

ARRI Rental

Everything you wanted to know about cameras, but were too afraid to ask...



RENTAL

LIGHTING

MEDIA

CAMERA SYSTEMS

MEDICAL

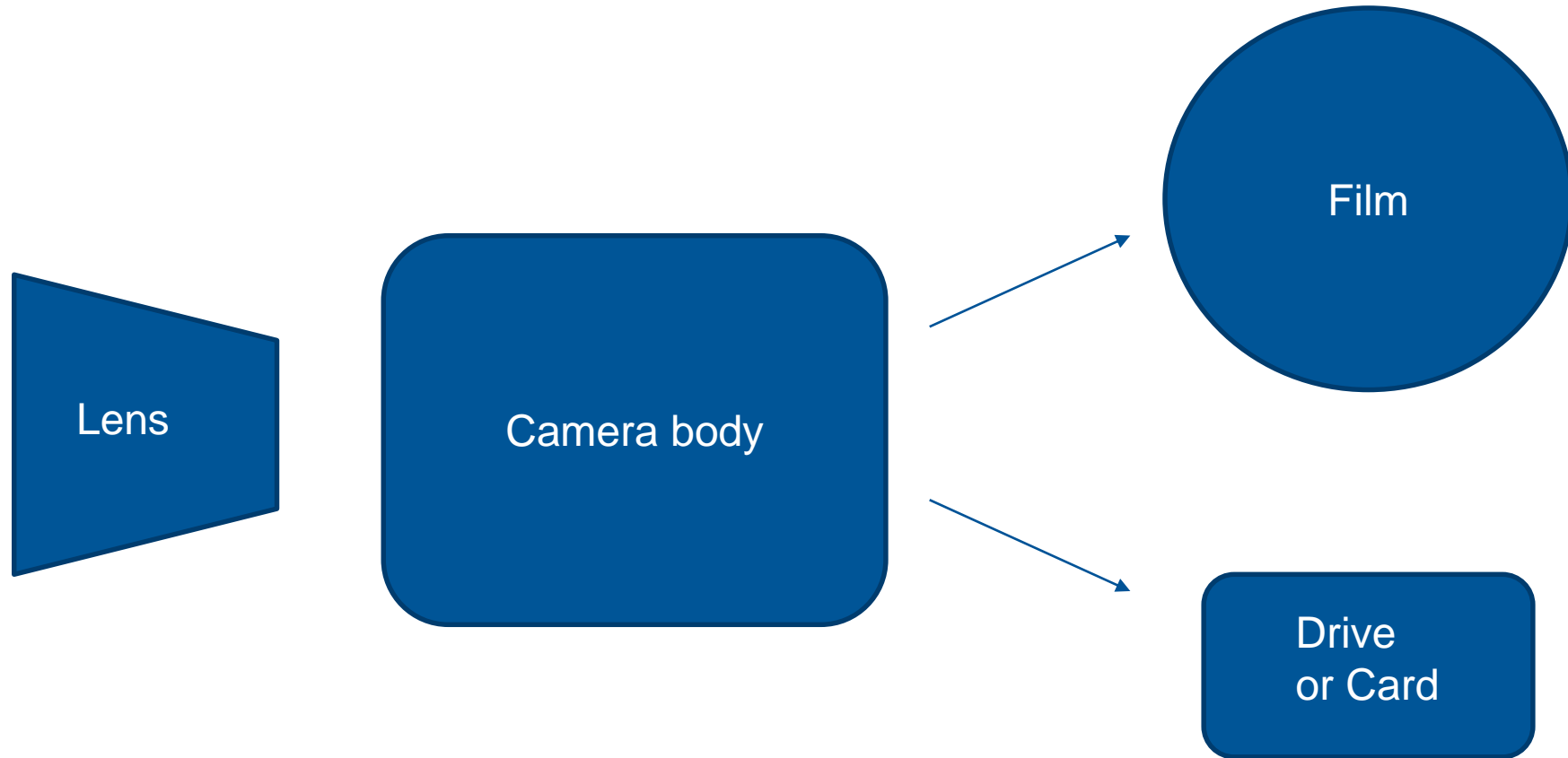
ARRI Rental are one of the largest suppliers of equipment to the film and television industry in the world. As part of the wider ARRI ecosystem, we are built on a bedrock of knowledge that dates back more than a century.

Through a network of facilities in North America, Europe, and the UK, our service crosses borders and continents, bringing you first-class camera, lighting and grip equipment, wherever you may be. We aim for warm welcomes, friendly expertise, personalized solutions, and relationships built on trust.

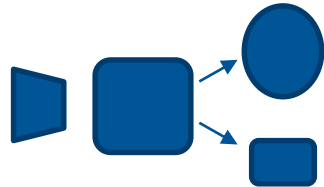
If you require a lightweight kit for a last-minute content job, or multiple cameras for movies such as 1917 or Joker, ARRI Rental are here to look after you every step of the way.

This guide is a reference for some of the terms often used when talking about the requirements and needs of your camera department.

Basic Components of a Motion Picture Camera



Film Camera
ARRIFLEX 435



Digital Camera
ALEXA Mini



Recording medium

Film is available in 400' and 1000' rolls, in 16, 35 and 65mm formats.

There are different types of film stock, selected by the DOP depending on the lighting and shooting conditions.

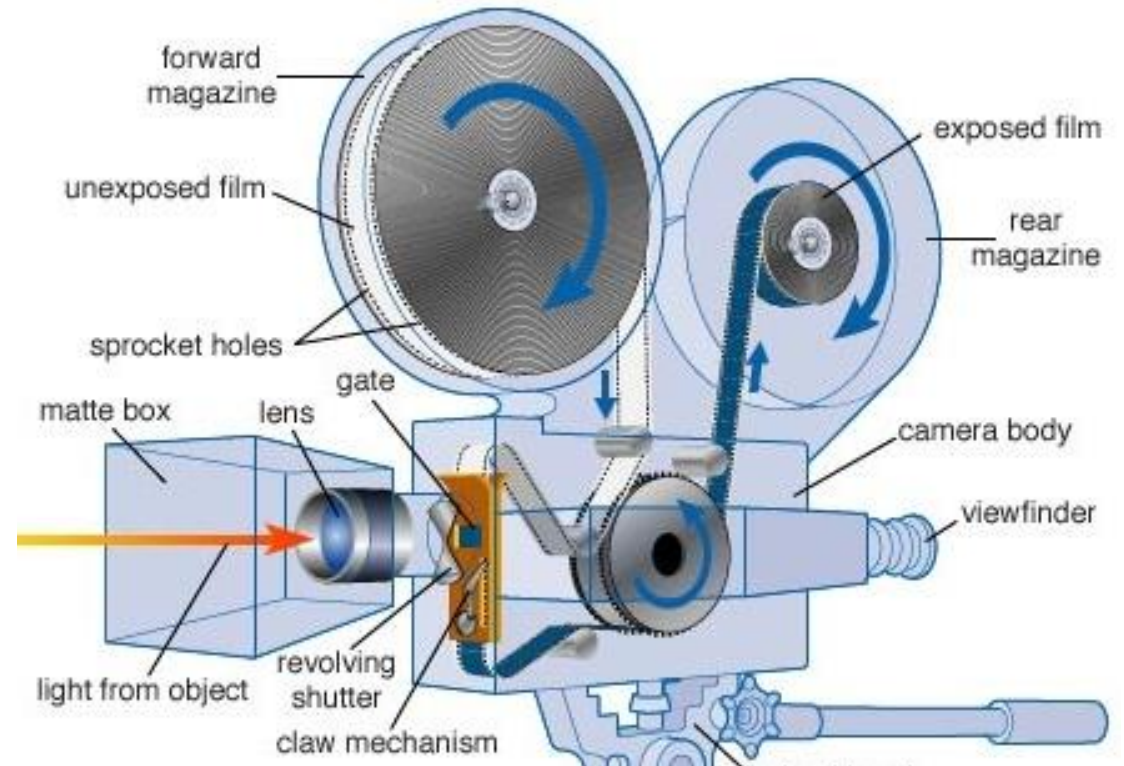


Digital cameras record on drives and/or cards. The technical spec of each of these will denote the amount of footage that can be recorded, depending on frame rate and resolution required.

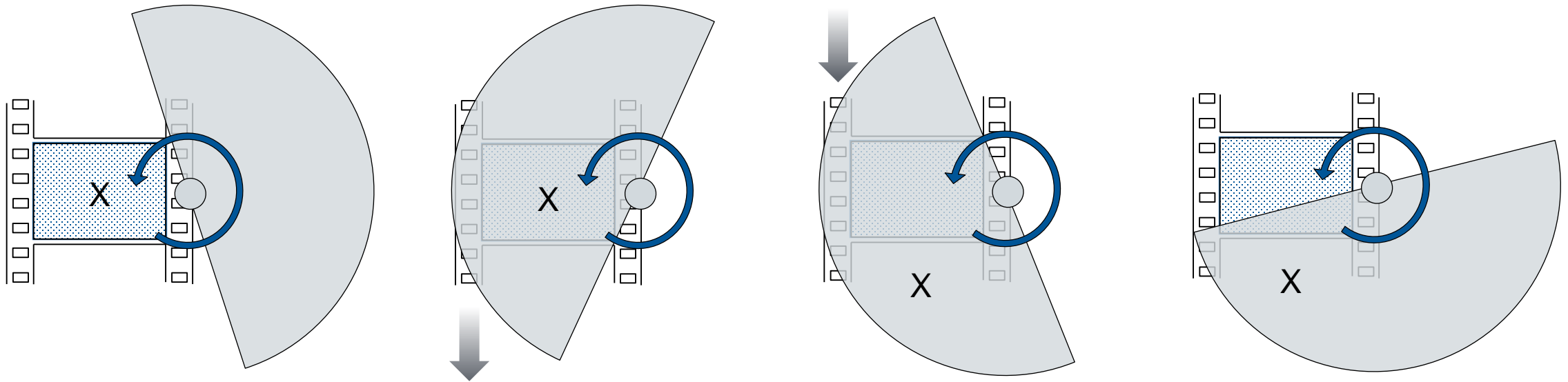


Unexposed film stock is loaded into a magazine, which is then attached to the camera. As the camera runs, the movement pulls the film from the magazine and feeds it through the **gate** where it is exposed.

The now exposed film, or **rushes**, are drawn from the camera by the motorised take-up side of the magazine. Once the whole roll has been exposed, the magazine is unloaded and the rushes are prepared for processing.



A mirror shutter is a semi circular disc that spins in sync with the travel of film through the **movement**. During one revolution of the shutter, the film will be held stationary in the gate while the open half of the disc exposes the image (X), then as the solid half of the disc covers the gate, the movement will advance the film one frame. At a normal frame rate of 25 **FPS**, this process is repeated 25 times every second, or '25 Frames Per Second'.

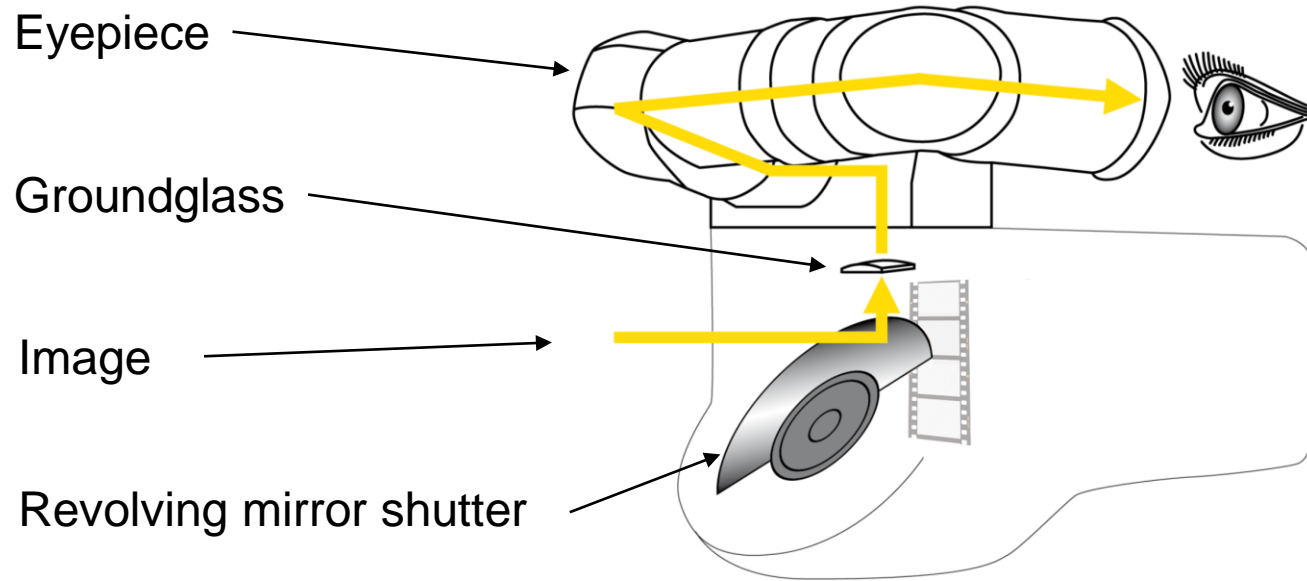


The **gate** is the rectangular opening that allows light through to the film when the shutter is open. Whilst the shutter is closed, the mirror reflects the image through a **groundglass** to the eyepiece, for the operator to see the frame. At this point, the image may also be split to a video tap to supply recording and monitoring options.

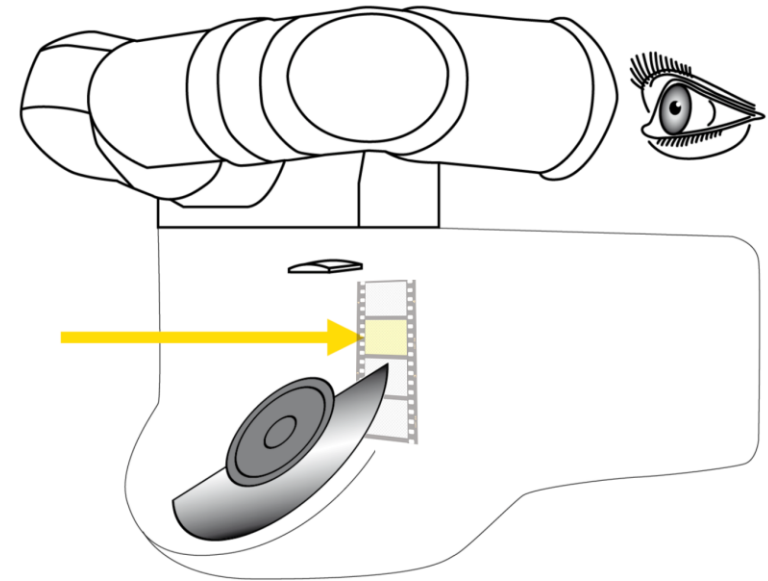
The 3 pictures below show the gate, rotating mirror shutter in different positions: Open, half open and closed.



Shutter closed – Image visible

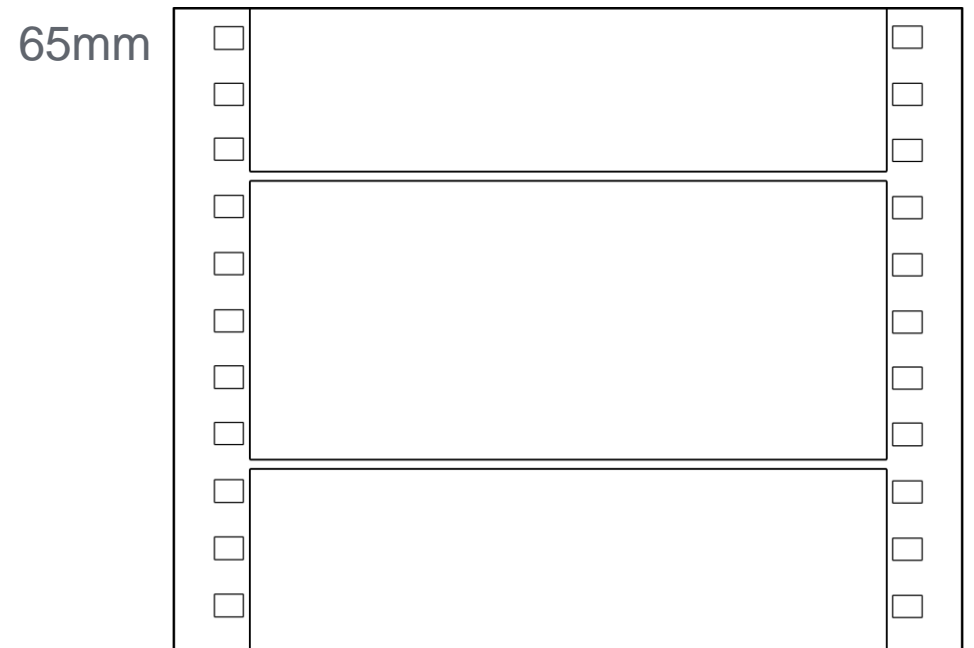
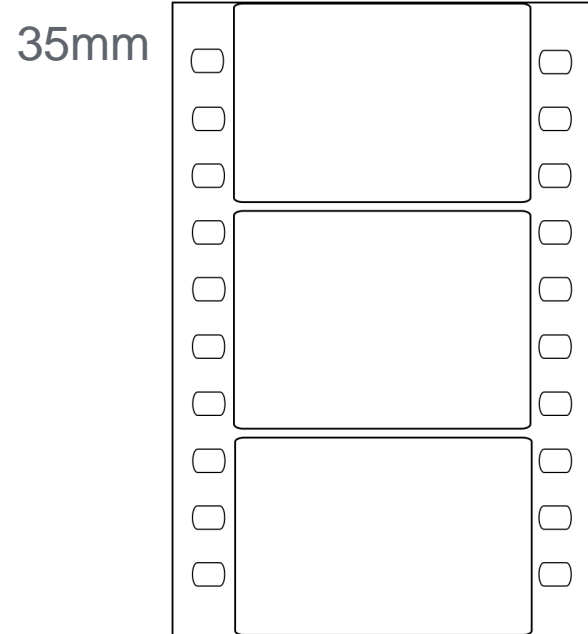
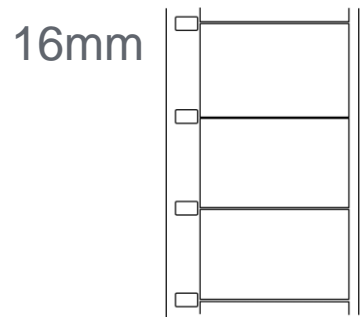


Shutter open – Film exposed



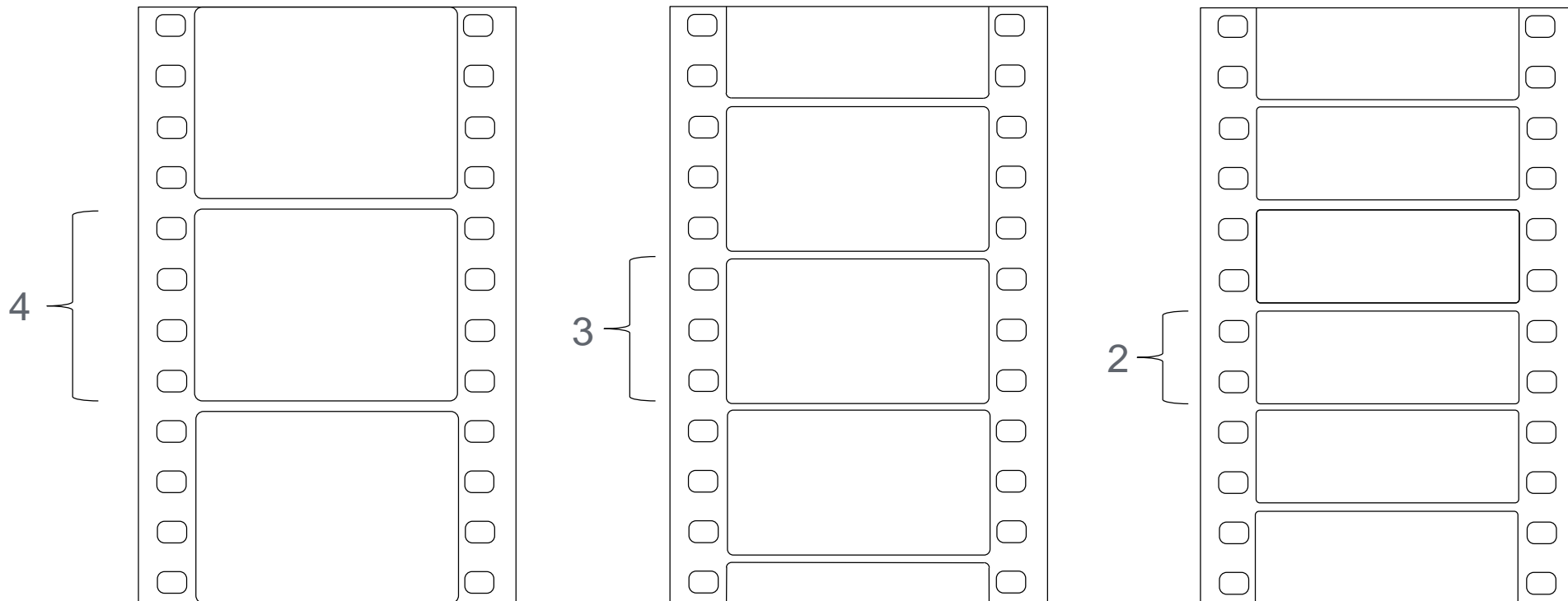
Film Formats

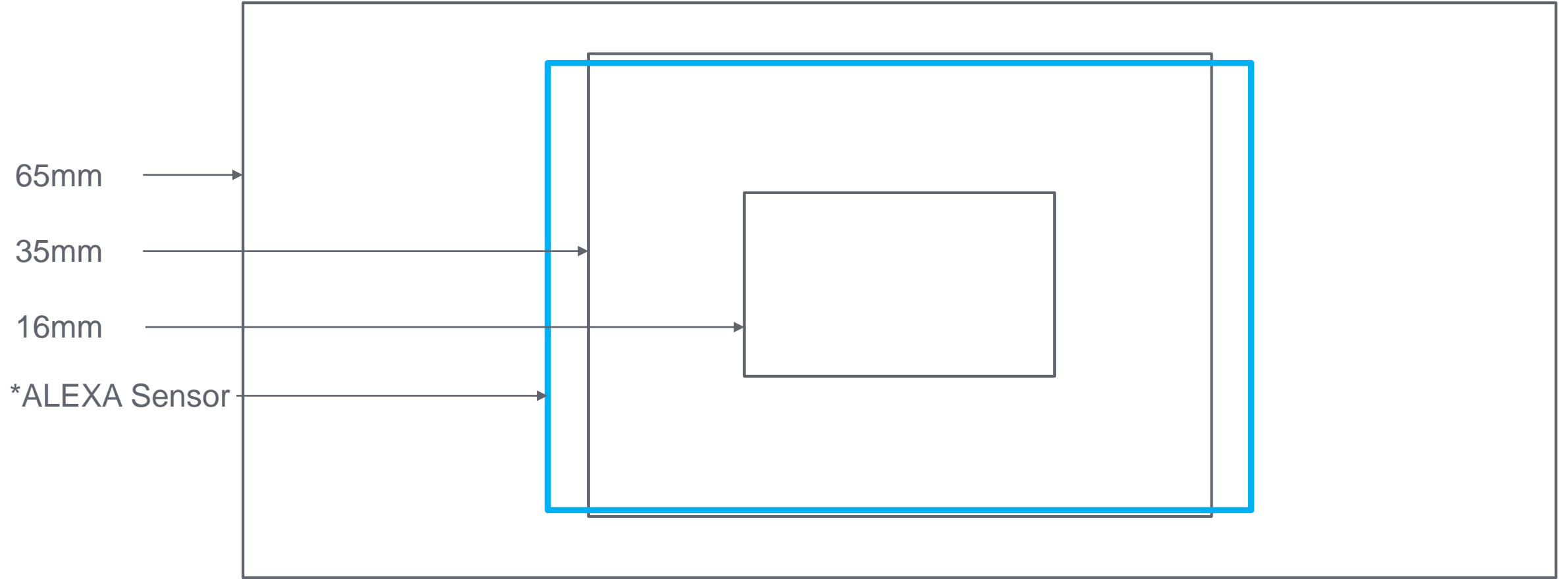
Film is available in 16mm, 35mm and 65mm. Some of the image area on 16 and 35 used to be allocated to recording the soundtrack, but when this process stopped, both formats were prefixed with the word Super. Super16 and Super35 are now the most common film formats still in use.



4 Perf, 3 Perf, or 2 Perf ?

Perf, or 'Perforations', refers to the number of sprocket holes in film stock used by one frame. The fewer 'perfs' restrict the height of the recorded image, affecting options of Aspect Ratio available. When shooting with 35mm 2 or 3 perf movement cameras, film stock consumption is reduced, making it a more economical process.



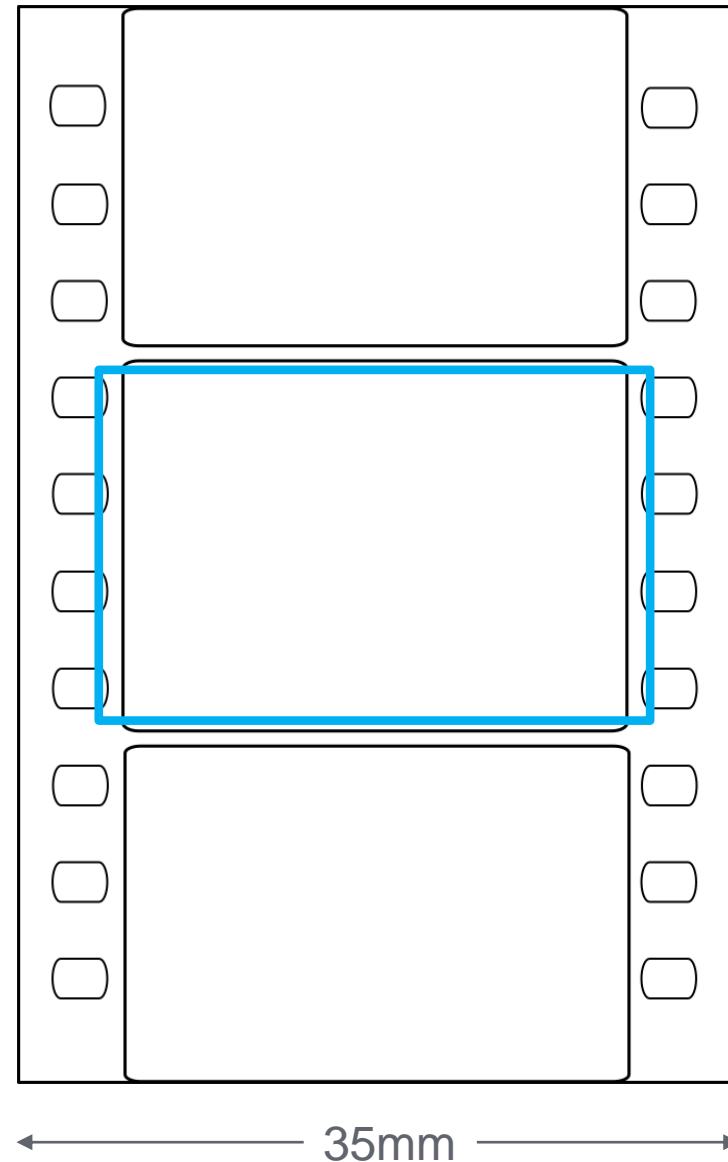


*Throughout this document, the blue ALEXA Sensor icon will appear to scale

Prior to the development of Digital Cinema Cameras, 35mm film was the most commonly used format in motion pictures.

As film began to be replaced by digital, the [ARRI ALEXA](#) became the most popular digital motion picture camera in the world.

At 28.25mm x 18.17mm, slightly wider than the original Super35 film format, it's digital [sensor](#) became the new global standard for cinematographers.



In a Digital Camera, the **gate**, movement and shutter have been replaced by a **sensor**.



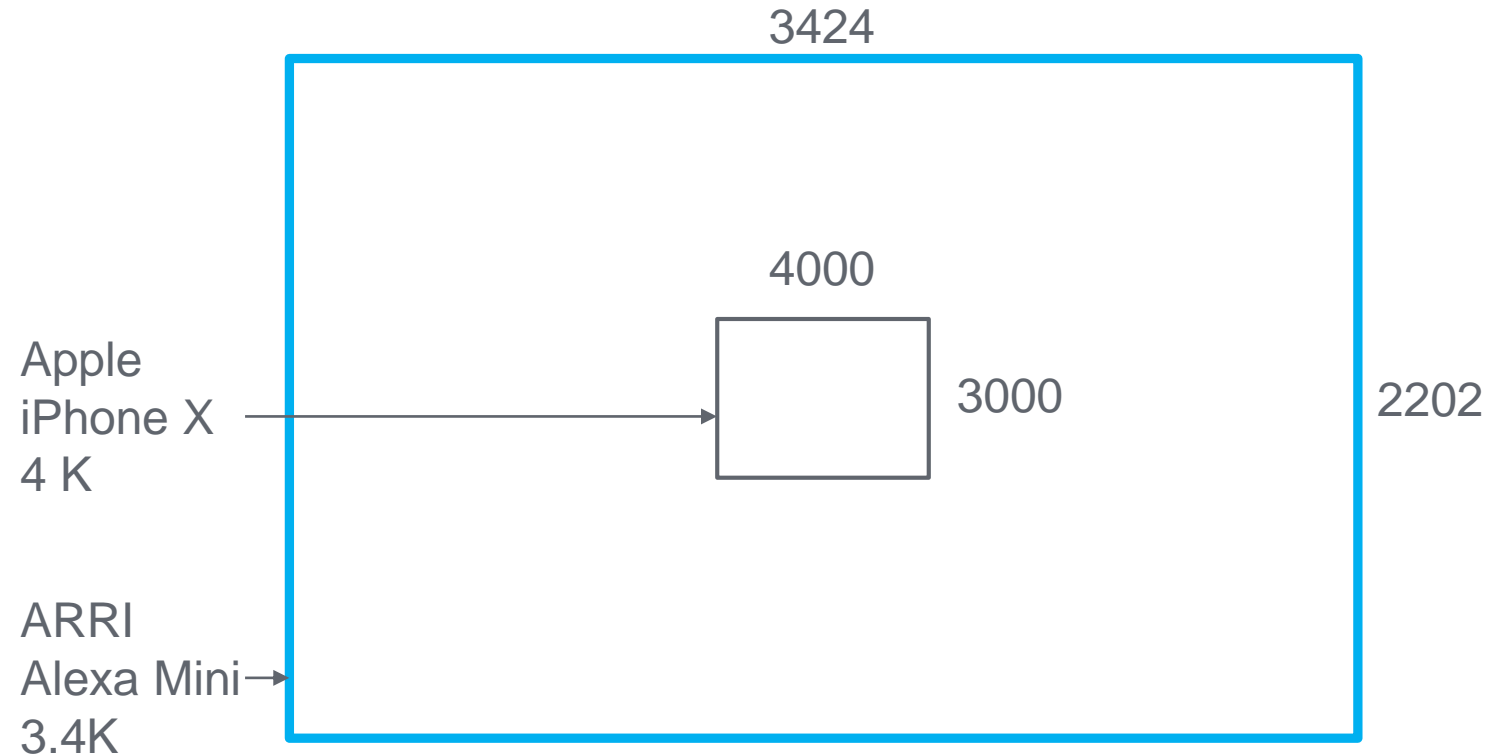
Digital Format, Resolution and 'K'

The most important thing to be aware of when talking about **format** is that the term refers to the physical size of the **sensor**, and NOT the number of **pixels** the sensor contains, as this scale graphic shows.

Resolution is quantified by the number of pixels in a sensor's width, and is rounded up or down to the nearest 100.

As 'K' (or 1000) has become the standard unit of measurement of resolution, an Alexa Mini sensor being 3424 pixels wide is abbreviated to 3.4K

A pixel's size does NOT relate to its quality or performance.



Digital Format, Resolution and 'K'

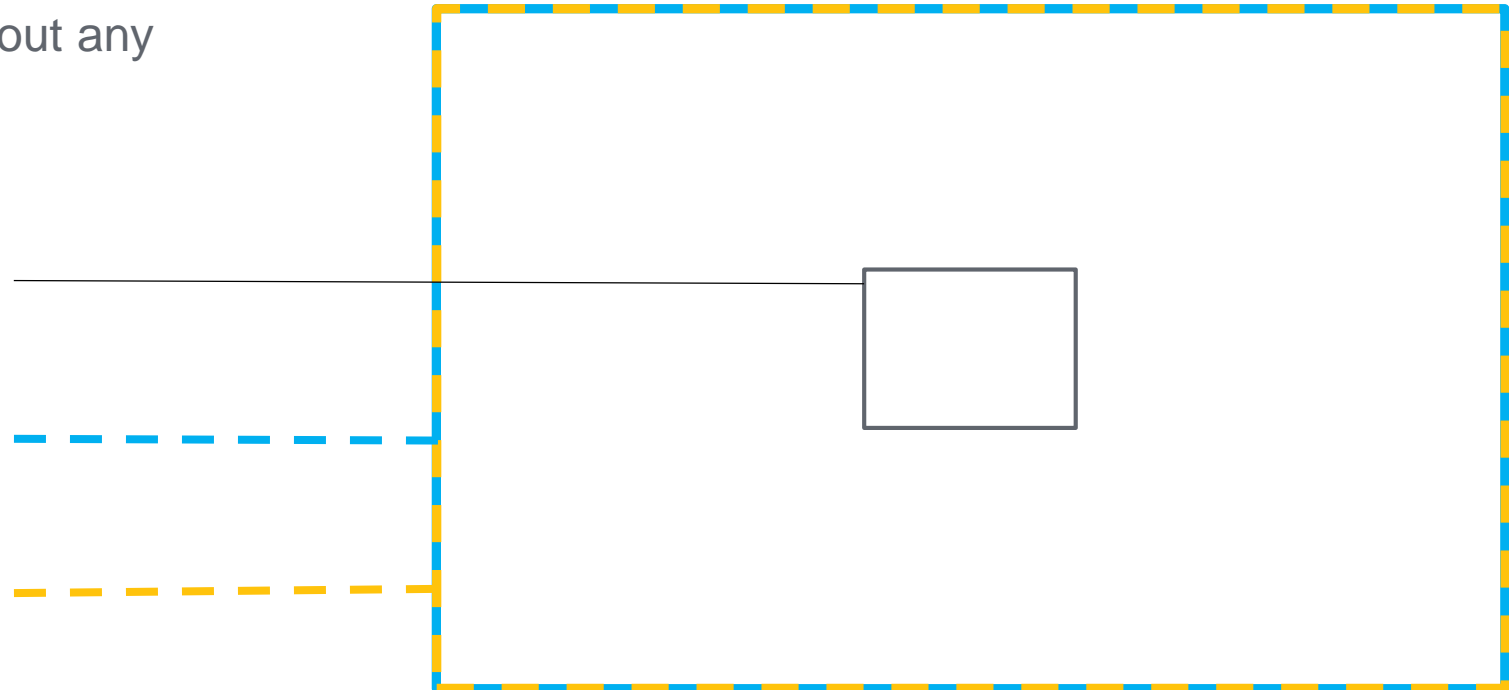
ARRI recently developed a new S35 sensor to meet the demands of platforms such as Netflix, Apple and Amazon.

The ALEXA35 uses a smaller pixel to achieve the required '4K' mandate specified by some studios, yet without any loss in the pixel's performance.

Apple iPhone X 4K
4000 x 3000 pixels

ARRI Alexa Mini 3.4K
3424 x 2202 pixels

ARRI Alexa 35 4.6K
4608 x 3164 pixels



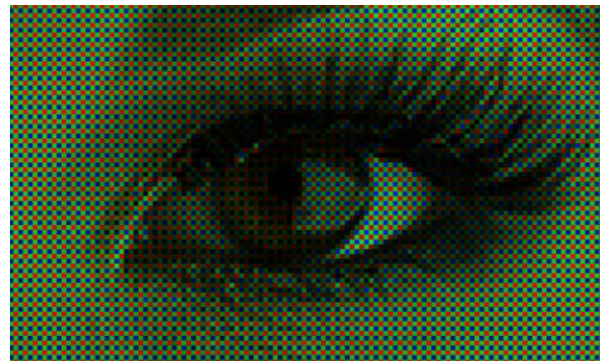
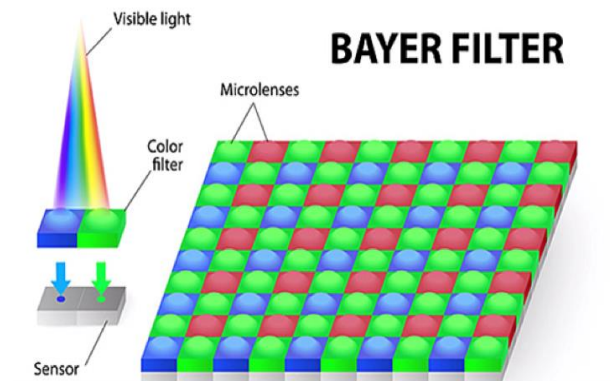
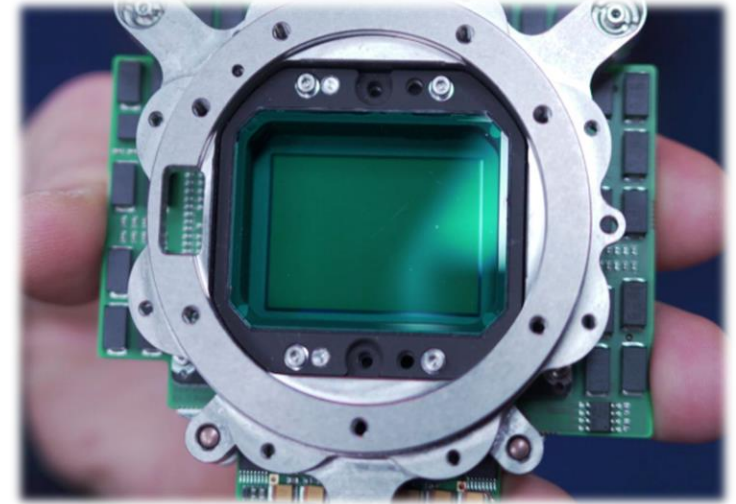
Digital Format, Resolution and 'K'

A digital camera sensor is made up of millions of tiny light sensitive pixels. Each pixel has a microlens filter on it that is either **RED**, **GREEN** or **BLUE** (also known as **RGB**)

When light hits a pixels it creates a red, green or blue signal. This RGB signal array is called a "Bayer Pattern" (or Bayer Filter) that then gets processed by the camera and turned into an digital image.

Light goes in.... Numbers come out.

There are twice as many green pixels as there are red and blue because the human eye sees more green.

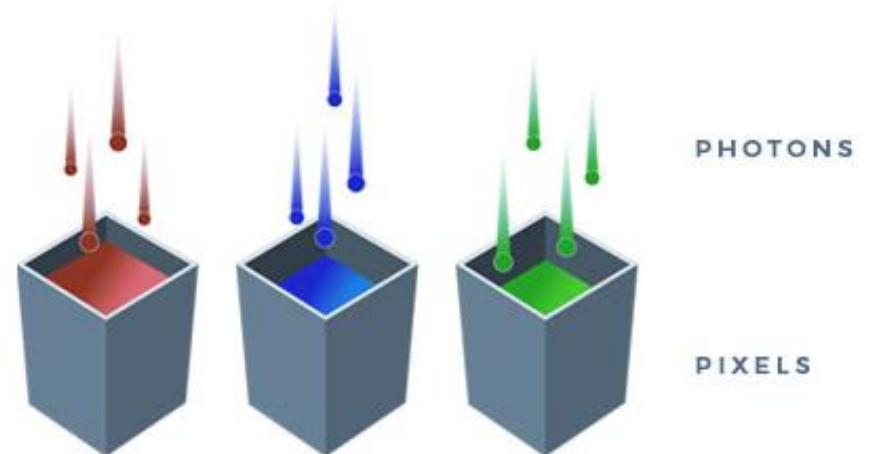


Digital Format, Resolution and 'K'

Although the science behind the ALEXA sensor is complex, the use of larger pixels is its main principle. The larger pixel is simply able to capture more light which is advantageous. The smaller the pixel, the less information it can see and thus has a knock-on effect to image quality.

By employing larger pixels ALEXA's sensor exhibits a much higher **dynamic range**, (it can see more light). It also has a higher light sensitivity and a cleaner image.

Think of a bucket capturing rain, where the rain is photons of light and the bucket is the pixel. A bigger bucket catches more rain.

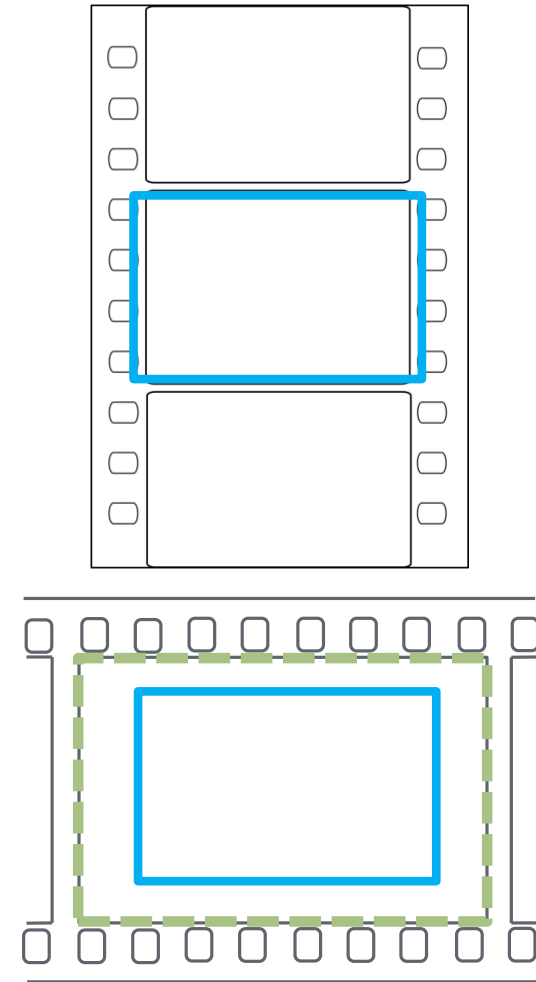


Large Format

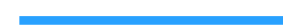
The **ALEXA Sensor** was based on the **Super35** film format that ran vertically through a motion picture camera.

In stills photography however, 35mm film stock ran horizontally allowing for a larger frame size. A new generation of **Large Format** digital cameras have sensors based on these dimensions.

The **ARRI ALEXA LF** has a sensor approximately 30% larger than the original Super35 version.



ALEXA



ALEXA LF

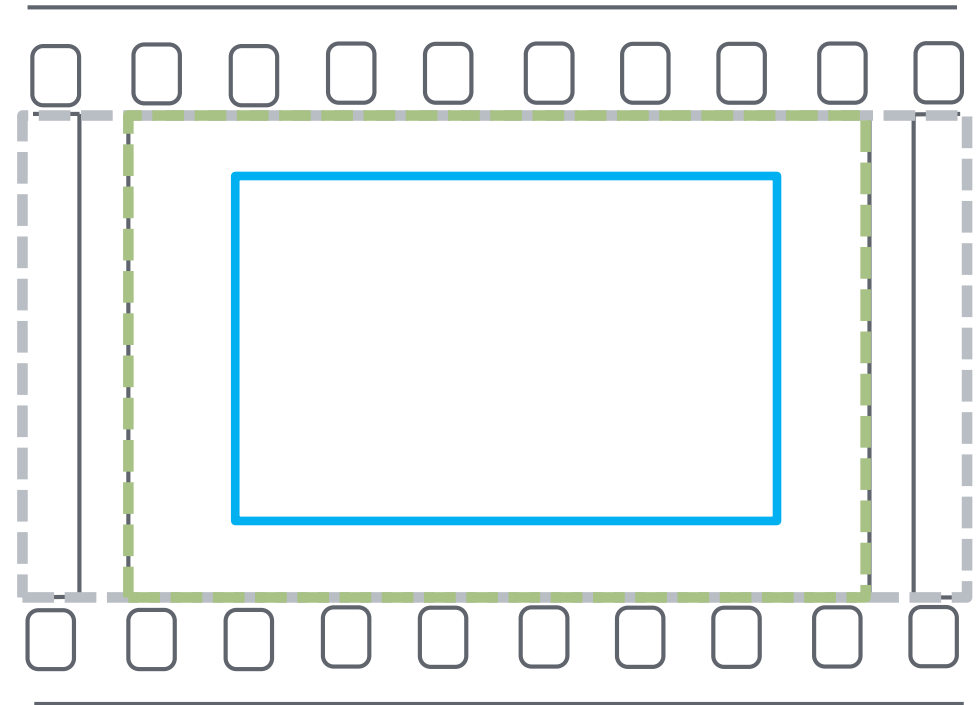





Large Format

The largest digital motion picture camera available is the state of the art [ALEXA 65](#), it's sensor being based on the 65mm film format.

Offering unprecedented image quality, the ALEXA 65 is widely thought of as being the best digital motion picture camera in the world.

These different formats can offer different looks and feels depending on lens choice, lighting and location, and are a creative choice for DP and director.

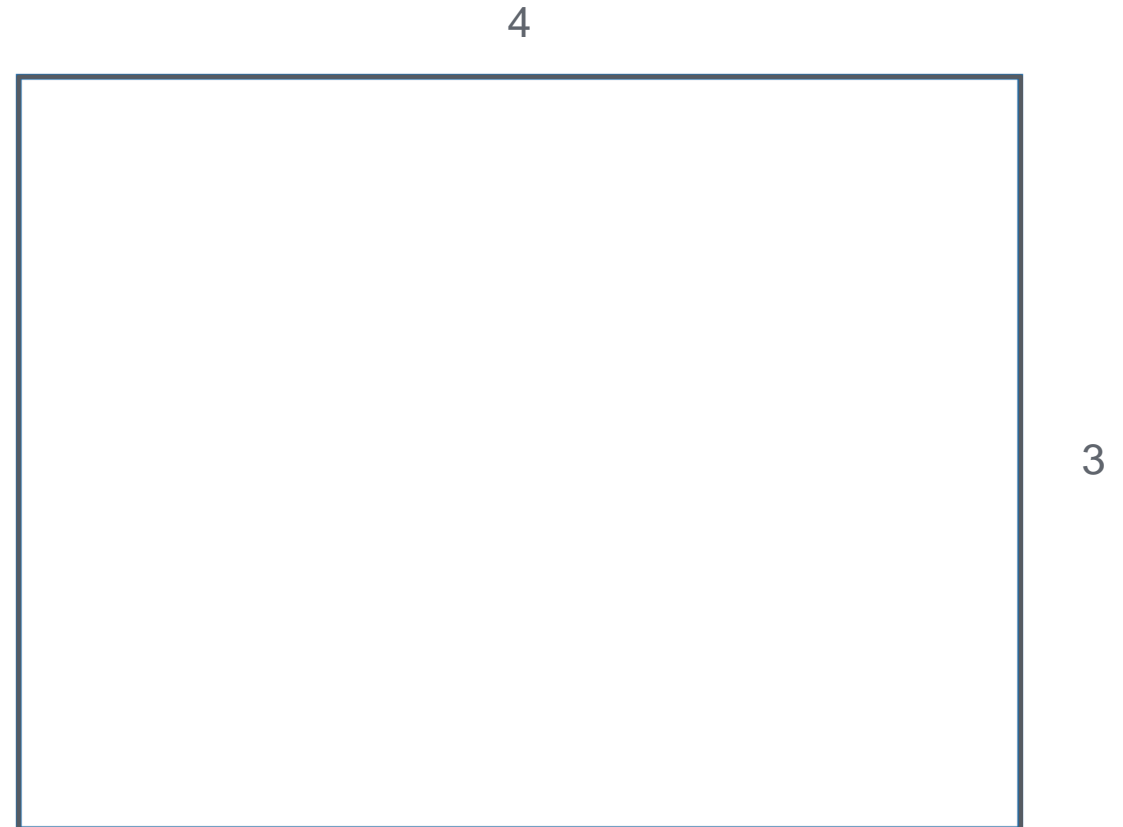


ALEXA 
ALEXA LF 
ALEXA 65 

Aspect Ratios

The Aspect Ratio of a frame is the proportional relationship between it's width and it's height. A square having an aspect ratio of 1:1.

The original Super35 **gate** has an aspect ratio of 4:3 or 1.33 : 1
(4 divided by 3 = 1.33)

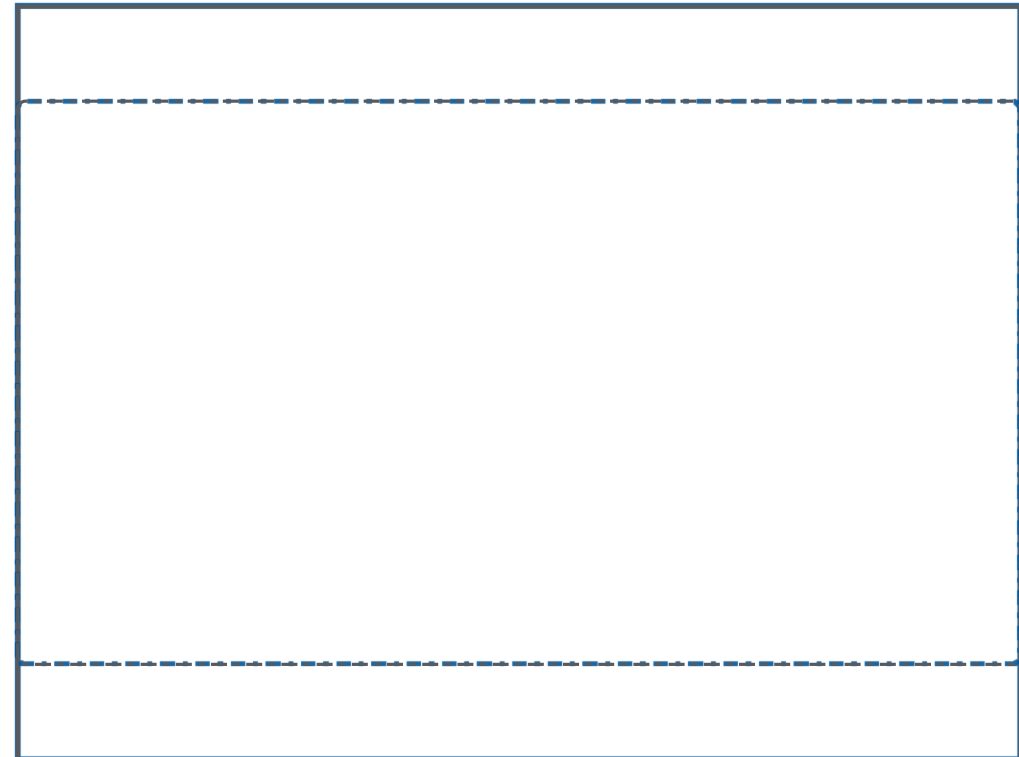


Aspect Ratios

The solid line represents the maximum area available for your image to be recorded onto either film , or a **sensor**, however, the Aspect Ratio of the required frame could be placed anywhere within this area.

The dotted line represents a 16:9 image (now industry standard) using as much of the recording area as possible.

**Aspect Ratios can be any size, on any format, film or digital. It is simply the shape of your frame.



Aspect Ratios

Below are the most commonly used Aspect Ratios in Commercials/Promos, TV and Feature Films.



16:9 (1.78)



1.85



2.40

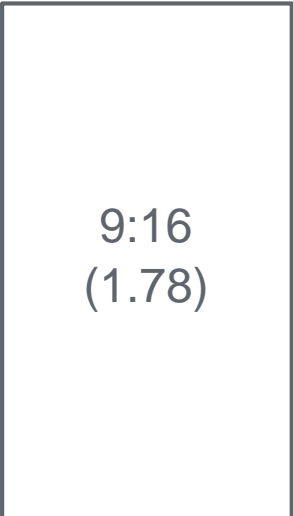


4:3

The demand for content on social media increase in the use of 1:1 and the vertical 9:16

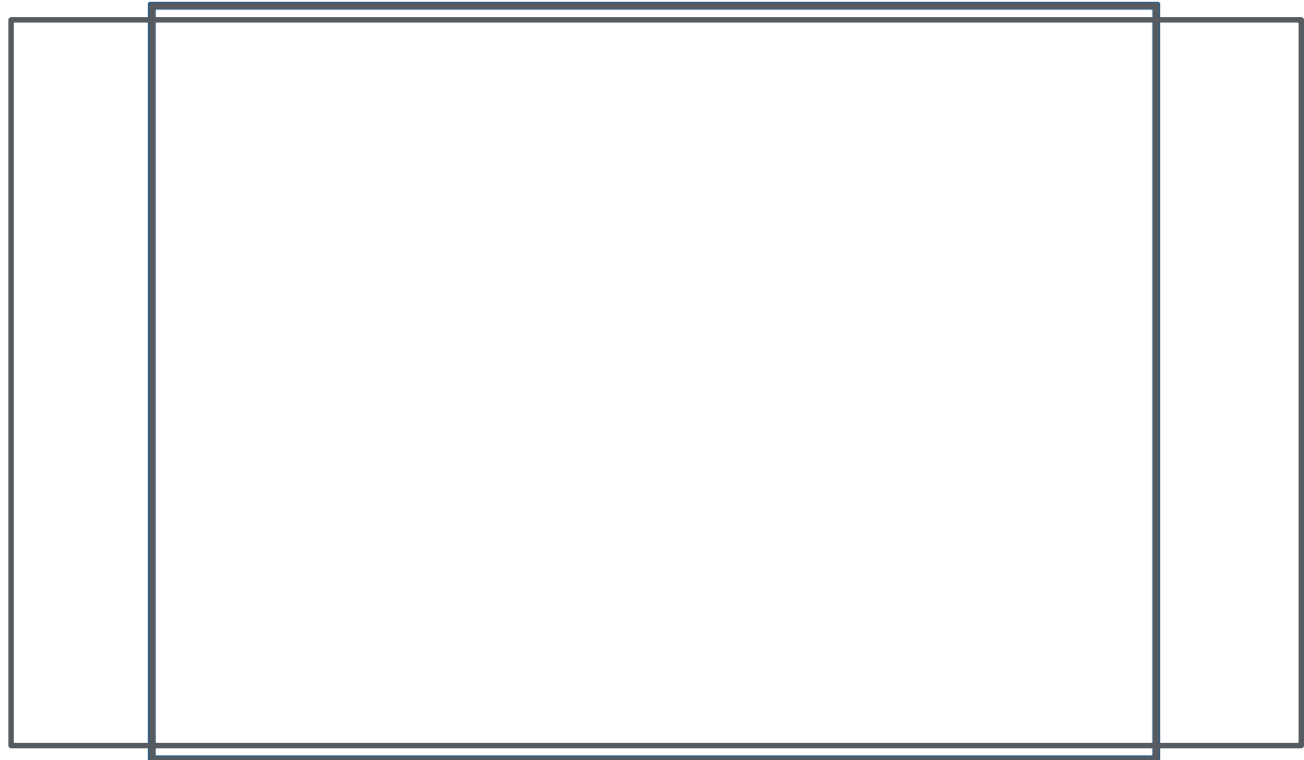


1:1



9:16
(1.78)

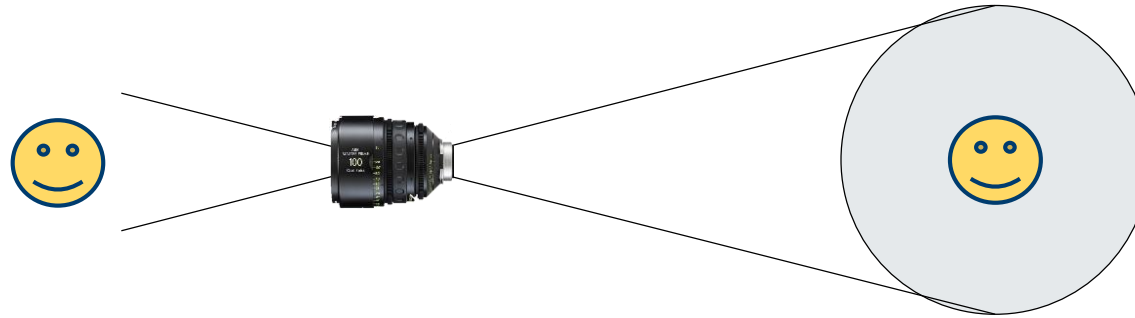
Until the late 1990s, TVs were manufactured in a 4:3 ratio, however this format became obsolete in early 2000s when the more popular 'widescreen' ratio of 16:9 became standard.



There is a vast selection of lenses available to today's cinematographers, each possessing different characteristics in contrast, sharpness and distortion. These can be separated into two different categories: Spherical, and Anamorphic.

Spherical lenses project a circular image that maintains the original width to height relationship of the object in front of the lens. These lenses are the most common and accessible optical format.

Spherical



Subject



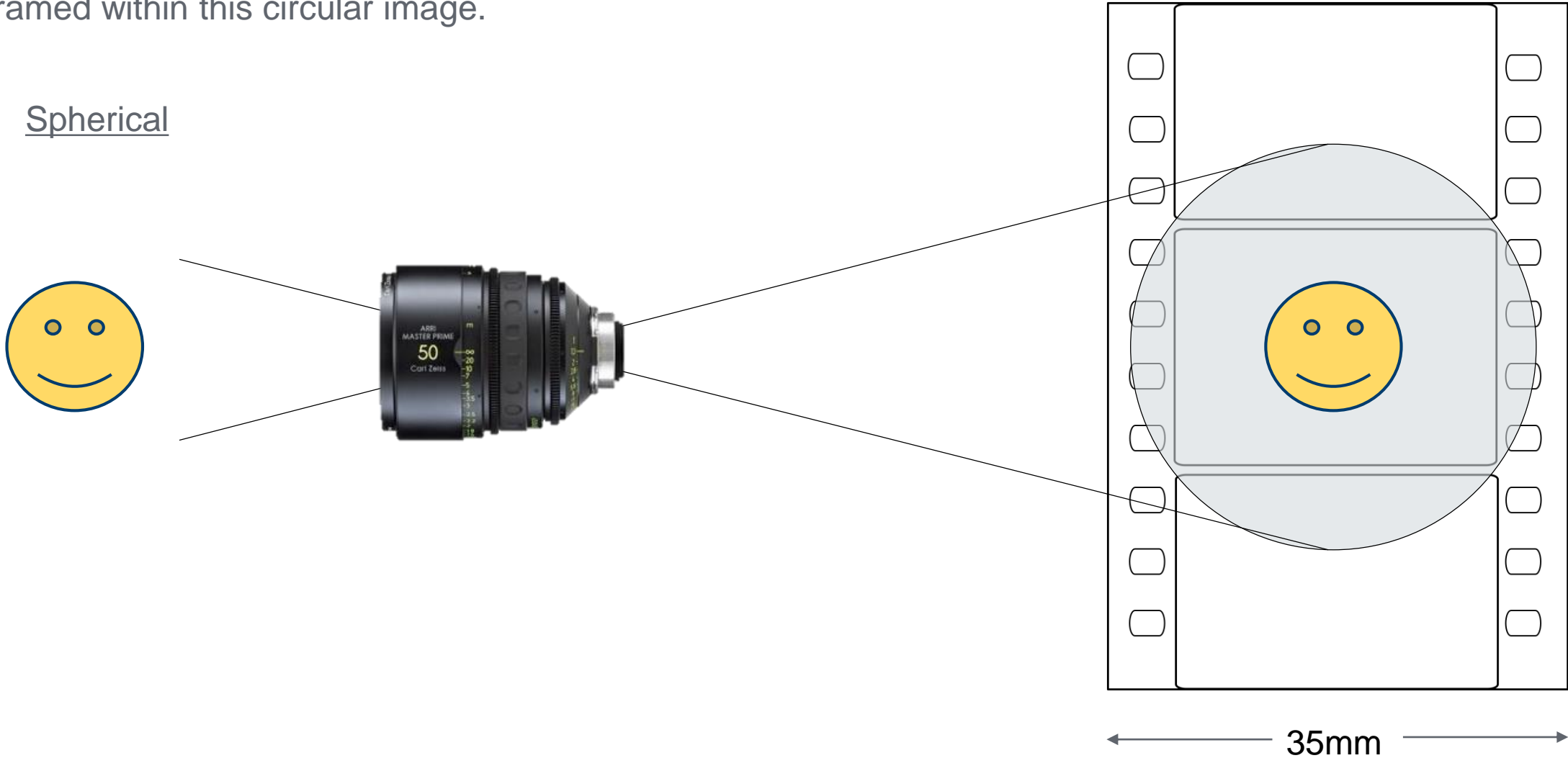
Recorded



Viewed

The original cinema Aspect Ratio of 4:3 could be easily framed within this circular image.

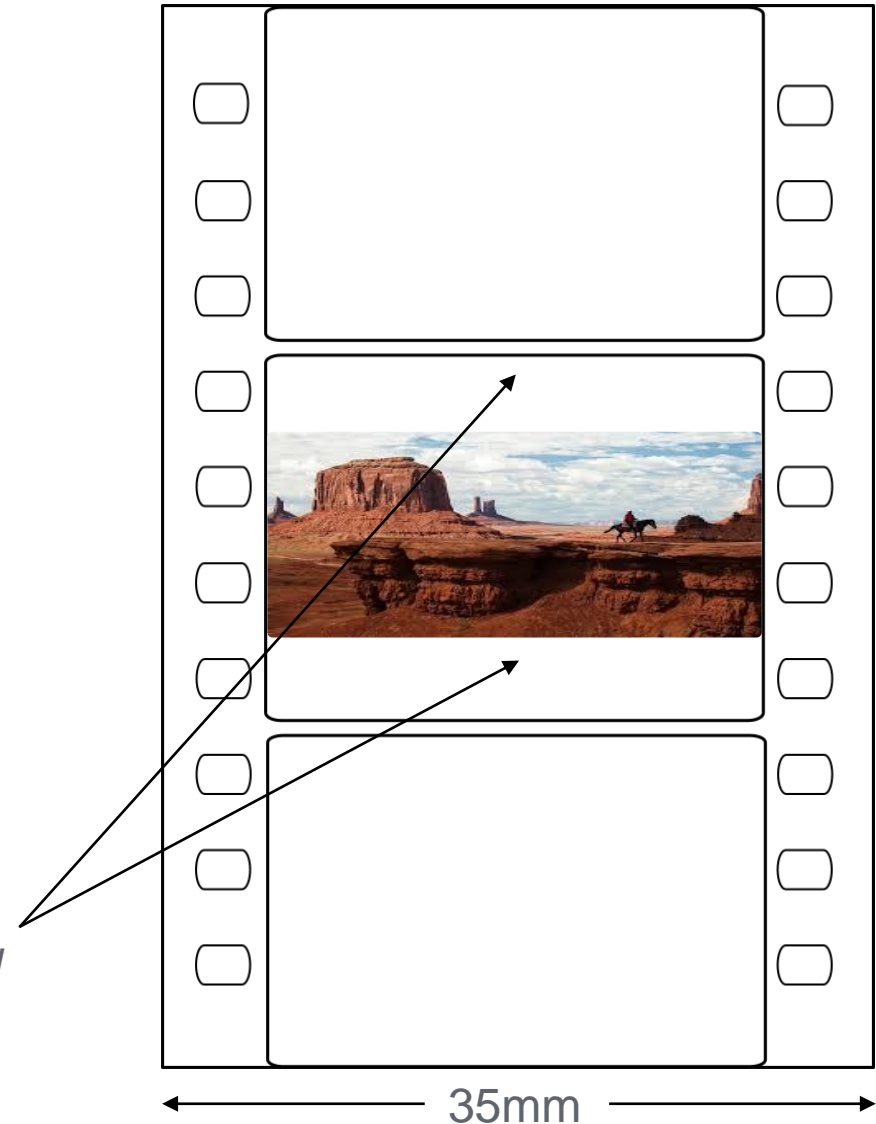
Spherical



As Television became more common in the 50s, cinema had to fight back. Large format Widescreen movies were produced to compete with TV, however, they required expensive 65mm cameras and film stock.

Although the aspect ratio of 2.40 could be achieved by simply cropping the spherical image, less of the available recording area would be used, at the expense of original image quality.

Unused, therefore wasted available recording area



To take full advantage of the quality available from the then industry standard 35mm format, the Anamorphic system was designed to achieve a wider viewing experience without cropping the original image.

Anamorphic lenses are designed to project a horizontally squeezed image onto the film or [sensor](#).

Anamorphic

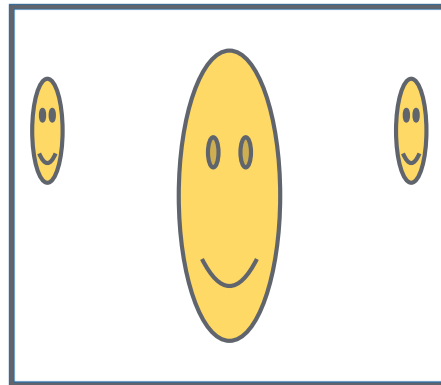


Anamorphic

Once this image is de-squeezed using digital post production, or optical projection, a wider more 'cinematic' aspect ratio can be achieved



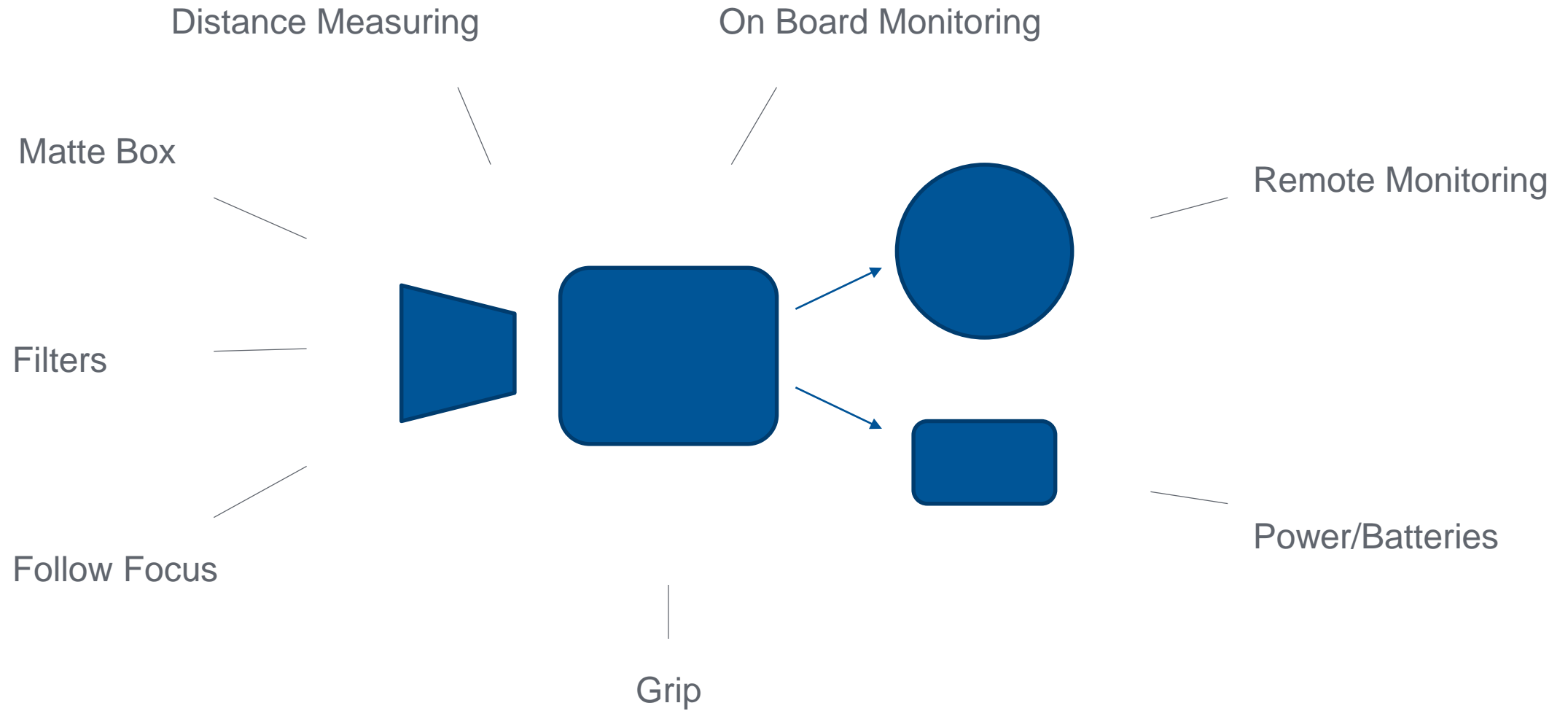
Subject



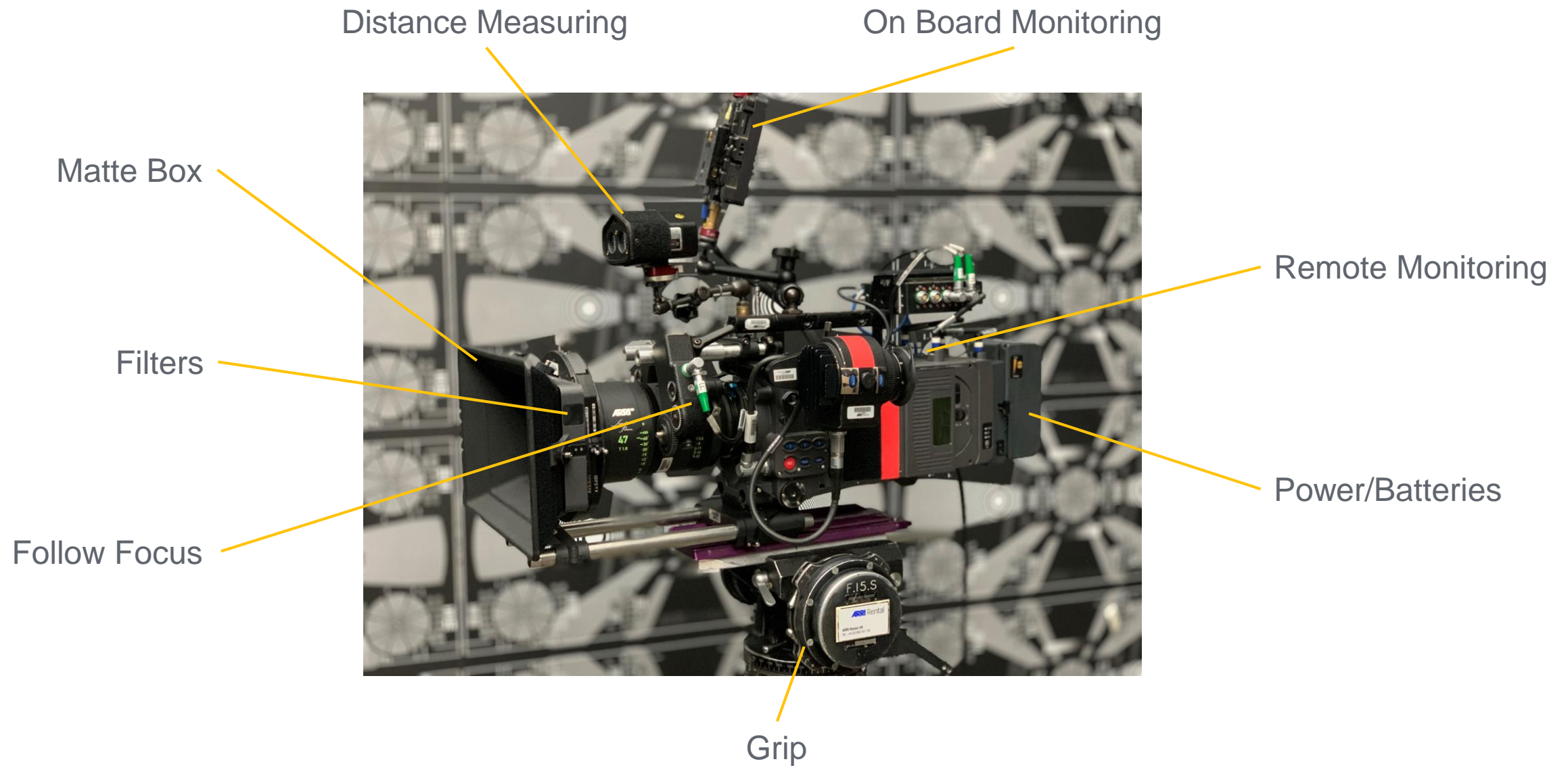
Recorded



Viewed



Common Accessories



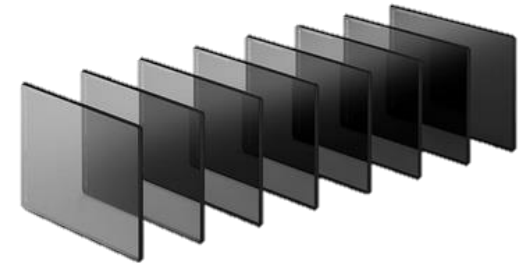
Matte Box

A hood that attaches either to the camera, or directly to the lens, having two purposes: To act as a shade, preventing direct light hitting the front of the lens, causing unwanted flare, and as a means of holding filters in front of the lens. They vary in size, depending on lenses being used, and the number of filters required



Filters

Filters are used to help control exposure, or add an optical effect to the image. Filters are available in either 6" square, or 4 X 5.65"



Follow Focus

This is controlled by the focus puller (1st AC) and is a device for adjusting the focus of the lens.

A manual follow focus requires the 1st AC to physically hold the device which is connected to the camera at all times.

A remote focus system enables the 1st AC to be free from the camera, controlling the focus by using a wireless radio handset with receiver and motors attached to the camera and lens. Steadicam and crane are examples where a wireless system is essential, however due to the freedom of movement most 1st ACs now use this system as standard.



Distance Measuring

A device that attaches directly to the camera, and using either sonic or laser witchcraft, is able to accurately measure the distance between camera and subject. This distance can either be displayed on the camera, or transmitted via a wireless system to a readout on the 1st AC's handset.



Common Accessories

On board, and
remote Monitoring



Although traditionally the Camera Operator would look through the eyepiece during filming, the development of digital cameras and high def video technology meant it was possible for operators to work off small monitors attached and wired directly to the camera. It is common to see multiple screens hanging off a camera for the operator / AC and/or director.

For the purpose of video playback, a signal can be fed to other departments by either hardware, or a wireless video system. Steadicam, handheld, or a wandering director with hand held monitor all benefit from a wireless system being used.

Power and Batteries

There are two types of batteries: 'On board batteries' that attach directly to the camera, or larger and heavier 'block batteries' connected via cable.

Although mains power is possible, it is very rarely used.

****Battery requirements will rarely be discussed with Production, apart from when equipment is to travel via air. Restrictions by airlines on the packing and shipping of Lithium Ion Batteries change so frequently, that there is currently no industry standard. ARRI Rental advise that these details are checked for every Airline/Flight in the schedule prior to travel.**

Grip

Grip equipment is the term used to describe anything that holds or supports the camera. It includes anything from a soft bag for resting the camera on the ground or a tripod and head, to an all terrain vehicle that can support a telescopic crane, or giro stabilised remote gimble attached to the nose of a helicopter. Or a wooden box to stand on. Or a wedge.



Glossary

ARRI Rental	Your first choice for camera and grip rental.
ALEXA	The family name of ARRI Digital Motion Picture Cameras.
FPS	Frames Per Second. The term used to describe the speed which a film camera is running. When footage captured at a high frame rate is played back at a normal frame rate, the playback will appear in slow motion.
Gate	Part of a film camera that contains a rectangular opening, through which the projected image passes to expose the film. When 'Check the gate' is announced on a film set after a successful shot, it is a request to the 1 st AC to confirm the gate is clean and clear of any fluff/dirt/fibres. <i>(Hair in the gate)</i>
Groundglass	An etched/frosted glass screen in a film camera onto which the image is projected to be viewed via the eyepiece and/or video tap.
Movement	The internal mechanism of a film camera that transports the film through the gate, holding it stationary whilst a single frame is exposed, then feeds it out to the take-up side of the magazine.
Rushes	Exposed Footage. Either an exposed roll of film ready for processing at the lab, or card/drive containing captured footage.

Format	The size of the recorded image, whether the camera be digital or film.
Pixel	Also known as a 'Photosite', the word Pixel is derived from the term 'Picture Element', and is the smallest component of a digital imager for capturing light.
Sensor	An electronic device that converts an optical image into an electronic signal, which the camera then converts into a digital image.
Dynamic Range	The difference between the darkest and lightest tones in an image that the sensor can process.
Rushes	Exposed Footage. Either an exposed roll of film ready for processing at the lab, or card/drive containing captured footage.

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Worldwide Locations

