output adjusted by ADJ pot on front connector panel.
DC PWR	2.5mm DC POWER JACK	BARREL	PWR GND	See Note 4
Note 1:	- 12V BATTERY VOLTAGE is sourced directly from battery voltage in 12V mode.			
	- 12V BATTERY VOLTAGE is sourced directly from DC-DC converter in 24V mode. (14.4 to 14.6Vdc at 100W max.)			
Note 2:	- 24V BATTERY VOLTAGE is sourced directly from two sled batteries connected in series.			
Note 3:	- Video source is determined by VDA DIP switches #1-8.			
Note 4:	- POWER GND and VIDEO GND can be connected by internally jumpering JP2-1 to JP2-2 on 800-0005 board.			
Note 5:	- 75 ohm termination switched via VDA DIP switch #10 when IN/OUT switch is set to IN.			
Note 6:	- 75 ohm termination switched via VDA DIP switch #9.			

RATE CHOICES	
Setting	+/- Degrees
0 (Default)	5
1	2
2	2.5
3	3
4	3.5
5	4
6	4.5
7	5
8	5.5
9	6
A (10)	6.5
B (11)	7
C (12)	8
D (13)	9
E (14)	10
F (15)	180

RANGE CHOICES	
Low Pass filter settings (6-Pole IIR filter)	
Setting	Hz
0 (Default)	5
1	0.75
2	1
3	2
4	3
5	4
6	5
7	6
8	7
9	8
A (10)	10
B (11)	12
C (12)	13
D (13)	16
E (14)	18
F (15)	40

NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES AND APPLY AFTER PROCESS FINISH.
TOLERANCES:
FRACTIONAL ±1/64
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL ±.01
THREE PLACE DECIMAL ±.005
CONCENTRICITY: .003 T.I.R.
BREAK SHARP EDGES: .005 - .010
MACHINED FILLETS: .003 - .005 R.
INTERPRET DRAWING PER: ANSI Y14.5M -1982
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	MW	2/27/07
CHECKED	-	-
ENG APPR.	-	-
MFG APPR.	-	-
Q.A.	-	-
COMMENTS:		

NEXT ASSY | USED ON | APPLICATION
FILE NAME: 800-0000

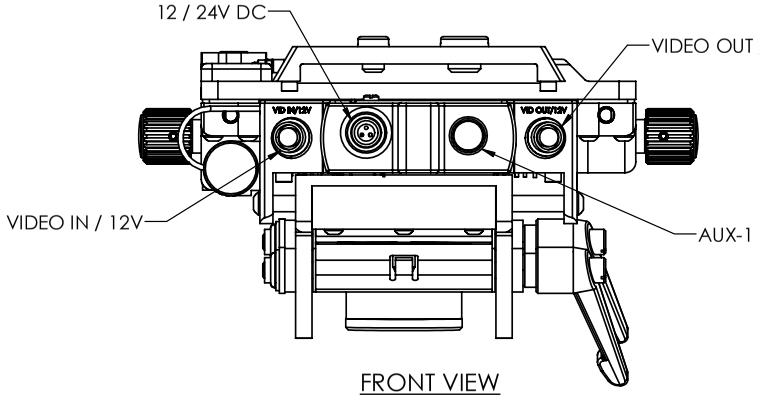
TIFFEN®
80 Oser Avenue, Hauppauge, NY 11788
Phone: 631-273-2500 Fax: 631-273-2557

TITLE: CONN. PIN-OUT DIAGRAM SLED BASE, ULTRA2

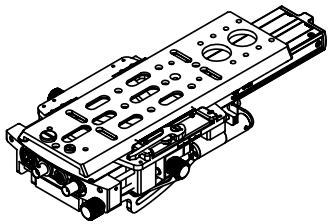
SIZE	DWG. NO.	REV
C	DOC-800000	B

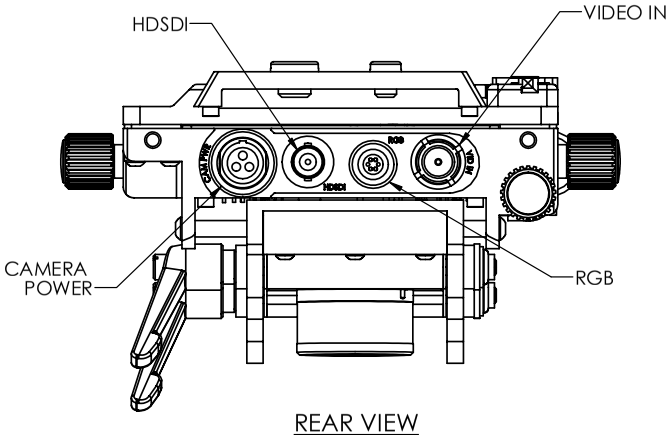
SCALE: 1:4 | WT: | SHEET 1 OF 1

REVISIONS					
BY	REV.	ZONE	DESCRIPTION	DATE	APPROVED
MW	A		PRODUCTION RELEASE	2/27/07	



FRONT VIEW





REAR VIEW

U2 SLED CONNECTOR DESCRIPTION				
Connector Label	**Connector Type**	**Pin #**	**Description/Function**	**Comments**
VID IN/12V	HIROSE HR10-7R-4S	1	PWR GND	See Note 4
VID IN/12V	HIROSE HR10-7R-4S	2	VIDEO GND	See Note 4
VID IN/12V	HIROSE HR10-7R-4S	3	COMP/GRN	Direct coax connection to RGB pin-1 and VID IN BNC. See Note 6.
VID IN/12V	HIROSE HR10-7R-4S	4	+12V	Regulated 12Vdc at 1A max.
VID OUT/12V	HIROSE HR10-7R-4S	1	PWR GND	See Note 4
VID OUT/12V	HIROSE HR10-7R-4S	2	VIDEO GND	See Note 4
VID OUT/12V	HIROSE HR10-7R-4S	3	VIDEO OUT	See Note 3
VID OUT/12V	HIROSE HR10-7R-4S	4	+12V BATTERY	See Note 1
CAM POWER	LEMO ECG.2B.303	1	PWR GND	See Note 4
CAM POWER	LEMO ECG.2B.303	2	+12V BATTERY	See Note 1
CAM POWER	LEMO ECG.2B.303	3	+24V BATTERY	See Note 2
HDSDI	BNC MALE	N/A	HDSDI VIDEO	Direct coax connection to HDSI BNC on sled connector panel. Isolated Video gnd.
RGB	LEMO EYG.1B.306	1	COMP/GRN	Direct coax connection to RGB pin-1, VID IN BNC, and VID 1N/12V pin-3 on stage. See Note 6.
RGB	LEMO EYG.1B.306	2	VIDEO GND	See Note 4
RGB	LEMO EYG.1B.306	3	RED VIDEO	Direct coax connection to RGB connector on sled connector panel.
RGB	LEMO EYG.1B.306	4	VIDEO GND	See Note 4
RGB	LEMO EYG.1B.306	5	BLUE VIDEO	Direct coax connection to RGB connector on sled connector panel.
RGB	LEMO EYG.1B.306	6	VIDEO GND	See Note 4
VID IN	BNC MALE	N/A	COMP/GRN	Direct coax connection to RGB pin-1 and VID 1N/12V pin-3 on stage. See Note 6.
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.			
	- 12V BATTERY VOLTAGE is sourced directly from DC-DC converter in 24V mode. (14.4 to 14.6Vdc at 100W max.)			
Note 2:	- 24V BATTERY VOLTAGE is sourced directly from two sled batteries connected in series.			
Note 3:	- Video source is determined by VDA DIP switches #1-8.			
Note 4:	- POWER GND and VIDEO GND can be connected by internally jumpering JP2-1 to JP2-2 on 800-0005 board.			
Note 5:	- 75 ohm termination switched via VDA DIP switch #10 when IN/OUT switch is set to IN.			
Note 6:	- 75 ohm termination switched via VDA DIP switch #9.			

NOTES: UNLESS OTHERWISE SPECIFIED

NEXT ASSY | USED ON | APPLICATION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES AND APPLY AFTER PROCESS FINISH.
TOLERANCES:
FRACTIONAL ±1/64
ANGULAR: MACH ±1° BEND ±1°
TWO PLACE DECIMAL ±.01
THREE PLACE DECIMAL ±.005
CONCENTRICITY: .003 T.I.R.
BREAK SHARP EDGES: .005 - .010
MACHINED FILLETS: .003 - .005 R.
INTERPRET DRAWING PER: ANSI Y14.5M 1982
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	MW	2/27/07
CHECKED	-	-
ENG APPR.	-	-
MFG APPR.	-	-
Q.A.	-	-

COMMENTS:
FILE NAME: 800-7400-XX

TIFFEN®
6810 San Fernando Rd, Glendale, CA 91201
Phone: 818-843-4800 Fax: 818-843-1829

TITLE: CONN. PIN-OUT DIAGRAM STAGE, ULTRA2

SIZE C | DWG. NO. DOC-800740 | REV A

SCALE: 1:1 | WT: | SHEET 1 OF 1