

# Beacon User Guide

Scientific camera imaging software from Teledyne Photometrics

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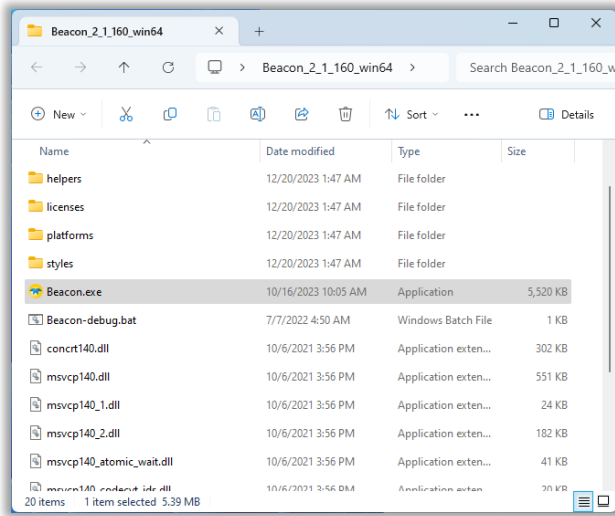
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## 1. Introduction

Beacon is imaging application software developed by **Teledyne Photometrics** for use with our full range of scientific cameras. Beacon allows users to configure and control scientific camera, verify functionality, and execute basic imaging experiments.

## 2. Launching the Application

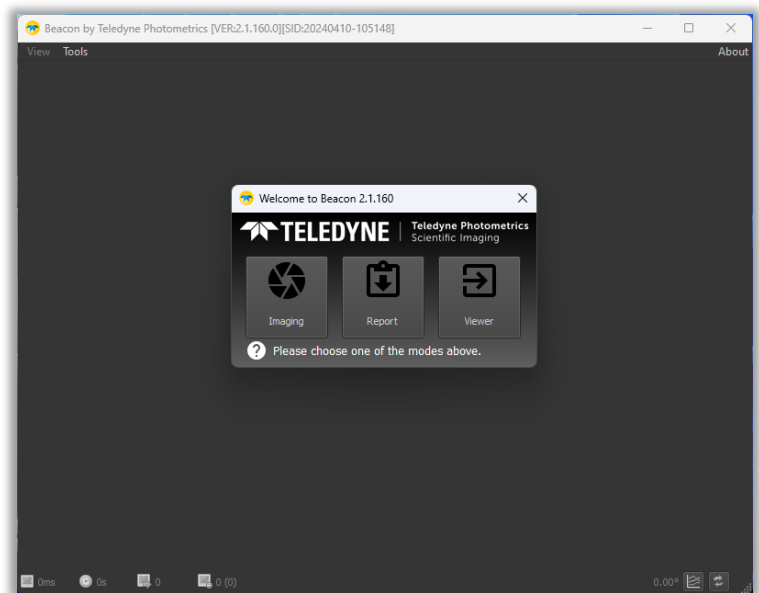
- If the Application was received in a compressed .zip file, unpack the .zip file first.
- Launch the Application by executing the Beacon.exe file.



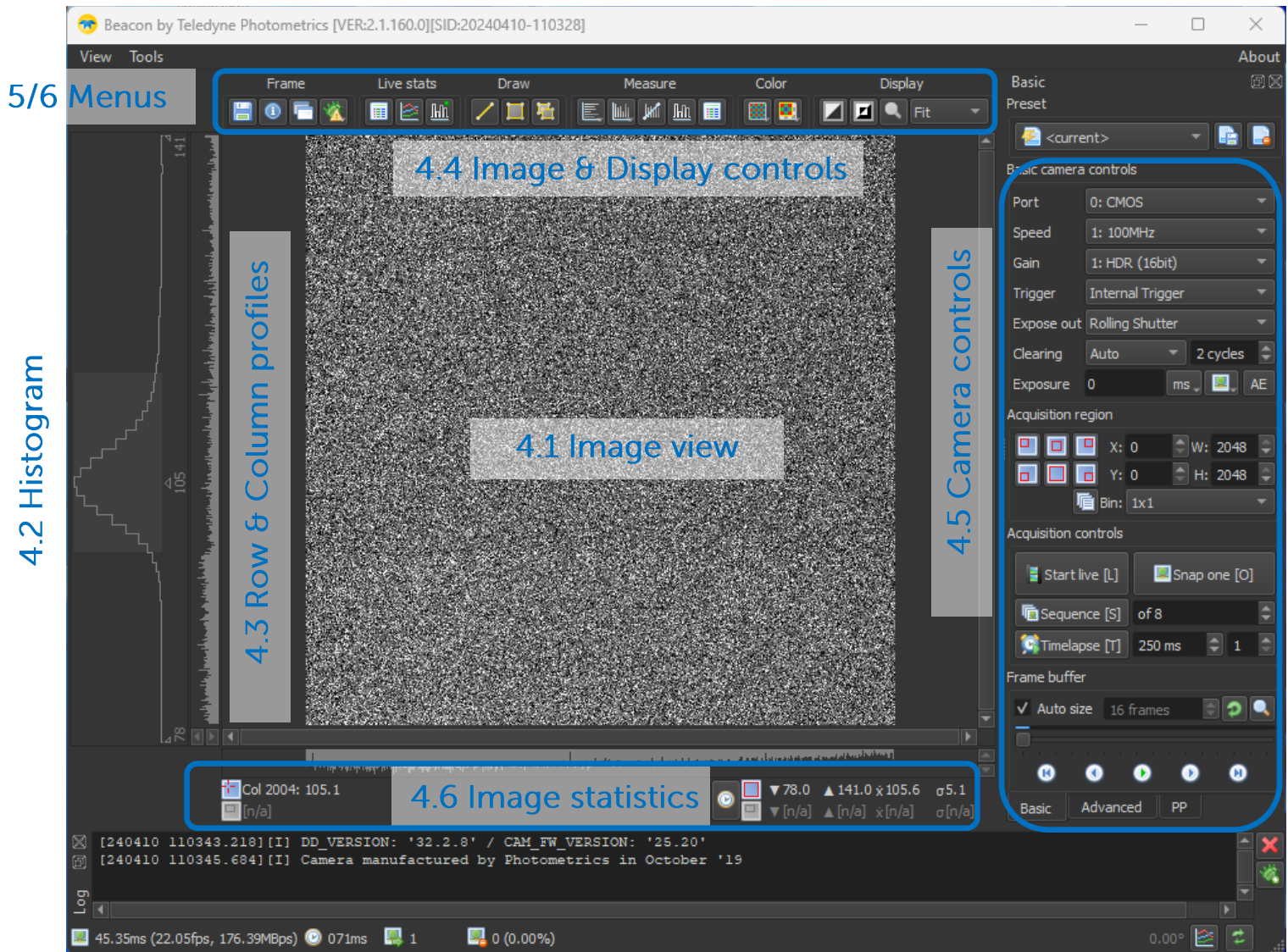
## 3. Startup Window

Three startup options are available for selection:

- **Imaging:** Use this mode by default and unless instructed otherwise. This mode will scan the system for supported cameras. If only one camera is available, the camera is opened and the application switches to the Main Application Window. If more cameras are available, the user is presented with a selection of cameras.
- **Report:** *Advanced feature.* This mode will open the selected camera and download all supported parameters from the camera. Use this mode only if instructed to do so. Users may be requested to send the resulting report file back to Teledyne Photometrics technicians for evaluation and support.
- **Viewer:** *Advanced feature.* This mode can be used to view existing image files and saved acquisitions. Drag & drop image files into the Main Application Window to display them.



## 4. Main Application Window



### 4.1 Image View

Camera images will be displayed here, once an acquisition is started.

### 4.2 Histogram

A histogram of the currently displayed image. By default, the image scaling is enabled and the histogram will show the scaling range. Currently, the application uses the “95% histogram scaling” technique. The scaling can be also configured to min/max mode or manual mode, using the Display / Image Adjustment tool box in the Image Controls area.

### 4.3 Row & Column Profiles

Each row and column of the displayed image has an intensity profile, seen to the left and bottom of the image

## 4.4 Image & Display Controls

### 4.4.1 Frame

This panel contains basic frame data options.

- **Save image to file:** Saves currently displayed to disk.
- **View frame metadata:** Views image metadata, including any embedded camera metadata, if enabled.
- **Display current frame in a separate window:** Pops out the current image to a separate window. This way the image will be “saved” and not be overwritten with next acquisition.
- **Debugging:** Various debugging options that may be requested by Teledyne Photometrics technicians.

### 4.4.2 Live stats

Options in this panel control the display of various image statistics from the “live” image preview. These statistics are optimized for the live display. For more detailed statistics of acquired images, please use the “Draw” and “Measure” panels.

- **Detailed image statistics:** Displays a window with image statistics of the current image. Full-frame and selection statistics are displayed, if available.
- **Statistics history:** Displays a window with image statistics over time. This can be used to track changes in images acquired over time.
- **Live histogram:** Displays a window with image histogram. This will display the same histogram as in the side histogram window; however, the window can be resized and provides more options.

### 4.4.3 Draw

This panel controls the drawing of shapes on the image window. Pixels under such shapes can be then analyzed using the “Measure” panel.

- **Draw line:** Drawing a line. Image pixels under this line can be then analyzed using the “Measure” panel.
- **Draw rectangle (default):** By default, users can draw a rectangle on the image. Pixels covered by the rectangular selection can be then analyzed using the “Measure” panel. **User can also right-click on a selection rectangle and apply the rectangle as an ROI to the camera.**
- **Draw multiple rectangles:** Users can draw multiple rectangles on the displayed image. These can be used to quickly switch between several rectangular selection for analysis. This option can be also used to apply selection rectangles as camera ROIs (if multiROI supported by the camera).

### 4.4.4 Measure

Together with the “Draw” panel, this panel controls the measurement of various image statistics on the currently displayed image. If no selection is drawn, statistics of the entire image are measured. In the measurement window, users can configure the chart by right-clicking on the chart area. Charts can be also zoomed into by drawing a rectangle over the area of interest.

- **Row profile:** Displays a row profile of the current image or active selection, mean and standard deviation profiles are available. Rectangular selections are supported. If line selection is active, a row profile of the line selection bounding box is calculated.
- **Column profile:** Displays a column profile of the current image or active selection, mean and standard deviation profiles are available. Rectangular selections are supported. If line selection is active, a row profile of the line selection bounding box is calculated.
- **Line profile:** Measures a line profile of active selection. Active line selection is required. This measurement can be used to display intensities of pixels covered by the drawn line selection.

- **Histogram:** Measures detailed histogram of the current image or active selection.
- **Statistics:** Measures detailed image statistics of the current image or active selection.

#### 4.4.5 Color

This panel allows users to configure color processing of the currently displayed image. Control in this panel should be used only if the camera sensor is equipped with a color mask.

- **Demosaicing pattern:** Overrides the automatically selected mask to a custom selection.
- **Demosaicing algorithm:** Select between various demosaicing algorithms.

#### 4.4.6 Display

This panel controls basic display options.

- **Auto contrast scaling:** Control image contrast scaling. This option will open a tool window with options to select the scaling algorithm or use manual override.
- **Invert colors:** Invert the image colors.
- **Magnifier tool:** Shows a small magnifier window that can be used to inspect the image.
- **Zoom:** Controls the main image zoom levels.

### 4.5 Camera Controls

#### 4.5.1 Basic camera controls

Use this panel to set basic camera settings like Port, Speed, Gain, Trigger modes (external, internal), Expose Out modes, Clearing and Exposure. For exposure controls, additional modes are available depending on the camera model: S.M.A.R.T streaming or VTM (Variable Timed Mode).

#### 4.5.2 Acquisition region

Hardware region of interest (ROI) control. Use this panel to set camera ROIs. Use the shortcut buttons to quickly set center and border quads. If the camera supports multiple ROI acquisition, multiple-ROIs can be drawn on an already acquire image, using the "Image Control" panel. Users can also use the "ROI Manager" to manually enter ROI coordinates and store a list of predefined ROIs.

#### 4.5.3 Acquisition controls

Main acquisition control

- **Start Live [L]:** Starts a continuous, circular buffer acquisition. Please note that, if circular buffer is disabled in the Advanced panel, this acquisition mode will use a simple "focus loop" – a repeated sequence of single snaps.
- **Snap One [O]:** Acquires single frame.
- **Sequence [S]:** Acquires defined number of frames.
- **Timelapse [T]:** Continuously acquires defined number of frames using the predefined interval.

#### 4.5.4 Frame buffer

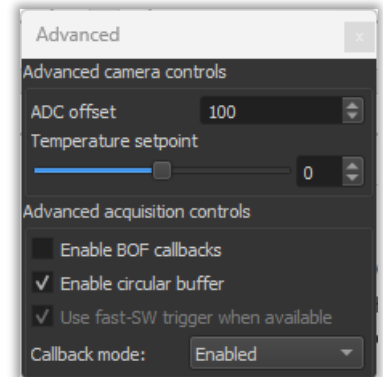
Use this panel to set the size of the circular buffer (used with "Start Live" mode). This buffer is also shared with the Sequence acquisition ("Grab One", "Sequence"). If sequence is initiated, the buffer size is automatically enlarged to the number of frames in the sequence.

The camera controls detailed in section 4.4 were in the 'Basic' panel, there are also the adjacent 'Advanced' and 'PP' (postprocessing) panels.

### 4.5.5 Advanced Panel

This panel configures advanced camera and acquisitions controls.

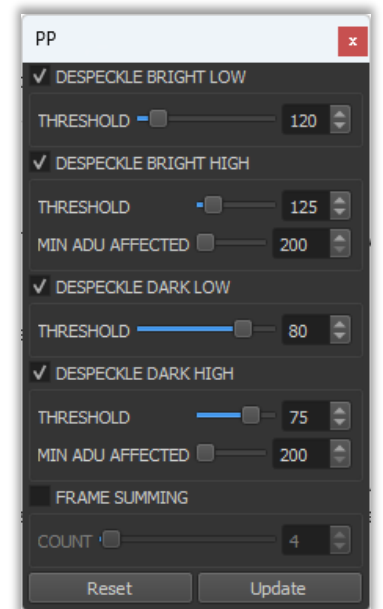
- **ADC offset:** While the value can be adjusted, it is not recommended to do so unless instructed by a Teledyne Photometrics technician.
- **Temperature setpoint:** Use the slider to configure the desired cooling temperature, if supported.
- **Enable BOF callbacks:** Enables BOF notifications that provide driver-generated BOF timestamps. Not supported on latest camera models.
- **Enable circular buffer:** *Keep enabled.* Disabling this feature will affect the "Start Live" mode, if disabled the mode will use repeated single snaps to emulate continuous acquisition.
- **Callback mode:** *Keep enabled.* Do not change unless instructed to do so.



### 4.5.6 Post Processing (PP) panel

If supported, this panel will display camera hardware provided post processing options. The post processing selection varies by camera model. Some cameras do not provide any post processing features.

In the example image users have access to image despeckle controls (enable/disable and establishing thresholds), as well as frame summation.

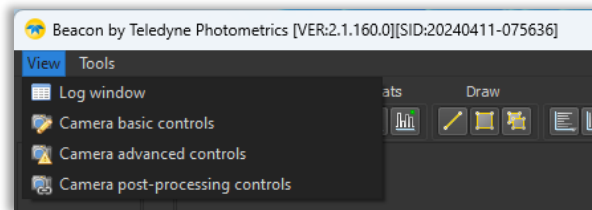


## 4.6 Image Statistics

Displays current pixel value under mouse pointer and basic image statistics for the full image and active selection.

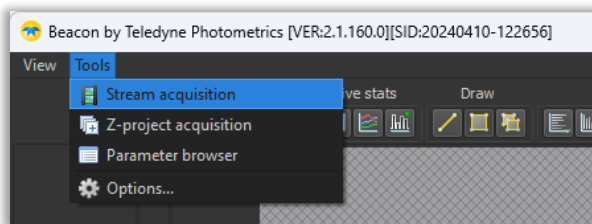
## 5 View Menu

This menu allows users to display or bring up various application tool windows should they be closed by the user or hidden behind other windows.



## 6 Tools Menu

This menu provides direct access to several tools, such as streaming to RAM/disk, on-the-fly Z-stack acquisition, camera parameter browser and general application configuration.



### 6.1 Stream Acquisition

This tool allows streaming camera images to disk or computer memory (RAM). For more information about high-speed disk streaming, please see the separate “Beacon fast streaming” document.

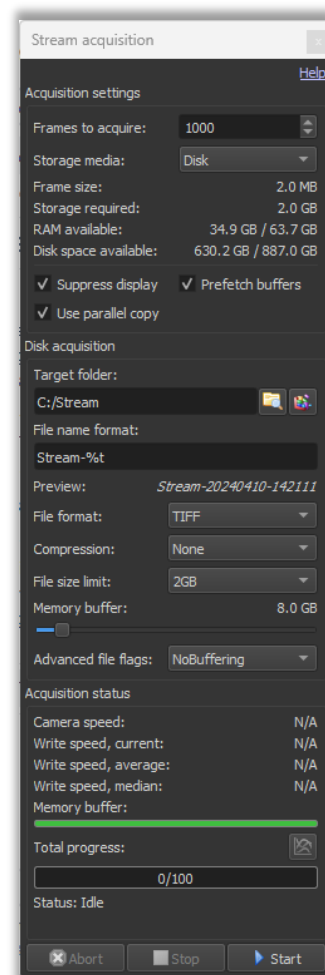
#### 6.1.1 Acquisition settings

- **Frames to acquire:** Total number of frames to acquire. This number also defines the amount of RAM or disk space required for the acquisition. If there is not enough space, the acquisition cannot start.
- **Storage media:** RAM or Disk. For RAM acquisition, the image stack will be displayed after the acquisition, with the option to save to disk.
- **Suppress display (advanced):** Leave checked for fast acquisition. This causes the main image window to not be updated during acquisition, leaving more computer resources available for streaming.
- **Prefetch buffers (advanced):** This option will cause a slight delay at the beginning of the acquisition, depending on the size and length of the acquisition. This should be enabled for extremely fast acquisitions (e.g. Kinetix Speed mode) but it’s not necessary for most other cameras.
- **Use parallel copy (advanced):** Keep this option enabled to take advantage of modern multi-core CPUs and multi-channel RAM configurations.

#### 6.1.2 Disk acquisition

This panel is only enabled if “Disk” storage media is selected.

- **Target folder:** A path to the folder where acquired frames should be stored. A subfolder will be automatically created in this folder as every acquisition consists of multiple files. The subfolder name can be configured in the **file name format** field.
- **Disk optimization button (advanced):** This option allows users to quickly bring up Windows optimization tool to optimize disks. This is useful for very fast disk acquisitions to SSD drives that often require optimization (trimming) before acquisition.



- **File name format:** This field configures the name of the subfolder where acquisition will be stored. A macro for timestamp can be used to automatically insert current time into the folder name to avoid collisions and quickly execute multiple acquisitions without changing the name manually.
- **File format:** For very fast acquisitions the RAW format should be preferred. However, uncompressed TIFF may also provide adequate performance, especially with large frames. The file format and compression selection depend on the overall frame rate, frame size and computer and disk performance. It is recommended to experiment with the settings for optimal results.
- **Compression:** Unless the acquisition is expected to be very slow (a couple of frames per second), it is not recommended to enable compression. However, compression may significantly reduce the disk space needed, especially for 12- or 16-bit image types.
- **File size limit:** It is recommended to use 2 or 4 GB limit. When streaming, the application buffers the incoming frames into memory, creating a large stack of frames that is then quickly “flushed” to a disk drive. This approach provides much better performance than saving frames one by one. This number defines the size of chunks that the stored image stack will be split into.
- **Memory buffer:** The size of the memory buffer. For fast acquisitions 8-32 GB is recommended. A large buffer will also allow streaming longer acquisitions to disk in situations where the disk, in general, cannot keep up with the camera. For example, if the disk write bandwidth is 10% slower than the camera bandwidth, one can configure the memory buffer to largest possible value. During the acquisition, the buffer will slowly grow until it overflows, but doing so will extend the overall length of the acquisition.

### 6.1.3 Acquisition status

This section provides various statistics about ongoing acquisitions.

- **Throughput graph** button (by ‘total progress’ bar): This button becomes available after a successful acquisition; it shows a graph of the write speeds over the duration of the acquisition. This may help diagnosing possible disk write issues (and identify bottlenecks caused by NVMe drive caching).

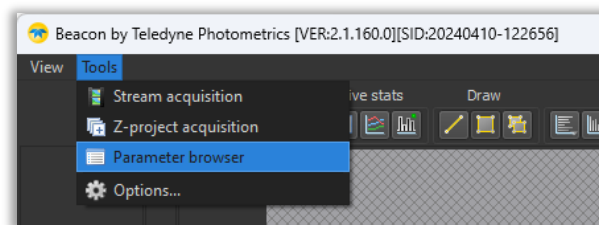
## 6.2 Z-Project acquisition

Z-Project acquisition creates z-stacks from incoming camera frames.

## 6.3 Parameter browser

The Parameter Browser allows for control over all supported camera parameters. The parameters are named as defined in the PVCAM API.

Upon selection, the Parameter Browser window will appear, pictured on the next page.





PVCAM parameter browser

CENTROIDS_RADIUS	Not available				
CENTROIDS_THRESHOLD	Not available				
METADATA_ENABLED	FALSE				
METADATA_RESET_TIMESTAMP	Not available				
ROI_COUNT	1				
<b>Port/Speed/Gain table</b>					
BIT_DEPTH	16				
GAIN_INDEX	1				
GAIN_NAME	HDR				
READOUT_PORT	0 - CMOS				
SPDTAB_INDEX	1				
SPDTAB_NAME	Not available				
<b>Post Processing</b>					
ACTUAL_GAIN	Not available				
PP_FEAT_ID	13				
PP_FEAT_NAME	DESPECKLE BRIGHT LOW				
PP_INDEX	0				
PP_PARAM	1				
PP_PARAM_ID	130				
PP_PARAM_INDEX	0				
PP_PARAM_NAME	ENABLED				
READ_NOISE	Not available				
<b>Scan Mode</b>					
SCAN_DIRECTION	0 - Down				
SCAN_DIRECTION_RESET	TRUE				

Filter Reload Save to XML