Jon Fauer's www.fdtimes.com October 2010 Special Report

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A Cinematographer's Tour of ARRI ALEXA

from Concept through Construction

ARRI ALEXA

The words we heard most often at IBC and Cinec were, "It feels like a film camera."

ARRI ALEXA is the first high-end digital camera that looks and feels like a film camera, not a motion picture camera that acts like a video or still camera, nor a still camera that also shoots motion.

In June 2010, we wrote, "ALEXA does for digital filmmaking what previous generations of ARRIFLEX analog film cameras did to revolutionize production: lighter, smaller, faster, handheld. ARRI ALEXA clearly demonstrates the thoughtful path taken by a long-established motion picture camera manufacturer into brave new hybrid film and digital worlds. 'Missing link' may be a popular evolutionary term, but there's little missing in this exciting new digital motion picture camera as we evolve from film to files."

The throngs of cinematographers, filmmakers and rental house personnel trying or buying ARRI ALEXAs at NAB, IBC and Cinec attested to the success of this new paradigm. Drawing on a long heritage of motion picture cameras, with an infrastructure of film, processing, editing, grading and printing, ARRI's ALEXA is an evolutionary development from a company with intimate experience in the entire process.

Timing was important as well. ARRI promised to deliver the first ALEXA models in June. They did. ALEXA's second sister, ALEXA Plus, was promised to debut in September. She did. This kind of punctuality inspired confidence, and the next thing you knew, customers were cajoling, pleading, whining and pushing to jump the line of orders.

Now, grizzled veterans of camera purchasing will remember that the typical turnaround time for first delivery of ARRIFLEX analog cameras was usually 18 months from the time it was first spotted under the counter at NAB or Cinec. You had to wait your turn for the camera to be built, carefully, at the rate of perhaps a dozen a month. Fast-forward to today, and they're building ALEXAs at the rate of about one every couple of hours.

Why the rave reviews and enthusiasm? Above all, image quality. ALEXA's film-like look comes from a masterful secret sauce created by ARRI's scientists. The look is very similar to what we'd expect from film: highlights don't blow out and shadow details are retained with very little noise. Colors are true and abundant; skin tones are gorgeous. ALEXA handles a wide 14 stops of exposure latitude, with a base sensitivity of 800 EI. The exposure index is adjustable from 160 to 1600 EI.

ARRI ALEXA rests comfortably on your shoulder like an ARRIFLEX 235 or 416, and is equally ergonomic on a head or Steadicam. ALEXA weights about the same as an ARRIFLEX 435.

Controls are all in the right places, down to the Camera-Left Start-Stop button. (It's red now, instead of green, and says "REC" instead of "RUN.")

ARRI ALEXA is, dare I say it, the first high-end digital DIT-less camera. The control panel is familiar to anyone who has used a recent ARRIFLEX or ARRICAM. You don't have to drill down through layers of complex menus. An elegantly intuitive, Apple-like interface guides you through the essential choices. Test drive the menu system at your leisure with a simple, online demo: www.arridigital.com/technical/simulator

There's something else. ALEXA is built like an ARRI. Which means it's really robust, incredibly well made, and solid as a...well, solid as an ARRI. Join us on the next pages, as we are invited to tour the development and manufacturing facilities at 89 Türkenstrasse in Munich. This is where all other ARRIFLEX cameras have been manufactured. ALEXAs are made in the same place, by many of the same familiar faces. Seven years ago we did a similar report on ARRICAM construction. Our ALEXA tour was like a reunion. Camera movements may have been replaced by electronic sensors, and sprocket rollers have made way for miniature cooling ducts. But the attention to quality, detail, and careful construction remains the same.

From IBC 2009 to IBC 2010

IBC, Amsterdam, September 10, 2009: Three new prototype ARRI digital cameras are announced, promising to be lighter, smaller, faster, cheaper. Code-named ALEXA, three models are planned: EV, EV-Plus, and OV-Plus. Left to round: ARRI (USA) Inc CEO Glenn Kennel; Jon Fauer; Product Manager Marc Shipman-Mueller.

AFC Micro Salon, Paris, February 13, 2010: The first working prototype of ARRI's ALEXA is shown at the AFC Micro Salon in Paris. Stephan Schenk, General Manager of the Camera Business Unit, introduces ALEXA to a packed auditorium in the Renoir Salon of La Fémis.

DGA, April 6, 2010: Advanced prototypes are introduced to the Hollywood production community right before NAB. Shoot>Edit is enabled with onboard SxS PRO Memory Cards, ProRes and uncompressed raw output. Another big surprise: two Alura zooms co-developed by ARRI and FUJINON. A week later, ALEXA is shown at NAB. ARRI is inundated with orders. Above: Haskell Wexler, ASC.

Cine Gear, June 2010: The first production models of ALEXA have been delivered. "Anonymous" has already wrapped, shot since March 2010 with the first two working prototype ALEXAs by cinematographer Anna Foerster and director Roland Emmerich. Candlelit scenes are exposed at 1280 EI.

Shepperton Studios, London, June 29, 2010: Seven ALEXAs begin production on Director Martin Scorcese's "Hugo Cabret," shot in 3D stereo by Bob Richardson, ASC (left), with first assistant Gregor Tavenner (right).

IBC, Amsterdam, September 10, 2010: One year later. Several hundred ALEXA cameras have been delivered. The second sibling, ALEXA Plus is introduced at IBC. By the end of the following week at Cinec in Munich, a huge number of ALEXAs have been ordered.

Origins of ALEXA: an Interview with Franz Kraus

Franz Kraus, ARRI Managing Director

Jon Fauer: The ARRI ALEXA already appears to be one of the most successful cameras ARRI ever built. It didn't evolve out of thin air. Please tell us how it came about.

Franz Kraus: The same group that designed the ARRISCAN and the D-20/D-21 cameras also designed ALEXA. Dr. Achim Oehler, who was head of the scanner project, took over the ALEXA project. So we had already collected the know-how in how images would need to look, and what image processing would have to be done to have film-like images coming out of digital capture. This also applied to manufacturing in the transition from the analog technology to digital. It may seem like a drastic change, but it is not that much. We had experience with film and digital cameras—the whole user interface, wireless control, micro controllers, CMOS sensors, FPGA based image processing—we had done that before. The new thing was to pull the image processing from the scanner, to reduce that significantly in size and power consumption, and to integrate it in an electronic box that could be carried around.

And it's not so alien or foreign to anyone. This is a camera that any analog filmmaker can relate to.

We really tried to use as much as possible from the 235 and 416, and we learned a lot when we designed this. Why should digital capture have a totally different user interface? Shooting takes place not for technical reasons but for creative ones.

However, ALEXA has the familiar ARRI feel and quality.

Actually, when we started to test the first prototypes of the ALEXA, we went back to where we started with the ARRICAM. With the ARRICAM, we put a very rigorous quality control system in place because many things had been new for us. The demand was very high, and we wanted to provide the very best camera to the industry. We installed extreme temperature and shaking tests. We shook the cameras at high acceleration rates. Not all the ARRICAMs passed, nor all the ALEXAs. They go back, parts are exchanged, and then the same testing happens again. Each ALEXA undergoes a burn-in phase, undergoes the shake tests. Part of why we feel rather confident in shipping products that can be used immediately on production is because we are taking as much care as possible in-house to deliver something that won't break down in rough environments.

When did this project first start? When was the first inkling that you knew you were going to do this?

We knew when we started the D-20 and D-21 that we would learn as much as possible. The D-20 was designed in a very modular way, with a housing much larger than it could have been. This was so we could include many things one would not use for regular shoots, but were, at that time, considered somewhat crazy: to have several corrected HD outputs and raw capabilities, optical mirror shutter, and optical viewfinder. We wanted to evaluate as much as possible whether the D-20 and D-21 would deliver images that could inter-cut with film, and provide a filmic image.

The ALEXA project really started when we put some ongoing development resources into making the D-20 become the D-21. We collected ideas on what the next generation camera should be, and how to manufacture it in quantity. We learned about the requirements of what people would expect from Raw Data, what people would expect from seeing a decent REC 709 image, but at the same time recording log C. After evaluating the advances in technology on the sensor side, we started on the design of the CMOS sensor about 3 ½ years ago, as the major building block. We also worked on the analog front-end, because it's a rather complex sensor. When we started, we wanted to have the best image possible for a 2K/HD workflow.

With the DI systems that we started many years ago, we always had been 4K compatible. But we also learned that 4K was unfortunately not really used often in the film industry, for many reasons. In print distribution, there's very little that is left and as we know, in digital distribution, there is not yet a common practice to bring 4K to the screen, not even to a 4K projector if you cross off the data rates which are a part of the DCI recommendations as they are today.

There is not, unfortunately, a benefit in going for 4K DI today and for the next few years. Seeing how easy it was, and with rather little extra expense, 4K was mostly neglected in digital intermediates. That got us to thinking: "why should people think differently about capture?"

Sure, it's always nice to have reserves, to have over-sampling. But, the question was, "how much do you need to trade in?"

And we felt for the time being that we'd rather go for wide dynamic range, high sensitivity, very good contrast, and accurate color reproduction, rather than go for high resolution, which unfortunately today nobody is able to enjoy.

Beautiful filmic-looking images exceeding 2K don't come for free. We can enjoy them with today's technology both in analog distribution or digital distribution, unfortunately with the limits mentioned. That was the reason why we concentrated on making the best possible camera for 2K DI and for HD workflow.

Is the sensor technology related to the scanner?

No, it's the next generation. The ARRISCAN has the same sensor technology that the D-20 and D-21 had. The scanner was released 2003. What we have done with the ALEXA, from the design and the foundry technology, wasn't possible then.

ALEXA was pretty much your vision. How do you go from a vision, an idea, to actually making it possible to the point where you have the sensors designed to where production begins—down to intricate details like even custom-designing the workbenches?

You need to have people who think in the same way. It's probably as much a sales effort selling products to the end customer as selling ideas to your team members, be it marketing or be it R&D. We have a team with a long history at ARRI. Marc Shipman-Mueller, on the product management side, worked on the ARRILASER as his first job when he came to Germany. He was there for the very first digital product ARRI ever produced. Walter Trauninger, head of the ARRICAM team, was responsible for the ALEXA manufacturing side. We wanted to have a product that was affordable and robust.

We knew that people expected ARRI to produce an innovative, dependable, rugged "best in class" camera that would live up to the reputation of our film cameras—to be used around the world, not just in selected production environments. Credit must also go to the ARRI owners, because they believed in ALEXA and spent a lot of money on development.

This idea was hatching in your mind a long time. I remember, it was exactly ten years ago. You and I were at NAB with the latest little consumer digital still cameras. You held it up, and said this is the future. I asked, "how long?" You said, "2010." Your prediction was correct ten years ago.

I think the technology roadmaps are there. An engineer can read that and know what will happen with consumer electronics and how much can become a tool for professional media production. Nobody should be surprised by that. One needs to put one's own strategy on it—not being part of consumer manufacturing.

Based on the success of ALEXA, we are very confident that we will have technology for the next generations of products, some of which will be different from what will come out of consumer electronics. I respect what they are capable of, whether it's backside illumination, ASICs, and so on. But they have approaches that must accommodate the needs of a very diverse group of users and hit rather low price points. That is where we need to get started in differentiating key technologies and features. Sometimes, you have to forego offering too many functions, but instead offer just the right ones in a well-conceived and reliable way.

I think the other thing you have to offer is service.

It's also a concept we tested with the D-20 and D-21. The concept we have is to carry as much of the positive attributes from the analog area to the digital world. Yes, we are expensive: that is probably not felt to be a positive attribute. But the investment is secured for many years. The difficulty comes with the electronic design.

We can't change Moore's Law; we need to watch very carefully to benefit from Moore's Law. What can be done is to work in a modular fashion and in an electronics architecture topology, where we know we are going to have certain elements probably exchanged in two years. Our belief with the sensor is that it isn't following Moore's Law as faithfully because the demands are driven by other industries. The large common sensors probably will remain with a quality you can provide if you have put enough headroom; you'll need more processing. The concept we have in mind is that whoever buys an ALEXA will not be left on their own in future years. That means we need to have a service network making sure that whenever something happens, we are close by to help. We will also be available to make upgrades or add modules. And that requires trained service personnel who can look after service and upgrades.

Please discuss size, weight, and cooling.

The larger D-21 did not have a fan; it was passive cooling that takes space. We knew we would not get along with this concept with a more compact camera. It needed to become more compact, this was very obvious. So we decided to go with encapsulated electronics and a heat pipe system. That comes at a cost. It adds price, it adds weight, it adds power consumption. So it doesn't, unfortunately, come for free. But ultimately I am convinced it will be part of why ALEXA is so robust. We control the temperature of both the sensor and the image processing electronics. In the regular world, you would not need this. But in extremes, if you don't do it, probably the images won't be consistent. We decided which ingredients each and every camera with the ARRI label needs to have. Those are elements where we think we differentiate ourselves from others.

Is the sensor a modular part that can be changed in the future?

I think if it had been so easy, we would have an ALEXA sensor in the D-21. We would love to have this, but there are too many changes. We would really have to build completely new electronics into an old housing, which does not make sense.

Where do you see the viewfinder going: optical or electronic?

Without any question, high end cinematographers are asking for optical viewfinders—especially the ones who operate their own camera. They grew up knowing exactly what to expect when looking into an optical finder. It won't be large numbers, but it's a larger number than you would expect. We are close to a decision. We are reviewing it now.

I vote for it.

It might be likely. But it's not going to be a great business model for us. It is more like doing a service and getting the appreciation from cinematographers who go from analog to digital, to support them. Obviously, we can't make money on that approach, and so that difficulty will be target pricing and the numbers of cameras we can sell for that.

What about film? What do you see as the role of film, or high end productions? What's the turning point?

I think there are very many variables. If the motion picture industry has learned from the professional still photo industry, then probably the industry will be more intelligent, not dropping service, not over-pricing.

Today, if you shoot a picture that is not 3D or relying heavily on CGI, probably the best thing is still film. It is future-proof. There are no archive issues. You can take it to any resolution. There are great DI tools. It's commonplace throughout the world. There's an established worldwide 4K capable workflow. So there is headroom. Why throw that away?

There are other productions, 3D features, TV drama or features with lots of CGI, where digital capture makes a lot of sense. It is interesting that we also see a small Renaissance of film (2 perf and Super 16) for TV programs in some countries because of the film look. Film has a unique look, and it probably doesn't make sense to work very hard to make digital look like film when you can simply shoot film instead.

How did you convert an entire area of your analog camera factory to digital production—almost overnight?

We changed many things because we rely on many components. If we want to assure quality, we need to have extensive testing and certification. So, we invested a lot in that. In selecting very good suppliers, as we have with digital high-end products, we knew them from the ARRILASER, the scanner, the HD-IVS—all with components that are very compact. We knew who would be the right partners. I'm happy to say that the majority of partners are in Germany, and I'm proud to say it's a German-made camera. People may think, "Well, they have film cameras, how can it be that they have a successful digital camera? That's probably luck."

No, it was hard work over many years, starting with the ARRILASER. The design of the ARRILASER was started in 1995 and the product was launched in 1998. We had a great team, with very solid internal and external capabilities. Whatever we could develop from where we were to the next generation, we did. We have partners going back many, many years. They have grown as well.

What about the sensor development? How did you arrive at that? Did you start with describing the look that you wanted and then find the suppliers?

We have a great guy in our R&D team who worked more than 10 years ago with a professor from the Munich University on the design of our first Cine format CMOS sensor and successfully carried it through several revisions. Regarding CMOS sensors and the imaging front end, we learned a lot from the D20/D21 and the ARRISCAN (which uses the same sensor, but in a black and white version). From 2003 on, when the first D-20s were supplied to film projects, we sourced as much information from production as possible in order to create an organic, filmic looking image from digital capture. All that experience, combined with substantial color science from another long-standing ARRI R&D member, led to the specification, characteristics, and structure of the rather complex but extremely powerful custom ALEXA CMOS sensor and the ALEXA imaging front end and color processing. The sensor is the key component but by far not the only one.

ALEXA is a great success. How will you keep up with the demand?

We are told that's a nice problem, but I need to say it's still a problem because it coincides with an increase in demand in the IT industry. A year ago the supply was an easy one; today, we have turnaround times which have changed dramatically. And, we did not expect the large number of orders we received.

So, that's a good thing.

It is a very good thing, but now the difficulty is to make sure not to disappoint customers who need a camera today. On the other hand, we don't want to jeopardize quality. The ramp-up is only limited by the supply of some of the essential components.

Are you flexible where you can add more people to the assembly if you had to?

That is not a problem. The ARRI spirit is there, and that really helps. The younger people within ARRI all know we need to work very hard in this digital arena. We can no longer live just off analog cameras. And that is the reason for the changed mindset: the willingness to have a single flow assembly line like you would see in Japan. If this mindset had not changed, you would see work benches where they are working on one camera, one person at a time—which probably would never produce working digital cameras in the quantities needed.

Explain single flow assembly.

With single piece workflow, we assemble the camera in three production lines. One line assembles the hardware, the second uploads the software and tests basic functions in a so-called "burn-in", and the third performs in-depth quality control.

When I come back next year, you'll have rival teams competing to build the most cameras in the shortest time? They win a prize?

No, I have seen that in Japan. But that is volume production. For us, quality is top. I'd rather look for a camera where the people who build it are proud to sign their names on it. Each camera can be identified by people who put it into production, and are aware of their responsibility.

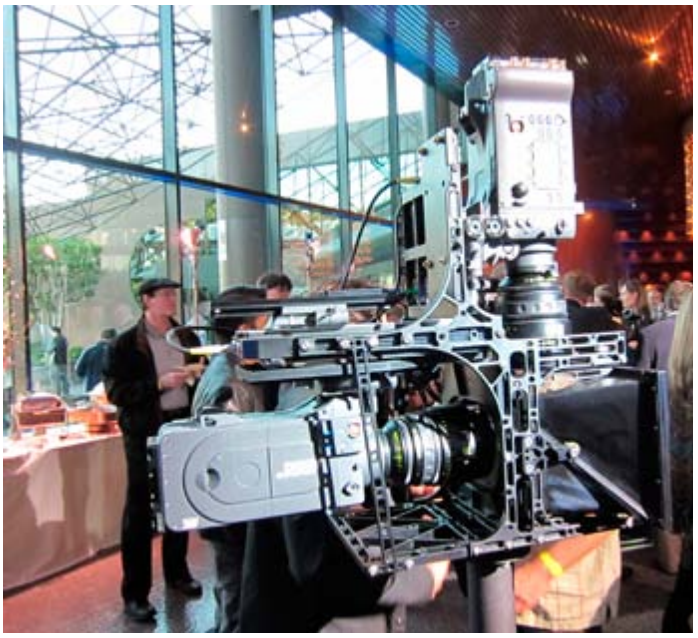
ALEXAs are built by some of the same people who were building ARRICAMs. That's very reassuring.

And there are people who had worked on the ARRILASER, the ARRISCAN, and on image processing software. It is not like converting a precision mechanical engineer to an electronic engineer. To build ALEXA cameras is not a trivial thing. You need to do things in the right order and to make sure that it works at the end. We need to have all the skill from the analog camera world combined with new talent to make this work.

In summary?

I think it is valuable to look at our DI products. Without the DI products, we would not have the D-20. Without the laser, we wouldn't have started the D-20 and the scanner. And the success of the laser was the ground-laying part of our digital camera business. If the owners had not been convinced that this risk had a good chance to become successful, maybe they would not have gone this route, and would have asked "can't we brand another product and add value in distribution?" There had been several other opportunities, but none of them would have left ARRI in the position of owning and mastering digital technology. That is probably the most important achievement of these last years, looking at the long term success of ARRI as a company. □

Accepting the Cinec 2010 award (left to right) from presenter Denny Clairmont are: Marc Shipman-Mueller, Product Manager; Dr. Achim Oehler; and Michael Cieslinski.

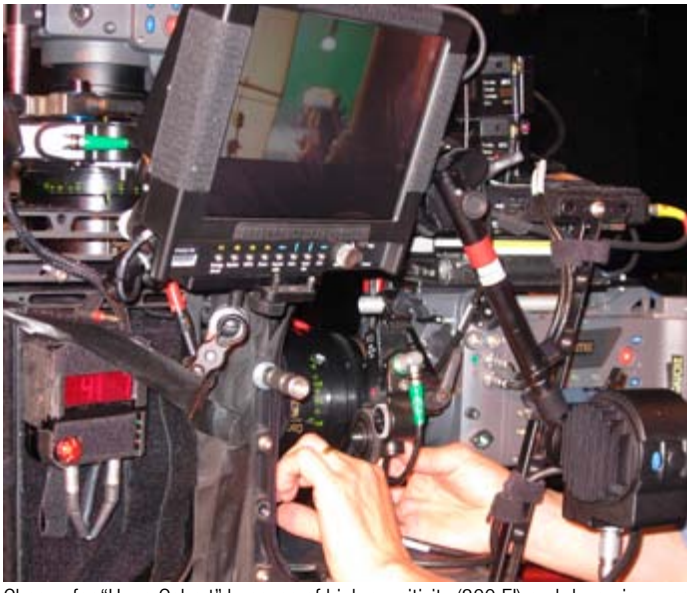


ALEXAs on 3D Rig at DGA Premiere in Hollywood, April 2010

ALEXA Plus at IBC, shown with Remote Control Unit RCU-4

Stefan Ukas-Bradley, of ARRI Burbank, with ALEXA Plus, ARRI/FUJINON Alura 18-80 mm Zoom, and Codex Recorder

Seven ALEXAs on the Martin Scorcese 3D film “Hugo Cabret.”



Chosen for “Hugo Cabret” because of high sensitivity (800 EI) and dynamic range

A Day in the Life of ALEXA Assembly

Türkenstrasse has changed. The once gritty Schwabing neighborhood is now one of the toniest in Munich. Mario's Restaurant, with its communal lunch tables, has evolved into a fancy delicacy shop. Former beer bars are now coffee bars with more varieties of espresso than ever imagined by Starbucks.

The entrance to 89 Türkenstrasse has been renovated. We enter the familiar main gate, checking in with the gentleman who surely is the industry's friendliest reception-concierge-guard (and is a helpful resource for getting directions or phoning for cabs).

The inner courtyard is a blend of styles from ARRI's ninety years in this location: stucco, glistening aluminum, stone and glass.

ARRI occupies and entire city block: Camera Sales, DI Systems Sales, Assembly and Service (ARRILASER, ARRISCAN, ARRICUBE), R&D, Film Laboratory, Movie Theater, Stages, Audio, Post, Editing, Camera Service, and Camera Assembly.

ALEXA Assembly: that's what we're here for today. Up an elevator, onto the same floors where we've been before to see previous cameras being assembled: ARRIFLEX 16SR, 35-3, 35BL, 435, 535, 235, 416, and ARRICAM.

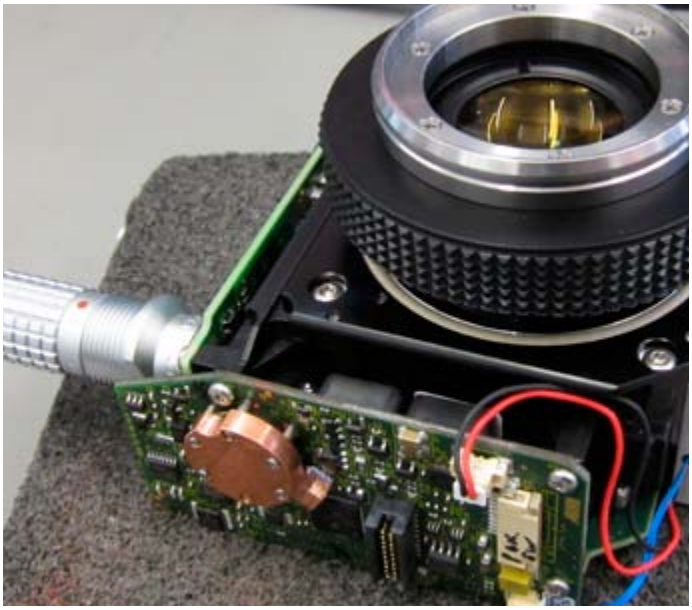
A day in the life of ARRI ALEXA assembly begins with the morning meeting for planning and discussion, attended by the heads of departments, below.

Dr. Martin Prillmann, ARRI Managing Director

Stephan Schenk, General Manager of Camera Business Unit, Sales and Marketing

Walter Trauninger, General Manager of Camera Business Unit, Production and Service—which, of course, includes ARRI ALEXA. Walter was the Project Manager of the ARRIFLEX 435 and ARRICAM.

Marc Shipman-Mueller, Product Manager of ARRI ALEXA. Marc was also Product Manager of ARRIFLEX 235, 416, Master Primes, Ultra Prime 8R and the Alura Zooms.



ALEXA Assembly Team

One hundred cameras...and counting. One hundred cameras were delivered worldwide earlier this year. This is part of the team that builds ARRI ALEXAs.

Parts Quality Control

This report is not intended as a comprehensive course on how to build or repair an ARRI ALEXA.

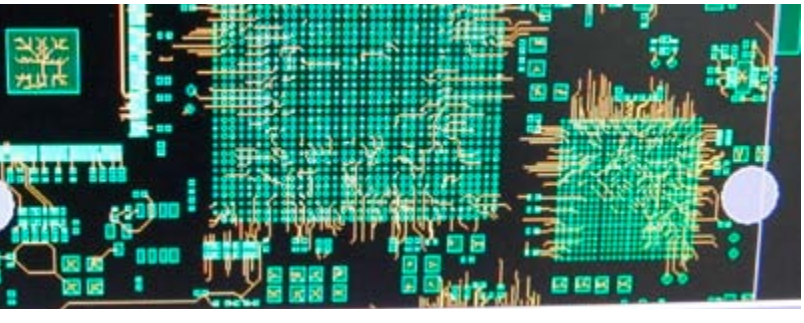
It is, instead, a tire-kicking cinematographer's guide to what is inside, and behind, an ALEXA camera.

As Walter Trauninger guided us through the assembly area, we noticed that the former heavy, rigid workbenches were gone.

In their place are ultra-modern, flexible workstations that can be individually customized by and for each worker. This is key to the modern single flow production technique that contributes to the "lean" and efficient style of manufacturing.

About 90% of the components come from nearby or are made in-house. Quality control is key to production, and all parts are rigorously tested before, during and after assembly—as we shall see.

Tested parts are placed in bins, ready for the next step.



What's the big difference between ARRIFLEX 416 assembly (besides T-shirt, above) and ALEXA? Spools of wire everywhere.

Furthermore, anyone working on electronic parts is connected with an antistatic wrist strap to antistatic mat on the workbench. This safely grounds the person working on delicate electronic components.

Service technicians working on ARRI ALEXAs will, of course, be grounded. Owner-operators, who may be tempted to look under the side panels, should be sure to be grounded first in common sense—do not attempt high-technology repairs without thorough understanding of the complexities involved. Then, and only then, proceed with caution, and with a wrist strap of your own. You can buy one for about $5 from Amazon, Radio Shack, or your favorite computer hardware store.

Printed circuit boards are tested on something that looks like a fast sewing machine—no photos here.

The board is held in place by a jig, while a testing needle rapidly checks over a hundred test points for connectivity, tolerance, soldering, resistance, capacitance, grounding, impedance, insulation, and so on. A bank of indicator lights come to life, showing that the myriad of test point measurements have passed the stringent standards.

Next, the various electronic functions are simulated. Again, over a hundred test points are rapidly measured. Some of the boards have as many as 18 layers of circuitry in a 1/2 millimeter thick wafer board.

Assembly

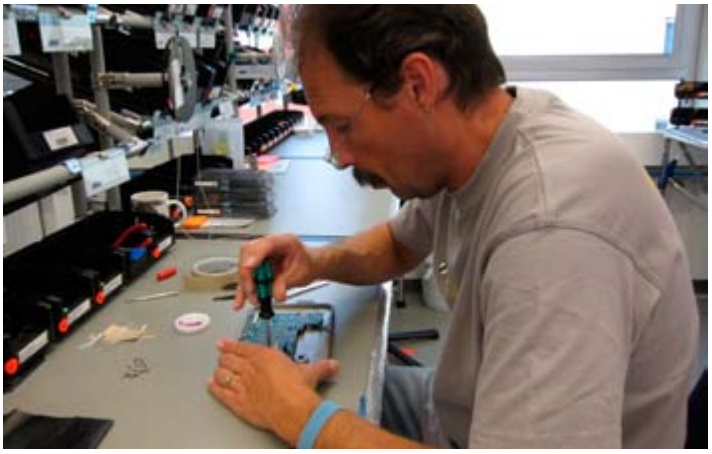
The printed circuit boards are installed in slots at the base of the camera. An innovative "radiator fin" dissipates heat from the sensor and electronics. It works just like your car. Heat is transferred to the large backbone and then to the fins at the rear of the camera. A single, large, and almost silent fan draws cooling air across the radiator. Since the electronics and sensor are sealed in a weatherproof housing, outside air contacts only the radiator fins—never the printed circuit boards or sensor.

External contaminants like dust, dirt, salt spray, pollution, particles, humidity, small insects, and rain are isolated from the internal camera components. The closest they get is the fan and the radiator.

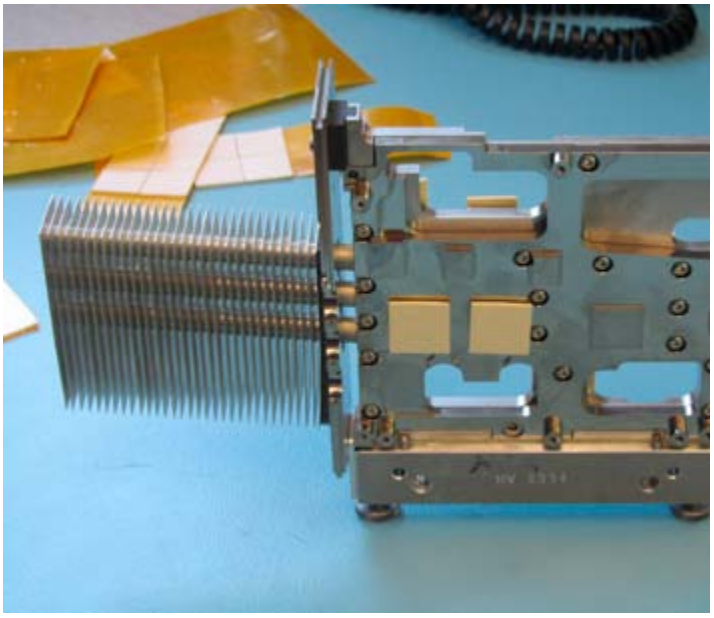
As bearings wear out, a fan can become noisier with use. Replacing an ALEXA fan is a relatively simple and inexpensive procedure for your local ARRI rental house or service center.

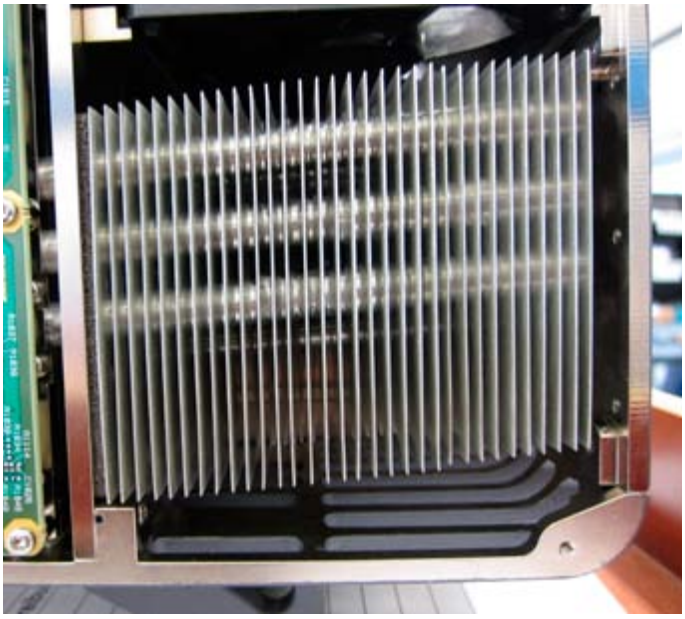
Assembly continues with installation of the cooling coil, analog to digital circuit board, system control board, and the power circuit. Then comes the signal processing, compression, picture, camera control, and HD-SDI / Accessory Circuit Boards.

The rear fan is installed, followed by the lens mount and 3.5K ALEV 3 sensor.

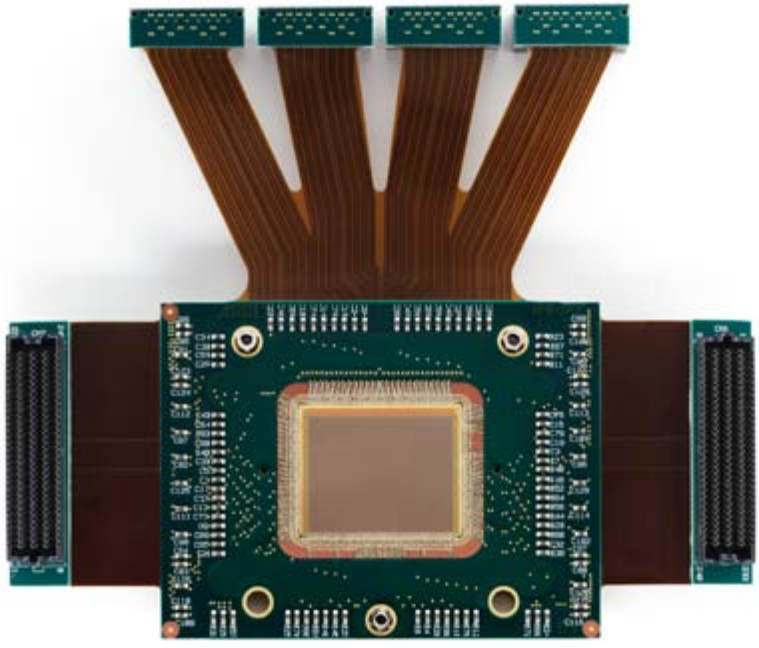


Below: backbone and radiator fins





Above: sensors arrive from the foundry on a flexible carrier, arranged like a circular tray of ice cubes. They must be cut apart, mounted, connected and protected by a low pass filter pack, below.



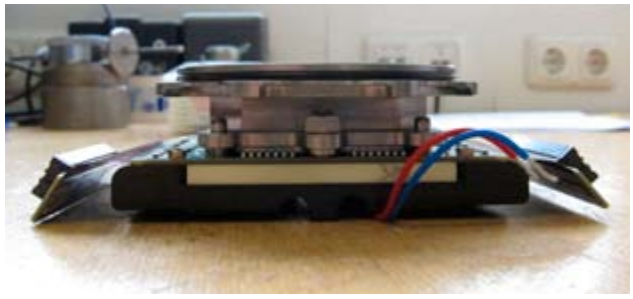
ALEXA uses a Super 35mm (16:9, 3-perf size, 25.344 x 14.256 mm) CMOS sensor. With a factory recommended setting of 800 EI, the ALEV 3 chip has a dynamic range of 14 stops, and can be rated from 160 to 1600 EI.

ALEXA's CMOS sensor and optical low pass filter are custom designed and fabricated. The 3.5K pixels oversample the image for 2K files or HD Video.

The sensor is only part of the story: imaging circuitry, software, processing algorithms, as well as proprietary components contribute to provide the filmic look, wide exposure latitude and familiar depth of field.

Specifications:

Mode	*Dimensions*	*Ratio*	*Pixels*
Recording ARRIRAW	23.76 x 13.365 mm 0.9354 x 0.5262"	16:9	2880 x 1620
Recording HD	23.76 x 13.365 mm 0.9354 x 0.5262"	16:9	2880 x 1620
Monitoring / EVF	26.136 x 14.702 mm 1.029 x 0.5788"	16:9	3168 x 1782



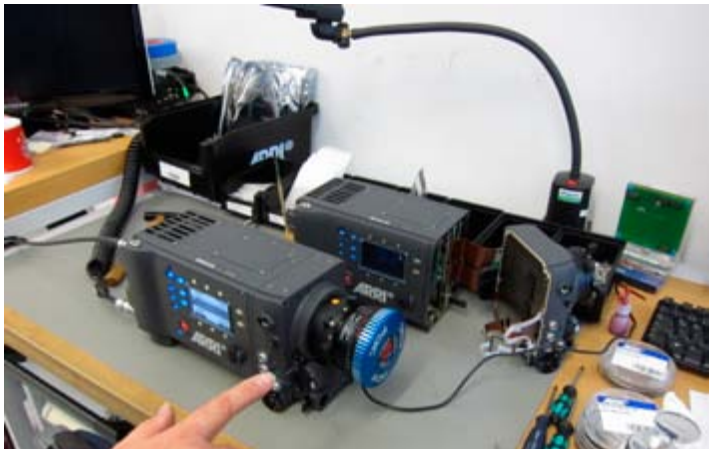
The sensor does a job similar to the emulsion on film. It gathers the light onto 8.25 micron photo receptors at the image plane. It is a thin wafer with flex cables on all sides like an octopus. It's mounted to a circuit board to keep it rigid, and a low-pass filter pack is attached. The low pass filter pack does much more than prevent aliasing. It cuts UV and IR, and is essential in keeping the sensor clean and free of dust.

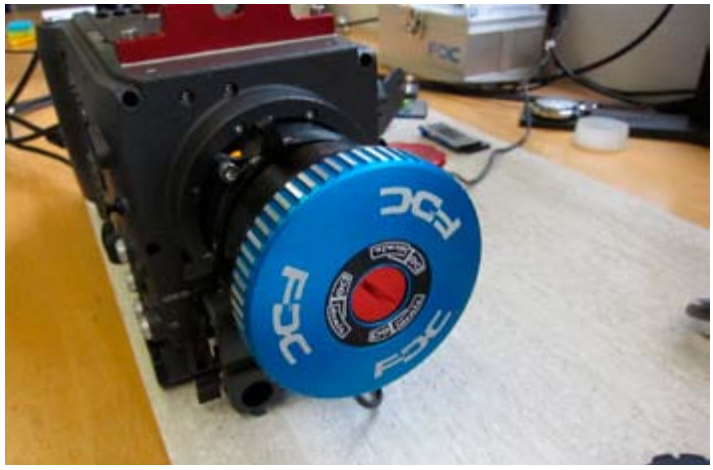
If the low-pass filter pack were at the image plane, it would be like a dreaded gel filter in the gate: any dust or smudges would show up in the photographed image. Because the low pass filter pack extends away from the image plane, contaminants are slightly out of focus. However, they are still there, visible in the finished image. Therefore, whenever you change lenses, be careful about dirt or dust entering the lens cavity. Check the sensor the way you checked the gate on film cameras: with a lighted magnifier.

While there are as many opinions on low-pass filter cleaning, I like the longtime favorite for lenses, mirror shutters and eyepieces: Pancro Lens Cleaning Fluid. (www.pancro.com)

The sensor assembly is attached directly to the rear of the lens mount assembly (instead of to the camera housing)—flange focal depth remains constant. ALEXAs come standard with PL mounts. However, because there's no mirror shutter in the ALEXA models, many varieties of flange focal depth can be accommodated: PV, Canon, Nikon, Leica, and so on.

Flange Focal Depth





The PL lens mount and sensor assembly is installed in the front casting.

Garrett Brown picked up on this and made a beeline for Dr. Prillmann and Walter Trauninger at IBC—asking whether sensor head could be separated from camera body to mount on his Steadicam Tango. It's a good idea, but until the heat dissipation issue is addressed, would certainly void warranty. You'd also have to manage the many high frequency connections between the front and back ends. Don't try this at home.

Adjustment of flange focal depth is done with the same reliable system of shims used on ARRIFLEX motion picture cameras.

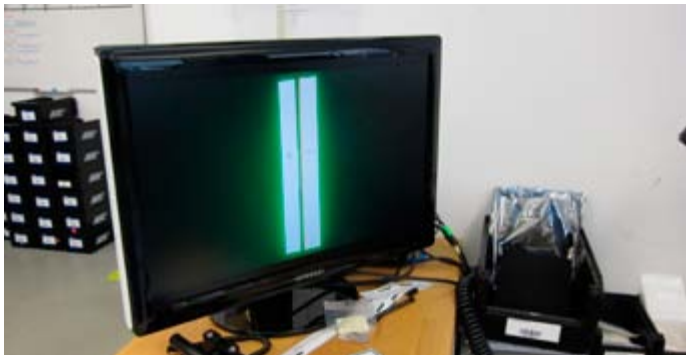
The big difference, however, is that you cannot use your trusty set of depth gauges. One poke with the pointy-tipped depth gauge probe, and you're in for a replacement low-pass filter pack.

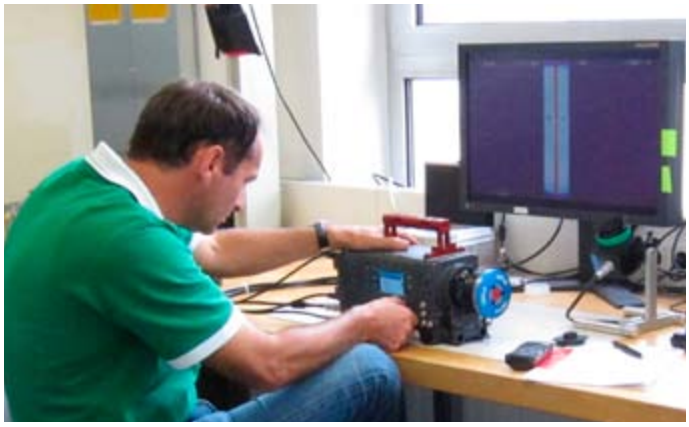
There are many ways of checking digital flange focal depth. Among other tests, ARRI uses the Denz FDC Flange Depth Controller on all cameras. This news will probably have many rental houses and owners calling Peter Denz in Ottobrunn, near Munich.

The FDC is reasonably priced, easy to use, and accurate to 1 Micron.

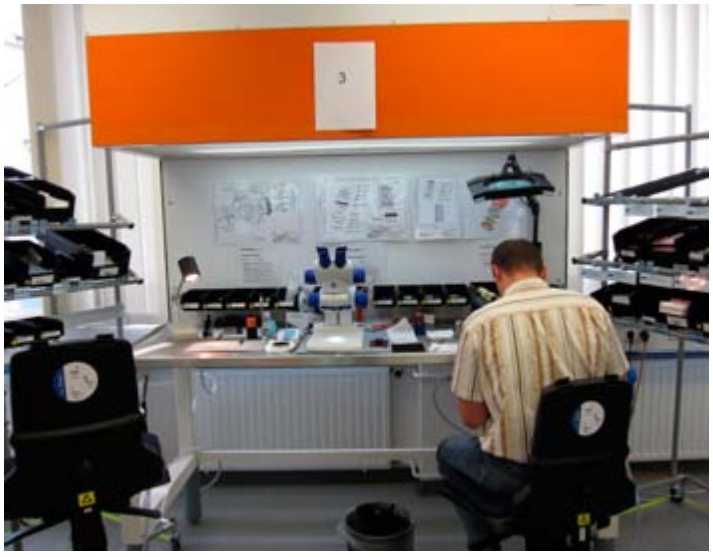
To check flange depth, you attach the FDC as you would a lens in the PL mount of ALEXA. Connect the camera to a monitor. Two lenses in the device project two vertical bars onto the CMOS chip. Rotate the FDC's barrel, as if you were focusing a lens. This adjust the focal distance. When a vertical red line appears between the two green bars, the actual measured flange focal depth is displayed on the FDC's scale. Ideally, it measures 52 mm. If not, let the shimming begin.

www.denz-deniz.com





Electronic Viewfinder



For the camera operator, the window to the scene is the finder. ALEXA's EVF-1 color electronic viewfinder uses a 1280 x 720 pixel F-LCOS micro display and temperature-stabilized ARRI LED backlight. Color and contrast remain the same at all temperatures. Adjust the eyepiece diopter by rotating the finder barrel.

The viewfinder can be mounted on the camera's left or right side (the image flips). Frame line format, color and intensity can be called up from the main menu. The electronic finder displays a line of text above and below the image area for camera status information. It also shows an additional 10% view surrounding the scene, so you can see microphones and C-stands conspiring against your perfect composition.

Push the ZOOM button on the viewfinder to magnify the image 2.25x (1 HD pixel = 1 sensor pixel) for critical focus checking.

Shake ‘n Bake

Next stop: the basement.

Every ALEXA is bolted to a shaker that sits on a giant slab of concrete. The cameras are then subjected to more vibration and G-forces than they may ever have to endure in the care of careless baggage handlers, tough teamsters, or the world’s worst camera crews.

Actually, the tests are so tough that ALEXAs have come through where some analog cameras have failed.

After the filling-rattling shake test, the cameras are alternately baked and chilled.

The next stop is back upstairs for a 24 hour burn-in. The camera is turned on overnight and allowed to heat up with limited fan cooling for an extended period of time.

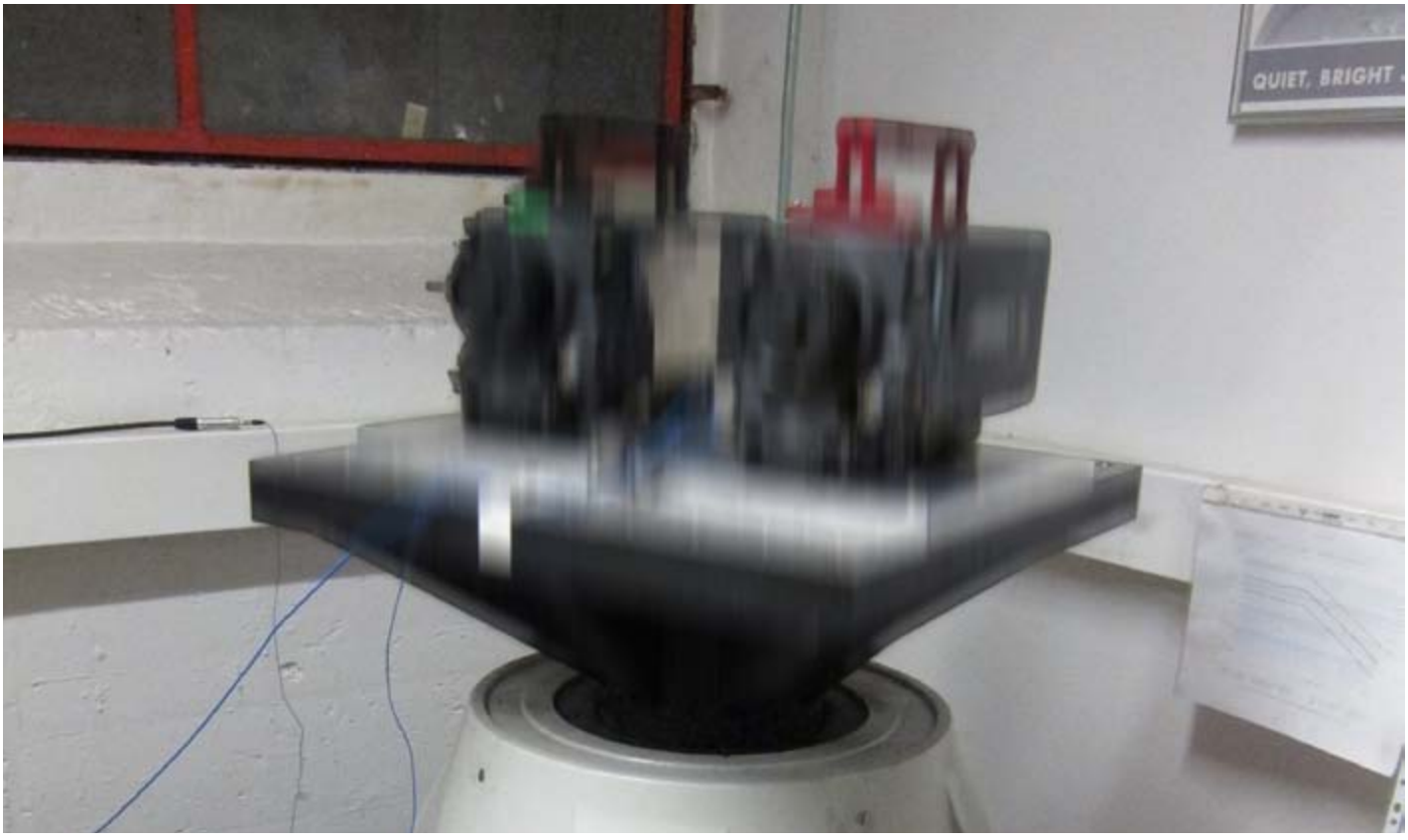
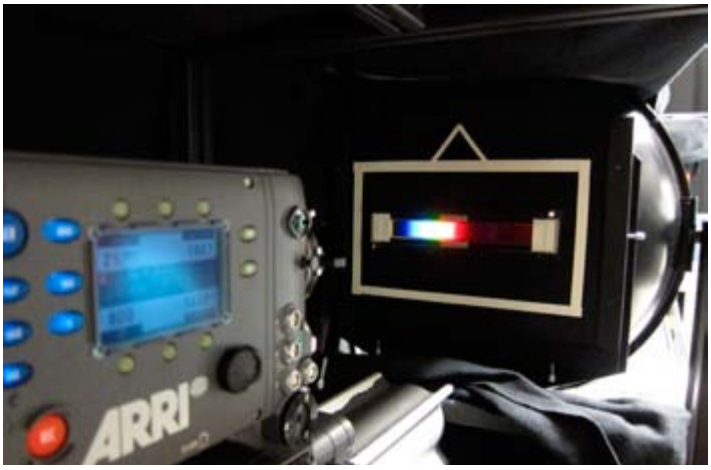


Image Testing

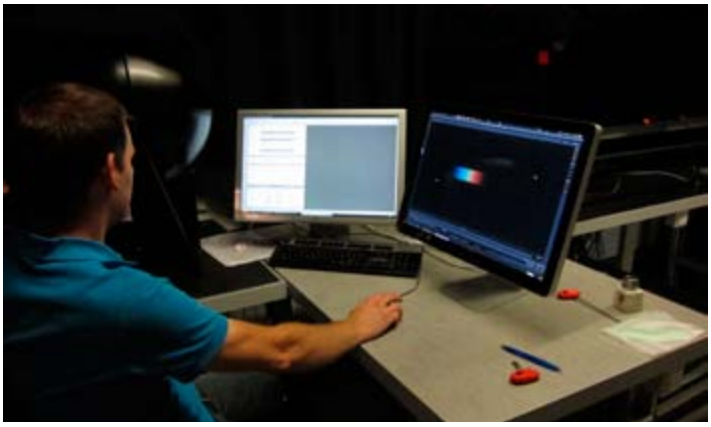


Dr. Hans Kiening, above, is Head of Central Quality Management and Image Analysis. He's familiar to many cinematographers for his lectures and tutorials on resolution (www.arri.de/camera/tutorials.html). His department develops and performs all tests concerning ALEXA's image quality, stability and reliability.

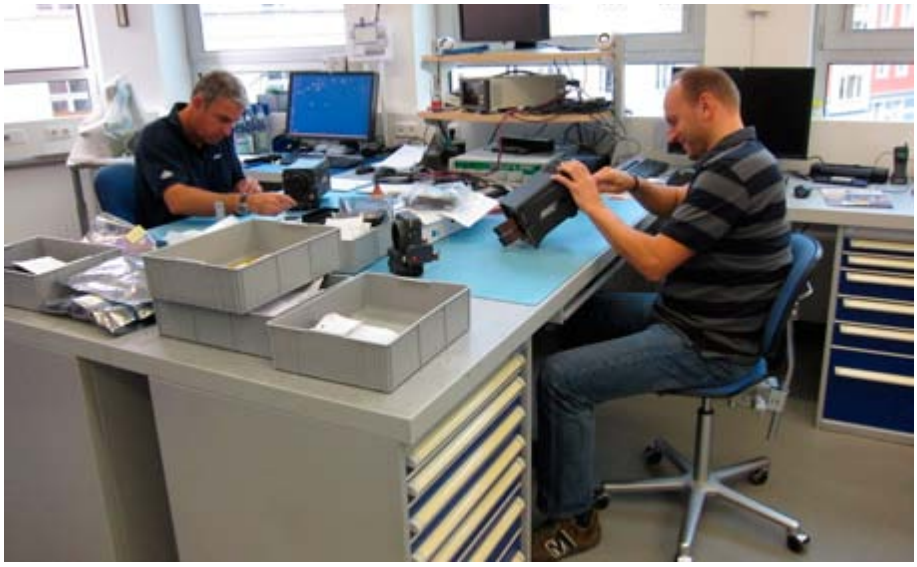
Every ALEXA is tested for image quality: MTF, dynamic range, color accuracy, and more. The test area is covered with black light-proof fabric because the camera sensor is so sensitive, even stray light from digital watches or light reflections from clothing or skin can be picked up and skew the test results.

Dynamic range and sensitivity are checked with a new, custom designed test chart. ARRI's ultra precise spectroradiometer is capable of measuring 20 f-stops, representing a dynamic range of 1,000,000:1.

The benefit of all this rigorous testing is that every ALEXA will match: multiple camera scenes will intercut seamlessly, and twin cameras on stereo 3D shoots will be identical.



Service



Below, left: Günther Zoeh, Service Manager for many years and the best name for any camera owner to know at ARRI, has announced retirement. Right: Alex Vollstaedt will be the new Service Manager.

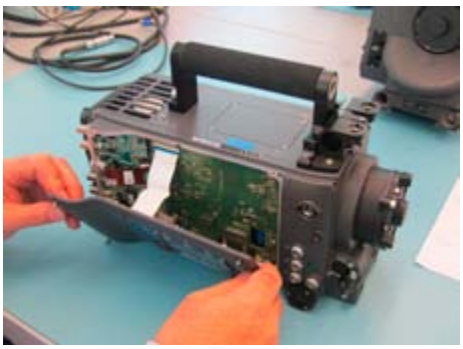
ARRI's comprehensive service department on Türkenstrasse is fully set up to handle any ALEXA problem.

Service technicians from ARRI facilities worldwide are receiving on-site training to bring authorized factory service back home.

On critical productions (and whose production is not?) it is both essential and reassuring to know there are highly skilled service technicians ready to jump in and repair whatever damage has been done or, gasp, problem that has developed.

Fedex may be great, but when you have a mega-star on your call sheet, overnight will not cut the mustard.

Think of authorized service as your on-call camera emergency room.



ALEXA: Now Shipping to a Production Near You

ARRI ALEXA Camera Specs

35 format film-style digital camera
Sensor: ALEV 3 CMOS
Frame Rate: 0.75 - 60 fps, adjustable in 1/1000 increments
Power: 11 to 34 V DC. 85 Watts.
Batteries: V-Mount or Gold Mount Anton-Bauer

Length: 12.95" (332mm) body with PL mount
Width: 6.02" (153mm) body only
Height: 6.22" (158mm) body only

Weight: 13.8 lbs (6.26 kg) body only with DTE-SxS Module
Electronic Viewfinder EVF-1 weight: 1.65 lbs (0.75 kg)
Viewfinder Mounting Bracket VMB-1 weight: 0.56 lbs (0.25 kg)
Camera Center Handle CCH-1 weight: 0.6 lbs (0.27 kg)

Standard Lens Mount: 54 mm PL mount, adjusted for Super 35.
Shutter: Electronic shutter, adjustable from 5° to 358° in 1/10° increments.

Active pixels (including surround view): 3168 x 1782
Image pixels (recorded area only): 2880 x 1620
Image size after downscale: 1920 x 1080
Recorded aperture: 23.76 x 13.365 mm
Image aperture (incl. surround view): 26.14 x 14.701 mm


ARRI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ALEXA Test Drive and Remote Control

Test drive ALEXA with ARRI's online, interactive simulator: www.arridigital.com/technical/simulator

For the full screen version, go to: www.arridigital.com/simulator/index.html

It's not an App but a fully functional, cross-platform live demo. Best viewed with iPad, because the touch screen works and you can twirl the rotary dial. For easy access: when viewing the full screen version on an iPad, tap the "+" symbol in Safari's top command bar, and choose "Add to Home Screen".

The control panel is familiar to anyone who has used a recent ARRIFLEX or ARRICAM. You don't have to drill down through layers of complex menus. An elegantly intuitive, Apple-like interface guides you through the essential choices. Push the green HOME button for Exposure Index, Frames Per Second, Shutter Angle, and Color Temperature.

Push the blue MENU button for other chores: Recording Format, Gamma, Frames lines, things like that.

The Remote Control Unit RCU-4 (left) replicates the main display and keypad functions of the camera right side. Attach it by cable to bring all controls to the left, "smart side" of the camera.

This report was written and photographed by Jon Fauer and Oli Laperal

For further information and contacts, visit
www.arri.com