ARRIFLEX D-20

ARRI

A FILM STYLE DIGITAL CAMERA

Over the last century cinematographers, innovators and equipment manufacturers have created a set of sophisticated tools for visual storytelling. At the heart of these tools is a 35 mm film camera with certain characteristics, including the size of the aperture, a large variety of lenses, a bright optical viewfinder, the ability to run at variable speeds, simple to use controls, robust and ergonomic construction and an extensive array of specialized accessories. Video cameras, on the other hand, have been based on the 2/3“ chip standard and have been designed for Electronic News Gathering, making them less than ideal for narrative film making.

The ARRI Group, a world wide supplier of the highest quality motion picture film equipment since 1917, has introduced a camera concept combining the handling, functionality and creative options of film cameras with the immediacy of digital cameras, making it ideal for TV oriented applications where turn-around time and costs are key issues.

FROM CONCEPT TO REALITY: THE ARRIFLEX D-20

At IBC 2003, ARRI presented the D-20 concept, which has received enthusiastic praise from cinematographers and rental houses alike. Starting in the Fall of 2004, ARRI will place D-20 pre-production units into the field for trial productions to further fine tune the D-20 to the needs and desires of cinematographers and producers. These cameras will be made available through ARRI rental houses to selected productions that are interested in experimenting with innovative workflows and are eager to make use of a modern film style high definition camera.


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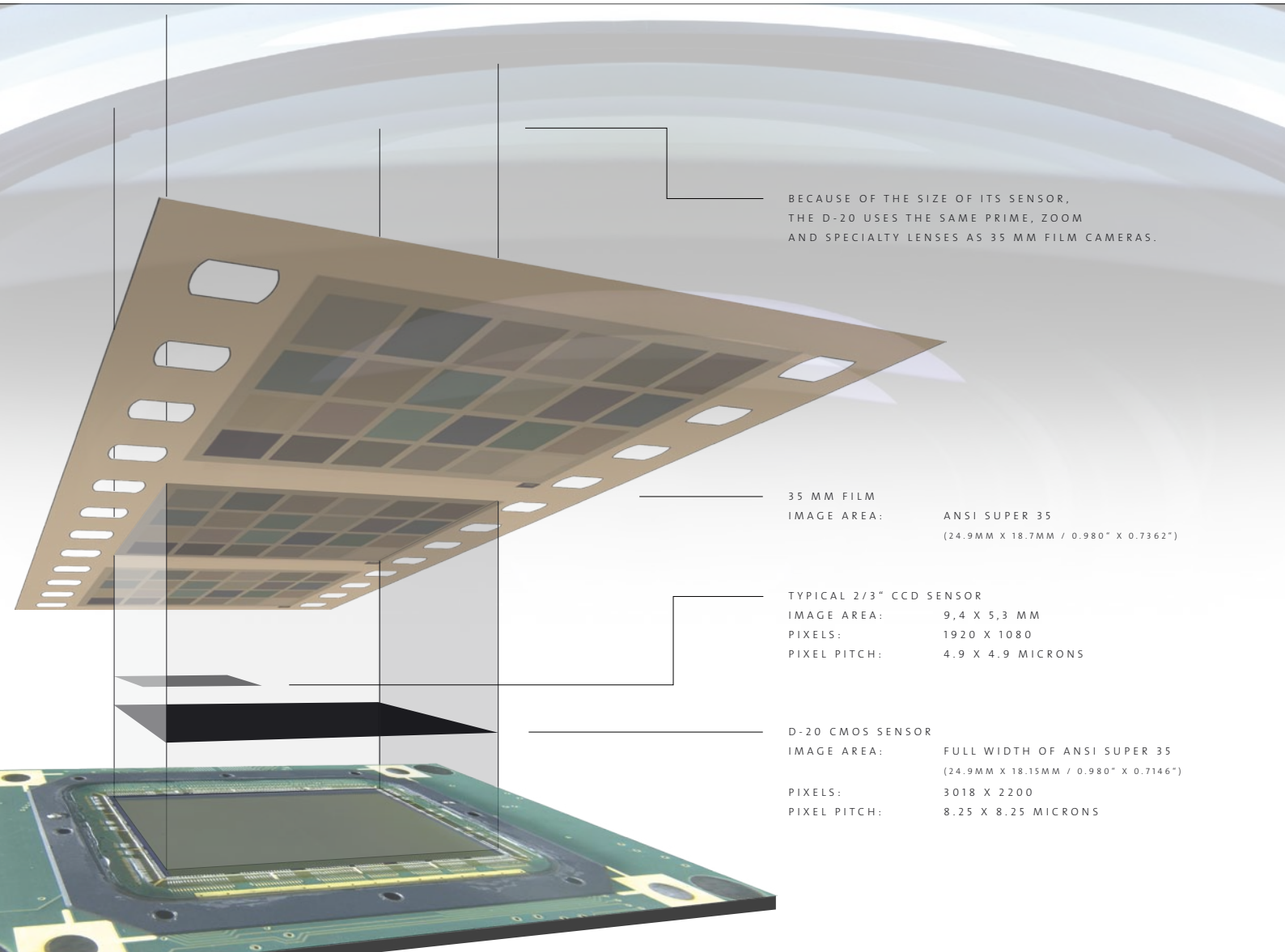
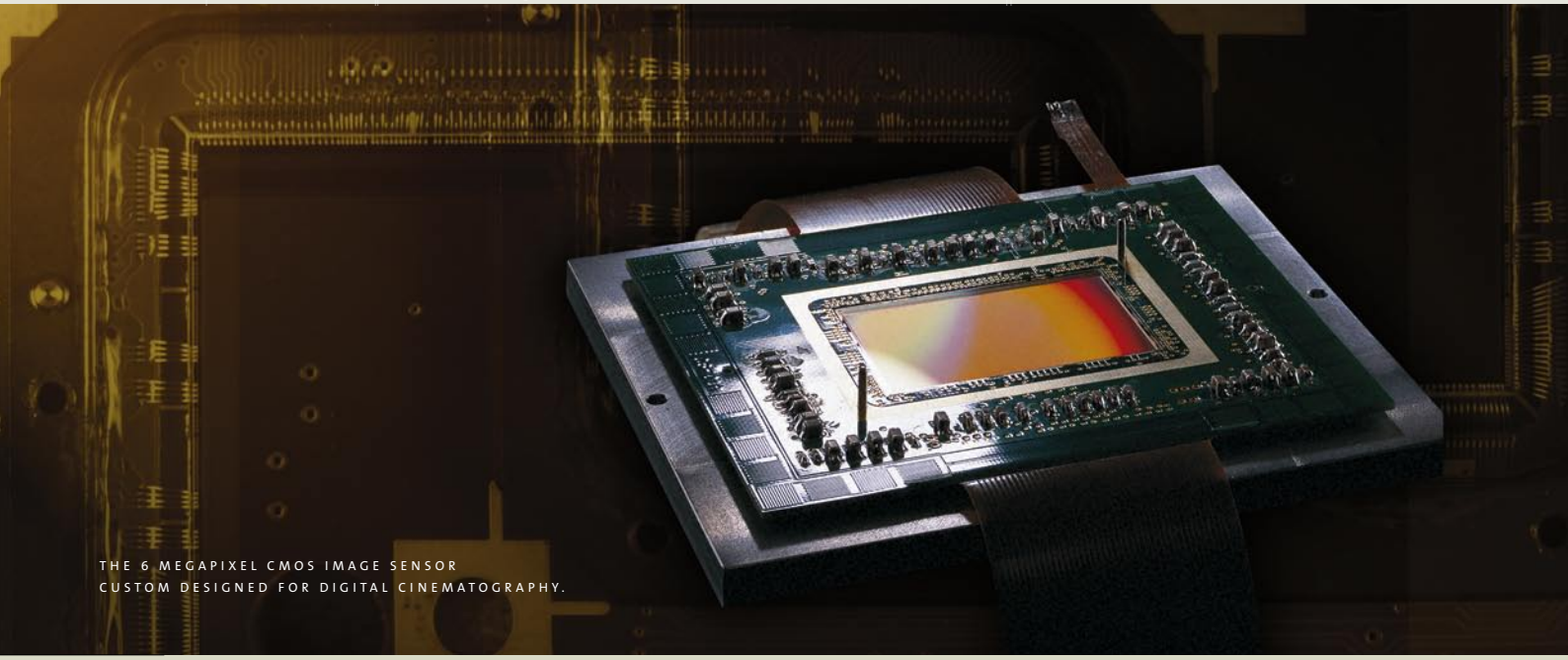
FILM STYLE CREATIVE OPTIONS BY DESIGN

Since the single 6 Megapixel CMOS sensor at the heart of the D-20 has the same size as a Super 35 mm film aperture, the D-20 uses the same lenses as 35 mm film cameras. This makes the vast range and excellent optical quality of 35 mm lenses available to directors and cinematographers when shooting HD, greatly expanding their creative options.

The resulting images have the same depth of field as 35 mm film, giving film makers the ability to direct the viewer's attention to a specific part of the image, a crucial tool in visual storytelling. Other issues essential to cinematography are also addressed: the D-20 has the ability to capture images at higher speeds, it runs speed ramps, has excellent color fidelity and a high dynamic range.





THE 6 MEGAPIXEL CMOS IMAGE SENSOR
CUSTOM DESIGNED FOR DIGITAL CINEMATOGRAPHY.

WHAT IS CMOS?

Like other photoelectric sensors, CMOS (Complementary Metal-Oxide Semiconductor) image sensors are based on an array of photo-sensitive diodes. Each pixel contains one diode that converts light into an electrical charge. Unlike CCDs (Charge Coupled Devices), which output the charge from the pixels serially in a “bucket brigade” process, CMOS image sensors provide a voltage signal at each pixel that is directly proportional to the amount of charge the pixel has collected. Each pixel can be individually addressed to access this information, resulting in a much higher level of flexibility with regards to timing or image format.

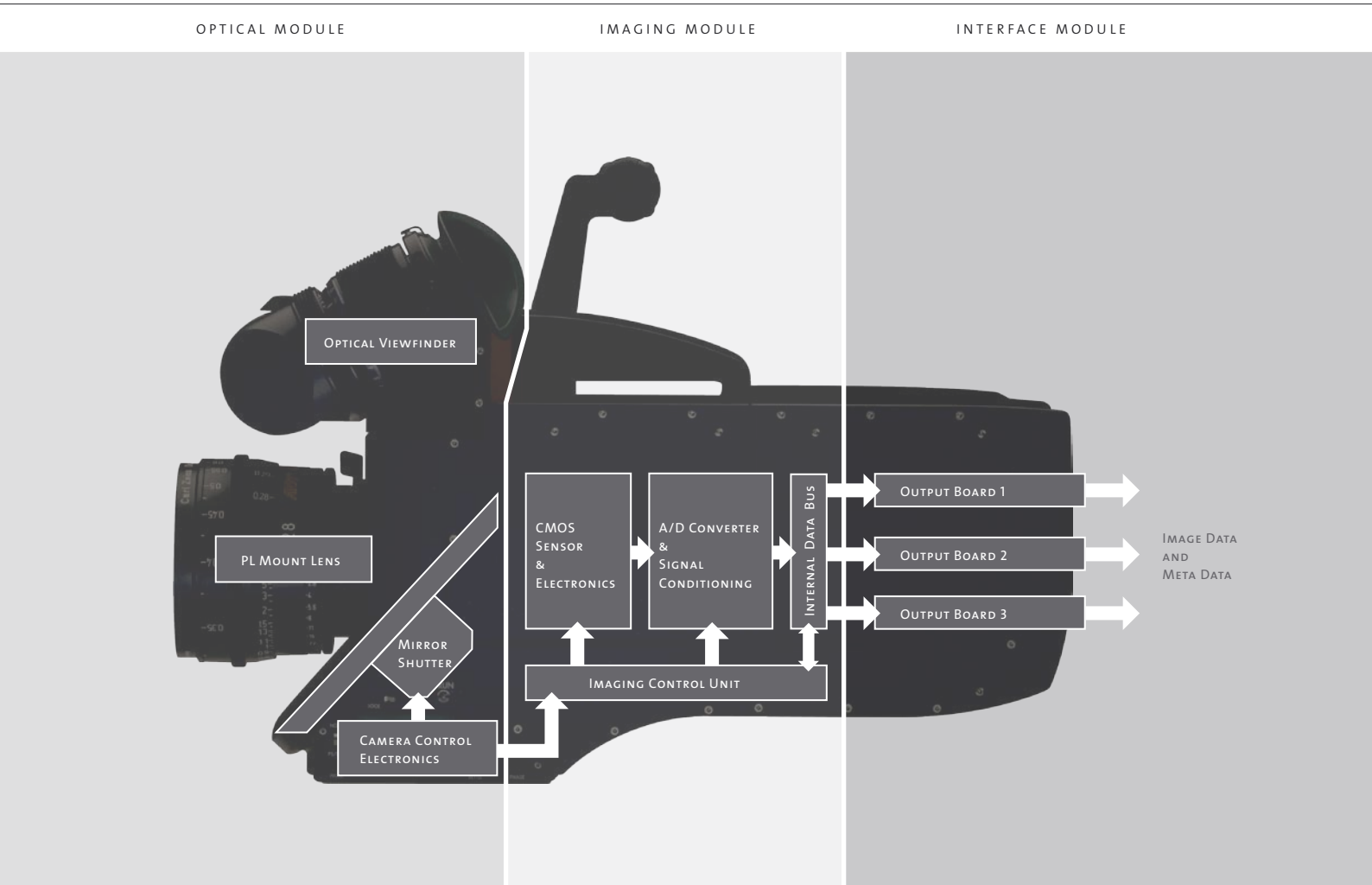
WHY CMOS?

Since the D-20 sensor is an ARRI specified design, its performance is custom tailored to digital cinematography and gives ARRI tremendous freedom for future developments. CMOS sensors inherently have superior power efficiency and a natural blooming immunity, plus it is possible to read out any portion of the sensor at any time. This has a wide range of advantages, including the ability to read out high frame rates despite the high pixel count and the ability to run speed ramps. It also means that the recording format can be freely chosen, so it is possible to trade spatial resolution for frame rate. Because CMOS is essentially a more flexible technology than CCDs, ARRI can experiment in the future with new and sophisticated features like higher frame rates or a double read-out of each frame to further increase dynamic range.

A MODULAR AND FUTURE PROOF APPROACH

To ensure that the D-20 is an economically viable investment it is designed in a modular fashion; the sensor can be upgraded when advances in technology offer better performance, and the signal output boards can be exchanged to accommodate future file based interface and storage options. The rest of the D-20, including the housing, the Optical Module (containing the lens mount, mirror shutter, optical viewfinder and camera control electronics) and the internal data bus have been designed to last through many upgrade cycles with traditional ARRI robustness.

To further future proof the D-20, many components have been designed for capabilities far greater than the currently available recording technologies can accommodate. The sensor and the internal data bus, for example, are prepared for frame rates up to 150 fps.



THE ARRIFLEX D-20 USES THE SAME VIEWFINDER DESIGN AS ALL OTHER MODERN ARRI CAMERAS. CAMERA OPERATORS ALL OVER THE WORLD APPRECIATE THE VIEWFINDER'S UNIQUE ABILITY TO BE FREELY POSITIONED, EVEN ON THE OTHER SIDE OF THE CAMERA. THEY ALSO LIKE THE BRIGHT, DISTORTION FREE IMAGE AND THE LARGE EXIT PUPIL THAT ALLOWS THEM TO MOVE THE EYE WITHOUT LOOSING THE IMAGE.

THE OPTICAL MODULE

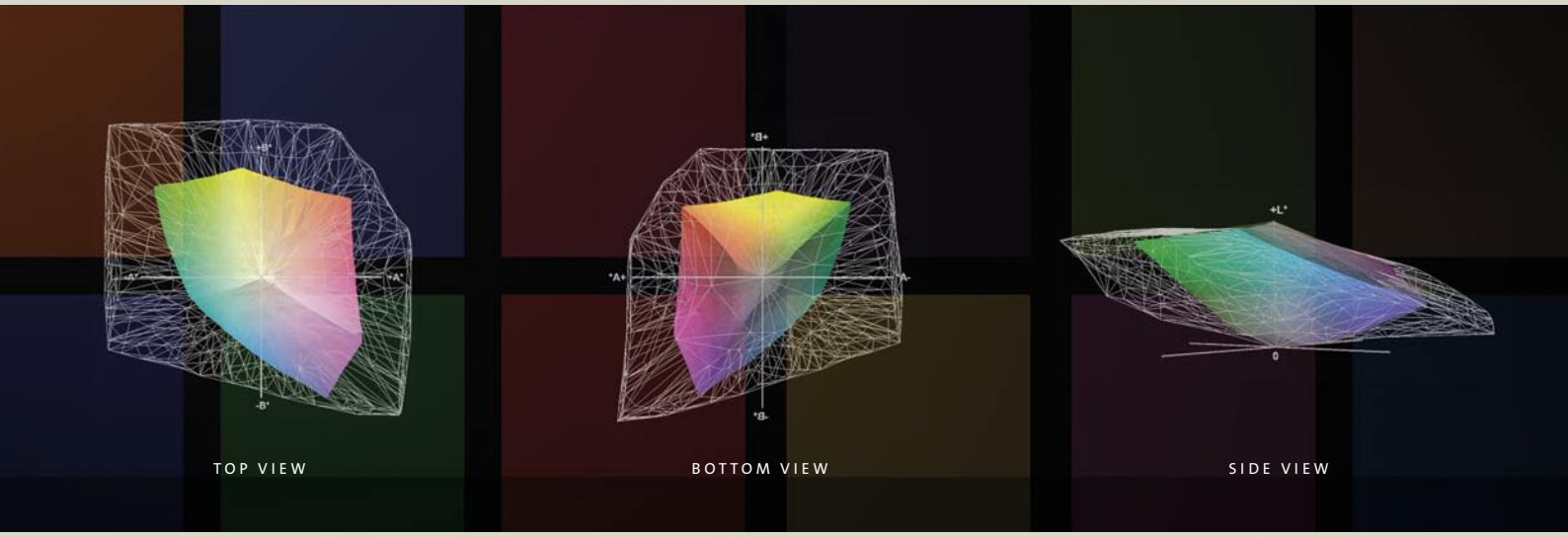
Users of ARRI film cameras should feel right at home with the bright optical viewfinder and the silent rotating mirror shutter borrowed from the ARRICAM. The optical viewfinder provides not only the highest quality color image for evaluating focus and composition but also allows the operator to see a larger image area than the sensor is capturing. The optical video assist, which is optional, consists of the IVS II optics and electronics from the ARRIFLEX 435 Xtreme. An optical video assist has many advantages in a digital camera, as it provides a video image when the mirror shutter is stopped in the viewing position, showing a larger area than the sensor is capturing and using little power. The Optical Module can be expanded to provide interfaces for many of the extensive range of cine accessories, including wireless lens and camera control or speed ramps with the Remote Control Unit RCU-1. These accessories integrate with the D-20 just like they do with any other ARRI camera.

FLEXIBLE OUTPUT OPTIONS: VIDEO OR FILM MODE

Different productions have different needs, and the D-20 is a flexible tool that can be used in two different output modes: Video or Film Mode.

In Video Mode, the data coming from the D-20 sensor is processed live in the camera. Color reconstruction is performed simultaneously as the 2880 x 1620 pixel grid is converted to 1920 x 1080 resolution. A sophisticated on-board color management system has been implemented to optimize the camera's performance for different lighting situations including blue and green screen work. In Video Mode, the D-20 can supply a variety of standard HD video signals for different recording formats, including HDCAM SR, thus allowing the D-20 to integrate seamlessly into existing HD infrastructures.

In Film Mode, the unprocessed data from the sensor is output directly to the recorder. Similar to a film negative, this data must first be „developed“ in an off-line process involving complex 3D Look Up Tables (LUTs) before it is usable or even viewable. The advantage is that all the image information captured by the sensor is retained, and being able to use more processing power in post production results in higher image quality. The live HD output can still be used for monitoring and as a guide for color grading. The grading parameters can be stored as metadata with the unprocessed image data.



THE ON-BOARD COLOR MANAGEMENT OF THE D-20 IS USED TO TRANSFORM DATA FROM THE EXTENSIVE D-20 COLOR SPACE (WHITE LINES) INTO THE MORE RESTRICTIVE COLOR SPACE OF CURRENTLY USED HD VIDEO STANDARDS (SOLID COLORS).

THE ARRIFLEX D-20 WITH THE OPTIONAL INTEGRATED VIDEO SYSTEM (IVS). THE IVS CAPTURES THE IMAGE OF THE GROUND GLASS, THEREFORE PROVIDING AN IMAGE EVEN WHEN THE MIRROR SHUTTER IS IN THE VIEWING POSITION.

PRELIMINARY SPECIFICATIONS

Operational Modes:	Video Mode	D-20 outputs standard SMPTE 292M HDTV video signal
	Film Mode	D-20 outputs raw Bayer data for post processing
Fps:	1 to 60 fps, including the standard HDTV speeds of 23.976 fps, 24 fps, 25 fps, 29.97 fps, 30 fps	
Mirror Shutter:	ARRICAM style silent mirror shutter, electronically adjustable in 0.1° steps from 11.2° to 180°	
Electronic Shutter:	Full electronic shutter optional, at 24 fps variable from 66° to 360°	
Lens Mount:	54mm stainless steel PL mount, accepts all 35 mm cine lenses	
Flange Focal Distance:	51.98 - 0.01mm	
Noise Level:	below 20 db/A	
Sensor:	Large format custom designed CMOS sensor with Bayer mask	
	Accomodates all formats up to ANSI Super 35 aperture width (24.9 mm / 0.980“)	
	Active pixels:	3018 x 2200
	Sensor is specified to be able to capture images up to 150 fps	
	Sealed with a low pass filter that has an antistatic and anti-reflective surface	
Film Mode:	Aperture size:	accomodates all formats up to ANSI Super 35 aperture width (24.9 mm / 0.980“)
	Active sensor pixels:	3018 x 2200
	Format:	4:3
	Output:	Raw Bayer data with 12 bits bit depth (Post processing necessary to derive full color images)
Video Mode:	Aperture size:	Super 35 HDTV
	Active sensor pixels:	2880 x 1620
	Format:	16:9
	Output:	1920 x 1080, YUV 4:2:2 10 bit (via single link HD-SDI)
		1920 x 1080, RGB 4:4:4 10 bit (via dual link HD-SDI)
Standard Definition Output:	Regardless of Film or Video Mode, there is always a standard PAL or NTSC video output available	
Sensitivity:	EI 300	
Viewfinder:	Bright and ergonomic optical viewfinder can be used camera left or right. Viewfinder arm telescopes closer/farther from camera body, with automatic or manual image rotation. Optional ARRIGLOW provides illuminated frame outlines with continuously adjustable brightness and warnings for BAT and ASY. Flip in contrast filter. Accepts 435/535 style eyepiece, eyepiece extensions and heated eyecups.	
Optical Video Assist:	Optional ARRIFLEX 435 Integrated Video System (IVS II)	
Image Processing:	ARRI Color Management	
	Proprietary algorithms for color reconstruction from raw Bayer image data	

Internal Data Bus: . . . . . 10 Gb/s maximum data rate

Power Input: . . . . . 18 V DC to 32 V DC

Power Consumption: . . . . . D-20 without optical video assist: . . . . . 50 W @ 24 fps
D-20 with optical video assist: . . . . . 54 W @ 24 fps

Dimensions: . . . . . Length: . . . . . 39 cm / 15.35“
Width (viewfinder arm up): . . . . . 19 cm / 7.48“
Width (viewfinder in normal viewing position, w/o IVS): . . . . 27 cm / 10.83“
Width (viewfinder in normal viewing position, with IVS): . . . 30 cm / 11.81“
Height (with handle): . . . . . 30 cm / 11.81“
Height (without handle): . . . . . 23 cm / 9.06“

Weight (without lens): . . . . . 7 kg / 15.4 lbs

Compatible Accessories: . . . . . Wireless Remote System, Wireless Remote Control (WRC-1), Remote Control Unit (RCU-1), Camera Handgrip Right, Remote Switch RS-4, matte boxes, follow focus systems, Eyepiece Leveler, Bridgeplates, all PL mounted 35mm lenses, Shift & Tilt System, Tilt Focus lenses, ARRI Macro lenses, ARRIHEAD, ARRIMOTION, Obie Light, power supplies, batteries.

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