



FLIR VIDEO CAMERAS SETUP GUIDE



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You can use supported FLIR cameras with Vicon Nexus to provide video captures that sync with your Vicon data.

This guide describes how to set up supported FLIR cameras and related hardware, and how to connect them into your Vicon Nexus system. Other information, such as recommended hardware and troubleshooting tips, is also provided.

For information on configuring the settings for FLIR cameras within Nexus, see *Configure and calibrate FLIR cameras* in the *Vicon Nexus User Guide*.

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Set up a Teledyne FLIR Blackfly S USB3 video camera

Set up a Teledyne FLIR Blackfly S USB3 video camera

Vicon Nexus 2.13 and later supports using Teledyne FLIR Blackfly® S cameras to provide synchronized, calibrated video captures.

The following information provides details about choosing the appropriate hardware and setting it up for use with Nexus:

- [Check the Blackfly S video hardware, page 4](#)
- [Connect the Blackfly S system components, page 5](#)
- [Set up the software for a FLIR camera system, page 9](#)
- [Troubleshooting a FLIR Blackfly S system, page 13](#)
- [Extended cable lengths for a FLIR camera system, page 18](#)
- [Verify synchronization of FLIR cameras, page 19](#)



Note

References to Vicon Lock, Lock units, and Lock apply to all current models of the Vicon Lock unit (at the time of publication, this includes Vicon Lock Studio and Vicon Lock Lab).

Set up a Teledyne FLIR Blackfly S USB3 video camera

Check the Blackfly S video hardware

Before you begin, check that your hardware is included in [Recommended Blackfly S hardware for Nexus](#), page 20.



Note

FLIR cameras are not compatible with Vicon T-Series cameras.

Set up a Teledyne FLIR Blackfly S USB3 video camera

Connect the Blackfly S system components

The following topics describe how to set up the hardware for a Nexus system that includes Teledyne FLIR Blackfly® S cameras:

- [Connect cables to the camera, page 6](#)
- [Install USB 3.0 expansion card, page 7](#)
- [Attach the mounting plate to the camera, page 7](#)
- [Attach the lens to the camera, page 7](#)
- [Connect the camera to the PC, page 7](#)
- [Connect the camera to the Lock, page 8](#)
- [Position and aim the camera, page 8](#)

Set up a Teledyne FLIR Blackfly S USB3 video camera

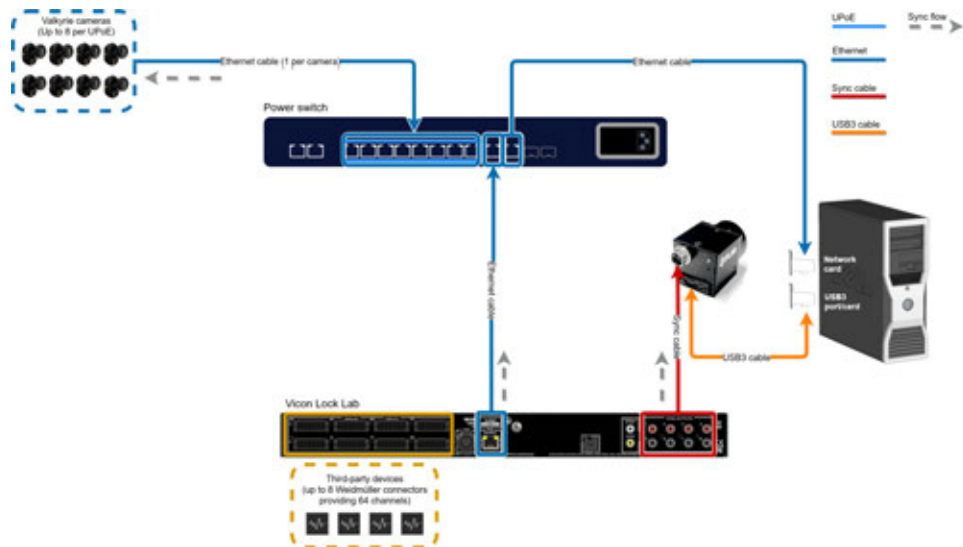
Connect cables to the camera

Connect two cables to each camera:

- Connect one cable to the PC for power, control and data.
- Connect the other cable to a Vicon Lock for synchronization.

We recommend initially setting the camera up close to the PC and Lock to verify correct functioning, using the 5 m cables, before introducing any extension cables. Extension cables are a likely source of issues with bandwidth and power, so it is wise only to attempt to add these after the camera is set up and functioning satisfactorily. For further details and advice on suitable cables, contact [Vicon Support](#)¹.

This diagram shows a setup for a single Teledyne FLIR Blackfly® S camera:



¹ <mailto:support@vicon.com>

Set up a Teledyne FLIR Blackfly S USB3 video camera

Install USB 3.0 expansion card

The expansion card is required when the onboard ports on the PC are not sufficiently fast, or when there are not enough onboard ports on the PC. The expansion card is required when using more than two USB 3.0 cameras.

Install the card in a spare PCIe slot, remembering to connect its external power to either a SATA or Molex drive power connector.

Latest drivers

If the USB3.0 host controller card is the recommended Fresco Logic model (see [Recommended Blackfly S hardware for Nexus, page 20](#)), based on the FL1100 chipset, support is built-in for Windows 8, 8.1, and 10.

However, we recommend downloading and installing the drivers from the [Fresco Logic website](#)².

Attach the mounting plate to the camera

Carefully attach the mounting plate to the underneath of the camera with the four small bolts included, taking care not to lose them or overtighten them.

Attach the lens to the camera

Attach a suitable C-mount lens for the camera.

Connect the camera to the PC

1. Attach the USB3 cable between the camera and PC.
2. Ensure that the screws are tightened up on the camera side to lock the cable in place and that the connector is not subject to excessive force, eg, from the weight of cables or because it is in a position where it could be knocked.

To avoid the whole weight being borne by the camera's connector, we recommend that you attach the cables to the tripod or rig with cable ties.


² <https://support.frescologic.com/portal/en/kb/articles/usb>

Set up a Teledyne FLIR Blackfly S USB3 video camera

Connect the camera to the Lock

Attach the sync cable from the Vicon Lock unit to the camera. To do this:

1. Rotate the camera end of the cable, which is keyed, until the correct alignment is found.
The cable end clicks into place.
2. Attach the other end to the Lock unit.
It uses an RCA phono connection, which plugs into the Lock's GPO port.
3. Make a note of the GPO port that the cable is connected to. You will need this during software setup as it is not detected automatically.

 **Note**

No video is displayed in Nexus until the sync cable is correctly connected to a Vicon Lock unit and the Lock is configured in Nexus.

Position and aim the camera

1. Attach the mounting plate to the tripod head or clamp on the rig.
2. Aim the camera in approximately the desired direction. You can change the exact direction later, when software setup is complete and video is being streamed to Nexus. Ensure you finalize the aim before calibrating.

Set up a Teledyne FLIR Blackfly S USB3 video camera

Set up the software for a FLIR camera system

Most of the setup of the software can be done from within Nexus.

We recommend that you do not run any FLIR utilities or other software that uses USB3 video cameras at the same time as Nexus.

The steps for setting up the software are:

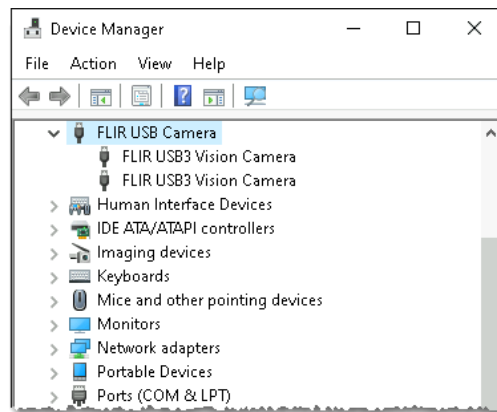
- [Check FLIR drivers, page 10](#)
- [Check cameras are displayed in Nexus, page 10](#)
- [Set the system frame rate, page 11](#)
- [Set the Trigger Source to the correct Vicon Lock output, page 12](#)
- [Configure and calibrate cameras in Nexus, page 12](#)

Set up a Teledyne FLIR Blackfly S USB3 video camera

Check FLIR drivers

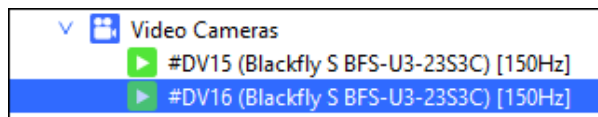
In Windows Device Manager, check that FLIR drivers are installed. They are normally installed as part of the Nexus installation.

If the device drivers are correctly installed, the camera(s) are displayed.

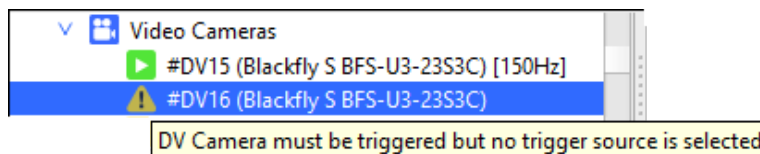


Check cameras are displayed in Nexus

In the Nexus System panel, go to the Video Cameras section of the system tree. If the cameras are connected and their drivers installed, they are displayed.



Newly connected cameras are likely to be displayed with a yellow warning triangle, which indicates that they need the trigger to be set (see [Set the Trigger Source to the correct Vicon Lock output, page 12](#)).

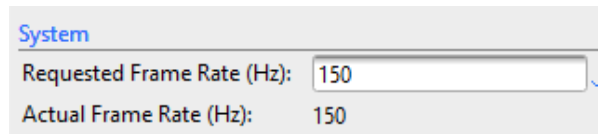


If the camera has previously been connected, its trigger settings are remembered and its icon turns green when the Lock that is generating the trigger becomes available.

Set up a Teledyne FLIR Blackfly S USB3 video camera

Set the system frame rate

1. On the System tab, select Local Vicon System
2. In the Properties pane below, go to the System section and set the Requested Frame Rate for the Vicon system.



The Vicon system frame rate determines which frame rates are listed for the video camera, so it makes sense to set this first.

The video frame rate cannot be higher than the system frame rate, and must divide into the system frame rate. For example, if you want 60 Hz video, set the system rate to a value such as 60 Hz, 120 Hz, 180 Hz, etc.

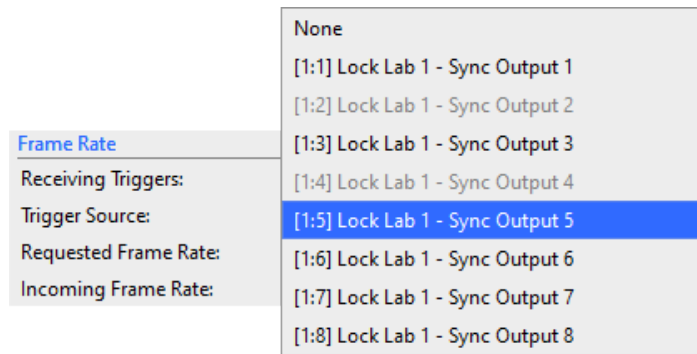
Set up a Teledyne FLIR Blackfly S USB3 video camera

Set the Trigger Source to the correct Vicon Lock output

To enable the Lock unit to provide a sync signal to the FLIR camera, you must set the Trigger Source.

To set the Trigger Source for the Lock unit:

1. On the **System** tab, go to the **Video Cameras** section and select the FLIR camera.
2. In the **Properties** pane, go to the **Frame Rate** section, and from the **Trigger Source** list, select the required GPO.



Ensure that the value that you choose in the software matches the physical cable connection.

After you select the correct trigger source, the camera icon turns green after a couple of seconds.

If you select the wrong GPO, the camera does not receive any trigger signals and the video will be initially blank, or else frozen on the last frame received, and the warning icon continues to be displayed next to the camera.

Configure and calibrate cameras in Nexus

For information on adjusting the settings in Nexus and calibrating FLIR cameras, see *Configure and calibrate FLIR cameras* in the *Vicon Nexus User Guide*.

Set up a Teledyne FLIR Blackfly S USB3 video camera

Troubleshooting a FLIR Blackfly S system

Issue	Resolution
<p>The camera is not displayed at all in the Nexus System panel.</p>	<ul style="list-style-type: none"> • Check that the USB3 cable is connected properly. If using extension cables, try eliminating those and connecting it directly. • If you are using an onboard USB 3.0 port, try a different one. Make sure that it is USB 3.0 and not legacy and that it has not been disabled in the BIOS. • If you are using a USB 3.0 expansion card, check that the correct drivers have been installed and that it is showing in Device Manager with no errors. • Check that the power LED on the camera is illuminated. • Try the camera with a different computer and cable to try to identify where the fault lies. <p>If none of the above fixes the problem, contact Vicon Support³.</p>

³ <mailto:support@vicon.com>

Set up a Teledyne FLIR Blackfly S USB3 video camera

Issue	Resolution
<p>The camera is displayed in the Nexus System panel, but no image is displayed from the camera. A warning about no trigger signal is permanently displayed.</p>	<ul style="list-style-type: none"> • Check that there is a Vicon Lock unit connected to the camera. • Check that the Lock unit is powered up and connected to the PC by Ethernet so that it can be configured in Nexus. • Check that the Lock is contributing, ie, that it is displayed as green rather than gray in Nexus. • Check that a GPO is selected in the video camera settings and that this corresponds to the correct connector on the back of the Lock. • If you have multiple Lock units, make sure you are using the right one. • We recommend labeling the sync cables for each camera and then setting the correct one in Nexus rather than using trial-and-error to identify the correct sync cable. • Check the sync cable and any extensions for signs of damage. If possible, swap the sync cable to identify where any fault lies.

If none of the above fixes the problem, contact [Vicon Support](mailto:support@vicon.com)⁴.

⁴ <mailto:support@vicon.com>

Set up a Teledyne FLIR Blackfly S USB3 video camera

Issue	Resolution
<p>The camera shows only low frame rates in the dropdown menu, when using an onboard USB 3.0 port.</p>	<ul style="list-style-type: none"> • Check the system rate. Only whole fractions of the system rate are permitted. For example, if the system rate was 200 Hz, but the max speed of the camera was 160 Hz, then the max available frame rate for the camera would be 100 Hz. If you changed the system rate to 150Hz, then a 150Hz option would become available for the camera. • A USB2 port could have been inadvertently used. Check that you are using a USB3 port, which is usually blue in color and sometimes marked SS. A black-colored port is likely to be unsuitable. • The USB3 port could be too slow for the camera. A port on the front panel of a PC may be slower than one on the main board if the internal cable is not of good enough quality. Try a different port. • The USB3 interface might be shared between cameras. If the issue only manifests when multiple cameras are in use, this is likely to be the case. If you have more than two cameras, we recommend using a USB3 expansion card. • The USB3 interface might be shared with another device. A device such as a USB web cam, network adapter, memory stick or removable hard disk might be to blame. Disconnect all these devices and retry.
<p>The camera shows only low frame rates in the dropdown menu, when using a USB 3.0 expansion PCIe card.</p>	<ul style="list-style-type: none"> • Check the system rate. Only whole fractions of the system rate are permitted. For example, if the system rate was 200 Hz, but the max speed of the camera was 160 Hz, then the max available frame rate for the camera would be 100 Hz. If you changed the system rate to 150 Hz, then a 150 Hz option would become available for the camera. • Install the correct drivers. We recommend the manufacturer's drivers rather than the default Windows ones.
<p>A warning about lost frames occurs sometimes, particularly when there is movement near the camera or Lock.</p>	<ul style="list-style-type: none"> • Sync cable may be strained or damaged, resulting in occasionally missed trigger pulses. Check the cable.

Set up a Teledyne FLIR Blackfly S USB3 video camera

Issue	Resolution
<p>A warning about black frames being inserted is permanently present.</p>	<ul style="list-style-type: none"> • The shutter duration for the camera may be set too high so that there isn't time to start sending the data before the next exposure period. Try decreasing the exposure time. • The frame rate may be set too close to the limits of the camera. Try reducing the frame rate. • If the camera fails to work at higher frame rates, this usually indicates an issue with a USB3 cable, the USB3 port on the PC, or the performance of the PC itself. Eliminate any extensions and see if the issue is solved.
<p>A black image is displayed from the camera.</p>	<ul style="list-style-type: none"> • Fix any warnings in the software about selecting a frame rate, and setting up triggers. • Check the lens cap has not been left on the camera. • Check the lens aperture is not set very low. • Check that shutter duration, gain or gamma are not set to extreme values, resulting in black data. Try setting the values to their default settings.
<p>A very noisy image is displayed from the camera.</p>	<ul style="list-style-type: none"> • Gain may be set very high. Consider increasing exposure and reducing gain.
<p>Calibrator doesn't collect any wands from the video camera.</p>	<ul style="list-style-type: none"> • Check that the video looks OK and it is not displaying a completely black image. Check that the red LEDs on the wands appear in the video when the wand is in Strobe mode. If they don't appear, there may be a very short exposure time or another timing issue. • Enable video calibration mode and ensure that centroids can be seen in the image. If they are not present, adjust the exposure, gain and threshold value to suit the lighting level in the video. • If the video frame rate is not the same as the system frame rate, the exposure could be too long and multiple wand strobes are being picked up by the video camera, confusing the calibrator. Reduce the exposure for calibration or increase the video frame rate to the same as the system frame rate.

Set up a Teledyne FLIR Blackfly S USB3 video camera

Issue	Resolution
<p>Video camera fails to calibrate.</p>	<ul style="list-style-type: none"> • There could be multiple wands in each video frame. Check that the calibration exposure time is not too long. • Camera could have moved during the wand wave or not be securely mounted. • Camera could have been connected or disconnected during the wand wave. • The video stream could be unstable. Ensure that there are no warnings about triggers being missed and black frames being inserted. • The wand wave may not have been suitable. It must cover as much of the desired volume as possible and be relatively quick. <p>If none of the above helps, contact Vicon Support⁵.</p>
<p>After calibration, the wand overlay does not match the video exactly.</p>	<ul style="list-style-type: none"> • Check that the test wand wave is in an area of the volume that was well-calibrated in the original wand wave. This is a particular issue with corners or when a small number of cameras were used. (When looking very closely at the wand, a small difference is expected because the IR LEDs are not in exactly the same position as the visible LEDs.)

⁵ <mailto:support@vicon.com>

Set up a Teledyne FLIR Blackfly S USB3 video camera

Extended cable lengths for a FLIR camera system

Sync cables can be extended by 30 m. For advice on suitable cables, contact [Vicon Support](mailto:support@vicon.com)⁶.

⁶ <mailto:support@vicon.com>

Set up a Teledyne FLIR Blackfly S USB3 video camera

Verify synchronization of FLIR cameras

Ensure the FLIR cameras are exactly synchronized to the Vicon system. To verify this:

1. Set the Vicon system and FLIR camera to the same frame rate eg. 100 Hz.
2. Position the Active Wand where it can be seen in both the video and by a Vicon optical camera.
3. Set the Active Wand to Strobe mode.
4. Start capturing.
5. Turn the wand on.
6. Turn the wand off.
7. Stop capturing.
8. Transfer the file and review it by stepping through the frames.
9. Find the video frame where the wand is switched on and check that is the same frame where the wand appears in the optical camera.

If you come across synchronization problems, check for errors in the log and contact [Vicon Support](mailto:support@vicon.com)⁷ if the problem can't be resolved.

⁷ <mailto:support@vicon.com>

Set up a Teledyne FLIR Blackfly S USB3 video camera

Recommended Teledyne FLIR Blackfly S hardware for Nexus

From the range of FLIR cameras, the Teledyne FLIR Blackfly S camera has been tested and is recommended.

For more information, see the following topics:

- [Choice of Blackfly S camera, page 21](#)
- [Number of Blackfly S cameras, page 21](#)
- [Vicon Lock unit, cables, and accessories, page 22](#)

Set up a Teledyne FLIR Blackfly S USB3 video camera

Choice of Blackfly S camera

The following camera has been tested with Vicon Nexus. The frame rate given is the maximum possible at full resolution using the camera's native Bayer format. Higher rates may be possible if region-of-interest windowing is enabled on the camera, whereas the camera is limited to lower rates if certain onboard processing features are enabled.

Range	Model	Sensor resolution	Max frame rate at full resolution	
			FLIR spec	Nexus
Teledyne FLIR Blackfly S	BFS-U3-23S3C-C ⁸	1920 × 1200 (2.3 MP)	163	150



Number of Blackfly S cameras

With Nexus 2.14 and later, you can use up to eight FLIR cameras in your Nexus system, subject to sufficient GPO ports being free on the Vicon Lock unit(s) and not required for any other devices. Note that, to do this, you must use an advanced PC (see [What are the latest PC specifications?](#)⁹). This also enables you to use post-processing with Theia. For details, contact [Vicon Support](#)¹⁰.

The number of cameras that can be used is constrained by the USB3 bandwidth of the PC or its ability to keep up with video encoding and/or disk bandwidth.

⁸ <https://www.flir.co.uk/products/blackfly-s-usb3/?model=BFS-U3-23S3C-C>

⁹ <https://www.vicon.com/support/faqs/what-are-the-latest-pc-specifications/>

¹⁰ <mailto:support@vicon.com>

Set up a Teledyne FLIR Blackfly S USB3 video camera

Vicon Lock unit, cables, and accessories

The minimum requirements are a Vicon Lock unit, sync cable, and USB3 cable. (The Vicon Lock unit is required to provide a sync signal to the camera.)



Important





If you are sourcing your own PC, ensure that, in addition to a USB3 controller card, it also includes a high-speed (M.2) hard drive, as supplied with current Vicon PCs (see [What are the latest PC specifications?](#)¹¹).

Item		Required/ Optional	Purpose
Vicon Lock Studio or Lock Lab		Required	Provides synchronization signal for FLIR camera.
Vicon 10 m Sync Cable		Required	Carries synchronization signal from Vicon Lock to FLIR camera.
Teledyne FLIR 5 m USB 3.1 Locking Cable ¹²		Required	Connects camera to PC for power, data and control.
M23VM615IR-V 2/3" Varifocal Lens 6–15mm C-mount		Required	Lens is required for camera.

¹¹ <https://www.vicon.com/support/faqs/?q=what-are-the-latest-pc-specifications>

¹² <https://www.flir.co.uk/products/usb-3.1-locking-cable/?model=ACC-01-2301>

Set up a Teledyne FLIR Blackfly S USB3 video camera

Item		Required/ Optional	Purpose
Teledyne FLIR Tripod Adapter for Blackfly S ¹³		Required	Enables camera to be mounted on tripod head.
Teledyne FLIR 4-Port Quad Channel USB 3.1 Host Controller Card ¹⁴		Required	Required for all Vicon systems that include FLIR cameras, to ensure stability of connection and data, especially at higher frames rates.
10 m Single RCA Phono Extension Cable		Optional	10 m extension for sync cable.
30 m USB3 Extension Cable		Optional	30 m extension for USB3 cable. For details and advice on suitable cables, contact Vicon Support ¹⁵ .

¹³ <https://www.flir.co.uk/products/tripod-adapter-for-bfs-30mm-bfly-cmln-cm3-ffmv-fl2-fl3-fmvu/>

¹⁴ <https://www.flir.co.uk/products/usb-3.1-host-controller-card/?model=ACC-01-1203>

¹⁵ <mailto:support@vicon.com>