

Model: OW1.7-VS-CL-640

USER MANUAL





CONTENT

| CONTI | ENT | 2 |
|-------|-----------------|------|
| 1. | INTRODUCTION | 3 |
| 2. | SPECIFICATION | 4 |
| 3. | GETTING STARTED | 6 |
| 4. | EPIX XCAP | 8 |
| 5. | MICRO-MANAGER | . 18 |

1. INTRODUCTION

1.1 Scope

This manual covers the Owl 640 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.

2. SPECIFICATION

2.1 Camera Specification

The OWL 640 digital camera is designed for high-resolution applications requiring visible to SWIR imaging (400-1700nm). The OWL 640 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.

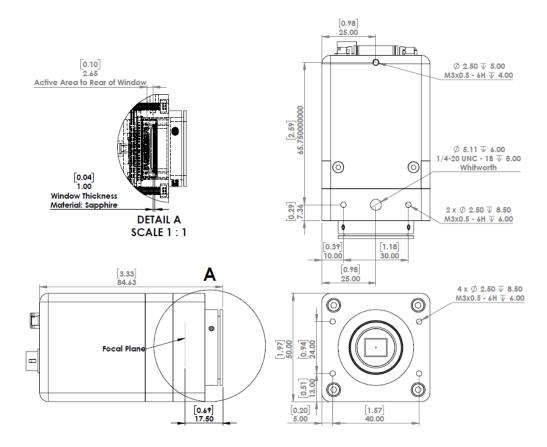
A Software Development Kit (SDK) is available for interfacing with custom software.

| 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: <190 electrons (174 electrons typical) | |
| LG = Low Gain HG = High Gain | HG: <50 electrons (36 electrons typical) | |
| Quantum Efficiency | >80% @ 1.55µm | |
| Full Well Capacity | LG: 650ke- | |
| | HG: 10ke- | |
| Pixel Operability | >99% | |
| Digital Output Format | 14 bit Camera Link (Base Configuration) | |
| Dark Current (e/p/s) | <28,000 @ 15°C | |
| Exposure time | 10µs to 26.8s | |
| Frame Rate | Up to 120Hz | |
| Dynamic Range | LG: 71dB, HG: 49dB | |
| Optical Interface | C-mount | |
| 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 | Exposure, Intelligent AGC, Non-Uniformity | |
| Communication | Correction, Gamma, Pk/Av, ROI | |
| Camera Power Consumption | <3.5W with TEC OFF, NUC ON | |
| | <5W with TEC ON, NUC ON | |
| Operating Case Temperature ² | -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 | | |

Latest version available on <u>www.raptorphotonics.com</u>

Note 1: Optional filters available: Shortpass, Longpass or Bandpass Note 2: Extended operating temperature range on request

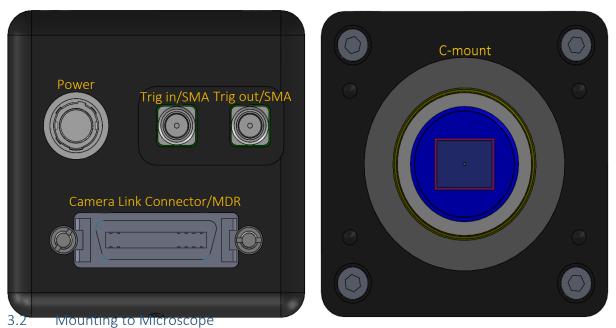
2.2 Mechanical Outline



3D drawings (STEP) are available upon request.

3. GETTING STARTED

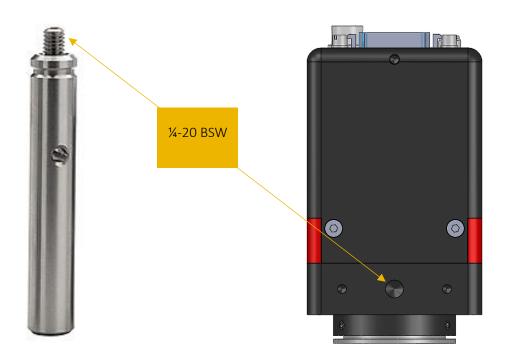
3.1 System Overview



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.



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 II | | | | |
| Falcon III | | | | |
| Eagle | | | \square | $\overline{\checkmark}$ |
| Owl 320 | | | $\overline{\mathbf{A}}$ | $\overline{\checkmark}$ |
| Owl 320 High Speed | | | | |
| Owl 'Mini' | | | \square | $\overline{\checkmark}$ |
| Owl 640 | $\overline{\mathbf{A}}$ | | $\mathbf{\overline{\mathbf{A}}}$ | $\overline{\checkmark}$ |
| Ninox 640 | | | $\overline{\mathbf{A}}$ | $\overline{\checkmark}$ |
| Owl 1280 | | | | |

✓ - Software tested by Raptor Photonics

 \blacksquare - 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 (<u>http://www.epixinc.com/support/files.php</u>) and Micro-Manager (<u>https://micro-manager.org</u>). Should you have other software support specific needs, please do not hesitate to contact our sales team on <u>sales@www.raptorphotonics.com</u>.

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.

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, <u>http://www.epixinc.com/support/files.php</u>, 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.

| k | PIXCI® Open/Close | | | |
|------------------------------|-------------------|------------------|--|--|
| | Options | | | |
| | Multiple Devices | Advanced | | |
| | Camera & Format | Driver Assistant | | |
| Open Close Cancel Board info | | | | |

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.

| Model- | | | |
|---|---|--------------------------------------|--|
| Frame Grab | | | |
| PIXCI E8DE | \$ | | |
| | | | |
| PIXCI® | ESDB | | |
| Camera | selection is preset, as pre | e-programmed | |
| into th | e PIXCI® E8DB. You may | choose an | |
| alternate c | alternate camera, or choose 'Generic Camera Link'. | | |
| | amera, or choose Gener | IC Calliela LIIIK. | |
| | amera, or choose Gener | ic callera Link. | |
| | | | |
| | ber Preset Camera & For | | |
| Frame Grak Generic Ca | ber Preset Camera & For | mat | |
| Frame Grak Generic Ca Configure S | ber Preset Camera & For amera Link | mat | |
| Frame Grak Generic Ca Configure S | ber Preset Camera & For amera Link software for Camera & Fo | mat | |
| Frame Grak Generic Ca Configure S | ober Preset Camera & For amera Link coftware for Camera & Fo otonics OwI-CL-640 | rmat ormat | |
| Frame Grak Generic Ca Configure S Raptor Pho | iber Preset Camera & For amera Link ioftware for Camera & Fo itonics OwI-CL-640 Open w. Last used Vid | rmat ormat Search leo Setup | |
| Frame Grak Generic Ca Configure S Raptor Pho | ober Preset Camera & For amera Link coftware for Camera & Fo otonics OwI-CL-640 | rmat ormat Search leo Setup | |

Figure 2: Camera Selection

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

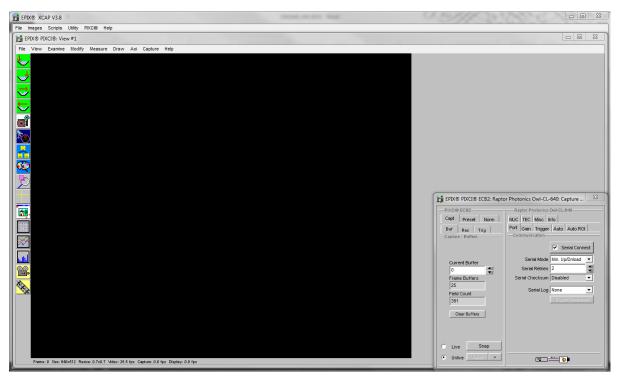


Figure 3: XCAP Camera Control Screen

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).

| 🛅 EPIX® PIXCI® E8DB: Rapto | or Photonics Owl-CL-640: Capture 🕅 |
|--|---|
| PIXCI® E8DB Capt Preset Norm Buf Res Trig -Capture - Buffers Current Buffer 0 Frame Buffers 25 Field Count 635 Clear Buffers | Raptor Photonios Owl-CL-640 NUC TEC Misc Info Port Gain Trigger Auto Auto RO Communication Serial Mode Min. Up/Dnload Serial Retries 2 Serial Checksum Disabled Serial Log None Export Commends |
| C Live Stap | _ |

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: O Size: 640 x 512 Resize 0.7x0.7 Video: 25.0fps Capture: 25.0 fps Display: 25.4fps.*

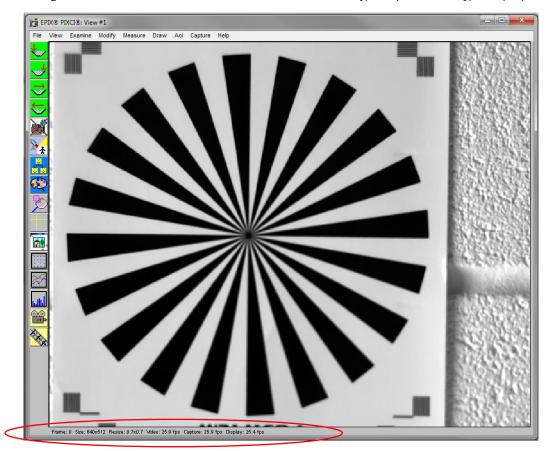


Figure 6: Live Image Capture Window

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.

| Discrete Contemporary Contempor | or Photonics Owl-CL-640: Capture 🛛 🕅 |
|--|--------------------------------------|
| PIXCIO ESDB | Raptor Photonics Owl-CL-640 |
| Capt Preset Norm | NUC TEC Misc Info |
| Buf Res Trig —Capture - Buffers | Port Gain Trigger Auto Auto ROI |
| | Analog Gain Low |
| Current Buffer | Auto Analog Gain Control |
| Frame Buffers | Digital Gain 0.000 (dB) |
| 25 Field Count 2236 | -48 -20 0 20 dB 48 |
| Clear Buffers | Exposure |
| | Exposure 0.008 (msec.) |
| | 0 10 msec. 20 30 40 |
| Live Snap | Auto Level Control 🔽 Dnload Setting |
| C Unlive Reset > | ••••••••• |

Figure 7: Gain Tab

4.5 Trigger

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

| 🛅 EPIX® PIXCI® E8DB: Rapto | or Photonics Owl-CL-640: Capture |
|------------------------------------|---|
| PIXCI® ESDB Capt Preset Norm | Raptor Photonics Owl-CL-640 NUC TEC Misc Info Port Gain Trigger Auto Auto ROI |
| Buf Res Trig —Capture - Buffers | -Timing & Trigger |
| Current Buffer | Readout Mode Live |
| 0 | Trigger Polarity Rising Edge |
| Frame Buffers | Trigger Delay 0.000 (µsec.) |
| 25 | Frame Rate 120.00 Hz |
| Field Count 5755 | |
| Clear Buffers | Exposure |
| | Exposure 1.747 (msec.) |
| | 0 4 msec. 8.3 |
| Live Snap | Auto Level Control 🔽 Dnload Setting |
| O Unlive Reset > | 0 1 |

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.

| 1 EPIX® PIXCI® E8DB: Rapto | or Photonics Owl-CL-640: Capture |
|------------------------------------|--|
| PIXCI® ESDB Capt Preset Norm | Raptor Photonics Owl-CL-640 NUC TEC Misc Info |
| Buf Res Trig —Capture - Buffers | Port Gain Trigger Auto Auto ROI |
| | ALC from Peak 43 (%) |
| Current Buffer | ALC from Mean 57 (%) |
| 0 | ALC Level 8496 |
| Frame Buffers | ALC Speed 7 |
| Field Count 12957 | AGC Speed 7 |
| Clear Buffers | Exposure 1.747 (msec.) |
| | 0 4 msec. 8.3 |
| Live Snap | Auto Level Control 🔽 Dnload Setting |
| O Unlive Reset > | |

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.

| 1 EPIX® PIXCI® E8DB: Rapto | or Photonics Owl-CL-640: Capture |
|------------------------------------|--|
| | Raptor Photonics Owl-CL-840 |
| Capt Preset Norm | NUC TEC Misc Info |
| Buf Res Trig —Capture - Buffers | Port Gain Trigger Auto Auto ROI |
| | ROI Highlight ROI Box |
| | ROI X Offset 172 |
| Current Buffer | ROI X Width 284 |
| Frame Buffers | ROI Y Offset 196 |
| 25 | ROI Y Height 232 |
| Field Count 30254 | Max ROI |
| Clear Buffers | Exposure |
| | Exposure 1.747 (msec.) |
| | 0 4 msec. 8.3 <u>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </u> |
| Live Snap | Auto Level Control 🔽 Dnload Setting |
| C Unlive Reset > | |

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.

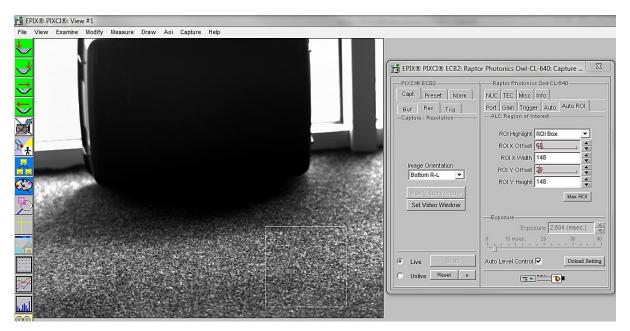


Figure 12: Active ROI

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.

| 🛅 EPIX® PIXCI® E8DB: Rapto | or Photonics Owl-CL-640: Capture 🔀 |
|---|--|
| PIXCI® E8DB Capt Preset Norm Buf Res Trig -Capture - Buffers Current Buffers Current Buffers 25 Field Count 68302 | Raptor Photonics Owl-CL-640 Port Gain Trigger Auto Auto ROI NUC TEC Misc Info Non-Uniformity Correction NUC State: Offset C Offset+Gain C Normal C Offset+Gain+Dark © 8 bit Offset/32 C |
| Clear Buffers Clear Buffers Live Snap Unlive Reset | Exposure Exposure 1.747 (msec.) |

Figure 13: Controlling the NUC Status

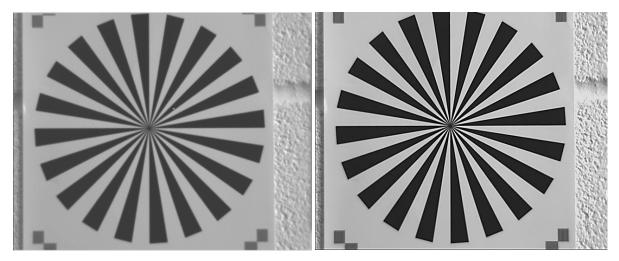


Figure 14: NUC Off

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.

| 🛅 EPIX® PIXCI® ECB2: Rapto | or Photonics Owl-CL-640: Capture 🗾 |
|------------------------------------|---|
| PIXCI® ECB2 | Raptor Photonics Owl-CL-640 |
| Capt Preset Norm | Port Gain Trigger Auto Auto ROI |
| Buf Res Trig —Capture - Buffers | NUC TEC Misc Info |
| | TE Cooler Enabled |
| | TEC Set Point 15 (°C) |
| Current Buffer 0 | CCD Temperature 32.1 (°C) Update Temp. |
| 25 | Note: TEC setpoints below the 15°C |
| Field Count | default may require a supplemental |
| 553 | heatsink or external cooling! |
| Clear Buffers | Exposure |
| | Exposure 5.615 (msec.) |
| | 0 10 msec. 20 30 40 |
| Live Snap | Auto Level Control 🔽 Doload Setting |
| O Unlive Reset > | |

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.

| 1 EPIX® PIXCI® E8DB: Rapto | or Photonics Owl-CL-640: Capture 🛛 🕅 |
|--|--|
| PIXCIO ESDB Capt Preset Norm Buf Res Trig -Capture - Buffers | Raptor Photonics Owi-CL-640 Port Gain Trigger Auto Auto ROI NUC TEC Misc Info Miscellaneous Video Invert |
| Current Buffer 0 Million Frame Buffers 25 Field Count 86903 | Active Image Enhancement Bad Pixel Replace Mirror Off Micro Reset |
| Clear Buffers | Exposure 1.747 (msec.) |
| Live Snap Unlive Reset > | Auto Level Control V Dnload Setting |

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.

| Di EPIX® PIXCI® E8DB: Rapto | r Photonics Owl-CL- | 640: Capture 🛛 🕅 |
|---|--|--|
| PIXCIO ESDB Capt Preset Norm Buf Res Trig —Capture - Buffers | Raptor Photonics C Port Gain Trigger NUC TEC Misc In Info Micro Version | Auto Auto ROI |
| Current Buffer 0 Frame Buffers 25 Field Count 98066 | FPGA Version Serial # Build Date Build Code ADC Calibration DAC Calibration | 10158 02/11/16 LARNE 1235/788 |
| Clear Buffers | 0 4 m | re 1.747 (msec.) |

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.

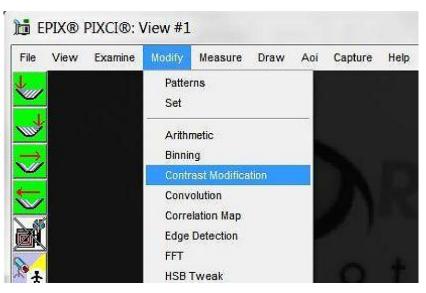


Figure 19: Contrast Modification

| -Operations- | Parameters | | |
|--|--|--|--|
| | Histogram Linear | | |
| Histogram Modification | C Histogram Exponential | | |
| | C Histogram, Exponential Transposed | | |
| | Histogram: Logarithmic | | |
| Stretch Contrast, Pixel Value Endpoints | G Histogram Logarithmic Transposed | | |
| | C Histogram User-Defined | | |
| Stretch Contrast, Histogram Percentile Endpoints | Histogram Shape f(Z) sin(2*pi*z/255.0) | | |
| | Neighborhood Size 3 | | |
| | Low Pixel Endpoint 984 | | |
| Invert Contrast | High Pixel Endpoint 1416 | | |
| | Low Percentile Endpoint 1 (%) | | |
| 401 | High Percentile Endpoint 99 (%) | | |
| 1X01 1X0 P1XC10 Buffer D: ((0.0),(658,496)), Grey Level | Report Endpoints Use | | |

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 <u>Open Imaging</u>, 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: <u>www.Micro-Manager.org</u>. 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.

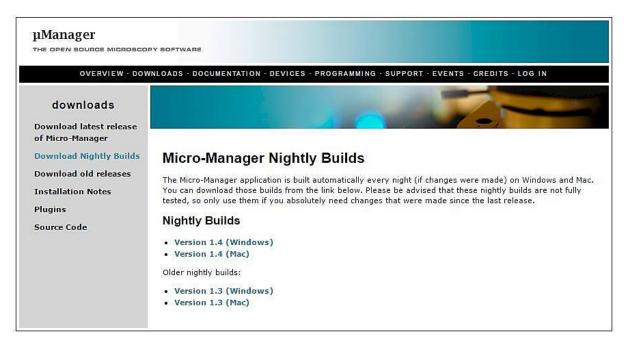


Figure 21: Micro-Manager Nightly Builds

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.

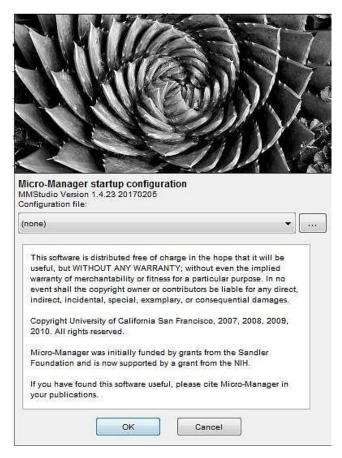


Figure 22: Hardware Configuration

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

| Hardware Configuration Wizard | |
|--|--|
| Step 1 of 6: Select the configuration file | |
| Dreate new configuratori O Modify or explore existing configuration Browse | Welcome to the Micro-Manager Configuration Wizard The Hardware Configuration Wizard will |
| | In the provide setup Micro-Manager software to work with your hardware. In this first step you can choose whether to create a new hardware configuration or modify an existing one. A the end of the wizard sequence, or any time you quit the wizard, you will be given a chance to give the configuration file a name. |
| | < Back Next > |

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.

| ep 2 of 6: Add | or remove devices | | | | |
|---|--|--|-----------------|-----------|--|
| installed De | vices: | | | | |
| Name | Adapter/Library | Description | Status | Edit | Adding or Removing Devices |
| lore | MMCore/Default | Core controller | Default | Periphera | Is |
| | | | | Remov | 1. The list above displays all of |
| | | | | Keniov | the devices that will be handled |
| | | | | | by Micro-Manager in this configuration file. |
| | | | | | 2. If you are making a new |
| | | | | | configuration file for the first |
| | | | | | time, please visit the |
| | | | | | Micro-Manager website |
| | | | | | (www.micro-manager.org) and |
| | | | | | look under Devices to find |
| | | | | | instructions for setting up all |
| vailable De | vices: list by vendo | r] [c | ompact view | • | your devices. |
| RAMP | | eg te | | Add | 3. You can begin adding new |
| | | | | * L | devices whenever you're ready |
| | 2 | | | | |
| T 🔫 | rEPIX | | | Help | (click 'Add' button). If you |
| Rapp | aptor Falcon Camera Rapti | | | Help | need more help with deciding |
| Rapp | aptor Falcon Camera Rapti aptor Kite Camera Raptor I | Kite Camera | | Help | need more help with deciding which devices to add, highlight |
| Rapp Rapto | aptor Falcon Camera Rapti aptor Kite Camera Raptor I aptor Osprey Camera Rapt | Kite Camera tor Osprey Camera | Camara | Help | need more help with deciding which devices to add, highlight a particular device and click |
| Rapp Rapt R R R R R R R R R R R R R | aptor Falcon Camera Rapti aptor Kite Camera Raptor I | Kite Camera tor Osprey Camera <u>Raptor Osprey R</u> GB | | Help | need more help with deciding which devices to add, highlight a particular device and click Help (it really helps!). |
| Rapp Rapto | aptor Falcon Camera Rapti aptor Kite Camera Raptor I aptor Osprey Camera Rapi aptor O <u>sprey RGB Camera </u> aptor Owl Camera 320 Rap aptor Owl Camera 640 Rap | Kite Camera tor Osprey Camera Raptor Osprey RGB otor Owl Camera 320 otor Owl Camera 640 | \supset | Help | need more help with deciding which devices to add, highlight a particular device and click Help (it really helps!). 4. While adding a device you can |
| Rapp Rapto Rapto R R R R R R R R R R R R R | aptor Falcon Camera Rapti aptor Kite Camera Raptor I aptor Osprey Camera Rap aptor Osprey RGB Camera aptor Owl Camera 320 Rap aptor Owl Camera 640 Rap aptor Owl Camera 640 Rap | Kite Camera tor Osprey Camera Raptor Osprey RGB otor Owl Camera 320 otor Owl Camera 640 Raptor Owl Camera | 640 Mini | E | need more help with deciding which devices to add, highlight a particular device and click Help (it really helps!). 4. While adding a device you can choose to allow the wizard to |
| Rapp | aptor Falcon Camera Raptu aptor Kite Camera Raptu r aptor Osprey Camera Raptu aptor Osprey RGB Camera aptor Owl Camera 320 Rap aptor Owl Camera 340 Rap aptor Owl Camera 640 Rap aptor Monx Camera 640 Rap | Kite Camera tor Osprey Camera Rantor Osprey RGB otor Owl Camera 320 otor Owl Camera 640 Raptor Owl Camera 6 aptor Ninox Camera 6 | 640 Mini | Help | need more help with deciding which devices to add, highlight a particular device and click Help (it really helps!). 4. While adding a device you can choose to allow the wizard to recognize these devices |
| Rapp | aptor Falcon Camera Raptu aptor Kite Camera Raptor aptor Osprey Camera Rapt aptor Osprey CBG:Camera aptor Osney CBG:Camera aptor Owl Camera 640 Rap aptor Owl Camera 640 Ra aptor Ninox Camera 640 R | Kite Camera tor Osprey Camera Raptor Osprey RG8 stor Owl Camera 320 stor Owl Camera 640 Paptor Owl Camera aptor Ninox Camera 6 r Eagle Camera | 640 Mini | E Help | need more help with deciding which devices to add, highlight a particular device and click Help (it really helps!). 4. While adding a device you can choose to allow the wizard to recognize these devices automatically (recommended) |
| Rapp Raptc Raptc R. R. | aptor Falcon Camera Rapti pator Kite Camera Raptor pator Osprev RGB Camera Rap pator Osprev RGB Camera aptor Owl Camera 320 Rap pator Owl Camera 4500 Rap pator Nuncx Camera 450 R aptor Fagle Camera Rapto pator Kingfisher 674 Rapto | Kite Camera tor Osprey Camera Raptor Osprey RGB tor Owl Camera 320 obtr Owl Camera 640 I Raptor Owl Camera 64 aptor Ninox Camera 64 r Fagle Camera or Kingfisher 674 | 640 Mini | E Help | need more help with deciding which devices to add, highlight a particular device and click Help (it really helps!). 4. While adding a device you can choose to allow the wizard to recognize these devices automatically (recommended) or show all of the subdevices |
| Rapp Raptc Raptc Ri Ri | aptor Falcon Camera Raptu aptor Kite Camera Raptor aptor Osprey Camera Rapt aptor Osprey CBG:Camera aptor Osney CBG:Camera aptor Owl Camera 640 Rap aptor Owl Camera 640 Ra aptor Ninox Camera 640 R | Kite Camera tor Osprey Camera Raptor Osprey RGB J otor Owl Camera 320 Stor Owl Camera 440 I Paptor Owl Camera aptor Ninox Camera 6 r Eagle Camera or Kingfisher 674 or Kingfisher 694 | 540 Mini 640 | E | need more help with deciding which devices to add, highlight a particular device and click Help (it really helps!). 4. While adding a device you can choose to allow the wizard to recognize these devices automatically (recommended) |

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).

| Hardware Configuration Wizard | × |
|--|---|
| Step 6 of 6: Save configuration and exit | |
| Step 6 of 6: Save configuration and exit Configuration file: C:\Program Files\Vilcro-Manager-1.4\Owl 640.cfg Image: Send configuration to Micro-manager.org Providing the configuration data will assist securing further project funding. | Finished! You have successfully completed the Configuration Wizard and the hardware configuration for your system has been built. |
| | < Back Finish |

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

| e Tools Plugins | | chartogramm | Files\Micro-Manager-1.4\Ow | vi 640.Cig | |
|---------------------------|---------------------------|----------------|----------------------------|----------------|------|
| Snap | Camera setting | s | Configuration settings | | Save |
| Live | Exposure [ms] | 17.0703 | Group | Preset | |
| 👔 🔿 Album | Binning | 1 • | | | |
| Multi-D Acq. | Shutter | • | | | |
| 😤 Refresh | Auto shutter 🔽 | Close | Ĩ | | |
| ease <u>cite Micro-Ma</u> | <u>nager</u> so funding v | vill continue! | | | |
| DI Zoor | | Autofocus | | | |
| I 🔛 🔍 |) 🔍 (40 X 512 X 2 | a) 🥜 | Group: + - | Edit Preset: + | Edit |
| | | | | | |
| Contrast Metada | ta Comments | | | | |
| Scale Bar Top | o-Left 👻 | White 🚽 🗌 | Sync channels Slow hist | | |
| Diselau madai | [consuments] | 1 | | | |
| Display mode: | Grayscale | - At | utostretch 🔄 ignore % | 2 Log hist | |
| | | | | | |
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| | | | | | |
| | | | | | |

Figure 27: Opening Screen

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

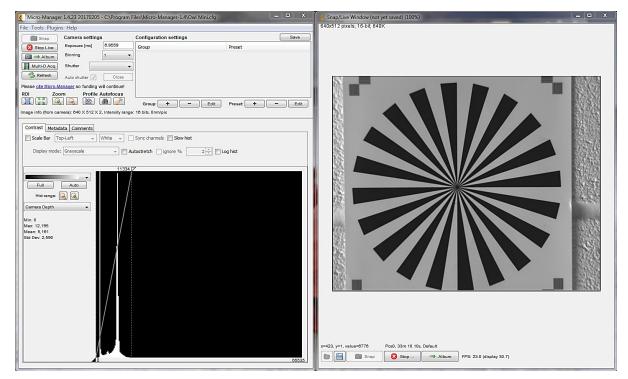


Figure 28: Viewing Window

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...

| Show cameras | 1 | |
|--|--|---|
| Show shutters | | |
| Show stages | properties | |
| | | |
| Show discrete changers | | |
| V Show other devices | | |
| Property | Value | |
| Raptor Owl Camera 640-Binning | 1 | |
| Raptor Owl Camera 640-BitDepth | 14 | |
| Raptor Owl Camera 640-Black Offset | 0 < | • |
| Raptor Owl Camera 640-Build Info | LARNE 11/2/2016 | |
| Raptor Owl Camera 640-CCD X Pixels | 640 | |
| Raptor Owl Camera 640-CCD Y Pixels | 512 | |
| Raptor Owl Camera 640-CameraID | 10158 | |
| Raptor Owl Camera 640-CameraName | Owl 640 | |
| Raptor Owl Camera 640-Description | RaptorEPIX Device Adapter | |
| Raptor Owl Camera 640-Device Adapter | v1.12.7, 9/27/2015 | |
| Raptor Owl Camera 640-EPIX Driver | PIXCI(R) 64 Bit Driver V3.8.01 [16.12.05.120648] | |
| Raptor Owl Camera 640-EPIX Library | PIXCI(R) 64 Bit Library 3.08.00 [15.08.31] | |
| Raptor Owl Camera 640-EPIX Model | PIXCI(R) ECB2 Imaging Board | |
| Raptor Owl Camera 640-EPIX Unit | 1 | |
| Raptor Owl Camera 640-Exposure | 5 4 | + |
| Raptor Owl Camera 640-Exposure Max | 1,000 | |
| Raptor Owl Camera 640-Exposure: Auto | On | |
| Raptor Owl Camera 640-Ext. Trig. Delay (ms) | 0 4 | + |
| Raptor Owl Camera 640-Ext. Trigger | Off | |
| Raptor Owl Camera 640-FPGA Version | 1.28 | |
| Raptor Owl Camera 640-Force Update | off | |
| Raptor Owl Camera 640-Frame Average | 1 | |
| Raptor Owl Camera 640-Frame Interval (ms) | 0 | |
| Raptor Owl Camera 640-Frame Rate | 25 Hz | |
| Raptor Owl Camera 640-Frame Rate (User) | 25 | |
| Raptor Owl Camera 640-Gain | 1 4 | * |
| Raptor Owl Camera 640-High Gain | On | |
| Raptor Owl Camera 640-Horizontal Flip | On | - |
| Raptor Owl Camera 640-Image Sharpen | off | - |
| Raptor Owl Camera 640-Invert Video | off | - |
| Raptor Owl Camera 640-Micro Reset | off | - |
| Raptor Owl Camera 640-Micro Version | 2.5 | |
| Raptor Owl Camera 640-Name | Raptor Owl Camera 640 | |
| Raptor Owl Camera 640-PixelType | 16 bit | |
| Raptor Owl Camera 640-ROI (AGC) X | 0 4 | + |
| Raptor Owl Camera 640-ROI (AGC) X Size | 640 < | + |
| Raptor Owl Camera 640-ROI (AGC) Y | 0 (| * |
| Raptor Owl Camera 640-ROI (AGC) Y Size | 512 4 | * |
| Raptor Owl Camera 640-ROI (AGC) 1 3/22 | Normal | - |
| Raptor Owl Camera 640-ROI Use | On | |
| Raptor Owl Camera 640-ROI Use Raptor Owl Camera 640-Show Bad Pixels | Off | |
| Raptor Owi Camera 640-Snow Bad Pixels Raptor Owi Camera 640-TE Cooler | 0π 0n | |

Figure 29: Camera Control Options

From here, you can access all the camera settings.



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