Instrument Expert
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OWL 640 M

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

USER MANUAL

CONTENT

1.   INTRODUCTION

1.1   Scope

This manual covers the Owl 640 M 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 640 M digital camera is designed for high-resolution applications requiring visible to SWIR imaging (400-1700nm). The OWL M camera uses an InGaAS sensor with a resolution of 640 x 512 in a 14-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	15µm x 15µm
Active Area	9.6mm x 7.68mm
Spectral response[1]	0.4µm to 1.7µm
Readout Noise (RMS) LG = Low Gain HG = High Gain	LG: <190 electrons (174 electrons typical) HG: <50 electrons (38 electrons typical)
Quantum Efficiency	>80% @ 1.55µm
Full Well Capacity	LG: 650ke- HG: 9ke-
Pixel Operability	>99%
Digital Output Format	14 bit Camera Link (Base Configuration)
Exposure time	10µs to 26.8s
Frame Rate	Up to 120Hz
Dynamic Range	LG: 72dB, HG: 49dB
Optical Interface	C-mount
Trigger interface	Trigger IN and OUT – TLL compatible
Power supply	12V DC ± 0.5V
TE Cooling	None
Image Correction	2 point NUC (offset & Gain) + pixel correction
Functions Controlled by Serial Communication	Exposure, Intelligent AGC, Non-Uniformity Correction, Gamma, Pk/Av, ROI
Camera Power Consumption[2]	<2.5W
Operating Case Temperature[3]	-20°C to +55°C
Storage Temperature	-30°C to +60°C
Dimensions & Weight	42mm x 62.21mm x 42mm / 170g

Latest version available on www.raptorphotonics.com

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

2.2   Mechanical Outline
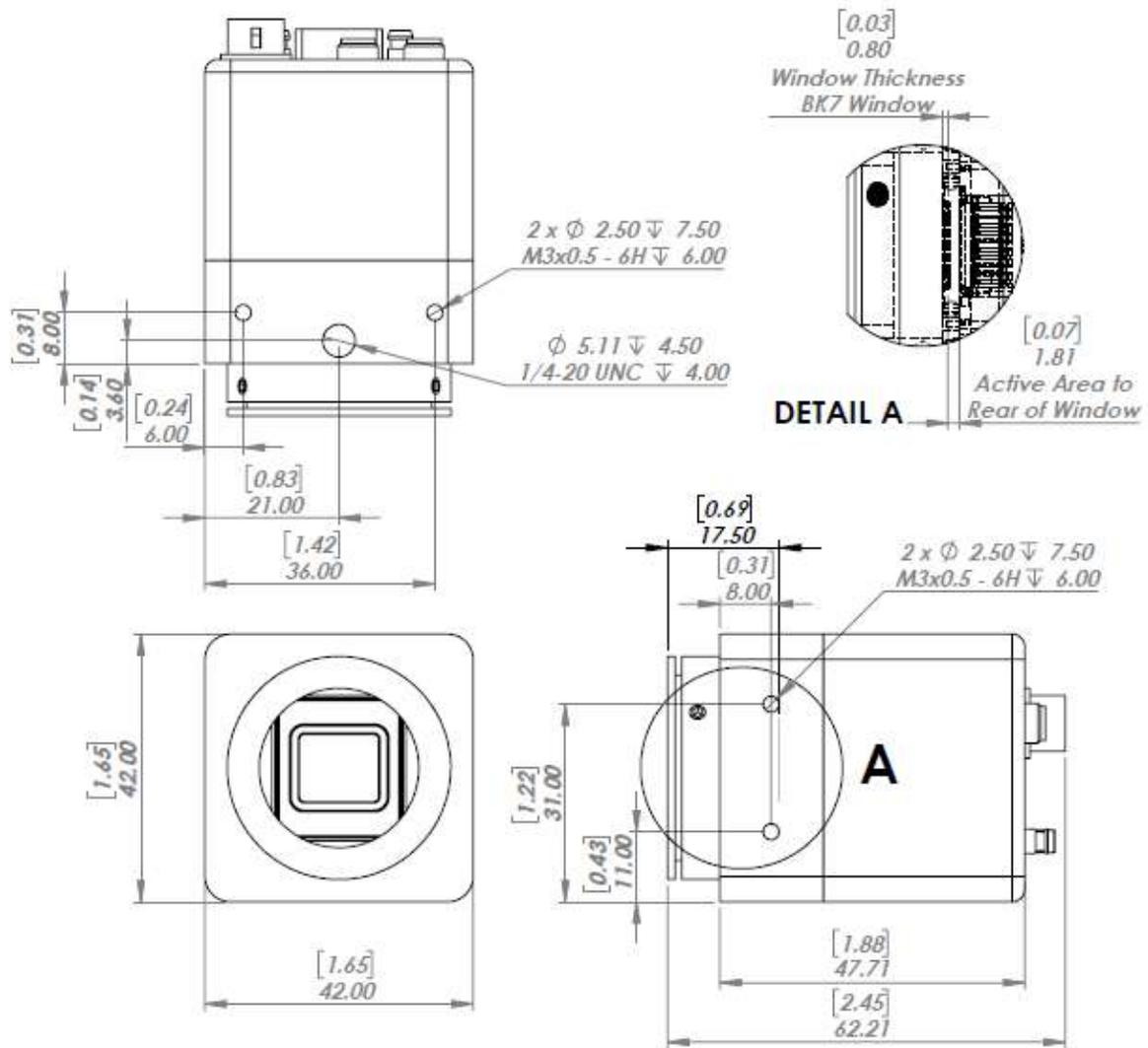
3D drawings (STEP) are available upon request.

3. GETTING STARTED

3.1 System Overview

Trig out/SMA Trig in/SMA Power

Camera Link Connector/SDR

C-mount

3.2 Mounting to Microscope

The OWL 640 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.

¼-20 BSW
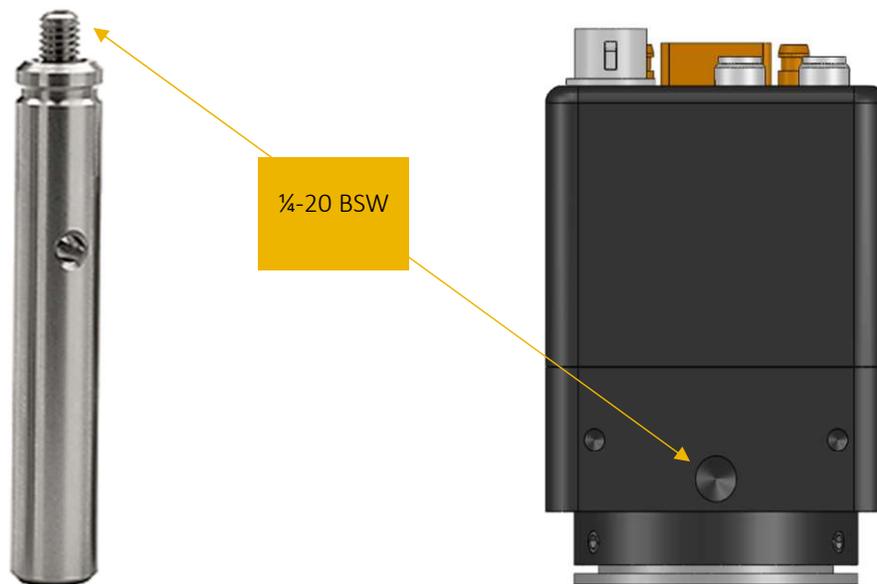
3.4   3rd PARTY SOFTWARE

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 640 M	☑	☑	☑	☑
Owl 640 II	☑	☑	☑	☑
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

- If using a laptop insert the Express Card to Camera Link adapter while the PC is switched off and make sure it is secure. If using a PC, insert the EPIX controller card into the correct slot of your PC. You can visit http://www.epixinc.com for further support issues.
- Insert EPIX software key dongle into a USB port (the red light on the dongle should light up).
- Boot up the computer.
- Use the Camera Link cable to connect the camera to the computer.
- Connect the other end of the Camera Link cable to the camera.
- 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 640 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.
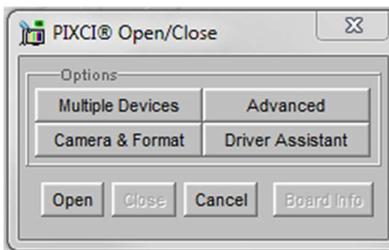
Figure 1: Open / Close

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

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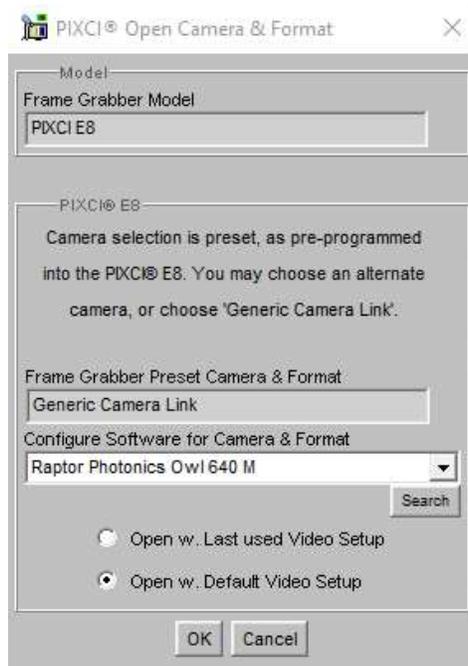
Figure 2: Camera Selection

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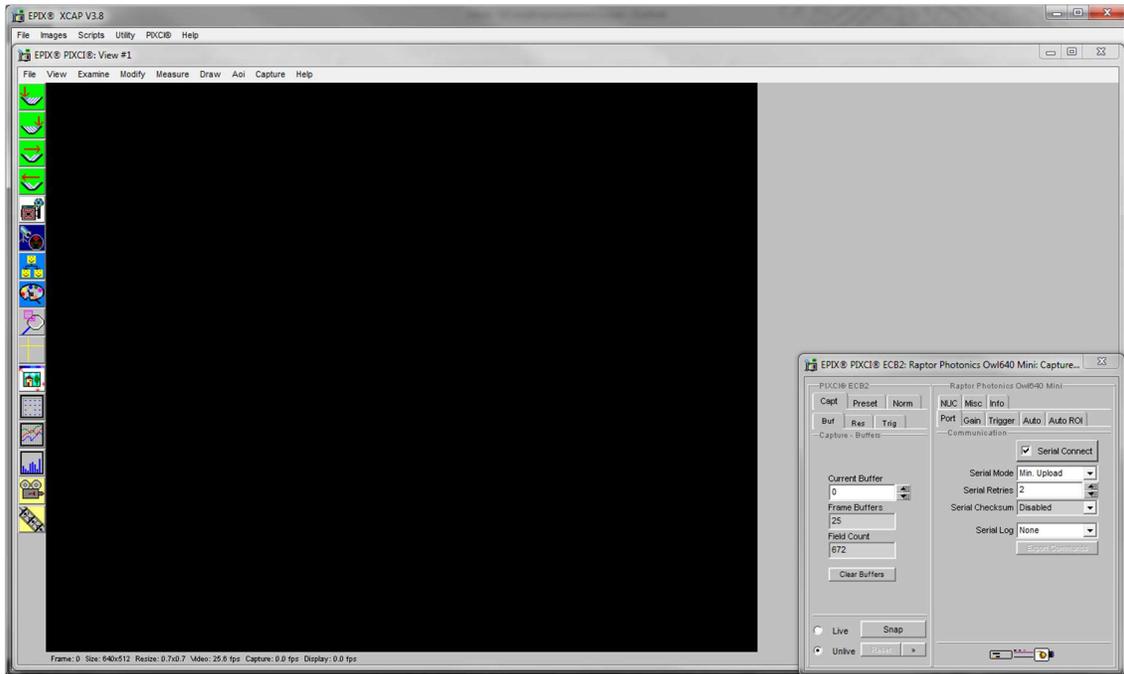
Figure 3: XCAP Camera Control Screen

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 640, it should read - EPIX PIXCI E8DB: Raptor Photonics OWL-CL-640. 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).
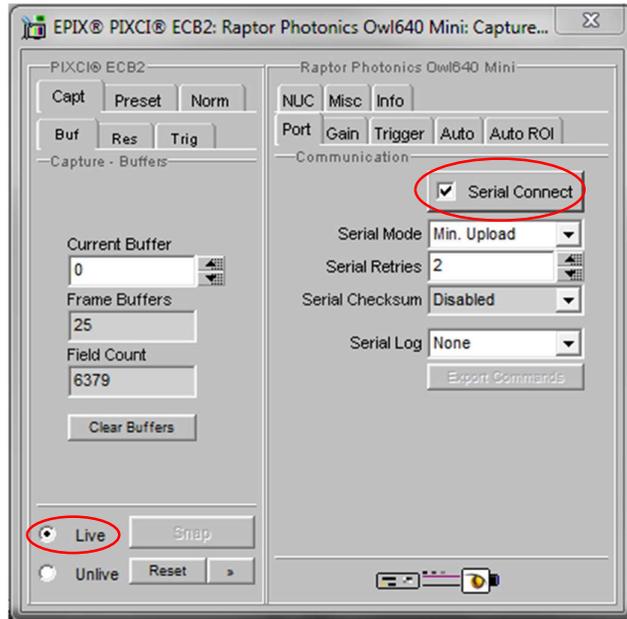
Figure 5: Image Capture

12. You should now see an image. On the bottom of the screen, you should see something similar to the following: *Frame: 0 Size: 640 x 512 Resize 0.7x0.7 Video: 26.0fps Capture: 26.0 fps Display: 25.1fps.*
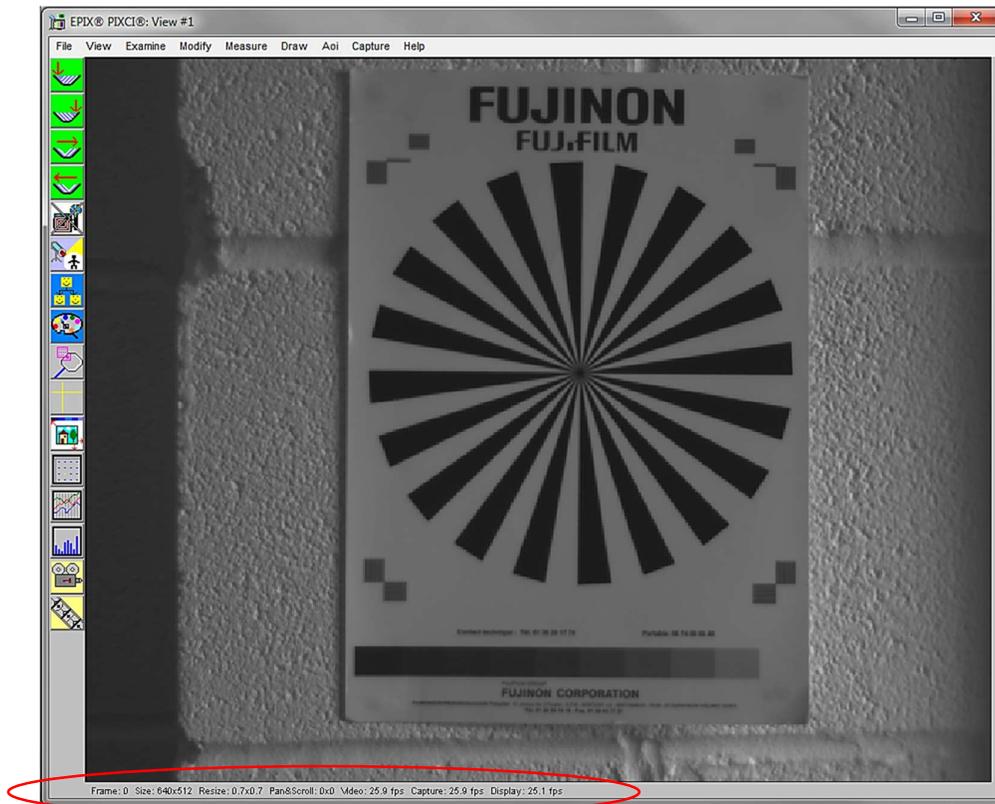
Figure 6: Live Image Capture Window

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.
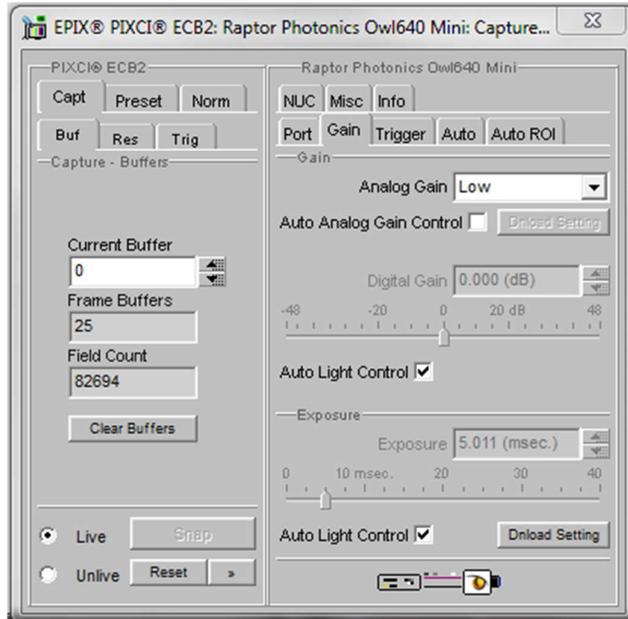
Figure 7: Gain Tab

4.5   Trigger

Use this tab to select the Readout Mode, and a Fixed Frame Rate value.
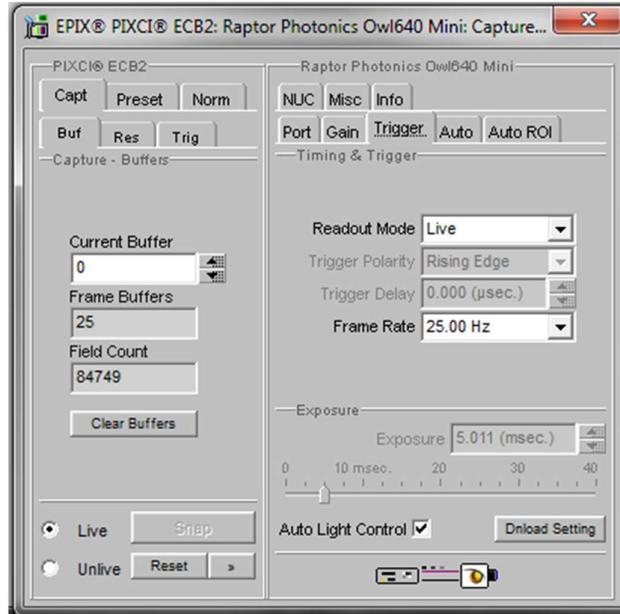
Figure 8: Trigger Tab

4.6   Auto

On this Tab, you can select the parameters for the Automatic Level Control, Including the speed, and spread of signal taken into account. 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.
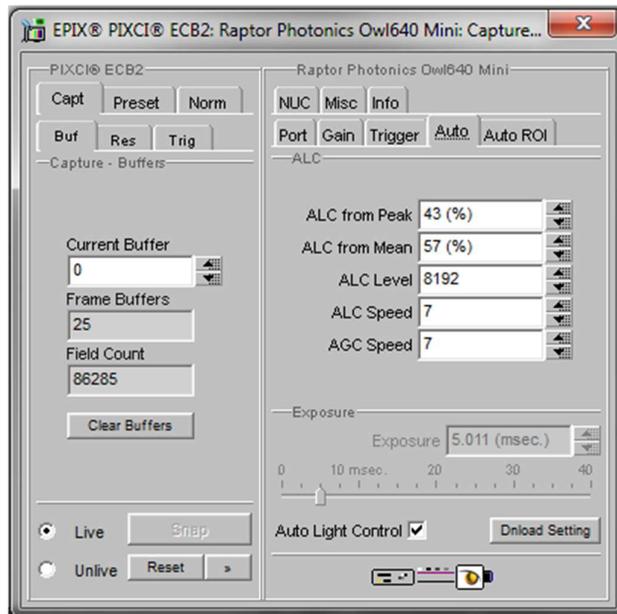
Figure 9: Auto Tab

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.
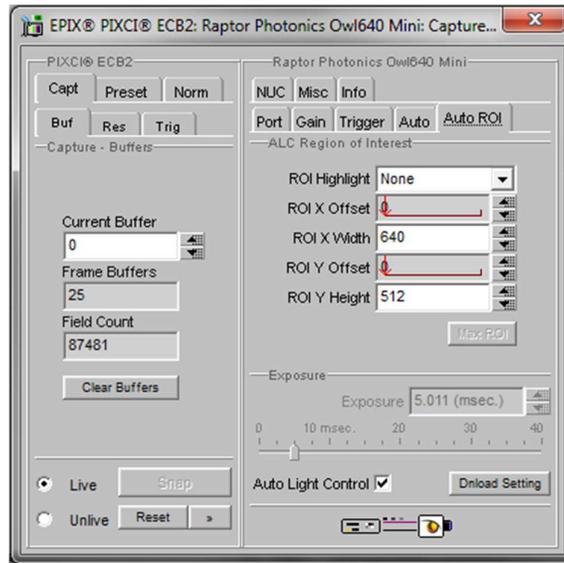
Figure 10: Auto ROI Tab
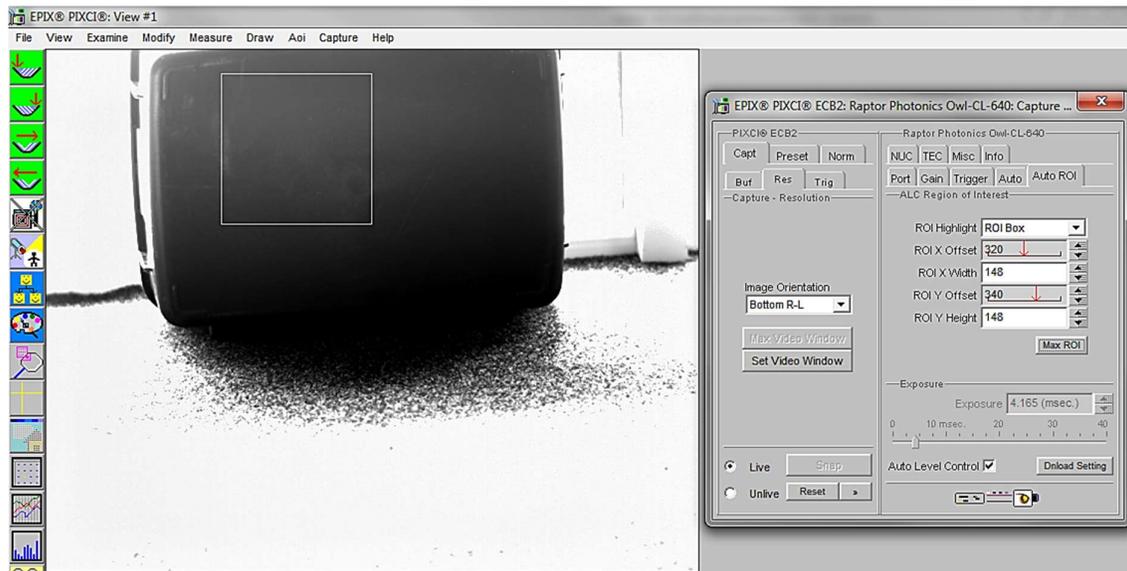
Figure 11: Active ROI Dark Area

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.
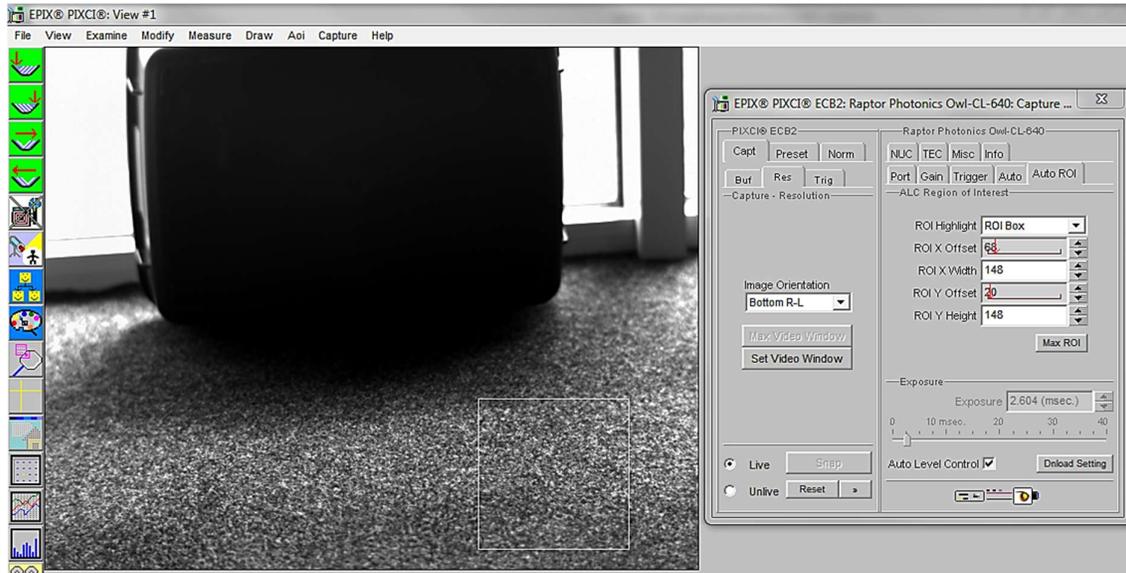
Figure 12: Active ROI

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 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.
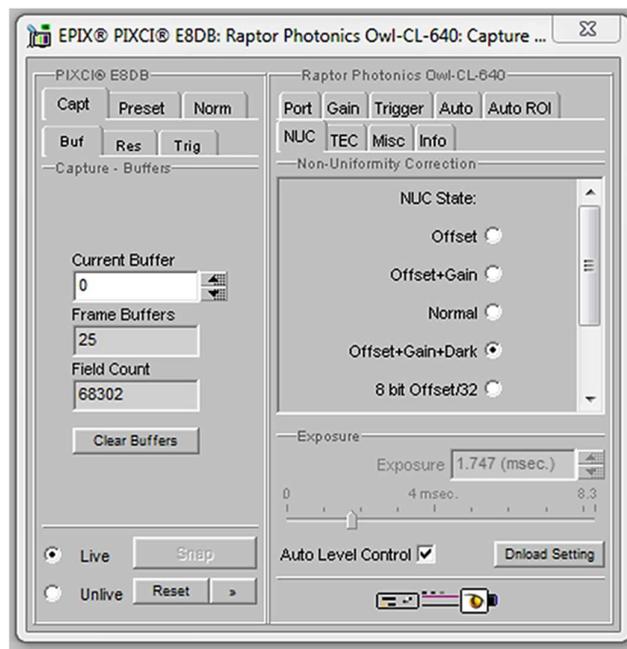

Figure 13: Controlling the NUC Status
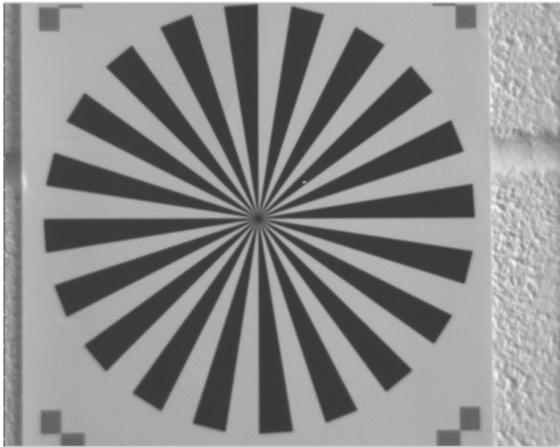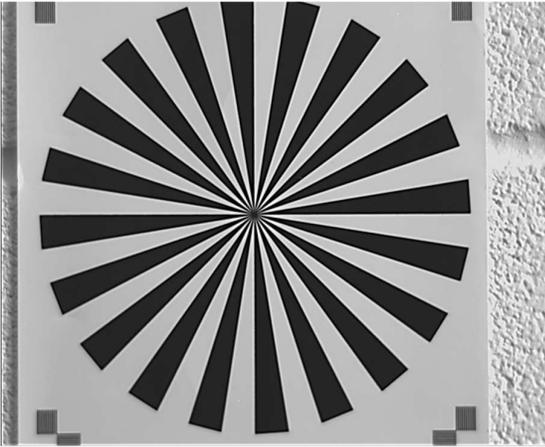
Figure 14: NUC Off   Figure 15: NUC On

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 640 should be 15°C.
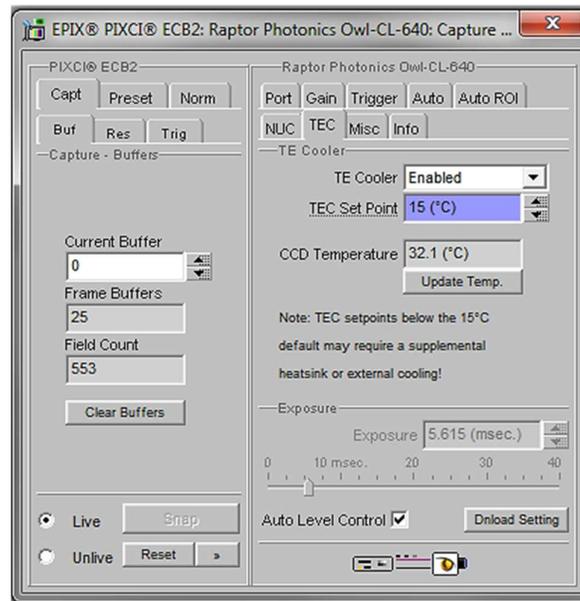

Figure 16: TEC Control

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.
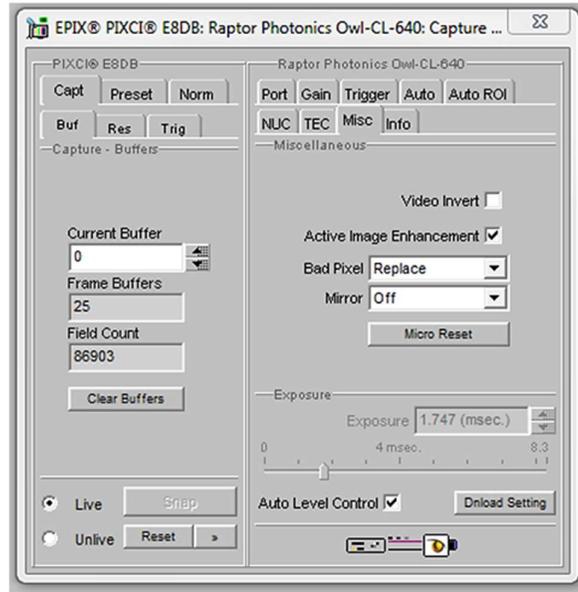

Figure 17: Camera Information

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.
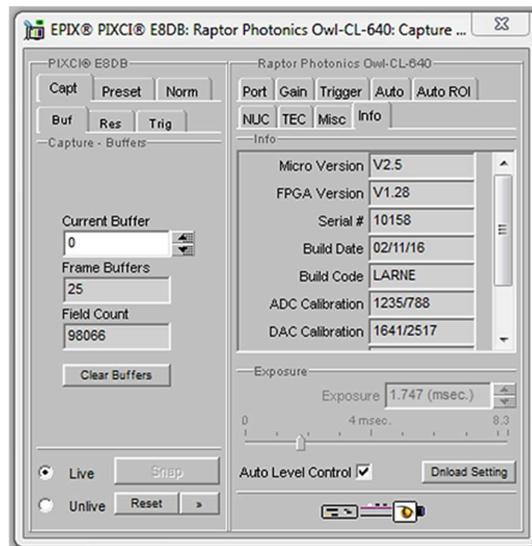
Figure 18: Information Tab

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.
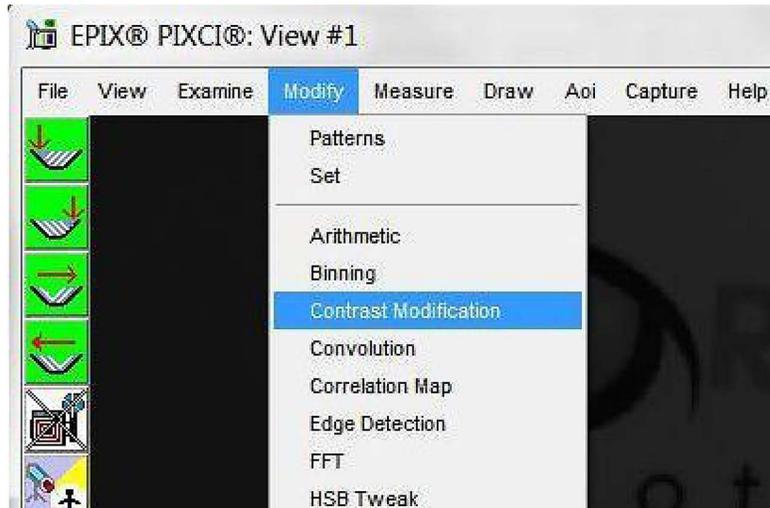
Figure 19: Contrast Modification
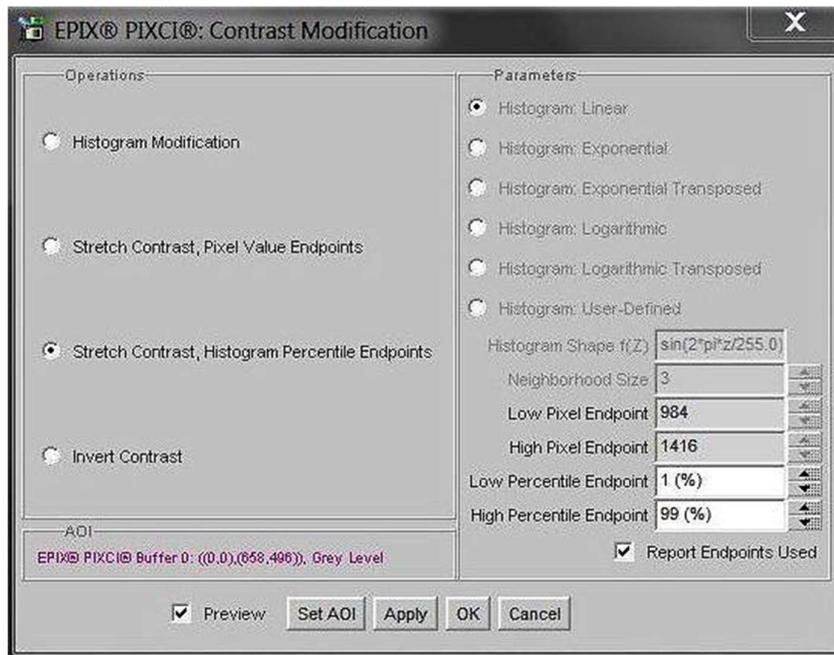
Figure 20: Stretch Contrast

5.   MICRO-MANAGER

Micro-Manager is software for control of microscopes. It works with almost all microscopes, cameras and peripherals on the market, and provides an easy to use interface that lets you run your microscopy-based experiments. Micro-Manager runs as a plugin to ImageJ, is Open Source, and is free.

It is a complete image acquisition and microscope control package, available for Windows, Mac and Linux, it is easy to install and configure right "out-of-the-box", with built-in functionality and user interface for most common tasks performed in a Life Science laboratory. It also is a software framework for implementing advanced and novel imaging procedures, extending functionality, customization and rapid development of specialized imaging applications.

Micro-Manager has been developed at UCSF since the beginning of the project. Starting on October 1, 2015, Micro-Manager is developed and maintained by Open Imaging, a company founded by the Micro-Manager development team.

5.1　Download and install

Begin by installing the latest Micro-Manager. This can be done by going to the 'downloads' section of their website: www.Micro-Manager.org. You should select the latest nightly build for your operating system, found in the 'Download Nightly Builds' section. This will open a direct link to the Micro Manger FTP site where you can download most recently modified file.


Figure 21: Micro-Manager Nightly Builds

5.2   Configuring Micro-Manager

When first opening Micro-Manager for the first time you will see the window shown in (Figure 22). You need to make sure (none) is selected then click Ok.
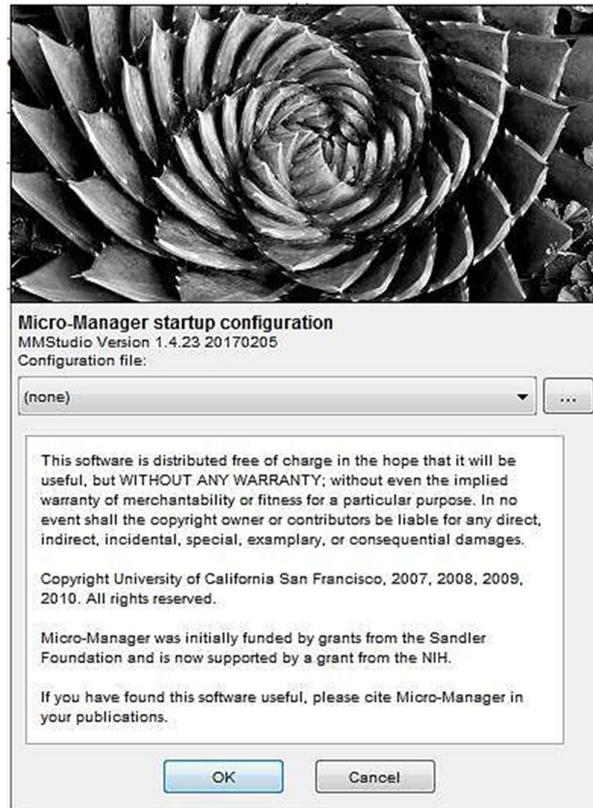

Figure 22: Hardware Configuration

1. Start the Hardware Configuration Wizard by going to tools then Hardware Configuration Wizard.
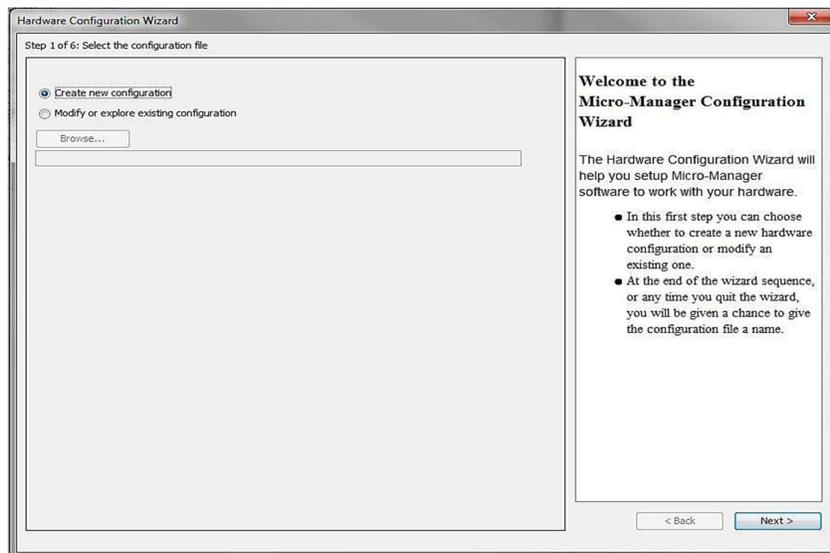
Figure 23: Hardware Configuration Wizard

2. Create a new configuration (figure 23) then look for the camera driver in the RaptorEPIX folder (shown in Figure 24), now click Next.
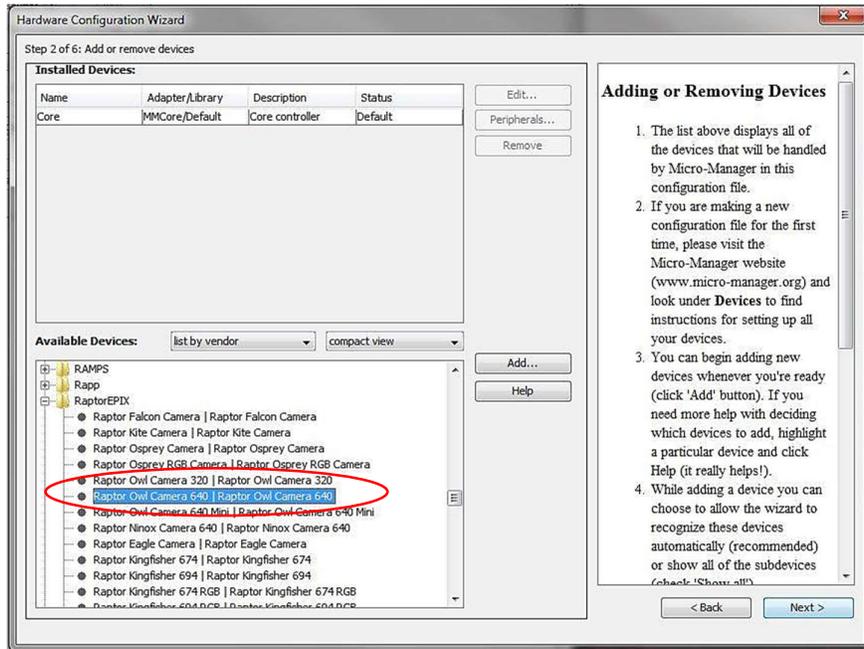

Figure 24: Add a New Device

3. Continue to click Next until you are faced with the screen shown in Figure 24.

4. Rename and save new configuration (e.g. "OWL 640" as shown in Figure 25).
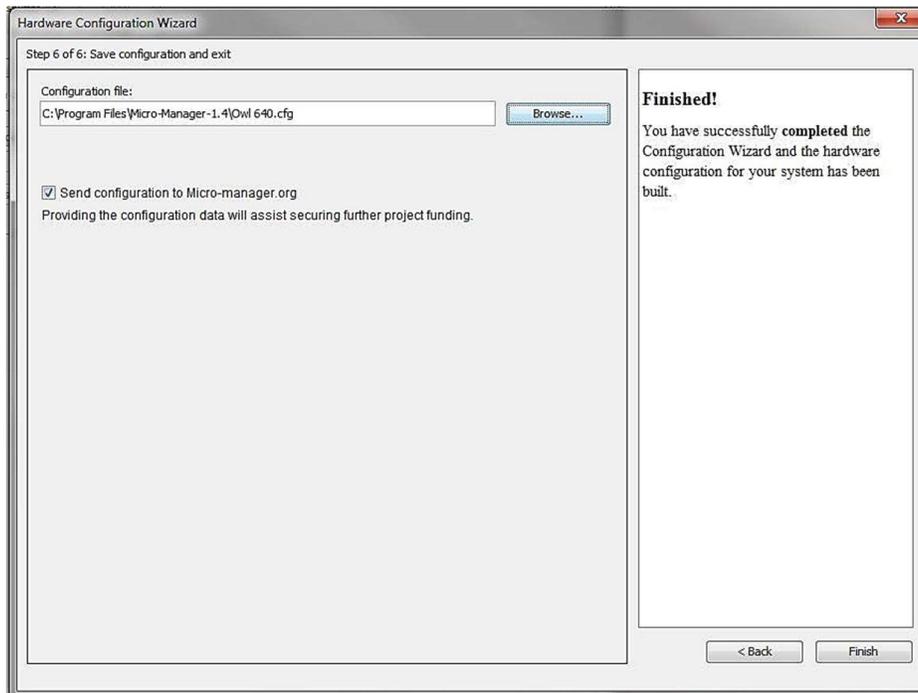
Figure 25: Save Configuration

The connected camera should now be recognized.

Next time you open Micro-Manager you can simply select the saved Raptor Owl 640.cfg from the drop down menu (figure 26) then click Ok.
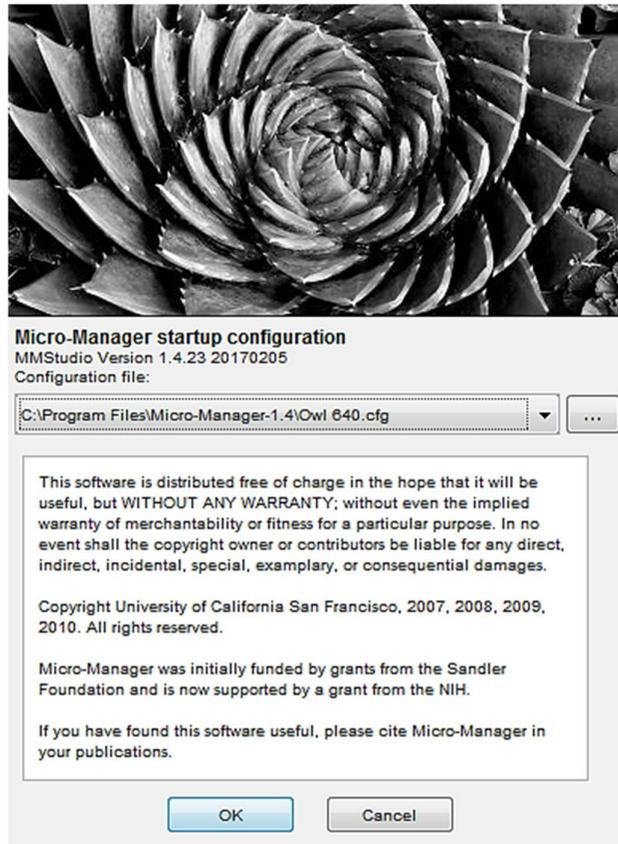

Figure 26: Selecting Saved Camera Configurations

## 5.3   Operating your camera using Micro-Manager
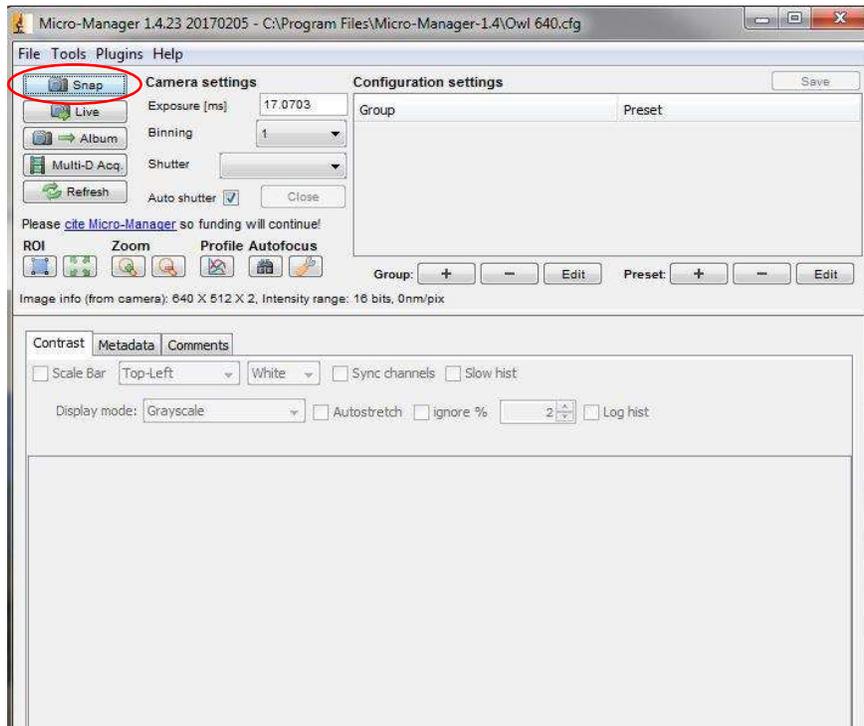
Figure 27: Opening Screen

1. Click on snap (Figure 27) for Micro-Manager to open the viewing window as shown in Figure 28
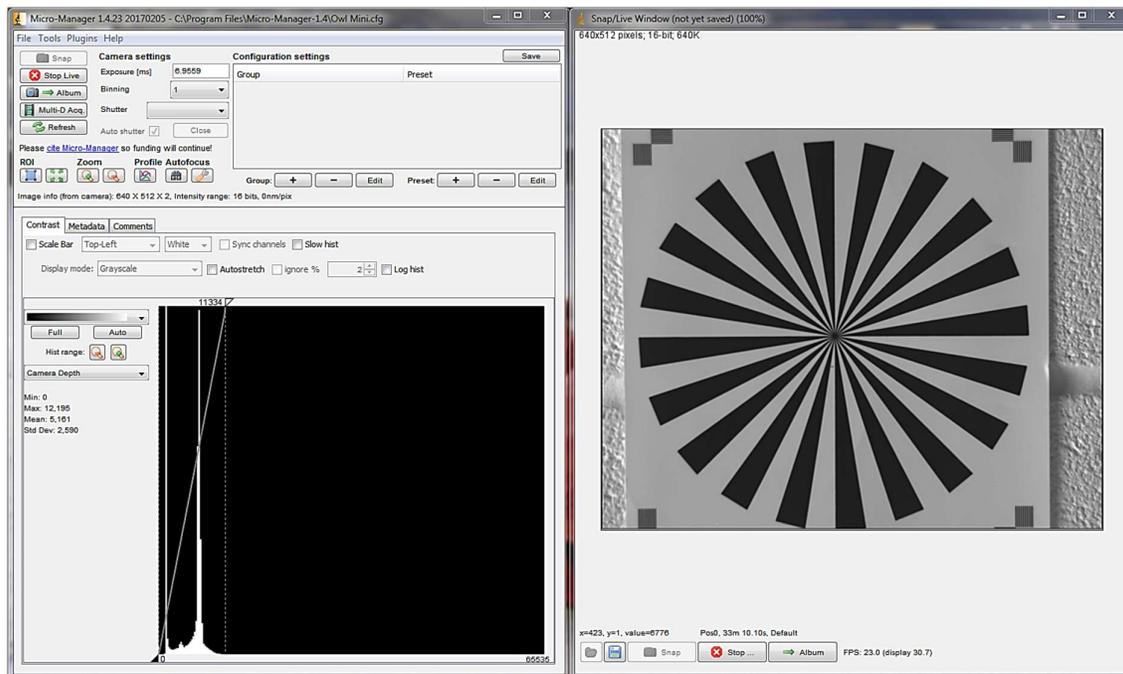

Figure 28: Viewing Window

5.4 Changing Camera settings

All of the camera parameters are controlled within the Device/Property Browser; this can be accessed by selecting Tools from the menu bar then Device Property Browser…
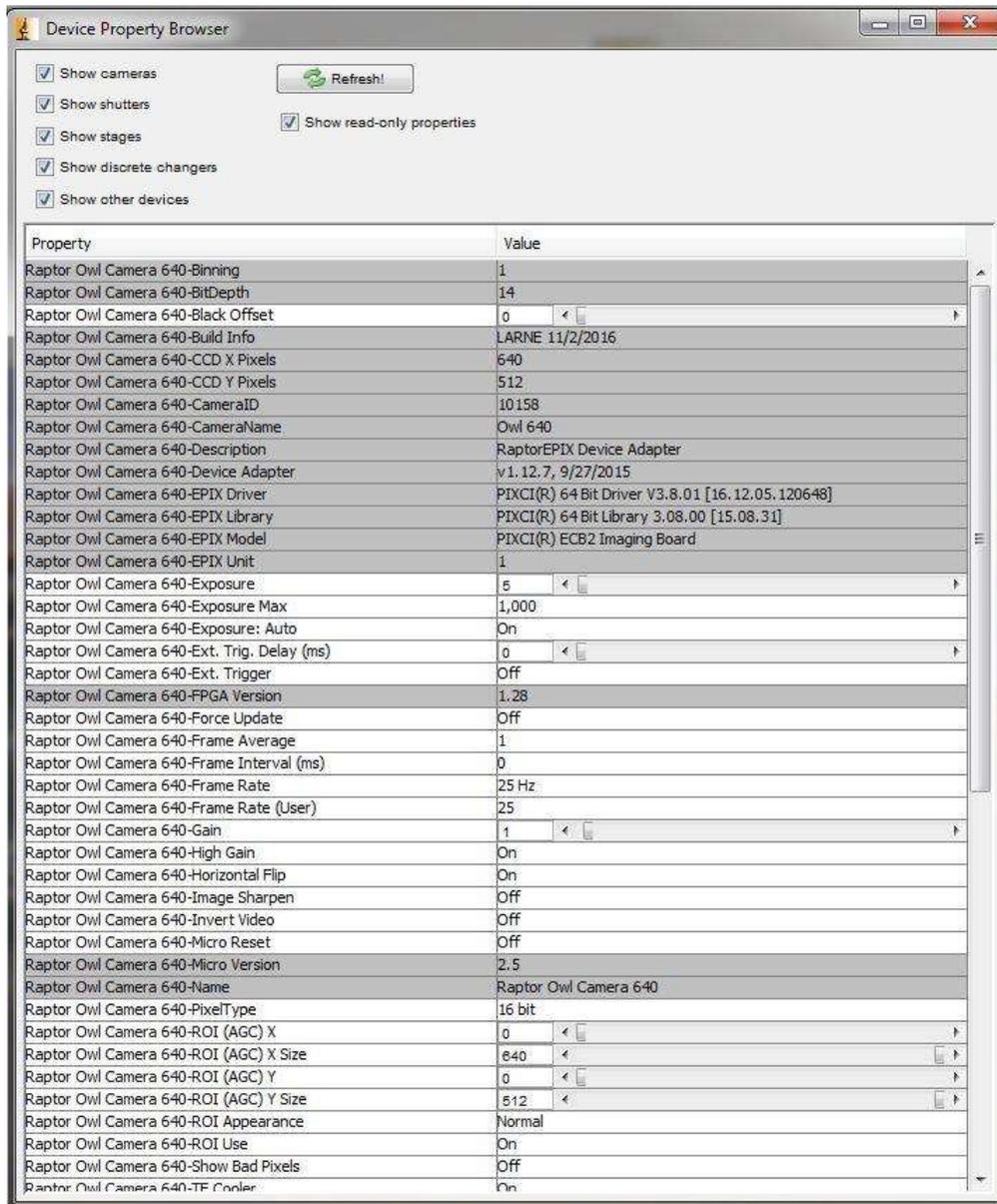

Figure 29: Camera Control Options

From here, you can access all the camera settings.

Instrument Expert
Original factory packaging
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