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FILM AND DIGITAL TIMES

Art, Technique and Technology in Motion Picture Production Worldwide

DJI Ronin 4D

FILM AND DIGITAL TIMES

Art, Technique and Technology

Film and Digital Times is the guide to technique and technology, tools and how-tos for Cinematographers, Photographers, Directors, Producers, Studio Executives, Camera Assistants, Camera Operators, Grips, Gaffers, Crews, Rental Houses, and Manufacturers.

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DJI Ronin 4D

No cinema camera looks like DJI Ronin 4D and does so much.

Close your eyes and dream of a protean primordial portable 1895 Lumière Brothers Cinématographe, mixed with 1970s Beauviala Aaton LTR, styled by a dreamed-up team of DaVinci, Gaudí and Ive, commingled with stabilizers, Lidar, wireless video, wireless control, inspired by Inspire 2, Zenmuses and ancestral Ronins. It is an astonishingly seamless cinematographic system.

The DJI Ronin 4D launched on October 20, 2021. It is a Full-Frame cine camera system consisting of 4-axis stabilizer, integrated video TX and RX, onboard and wirelessly connected monitors, dual handgrips for local and remote control, and Lidar guided Autofocus/Automated Manual Focus/Manual Focus.

There are two models. Ronin 4D with 8K sensor will record 8K 8192x4320 (17:9) up to 60 fps 12-bit at a maximum data rate of 506 MB/s. The Ronin 4D with 6K sensor will record up to 6K 6008x3168 (17:9) up to 48 fps at a maximum data rate of 326 MB/s.

There's a convenient slot on the lower camera left side for an internal, slide-in DJI PROSSD 1TB SSD that connects via USB-C connector directly to the camera, without cables. You can connect other SSD drives with a USB-C cable. Or, remove the SSD slot and replace it with a CFexpress 2.0 Type B module.

Recording format choices include Apple ProRes RAW HQ, Apple ProRes RAW, Apple ProRes 422 HQ, Apple ProRes 422, and H.264 (4:2:0 10-bit).

Overall weight with lens, media, Lidar, onboard battery, monitor, top handle, video transmitter and side handgrips is about 10.3 lb (4.7 kg). Two articulating handgrips invite you to try countless moves as you dance, glide and run across your locations and sets. Push the silver levers forward to adjust the grips horizontally and gently rest the camera against your torso for tummy-resting mid-level shots. Grab the Ronin 4D by its top handle to follow footsteps, run after rabbits, or dream of emulating Garrett Brown's low angle Ur-Steadicam shot of Danny on his tricycle in *The Shining*.

Remove the handgrips and handle to reconfigure Ronin 4D as a remote head. Put it on the end of a crane or remote arm. Mount it on the hood of a truck to smooth out bumpy roads. Attach Ronin 4D on the nose of a camera car for smooth POV driving shots. Drive it on a dolly, without track, on a bumpy floor. Pair it with DJI Master Wheels or Remote Controller.

When you're bumping along in the back of a pickup, tracking the good guys on horseback wondering "who are those guys," Ronin 4D is a self-contained, self-centering, bump-removal system. Bouncing around in a Zodiac rigid-inflatable boat in heavy seas,

Ronin 4D will even out the chop. Although it's IP53 rated, you'll still want to protect the Ronin 4D system from salt water spray.

A tiny Lidar module attaches above the lens. You can keep it there indefinitely. It is unobtrusive and maintains astonishingly accurate focus most of the time. Lidar (Light Detection and Ranging) employs eye-safe laser beams to measure distance using 43,200 ranging points. As it tracks focus, the rubberized focus wheel on top of the right handgrip spins as distances change. This is a new order of haptic response. If you've engaged Automated Manual Focus, you can manually take over from autopilot. The onboard monitor guides you with a distance scale and Lidar histogram.

Out of the box, Ronin 4D is not set up for cat-on-the-shoulder cinéma vérité style shooting. Ronin 4D encourages entirely new styles of camera operating. You might add a handgrip extender on each side, an arm to move the monitor forward on top, and a shoulder pad on the bottom for hours of shoulder-resting. Edgar Morin and Jean Rouch would have adored this camera to chronicle their summer of 1961, reveling in a device capable of enhancing cinéma verité camera moves that would have challenged even their prototype KMT Coutant-Mathot Éclair.

Drew and Pennebaker might have preferred a Ronin 4D to their heavy Mitch Bogdanowicz-modified Auricons on *Primary* in 1960. And Haskell Wexler, ever the proponent of tools that influenced style, surely would have been first in line had Ronin 4D been ready for *Medium Cool* in 1969.

Why? Ronin 4D's pan-tilt-roll gimbals and Z-axis up-down stabilizer arm smooth out every footstep and wobble as you walk, circle and run, documentary-style. And when you do come to a stop, your stabilized camera is steady as a tripod in the sky.

A prototype Ronin 4D landed at FDT a couple of weeks ago. The following pages are notes on what we learned. These are early-stages, neither definitive nor official. Your mileage may differ.

Ronin 4D is a versatile, integrated, plug-and-play camera system that will surely delight every cinematographer and filmmaker—gliding through blockbuster-budgeted features, commercials, documentaries, corporate films and solo independent projects. Ronin 4D gets us ever closer to that magic intersection of imagination and production—a once elusive place where you can dream up incredible scenes and then be able to elegantly capture those dreams.

DJI Ronin 4D Discussion

In the months leading up to launch, Film and Digital Times discussed the Ronin 4D with DJI Product Managers, Planners and Engineers.

Product Concept

When and how did the concept for this camera first come about?

The Ronin 4D builds on our Ronin and Inspire series. It came about after numerous product demos and focus groups with many cinematographers around the world.

What was the original goal? Did those ideas change over time?

DJI is driven by its engineers who focus on innovation and user experience. We help users break down the barriers of professional gimbal technology and make it easy to use, reliable, and accessible to almost anyone.

Who are the potential customers and users of Ronin 4D?

DJI strives to bring professional grade equipment to almost anyone with a creative drive. Back in 2014, we brought to market the Ronin, a 3-axis stabilized gimbal. This was different from anything that had come before and it opened up cinematically smooth video for those looking to achieve "Hollywood" quality.

The new Ronin 4D meets studio requirements and also the desires of cinematographers who wish to push their own filmmaking boundaries. These were key considerations in the design of this camera system. We hope and believe that it will be embraced by everyone with a serious interest in creating professional grade productions.

Product Development

Please discuss the developments that went into some of the new technologies in Ronin 4D.

The three innovative features of the new product are 4-Axis Stabilization, Wireless Transmission and the Focusing System.

Were lenses specifically designed for this camera?

We first entered the Super35 market with our Zenmuse X7 camera and DL-Mount lenses (16.84 mm flange focal depth; 58 mm ID). This was a popular system with the professional Inspire 2 drone. The 16mm F2.8 DL lens covers Super35 only. The other three DL lenses cover Full-Frame: 24mm F2.8, 35mm F2.8 and 50mm F2.8. Today's new camera allows these lenses to be utilized on the ground.

Are you only supporting DL prime lenses or do you have plans to broaden the selection by incorporating third party lenses?

We encourage other manufacturers to produce lenses that fit the DJI system and increase the selection for users. A Leica M mount and Sony E-mount is already available for Ronin 4D.

Another good example is the ultra-wide angle lens from Laowa for the Inspire 2. This lens (9mm f/2.8 DL Zero-D) was greatly appreciated by Inspire 2 cinematographers who were able to achieve a new look for their scenes.

We'll also share a new zoom lens plan for compatibility with third parties through interchangeable lens mounts.

What were some of the challenges in designing and building the Ronin 4D camera system?

One big challenge was the ability to bring 9 physical ND filters into such a small gimbal camera, with only 16.84 mm between the sensor and the lens mount, and how we successfully accomplished it in the end.

Why does Ronin 4D go against the current trend of making lighter and smaller cameras?

The main reason for Ronin 4D's additional weight is the innovative Z axis. This was not an easy decision to make but we believe that its benefits to the user far outweigh having a slightly lighter camera. It's also important to consider that the full system is actually lighter than combined individual components available before.

Product Impact

What is the relationship between Ronin 4D and DJI Ronin gimbals? Will Ronin 4D be a replacement?

No, Ronin 4D is not a replacement. They are different systems to satisfy the needs of different customers. We'll continue to upgrade our handheld gimbals, and we'll provide even more expansion accessories for them to improve customers' experiences. You might say this is a hint of our future accessory project plans.

Are you launching Ronin 4D to compete with other camera manufacturers such as ARRI, Sony, Canon, RED, etc.?

No, Ronin 4D is not a direct competitor to these established market leaders as it offers something unique that wasn't previously available. We wanted to introduce a new system to the filmmaking community that provides users with additional choices.

Thoughts about Future

What are DJI's ambitions in the professional camera market?

Ever since we introduced the Ronin gimbal back in 2014, as an innovative product that brought professional grade stabilization for everyone in the content industry, the desires and needs of this market have been very important to us.

Over the past seven years, we've worked closely with cinematographers around the world to create products that fulfil their requirements and make the production process as easy as possible. These are relationships that we value and will grow stronger moving ahead.

Do you think AutoFucus, ActiveTrack and other intelligent tools will replace manual focusing and gimbal control in the future?

Our technology is designed to help and improve current working practices. It is not designed to replace, but rather to augment the content capture process. Robots should be in the service of human beings, not a replacement.

Let's set up a Ronin 4D

1. You might pack your Ronin 4D in a foamed backpack or case like this.

In the example at right, all three axes are unlocked and the gimbal is stored in a "contorted" position to keep the profile thin.

Storing the Ronin 4D in a ready-to-shoot configuration certainly could save time from storage to shooting.

If you've worked with a Ronin RS 2, you're familiar with the fundamentals of the Ronin 4D gimbal system and how it "unfolds."

2. Gently pull the Ronin 4D from its case.

3. Unlock the Tilt, Roll and Pan switch-style locks to get Ronin 4D ready. The switches are color-coded. When you see red, the gimbal axis is locked. (Red = locked. Black = unlocked.)

Z axis Lock—protects up-down 4D stabilizer arm during shipping and to lock it off for stunts and extra bumpy rides.

Attaching Lens and Lidar on Ronin 4D

4. This is how Ronin 4D looks when pan, tilt and roll gimbals are all unlocked and adjusted in a ready-to-film position.

5. You could attach the Lidar and lens with the gimbals loose. But it is easier to lock all 3 locks. The Lidar is a great device for focus. Let's assume you're using a DJI DL or E-mount Autofocus lens. (We'll get to focus motors later.)

Attach the Lidar unit to the bracket above the lens and connect its short USB-C to USB-C cable. (The cable has screw-in safeties at each end.)

Remove the lens cap.

6. Mount the lens.

When you unlock the gimbal locks, gently hold the lens to keep it from diving down. Careful! Lens and Lidar can be very top-heavy. Balancing is discussed on the next page.

Yes, it is much easier to keep things in balance with lens alone, no Lidar. But we like Lidar a lot, so it remains onboard.

Balance Pan and Tilt

Balance the Tilt Axis

- Put the Ronin 4D on a level surface.
- Unlock the Tilt lock.
- Unlock the Tilt Balance Knobs on both sides of the lens.
- If it is front-heavy, move the camera backward.
- If back-heavy, move the camera forward.
- Tighten the two Tilt axis knobs.
- Lock the Tilt lock.

1. Tilt top handle toward camera left.
2. If the lens pans to the left...
3. Push the pan axis arm toward the rear of the camera.

Balance the Pan Axis

- Unlock the Pan lock.
- Unlock the Pan Balance knob.
- Turn the Ronin 4D so you're facing its camera left side.
- Holding the top handle, tilt Ronin 4D to its left (camera left) about 30 degrees.
- If the lens pans to the left, push the pan axis arm towards the rear of Ronin 4D.
- If the lens rotates to the right, push the pan axis arm toward the front of the camera.
- Tighten the Pan axis knob.
- Lock the Pan axis lock.

Power Ronin 4D On

1. To prepare the Z axis arm, loosen the Z axis safety knob. Unlock all 3 locks: pan, tilt and roll.

2. Push the main Power Button for 1 second to turn the camera ON. Hold the button for 3 to 5 seconds to power OFF.

3. While holding the lens, set the left GIMBAL MODE switch from OFF to FOLLOW or LOCK. It takes about 5 seconds for the brushless motors to take over and keep the camera and lens assembly stablized in place.

4. Of course, you probably want to benefit from the Z axis. So, push the 4D (Z axis) button. The arm gracefully ascends. It should be more or less horizontal. If not, adjust the knob marked "+ –" at the rear of the Z axis arm.

- OFF - FOLLOW - LOCK Switch.
- OFF means gimbal brushless motors are not active.
- FOLLOW means the camera follows the direction you move the top handle.
- LOCK means the camera remains "locked" or fixed on the last position you aimed at, no matter where you point the handle.

Four Tx (transmitter) antennas: 2 on top and one on each side.

DJI TB50 Battery slides down from top. 4280 mAh; 97.58 Wh; 22.8 V.

Battery Release

Z axis arm smooths out up-down shake and unsteadiness to a much greater degree than gimbal or OIS (Optical Image Stablization) can achieve.

It is not a weightless-in-space spring-balanced system. Instead, the Z axis is controlled by active stablization, assisted by downward-facing ToF (Time of Flight) sensors at the bottom of the camera that measure distance from base to ground.

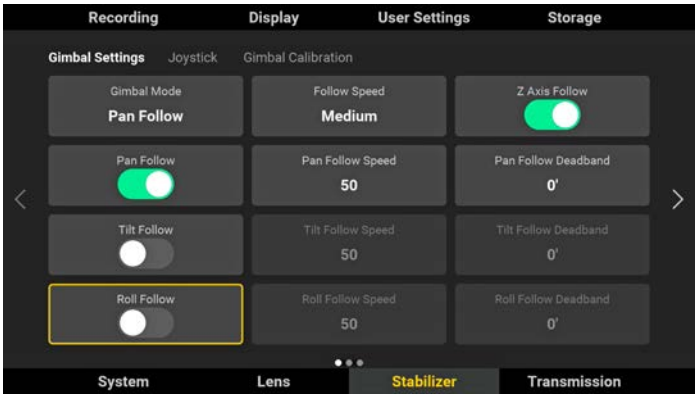
DJI PROSSD 1TB SSD

You can unscrew the SSD media holder and replace it with Ronin 4D's CFexpress media holder.

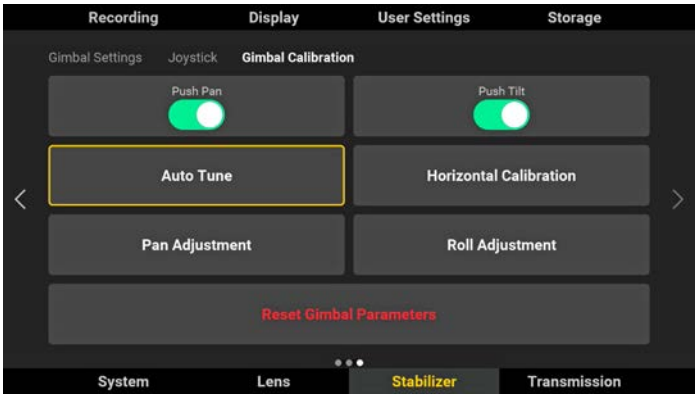
Auto Tune Ronin 4D

You should Auto Tune Ronin 4D at the start of each day, with each major new setup, and each time you change lenses.

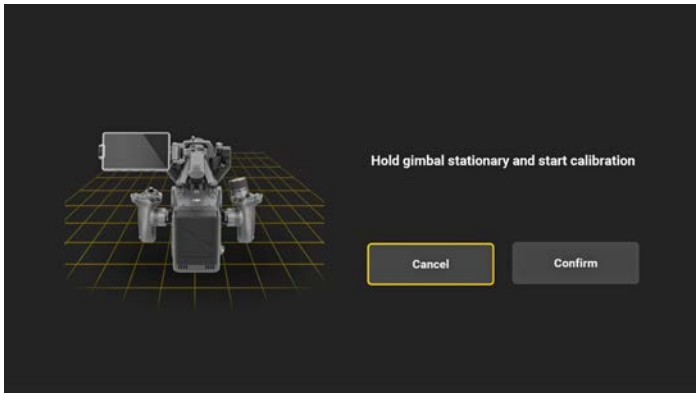
To begin the calibration process, push the MENU button of the onboard High-Bright Main Monitor.



1. To calibrate, navigate to the Stabilizer tab.



2. Go to the 3rd Stabilizer page. Touch or select AUTO TUNE.

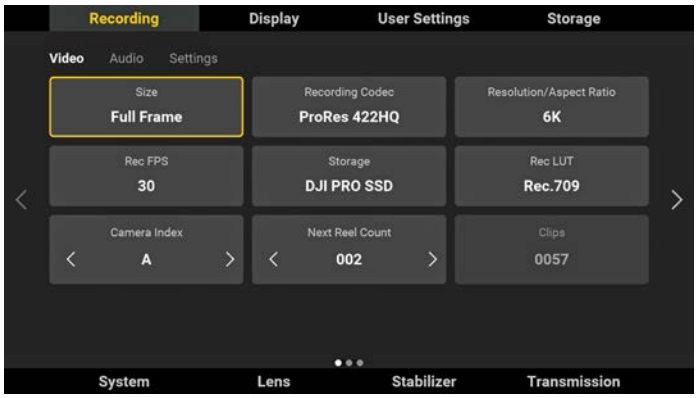


3. Confirm to begin Auto Tuning. Hang on to the top handle.

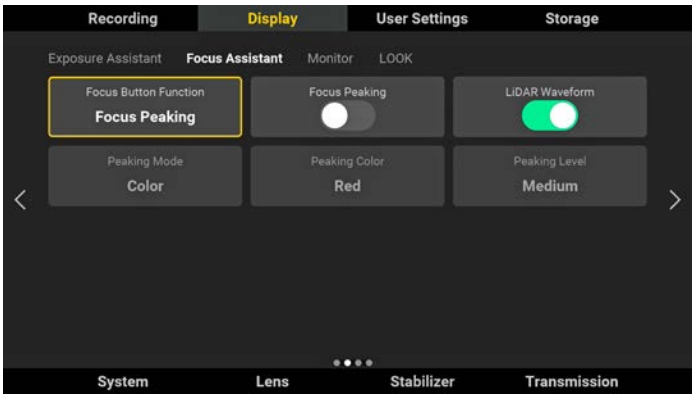
4. Stay calm and continue. The camera will shake, bounce and vibrate.

Ronin 4D Menus

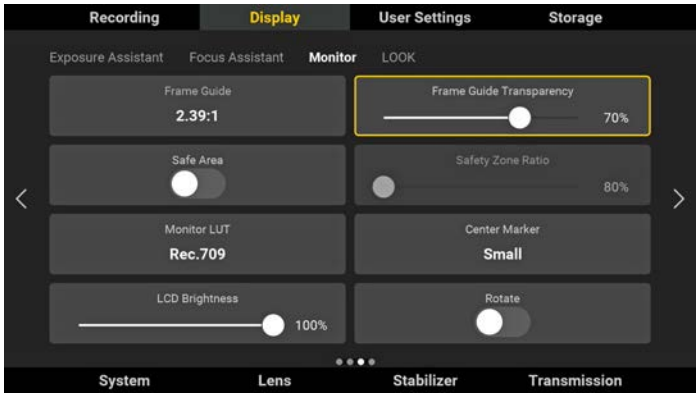
The following menu settings are things we liked. There are many flavors of Van Leeuwen ice cream. You may prefer other choices.



1. The Home tab is for RECORDING settings. There are 3 pages.

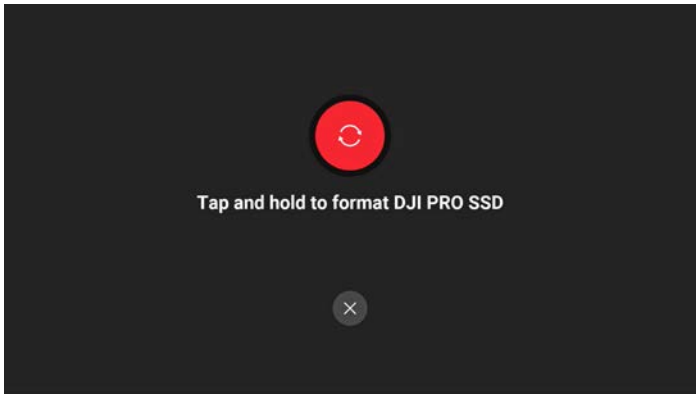


2. Go to Display page 2 and turn Lidar Waveform ON.

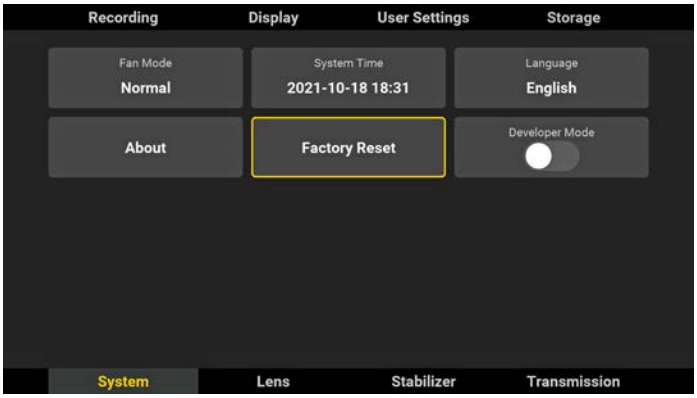


3. Go to Display page 3 for framelines, center marker, monitor LUT, etc.

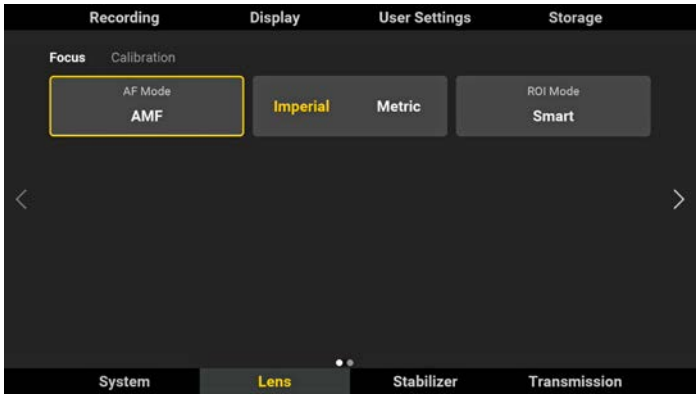
4. Time remaining and Format Media is under the Storage tab.



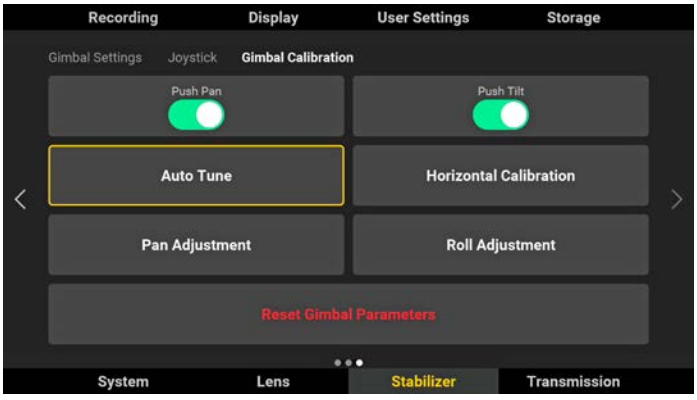
5. You have to press the red center circle for 3 seconds to format.



6. Factory Reset is under the System tab. When all else fails, it's here.



7. AMF (Automated Manual Focus) under the Lens tab is good. It lets you override autofocus. Imperial or Metric is for the on-screen focus display. ROI is Region of Interest for focus area. Choices are Smart, Spot or Wide.



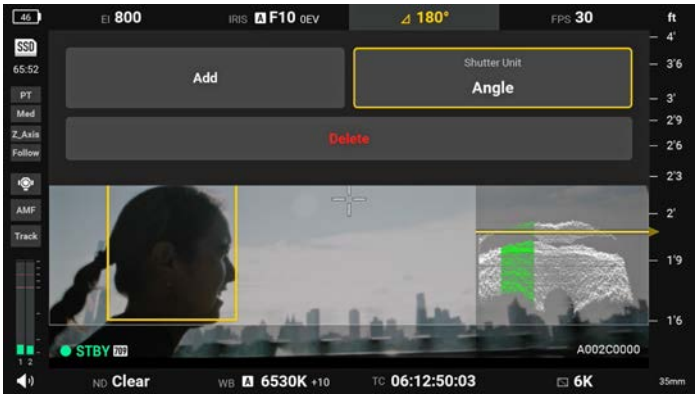
8. Push Pan and Push Tilt, under the Stabilizer tab, lets you manually adjust the pan and tilt direction of the lens—even while the stabilizers are active.

On-Screen Settings

1. Most camera settings are available at the touch of the touchscreen or the push of a button. Ajsut with a finger swipe or by turning the monitor dial. The EI button selects from 200 - 12,800.

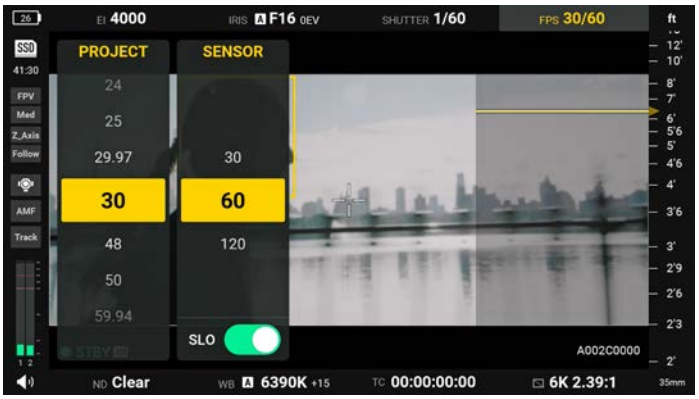
2. If you choose AUTO IRIS, be sure to select 0 EV if you do not want exposure compensation. Manual IRIS takes control of electronically enabled lense via the lens and camera pogo pin contacts.

3. You probably want Shutter Angle to remain on manual control.



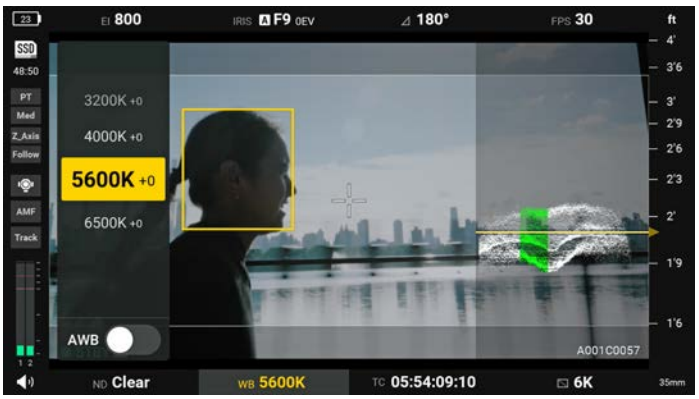
4. If Shutter displays speed, like 1/60, you can change to Shutter Angle. Press and hold the Shutter button or icon for a second or two to select.

5. Tap or touch FPS for frame rate.



6. Press SLO and you see Project (playback) and Sensor (shooting) speeds. If you select 120 fps here, it prompts you that it will be in S35.

7. Select internal NDs of Clear and ND.3 (1 stop) to ND2.7 (9 stops).



8. Press and hold White Balance to measure WB or add custom settings.

Ronin 4D Views

Front view

What is ActiveTrack Pro? It keeps the subject locked in frame and usually centered, even if you pan or tilt away.

Push the left handgrip trigger to engage.

Top view

Bottom view

Dual Handgrips with Controls

Attach the left and right handgrips for solo operator's full control of the Ronin 4D

Right Trigger. Press twice to enable or retract Z axis.

Left Trigger. Get to know this very important button.

- Press twice to center the subject when ActiveTrack Pro is enabled (to keep subject centered).
- Press and hold to start ActiveTrack Pro when in Smart mode. (Smart mode is selected in Menu > Lens > ROI Mode > Smart.)
- Press to switch between Follow and Lock mode when not in Smart mode.
- Press twice to recenter the gimbal when not in ActiveTrack Pro.

Left Handgrip

Right Handgrip

High-Bright Remote Monitor

Attach the same two handgrips on the 8" High Bright Monitor for full remote control of most Ronin 4 functions.

Lidar is enabled, but in this example we adjusted focus manually to 4'. See yellow arrow on the right side of the screen.

In this example, in Lidar we trust, and it correctly sets focus to 2'4".

Rear View. The WB37 can be replaced with a DJI adapter to accept NP series Sony style batteries

There are 4 antennas on the High-Bright Remote Monitor and 4 antennas on the Ronin 4D. They are all the same size.

Left side

Right side

Top View: there are 4 neck/shoulder strap attachment points.

Left side with handgrips

Bottom: two 3/8-16 and three 1/4-20 threaded sockets

Lenses for Ronin 4D

Currently, there are four DJI DL lenses for the Ronin 4D. They have lightweight, carbon fiber barrels. You may recognize them: they were introduced as companion lenses for DJI's aerial Super35 Zenmuse X7. The 16mm DL-S (S as in Super35) will require Ronin 4D Super35 format. But the DL 24, 35 and 50 mm lenses conveniently cover Full-Frame.

Maximum lens weight is 600 grams. As long as a lens is under 600 grams, you can use Sony E-mount and Leica M Mount lenses with adapters that are shipping at launch. PL, Canon EF and other mounts are said to be in the works.

Lens	DL-S 16mm F2.8 ND ASPH	DL 24mm F2.8 LS ASPH	DL 35mm F2.8 LS ASPH	DL 50mm F2.8 LS ASPH
Coverage	Super35	Full-Frame	Full-Frame	Full-Frame
Weight	Approx. 182 g	Approx. 178 g	Approx.180 g	Approx. 182 g
Max Aperture	F2.8	F2.8	F2.8	F2.8
Elements/Groups/ASPH	13 / 12 / 4	9 / 8 / 3	9 / 8 / 3	9 / 7 / 2
Close Focus	0.40 m	0.65 m	0.85 m	0.93 m
Front Diameter	46 mm	46 mm	46 mm	46 mm
Barrel Dimensions (diameter x length) incl. lens hood	Ø 55.0 × 69.1 mm	Ø 55.0 × 71.2 mm	Ø 55.0 × 71.2 mm	Ø 55.0 × 71.2 mm

Left: DJI Ronin 4D has a native DX mount with a very shallow distance of about 6 mm from flange to cover glass. Sandwiched between the cover glass and the Full-Frame sensor is the internal ND filter mechanism.

Above: DJI Ronin 4D's DX to DL mount.

DX and DL Lens Mounts

DJI Ronin 4D native DX mount

DJI DL 35mm F2.8 LS ASPH

DJI DL Mount
16.84 mm FFD
58 mm ID Ø
2.2 oz
Lens data contacts
Auto focus/iris functions

Leica M Mount
27.8 mm FFD
44mm ID Ø
5.1 oz

Sony E-mount (3.5 oz)
18 mm FFD
46.1 mm ID Ø
2.2 oz
Lens data contacts
Auto focus/iris functions

DJI DL Mount

Leica M Mount

Sony E-mount

DJI DL Mount

Leica M Mount

Sony E-mount

Sony Sonnar T* FE 35mm F2.8 ZA E-mount

Leitz Wetzlar 1958 Summaron-M 35mm F2.8

Leica Summilux-M 50mm f/1.4 ASPH

Leitz M 0.8 Lenses on Ronin 4D

High Bright Remote Monitor

DJI has a Leica M mount for Ronin 4D. Leitz M 0.8 lenses are based on iconic Leica M series, declicked and with industry-standard 0.8 M gears for focus and iris. There 8 M 0.8 lenses:

- 21mm f/1.4 Summilux-M
- 24mm f/1.4 Summilux-M
- 28mm f/1.4 Summilux-M
- 35mm f/1.4 Summilux-M
- 50mm f/1.4 Summilux-M
- 50mm f/0.95 Noctilux
- 75mm f/2.0 Summicron-M
- 90 mm f/2.0 Summicron-M

Leica M lenses are completely manual. There are no electronic in the lens or the mount. So how do you focus?

DJI supplies the X9 Zenmuse Focus Motor. It attaches below the lens and plugs into the USB-C port on the camera left side of the brushless tilt motor. This is when you want a camera assistant pulling focus with the High Bright Remote Monitor.

Ronin 4D Lens Motor

You calibrate the focus scale in pretty much the same way as you would other wireless focus systems: select and confirm lens scale distances on the monitor's display

First, initialize the lens motor. This locates the end stops of the lens: Menu>Lens>Page 2>Focus Motor Initialize>Confirm.

You'll find Focus Calibration next to FOCUS MOTOR INITIALIZE on screen. Enter Lens Name, Focal Length, and then Initialize, Calibrate.

Note that when you see the command to RECORD, that does not mean press the camera's Record button. It means tap on the word RECORD, as in "Duly Noted."

Ronin 4D with Master Wheels

Ronin 4D can work masterfully with DJI Master Wheels.

Strip 4D down to its lightest and most compact bare essentials. Remove the top handle, monitor and side handgrips. You now have a capable and affordable stabilized remote head. Mount it on a crane, camera car, picture vehicle, boat, plane, train or automobile.

Master Wheels are around $9,500. Paired with the Ronin 4D, you have a very affordable remote camera system.

Ronin 4D Remote Head

You do not always need Master Wheels to work remotely. As discussed earlier, Ronin 4D is pleasantly operable with joystick control by the left handgrip on the High Bright Remote Monitor.

There will be times where you do not need the extra vertical dampening of the 4th dimension (Z axis) and that's when you simply turn it off and lock it with the front safety knob.

DJI Ronin 4D Specs

The following specifications are unofficial, not final, and may change.

General

Main Body Dims (l×w×h)	235×115×160 mm
Dimensions (l×w×h)	309×290×277 mm. (Measured when 6K Combo is fully set up with the main monitor attached and Z-Axis off.)
Gimbal / Main Body Weight	Approx. 1.04 kg / Approx. 1.45 kg
Overall Weight	Approx. 4.67 kg (after installing all modules in the combo, excluding lens and storage card)
Maximum Operating Time	Approx. 150 mins. (Measured with a fully charged TB50 Battery and Ronin 4D with the gimbal balanced, the Z-axis inactive, and continuously recording in RAW. Gimbal movements or use of the Z-axis will reduce operating time.)
Intelligent Features	ActiveTrack Pro, Autofocus (supports human face/body recognition and framing)

X9 Camera

Sensor / Dynamic Range	Full-Frame 36 x 24 mm (approx) CMOS sensor / 14+ stops
Base Lens Mount / Supported Lens Mounts	DX Mount / DL Mount (standard), M Mount, and E-mount
White Balance	Manual 2,000-11,000 K and tint adjustment. Also AWB
Gamma	D-Log, Rec.709, HLG
EI Range	X9 8K: EI 200-12800, Dual Native ISO 800/4000 X9 6K: EI 200-12800, Dual Native ISO 800/5000
Shutter Speed	Electronic Rolling Shutter 1/24s-1/8000s
ND	Internal 9-stops of ND filters: Clear, ND.3, ND.6, ND.9, ND1.2, ND1.5, ND1.8, ND2.1, ND2.4, ND2.7
Focus Control	Autofocus, Manual Focus, Automated Manual Focus (AMF). Autofocus on manual lenses requires DJI Zenmuse X9 Focus Motor.
X9 6K Max Bit Rate	6008×3168, 48fps. RAW 326MB/s.
X9 8K Max Bit Rate	8192×4320, 60fps. RAW 506MB/s
Supported File System	exFAT
DJI PROSSD 1TB Recording Formats	Apple ProRes RAW HQ / Apple ProRes RAW Apple ProRes 422 HQ / Apple ProRes 422 (future firmware update) H.264 (4:2:0 10-bit), etc.
Storage Media	DJI PROSSD 1TB, CFexpress 2.0 Type B, USB-C SSD. Unlimited recording time with PROSSD 1TB
CFexpress 2.0 Type B Recording Formats with recommended Cfexpress cards.	**ProRes 422 HQ:** 6K: 23.976/24/25/29.97/30fps C4K: 23.976/24/25/29.97/30/48/50/59.94/60/72/96/100/120 fps 2K: 23.976/24/25/29.97/30/48/50/59.94/60/72/96/100/120 fps **H.264:** C4K: 23.976/24/25/29.97/30/48/50/59.94/60/72/96/100/120 fps 2K: 23.976/24/25/29.97/30/48/50/59.94/60/72/96/100/120 fps
USB-C External SSD Recording Formats with recommended SSDs.	**ProRes 422 HQ:** C4K: 23.976/24/25/29.97/30/48/50/59.94/60 fps 2K: 23.976/24/25/29.97/30/48/50/59.94/60 fps **H.264:** C4K: 23.976/24/25/29.97/30/48/50/59.94/60 fps 2K: 23.976/24/25/29.97/30/48/50/59.94/60 fps
Built-in Mic / Audio Format	Built-in 2-ch stereo / LPCM 2-ch, 24-bit 48kHz

Main Monitor

Screen Size / Resolution / Refresh Rate	5.5 inches (diagonal) / 1920×1080 / 60Hz
Screen / Max Brightness	LCD touchscreen. Can flip image 180 degrees (upside-down) / 1000 cd/m²

Battery

Battery	TB50 Intelligent Battery. 4280 mAh. 97.58 Wh. 22.8 V.
Max Charging Voltage / Charging Time	26.1 V. 180 W. / Approx. 1.5 hours (with standard 65W power adapter)

DJI Ronin 4D Specs

Gimbal

Mechanical Range	Pan: ±330°. Tilt: -75° to 175°. Roll: -90° to 230°.
Z Axis Range	approx 130mm up-down. Stabilization range of the Z-axis is subject to change based on Z-axis modes and usage scenarios and may be smaller than the mechanical range.
Controllable Range	Pan: ±285°. Tilt: -55° to +155°. Roll: ±35°
Max Control Speed (°/s)	DJI Master Wheels or DJI Force Pro: Tilt: 360°/s. Roll: 360°/s. Pan: 360°/s. Ronin 4D Hand Grip: Tilt: 120°/s. Roll: 120°/s. Pan: 120°/s.
Maximum Z-axis Payload	2000 g (including maximum 1040 g gimbal payload)
Angular Vibration Range	±0.01°

Lidar Range Finder

Weight	88 g
Dimensions (length×width×height)	71×47×34 mm
LiDAR Range Measurement Precision	0.3-1m (±1%) and 1-10m (±1.5%)
FOV (Field of View)	30cm to 3m @ >18% reflectivity 60° (horizontal) × 45° (vertical) 30cm to 10m @ >18% reflectivity 60° (horizontal) × 7° (vertical)
Safety Rating	Class 1 (IEC 60825-1:2014) (safe for human eyes)
Operating Environment	Use in environments with diffuse reflective surfaces (>10%, such as walls, trees, people, etc.) Do not use in environments with dense fog. Do not aim Lidar at, or through, glass surfaces.
Laser Wavelength	940 nm
Single Pulse Width	Two types of pulses emitted: 5ns and 33.4ns.
Max Laser Power	6 W

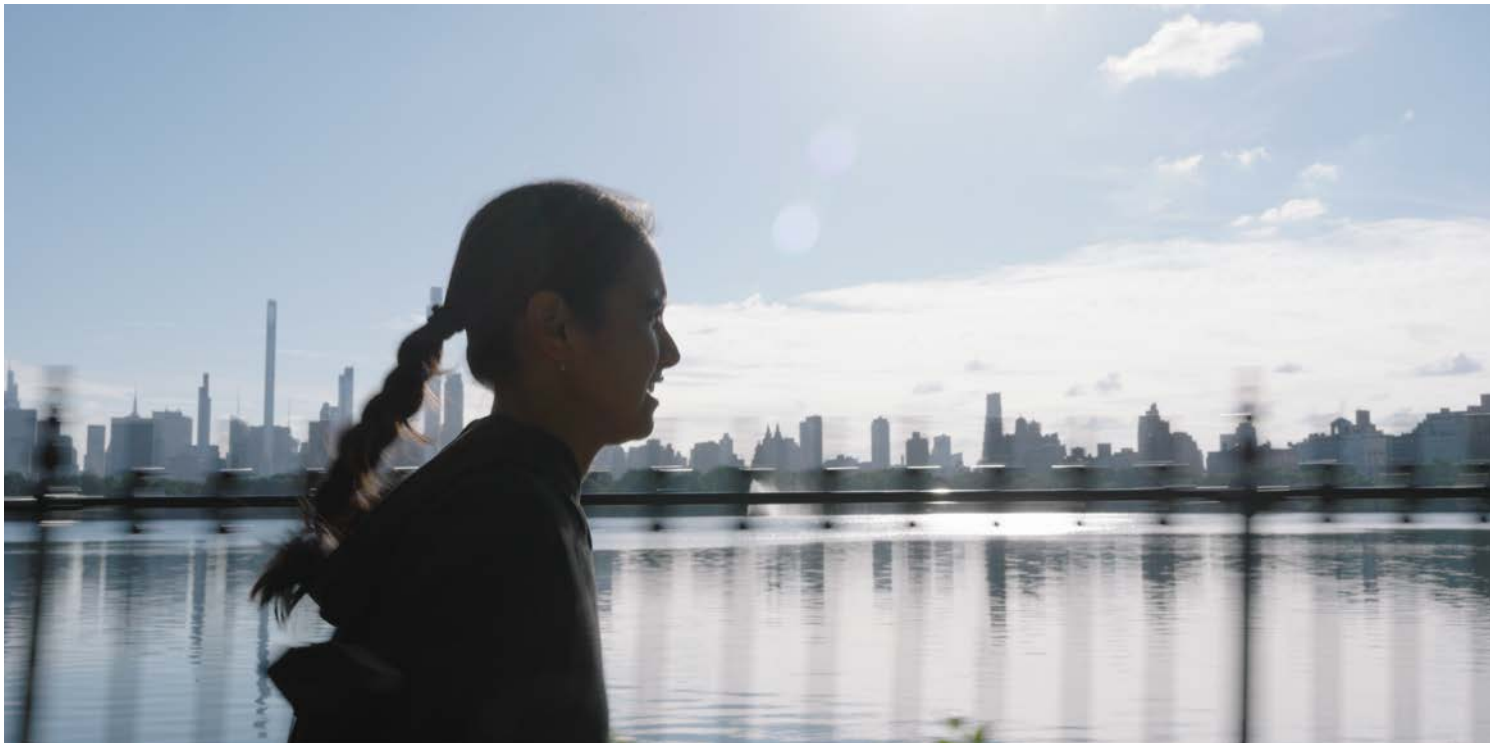
DJI O3 Pro Video Transmission

Max Transmission Distance	20,000 ft (approx. 6km), when unobstructed, free of interference. FCC-compliant
Max Transmission Resolution and Frame Rate	1920×1080 @60fps
Minimum End-to-End Latency	100 ms measured at 4K / 24 fps. 68 ms at 4K / 24 fps
Wireless Frequencies. Some frequency bands may not be available depending on policies of the region in which the monitor was activated.	**Non DFS frequency band:** 2.400-2.483 GHz / 5.150-5.250 GHz / 5.725-5.850 GHz
	DFS Frequency Band: 5.250-5.350 GHz / 5.470-5.600 GHz / 5.650-5.725 GHz
Transmitter Power (EIRP)	2.400-2.4835 GHz: 33 dBm (FCC); ≤20 dBm (SRRC/CE/MIC) 5.150-5.250 GHz: <23 dBm (FCC/SRRC/CE/MIC) 5.250-5.350 GHz: <30 dBm (FCC); <23 dBm (SRRC/CE/MIC) 5.470-5.600 GHz, 5.650-5.725 GHz: <30 dBm (FCC);<23 dBm (CE/MIC) 5.725-5.850 GHz: <33 dBm (FCC); <14 dBm (CE); <23 dBm (SRRC)
Max Bandwidth / Max Bitrate	40 MHz / 50 Mbps

Connections

Main Body	3.5mm TRS Stereo Input Jack × 1 (supports mic, plug-in power mic, and line inputs) / 3.5mm Stereo Output Jack × 1
	USB3.1 Type-C Data Port × 1
	6-pin 1B DC-IN (DC 12-30 V) × 1 / Battery Mount Power Port (female) × 1
	4D Expansion Plate Data Port (female) × 1
	High-Bright Main Monitor Port × 1
	Hand Grips Port × 2 / Top Handle Port × 1
	HDMI Type-A Video Output Port × 1 (Currently supports HDMI 1.4 and will support HDMI 2.0 in a future firmware update.)
X9 Gimbal	Lidar Range Finder/ Focus Motor Port × 2
TB50 Battery	Battery Mount Power Port (male) × 1
	TB50 Battery Port × 1

Running with Ronin 4D



Above: 6K framegrab from *Running with Ronin 4D* video.
Below: Marlena Fauer and Jon Fauer running with Ronin 4D.

What is your most memorable movie running scene? Most likely it's *Marathon Man,* starring not only Dustin Hoffman, but also Garrett Brown, ASC on his debut year with Steadicam in 1975. His other films that year were *Rocky* and *The Shining* (see page 45).

Now, there's no way we were going to match Garrett's prowess or the marvels of Steadicam. Without a city filming permit, accompanying crew, Gator 4x4 vehicle, Steadicam, Flowcine Black Arm, camera car, jib arm or remote head, how would we test Ronin 4D for an imaginary remake of *Son of Marathon Man*, or *M10—Marathon Man 10,* or *Daughter of Marathon Man*?

On a fine fall day, with Ronin 4D in hand, we headed to the Jacqueline Kennedy Onassis Reservoir Running Path in Central Park. The crew was complete: two architects and the editor of FDT. As Tony Richmond ASC, BSC once said, nepotism is fine as long as you keep it in the family. And so, Marlena Fauer was drafted in the role of Marathon Runner.

Jonathon Brearley was camera operator, running with Ronin 4D. He's a marathoner, never tired and carried Ronin 4D's 10.3 pounds as if it were light as a water bottle. I operated a couple of shots and was OK. We were running pretty much flat out.

Ronin 4D stability ability was amazing. These were entirely handheld running sequences, at full tilt, weaving around other runners and though crowds of pedestrians. The Z axis soaked up bumps and bobbles. The gimbal's pan, tilt and roll axes kept Billionaires' Row and the New York skyline horizontally level and steady. Lidar and ActiveTrack Pro kept the image sharp and nicely framed.

Thanks to Shawn Carlson, Product Specialist, for help with editing and grading Ronin 4D footage in DaVinci Resolve.

Full 6K playback worked well directly from DJI's PROSSD 1TB.

Watch the video. YouTube: *youtu.be/0PzH5dlGQh8*
Vimeo: *vimeo.com/637053837*

Jacqueline Kennedy Onassis Reservoir Running Path in Central Park. Jonathon Brearley running with Ronin 4D.

ARRI Rental Moviecam and ALFA Primes

Moviecam photos: Hannes Rohrer

ARRI Rental Moviecam Primes

Focal Length	16mm	20mm	24mm	28mm	35mm	40mm	50mm	60mm	85mm	100mm	135mm
Maximum	T2	T2	T2	T2	T2	T2	T2	T1.5	T2	T2.8	T2.8
Close Focus / ft	8"	8"	11"	12"	14"	11"	17"	16"	3'	3' 6"	4' 3"
Weight	1.1kg	1 kg	1 kg	1 kg	1 kg	1 kg	1 kg	1.1 kg	1.1 kg	1.2 kg	1.2 kg

Image Circle Ø: 46 mm
Lens Mount: LPL with LDS-2
Front Diameter: 114 mm

Over the past couple of consternated years, ARRI Rental has been busy developing and building two new sets of exclusive large-format primes: the ALFA anamorphics and Moviecam spherical lenses.

ARRI Rental is already well established as a boutiquey lens manufacturer, having previously developed Prime 65 and Prime DNA lenses for its ALEXA 65 cameras, as well as DNA LF lenses for large format. The company's lens customization and detuning experiences have also added to its awareness of what today's filmmakers are looking for, and how to provide it. With demand for large format filming on the rise, coupled with an increased interest in unique looks, the lens development teams at ARRI Rental got to work.

Using ARRI/ZEISS Master Anamorphics as a starting point, the ALFAs evolved through a process of testing and optical experimentation with cinematographers to eventually emerge as characterful lenses with an entirely new look.

The Moviecam primes began life as vintage lenses, originally developed in the 1980s by Fritz Gabriel Bauer for his Moviecam Super America and other BNCR mounted cameras. Scarce and seldom used after ARRI's takeover of Moviecam in the 1990s, the Moviecam lenses have now been given new housings and new features by ARRI Rental, ready for a new life on large-format productions.

ALFA and Moviecam lenses are now equipped with LPL mounts and ARRI LDS-2 lens data. They are available from ARRI Rental facilities worldwide.

The looks of the ALFAs and Moviecams fall squarely into the vintage/detuned/imperfect category. Actually, ARRI Rental is

ALFA photos: Hannes Jung

ARRI Rental ALFA Anamorphic 2x Primes

Focal Length	40mm	47mm	60mm	72mm	90mm	108mm	145mm	190mm
Aperture	T2.5	T2.5	T2.5	T2.5	T2.5	T2.5	T2.5	T3
Close Focus / ft	2' 6"	2' 5"	2' 6"	3'	3'	3' 2"	3' 11"	5'
Weight	2.5 kg	2.6 kg	2.7 kg	2.7 kg	2.7 kg	3.3 kg	3.5 kg	3.3 kg

Image Circle Ø: 39.8 mm
Lens Mount: LPL with LDS-2
Front Diameter: 114 mm

open about the fact that, unlike ARRI, they do not have to try to please everybody when they build a set of lenses. Not being a sales company liberates them to make bold choices and offer distinct looks. Some will love the new lenses and others might gasp in dismay—but they seem to be content with that.

One gentlemen who is very pleased is Gabriel Bauer. We spoke by phone and he said, "I was very proud, to be honest, when Manfred told me that they were relaunching these lenses under the Moviecam name and logo."

We also spoke with the ARRI Rental lens experts who were the driving forces behind each new series. Manfred Jahn in Munich talked about the Moviecams and Christoph Hoffsten in Berlin discussed the ALFAs. Like the DNA lenses, both series were a team effort of ARRI Rental's global technology group, with important contributions from not only the EU, but also the UK and US.

Manfred Jahn on ARRI Rental Moviecam Primes

Manfred Jahn is Head of Camera Rental at ARRI Rental in Munich. He started his career at Zeiss Ikon Anschütz in Kiel, working on camera and gyro systems. Further study led to assembly and service of optical instruments, followed by his first role at ARRI Rental. Manfred was the one clambering up Himalayan foothills, supporting Vittorio Storaro, ASC, AIC on Little Buddha, *as camera technician for the show's Arriflex 765 65mm film cameras.*

Manfred has been friend and guru to every DP and camera crew who entered his office on Tűrkenstrasse and now Münchener Str. in Ismaning. He has been a mentor for most of my career—on all things about cameras, viewfinders, lenses and sailboats. When it was time to show me a new lens system, Manfred was the one who drove for hours, even at risk of being late for his wedding anniversary. I hope he got home in time.

With years of experience on set and at the work bench, Manfred has a profound understanding of camera and lens systems. Mark Hope-Jones and I wanted to hear more from Manfred about ARRI Rental's Moviecam primes. And so, it was good to see him on Zoom.

What is the story of the original Moviecam lenses, and did you have sets of them already at ARRI Rental?

The original versions were built in the mid-1980s with a BNCR mount for the Moviecam Super America camera. It was Gerhard Giesser who built the lenses and they were used at that time by many colleagues of Fritz Gabriel Bauer, AAC, the founder of Moviecam. Gabriel sold them as well, mostly in Europe and to Samuelson Film Service in London because their cameras mostly had BNCR mounts. Some sets went to the US, including to Ed Lachman, ASC, for his Moviecam. It's not clear how many sets were made—maybe 30 or 40 sets—but not a big number.

Those original Moviecam primes used the old housings of the donor lenses and people found that challenging because there can be various mechanical problems. Years ago, we had one of our sets rehoused, but they were still tricky to use and got very little utilization during the ARRICAM years. In the end, it was mainly students taking them out with Canon DSLR cameras, and all our other sets just sat in the basement, unused.

What prompted their resurrection?

When the ALEXA LF camera was released, we thought we'd try the Moviecam primes on the larger sensor, because the donor lenses were designed for Full-Frame still cameras. Using them on Super35 never got the best out of them. I put them on the camera and saw what they did, and then showed them to a friend of mine while he was shooting tests for a film, and he just fell in love with the lenses. But he couldn't use them as they were. We needed to find a way to re-house them.

I realized that we could probably use the lens housings we had designed in-house for our DNA LF lens series as a starting point. So, we assembled three prototype sets of Moviecam primes with these housings, working under the radar. My friend used them on his film, and the one after that, and then another one after that. And then a friend of his started asking for them, and within two or three years they had gone out on maybe 12 movies. I did tests and screenings, getting more positive feedback, and we found that when clients tested four of five different lens sets they were frequently falling in love with the look of the Moviecam primes.

How would you describe that look?

There's something about how the perspective, contrast, and distortion of the lenses work together to create a look that is a bit three-dimensional. You get a feeling of proportion and depth, a sense of naturalness to the relative sizes of foreground and background elements. Not everyone sees it; the best way to see it is to photograph a place you know well, like your living room. With the Moviecam primes it will really look like your living room. But, with many other lenses, the dimensionality won't feel right: it will be different from what you see with your eyes.

One of the things that really works for these lenses on large format is that they have nice fall-off at the edges in terms of sharpness. But, contrast at the edges is retained. Of course, ARRI Signature Primes hold their sharpness and their contrast all the way to the edges, but it's the fall-off of vintage glass that people often respond to. So, I'd say that the Moviecams sit between the Signatures and our DNA LF lenses, which is good because I think a lot of people are looking for something in the middle. The other great advantage is their consistency.

Consistency even though the donor glass is vintage?

Yes, the Moviecams are unusually consistent for vintage lenses, which was one of the reasons why it made sense to manufacture a larger number of sets that could be stocked by ARRI Rental facilities all over the world. The core set up to 100 mm is very consistent, and it's T2, so that's a big factor in their popularity. The only exception to that is a 60 mm, which we added to the original set, and is faster at T1.5. It's still the same kind of lens, but the higher speed gives it a different look wide open and makes it a really interesting portrait lens. All the focal lengths have better close focus distances than the originals because of our new housings, and that's important for today's filmmakers.

Are they as compact as the original lenses?

They are a bit bigger, but we're talking about a few centimeters. The ARRI Rental housings bring advantages that far outweigh the size increase. Most people don't want tiny lens scales. We increased the rotation on the focus ring from around 90 degrees to 340 degrees, and made it a lot smoother. We also enlarged the iris ring scale, and moved it from the front of the lens to the back, in line with standard cine lenses. We couldn't have done that without the larger housing; there wouldn't have been the space.

The weight is basically the same as the originals, somewhere around 1 kg, so they're very light. The housings are much more robust, made of very strong aluminum. They can take a hit, whereas if you drop a tiny lens it will fail. Our design is strong enough to withstand hard work on real sets. And, because the same housings were used for the DNA LF lenses, they have already been tried and tested in the heat, in the cold, in every situation you can think of. We're only making a relatively small number of Moviecam sets, perhaps 25 globally, so we need to know for sure that they are reliable.

Was it difficult to retain the original look, despite all these physical changes?

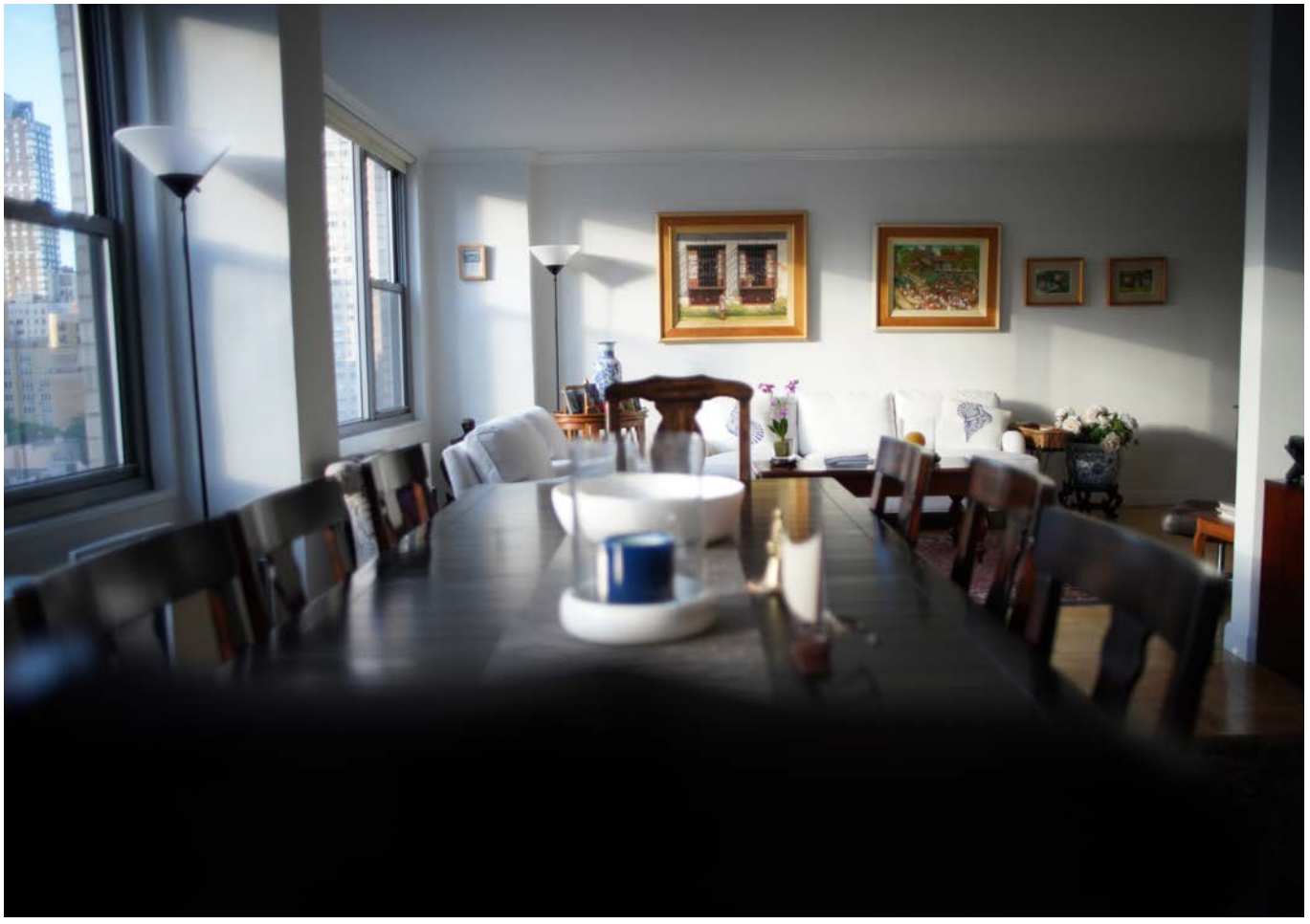
The glass is still the same and we use the original lens barrels inside to maintain the original look because there are people who remember them well. We wanted to give them the look they remembered, but in a much more practical form. That's what the new housings do: they eliminate the old problems of backlash, image movement when pulling focus, and stray light, while adding the robustness, the consistency of lens ring positions and front diameters, and the LDS-2 chip for lens metadata, which can be very important on modern productions.

Ease-of-use was a consideration for us as well, not just our customers. We designed the housings to be quick and easy to service, requiring only a small number of tools. That makes it simpler for us to support these lenses at all of our facilities across all territories, and those efficiencies bring benefits to our clients as well.

Can the new Moviecams also be used for Super 35?

Naturally, they will cover Super35, and will perform better than the originals on that format, mainly because of the stray light suppression. But the donor glass was designed for Full-Frame, or what we call large format in the world of ARRI cinematography, and that is where the Moviecams really shine. In a way, this new generation of Moviecam lenses is finally realizing their full potential, because of the larger format and the work we've done to them, while fully respecting their origins and the very high standing of the Moviecam brand in the history of our industry.

28mm T2 & 135mm T2.8 Moviecam at Home



When Manfred Jahn says, "The best way to see the look of the Moviecam primes is to photograph a place you know well—like your living room," that is exactly what you do: photograph your living room.

28mm T2 Moviecam Prime

135mm T2.8 Moviecam Prime

Christoph Hoffsten on ALFA Anamorphic 2x LF Primes

Christoph Hoffsten is Head of the Camera Department at ARRI Rental in Berlin. With a background in electronics engineering, he has worked at rental houses for many years, moving to ARRI Rental in the early 2000s. Known and admired by many cinematographers for his personal level of service, Christoph has a wealth of experience customizing and detuning lenses in pursuit of unique looks.

Why was the decision made for ARRI Rental to develop its own large-format anamorphics?

There was so much demand from clients. It felt as though every other DP coming in was saying that they wanted to shoot large format and that they wanted to shoot anamorphic. At first, there weren't many anamorphic options around for the bigger format, so we started exploring ways we could do it ourselves. By now, we've built up a lot of experience manufacturing our own lenses.

A sense of urgency came when Greig Fraser ASC, ACS, approached us and asked if we could provide large format anamorphic lenses for his next production. In order to respond as quickly as possible, we initially worked with colleagues at ARRI to enable Master Anamorphics to cover the ALEXA LF sensor with a standard expander. That's how the process began, but we immediately started looking for different ways to enlarge the image circle and also make the image more interesting.

Greig was in London with the ARRI Rental UK team and I was in Berlin, so it was a remote collaboration. I had worked with Greig before in Budapest and had a sense of what he might like. From my own trials tuning and detuning the prototype lenses, I was finding that the cleaner I got the image, the less I liked it. I had some versions that were technically not what you would normally expect, in fact you could say they were outrageously bad. At some point I decided to take the gamble and sent over one of these pretty extreme lenses to Greig, and he loved it. That gave us an initial direction for our development of the ALFA look.

What was so extreme about that lens? What did it do?

I created a very strong astigmatism towards the edges, with a fall-off so extreme that you couldn't really focus out there at all. There was a pronounced center punch, so it was easy to create depth with a centered composition. I also played with the horizontal and vertical field curvatures to give it an artistic mix that is completely different to what the Master Anamorphics normally do.

With anamorphics, you have the option to do different things on the horizontal and vertical axes. The field curvature can be folded backwards on the sides of the image, but folded forward on the top and bottom. In fact, you have two different field curvatures in the lens. Then, whatever you do with your focus rack, areas of the image are out of focus in ways that are disproportionate with the image plane. As a viewer, it disrupts your ability to gauge the size and distance of out-of-focus image elements, which creates a different dimensionality.

Do the final ALFAs have a look as extreme as that?

No, that was about getting Greig interested and giving him what he wanted. It was only the second phase of our journey towards the final look of the ALFAs, but it sent us down an interesting road. What helped me with the next phase was our involvement in a Netflix production being prepared at that time by the DP Nikolaus Summerer, with whom we've worked a lot in the past. He had a specific look in mind and it was similar to where we wanted to take the ALFAs, pulling back a bit from the extreme, but keeping a lot of the character.

There was a defining moment when we were looking at images with Nikolaus and he asked if we could vertically stretch out the bokeh even more, which he expressed with a hand movement rather than words. Initially I laughed, but a second later it occurred to me that it was actually possible. It took me a couple of days to build that into the lens, stretching the bokeh into a completely different shape, and Nikolaus loved it. That stretched bokeh became a key component in the final ALFA look.

So, the final ALFA design is not just a Master Anamorphic with an expander on the back?

Not at all. We cut deep into the optical looks and made changes at the front and at the back. Some of the glass is the same, but a lot is new. It's a different optical concept. The idea of just using expanders to increase magnification and image circle was left behind after the first phase. We get a large image circle now with a series of dedicated optical elements that work together and are customized for each focal length, so the magnification varies across the range.

The final look is completely different from the Master Anamorphics. We started out just by expanding those lenses, then went to extreme levels with the detuning for Greig, and then pulled it back to a compromise through our work with Nikolaus, all the while developing new optical plans to refine the design. I'd say that the resulting look is still a detuned look. It won't be for everyone, but we can afford to polarize opinion because we're not selling them; we're only making around 25 sets.

Having said that, there were definitely benefits to having such clean and perfect lenses as a starting point. It means you can choose to retain certain optical characteristics, even if you are completely changing others. For example, we kept the original Master Anamorphics' low distortion, lack of breathing and well-controlled chromatic aberration, while adding a strong anamorphic bokeh. It's also easier to achieve consistency across focal lengths and across sets by starting out with modern glass, as opposed to vintage.

Physically the lenses are rehoused and were manufactured in-house at ARRI Rental, with only a few individual parts supplied by outside vendors to our specifications. They are less than an inch longer than original Master Anamorphics, and have a maximum aperture of T2.5.

Can these lenses be tailored to individual cinematographers and shows as you do with the DNAs?

In theory they could be, but it's not part of the concept. As with the DNAs, the ALFAs evolved out of relationships with DPs. But, the process was about finding a good balance between all the different elements, which with anamorphics is much more complicated. The other thing is that more often than not, DPs just don't have time for a lengthy detuning collaboration. I think a lot of DPs will be really happy with where we eventually arrived with the ALFA look. It provides them with a new and very interesting option for large-format anamorphic shooting.

Vintage and detuned lenses are very popular on streaming productions, and can seem to look better on a small screen than on a big screen. Why is that?

It is a very interesting question. Television seems to respond well to extreme looks; you can do very cool things that might not appear as good on a big screen. Contrast in the details is part of it, because I think that's much higher on a TV screen. It also has to do with your viewing position and the relative size of the screen to your field of view; in a theater you are better able to judge the quality of the fine details.

Whether our clients are shooting anamorphic or spherical, but especially if they are considering detuned, or vintage, or characterful lenses, my first question is always to ask how the project will be released. Is it for the small screen or for the big screen? And we encourage them to watch all of their tests in the environment of the intended final screen size, because the outcome can be very different.

Do detuned lenses look better on larger formats?

I think so. The whole subject of what larger formats give you is a weird discussion, and it is taking the industry a while to debate. There are those who say you can create a different perspective with different distortion on large format, while others say that isn't true and you can recreate anything on a smaller format through the choice of focal length and T-stop. Technically, the second opinion may be correct, but people definitely do respond to large format images in a different way.

My own theory is that you can capture more contrast in the fine details with large-format lenses, and that corresponds very well to messier lenses with a lot of artifacts. If you give them more optical information then you can maintain a sharpness or a crispness that they need, and that creates a nice balance. The fact that large format looks much crisper than Super 35 lets you keep a connection to your actors, even if they are smaller in the frame. And if you can be wider on your actors and maintain the distance, while also showing off the environment around them, then your perspective is closer to the natural perspective of the audience.

Why do you think anamorphic lenses are still so beloved by cinematographers?

I think it is because anamorphic lenses were traditionally more extreme in their look, and that is what people have been looking for since the return to vintage glass. With high-quality modern glass on digital, it can be difficult to distinguish one set of spherical lenses from another, especially on the small screen with streaming productions. Anamorphics, on the other hand, tend to be more varied and characterful, which is interesting for a lot of people.

Some like anamorphic for the streak flares, although they are not hard to replicate with filters or fishing line on spherical lenses, and for others it is all about the bokeh. For me, the main factor is what anamorphic can do to the depth of the image. The squeeze factor is only what it is at the image plane; the background squeeze factor is different, and in the foreground as well. That gives you an additional depth cue, a different orientation in your composition, and I think that is something people are really looking for.

ALFA 40mm & 90mm 2x Anamorphic Frames

Above: 40mm ALFA Anamorphic prototype taken with 90mm ALFA Anamorphic.
Below: Taken with 90mm ALFA Anamorphic. Bottom: 40mm ALFA Anamorphic. Framegrabs by Jon Fauer.

Jarred Land on RED V-RAPTOR

Dimensions

Above, RED V-Raptor:	4.25" H x 4.25" W x 6" D.
Left, iPhone 11 Pro Max:	5.78" H x 2.82" W x 0.29 D.
Left, Jarred Land:	6'7" H.

Jarred Land needs no introduction. He is President of RED Digital Cinema.

Jon Fauer: How did the V-RAPTOR project begin?

Jarred Land: We started on V-RAPTOR a few years ago, shortly after KOMODO entered its engineering phase of development. Jim, whom I still lean on a lot for input, had been shooting a great amount of stills and motion in his retirement. We both really liked what KOMODO was turning into and we both knew that RAPTOR would need to follow that same spirit, but with a lot more of horsepower. We had to not just beat MONSTRO and DSMC2, we wanted RAPTOR to be twice as fast while being smaller. Those are usually fighting words when it comes time to sit down with the engineers. But this time, our engineers anticipated the direction and already were prepared for it, so the arm wrestling was a little less dramatic than it normally is.

When we design a new camera, we start by asking ourselves what we want to go after: more resolution, more dynamic range or more frames per second. And how we want it to feel when you hold it. We haven't had very many requests for more dynamic range or more resolution with DSMC2. Nobody was complaining about 8K not being enough. But every year, I have a pretty intimate Q&A session with our rental house customers during Cinegear, and for the last two years the key thing they requested both out loud and in whispers was a higher frame rate. So we just started there—just one simple spec. Let's try to get 8K to 120fps.

It was pretty obvious that to get there we needed to start with a new sensor, but then to handle that new sensor and the speeds it required, we also needed new internals and new processing. And then new memory and more power which meant a whole new thermal design. Along the way we decided to also beat the optical stack in front of the sensor for better color. And, oh yeah, it needed to be small—smaller than DSMC2, and twice as fast. So that one simple spec bump required a whole new everything, a whole new platform, even down to the media. We had just switched to CFast for KOMODO because it was really fast, but now that wasn't going to be fast enough. CFexpress was the only viable option, and as of today, it is just barely—as in 3 or maybe 4 specific cards can keep up. So, even though one simple frame rate started it all, pretty quickly it turned into a completely fresh sheet with all new parts and a lot of new vendors… in the middle of a supply chain crisis.

Jarred Land on RED V-RAPTOR

Production Pack includes:

- 1x V-RAPTOR 8K Camera System
- 1x DSMC3 RED Touch 7" LCD
- 2x RED PRO CFexpress 660GB
- 1x RED CFexpress Card Reader
- 4x REDVOLT MICRO-V 98Wh (V-Lock Variant Only)
- 1x RED Compact Dual V-Lock Charger (V-Lock Variant Only)
- 1x V-RAPTOR Tactical Top Plate
- 1x V-RAPTOR Top Handle w/ Extensions
- 1x V-RAPTOR Expander Blade
- 1x V-RAPTOR Advanced Adapter (V-Lock or Gold Mount)
- 1x V-RAPTOR Quick Release Platform Pack
- 1x DSMC3 RED 5-Pin to Dual XLR Adapter
- 1x V-RAPTOR Side Ribs
- 1x V-RAPTOR Production Plates
- 1x RED Production Grips

What influenced the concept and how did it develop?

You can see a lot of KOMODO in RAPTOR, and those two cameras fit very well together. But development was much more difficult for RAPTOR as we were pushing everything so far forward than we had ever before. This demanded more from our team, not just engineering but manufacturing as well, and like I just mentioned, this was all going to happen in the middle of a global supply chain disaster. Organizing all the pieces during that, and in the middle of a pandemic, was not going to be easy. We have an incredible team at RED, but there is one guy who really gets to take a bow for keeping the wheels on the RAPTOR bus. Jeff Goodman has been with us for a long time, He is my right hand in Product Development and although he really stepped up during KOMODO, for RAPTOR he really stepped up his game. He organized my half-baked ideas and took our teams' feedback and the thousands of lines of customer input, worked with our 3rd party partners and implemented everything without missing a beat…and did I say it was in the middle of a pandemic? COVID was horrible for pretty much everyone, but in some ways it presented a great development environment. I started going to Big Sur to escape COVID which, over the last year, allowed me to spend much more time than I normally would really testing the prototypes in some pretty extreme conditions. It allowed me to get a new respect for our customers who shoot in the wild. So many hours of just being alone with the camera, doing new things with no distractions, got me just far enough out of Jeff's hair so he could actually get more work done. He is much more organized than I am—and much more diplomatic. There were many late nights where I would break something in the camera in the middle of the night and in most cases by the time I woke up the next morning he already had the team responsible resolve

Production Pack Lite includes:

- V-RAPTOR 8K Camera
- DSMC3RED Touch 7" LCD
- RED CFexpress Card Reader
- RED Compact Dual V-Lock Charger
- 2x REDVOLT MICRO-V Batteries
- 2x RED PRO CFexpress 660GB media cards
- V-RAPTOR Top Handle
- V-RAPTOR Quick Release Platform Pack
- DSMC3 RED 5-Pin to Dual XLR Adapter
- V-RAPTOR Expander Blade (provides BNC Genlock, Timecode 5-Pin, R/S Run/Stop 3-Pin, and RED CTRL 4-pin)

whatever went wrong and I had a new firmware waiting in my inbox ready for me to install. I'm really proud of that guy and honestly he deserves the most credit for how well RAPTOR turned out. Of course, a standing ovation should also go to the engineers, designers, sensor team and poor Aaron who manages our supply chain. I'll keep saying supply chain today because it is just so dramatic, I've never seen anything like what has happened with the parts shortages this year. It's not just finding parts, it's finding out that the parts you designed to are no longer are available. So our purchasing team scrambles to find a suitable replacement, the engineers then scramble to redesign to those new parts, and then many times those replacements suddenly become unavailable again so you have to redo everything. This happened dozens and dozens and dozens of times. This doesn't just make everyone's head spin, it gets expensive really fast.

You worked with other companies on accessories?

Yes indeed. For the past 5 or 6 years, we really have embraced third parties, but with RAPTOR we brought that to a whole new level. For some reason it is hard for a lot of companies to make that decision—to accept the idea that other companies may specialize in one thing and to acknowledge, "Wow, they could do this better than we can." RAPTOR offered perfect timing to partner with the SmallHD team. They make the monitors that almost everybody uses and they have been doing this so well for so long. Recently, Creative Solutions acquired SmallHD and then they hired Dominick Aiello as Senior Director of Accessories.

Dominick is a force to be reckoned with. He was at Panavision and I got to know him when we did the DXL program there. He designed the accessories for the DXL and I was incredibly impressed with what he brought to the table. When he left Panavision and went over to Creative Solutions, it was like this magic moment in time and made me wonder what would happen if we got Matt Tremblay and Dominick together to create a dream team.

Matt has been our Chief Design Officer forever. He's so much more than an industrial designer because he is not just incredible at design but he is so insanely talented at the mechanics of it all. He can create sculpture out of anything—better than anybody in our industry can. Dominick is the same on the mechanical side. The two together…look out. We just let those two go at it. We had these big virtual roundtables and there was a lot of input from a bunch of other people on both teams, but the magic really happened between those two and it was incredible to watch. Working with Creative Solutions on accessories and their execution on all the bits around RAPTOR really makes me feel dumb for having tried to do everything ourselves all these years. It just is insane how good of a job they did in such a short amount of time.

Did you approach Creative Solutions? How did you start working together?

We approached them. For RAPTOR, I really really wanted it to

Starter Pack includes:
- RED V-RAPTOR Camera
- RED PRO CFexpress 660GB media card
- RED CFexpress Card Reader
- DSMC3 RED Touch/SmallHD 7.0" LCD Monitor
- RED EXT-to-Timecode 3' Cable
- RED Compact Dual V-Lock Charger
- 2x 98Wh REDVOLT MICRO-V Batteries
- 2x V-RAPTOR Wing Grips

have its own display like we had on DSMC2. So the monitor is what started it all. Both Jeff and I were big fans of SmallHD from the work they have done over the years. We got in touch with Greg Smokler, the General Manager of Cine at Creative Solutions. And then Dominick suddenly became part of their team. In the early meetings, after talking about monitors and listening to them all talk about the accessories they were working on and the things they wanted to do and what drove them crazy, things aligned so well with what we wanted, it was impossible to not get excited and see more opportunities. It was like, "Okay, let's work together. Let's get engaged and have lots of little RAPTOR babies because this is all just so awesome."

How are the RAPTOR babies branded?

The accessories are labelled both RED and Creative Solutions. The monitor says SmallHD on it. You can't really do this without giving credit where credit is due. Well I guess you can, but meh. I know it's hard for some companies to say, "Let's share logos. Even though you did all the work, we're going to put our logo on it because we paid for it," which I guess is a valid argument. But it just doesn't make much sense anymore. The monitor obviously deserves the SmallHD logo. And the accessories are so beautiful as well. The CS team worked so hard on those and when it came time for us to decide on the Creative Solutions logo placement on the parts, it was something that Matt and I were very conscious and respectful of, and we spent a lot of time on positioning. In most instances, we put their logo on those accessories before we added our own logo to make sure that they were appreciated as much as they should be.

What are some of the accessories?

There's a micro V-Lock battery plate on the back of the camera. There is a beautiful adapter that clips on so you can use full-size V-locks or Anton/Bauer batteries. There's a breakout blade that has timecode and genlock, etc. These accessories all fit together really well. There's a top handle and a really cool smart top plate. The smart plate has auxiliary power output plus these cool little LED lights that Loren came up with that shine down over the user interface on the side of the camera so you can see them clearly when you're operating the menus. We should call that "The Loren LED." Loren Simons is in our business development/support department. He works with the best DPs everyday and has a lot of great input. Before RED, he worked at Redrock Micro and Canon. That little LED light is one of my favorite things in the whole package.

Did any of your usual suspects test the camera and offer suggestions for accessories?

Erik Messerschmidt, who is Fincher's DP extraordinaire for his last few films, helped a lot with testing. Dominick loves that kind of feedback, but although he will never admit it, he almost always already knows what to do. He has so much experience after talk-

ing to so many DPs and Camera Assistants over the years that he instinctively just knows what needs to be done.

Are you working with Teradek as well?

We're working with them for Fincher on another custom Xeno camera, the most insane one yet. There's a Teradek 4K Bolt in there and Xeno is a great opportunity to test this stuff out and see how it all works together and then maybe bring it to the next camera. Mikael Lubtchansky is another great example of working with people who just run circles around what we are capable of. I love that guy.

RED V-RAPTOR has a native RF mount with a short flange focal distance (FFD) of 20 mm. But is anybody really building dedicated short FFD CINE lenses?

We went with the RF mount for numerous reasons. But that's true, there really aren't many RF cine lenses (yet). I really like the RF mount and you know that a new mount is something I have been championing for years. I always said it has got to come from the lens companies. I think it's great that Leica formed the L-Mount alliance with SIGMA and Panasonic joining them, but there are not enough options there. With the RF mount, you have this built-in compatibility with EF that is just a huge advantage. We had the pick of any mount for RAPTOR and the RF, I think, had the best combination of everything. Especially when we added our double lock ring to it.

Hello, hello, are you there? Maybe we should do an old-fashioned phone call instead of Zoom?

Lost your video. Sorry I don't have great internet up here in Big Sur. How about switching to FaceTime?

At this point, two guys talking about the latest sensors, color science, high-tech cinematic devices and lenses are thwarted by modern telecommunications.

Let's switch to audio only. You were talking about the RF mount and its lock ring.

If you remember, we had a locking ring on the RED ONE with our EF mount. That made the EF mount so much better and helped a lot of people adopt EF lenses as being viable options on cinema cameras. PL just isn't that practical anymore with cameras because it would add almost 2 inches to the front of the camera; the need for that extra depth is completely irrelevant as we don't have optical finders anymore. LPL is a half-measure, a compromise kind-of way between traditional and shallow distances. And with an RF Mount, you can always go back to LPL, PL, EF, or an array of other glass with adapters if you need to for a specific lens.

I like your locking RF Mount because it turns clockwise to lock, as opposed to some others that counter-intuitively lock counter-clockwise. So, if you put a heavy lens on the V-RAPTOR's RF Mount with an adapter, is it going to be solid enough or do you need extra supports?

That's a good question. The RF Mount by itself is pretty solid.

Canon has some pretty big RF lenses and you can just hang on the front of the camera without any problem. They did a pretty great job with that. And our double lock dramatically improves the weight capacity.

Is there a recommended maximum weight?

I have heard people say that you should use a lens support if your lens weighs more than your camera, or if your lens is twice the weight of the camera, but that's all sort of wrong. It's really more about the type of lens than its actual weight. It's more about torque. Are you using motors that jam the whole lens sideways? If you have a long telephoto lens with a big piece of glass at the front far away from the mount, it's going to be very different than using a heavy ultra-wide prime that's close to the mount. So there really is no right answer on what's the weight limit. It's mostly common sense when to use rods and a lens support. You kinda just know.

Also, we added a row of ¼-20 threads on the front of the V-RAPTOR so you can secure a lens adapter or add a lens support there. It's nice to have, especially with the Atlas anamorphics and some of the smaller primes, to be able to get away with not having to put on the rails and rods, you know, the whole lens support circus that goes around it. With those support mounts you can just bolt in a little bracket and get the support you need.

But KOMODO doesn't have a locking RF mount?

KOMODO is just too small and we couldn't really add a locking ring. But on the RAPTOR, I think that double lock makes it the mount to beat now.

Why didn't you choose L-Mount (20mm FFD) or E-mount (18mm FFD) for V-RAPTOR?

RF has the largest inside diameter at 54 mm. L-Mount's ID is 51.6 mm. E-mount is 46.1 mm. All those mounts do have some great glass dedicated to them, and you've got to give credit to Sony because their G Master series of lenses for the E-mount are really, really nice, but the RF lenses that Canon are putting out are pretty incredible.

But you cannot remove the front of the V-RAPTOR and swap lens mounts directly the way you can on RED DSMC2 cameras?

No, not on the RAPTOR. We will be making an XL RAPTOR where you can change the mounts. Obviously, I'm biased and I know I keep saying it, but I think RF is the market-leader in lens mounts right now. You and I have had many conversations and I thought a lot about this. Canon RF lenses, of course, have internal focus and iris motors and an additional control ring that you can map do other things. I wish cinema lenses would someday have all these things.

Are all 12 pogo pins in your RF Mount fully functional? Because on the KOMODO it was just EF protocol?

Yup, all 12. We have fully functional RF protocol on both the V-RAPTOR and KOMODO as well. When we released KOMODO, only the EF electronics was functional. Now, they're both com-

plete with control ring, IS Image Stabilization and Autofocus enabled. The new sensor on the V-RAPTOR also facilitates phase-detection Autofocus (PDAF).

How were you able to do all this? Isn't Canon pretty protective of their technology?

I love Canon. I always have, ever since we started. Jim also switched from Nikon to Canon early on in the RED days, but I've just always been a Canon guy and I love everything about their cameras and their lenses. I like to think there's a mutually beneficial relationship where I hope we sell lots of their RF lenses to people who normally wouldn't buy RF lenses.

That's nice to hear. It's interesting, you released two cameras in the middle of a pandemic, with massive supply chain challenges.

We learned a lot about the supply chain. It changes week by week. A lot of companies are deciding to hold back on some of the new stuff until they can actually make it, which makes a lot of sense. That's something we had to think about ahead of releasing the RAPTOR in this tornado of supply chain logjams and knowing that the demand is going to outpace supply. KOMODO was a great warm up for this—with KOMODO we developed a lot of great manufacturing partners around the world to lean on when things went sideways.

We're clearly not over the pandemic. And yet, production is so busy right now, everybody's shooting. It just seemed that releasing RAPTOR was the right thing to do, despite the prospect of possibly being stopped dead by lack of inventory. I totally understand how some companies might say, "We might not have enough inventory. We can't guarantee the parts, it's too much risk, we are just going to wait." It's like some of those studios in the film industry right now, holding back some of their big movies, waiting until they get the biggest bang. When you release something and make a big effort in marketing but then suddenly you don't have the inventory, then you can't sell on the marketing you just invested in. And by the time you do get inventory back, the danger is that the demand has gone or something new has come and then you're stuck. I guess we are just kinda reckless like that, but we always have been. It's probably born from my incredible impatience.

And yet, no one has really come out with dedicated cine lenses with a short flange depth and built-in motors for your two new cameras.

Not yet :). It's funny because I don't know what the disconnect has been for so many years. I just don't understand why cine lenses don't marry two key things: shallow depth and built-in lens motors. A lot of cinema lenses are born from still glass and then they take motors out and throw them away. So odd. Panavision has new lenses with motors built in, but for the most part those motors are just always disconnected. Some day, 1955 is going to call

and ask to get their rods, cables and giant lens motors back, and that is a day I will celebrate.

Come to think of it, Sony has two motorized Full-Frame, E-mount, cine zoom lenses: a 16-35mm T3.1 G and 28-135mm f/4 G OSS Lens.

Yes exactly. They get to claim the first fully motorized shallow depth cine lenses. And they are great lenses. I love that Canon and Sony are both in the position where they can push this concept of internal motorized cine lenses forward. I hope SIGMA gets on-board as well. I've been harassing them for some time. I've been harassing everyone. I really am starting to sound like a broken record with this whole internal lens motor thing :).

And yet, ironically some technology advances in our high-tech business are so slow to change. It's been almost 40 years since the PL mount was introduced around 1982.

It made sense to have the PL mount when you had a mirror reflex camera with an optical finder. But it seems the still photography world is the one that pushes the cinema industry forward these days. Digital photography was adopted by still photographers way before it was by cinematographers. That's what drove us with our first camera. The RED ONE had an interchangeable Nikon and Canon mount. I disassembled a lot of those early Digital SLRs to find parts for our first prototypes. Not just lens mounts but OLPFs, etc. I'm telling you, we all should thank the stills guys. As important as we like to think the Red One was to the filmmaking industry, that first Canon 5D changed the way people thought of things.

You mentioned the XL RAPTOR. Can you tell us more?

XL is to RAPTOR as RANGER was to DSMC2. XL has the same imager as RAPTOR, but it's bigger, with more inputs, more outputs, more SDI feeds. It has an electronic variable ND built in, plus a clear ND—it's mechanical and electronic all in one. It will actually slide out of the way for clear so you don't have that one stop loss you have with electronic NDs. It looks so big in the photo but RAPTOR XL is almost exactly the same size as the MONSTRO RANGER. It just seems so much bigger today when you look at it beside the RAPTOR because the RAPTOR is just so small.

But you're calling it XL and not RANGER?

We had interesting discussions around here, calling it RANGER 2 or RANGER XL. Moving to DSMC3, I think keeping the RANGER would have added confusion. Imagine you're a rental company. If people call asking for a RANGER, do they mean the RAPTOR RANGER or the MONSTRO RANGER? So, this is the XL—simple, the Extra Large version of the RAPTOR. That name just kind of stuck.

Tell us a little more about the RAPTOR sensor. How is it different from the MONSTRO 8K VV?

V-RAPTOR rigged with Starter Pack

It's funny because some people who bought the first RAPTORs did their first reviews and they wrote, "Oh RAPTOR has the identical MONSTRO sensor, but in a new body." And I would be sitting there yelling at my YouTube screen, "Why are these people saying it's the same sensor? It's an all-new sensor. Are they trying to make me mad?"

And then I realized, "Oops, we never actually told everybody that it is a new sensor." It was one of those things we just assumed because we've been so close to it for so long, we never actually came out and said, "Oh, it's obviously a new body, but it's also a new sensor as well."

So yes, it is a brand new sensor. It also has PDAF Autofocus pixels. But the biggest advantage is the read-reset speed, which gives you the higher frame rates and reduces rolling shutter artifacts. You get the benefit of greater dynamic range, which we couldn't do with KOMODO (also no dynamic range slouch given it is a global shutter camera). So the real issue of global shutter versus rolling shutter, besides the flashes, is the skewing and bending of fast-moving objects. Making RAPTOR read out twice as fast as MONSTRO reduces those artifacts tremendously.

The lower noise floor is also a big advance from an image standpoint. With MONSTRO, we ended up making a low-light OLPF and a separate skin-tone OLPF because we couldn't do both really well. RAPTOR does both really well so you don't have to change the OLPF. We, of course, also have a new de-mosaicing scheme with new Graeme processing.

We just did a test at Company3 last week with Stefan. We were looking at footage in DaVinci Resolve, pushed as high as 40,000 ISO just to try and break it. And even though nobody should ever shoot at that high ISO (we won't even let you shoot that high in-camera) the difference between MONSTRO and RAPTOR really became apparent when you push it that far. And when you are trying to tune color at that level, where the smallest change in registers has such a compounding effect, it is really amazing to see what Graeme Nattress has done. He tuned the color science so accurately that it highlights the beautiful combination of his processing, the new low-pass filter, the new sensor all working together in harmony. Graeme is probably one of the smartest guys at RED. No. Scratch that, he most definitely is the smartest guy at RED. He works on so much more than just compression and color science—the balance and the interpretation of color. He's solves the problems that the problem solvers don't even know are problems. It sounds simple but he breaks things in a very special way. He writes his code and he sometimes breaks it on purpose at the very end and sometimes at the very beginning and while you're trying to figure out why he just broke something that seemed to be so perfect, he pulls a lever on the completely opposite side and then something magical happens. He does this because he knows every step in between so intimately, a conductor who can strategically manipulate an individual string on an individual instrument in the hall of a massive orchestra and somehow it all blends together to create delicate, but incredibly powerful, art.

Once Graeme identifies something, is it then mostly a question of hardware, software or programming?

Graeme can work with the sensor team to make changes if it has to be hardware. He can work with the optical team on the low-pass filter and he can work with the compression team. He has that hat where he writes code and he shoots almost every day and he can do both software and hardware and he does all this without ego. He is not one you really want to have an argument with because you probably will lose, but he's not the kind of guy who requires to be praised. The way he works is by his own design and he elevates everyone in the room.

That brings up another question in the world of 1955 or 40-year PL mounts. How do you respond to people who might ask why 8K? They might say that things are too sharp. In France, they might say it's too "crispy."

But remember, they said the same thing about 4K. When we started, we heard the same arguments. Even before we started RED, there were arguments that 1080p was too sharp. Panasonic was pushing 720p. Sony 1080p. And then the same arguments came up with 2K and then 4K. They said, "You don't need 4K. 4K is way too much and nobody cares." And now you can't be on Netflix without 4K, and that had nothing to do with us. That was a smart business decision by Netflix, and almost every TV you buy now is 4K. I am sure the same thing will happen with 8K. It just takes a while. We've been doing 8K for a long time now, and even though there aren't a ton of 8K delivery options, the benefits of oversampling and the benefits for plates and still photography make it an obvious choice for today, not just tomorrow. One day Netflix (or

V-RAPTOR rigged with Production Pack Lite

someone else) will say, "Hey, we can charge an extra $6 for 8K. Let's do that." And then everybody else will jump on. Remember 4K TVs started getting cheap when the content began delivering in 4K.

Maybe there's an analogy when you're painting on a canvas. Are you going to use a surface with a rough weave or one that is very finely woven? Or printing at low resolution with big dots or high resolution with many fine dots.

Absolutely. And especially as screens get bigger, that's the thing.

Hang on. Your video is reconnecting.

Oh the irony. Sorry, my Starlink is having such a hard time today. The wind is picking up here quite rapidly.

Anyways, you want to push forward because, as an industry, you want people to go to the theater and have a better experience. If you can make it better, I think you should try. Saying, "I don't want 8K, 8K is bad," just doesn't make sense because you can't really argue that it's any worse than 4K. There was a time when resolution got a bad name because companies that couldn't actually do it would up-res or over-sharpen and break the image. We don't do that. And with REDCODE, along with our efficient compression, your footprint for 8K is actually smaller than most RGB 4K.

During your launch, it was pointed out that V-RAPTOR MQ is equivalent to the maximum quality of MONSTRO. And the recommendation for V-RAPTOR was to use MQ as the default, and to use HQ for VFX and stills. Why is that?

We introduced the LQ, MQ and HQ modes on KOMODO to make it simple. MQ is almost equivalent to the highest bit-rate on our other cameras, so it is best for most people. If you have a limitless amount of media, or are shooting very specific complex scenes for stills, then you can go with HQ—but it will be hard to see the difference on most things, especially with moving footage. You will burn through a lot of media when shooting HQ. It's about finding a balance of how many minutes you want to lay down on that card.

People shouldn't think of it like medium quality even though it's called MQ. It's really high. And then HQ is super high. You know, on still cameras they have medium, standard, high, fine and then super fine resolution?

Those would be fun RAPTOR settings: Super Good, Super High, and Super Fine. What's your recommended base ISO?

800. Graeme will probably say 800 as well. The sensor engineers go a more conservative way. A lot of our users like 1280 and find that a safer way to go for RAPTOR because of the decreased noise characteristics and to protect highlights. But 800 really is where everybody should start. And then you decide where you want to go from there.

For high ISO, I like 3,200. You almost never get into any trouble there. Fincher, for a while, would stay at 3,000 for everything, but it's such a subjective thing. On the other hand, there are people who like to shoot at 320 ISO, which is insane, but they just don't want to see any texture on the image whatsoever. At 320, you have to be more conscious of your highlights. But there really is no wrong answer. Go whichever direction you feel is good for you and the way that you shoot. One more great reason for shooting REDCODE is that you can push it in a lot of directions.

What about lens metadata?

RF lens data is supported. Our PL lens mount adapter with variable ND supports /i Technology lens data. We take /i data from the PL mount and we read it all the way through the RF mount. We'd love to support LDS as well, but ARRI has not made that public. We'd like to be able to implement ZEISS eXtended Data as well because it is so awesome. And of course with Canon and Canon compatible lenses, we capture that metadata as well.

So congratulations on another amazing camera. Sorry, FedEx is knocking on the door.

Another NDA package that you'd better hide from me. We've been on this call for almost two hours.

Your satellite must be sizzling from all of the data going through. Maybe this will be an epic streaming miniseries. Thanks for your time.

Thank you. Always a pleasure.

RED V-RAPTOR Specs

RED V-RAPTOR 8K VV

- Sensor Size: 40.96 mm x 21.60 mm (Diagonal: 46.31 mm)
- 35.4 Megapixel CMOS Sensor. 8192 × 4320 Effective Pixels.
- Integrated RF mount with RF lens support
- Supports Canon EF lenses with Canon RF to EF mount adapters
- Accepts other RF mount adaptors
- Max. Data Rates up to 800 MB/s using qualified CFexpress media

REDCODE RAW MAXIMUM FRAME RATES

- 120 fps at 8K 17:9 (8192 x 4320), 150 fps at 8K 2.4:1 (8192 x 3456)
- 140 fps at 7K 17:9 (7168 x 3780), 175 fps at 7K 2.4:1 (7168 x 3024)
- 160 fps at 6K 17:9 (6144 x 3240), 200 fps at 6K 2.4:1 (6144 x 2592)
- 192 fps at 5K 17:9 (5120 x 2700), 240 fps at 5K 2.4:1 (5120 x 2160)
- 240 fps at 4K 17:9 (4096 x 2160), 300 fps at 4K 2.4:1 (4096 x 1728)
- 320 fps at 3K 17:9 (3072 x 1620), 400 fps at 3K 2.4:1 (3072 x 1296)
- 480 fps at 2K 17:9 (2048 x 1080), 600 fps at 2K 2.4:1 (2048 x 864)

AVAILABLE REDCODE SETTINGS

- REDCODE HQ, MQ and LQ at 8K 17:9 (8192 x 4320) up to 60 fps
- REDCODE LQ at 8K 17:9 (8192 x 4320) up to 120 fps
- REDCODE HQ, MQ and LQ at 6K 17:9 (6144 x 3240) up to 96 fps
- REDCODE MQ and LQ at 6K 17:9 (6144 x 3240) up to 160 fps
- REDCODE HQ, MQ and LQ at 4K 17:9 (4096 x 2160) up to 240 fps
- REDCODE HQ, MQ and LQ at 2K 17:9 (2048 x 1080) up to 480 fps

REDCODE RAW ACQUISITION FORMATS

- 8K 17:9 (8192 x 4320), 2:1, 2.4:1, 16:9, 1:1 and Anamorphic 2x, 1.8x, 1.6x, 1.5x, 1.3x, 1.25x
- 7K 17:9 (7168 x 3780), 2:1, 2.4:1, 16:9, 1:1 and Anamorphic 2x, 1.8x, 1.6x
- 6K 17:9 (6144 x 3240), 2:1, 2.4:1, 16:9, 1:1 and Anamorphic 1.5x, 1.3x, 1.25x
- 5K 17:9 (5120 x 2700), 2:1, 2.4:1, 16:9, 1:1
- 4K 17:9 (4096 x 2160), 2:1, 2.4:1, 16:9, 1:1
- 3K 17:9 (3072 x 1620), 2:1, 2.4:1, 16:9, 1:1
- 2K 17:9 (2048 x 1080), 2:1, 2.4:1, 16:9, 1:1

PHYSICAL

- Construction : Aluminum Alloy.
- Weight: 4.03 lb (without body cap and CFexpress card)
- Dimensions: 6" x 4.25" x 4.25" (L x W x H)
- Battery: Integrated V-Lock battery plate optimized for Micro V-Lock
- DC Power Input: 11-17 V via 6-pin DC-IN

COLOR MANAGEMENT

- Image Processing Pipeline 2 (IPP2)
- Supports 33×33×33 3D LUTs
- Supports import of CDLs

AUDIO

- Integrated dual channel digital mono microphones, uncompressed, 24-bit 48 kHz
- Integrated dual channel mic/line/+48V input via 5-pin Audio Port, uncompressed, 24-bit 48 kHz

REMOTE CONTROL

- Wi-Fi for camera control via interchangeable dual band (2.4 GHz/5 GHz) antenna mounted to a female RP-SMA connector
- Genlock, Timecode-in, GPIO and Ctrl (RS-232) via integrated 9-pin EXT Port
- Wired control via USB-C or Gigabit Ethernet (compatible USB-C to Ethernet adapter required) allowing remote camera control, live MJPEG preview video feed and remote media offload

MONITOR OUTPUTS

- Integrated dual 12G-SDI with 6G-SDI, 3G-SDI and 1.5G-SDI modes
- 12G-SDI: Up to 4096 x 2160 4:2:2 for 60p
- 6G-SDI: Up to 4096 x 2160 4:2:2 for 30p, 25p, 24p
- 3G-SDI: Up to 2048 x 1080 4:2:2 for 60p
- 1.5G-SDI: Up to 2048 x 1080 4:2:2 for 30p, 25p, 24p
- SMPTE Timecode, HANC Metadata, 24-bit 48 kHz Audio

MONITOR OPTIONS

- DSMC3 RED Touch 7.0" LCD
- Wireless 1080p live preview video feed via 2.4Ghz/5Ghz Wi-Fi for framing
- Integrated 2.4" LCD for camera control (no preview video)

RED CONTROL

- Access full camera controls and live preview from iOS or Android devices
- Available from the Apple App Store and Google Play Store. RED Control works wirelessly or wired via USB-C

AVAILABILITY

- Available now.
- $24,500.

Greg Smokler on V-RAPTOR Accessories & Monitor

Greg Smokler is Vice President, Product at Creative Solutions.

Jon Fauer: How did it happen that RED and Creative Solutions began working together on V-RAPTOR?

Greg Smokler: You'll like this, Jon, as it is gastronomic in origin.

We've been friendly with Jarred and the rest of the RED team over the years, and we've been making integrated RED-certified products for years, but the project that ultimately became the V-RAPTOR collaboration began over an unplanned dinner during NAB 2019. I was taking my team to a well-deserved dinner at Momofuku and we bumped into RED Sr. Director of Product Management, Jeff Goodman and his team who were trying to get a last-minute table.

Luckily we were able to find a big table and we ended up really hitting it off over an amazing meal (salt and pepper lobster and shrimp), during which the idea came up about the possibility of SmallHD building a monitor for RED, and this is the result.

How did the project expand to accessories?

I was texting with Dominick Aiello randomly one night, and I found he was considering a career move. This was just an incredibly fortuitous opportunity because Ryan Schorman, the original founder and product designer of Wooden Camera, had just decided to leave the company to pursue filmmaking, and in my head, Dominick was without question the platonic ideal to lead our accessories team. In our little industry, Dom truly has an unmatched depth of knowledge and creativity—I never thought he would be available to come over to our little company.

Top Handle Extensions

Renders of V-RAPTOR Accessories and Monitor courtesy of Creative Solutions

Carry Handle

Jarred and Jeff at RED also recognized this immediately because we had been talking to them about V-RAPTOR for over two years. At a certain point, I told them, "Hey, we just hired Dominick to do our accessories."

And the next thing you know, we were all working together to dream up the accessory pack.

How has that collaboration worked out?

It's been a very illuminating experience because obviously the team at RED have been at the core of the reshaping of the camera industry, and are amazing designers who have created a striking and unique body of camera and accessory solutions over the years. But there are all kinds of other viewpoints of how cameras can go together and be designed and built. To put it mildly, we all have very strong opinions about how cameras should be designed, so all bets should have been off, but in the end it's shocking how smoothly this collaborative creative process flowed.

The ergonomics of a camera is critical: how you hold it, how you carry it, where the power goes and so on. You worked on this new camera from early on and it shows.

Jarred said during the V-RAPTOR launch something to the effect of, "We're good at RED designing and building cameras and we love accessories, but we decided to work with people—Creative Solutions—whose only focus is on accessories." And so that integration of minds and design ideas made it so they could have a really great camera body and also have a totally integrated accessory arsenal--not just hot-rodding the camera after the fact, but intentionally building something that was a complete end-to-end system. Everything clicks together in a way that I don't think I've ever seen before.

For example, the top handle?

We made a handle that has a unique connection point so it's really secure. It's ergonomic. We found a super durable wood from Central America called Bocote. Throughout, there are ¼-20 and 3/8-16 threaded mounting points with locating-pin holes.

At the rear of the camera, there's a Gold Mount integrated plate with a V-Lock option. There's an electronic fuse that prevents overdraw and protects the camera. The top plate is integrated with pogo pins to connect the battery plate.

A-Box Audio Inputs

Side Rails

V-RAPTOR Baseplate System

There are accessory power outputs. And there's a downlight in a recessed soffit that casts light to illuminates the face of the control panel when you're working in very dim light.

Working with RED, they did some amazing things. Their Chief Design Officer is the legendary industrial designer Matt Tremblay, and he is really a force of nature.. The amount of contouring of surfaces is over-the-top in a good way. It's beautiful, sculptural, and practical. It's useful, like it doesn't snag on your shirt. It's not ornamental. It has purpose.

Tell us about the monitor.

The monitor attaches to the camera with a RED interface. It connects to the pogo pins on top of the camera. It has a flex PCB inside that connects to the RED Monitor Interface connector with a USB-3 Thunderbolt cable that we make.

What's different about this from other RED touchscreen monitors is that it can be popped off and used from other positions on the camera or remotely, connected by different lengths of cable. So it's quick to move around on the camera. Our goal was to make it more of a wild monitor that you could have anywhere. You can put it at the back if you're on a fluid or geared head.

I like the way each thing is labeled clearly as to what it does, so you don't have to guess.

Yeah, Matt Tremblay added those. It's informative, it looks good, and it's really cool. It adds style in a very utilitarian way.

The monitor gets power and video via USB?

Yes. The USB-C cable plugs into the monitor and supplies power, communication, and video on one tiny little cable. We wanted to allow the monitor to be placed anywhere, without a cumbersome camera interface module, so we came up with the idea of using the USB-C cable because it can send high-speed video as well as plenty of power. Our engineers at SmallHD did an amazing job of making it possible by adding the RMI processing unit inside that converts all the different signals from the V-RAPTOR into one signal that's transmitted over the USB-C type cable.

It's a standard USB-C cable?

Gold Mount Advanced Adapter (right side)

Gold Mount Advanced Adapter (left side)

V-Lock Advanced Adapter (left side)

Top Plate

B-Box (Breakout Box for Genlock, Timcode, Control, and 3-pin R/S

Production Plates

No, it's not standard, and there is a technical reason for that. There are all kinds of different USB-C cables because USB-C also has a Thunderbolt version that supports higher data-rate needed to send 4K video. Not all USB-C is designed for video; some provide power or battery charging. So the "Red Monitor Interface" Cable is a very specific cable that we're manufacturing ourselves. We use available technology to make an affordable cable that's flexible and nice. I think people will like it. I would say the dream is no cables, but one cable is getting there.

Is it the only monitor that works with the V-RAPTOR. Earlier models do not?

This is it. RED and SmallHD engineered it together. The user interface that we made with RED is unique. It is intuitive and scalable and integrates with all of our other monitoring tools, like peaking, false color, and magnification. If you've ever used a RED camera, one of the best features is the magnify function, like a still camera, but unlike any other movie camera. You can instantly get sensor magnification without any interpolation. It's an incredibly sharp way to check focus. We integrate these things because you can now pinch the touchscreen to zoom.

Since the camera is so small, how do you attach it to a baseplate and rods?

The dovetail for the camera is short. And the distance from the base to the lens mount center is about 54 mm, which is significantly shorter than almost any other camera. You cannot attach it directly to a BP-9; the camera would be too low for any mattebox. So we made this mini lightweight support with 15mm rods with two different ways to quick-release it. You can attach the plate to the top of an ARRI-style bridgeplate or directly to an ARRI dovetail, and because it has a quick release, you can pop it off from your studio rods and go handheld instantly.

I guess your background in the camera department helped in all of this.

My philosophy is, if you're an AC–a cameraperson–you know some tricks, but that doesn't mean all the tricks are good for you or that you know all the tricks. You might wish you knew that someone else has been doing it another way. Like how to tape a filter onto the front of a lens. Those are the little tricks that the pros have passed on through word of mouth for a hundred years.

I think that's what has been missing from so many of the accessories of our industry. It's the little things. We can now flow those concepts through to any level of production. And that's what's been so exciting about getting Dominick in here because he knows what all the top camera people have asked for and, speaking philosophically, what the 'best way' to do things is.

The strength of Creative Solutions is that we are truly connected to our industry. It may seem sometimes like we're this monolithic corporation, but inside it's really the opposite of that. Our product team comes from industry, and we have a continuous dialogue with working camera people from around the world.

It's this intimacy/proximity with people on set and on location that gives us the best insight into how people are doing photography and lets us, hopefully, make the best choices in how we design our products.

Dominick and I continue to talk to ACs from around the world, as does RED, so that has helped us to launch a camera system that allows everyone the opportunity to benefit from modifications to the way they have been doing their specialized jobs for long.

Lowel Blender XL LED Light

The Lowel Blender XL is a new Bi-Color LED light from Tiffen. It reminds me of the archetypical and versatile Lowel Tota fixture. But Blender XL is even cooler, lighter and brighter.

Blender XL gives you a heavy T8 from 6 feet away at 800 ISO and 24 fps. The classic tungsten Tota with a 300 Watt hot halogen bulb reads T5.6 at 6 feet.

Lowel Blender XL is compact—about the size of a clip-on matte box. It is made of 24 powerful surface mount LEDs arranged in a honeycomb pattern. 12 are tungsten and 12 are daylight. They measure 98 CRI/99 TLCI. Two separate dimmer knobs at the rear adjust the brightness of each array and determine the amount of blending. Bi-color blending ranges from 3000°K to 6000°K.

Two slots at the front of the metal housing accept removable diffusion panels to provide smooth, single-source shadows. With the diffusion panels removed, Blender XL's beam is a punchy 45 degrees. It's a good idea to use a removable Clear LED Guard that slides in front of the LEDs for protection.

The Lowel Blender XL comes with a switching power supply: 100-240 VAC / .8 A in — 12 VDC / 38 A out. It comes with U.S. and EU plugged cables. A D-Tap power cable plugs into 12 V batteries.

Now we get to the best part. Ross Lowel was not only a genius lighting designer and inventor of lighting kits, gaffers tape and catalogs full of brilliant new ways to illuminate locations. He was also a brilliant cinematographer who understood how to outfit his revolutionary, itty bitty lights so they could become bigger, softer, beautiful sources.

The first thing he added was the famous, collapsible Lowel Tota/Omni Gel Frame for 10"x12" gels. The frame attached to the fixture with a flat, 1/2" wide x 6" long aluminum tongue. Spring clips at each of the frame's four corners grabbed the gel. Rosco and Lee loved it. Imagine all those perfectly fine gel and diffusion rolls getting cut up into many tiny 10x12 pieces. Crews quickly discovered that you could clip much larger pieces to the frame, saving time in surgery while also providing even bigger, softer diffusion. (See opposite page.)

Imagine my delight when I saw that the new Blender XL had a flat socket to accept the beloved Tota/Omni Gel Frame. Perhaps it will be renamed Tota/Omni/Blender XL Frame.

Equally delightful, the cutout in Blender XL's body looks like a keyhole. The 5/16" diameter hole accepts Lowel Tota-Brellas. They originally were 27" diameter, shiny silver, and beautiful for portrait lighting. White and diffusion umbrellas came later. The great John Alcott ASC, BSC had bespoke black umbrellas brought in from London on which to bounce his Tota lights. It was quite subtle.

Lowel Blender XL LED

- Weight: 2 lb /9 kg.
- Dimensions: 5.38"h x 4.25"w x 3.13"d (13.65 x 10.8 x 7.9 cm
- Mount: 5/8" tilting baby receiver
- Output: 3796 Lux / 656 FC at 3 feet.
- $379 MSRP.
- www.tiffen.com/blenderxl

Lowel Blender XL powered from the D-Tap port of a small Hawk-Woods BPU 98W 14.4V Lithium-Ion Battery.

Lowel Blender XL LED with Tota/Omni Frame

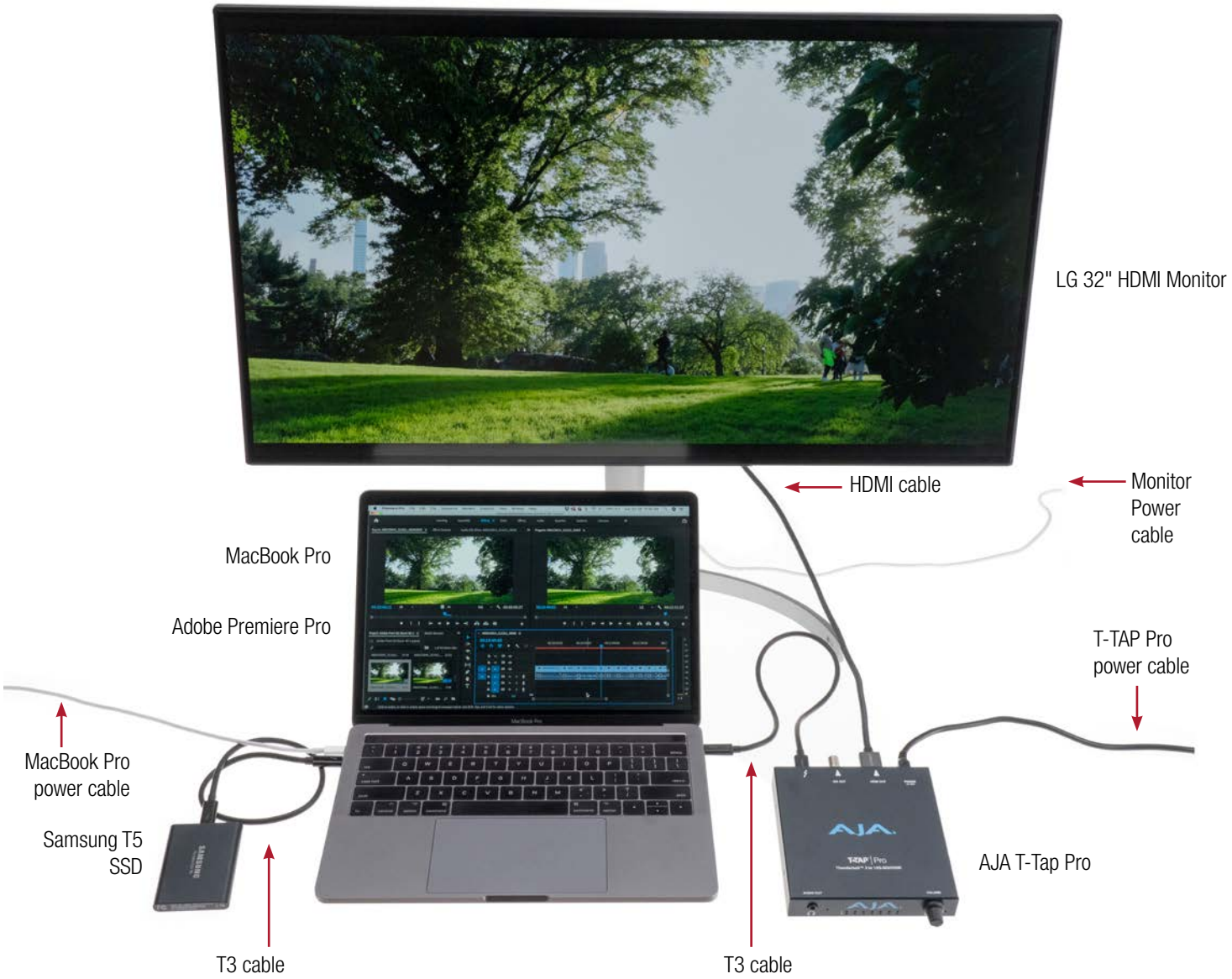
Lowel Blender XL with slide-in diffusion panel and Tota/ Omni Frame.

Rear of Blender XL. Daylight dimmer on top, Tungsten dimmer on bottom.

Lowel Blender XL LED with Tota-Brella

Lowel Blender XL with vintage Tota-Brella, given to me personally by Ross Lowel long ago. Tota-Brellas are still available from Tiffen.

AJA T-TAP Pro



How do you view video from a Mac or PC—with Thunderbolt 3 ports—on an external monitor with HDMI or SDI inputs?

And why would you want to do this? If you are a colorist or editor, your post production suite might already have large, affordable LG OLEDs like the 55-inch LG CX 55, 65-inch LG CX 65 or 77-inch LG CX 77. Although intended for consumers, these TVs are so spectacular they easily pass as client monitors. They have HDMI inputs (not SDI). So, the T-TAP Pro is the go-between from computer to TV.

If you are grading remotely, at home, these LGs are as attractive as they are affordable. When your session is finished, the family can gather to watch and critique your latest streaming masterpiece.

If you're a DIT on location, your Inovativ Echo 36 cart is likely equipped with a MacBook Pro and 31" Production Monitor with SDI input.

AJA's T-TAP Pro is the small and versatile Mobile I/O device to send video from your computer's Thunderbolt output to the HDMI or SDI input of a monitor. Please do not call T-TAP Pro a Mini-Converter, for which AJA is also famous. Instead, T-TAP Pro is powered by 12V DC, up to 18W. It comes with a power supply to plug into the wall. That's because it gobbles up more wattage than a single T3 cable can provide alone.

In the example above, we are editing and grading on a MacBook Pro with Adobe Premiere Pro. This MacBook Pro has four Thunderbolt 3 ports.

A Samsung 1TB T5 SSD connects our UHD 4K 30p media via Thunderbolt 3. The AJA T-TAP Pro plugs directly into the MacBook Pro via Thunderbolt 3 as well. And, the T-TAP Pro sends the UHD video directly to the LG 32" monitor via HDMI.

T-TAP Pro handles 4K, UltraHD, HD in SDR or HDR from many editing, grading, on-set and audio software packages connecting to the computer with a single Thunderbolt 3 cable.

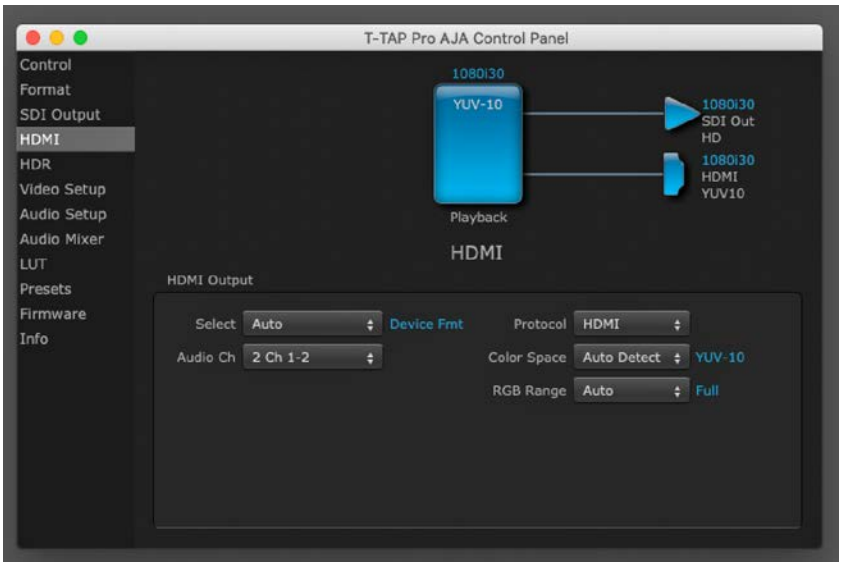
Compatible applications (Mac and PC) include: Avid Pro Tools; Colorfront Transkoder / Express Dailies, On-Set Dailies; Adobe Premiere Pro; Avid Media Composer; Adobe After Effects; Unreal Engine. Mac-only apps include: Adobe Audition; Autodesk Flame; and Apple Final Cut Pro.

AJA T-TAP Pro

AJA T-TAP Pro - front

AJA T-TAP Pro - rear

AJA T-TAP Pro - top



AJA T-TAP Pro is configured and managed by AJA's Control Panel app. Download it as part of AJA's free AJA Control Room software: *aja.com/en/support/downloads/*

T-TAP Pro is compact: 5" x 5" x 1" — and weighs about 8 ounces. The sound department will have no complaints on set, at least not about the T-TAP Pro. There is no fan to disrupt or distract.

Your clients will be contented in the grading suite, viewing the large OLED monitor from the comfort of a Gropius Sofa or Eames Lounge Chair. The loudest noises will be the hum of the client snack and beverage refrigerator in the corner and the chortles of delight from the agency art director. They will not hear a sound from the T-TAP Pro, that essential component connecting the grading suite's Mac or PC to the viewing monitor's 12G-SDI or HDMI 2.0 input for 4K, UHD or HD.

T-TAP Pro manages audio in the multi-channel embedded SDI and HDMI streams. You can plug headphones into its standard 3.5mm stereo connector to monitor analog audio or connect to an external analog audio mixer. There's a volume control and LED level indicators on the front.

T-TAP Pro feature highlights include:

- Thunderbolt 3 input (single cable).
- Silent-running for quiet on set.
- 12G-SDI and HDMI 2.0 simultaneous output on both connectors.
- 4K/UltraHD/HD output over SDI and HDMI up to 60p over a single cable.
- Up to 4K 10-bit and 12-bit 60 fps uncompressed 12G-SDI video output.
- Up to 4K 10-bit 60 fps uncompressed HDMI v2.0 video output.
- HDR support for Hybrid Log Gamma (HLG) and HDR10; Dolby Vision via the AJA Software Development Kit (SDK); HDR signaling over both HDMI and SDI.
- Up to 16-channel embedded SDI audio output.
- Up to 8-channel embedded HDMI audio output.
- Front panel audio levels reference display.
- 2-channel 3.5mm headphone output with rotary knob adjustment.
- Because T-TAP Pro draws more power than the Thunderbolt bus can provide, an external power supply is provided. Included power supply, 12 V DC, 18W Max.
- T-TAP Pro is available now for $795 US MSRP via AJA's worldwide reseller network.
- AJA Control Panel software application shows how the T-TAP Pro is configured and lets you make changes.
- www.aja.com/products/t-tap-pro

Panasonic LUMIX BS1H Full-Frame L-Mount Cine Camera

Front

Rear

Left

Top

Right

Bottom

LUMIX BS1H Full-Frame L-Mount Cine Camera

You probably wondered which member of the L-Mount Alliance—Leica, Leitz, SIGMA or Panasonic—would be first with an L-Mount Full-Frame cine camera.

On October 7, 2021, Panasonic announced their new, L-Mount, Full-Frame, cube-style LUMIX DC-BS1H. As Panasonic's Matt Frazer explained, "Picture a LUMIX S1H mirrorless camera put into a box." Hence the "B" in BS1H.

You could also call it a cube instead of a box, especially remembering Fritz Gabriel Bauer's sassy comment, "A camera is just a box onto which you put beautiful lenses." Gabriel was half sarcastic. It was a tongue-in-cheek statement from the gentleman who made Moviecam cine cameras and beautiful Moviecam lenses.

Clearly, the new BS1H is much more than a box, even if all three dimensions are almost symmetrical (3.7" h x 3.7" w x 3.1"d). It is also more than just an S1H mirrorless hybrid still/cine camera stuffed inside.

BS1H and S1H both share most of the same specifications inside: 24-megapixel Full-Frame (35.6 mm x 23.8mm) sensor with Dual Native ISO, L-Mount with 20mm FFD, 6K full-height recording, wide dynamic range, V-Log, anamorphic desqueeze, and more. You can shoot up to a maximum 51200 ISO, 204,800 expanded. Top speed at 6K is 24 fps in Full-Frame 3:2 aspect ratio. Top speed at 5.4K Full-Frame 3:2 and 5.9K Full-Frame 16:9 is 30 fps. The list of resolutions and formats is long. Scroll down to "See All Specs" online at: *tiny.cc/BS1H-specs*

The BS1H is lighter, smaller, stronger than S1H and adds SDI output, Genlock, Ethernet, and eleven ⅜-16 threaded sockets.

The BS1H closely matches the look of Panasonic VariCam cine cameras. Dynamic range is more than 14 stops when shooting in V-Log/V-Gamut. BS1H has accurate subject detection that locks focus onto people and animals. There's no EVF or built-in monitor as on S1H. Instead, you'll use an onboard monitor or tether BS1H to an external one.

Who would enjoy such a box...er...cube? Its shape, small size and light weight begs you mount BS1H almost anywhere. The body is made of rugged aluminum and magnesium alloy to endure rough rides on rigs, drones, remote heads, stabilizers, in underwater housings and hostile environments. The ability to tether up to 12 BS1H cameras together will be appealing for simultaneous multiple camera setups, active background capture, and stunts.

The selection of L-Mount lenses from Leica, Panasonic LUMIX and SIGMA is growing rapidly. The BS1H's shallow 20 mm flange focal depth encourages adding L-Mount adapters for PL, LPL, PV and many other lenses. With handle and monitor on top, BS1H becomes an unobtrusive, affordable, Full-Frame production camera.

For external recording, the BS1H can output up to 4:2:2 10-bit 4K 60p/50p video via HDMI. You can record ProRes RAW up to 5888 x 3312 12-Bit at 23.98/25/29.97 fps with an Atomos Ninja V or Ninja V+ via HDMI. You can also record Blackmagic RAW on the Blackmagic Video Assist 12G HDR via HDMI.

Variable frame rates in C4K/4K are possible up to 60 fps and down to 2 fps. For internet streaming, BS1H can send 4K 60p (50p) video in H.265. That's at half the bitrate of H.264 with the same image quality. Almost unlimited recording is possible because of advanced heat management.

BS1H has two internal SD Card slots that can be set up for simultaneous (master and backup) or relay (never run dry) recording.

- USB 3.1 Type-C.
- 5 programmable function buttons.
- Simultaneous 3G-SDI (BNC) and HDMI Type-A Output.
- Genlock IN (BNC)
- Timecode IN/OUT (BNC)
- Ethernet RJ45 supports Power over Ethernet+ (PoE+).
- Control up to 12 BS1H cameras with Panasonic PC software LUMIX Tether for Multicam.
- Remote camera control using LUMIX Tether for Multicam and LUMIX Sync.
- Anamorphic desqueeze.
- 2.4GHz Wi-Fi and Bluetooth 4.2 (BLE).
- SDK for camera control via USB/LAN will be provided free
- LUMIX BS1H is available in November for $3,499.99.

BS1H External RAW Recording via HDMI

Atomos Ninja V

Blackmagic Video Assist 5" 12G

Image Area	Resolution	Frame Rate	Aspect Ratio	HDMI Output
Full-Frame	5.9K (5888x3312)	29.97p/25p/23.98p	16:9	12-bit
Super 35	4K (4128x2176)	59.94p/50p/29.97p/25p/23.98p	17:9	12-bit
Super 35 Anamorphic	3.5K (3536x2656)	50p/29.97p/25p/23.98p	4:3	12-bit

V-Log or V709 is also selectable on an external monitor via SDI during RAW output.

Apple ProRes RAW on Atomos Ninja V

- Recording mode depends on the firmware version of Atomos Ninja V.
- See Atomos website for information on the corresponding firmware version of Atomos Ninja V. *atomos.com/product-support*
- Software that supports Apple ProRes RAW is required to edit RAW video recorded with Ninja V—for example Apple Final Cut Pro and Adobe Premiere Pro.
- LUT available for ProRes RAW to V-Log/V-Gamut color conversion for color grading: *av.jpn.support.panasonic.com/support/global/cs/dsc/download/lut/s1h_raw_lut/*
- Some functions may not be available, depending on the situation.

Blackmagic RAW on Blackmagic Video Assist 5” 12G

- Recording mode depends on the firmware version of Blackmagic Video Assist 12G HDR.
- See the Blackmagic Design website for information on the corresponding firmware version of Blackmagic Video Assist 12G HDR: *blackmagicdesign.com/support/family/video-and-audio-monitoring*
- DaVinci Resolve or DaVinci Resolve Studio is required to play back and edit Blackmagic RAW. DaVinci Resolve Studio is required to deliver projects using Blackmagic RAW in resolutions over 3840x2160.
- Some functions may not be available, depending on the situation.

LEE Elements Filters

LEE Elements Big Stopper

LEE Elements Circular Polarizer (CPL)

LEE Elements Variable ND (VND)

November 1, 2021. LEE Filters, part of Panavision and maker of lighting gels and lens filters, introduces LEE Elements. They are a new range of high-performance circular filters for photographers and filmmakers.

LEE Elements come in four standard sizes: 67mm, 72mm, 77mm and 82mm. So, you screw these filters onto the threaded front of a lens. They don't slide into a mattebox.

There are five flavors:

- Little Stopper (offers 6 stops of light reduction)
- Big Stopper (10 stops of light reduction)
- CPL (circular polarizer)
- VND (variable ND) 2-5 stops of light reduction
- VND (variable ND) 6-9 stops of light reduction

Little Stopper and Big Stopper are fun names, conjuring up characters you could read about in a crime novel. "Little Stopper and his accomplice Big Stopper stopped traffic during a stopgap stopover in Stopwich."

Or, if you're a fan of *Jeeves and Wooster*, it might be, "I beg your pardon, but you're not going to put that Big Stopper in the Martini shaker, are you sir?"

No, Stoppers are in fact LEE-speak for seriously strong neutral density filters. They are the filter equivalent of stopping down the lens iris, would that you could. Not even a Leica Noctilux covers that range—from F0.95 to F16 is "only" 8 stops. So, it's LEE Stoppers you want when you're wide open at 800 ISO for that high-noon, shallow depth of field scene. Or, you're doing timelapse at impossibly slow exposure times and painful intervals. So, Little Stopper's 6 stops is an ND1.8 and Big Stopper's 10 stops is an ND3.0. And watch out, there's also a Super Stopper (15 stops) that's not yet in the Elements line-up.

Up to now, LEE's Stopper filters came in square sizes (100x100, 150x150 and 85x90 mm) that fit into special LEE filter holders you clipped onto the front of the lens. The new LEE Elements Stoppers are circular and screw on. LEE Elements Little Stopper and Big Stopper also are stackable. In addition, the rotating CPL and VND filters can be stacked in front of a Stopper.

LEE Elements filters are made of high quality glass that are multilayer-coated for excellent optical performance. The filters are ringed by a rugged black anodized aluminum frame. They have a knurled finish that's helpful to grab onto in all kinds of weather. The front and rear sections of the rotating CPL and VND have differentiated grip patterns that you can feel as the filters are adjusted.

"With LEE Elements, we're bringing our experience and know-how to a new range of quick and easy-to-use circular filters, providing the quality and performance that customers expect from LEE, whether they're capturing stills or video," said LEE Filters Managing Director Paul Mason.

The smooth rotational mechanics of the CPL and VND filters are smooth and silent. The VND filters have a rotational limit that eliminates the risk of cross-polarization anomalies. They are clearly marked with numeric stops of light loss to confirm exposure control.

LEE Elements filters are scratch-resistant and are anti-reflective, hydrophobic (moisture) and oleophobic (donut sticky fingers) as you would find on Panavision's PanaND and LEE's ProGlass Cine IRND filters.

Each LEE Elements filter comes in a single-piece, impact-resistant protective hard case with a custom foam insert. The curved, single-piece design let you hold the case comfortably in one hand as you remove or replace the filter. The cases fit into your pocket and take up minimal space in a camera bag. Each filter also comes with its own cleaning cloth.

LEE Elements filters are available worldwide through LEE Filters' dealer network and in the U.K. through LEE Filters dealers and LEE Direct.

leefilters.com

The Business of Rentals: LVRUSA Cine & Lighting

This is a New York story. In the golden triangle intersection of Hudson Yards, Hell's Kitchen and the Garment District, you'll find LVRUSA Cine & Lighting Rentals on 38th Street. This year is the 28th anniversary since the company was founded by President & CEO Michael Liman. Our discussion was joined by company managers Hallie Liman and Derek Barocas.

Jon Fauer: We first met many years ago when you were at FERCO, the boho rental house affectionately mispronounced as "Freako." How did you wind up at FERCO?

Michael Liman: I started in the business at a place called L. Matthew Miller. They were a little sales house and they had a little rental. I didn't know anything about the business. A family friend said, "Hey, there's a job opening." So I went for it. and I worked there for about six to eight months. Some of them were friendly with the people at FERCO, and they basically reached out to me and they lured me over.

When did you leave FERCO?

I ended up becoming partners with one of my customers. We were 22 years old at the time, and the company was called Citicam. We serviced the magazine shows and MTV when that all started.

How did LVR begin?

We started with two Sony cameras. And my friend from De Sisti Lighting gave me extended terms—like three, four months to pay. Everyone was very nice to me.

We now have 15 people working here. We have a full complement of cameras, lenses, lighting and grip.

I'm constantly reading and searching for stuff. One thing that I tell everybody here, anybody that has deep pockets can go out and start a rental house, and everyone can buy the same equipment. But the difference is the quality of the equipment, how it's presented, how it's put out, and customer service. Those are the key things. I also try and buy things that are unusual. Like we have the Flowcine Black Arm for car mounts. I have eight different types of car mounts here.

When did you start getting deeper into renting motion picture equipment more than broadcast?

Probably about 10 years ago. We still provide the networks with a lot of broadcast stuff. We still have plenty of that. But the whole industry was changing and we had to pivot. The ratio of cine to broadcast rentals these days is about 95% cine.

What's the reason?

It's funny. In cine, the camera is a little square box. No one wanted anything that looked like a broadcast camera. But then you build it up to look like a broadcast camera because it still has to go on your shoulder.

It looks like a Christmas tree.

It's the way things come around, like a big circle. And now ARRI has gotten into it with their AMIRAs for live broadcast and multi-camera shoots.

Do you have AMIRAs?

Yes. We have regular AMIRAs and every camera from high-end all the way down. We have a very large inventory. I think we're at about a million barcodes. For instance, the FX9 and FX6 are popular, inexpensive cameras. We constantly buy and try to stay up. Those kind of cameras come and go, and they're inexpensive, but you have to have them. The key things that we've been buying are lights and lenses. The two Ls I call it. Lights and lenses. Last long, and hold some sort of value.

Maybe it should be five Ls: LVR's lenses lights last long.

There you go. The timing was good, because Full-Frame was just coming out, and other companies had an edge on us because some of them were film shops that had vintage lenses and a lot of other lenses. And we didn't have that. We had broadcast lenses. As soon as the Full-Frame came out, we really bought a ton of Full-Frame lenses. So we sort of evened the playing field. Yes, we also have a lot of Super35 stuff. We have a lot of Leitz/Leica, ARRI, ZEISS, and Cooke. We're jumping on everything that's new.

You said you started moving to cine about 10 years ago. What were your first cine cameras?

Canon C300.

Good choice. And these days, what are the most popular cameras that you're renting?

The ALEXA Mini and Mini LF. We have VENICE. Also all the Canons. And then the FX9 and all those other little cameras. If people want something we don't have, I can go pick it up really quick if I want to.

What's the percentage of people shooting Full-Frame compared to the Super35 lately?

I'd say it's about 35 to 40% Full-Frame and growing. I think we're still in the middle of that transition. But it's good enough where the Full-Frame lenses could be used on anything.

Do you see a trend in lenses?

The Canon 17-120 and 25-250 are popular. And the Fujinon 19-90. Also the Angenieux EZ-1 and EZ-2 are very popular. People can use them on Super35 or Full-Frame. You can swap formats, and they're very economically priced. I'm very happy with them.

Photos are appropriately NY Film Noir. Opposite: Michael Liman with Cooke Panchro/i. Above, LVR interior. Below, car rig with Flowcine Black Arm.

We have the whole line of ARRI/ZEISS Master Primes, ARRI Signature Primes, Angenieux Optimo Primes, and the Cooke Anamorphic Full-Frame Special Flare set.

Are you busy right now?

We have been very busy since the second week in March this year. I mean crazy busy. I saw the supply chain problems and I just tried to get ahead of it, and I bought a ton of new gear.

How do you keep on top of things and know when to sell off old equipment?

We hardly sell anything. I've got to tell you, unless it becomes a point where these things are just never going out and costing us more to store it, at that point we would look to move it out.

What kinds of shows are you mostly supporting now?

Hallie Liman: We have a lot of TV shows, streaming, commercials and non-scripted shows.

Michael: We do 20 to 30 jobs a day. Sometimes they're long, 13-week jobs, and sometimes it's a pickup here and there for a day.

What equipment have you gotten recently?

Derek Barocas: Angenieux Optimo Primes. 4K Teradek Bolt Wireless video systems, Cooke anamorphic Full-Frame Special Flare primes, ARRI Signature Primes, ZEISS Supremes, Canon Sumire, SIGMA Full-Frame primes, Raptor Macros, ALEXA Mini LFs.

Michael: I just buy stuff. I love buying gear And if we don't have it, then we decide, let's buy it.

I thought rental houses had to be cautious because they have to catch up for many months of no work during the pandemic.

I've been opening up the pocketbook. There's a NY film quote about this, "If you're not moving forward, you're moving backwards." We bought a lot of new lights. We have ARRI Orbiters and SkyPanels. Litegear, Aputure, Quasar Science. We're constantly buying, trying to stay ahead of everything. Especially now, because like I said, the supply lines are so slow. If I wanted to buy some things right now, I don't think I could get the ones I wanted.

If you were to look in your crystal ball, where do you see the industry going in the coming years? What kind of shows will people be watching and where — streaming, phones, tablets or movies in theaters again?

I think movies definitely changed, especially with the pandemic. A lot of people put large TVs in their houses. But there's something to be said about watching a movie with a whole crowd and getting the audience reactions. I love going to the movies.

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