ALEXA Software Upgrade Packet 11.0.1

for ALEXA XT/XR (SUP_AlexaX_11.0.1_29455)
and ALEXA Classic (SUP_Alexa_11.0.1_29455)

RELEASE NOTES

March 23, 2015

A. Introduction

Software Update Packet (SUP) 11.0.1 is now available as a download for ARRI ALEXA XT and ALEXA Classic cameras with the XR Module upgrade (ALEXA XT/XR) and for the ALEXA Classic cameras. SUP 11.0.1 fixes a number of bugs, including

- a bug that created problems for third party equipment using the ALEXA metadata,
- a bug that could stop recording in rare cases when recording ProRes 3.2K 4444 at 29.976 fps with audio,
- a bug that prevented the proper use of the PHASE button,
- a bug that made extended range the MON OUT default for 4:3 Sensor mode (when it should be legal range).

Since especially the metadata bug does affect the workflow on some sets, we recommend that you upgrade your ALEXA cameras as soon as possible.

This document also describes the new features and changes that were introduced with SUP 11.0 and if they apply to ALEXA XT and ALEXA Classic cameras with an XR Module upgrade and/or ALEXA Classic cameras. Useful references can be found at the end of this document: ALEXA ProRes 3.2K, ALEXA Maximum Frame Rates, ALEXA Data Rates, ALEXA REC OUT Options, REC OUT = Clean MON OUT Overview.

Codex Software Updates (ALEXA XT/XR)

Starting with SUP 11.0, the ARRIRAW format is enhanced with checksum information. Only the latest version of Codex software (Vault 3.0 and DTS 3.0) can read the ARRIRAW data from XR Capture Drives recorded with SUP 11.0 or later. **Therefore, it is essential to also update the Codex software to the latest version.** You can find Codex software updates at http://www.codexdigital.com/software.

New Features Overview

A more detailed description of each feature is given in the section 'New Features and Changes'.

- **ALEXA ProRes 3.2K** (ALEXA XT/XR)
  ALEXA ProRes 3.2K is a new recording resolution that uses 3.2K photosites from the sensor to record a 16:9 3.2K ProRes file. This format is specifically designed for TV productions that can create their 4K UHD deliverable by up-sampling 3.2K to 3.8K (=4K UHD) in post. Despite the minor up-scale, the image quality is usually equal to or better than that of other cameras.

- **ARRI Debayer Algorithm ADA-5** (ALEXA Classic, XT/XR)
  ADA-5 is the latest revision of the ARRI debayering algorithm, used to create a color image from the sensor's raw Bayer data. It offers better image quality for ProRes and DNxHD recording, for the REC OUT, MON OUT and the EVF-1 electronic viewfinder. ADA-5 has already been made available in the ARRIRAW SDK for offline image processing. The new algorithm improves rendering of small, high contrast details and reduces the noise level in the red and blue channels.

- **Expanded Media Support** (ALEXA Classic, XT/XR)
  In addition to previously supported media, cameras running SUP 11 also support SxS PRO+ revision C cards (SBP-64C and SBP-128C) and SanDisk CFast 2.0 128 GB cards (ALEXA XT/XR).

- **Expanded Support for the ARRI Electronic Control System (ECS)** (ALEXA Classic, XT/XR)
  SUP 11 supports the new Lens Data Encoder LDE-1 and provides a number of new features when using the WCU-4 with ALEXA cameras.

- **Web Remote 2.0** (ALEXA Classic, XT/XR)
  The camera web remote has a greatly improved user interface and better functionality.

- **Refined User Buttons** (ALEXA Classic, XT/XR)
  The 'Check Last Clip' user button command has been split into two new commands:
  'Check last clip end' and 'Check last clip start' for greater flexibility.

- **ARRIRAW Checksum** (ALEXA XT/XR)
  The camera now records checksum information for each ARRIRAW frame that can be used to verify the integrity of the image data. This function greatly shortens the verification time during the copy process and offers even more safety when working with ARRIRAW data.

- **Framelines in the Metadata** (ALEXA Classic, XT/XR)
  Up to six framelines can now be saved in metadata. They can be used to speed up automated dailies processing or can be displayed in post software.
- **Time Zone in the Metadata** (ALEXA Classic, XT/XR)
  ALEXA cameras now save time zone information in metadata, as we have seen that some post systems require this information for a smooth workflow.

Update Information

Cameras should always be running the latest SUP release version as this allows you to benefit from the latest improvements, features and bug fixes. We do not, however, recommend installing a new SUP in the middle of a production.

Please note that ALEXA Classic and ALEXA XT/XR cameras require different installation packages.

- **An installation package for ALEXA Classic cameras is named 'SUP_Alexa_[version-number]'.** It can be installed on the classic version (SxS recording module) of ALEXA, ALEXA M, ALEXA Plus, ALEXA Plus 4:3 and ALEXA Studio. It is not compatible with any ALEXA XT model, ALEXA cameras with an XR Module upgrade, ALEXA HD, ALEXA HD Plus, ALEXA Fiber Remote or ALEXA Fiber Remote Plus.

- **An installation package for ALEXA XT/XR models is named 'SUP_AlexaX_[version-number]'.** It can be installed on all cameras with an XR Module. This includes ALEXA XT, ALEXA XT M, ALEXA XT Plus, ALEXA XT Studio, and ALEXA Classic cameras with an XR Module Upgrade (all together in the following referred to as 'ALEXA XT/XR cameras'). It is not compatible with any ALEXA Classic model (with an SxS recording module), ALEXA HD, ALEXA HD Plus, ALEXA Fiber Remote or ALEXA Fiber Remote Plus.

Warning: Do not install a SUP onto a camera model it is not made for! Do not attempt to install these SUPs on an ALEXA HD, ALEXA HD Plus, ALEXA Fiber Remote or ALEXA Fiber Remote Plus camera! Doing so may cause the camera to malfunction and become inaccessible. If that happens, the camera can only be made accessible with the support of an ARRI Service Center.

Updating XR Capture Drives (ALEXA XT/XR)

We have encountered a few cases where an XR Capture Drive became unresponsive and had to be sent to Codex service. The root cause has been found and resolved with a new firmware for the XR Capture Drives. Every ALEXA XT/XR running SUP 9.2 or later does automatically check and update all XR Capture Drives if an old firmware is found.

Updating ALEXA Classic M or ALEXA XT M cameras

Please note that the update procedure for ALEXA Classic M and ALEXA XT M cameras differs slightly from the procedure for the other cameras. It is described in detail in the section 'Updating Instructions'.

Downgrading

It is possible to revert back to a previous release version, as low as SUP 8.0.

Warning: ALEXA Classic software before SUP 8.0, should no longer be used and may cause the camera to malfunction and become inaccessible. If that happens, the camera can only be made accessible with the support of an ARRI Service Center.

Table of Contents

Further attached reference documents:

Maximum Frame Rates

for ALEXA Classic Cameras

for ALEXA Classic Cameras with XR Module Upgrade

for ALEXA XT, ALEXA XT M and ALEXA XT Plus

for ALEXA XT Studio with Mirror Shutter Off

for ALEXA XT Studio with Mirror Shutter On

Data Rates

For in-camera recording with ALEXA Classic cameras

For in-camera recording with ALEXA XT cameras

ALEXA REC OUT Options

REC OUT = Clean MON OUT Overview

B. New Features and Changes

Accessories

Lens Data Encoder LDE-1 Support

The LDE-1 can generate lens data when an ALEXA Plus or Studio (Classic or XT/XR) or a camera with attached UMC-4 is used without an LDS lens or an ARRI lens motor. The LDE-1 contains an encoder that delivers lens data to the camera, or UMC-4, and even can be used in parallel with a manual follow focus or a third-party wireless lens control system. It therefore extends the abilities of the ARRI Lens Data System to any lens and camera setup. The LDE-1 is compatible with any Plus or Studio ALEXA (Classic, XT/XR) and with any other ALEXA, when used with a Universal Motor Controller UMC-4.

Electronic Viewfinder and/or MON OUT
No changes.

External Recording
No changes.

General
No changes.

Imaging
No changes.

Image Processing

ARRI Debayer Algorithm ADA-5
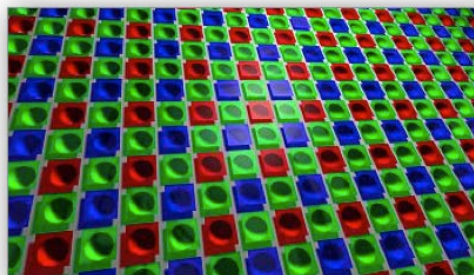
ALEXA XT cameras, ALEXA Classic cameras and ALEXA Classic cameras with the XR Module upgrade benefit from this advancement in ARRI color science. In order to create a color image out of the raw data coming from the ALEXA sensor, a process called 'debayering' is used. It is applied to all color image outputs: ProRes and DNxHD recording as well as REC OUT, MON OUT and the EVF-1 viewfinder image.

Image Quality Improvement
The ARRI Debayer Algorithm ADA-5 represents a great improvement in image quality, as it significantly reduces color aliasing and removes ringing artifacts, resulting in clearer and sharper images. This is especially visible in small, high contrast details (think thin branches against a blue sky), which will exhibit

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smoother, cleaner edges. ADA-5 also reduces noise in the red and blue channels, making for significantly better blue screen compositing in VFX. ADA-5 has already been available through the ARRIRAW Converter since ARC 3.1, as part of the ARRIRAW Software Developer's Kit (SDK) and is also being used in the AMIRA camera since AMIRA SUP 1.1.

<u>Intercutting ADA-3 with ADA-5</u>

The change from ADA-3 (ALEXA SUP 7.0 to SUP 10.0.1) to ADA-5 (ALEXA SUP 11) does not affect color or contrast. Images recorded with ADA-5 have the same colorimetry as those recorded with ADA-3 and can be seamlessly intercut.

Inputs

No changes.

Internal Recording

ALEXA ProRes 3.2K (ALEXA XT/XR only)

MENU> RECORDING>INTERNAL>RESOLUTION>3.2K (3164x1778)

ALEXA XT and ALEXA Classic cameras with the XR Module upgrade can now record in a new recording format: ALEXA ProRes 3.2K. ALEXA ProRes 3.2K allows the same easy up-sampling in post to 4K UHD deliverables as Open Gate ARRIRAW does to 4K Cine. These formats, combined with ALEXA's unsurpassed overall image quality, make ALEXA XT/XR cameras suitable for any type of production with any distribution requirements.

<u>ALEXA ProRes 3.2K Description</u>

Because of ALEXA's best overall image quality, and since up-sampling from 3.2K to 3.8K uses a very small factor, the result looks as good, if not better, than the 4K UHD produced by other cameras. The 3.2K sensor area (blue in the image above) is slightly smaller than the Open Gate sensor area (green in the image above) and was chosen since it is the largest ALEXA sensor area that can still be covered by almost all Super 35 PL mount lenses. At data rates far below uncompressed ARRIRAW, ALEXA ProRes 3.2K provides the benefits of the well-established and efficient ProRes workflow. A straightforward up-sample from ALEXA ProRes 3.2K using standard post tools delivers 4K UHD images of the highest quality for broadband and broadcast.

ALEXA ProRes 3.2K Behavior

ALEXA ProRes 3.2K is a 16:9 format and can be recorded in any ProRes flavor at up to 30 fps. The format can be recorded onto XR Capture Drives, SxS PRO, SxS PRO+ and CFast 2.0 cards with some exceptions (see Maximum fps charts at the end of these release notes). ALEXA ProRes 3.2K playback in the camera is available at up to 30 fps for ProRes 422 and 422 HQ and up to 24 fps for ProRes 4444. The camera cannot play back this resolution in ProRes 4444 XQ, due to limitations of the playback electronics. The viewfinder smooth mode is not available while the camera is set to ALEXA ProRes 3.2K. There is a white paper (named 'ALEXA ProRes 3.2K') at the end of these release notes describing ProRes 3.2K in detail.

Sensor Calibration

There is no obligation, but we recommend getting a sensor calibration by a certified ARRI service center before using ProRes 3.2K, to ensure full image fidelity.

Lenses

No changes.

Media Access

No changes.

Metadata/Time Code

ARRIRAW Checksum (ALEXA XT/XR only)

ALEXA XT and XR cameras will automatically calculate a CRC32C checksum for the image data inside each ARRIRAW frame. This checksum is recorded onto the XR Capture Drive, where Codex software uses it to verify the image content during all copying and processing steps. In addition to providing extra security, this also speeds up the copying process.

ARRIRAW Checksum in Metadata

The checksum is also stored in the ARRIRAW header as metadata (fields 'ImageDataChecksumType' and 'ImageDataChecksum'), thus making it available to third parties. Note that this checksum does not validate the entire .ari file, only the image data itself.

ARRI Meta Extract 3.3

The ARRI Meta Extract software (starting with version 3.3) will be able to read ARRIRAW files and compare the image content with the saved checksum.

Codex Software

Please note that only the latest version of Codex software (Vault 3.0 for Vault and DTS 3.0 for Mac) can read SUP 11 ARRIRAW files. If an XR Capture Drive containing SUP 11 material is loaded in a Vault or Mac running an earlier Codex software version, then the material will not be recognized. Updates to the Codex software can be found at http://www.codexdigital.com/software.

Framelines Saved in Metadata
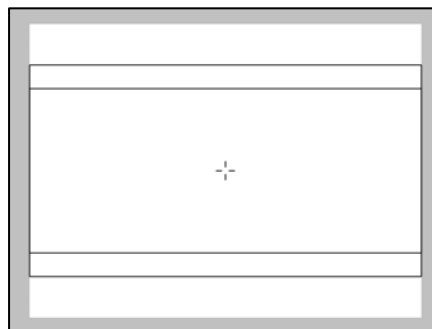
ALEXA Classic, XT and XR cameras can record up to six rectangular framelines from the active frameline files into metadata. This metadata is present in all recording formats and on all HD-SDI outputs. The frameline metadata can be used either for automatic dailies creation or for displaying the framelines in post.

Automated Dailies Creation

It is possible to load two frameline files simultaneously into the camera for a total of six framelines displayed in the viewfinder or on MON OUT. In metadata, the framelines of the first file will be called frameline 1A, frameline 1B and frameline 1C, while the framelines of the second file will be called frameline 2A, frameline 2B and frameline 2C. Frameline 1A automatically is the master frameline. The master frameline can be used by dailies creation software to automatically frame the dailies. This feature will first become available on the Codex Vault, but we expect that other dailies creation software will follow soon.

Framelines in Post

The frameline metadata makes the original camera framelines available during post production for editing, color grading or compositing tools and can be displayed as an overlay in the respective image viewer.

Frameline File Compatibility

ALEXA framelines are stored in XML frameline files. SUP 11 framelines files (as created by the ARRI Frameline Composer AFLC-3, for instance) are slightly different from pre-SUP 11 frameline files. However, the basic file format remains the same so they are forwards and backwards compatible as far as displaying framelines is concerned. Saving the framelines into metadata, however, works only with a camera that has SUP 11 installed and a SUP 11 frameline file.

Camera Software	Frameline File	Functions
SUP 11	SUP 11	Display framelines, save framelines in metadata
SUP 11	pre-SUP 11	Display framelines
pre-SUP 11	SUP 11	Display framelines

ALEXA Frameline Composer

The ALEXA Frameline Composer has been updated (AFLC-3) and writes the new frameline XML files. In addition, the AFLC-3 now allows the creation of three framelines per file (previously only two).

http://www.arri.com/camera/alexa/tools/alexa_frameline_composer/

Time Zone Saved in Metadata
MENU>SYSTEM>TIME + DATE (Time zone)

ALEXA Classic, XT and XR cameras now save the time zone information, as we have seen that some post systems require this information for a smooth workflow. This metadata is present in all recording formats and on all HD-SDI outputs.

Optical Viewfinder
No changes.

Outputs
No changes.

Recording Media

Support for SONY SxS PRO+ Memory Cards (SBP-64C and SBP-128C)

ALEXA Classic, XT and XR cameras now support SONY SxS PRO+ revision C (SBP-64C and SBP-128C) cards, in addition to SxS PRO+ revision B (SBP-64B and SBP-128B) and the SxS PRO (SBP-64A) cards. Using SxS PRO/PRO+ cards in an ALEXA XT or XR camera requires our SxS Adapter (K2.48838.0).

SxS PRO+ Revision B vs. Revision C Cards

The SxS PRO+ revision C cards are easily distinguishable by the following features:

	SxS PRO+ Revision B (supported with SUP 10)	SxS PRO+ Revision C (supported with SUP 11)
Read Speed indication (blue front label)	none	R: 3.5 Gbps
Model ID (back label)	SBP-64B / SBP-128B	SBP-64C / SBP-128C
Write protection switch (bottom end)	black	white

Revision B   Revision C

SxS PRO+ Driver Update

On February 3 2015, Sony released a new version of their SxS Device Drivers. Please make sure to update all computers that are used to access SxS media. You can find the drivers online at pro.sony.com > Products > Recordable Media > Resources > Downloads: SxS & QXD Device Drivers for Windows & MAC.

https://pro.sony.com/bbsc/ssr/cat-recmedia/resource.downloads.bbsccms-assets-mkt-recmedia-downloads-upgrades.shtml

Support for SanDisk CFast 2.0 128 GB Memory Cards (ALEXA XT/XR)

ALEXA XT and XR cameras now support the 128 GB SanDisk Extreme PRO CFast 2.0 cards (with SanDisk firmware HDX 14.14) in addition to the SanDisk's 60 GB and 120 GB CFast 2.0 cards. Their 64 GB cards are not supported. Using CFast 2.0 cards in an ALEXA XT or XR camera requires our CFast 2.0 Adapter (K2.48839.0).

Please note that there also are 128GB CFast 2.0 cards by SanDisk with unsupported firmware! SanDisk accidently released a batch of 128 GB CFast 2.0 cards with a firmware (HDX 14.02) that has NOT qualified for use in our cameras. Even though these cards may be recognized by the camera, they are not approved for use with any ALEXA camera because they can cause various and severe problems during recording, including loss of all data.

You can identify approved/supported SanDisk CFast 2.0 cards by the following features:

1) Product code on the retail packaging

- **SDCFSP-060G**-A46 or -X46
  All 60 GB SanDisk Extreme Pro™ CFast 2.0 cards are supported.
  These cards have been discontinued.

- **SDCFSP-120G**-A46 or -X46
  All 120 GB SanDisk Extreme Pro™ CFast 2.0 cards are supported.
  These cards have been discontinued.

- ~~**SDCFSP-064G-A46, -G46, -J35**~~
  The 64 GB SanDisk Extreme PRO™ CFast 2.0 cards are not supported.
  These cards were showing some technical limitations that prevented their qualification.

- ~~**SDCFSP-128G-A46, -G46, -J35**~~
  Not all the 128 GB SanDisk Extreme Pro™ CFast 2.0 cards are supported. If the product code on the packaging does not end with the letter "A", then these cards have a non-approved firmware.

- **SDCFSP-128G**-B**A**, -A46**A**, -G46**A**, -J35**A**
  Only 128 GB SanDisk Extreme Pro™ CFast 2.0 cards with firmware HDX 14.14 are supported.
  The product code of these cards ends with the letter "A".

2) Letter "A" on the backside label (128GB cards only)

If you are looking at a 128 GB SanDisk Extreme Pro™ CFast 2.0 card without packaging, a letter "**A**", printed on the lower left corner of the backside label, indicates that the card is supported.

3) Tested by ARRI

All SanDisk CFast 2.0 cards that are shipped from ARRI have passed a functional test, which also verifies that the cards are supported.

Exchanging unsupported cards

If you have already purchased SanDisk CFast 2.0 128 GB cards with the old firmware, SanDisk offers to exchange the cards. Send an email to support@sandisk.com or call 866-270-5532 (USA Toll Free) to talk to the SanDisk Extreme Cards Team. State that you have purchased 128 GB CFast 2.0 cards that are not recognized in an ARRI camera. Provide the quantity purchased/needing replacement and your full contact information (name, email, address). Emails will be responded to within 24-48 hours.
Unfortunately, it is not possible to update the card firmware in the field.

Support for other CFast 2.0 Memory Cards (ALEXA XT/XR only)

At the time SUP 11 was finalized, only the 128GB ("A"), 120GB and 60GB SanDisk cards described above had passed our qualification for use in the ALEXA XT and ALEXA Classic camera with the XR Module upgrade.

Other storage media are still under evaluation. As soon as new memory cards will have qualified, they will be supported in the next possible SUP.

If you are unsure whether a certain card is supported in the current camera software version (SUP), you can find this information in the SUP release notes and in the AMIRA and ALEXA section on our website at http://www.arri.com.

Important Note: Every major SUP release usually brings important new features or improvements. To get those updates to you as soon as possible, we sometimes have to push smaller improvements or last minute additions into the next minor release.

As a result, the support for the new Lexar Professional 3400x CFast 2.0 memory cards did not make it into SUP 11, even though they passed the technical qualification.

Remote Control/3D

WCU-4/UMC-4 Remote Control of None-Plus ALEXA cameras

The Wireless Compact Unit WCU-4 can connect directly to Plus or Studio ALEXA models (Classic, XT/XR), since those have a radio built in. For all other ALEXA models, an extra box is needed, the Universal Motor Controller UMC-4.

Starting with SUP 11, you can use the WCU-4 Remote License also to control an ALEXA without a built-in radio (ALEXA, ALEXA XT, ALEXA M, ALEXA M XT). This requires our new connection **Cable UMC-4 to ALEXA** (K2.0005951).

WCU-4 Expanded Lens Table Programming

SUP 11 supports fast and easy lens table programming via WCU-4 in wireless or hard-wired mode (requires WCU-4 SUP 2.0).

WCU-4 Controls ALEXA User Buttons 1, 2 and 3

Access to the ALEXA user buttons 1, 2 and 3 greatly expands the powerful Wireless Compact Unit WCU-4 remote control license features.
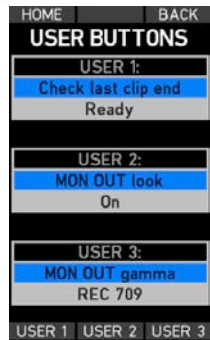
Web Remote 2.0

All ALEXA Classic, XT and XR cameras run a web server that provides a user interface for camera remote control. In SUP 11, this Web Remote has been updated with a new and improved interface and new features. The Web Remote now offers camera status information an controls in a single screen, so you don't loose sight when adjusting a camera setting. Next to the standard operational parameters, the new Web Remote offers control over the MON OUT, pre-recording, the selection of the recording codec, and offers a great number of editable metadata fields, expanded warnings and status info messaging.

<u>Connecting to the Camera</u>

The Web Remote can be accessed via an Ethernet connection from the camera's ETH port to a computer's Ethernet port, using the Bonjour protocol or by directly entering the camera's IP address. First, make sure on the camera that MENU>SYSTEM>NETWORK ACCESS READ-ONLY is set to 'Off'. If you want to prevent access to the Web Remote, set MENU>SYSTEM>NETWORK ACCESS READ-ONLY to 'On'. Connect the cable. To use the Bonjour protocol, open the web browser on the computer and enter the address alexa####.local in the browser's address bar, where you need to replace #### with the serial number of the camera. Alternatively, you can look up the camera's IP address (INFO > SYSTEM) and enter that in the browser's address bar. Connecting via IP address may require that your computer is in the same subnet as the camera (e.g. 169.245.###.###).

User Interface

Refined User Buttons

USER button>Jog Wheel press (Check last clip end, Check last clip start)

The 'Check last clip' command has been replaced with the 'Check last clip end' and 'Check last clip start' commands for greater flexibility. This works on all ALEXA XT/XR and Classic cameras.

• 'Check last clip end' plays the last 5 seconds of the last clip, then returns to the live image
• 'Check last clip start' plays the first 5 seconds of the last clip, then returns to the live image

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C. Known Issues

This is a list of known issues for this particular software update packet. For a listing of answers to frequently asked questions please visit our website at www.arri.com/alexa/learn.

Frame Grab

• Lazy grab icon on EVF and MON OUT.

When you trigger a frame grab, the MON out and EVF status bars will not show a grab icon for the first few seconds. If in doubt, please check the home screen on the camera menu, which immediately shows when the camera takes a frame grab.

• No warning if frame grab failed.

If a frame grab is triggered with one of the User buttons (assignable to button 1-3) while no SD card is inserted, the camera will not show a warning.

Framelines

None

LDS/LDA

• Alura LDS information drops out during fast adjustments.

If the Iris, Zoom or Focus ring on an LDS Alura Zoom is turned very quickly, the corresponding LDS information is lost and the camera will show 'Turn Lens rings!' A slow or normal ring turn recalibrates the lens and brings back the LDS information. Thresholds are (rotation of lens ring end to end):
FOCUS: 1.0sec, ZOOM: 0.4sec and IRIS: 0.2sec.

• LDS or Cooke/i Lens not detected.

On rare occasions a lens is not recognized by the LDS system of the ALEXA M and ALEXA XT M.

Metadata

• First frame of DNxHD may contain wrong metadata.

The first frame of a DNxHD file may contain wrong (dynamic) metadata. After that, the data shows up normally.

• LDA produces "random" Lens_SN in metadata field.

When the LDA (Lens Data Archive) is used to identify a lens, the camera records a random lens serial number in the metadata. This does not represent the actual serial number of the lens.

Playback

• 2K 16:9 ProRes playback not showing full image.

When playing back 16:9 ProRes 2K material from the camera, the playback image is slightly cropped/smaller. The recorded footage, however, shows the same framing as indicated in the live EVF/MON OUT image.

Recording

• Camera takes long to start recording with SxS PRO+ Cards.

Compared with an original SxS PRO card (SBP-64A), it takes an ALEXA about 2 seconds longer to start/stop recording with an SxS PRO+ rev B card (SBP-064B and SBP-128B) and about 1 second longer with the latest SxS PRO+ rev C cards (SBP-064C and SBP-128C).

• Damaged file from power loss during recording.

If the camera loses power while it is recording, the clip may be damaged. We recommend to immediately copy the contents from the memory card and check if all clips, especially the last one, have been transferred properly. If the last clip in fact is broken and it is not possible to shoot another take, please contact an ARRI service center for assistance in the recovery of the broken clip. To help avoiding this problem, please make sure that the power warning levels are adjusted properly (MENU>SYSTEM>Power).

Time Code

• Time Code INT Free Run reset to 00:00:00.

With asynchronous recording, i.e. "Project frame rate" NOT EQUAL to "Sensor fps" and time code set to INT FREE RUN, the time code will be reset to 00:00:00 after a reboot.

Usability (ALEXA Classic)

• Changing the SxS recording resolution may change your REC OUT setting.

If you set the SxS recording resolution to e.g. 2K, the camera will default the REC OUT to the clean MON OUT clone setting. If you intend to record ARRIRAW via T-Link over the REC OUT, make sure to always adjust the REC OUT setting last.

Usability

• Frame grab slows down GUI.

When you trigger a frame grab, the GUI may react slowly while the image is saved to the SD card. This becomes more notable if you grab a frame during recording.

• MON OUT CLONE stuck in Log C.

If you assign a User Button to toggle the MON OUT Gamma and the REC OUT is set to show the MON OUT clone, then toggling from Log C to Rec 709 and back will leave the REC OUT stuck in Log C. Use HOME > COLOR > GAMMA > REC OUT to switch the Gamma back to REC 709.

D. Updating Instructions

Download and Registration Process

You have to register your ALEXA camera by serial number to access the Software Update Packets (SUP) in the ALEXA DOWNLOADS Section on the ARRI website. A SUP can be installed on the camera either by using an SD card directly on the camera (described in detail below) or from a computer via the ALEXA Ethernet Cable (K2.72021.0).

Please note that ALEXA Classic cameras and ALEXA XT/XR cameras require different SUP installation packages.

- Installation packages for ALEXA Classic models are named 'SUP_Alexa_[*version-number*]'.
- Installation packages for ALEXA XT/XR model are named 'SUP_AlexaX_[*version-number*]'.

How to get a Software Update Package

- If you have not registered yet, go to the ALEXA DOWNLOADS page at http://www.arri.com/alexa/downloads and scroll to the 'ALEXA Software Update Packet x.x' section (where 'x.x' is the version number of the desired Software Update Packet). Click 'Please -> register to get an account.' The ALEXA customer registration page will be opened.

- Fill in the relevant data and make sure to put in the serial number(s) of your camera(s) in the format of K1.71000.0-2xxx, K1.71100.0-4xxx, K1.71200.0-6xxx, etc. Don't forget to agree to the registration terms at the end of the page.

- When you hit the 'create account' button the system will send you an acknowledgement email with a link for the activation of your account. After following the link a welcome mail is sent to you containing the login credentials. Please login at http://www.arri.com/login/login.html and navigate to the download section again.

- Upon access of the software package download you will be asked to agree to the terms and conditions of this download. If you agree to these terms the download link is released.

Updating ALEXA Classic M or ALEXA XT M Cameras

Please note that the first time an ALEXA Classic M or ALEXA XT M is upgraded from a version before SUP 10 Open Bate 2 to SUP 10 Open Beta 2 or later, a slightly different update process (two-pass upgrade) has to be used. So, for instance, when updating from SUP 9.2 to SUP 10 OB2 the two-pass update process should be used or, when updating from SUP 8 to SUP 10. When updating from SUP 10 OB 2 to SUP 10, however, the regular one-pass update process can be used. The two-pass update process is as follows:

- Initiate the update as described in the release notes.

- The camera will start the update and at some point inform you that the APIC update failed. This is normal and not a problem. Please wait until the update is finished updating the CMC and ACOM boards.

- Then power down the camera and power it back up again.

- You will see an error and a message in the LIVE INFO screen like this:
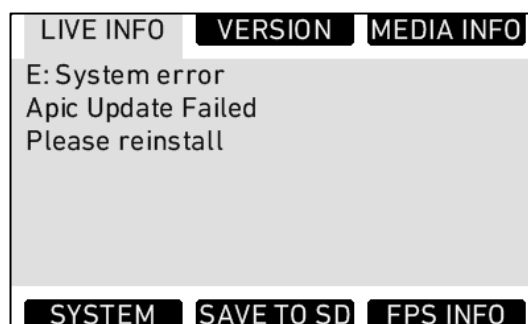
- Initiate the update again. The camera should go through the entire update procedure this time.

ALEXA Classic M and ALEXA XT M Downgrade

While in general we do not recommend downgrading ALEXA cameras to previous SUPs, it is possible to downgrade ALEXA Classic M and ALEXA XT M cameras from SUP 10 OB2 to SUP 9.2. When such a camera is upgraded again to SUP 10 OB2 or later, it will not have to use the two-pass upgrade process but the regular, one-pass upgrade process.

Camera Update Procedure via SD Card

Using the SD card for updating is the easiest method. It updates the ALEXA camera as well as the Electronic Viewfinder (EVF-1) as long as the viewfinder is connected to the camera.

Precautions

• Make sure the power supply of the camera is stable. The best way to achieve this is by using a mains power supply attached to the battery socket. We do not recommend updating a camera that is powered from a battery.

Preparing the SD Card

• Have a FAT16 or FAT32 formatted SD-Card ready.

• Cards larger than 4 GB are not supported. If you have a larger SD card, you need to create one partition with max. 4GB so it will be compatible with ALEXA.

• Go to MENU > SYSTEM > SD CARD and choose
- 'Prepare SD card' to create the ALEXA folder structure on the SD card, and keep the existing data.
- 'Format + prepare SD card' to DELETE ALL DATA on the SD card before creating the ALEXA folders.

• Copy the update package
SUP_AlexaX_x.x_zzzzz.pkg (for ALEXA XT/XR) or
SUP_Alexa_x.x_zzzzz.pkg (for ALEXA Classic)
into the 'Firmware' folder on the SD card.
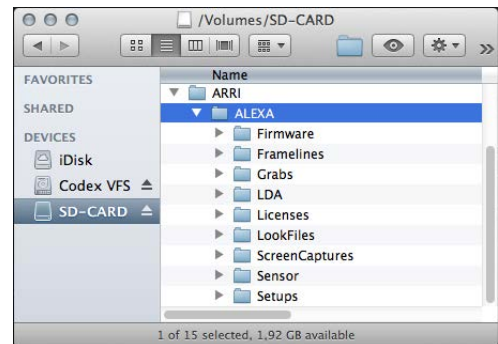
Performing the Update

• Turn the camera on.

• **Perform a factory reset** in MENU > USER SETUPS > FACTORY RESET.

• Insert the SD card into the SD card slot of the camera. The slot is located below the display on the bottom of the camera, covered by a slider. The direction how the SD card has to be inserted is shown on the camera housing.

• A card icon will show up in the notification area of the camera display. If not, the card is not recognized by the camera.

• Go to MENU > SYSTEM > FIRMWARE.

• The FIRMWARE screen shows you which packet is currently installed (Current version: xxx).

• Press the jog wheel to select an update file. The list shows all SUP files that are available on the SD card.

• Choose the desired packet and press the two lower outer screen buttons simultaneously to start the update.

• Caution: Do not remove the SD card while the packet is being copied to the camera!

• When the 'copying files' message disappears the SD card can be safely removed.

• The update process may take 15 to 20 minutes, depending on the actual software packet. Wait until the update process has finished. This is indicated by a green screen informing you that the update process is completed.

• If the update process fails, which will be indicated by a red screen, please restart the camera and repeat the update procedure.

• After the update, turn the camera off by holding down the power button for a few seconds.

• Turn the camera back on. The software is now updated and you can use the camera.

Camera Update Procedure using a Web Browser on your Computer

How to connect ALEXA to a computer

• Turn the camera on.

• Connect the Ethernet port of the computer to the camera with the ALEXA Ethernet/RJ-45 Cable KC 153-S (3.00m/9.8ft, order number K2.72021.0).

• Configure the computer's network interface to which the camera is connected with the following settings:
IP address: 169.254.1.2 (static IP)
Subnet mask: 255.255.0.0

• Open a web browser

• If you are using a Macintosh or a computer with Apple's Bonjour protocol installed enter the following URL into the address bar:
http://alexaXXXX.local/update.cgi, where XXXX is the four-digit serial number of your camera (e.g. for ALEXA 7123: http://alexa7123.local/update.cgi).

• If you are using a computer without Bonjour support please use the camera's IP address to connect, e.g.:
http://192.168.xxx.xxx/update.cgi, where xxx.xxx is the two last groups of your camera"s actual IP address. You can determine ALEXA's IP address by going to INFO > SYSTEM.

• If the network settings are configured correctly you will be presented the update page of the camera.

Performing the Update

• Download the Software Update Package to your computer.

• **Perform a factory reset** in MENU > USER SETUPS > FACTORY RESET.

• In the 'Camera Update' section select the Software Update Package by clicking the 'browse' button and selecting the path to the downloaded SUP on your computer.

• Click the 'Update Camera' button in the 'Camera Update' section.

• The file will be uploaded to the camera which takes about a minute. The browser will switch to the 'Update Log' page showing the update log of the three main boards. This page can be updated by refreshing the page. At the same time the update screen with the progress bars appears on the camera display.

• The update process may take 15 to 20 minutes, depending on the actual software packet. Wait until the update process has finished. This is indicated by a green screen informing you that the update process is completed.

• If the update process fails, which will be indicated by a red screen, please restart the camera and repeat the update procedure.

• After the update, turn the camera off and on again. The software is now updated and you can use the camera.

Updating an Electronic Viewfinder EVF-1

In case an ALEXA electronic viewfinder EVF-1 has not been updated with the camera, it is possible to update the EVF-1 separately by using a computer. Please note that the EVF-1 will be updated to match the SUP package that is installed on the camera.

• Connect the Ethernet port of the computer as described above in 'How to connect ALEXA to a computer'.

• Connect the EVF-1 to the camera.

• Open a web browser on the computer and open the update web page of the camera (see above).

• Click the 'Update EVF' button in the 'EVF Update' section.

• You can watch the progress of the update on the screen.

• When the update is done, the last line on the screen reads 'successfully updated Evf'. The update is now finished even though the web browser continues to refresh the page. This is normal. The viewfinder is up to date.

• Depending on its software version the camera will state a 'software error – reboot camera' on the camera display. This is normal. Please reboot the camera.

Updating the V-Mount Top/Back Battery Adapter with a Computer

This procedure requires the ALEXA to be connected to a computer and SUP 4.0 or later. To update the firmware of the V-mount battery adapters please perform the following steps:

• Connect the Ethernet port of the computer as described above in 'How to connect ALEXA to a computer'.

• Attach a charged V-Mount battery to the mount.

• Open a web browser on the computer and open the update web page of the camera (see above).

• Click the 'Update VMOUNT' button in the 'V-Mount Update' section.

• The update will take approximately three minutes. You can watch the progress of the update on the screen.

• If you get an error, you might have an old style V-mount battery adapter, which cannot be updated.

• When the update is done, the last line on the screen reads 'successfully updated V-Mount Adapter' and the V-mount battery adapter's firmware is up to date.

• If your V-mount battery adapter cannot be updated, please contact ARRI Service
http://www.arri.com/service.

E. Appendix – ALEXA ProRes 3.2K

With ALEXA Software Update Packet SUP 11, ALEXA XT cameras and ALEXA Classic cameras with the XR Module upgrade can record in a new recording format: ALEXA ProRes 3.2K.

ALEXA ProRes 3.2K allows the same easy up-sampling in post to 4K UHD deliverables as Open Gate ARRIRAW does to 4K Cine. These formats, combined with ALEXA's unsurpassed overall image quality, make ALEXA XT/XR cameras suitable for any type of production with any distribution requirements.

ALEXA ProRes 3.2K Description

Because of ALEXA's best overall image quality, and since up-sampling from 3.2K to 3.8K is a very small factor, the result looks as good if not better than the 4K UHD produced by other cameras. The 3.2K sensor area (blue in the image above) is slightly smaller than the Open Gate sensor area (green in the image above) and was chosen since it is the largest ALEXA sensor area that can still be covered by almost all Super 35 PL mount lenses. At data rates far below uncompressed ARRIRAW, ALEXA ProRes 3.2K provides the benefits of the well-established and efficient ProRes workflow. A straightforward up-sample from ALEXA ProRes 3.2K using standard post tools delivers 4K UHD images of the highest quality for broadband and broadcast.

ALEXA ProRes 3.2K Behavior

ALEXA ProRes 3.2K is a 16:9 format and can be recorded in all ProRes codecs running at a maximum recording frame rate of 30 fps. ALEXA ProRes 3.2K can be recorded onto XR Capture Drives, SxS PRO, SxS PRO+ and CFast 2.0 cards with some exceptions. It supports in-camera playback for ProRes 422 and 422 HQ at 30 fps, in-camera playback for ProRes 4444 at 24 fps, and does not support in-camera playback for ProRes 4444 XQ since the data rate is simply too high for the playback electronics. ALEXA ProRes 3.2K does not support EVF smooth mode.

ALEXA ProRes 3.2K QuickTime Container

For technical reasons, the ALEXA ProRes 3.2K QuickTime file container is 3200 X 1782 pixels sized, containing an active image area of 3164 x 1778 pixels. The active image area is noted in the file's metadata, and some players can display the file correctly (QuickTime Player 10) while others will show a thin black border around the image (QuickTime Player 7, Final Cut Pro 7, Final Cut Pro 10, Avid Media Composer, Resolve, Adobe Premiere, Baselight) that has to be cropped.

Image with black border

The screen shot below shows an ALEXA ProRes 3.2K ProRes image displayed in QuickTime Player 7. There is a 2 pixel black border on top and bottom and an 18 pixel border left and right.

Image without black border

To hide these black lines the camera stores in QuickTime specific metadata atoms the information to crop out the valid image area automatically. This automatic crop out is currently supported in QuickTime Player 10 only, but we are working with the software manufacturers so more players will gain this ability. For AVID Media Composer it will be available in version 8.3.1. The screen shot below shows in QuickTime Player 10 the identical ALEXA 3.2K ProRes image, but here the player has automatically cropped the none active image area.

Post Production Tools

The following table shows which post-production tools automatically can crop the ALEXA ProRes 3.2K container to show only the active image area.

Tool	Support	Note
QuickTime Player 7	NO	
QuickTime Player 10	YES	
FCP 7	NO	
FCP 10	NO	Planned for future release
NUKE 9.0	NO	
Resolve 11	NO	
Premier Pro CC 2014	NO	
AVID Media Composer	NO	Available in release 8.3.1 and higher

AMIRA ProRes 3.2K

Please note that this is slightly different from the AMIRA ProRes 3.2K, which is 3200 x 1800. While we would have very much liked to keep both formats exactly the same, it was technically not possible.

Sensor Calibration

While it is not mandatory, we recommend to have a sensor calibration done by an ARRI service center before using ProRes 3.2K to ensure full image fidelity in the Surround View area.

Contact

If you have any questions regarding ProRes 3.2K, please feel free to contact us via email at
digitalworkflow@arri.de

Maximum Frame Rates
for ALEXA Classic Cameras
with SUP 11.0 (ALEXA Classic)

ARRI

Recording Format				Maximum Frame Rate in fps [1, 2]		
				Internal Recording		External Recorder
Sensor Mode	Recording File Type	Recording Resolution [8]	Recording File Setting [3]	SxS PRO 32 GB	SxS PRO 64 GB SxS PRO+ 64 GB SxS PRO+ 128 GB	Codex Onboard S Plus
16:9	ProRes	HD	422	60	120	-
			422 HQ	60	120	-
			4444	40	60	-
		2K	422	60	60	-
			422 HQ	50	60	-
			4444	30	60	-
	DNxHD [4]	HD	145	60	120	-
			220x	60	120	-
			444	30	55	-
	REC OUT HD-SDI Video	HD	422 1.5G SL	-	-	30
			422 1.5G DL	-	-	60
			422 3G SL [5]	-	-	60
			444 1.5G DL	-	-	30
			444 3G SL [5]	-	-	30
			444 3G DL	-	-	60
	REC OUT ARRIRAW T-Link	2.8K	1.5G DL	-	-	30
			3G SL [5]	-	-	30
			3G DL	-	-	60
4:3 [6]	ProRes	2K	422	48	48	-
			422 HQ	40	48	-
			4444	30	48	-
	REC OUT ARRIRAW T-Link [7]	2.8K	1.5G DL	-	-	30
			3G SL [5]	-	-	30
			3G DL	-	-	60

(1) Minimum frame rate is always 0.75 fps
(2) Frame rates above 60 fps require purchase of a High Speed license
(3) SL = Single Link, DL = Dual Link
(4) DNxHD requires the purchase of a DNxHD license for ALEXA, ALEXA Plus andf ALEXA M; a DNxHD license is included in ALEXA Plus 4:3 and ALEXA Studio.
(5) Same as 1.5G DL, just over one cable
(6) 4:3 sensor mode only available in the following ALEXA Classic cameras: ALEXA Plus 4:3, ALEXA M and ALEXA Studio
(7) In 4:3 sensor mode, REC OUT can be either ARRIRAW or MON OUT clone. Since MON OUT clone is not usable as a master recording format, REC OUT HD-SDI video is not listed here.
(8) The ‚recording resolution‘ determines the number of horizontal pixels that will be recorded (the number of vertical pixels is dependent on the recording file type and sensor mode).
   HD = 1920
   2K = 2048
   2.8K = 2880

„-" = Not available

Maximum Frame Rates
for ALEXA Classic Cameras with XR Module Upgrade
with SUP 11.0 (ALEXA XT/XR)

ARRI®

Recording Format				Maximum Frame Rate in fps [1]				External Recorder
Sensor Mode	Recording File Type	Recording Resolution [8]	Recording File Setting [2]	Internal Recording				
				SxS PRO 32 GB [3]	SxS PRO 64 GB / SxS PRO+ 64 GB / SxS PRO+ 128 GB [3]	CFast 2.0 60 GB / CFast 2.0 120 GB / CFast 2.0 128 GB [4]	XR Capture Drive 512 GB	Codex Onboard S Plus
16:9	ProRes	HD	422	60	120	120	120	-
			422 HQ	60	120	120	120	-
			4444	40	60	120	120	-
			4444 XQ	25	48	75	75	-
		2K	422	60	60	60	60	-
			422 HQ	50	60	60	60	-
			4444	30	60	60	60	-
			4444 XQ	-	40	60	60	-
		3.2K	422	-	30	30	30	-
			422 HQ	-	30	30	30	-
			4444	-	30	30	30	-
			4444 XQ	-	-	30	30	-
	DNxHD [5]	HD	145	60	120	120	120	-
			220x	60	120	120	120	-
			444	30	60	90	96	-
	REC OUT HD-SDI Video	HD	422 1.5G SL	-	-	-	-	30
			422 1.5G DL	-	-	-	-	60
			422 3G SL [6]	-	-	-	-	60
			444 1.5G DL	-	-	-	-	30
			444 3G SL [6]	-	-	-	-	30
			444 3G DL	-	-	-	-	60
	ARRIRAW	2.8K		-	-	-	120	-
4:3 [7]	ProRes	2K	422	48	48	48	48	-
			422 HQ	40	48	48	48	-
			4444	30	48	48	48	-
			4444 XQ	-	30	48	48	-
	ARRIRAW	2.8K	Full	-	-	-	90	-
		2.6K	Cropped	-	-	-	96	-

(1) Minimum frame rate is always 0.75 fps
(2) SL = Single Link, DL = Dual Link
(3) Requires an SxS Adapter
(4) Requires a CFast 2.0 Adapter
(5) DNxHD requires the purchase of a DNxHD license for ALEXA, ALEXA Plus andf ALEXA M; a DNxHD license is included in ALEXA Plus 4:3 and ALEXA Studio.
(6) Same as 1.5G DL, just over one cable
(7) 4:3 sensor mode is only available on ALEXA Classic cameras with an XR Modul upgrade that are inherently 4:3 capable: ALEXA Plus 4:3, ALEXA M and ALEXA Studio
(8) The ‚recording resolution‘ determines the number of horizontal pixels that will be recorded (the number of vertical pixels is dependent on the recording file type and sensor mode).
    HD = 1920
    2K = 2048
    2.6K = 2578
    2.8K = 2880
    3.2K = 3164

„-“ = Not available

Maximum Frame Rates
for ALEXA XT, ALEXA XT M and ALEXA XT Plus
with SUP 10.0 (ALEXA XT/XR)

ARRI

Recording Format				Maximum Frame Rate in fps [1]					
Sensor Mode	Recording File Type	Recording Resolution [7]	Recording File Setting [2]	Internal Recording					External Recorder
				SxS PRO 32 GB [3]	SxS PRO 64 GB SxS PRO+ 64 GB SxS PRO+ 128 GB [3]	CFast 2.0 60 GB [4]	CFast 2.0 120 GB CFast 2.0 128 GB [4]	XR Capture Drive 512 GB	Codex Onboard S Plus
16:9	ProRes	HD	422	60	120	120	120	120	-
			422 HQ	60	120	120	120	120	-
			4444	40	60	120	120	120	-
			4444 XQ	25	48	75	75	75	-
		2K	422	60	60	60	60	60	-
			422 HQ	50	60	60	60	60	-
			4444	30	60	60	60	60	-
			4444 XQ	-	40	60	60	60	-
		3.2K	422	-	30	30	30	30	-
			422 HQ	-	30	30	30	30	-
			4444	-	30	30	30	30	-
			4444 XQ	-	-	-	30	30	-
	DNxHD [5]	HD	145	60	120	120	120	120	-
			220x	60	120	120	120	120	-
			444	30	60	90	90	96	-
	REC OUT HD-SDI Video	HD	422 1.5G SL	-	-	-	-	-	30
			422 1.5G DL	-	-	-	-	-	60
			422 3G SL [6]	-	-	-	-	-	60
			444 1.5G DL	-	-	-	-	-	30
			444 3G SL [6]	-	-	-	-	-	30
			444 3G DL	-	-	-	-	-	60
	ARRIRAW	2.8K		-	-	-	-	120	-
4:3	ProRes	2K	422	48	48	48	48	48	-
			422 HQ	40	48	48	48	48	-
			4444	30	48	48	48	48	-
			4444 XQ	-	30	48	48	48	-
	ARRIRAW	2.8K	Full	-	-	-	-	90	-
		2.6K	Cropped	-	-	-	-	96	-
Open Gate	ARRIRAW	3.4K		-	-	-	-	75	-

(1) Minimum frame rate is always 0.75 fps
(2) SL = Single Link, DL = Dual Link
(3) Requires an SxS Adapter
(4) Requires a CFast 2.0 Adapter
(5) DNxHD requires the purchase of a DNxHD license for ALEXA XT and XT M; a DNxHD license is included in ALEXA XT Plus and ALEXA XT Studio.
(6) Same as 1.5G DL, just over one cable
(7) The ‚recording resolution' determines the number of horizontal pixels that will be recorded (the number of vertical pixels is dependent on the recording file type and sensor mode).
    HD = 1920
    2K = 2048
    2.6K = 2578
    2.8K = 2880
    3.2K = 3164
    3.4K = 3414

„-" = Not available

Maximum Frame Rates
for ALEXA XT Studio with Mirror Shutter Off
with SUP 10.0 (ALEXA XT/XR)

ARRI

Recording Format				Maximum Frame Rate in fps (1)					
				Internal Recording					External Recorder
Sensor Mode	Recording File Type	Recording Resolution (8)	Recording File Setting (2)	SxS PRO 32 GB (3)	SxS PRO 64 GB SxS PRO+ 64 GB SxS PRO+ 128 GB (3)	CFast 2.0 60 GB (4)	CFast 2.0 120 GB CFast 2.0 128 GB (4)	XR Capture Drive 512 GB	Codex Onboard S Plus
16:9	ProRes	HD	422	60	120	120	120	120	-
			422 HQ	60	120	120	120	120	-
			4444	40	60	120	120	120	-
			4444 XQ	25	48	75	75	75	-
		2K	422	60	60	60	60	60	-
			422 HQ	50	60	60	60	60	-
			4444	30	60	60	60	60	-
			4444 XQ	-	40	60	60	60	-
		3.2K	422	-	30	30	30	30	-
			422 HQ	-	30	30	30	30	-
			4444	-	30	30	30	30	-
			4444 XQ	-	-	-	30	30	-
	DNxHD	HD	145	60	120	120	120	120	-
			220x	60	120	120	120	120	-
			444	30	60	90	90	96	-
	REC OUT HD-SDI Video	HD	422 1.5G SL	-	-	-	-	-	30
			422 1.5G DL	-	-	-	-	-	60
			422 3G SL (5)	-	-	-	-	-	60
			444 1.5G DL	-	-	-	-	-	30
			444 3G SL (5)	-	-	-	-	-	30
			444 3G DL	-	-	-	-	-	60
	ARRIRAW	2.8K		-	-	-	-	120	-
4:3	ProRes	2K	422	48	48	48	48	48	-
			422 HQ	40	48	48	48	48	-
			4444	30	48	48	48	48	-
			4444 XQ	-	30	48	48	48	-
	ARRIRAW	2.8K	Full	-	-	-	-	90	-
		2.6K	Cropped	-	-	-	-	96	-
Open Gate	ARRIRAW	3.4K		-	-	-	-	75	-

(1) Minimum frame rate is always 0.75 fps
(2) SL = Single Link, DL = Dual Link
(3) Requires an SxS Adapter
(4) Requires a CFast 2.0 Adapter
(5) Same as 1.5G DL, just over one cable
(6) Except with SxS PRO 32 GB cards. Since the maximum fps for SxS PRO 32 GB cards is lower, the maximum shutter angle is 180°
(7) Except with SxS PRO 32 GB cards. Since the maximum fps for SxS PRO 32 GB cards is lower, the maximum shutter angle is 172.8°
(8) The ‚recording resolution' determines the number of horizontal pixels that will be recorded (the number of vertical pixels is dependent on the recording file type and sensor mode).
  HD = 1920
  2K = 2048
  2.6K = 2578
  2.8K = 2880
  3.2K = 3164
  3.4K = 3414

„-" = Not available

Maximum Frame Rates
for ALEXA XT Studio with Mirror Shutter On
with SUP 10.0 (ALEXA XT/XR)

ARRI

Recording Format				Maximum Frame Rate in fps (1)						Mirror Shutter	
				Internal Recording					External Recorder		
Sensor Mode	Recording File Type	Recording Resolution (8)	Recording File Setting (2)	SxS PRO 32 GB (3)	SxS PRO 64 GB SxS PRO+ 64 GB SxS PRO+ 128 GB (3)	CFast 2.0 60 GB (4)	CFast 2.0 120 GB CFast 2.0 128 GB (4)	XR Capture Drive 512 GB	Codex Onboard S Plus	Max. Fps at 180° Mirror Shutter	Max. Mirror Shutter at Max Fps
16:9	ProRes	HD	422	60	60	60	60	60	-	48	135.0°
			422 HQ	60	60	60	60	60	-	48	135.0°
			4444	40	60	60	60	60	-	48	135.0° (6)
			4444 XQ	25	48	60	60	60	-	48	135.0° (6)
		2K	422	60	60	60	60	60	-	48	135.0°
			422 HQ	50	60	60	60	60	-	48	135.0° (7)
			4444	30	60	60	60	60	-	48	135.0° (6)
			4444 XQ	-	40	60	60	60	-	48	135.0°
		3.2K	422	-	30	30	30	30	-	30	180.0°
			422 HQ	-	30	30	30	30	-	30	180.0°
			4444	-	30	30	30	30	-	30	180.0°
			4444 XQ	-	-	-	30	30	-	30	180.0°
	DNxHD	HD	145	60	60	60	60	60	-	48	135.0°
			220x	60	60	60	60	60	-	48	135.0°
			444	30	60	60	60	60	-	48	135.0° (6)
	REC OUT HD-SDI Video	HD	422 1.5G SL	-	-	-	-	-	30	48	180.0°
			422 1.5G DL	-	-	-	-	-	60	48	135.0°
			422 3G SL (5)	-	-	-	-	-	60	48	135.0°
			444 1.5G DL	-	-	-	-	-	30	48	180.0°
			444 3G SL (5)	-	-	-	-	-	30	48	180.0°
			444 3G DL	-	-	-	-	-	60	48	135.0°
	ARRIRAW	2.8K		-	-	-	-	60	-	48	135.0°
4:3	ProRes	2K	422	48	48	48	48	48	-	36	135.0°
			422 HQ	40	48	48	48	48	-	36	135.0°
			4444	30	48	48	48	48	-	36	135.0° (6)
			4444 XQ	-	30	48	48	48	-	36	135.0°
	ARRIRAW	2.8K	Full	-	-	-	-	60	-	36	135.0°
		2.6K	Cropped	-	-	-	-	60	-	36	135.0°
Open Gate	ARRIRAW	3.4K		-	-	-	-	60	-	33	74.0°

(1) Minimum frame rate is always 0.75 fps
(2) SL = Single Link, DL = Dual Link
(3) Requires an SxS Adapter
(4) Requires a CFast 2.0 Adapter
(5) Same as 1.5G DL, just over one cable
(6) Except with SxS PRO 32 GB cards. Since the maximum fps for SxS PRO 32 GB cards is lower, the maximum shutter angle is 180°
(7) Except with SxS PRO 32 GB cards. Since the maximum fps for SxS PRO 32 GB cards is lower, the maximum shutter angle is 172.8°
(8) The ‚recording resolution' determines the number of horizontal pixels that will be recorded (the number of vertical pixels is dependent on the recording file type and sensor mode).
  HD = 1920
  2K = 2048
  2.6K = 2578
  2.8K = 2880
  3.2K = 3164
  3.4K = 3414

„-“ = Not available

Data Rates

For in-camera recording with ALEXA Classic cameras
with SUP 11 (ALEXA Classic)

Sensor Mode [1]	Recording File Type [2, 3, 4]	Recording Resolution	Recording File Setting	Output Resolution	Bit Depth	Target Data Rate @ 24 fps [5]	Data Volume @ 24 fps in GByte/h	Recording Time @ 24fps on SxS PRO 64GB
16:9	ProRes	HD	422	1920 x 1080	10	126 Mbit/s	56	65 min
			422 HQ	1920 x 1080	10	188 Mbit/s	85	43 min
			4444	1920 x 1080	12	283 Mbit/s	127	29 min
		2K	422	2048 x 1152	10	143 Mbit/s	64	57 min
			422 HQ	2048 x 1152	10	214 Mbit/s	97	38 min
			4444	2048 x 1152	12	322 Mbit/s	145	25 min
	DNxHD	HD	145	1920 x 1080	8	120 Mbit/s	54	72 min
			220x	1920 x 1080	10	190 Mbit/s	86	48 min
			444	1920 x 1080	10	405 Mbit/s	182	24 min
4:3	ProRes	2K	422	2048 x 1536	10	286 Mbit/s	86	42 min
			422 HQ	2048 x 1536	10	286 Mbit/s	129	28 min
			4444	2048 x 1536	12	429 Mbit/s	193	19 min

(1) 4:3 sensor mode is only available in the following ALEXA Classic cameras: ALEXA Plus 4:3, ALEXA M and ALEXA Studio

(2) ProRes is a variable bit rate codec. While it is usually close to the target data rate, the actual data rate can vary with image content.

(3) The ALEXA ProRes target data rate is the Apple target data rate plus metadata and other overhead.

(4) DNxHD requires the purchase of a DNxHD license for ALEXA, ALEXA Plus andf ALEXA M; a DNxHD license is included in ALEXA Plus 4:3 and ALEXA Studio.

(5) The remaining time indicated by the camera is always calculated based on the theoretical maximum data rate, not the target data rate, to be on the safe side.

Data Rates
For in-camera recording with ALEXA XT cameras
with SUP 11 (ALEXA XR/XT) [1]

Sensor Mode	Recording File Type [2,3,4]	Recording Resolution	Recording File Setting	Output Resolution	Bit Depth	Target Data Rate @ 24 fps [5]	Data Volume @ 24 fps in GByte/h	Recording Time @ 24fps on XR Capture Drive	Recording Time @ 24fps on SxS PRO 64GB	Recording Time @ 24fps on CFast 2.0 128 GB
16:9	ProRes	HD	422	1920 x 1080	10	126 Mbit/s	56 GB/h	240 min	65 min	120 min
		HD	422 HQ	1920 x 1080	10	188 Mbit/s	85 GB/h	160 min	43 min	80 min
		HD	4444	1920 x 1080	12	283 Mbit/s	127 GB/h	107 min	29 min	53 min
		HD	4444 XQ	1920 x 1080	12	424 Mbit/s	191 GB/h	71 min	19 min	35 min
		2K	422	2048 x 1152	10	143 Mbit/s	64 GB/h	210 min	57 min	105 min
		2K	422 HQ	2048 x 1152	10	214 Mbit/s	97 GB/h	140 min	38 min	70 min
		2K	4444	2048 x 1152	12	322 Mbit/s	145 GB/h	93 min	25 min	46 min
		2K	4444 XQ	2048 x 1152	12	482 Mbit/s	217 GB/h	62 min	16 min	31 min
		3.2K	422	3164 x 1778	10	341 Mbit/s	153 GB/h	210 min	23 min	43 min
		3.2K	422 HQ	3164 x 1778	10	511 Mbit/s	230 GB/h	56 min	15 min	28 min
		3.2K	4444	3164 x 1778	12	767 Mbit/s	345 GB/h	37 min	10 min	19 min
		3.2K	4444 XQ	3164 x 1778	12	1,15 Gbit/s	517 GB/h	25 min	-	12 min
	DNxHD	HD	145	1920 x 1080	8	120 Mbit/s	54 GB/h	264 min	72 min	132 min
		HD	220x	1920 x 1080	10	190 Mbit/s	86 GB/h	175 min	48 min	87 min
		HD	444	1920 x 1080	10	405 Mbit/s	182 GB/h	87 min	24 min	43 min
	ARRIRAW	2.8K		2880 x 1620	12	1,34 Gbit/s	605 GB/h	47 min	-	-
4:3	ProRes	2K	422	2048 x 1536	10	190 Mbit/s	86 GB/h	157 min	42 min	79 min
		2K	422 HQ	2048 x 1536	10	286 Mbit/s	129 GB/h	105 min	28 min	52 min
		2K	4444	2048 x 1536	12	429 Mbit/s	193 GB/h	70 min	19 min	35 min
		2K	4444 XQ	2048 x 1536	12	643 Mbit/s	289 GB/h	46 min	12 min	23 min
	ARRIRAW	2.8K	Full	2880 x 2160	12	1,79 Gbit/s	806 GB/h	39 min	-	-
		2.6K	Cropped	2578 x 2160	12	1,60 Gbit/s	722 GB/h	35 min	-	-
Open Gate	ARRIRAW	3.4K		3414 x 2198	12	2,16 Gbit/s	973 GB/h	29 min	-	-

(1) ALEXA Classic cameras with the XR Module upgrade have the same maximum fps, except for Open Gate ARRIRAW, which is only available on ALEXA XT cameras.

(2) ProRes is a variable bit rate codec. While it is usually close to the target data rate, the actual data rate can vary with image content.

(3) The ALEXA ProRes target data rate is the Apple target data rate plus metadata and other overhead.

(4) DNxHD requires the purchase of a DNxHD license for ALEXA XT and XT M; a DNxHD license is included in ALEXA XT Plus and ALEXA XT Studio.

(5) The remaining time indicated by the camera is always calculated based on the theoretical maximum data rate, not the target data rate, to be on the safe side.

ALEXA REC OUT Options
with SUP 10

Fps Mode	Sensor Mode	Recording File Type	Recording Resolution	REC OUT Options
Normal Speed	16:9	ProRes	HD	REC OUT/MON OUT independent REC OUT = MON OUT Clone REC OUT = Clean MON OUT
		ProRes	2K	REC OUT = MON OUT Clone REC OUT = Clean MON OUT
		DNxHD	HD	REC OUT/MON OUT independent REC OUT = MON OUT Clone REC OUT = Clean MON OUT
		ARRIRAW		
	4:3	ProRes	2K	REC OUT = MON OUT Clone REC OUT = Clean MON OUT
		ARRIRAW	Full Cropped	
	Open Gate	ARRIRAW		
High Speed	16:9	ProRes	HD	REC OUT = MON OUT Clone REC OUT = Clean MON OUT
		ProRes	2K	
		DNxHD	HD	
		ARRIRAW		
	4:3	ProRes	2K	(1)
		ARRIRAW	Full Cropped	REC OUT = MON OUT Clone REC OUT = Clean MON OUT
	Open Gate	ARRIRAW		(2)

(1) High Speed/4:3/ProRes 2K is not available on ALEXAs. When this setting is chosen, the camera switches automatically to High Speed/16:9/ProRes 2K

(2) Open Gate works up to its maximum fps in Normal Speed mode so High Speed/Open Gate behaves the same as Normal Speed/Open Gate.

REC OUT = Clean MON OUT Overview
for ALEXA Classic, XT and XR with SUP 10

	Normal Speed			High Speed
	ProRes and DNxHD	ARRIRAW (Internal recording)		ProRes, DNxHD and ARRIRAW
	16:9 and 4:3	16:9 and 4:3	Open Gate [3]	16:9 and 4:3
GAMMA	If MON OUT is LOG C => REC OUT follows MON OUT If MON OUT is REC 709 => REC OUT is independent	If MON OUT is LOG C or REC 709 => REC OUT is independent	REC OUT: follows MON OUT	REC OUT: follows MON OUT
COLOR Look	If MON OUT is REC 709 & if REC OUT is REC 709 => REC OUT follows MON OUT If MON OUT is REC 709 & if REC OUT is LOG C => on REC OUT no ARRI Look File possible If MON OUT is LOG C => REC OUT follows MON OUT, but no ARRI Look File possible	If REC OUT is LOG C => on REC OUT no ARRI Look File possible If REC OUT is REC 709 => REC OUT is independent	REC OUT: follows MON OUT	REC OUT: follows MON OUT
Frame Rate	REC OUT: follows MON OUT	REC OUT: follows MON OUT	REC OUT: follows MON OUT	REC OUT: follows MON OUT
Scan Format	REC OUT: follows MON OUT	REC OUT: follows MON OUT	REC OUT: follows MON OUT	REC OUT: follows MON OUT
Surround View	REC OUT: follows MON OUT [1]	REC OUT: follows MON OUT [1]	REC OUT: follows MON OUT [1]	REC OUT: follows MON OUT [1]
Status Info	REC OUT: follows MON OUT [1,2]	REC OUT: follows MON OUT [1,2]	REC OUT: follows MON OUT [1,2]	REC OUT: follows MON OUT [1,2]
Frame Lines	REC OUT: no frame lines	REC OUT: no frame lines	REC OUT: no frame lines	REC OUT: no frame lines
Peaking	REC OUT: follows MON OUT	REC OUT: follows MON OUT	REC OUT: follows MON OUT	REC OUT: follows MON OUT
False Color	If MON OUT is LOG C => REC OUT follows MON OUT If MON OUT is REC 709 & if REC OUT is REC 709 => REC OUT: follows MON OUT If MON OUT is REC 709 & if REC OUT is LOG C => on REC OUT no False Color	on REC OUT no False Color	REC OUT: follows MON OUT	REC OUT: follows MON OUT
Anamorphic Desqueeze	REC OUT: follows MON OUT	REC OUT: follows MON OUT	REC OUT: follows MON OUT	REC OUT: follows MON OUT

(1) Surround view on REC OUT is only indicated by grayed out area, not by a white line
(2) If MON OUT Status Info is on, REC OUT image will be scaled like MON OUT but without Status Info)
(3) Open Gate works up to its maximum fps in Normal Speed mode so High Speed/Open Gate behaves the same as Normal Speed/Open Gate.