

User Pixel Masking

ARC Software Version 4.0

QUICK GUIDE

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1 Introduction

ATTENTION!

Please note, that the User Pixel masking feature is only a temporary solution to mask defect pixels.

Defect pixels should be dealt with by sensor calibration at an ARRI service department. A User Pixel Mask is a stopgap solution between when the defect is noticed, and when the camera is recalibrated, to verify the sensor is still functioning within ARRI specifications and to comprehensively assess and permanently and automatically compensate for defect pixels.

If the installed pixel masking map is deleted, the camera will be reset to its old status with all defect pixels.

All camera sensors exhibit a certain number of defect pixels. In the majority of cases, the sensor calibration and dynamic dead pixel compensation should address all single-pixel errors.

In the very rare case that some defect pixels are not corrected in the camera, defect pixels there are two places in the production workflow where a User Pixel Masking can be used: in-camera, or in post-production.

Each approach has its pros and cons:

In-camera:		Post-production:	
<p>Pro</p> <ul style="list-style-type: none"> Can be used for all types of camera output. Applied in real-time. 	<p>Contra</p> <ul style="list-style-type: none"> If the User Pixel Masking is improved (e.g. if a new failing pixel is identified after the content has been shot), the content cannot take advantage of the improvement. Irrevocable. Any mistake in the User Pixel Masking will 'bake' that mistake into camera output. If the User Pixel Masking application algorithm is later improved, the production's content will not see the benefit. 	<p>Pro</p> <ul style="list-style-type: none"> The ARRIRAW Converter is free. Mistakes in User Pixel Masking can be corrected. The corrected User Pixel Masking can be re-applied to produce improved output. If ARRI improves User Pixel Mask application, mask can be re-applied to produce improved output. 	<p>Contra</p> <ul style="list-style-type: none"> Can only be used for MXF/ARRIRAW or ARRIRAW (.ari) origination workflows. May be slower than real-time, depending on post-production hardware.

2 User Pixel Masking Overview

How to open the User Pixel Masking panel:

1. Open the ARRIRAW Converter (ARC).
2. Select the main menu entry *View*.
3. Select *Show User Pixel Masking Panel*.
→ The *User Pixel Masking* panel will open on the right-hand side above the timeline in the *VIEW* room.

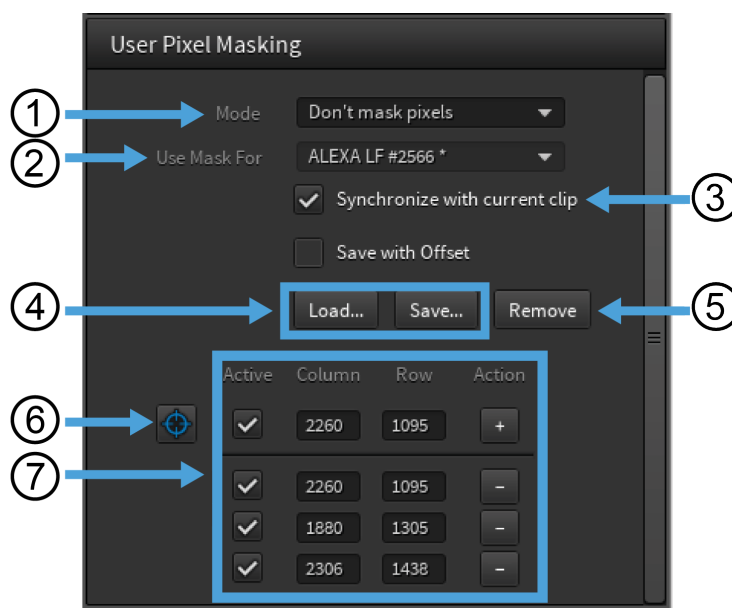


Fig. 1: Overview User Pixel Masking Panel

Number	Function	Description
1	User Pixel Masking modes	Current selected User Pixel Masking mode. The different modes will be described in section "User Pixel Masking Modes".
2	Use Mask For	Indicates the camera with 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. Hovering over this field will show the path to which the pixel masking map was saved.

Table 1: Overview User Pixel Masking panel

Number	Function	Description
3	Synchronize with current clip	Defect pixels can be masked in a single frame or in the whole clip. To mask the defect pixels in the whole clip, tick the check box <i>Synchronize with current clip</i> . Otherwise the pixels will only be masked in the currently selected and displayed frame in the Viewing Area.
4	Load... and Save... buttons	Load: Load an existing pixel masking map for your current selected clip, to correct defect pixels. Save: Save a new created pixel masking map. Pixel masking map files have an '.xml' suffix.
5	Remove	Removes all highlighted pixels from the pixel position list.
6	Pixel picker	Enables pixel picking mode, to highlight pixel positions in the viewing area, when this control is blue.
7	Pixel position list	Holds list of pixels that collectively make up the User Pixel Mask. Any pixel in that list can be removed from the list by clicking on the minus sign at right. The plus symbol adds pixel with manually-entered column and row number to the list of pixels..

Table 1: Overview User Pixel Masking panel

3 User Pixel Masking Modes

Highlight pixels

The *User Pixel Masking* contains a pixel picker, to highlight pixels in the color of their respective pixel on the center and add a surrounding circle to make it easier to spot the pixels. All highlighted pixels are listed with their image coordinates in the *User Pixel Masking*.

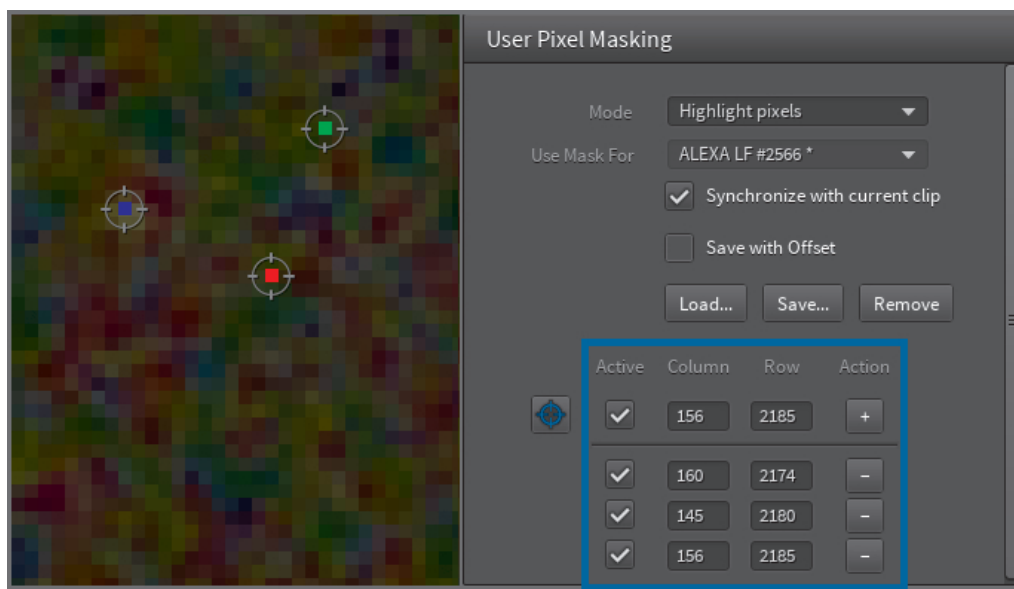


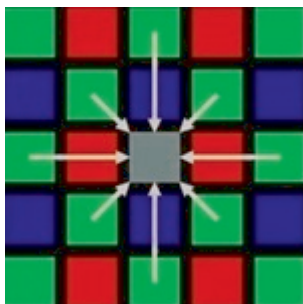
Fig. 2: Highlight pixels

Highlighted pixel positions can be:

- Activated
By default, all highlighted pixel positions are activated.
- Deactivated
Untick the check box next to the pixel coordinates to deactivate a pixel position for the pixel masking.
- Deleted
Select the minus symbol next to the pixel coordinates, to delete a certain highlighted pixel position. To remove all pixel positions, select the *Remove* button over the pixel position list.

Mask pixels

As soon as the *User Pixel Masking* mode *Mask Pixels* is selected, all activated pixel positions in the pixel position list will be masked.



4 Masking Defect Pixels

⚠ CAUTION!



Too many masked pixels

Can create uncorrectable clusters in the camera.

User Pixel Masks compensate for defective pixels by using neighboring pixels to intuit 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.

- Do not mask too many pixels in a clip.
- Do not mask too many pixels too close to each other.
- Return the camera to an ARRI service center if more than 10 pixels are defect.

NOTICE



Incorrect handling

May result in material damage. When applied in-camera, the effect of a User Pixel Masking cannot be undone. Any image artifacts resulting from in-camera application of a User Pixel Masking will be burned in to all types of camera output (including ARRIRAW).

- ARRI recommends that this feature be used only by individuals who have had ARRI Level 1 Service Training.

ATTENTION!

To achieve an optimal result, ARRI recommends using an ARRIRAW image from a clip or sequence of frame grab 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.

How to mask defect pixels

Preconditions for masking

- 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*.

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

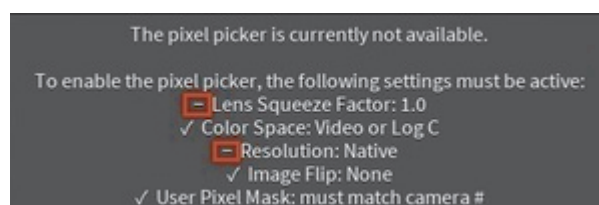


Fig. 3: Precondition error message

1. Add frame or clip to *Project Files* in the **BROWSE** room.

ATTENTION!

If the clips were recorded on different cameras, this will generate a unique User Pixel Mask for each camera.

2. Follow the steps in the instruction "How to open the User Pixel Masking panel:".
3. Set the *User Pixel Masking* mode to *Highlight pixels*.
4. Activate the pixel picker in the *User Pixel Masking* panel.
5. Highlight the defect pixel position.
6. Set the *User Pixel Masking Mode* to *Mask pixels*.

ATTENTION!

Defect pixels can be masked in a single frame or in the whole clip. To mask the defect pixels in the whole clip, tick the check box *Synchronize with current clip*. Otherwise the pixels will only be masked in the currently selected and displayed frame in the *Viewing Area*.

→ All highlighted pixels will be masked.

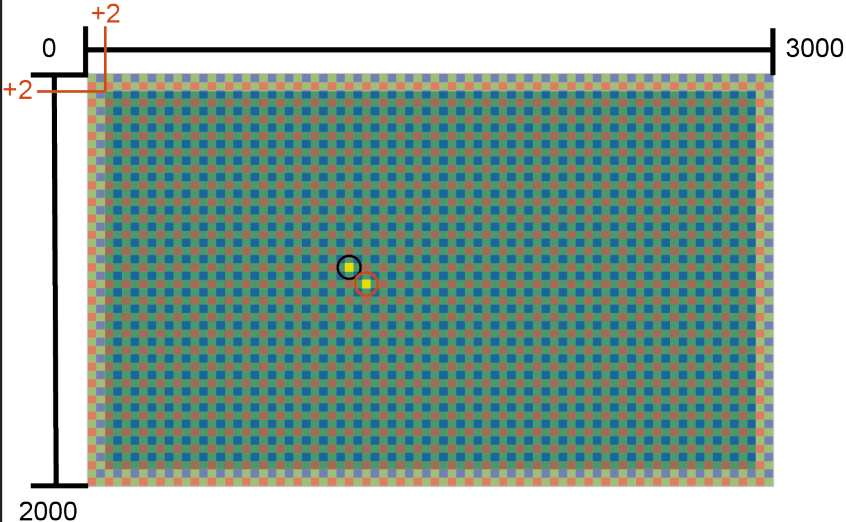
7. Watch the sequence to make sure you have highlighted the correct pixel position.
→ The pixel error will be masked automatically.

How to save a pixel masking map

ATTENTION!

In the rare case, that the pixel coordinates of the pixel masking map does not match the pixel coordinates in the camera sensor, you have the possibility to save images with an offset. The offset shifts the pixel coordinates towards the set values in the x- and y-direction.

Example in ALEXA SUP 11.0: The row offset has to be set to 2.




- Sensor image
- Sample image
- Original defect pixel position
- Defect pixel position for another recording format

Tick the check box *Save with Offset* and you can set the offset values after you select *Save....*

1. Select *Save...* after the pixel masking process.
2. Use the predefined name for the pixel masking map.

NOTICE



Incorrect name for the pixel masking map

The camera cannot read the pixel masking map.

- Use the predefined named for the pixel masking map:
Userpixelmask_camera_#####.xml
(##### = serial number of the camera)

3. Select the target folder on your operating system for the pixel masking map.
→ The pixel masking map will be saved as XML file.


How to render a clip with the User Pixel Masking settings

1. Add the clip with the masked pixels to the render queue in the *RENDER* room.
2. Configure a render target for the rendering process.
3. Select the tab *Advanced* in the render target.

4. Tick the check box *Apply User Pixel Mask*.
5. Start the rendering process.
 - All masked pixels will be fixed in the rendering process

5 Installing a Pixel Masking Map in the Camera

⚠ CAUTION!



An incorrect installed pixel masking map
Can create uncorrectable clusters in the camera.

- Record a sample file after the installation of the pixel masking map to prevent image clusters.
- Only install the pixel masking map for the camera model it was made for.

The folder into which the User Pixel Mask XML needs to be saved depends on the particular ARRI camera model. The following table shows, for each camera model, both the path of the directory on the camera-loadable storage into which the User Pixel Mask XML file should be placed, and the path through the camera's menu tree to enable User Pixel Masking.

Camera model	Directory path storage medium	Directory path in the camera menu
ALEXA Classic, ALEXA Studio, ALEXA XT, ALEXA SXT, ALEXA SXT W, ALEXA LF	ARRI/ALEXA/SENSOR	MENU > SYSTEM > IMAGING
ALEXA Mini	ARRIA-MINI\SENSOR	MENU > SYSTEM > SENSOR
AMIRA	ARRIAMIRA\SENSOR	MENU > SYSTEM > SENSOR

Table 2: Directory path storage medium and camera menu

How to install a pixel masking map in the camera

ATTENTION!

Please record a sample image sequence or clip in different recording formats after the installation of the pixel masking map.

Depending on the recording format, the sensor timing can be configured differently and 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.

In such a case please contact the ARRI service department.

Preconditions:

- Created pixel masking map for the right camera model.
- The pixel masking map XML file is saved in the right folder of the storage medium.

1. Open the camera menu.
2. Follow the directory path in the camera menu according to table 2.

3. Select *User Pixel Masking*.
4. Select *Install User Pixel Mask*.
5. Select the pixel masking map on your storage medium.
→ The pixel masking map will be installed on the camera.