

Quintic Software

Tutorial 7D

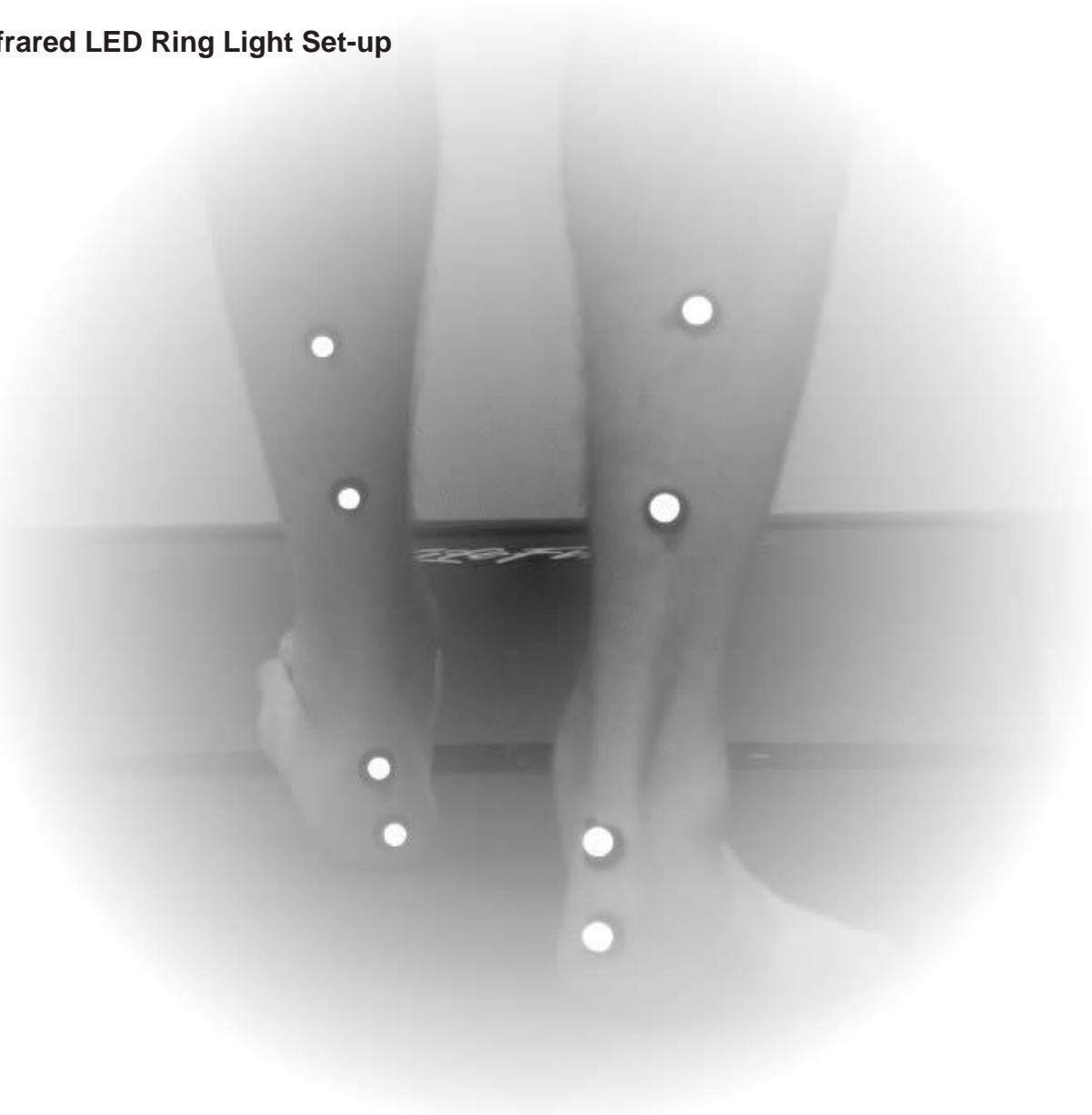
1.3MP / 4MP

Quintic High-Speed LIVE
USB3 Camera Capture



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1. Camera Setup

Place the camera on the tripod, using the tripod plate, supplied with the tripod.

Connect the camera to the PC/Laptop via the 4m cable provided with the camera. Ensure that the cable is inserted into a USB3 port. These are displayed either with a blue chip inside the port, corresponding with a blue chip in the cable adapter, or a label of "SS" which stands for "super speed".

2. Camera Parameters

There are a range of pre-created camera parameter sets for both 1.3MP and 4MP camera capture, with differing frame rates and image resolutions.

In order to access these, go to the following file path:

- C: Drive \ Program Files (x86)\Quintic \ Camera \ 1.3MP HS Capture \ 1.3MP Cam Files **OR** 4MP HS Capture \ 4MP Cam Files.

Select the required frame rate and screen resolution folder and then copy and paste the required number of camera files (e.g. Cam1, Cam2, Cam3) into the 1.3MP HS Capture/ 4MP HS Capture folder.

These pre-created camera parameters have already been tried and tested by Quintic and allow the user to collect good quality data whilst being able to change the frame rate or resolution of the video from a pre-set selection which increases from:

- 100 fps (1280 x 1024)

Upto:

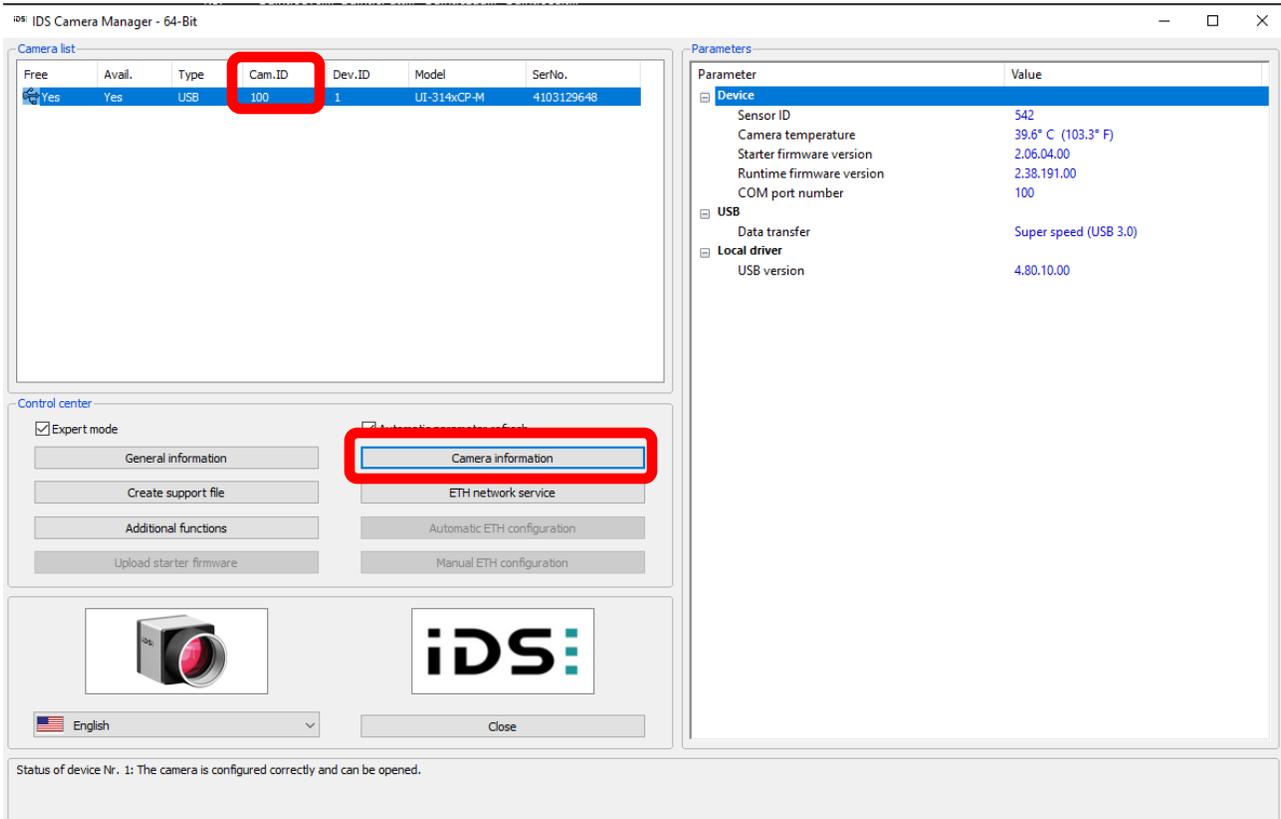
- 1000 fps (1280 x 112)

In Pre-set frame rate increments (100 fps, 150 fps, 200 fps, 250 fps, 300 fps, 350 fps, 400 fps, 500 fps, 750 fps and 1000 fps).

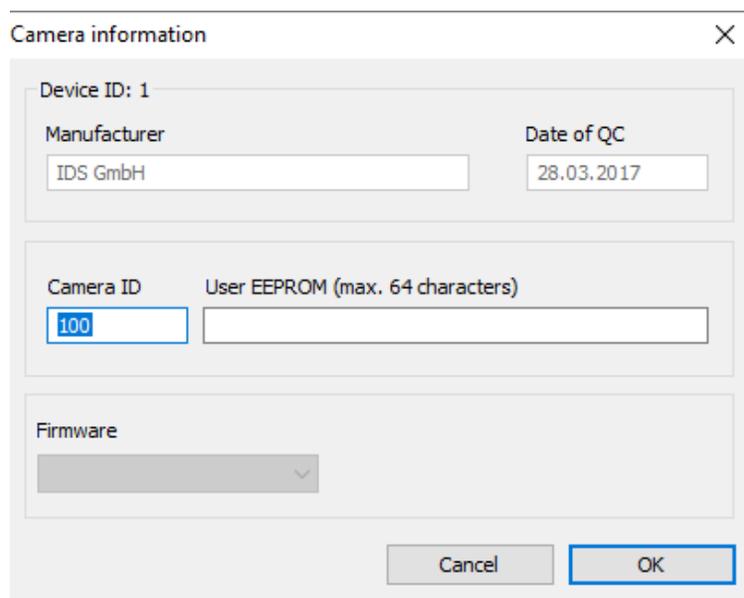
Cam ID's

If the 1.3MP/4MP camera is not being picked up by the Quintic Software when trying to capture a video this could be due to the Cam ID that is displayed in the IDS camera manager software. For both the 1.3 MP and the 4 MP camera the Cam ID has to start at 100 then go up by 1 for every camera that is added (e.g. 100, 101, 102).

In order to change the Camera ID, load the IDS camera manager software, which should show the camera that is connected to the computer.

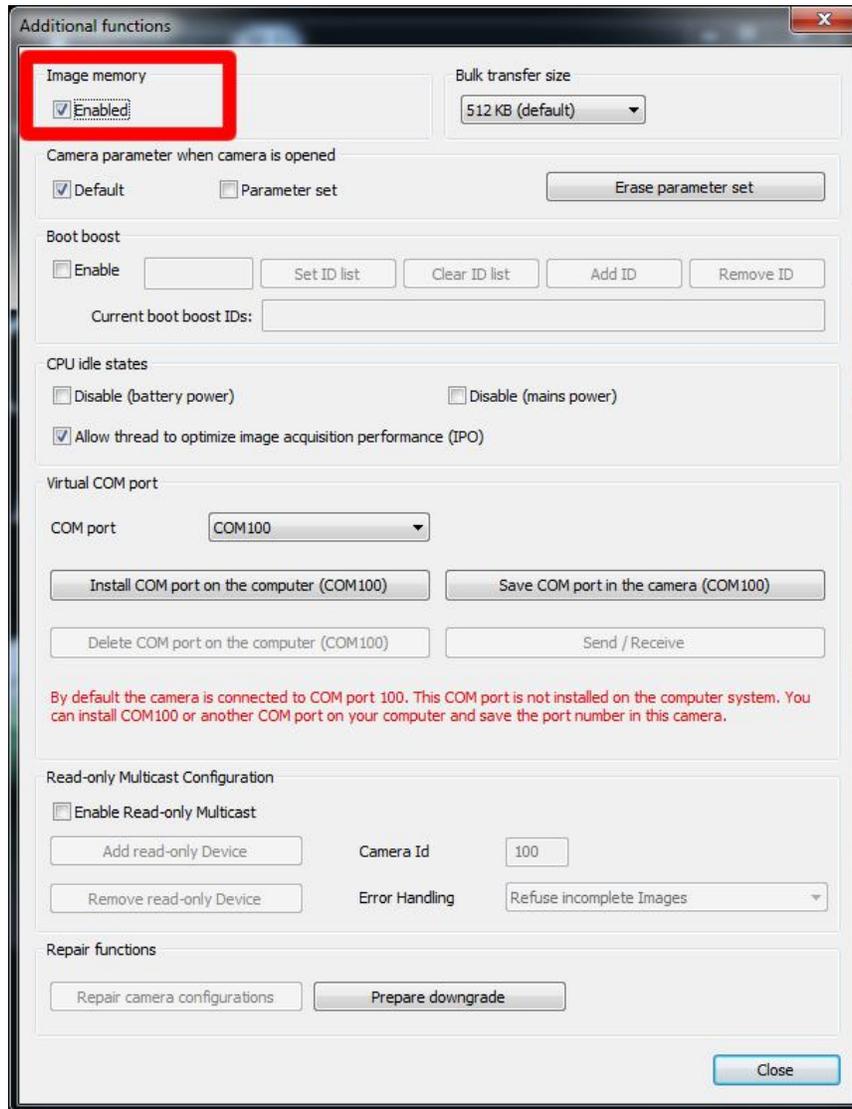


Then click on camera information and edit the Camera ID if necessary, click OK which will then save any changes made to camera information.



Memory Mode - For the camera to be compatible with Quintic standard 1.3 cams files, memory mode must be enabled. Open IDS camera manager and select “Additional Functions”. A pop-up window will appear. The first box will be labelled “Image memory: This **MUST** be enabled or the camera will resort to default cam settings when opened in our 1.3 camera capture program.

This can only be done before opening the camera. Once the camera is open in U-eye cockpit, then the memory mode cannot be changed until it is closed.



Scroll to the bottom of the Cam file and the title “Memory” will head the final paragraph. The “Camera memory mode” **MUST** be 1 on all cameras. This can be changed and saved in the cam file.

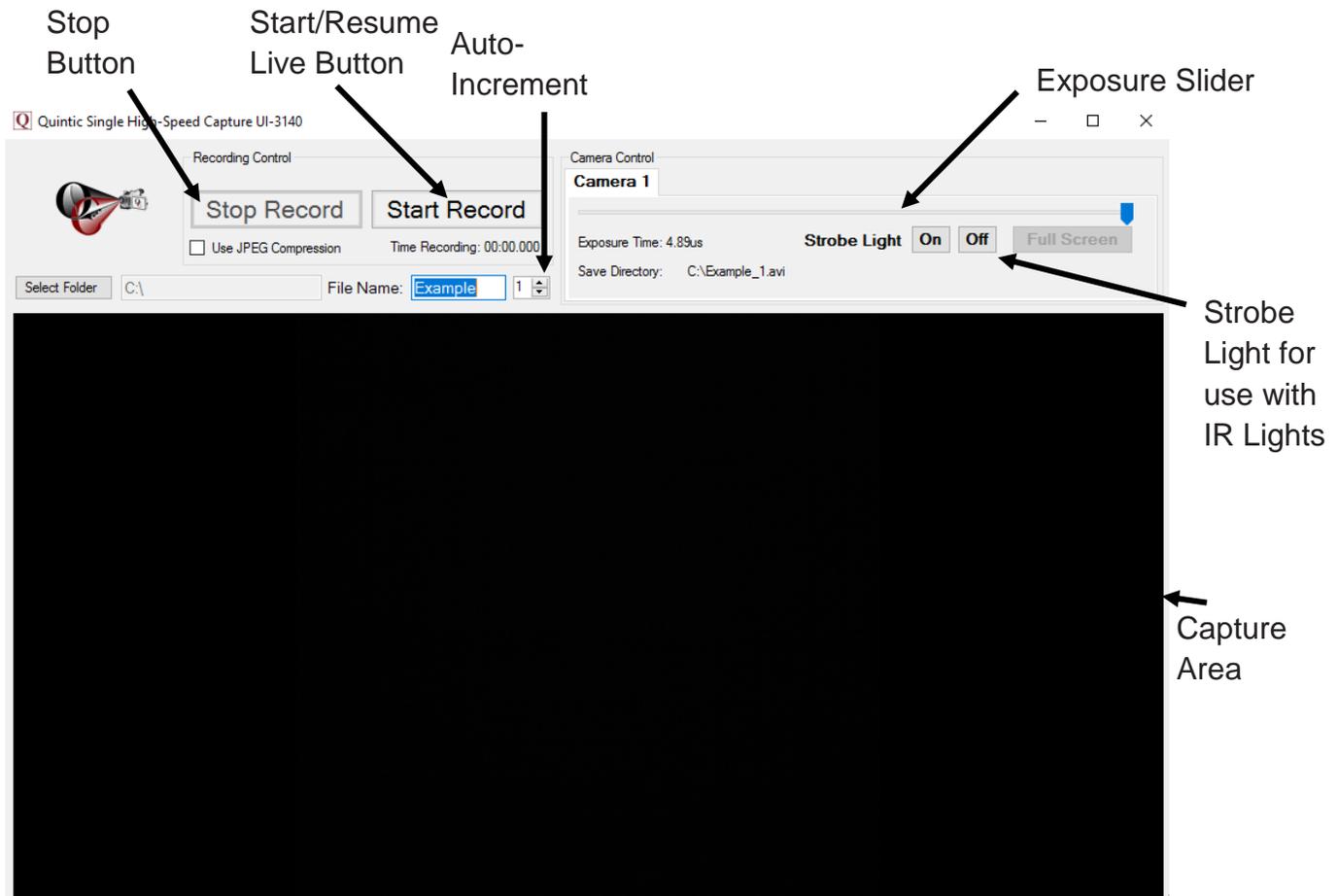
[Memory]
Camera memory mode=1

3. Capturing a Video

Open Quintic and select the “Camera” tab. Then click the relevant camera capture program:

- High-Speed 1.3MP
- High-Speed 4MP Camera

The following window will appear:



Select the folder where you wish to save the video file. Then enter a valid name into the “File Name” box.

The exposure slider is set relative to frame rate when creating the camera parameters file. However, if you wish to alter the exposure manually, slide the slider to a relevant setting for the activity you wish to record.

When you are ready to record, click the “Start Record” button. Then click the “Stop Record” button when you wish to end the recording. When using a 1.3MP camera, the video length limit is 15 seconds, whilst the limit for the 4MP is 10 seconds.

Once you have clicked “Stop Record” a progress bar will appear in front of the window. This progress bar represents the time the computer uses to write the video file to the Hard Disk/SSD from RAM, where it was written during capture.

At the same time, the “Start Record” button changes into a “Resume Live” button. Selecting this button will again display a live image in the capture area. The camera is now ready to record again.

Every time a video is saved the Auto-Increment will increase by 1.

4. Creating Bespoke Cam Files

Open Quintic, open the “Camera” tab, and select “Single High-Speed” from the choice of capture programs.

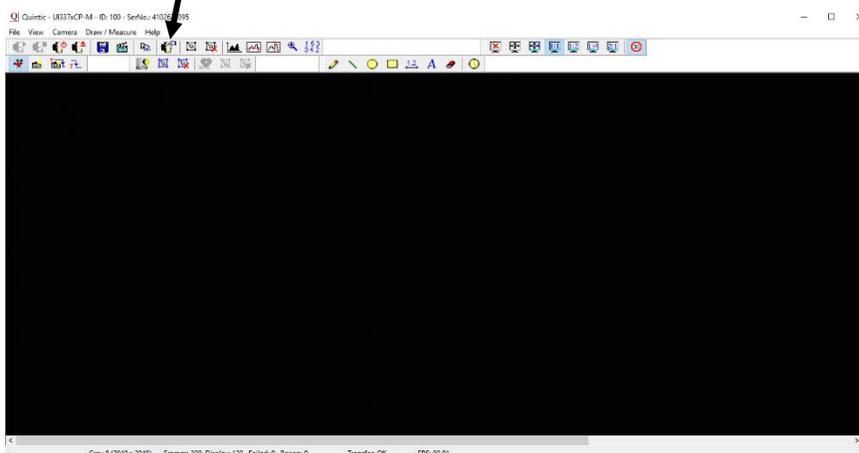
Select the open camera button and choose the relevant camera from the list that appears in a separate window.

Open Camera Button

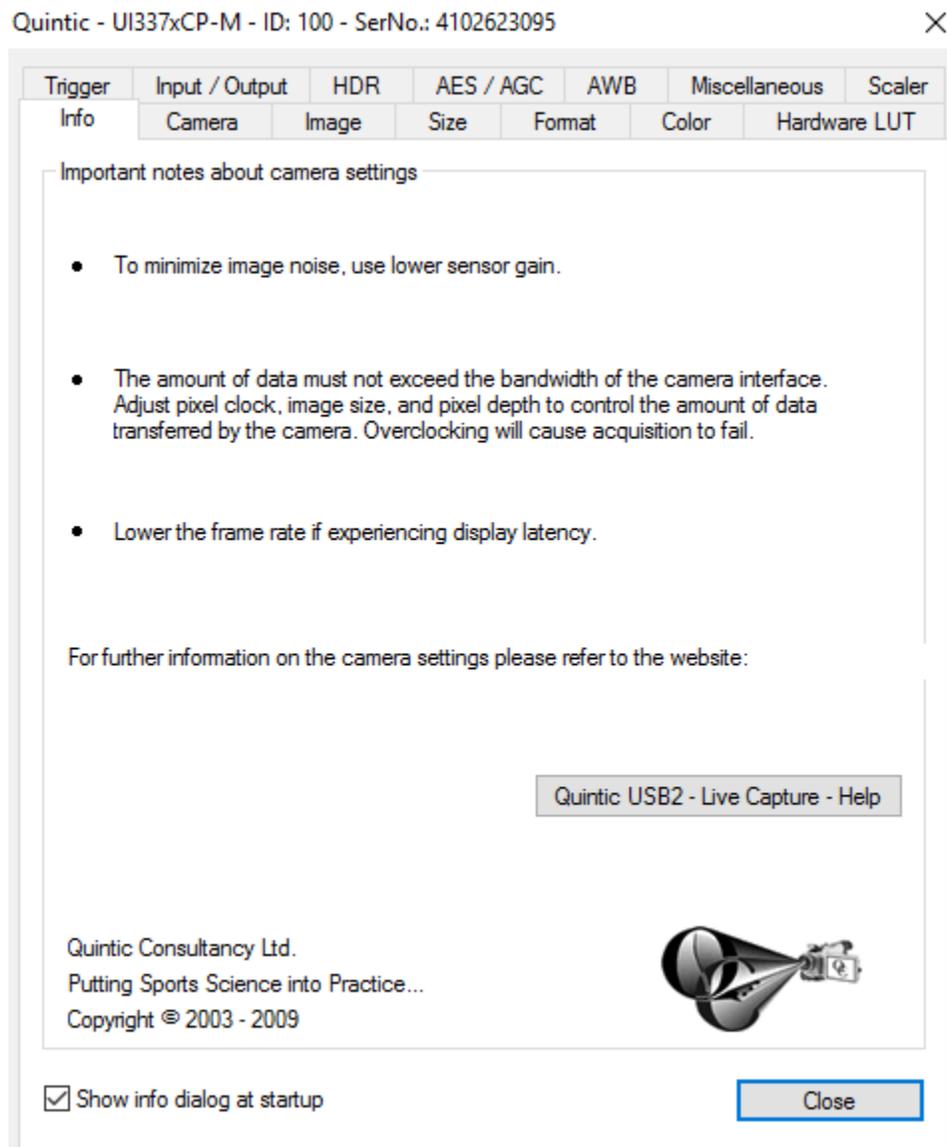


Then select the settings button in order to change the parameters of the camera files.

Settings Button



The following window will appear:



Select the “Camera” tab which allows the pixel clock frequency, frame rate and exposure time to be altered.

Firstly check the 'Optimum' selection box (1), this will allow the software to run at the optimal Pixel Clock Rate. This will improve/increase the maximum frame rate at which the camera can capture at.

Timing

Camera Peak Bandwidth is the maximum required bandwidth in MB/sec (Peak). If the bandwidth is exceeded this is displayed in red (2).

Camera Average Bandwidth is the average bandwidth required in MB/sec. If the bandwidth is exceeded this is displayed in red.

N.B. Make sure that these values don't exceed the bandwidth, otherwise performance will be impaired.

Quintic - UI337xCP-M ID: 100 - SerNo.: 4102623095

Trigger Input / Output HDR AES / AGC AWB Miscellaneous Scaler
Info Camera Image Size Format Color Hardware LUT

Timing

Camera peak bandwidth: 356.0 MB/s
Camera average bandwidth: 375.4 MB/s (2)
Sensor (max. bandwidth): 344.0 MP/s

Pixel clock 38 MHz 344 MHz
(1) Optimum
Auto pixel clock test period (s) 5

Frame rate (Freerun) 2.00 fps 80.91 fps
(3) Hold
(4) Max
(5) Auto

Exposure time 0.038 ms 0.710 ms
(9) Hold
(10) Max
(11) Auto
 Long-term (Trigger mode)

Default Close

Pixel Clock

Sets the clock rate at which the image data is read from the sensor. Altering this setting affects frame rate and exposure time.

Frame Rate

Depending on your bandwidth value there are varying maximum amounts of frames per second that can be captured. This value will decrease as the resolution value increases. When setting the frame rate in freerun mode the camera will capture one image after another at the set frame rate.

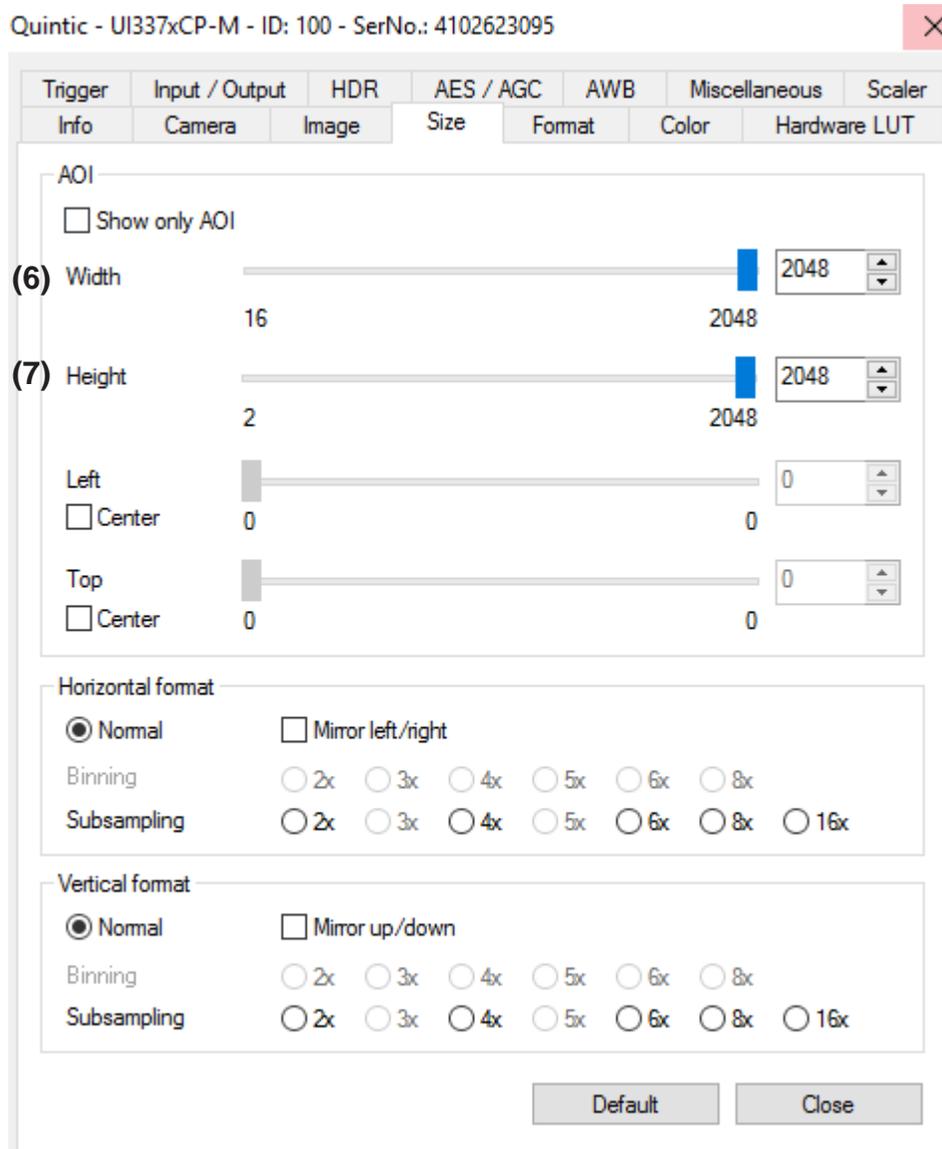
Hold (3): When this check box is selected the frame rate will remain at the set rate, if the pixel clock changes.

Max (4): when this box is selected the camera will record at the maximum rate that is possible: frame rate depends on the capture resolution and the pixel clock.

Auto (5): This option selects the Auto Frame Rate Function - this is only available when Auto Exposure is selected.

Frame rate will change when the user sets a new area of interest (AOI). Therefore, once you have optimised the pixel clock, alter the width (6) and height (7) of the AOI before selecting a frame rate.

Next, ensure that the image is centred relative to the AOI, by ticking the “Show only AOI”, “Left Center” and “Top Center” boxes (8).



Utilising the highest frame rate possible is especially important when capturing fast movements (e.g. the golf swing). A typical golf swing can occur at 100mph or 150ft/sec (if your camera is sampling at 30Hz the club will move 5 feet per 1/30 of a second).

In order to ensure that all actions are accounted for you must have a high sample rate otherwise the subtle movements will be lost.

Exposure Time

This is the amount of time the shutter remains open to allow light into the sensor in order to form an image.

When using higher frame rates, you will require a lower exposure in order to maintain a sharp image throughout all frames.

Hold (9): When the check box is selected the exposure will remain at the desired setting if the frame rate changes.

Max (10): The camera runs at the maximum exposure time that is possible at the current frame rate.

Auto (11): this option selects the Auto Exposure Function, the exposure time changes automatically depending on the selected frame rate.

Image Tab

In digital imaging a voltage proportional to the amount of incident light is output from the sensor. To increase image brightness and contrast, this signal can be amplified by an analogue gain and offset before the digitising process.

Analogue amplification of the read-out pixel values increases overall image brightness and contrast allowing for a higher shutter speed to be applied.

Click on the '**Gain Boost**' (12) option within the Image tab, to automatically increase the brightness and contrast of the image.

Format Tab

Ensure that the colour mode is set to "Mono 8" in the Software column.

When you are happy with the parameters of your camera, click "File", select "Save parameters" and then "to File..." and select a relevant folder to save the cam file. For filing purposes this should be named Cam1 for camera 1, Cam2 for camera 2 etc...

Trigger	Input / Output	HDR	AES / AGC	AWB	Miscellaneous	Scaler
Info	Camera	Image	Size	Format	Color	Hardware LUT

Hardware settings

Master gain
1.00x

Auto

0 100

0

(12) Gain boost

Black level (Offset)

Auto

0 255

52

Red gain
1.00x

0

Green gain
1.00x

0

Blue gain
1.00x

0 100

Edge enhancement

On

Factor

0 2

0

Gamma

On

Factor

1.0 2.2

1

Hardware sensor gamma

Default Close

5. 1.3MP Only

When using the 1.3MP camera the sensor is susceptible to noise affecting the image quality, most commonly displayed as dark vertical lines causing the image to appear grainy. These lines can become darker when the pixel clock is optimised and the aperture of the lens is low.

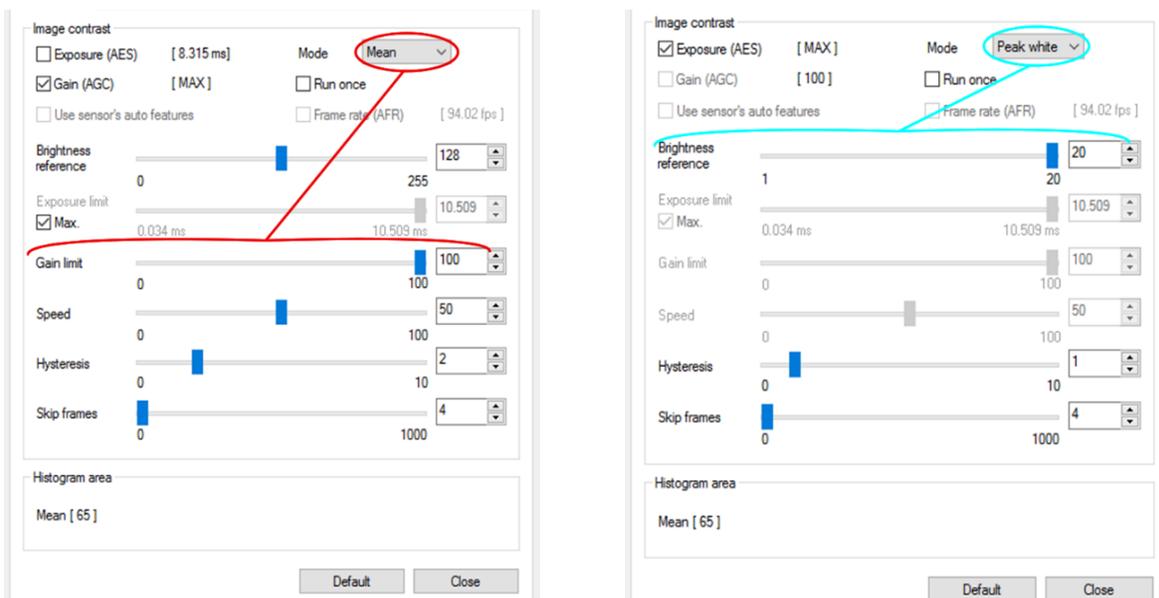
Auto Gain is a default setting that manages the brightness of the image according to the light in the scene. This is useful as it artificially creates a brighter image when control over external lighting is limited (for example, an outdoor scene).

However, in an indoor environment the algorithm used to control brightness, is constantly trying to find a mean brightness for the pixels, often resulting in dark vertical lines.

The gain limit can be altered in the AES/AGC tab. The gain limit controls the extent to which the gain is allowed to artificially brighten the image. This only affects the image quality when the mode of control for image brightness is displayed as “mean” in the top right (below, left). In this case, auto gain can either be deselected, or the gain limit can be reduced until the image quality is sufficient for purpose.

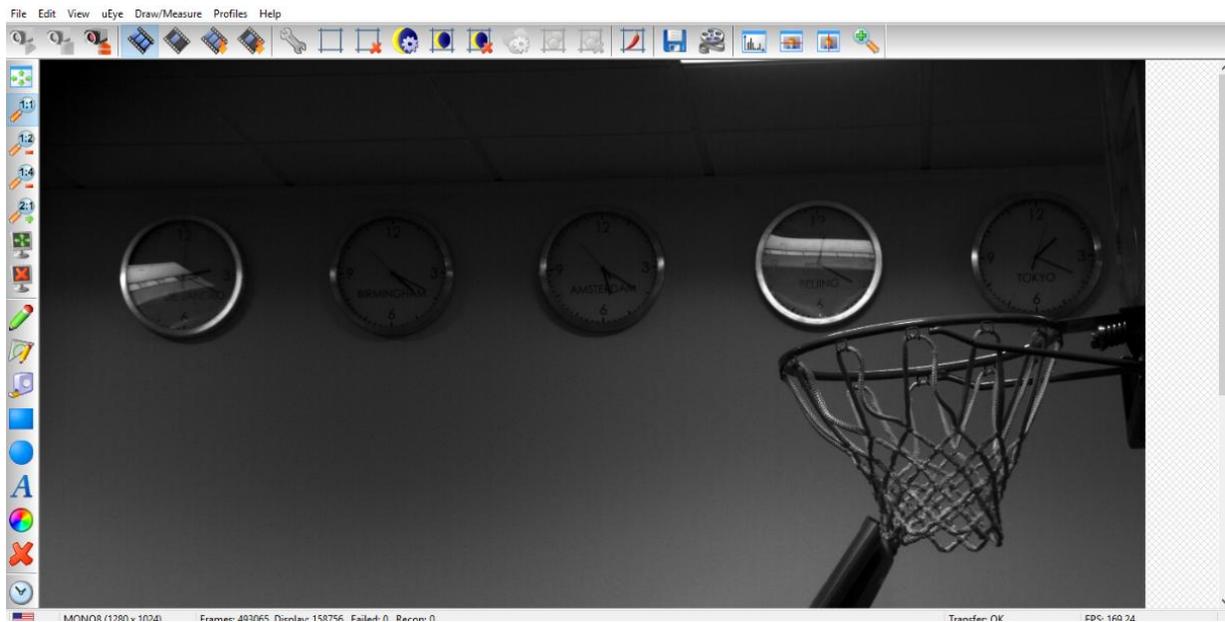
However, reducing the gain will result in a darker image. This can be combated by increasing light in the scene, the gain boost function or increasing the aperture.

Gain Boost - To increase the brightness of the image gain boost (to be found in the “image” tab) can be enabled. However, this can result in a more grainy image.



Peak White Limit - The increased light from an opened aperture will result in the overexposure of the light pixels in the scene. This can cause a problem if the use of reflective markers is required for auto tracking, as overexposure can affect their spherical appearance.

This can be reduced by changing the “Mode” option from “Mean” to “Peak white” (above, right). This is associated with the “Brightness Reference” slide bar, which controls the amount of pixels over exposed at any one time.



6. Infrared LED Right Light Set-up

Once the Infrared LED Right Light has been set up there is a process to follow so that the Infrared LED Ring Light is synchronised with High-Speed camera capture. If you are unsure on how to set-up the Infrared LED Light Ring please follow the instructions which are available at: <http://www.quinticsports.com/ir-led-ringlight/>



Please ensure that the correct camera is attached and available to open with IDS Camera Manager.

IDS Camera Manager - 64-Bit

Free	Avail.	Type	Cam.ID	Dev.ID	Model	SerNo.
Yes	Yes	USB	100	1	UI-314xCP-M	4103129648

Parameters

Parameter	Value
Device	
Sensor ID	542
Camera temperature	39.6° C (103.3° F)
Starter firmware version	2.06.04.00
Runtime firmware version	2.38.191.00
COM port number	100
USB	
Data transfer	Super speed (USB 3.0)
Local driver	
USB version	4.80.10.00

Control center

Expert mode Automatic parameter refresh

General information Camera information

Create support file ETH network service

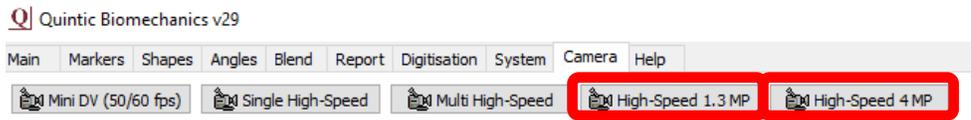
Additional functions Automatic ETH configuration

Upload starter firmware Manual ETH configuration

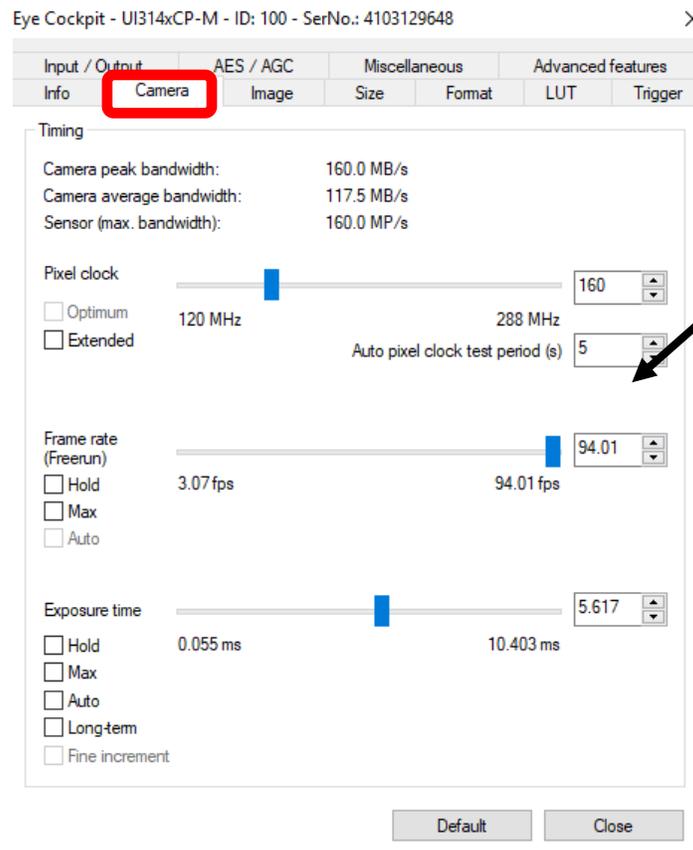
English Close

Status of device Nr. 1: The camera is configured correctly and can be opened.

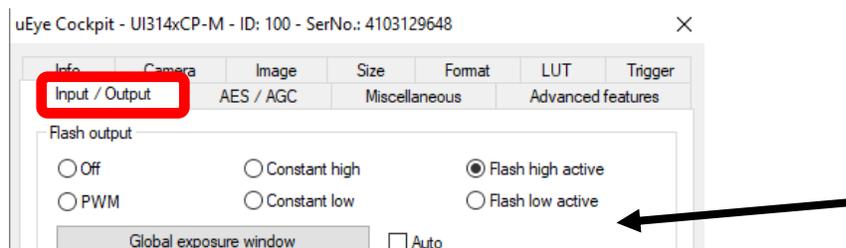
Open Quintic Single High-Speed Capture (within the Quintic software). This will open the camera window showing the live feed from the High-Speed Camera. Please then click on Camera Settings.



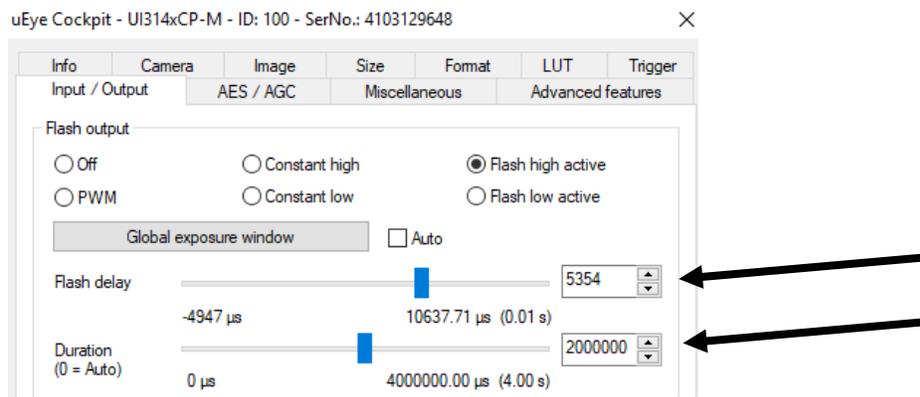
It is now recommended to change the frame rate to what is required for your specific data collection, so that this does not need to be changed whilst setting up the Infrared LED Ring Light.



Once the camera frame rate has been set, click on the 'Input / Output' tab, then under the Flash output section change the default setting from 'Off' to 'Flash high active.'

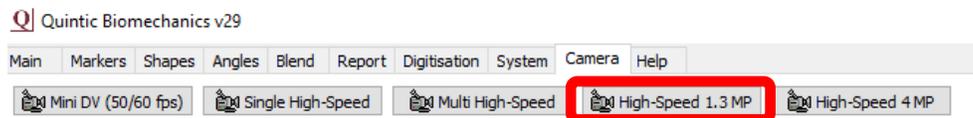


This may make the live camera feed start flashing, this is completely normal. This is then changed by the 'Flash delay' and the 'Duration' sliders. It is recommended that the 'Duration' slider is in the middle. The 'Flash delay' is then dependent on the recording speed. The flash delay should be altered until the flickering of a reflective marker stops in the Live Camera feed stops and the markers are visible and constantly in picture. Please also ensure that the marker is sharp (and doesn't have a faint glow around the edge). Quintic tracking works on the contrast of the markers.

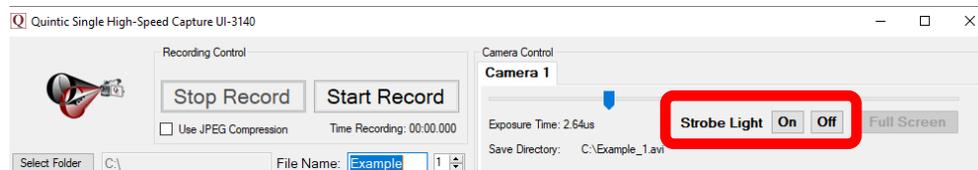


It is now recommended that a cam file is now created to ensure that the Camera and Infrared LED ring light settings are not lost. (This process is explained above in the Tutorial in section 2).

Now within the Quintic software, click on the 'Camera' tab and then the 'High-Speed 1.3 MP' tab.



This will then open the Live Camera feed with the Quintic software, which also has the option to make the markers visible or non-visible by switching the Strobe Light either 'On' or 'Off'.



Below highlights the use of switching the 'Strobe Light' function to either 'On' or 'Off' as the picture on the left is with the Strobe light set to off, whereas the picture on the right is with the Strobe light set to on.

