ARRI Reference Tool
User Pixel Mask

QUICK GUIDE

January 7, 2025

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1. Introduction

All modern camera sensors have some defect pixels. ARRI cameras use three methods to correct them. First is a camera-specific, per-pixel sensor calibration that is performed during manufacturing and can also be done later in service. This is called the static defect pixel map. Second, each camera has a continuously working, automatic dynamic defect pixel compensation when running. In the majority of cases, both those methods should address all single-pixel errors. If you still encounter defect pixels, we recommend a new sensor calibration at an ARRI service facility.

The third method is the User Pixel Mask, which is a temporary solution between the time a defect is noticed and the time the sensor can be recalibrated. A User Pixel Mask can be created with the ARRI Reference Tool (ART) version 1.3.1 and higher for AMIRA, ALEXA Mini, ALEXA 65, ALEXA LF, ALEXA Mini LF, ALEXA 35 and ALEXA 265. For all ALEXA Classic, ALEXA XT, and ALEXA SXT models, please use the ARRIRAW Converter to create User Pixel Masks. It is not possible to create User Pixel Masks for the ARRIFLEX D-20/21 cameras.

NOTICE
When applied in-camera, the effect of a User Pixel Mask cannot be undone. Any image artifacts resulting from in-camera application of a User Pixel Mask will be burned in all camera outputs (including ARRIRAW). ARRI recommends that this feature be used only by individuals who have had ARRI Advanced Level Service Training.

CAUTION
User Pixel Masks compensate for defective pixels by using neighboring pixels to extrapolate what a non-defective pixel would have produced. This effectively produces a ‘blurry pixel’. There is no limit to the number of entries that can be entered into a User Pixel Mask, nor any restriction on how closely they can be spaced. Adding enough User Pixel Mask entries close together, however, can create an image artifact in the form of a small, fixed, blurred region in the corrected image.

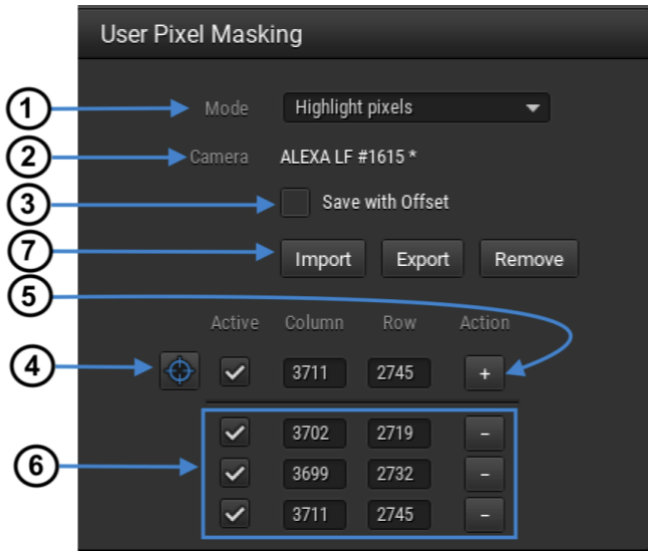
ATTENTION
To achieve an optimal result, ARRI recommends using an ARRIRAW image from a clip or sequence of frame grabs that was shot at the same exposure index and frame rate at which production content will be shot. To handle the full set of possible exposure indices and frame rates, have ARRI Service recalibrate the camera.

2. The Toolset for creating User Pixel Masks

The ARRI Reference Tool (ART) is the only means of creating a valid new User Pixel Mask for modern ARRI cameras, or for modifying an existing one.

The User Pixel Masking panel is activated by selecting *"Show User Pixel Masking Panel"* from the View menu and is displayed in the lower right corner of the View Room, below the Image Processing panel.

The components are briefly described in the following figure and table, and are explained in more detail in the following sections.

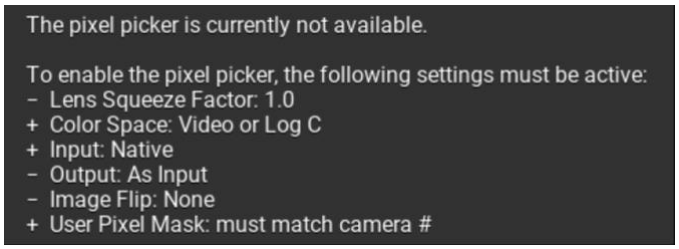


Number	Label	Description
1	Mode	Switches between disabled masking (Don't mask pixels), enabled masking (Mask pixels), or indicate masked pixels (Highlight pixels) to manually construct or edit a User Pixel Mask.
2	Camera	Indicates the camera to which this User Pixel Mask is associated. This field is automatically filled in from ARRIRAW metadata and cannot be edited. An asterisk at the end of this field indicates unsaved modifications.
3	Save with Offset	To set manual X/Y offset values when *"Export"*, if the mask coordinates do not match the sensor coordinates.
4	Pixel picking mode	Enables 'pixel picking mode' in the preview window, when this control is blue. When the control is grey, clicking in the preview window has no effect. The control itself toggles from enabled to disabled when the control is clicked.
5	Manual pixel position entry	Adds pixel with manually-entered column and row number to the list of pixels when the plus sign at right is clicked.
6	Pixels-to-be-corrected list	Holds list of pixels that collectively make up the User Pixel Mask. The Active checkbox must be selected to highlight masked pixels in the preview window. Any pixel in that list can be removed from the list by clicking on the minus sign at right.
7	Import…, Export… and Remove buttons	Allows an existing pixel masking map to be imported, or a new or edited pixel masking map to be exported (saved). Pixel masking map files have an '.xml' suffix. Remove deletes all pixels from the pixels-to-be-corrected list.

Note: Following conditions must be met before one can add pixels to the User Pixel Mask:

- The color space button must be set to *Video* or *Log C*
- The lens squeeze must be set to *1.0*
- The orientation must be set to *Unchanged*
- The input format must be set to *Native*
- The output format must be set *as Input*

Unless these preconditions are all met, an attempt to use the pixel picker will generate an informative overlay detailing which of the preconditions still need to be met:

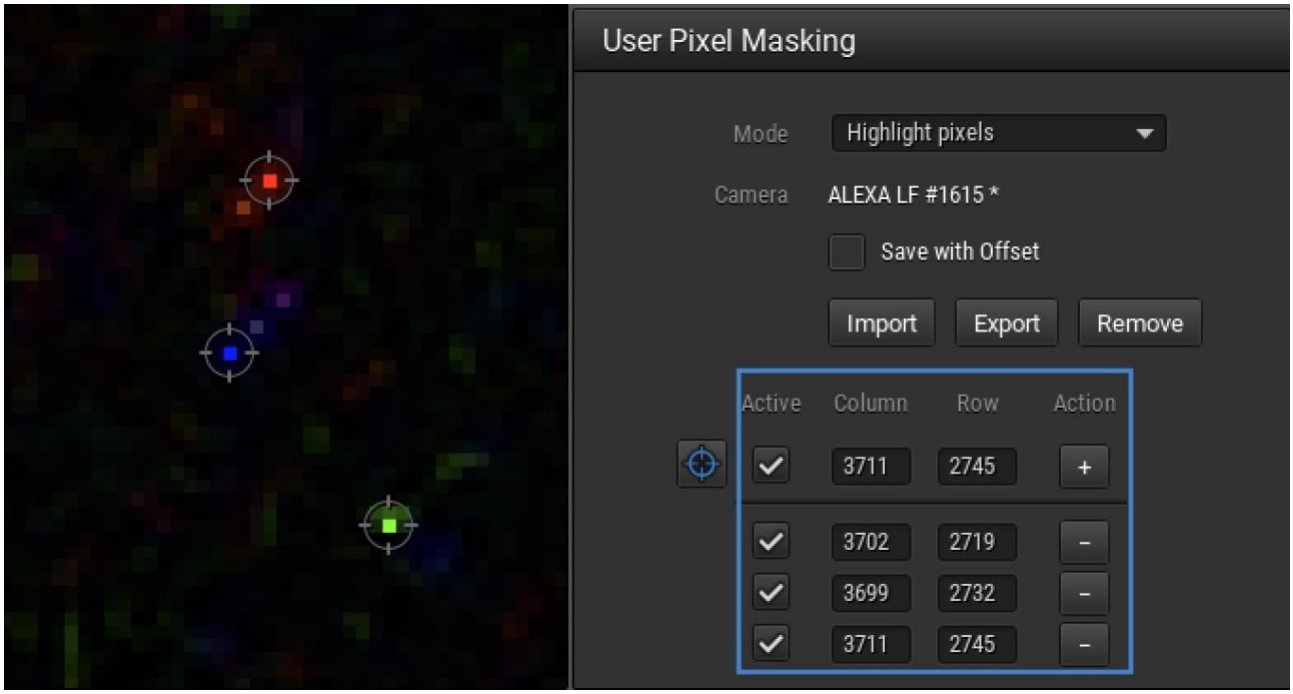


3. Generating a User Pixel Mask

Generating a User Pixel Mask requires two things: a recent version of the ARRI Reference Tool and an ARRIRAW clip, or ARRIRAW frame grab.

Steps

1. Open the ARRI Reference Tool (ART).
2. Add frame or clip to Project Files in the BROWSE room in ART. Note that multiple clips can be loaded into a single project. If the clips were recorded on different cameras, this will generate a unique User Pixel Mask for each camera.
3. Move into the ART VIEW room.
4. Activate the User Pixel Masking panel, by selecting “Show User Pixel Masking Panel” from the View menu as described in the section “The toolset for creating User Pixel Masks”.
5. Optionally, load an existing pixel masking map file.
6. Select or enter locations of the pixels to be masked by using the pixel picker to add or remove individual pixels. Note that a left click will add the pixel under the cursor, and a right click will remove it (if already present) from the list of pixels to be masked.
7. In this step, it may be useful to switch between the different User Pixel Mask display modes to refine your selection. The figure below shows the use of the “Highlight pixels” mode.
8. Save the User Pixel Mask XML file.



4. Working with User Pixel Masks

Installing and using a User Pixel Mask in-camera

The following table shows for each camera model the path of the directory on the user storage (USB stick) in which the User Pixel Mask XML file should be stored and the path through the camera's menu structure to activate user pixel masking.

Camera Model	Path on User Storage	Menu Tree in Camera UI
ALEXA LF	ARRI/ALEXA/SENSOR	MENU > SYSTEM > IMAGING > User Pixel Masking
ALEXA 65	ARRI/ALEXA/SENSOR	MENU > SYSTEM > IMAGING > User Pixel Masking
ALEXA Mini ALEXA Mini LF	ARRI/A-MINI/SENSOR	MENU > SYSTEM > SENSOR > User Pixel Masking
AMIRA	ARRI/AMIRA/SENSOR	MENU > SYSTEM > SENSOR > User Pixel Masking
ALEXA 35	ARRI/ALEXA35/SENSOR	MENU > SYSTEM > SENSOR > User Pixel Masking
ALEXA 265	ARRI/ALEXA265/SENSOR	MENU > SYSTEM > SENSOR > User Pixel Masking

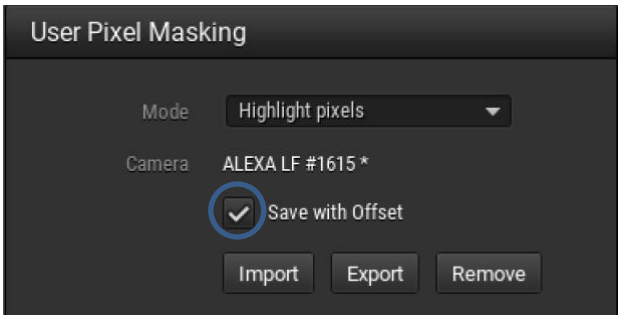
After mounting the user storage device (USB stick, or SD card for older camera models) in the camera with the User Pixel Mask XML file in the corresponding folder, you can select the sensor in the menu tree with “Install User Pixel Mask”.

The camera serial number of the user pixel mask must match the camera on which the installation is performed.

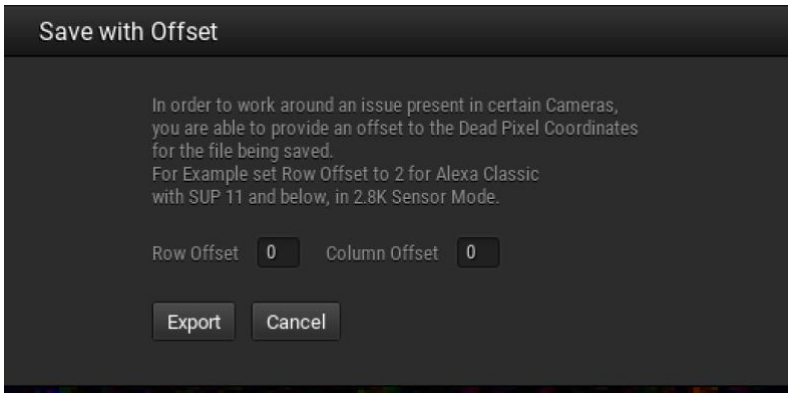
5. Saving a User Pixel Mask with Offset

In some cases, the pixel defects of legacy cameras prior to the ALEXA Mini LF may not match the values entered in the user pixel mask file due to sensor timing. The symptom when playing back the image sequence or clip would be that the defects are still present, and that some image areas are now more blurry than they were previously. Should this be seen, please contact ARRI Service for assistance.

To set manual X/Y offset values during “Export”, “Save with Offset” must be selected.



Manual X/Y offset values should only be used in extreme cases, as it is only a “trial and error” method.



6. Unsupported camera models

For creating User Pixel Masks from unsupported legacy models like ALEXA Classic, ALEXA XT and SXT models, please try our ARRIRAW Converter (ARC) Archive Download page

https://www.arri.com/en/learn-help/learn-help-camera-system/tools/legacy-software/arriraw-converter

It is not possible to create User Pixel Masks for the ARRIFLEX D-20/21 cameras.

7. Contact

If you have any questions regarding User Pixel Mask in ALEXA or AMIRA cameras, please feel free to contact ARRI Service via email: service@arri.de