

Jon Fauer ASC

www.fdtimes.com

April 2020

Issue 101

FILM AND DIGITAL TIMES

Technique, Technology and Art in Motion Picture Production Worldwide

Canon EOS C300 Mark III
Canon CINE-SERVO 25-250

Panasonic LUMIX DC-S1H
Apple ProRes RAW
and Atomos Ninja V

Cooke Tour 2020

DENZ FDC-LPL
Focus Puller at Work
ARRI EF Mount, ERM
Mole 20K & LED Spacelites
Codex Dock & Reader for ARRI

Blackmagic Pocket Cinema Camera Reports
ARRI OCU-1 & Master Grips on Location
FUJINON Premista Around the World
Hunters, Rexer, SIGMA, RED
Teradek Bolt 4K

Cover Photo by Ron Batzdorff

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.

It's written, edited, and published by Jon Fauer, ASC, an award-winning Cinematographer and Director. He is the author of 14 bestselling books—over 120,000 in print—famous for their user-friendly way of explaining things. With inside-the-industry “secrets-of-the-pros” information, *Film and Digital Times* is delivered to you by subscription or invitation, online or on paper. We don't take ads and are supported by readers and sponsors.

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Introduction, Part 1: Film in Coronavirus Times



It's 7 pm. The daily collective clamor of a city in crisis commences. From rooftops, open windows and empty streets, anxious New Yorkers let off steam to applaud health care heroes, police, first responders and essential workers. The cacophony of cheering, clapping and clanging connects cities and countries everywhere in a global outpouring of shared emotions and the realization that we're all in this together.

New York Hospital is ten blocks south. The constant wail of ambulance sirens seems more punctuated today. Hopefully things are getting better. The silence of the city is palpable. It felt this way on 9/11. With twin plumes of smoke reaching to the sky, we wondered why defensive fighter jets were not scrambling in those skies. The rivers encircling the city were not secured by Coast Guard cutters or high-speed rigid inflatables. At the time, who knew what might come next or from where? That feeling of being on your own, with a notable lack of immediate Federal response, is here again. As before, first responders, doctors, nurses, fire fighters and police are the ones on the front lines. Meanwhile we stay at home and social-distance. That is a gentler way of saying "shelter in place," which is what they ominously called it at first.

We should have known what to expect, especially all of us in the film community. Any good screenplay foreshadows what comes next. We neglected the arc of the obvious. Steven Soderbergh's 2011 film *Contagion* could only happen in the movies, right?

Wuhan locked down on January 23.

On January 31, the U.S. imposed travel restrictions on non-citizens who had traveled to China within the last two weeks from entering the U.S.

That was not exactly comforting news as I landed in New York on February 2 after having shuttled to AFC Expo Paris, ASC Awards in LA and BSC Expo. The CBP officer at JFK asked, "Have you been to China in the past 2 weeks?" I replied, "No, I haven't been to China." I wanted to continue, "But what if the virus from Wuhan had already spread to Paris, LA or London and joined us on-board Virgin Atlantic SV 45 LHR-JFK. And where are the body temperature scanners like they have in Japan and Singapore to tell you whether passengers may be ill?" I did not ask these things and went through customs in record time.

We are not alone.

Forest Liu of ARRI China emailed on February 9, "We're stuck in the middle of the Coronavirus. Nothing in China is normal. Beijing is a ghost town and no one dares to go out of the house."

Tina Yao called from Beijing a few days later, "We keep masks on all the time when we go out. We see pictures from New York. Why are you not wearing masks? I'll send you some." She did.

"Our government said we don't need them," I replied, not believing what science and common sense soon would prove otherwise.

Lu Sheng of Ko Film Rental in Beijing wrote on March 16, "All film projects, all shopping centers, cinemas and schools are shut down. Wash your hands, wear a mask, especially when traveling by subway and other public transport. I will send some." He did.

Juan Pablo Fabres of JPF Cine in Chile wrote, "Film production stopped on March 17. Complete shut down since. Have been checking and cleaning equipment so hard for the past ten days that I almost fear rubbing the cameras' paint off."

On April 11, Masa Yasumoto of Sanwa wrote, "Seven major cities in Japan are in a public health emergency and we are requested to stay home to reduce social contact. According to our sister company in Korea, they have started to shoot TV commercials, but no dramas or feature films yet."

Storyline Studios in Norway got in touch: "We have new routines. In doing so, we can offer normal activity with some precautions. All equipment in use at rental or post-production will either have been wiped down with disinfectant or stored untouched for 72 hours after use. Respect 2-meter distance from each other."

Yang Shao of Tiltla in Los Angeles emailed, "Please stay safe. Would you and your family need any masks? I could ship you some." He did.

Thanks to Lu Sheng, Tina Yao and Yang Shao for their thoughtfulness in sending masks. Many were donated to frontline and healthcare workers.

Meanwhile, life at FDTimes has been business as almost usual, bunkered and battened down in the two hectic months before NAB. It's jet-lag without the jets, time-zone teleporting in pre-dawn NY time conference calls with Europe and UK five to six hours ahead of us, daytime Zoom sessions in the US, evening WebEx meetings with Japan, and anytime FaceTime everywhere.

This edition is even larger than the usual NAB LVCC Las Vegas epic. There have been so many concurrent introductions that I'm splitting them up between this and the next edition coming in a couple of weeks. Do we see any trends? Yes. Lighter, smaller, faster, cheaper, sooner.

The cover story is a new Super35 4K Camera from Canon. They also have a new super small and super lightweight Super35 25-250 mm zoom lens. With a built-in 1.5x extender, it doubles as a Full Frame 37.5-375. Panasonic's S1H Full Frame mirrorless still/video camera now records Apple ProRes RAW on the Atomos Ninja V. Meanwhile, there's always a high end and factory visits continue with a 2020 Cooke Tour. And there's lots more.

The big question beyond staying safe and healthy is what happens next. When do productions start up and cameras roll again? For a satirical take on that, read on.

Part 2: Working in this Town Again



Coronavirus is no laughing matter. But what else can you do, sheltered in place, watching the nightly rally of feckless pretenders scaring the daylight hours out of innocent citizens who can only wonder why Andrew Cuomo is not appointed Virus Czar?

I was on my daily 5-mile run around the reservoir and through Central Park. The skies have never been clearer now that cars and trucks and polluting factories are sidelined. I stayed the required 6-feet apart from other runners, huffing and puffing in my face mask, now finally required by the State of New York but not everywhere else. Perhaps it was oxygen deprivation that caused the following hallucination.

.....

The soothing Spotify runner's playlist was rudely interrupted. I fumbled with the AirPods Pro force sensor as my mask's elastic band snapped painfully against both cheeks and the call came through. "Monty Starr on the line," a voice said.

Monty Starr, whose favorite threat, "You'll never work in this town again," is the fictitious lost tycoon and studio chieftain of high anxiety dreams. Of course he wouldn't place the call himself. Monty wouldn't touch anything. His long-suffering secretary Myrna would do it, no doubt wearing surgical gloves and tapping the buttons of an ancient analog phone with chopsticks. "Mr. Starr invited you to a Zoom meeting," she snapped. Evidently Monty or Myrna had mastered remote video conferencing.

You've met Monty Starr in earlier editions of *FDTimes*. He reminds me of producers I have known and Monroe Stahr in F. Scott Fitzgerald's *The Last Tycoon*. As J. Donald Adams wrote on Nov 9, 1941 in the *New York Times*, "It is the best piece of creative writing that we have about one phase of American life—Hollywood and the movies. Fitzgerald was by reason of his temperament and his gifts the best fitted to explore and reveal the inner world of the movies and of the men who make them." But, I keep digressing.

I extracted my iPhone from an inner pocket. There it was: "Topic: Working in this town again." I clicked and connected. Monty was puffing on a Cohiba cigar poking through his designer custom cloth surgical mask. He demanded, "Whaddaya know and whaddaya think we're gonna get this town working again?"

"As soon as the country unifies to provide widespread testing and contact tracing," I replied, putting on my best Dr. Anthony Fauci voice.

"Not gonna happen, or not gonna happen soon enough. Can't wait that long," he barked.

"Did you read your governor's guidelines on reopening production in California?"

"What does he know about production? Reagan, he knew production."

I wasn't sure which rabbit hole this was going down so I tacked to optimism. "Well, I hear that China production resumes on May 1. You could shoot there. They have tax incentives. What is the title of your script?"

"*Decline and Fall of the Roman Empire*. It's a whodunit about a virus that spreads in 10 BC as trade routes open to the East."

Not going to be easy to get a permit for that one, I thought. "It sounds allegorical," I ventured.

"It's not gory at all," Monty fumed. "Well, we have gladiators and chariot races and Roger Deakins will be the DP, so I see Oscars."

I checked the Johns Hopkins Covid-19 Dashboard. The island nation of Sao Tome and Principe off the equatorial coast of Africa was pretty low on the list of cases. So was Bhutan. But maybe there was a better place. "What about going on location to the remotest part of Western Mongolia where they shot *The Eagle Huntress*? You could set up a tent camp, airlift supplies, things like that."

Monty didn't like that idea either. "Leaving LA is like camping out. It's gotta be a hotel. Everyone on the crew gets isolated and quarantined there for 14 days before we even think about starting. Same with family or friends who want to stay. Same with the hotel staff. Anyone in or out has to be tested. Remember, I did something like this during the days of AIDS and H.I.V."

I had forgotten that Monty once worked in what was euphemistically called the Adult Film Industry. Monty referred me to a November 5, 2012 article by *NYTimes* health reporter Donald G. McNeil, Jr about a ritual unique to that industry: the actors had to show an e-mail from a certified laboratory confirming negative tests within the past 15 days.

Monty continued. "We'll have Contract Services do the testing and set up a list of who's safe. They already do those safety classes like how not to fall off a dolly and stuff. Anyway, they do a database, sort of like what we did in the good old days that I don't like to talk about, if you get my drift. And, we still can't get too crammed together on set. Only shoot on long lenses. Close-ups will have to be from at least 6 feet away."

"But you're getting Roger Deakins and he loves wide lenses up close," I argued from experience.

"It's long lenses or get fired," Monty was fired up. "No sharing of tools by grips or electricians. Craft Service can only serve pre-packaged snacks and we still have to zap the wrappers with Lysol. I always thought Craft Service was like a Petri dish accident waiting to happen with everybody poking and picking at unrefrigerated celery sticks. And catering. You sit alone and it's delivered to you by an IATSE approved Seamless Grubhub Postmate postilion."

"No dailies in a trailer. It's online video and remote editing and remote grading. Charter flights and sanitized campers and buses. Medical doctors and nurses on call full-time. That's how we get back to work in this town again."

Canon EOS C300 Mark III Super35 Camera

Canon has an exciting new Super35 4K camera: the EOS C300 Mark III.

You may be surprised to hear “exciting” and “Super35” in the same breath after all the huffing and puffing over Full Frame in FDTimes.

But now, Canon has come up with enough compelling new features and interesting innovations to catch the attention of even the most jaded cinematographers and rental houses who thought they’d seen, or had, everything:

- Records Cinema RAW Light and XF-AVC internally.
- 4K 120 fps Cinema RAW Light internal recording.
- Electronic image stabilization.
- Dual Gain Output Sensor with improved dynamic range.
- Dual Pixel Focus Guide eyepiece display shows whether you’re near focused or far and when you’re right on, it glows green.
- HDR support for both HLG and PQ.

To paraphrase Mark Twain, reports of Super35’s demise may have been exaggerated. As Panavision’s Jeff Allen said in FDTimes November 2016, “35mm as we currently know it in the movie industry will be used like the current 16mm format. And, Full Frame will become the standard for what formerly was shot in 35mm.” In other words, Full Frame is becoming the “new” 35mm, and 35mm may be the former 16mm.

Why is this?

There is a vast inventory of Super35 lenses. Sure, you can use them in windowed mode on Full Frame cameras or cropped in post. But what if you built a new Super35 camera that is similar in shape and weight to Canon’s popular C500 Mark II but made it to do more things?

- C300 Mark III has a Super35 4K sensor.
- C500 Mark II has a Full Frame 5.9K sensor.
- C300 Mark III records 4K RAW up to 120 fps.
- C500 Mark II records 5.9K RAW up to 60 fps.
- C300 Mark III shoots Super35 4K XF-AVC Intra to 120 fps.
- C500 Mark II can crop to Super35 and shoot 4K XF-AVC Intra up to 60 fps.

The C300 Mark III and C500 Mark II both have:

- Recording to internal CFexpress Cards.
- Electronic Image Stabilization.
- Diffraction Correction (sharpens images naturally).
- Enhanced Dual Pixel CMOS Autofocus
- Extended range of the alternative Focus Guide
- Feathered focus end stops.

This is the 10th Cinema EOS camera since Canon introduced the C300 in November 2011 at Paramount Studios, Hollywood.

Canon is also introducing the new CINE-SERVO 25-250 mm T2.95-3.95 Zoom. It may not be the official “kit” lens, but it certainly will be the must-have zoom for the C300 Mark III.



Canon EOS C300 Mark III with CINE-SERVO 25-250mm T2.95-3.95



Canon EOS C300 Mark III Super35 Camera

Canon's C300 Mark III Super35 4K cine camera has interchangeable lens mounts and internal ND filters in an extremely compact and incredibly lightweight body that weighs less than 3.9 lb (1.75 kg).

The camera records 12-bit or 10-bit Super35 4K Cinema RAW Light and XF-AVC internally from 12 to 120 fps. You don't need a piggybacked or external recorder.

It comes with a standard Canon EF mount that accepts more than 130 million EF lenses worldwide.

Remove four 3mm screws in front, and you can swap the EF Mount yourself for a PL Mount or EF Cinema Lock Mount in about 5 minutes. Canon offers these as accessories. A shim kit is included with these mounts so you can adjust flange focal depth.

The C300 Mark III has 2 sensor modes: Super35 and Super16. Cropping is done in-camera. This is nice because you can summon up an entire collection of contemporary and vintage lenses, from Canon or anyone else, in Super35 or Super16 format. These might include a vintage Canon Super16 documentary classic 8-64mm T2.4 Zoom, K-35 Primes, Canon Zooms, Cine-Servo Zooms, Compact Zooms or Compact-Servo Zooms. Of course, Canon's CN-E and Sumire Primes fit as well.

Various modules let you configure the C300 Mark III camera for handheld, shoulder resting, studio mode, crane, rig, aerial or gimbal mode—with EVF, handgrip, handle, expansion units and other accessories.

There are 3 viewing options.

The LCD Monitor LM-V2 LCD is included with the camera.

OLED Electronic Viewfinder EVF-V70 was introduced with C700 series and will work with C500 Mark II, C300 Mark II, C200, and now with the C300 Mark III.

EVF-V50 is a small, 0.46" OLED viewfinder that attaches to the back of the camera. It is removable.

Front - EF Mount



Front - PL Mount



Canon EOS C300 Mark III

The lens mount attaches with four 3mm hex screws. Users can swap it in the field for an optional PL Mount or optional EF Cinema Lock Mount. Mounts come with a set of shims. Remember: to tighten the PL mount, think “clock(wise) to lock.” For the Locking EF mount, it’s counter-intuitive: “Counter-clock(wise) to lock.”



The C300 Mark III comes with a standard Canon EF Mount. It has pogo pins for lens data and auto functions like AF and IS.



The Canon EF Cinema Lock Mount is a helpful upgrade to securely keep lenses from twisting and adds greater mechanical support.



The PL Mount has /i Technology pogo pins at the standard 12 o'clock position and transfers lens data directly to the camera.

VIDEO & Power for LM-V2 (included) or EVF-V70 (optional—same OLED Viewfinder released with C700)



Canon EOS C300 Mark III

EOS C300 Mark III Super35 Camera with Canon Sumire Prime CN-E50mm T1.3

Canon Sumire Prime Family:
Full Frame, PL Mount,
so use PL Mount on C300 Mark III

CN-E 14mm T3.1 FP X
CN-E 20mm T1.5 FP X
CN-E 24mm T1.5 FPX
CN-E 35mm T1.5 FP X
CN-E 50mm T1.3 FP X
CN-E 85mm T1.3 FP X
CN-E 135mm T2.2 FP X



C300 Mark III Super35 Camera with Canon Prime CN-E 85mm T1.3



Canon CN-E Cinema Prime Family:
Full Frame, EF Mount,
so use EF Mount on C300 Mark III

CN-E 14mm T3.1 L F
CN-E 20mm T1.5 L F
CN-E 24mm T1.5 L F
CN-E 35mm T1.5 L F
CN-E 50mm T1.3 L F
CN-E 85mm T1.3 L F
CN-E 135mm T2.2 L F

Canon EOS C300 Mark III

C300 Mark III Super35 Camera with Canon EF24-105mm F4 IS USM

LM-V2
LCD
Monitor

EVF-V50
is a small, removable, 0.46"
OLED viewfinder that attaches
to the back of the camera.

Onboard 14.4V DC BP
Series Battery Pack.
Camera accepts BP-30
and BP-A60.

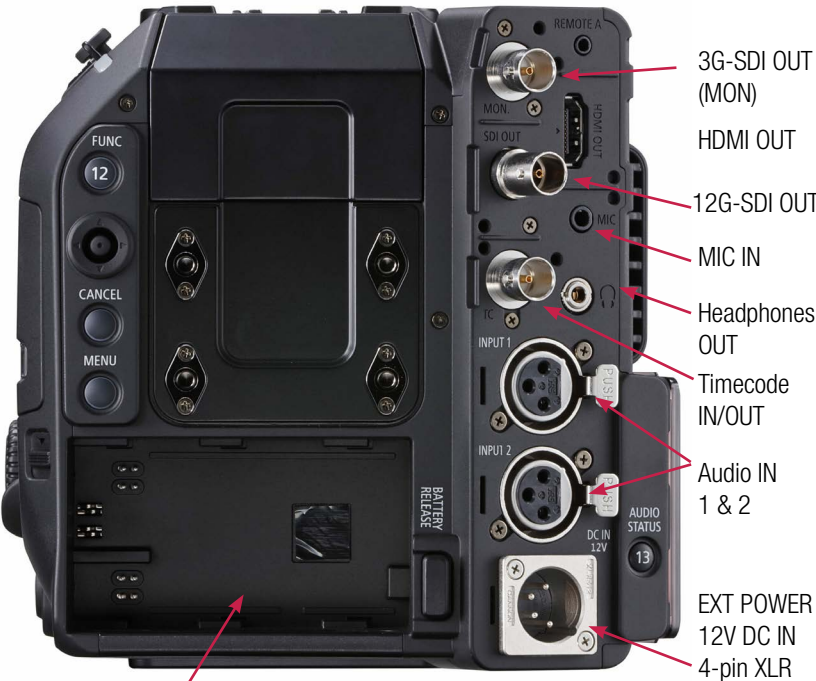
C300 Mark III Super35 Camera with Canon Compact-Servo CN-E70-200mm T4.4



Canon Compact-Servo Lens Family:
Super35, EF Mount,
so use EF Mount on C300 Mark III

CN-E18-80mm T4.4 L IS KAS S
CN-E70-200mm T4.4 L IS KAS S

Canon EOS C300 Mark III



Internal Compartment for Canon BP batteries

Rear



Rear with Connector Caps Attached



Bottom



Top

Canon EOS C300 Mark III

Shoulder Mode

Expansion Unit EU-V2

WiFi



Expansion Unit EU-V2

adds:

- V-Mount battery bracket
- 24V DC 2A Out
- D-Tap 12 V DC 50W Out
- Genlock / Sync
- Remote B
- Ethernet (LAN)
- Lens control
- Audio Channels 3 and 4
- and additional functions



Canon EOS C300 Mark III

Studio Mode



Canon Cine Zoom Family

Canon Zooms in PL (SP) and EF (S):
CN-E 14.5-60 mm T2.6 L
CN-E 30-300 mm T2.95-3.7 L

Canon Cine-Servo Zooms in PL and EF:
CINE-SERVO 17-120 mm T2.95-3.9
CINE-SERVO 25-250 mm T2.95-3.95
CINE-SERVO 50-1000 mm T5.0-8.9

Canon Compact Zooms in PL (SP) and EF (S):
CN-E 30-105 mm T2.8 L
CN-E 15.5-47 mm T2.8 L

Canon Compact-Servo Zooms in EF Mount:
COMPACT-SERVO 18-80 mm T4.4 L IS
COMPACT-SERVO 70-200 mm T4.4 L IS



Steve Holleran on Canon EOS C300 Mark III and CINE-SERVO 25-250 Zoom



Steve Holleran on Canon EOS C300 Mark III



Jon Fauer: I understand you were probably one of the first people to use both the new Canon C300 Mark III and the new 25-250 T2.95-3.95 zoom lens. How did this happen?

Steve Holleran: About a month and half ago, Tim Smith from Canon approached me about pitching a concept for a short film to showcase the aesthetics and visuals of a new camera Canon was developing. What I created was a concept called *Boneyard Ballet*. It's an art piece, an ode to flight, human and mechanical. It features a ballerina dancing through an abandoned 747 airliner in a Mojave Desert airplane boneyard. The idea was born out of trips I used to take to the desert with my dad, who's an airline pilot. He would point out the old planes in the Mojave Air and Space Port and refer to them as big metal birds. That sparked the idea of having a ballerina dance along the wing of a plane set to the music of Tchaikovsky's *Swan Lake*.

To communicate this visually, we open in the boneyard and push through the cabin of a retired 747 onto the cover of an old Skyways magazine where we see a picture of a ballerina. Then, the foot of a real ballerina is reincarnated. It's meant to be magical, lyrical and nostalgic—as if by coming alive off the page, so too is the plane. In fact, the cabin is the stage and our ballerina is dancing for a bygone audience. Ultimately, she leaps off the end of the wing in a huge stunt where she's airborne for a good 20 seconds and disappears like a mirage back into the boneyard. It is about the history of aviation, the memory of abandoned spaces, and the art of bringing new beauty to an old place.

We had certain goals in mind going into the shoot that we wanted to accomplish. We wanted to showcase the mobility of the camera and its build functionality. Examples include moving from hand-

held to a drone setup, or to a MoVi, or a Tero remote control car, or a studio set-up. We also wanted to test field-swapping EF and PL lenses, as that's a great feature of the EOS C300 Mark III. The shoot was designed to be run-and-gun, guerilla style, to utilize the camera in a variety of ways on a quick timeline.

Let's talk about the camera.

The Canon C300 Mark III camera is the cleanest Canon body that I've ever used. It has all the standard accoutrements on the outside in terms of buttons that you would expect from Canon. In that sense, you slip right into it. Short learning curve. It is extremely lightweight and well balanced. It's great for handheld.

It shoots 4K up to 120 frames per second in RAW, which is an exciting function. You don't have to sacrifice image quality at the higher frame rates as you normally do, which means you're not looking at bringing in a different camera body specifically for that shot. I love the way the camera handles details at 120 fps. You can watch the ballerina's dress blowing in the wind, seeing every nuanced detail in slow motion. I can't say enough about that feature. Slow motion at 4K is exciting for documentary, live sporting events, feature filmmaking, and as a specialty camera.

Two other exciting features include 10 stops of internal ND, adjustable with a plus and minus button on the side of the camera—and internal stabilization. The stabilization was extremely handy to have when I was operating inside the plane cockpit and down the aisles because there was so little space.

One new feature I'd never seen before was the C300 Mark III Dual Gain Output (DGO) sensor. Essentially DGO pushes the camera's sensitivity and you can gain a stop and a half of latitude. It takes

Steve Holleran on Canon EOS C300 Mark III

the sensor from 15 stop dynamic range to 16+ stops. There's no button to turn it on or off, so it's something that the sensor is doing full time at 24 fps. I rated the camera as having a 16+ stop dynamic range at regular speed 4K Cinema RAW Light (.CRM). That's exciting. We actually put the camera in a number of environments where we had that type of dynamic range: looking out of the cockpit behind the wing at sunset as our ballerina is jumping off the wing in the background.

You recorded RAW directly to an internal CF express card?

We recorded CRL directly to the CFexpress card and there's another recording slot that lets you record 2K XF-AVC proxies internally at the same time. This changes the workflow game on the post side. We've been editing in post straight off those proxies.

Your viewfinder does not normally come with the camera.

We used the viewfinder from the C700. I specifically asked for that viewfinder because we were outside in a bright desert situation. I knew I wouldn't see a proper picture using an onboard monitor, so I had the eyepiece there. It plugs right into the front of the body and we had it on almost the whole time. It's a great fea-

ture to be able to bring over accessories from other Canon bodies.

You were handheld with a 25-250 mm zoom. That is not a usual sight. Do you want to expand on that?

Towards the end of day 1, we were shooting the final crescendo of the ballet piece. Our ballerina dances down the 250-foot length of the 747 wing and then leaps off the end. I was on the wing as well, circling handheld around her and shooting closeups. I had the 25-250 because I wanted to move fast. We were running out of daylight and the zoom gave me the ability to change focal lengths, from wide to extremely tight, really quickly.

The rest of the crew was underneath the wing to be out of the shot, so there was no chance to swap lenses. Even Dennis Scully, our first AC, was pulling focus from the ground. It was just our ballerina Alison Stroming, the safety crew, and myself on the wing. I was racing around to get as many angles as I could in the limited time we had as magic hour approached.

It was also a way to test the qualities of the lens: how it flared, how it handled shadows in HDR with very strong backlight, what it felt like to operate.





How did the 25-250 look and handle?

I've never handheld a zoom lens with that long a range, from 25 to 250 mm. It's a massive range that offers you lots of flexibility. Another exciting thing about the lens is that it is lighter and smaller than almost any other zoom I've used—while still covering this much range.

Last year, when I shot *The Age of A.I.*, the YouTube documentary series with Robert Downey, Jr., we traveled around the world mostly handheld with heavy zooms that often doubled the weight of the camera. They looked great but it was just miserable operating with those heavy lenses in handheld situations.

The new Canon 25-250 is the first time I've ever seen a zoom that is small in length, width and weight while at the same time covering such a long range. It even has a helpful 1.5x extender built in and you can turn it on or off with the flip of a switch to punch in even tighter. Originally, I didn't know if I was going to be using the 25-250 that much on the shoot—but the funny thing is it stayed on the camera the rest of the day and part of the next day as well.

From a build perspective, having that zoom was excellent. If I were going to use a 250mm prime, I would have to reconfigure the camera for that big lens. And if I wanted to go back to a small 35mm prime, I'd have to reconfigure and rebalance the camera again. There wasn't enough time to do that on this shoot—which is often the case.

In terms of quality, the bokeh with the lens wide open at magic hour was pleasing and gentle. It recreated skin tones with an authentic quality. Flares were not overdone and they looked very smooth. It was a pretty image and it cut nicely with the Sumire

Primes. It's a unicorn in terms of zoom lenses.

What other lenses did you have?

This was the first time I had access to the entire range of Canon glass from PL to EF. A nice feature about the C300 MKIII is the easily-changeable lens mount. With four screws you can quickly swap PL or EF mounts in the field.

For this shoot, I fielded PL zooms and primes, particularly the Canon 25-250, Canon Cinema Zooms, and the Canon Sumire Primes. I also had Canon EF tilt shifts for some specialty shots I did in the cockpit where I wanted to play with depth of field. I think the PL primes and zooms cut together perfectly. I cannot see much of a difference at all in the edit.

The nice part about staying within the Canon lens family is you're guaranteed a reliability across the optics both in quality and build. I thought the color rendition, skin tones, and bokeh all stayed consistent with our variety of lenses. I was pleased with how well they matched.

What onboard monitor did you use?

That was an Atomos Shogun 7. It accepts 4K from the camera and displays it in HDR on its 1920x1200 screen. We were shooting in an HDR world and we knew we were going to do both HDR and SDR passes in post.

Where was video village?

We had multiple video villages. We were sending a feed to Dennis pulling focus at his 13-inch SmallHD monitor. We were sending another feed to our DIT in his own tent where he was monitoring. We had two cameras out there, so he was viewing

Steve Holleran on *Boneyard Ballet*





Steve Holleran on *Boneyard Ballet*



both and helping me maintain consistent exposure. He had two different monitors getting a separate feed from each camera and an extra Canon monitor so he could look at them in HDR as well. We sent a third feed to client video village where there were two 4K monitors to be able to watch both cameras as well.

Canon monitors, of course. What about lighting?

Exteriors were all natural light, basically backlit or side top lit the entire time. We had consistent lighting conditions for the entire day along with morning and evening magic hours on either side that fit nicely into a 12-hour day. We often saw dappled skies with punchy sunlight coming through.

I did a lot of lighting in the interior of the plane's cabin. We had a Condor with two 4K HMIs angled about 30 degrees off from each other, punching through the coach cabin windows to give us strong shafts of light. We used smoke for atmosphere.

There was an eight tube Asterra set that I put in the recesses above the overhead bins to provide soft top fill. We had two 2x8 Light Tiles for soft key/fill as they fit nicely above the plane's seats, and we used a 1.8K HMI shooting down the left passageway for an edge.

How would you describe the look and style of the film?

The style and look is lyrical. It's meant to be magical and atmospheric—as if a memory. I designed a moody quality inside to lead into a dynamic and vibrant exterior world when we're looking at the ballerina. There was also a variety of slow motion and on-set stabilization because I wanted it to feel like you were taking flight with the ballerina.

Gods of Focus: Dennis Scully



Dennis Scully in front of camera, attaching Preston DM1x Motor

Jon Fauer: Tell us about your impressions of the C300 Mark III.

Dennis Scully: My history with Canon goes back to the prototype C700 on the demo film with Russell Carpenter, ASC and Tyler Stableford in Aspen. And many other jobs with Canon cameras and Steve Holleran since then. The C300 Mark III feels very much like the new generation of smaller form factor cameras. It's a good, solid, well-built, small module to which you can add components and has places to do it properly. The functionality and assignability of the switches make sense and meet our needs for speed changes and so on. Access to the media cards was good.

The images are beautiful. Canon has had their color science down to a science for a long time. The colors and the pleasing rendition of skin tones are all there on this camera as well. The RAW data retains great detail and holds a very wide dynamic range. That impressed us. Everything seems well thought out ergonomically and I was very happy with where things were located.

The menu is intuitive, especially if you're a Canon user. I would like to see the addition of a second high-resolution viewfinder port so we could have the small 4.3" Canon LM-V2 LCD Monitor on there for menus at the same time as we have the OLED EVF for the camera operator.

Tell us your impressions of Canon's new 25-250 zoom lens.

Especially if you're doing documentary style, it has great range and is a tremendous amount of lens for the weight and size. It has pretty bokeh in the out-of-focus background and highlights.



Dennis Scully: What's on the Camera

Canon CINE-SERVO
25-250mm
T2.95-3.95

Preston
Light
Ranger 2

Canon EVF-V70
OLED Electronic
Viewfinder

Atomos
Shogun Inferno
Monitor

Bright
Tangerine
Cage

Bright
Tangerine
Titan Arm

Bright
Tangerine
Top Handle

Preston
MDR 3
analog port

Gold Mount
Battery



Bright Tangerine
Misfit Kick
Mattebox

Bright Tangerine
Drumstix
Titanium Rods

Spidergrips

Scully Tactical
Motion Focus
Wheel

OConnor
2575

Canon EOS
C300
Mark III

Bright Tangerine Left
Field LWS Baseplate
and Sliding Top Plate.

Wooden
Camera
D-Box

Teradek Bolt
4K 1500 TX

Canon EOS C300 Mark III Boneyard Ballet Build-Out (Camera Left Side)

Starting from the front, tell us how you outfitted the camera.

Up front is the Bright Tangerine Misfit Kick 2-stage Mattebox with Reveal Stage that expands to 3 stages without tools. It clips on to the front of the lens but also has a lens rod bracket.

We are also using the Bright Tangerine lightweight Drumstix titanium rods and titanium cage. I'm very impressed with the cage. We also had the Bright Tangerine Left Field 15mm LWS Baseplate and Sliding Top Plate. You loosen the lever to slide it. And there's an extra knob that lets you push the lever forward to have a sideways quick release off of the baseplate.

There's a small dial attached to the left lens rod. This is for the camera operator to take over focus control from my FIZ hand unit.

On top, we have the Bright Tangerine orange Titan Arm holding an Atomos Shogun Inferno monitor. It's a 7-inch HDR 1920 x 1200 monitor that supported our LUTs and 4K input. We did not use it for recording. We used it because it's easy to view in daylight and for its accurate picture quality.

The top handle is from Bright Tangerine.

Above the lens, there's a Preston LR2 (Light Ranger 2).

The handgrips are Spidergrips from Camera Accessory Solutions.

At the back of the camera we have a Wooden Camera D-Box for power distribution to all our accessories. Next, towards the rear, is a new Teradek Bolt 4K 1500 TX video transmitter. We were very excited to have 4 K sent from the camera going to the Teradek 4K receiver connected to a Canon 4K HDR 17-inch DP-V1711 monitor with a single 12 G input cable. It was a game-changer being able to actually pull focus in 4K and in real time.

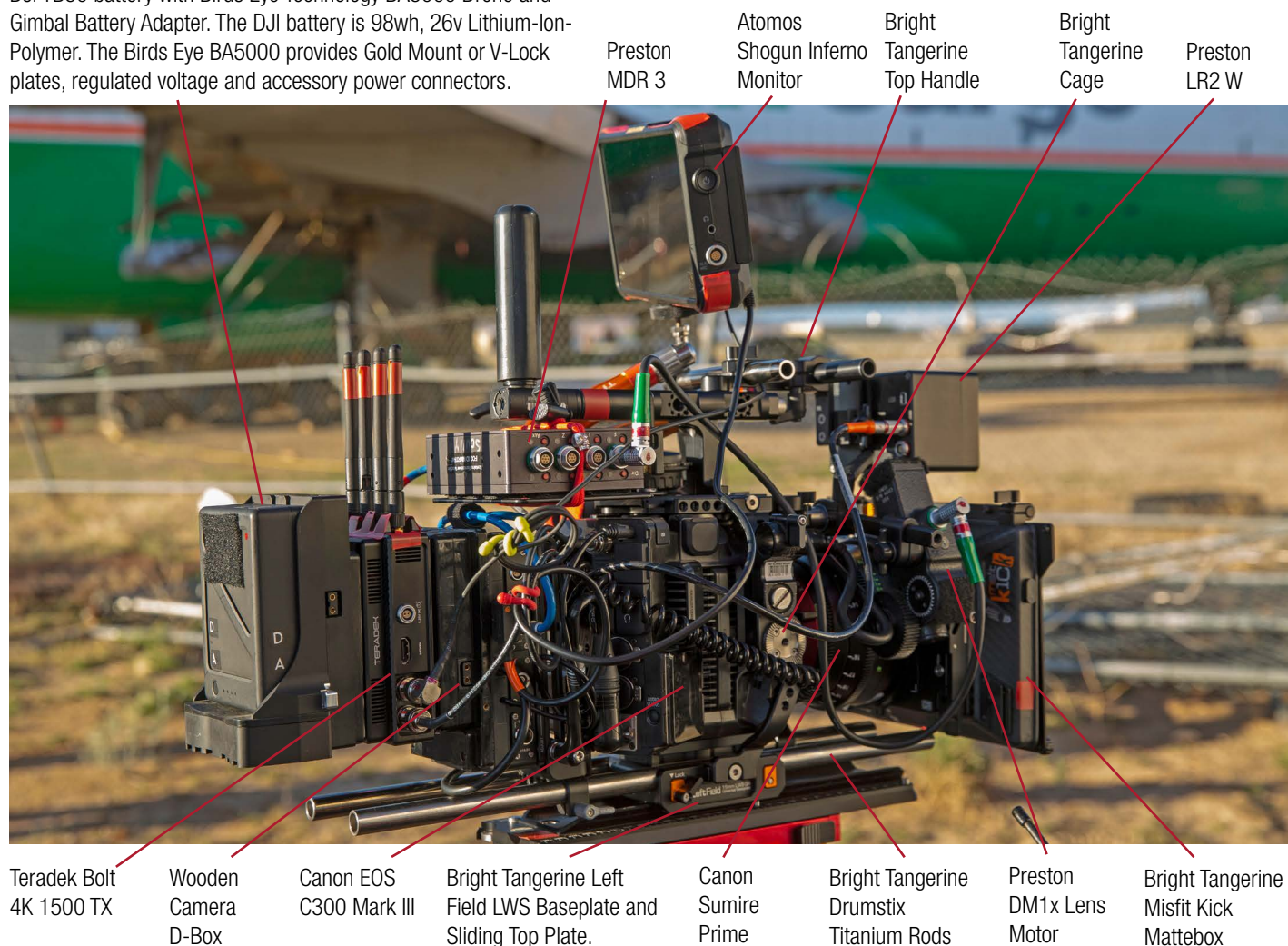
Teradek was nice enough to lend us two new Bolt 4K systems.

Preston LR2 W Light Ranger?

I just cannot speak more highly about the Light Ranger 2. I'm a year and a half into using it and I just can't see doing a job without it. Now, if the camera's moving, handheld, on a gimbal or anything that's moving, it is such an essential tool. The old ways of "using the force" are still important where you go off of marks, needing to understand the nonlinear nature of focus, and developing a rhythm. But rehearsal times where we can get marks are rarer.

Dennis Scully

DJI TB50 battery with Birds Eye Technology BA5000 Drone and Gimbal Battery Adapter. The DJI battery is 98wh, 26v Lithium-Ion-Polymer. The Birds Eye BA5000 provides Gold Mount or V-Lock plates, regulated voltage and accessory power connectors.



Canon C300 Mark III Boneyard Ballet Build-Out (Camera Right Side)

The Light Ranger becomes very important when, for example, the camera moves in a direction that's not rehearsed—so we can react properly. Steve Holleran is famous for this and I've worked with him often on handheld and on features where he holds on an actor doing a long monolog. As the monolog is winding down, he starts an ever-so-subtle push in. If you aren't ready, you could buzz out of the actor's perfect 2-minute delivery. You wouldn't want to be that focus puller.

You mentioned, and Steve also talks about, something on the camera where the operator can take over focus even when your Preston system is engaged. How does that work?

A while ago, I was working with a DP who wanted to have focus temporarily for some sports action handheld shots. We had limited time with the athletes. He didn't necessarily want to rehearse a focus move. I had an original Preston single channel MDR with a little iris knob on it. I used that for focus. So I rigged it to hang from the rods up front about where the focus knob would be and he could actually activate it. When Preston fazed out the single channel MDR, they integrated an analog port in the new MDR.

The analog port allowed me to add what I call a Tactical Motion

Focus Wheel. I'm now on a generation four of a small focus wheel with an inline switch that allows the operator at the camera to take over focus temporarily with the motors still engaged. It is not an encoded device, so it jumps when you take over or hand it back. But, we've learned to work with that.

I first created the Tactical Motion Focus Wheel towards the end of 2016. It's a small, nondescript analog type of rheostat that I have hardwired into the MDR's analog port and that's mapped to the focus channel. It has an inline on/off switch.

Most operators or DPs who have seen it enjoy having that option for solo shooting or if I'm not at the focus station. Or, we're in the setup phase and maybe the DP and Director want to line up a shot. They can take over focus without disengaging my motor, or messing up any of the calibrations that already have been set. The motor stays engaged. You should map the lens in advance.

On the *Artificial Intelligence* show, we had a B camera shoulder rig camera with a Preston system on it and usually a macro lens with the Tactical Motion focus wheel on it. Steve could grab the camera and go shoot B roll tight shots while we were building the main setup and getting it lit. When he was ready for me to pull

Dennis Scully

focus, I could just have my hand unit tuned to that channel and he would switch over for me to take over focus control. I was the only AC but we had two cameras.

It didn't matter what camera Steve was on, I could be on that camera. I had two Teradek receivers piggybacked on my monitor and could just change from A camera to B camera whenever needed. So we always had Prestons engaged and ready to go without the bulk of a big studio follow focus.

Do you notice a difference between 2K and 4K monitors for focus? Even on smaller monitors?

Yes, 4K monitors are the way to go, especially with everybody wanting to shoot with lenses wide open and super shallow depth of field. It's not even a matter of choosing the right eye or left eye. It's whether you want the eyelashes or the eyeball to be sharp. It's crazy shallow. It looks amazing, but it is brutal. If you're on something like a 135mm at T1.3 on a tight choker, God help you. Unless you're viewing on a 4K monitor.

Do you think this marks the beginning of a return or come back for Super35?

I think the C300 Mark III is certainly positioned in the right place at the right time because a challenge with Large Format can be to find enough Large Format lenses. There are so many more Super35 lenses out there.

In closing?

So, in summary, the Canon C300 Mark III is a progression of the move to new, small form factor cameras. It's a documentary style design that can be used by many people, from the solo shooter all the way up to the highest level productions using lightweight cameras. We loved that it could go directly onto the gimbal and the drone and we did not have to use multiple cameras, with different form factors and different models to accomplish that. I'm really excited about it—the body is so light and so capable that it now allows us to fly some larger lenses on the gimbal and the drone.



Dennis Scully's Tactical Motion Focus Wheel
www.tacticalmotion.com



Rain. What better way to test a new camera?



Why does the DP always want to put the prototype camera in a puddle?

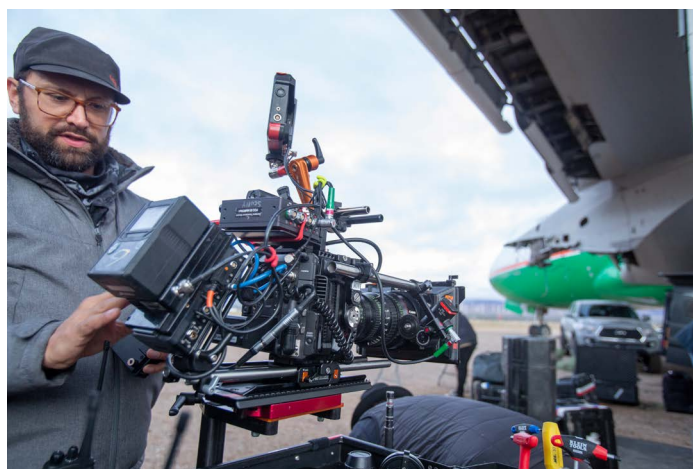


Freely TERO remote-controlled vehicle, C300 III, Sumire Prime 14mm.



Freely Alta 8 with C300 III, Sumire 35mm Prime. Pilot: Josh Lambeth.

Canon EOS C300 Mark III



Adam Wheeler, DIT.





The Cinema EOS Dozen: Charles Zablan (Canon), Alex Sax (Canon), Dara Grombiniak (Canon), Crystal Marzigliano (Canon), Lisa Belli (Canon), Steve Tobenkin, Steve Holleran, Michael Bravin (Canon), Yotaro Sanjo (Canon), Yosuke Kamada (Canon), Keisuke Matsuno (Canon), Kengo Takasawa (Canon).



BONEYARD BALLET

An Ode to Flight

Boneyard Ballet Framegrabs from finished Apple ProRes 4444 1.9:1 Video courtesy of Canon. Shot on Canon EOS C300 Mark III Super35 Camera.









DIRECTED BY STEVEN HOLLERAN

BONEYARD BALLET

Shot entirely on the Canon EOS C300 Mark III camera and Canon lenses

producer
STEVE TOBENKIN
director of photography
STEVEN HOLLERAN
editor
ADAM MCCLAUGHRY
line producer
MIKE MACHIN
first assistant director
BENJAMIN CAIRD

featuring
ballet dancer **ALISON STROMING**
stunt double **CASSIE JO CRAIG**

CINEMA EOS

production coordinator
JEROME MARSHALL
art director
WADE MORRISON
wardrobe
AMANDA LIN
digital imaging technician
ADAM WHEELER
stunt coordinator
JOHN C. EPPERSON

Canon EOS C300 Mark III Specifications

Image Sensor

Effective Pixels:	4096 x 2160 - when 4096 x 2160 or 2048 x 1080 is selected (approx. 8.85 megapixels) 3840 x 2160 - when 3840 x 2160 or 1920 x 1080 is selected (approx. 8.29 megapixels)
Total Pixels:	4206 x 2280 (approx. 9.6 megapixels)
Sensor Size:	Super 35mm 4K: 26.2 x 13.8 mm (29.61 mm diagonal) UHD 4K: 24.6 x 13.8 mm (28.21 mm diagonal)
Sensor Modes:	Super 35mm, Super 16mm (cropped)
Pixel Pitch:	6.4 µm
Sensor:	CMOS with RGB Primary Color Filter (Bayer Array)
Processor:	DIGIC DV 7 Imaging Processor

Lens Mount

Lens Mount:	Comes standard with EF Mount
Optional Mounts:	EF-C locking Mount, PL Mount All mounts are interchangeable with 4 screws
ND Filter:	Mechanical ND filter system with clear, 2, 4, and 6 stops; 8 and 10 stops in extended mode
Correction:	Peripheral Illumination Correction Available

Exposure, Shutter, Iris, ISO

Manual:	Manual setting of shutter speed/angle, iris, ISO/gain, and ND filter
Auto:	Push Auto Iris Control, Auto Iris Control
Metering:	Standard, Spot and Backlit
ISO:	100 to 102,400 ISO
Exposure:	Exposure Compensation/AE Shift -2.0 to +2.0 in 0.25 point increments
Shutter Modes:	Shutter Speed; Angle; Slow Shutter; Clear Scan
Shutter Speeds:	1/12 to 1/2000 in 1/3 or 1/4 stop increments (at 59.94, 50, and 24 Hz.)
Shutter Angles:	360, 240, 180, 120, 90, 60, 45, 30, 22.5, 15, 11.25 (at 59.94, 50, and 24 Hz.)
Iris Settings:	1/2 stop, 1/3 stop or Fine increments with EF lenses. Push auto iris control Auto iris control in 1/2, 1/3 stop or fine increments (Compatible EF lens required)

Focus

Autofocus:	Dual Pixel CMOS AF System (only with lenses that support AF functions can be used in AF modes)
Focus Modes:	Manual, continuous AF, One-Shot AF, AF-Boosted MF, Face Detection AF

Dimensions

	Approx. width x height x depth
Body Only:	153 x 148 x 168 mm (6.0 x 5.8 x 6.6 in.)
Body and Grip:	183 x 148 x 189 mm (7.2 x 5.8 x 7.4 in.)
Camera System:	343 x 277 x 333 mm (13.5 x 10.9 x 13.1 in) (includes Body, Grip, Handle, Mic Holder, LCD Monitor LM-V2 and Expansion Unit EU-V2)

Input/Output

SDI OutHD:	SMPTE 292
3G:	SMPTE 424, SMPTE 425
6G:	SMPTE ST 2081
12G:	SMPTE ST 2082
Audio:	SMPTE ST 299 BNC Connector output only
Monitor Out:	Available
Monitor:	2048x1080 / 1920x1080 Resolution 23.98p/24.00p/25.00p/29.97p/30p/59.94p/60p
Time code:	BNC Connector (Input and Output)
Genlock:	Supported when optional expansion unit EU-V1 or EU-V2 attached
Sync Out:	Supported when optional expansion unit EU-V1 or EU-V2 attached (shares function with Genlock)
HDMI Output:	Type A 4096x2160/3840x2160/1920x1080/1280x720
Audio Input:	2x Balanced 3-pin XLR (Mic Level, Mic Level with Phantom Power and Line Level) 3.5mm Microphone terminal
Headphone:	3.5mm stereo mini-jack
Remotes:	Remote A (Standard — LANC Compatible or RC-V100) Remote B with expansion unit EU-V1 and EU-V2 Remote control through WFT-E9
CCU :	Optional RC-V100
USB:	Available

Power

Battery:	14.4V DC Battery — BP-A Series Battery Pack
DC IN:	12V connector or V-mount battery with EU-V2)
Ext. Power:	11.5V - 20V DC 12-20V
Power Adapter:	CA-CP200B Compact Power Adapter (for Battery Charger)

Weights (approx)

Camera body only	
with EF mount:	1.75 kg (3.9 lb)
with PL Mount:	2.030 kg (4.5 lb)
w/ EF Cinema lock:	1.860 kg (4.1 lb)
Camera Grip GR-V1:	260 g (9.2 oz)
LCD Monitor LM-V2:	204 g (7.2 oz)
Top Handle:	227 g (8.0 oz)
Battery Pack BP-A60	434 g (15.3 oz)
LCD LA-V2 Attachment Unit:	265 g (9.3 oz)

Onboard LCD Monitor

Type:	4.3-inch (10.9 cm diagonal) color LCD Approx. 2,760,000 dots (1280 x RGB x 720),
Aspect Ratio:	16:9
Field of View:	100%
Adjustments:	Brightness, Contrast, Color, Sharpness and Luminance

Audio

Recording Format:	Linear PCM; 4-Channel; 24-Bit; 48 kHz
Built-in Microphone:	Monaural
External Audio Inputs:	2x XLR inputs (Auto and Manual level settings)
Phantom Power:	+48V
Speaker:	Built-in Speaker with Adjustable Volume

Recording (Internal)

Canon EOS C300 Mark III Specifications

Slots: CFexpress 2.0 (Type B) x 2 slots
SD Card (for Proxy Recording, JPEG Stills, Custom Picture Data, Clip Metadata, Menu Settings)
SD/SDHC/SDXC Supported

File Formats: XF-AVC: MXF (OP-1a)
Cinema RAW Light: CRM

CFexpress: exFat File Format

SDHC card: FAT32 Format on SDXC card up to 32 GB
exFAT Format for more than 32 GB

File division: 4 GB for FAT32, none for exFAT

Clips: 999 clips maximum per media card

Resolutions

Mode	Resolution	Frame Rates
Cinema RAW Light	4096 x 2160	59.94p / 29.97p / 23.98p 50.00p / 25.00p / 24.00p
	2048x1080	59.94p / 29.97p / 23.98p / 50.00p / 25.00p / 24.00p
XF-AVC	4096x2160 / 3840x2160	59.94p / 29.97p / 23.98p / 50.00p / 25.00p / 24.00p
	2048x1080 / 1920x1080	59.94p / 29.97p / 23.98p / 50.00p / 25.00p / 24.00p/ 59.94i / 50i
	1280x720	59.94p / 50p
Codecs:	XF-AVC 10 bit 4:2:2 on CFexpress Cards or 8 bit 4:2:0 on SD card	
	Cinema RAW Light on CFexpress Cards	
Color Gamuts:	Cinema Gamut, BT.709, BT.2020	
Gamma Curves:	BT.709, Wide DR, Canon Log 2, Canon Log 3, PQ, HLG	

Slow Motion and Undercranking (Slow and Fast Motion)

Sensor Mode	Recording Mode	Available Frame Rates
Super35	Cinema RAW Light	23.98P/24P: 12-120
		29.97P: 15-120
		25P/50P: 15-120
		59.94P: 15-120
Super16 (Crop)	Cinema RAW Light	23.98P/24P: 12-180
		29.97P: 15-180
		25P/50P: 15-180
		59.94P: 15-180
Super35	XF-AVC	23.98P/24P: 12-120
		29.97P: 15-120
		25P/50P: 15-120
		59.94P: 15-120
Super16 (Crop)	XF-AVC	23.98P/24P: 12-120
		29.97P: 15-180
		25P/50P: 15-180
		59.94P: 15-180

Selected Recording Times

CFexpress 512 GB Card recording Cinema RAW Light
1Gbps = 64 Mins 250 Mbps=256 Mins

CFexpress 512 GB Card recording IntraFrame
810Mbps=79 minutes 410 Mbps=156 Mins 310 Mbps= 207 Mins
160 Mbps=401Mins

CFexpress 512 GB Card recording Long GOP
260 Mbps= 246 Mins 160 Mbps= 401 Mins 50 Mbps=1284Mins

SD 512 GB Card recording Long GOP
35 Mbps= 1945 Mins 24 Mbps= 2840 Mins 17 Mbps= 4010 Mins

Other Functions

Photo Recording: Still Images captured to SD Card

Pre-Record: Yes, 3 seconds cache (Audio and Video)

Time code: Drop Frame (DF) and Non-Drop Frame (NDF)
Record Run, Free Run, Regen, External Source

Black Balance: Auto Black Balance

White Balance: Auto White Balance (AWB)

White Balance: 2,000K to 15,000K in 100K increments
-20CC to +20CC in 1 CC increments

Presets: Daylight (5,600K); Tungsten (3,200K), Custom A, B

Custom Picture: 20 Custom Picture settings—can be saved to SD—
Gamma, Black, Black Gamma, Low Key Saturation,
Knee, Sharpness, Noise Reduction, Skin Detail,
Selective Noise Reduction, Color Matrix, White
Balance, Color Correction, Setup Level

Custom Display: Customized LCD panel and EVF information

Framelines: Marker options include center, horizontal, grid,
aspect ratio, safety zone, and user marker.

User Markers: Size and position markers in .yellow, blue, green,
red, black, gray, or white.

Assign Buttons: 18 total assignable button (15 assign buttons
on camera body, 1 on the grip and 2 buttons on the
monitor unit)

Relay & Double: Relay Recording* and Double-Slot Recording**
* Not available in Slow Motion recording
** Not with Slow & Fast recording or Relay Record-
ing

Dynamic Range

Canon Log 2: 1600% / 16+ stops (ISO 800)
Canon Log 3: 1600% / 14 stops (ISO 800)

Accessories

Tripod Adapter: Canon TA-100

Wi-Fi Adapter: WFT-E9

Expansion Units: EU-V1
EU-V2

Viewfinders: EVF-V50
EVF-V70

Lens Mounts: PL Mount Kit PM-V1,
EF Cinema Lock Mount Kit CM-V1

B4 Adapters: MO-4E (EF to B4)
MO-4P (PL to B4)

Canon EOS C300 Mark III Formats, Rez, Bit Depth, Max FPS, Slow & Fast, etc.

Super35
4K RAW
and S16
2K RAW

Format	Resolution	Color Sampling	Data Rate	Bit Depth	Max Frame Rate (fps)	Recording Media CFexpress	Slow & Fast (No Audio)
						Recording Durations 512GB	
Cinema RAW Light S35 Sensor	4K 4096 x 2160	RGB Bayer RAW	1Gbps	10-bit 12-bit	59.94P / 50P 23.98P/24P/25P/29.97P	64min	12-120fps
Cinema RAW Light S16 Sensor (Cropped)	2K 2048 x 1080	RGB Bayer RAW	250Mbps	10-bit 12-bit	59.94P / 50P 23.98P/24P/25P/29.97P	256min	12-180fps

Charts courtesy of Canon. DGO sensor is effective below 60fps.

Super35
XF-AVC
Intra-Frame
and
Long-GOP
4:2:2 10-bit

Format	Resolution	Color Sampling & Bit Depth	Data Rate	Max Frame Rate (fps)	File Format	Recording Media CFexpress	Slow & Fast (No Audio)
						Recording Durations 512GB	
XF-AVC S35 Sensor Mode	4K (4096 x 2160) Or UHD (3840x2160)	4:2:2 10bit 4:2:2 10bit	810 410	59.94P / 50P 23.98P/24P/25P/29.97P	MXF	79min 156min	12-120fps 12-120fps
	2K (2048x1080) Or HD (1920x1080)	4:2:2 10bit 4:2:2 10bit	310 160	59.94P / 50P 23.98P/24P/25P/29.97P		207min 401min	12-120fps 12-120fps
XF-AVC S35 Sensor Mode	4K (4096 x 2160) Or UHD (3840x2160)	4:2:2 10bit 4:2:2 10bit	260 160	59.94P / 50P 23.98P/24P/25P/29.97P		246min 401min	12-120fps 12-120fps
Long-Gop	2K (2048x1080) Or HD (1920x1080)	4:2:2 10bit 4:2:2 10bit 4:2:2 10bit	50 50 50	59.94P / 50P 23.98P/24P/25P/29.97P 59.94i/50i		1284min 1284min 1284min	12-120fps 12-120fps -
	HD (1280x720)	4:2:2 10bit	24	59.94P / 50P		2675min	-

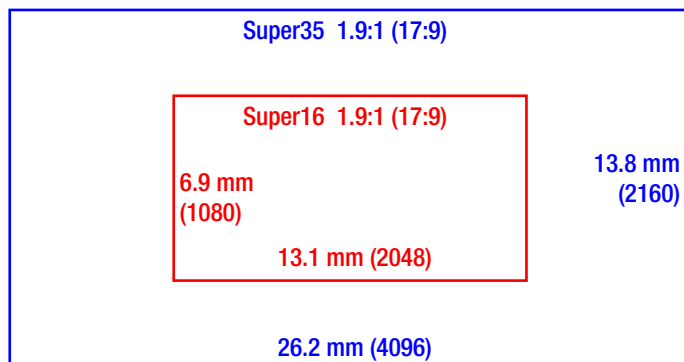
Super16
XF-AVC
Intra-Frame
and
Long-GOP
4:2:2 10-bit

Format	Resolution	Color Sampling & Bit Depth	Data Rate	Max Frame Rate (fps)	File Format	Recording Media CFexpress	Slow & Fast (No Audio)
						Recording Durations 512GB	
XF-AVC S16 Sensor Mode (Cropped)	2K (2048x1080) Or HD (1920x1080)	4:2:2 10bit 4:2:2 10bit	310 160	59.94P / 50P 23.98P/24P/25P/29.97P	MXF	207min 401min	12-180fps 12-180fps
Long-Gop	2K (2048x1080) Or HD (1920x1080)	4:2:2 10bit 4:2:2 10bit 4:2:2 10bit	50 50 50	59.94P / 50P 23.98P/24P/25P/29.97P/ 59.94i / 50i		1284min 1284min 1284min	12-180fps 12-180fps -
	HD (1280x720)	4:2:2 10bit	24	59.94P / 50P		2675min	-

Super35
XF-AVC
Long-GOP
and
Super16
Long-GOP
4:2:0 8-bit

Format	Resolution	Color Sampling & Bit Depth	Data Rate	Max Frame Rate (fps)	File Format	Recording Media SD Card		Slow & Fast (No Audio)
						Recording Durations 64GB	Recording Durations 128GB	
XF-AVC S35 Sensor Mode	2K (2048x1080) Or HD (1920x1080)	4:2:0 8bit 4:2:0 8bit	35 24	59.94P / 50P 23.98P/24P/25P/29.97P	MXF	240 min 350 min	485 min 705 min	12-180fps 12-180fps
	HD (1280x720)	4:2:0 8bit	17	59.94P / 50P		495 min	995 min	-
Long-Gop	2K (2048x1080) Or HD (1920x1080)	4:2:0 8bit 4:2:0 8bit	35 24	59.94P / 50P 23.98P/24P/25P/29.97P		240 min 350 min	485 min 705 min	12-180fps 12-180fps
	HD (1280x720)	4:2:0 8bit	17	59.94P / 50P		495 min	995 min	-

Canon EOS C300 Mark III Sensor Modes



Super35 = 26.2 x 13.8 mm
29.61 mm Ø
Super16 = 13.1 x 6.9 mm
14.81 mm Ø

Frame Rates

Sensor mode	Frame Rate	Shooting Frame Rate																						
Super 35	59.94p	15	30	44	48	52	56	60	90	120	Dual pixel CMOS AF support													
	29.97p	15	22	24	26	28	30	32	36	40	44	48	52	56	60	90	120							
	23.98p	12	16	18	20	22	24	26	28	30	32	36	40	44	48	52	56	60	72	96	120			
	24.00p	12	16	18	20	22	24	26	28	30	32	36	40	44	48	52	56	60	72	96	120			
	50.00p	15	25	34	38	42	46	50	54	58	60	75	100	120										
	25.00p	15	17	19	21	23	25	26	28	30	34	38	42	46	50	54	58	60	75	100	120			
Super 16	59.94p	15	30	44	48	52	56	60	90	120	150	180												
	29.97p	12	15	22	24	26	28	30	32	36	40	44	48	52	56	60	90	120	150	180				
	23.98p	12	16	18	20	22	24	26	28	30	32	36	40	44	48	52	56	60	72	96	120	144	168	180
	24.00p	12	16	18	20	22	24	26	28	30	32	36	40	44	48	52	56	60	72	96	120	144	168	180
	50.00p	15	25	34	38	42	46	50	54	58	60	75	100	120	150	175	180							
	25.00p	15	17	19	21	23	25	26	28	30	34	38	42	46	50	54	58	60	75	100	120	125	150	175

Recording Times

CFexpress Card 512 GB	Cinema RAW Light			
	1 Gbps	250 Mbps		
	64 Minutes	256 Minutes		
CFexpress Card 512 GB	IntraFrame			
	810 Mbps	410 Mbps	310 Mbps	160 Mbps
	79 Minutes	156 Minutes	207 Minutes	401 Minutes
CFexpress Card 512 GB	Long GOP			
	260 Mbps	160 Mbps	50 Mbps	24 Mbps
	246 Minutes	401 Minutes	1284 Minutes	2675 Minutes
SD Card 512 GB	Long GOP			
	35 Mbps	24 Mbps	17 Mbps	
	1945 Minutes	2840 Minutes	4010 Minutes	

Canon CINE-SERVO 25-250 mm T2.95-3.95 Zoom

Canon's new CINE-SERVO 25-250 mm T2.95-3.95 is an opto-mechanical marvel. It weighs a mere 6.7 lb and is about 11 inches long. It comes in PL or EF mount.

In M.O.D. Mode, shooting at the tight end with its built-in 1.5x Extender, this CINE-SERVO can fill the frame with an average credit card.

Usually you don't handhold a 10:1 zoom. This one you can. And, with the internal 1.5x range extender, you can increase your selection of focal lengths from 25 to 375 mm.

To borrow a famous film title, this Extremely Light and Incredibly

Close lens covers a wide range of cameras and formats, not only on Super35 cameras like the new Canon EOS C300 Mark III, but also Full Frame.

With the built-in 1.5x Extender engaged, it becomes a 37.5-375 mm T4.4-5.9 zoom lens with image coverage up to around 44.42mm Ø (as estimated by FDTimes—see explanation on page 35.) And so, you can use this CINE-SERVO Zoom in Full Frame/VV/Large Format/Ultra35 for most aspect ratios on ALEXA LF, Mini LF, Mini, Sony VENICE, RED MONSTRO 8K VV.



Canon CINE-SERVO 25-250 mm T2.95-3.95

The new CINE-SERVO 25-250 mm T2.95-3.95 Zoom joins a Canon family of remarkable Super35 format CINE-SERVO Zooms. The wide CINE-SERVO 17-120 mm is a documentary darling. The CINE-SERVO 50-1000 mm (75-1500 mm with built-in 1.5x extender) is amazingly small and light for something with such a long range.

The last time a 25-250 came close in weight and size was in 1962. The Angenieux 10x25B f/3.2 T3.7 zoom was 9.5 lb (4.3 kg). These days, most 10:1 zooms come in at 10 to 18 lb.

To keep size and weight down, the Canon CINE-SERVO 25-250 mm has a slight ramping of the aperture at the long end when wide open.



PL Mount is compatible with Cooke /i Technology lens metadata protocol.
EF Mount is compatible with Canon EF lens mount communication protocol.
EF Mount and PL Mount can be swapped at an authorized Canon service facility.



Canon CINE-SERVO 25-250 mm T2.95-3.95

Witness marks and scales are engraved on both sides of the lens.

Focus distance is indicated in both Imperial and Metric scales. You do not have to change lens rings.

Distance in Feet is marked in white. Distance in Meters is marked with green luminous paint that is visible in the dark.



Canon CINE-SERVO 25-250 mm T2.95-3.95

The Servo drive unit enables smooth zooming, with precise speeds from fast to slow, and minimum backlash. Iris control is responsive, also with minimum backlash.

12 Pin Serial Communication via fixed cable



Three 20-pin connectors for externally operated accessories for Zoom/Focus/Iris (FIZ controls with 20pin broadcast connections) and metadata output from 16-bit absolute encoder for virtual studio systems.



Canon CINE-SERVO 25-250mm T2.95-3.95 Specs

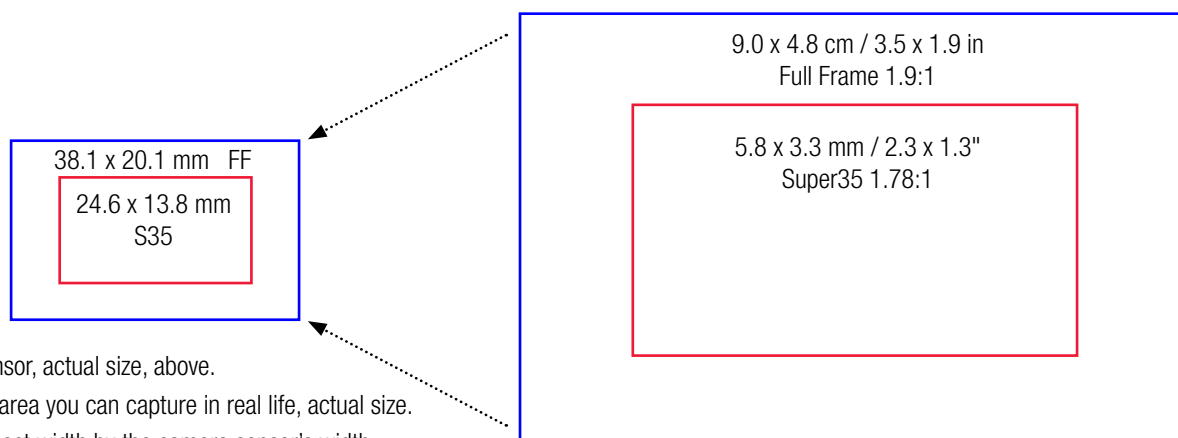
Lens name with EF mount	CN10x25 IAS S/E1
Lens name with PL mount	CN10x25 IAS S/P1
Zoom ratio	10x
Focal length	25 - 250 mm Super35 coverage 37.5 - 375 mm Super35 and Full Frame coverage when using built-in 1.5x Extender
Maximum aperture	T2.95 from 25 - 187 mm / T3.95 at 250 mm T4.4 from 37.5 - 281 mm / T5.9 at 375 mm when using built-in 1.5x Extender
Iris Blades	11 blades
MOD	1.2 m / 4.0' Minimum Object Distance
Weight	3.06 kg / 6.7 lb approx.
Front Diameter	114 mm
Front Filter Thread	112 mm (127 mm filter thread inside detachable lens hood)
Dimensions EF	186.7 x 131.7 x 282.1 mm / 7.6 x 5.2 x 11.1 in. approx (w x h x l)
Dimensions PL	186.7 x 131.7 x 274.1 mm / 7.6 x 5.2 x 10.8 in. approx. (w x h x l)

Minimum Object Distance and Minimum Object Size at 1.2m / 4.0'

Aspect Ratio	FF or S35	Image Area on Sensor	Actual Object Size at Wide End of Zoom	Actual Object Size at Tight End of Zoom
1.9:1	FF	38.1 x 20.1 mm	89.3 x 47.1 cm at 37.5 mm*	9.0 x 4.8 cm at 375 mm* 3.5 x 1.9 in
1.5:1	FF	36 x 24 mm	84.4 x 56.2 cm at 37.5 mm*	8.5 x 5.7 cm at 375 mm* 3.3 x 2.2 in
1.78:1	S35	24.6 x 13.8 mm	86.5 x 48.5 cm at 25 mm	8.7 x 4.9 cm at 250 mm 3.4 x 1.9 in
			57.7 x 32.3 cm at 37.5mm*	5.8 x 3.3 cm at 375 mm* 2.3 x 1.3 in
1.9:1	S35	26.2 x 13.8 mm	92.1 x 48.5 cm at 25 mm	9.3 x 4.9 cm at 250 mm 3.7 x 1.9 in
			61.4 x 32.3 cm at 37.5 mm*	6.2 x 3.3 cm at 375 mm* 2.4 x 1.3 in

* With built-in 1.5x Extender

Magnification Ratio = Minimum Object Size ÷ Sensor Size



1. This is a camera's sensor, actual size, above.
 2. At right, the smallest area you can capture in real life, actual size.
 3. Divide the real life object width by the camera sensor's width to calculate the Magnification Ratio of the lens.
- For example, in Full Frame, we have $90 \div 38.1 = 1:2.36$ ratio.

Actual size of an average credit card

Canon CINE-SERVO 25-250mm T2.95-3.95 Image Coverage

Although Canon does not publish lens image circles, FDTimes calculates that the Image Circle coverage of the CINE-SERVO 25-250mm T2.95-3.95 is approximately:

29.61 mm Ø for Super35

and

**44.42 mm Ø for Full Frame / VV/ Large Format / Ultra35
with the 1.5x Extender engaged**

How did we arrive at these numbers? This sounds like an SAT question.

Answer: Well, we could look at the Canon EOS C300 Mark III's Super35 sensor specs on page 26 or 29. Image area is 26.2 x 13.8 mm.

Or do the math: $c = \sqrt{a^2 + b^2}$

Or go online to Google's Pythagorean Theorem Calculator. Enter 26.2 mm for one leg of the triangle. Enter 13.8 mm for the other leg. The hypotenuse (image diagonal) is calculated: 29.61 mm.

Therefore, because we have been told that the Canon CINE-SERVO 25-250mm T2.95-3.95 covers the full sensor of the EOS 300 Mark III, I think we can agree that the image circle diameter of the lens is at least as large as the sensor's.

To arrive at the image coverage for Full Frame / VV/ Large Format / Ultra35 and formats larger than Super35, let's calculate as follows.

Multiply the Super35 image diagonal of 29.61 mm by 1.5 (which is the ratio of the built-in 1.5x Extender) and we get 44.42 mm Ø.

Note, these are FDTimes numbers, not Canon's. Your "mileage" may vary. Image Circle Diagonal is an imprecise number. It is often mixed up with Image Illumination. You might love the focus fall off and shading around the edges of frame that would have the lens designers shaking their heads. Therefore, the best way to judge Image Circle is to look at the lens on a projector, shoot a test, and see the results.

Thanks to the Canon Optics Team for helping with the math and guiding the way.



Canon CINE-SERVO 25-250mm T2.95-3.95 Aperture Ramping Explained

There are common misconceptions about aperture ramping. Here are some things to remember:

1. Aperture ramping typically occurs wide open, when the iris is set to T2.95.
2. The aperture ramping is gradual.
3. As you stop the iris down from wide open, the T-Stop drop-off point shifts toward the telephoto end. If you stop the iris down past T3.95, then aperture ramping no longer occurs.
4. The same concept holds true when using the 1.5x Extender. Note that with the 1.5x Extender engaged, you will have to calculate the light loss (and resulting T-Stop) yourself.

CN10x25

	Iris Scale Setting	Focal Length		
		25mm	187mm	250mm
T Number	Wide Open (T2.95)	2.95	2.95	3.95
	T3.95	3.95	3.95	3.95

Teradek Bolt 4K



Teradek Bolt 4K MAX Transmitter (TX)



On page 25, we heard Focus Puller Dennis Scully say, “It was a game-changer being able to actually pull focus in 4K and in real time.”

Dennis was working with two new Teradek Bolt 4K transmitters sending video to Teradek 4K receivers. Dennis said, “With everybody wanting to shoot wide open and super shallow depth of field, it’s not even a matter of choosing the right eye or left eye. It’s whether you want the eyelashes or the eyeball to be sharp. If you’re on something like a 135mm at T1.3 on a tight choker, God help you. Unless you’re viewing on a 4K monitor.”

In this shallow new world of focus, Teradek’s 4K Transmitters and Receivers will surely become required ingredients of any 4K, or more K, camera package.

Teradek Bolt 4K transmitters can send full HD and 4K video up to 5,000 ft, with less than 1 millisecond of latency to Teradek Bolt 4K receivers. That miniscule amount of delay is essential for focus pulling. Imagine how those eyelashes might buzz out of focus if your video lags behind the talent’s gentle turn of the head. Or

Teradek Bolt 4K



worse, would your drone operator see that brick wall in time if the video were late?

FDTimes readers may remember the factory tour last year when Creative Solutions acquired Amimon. (FDTimes issue 92, Feb 2019.) That's where I first saw a comparison between 4K (then a prototype) and HD wireless video. It was jaw-dropping, no contest.

Teradek Bolt 4K transmits and receives 10-bit 4:2:2 images at every resolution up to 4096x2160, with frame rates to 60 fps, and with a degree of quality that is so detailed and color-accurate that it is almost indistinguishable from a direct SDI cable feed.

There are currently three Teradek 4K systems:

- **Bolt 4K 750.** Range: up to 750 ft.
- **Bolt 4K 1500.** Range: up to 1500 ft.
- **Bolt 4K MAX.** Range: up to up to 3000 ft. (5000 ft. with Panel Antenna)

Inputs and outputs are 12G-SDI and HDMI 2.0. You can send

video from 1 transmitter (TX) to up to 6 receivers (RX). The Bolt 4K family operates on 13 certified 40MHz channels.

Dimensions are slightly larger than previous Bolts, but not by much. The 4K MAX transmitter is 132 x 91 x 27 mm (5.2 x 3.6 x 1.1") and weighs 668 grams (23.6 oz) with antennas and Gold-Mount battery plate.

The 4K MAX receiver is 112 x 139 x 27 mm (4.4 x 5.5 x 1.1") and weighs 668 grams (23.6 oz) as well.

If pulling focus on anything other than a 4K wireless video system and 4K monitor is said to be like asking for divine intervention, then it also follows that a DP shooting a 4K HDR show without a 4K HDR monitor on set is like filming with your eyes wide shut.

Bolt 4K sends and receives lossless video conforming to HLG, PQ, and HDR-10 standards. Of course, everyone on set will want to be watching on 4K HDR monitors—and SmallHD 4K HDR 13", 17" and 24" Production Monitors are coming soon.

Apple ProRes RAW with Panasonic LUMIX DC-S1H and Atomos Ninja V

Panasonic LUMIX DC-S1H Full-Frame mirrorless cameras will soon record Apple ProRes RAW on the Atomos Ninja V.

This was announced last September. It will be available in a free firmware update on May 25, 2020.

You can then shoot 5.9K RAW (5888x3312) Full-Frame, 12-bit, 16:9, at 23.98, 25 or 29.97 fps and record in Apple ProRes RAW on Atomos Ninja V 4K HDR monitor-recorders.

With this firmware update, the S1H camera can also shoot Super35 4K 17:9 12-bit and Super35 Anamorphic 3.5K 4:3 to be recorded in Apple ProRes RAW on the Atomos Ninja V.

This free firmware update version 2.0 will be available beginning May 25, 2020 on the LUMIX Global Customer Support website: <https://av.jpn.support.panasonic.com/support/global/cs/dsc/>



Atomos Ninja V menu recommendations for RAW and HDR:

- RECORD > CODEC > Apple ProRes RAW (if you do not do this, the Ninja V will prompt you when connected to S1H)
- INPUT > TRIGGER > HDMI
- TIMECODE > SOURCE > HDMI
- Ninja V MONITOR > PQ (or HLG)

Additional suggestions:

- Atomos HDMI 2.0 cable to connect S1H to Ninja V
- Use an AtomX SSDmini drive to record in the Ninja V

Panasonic LUMIX DC-S1H Firmware Version 2.0

LUMIX S1H Firmware Version 2.0 — RAW

1. RAW video data output via camera's HDMI connector

5.9K Full-Frame, 4K Super35, and Anamorphic 3.5K Super35 video data — all 12-bit— from the LUMIX S1H's HDMI connector to be recorded in Apple ProRes RAW on the Atomos Ninja V.

- For viewing, V-Log or Rec.709 is selectable for Live View monitoring on the S1H during RAW output.
- Shooting assist functions including WFM (Wave Form Monitor), Vector Scope, Luminance Spot Meter, Zebra Pattern can be used during RAW output.

Format	Resolution	Frame Rate	Aspect Ratio	HDMI Output
Full-Frame	5.9K (5888 x 3312) RAW	29.97p/25p/23.98p	16:9 (1.78:1)	12-bit
Super 35mm	4K* (4128 x 2176) RAW	59.94p/50p/29.97p/25p/23.98p	17:9 (1.89:1)	12-bit
Super 35mm Anamorphic	3.5K (3536 x 2656) RAW	50p/29.97p/25p/23.98p	4:3 (1.33:1)	12-bit

* 4128 x 2176 (17:9) was previously called "C4K" by Panasonic at IBC2019 and in FDTimes. However since C4K may be confused with 4K DCI (Digital Cinema Initiatives 4096x2160), Panasonic now refers to their resolution as 4K (4128 x 2176).

LUMIX S1H Firmware Version 2.0 — Additional Updates

2. Enhanced S1H functions and improved performance

- Downconverted output over HDMI during 6K, 5.9K and 5.4K video recording is available.
- In Creative Video mode, you can disable start/stop of video recording by pressing the shutter button.
- In Creative Video mode, you can set **REC QUALITY (My List)** from the control panel.
- Noise reduction for V-Log in Photo Style has been increased to -1. This suppresses after-images that previously occurred in some situations.

- You can prevent the enlarged view window during manual Focus (MF) Assist from being output via the HDMI connection.
- Color banding appeared in 4:2:0 10-bit video recording in some situations. This has been minimized.
- REC RUN time code sometimes did not count up when the video was recorded on an external device via HDMI but was not being recorded onto an SD Memory Card. This bug has been fixed.

3. Other added functions and improvements

- You can set **AF+MF** (Auto and Manual Focus) in AFC mode.
- Assign functions to the Fn buttons on the lens when the Panasonic LUMIX S PRO 70-200mm F2.8 O.I.S. (S-E70200) zoom lens is mounted.
- Assign functions to the Fn buttons of Sigma L-Mount interchangeable lenses.
- When attaching an EF lens using the Sigma MC-21 mount converter (EF to L-Mount) and **Image Stabilizer > Lens** is set to **ON**, Body I.S. (Image Stabilization) will work to suppress roll movement.
- **Backlight Illumination Period** has been added to the menu of Status LCD. **ON1** prevents the LCD backlight from being turned off.
- Select the card slot to save the JPEG images developed by in-camera RAW processing of still images.
- **0.5 SEC** has been added as an option for **Duration Time (photo)** in **Auto Review**.

- **Off (Disable Press and Hold)** can be assigned to the Fn button. This disables operation when the button is pressed for a longer amount of time.
- The Fn button can be used for checking aperture effect while the button is pressed.
- For added protection, touch-control is disabled for **Delete All** operation in playback mode. Only the cursor buttons can be used to **Delete All**.
- There were rare cases where the camera froze during **Segmented File Recording** or when recording at 400 Mbps under a particular set of conditions, including the type of SD Card used. This phenomenon has been improved.
- Aperture and shutter speed can be controlled using the front and rear dials when the rear monitor is set to OFF.
- There were cases where the F value control failed depending on the maximum F value when non-Panasonic L-Mount lens were mounted. This has been fixed.

Panasonic LUMIX DC-S1H

Panasonic S1H with native L-Mount

20 mm Flange Focal Depth
51.6 mm Mount Inside Diameter

Full-Frame
(35.6mm x 23.8mm)
CMOS sensor
24.2 MP
6024 x 4016 photosites

Lens Release



Tally Indicator

Timecode IN/OUT,
Flash Synchro

Connectors on this side:

Remote
MIC
Headphones
USB-C (3.1)
HDMI

Video Start/Stop

Panasonic S1H with PL to L-Mount Adapter

52 mm Flange Focal Depth
54 mm Mount Inside Diameter



Creative Video Mode

Image Plane.

The strap holder is aligned with the image plane so that you can use this as the hook for a tape measure.



Front Dial

Shutter (Stills)

Camera ON/OFF/
Status LCD Backlight

White Balance
ISO

Exposure Compensation

Video Start/Stop

Status LCD

Rear dial

Panasonic LUMIX DC-S1H, Atomos Ninja V & Apple ProRes RAW



Discussion with Panasonic S1H Design & Engineering Team



A discussion with Masanori Koyama (above), Panasonic S1H Product Planning Group.

Jon Fauer: Please tell us how you arrived at getting Apple ProRes RAW out of the S1H?

Masanori Koyama: In recent years, there has been increased demand for more creative flexibility in post-production. Shooting in 4:2:2 10-bit or Log are examples. Furthermore, we considered RAW recording to be an ultimate goal. We have been working on RAW development for several years, but it has been difficult to realize with mirrorless cameras because their form factor is smaller than cinema cameras. Power consumption and the size of circuits that handle large amounts of data have also been a challenge.

We have been strengthening alliances with third party manufacturers and, as you may already know, we have had a good relationship with Atomos for long time. Atomos has a deep understanding of Apple ProRes RAW recording. They quickly implemented Apple ProRes RAW recording via SDI with our EVA1 camera. Now, we have achieved Apple ProRes RAW recording via HDMI for the S1H as well, with the kind cooperation and innovative work of Atomos.

How did this concept of ProRes RAW for the S1H begin? Did you talk to Apple and then Atomos?

We had been discussing RAW output with Atomos since 2018 and started working on it beginning in 2019. At that time, the S1H's development was already at its peak, but we started implementing RAW output as well.

Based on our specifications, we discussed concepts with Atomos at many meetings in Osaka, Tokyo, the United States and Australia. Thanks to Atomos's kind cooperation, along with the will and passion to achieve this dream, we established most of the specifications by the beginning of summer 2019. And then, when

we saw the prospects of realizing this project earlier than expected, Mr. Yosuke Yamane, Director of Panasonic's Imaging Business Unit, announced the development of RAW output at the S1H official announcement event in August 2019. The following month at IBC in September 2019, we announced some functions and timing of a firmware release. Of course, from that time until now, we have been discussing the details of how and when to announce the information along with Atomos and Apple. We are delighted to release the firmware for customers who were waiting for this.

Please explain how it works technically. Did you have to modify the original S1H camera? Is it all firmware/software or were sensor/electronic modifications involved as well?

Customers can enable RAW recording by installing our free firmware and Atomos's NINJA V free firmware. Modification of the hardware is not necessary. In other words, S1H ProRes recording was realized uniquely by our software development. It was made possible by improving the software specifications and enabling communication with Atomos's platform. To achieve this, we took into account the image sensor's specifications as well. But, looking back now, maybe that was not such a big problem. The most difficult part was how to move relatively large 5.9K RAW files via the HDMI output from the S1H camera to the Atomos Ninja V. This was what took up a fair amount of time during the development process for us and Atomos.

Please introduce the members of your S1H team.

- Masanori Koyama: Product planning group.
- Toshihito Egami: Project leader of S1H RAW output development, engineering group.
- Keishi Okamoto: Manager of platform development, engineering group.
- Ken Ishida: Software design, engineering group.
- Satoshi Horie: Product leader of S1H development, engineering group.

Which nonlinear editing and grading software systems are compatible?

It is compatible with high-end applications such as Apple Final Cut Pro X, FilmLight (Baselight, Daylight), MTI FILM (Cortex), Assimilate (Scratch), and all applications that Apple is announcing as compatible with ProRes RAW. For consumer applications, EDIUS Pro9 (9.4 or later) is compatible. Also, at IBC 2019, Adobe Premiere Pro and Avid Media Composer were announced as being in development for future compatibility with Apple ProRes RAW. We expect that additional NLEs will become compatible with Apple ProRes RAW.

Is S1H ProRes RAW mainly for high-end production?

It will not only be for the high-end. ProRes RAW will become increasingly popular with single-person and small workgroup creators. Demands for creative cinematography using ProRes RAW will continue to grow.

You implemented Super 35 Anamorphic ProRes RAW. What about Full Frame Anamorphic? Especially since the S1H captures full height Full Frame images.

We have not considered this, but technically, it could be possible. However, it is not easy to achieve. We'd like to hear customers' requests and learn about their requirements.

Selected S1H Image Areas and Dimensions RAW Highlighted in Yellow

Sensor Area	Aspect Ratio	Mode	Actual Dimensions (mm)		
			Horizontal	Vertical	Diagonal
Full Frame	3:2	6K	35.4 mm	23.6 mm	42.5 mm
	3:2	5.4K	31.9 mm	21.3 mm	38.4 mm
	16:9	5.9K	35 mm	19.7 mm	40.1 mm
	17:9	4K	35.6 mm	18.8 mm	40.3 mm
	16:9	4K	35.6 mm	20 mm	40.9 mm
	16:9	FHD	35.6 mm	20 mm	40.9 mm
Super 35mm	4:3	3.5K Anamorphic	21 mm	15.8 mm	26.3 mm
	17:9	4K	24.5 mm	12.9 mm	27.7 mm
	16:9	4K	24.1 mm	13.6 mm	27.7 mm
	16:9	FHD	24.1 mm	13.6 mm	27.7 mm

S1H Image Areas and Sensor Modes RAW Highlighted in Yellow

Full-Frame

FF 6K 3:2
35.4 x 23.6 mm
Ø 42.5 mm
5952 x 3968

FF 5.4K 3:2
31.9 x 21.3 mm
Ø 38.4 mm
5376 x 3584

FF 5.9K 16:9
35 mm x 19.7 mm
Ø 40.1 mm
5888 x 3312

FF 4K 17:9
35.6 x 18.8 mm
Ø 40.3 mm
4096 x 2160

FF UHD 4K 16:9
35.6 x 20 mm
Ø 40.9 mm
3840 x 2160

FF FHD 16:9
35.6 x 20 mm
Ø 40.9 mm
1920 x 1080

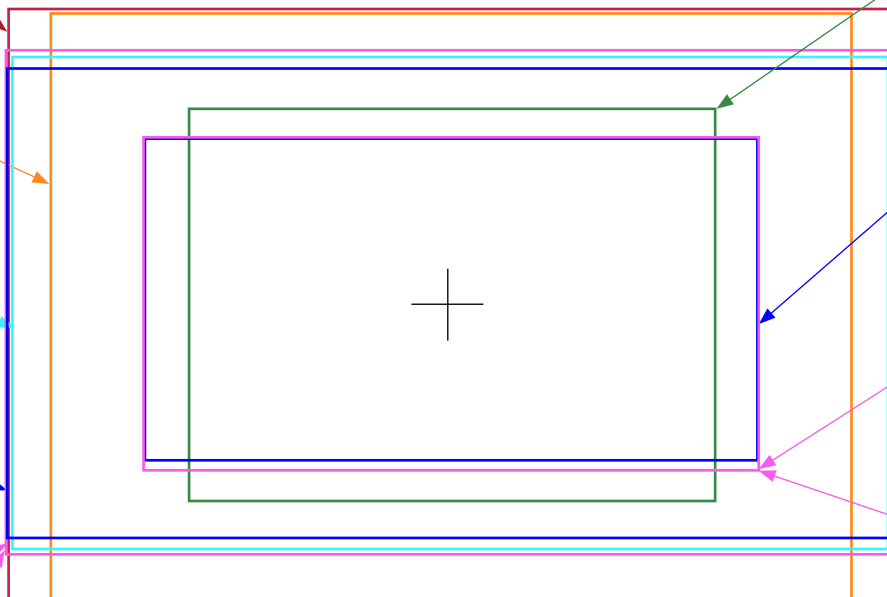
Super35

S35 4K anamorphic
4:3 2x squeeze
21 x 15.8 mm
Ø 26.3 mm
3536 x 2656

S35 4K 17:9
24.5 x 12.9 mm
Ø 27.7 mm
4128 x 2176

S35 UHD 4K 16:9
24.1 x 13.6 mm
Ø 27.7 mm
3840 x 2160

S35 FHD 16:9
24.1 x 13.6 mm
Ø 27.7 mm
1920 x 1080



Panasonic S1H Selected Settings for Apple ProRes RAW Output

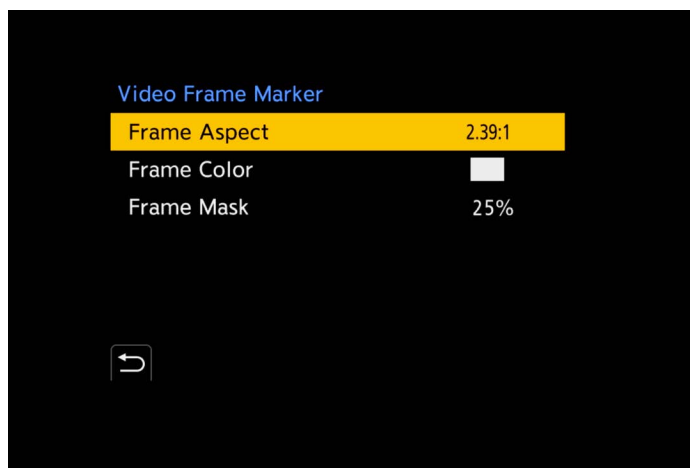
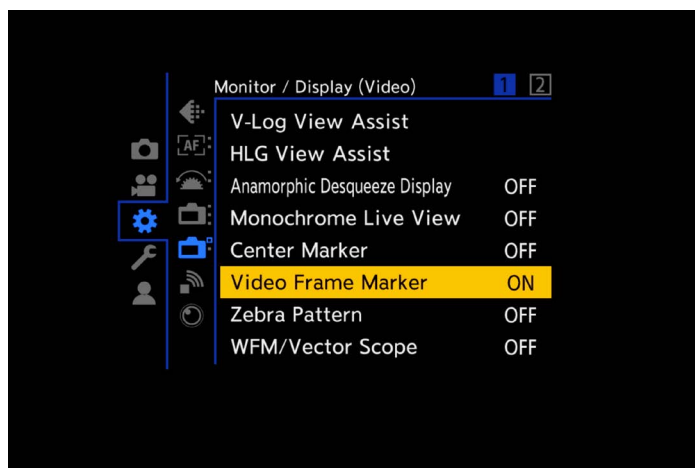


HDMI Output

Set Dial to Creative Video Mode



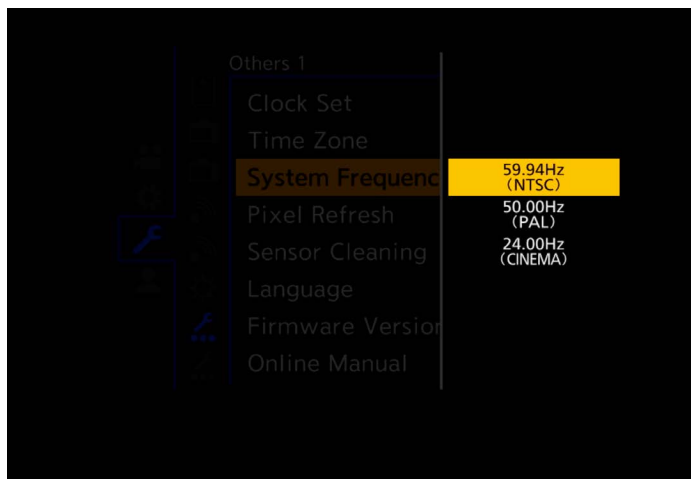
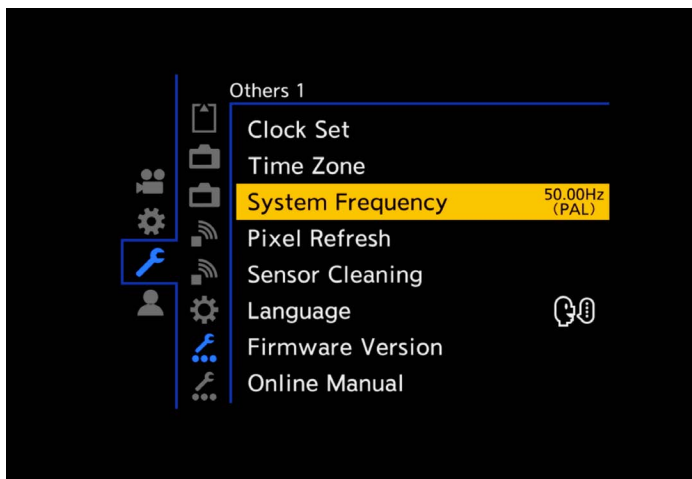
Set Framelines (Aspect Ratio) in Menu



MENU > CUSTOM > MONITOR / DISPLAY (VIDEO) 1 > Video Fame Marker > FRAME ASPECT. Frame Color gives you ten choices. Mask sets the amount of opacity outside of frame. Don't make the mask so heavy that you will not see errant C-Stands or impinging mic booms. Note: this is for the S1H display only. The Ninja V has its own setup for viewing anamorphic.

Panasonic S1H Menu Settings

1. System Frequency: NTSC, PAL or 24p



This is an important choice. MENU > SETUP > OTHERS 1 > SYSTEM FREQUENCY.

The System Frequency choices are:

- 59.94Hz (NTSC) for 23.98p, 29.97p, 47.95p, 59.94i, 59.94p or 119.88p
- 50Hz (PAL) for 25p, 50i, 50p or 100p
- 24.00Hz (CINEMA) for 24p or 48p (not available for RAW output)

2. Enable HDMI RAW Data Output

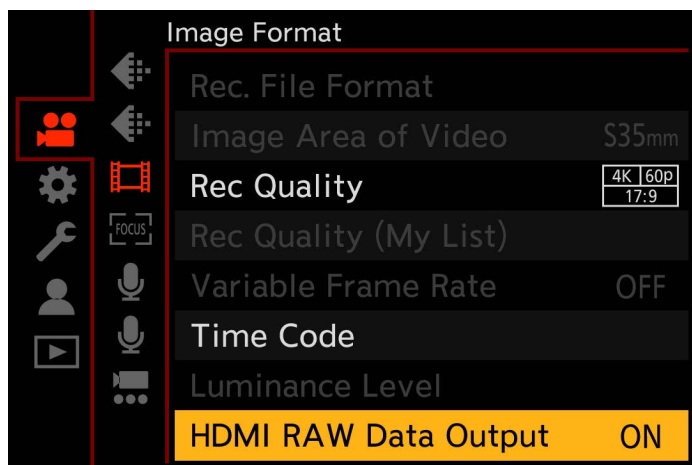


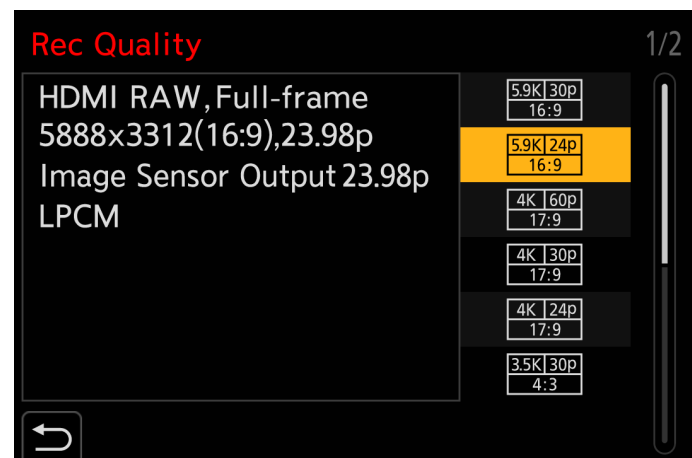
Image Format > HDMI RAW Data Output > ON: to turn HDMI RAW Output ON

3. Set S1H to Trigger Ninja V Record / Stop

MENU > CUSTOM > HDMI Rec Output >
HDMI Recording Control > ON

and enable time code output:
HDMI TIME CODE Output > ON

4. Image Format > Rec Quality >



RECORD QUALITY (Rec Quality) lets you select format, resolution, aspect ratio, etc.

Here, we have:

- HDMI RAW Output
- Full-Frame Sensor Mode
- 5.9K 5888 x 3312 Resolution
- 16:9 aspect ratio
- 23.98 frame rate (abbreviated to 24p in the yellow selection box)
- LPCM audio

Chris Sieniawski on Panasonic S1H and Atomos ProRes RAW



Dan Chung, Chief Marketing Officer of Atomos, was on a lockdown chat from London. We were joined by Krzysztof (Chris) Sieniawski in Warsaw. Here is an edited summary of our discussion.

Dan Chung: Chris Sieniawski is an excellent cinematographer from a country with a great tradition of filmmaking. He comes from a background, interestingly, of stunt work on some major movies that you might have seen. And now he's turned his eye and hand to cinematography. Recently, he did the docudrama *Born For The Saber*.

Chris Sieniawski: Thank you for these kind words. Excuse me for a second, I'm just pouring a gin and tonic for myself here in locked-down Poland. So, *Born For The Saber* is a historical epic movie that we did with very little money. History Channel distributed it in more than 35 countries. Now we are working on another historical based film set in 17th century Poland.

Dan: That docudrama was entirely shot on a Panasonic GH5 cameras, amazingly, and recorded on Atomos Ninja Infernos. So Panasonic and Atomos decided to work with Chris to create a demo film with the S1H recording ProRes RAW onto the Atomos Ninja V. The short film is named *Blind Love*.

Chris: It is almost four minutes. We have a lot of action scenes and a little story. It's basically a drama based on the theme of a pursuit, a mysterious love story in the background and a lethal knife fight in the final scene.

We recorded ProRes RAW in 5.9K from the S1H onto the Ninja V. We only had one camera but we were able to switch quickly among different rigs. We shot on a gimbal, handheld, and other setups. It was very interesting for me because I had never worked in ProRes RAW before, and especially with HDR that the Ninja V helped us achieve.

I have to say that I'm absolutely blown away by the quality of the S1H in 5.9K and Ninja V ProRes RAW. It's something amazing.

Jon Fauer: How did you get started in film?

Chris: I began my stunt career because of my dad was my fencing teacher and the man behind the saber duels in the very well-known Polish movie *With Fire and Sword* (Dir. Jerzy Hoffman). He was the inspiration for my interest and involvement in film and theater work.

Our team is made up of self-taught filmmakers. My knowledge about filmmaking comes from real-life experience as a stunt and fight coordinator on some major Polish film productions like *Battle of Warsaw 1920* (Dir. Jerzy Hoffman, DP Sławomir Idziak) and *Karbala* (Dir. Krzysztof Łukaszewicz, DP Arkadiusz Tomiak). That is my background, the reason I fell in love with filmmaking and started my own journey in the art of motion pictures.

I'm very grateful to have had the chance to work on big productions with professional filmmakers. Watching how they work and what kind of decisions they make in the process is something priceless. I did not graduate from the film school but that is something I'm both sad and happy about at the same time.

Jon: Tell us about the challenges of a new workflow for you and editing and finishing ProRes RAW.

Chris: The biggest challenge was shooting in Poland in the time of coronavirus. We were fighting against time just to be able to shoot this video before the country was put on lockdown. We had to deal with a big group of people going on the set. Shortly after we wrapped, they shut down production in the entire country. We were lucky.

About the ProRes RAW workflow, you should have a reasonably powerful computer to play back the files. Thunderbolt 3

Chris Sieniawski on Panasonic S1H and Atomos ProRes RAW



computers like a MacBook Pro or an iMac are good. A Mac Pro if you can afford it. You need the right software, like Final Cut Pro X. It's nice to have an HDR monitor—like the Atomos Sumo 19-inch (and Thunderbolt to HDMI / SDI hardware.)

Jon: On the MacBook Pro 2017 and running Final Cut Pro, are you able to play the ProRes RAW in real time?

Dan: Final Cut Pro X has two playback settings. One is optimized for smoothness and playback and the other is for quality. So you can get it to play back smoothly. You can definitely play back 5.9K in optimization for playback. Basically, what you get is a slightly softer screen image. And then when you put it to best quality, which is 100% normal quality, then it will start to slow down. And that's where you'd really want either the latest MacBook Pro or a Mac Pro.

Jon: To begin the editing process, did you transcode?

Chris: We transcoded to Apple ProRes Proxy 422 Proxy (1920 x 1080 resolution with a data rate of approximately 45 Mbps).

Chris: Originally, we were going to go to a post-production facility in Warsaw. But then the virus changed things. They closed everything down, so we ended up editing on an old machine.

Dan: It's quite tale of defeats but Chris has pulled it off to get this done. It's quite incredible.

Jon: When were the shoot dates?

Chris: It was one, very long shoot day. We worked for 24 hours straight through. Poland went on lockdown a few days later, on March 13.

Jon: Let's talk about the Panasonic S1H camera. Starting from the front, what lenses did you use?

Chris: We used my Nikon AI-S lenses, 50 mm f/1.8 and 85 f/1.4 mm. They have been modified with EF mounts. To attach to the camera, I had a SIGMA MC-21 EF to L-Mount converter. (The mirrorless S1H has an L-Mount. Flange Focal Depth is 20 mm.)

Jon: What were your settings in the S1H's menu?

Chris: It was 5.9K Full Frame, 23.98 frame rate, 16:9 aspect ratio, 12-bit HDMI RAW Output, NTSC.

Jon: And the Ninja V Recorder / Monitor?

Chris: I was very happy with Ninja V recorder. You can see the image in wonderful HDR quality. The screen is very bright which was helpful during that sunny day in the forest. We were also using B&W mode with red peaking so we could be very precise about getting things in focus.

Jon: What was your shooting style on this film?

Chris: We were shooting with a shoulder rig, on a gimbal, and handheld. I would like to point out that this particular production was historical in nature. We used period costumes. The two daggers the actors were using were made especially for this production. We rented a historical location, an open-air museum resembling a village from the 17th century. A lot of pre-preparation went into this project before we began shooting.

Jon: How big was your crew?

Chris: About ten people: two camera operators, one camera assistant, two stunt performers/actors, one actress, one sound recordist, a production manager, a military advisor and a makeup person.

Jon: You pulled your own focus?

Chris: We did not have a focus puller crew member. Because we had only one camera and two camera operators, one of us pulled

Chris Sieniawski on Panasonic S1H and Atomos ProRes RAW



focus while the other was operating. I was working basically on the gimbal and my friend was on the shoulder rig. We had a Tilta Nucleus wireless focus on the MoVi Pro gimbal.

Dan: Normally you would shoot with two cameras, but it's just that we didn't have two prototype RAW S1H cameras to lend you at the time.

Jon: What advantages did ProRes RAW give you in post-production?

Chris: I would absolutely say dynamic range. It's incredible and so is the color quality. The file size is not that heavy, like other

RAW files that I have worked with. It's an advantage regarding the equipment that the file sizes are pretty small. You don't need to have a lot of storage for all these files. At the end of our 24-hour shoot day, we had recorded a total of only 1.2 TB.

Jon: All right, Chris. I'd better let you get back to your gin and tonic.

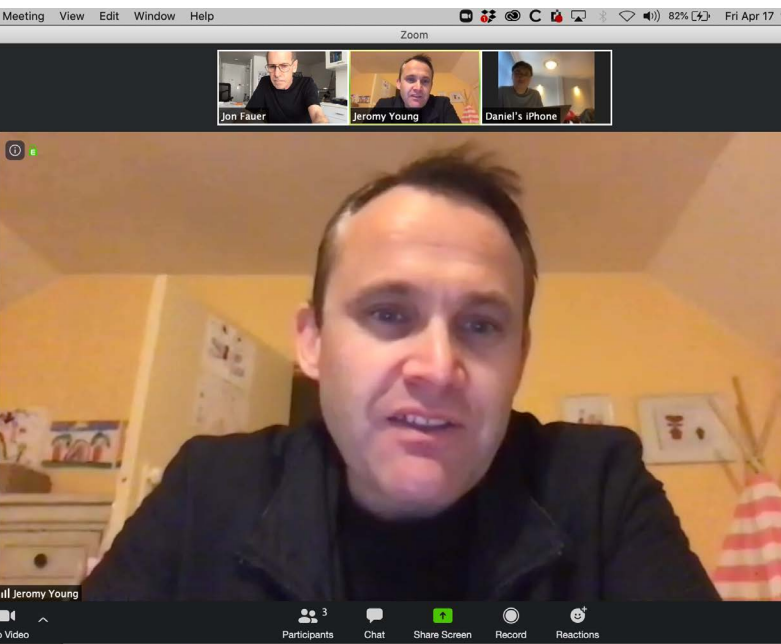
Chris: It would be nice if we could share a drink in the same place.

Jon: Next time. It's been a pleasure talking to you.



Photos: Aleksander Leydo

Jeromy Young, CEO of Atomos



Normally, this discussion would be in person. But the new normal in our Full Frame 4K world is a sometimes fuzzy video image of dubious resolution, beloved by, among many others, exercise-at-home Zumba instructors and bunkered executives. One of these executives, Jeromy Young, CEO of Atomos, was on screen from Melbourne, the far side of the world where many of us hunkered down here would prefer to be. Dan Chung, Chief Marketing Officer of Atomos, was also online.

Jon Fauer: For anyone not already cheering wildly about this announcement, why is Apple ProRes RAW important?

Jeromy Young: Apple ProRes RAW advances the levels of quality and ease of use to RAW video that ProRes brought to conventional video. When you record in the Apple ProRes RAW format, it's like having a camera original negative. Apple ProRes RAW offers great flexibility to adjust the look of your image, brightness and shadows. Best of all, file sizes are relatively small and easy to manage.

Apple ProRes RAW was the first step into a truly RAW workflow for the mass market. I think the reason we were chosen as one of the initial partners was to help democratize it. The original concept was to get the performance of ProRes in a RAW format, with more flexibility than a video codec.

Can you explain ProRes RAW for readers who have not waded through Apple's white paper?

Sure. You take the values from the sensor that the camera makers usually keep to themselves, then they send it to us to record with the associated metadata. We pack the RAW data into the ProRes codec format, basically making it compressed RAW with significantly reduced file sizes. This allows it to be recorded at high data rate onto reliable SATA disk, either our AtomX SSD-mini drives or other affordable media. That is the market they were aiming for, and that we service. And that is what ProRes RAW is all about: a RAW codec for the mass market that's perfect for HDR deliverables.

Do you anticipate it will become as popular as regular ProRes in the future?

I do. It will take some time as the tools evolve. There are other RAW formats out in the world. RED and ARRI and other formats may provide wider traditional film style tools. ProRes RAW was not initially envisaged to be used like that. However, the requests were thick and fast from users who were working with it, especially from our users. Now, we record a lot of metadata—white balance, ISO, camera information, etc. It is frame by frame, pixel by pixel, line by line data that is in the file—it just isn't being read in the post-production applications as yet. We will be able to add those capabilities as we work with new cameras, but over time it must be enabled by the software makers to be able to read it. So that's where we'll see a plethora of tools opening up for the ProRes RAW ecosystem.

How did your project with the Panasonic S1H camera start?

We visited them every couple of months, until recently, in Japan and sat down with the engineers and the team. We discussed being able to output RAW over HDMI. Previously, we had enabled the Nikon Z6 and Z7 to record ProRes RAW on our Ninja V. That allowed us to have an example to show what we'd done. So, that was the starting point for the discussions.

At IBC 2019, you said, "We are very proud to continue developing new ground-breaking technology with a company of the caliber of Panasonic." Please comment.

We are both highly committed to the democratization of filmmaking. The ability to transmit RAW over HDMI from the S1H to a Ninja V is a major leap forward in this endeavor.

A few months earlier, at the launch event in LA in June 2019, Panasonic representatives said, "One of the leading brands of external monitor-recorders is definitely Atomos. We both have a very good working relationship. We are very proud to be developing RAW output via HDMI with Atomos for the S1H." And now Apple ProRes RAW.

Our advancements in screen technology now allow creators to accurately monitor RAW video in real-time as it would be viewed in the home or cinema—with the original creative intent preserved.



Our Atomos HDR screens are excellent in color accuracy and representation of brightness from RAW signals. The ability to record ProRes RAW offers new possibilities for filmmakers.

When did Atomos begin working on this project?

Usually cameras are a couple of years in development. I'd say we started in March 2019 after we had already proved that we could do it together.

Did Panasonic approach Atomos? How did it all evolve?

It was mutual timing. It takes a little while to develop. I usually ask, "Have you thought about HDMI RAW to record ProRes RAW?" And, they'd say, "You know, we've been thinking the same thing."

This was a team effort between two companies. Who did what?

A path of data that isn't specified at the beginning of a camera project, or any complex project, is usually a work-around. We take certain standards for granted, like HDMI and SDI. You can rely on those specifications and make one product that can connect to everything. This is not that. Each camera has its own unique way of working. Of course, we'd like there to be a standard and we've given it out to others that they're now building for. The more efficient the process is, the faster the development is for us, the faster the frame rates can be, and the more data we can pack in a short interval of time.

It wasn't as simple as some that we've done before. There was a bit

of work on our side and challenges appeared on the engineering side. When you've got two teams working together, it's never as easy as if the teams are working right next to each other. But the beauty is when you finish the project, you do something that no one else or any other group has had a chance to do before. And that really does bring some amazing results, which you'll see in the footage that we'll be releasing at launch.

I saw the demo and it's gorgeous. Wonderful production value, look and quality of the images.

I'm glad you liked it. We're pretty proud of it.

You and Panasonic have developed something that will thrill the entire filmmaking community.

Faster development is obviously desired, but often the best things come out of challenges. Panasonic has an amazing camera with the S1H. They've packed a lot of knowledge into that device. They have combined great consumer knowledge and professional knowledge—the best of VariCam and the best of Lumix GH5 in one camera. My prediction is that it will be the B Camera of choice.

That's what they said about ALEXA Mini at launch: just a B Camera. I think the S1H and Ninja 5 system shooting ProRes RAW is also going to work as an A camera. Just look at the great work Chris Sieniawski did on his short film *Blind Love*. Imagine that kind of quality on indies, features, commercials, TV.



With the camera's L-mount, readily available adapters enable shooting with almost any lens on the planet: PL, Panavision, LPL, M, EF, F, Spherical, Anamorphic.

That's an interesting angle, Jon. We might think our market's one thing, but then we might walk into another market. It would be totally acceptable to shoot anamorphic on the S1H, and you could record in ProRes RAW on our nice little monitor.

As Chris showed us with the quality of the short he shot on the S1H in ProRes RAW on Ninja V, this could be very good.

I think you announced last year that the Shogun 7 might record ProRes RAW from the S1H.

It's still on the roadmap. It won't happen at launch. We've been a little bit busy over the last six months. We do plan to open up HDMI RAW on the Shogun 7 because I think for rigging and for focus pullers, having a 7-inch Monitor-ProRes RAW Recorder will be an important step.

The more choices the better. I assume it will also be available on Atomos Neon 4K HDR monitors?

Yes, correct.

Are you launching ProRes RAW Recording on Ninja V simultaneously with Panasonic?

Yes, on May 25. There will be a firmware update necessary for the Ninja V. It's free. There's no license fee.

Are you going live with *Blind Love* on Monday along with the launch announcement?

Yes, the video will be on the Atomos website beginning Monday, April 20 at 8pm EDT.

Not trying to flatter or ask a leading question, but why is Atomos one of the few companies doing ProRes RAW monitor-recording?

I think there's a challenge in the communication of trust. You need to have the trust of your partners. You need to have, at the same time and on both sides, Apple's trust and the camera maker's trust. I think that's why we encourage this Atomos United team. The camera manufacturers that we deal with know that we try to be camera agnostic, to work with everyone. What we can help them with is connecting the dots on the workflow.

I think the reason we're the ones doing it is that we have both of those relationships. We take all comers, we don't pick and choose favorites. Equally, they can go to any other company to do RAW recording if they want. I am open-minded. I just want to support people with a dream I have, which is to bring those workflows together for customers. And if a camera maker shuts us out, then we'd probably have to make a camera. If a software company shuts us out, we'd have to make software. But right now it's much easier to deal with our friends.

I believe in choice. I believe in one's ability to make a decision. Unfortunately that requires a lot of management in the real world, which I'm learning as I get older and wiser, but I still believe in it.

You're almost becoming something of a universal standard capture company. In some ways, you almost remind me of Kodak in their prime, which was 100 years as a universal standard, supplying motion film that would run through the gate of almost any camera.

I appreciate that. At this time, it's good to hear you've built something that's reputable and valuable in some way.

I think what's happened is the budgets for many productions will be going down. This may be a very good opportunity to up-sell prosumer products, because that's really been a bread and butter market for us. And in our world, now may be the right time and the right place for the S1H, Ninja V and ProRes RAW.



Codex Compact Drive Dock for ARRI ALEXA Mini LF



Codex Compact Drive Dock



Codex Compact Drive

Codex and ARRI introduce their new Thunderbolt 3 Compact Drive Dock. It can read ARRI ALEXA Mini LF Compact Drive Media up to 20 Gb/sec. That is 2.5x faster than the currently-shipping Compact Drive USB-C Reader (up to 8 Gb/sec, opposite page).

The Codex Compact Drive Dock lets you offload ARRI ALEXA Mini LF data much faster than ever before. Combined with Codex Device Manager and HDE (High Density Encoding), downloads are easy and reliable.

The Codex Compact Drive Dock (Thunderbolt 3) is scheduled to ship in May of this year. ARRI part # K2.0034320.

Key Features

Runs on Mac and Windows.

Works with Codex Device Manager and HDE on macOS.

Powered by external AC adapter.

Up to 20 Gb/s connection speed.

Technical Specifications

Interface:	Thunderbolt 3
Operating System:	macOS 10.14.4 / Windows 10
Connection Speed:	Up to 20 Gb/s
Power:	12V / 2.5A using supplied AC adapter
Dimensions:	132 x 124 x 37 mm
Weight:	500 g

Q & A by Codex

Is a driver or license required for the Compact Drive Dock?

No, there is no driver or license required for the Compact Drive Dock. It can be used as a "plug and play" device.

Can I use the Compact Drive and Dock with Device Manager and HDE (High Density Encoding)?

Yes, the Compact Drive and Dock can be used with Codex Device Manager and HDE on macOS.

Note that the Device Manager and HDE is not available on Windows.

What are your recommendations as to connections?

We recommend connecting the dock directly to a Thunderbolt 3 port that is not shared. The Compact Drive Dock will then provide a read speed of 20 Gb/sec.

If connected on older hardware with Thunderbolt 2 ports, using a supported adapter and sharing with other Thunderbolt devices on the same system, the connection speed may be reduced.

What is the correct way to connect the Compact Drive Dock?

When using a Mac, connect the Compact Drive Dock to the Mac with the provided Thunderbolt 3 cable before booting up the Mac. If the Mac is already booted, connect the Thunderbolt 3 cable to the Compact Drive Dock first and then to the Mac.

What about USB-C cables?

Although USB-C cables may look like Thunderbolt cables, they are not. Make sure the Thunderbolt cable is properly labeled and rated as Thunderbolt 3. Cables can vary depending on the manufacturer. If you experience reliability issues then try another cable, or a cable from another supplier.

Which cables are suitable with the Compact Drive Dock?

0.5m to 2m (20" to 6 ft) Thunderbolt 3 cables (passive type).

Can I use the Compact Drive Dock with the Codex SXR Capture Drive Dock?

Yes, you can daisy-chain the Compact Drive Dock to the open Thunderbolt 3 port on the Capture Drive Dock.

Can I use the Compact Drive Dock with a Thunderbolt 2 to Thunderbolt 3 adapter?

Yes, however Thunderbolt 2 to Thunderbolt 3 adapters may limit throughput speed. Ideally the dock should be connected directly to a Thunderbolt 3 port.

Codex Compact Drive Reader



Codex Compact Drive Reader

The Codex Compact Drive Reader is currently shipping with the ARRI ALEXA Mini LF. Although it is only capable of 8 Gb/sec, it is low cost and easy to connect and use.

Nevertheless, an advantage of the Compact Drive Reader is that it does not require a power supply. Just connect it to a laptop or computer's USB-C port and start managing your data. This is especially helpful when racing around on location.

The cost-effective Codex Compact Drive Reader can also be purchased separately and several of them should be in every DIT's permanent collection.

Codex Compact Drive Reader (USB-C) part # K2.0024134.

Key Features

Runs on Mac, Windows, and Linux. USB-C powered.
Works with Codex Device Manager and HDE on macOS.
Up to 8 Gb/s connection speed when using USB-C (3A).

Technical Specifications

Interface/Power:	USB-C
Operating System:	macOS 10.14.4 / Windows 10 / Centos 7
Dimensions:	122.5 x 71.5 x 24.5 mm
Weight:	160g
Connection Speed:	8 G b/s using USB-C (3A)

Codex Compact Drive Adapter



Codex Compact Drive

Codex Compact Drive Adapter

Codex has also designed an adapter to mount an ALEXA Mini LF Compact Drive into an existing SXR Capture Drive Dock (that normally accepts 1TB or 2TB SXR Capture Drives as used in ALEXA LF and ALEXA SXT). Using this adapter, the Compact Drive can be read at the full bandwidth capabilities of the Thunderbolt 2 or Thunderbolt 3 Capture Drive SXR Dock.

ARRI # K2.0024131 Codex Compact Drive Adapter

Codex SXR Capture Drive Dock

To support ARRI SXT and ALEXA LF cameras that use SXR Capture Drives, the Codex SXR Capture Drive Dock is still available for sale from ARRI or for rental from leading camera rental houses worldwide. Its dual ports allow for daisy-chaining a CODEX Compact Drive Dock and offloading both an SXR Capture Drive and a Compact Drive at the same time at the full 20Gb/sec bandwidth.

Codex SXR Capture Drive Dock (Thunderbolt 3)
ARRI part # K2.0019728.

ARRI ALEXA Mini LF
Codex Compact Drive Media Bay



Attila Kaldy, Australian Bigfoot and Blackmagic Pocket Cinema Camera 4K



Attila Kaldy's Track: Search for Australia's Bigfoot is coming soon to streaming. Produced by Sydney-based MoonLark Media, Attila takes us on a fascinating journey into the rugged Australian wilderness with an intrepid band of scientists and adventurers. Attila shot this documentary with the Blackmagic Pocket Cinema Camera 4K, edited and graded in DaVinci Resolve Studio. We spoke by phone for this interview.

Jon Fauer: Please tell us about yourself and this production.

Attila Kaldy: I'm a solo, independent filmmaker. I basically do everything. My daughter, who just finished film school at AIT Sydney sometimes works with me. She did a lot of the shots where I'm actually in the film and some of the slow motion and establishing shots. I usually have three cameras hanging off me when I'm running around. It's hard work but someone's got to do it.

What kind of cameras do you have hanging around your neck?

I have the Blackmagic Pocket Cinema Camera 4Ks. The 120 frames per second in HD is damn great. I am very happy with the design of their camera. I know it's not the only camera out there, but with the color science behind Blackmagic Design, it's just one of those no-brainers, it's the perfect camera for my jobs. When I'm running and gunning, sometimes I'll also bring along a Canon C100 for its auto focus option when I'm interviewing people out in the field. I also have a little Sony Handycam for the night vision scenes when it gets completely dark, rather than just flooding the whole area with white or red light and then going blind for half an hour in the wilderness. So, these are the three cameras that I have out in the field.

And what kind of lenses do you use with the Pocket Cinema Camera 4K? It's Micro Four Thirds?

I go for a Micro Four Thirds to EF adapter straight away. I use EF

lenses because I've got a speed booster on it. It gives me an extra 1 2/3 stops of aperture. I mostly use a SIGMA 50mm lens. I also have a 35mm f/1.4 Canon. And I recently bought a 150-600mm f/5-6.3 SIGMA telephoto lens that is fantastic for doing wildlife scenes. I effectively camp out somewhere, double camo, and wait patiently. I also use a 24-70mm f/2.8 Tamron.

I'm now looking at getting the Blackmagic Pocket Cinema Camera 6K because it accepts my EF lenses with autofocus, doesn't need the speed booster, and with its larger, Super35 sensor, is going to be better in lower light. But the low light aspect of the Pocket Cinema Camera 4K has been really good so far and I really can't complain.

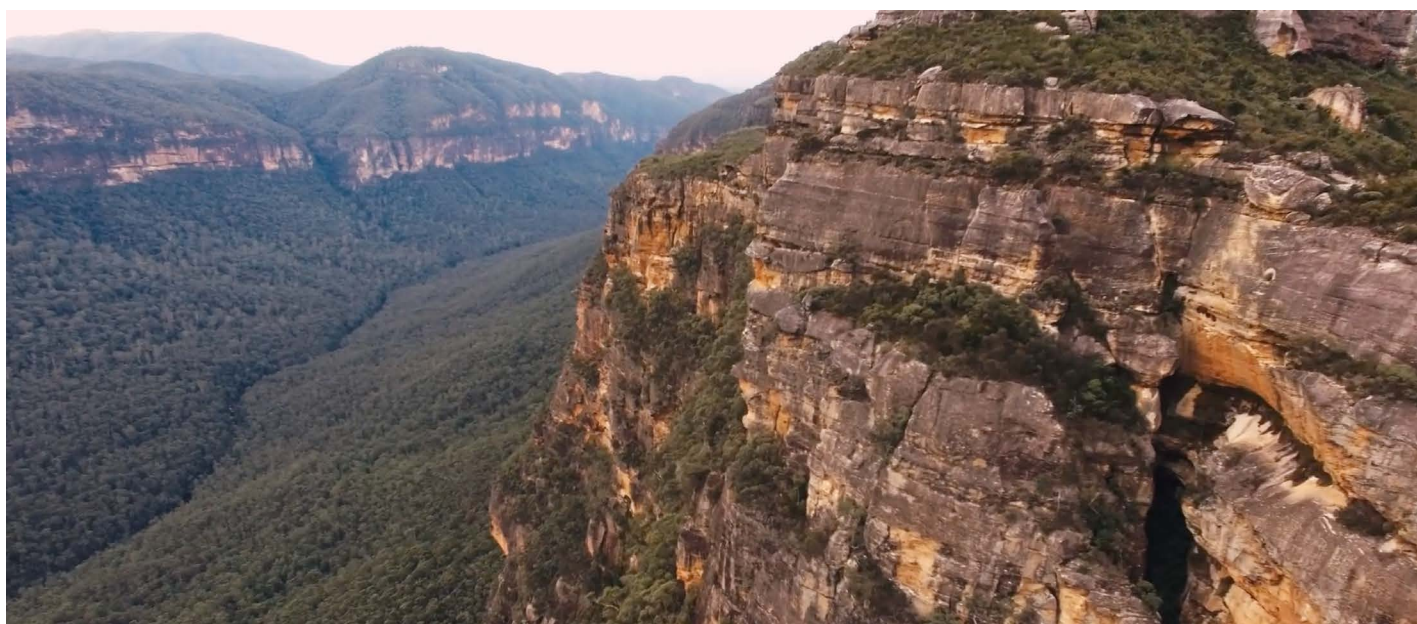
Who does the audio?

I do the audio as well. But, running around on my own and setting up audio, I need to be very conscientious about all the different aspects of filming. I want to make sure, when I go into post-production, I don't start screaming at myself, "Well mate, you're an idiot. Why didn't you pay more attention to that?" Because I do the editing as well. I basically do everything from pre-production, to production and post production.

As a one-man band, how do you do audio if you're all alone?

With the Pocket Cinema Camera 4K, I have the onboard mic going as a baseline. I have a RØDE NTG1 lightweight shotgun microphone. I put a little windsock on it and try to avoid any kind of rumbling if there is a windy day. It's been providing very good audio. When I am on camera or do interviews, then I use a Sennheiser radio mic. I plug it into a field recorder for good quality audio. I synchronize the old-fashioned way, with a clapper, and line up the audio in the DaVinci Resolve Studio timeline afterwards.

What are your settings on the Pocket Cinema Camera 4K?





On my current production, I'm recording 4K. On *Track*, I went completely HD, recording in Apple ProRes 422 HQ, which is a 10-bit file at 27.5 MB/s data rate. When I first saw the Pocket Cinema Camera 4K advertised and looked at the specifications, I was amazed at what that little camera can actually do compared to a lot of the larger cameras. The quality is great and also having 13 stops of dynamic range retains the shadow detail and the highlights. It's just a superb mixture.

When you are in the wilderness for a long time, how do you wrangle the data? Do you have a Bigfoot download your CFast card at night?

Well, if I ask them nicely, maybe. Effectively, I use 250 GB CFast cards. I still use SD cards on the C100 but that is an 8-bit camera. So, trying to actually match the color and everything else when I'm doing color correcting and grading in the timeline is a bit of fun, but it can be done. It obviously won't get any way near the quality of the Pocket Cinema Camera 4K. But I usually take a little laptop with me. I have a rugged hard drive when I need to do a data dump in the middle of nowhere on a regular basis. I also do a backup onto another drive. It's a direct copy. Because I've got three cameras with me, the folder's name is the name of the actual camera and then the date. Within that folder, if I have daytime and night shots, I name different folders as to different times of the day.

You also do your own editing.

Initially I was using another software program. When I bought the Pocket Cinema Camera 4K, it came with the full version of DaVinci Resolve Studio. I basically said, "I'm going to learn how to use it and see how it goes." I was a bit worried at first because, in going from one program to DaVinci Resolve Studio, I didn't know what to expect. But the pleasant surprise I got was absolute-

ly incredible. The editing and output was smooth. Rendering was fast. I had no issues whatsoever. It's probably the best software I've worked with when it comes to editing. I know that there are other programs out there that are great, but all I can say is with DaVinci Resolve, you have Fusion, Fairlight, Color Correction and Grading and Editing all in one program. It is fantastic.

What were your DaVinci Resolve Studio project settings to match the different cameras?

When I go from an interview to a field shot, I'm cutting between Apple ProRes HQ and something that has been recorded in MP4 H.264 at a much smaller bit rate. First, I match the color automatically in DaVinci Resolve Studio even before I actually start grading. Then I'll do my grading afterwards, correcting the different color tones and contrast. I generally use the wave form monitor in the color correction page. The RGB parameter gives me a good indication as to how my colors are with each subject. The other good thing is how DaVinci Resolve Studio allows you to work in split screen of before and after to give you a good indication as to where you are with the color correction.

The project settings are 10-bit. I output the project as Uncompressed YUV 10-bit 422 Quicktime. That can be re-encoded into ProRes for delivery.

I thought Bigfoot was a phenomenon in our Pacific Northwest. I didn't realize you had them in Australia.

The Bigfoot culture is also here in Australia, although in another version. It's known under different names, but commonly as "Yowie" over here. The indigenous cultures have their own names for them depending on which nation and which part of Australia.

It was fascinating because the actual story of Australian indigenous

Attila Kaldy, Australian Bigfoot, Pocket Cinema Camera 4K



culture has similarities to the native American and Canadian Sasquatch. The local indigenous culture refer to them as Junjudee and the Duligaa. But, our documentary primarily focuses on the people who actually go out and look for them. It's very much a humanistic story. Rather than focusing on running through the woods and chasing Bigfoot, we focus instead on the people whose passion and drive moves them to search for evidence.

How long was this production?

We started in November 2018 and I finished in November 2019.

How did you fund it?

The whole point of being a solo independent filmmaker is that having the gear and the knowledge of using the gear and then being able to plan, develop, execute and then create the end product to distribute. So, the whole thing was basically funded out of my own pocket.

Please describe the story.

It starts out as my own journalistic inquiry. I personally had an interesting experience myself, so I just wanted to know more. That's how the whole story started. Then we meet up with a man who allegedly filmed a Bigfoot accidentally in the Blue Mountains. He speaks about his own experience and ultimately we bring out a university lecturer to investigate the location. We see what other people have acquired in a way of evidence and what they feel is going on in the wilderness.

As we're making these inquiries, interviewing people and going out into the field with them, the story is building up to a larger expedition to the Blue Mountains to see what we can actually locate and find out what's actually going on. It's focused largely on people but also examines the reality and characteristics to these creatures.

What was your experience?

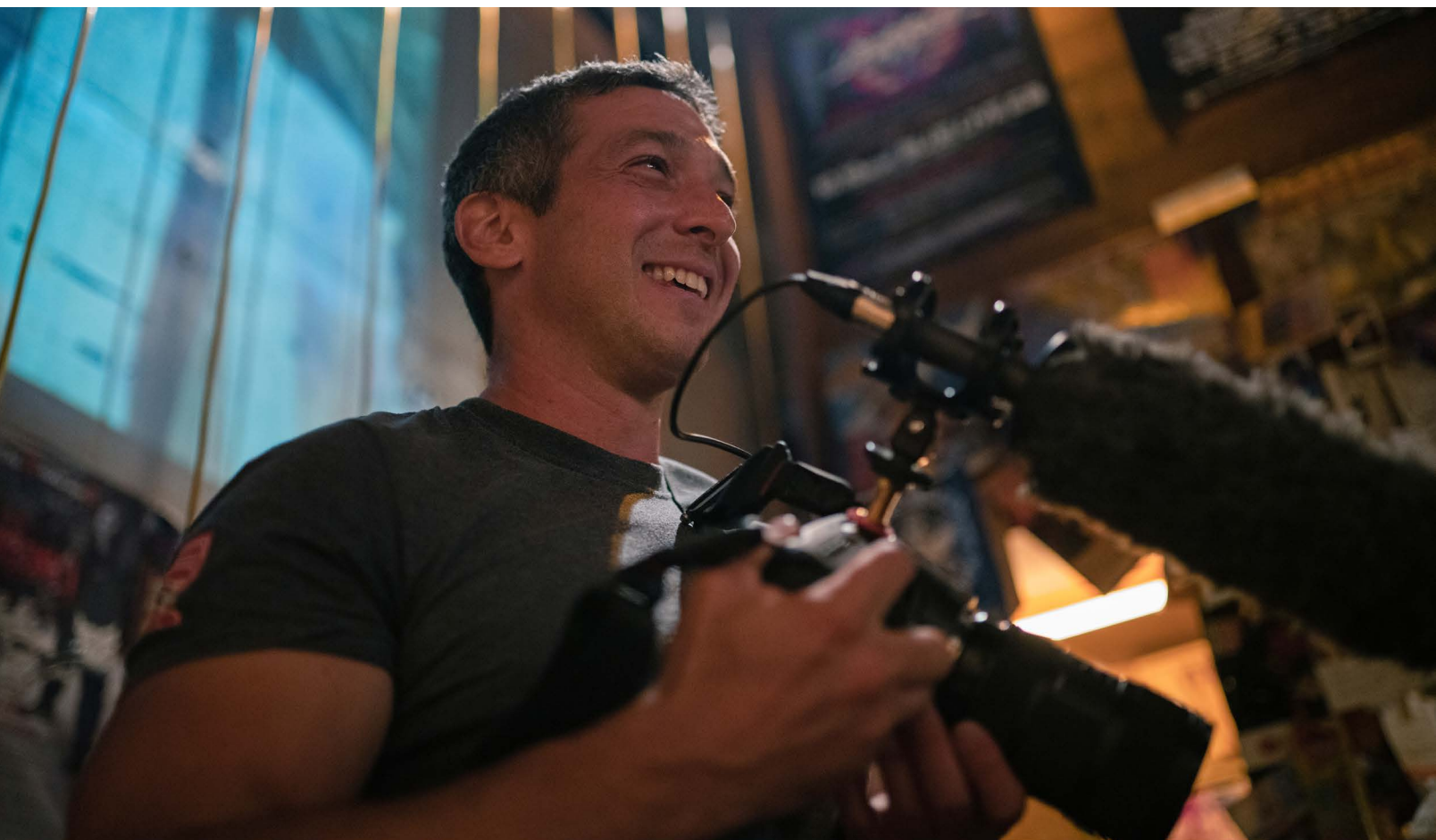
It was a very direct and interesting experience. We were chased out of the wilderness by whatever these things were. They were massive and just bulldozing their way through the trees and throwing rocks at us. One might say they could have been people out there, but not the way those things went through some really rugged terrain. We were a small expedition crew at the time. Everybody was panicking and we just wanted to get the hell out of there. To be honest, that woke me up to the idea that there are things in the wilderness we need to pay attention to.

And you carry all the camera gear in a backpack yourself?

Yes, and also water, clothing, food, tripod, laptop.



Into The Rising Sun with Blackmagic Pocket Cinema Camera 6K





Scott Wilson, Producer / On-Camera Host, opposite top and at left.
Andre Dupuis, Director / DP, opposite bottom and at right.

Jon Fauer: Please tell us about your company and the origins of *Into The Rising Sun*.

Scott Wilson: Andre Dupuis and I started Echo Bay Media, a full-service film production company, 20 years ago. Our focus was mainly on travel documentary TV production. We worked in more than 80 countries and all seven continents following our passion for travel and telling those stories. We created over 70 hours of TV documentaries shown on Netflix, Amazon Prime, National Geographic, Discovery Channel and many more worldwide. We pride ourselves on taking these projects from inception through post-production and delivery, all in-house.

In all that travel, we had the pleasure of going to Japan many times. So when we were approached by a Japanese TV network called TSS, based in Hiroshima, to co-produce a mini-series about travel in Japan, we jumped at the opportunity. They were looking for an English-speaking TV-documentary with a production company that had the ability to help them create the series for a western audience. They had seen our work and felt we were a good fit.

Tell us about your camera package.

Andre Dupuis: We had Blackmagic Design Pocket Cinema Camera 6K, Pocket Cinema Camera 4K and the URSA Mini Pro 4.6K G2. The Blackmagic Design URSA Mini Pro 4.6K G2 was our main “A” Camera. The built-in ND filters of the URSA Mini Pro G2 made life really easy—especially in a documentary where, as you know, you’re outside following content one second and then

the story has you being pulled inside. Spinning a dial to change the ND lets me stay in the flow of content. I hate stopping a developing story just to change filters. I like the URSA Mini Pro G2 because it has 15 stops of dynamic range. The Pocket Cinema Cameras have 13 stops of latitude.

Despite having 15 stops of Dynamic Range, the URSA Mini Pro G2 does not have dual ISO like the Pocket Cinema 4K and 6K. Especially when using the Pocket Cinema Camera 4K with our Metabones Speedbooster, it is amazing in low light.

I’ve been quite happy with the images I’m getting with 13 stops of dynamic range from the Pocket Cinema Cameras given the benefits of having such small and light (and inexpensive) camera bodies. Their 13 stops of latitude make them acceptable as “A” cameras for National Geographic and Discovery Channel broadcast standards. As HDR becomes more adopted, I would love to see a future Pocket Cinema Camera 6K with 15+ stops of latitude. (And maybe internal NDs :)

Because the URSA Mini Pro G2 is more like an ENG-style camera, it can sometimes be a bit large for the quick run and gun adventure filming we often find ourselves in. So we would then switch to the Blackmagic Pocket Cinema Cameras. We had both the 4K and the 6K models. The 4K was in a cage powered by a V-mount battery, which was crazy. I don’t think we even used a quarter of the battery’s power for an entire day of shooting. The Pocket Cinema Camera was also our “B” camera for cross-shoot-



ing interviews and grabbing cutaways. Often it was fitted with a Canon 70-200 f/2.8 lens.

The Pocket Cinema Camera 6K has a Super35 sensor. The 4K has a Micro Four-Thirds sensor, so we had a Metabones Speed Booster which makes that camera a low light beast. Along with our SIGMA 35mm f1.4, and the low noise at 3200 ISO, we could nearly see in the dark.

The Pocket Cinema Camera 6K was also our dedicated gimbal camera on a DJI Ronin-S. I've operated Steadicam for years, so I'm used to the delicate art of Steadicam-ninja-stepping. Nevertheless, with a Gimbal there's always a little bit of image sway because of the lack of a stabilized Z-Axis. So, the extra resolution of the Pocket Cinema Camera 6K was helpful because we could remove any sway digitally in post-stabilization. We had the resolution to post-stabilize and still get a sharp 4K image.

What lenses were you using?

Andre: We had a kit of EF-mount lenses—mainly the SIGMA Art series. They were fitted with 3D printed gears to use with our Ronin-S gimbal and follow focus. The SIGMA 18-35 ART f/1.8 was our main lens on the URSA Mini Pro G2. It's a nice wide zoom that was great for covering most of the on-camera spoken content.

The rest of our kit was comprised of the SIGMA ART 24-35 f/2 Art

Lens on the Ronin-S. We had a number of SIGMA ART primes: 35 mm, 50mm, and 85mm f/1.4 DG HSM Art lenses. We also had a ZEISS 135mm f/2 Apo Sonnar T* ZE . They color match quite well and have similar bokeh. Canon lenses made up the rest of our kit: EF 100mm f/2.8 Macro L IS, EF 70-200mm f/2.8 L USM and my favorite, the EF 11-24mm f/4 L USM. We had to do a little bit to color match the Canon glass to the rest of the kit in DaVinci Resolve Studio.

All lenses were in EF mount?

Andre: Yes, they all are. I'm a big fan of the SIGMA Art series because of their technical quality. They're not weather sealed like the SIGMA Full Frame High Speed Cine lenses, but they're high performing glass for the money. In our other productions, over the years we've written off about three because of dust and moisture. But, you get so much value in terms of the image quality compared to the cost. We haven't gotten to the point yet where we have to spend four times the money to get a lens that might be a little bit more robust for the kind of shooting that we do. I've been quite happy with them.

Scott, are you the on-camera person?

Scott: Being a partner and producer with the company, I can't ever escape being heavily involved behind the camera, but for a number of our successful series I have also ended up in front of

Into The Rising Sun with Pocket Cinema Camera 6K



the lens as well.

We're usually a pretty lean team which allows us to be quite agile and mobile for a lot of the work that we do. A big crew not only can be costly with all the travel, but also, for the kind of story we're trying to tell, can get cumbersome. And so, there's often a need from the very beginning for us to wear a few different hats from time to time.

How big a crew did you have on this job?

Scott: We had a crew of six from Canada: Jeff Wilson, Producer; Keiichi Kubo, Exec. Coordinating Producer; Scott Wilson (me) as Host/Producer, Andre Dupuis, DP and Camera Operator; Ryan Edwardson, Second Camera Operator/1st AC; Kristin Thoroughgood, PA/BTS camera.

The Japanese team consisted of Toshihiro Mori and Takeshita Takami, Producers from TSS; and Taro Yagi, Director at TSS.

Did you have a Focus Puller?

Andre: The kind of travel-adventure shows we produce often have very small crews of no more than 5 people who combine jobs. I'm both Director and DP. I love working with big crews and having all the collective creative brain power and the tools.

But on these shows, that size of crew strangles the authenticity of the scene and everything ends up feeling scripted and stiff. We

have a crew of 5, a production van and whatever we can carry on our backs. Part of the reason why I love the Blackmagic Pocket Cinema Cameras so much is that I get to have incredible image quality and still fit a number of great lenses and a drone in my backpack.

Then how do you manage focus?

Andre: I started in ENG-style production, so I'm just used to pulling my own focus. It gets tricky with a gimbal move while simultaneously following focus. Sometimes I ask for another take or two. One issue we found with the Blackmagic Pocket Cinema Cameras is that without the added weight of the Cage and V-Mount battery, we would have to be very delicate pulling focus as the torque would easily translate into the shot. The cameras are so light that the slightest touch can show up as shake in the shot. Most of the time I am pulling focus directly on the lens myself. On the Ronin-S we have DJI's follow focus which is incredibly smooth and responsive.

Scott: After more than 60 hours of hosting TV documentaries with Andre shooting, you really learn a necessary rhythm to anticipate the needs of the camera. We're very aware of each other and how to work together for the best shots. If I need to slow up just for a second before I switch from sun to shade to give him a moment to close down, then I can.

Into The Rising Sun with Pocket Cinema Camera 6K



What is *Into The Rising Sun* about?

Scott: *Into The Rising Sun* is a four-part half hour mini-series. I am the foreign traveler exploring some of the lesser-seen parts of Japan by motorcycle. I've done quite a lot of travel by motorcycle and I find that it's a great way to explore a country because, for better or for worse, you're immersed in the environment. So, if it's cold, you feel cold. If it's raining, you get wet. I think there's something about that heightened sense of awareness of where you're going and where you are.

And so for me, hosting and being truly a part of the environment that I'm exploring is a great way to experience it. The sights, the smells, going through the countryside on a motorcycle all add to the experience. Best of all, it's often a conversation stimulator even beyond language. You stop for a snack or to get gas and even through a language barrier someone will come up and want to know about the bike and who you are, where you are going.

For this show, I was riding a 2020 Kawasaki Z900RS. It's a great modern bike that reflects on Kawasaki's heritage with classic retro styling. This is a theme we touch upon in the series: Japan as a wonderful meld of old and new.

How did you do running shots of the motorcycle?

Andre: We had a production van and shot from it using the Ronin-S stabilizing the Pocket Cinema Camera. Scott has a Bluetooth headset in his motorcycle helmet so we could communicate directly with him from the van. We also had a few drones: the Inspire 1 and the Mavic Pro 2. Takeshita Takami, Producer for TSS Japan, did an incredible job assisting us with Drone clearance. He was able to clear almost anywhere we wanted to shoot in a matter of minutes. Normally Scott handles this and it can take weeks or even months to get permission to film specific locations on a specific day at a specific time. We were very lucky to have Takami-san.

Where were the locations?

Scott: The series covers mostly south-central Honshu from Shimonoseki to Okayama, and then on to Shikoku as well. The scenery and riding there was mind-blowing.

Who does the editing and the grading?

Scott: The editing was done by Jordan Krug and Cameron Hucker at Suede Productions, in Windsor. We've had the pleasure of using their talent a number of times for our past projects. All the color grading and online was done in-house at Echo Bay Media with DaVinci Resolve Studio. Finishing in DaVinci Resolve Stu-



dio is such a dream now. When shooting on Blackmagic cameras in Blackmagic RAW, the workflow is the way it was meant to be.

Andre: I don't know if DaVinci Resolve Studio has made me a better or worse DP because now I often know what I can get away with in color. There have been times in the past where I would never shoot at some of the ISOs that we do today. I now have more confidence in knowing how much noise I can eliminate by using DaVinci Resolve Studio with the press of a button. I know I shouldn't say "Fix it in post" but DaVinci Resolve Studio is magic, and sometimes in the documentary world you just have to make do with the light you are given.

That lets you be more daring. What formats were you shooting in and how did you handle the data on location?

Andre: We shot everything in Blackmagic RAW 8:1. Now that we have gone through the whole process with Blackmagic RAW from acquisition to finish, in some situations 8:1 was not good enough. With shots that had a lot of foliage or highlights sparkling on the ocean at sunset, the codec started to have macro-blocking. We cleaned it up in DaVinci Resolve Studio using temporal noise reduction but for more recent productions we have now been shooting Blackmagic RAW 5:1.

The DJI Inspire footage was shot in RAW using CinemaDNG RAW. Our Mavic 2 Pro was shooting in DJI D-Log H.265 4K.

For Data Management we had a Pelican 1510 case with all our hard drives and media card readers. We copy everything over to multiple backups using HEDGE DMT software on a MacBook Pro. We had three levels of backup: two spinning 7200 RPM drives and one SSD Raid. The SSD Raid consists of multiple Samsung EVO 2TB SSDs arranged in a Raid 5. The whole four-part series was just shy of 12 Terabytes of data.

How was this production funded and what were the shoot dates?

Scott: It was funded by TSS and the Japanese Government. We shot from September 1 to 17, 2019.

In summary?

Andre: The new Pocket Cinema Cameras power on quickly. They are lightweight. A single V-mount battery powers it for more than a day. All the support gear can be smaller, lighter and more manageable for the most demanding types of remote documentary production. As Scott and I plan out our next series, these Blackmagic Pocket Cinema Cameras will be with us again.



Les Zellan in the master gauge library, where thousands of original forms are stored. Cooke Optics has been making lenses since 1886.

The Ins and Outs of Cooke Optics



Outside view, above: new expansions at Cooke Optics factory at Cooke Close, Thurmaston, Leicester UK.

Inside view, below: new clean room where the lens “inners” (optical groups) are assembled into the “outers” (mechanical barrel and mechanisms).



Les Zellan, Chairman of Cooke Optics



Les Zellan in the raw glass storeroom at Cooke Optics, Leicester.

Jon Fauer: How has Cooke Optics changed in the past few years?

Les Zellan: We've brought the factory a long way from when you saw it the first time in November 2006 and then again in 2009 and 2013. Over time and several steps, we have developed a very modern facility with state-of-the-art clean rooms and equipment. We work smarter and more efficiently, and we are able to address some of our back-order issues. It will take time as we learn to adapt to the new surroundings, but in the long run it's necessary.

What did you do to improve and expand the factory?

The glass manufacturing area is cleaner and neater and there are many more CNC machines. The assembly area is now twice the size. We added a second floor. All the "dirty" work is done upstairs: the metal work, irises, assembling the outers and inners, cleaning it all, and then sending it downstairs to the clean area. The ground floor is basically one gigantic clean room. Everybody has to put on a bunny suit, hairnet, beard net or mustache net before going inside. Just to come into the factory, you need to get out of your dusty street shoes and wear indoor shoes. To go into the clean room, you change your factory shoes for clean room shoes. There's a strict regimen now to try to keep everything very clean.



"Inners" of a Cooke lens: the optical sub-assembly.

What are "inners and outers?"

The "outer" of a Cooke lens is the metal work that you interact with: the outer barrel, the focus gear, the iris gear. The "inner" of the lens is where all the glass is. What we do is build the outer and the inner separately, and then when they are ready, the inner slides into the outer and we lock it all together.

Rhetorical question: why do you and other manufacturers now need a clean room for lens assembly when in the past you did not? Your clean room is on par with the best of the optical manufacturers worldwide.

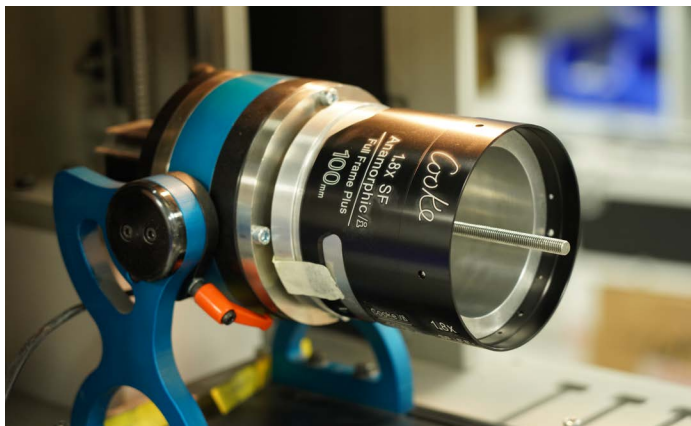
To minimize dirt and dust that get into a lens. As often as you clean a lens and as hard as you try to keep a speck of dust from getting inside, it still finds a way to get in. Not just us, but everybody. In our case, we used to build lenses in a non-clean area. We'd adjust it (a very iterative process), put the lens together, look at it on the projector, see something that could be better, and then go back and make an adjustment. We'd keep doing this until the lens was acceptable. Then, after all that work, when the lens was good, we would go into a fairly small clean room, take the lens completely apart, degrease it, de-dust it, and then put it back together in a pressurized flow box in that small area.

The theory now is to build the lens in a clean environment so when we get it right, we're done. We know that worked pretty well because while we were renovating and expanding the factory, we built a second facility a couple miles away that we used for three years using this new system. Now that we completed renovations, we have moved everybody back here, all under one roof.

On our new second floor, we have expanded the engineering area. As we have more designs and more lenses, we need more engineers and optical designers.

How has the business changed? I assume that's what drove you to do this expansion?

The business has changed ever since Jim Jannard announced the RED One camera in April 2006 and jump-started the new digital era in cinema. Up until then, all the companies—ARRI, Angénieux, Cooke, ZEISS—dealt with the same 200 or 300 main customers. It was very nice, very clubby: basically Denny Clairmont, Otto Nemenz, Joe Dunton, Movietech here in London and the major rental companies in the world. Everybody knew everybody. When the first RED One cameras came a year later, in April 2007, the market expanded exponentially, almost overnight.



"Outers" of a Cooke Anamorphic/i 1.8x SF-FF+ 100mm barrel.

Les Zellan, Chairman of Cooke Optics



Cooke Panchro/i Classic S35 series



Cooke Anamorphic/i 2x S35 series

In the film days an ARRI camera package could cost \$500,000—a half million dollars—and would not be replaced for more than a decade. Then, suddenly people thought they could make a movie for \$20,000 with a RED One. I can't tell you how many people called and said, "I'm getting my RED One tomorrow and can I get a whole set of Cooke lenses tomorrow?"

It was aspirational and a paradigm change.

Jim had a dream. I remember that first announcement at NAB 2006. They were taking orders and you got a piece of metal with a serial number of the future camera on it. A year later, he had a big red tent that was about two-thirds of the way down in the South Hall and there was a quarter mile line of people all the way to the entrance of the RED booth. RED won best new product at the show without having a product yet. It was brilliant. That is when I realized this industry is about ready to be knocked on its ear because we all marketed like it was still 1950. Jim came in and marketed like it was today, and he really took it by storm. He started the digital revolution. And then, of course, everybody followed him. We went from a clubby little business of a few hundred customers to tens of thousands almost overnight.

If the digital revolution had never happened, we'd still be here — ARRI, Cooke, Panavision, Angenieux, ZEISS, Canon, Fujinon. But now, it's us along with what seems to be half your FDTimes sponsors. The lens and equipment business has expanded because the market has expanded and people see opportunities.

We all have benefitted from this rapid acceleration in the market. We've done very well with our Super35 and Full Frame anamorphics. People had asked me since I bought Cooke in 1998 to build anamorphic lenses, and I always resisted.

Until that fateful Cooke dinner in Munich around Cinec where every rental house guest kept topping up your glass of Scotch whisky until you agreed to make anamorphics.

Panavision had that market pretty well sewed up along with, and to a lesser extent, Hawk. If we were going to get into that space, we didn't want to compete with them we wanted to create our own space. Also, the economics of anamorphic at that time was steep: millions of dollars in glass before you even talked about modifying your film cameras and finders for anamorphic desqueeze.

When customers heard the costs, they walked away from the table. Then digital came in. It seemed clear to me from the beginning that digital was too sharp, too pristine as a storytelling format. We knew that because cinematographers were clamoring

for vintage Cooke Speed Panchros and Baltars, diffusion filters and anything else they could get their hands on to take the sharp edge off the digital image. Meanwhile, the engineers were trying to put more sharpness in: 2K, 4K, more K.

It seemed to me that digital was crying out for things that would give it the character and personality that film intrinsically had.

Which included random grain, a degree of unsteadiness no matter how good your registration pin was, loss of sharpness through the many generations of processing and printing, not to mention all the different film stocks, labs, processes, and other variables—maybe even the water pumped into the lab.

Seeing the possibility of creating our own space in the digital market, we began work on anamorphic almost as soon as digital started to take a foothold.

And I think you kept that philosophy of more forgiving lenses with additional series.

The Cooke Look by definition is an interesting combination. I hate the word soft, because it's not. Smooth and gentle would be a good description.

The Cooke Look is sort of a magical thing, and it's been consistent with Cooke lenses since the Speed Panchro, going back to the 1920s. It's a warm and round look. I think Ed Lachman likes to call it a roundness to things. It has a nice falloff of focus. And it makes actors look good.

It's a consistent look. After we did the anamorphic lenses, we did the S7/i Full Frame Plus series. Dan Lopez at Otto Nemenz said he really liked the S7 primes because they looked like our S4/i series but were Full Frame instead of Super35. That was the idea.

As I mentioned above, we noticed how people were using vintage lenses for digital, and obviously old lenses are in limited and finite supply and various states of repair. So we introduced the Panchro Classics. They used the old designs of our vintage Speed Panchros. But, the last speed Panchros were built in 1965 and none of the glass types were made any longer. They used leaded glass, as did most lenses back then as well as the fact they had Thorium in them. None of those are allowed to be made anymore. We know what they're supposed to look like when the image gets on film, so using modern glass, we came up with the same end product.

One disadvantage nowadays with old Speed Panchros is you often need a different lookup table for each lens, because the colors can be all over the place. Coatings fade. Mixing sets of different vin-

Les Zellan, Chairman of Cooke Optics



Cooke S7/i Full Frame Plus

tages means that each lens may look slightly different. Our new Panchro Classics are consistent.

Panchro Classics have the same falloff, the same Cooke Look, the same characteristics as the Speed Panchros. They look like Speed Panchros would have looked when they were new. Also, you can get replacement front and rear elements. You can get spare parts. They're serviceable. They have modern mechanics and the cam focusing we have been famous for since the S4 primes. The new Panchro Classics have /i electronics, and a decent sized focus barrel for all the marks.

How has Full Frame changed things?

We introduced the S7/i spherical series and Full Frame anamorphics. Super35 orders have slowed. We thought they'd see a resurgence this year because ARRI was supposed to have a Super35 4K camera, which seems to have been delayed. Certainly, at the moment, our orders are shifting towards Full Frame, and some customers are using it on Super35 because they want to be "future-format proof."

If you're shooting Super35, why would you go back to a Super35 lens instead of a new future-proof Full Frame lens?

Part of the Cooke Look is the focus fall-off at the edges. Our lenses are not "flat" meaning that we do not try to make the corners and the center equally sharp.

If you draw a vertical line through the center axis and you spin that around and make a circle, that's what we call the picture height area. Obviously, that's a larger circle in Full Frame than it is in Super35. This area on a Cooke lens, the sweet spot, is where we pay a lot of attention. Outside that circle, we let the image fall off to the corners. The center is as sharp as can be, and as we move to the edges of frame, it gets slightly softer. We do that because most of the time you are filming people or things where the area of interest is towards the center, and the edge fall-off adds a pleasing dimensionality to the image and brings the viewer's attention toward the center.

Now, if you think about a Full Frame lens, keep in mind that the picture height circle is bigger. It is usually 24mm high instead of 18mm. So, if you put a Full Frame lens on a Super35 camera, the image is going to be cleaner because all that pleasing fall-off area is outside of frame.

I would guess that there are other things in heaven and earth that contribute to the Cooke Look in addition to fall-off?

The warmth of the Cooke Look comes mainly from the choices of glass that we use in the lens. We look at their color transmission. The designers are looking at their index of refraction. Every glass type, and there are several hundred, has different qualities for color transmission. Some do red better than green or blue and vice-versa, and we're always looking at different combinations. The choice of glass really helps define the Cooke Look.

What can you tell us about the Cooke special flare lenses?

When we designed the anamorphic lenses, we didn't want all flare all the time, so we designed them to be what I call a classic anamorphic normal, but funky, look.

The anamorphic look is funky. It has different bokeh. Distortion happens in weird ways. There are two different depths of field—one vertical and the other horizontal. All these things contribute to making anamorphic very interesting. To get a real anamorphic feel you should have front anamorphic cylinders, which we do. If you built a rear anamorphic lens, it's easier. We don't do that. They have teeny little cylinders behind the iris and you get the wide-screen coverage, but you don't get the bokeh or the feel.

The challenge with front anamorphic is that some of the cylinders are 4 inches in diameter and they're huge.

But that's the trade off if you want a true anamorphic feeling. With the first series of anamorphics we introduced, you could get them to flare, but you had to work at it pretty hard. Then we had a lot of requests from the industry for something with more flare. We came out with the SF set, which really means Super Funky. But, as somebody pointed out, if producers were reading your equipment list and saw lenses called Super Funky, they'd say, "We're not renting those." So we changed the name in our literature and called them "Special Flair." I think an SF set is really the best of both worlds. You can get the flare pretty easily, and if you don't want it, you just have to light appropriately and you don't get it.

How are they built? Can you convert a normal funky anamorphic to super funky flare anamorphic?

Unfortunately, you cannot just swap out a front element. The main differences between normal and SF sets are the coatings on the cylinders. The cylinder section is especially sensitive. So that's why you cannot convert back and forth between normal and SF sets. Many rental houses carry both types.

I'm sure you would be delighted to tell us about /i.

Oh, yes. That would make me happy. As you know, we've been working on metadata for almost 20 years, and I am pleased to say that it has evolved. All the camera and most lens manufacturers are supporting /i. It started off as just basic information about focus, iris and depth of field. Then we expanded it to the second generation, which was inertial data to help track the camera through space, and now we're expanding it with i3, which includes distortion and shading.

What lenses are coming next?

At BSC Expo, we announced the Full Frame anamorphic 85mm Macro. It is in the tradition of the Super35 65mm anamorphic Macro that we already have. The Full Frame 85mm has roughly the same angle of view as the 65mm Super 35 lens. It focuses to about 4:1 magnification, which is about six inches in front of the lens.

Les Zellan, Chairman of Cooke Optics



Cooke 85mm Macro Anamorphic/i 1.8x Full Frame Plus prime.



Cooke Anamorphic/i 1.8x Full Frame Plus SF primes.

At NAB, we were planning to announce and show the new 180mm Anamorphic/i Full Frame Plus lens, the 300mm S7/i lens as well as the new branch of the S7/i family, the 60mm, 90mm and 150mm 1:1 Full Frame Macro lenses.

Someone said that Cooke builds lenses to order. But it seems that some of your resellers order lenses and stock them, knowing that someone's going to need them right away.

We like resellers who are proactive because our delivery times are not stellar, to be candid. If a reseller has the financial wherewithal, they're much better off ordering lenses and putting them in inventory. If they call us and say, "I need two sets of lenses on Tuesday," they know the answer is going to be, "Are you kidding me?"

We try to encourage stocking because we just can't react quickly enough for what Jon Fry calls "Just in time." We have about a hundred products now and we're inefficient by design. We have all those CNC machines you saw, and all the skilled technicians who make us efficient. We have machines that could make thousands of the same lens, and yet we only make 10 or 20 of each, reconfigure the machine, and make 20 of something else. Every month we have to make a few of every focal length in every series because if a cinematographer is making a movie, they do not want to hear, "Oh I'm sorry, we're not doing long lenses until December, so you'll have to wait for your lens until December."

And you're still doing a lot of work by hand, which is part of the aura and the artisanal nature of Cooke.

Yes. Some of the glass types are better handled on traditional polishing machines. As good as CNC machines are, they're not as good as an experienced master polisher. If a lens requires really tight tolerances, we give it to one of our master polishers.

Paul Utting said he could get a five micron tolerance in the edging, whereas the CNC machine does about 10 microns. That's something.

They are true craftsmen and craftswomen.

Every lens we make is built from the ground up. We do not modify still lenses and put them in bigger barrels. Our lenses are designed and built specifically for motion picture use by the same team that did the fours (S4/i), the fives (5/i), the miniS4/i, the Panchro Classics, the S35 2x Anamorphics, the Full Frame 1.8x Anamorphics, the Full Frame S7/i and now the new S7/i Full Frame 1:1 Macros.

That's from the mechanical side as well as the optical side. We're really proud of that. That does mean it can take us longer to get to market because we're not saying, "Oh, look, we can take a mass-market still lens and stick it in here and nobody will know." So

that's one of the reasons our delivery is not as good as people would wish, but the lenses are specifically designed to meet the needs of our customers.

It seems that in your newly-expanded factory, and with additional people onboard, your delivery times might get faster.

We certainly look forward to maintaining quality while increasing output.

How has manufacturing lenses changed since you acquired Cooke?

Since the days of Taylor Hobson, the workforce went through an apprentice program of four or five years. They emerged as highly skilled engineers. Today, few people want to apprentice. From 1998 to 2008, getting young people to work here was difficult because everybody thought they could go down to the City, London's equivalent of Wall Street, and make a million pounds overnight and retire. That was never true, but there was the perception. After the financial crash of 2008, hiring became easier. We have a lot of young, skilled people working here now.

We've done a lot of recruiting and we have a great crew. And we are all getting better. Tolerances on the metal parts are far tighter than they probably were 20 or 30 years ago. And in the old days, I have to say, there was a fair amount of trial and error and dark arts. We've tried to take that out as well, and replace it with smarter engineering.

One of our best builders was, in her previous career, a receptionist at a hair salon and she's been with us for over 10 years. We are constantly looking for people with intelligence and good hand-eye coordination.

That's one of the reasons they don't let me build anything because my hand-eye coordination is terrible. They won't let me near a screwdriver. I've owned the company for 22 years and I never lived here full-time. I'm here on average a week every month. The reason is that being on the road and talking to people all over the world is what I like best. It provides new perspectives and fresh ideas. Customers tell me, "Well, our business is starting to look a little like this." I read your Film and Digital Times magazine and look at the trends where the manufacturers are going. It's not brain surgery.

I am very grateful for the opportunity I've had here at Cooke. I am honored to have been working with such a great group of people here in Leicester and at Cooke Americas (formerly ZGC) for the past 40 years.



Jon Fauer: Please tell us about recent developments at Cooke.

Robert Howard: The big developments have been in Full Frame. Initially, our S7/i Full Frame range, and then the anamorphic Full Frames, are proving to be very popular.

How have things changed in your business?

The major change is the work we've been doing here to create a mezzanine floor and get everybody back altogether in one factory, because we'd been running with two factories for the last couple of years. Getting the entire factory together helps a great deal and it also makes it easier to run the business. Multi-sites are more difficult to deal with. That was a nice start to the new year.

What can we expect to see coming next—that you can tell us about?

At the moment, we're gearing up to get more and more of the anamorphic Full Frames out into the marketplace. But they're not easy to do.

What's the current trend? Is it Full Frame spherical or anamorphic? Do you see a balance?

There's more to go, but we have quite a few of the Full Frame sphericals out in the market now. The anamorphics are driven by our customers who say, "We're desperate to have them because we want to get them on a certain project." It's usually the same with new things. There's that initial take up, and then people start to try them and figure out how best to use them and decide that they like the look, and then there's a further take up after that.

We're seeing the drive now on anamorphic. That doesn't mean to say we're not delivering the sphericals. We absolutely are and con-

tinue to do so. In fact, we can't deliver as many as our customers want, which is a constant problem, obviously.

It's like a pendulum swinging from anamorphic and back to spherical?

Yes. The other thing we are seeing, and it is a departure from our initial anamorphic set that we did in Super35, is there's a very strong initial demand for the SF, the Special Flair version. Whereas before, we sold quite a lot of the normal anamorphics and then introduced the Special Flares. By putting the two options together this time, the Special Flair is proving to be to be more popular. It depends on the regions, mind you.

Which regions?

America is definitely Special Flair. We've sold some of the normal ones into America, but probably deliveries have been about three-quarters SF and one-quarter normal anamorphics.

And how about the UK?

UK has a bit more of a balance, and in fact in Europe generally there may be a bit more of a balance between the normal and the Special Flares.

Some companies reported that orders for Super35 have plummeted. Do you see that as well?

Yes. I don't think that means Super35 is dead. It's a case of people having to be careful where they spend their money. They do not have unlimited budgets. And most rental houses already have a very large inventory of Super35 lenses on the shelf.

It has been said that the market may almost be saturated in Super35.

Robert Howard, CEO of Cooke Optics

If you come out with something that's different, whether it's in the camera format or in the lens, then there will always be people who want to use it. But at this point in time, people are sitting there thinking, "Well, I've got Super35 cameras. I've got Super35 lenses. I don't have, or I don't have as many, Full Frame lenses. So I'm going to buy Full Frame."

And if you have Full Frame lenses, they are backwards compatible to Super35, right?

To an extent. But people need to be careful with that statement because at the end of the day, one of the things that we're known for at Cooke is the way our lenses fall off: a nice gradual fall off, et cetera, et cetera. If you get the same sort of fall off with a Full Frame lens on a Full Frame camera, but then try and put that Full Frame lens onto a Super35 camera, you've lost that fall off of frame. So yes, it's backwards compatible, but as I say, sort of.

Do you see that pendulum also swinging back and forth between Full Frame and Super35?

Super 16 basically started fading out as Super35 took over, except in certain very niche areas. So these are the questions. Is the same thing going to happen? Will Super35 be taken over by Full Frame? Is Super35 going to go the way of Super16?

As we keep getting bigger formats and faster lenses, the things we're doing with depth of field is interesting and can be creative, but also you can make a terrible mess with it.

In the great scheme of things, how do you allocate your resources as to how many Super35 lenses versus Full Frame lenses you're going to build?

We very much look at our order book to see what our customers are requesting. Essentially that's how we allocate the resources.

You don't have to build in advance to anticipate demand?

No. That would be a nice position to be in. But, on the other hand, it's not. Because we have such a high demand for our lenses, we're always in a position of knowing what we're going to be building. I could tell you what we are building next month quite easily. I could take a good stab at what we're going to be building in summer. We have good visibility from that point of view because we have all this pent-up demand. The main thing we have to predict is in R&D, obviously to look where the market's going, what's going to be new to the market and what people may want next.

How do you decide what's next?

We get all of our sales and marketing people together at an annual

conference with Les and me. We brainstorm and ask, "What are people saying they want? Should we do that?"

Then Les and I will bring those ideas back here. We sit down with the R&D and manufacturing departments, and we hammer out the concept and specifications. Ultimately, all these specifications are somewhat of a compromise. How fast do you want the lens aperture? Well, super fast and weighing nothing and affordable.

But you cannot have all three?

Exactly. So you have to determine what people really are asking for. What are they willing to compromise? At the same time, we always have to be aware of our manufacturing ability. It's something that we try to keep a close eye on. Because we hand build. We are very much a craft industry.

That was very clear during the tour today. Some of the artisans have been here for 30 years.

Yes. And we don't want to change that. But on the other hand, there's no point in designing a lens that takes too long to build. Or that can't be built at all.

At the ever-popular annual Cooke dinners, your customers seem to grill you in a good-natured way about long deliveries. Is that getting any better?

Yes, deliveries are getting better. To be honest, with the new facility recently opened a couple of weeks now, it will take a little time. We just moved in, and we're moving some people around and training them in new areas. As we discussed, Super35 is not in as much demand as before. So, people in those departments are having to learn the new lenses and how to build them.

Is it a different skill set?

Very much with the anamorphic: moving from a spherical build to an anamorphic build. It's quite a change, even for people who've been building lenses for the last 20 years. You know as well as I do, when you project an anamorphic lens and compare it to a spherical lens, it's a completely different experience. One of the best ways to evaluate an anamorphic lens is to put it on a camera. But we still have to put it on a projector and that means we have to learn how to look at an anamorphic lens in a different way.

Thoughts on where the next trends will take us?

Everybody continues to try to come up with a new look, something that distinguishes their work from others. It's understandable. And we at Cooke Optics will try to be ready with lenses to take them there.



New Cooke 300mm S7/i
Full Frame Plus (spherical).



New Cooke 180mm
Anamorphic/i 1.8x FF+.



Jon Fauer: What does the COO at Cooke do and how long have you been here?

Alan Merrills: I have been at Cooke for 12 years. The COO is the main progress chaser throughout the factory. Making sure everything's going through, making sure everything happens on time and that we get the output on time. Now that we are all under one roof, everybody gets one message

and I think people work together better.

How many people work here now?

We're between 125 and 130. Yes. It's grown significantly over the years considering the fact that when we first moved into this building there were 36 of us.

We've grown. The business has grown, the turnover's grown, the product range has

grown. We've moved on significantly. The number of products we have in the marketplace now is quite impressive and we have a big market penetration with all of our products.

Is turnaround time faster now?

It is, definitely. I think we've improved our production output. 12 years ago we were making about 35 lenses a month. We're now making around 200.

10, 15 years ago, design and development took 12 months for just one lens. We're now designing a whole series in that time. It is the result of computers, people, and different approaches.

How do you find skilled lens technicians?

With great difficulty. There are very few. We're one of the few companies in the UK that build cine lenses. So there aren't many skilled optical technicians out there. I tend to look for people with the right attitude and aptitude. If they've got that, I believe that we can give them the skills that they need to produce our lenses.

So there's no university in the UK that teaches these skills.

There is. Imperial College in London, which is where you'll find Jon Maxwell. They teach optical design. But when it comes to mechanical design and building and designing lens movements and mechanisms, there isn't anybody who teaches that. That comes from experience.

Allison Langley, Front of House



I'm Allison Langley—Front of House, Sales Support Administrator, answer the phone, deal with customers, suppliers, whoever comes through. I do all the quotations, invoices, order acknowledgements, shipping, export, and delivery notices.

I arrange the tours of the factory and training of lens technicians who come from all around the world.

I have been at Cooke for 12 years. When I first started I also used to do all the spare parts and arrange for service.

Recently I have seen a lot of new customers. It's not just the same ones that keep coming back. There are a lot of new ones going on. A lot more owner operators, individuals who want to buy their own lenses.



My name is Chris Marriott. I recently joined Cooke to continue in the Chief Operating Officer position from Alan when he retires in July. My background is very similar. Previously, I was in the COO role at a company that was divested from Nikon. When I first came to visit as part of the interview process, the mix of technologies I saw here was astounding.

For me, the fundamental challenge will be continuing on from Alan. Obviously, the demand for Cooke lenses is growing and I've got to ensure that we can keep pace with that demand. We do not want to upset the balance of the iconic Cooke look or the Cooke characteristics.

The last thing you want to do with this iconic brand is to make them sterile and just another ordinary series of lens. You've got to be very careful about changes and make sure that they don't produce any adverse effects while increasing productivity.

I think the demand we're seeing now, that we're trying to build for, will continue to increase because the quality of the product remains the same, the characteristics remain the same, but the technologies

and capabilities going into the lenses are driving new requirements. Anamorphic, /i data, and other technologies open up new opportunities for using the lenses in a different way and adding things in post-production.

In terms of new product development, we live in an age where the expectation is for things to be instantaneous. "I want it. I want it now." I heard how long it took for the S4s—nine years to get them off the drawing board into pre-production and then production. That is not possible anymore.

I think in most industries anything more than a year runs the risk of letting other technologies disrupt the product that you've planned. The time to market, the manufacturing to market lead time, is critical. Don't try and come up with a lens that is the next best thing but will take you 10 years to develop—because the market will have moved on by then.

You're actually better splitting the concept into two or three developments and iterating on your initial development to get the product to market.

One of the things that I've seen here at

Cooke, which I was absolutely delighted with, is the NPI (New Product Introduction) process that is properly staffed. One of the things that a lot of companies either miss or disregard is the link between engineering, design and production.

In an ideal world, engineering designers would do their job, they would hand it over, and it would get produced. But that rarely happens. There are always issues that either are not apparent at the design stage. Or, changes are made after release of the lens and they improve the product, or the efficiency, or the process, or the cost.

So having an NPI team focuses on transitioning from engineering and design into the production environment. They're not bound by one or the other. They don't get wrapped up in the politics of pure design. They don't get pulled into the pressures of production. The NPI team is a task force to ensure that we have an effective transition. Any issues that are found during the process are resolved. It's an absolutely key role and it's one that is somewhat understated and not given, shall we say, the credit that it deserves.

New Optical Design and Mechanical Engineering Offices



The Lens design department is now in new offices upstairs at Cooke.



Also in new upstairs addition: outers department (irises, barrels, etc.)

John Monahan, Production Engineering Manager



I'm John Monahan, Production Engineering Manager.

The new mezzanine floor added 400 square meters of capacity to the assembly shop. We've upgraded the air-conditioning and all the air that comes into the building is filtered through F7 HEPA filters.

To determine the new layout, we had several meetings. I put my ideas down onto paper, did a rough layout of how we might want the rooms to be, and how we want to work. Then I discussed that with the assembly supervision and obviously with Alan Merrills, our COO. It was a process of elimination: "I like that bit. Don't like the other bit." Eventually we came up with how the room wants to be.

Keith, Jamie and Alan had many more ideas on how the assembly needed to work, so they had a great input to that. I then went back and did new layouts. And that's how we arrived here, at what we actually wanted and needed.

Steve Pope, Director of Engineering



I'm Steve Pope, Director of Engineering. My job involves optical, mechanical and a bit of electronic engineering as well as new product development. That includes R&D, prototype builds and getting products into production.

I have been at Cooke for eight years. In that time, some personnel have retired and quite a few new people have come onboard. They brought new ideas with them and we've changed some of the ways we do things. For example, we do a lot more science and metrology in the build process than we used to. So, we're trying to do as much work before going on a lens test projector, and spending less time there as well.

We are putting more knowledge, more forethought and more educated guesses into the build process rather than just doing it in an iterative way. The other significant change is the way optical design capability has improved as computing power and the software has advanced. If you look at the past 30 years, the increase in the number of ray traces per second we can do is staggering. So now we can do many more optical design calculations in a much shorter period of time.

We tend to begin a standard optical design with calculations of aberrations and MTF performance. Since the introduction of SF series lenses, we have techniques in the ray tracing to set up and work out where we're going to take coatings off, put coatings on, change coatings and anticipate the effects that they will give. But that's very much a modeled image. We then have to try and simulate the effects by building the first lenses and shining a light down them, looking through and seeing what happens. You might almost call them prototypes. They're the ones you usually see at the trade shows. In general, we've modeled and reviewed everything in the design process to be where we want to be.

It's interesting. I go back 30 years ago to where we used to build lots of different prototype models before we got to production. I'd have to say what we now call a prototype here is usually the first set of three lenses. And then full series production follows from there.

We go over those first three lenses with a fine tooth comb to cover all the issues and to find out how things worked out. Next, they go over to the people who develop the tooling that we need for the production process of these new lenses.

We know from the optical design data that these optics are going to give us what we want. And we review our mechanical design to be sure we're in the bounds of what is manufacturable. We've done a lot of that hard work before we get to the build, to steer the design in the right way.

The Super35 Anamorphics were an interesting driver for us. We heard customers say, "Don't make them too pristine." The design became a place where science and art met.

It's definitely a team effort, and a great deal of the results come out of the optical design team. They've got the knowledge of what we're looking for in the final image.

We have a number of optical designers on site and off. We have seven mechanical designers. And I do a bit myself along with tooling design and development engineering.

Building Cooke Lenses



Lens manufacturing begins by sourcing the rough optical glass blanks.



Les Zellan and Chris Marriott among shelves of raw glass.

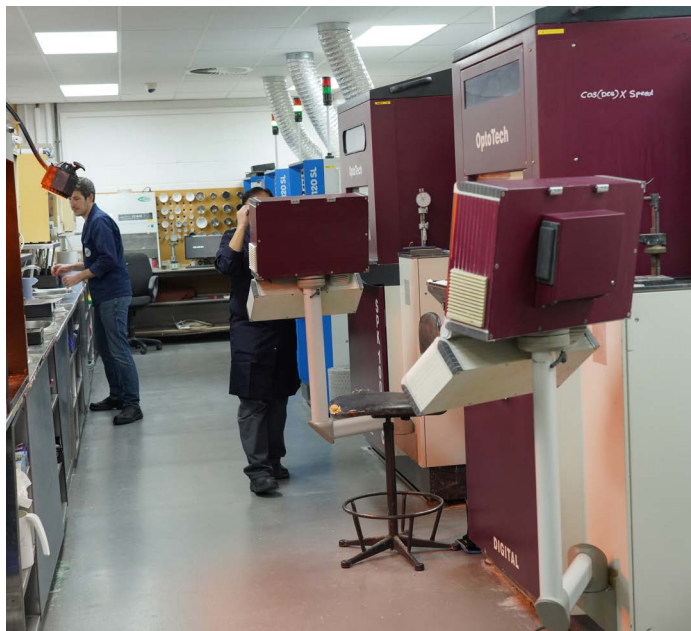


Paul Prendergast: "Although the glass is usually bought in molded forms, they may look round and parallel but actually are not."



"Supermarket" Supply Room for incoming parts.

Grinding and Polishing



OptoTech CNC lens grinding machines.



Satisloh CNC lens polishing machines.



Aspherical element polishing



High speed CNC polishing



Traditional polishing techniques are slower but can be even more precise



The polishing compound is an abrasive slurry of Cerium Oxide.



Chris Norton, Master Glass Polisher.



Paul Prendergast, Glass Production Manager



My name is Paul Prendergast and I manage the glass production, the flow of glass through the workshops and the team working on the grinding, polishing, edging, coating, blacking and finishing. I regard the assembly shop as my customer. I'm supplying my customer, which is the assembly shop, with the glass they require to build the lenses.

The first process that we do is pre-edging. Although the glass is usually bought in molded forms, they may look round and parallel but actually are not. They are made from molten glass, supplied mostly by Schott, a German company, and Ohara in Japan.

We do edging to ensure the glass diameters are perfectly round. Then they go onto the grinding machines to grind the surfaces prior to polishing.

I started at Cooke Optics a bit more than 30 years ago, back in the days when it was part of Taylor Hobson on Stoughton Street in Leicester city and then at New Star Road nearby. I can even remember the date I started. It was the 5th of November 1989. I started as an apprentice or trainee glass polisher. And I continued to do that for around 10 years. I became the cell leader—supervisor of the glass shop and then glass production manager, so it's worked out quite nicely.

Since I started here, one of the main changes has been the CNC machinery. There was none of that 30 years ago, but now we rely on them heavily.

Of course, we're still using the old processes. The machines that I trained on in lens polishing are still in use every day of the week now, which is great. We use the old style machinery for some of

the more difficult glass components. The CNC machinery is fantastic, and it is the way forward, but some of them have their limitations as to geometry. Therefore, we have the ability to make any lens shape we want.

Examples of when we use the conventional machines include polishing some of the steeper curves on the optical surfaces. As for edging, the conventional machines are generally used for some of the more difficult edge profiles and components with quite a few steps and chamfers.

One thing that the design team always has in mind is to reduce the weight of the lenses. Sometimes they put big chamfers on the optical elements. These look like big steps, just to reduce the weight of the glass. And sometimes that has another function as well: to fit into the metal work.

Aspherics are polished on Satisloh CNC machines and then measured on Taylor Hobson equipment.



Paul Utting, Supervisor of Edging and Blacking



I'm Paul Utting. As supervisor in the edging and blacking area, I do the day to day troubleshooting. Paul Prendergast and I liaise together to decide on what's actually needed throughout the process.

Here is a tour of the edging process.

First, we "pitch the lenses on." We are literally using pitch to attach the glass to a metal shaft. We warm up the brush chucks, finding the optical center through the collimator, which is a piece of equipment that's been within the business for many, many years. It was originally designed by Taylor, Taylor and Hobson. It's still in full production today. We stick the lens on using a gas flame to soften the pitch while looking at the optical image until it is absolutely perfectly centered.

It comes down to experience. To be honest, when anyone first learns this particular process, you hear a few obscenities, shall we say, because people might burn their fingers if not careful. But over a period of time, with practice and hand-and-eye coordination, you actually learn how to do that process, hopefully without burning your hands. If you've got any sense, you only burn yourself once.

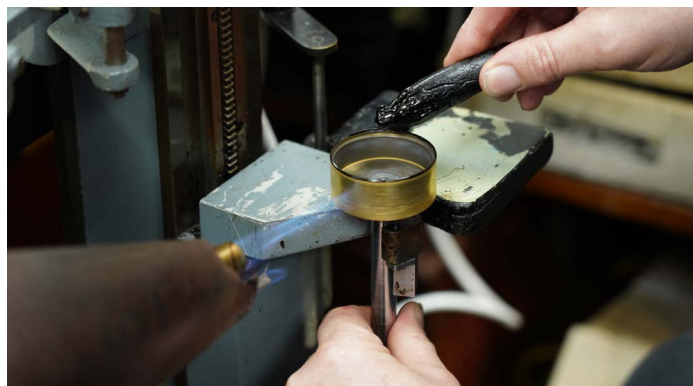
The collimator shows a series of lines that you can see through the eyepiece. When we pitch the lens on, we optically true the lens using gratitudes that are graduated down to around five microns. It's a matter of centering the optical imaging until there's no deviation.

We have the 70 series machines within our department that date back to 1912-1914 and are still in full production today. They were working during World War I to produce lenses for binoculars.

The difference between what the old machines do and the CNC machines is as follows. The old 70 machines have a series of wheels. There's a very coarse wheel for when there's a lot of stock to remove rapidly. We also have a very fine wheel. And actually, we can use the CNC in conjunction with the older machines. When we want a very fine finish, the extremely slow, belt-driven rotation on the 70 gives you an absolutely superb, magnificent finish. This, I think, is one of the things that sets us apart from other companies. That probably helps with the Cooke Look because the way we do things is quite unique.

We maintain all the equipment ourselves. We do the chuck turning and we use a two micron clock to check the run out. The old machine is very precise, to 5 micron accuracy, providing I actually pitch it on in the correct manner. Sometimes it can prove to be even more accurate than the CNC machines. But a lot depends on the lens. Different lenses react differently to what we're actually doing. We tend to do it through the experience of knowing the products. We know what works and what doesn't work, so we load the work accordingly.

I joined the company 20 years ago and worked in the edging department. Then I was moved into polishing for about five or six years. When my brother, who also worked in the edging department, retired, I moved back into the edging and became the edging supervisor.



It begins by heating and applying sticky pitch to a metal carrier.



Place the glass element on top. Careful not to burn your fingers.



Looking through the collimator, center the element while pitch is hot.



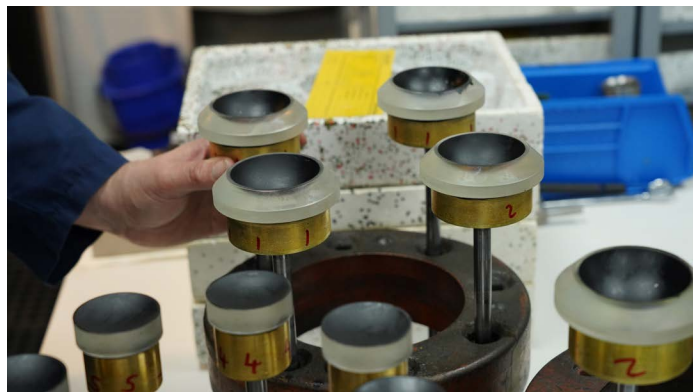
Vintage machines in the hands of a master craftsman like Paul Utting can produce accurate results to tolerances of less than 5 microns.



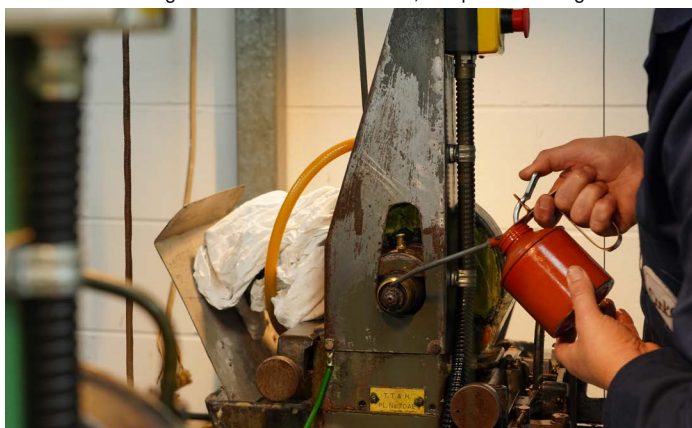
Edging



Edging ensures the element fits into its mechanical supports within the barrel. Paul Utting demonstrates: once cool, the pitch is like glue.



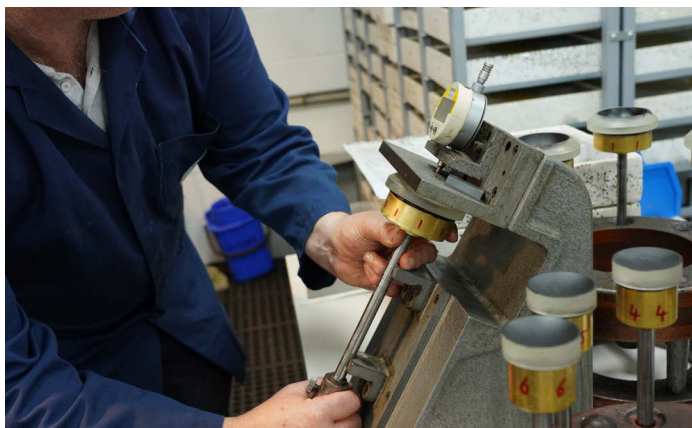
Protect the top and bottom surfaces against scratches.



Oil the precise, vintage Taylor, Taylor & Hobson edging machine.



Begin edging.



Measure.



Example of complex stepped edge



Separate the element from the spindle by gently tapping shaft. Les Zellan demonstrates.



Of course, many lenses undergo high-speed CNC edging.

Blacking



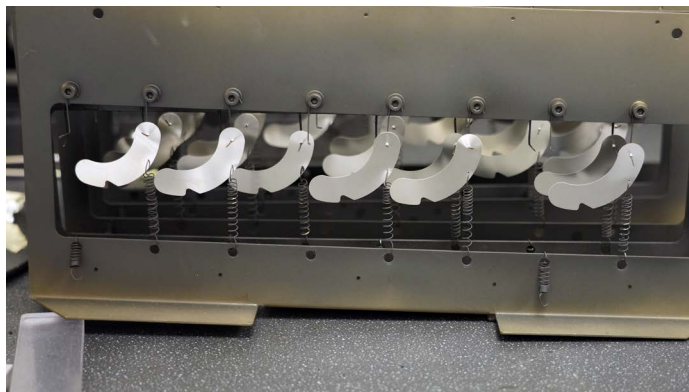
Irises



Iris leaf pins are welded into position.



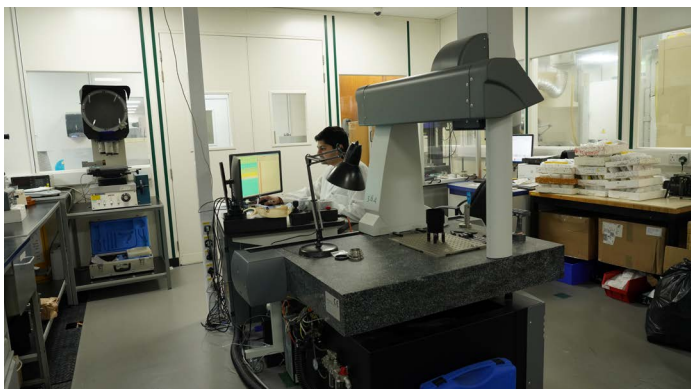
Iris pins are measured.



And made ready for anodizing.



An essential ingredient of lens manufacturing is consistent, persistent and accurate measurements.



William and Thomas Smithies Taylor, founders of what is now Cooke Optics, knew "if you can't measure it, you can't make it."



The Form Talysurf measures aspheric polishing inconsistencies. The original Talysurf 1 by Taylor & Hobson Talysurf was introduced in 1941 to accurately measure surface texture.

Ian Johnson, Coater for Cooke Optics



My name is Ian Johnson and I'm a coater. I have been with the company for 35 years. We work with several different types of machines: Bühler, Belzer and Leybold. Coating is a process of evaporating minerals at high heat in a vacuum to deposit a thin film onto the glass.

The Bühler plant uses a planetary motion in the top part. It doesn't just turn around on one axis, it turns round on several.

The Leybold Optics Box Coaters are older dome coating machines, some dating back to the early 1960s and are still actively in use today.

We essentially put down four different types of coatings on the glass depending on their various jobs.

The old Belzer machine is used for special coatings, like the ones that make up the SF — Special Flair (Super Funky) sets.



Clean the optical elements before coating.

Prepare the vacuum chamber. Add secret sauce. Close chamber. Heat.



Load the optical elements onto carrier.



Keith Wykes, Production Manager for Assembly



I'm Keith Wykes. Here at Cooke, we have increased capacity in our vast clean room with a lot more people working in assembly. This was necessary because the portfolio of lenses has expanded from S4/i, 5/i and Mini S4s to include S3, S6 and S7 as well.

S3 and S6 were the code names during development. You know the S3 as Panchro Classics and S6 as Anamorphic/i (Super35). Some of the code names have stuck, like S4. That's because when we were ready with S4, nobody could come up with a better name.

We were about 46 people in assembly and struggling for space. An extension was built to accommodate the new lines of lenses that were coming out. We added a new projection room. We expanded the clean room, but it filled up very quickly. So, when it was decided to launch Panchro Classic, we needed somewhere to build them. A facility at Crest Rise, about 3 miles from the main factory at Cooke Close, was leased and all the assembly teams except for S4 and 5 moved there. We've only recently moved back. The S7s have only been back here about two weeks.

You asked earlier about our new preoccupation with clean rooms. In my opinion, you have two customers. You've got the customers whose money it is. If you've paid thousands of pounds or dollars for a lens, you might say, "Oh, I don't like this and I don't like that." It has nothing to do with how you would use the lens. Nothing at all.

The other customer is the one who uses the lens—the DP or Assistant. They are not as interested in the color of the paint on the outside of the lens. They're more interested in what the optics produce on the image sensor or film.

If it's your money, you wouldn't buy a new car with a mark on the paint job, would you? It's still going to drive. You're still going to go down the road. But if you're renting a car from Hertz or Avis, you don't worry about a blemish on the bonnet. And that is why we've got two customers.

The process of assembling a lens is as follows.

The majority of our lenses are divided into two essential parts: an inner and an outer. They are built separately. The inner contains the optics and the iris. The outer contains the barrels, the movement of the cam for focus and the iris movement. The inner clicks into place inside the outer and is driven off the cam followers.

With spherical lenses like an S4, 5/i, S7, one person will build the

inner. Glass it all up. Look at it in projection. Put the mount on. Project it and tweak it again. Then present it to inspection to get tested. Next, somebody else will fit the inner into the outer, connect it all together and present it to inspection for focus and iris marks. And then off to engraving and the other final processes.

There are many skills involved. One of these, sometimes unappreciated, is to clean the piece of glass and then to be able to put it into the cell and keep it clean.

Anamorphics are a different story and really a team effort. There are five cells in an anamorphic. You've got the front, which everybody sees. You've got the focus, which is the internal focus. Then you've got the cylinder cell. Next you've got a middle cell that contains the iris and then the rear cell that everybody sees.

Next, we take those cells upstairs for fettling. Fettling is the term for making sure all the screw holes and all the metals are clean and there are no loose bits hanging off. Make sure it's all manufactured correctly and fits together correctly. It's cleaned upstairs again, and then brought downstairs.

Once downstairs, they fit all the glass into the cells. They have a spreadsheet. They're putting in all the calculations to determine what spacers to use and which shims to add. And then what we have is what we call final inner builders who will put the cells together, put it in tooling, project it onto the wall, and tweak it.

It's not really an assembly line for the anamorphics, but more people are involved in building one lens. We do like to take ownership and say, "That's what I built." Not, "Well I put in them six screws and that sort of thing."

We have an apprenticeship program. People who come here are usually trained to use tools at college and to understand metals, but they don't get shown how to build lenses. So, when we take somebody on, it is like a buddy system and they are put alongside somebody with plenty of experience.

We've had lots of people here who had never built a lens before. The work is something completely different. One of the best people who joined recently came through a job placement scheme for 20 year olds. We've got a real good mix of people. The oldest person here is Keith Norton. He's mid seventies and has been with Cooke for over 50 years. He used to build zoom lenses. One of the youngest people is a supervisor. She's 22.

I've been here 37 years. I started in 1982 in the glass manufacturing department. I only came over to the assembly side when they started building the Minis. But, if you know glass, you'll be fine.



Flow booths and benches inside the clean room.

Jamie Cluer, Assembly Supervisor and Service Manager



Jon Fauer: Tell us about Cooke lens service please.

Jamie Cluer: After the lens has been out in the field for God knows how many years, they are then returned to us for an overall overhaul which would involve glass cleaning, a general check over of the mechanics to make sure that they're still okay, and cleaning the grease.

Do the cams have to be replaced?

Only if the lens has been dropped. This happens more often than not. What you'll probably find is the internal pin will be bent in the cam and that means it will have to be replaced and the lens may have to be remarked.

How fast can you turn around a lens in service?

A new front element is pretty straightforward because it doesn't affect the optical unit as such. Changing a front element and checking it in projection would take about three hours. If you're replacing a cam, that's a whole different story because it means possibly having to rescale the focus of the lens. All our lenses are hand marked for focus. So you need a new focus ring.

Our turnaround time in general, whether it's from London or somewhere else, is normally three to four weeks. Many of the rental companies do their own service and we train them. Also, we now have Cooke service centers in Shanghai, Brazil, Los Angeles, New Jersey and, of course, the UK. That should make the turnaround much faster.

Take us through the assembly process from your point of view.

It's different now. We've gone from being a small company with just S4 and 5 lenses to bringing out the Minis, the Sixes, the Sevens. The company has grown a lot in the past 10 years. We have brought out more focal lengths and more series of lenses. The shop floor is now organized into various cells. The cells are for different series of lenses. It looks like rows of desks and booths with all the necessary tooling and equipment right there.

That's something that's changed from how we used to work. With Fours and Fives (S4/i, 5/i), each builder would do the whole lens from start to finish. The way we work now on some of the lenses is that we have sub assembly builders. Now their job is to do the first stage of the product, to take the glass measurements, work out the spacings between each glass and do the metal prep as well.

Once that stage is complete, they clean the glass and put that clean glass into clean metal work. Then it will go on to the final builder who will complete the job. Then it goes into projection tooling, where they make adjustments while seeing the adjustments' results on the screen. The old way of building was to take it apart, clean it, put it back together again, and so on. It was like building with your eyes shut.

It was a case of building the lens and you didn't know what you were going to see until you put it on the projector. And then, for example, if you saw a tilt, it'd be a case of taking that lens off the projector, going back to your desk, making an adjustment and hoping for the best. So you did not know until you were back on the projector again. Now you can make adjustments in real time.

You have a lot more projectors than before.

That's basically to keep up with the amount of lenses we now have. And we need the projectors because that's where we now make our adjustments.

How are the lenses inspected once completed?

We have two inspection phases. In the initial QC, the lens is tested on the projector. It is inspected cosmetically: clean inside and out, no dust or scratches. If it passes that stage then we will continue to do the marking up of focus marks, the engraving, and fit the /i electronics. Then it will go to final inspection where we test it again for the final time.



The shop floor in the clean assembly room is organized into various cells.

Cooke Clean Room



"Glassing up the Inners" in the Clean Room — the assembly area where Inners meet Outers. Panorama of the new Cooke Clean Room, above.



Lens elements are cleaned and inspected again.



The precise edging done earlier pays off as lenses mount inside barrels.

Cooke Clean Room



Inners (sub assemblies) slide into outers, below.



Adjust the inners through the outers to correct specifications, below.



Securing the /i technology electronics into a Panchro/i Classic 40mm.



Preparing a Cooke S7/i 135mm for marking.

Marking the Focus Scale



Raj Mistry hand calibrates the focus scale of each lens. After this, the focus barrel is laser engraved.



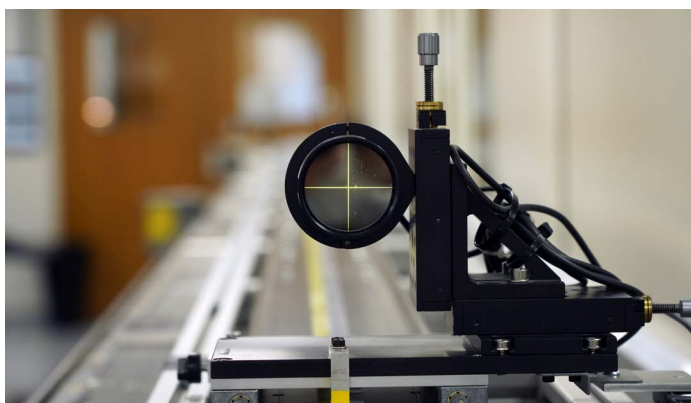
Marking the Focus Scale



In the good old days (2014), Raj Mistry eye-focused the focus scales.



These days (2020) he now confirms accurate focus with an MTF display.



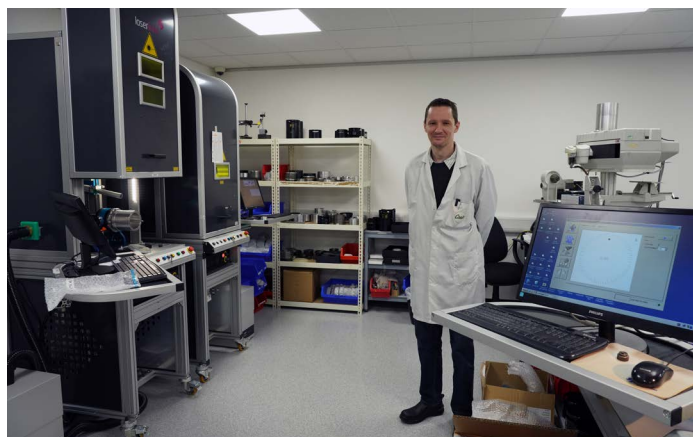
The focus target moves along a 60-foot long track.



Infinity is established with a supplemental mirror.



Each mark is lined and identified. The lens then goes to the engraving room. Laser engravers are seen above at left. CNC engravers are at right.



Projection



Lenses are checked, tweaked and rechecked in the newly expanded projection room that is part of the clean room. Gone are the days of building, testing, taking the lens apart again for adjustment, re-cleaning and re-assembling. It is now a seamless process within the one dust-free work space.



Delivery



Cooke lenses flying off the shelves and into the shipping department.



Above and below: checking out the new 85mm Macro Cooke Anamorphic 1.8x FF+



New: Cooke S7/i Full Frame Macro 1:1 60mm, 90mm, 150mm Primes



“We are introducing a new branch of the S7/i family—the 60mm, 90mm and 150mm 1:1 Full Frame Macro lenses,” Les Zellan said in our interview at the factory. He continued, “Most of our lenses have an MOD (Minimum Object Distance) of roughly 10 times the focal length. Over the years, we’ve been asked to do macro lenses and we’ve done it with the Panchro Classic 65mm and the Anamorphic 65mm and now the Full Frame Anamorphic 85m.

“The new 60, 90 and 150 mm S7/i Full Frame Macros include /i lens metadata, which we’re very proud of.”

By the way, 1:1 Magnification in a Macro means you can focus down to fill the frame with an object that is 36x24 mm or 40 x 20mm actual size.



60mm	
T-Stop Range	T2.5 - T22
Magnification	1:1
Close Focus from Lens Front	55 mm
Angular Rotation to MOD Endstop	270°
Max. Diagonal Angle of View for Super 35 Format	28°
Max. Diagonal Angle of View for 24 x 36mm Format	39°
Maximum Format Coverage	46.31mm
Front Diameter	110 mm
90mm	
T-Stop Range	T2.5 - T22
Magnification	1:1
Close Focus from Lens Front	114 mm
Angular Rotation to MOD Endstop	270°
Max. Diagonal Angle of View for Super 35 Format	19°
Max. Diagonal Angle of View for 24 x 36mm Format	22°
Maximum Format Coverage	46.31mm
Front Diameter	110 mm
150mm	
T-Stop Range	T2.5 - T22
Magnification	1:1
Close Focus from Lens Front	172 mm
Angular Rotation to MOD Endstop	270°
Max. Diagonal Angle of View for Super 35 Format	16.54°
Max. Diagonal Angle of View for 24 x 36mm Format	12.05°
Maximum Format Coverage	46.31mm
Front Diameter	110 mm

ERM Wireless Range Extenders for ARRI



Seen at BSC Expo 2020, ERM Radio Modules by FoMa Systems let you work with ARRI and cmotion hand units, as well as SRH Remote Heads, at greater wireless distances from the camera.

The ERM system works in pairs: one as a transmitter and the other as a receiver, using spread spectrum frequency-hopping technology for a long range and secure connection. The rugged housings are built to withstand rough setups and car rigs, as they did on *Ford v Ferrari* and *Fast & Furious 9*.

There are 3 versions:

- ERM-2400 LCS has a 1,000 m / 3,280 ft range, operates on 2400 MHz, and extends the ARRI WCU-4 or SXU-1 Hand Unit connection to camera over air.
- ERM-2400 SRH also has a 1,000 m / 3,280 ft range and operates on 2400 MHz. It pairs ARRI's SRH Remote Control Panel with ARRI SRH-3 and SRH-360 stabilized heads.
- ERM-900 has a longer 3,000 m / 9,840 ft range, operates on 900 MHz, and pairs ARRI's SRH Remote Control Panel with ARRI SRH-3 and SRH-360 stabilized heads.



The ERM-2400 LCS package consists of a paired set of 2 radio modules, including necessary cables. Once connected to the hand unit and camera, they will power up and connect automatically.

The modules can be used both as transmitters and receivers. Pre-configured pairs can be identified by their matching number code at the back of each device.



Example of ERM-2400 LCS working as a range extender, connected to LCS port on the WCU-4 or SXU-1 and EXT connector of ALEXA Mini / Mini LF



ARRI EF Mount with LBUS for ALEXA Mini, Mini LF



New ARRI EF Mount (LBUS)



Earlier ARRI EF Mount for ARRI AMIRA (no LBUS connector)

More than 130 million EF lenses are out in the world from Canon, along with countless others from SIGMA, Tokina, Tamron, ZEISS, Fujinon, Samyang and others.

Wouldn't you want to try some of these on your ARRI ALEXA Mini or ALEXA Mini LF camera?

Now you can, with the new ARRI EF Mount (LBUS) for large-format and Super 35 cameras. Yes, there was an earlier ARRI EF Mount, but it did not have an LBUS electronic connector and it vignetted certain Full Frame lenses.

The new ARRI EF Mount (LBUS) has:

- a wider light baffle that doesn't vignette,
- an extra LBUS connector that frees up the EXT connector on the camera,
- focal length and iris lens metadata that are sent to the camera.

Marc Shipman-Mueller, ARRI Product Manager Camera Systems, explains, "The use of Canon EF mount lenses on motion picture cameras has been a popular way to make a wider range of more affordable high-quality optics available to budget-conscious productions. It also allows filmmakers to use interesting EF mount lenses.

"Since the EF mount was originally designed to cover full-frame 35 mm stills, the lenses are equally useful for large-format and Super 35 cinematography."

Some of the special EF mounted lenses that Marc mentions are vintage, modern and glass of unusual distinction. They include wide zooms, macros, tilt-shifts, fast long lenses and products with built-in optical image stabilization (IS or OS).

It can be a lot cheaper to use these lenses as-is with their native EF mounts than subject them to a lens conversion.

A partial list of interesting Canon EF lenses might include:

- EF 100mm f/2.8L Macro IS (Image Stabilized)
- EF 180mm f/3.5L Macro
- EF 8-15mm f/4L Fisheye
- EF 11-24mm f/4L
- EF 16-35mm f/2.8L III
- EF 85mm f/1.4L IS (Image Stabilized)
- EF 70-200mm f/2.8L IS II (Image Stabilized)
- EF 28-300mm f/3.5-5.6L IS (Image Stabilized)
- EF 100-400mm f/4.5-5.6L IS II
- EF 200mm f/2L IS
- EF 300mm f/2.8L IS II
- EF 400mm f/2.8L IS III
- EF 600mm f/4L IS III
- EF 800mm f/5.6L IS
- TS-E 17mm f/4L Tilt-Shift
- TS-E 45mm f/2.8 Tilt Shift
- TS-E 50mm f/2.8L MACRO Tilt-Shift
- TS-E 90mm f/2.8L MACRO Tilt-Shift
- TS-E 135mm f/4L MACRO Tilt-Shift

A few of the more than 40 SIGMA lenses in EF Mount:

- 14-24mm F2.8 DG HSM | Art
- 24-70mm F2.8 DG OS HSM | Art, Optical Stabilizer
- 105mm F2.8 EX DG OS HSM Macro
- 200-500mm F2.8 APO EX DG
- 150-600mm F5-6.3 DG OS HSM | S

Marc continues, "In order to extend the benefits of using EF mount lenses for large-format productions, ARRI has redesigned the existing EF Lens Mount. The new one has a wider light baffle, allowing it to cover the large-format sensor of the ALEXA Mini LF, as well as the Super 35 sensor of the ALEXA Mini. In addition, an extra LBUS connector frees up the EXT connector on the camera. The previous ARRI EF Lens Mount will remain available for the ARRI AMIRA camera, which does not support LBUS.

ARRI EF Mount with LBUS for ALEXA Mini, Mini LF

Remote control of EF mount lenses

Marc Shipman-Mueller explains, “As with the old EF Mount (no LBUS), the new EF Mount (LBUS) allows internal motors of EF mount lenses (focus, iris and zoom) to be controlled by the ARRI WCU-4 or SXU-1 wireless hand units, Operator Control Unit OCU-1 and Master Grips.

“Focus pulling will work best with the OCU-1 or Master Grips since their control rings, like most EF mount lens focus rings, do not have fixed end stops. This is also why only focal length and iris metadata (not focus) are available from those lenses; the lens simply does not know its absolute focus setting.

“Also new is the ability to use an external cforce motor without an external radio receiver. With the old EF lens mount, camera assistants had to use the AMC-1 (Active Motor Controller), UMC-4 (Universal Motor Controller) or cforce mini RF motor. Now the LBUS cable of the cforce motor plugs directly into the LBUS connector of the EF Mount (LBUS) and the camera’s radio is used to communicate with the WCU-4 or SXU-1. The advantage of ditch-

ing the external receiver is a smaller and simpler set up.

“In addition, lens metadata now goes into the camera, where it can be displayed via SDI outputs and in the viewfinder as well as recorded into the image file.

“To use the cforce mini RF motor, which is the fastest and most responsive motor, switch the motor to “client” mode and connect it with an LBUS cable to the EF Mount (LBUS).

“Note that when the focus of the EF mount lens is switched to AF (Auto Focus) and a cforce motor is connected, the EF lens’s internal focus motor has priority. To give priority to the cforce motor, switch the EF lens to MF (Manual Focus).”

All these remote control options work with ALEXA Mini LF as well as with ALEXA Mini.

The EF Mount (LBUS) joins the list of lens mounts for ALEXA Mini LF and Mini from ARRI and third parties: LPL, PV, PV70, PL-to-LP adapter, Leica M and XLP52. The EF Mount (LBUS) is available in April 2020.

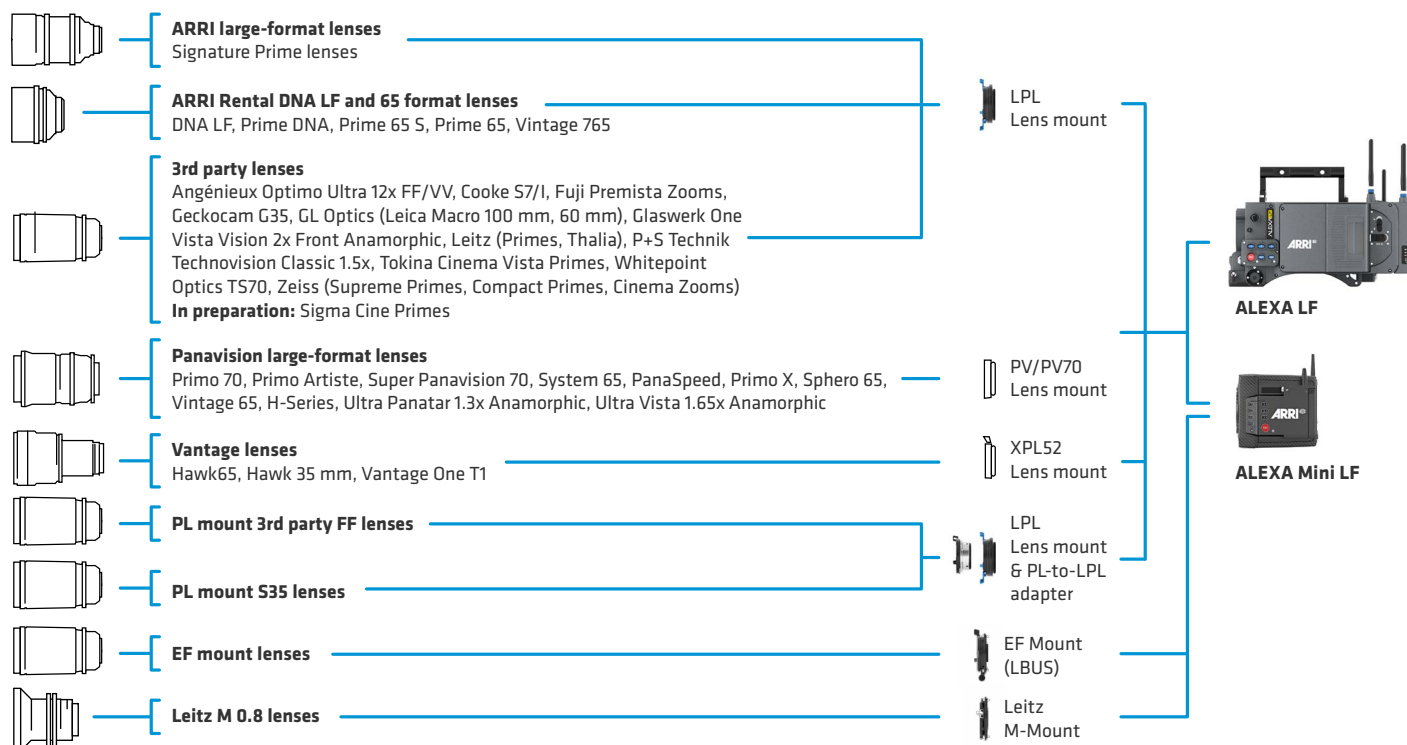
Lenses and Mounts for Large Format ARRI ALEXA LF and Mini LF



ALEXA Mini LF with LPL lens mount



ALEXA Mini LF with lens mount removed



ARRI OCU-1 Operator Control Unit

ARRI's OCU-1 (Operator Control Unit) is a major breakthrough for camera operators to recover control of focus or other lens functions. Here's a quick refresher course.

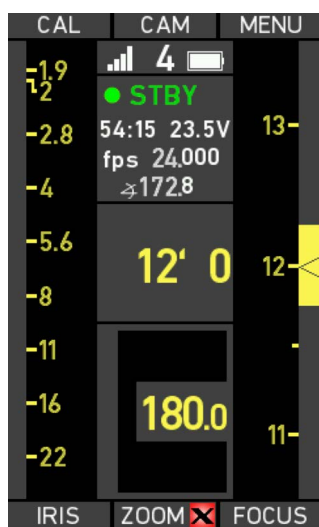
The OCU-1 lets the camera operator override and take back focus, zoom or iris control from the WCU-4 (Wireless Compact Unit) at the touch of a button, even when lens motors are attached.

When is this important?

1. You, the Camera Operator, are racing to the next setup and the AC is busy moving all the gear. The Director asks you to line up the shot. Have you ever tried to focus by turning the lens barrel while the motor is still engaged?
2. What if (gasp) your Focus Puller slightly missed the mark during a critical shot. You see the buzz in the eyepiece, press the override button, and can correct the focus with the OCU-1.
3. When you push the OCU-1 override button, the Focus Puller is alerted on the WCU-4 hand unit and can then seamlessly regain control of focus without a jump.
4. The OCU-1 lets you shoot on a gimbal without letting go.
5. When the camera is on a crane, you can adjust the zoom. The OCU-1 connects via an LCS cable from the LBUS to the WCU-4. You can then control the zoom remotely while the Camera Assistant does focus and iris.
6. The OCU-1 is able to control the roll axis of an ARRI Stabilized Remote Head.
7. OCU-1 controls Canon EF lenses without external motors.

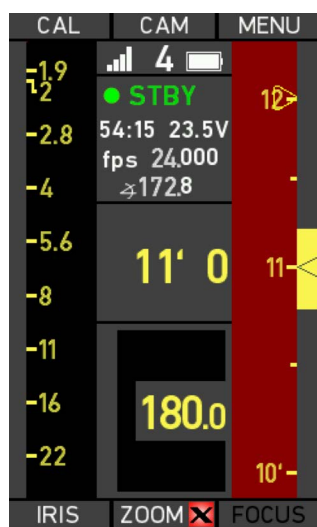


What OCU-1 Override Looks Like on the WCU-4



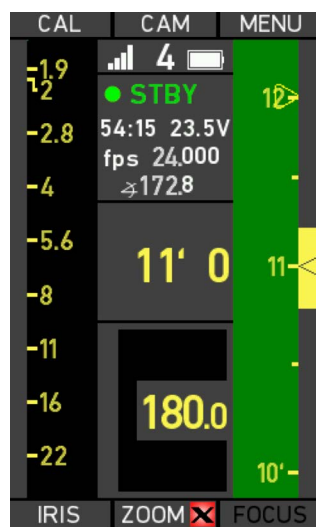
1. Focus Puller focuses Wireless Control Unit (WCU-4) at 12'.

Uh-oh! The Camera Operator sees the focus buzz.



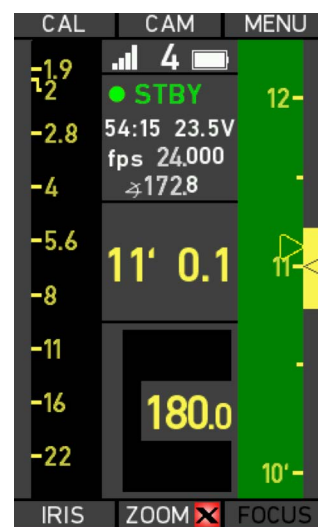
2. Camera Operator takes control by activating the Override function on the OCU-1 and focuses to 11'.

The WCU-4 screen turns red to alert the Focus Puller and the 12' mark is now a hollow triangle.



3. Operator returns control to Focus Puller by de-activating the Override functions on the OCU-1.

But the focus is still offset (solid and hollow triangles).



4. The Focus Puller turns the WCU-4 focus knob to move the hollow triangle back to the 11' index mark and then can re-engage lens motor control without a jump.

ARRI Master Grips

ALEXA Mini LF with Master Grips



ARRI Master Grips are not the same as the OCU-1.

Think of Master Grips as left and right handgrips that attach to the rosettes on either side of the camera. Add a wheel or rocker to control lens motors directly by cable. Electronics and an OLED readout on top assign focus, iris or zoom functions.

If you're working with a zoom lens, chances are you will want a zoom rocker on the right side and an iris or focus control on the left side. If you're working with a prime, you'll probably have an iris wheel on the right handgrip and focus on the left. If you are working with a Focus Puller who has a WCU-4, then you may want a focus control (with override) or no electronics on the left handgrip.

When shooting documentary style in the prehistoric era before Master Grips, you usually had to let go of the camera to adjust focus, iris or zoom with your left hand. Now, with Master Grips, you never let go. Master Grips combine comfortable camera handgrips with responsive fingertip control of lens and camera—especially while shooting handheld.

When are Master Grips helpful?

1. You're bouncing around in the back of a bumpy Land Rover, handheld and comfortably controlling lens functions.
2. Or, you're hanging on for dear life in a jetboat on the Shotover River. Master Grips provide solid grip and precise lens control when there's no room for a Focus Puller.
3. You need to react quickly and be ready for anything.
4. You can attach a Master Grip to the pan bar of a fluid head and use it as a zoom control.



ARRI OCU-1 and Master Grips Around the World

Cinematographers and Camera Crews worldwide have been sending location pictures and comments about working with ARRI OCU-1 and Master Grips.

The production stills are interesting because, as inevitably happens, they show innovative ways of using the gear. For example, the OCU-1 was intended so the operator, like a pilot, could take over temporary control of focus from the co-pilot, the AC.

Here's what Camera Operator in LA (*La La Land*, *Wine Country*) Ari Robbins wrote, "I really enjoy being able to have my Focus Puller at the camera more often without having him to be tied to his hand-unit." See Neil Harvey's camera, below right, as an example.

First AC Jake Marcuson (*Zero Dark Thirty*, *Rogue One: A Star Wars Story*) based in London said, "We had the OCU-1 on the camera most of *Dune* and it was really useful. Greig Fraser really liked having it on there."



Neil Harvey (DP) with Master Grips. UK.

"I like using the Master Grips for follow focus when I'm doing handheld work, and I thought that might be the only time I'd use it. But I found that when I was working with the camera on a tripod, I was equally at home pulling focus using the Master Grips. I thought perhaps with tripod work I wouldn't necessarily need them, but actually you just get hooked on the simplicity and the easy fine-tuning of focus using the Master Grips. I was impressed by how they survived the rugged environment. Great for drama shooting for spontaneous moments, without rehearsals."



Eugen Gritschneider (DP). Munich.

"The OCU-1 is a small and compact unit and felt like a part of the camera setup right from the beginning. The Master Grips let me react to what was happening and I could use the zoom without having to change my grip – I could keep the camera stable."



Ian Barbella (Focus Puller in LA) with OCU-1. Los Angeles.

"I am actually now on my fourth show using the OCU-1 as my digital follow focus. I use it almost everyday to be able to do rehearsals at camera with my operator and then send control back to my WCU-4 hand unit when I can't stay at the camera."

ARRI OCU-1 and Master Grips Around the World



Birgit Gudjonsdottir, BVK with OCU-1. Berlin.

"It makes my work fast and much easier. This is the tool we have been waiting for. From now on, it will be an essential part of my camera equipment list."



Marvin Hastert (Cinematographer).
Hessen, Germany.

"The ARRI Master Grips were a huge help when using ND filters. You can put the ND filters in and pull them out on the ALEXA Mini or the AMIRA pretty quickly and that's a huge relief. Especially together with the EF lenses, where you can directly adjust the aperture without making changes in the viewfinder, here you can hold the camera stable in your hands."

Photo credit: World Club Dome Zero Gravity, at left.

ARRI Master Grips Around the World



Markus Nestroy (DP) with Master Grips. Berlin.

"I had the Master Grip rocker on days where things needed to go fast. That was really cool and they worked very well—especially when I wanted fast zooms, which you are not able to do manually because you need both hands on the grips. With the Master Grips it is possible."



Richard Ladkani (DP) with Master Grips. Austria.

"I could not have shot the film without Master Grips. I had to be flexible, never in the way, and fast - and I still had to deliver the best quality pictures, and tell the story. I was used to focus with my left hand, and now I have it on my right thumb - on my fingertips. It was intuitive after 10 minutes."



Isabella Tan (DP) with Master Grips. New York.

"The Master Grips performed perfectly. I underestimated how solid they would be. They were great!"



Jake Horgan (DP) with Master Grips (above and below). New York.

"Master Grips put all the creative control into the hands of a DP or operator. Having a focus puller is usually the ideal situation but sometimes you need to do it yourself."



Josh Flavell, ACS with Master Grips. Australia.

"Easy to set up and calibrate, and so great to have focus and remote control in a comfortable position when you don't have a focus puller."



Mole LED Spacelites



Mole 6000 watt (6x 1000 watt) quartz Spacelite with skirt.

Spacelites are hung in large numbers at regular intervals from studio grids to illuminate large areas with soft, relatively even light. Skirts with diffusion are usually attached. To prevent multiple shadows, an additional black skirt can be attached to create pools of down-light. A drawback has been massive power requirements and lots of heat.

The next generation of Mole-Richardson Co. LED Spacelites will debut in 2020 — the Varispace 2 and Varispace 4.

These Spacelites use the same color science and controls found in the popular Mole “Vari” line of Fresnels.

The Varispace 2 and Varispace 4 are designed as LED alternatives to the Mole 2000 watt and 6000 watt quartz Spacelites.

With power draws of 350 watts for the Varispace 2, and 900 watts for the Varispace 4, both Spacelites include variable color temperature (2700K to 6500K), Plus/Minus Green correction, built-in LumenRadio, RDM and Bluetooth compatibility.

Along with the complete line of Vari-Fresnels and Vari-Soft Panels, Mole-Richardson Co. will also be featuring the 20K LED. This 24" single-source LED Fresnel fixture delivers incredible output, requiring only two separate 15 amp circuits. So, now you can plug a 20K (20,000 watt equivalent) light into two household electric outlets.

Mole 20K LED



DENZ FDC-LPL Flange Focal Depth Tester



The new DENZ FDC-LPL Multi tool is the latest addition to their line of essential Focal Depth Controllers, joining the FDC Multi which comes in PL mount and a variety of adapters. If you build, buy, rent or use LPL mount cameras, you need this testing device.

Why? Flange focal depth (FFD) is the distance from the shiny metal flange of the camera's lens mount to the imaging sensor. This distance can vary with (gasp) manufacturing tolerance errors, wear-and-tear on location, temperature, shipping and age. An unsupported heavy lens can weigh heavily on the mount. A bumpy and crazy car chase could cause problems, most likely not on a solid-as-a-rock ARRI, but you never know.



And so, if the flange focal depth is out of whack, the focus marks on your lens will be wrong. When you focus the lens to 6 feet, the camera's sensor could think it is 5 feet or 7 feet.

There are a number of terms used interchangeably, but to avoid confusion, let's settle on the following:

1. Flange focal depth (FFD), sometimes shorted to "Flange depth," is the depth of the camera cavity from the **camera's** mount to the sensor.
2. Flange focal distance is the distance from the rear surface of the mount on the **lens** itself to the sensor.
3. Back focus is just another term for flange focal distance—**lens** mount to sensor.

In the prehistoric analog days of film, just a few years ago, you checked flange focal depth by poking a pointy-tipped tool—a dial with a probe—appropriately named a depth gauge. The big difference now is that with digital cameras you risk scratching the low-pass filter covering the sensor. Also, few digital cameras use the same sensor, low pass filter or cover glass and the cover glass is not the image plane. The sensor, with its photosites, is the image plane.

And that is why the DENZ FDC-LPL and sister FDC Multi are considered industry standards. Major manufacturers such as ARRI, RED, Blackmagic Design, Vision Research and others have been using the DENZ FDC for years to check the depth of their cameras during assembly. Many rental houses check their cameras with the FDC and busy camera assistants carry them in their kits.



If you're using a PL mount camera, you have been using the FDC Multi. The Flange Focal Depth of PL mount cameras is 52.00 mm. (At least that is the default setting. Some companies and rental houses may deviate from this standard measurement for a variety of reasons, but that's another story.)

Now, the FDC-LPL has been introduced. Flange Focal Depth of LPL cameras (ALEXA LF, ALEXA Mini LF, etc) is 44.00 mm.

To paraphrase David Byrne (from *Once in a Lifetime*), you may ask yourself, well, why not just use a PL to LPL adapter? You could. But the nagging question is whether that introduces yet another variable into a process where we are looking for micron accuracy. And a dedicated LPL version is easier and faster to use.



Just as analog depth gauges for film cameras are zeroed out and calibrated using a metal collar, DENZ FDC Multi testers can be checked on a DENZ FDC Master.

The new DENZ FDC Master in LPL mount calibrates the FDC-LPL. A high-resolution black-and-white sensor inside displays a test image and so calibration correction of the FDC can be done by simply adjusting the scale ring.

DENZ FDC Multi



To begin measuring, attach the FDC Multi to your camera as you would a lens. The FDC projects a red laser and a pair of green lasers focused at the image plane of the sensor from two different optical axes. If the measurement is correct, a vertical red bar aligns—centered evenly—between two green boxes. This is displayed on a monitor connected via the video output of the camera being tested.

When the flange focal depth of the camera is correct—e.g. 44.00 for an LPL mount and 52.00 mm for a PL mount camera, the FDC-PL measuring scale's red "52" witness mark will line up with the red index mark. On the FDC-LPL, it will line up at 42.00 mm. This means that no correction is necessary.

If the flange focal depth is off, your monitor will show the red target offset and overlapping one of the green boxes. Rotate the barrel of the FDC multi until the red bar is centered.



Next, read the amount of correction on the barrel's scale. Each witness mark line represents 0.01 mm (10 microns). For example, if it shows 2 witness marks on the Minus (-) side, that means you are -0.02 mm short of optimal 52.00 mm.

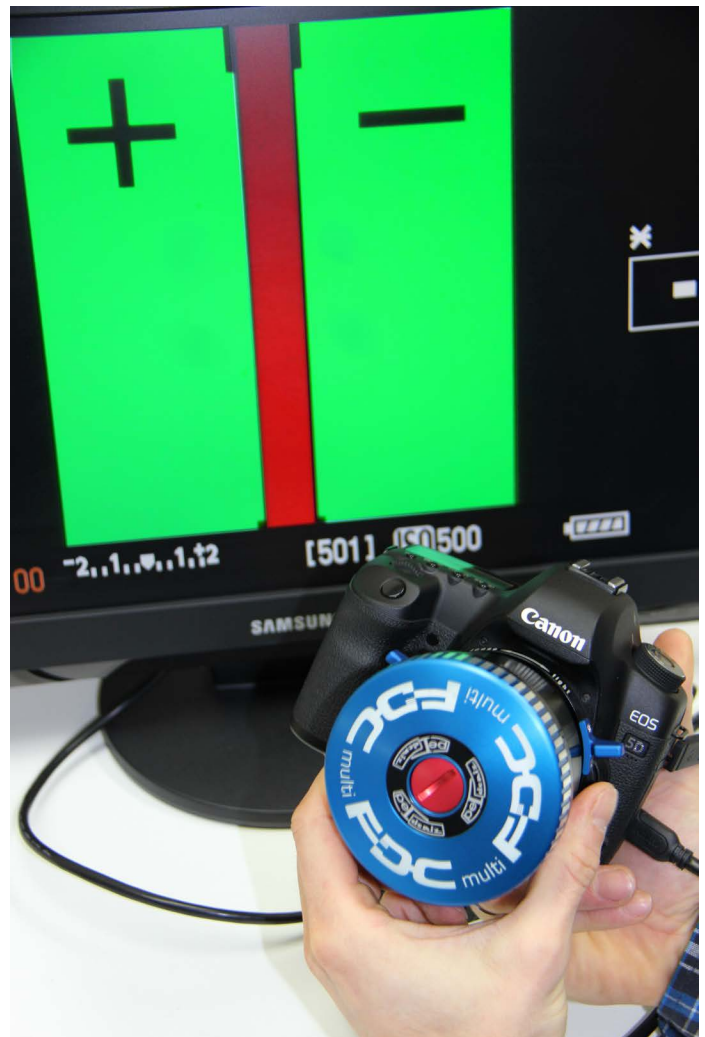
The remedy is to adjust the flange focal depth of the camera by removing the camera's lens mount and adding a 0.02 mm shim under the camera mount. Similarly, if the FDC multi shows a Plus (+) reading, you remove shims. Tedious trial and error procedures are a thing of the past because the FDC tells you exactly how many shims to add or remove.

The FDC Multi comes in a small, padded, lockable, water repellent aluminium case. Compartments inside hold accessories and adapters, power supply, and a user manual.

For studio and test-bench use, the FDC Multi can be powered by its external AC power supply (100-240V AC, 50-80 Hz, 300 mA in — 5V DC, 1.5 A Out). It can also run off a self-contained 3V button battery— useful on location. To save battery power, the FDC Multi has an automatic off function.



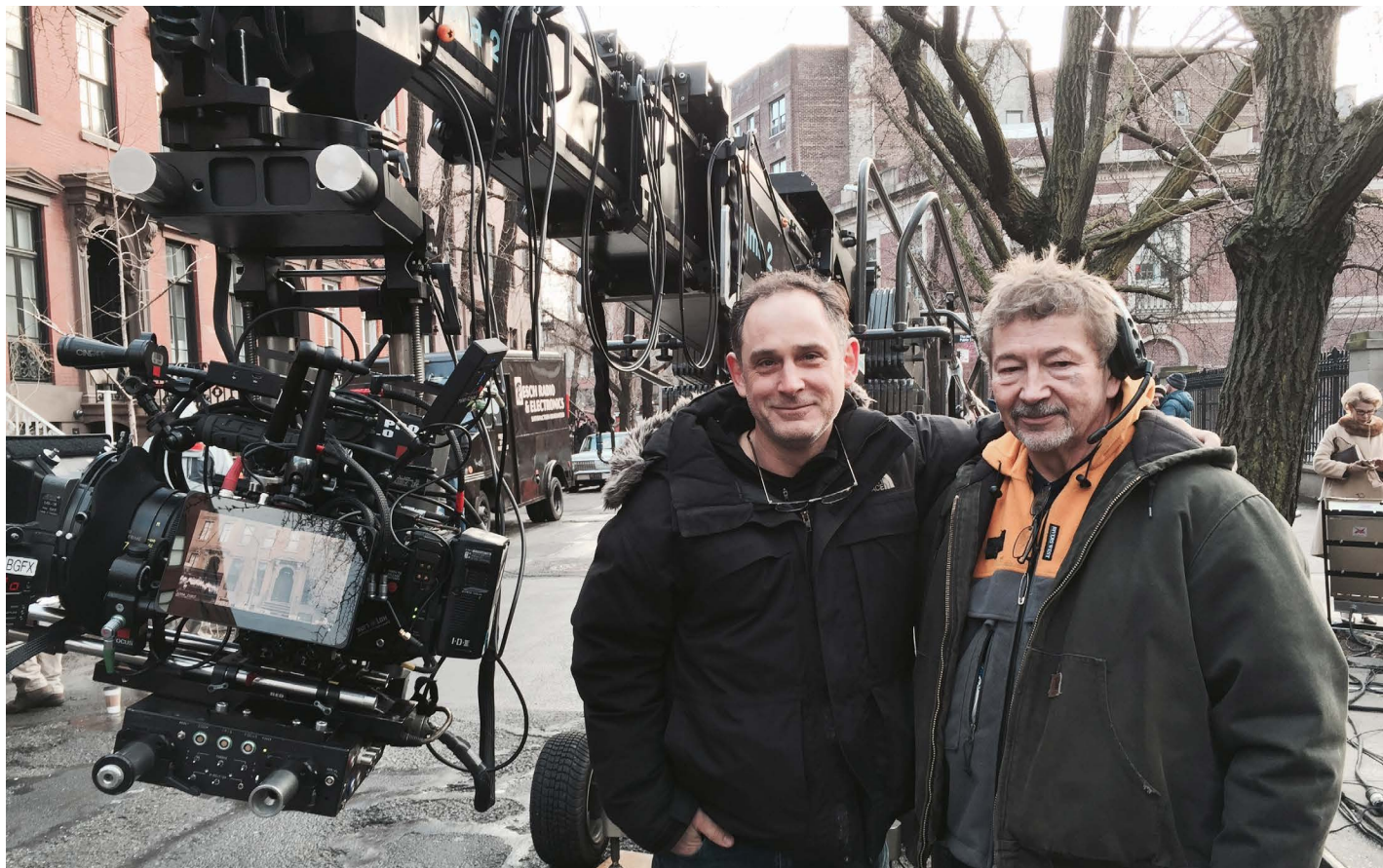
DENZ provides a number of adapters to work with the FDC on a number of cameras: EF, RF, F, E-mount, XPL and more.



Quick Start for DENZ Flange Depth Controller (FDC)

1. Attach the FDC Multi as you would a lens in the mount of the digital camera
2. Connect the camera to a monitor. Lasers in the FDC measure the flange focal depth from mount to the sensor.
3. Rotate the FDC's barrel as if you were focusing a lens. This adjusts the flange focal depth measurement. When the vertical red line appears centered between the two green bars, the actual measured flange focal depth is displayed on the FDC's scale.
4. Ideally, it measures to spec. If not, begin shimming the camera's mount.

Präzisions-Entwicklung DENZ Fertigungs-GmbH, Munich
www.denz-deniz.com



William Rexer, DP on *Hunters*, left. Stuart Allen, Louma Crane Operator, right.

"Hunters, Rexer, SIGMA, RED" almost sounds like the incantation from Fellini's 8½: "Asa, Nisi, Masa."

*If you are binge-watching at home, here is a background interview with William Rexer, cinematographer on *Hunters*. There is technical information on his use of SIGMA Full Frame High Speed Primes — one of the first shows on which they were used. The episodes were shot with RED MONSTRO 8K VV cameras.*

*Hunters is now streaming on Amazon Prime Video. In case you haven't seen the show: "Inspired by true events, *Hunters* follows a rag-tag team of Nazi hunters in 1977 New York City who discover that hundreds of escaped Nazis are living in America. They set out on a quest for revenge and justice as they discover a far-reaching conspiracy and must race against time."*

Jon Fauer: How long were you working on *Hunters*?

William Rexer: There are 10 episodes and they averaged about 12 days per episode. Fred Elmes, ASC shot the pilot. He started slightly before we began the series. Due to scheduling issues, we were all working at the same time. Essentially, we were completing episode eight as the pilot was finishing production. It wasn't like a traditional show where the pilot was done first, analyzed as to what worked and didn't work, and then the individual episodes began. Instead, it was all happening at once. Most of *Hunters* was shot in the New York area. Ten days were done in Budapest. We finished shooting last March.

Were there different directors?

There were six directors: Alfonso Gomez-Rejon, Wayne Yip,

Millicent Shelton, Michael Uppendahl, Nelson McCormick, Dennie Gordon. And three DPs: Fred Elmes, Timothy G. Norman and myself. I did most of the work on five episodes and some of the work on the others. Tim shot four episodes and he and I worked closely together, planning, talking about our scenes and discussing dailies.

Who established the look to maintain continuity throughout?

It was interesting. While Fred and Alfonso were doing the pilot, we were prepping episodes two and three at that same time. David Weil, the creator, wanted Wayne Yip and me to come up with our own look independently. Our producing director, Nelson McCormick and co-show runner, Nikki Tuscano, pushed Wayne and me to expand the look and our references.

I wanted to respect what Fred and Alfonso were doing. I did look at their dailies, but at the same time, David Weil wanted us to embrace more of the comic book elements. We were given license to go our own way and to create a new look for the show starting with episode two. Fred and Alfonso pretty much live on two lenses: a 40 mm and a 50 mm throughout.

On the other hand, we mixed it up using a wider selection of lenses and more wide lenses. We were not afraid to introduce 14mm and 20mm. We found ourselves on the 28mm more often than not.

Why do you say comic book style?

It was not based on a comic book. David grew up hearing stories from his grandmother who was a Holocaust survivor. As a little



Photo © Christopher Saunders, Amazon Prime Video.

kid, the only ways he could understand these horrific stories were in terms of comic books because he was a comic nerd and saw it in abstract images of good versus evil. He said, "When I heard those stories, that was the only way I could make sense of them."

That was the direction he wanted us to go in. It was a delicate dance, but we definitely used some of that language of superheroes opposing evil. We looked at Tarantino's *Jackie Brown* and Marvel action hero films.

To establish the look, I gathered reference material for every scene and had conversations with the director. On episode two and three, Wayne Yip and I sat down with David Weil and Nikki Toscano presented how and where we were going to take it.

Hunters takes place in 1977 with flashbacks to the 1940s. The present day, 1977, has a bit more contrast. I slightly desaturated skin tones and added some cyan into the shadow areas and it's on the edge of being noir. When we go into the 1940s, there are black and white elements as well. Probably our biggest reference for that was Spielberg's *Munich*.

Explain the lighting style.

The lighting style is exaggerated naturalism. All the lighting is justified in terms of sources, but at the same time, heightened. The saturation and colors are slightly over the top, but not too far. The camera work is "active participant" meets exaggerated action thriller. We wanted to make sure that the audience was going for a ride with us. I wanted to make sure that the audience experienced the scene as a participant.

It reminded me a little of Kodachrome.

Yes. It leans slightly towards Kodachrome. For the most part, I was thinking of a 5248 film stock look where the blacks were truly black. The reds have a particular color. Of course, the reenactments in Auschwitz are a different story. We created three in-

camera LUTs for the show: two for the recreations and one LUT that was consistent all the way through for the 5248 type of look.

How did you handle the grading?

Joe Finley, our colorist, was in LA. I did a lot of the initial grading remotely from Tribeca, NY, live, in real time. Then I went out to LA for a week and sat down with him. We graded with DaVinci Resolve. I always fight to get into the room with the colorist; so much happens in the final grade.

Cameras?

We shot RED MONSTRO 8K VV cameras. It was finished 4K HDR. On the technical side, that's the one thing we're all still working on: we really are not viewing HDR on set. We're viewing standard Definition. On set, I'll switch back and forth between the Log and LUT image to try to judge what I'm going to have in the land of HDR. I look forward to the day where I can actually view what we're really doing.

Could you not have used HDR monitors on set?

Production finds them too expensive. It's tricky when you have all the producers and directors on set. I try my best to get matching monitors across the board so that everybody's looking at the same thing. I try to have six good monitors that have been taken to the facility and balanced for a consistent image. At the moment, few of us can afford that.

Hopefully that will change. Where did the camera package on *Hunters* come from?

Panavision equipped the whole show. As mentioned, I had RED MONSTRO 8K cameras and SIGMA Full Frame High Speed Primes. The cameras on the pilot show came out of ARRI Rental because Fred has a relationship there. He used ALEXA LF with Cooke S7/i lenses, and ALEXA Mini for his work on specialty rigs.

Hunters, Rexer, SIGMA, RED

What influenced your choice of SIGMA primes?

I like the look of the SIGMAs. Also, we did a lot of gimbal work. The SIGMA lenses are not only beautiful but they are also some of the lightest and smallest lenses out there, which is helpful for gimbal work. I love those lenses. I think the Cooke S7 primes are gorgeous too, but I'm doing too much gimbal work.

Getting back to the lenses, yours is one of the first major productions to use the SIGMAs. They were on *Top Gun* and *Silence of the Tides*. But *Hunters* is the first episodic show I've heard about. Please tell us more.

I love the size and the quality, and the build has been fantastic. Since they were relatively untried, I didn't know how they would hold up — and they held up beautifully. Their look is somewhere between Cooke and the ARRI/ZEISS Master Prime. They really have their own style. They have very nice contrast, excellent resolution and there is a slight fall off on the edges, sort of the way Cookes do. (This may be because the SIGMAs have a stated image diagonal of 43.3mm for Full Frame format, but the RED MONSTRO 8K VV has an image circle of 46.31mm. Therefore, SIGMA's Illumination Circle covers the RED MONSTRO, albeit with slight shading and slightly decreased resolution around the edges.)

In Full Frame, you get an ever-so-slight fall off. I'm constantly putting a slight vignette on all my images anyway, very often by cutting ND gel and putting that in front of the lens. So I'm very happy to have this naturally with the SIGMAs. I like them so much that for *Halston*, I'm using the SIGMA FF High Speed Cine Primes again. I also have a new set of SIGMA Classics for some nighttime scenes where I want it to be flared and have a unique look. They're gorgeous.

On the SIGMA Classics, I appreciate how the skin tones look so beautiful. They're not clinical. They feel like an older style lens. I was an ARRI/ZEISS Master Prime person for so long and now in this Full Frame world, I'm using both series of the SIGMA Full Frame lenses: both the regular High Speed set and the Classics. I like the blacks, I like the flares and at the same time, the resolution.

For the Classics, they re-coated just some of the elements—not all of them. You'll find that their speeds vary because of some of them have just a couple of uncoated elements while others have more. They flare in a really beautiful way. They're not a lens that you could use for everything because if you shoot against a bright window there may be too much halation. But in the right environment, and the right lighting, they are gorgeous. For *Halston*, I was shooting a Liza Minnelli scene with her performing and we had some old Fresnels in the background, just in frame, and the flares are just stunning.

I think you were one of the first people who got the SIGMAs. They were barely out of the factory?

They told me they'd have them in December and I said I really, really would like them for this show. And so SIGMA made it happen. I even bought a set.

Who does service on your SIGMA primes?

I've sent mine to Duclos twice for general maintenance in between jobs, which I do with any of my lenses.

Getting back to the RED MONSTRO cameras, tell us more.

I use the RED MOSNTRO cameras for many reasons. One, I like the fact that we have the resolution to work with. Resolution does matter. Two, I like the form factor and the size for doing a lot of the gimbal work. Three, RED has been a really great camera and I also love its look.

We shot with 5:1 REDCODE. As for filters, we were using diffusion all the time. I used something that Fred Elmes introduced on the pilot. He had a wedding veil in front of the lens. It wasn't behind the lens diffusion but rather a stretched front diffusion net.

There are some daytime exterior scenes where we used the Angenieux 25-250 HR zoom lens with a 1.6x Tokina expander to make it cover Full Frame. With that setup, we wouldn't use any diffusion because it already had a nice, softer contrast look to begin with.

Aspect ratio?

Hunters was shot in a 16:9 Full Frame aspect ratio. *Halston*, for Netflix, is 2.39:1. Both shows were done with SIGMA High Speed Primes and RED MONSTRO 8K VV.

How did you get into film?

I grew up in Huntington, Long Island. I went to boarding school in Pennsylvania, The Hill School. After that, it was Dartmouth College in Hanover, NH. One of my mentors, like you, was film professor, film critic and screenwriter Maurice Rapf, also a Dartmouth alumnus and co-founder of the Screen Writers Guild.

My mother had a theater company and my father was a theatrical producer. My first job in the business was probably cutting off the asbestos leads on Fresnel lights and putting in proper wiring. My dad produced and promoted shows in the 1970s. At age 16, I was running carbon arc follow spots on performers like Cab Calloway, the Spinners and Earth, Wind, and Fire.

Filmmaking wasn't something I considered. I was going to be a doctor, but I loved lighting. At The Hill School I did all the plays, all the lighting design. Then I got to Dartmouth, shot many student films, but I was studying neuropsychology and thought that was where I was going to end up.

Then Maury (Maurice Rapf) got my attention, and the rest is history. Actually, as a little kid, my father would go to the New York City Public Library and bring home Keaton, Chaplin and art movies. We would project them in 16mm in our living room. So, at Dartmouth I was taking film classes because it was something both interesting and familiar.

Because I knew something about lighting, the students in acting classes would ask me to shoot things and there was Maury with that crazy Super 8mm Steenbeck that was broken all the time. I was kind of handy, so I could fix it. He noticed and said, "If you can fix this thing, do you want a job here in the camera room to help maintain all our gear?" I said, "Sure."

I returned to New York, worked as a camera assistant and then a cinematographer.

Congratulations on a beautiful job on *Hunters*.

Thanks. I also want to thank my team. I owe so much on this show to my them: my gaffer, Scott Ramsey, and key grip, Gary Martone, my entire camera team. I ask so much of them all. Working in Full-Frame and with fast lenses, the camera team has to give it there all.

Gods of Focus: Michael Burke on *Hunters*



Photo: Allison Ruth Burke

Jon Fauer: On *Hunters* with William Rexer, I understand you used RED MONSTRO 8K VV, SIGMA primes and the Preston Light Ranger 2.

Michael Burke: The studio and handheld cameras had Light Rangers on them. We had the Light Ranger 2 with the standard sensor. This year, the LR2 W (wide) has come out, and that's become, for large format, a must-have now. It would have been great to have on *Hunters*, but it wasn't available until this year.

Right. Why do you say it's the go-to for large format?

It just has a wider field. If you're on, for example, a 35mm lens, and the Light Ranger really only picks up the center of the frame, so if you have a shot where something is not in the center, then the Light Ranger just doesn't work. But now with the wide version, for anything say 50 mm, or wider, the wide will pretty much cover the whole image now. Our "C" camera went on the Ronin Gimbal, and it had a Focusbug.

What kind of monitors were you using?

Our basic setup was the SmallHD 1303 HDR monitor. That's the go-to focus monitor. Both Michael Guthrie and I have wireless SmallHD 703 monitors and the new Cine 7 Sidekick monitor if we needed a handheld focused monitor.

You mostly used SIGMA Cine primes?

We basically had two matching SIGMA sets, A and B, and each set was 14 through 135 mm.

To supplement the focal lengths, Will Rexer, Director of Photography, has a 58 mm Zero Optik rehoused Nikon Noct-Nikkor 58mm T1.3 lenses.

On the longer end, we had two matching 180mm Leicas and a couple of 200 mm and 300 mm Nikon still lenses with PL mounts.

Will has the whole series of Angenieux Zooms. Our go-to zoom ended up being the Angenieux 25-250 mm HR. Will likes the fact that it's a little lower contrast. So, if it's a sunny day, it helps lower the contrast a little bit. We had a couple of older lenses for some of the news footage in the show, including two Angenieux 25-250 HP zooms.

For some specific applications, we had the 70-200 ZEISS CZ.2 Compact Zooms.

We used Leitz Cine MacroLux Diopters frequently to further defocus the background. They have a 95mm diameter and can quickly attach to the front element of the Sigma Primes and the 58mm Zero Optik lens.

Shooting exteriors, would you mostly use zooms for speed of setup?

Most interiors were shot with primes. The day exteriors were definitely zooms. I think there was an initial idea of using more zooms, but I think just opting for shallow focus, and being close and wide. I think we ended up more on the 20 to 35 mm for wides, and then the 58 mm for closer shots.

What's the reason for the 58 mm Nikon?

Will wished there were a SIGMA 65 mm, so the Noct-Nikkor 58mm f/1.2 mm filled the gap between the 50 mm and the 85 mm. It matched nicely. Will really likes that lens for closeups. It's a beautiful lens. It's reminiscent of the Leica Noctilux. But please remember, it's a rehoused still photo lens and as a result is very small which makes it extremely challenging for focus pullers.

I think you were one of the first people to actually shoot a major episodic series with SIGMA FF High Speed Primes.

They're great lenses. The look is totally awesome. They have a nice amount of focus fall-off at the edges, which a lot of DPs like that. Compared to most other fast cine lenses, the main difference is size and weight. The SIGMA Primes are significantly smaller and lighter.

There's one small thing that would be good to add regarding the lenses and lens motors. Because the SIGMA primes and the 58mm Zero Optik Nikon lenses are smaller and lighter weight, we are using the Heden MV26VE-LX motor for focus and the M21VE-L motor for iris, especially when building the camera for Steadicam and for the Ronin 2.

You were shooting 16:9 aspect ratio, using the full width of the RED sensor? That's interesting, because the factory spec image circles of the SIGMA High Speed FF Cine Primes are around 43.3 mm diagonal, and the RED MONSTRO 8K VV is 46 mm. It's nice to know the SIGMAs covered. And maybe that's why there's focus fall-off at the edges, in a good way.

We benefitted from the full frame illumination circle of the lens.

How did the lenses hold up under the abuse of a TV series with lots of setups?



When the job wrapped, we sent all the lenses to Duclos. They did a full check and actually only one or two lenses out of the full two sets needed to be adjusted. I mean, this was on a TV show, so the lenses get totally abused. Particularly the 35 and 50 mm. There was a lens motor on them nonstop.

How did you get started in all of this business?

I grew up in Vermont, north of Montpelier. In high school, I did a film class and that got me into filmmaking. I did a little bit of film study: a year at Ithaca college, a semester abroad in Australia, and then I transferred to the University of Vermont. I also taught film production classes there as a work study program. Then, a position opened up in the camera department at the Sundance Institute's filmmaker's lab and in 2000 I went there as an assistant. It was an amazing initial experience for a 20 year old kid because I met Alan Daviau, Paul Thomas Anderson and Kathryn Bigelow. I moved to New York City in September 2001. My first job as AC there was *Raising Victor Vargas* with Tim Orr. I was loading in the East Village when the planes hit on 9/11. I moved up to pulling focus and joined the union in 2004. I've been mostly based out of New York ever since.

Some of your production stills show the camera on a Louma 2 crane.

We used the Louma 2 a lot for specific crane work that required slightly more complicated moves. Stuart Allen was our Louma2 Operator. We also did a lot of gimbal work on *Hunters* and Michael Guthrie was our B Camera 1st AC and Head Tech with the DJI Ronin 2.

And RED MONSTRO 8K VV?

We had lots of success with it. We didn't have any problems. We've been using that camera for a long time now. You cannot beat the MONSTRO for being a compact camera with a large format look. I think that the MONSTRO sensors are just incredible.

How long was your checkout at the beginning of the job?

We originally were going to have five days, and we ended up having just three and a half days to prep the series. We've done so many jobs with Will over the years that many things are already somewhat prepped. We have Will's particular lens cart and custom designed cases.



William Rexer with a Venus Optics Laowa 24mm f/14 Macro Probe Lens lining up a POV shot through a monocle. Michael Burke said, "It's a killer speciality lens which we found as a very effective and creative way to tell the story."

CAMERAS

- 3x Red Monstro 8K VV
- 3x Red DSMC 2 Red EVF
- 3x Red DSMC 2 Lemo Adaptor A
- 3x DSMC 2 Base Expander
- 3x DSMC 2 Gold Mount Battery Module
- 3x Wooden Camera Right Side Plate Red DSMC2
- 3x Wooden Camera Easy Riser Red DSMC 2
- 3x Wooden Camera AIR EVF Mount Red DSMC 2
- 3x Wooden Camera LW 15mm Bracket Red DSMC 2
- 3x DSMC VV AL PL Mount 2.0
- 1x DSMC VV AL CANON Mount 2
- 3x DSMC2 Tactical Top Plate
- 3x DSMC2 Top Handle
- 3x 7" Red Monitors w/Noga Arms
- 3x 5" Red Monitors w/Noga Arms
- 3x ARRI BP-8 19mm Studio Universal Plate

- 3x 12" ARRI Sliding Base Dove Tale Plates
- 6x Red EVF Cables Flexible from Off Hollywood
- 6x Red Power Cables 4-Pin to Red Lemo Power Adaptor
- 6x 8' 4-Pin 12 V Power Cables
- 3x Media Black Out 2-Pin Splitter Boxes
- 12x Cine Locks
- 1x Panasonic EVA-1 w/ARRI Cage & Canon EF & PL Mount Adapters & Shogun Inferno Monitor
- 2x Panasonic GH5 w/Movcam Cage and Meta Bones EF and PL Adaptors

LENSES

- 2x Sigma PL Mount Prime Lenses 14, 20, 24, 28, 35, 40, 50, 85, 105, 135
- 1x Sigma EF Mount Prime Lenses 14, 20, 24, 28, 35, 40, 50, 85, 105, 135
- 2x Leica 180mm Lenses

- 1x Nikon 58mm Noct 1.2 Zero Optek Lens
- 2x Nikon 200mm T 2.0
- 1x Nikon 300mm T2.8
- 1x Angenieux 25-250 HR
- 1x Angenieux 28-76mm T 2.8
- 1x ZEISS Compact Zoom 14.5-45
- 1x ZEISS Compact Zoom 70-200
- 1x 12mm FF Lens
- 1x Medium format ZEISS Jena uncoated 300mm, 180mm, 120mm, Funky 55mm, Funky 35mm
- 1x Lens Baby System
- 1x 1.4 Extender,
- 1x 2x Extender Duclos
- 2x 1.6 Extender Tokina
- 1x Leica Macro Lux Diopter .5
- 1x Leica Macro Lux Diopter 1
- 1x DXLF View Finder PL Mount 8K HD 16:9 Framelines



B Camera with the Angeniuex 25-250 T3.5 HR.

MEDIA & READERS

- 20x 480 Gig Red Mini SSD Cards
- 3x RED Station Red Mini-Mag USB 3.1 SSD Card Readers
- 5x 480 Gig SSD Red Mini Mags
- 8x 128 Gig Sony Tough SD Cards

DP MONITOR

- 1x Flanders Scientific DM250 OLED Reference Monitor

MATTEBOXES

- 1x 4x5 ARRI LMB 4x5 Pro Set Matte Boxes w/All Accessories
- 1x ARRI SMB-1 6x6 Matte Box w/All Accessories
- 2x 4x5 Panavision Modular Matte Boxes w/All Accessories
- 1x 4x5 ARRI LMB 4x5 Pro Set Matte Boxes w/All Accessories
- 1x LMB-6 6x6 Clip-On Matte Box w/All Accessories

FILTERS

- 1x Each 4x5 Filters True NDS 3,6,9,1.2,1.5,1.8,2.1, 2.4
- 2x 4x5 Filters 85
- 1x Each 4x5 Filters True Net Black 1, True Net Grey 1, Black Satin ½, Black Glimmer

Combo Diffusion, Radiant Soft ½, 1, 2, Warm Classic Soft 1/4, Warm Classic Soft 1/8

- 1x Each 6x6 Filters Mitomo True NDS, 3,6,9,1.2, 1.5, 1.8, 2.1, Rota Polarizer, True Pola, Clear, SEG 3, 6, 9, HEG 3, 6, 9, 85 Filter, ½ Black Satin
- 2x Each Sets of 85NDS
- 2x Panavision Net Diffusion Sets
- 1x 4x5 Rota Polarizer
- 2x Each 4x5 True Pola, Clear
- 2x 138mm Polas
- 1x Each 4x5 Filters Mitomo True NDS 3,6,9,1.2,1.5,1.8,2.1,
- 1x 4x5 Rota Polarizer
- 1x Each 4x5 Filters True Net Black 1, True Net Grey 1, Black Satin ½, Radiant Soft ½, 1, 2, Warm Classic Soft 1/4, Soft Net 1, Soft Net 2, Black Magic 1/4
- 1x Tiffen Variable ND

CAMERA SUPPORT

- 1x Panavision Geared Head
- 1x Hi-Hat
- 1x Lo-Hat
- 1x Spider Grips
- 2x OConnor Head 2575D
- 1x Cartoni Lambda Head
- 1x O'Connor 100
- 1x Tango Head II

- 1x Standard Legs
- 1x Baby Legs
- 1x Hi-Hats
- 1x Lo-Hats
- 1x Spider Grips
- 3x Holzer Shoulder Pad
- 1x Easy Rig Cinema Vario 5
- 1x Cinesaddle
- 1x Matthews Rocker Plate
- 1x Rolling Spreaders
- 1x Sneaker Butt Dolly Complete Set
- 1x Cinemilled Fig Rig
- 1x OConnor Head 2575D
- 1x OConnor 100
- 1x Weaver Steadman
- 1x Ronford Standard Legs
- 1x Ronford Baby Legs
- 1x Easy Rig Cinema Vario 5
- 1x Tiffen Steadimate
- 1x Large Cinesaddle
- 1x Small Cinesaddle
- 1x Betz Wave

ADDITIONAL ITEMS

- 2x Preston FIZ MDR 3 w/ Single Channel (Each Kit w/ 3x Heden Motors)
- 2x Preston Light Ranger 2 w/ All AKS
- 2x Cinematography electronics CineTape
- 2x Focus Bugs
- 2x Denecke SB-T Time Code Sync Boxes



- 1x Cine-Tape
- 3x Panavision Top Handle Complete Set
- 3x Panavision Red Monstro Back
- 3x Panavision Red EVF Mounts
- 3x Panavision General Hot Swap Gold Mount Pass Through Backs w/ 4 Pin 12 V Hot Swappable Power
- 3x Each Sliding Base Dove Tail Plates 12" & 18"
- 3x Panavision RBQ Plates
- 3x Sets of 19mm Rods: 9", 12", 18", 24"
- 3x Sets of 15mm Rods: 3", 4", 6", 9"

BATTERIES

- 16x Anton Bauer 14.4/28V VCLX Block Batteries w/ 6x VCLX Chargers
- 16x Switronix 150 WH Batteries Gold Mount w/ 4x Quad Simultaneous Chargers
- 3x V-Mount to Gold Mount Adaptors
- 3x Gold Mount to V-Mount Adaptors
- 3x Gold Mount to 4-Pin Power Adaptors
- 1x Battery Belt
- 16x Switronix Nano 98 WH Batteries w/ 2x Quad Chargers
- 1x Battery Belt
- 3x Hot Swap Adaptors
- 10x Canon LP-6 Batteries w/ 2x Chargers
- 10x Sony L Series Batteries w/ 2x Dual Chargers

VIDEO & CABLES

- 1x Teradek Link Pro
- 1x Teradek Bolt 3000 XT Complete Set w/ 1 Tx & 2 Rx
- 1x Teradek 10K Receiver
- 1x Small HD 703 Bolt Wireless Monitor
- 1x Focus Bolt Sidekick
- 1x Small HD 1303 Monitor
- 1x Small HD 503 High Bright Monitor
- 1x Small HD 702 High Bright Black Monitor
- 2x Sony 17" PVMA OLEDs w/ AB Backs
- 1x Breakaway Video Cart
- 1x Teradek Bolt 3000 XT Complete Set w/ 1 Tx & 2 Rx
- 1x Teradek 10K Receiver
- 1x Small HD 703 Bolt Wireless Monitors
- 1x Small HD 1303 Monitor
- 1x Small HD 503 High Bright Monitor
- 1x ARRI 5" Transvideo Monitor
- 1x Small HD 702 Monitor
- 10x 3' BNC s
- 10x 10' BNCs
- 10x 25' BNCs
- 10x 50' BNCs
- 10x 50' BNC 3-Wire SNAKES
- 10x BNC Barrels
- 2x AJA Video DAs w/ AB Power Cables
- 1x Panavision Quad Box w/ 4 Way Switcher
- 8x 8 Foot 4-Pin XLR 12V Power Cables
- 4x Rolling Monitor Stands

Louma 2 with RED MONSTRO 8K VV aloft, above.

GRIP EQUIPMENT

(list from Key Grip Gary Martone)

- Chapman Hybrid 4 Dolly
- Pee Wee 3 Dolly
- Aero Jib
- That Cat Sliders 2x 36"
- Ronin on a Fisher 23 arm
- Go-to default camera crane was Louma 2.
- M7 Heavy duty stabilized head
- 50' SuperTechno on Taurus base
- Drones from Monster Remotes
- Inspire 2 Drone

CAMERA CREW CREDITS

DPs: William Rexer & Timothy G. Norman

Camera Operators: Alan Mehlbrech & Matthew Pebler

ACs: Michael Burke & Michael Guthrie, Steve McBride & Vince Tuths

DIT: Luke Taylor

FUJINON Premista Production Stills from Around the World

It has been exactly a year since Fujifilm launched new Large Format Zoom lenses at NAB 2019. The name is derived from Fujinon's top-of-the line zooms, "Premier" and "Vista," as in VistaVision. Premista.

It didn't take long for the 28-100 mm T2.9 and 80-250 mm T2.9-3.5 to travel to studios and locations around the world. Lightweight and remarkably compact, the Premista zooms cover a Full Frame / VV image circle up to 46.3 mm.

The following pages comprise a photo essay of Premistas working around the world.



Paolo Sodi with the FUJINON Premista 28-100 mm on Sony VENICE in Africa. Photos above and opposite: Gabriele Coradeschi.



Italian Director / Cinematographer Paolo Sodi with the FUJINON Premista 28-100mm large format zoom on a Sony VENICE with Wooden Camera mattebox and Tilta Nucleus-M Lens Control System / Handgrips on *Qualcosa Si è Rotto*, a short film for Amref Health Africa on location in Kenya.





David Dellaria is a freelance Cinematographer living in the San Francisco Bay Area. He writes, "As CBS Sunday Morning often appreciates feature stories emphasizing nature and artful photography, the location for this shoot is a mustard field in Alexander Valley in the Sonoma County wine growing region."

"The opportunity to take advantage of the Sony FX9's larger sensor meant working with a Full Frame lens like FUJINON's new Premista zoom, which could be a game-changer. And what better backdrop to test out Sony's new S-Cinetone color profile with a variable focal (28-100mm zoom) lens setup that did not require carrying all five of my prime lenses to frame up geometric landscapes of yellow flowers set against a backdrop of vineyard post grids and shallow hillsides under sunny blue skies?"

"Not having to stop, grab my Pelican prime lens case to perform a single-handed lens rotation switch-off and reset of camera settings was a real time-saver."

"Framing for wide landscape or time lapse and then being able to reframe in a longer telephoto focal length made all my decisions easier, especially when not committed to another prime lens change based on speculation."

Additional accessories:

"Because the Sony FX9 camera has an E-mount and the FUJINON

Premista has a PL-mount, a simple Wooden Camera (or other 3rd party) PL-mount to Sony E-mount is required. Rods for a lens support system is a must, given the added weight that comes with a variable focal length full frame setup.

"Monitor: Convergent Design's 7" field portable SSD recorder, which allows for waveform, color balance and a host of other usable tools."

"Legs: Sachtler's carbon fiber Flowtech legs are hard to beat when carrying a 100mm head to handle additional weight of add-ons like monitors, dual battery systems, wireless mics, follow focus, and everything we often wish to add to our already oversized payload."

Photo: David Dellaria.





Active Camera Systems (ACS) Owner/DP Patrick Longman installs the FUJINON 28-100 Premista on an ALEXA Mini LF in a GSS Cinema Pro Gimbal. Pat commented how lightweight and compact the gimbal is in this setup with a large format camera and lens. This system is easy to take as excess baggage when traveling to locations. *Photo: Rick Gomez.*



Bill Bennett, ASC - Cinematographer



Bill Bennett commented, "This was a commercial shoot for the new 2020 Kawasaki Teryx KRX 1000. It was hot, dusty and dirty, with lots of rocks. For the camera car shots, the FUJINON 28-100mm Premista was paired with a RED MONSTRO 8K VV. The camera car and Black Unicorn Head were supplied by Chase Car Inc. There was also a Phantom 4K Flex doing all the really high speed closeups of tires, etc." *Photo: Andrew Amine.*



AJ Bleyer - Director



Director AJ Bleyer with FUJINON Premista 28-100 and Preston LR2, RED MONSTRO 8K VV supported by an OConnor 2560. AJ said, "The incredible sharpness and clarity of the Premista, Full-Frame coverage and lightweight design make it one of my favorite lenses. The large focal range gives me almost endless possibilities without needing to swap glass. It's become my go-to lens for nearly every shoot." Photo: Mo Satarzadeh, Advent Films.



Jeff McCoy - Owner, Industrial Digital



Jeff McCoy explains, "On this *Skecher* job directed by AJ Mester, our 28-100 FUJINON Premista is paired with our RED MONSTRO 8K VV shooting 8K RAW. We're using a Preston Light Ranger 2, Teradek Bolt 1000 transmitter, RED 7" LCD monitor, Anton/Bauer 150 battery, ARRI 4x5 clip-on mattebox, audio gear for scratch sound, and an OConnor 2560 fluid head on a JL Fisher 10 dolly.

"There was an ARRIMAX HMI just outside of frame, along with a few 4Ks and shiny boards and various diffusion.

"We mixed Canon primes with the Premista, since we were using 4 multiple cameras all over the golf course. The Premista was the obvious choice on the dolly, since it allowed us to frame quickly. We also did a really cool smash zoom shot, but unfortunately it didn't make the final cut."

DP: Jeff McCoy (in photo at left)

1st AC: Robert Royds

Director: AJ Mester

Production Co: Skechers

Location: Classic Golf Club in Palm Desert

Client: Skechers

Product: Skechers Go Golf



Jeff McCoy continues, "This is our 28-100 FUJINON Premista and RED MONSTRO 8K VV on a Toyota shoot.

"We used the Premista for several reasons. First, because it covers the full sensor in 8K on MONSTRO.

Second, because we had to shoot six commercials in one day, each with two different looks, so we needed to work quickly and avoid using primes.

Third, the beautiful look of this lens worked in all of our scenarios, even at night while maintaining sharp focus and minimal distortion at the edges of frame."

1st AD: Ryan Lippert (in the photo)

DP: Vic Huber

1st AC: Jeff McCoy

Director: Marc Ryan

Production Co: Third Story Films

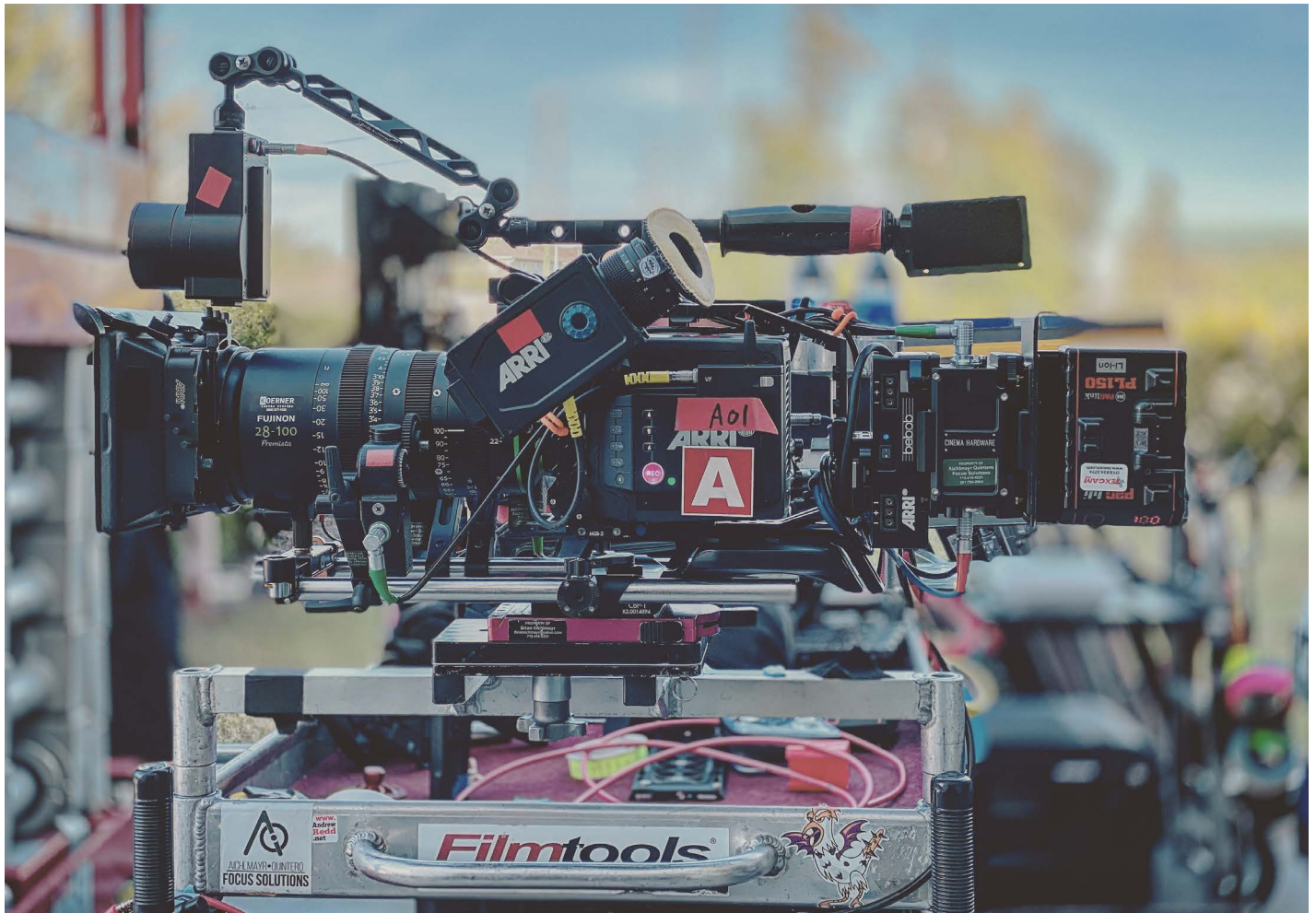
Location: Golden Oak Ranch

Client: Toyota

Products: Camry Hybrid, RAV4 Hybrid, Highlander Hybrid, AWD Prius, Corolla Hybrid, AWD Sienna

Photos: Jeff McCoy, Industrial Digital

Corey Koninieć - Cinematographer / Motion State Co-Owner



Koerner Camera's FUJINON Premista 28-100 prepped on the ARRI ALEXA Mini LF by 1st AC Brian Aichlmayr for a Summer Olympics commercial. Preston LR2, ARRI Mattebox, Bebob Power Splitting Box and PAG batteries. DP: Corey Koninieć, Co-Owner of Motion State. Below, FUJINON Premista 28-100 on a Cinemoves 23' Scorpio Telescopic Crane. *Photos: Corey Koninieć*



Mohd Abudin Abdullah, Focus Puller at Work in Malaysia



The focuspulleratwork.com community is an engaging forum for Focus Pullers around the world. Interesting topics include “10 Best Things in your Toolbag” and “10 Things for Desert Shoots” and “10 Questions about You.” There is also a group interview with 10 questions and every member is invited to share their personal story. Here is the interview from Malaysian Focus Puller Mohd Abudin Abdullah. If you want to share your story with the community, you can do so on the forum. (www.focuspulleratwork.com/forum/general-topics-16/question/community-interview-1230)

Clemens Hönig: How did you become a Focus Puller?

Mohd Abudin Abdullah: My name is Abudin. Friends call me Din. I am based in Malaysia. I started as a Focus Puller by accident, to be honest.

I was a 2nd AC on a feature job a few years back. I think it was 2011. At the time, not even once had I ever pulled focus—not even for an insert. So one fine evening, we were at the end of a 14-hour day and the 1st AC became ill. We were down to the last

hour of the day and were on a tight schedule. The Director, DP and Camera Operator were discussing what to do. You can probably guess what happened next.

Next, I was on the focus knob for the first time, wondering what I was going to do with an 85mm lens at T2 on an Arriflex 435 with the actors at 15 feet away from camera. I was drenched with sweat as if I had just gotten out of the swimming pool. The AD called out, “Roll camera, and action,” and eventually, “Cut.” I’m pretty sure I was holding my breath throughout the entire take. After two more takes, the AD asked if they were OK. I said “Yes” and he said “Check the gate.” We wrapped. The rushes came back two days later and they were fine. That was how it all began.

My take-away from that experience is a belief in the necessity for anyone aspiring to become a Focus Puller to understand the whole process, not just technically, but mentally.

What do you love most about your job ?

I love the challenges. Sometimes it’s something you’ve never seen

Mohd Abudin Abdullah, Focus Puller at Work in Malaysia



Production: SKOP Productions
Project Title: *KL GANGSTER 2*

Director: Syamsul Yusof
DP: Azami Alias

or experienced before. I always like to treat every situation as if it's the first time. I try to bring the same camera team with me, if possible. I strongly believe that our 2nd AC contributes at least 60%, and often more, to the success rate of my focus pulling.

Of course, because we've become close friends over the years, every job we got on is an adventure.

From whom have you learned the most and why?

In terms of focus pulling over the years, I've picked up a lot here and there. Most of it came from observing how people work. How an actor moves and knowing the story really helps to anticipate moves. Watching a lot of movies helps as well. My father, who is a DP, was formerly a Focus Puller. But he never once shared his secrets to focus pulling. If he hired me as a Focus Puller, he would never give me any pointers. All he did was to grunt and roll his eyes if I missed a mark. But that really became a driving force for me to find a way that worked. And I wouldn't be who I am today if not for him.

What are your other passions to counterbalance focus pulling?

I was a photographer before I got into the film industry. I continue to shoot stills, but just as a hobby now. I play music and also write poetry. But I am an aspiring DP.

How do you keep up your spirits between jobs? And now, in this time of coronavirus.

I consider time off from work a blessing. The pandemic is a terrible misfortune but it is also a time to reflect and learn more about what's around you and about yourself as a person.

What can we in the industry learn from the current situation?

Be more forgiving. We're not self sufficient. We're depending on everyone to do their part.

What personal experience would you like to share, at this very moment, regarding spirit?

Roughly 4 years ago, in Malaysia, we were hit by the news of an embezzlement of funds high up in the government. A heavy toll was put upon each Malaysian. It affected the way we spent our money, our wages and even the number of jobs in a year. There were more filmmakers in Malaysia than there were jobs. A handful of my friends in the industry had to switch careers because of that. I stayed. I could have followed them but I didn't.

I didn't work my way up the ladder just to be taken down by temptation. My wife supports what I do. She understands how much my work means. To sum it up, as long as you're not going through it alone, you'll do fine. But if you are, know that it's a choice you made.

What is your SSSP (soft-skill super power) that makes you a Focus Puller ?

I'm told that I have timed my focus well. Some DPs and Directors have mentioned how they enjoyed listening to my insights when it comes to focus pulling. To them, there is a bit of philosophy behind what we do and what shows up on screen in focus pulling. What we do is technical. But, if applied well enough, it becomes a story in itself.

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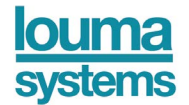
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