

GenTL Viewer User Manual

Information current for application v1.3.0

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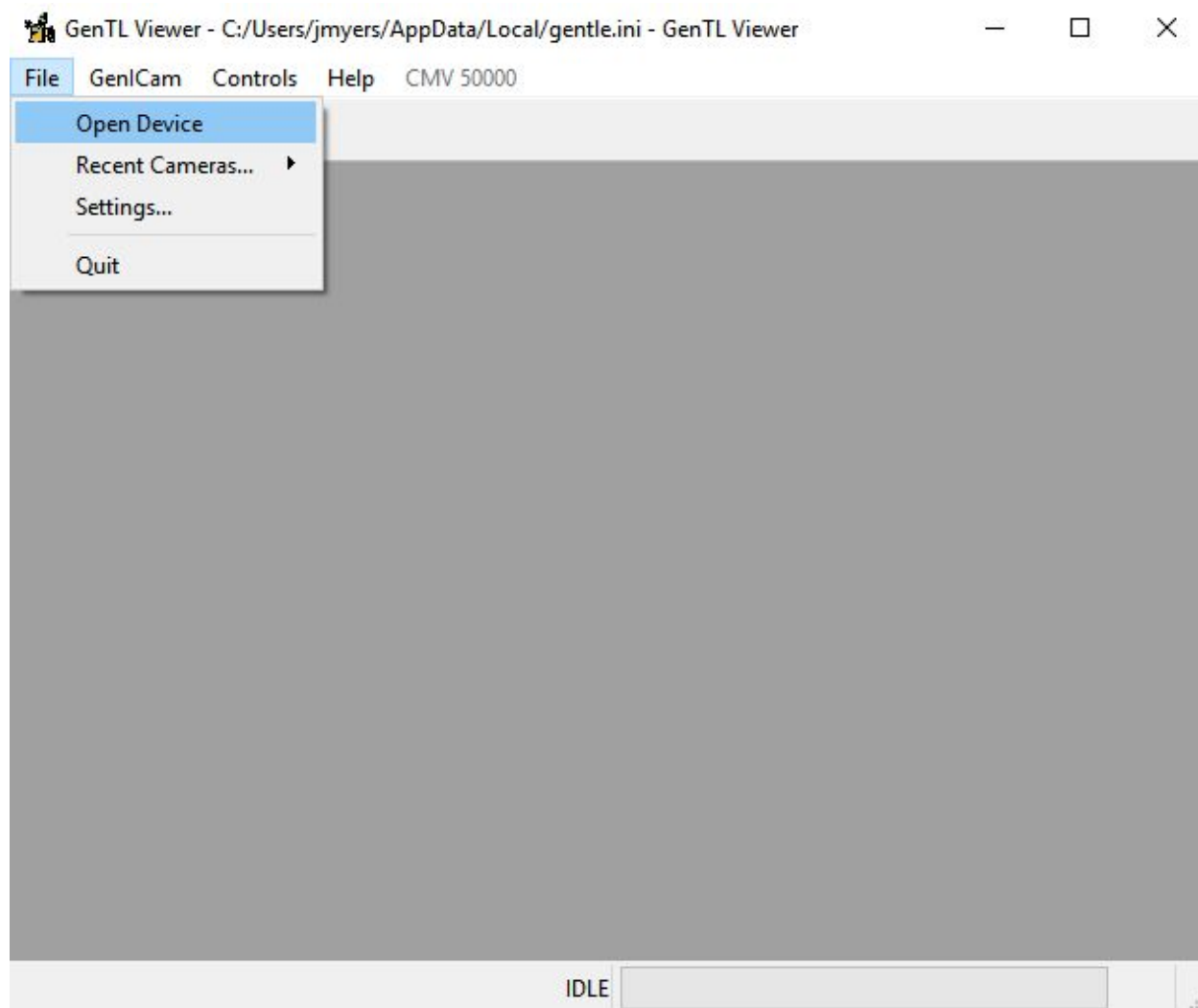
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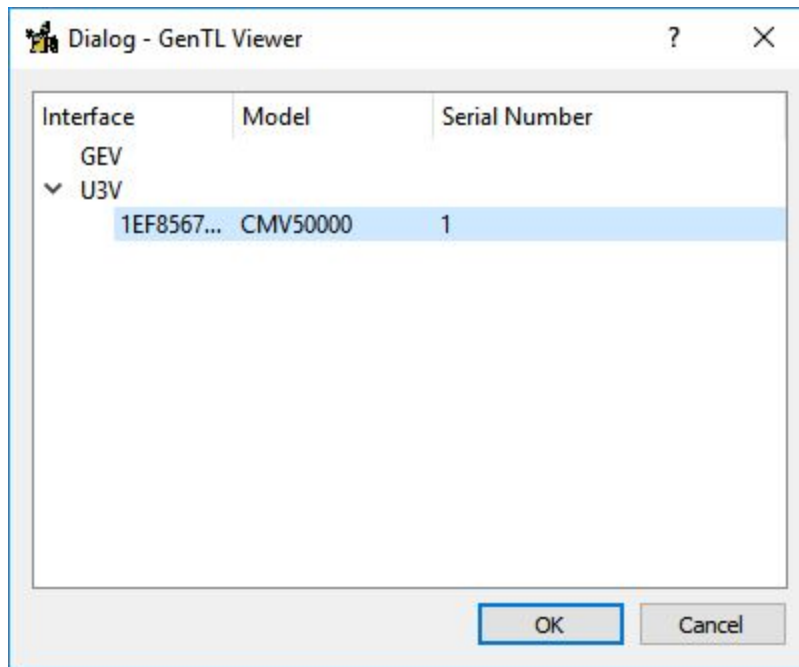


Opening a Camera

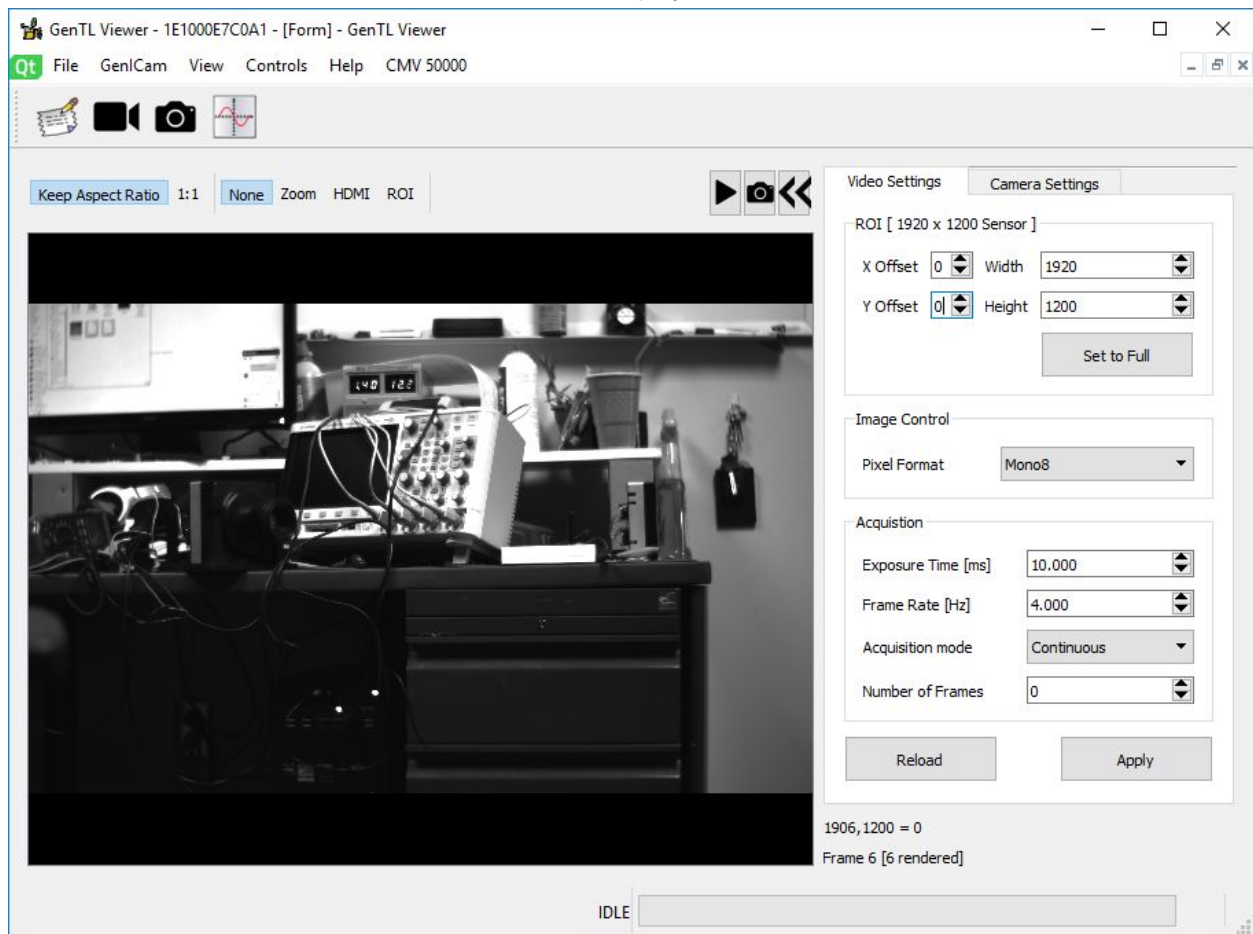
Once the application is launched, go to File and Open Device:



Select the camera and press "OK"



After a moment, the main screen will show the video display screen.



Troubleshooting

If the camera does not show up on the list, click "Cancel." Next, ensure the camera is powered on and connected to the PC. Follow the steps again to see if the camera appears.

USB3

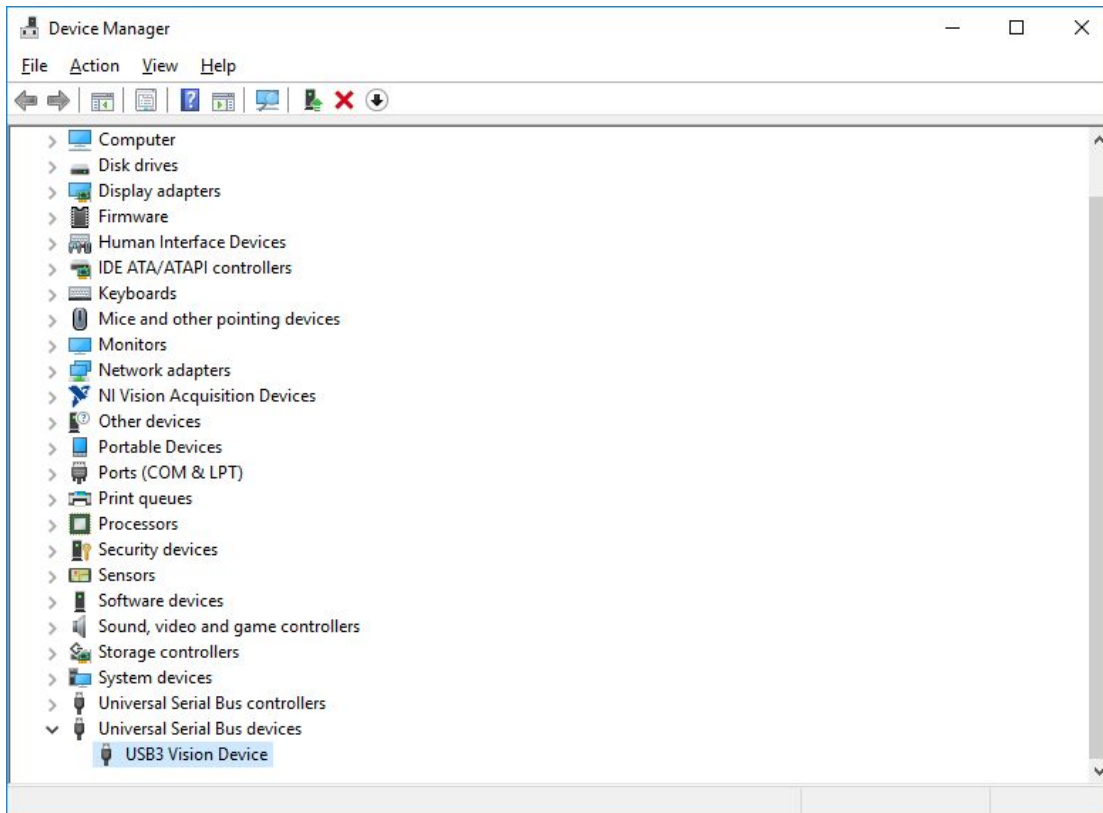
If the camera does not show up on the list, click "Cancel." Next, ensure the camera is powered on and the USB3 cable is connected between the camera and the PC. The camera must be connected to a USB3 port on the PC (the port may be blue in color or be marked as USB3, "SS" or SuperSpeed).



Verifying the Driver

If other viewing software is installed on the PC, it may be possible that the camera is not using the correct driver.

Open Device Manager, look for “Universal Serial Bus devices.” There should a device listed for the camera within that category called “USB3 Vision Device.” If the device is not listed, the driver may not be installed or selected.



Configuring the Camera

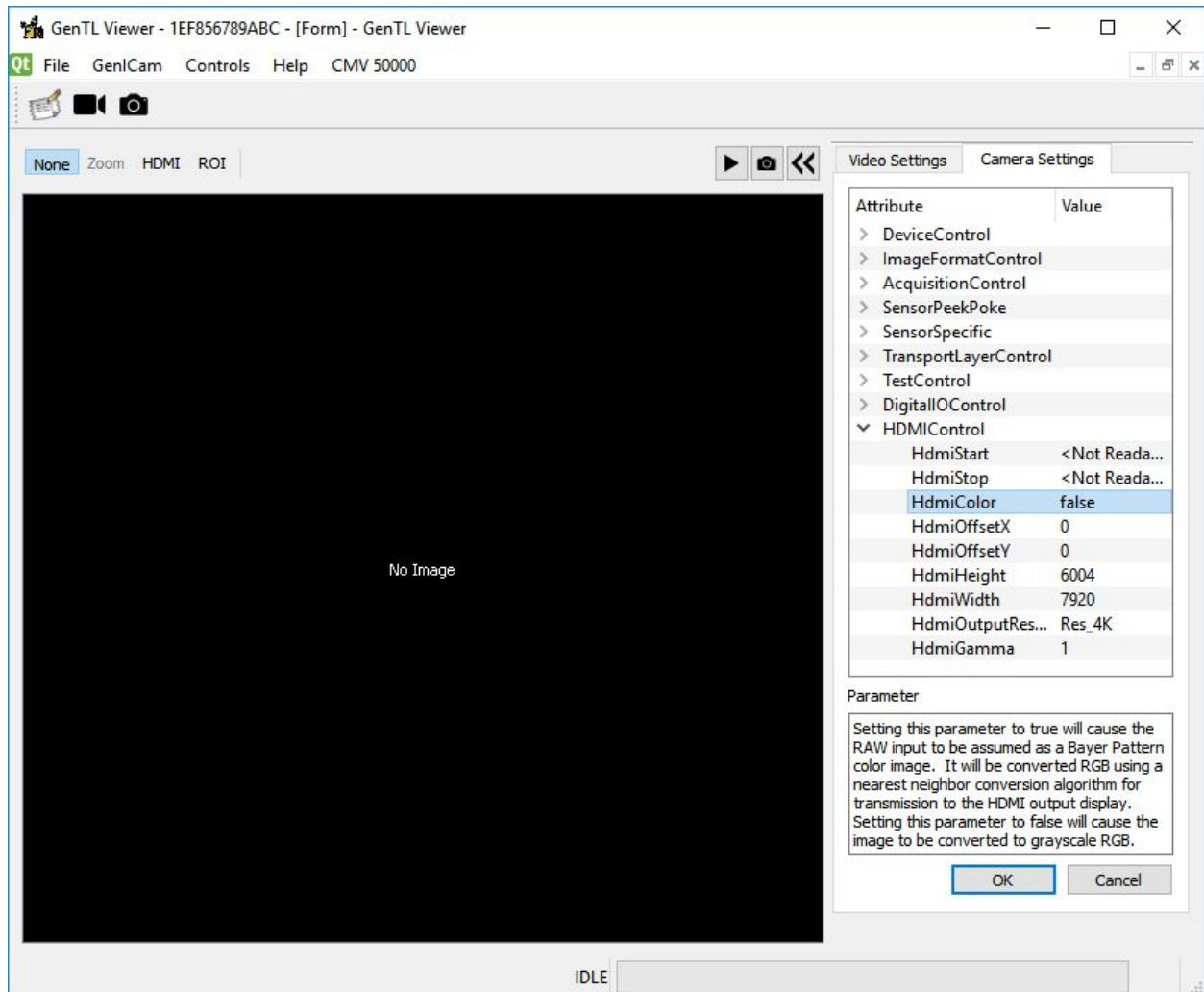
Modifying Parameters

Parameters can be modified in two ways. Basic settings can be modified on the “Video Settings” tab.



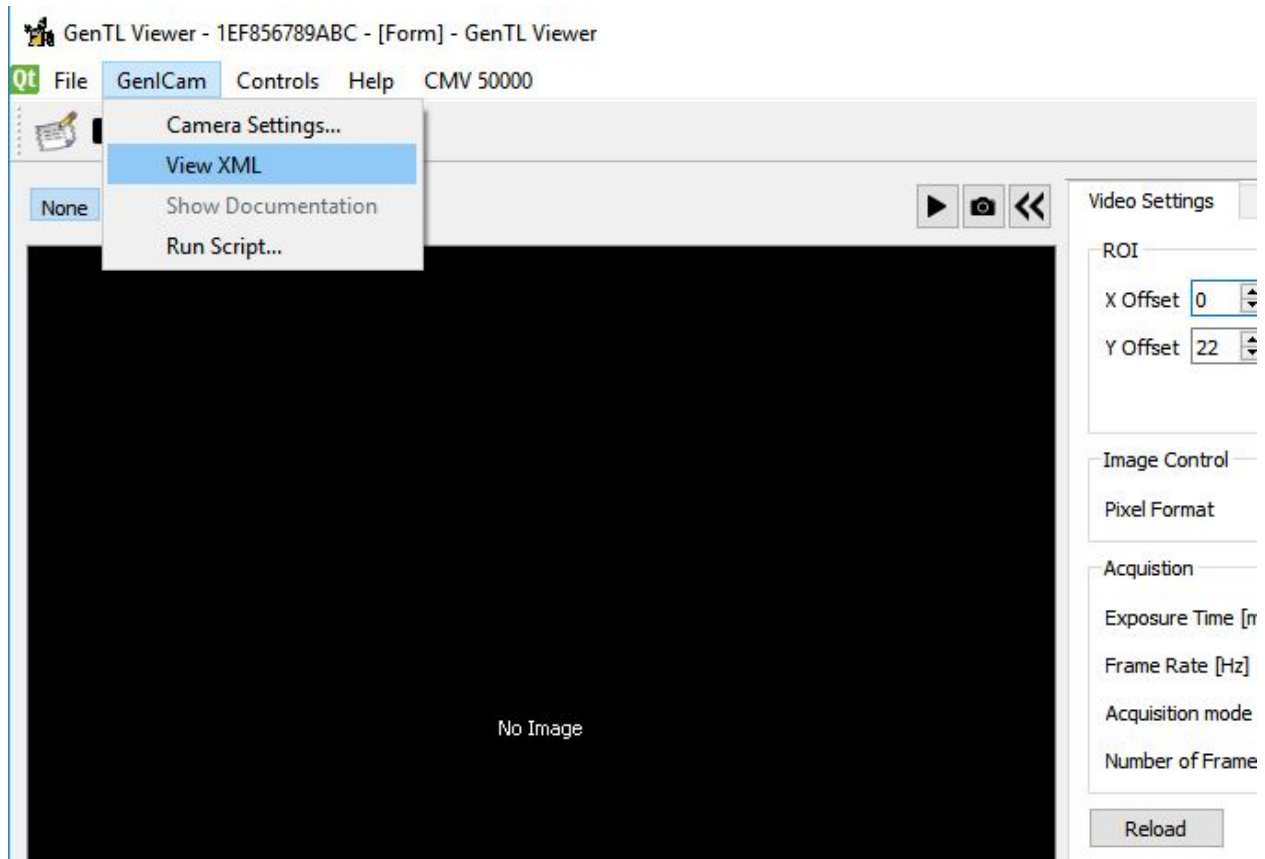
Directly Modifying Parameters

A complete feature parameter list is available on the “Camera Settings” tab. Clicking on the Attribute name will update the “Parameter” box below. This box, if possible, will contain a description of what the parameter does.

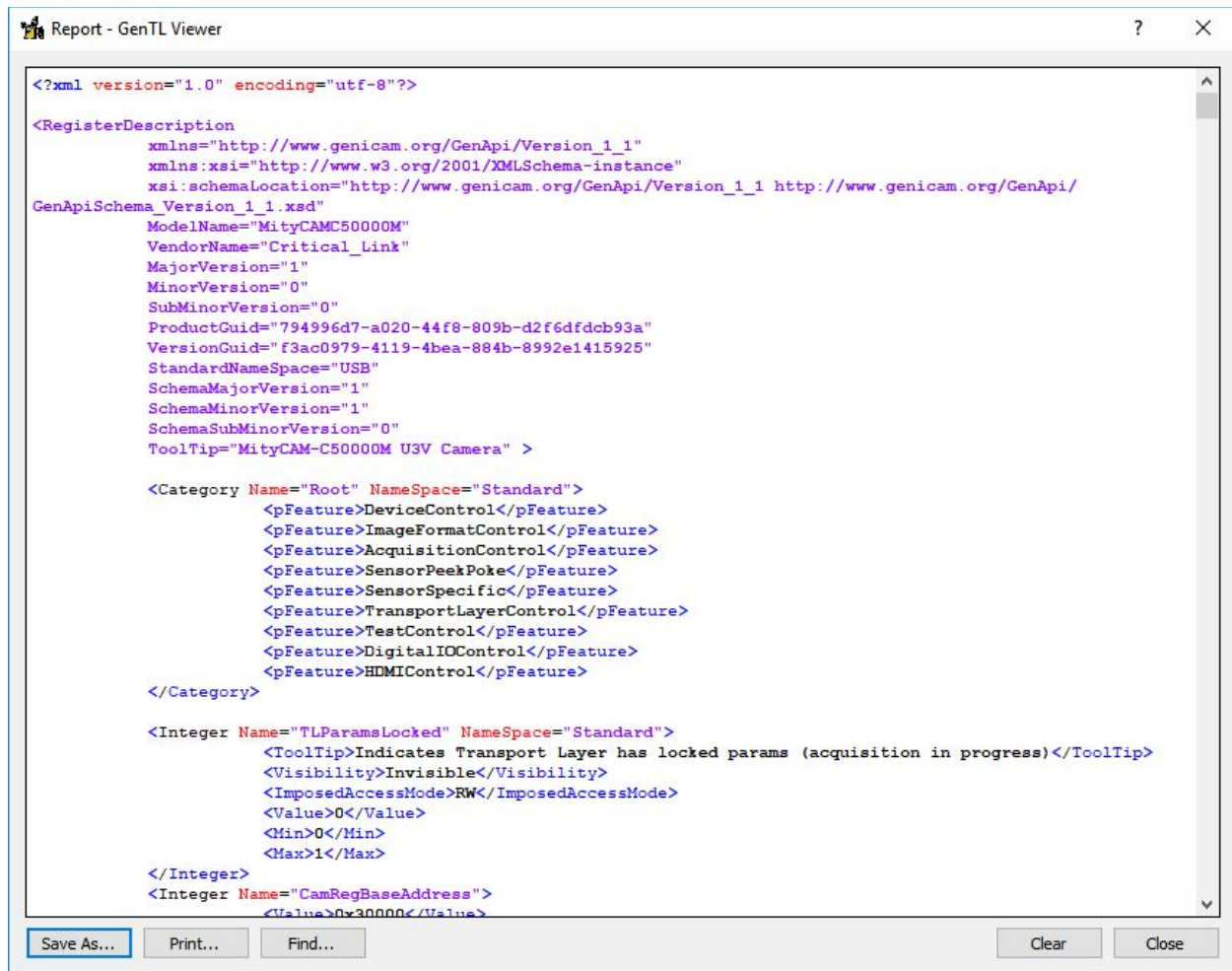


Viewing XML

The complete XML file sent from the camera can be viewed. Go to “GenICam” and select “View XML.”



The XML will be displayed in a separate window.



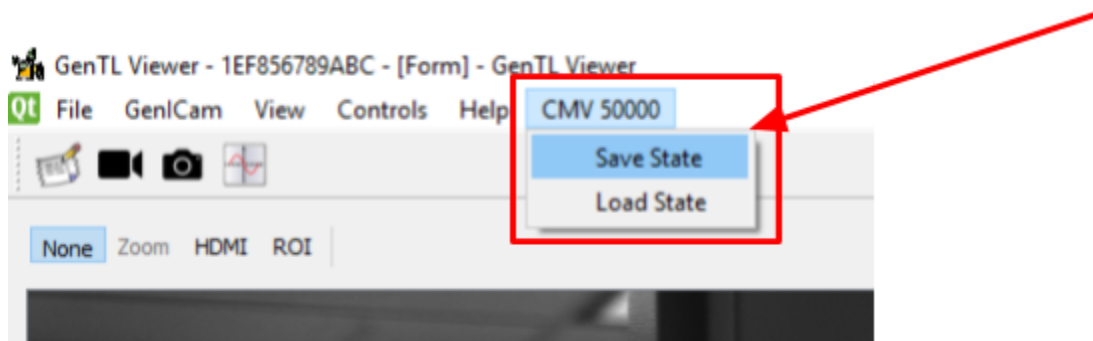
Save/Restore

It is possible to save and restore the settings of a camera (the GenICam settings and for certain cameras, the sensor register settings).

CMV50000

Open the CMV50000 menu. Select "Save State"





Select a location and name for the configuration to be saved to.

To load, select “Load State” and select the .ini file saved previously.

Note that not all .ini files are valid saved configurations.

Note that the save and load operations take a long time to complete.

Scripting Configurations

The application supports scripting configurations with a set of commands; this includes GenlCam register read/write/execute, sensor register peek/poke, sleep and the ability to compare read values to expected values. Parameters in angle brackets `<parameter>` are required, parameters in square brackets `[parameter]` are optional.

| Command | Syntax | Description |
|------------|---------------------------------|---|
| HELP | HELP [cmd] | Displays the possible commands that can be used [or just the details for the given command] |
| CMP | CMP <value> [mask] | Masks the previous result and compares versus Value |
| GENI READ | GENI READ <address> | Reads a GenlCam address |
| GENI WRITE | GENI WRITE <address> <value> | Writes to a GenlCam address |
| GENI EXEC | GENI EXEC <command> | Executes the named command |
| GENI SAVE | GENI SAVE <filename> | Save the GenlCam configuration of the camera to the named file |
| GENI LOAD | GENI LOAD <filename> | Load the GenlCam configuration of the camera from the named file |
| SLEEP | SLEEP <sleep_time> | Sleeps for sleep_time milliseconds |
| PEEK | PEEK <address> | PEEKs at sensor address |



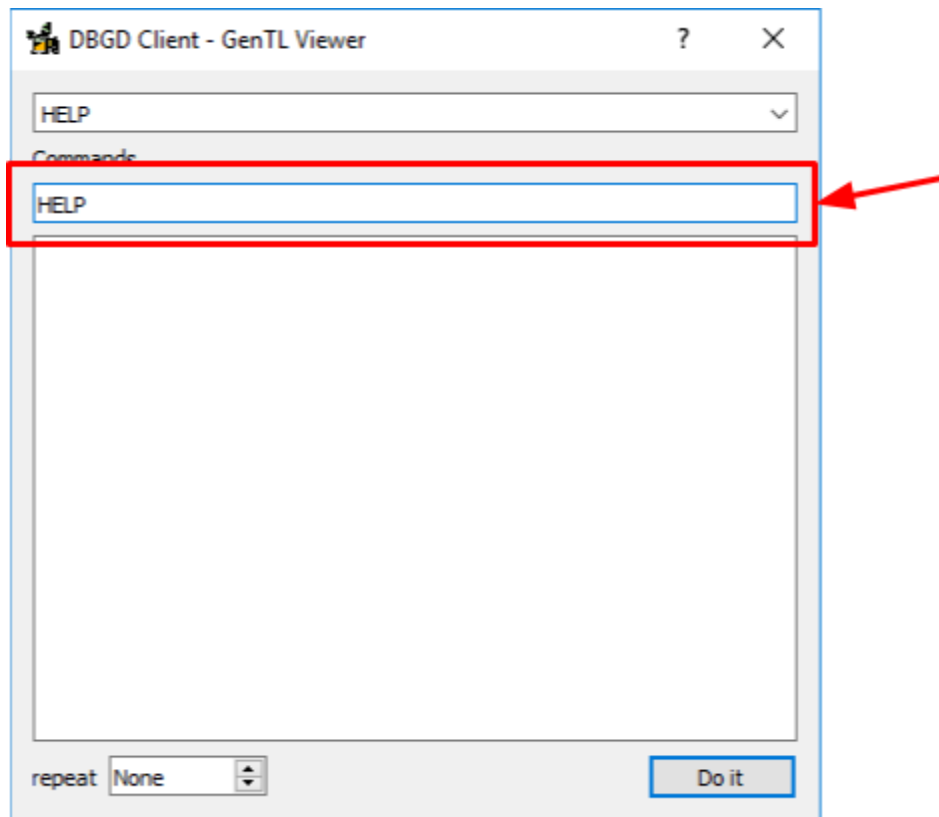
| | | |
|------------|------------------------------|---|
| POKE | POKE <address> <value> | POKEs value to the sensor address |
| CAM START | CAM START | Start camera streaming images using current GenICam parameters. |
| CAM STOP | CAM STOP | Stop camera streaming. |
| CAM WAIT | CAM WAIT [msec] | Wait for a frame from the camera. If msec is not specified, wait forever. |
| REC START | REC START | Start recording frames |
| REC STOP | REC STOP | Stop recording frames |
| REC SAVE | REC SAVE [filename] | Save the current frame to file <filename> if no filename is given, the default filename of <DIR>/<PREFIX><frame#>.<FMT> will be used. If the filename is relative, it will be stored under the recorder DIR |
| REC PREFIX | REC PREFIX [prefix] | Set the recording filename prefix. If [prefix] is not given, display the current value. |
| REC DIR | REC DIR [directory] | Set the recording directory. If [directory] is not given, display the current value. |
| REC FMT | REC FMT [format] | Set the recording file format If [format] is not given, display the current value. Valid formats are shown in HELP |
| PROMPT | PROMPT <type> <message text> | <p>type is the QMessageBox StandardButton mask for the buttons to include</p> <pre> NoButton = 0x00000000 Ok = 0x00000400 Save = 0x00000800 SaveAll = 0x00001000 Open = 0x00002000 Yes = 0x00004000 YesToAll = 0x00008000 No = 0x00010000 NoToAll = 0x00020000 Abort = 0x00040000 Retry = 0x00080000 Ignore = 0x00100000 Close = 0x00200000 Cancel = 0x00400000 Discard = 0x00800000 Help = 0x01000000 Apply = 0x02000000 </pre> |



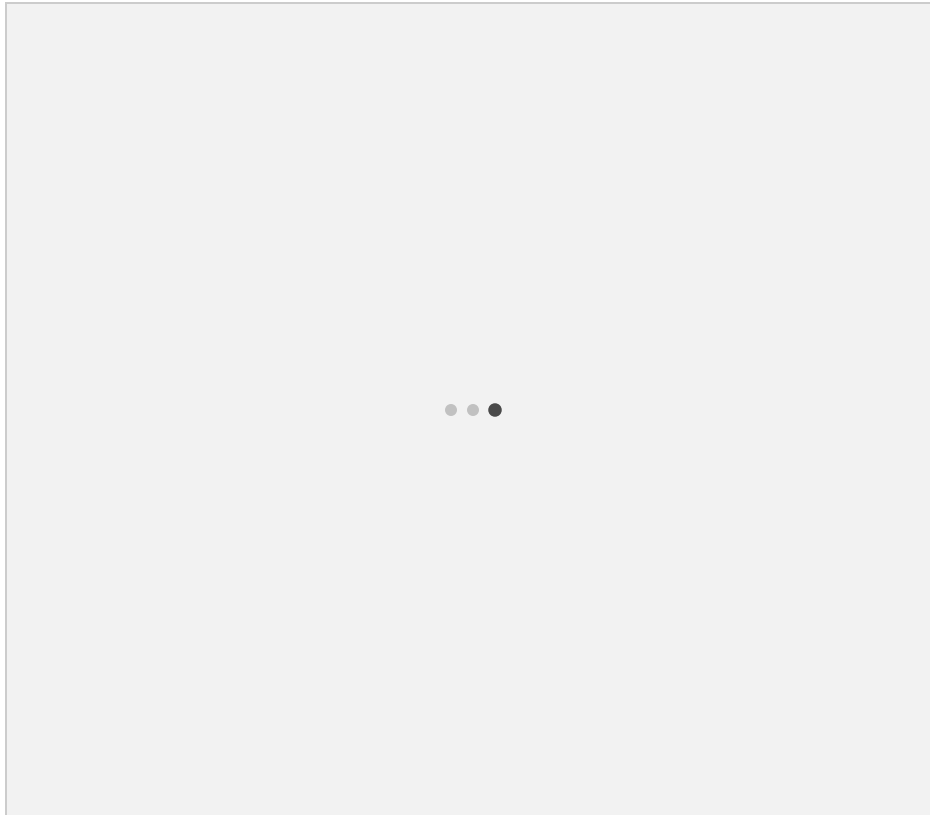
| | | |
|--|--|---|
| | | <code>Reset</code> = 0x04000000 <code>RestoreDefaults</code> = 0x08000000 |
|--|--|---|

Command Console

Open the command console by going to “Controls” and selecting “Command Console.” The commands are typed into the box then press “enter” or click “Do it.”



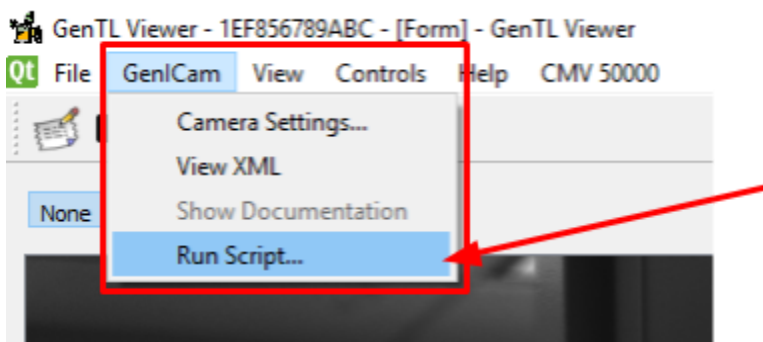
Output will be displayed in the large text box:



Scripts

Scripts are text files that consist of the commands used in the command console. The file is executed and a results window presented at the end showing the output of the commands.

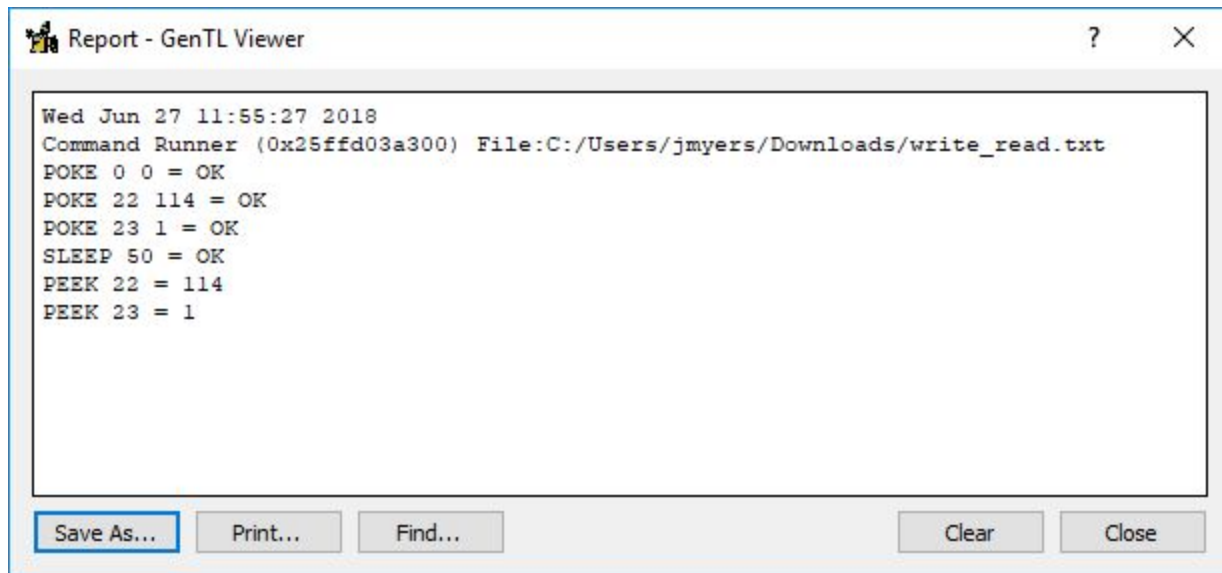
To execute a script, go to “GenlCam” then select “Run Script...”



Here is an example script in a .txt file which uses the Sensor Peek/Poke to write 3 registers directly to the sensor, wait, then read back the results:

```
POKE 0 0
POKE 22 114
POKE 23 1
SLEEP 50
PEEK 22
PEEK 23
```

After running the script, a results window is displayed:



The results of the sleep/poke commands are OK if the command completed successfully. The result of the PEEK command is the value that was read from the sensor.



A more advanced script that sets acquire parameters, takes an image, saves it, and repeats might look like.

[NOTE: Values (especially register/genicam) are illustrative only... not based on real camera settings!]

```
POKE 0 0
POKE 22 114
# Set the exposure time
GENI WRITE ExposureTime 10000 # 10 ms exposure
# Set the capture mode to single frame
GENI WRITE AcquisitionMode SingleFrame
#Start acquisition
CAM START
#wait for a frame from the camera
CAM WAIT
REC DIR C:\work\camera
#Save the frame to a uniquely named file in recorder DIR
REC SAVE reg_22_114.tif
# Change a register setting...
POKE 22 82
#Start acquisition of the next frame
CAM START
#wait for a frame from the camera
CAM WAIT
#Save the frame to a uniquely named path
REC SAVE c:/files/reg_22_82.tif
# Stop acquisition
CAM STOP
```

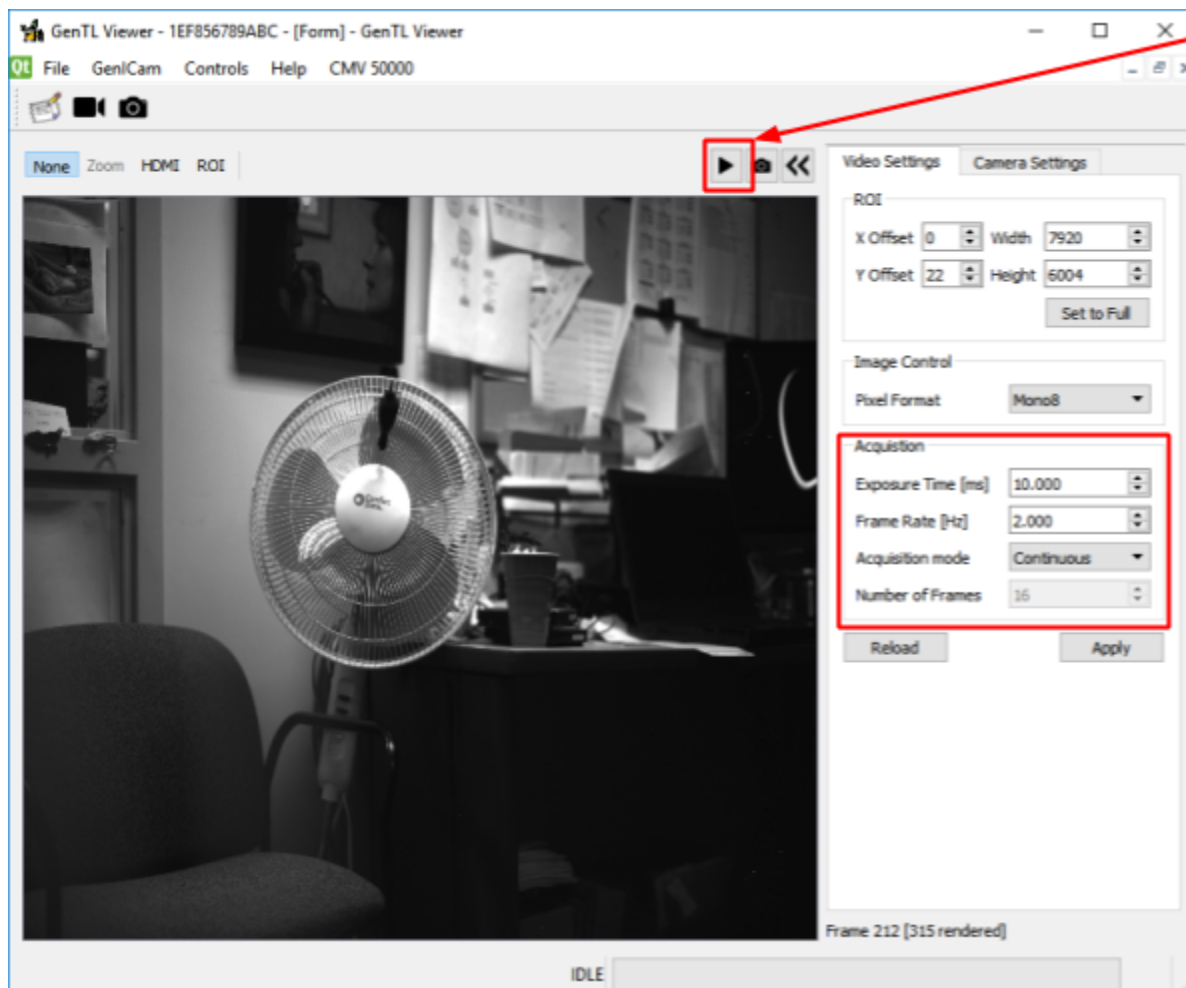


Video/Live View

Capture Modes

Continuous Video

In the Acquisition parameters box, select “Continuous” for Acquisition mode. After setting the exposure time and frame rate, press the “play” button above the display box.



The video in the display box will begin updating. The frame counter in the lower right hand portion of the display will begin incrementing with the received frames.



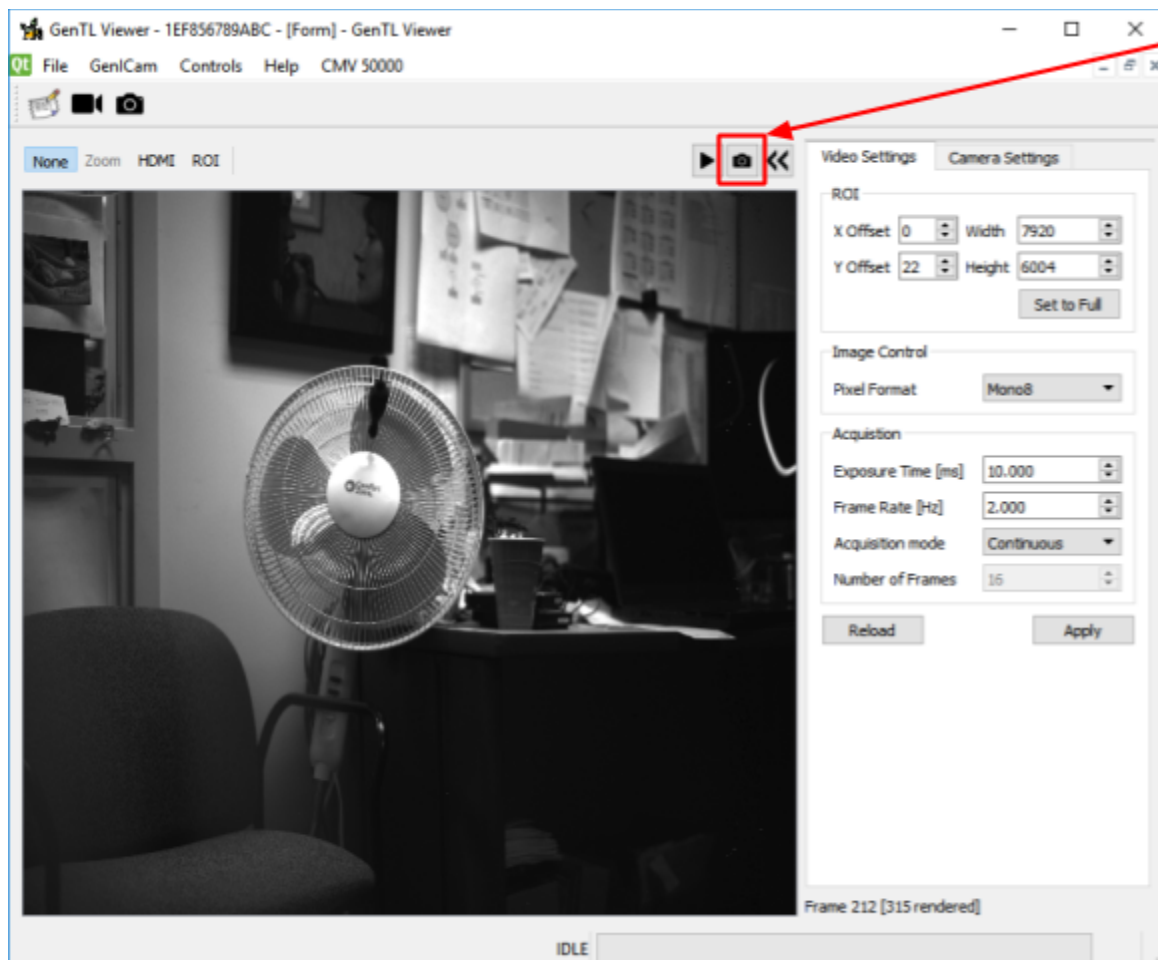
Burst Capture

Burst capture is when the camera collects frames at a rate faster than the interface can handle. The frames are then sent to the PC at a rate that can be handled. Set the “Acquisition mode” to “SingleFrame” or “MultiFrame” then, configure the “Number of Frames” if applicable.

Clicking the play button will initiate the capture. After receiving and displaying the requested number of frames, the application will go back into the “Idle” state.

Single Frame Snapshot

Clicking the “Camera” button will initiate a single frame capture. It will configure the Acquisition mode to “SingleFrame” and grab an image. The image will be displayed and the application will return to the Idle state.



Video Display Adjustments

☐ Display Brightness

0.00

☐ Display Gain

R 1.00

G 1.00

B 1.00

White Balance

Same Gain for all Channels ☐

☐ Display Gamma

1.00

Display Brightness

Add/Subtract value from every pixel being displayed.

Display Gain

Multiply every pixel by value. For color images, red/green/blue channels have a separate gain value. When "Same Gain for all Channels" is set, the red gain value is used for all channels.

White Balance

Performs a simple white balance algorithm. Algorithm works off the grey world assumption, by changing the gain to normalize the average pixel value so that the average of each channel is equal. This will not work in all situations but should get close.

Display Gamma



Video Display Controls



Keep Aspect Ratio

When this is checked, the viewer will adjust the image display size to maintain the original aspect ratio of the frame as acquired.

1:1

When “1:1” is enabled, the display is set such that there is a pixel for pixel representation of the frame displayed (zoom is disabled).

None

The “None” action turns off all the image interaction modes (except PAN)

Zoom

When zoom is selected, the user can draw a rectangle around the area of interest on the image and it will be magnified to fill the display (honoring aspect ratio, if checked). When Zoom is enabled, other image interaction modes are disabled. Only 1 level of zoom is supported, you can select “Zoom Out Full” from the context menu to reset/re-start zoom.

Panning

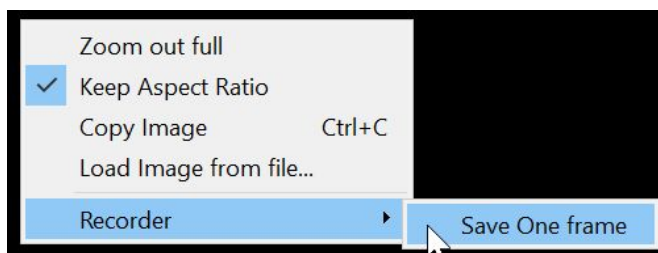
If the user holds the shift key and left clicks on the image, panning mode is initiated. As you drag the mouse around the image pans accordingly.

Save Image

To save the current frame as a file, select Recorder->Save One Frame and you will be prompted where to save to. See [Supported File Types](#)

Copy Image

Select “Copy Image” from the context menu to copy the image to the clipboard.



[note that the Ctrl-C shortcut is currently broken]

Load Image from file

For debug/review purposes, you can load a saved image from disk and display it in the viewer. As this is not a video frame, you cannot use image processing functions on loaded images (plotting, etc).

HDMI Control

If the Critical Link camera supports HDMIControls, the image viewer can act as a preview to select the HDMI ROI.

Starting HDMI Video

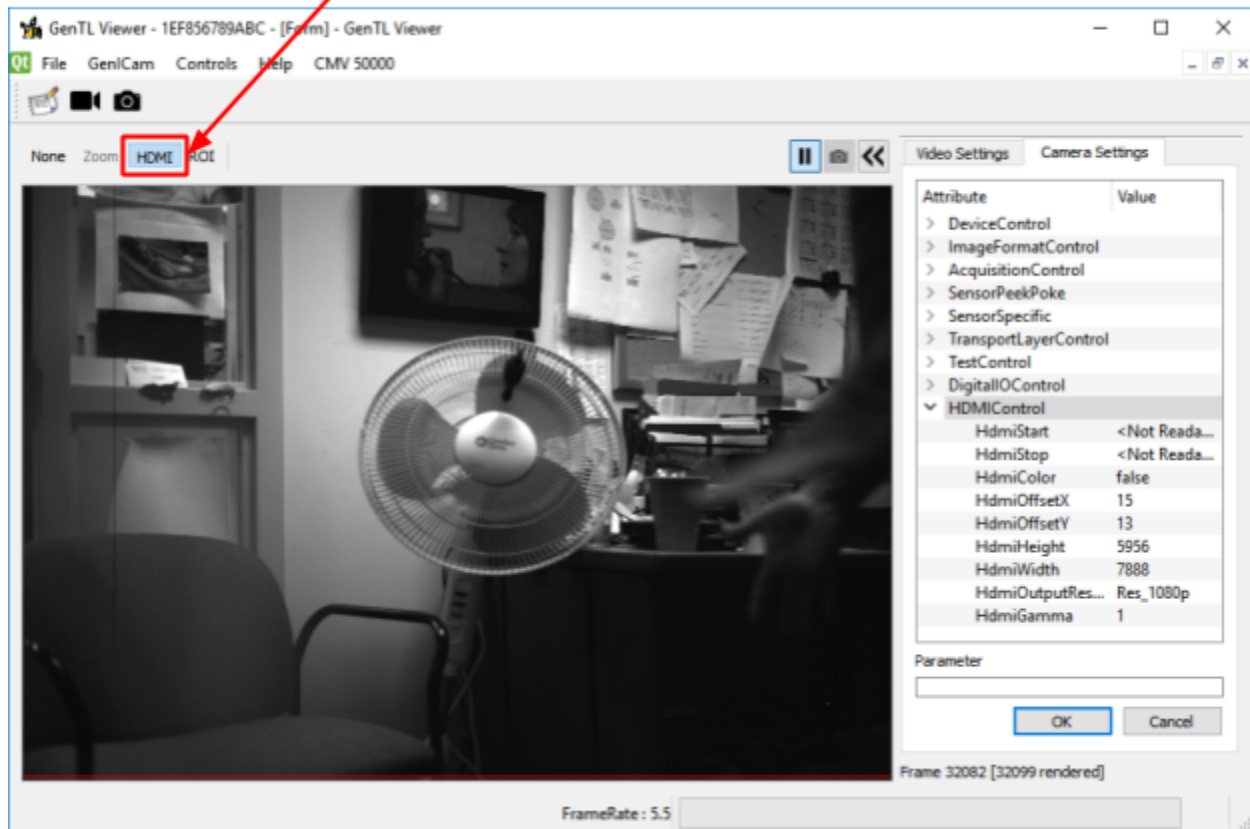
In the “Video Settings” tab, set the frame rate to be 30Hz (to allow for smooth video play on the HDMI display) and continuous acquisition. Click the play button. The image preview will begin updating.

In the “Camera Settings” tab, expand the HDMIControl group. Click “HdmiStart” to begin outputting frames over HDMI.

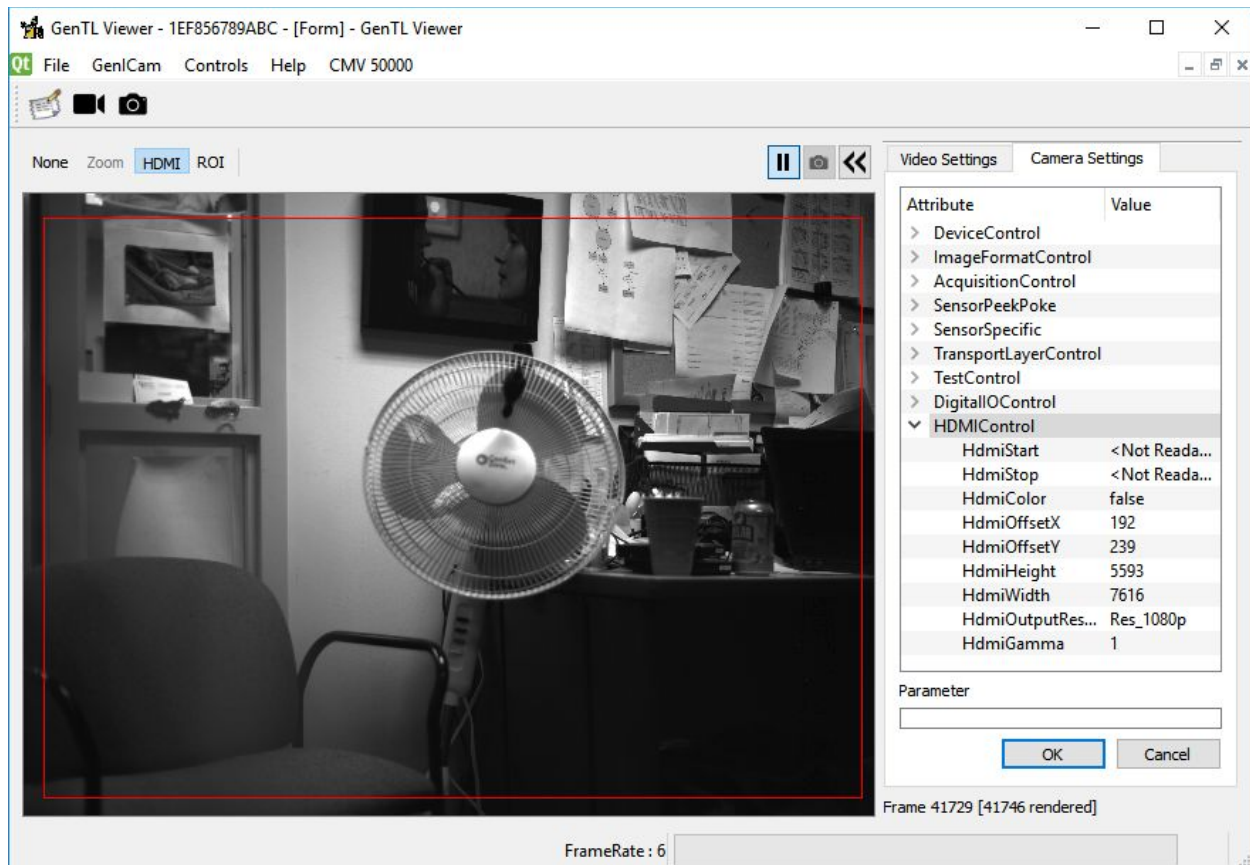


Setting HDMI ROI

Click the “HDMI” view option on the image display.



Within the image, click and drag to select a rectangle that will be displayed on HDMI. The selected HDMI ROI will be displayed as a red bounding rectangle.



Recording

Recording saves every frame that is received while recording is enabled.

Acquisition Modes

Recording is generally done in either “Burst Capture” or “Continuous” mode but can be done using separate snapshots.

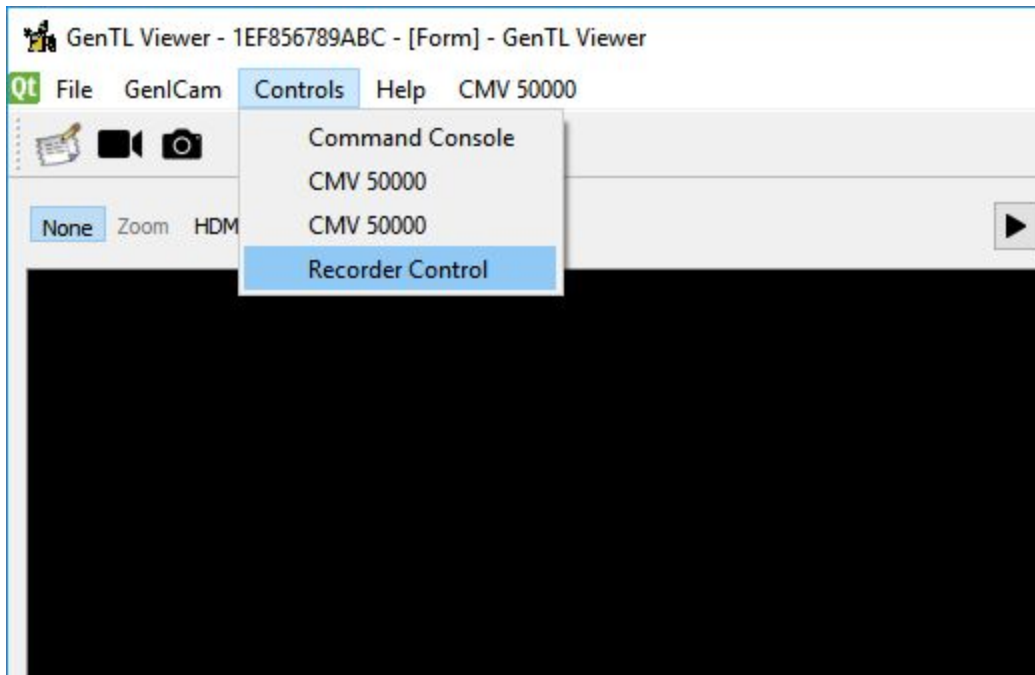
In continuous mode, the camera may be forced to drop frames. Because of this, the recording may not contain complete data. It is important to select a frame rate that is appropriate when recording in continuous mode.

“Burst Capture” mode will capture, at the configured rate, the number of frames requested. This guarantees the recording will have all of the data requested.

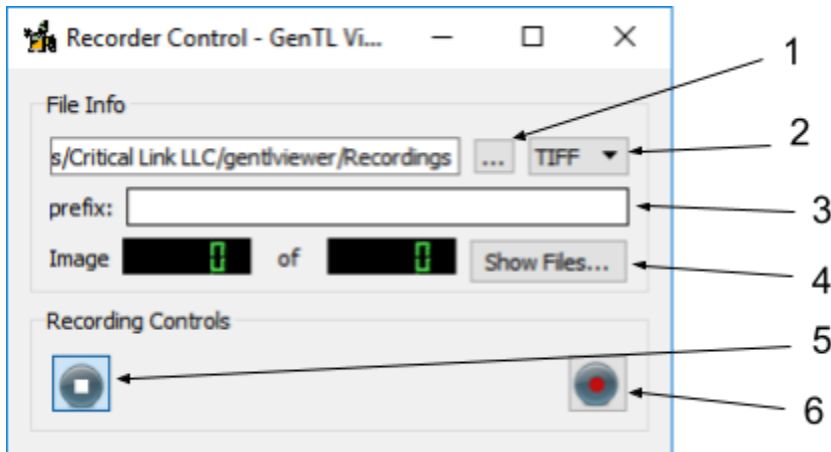


Recording Control

Open the control by selecting “Controls” and clicking on “Recorder Control.”



The control will be displayed.



1. Clicking this opens selection of the save location
2. Selects the format of the images to save. See [Supported File Types](#)
3. Sets the prefix for the files to named
4. Opens the save location in explorer
5. Triggers the application to stop saving frames; this resets the frame counter
6. Triggers the application to begin saving frames; frames will be captured and saved until “Stop” is clicked



Supported File Types

- **TIFF**
TIFF files are created using [opencv's imwrite](#) and debayered image with all software filters applied.
Note: 12bit images will be shifted to 16bit as TIFF doesn't support a 12bit image format
- **PNG**
PNG files are created using [opencv's imwrite](#) and the debayered image with all software filters applied
Note: 12bit images will be shifted to 16bit as PNG doesn't support a 12bit image format
- **DNG**
DNG files save the raw pixel data from the camera with the information needed for the dng viewer to debayer/display the image.
https://en.wikipedia.org/wiki/Digital_Negative
The files are created by manually creating the TIFF file and adding the appropriate DNG v1.1.0.0 TIFF tags. This standard is not well documented and all viewers may not work correctly.
Note: Please report any issues with decoding this file format.
Tested viewers:

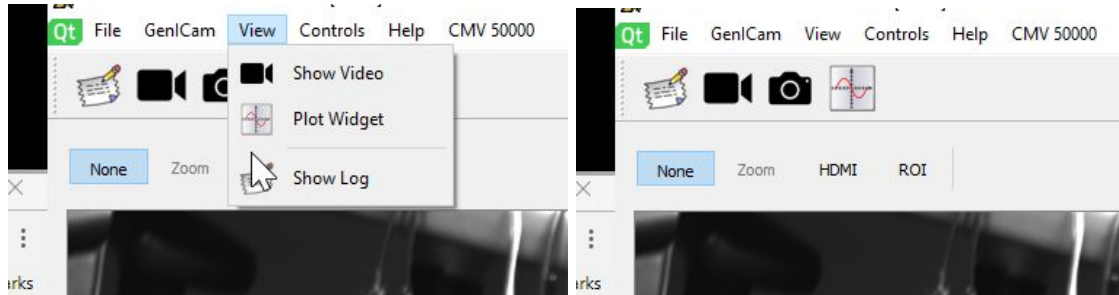
| | |
|-------------------|--|
| Windows 10 Photos | Works |
| darktable | Works |
| UFRaw | Partially works. Mono images reported as broken. |
| Photoshop | Unknown. Need a copy of photoshop to test |

- **RAW**
RAW files are created by copying the debayered image with all software filters applied directly to a file. Pixels will be in RGB order. 8bit images will result in a 888 RGB format and 12/16 bit images will result in a 161616 RGB format.
Note: To parse a raw file, you will need to know the image resolution and whether it is 8bit or 16 bit. Although the bitsize could be guessed based on file size if resolution is known.
Note: 12bit images are not shifted even though they are stored in 16bit format.

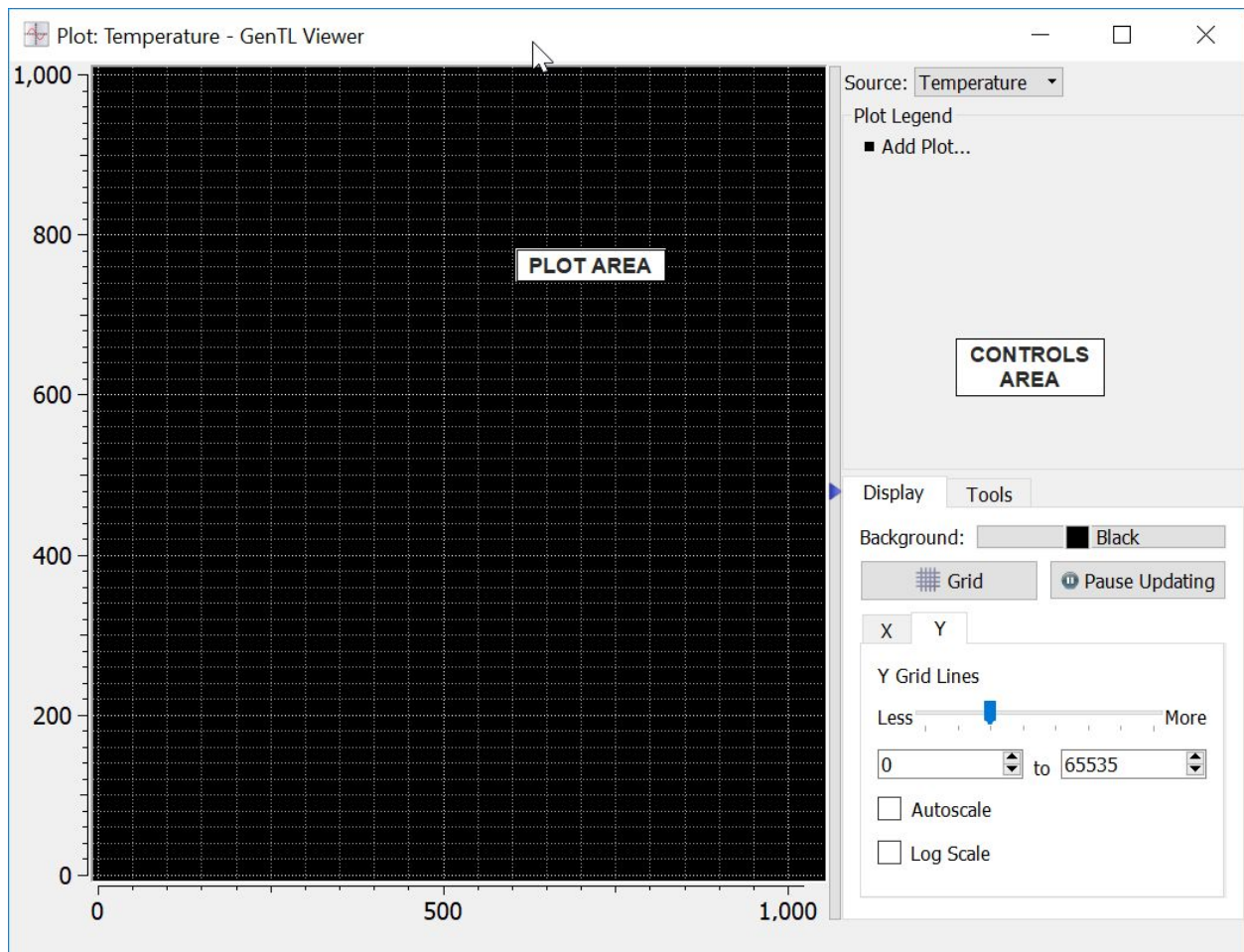


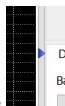
Plotting

The plot viewer window allows you to plot data from any of the plugins that provide it. It can be used to view rows or columns of image data, various image statistics, and sensor data (temperatures, etc). Open a plot widget by selecting “Plot widget” from the view menu, or clicking the plot icon on the toolbar.

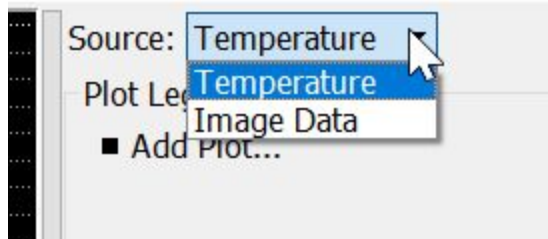


The plot widget consists of 2 main areas, the plot area and the controls area.

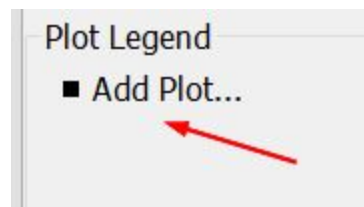


There is a small blue arrow between the 2 areas , which can be used to hide and show the controls (allow more plot area).

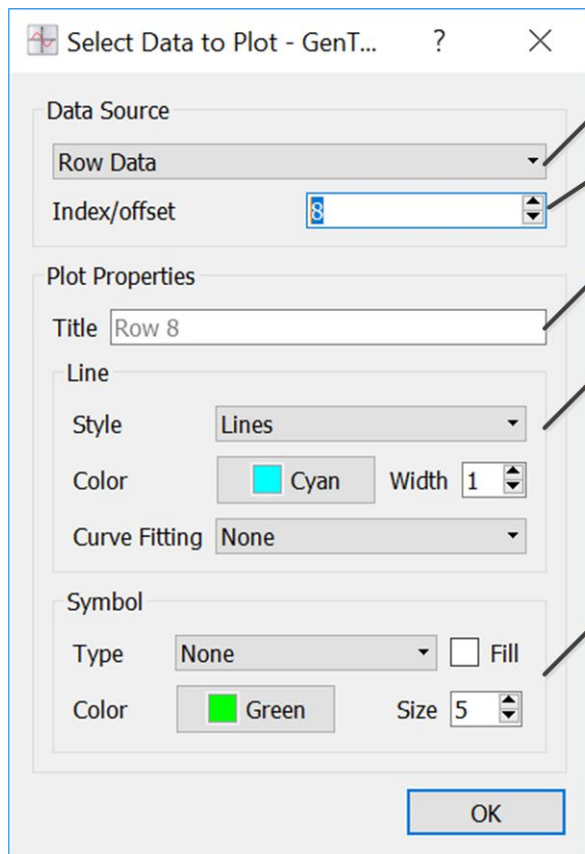
Before you can add a curve to the plot, you must first select the data source to plot



Once you have done that, you can add curves using

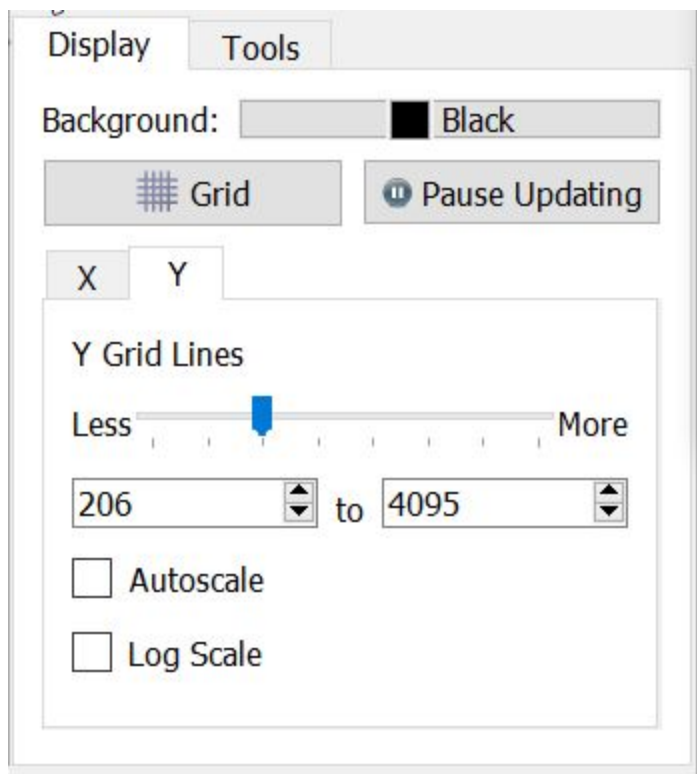


the “Add Plot...” item in the Plot Legend area. This will bring up the plot properties dialog to allow you to select the particular set of data to plot and some display options.



The source selected on the plot widget will dictate the available data sources show in [1]. For the Image Data source, you can select Row Data or Column Data. The Index/offset control [2] selects the row or column (respectively) to plot. The title edit box [3] allows you to give the curve a specific title. If you do not enter a title, the suggested title shown (in grey text) will be used. Section [4] controls the attributes of the lines drawn (or not) for this curve. Remember that curve fitting the data will require additional processing by the PC and may affect displayed frame rate. Section [5] provides similar settings for the symbols for the curve (which default to “none”).





Display Tab

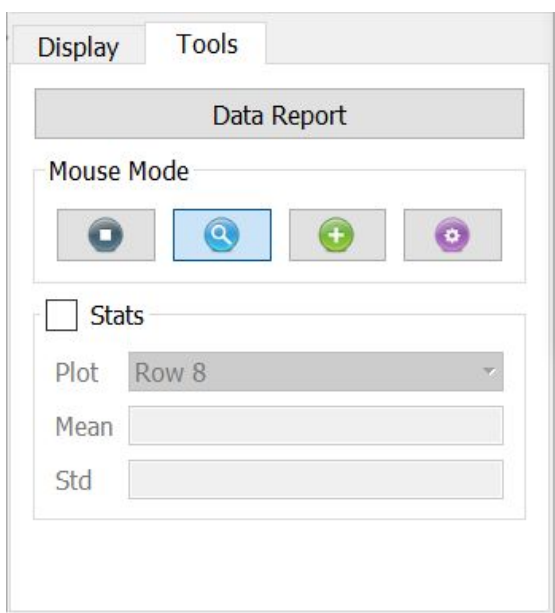
The **Display** tab has several controls affecting the data presentation. You can change the background color and the color of the plot, show/hide the grid and control the axis scales. Using the **X** and **Y** axis controls, you can specify the range of axis. If you select the **AutoScale**, the plot viewer will scale the axis to the extent of the image every time a new image is loaded. The **Log Scale** checkbox changes the given axis scale to a log10 based one.

The last control in the **Display** group is the **Pause Updating** button. This is a toggle button, and when active, the snapshot display will not update when new images are acquired.

Tools Tab

The **Tools** tab has the **Data Report** button that will create a csv version of the image data and display it in a text viewer. You can then save the text as a file to import into another application. You can control how the mouse interacts with the plot using the Mouse Mode group.





Disables mouse interaction.



Uses the mouse to zoom. Left button to drag and define zoom region, right button to zoom back one.



Show crosshairs on display when left mouse button is down.



Find the nearest point on any curve and show it in the bottom right corner when left button is down.

Application Updates

The GenTL Viewer application includes a feature enabling it to check for new versions of the software. This check can be initiated manually, or configured to automatically check.

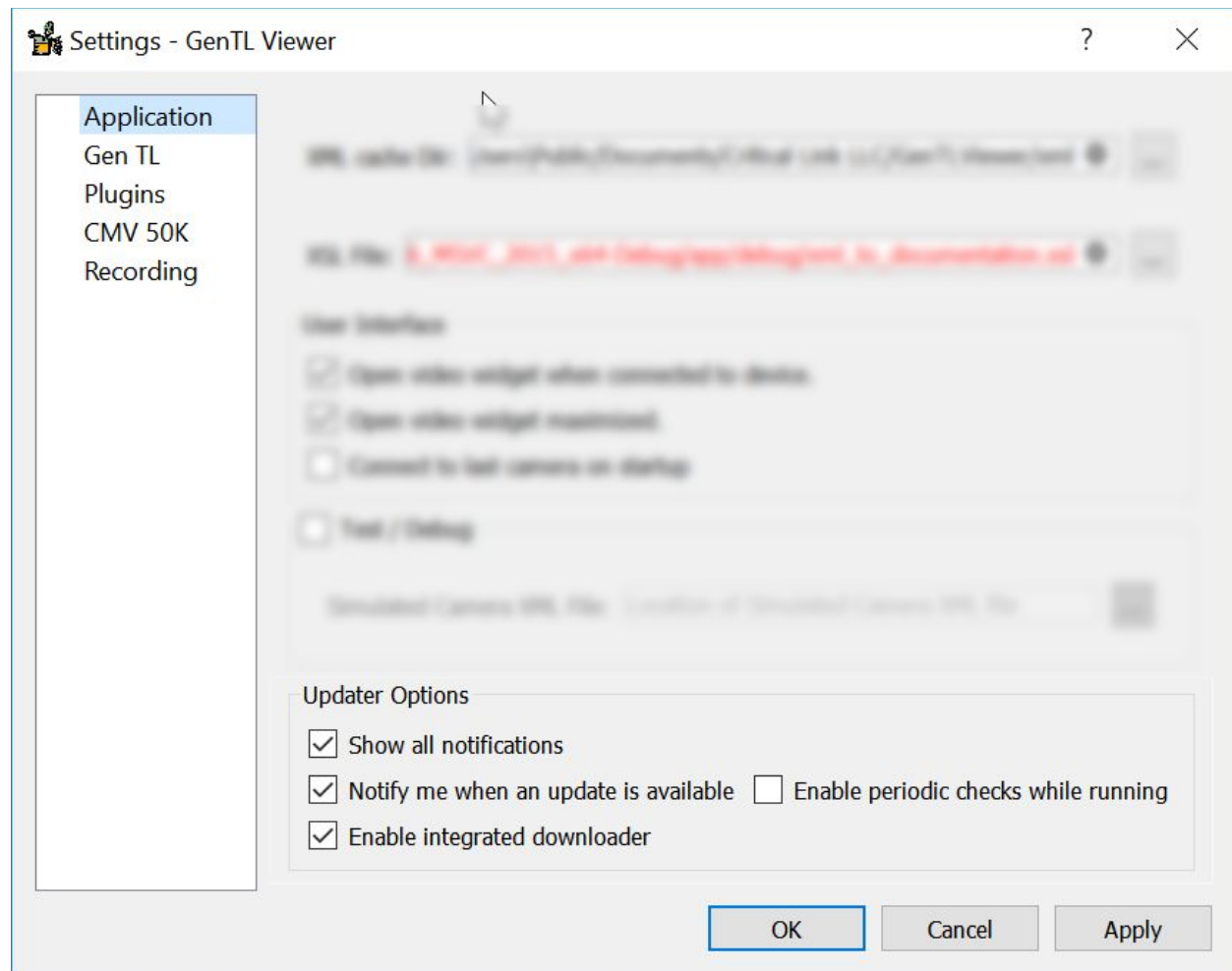
Settings

The Application settings dialog provides a group of controls (Updater Options) affecting the update checking.

| Option | Description |
|---------------------------------------|---|
| Show all notifications | If checked, application will notify every time an update check is run. If not checked, the application will only notify when an update is available. |
| Notify me when an update is available | Checking this will have the application check for updates when the application starts. |
| Enable periodic checks while running | If checked, application will check once per day for updates while running. |
| Enable integrated | If checked, the application will prompt you to download and |



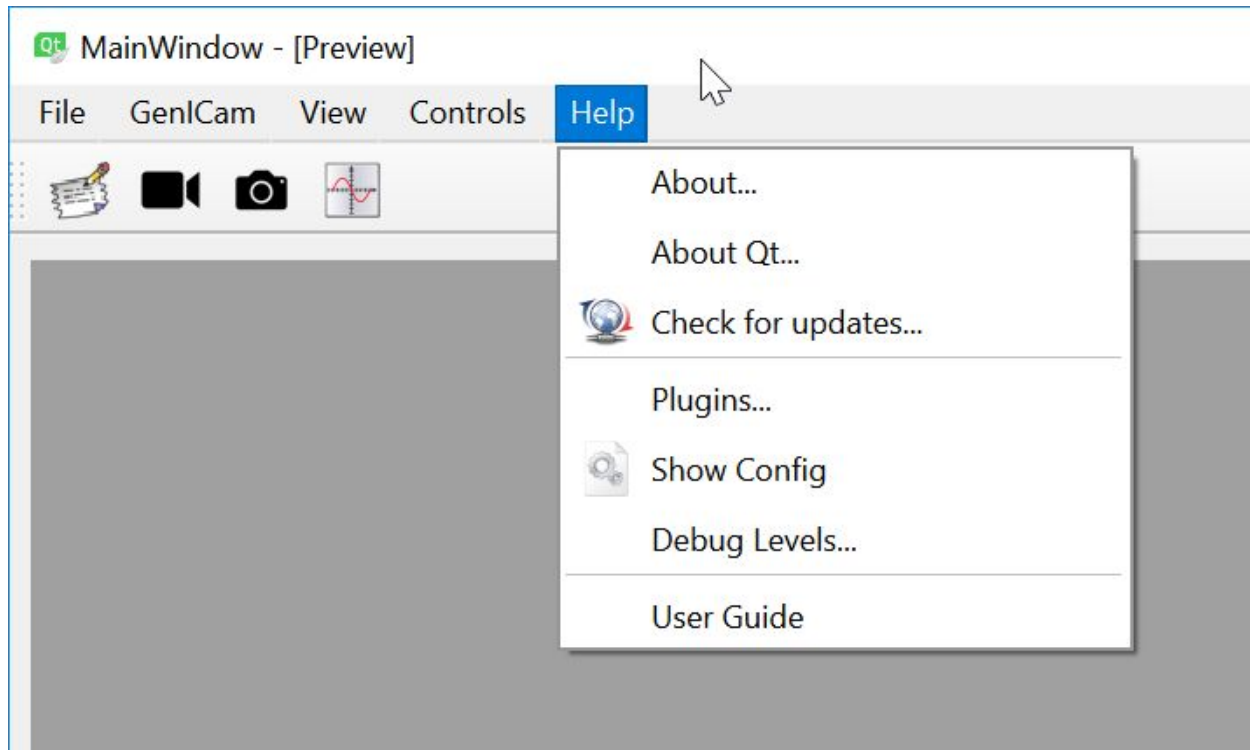
| | |
|------------|---|
| downloader | optionally install the update. If not checked, you will have to download the update manually (from a web browser, etc). |
|------------|---|



Application settings - Updater Options

To manually check for updates, select “Check for updates...” from the Help menu.





Help Menu - Check for updates...

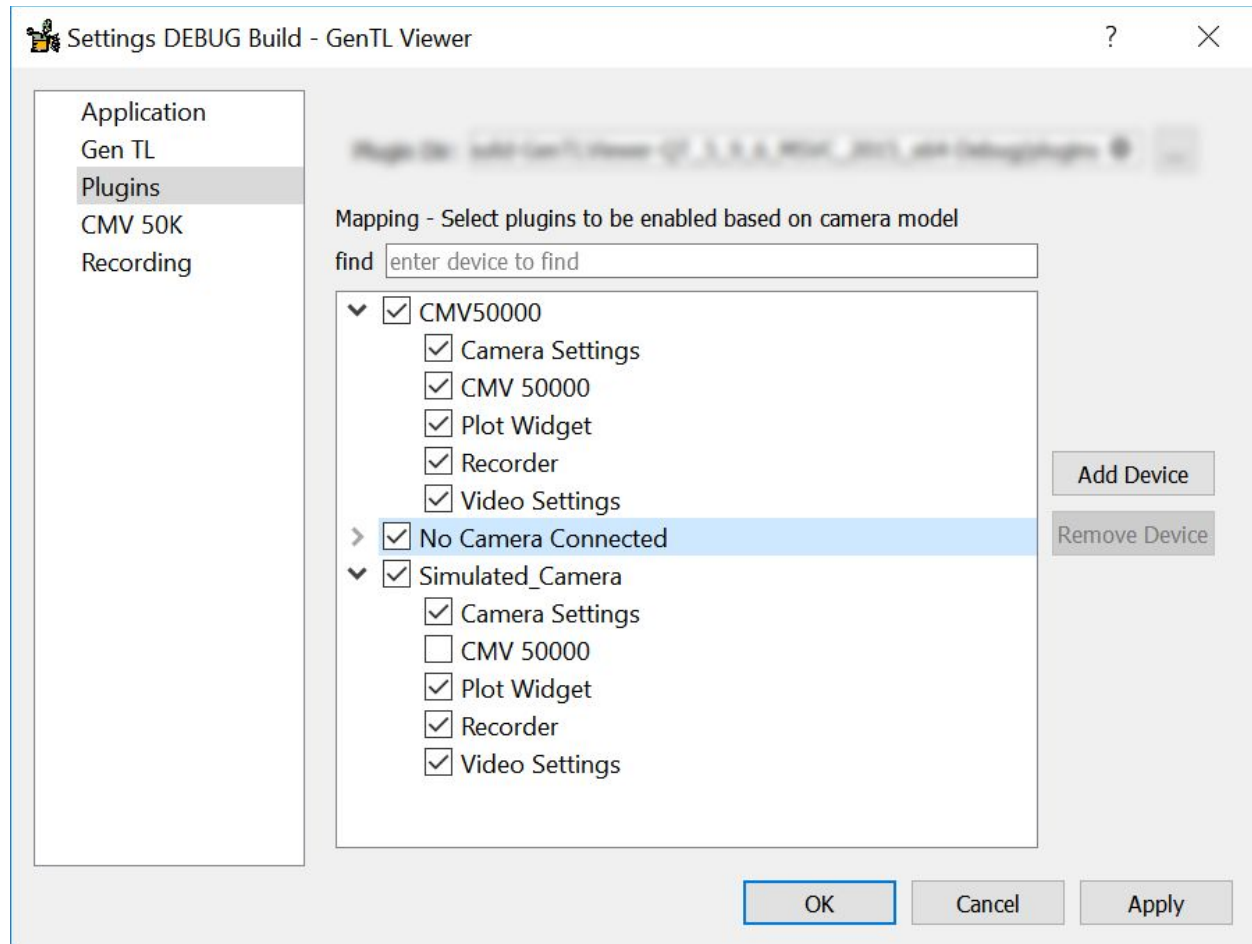
Plugin Management

The GenTL Viewer application makes extensive use of plugin modules to provide the correct functionality for the camera connected. Each plugin module can provide custom functionality based on either a specific family/model of camera or by examining the device's GenlCam XML structure for the presence of supported features. When a new camera model (as defined by the XML SNFC::DeviceModelName node) is discovered, a new mapping is created for it and any plugins that are either enabled by default (as identified by the plugin) or have declared themselves compatible based on the camera's GenlCam XML model will be enabled for the model.

NOTE: There should be no need to alter the plugin mapping during normal use of the application. The following information should be considered for advanced/test usage only!

The user can modify this mapping (although one really should NOT do so, unless you really know what you are doing!) in the plugin settings dialog, as shown below. Changes made to plugin settings will be applied the next time the application is run.

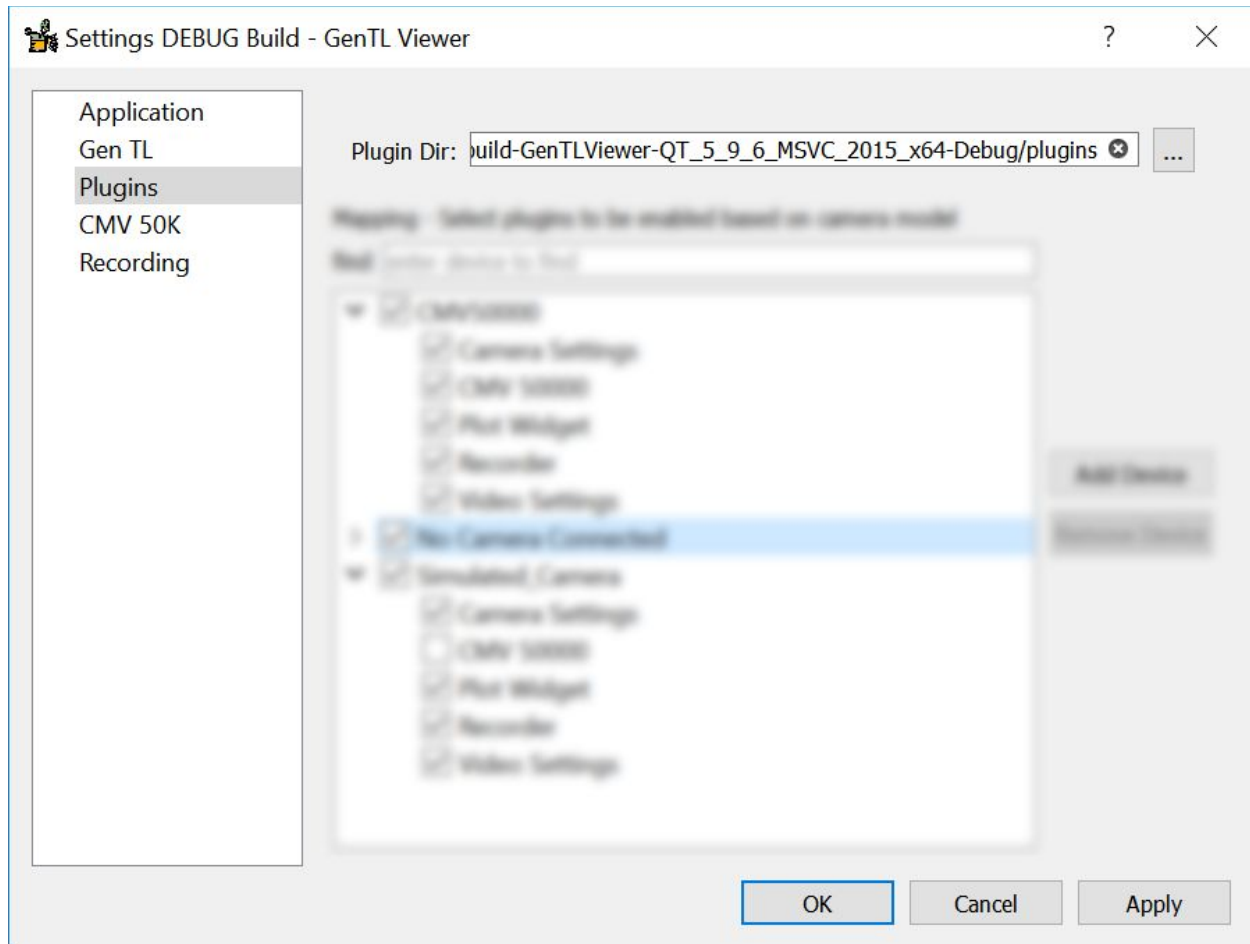




Plugin Settings - Select plugins by model.

You can also change the location of the plugins directory from the default (again intended for development/test). If the application cannot find plugins in the specified path, there will be very little you can do with it!



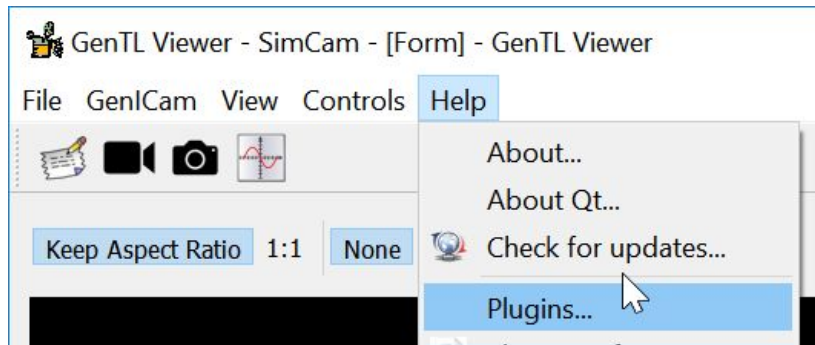
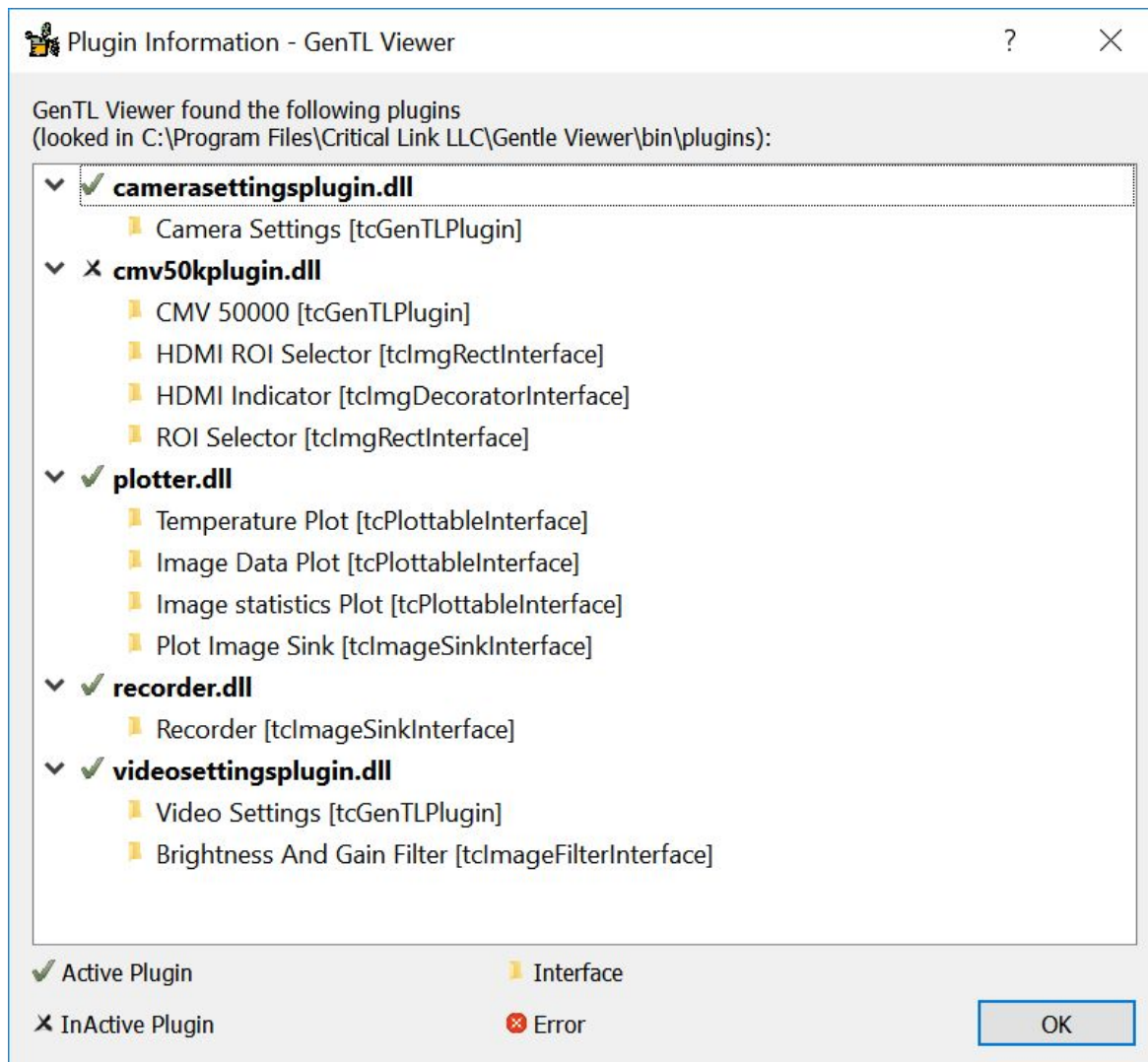


Plugin Settings - Select plugins directory.

Plugin Information

One can see which plugins are currently available and/or loaded by selecting "Plugins..." from the Help menu. This will bring up a dialog box listing all of the plugins found and their current status.



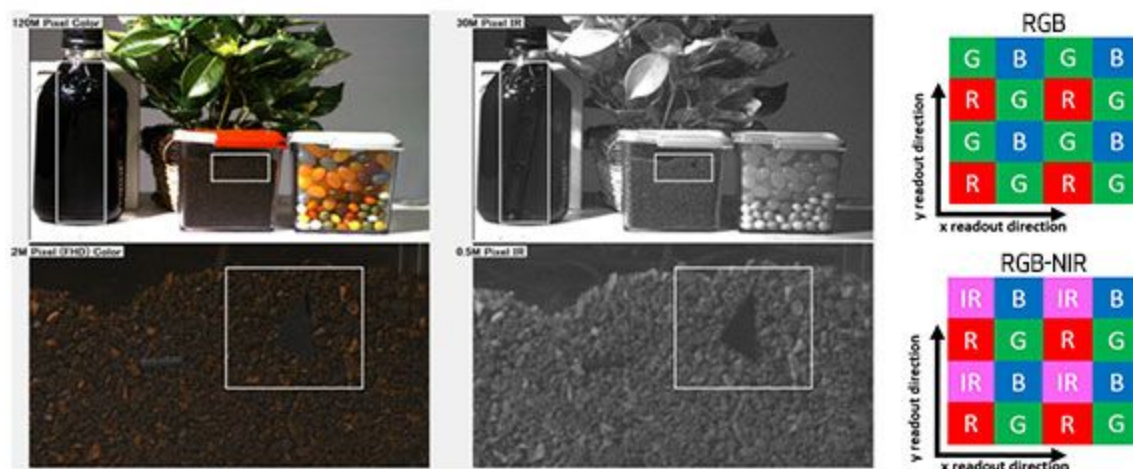
*Help Menu - Plugins....**Plugins Information Dialog*

Appendix: Canon Sensor IR Plugin

Description

The CanonIR plugin allows the GenTL viewer to decode Canon RGBIR sensor data.

These sensors replace one of the green pixels in the bayer pattern with a Near Infra-Red (NIR) filter¹.



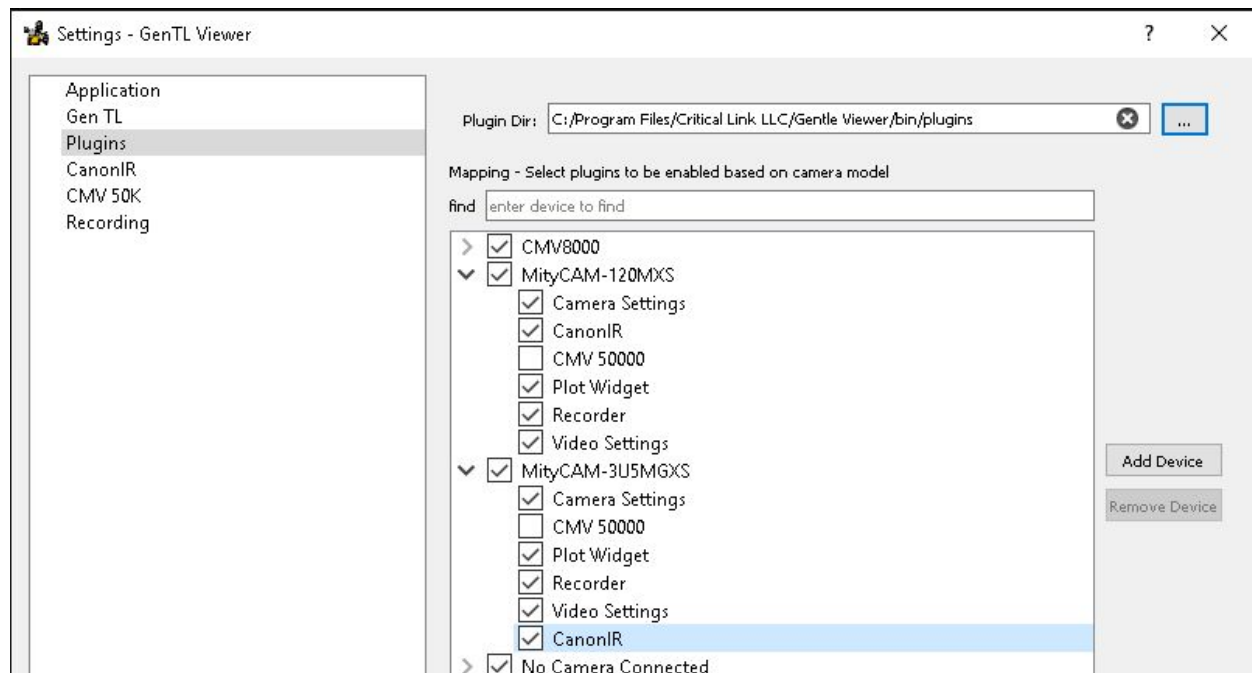
¹ <https://canon-cmos-sensors.com/canon-3u5mgxs-5mp-cmos-sensor/>

Enabling the plugin

- Open the settings window. File -> Settings...
- Select the plugins page:
 - Ensure “Plugin Dir:” is set to the plugins directory in the install path.
 - Expand the entry for the camera you want to use the plugin with and Check “CanonIR”²

Note: If the camera does not show up, you need to open and close the camera at least once.

- Click OK to close the settings and then restart the GenTL Viewer.

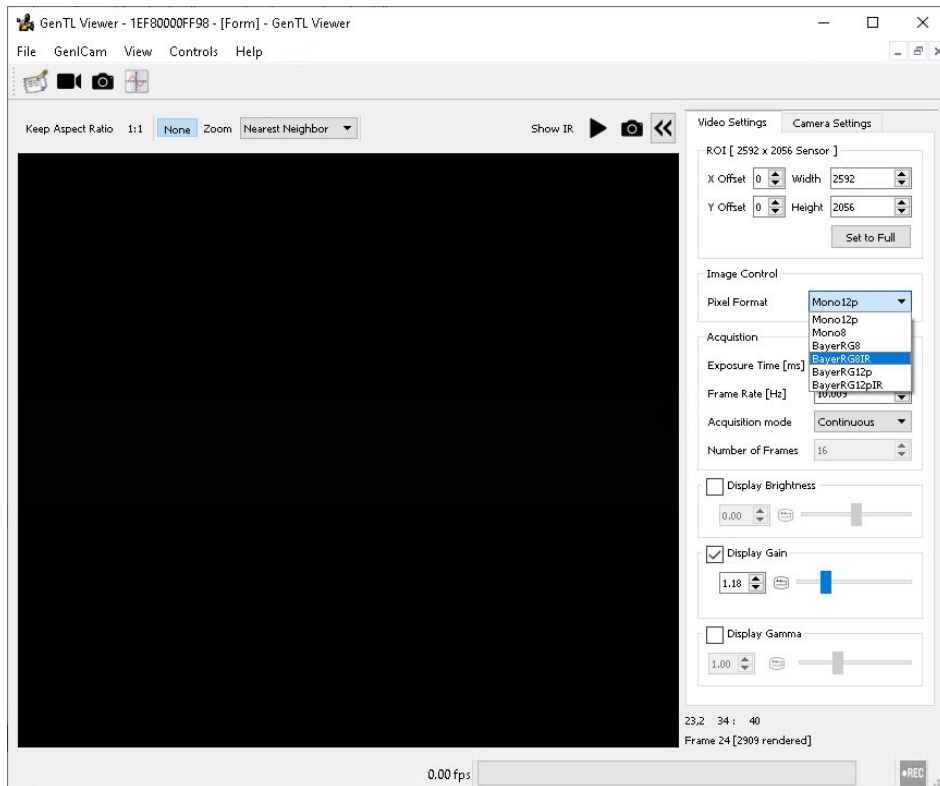


² Note: The CanonIR plugin currently only supports the MityCAM-120MXS and MityCAM-3U5MGXS

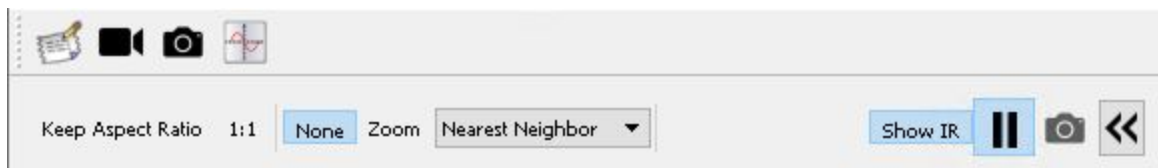


Using the plugin

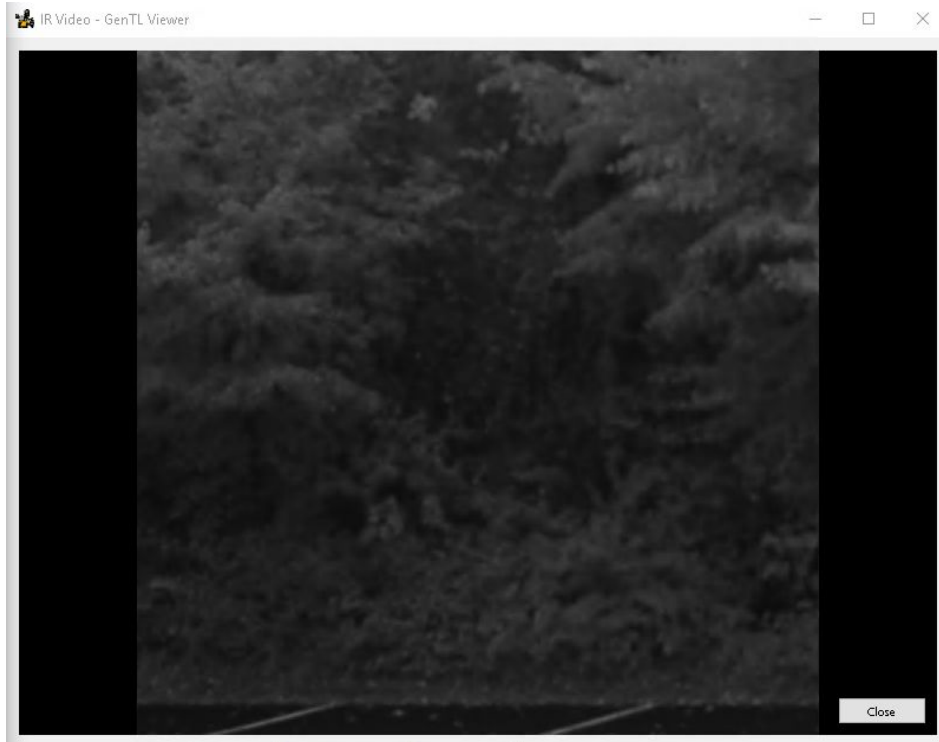
- Select a Pixel Format ending in IR.



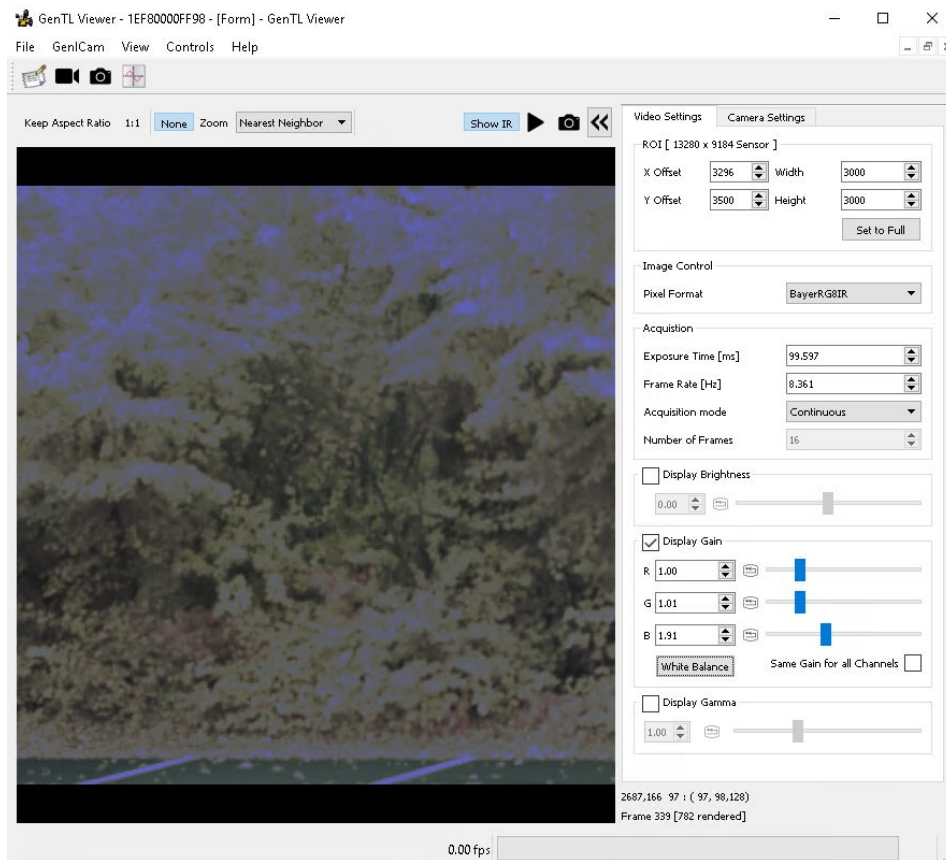
- Select the “Show IR” button next to the Play button.
- Select Play.



- When a frame comes in with an IR pixel format, the “IR Video” window will open and show you the live IR data.



- The RGB color image will be shown in the regular video window



Note: The RGB pixels are still sensitive to IR. So the image will look washed out without an IR filter. The [IR Subtraction](#) feature can be used to reduce this washed out effect.

Recording images

- Ensure the Recorder plugin is enabled.
- Open the Recorder Control. Controls -> Recorder Control.
- Setup where you want the images to be saved and what file format.
- Hit the record button.
- Start streaming frames.
- Each frame will save a Channel 0 and Channel 1 image. Channel 0 is the color image and Channel 1 is the greyscale IR image.

Note: The IR image is $\frac{1}{2}$ the resolution of the color image.



IR Subtraction

This feature subtracts the IR data from the RGB pixels.

Each IR pixel value is multiplied by the three IR subtraction ratio values. The results are then subtracted from the corresponding color pixel in the 2x2 bayer pattern.

Configuring IR Subtraction

- Open the settings window. File -> Settings...
- Select the CanonIR page:
 - Select “Enable IR Subtraction”
 - Default values are selected based on the MityCAM-120MXS @ 820nm. These values will need to be adjusted based on environment and lighting conditions.
 - Click “OK” or “Apply” for settings to take effect.
 - Clicking the “Default” button will set all the settings back to default immediately. Pressing “OK” or “Apply” is not needed.

