# OWL 640T

Model: OW1.7-VS-CL-640-T

USER MANUAL

Raptor photonics

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# 1. INTRODUCTION

## 1.1 Scope

This manual covers the Owl 1280 digital camera and all applicable components. Raptor recommends that this manual be used to optimize camera operation.

## 1.2 Camera Care

Raptor cameras require no regular maintenance except occasional external cleaning of the sensor window (the glass window between the camera sensor and the microscope or lens). Should any other issues occur please contact your local agent.

To clean the sensor window: gently wipe the face of the sensor window with a small amount of optical grade isopropyl alcohol and lens paper. Apply forced air again to remove any loose particles.

CAUTION — The camera's sensor, and circuits are sensitive to static discharge. Ensure you are using a static strap or are completely grounded at all times to release any static energy before you clean the window.

CAUTION — Do not use acetone.

## 1.3 CameraLink Cable

If using a CameraLink cable not supplied direct from Raptor, for CE compliance we recommend using a screened CameraLink cable with ferrite (100 ohms at 100MHz) fitted as close to the camera as possible.

# 2. SPECIFICATION

## 2.1 Camera Specification

The OWL 640T digital camera is designed for applications requiring visible to SWIR imaging (600-1700nm). The OWL 640T camera uses an InGaAS sensor with a resolution of 640 x 512 in a 12-bit digital output. High-speed low-noise electronics provide linear response and sensitivity for rapid image capture.

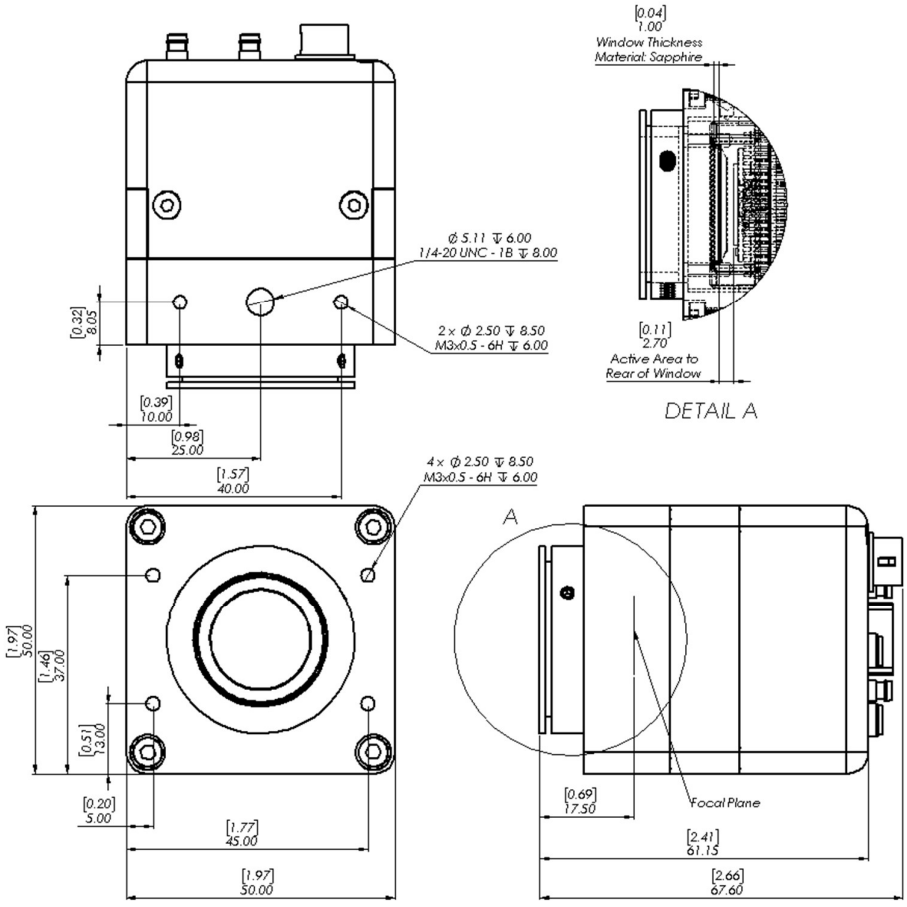
The Camera Link digital interface provides the most stable platform for data transfer and the camera will work on any Camera Link standard card.

A Software Development Kit (SDK) is available for interfacing with custom software.

| SPECIFICATION | |
|---|---|
| Sensor Type | InGaAs PIN-Photodiode |
| Active Pixel | 640 x 512 |
| Pixel Pitch | 10µm x 10µm |
| Active Area | 6.4mm x 5.12mm |
| Spectral response[1] | 0.6µm to 1.7µm |
| Readout Noise (RMS)<br>LG = Low Gain HG = High Gain | LG: <190 electrons (160 electrons typical)<br>HG: <50 electrons (47 electrons typical) |
| Quantum Efficiency | >80% @ 1.55µm |
| Full Well Capacity | LG: 450ke-<br>HG: 10ke- |
| Pixel Operability | >99% |
| Digital Output Format | 12 bit Camera Link (Base Configuration) |
| Dark Current (e/p/s) | <19,000 @ 15°C |
| Exposure time<br>LG = Low Gain HG = High Gain | LG: 300µs to 92.5ms<br>HG: 600µs to 86.5ms |
| Frame Rate | 10 to 60Hz |
| Dynamic Range | LG: 69dB, HG: 47dB |
| Optical Interface | C-mount (selection of SWIR lenses available) or M42 |
| Trigger interface | Trigger IN and OUT – TLL compatible |
| Power supply | 12V DC ± 0.5V |
| TE Cooling | Active |
| Image Correction | 3 point NUC (offset, gain & dark current) + pixel correction |
| Functions Controlled by Serial Communication | Exposure, Intelligent AGC, Non-Uniformity Correction, Gamma, Pk/Av, ROI |
| Camera Power Consumption[2] | <3W with TEC OFF, NUC ON<br><5W with TEC ON, NUC ON |
| Operating Case Temperature[3] | -20°C to +55°C |
| Storage Temperature | -30°C to +60°C |
| Dimensions (L*W*H)[4] | 50mm x 67.60mm x 50mm |
| Weight | 247g |

Note 1: Optional filters available: Shortpass, Longpass or Bandpass
Note 2: Measured in ambient of 25°C with adequate heat sinking
Note 3: Extended operating temperature range on request

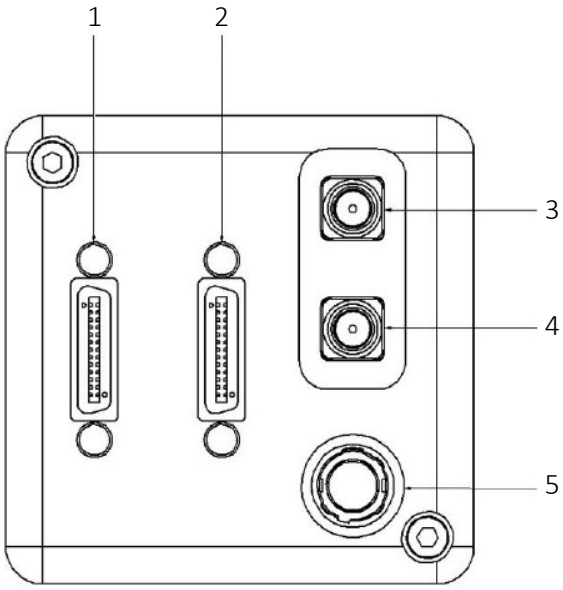
## 2.2 Mechanical Outline




3D drawings (STEP) are available upon request.

# 3. GETTING STARTED

## 3.1 System Overview



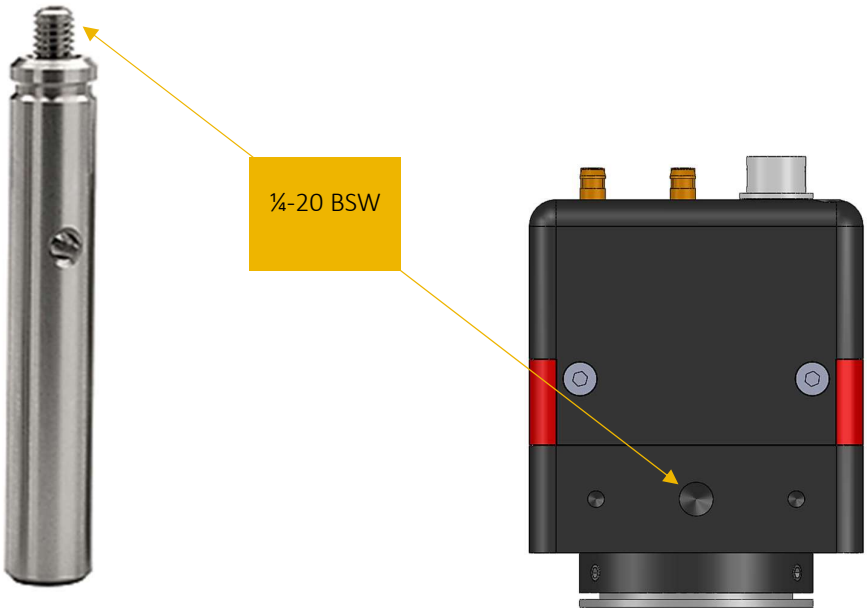

1. **NOT IN USE**
2. **3M CameraLink connector (TxOUT +comms)**
   Part #: 12226-1150-00FR
3. **SMA connector**: Trigger Out.
   Single ended, source impedance = 51 Ω, capable of sinking and sourcing 32mA and will have an output voltage of 3.3v i.e. TTL compatible.
4. **SMA connector**: Trigger In.
   Single ended, termination impedance = 510 Ω, capacitive load = 200 pF, TTL compatible.
5. **4 Pin Hirose connector**
   Part #: HR10A-7R-4PB(73)

## 3.2 Mounting to Microscope

The OWL 640T has a standard C-Mount that should easily screw onto any microscope port.

## 3.3 Mounting to a tripod or optical table

The camera has a ¼-20 BSW (Whitworth), threaded hole to mount to a tripod or an optical table. The image below shows an optical table mount with the ¼-20 BSW thread.



## 3.4 3rd PARTY SOFTWARE

Raptor supports a range of 3rd party software packages as per the matrix below.

| | XCAP | XCLIB | NI Labview | Micromanager |
|---|---|---|---|---|
| Hawk 252 | ☑ | ☑ | | |
| Falcon III | ☑ | ☑ | | ☑ |
| Eagle | ☑ | ☑ | ☑ | ☑ |
| Owl 320 High Speed | ☑ | ☑ | | |
| Owl 640M | ☑ | ☑ | ☑ | ☑ |
| Owl 640 II | ☑ | ☑ | ☑ | ☑ |
| Owl 640T | ☑ | ☑ | | |
| Ninox 640 II | ☑ | ☑ | ☑ | ☑ |
| Owl 1280 | ☑ | ☑ | ☑ | |
| Ninox 1280 | ☑ | ☑ | ☑ | |

☑ - Software tested by Raptor Photonics

☑ - Software tested by other companies

Blank - The camera has not been tested or is not supported by this software

In this guide, there is a quick overview of XCAP (http://www.epixinc.com/support/files.php) and Micro-Manager (https://micro-manager.org). Should you have other software support specific needs, please do not hesitate to contact our sales team on sales@www.raptorphotonics.com.

## 3.5 Connecting your camera to a computer

- Boot up the computer.
- Insert EPIX software key dongle into a USB port of your PC (the red light on the dongle should light up).
- Use the Camera Link cable to connect the camera to the computer. Be sure to use the Camera Link port closest to the trigger and power connectors on the camera. The 2nd port is not in use.
- Carefully thread the C-mount lens onto the camera's lens ring, rotating the lens in a clockwise direction until it is securely fastened. Use the lens controls to adjust focus. We suggest that the camera be mounted on a tri-pod or an optical bench.
- Connect the 12V power supply to the camera.

The Owl 640T camera is compatible with all types of Camera Link frame grabber. However, our cameras are extensively tested using Epix Inc equipment's XCAP, for this reason we recommend XCAP software.

If using a CameraLink cable not supplied direct from Raptor, for CE compliance we recommend using a screened CameraLink cable with ferrite (100 ohms at 100MHz) fitted as close to the camera as possible.

# 4. EPIX XCAP

For minimum computer system requirements, please contact Epix for the latest information.

## 4.1 Download and Install XCAP

Using the following link, http://www.epixinc.com/support/files.php, please select the appropriate version of XCAP for your computer. Please ensure you are downloading from the section labelled. *Pre-release version with support for the latest cameras and latest PIXCI® imaging boards.* Open the downloaded file when complete and follow the onscreen instructions. Be sure to accept the board driver installation.

## 4.2 Operating your camera using XCAP

1. Open XCAP from within your operating system enabling administrative privileges.

2. Select PIXCI dropdown menu and select PIXCI Open Close, Figure 1 should appear.

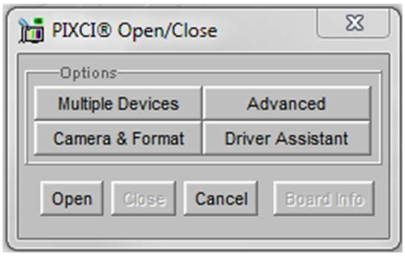



Figure 1: Open / Close

3. Select Close, and then Click on the Camera & Format button.

4. Using the dropdown menu scroll down and select Raptor Photonics OWL 640T from the list (Figure 2). Selecting OK when done.

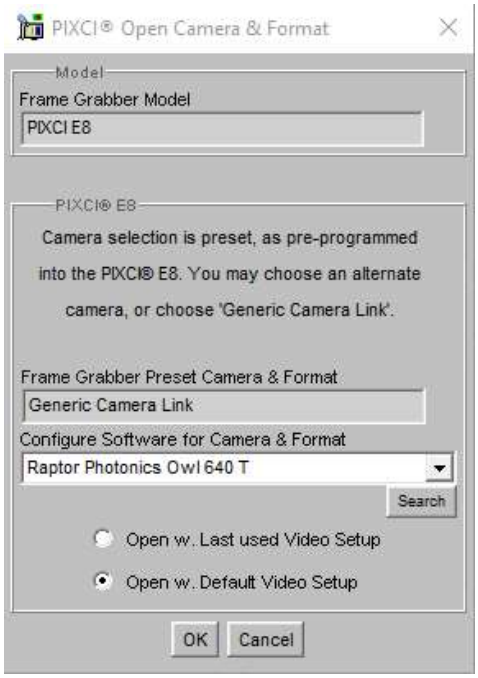



Figure 2: Camera Selection

5. Select Open and the viewing and control screens, Figure 3, will now open. Two windows should open, a viewing window (Left) and a control window (Right).

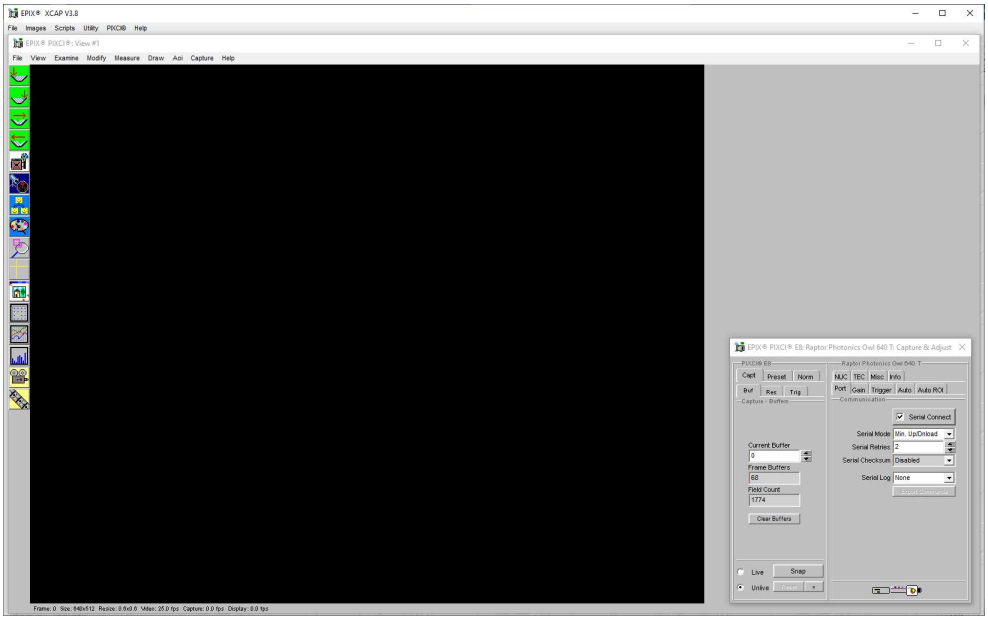


Figure 3: XCAP Camera Control Screen

6. The camera controls are pre-configured in EPIX.

7. The control window on the right should reflect your chosen camera. For example, for the Owl 640T, it should read - EPIX PIXCI EL8: Raptor Photonics OWL 640T. If not, you need to select a different camera.

8. Check that the camera is communicating, see animated icon (Figure 4) on bottom right of control screen.

Figure 4: Active Communication

9. You are now configured and connected, ready to acquire an image.

10. Check the Serial Connect box (to establish serial communication to the camera). This should contain a tick (as circled in Figure 5).

11. Check the live button (as circled in Figure 5).

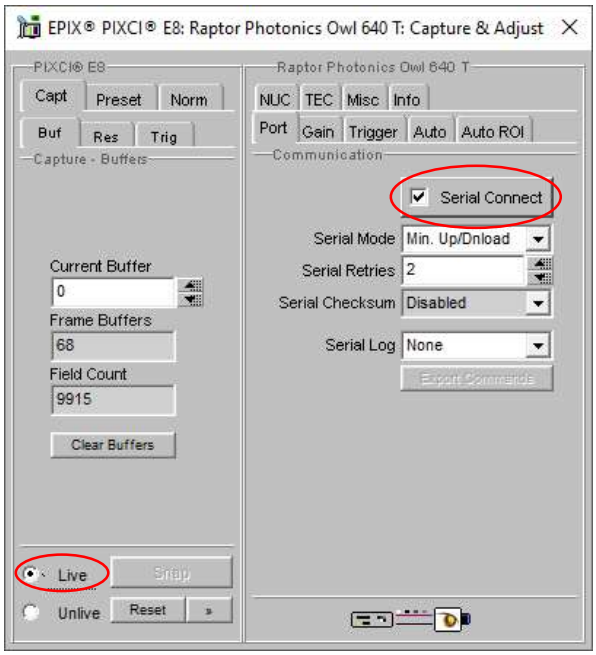



Figure 5: Image Capture

12. You should now see an image. On the bottom of the screen, you should see something similar to the following: *Frame: 0 Size: 640x512 Resize 0.7x0.7 Video: 25.0fps Capture: 25.0 fps Display: 25.0fps.*

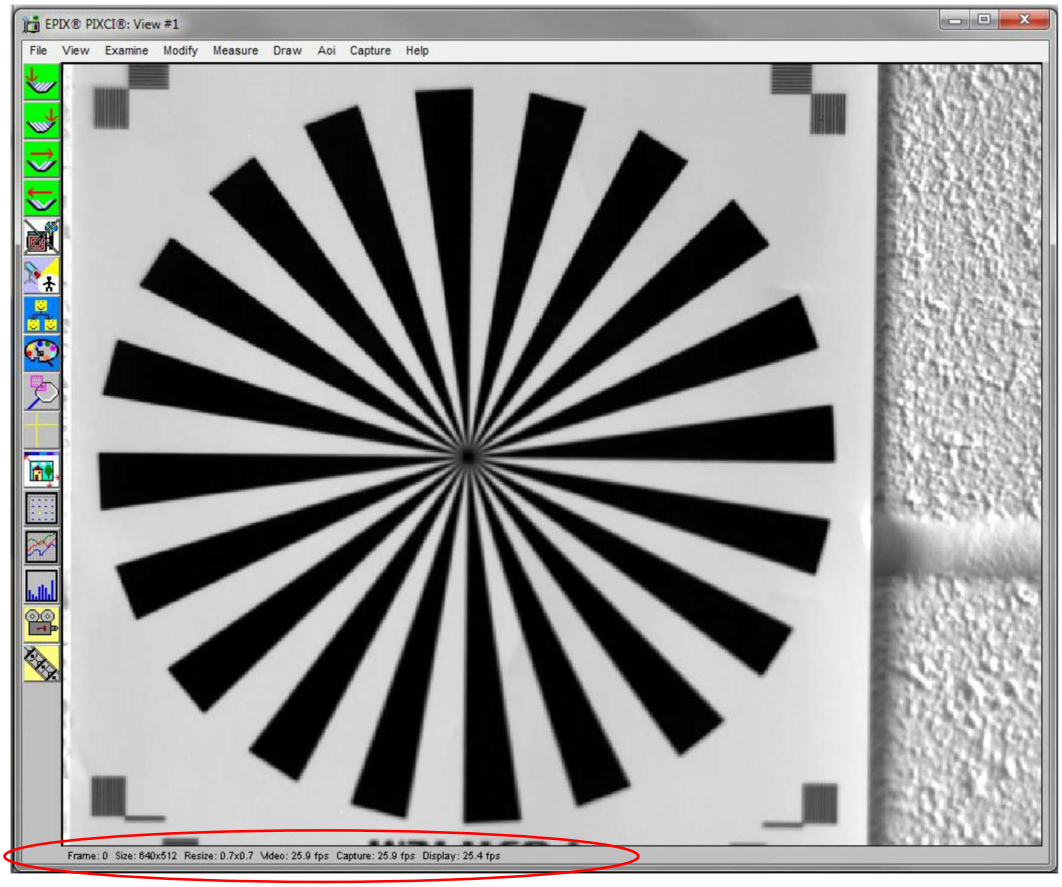



Figure 6: Live Image Capture Window

## 4.3 Changing the settings on XCAP

You have the ability to change several settings to control the camera through the tabs in the control window of the EPIX software.

## 4.4 Exposure

Click on the Gain Tab.

There is an option for Auto Level Control (ALC). When Auto Level Control is unchecked, you can manually adjust the exposure and digital gain using the sliders or entering a specific value in the field. It is recommended to start with auto gain on to get an image, then turning it off to fine-tune your image.

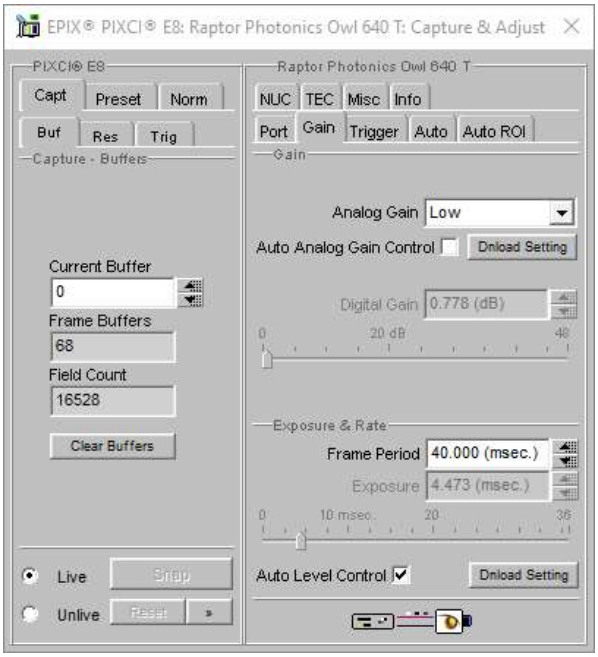



Figure 7: Gain Tab

## 4.5 Trigger

Use this tab to select the Readout Mode, and a Fixed Frame Rate value.

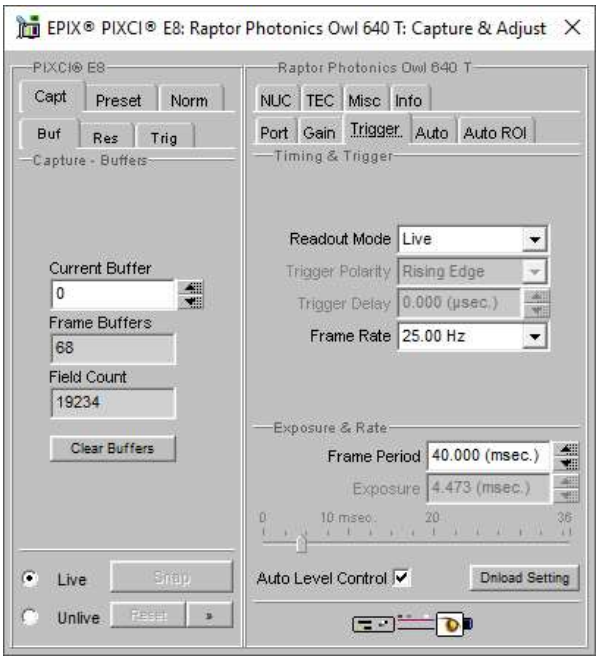



Figure 8: Trigger Tab

## 4.6 Auto

On this Tab, you can select the parameters for the Automatic Level Control, Including the speed, and spread of signal. In this mode, the FPGA of the camera will automatically adapt the exposure time and digital gain within the given frame rate to optimise the image quality.

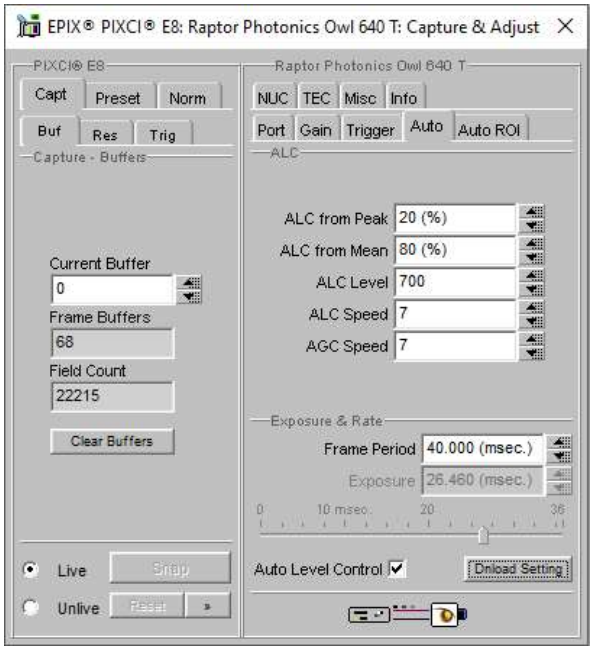



Figure 9: Auto Tab

## 4.7 Auto ROI

Use this tab to set the Region of Interest (ROI) used for the Auto Level Control; ROI gain will set an overlay onto the image, so you can track its position. By default, this will be set to account for the

whole image.  Edit the values of Offset, Width and Height to place the Auto Level Control ROI over the image.

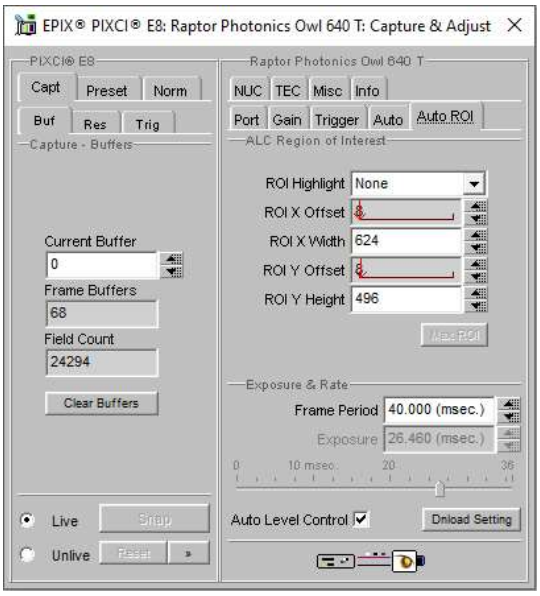



Figure 10: Auto ROI Tab

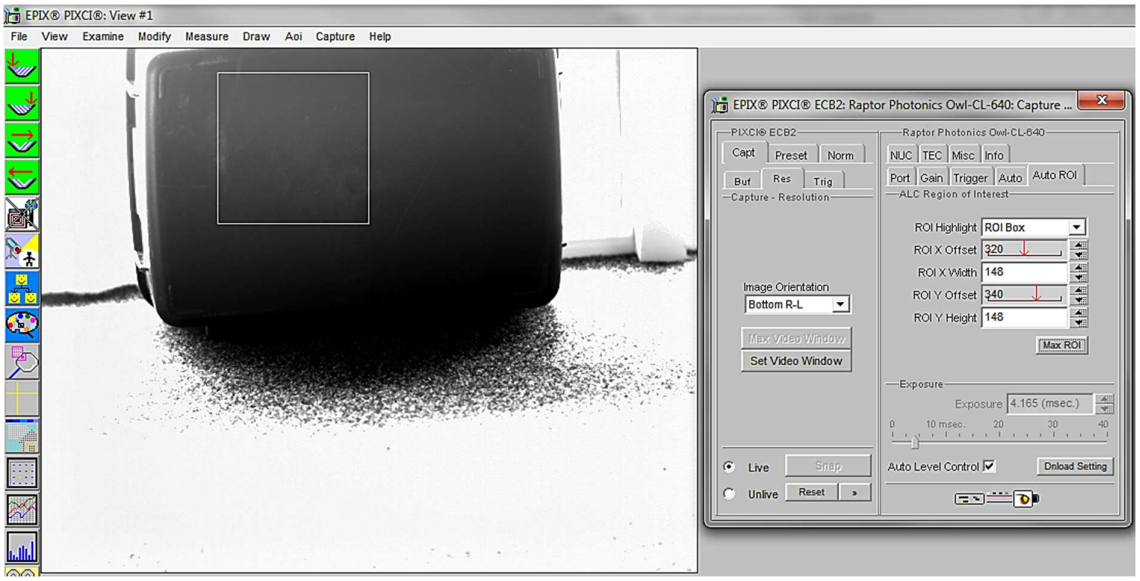



Figure 11: Active ROI Dark Area

In Figure 11, the ROI is contained within the small white box, and as such when centred on the black case we can see the minor scratches but the sun light on the carpet has saturated the image.

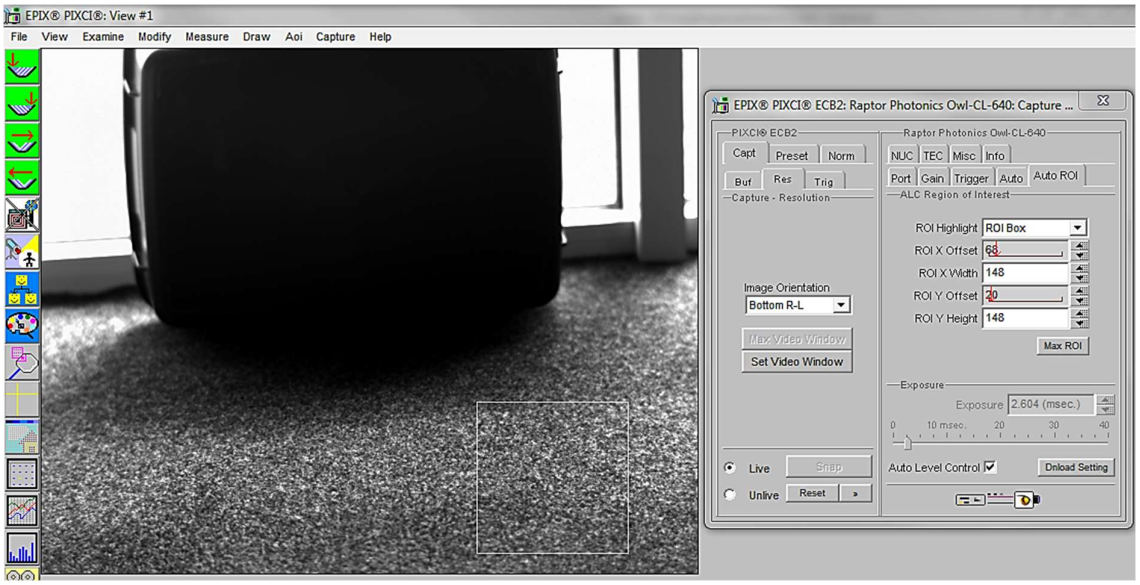



Figure 12: Active ROI

However, when we move the ROI box to the carpet, Figure 12, where the sun is shining the camera adjusts the exposure, but the box becomes too dark to see any detail. This is an extreme example used with our Owl 640 camera to illustrate this feature.

## 4.8 NUC

On this tab, you can select the parameters for the on-board Non Uniformity Correction (NUC); select the 3point NUC Offset, Gain & Dark shown in Figure 13. Figure 14 and Figure 15 show the effect of the NUC off and on.

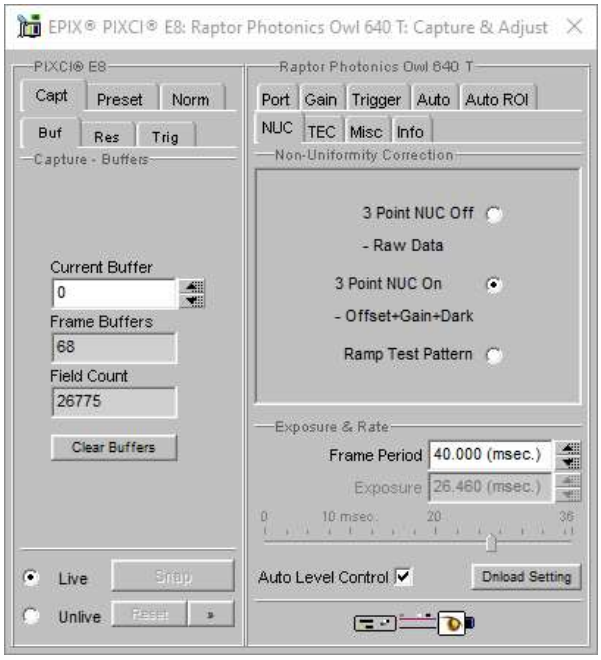



Figure 13: Controlling the NUC Status

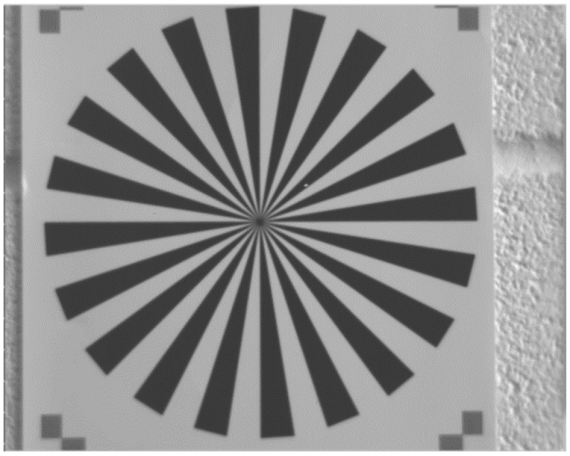


Figure 14: NUC Off

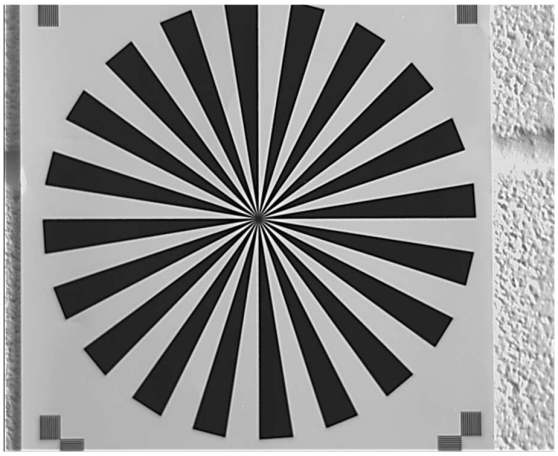


Figure 15: NUC On

## 4.9 TEC

Thermoelectric Cooling (TEC). Use this tab to set and read back the sensor temperature. The optimum temperature should be set on start-up, for the OWL 1280 should be 15°C.

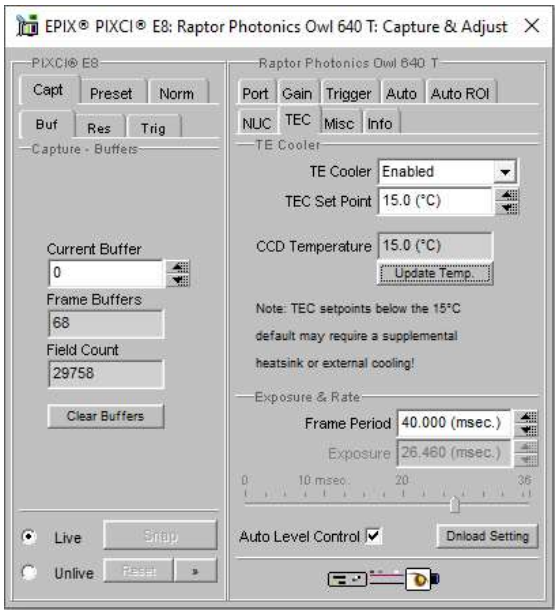



Figure 16: TEC Control

## 4.10 Miscellaneous

There are two features here, Video invert and Active Image Enhancement. Output video can be digitally inverted such that dark areas in the image will appear bright by checking the video invert box.

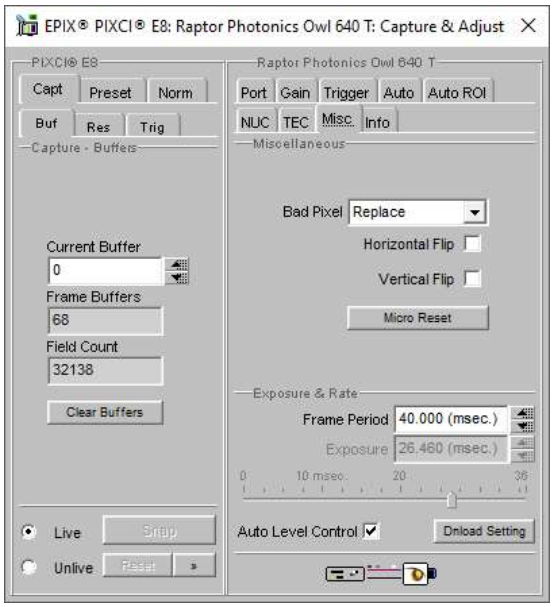



Figure 17: Camera Information

Output video can be digitally processed to provide image sharpening by checking the Active image enhancement box as shown in Figure 17.

The Info tab can be used to view the cameras manufacturer data, for example Build date and serial number.

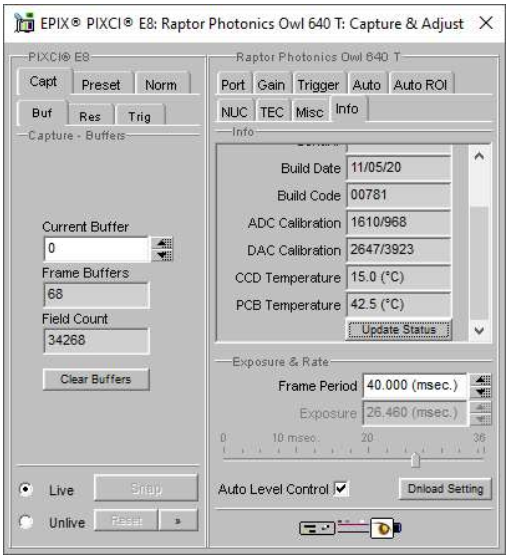



Figure 18: Information Tab

## 4.11 Adjusting the image display (With XCAP Std only)

The Viewing Pallet is not automatically adjusted in the XCAP software.

This needs manually Configured to give the best display of the RAW image data from the camera.

1. Go to the Modify/Contrast Modification menu, Figure 19.

2. Select “Stretch Contrast, Histogram Percentile Endpoints” and “Preview” Figure 20: Stretch Contrast.

3. Adjust the “Low Percentile Endpoint” and “High Percentile Endpoint” to optimize the image display, defaults should be acceptable for most applications.

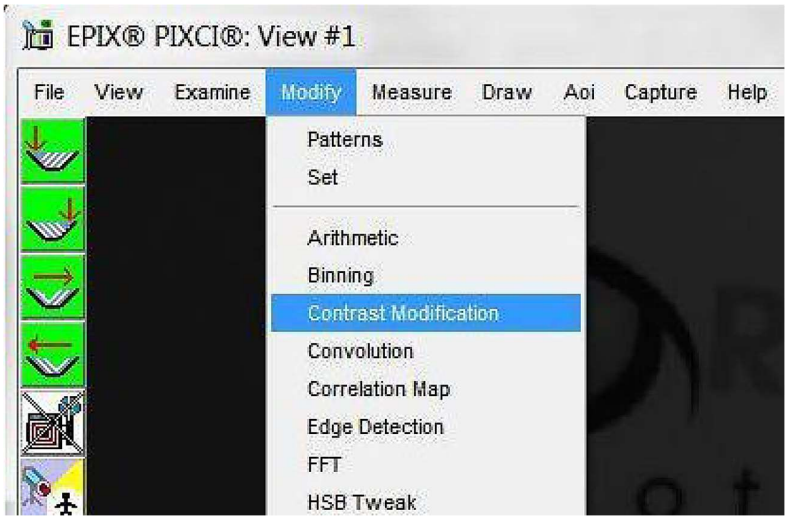



Figure 19: Contrast Modification

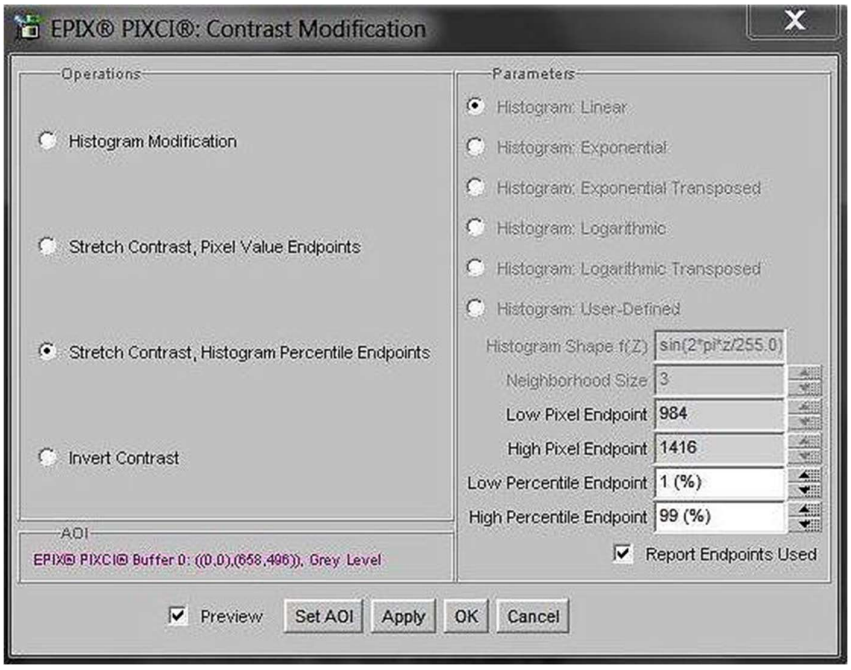



Figure 20: Stretch Contrast

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