



# VICON NANTAGE

## REFERENCE GUIDE

© Copyright 2015–2021 Vicon Motion Systems Limited. All rights reserved.

Vicon Motion Systems Limited reserves the right to make changes to information in this document without notice. Companies, names, and data used in examples are fictitious unless otherwise noted. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic or mechanical, by photocopying or recording, or otherwise without the prior written permission of Vicon Motion Systems Ltd.

Vicon® is a registered trademark of Oxford Metrics plc. Vicon Bonita™, Vicon Lock™, Vicon Lock+™, Vicon Lock Lab™, Vicon Lock Studio™, Vicon Nexus™, Vicon MX™, Vicon Shogun™, Vicon Tracker™, Vicon Vantage™, Vicon Vero™, and Vicon Vue™ are trademarks of Oxford Metrics plc.

VESA® is a registered trademark owned by VESA ([www.vesa.org/about-vesa/](http://www.vesa.org/about-vesa/)). Other product and company names herein may be the trademarks of their respective owners. For full and up-to-date copyright and trademark acknowledgements, visit <https://www.vicon.com/vicon/copyright-information>.

Vicon Motion Systems is an Oxford Metrics plc company.

Email: [support@vicon.com](mailto:support@vicon.com) Web: <http://www.vicon.com>

<https://accessgudid.nlm.nih.gov/>

B548VICONVANTAGESYSTEM0



## Contents

About this guide .....	4
Vicon Vantage hardware .....	5
Introducing Vicon Vantage systems .....	6
Vicon Vantage cameras .....	19
Vicon Lock connectivity units .....	43
Vicon Vantage host PC .....	59
Vicon Vantage system cables .....	67
Vicon Vantage calibration device .....	76
Vicon Vantage accessories .....	83
Set up a simple Vicon Vantage system .....	85
Build a Vicon Vantage system .....	90
Add cameras and connectivity to a basic Vantage system .....	91
Add analog capture devices to a Vantage system .....	104
Add synchronized output devices to a Vantage system .....	108
Add remote triggering devices to a Vantage system .....	128
Add genlock/timecode devices to a Vantage system .....	132
Add VESA stereo to a Vantage system .....	142
Integrate MX T-Series components into a Vantage system .....	146
Focus a Vicon Vantage camera lens .....	151
Include a Steam VR source to genlock .....	157
Vicon Vantage technical specifications .....	158
Vicon Vantage camera technical specifications .....	159
Vicon Lock unit technical specifications .....	185
Vicon Vantage regulatory, safety and warranty information .....	186
Radio and television interference .....	187
Environmental regulations (EU customers) .....	189
EU Declaration of Conformity (Vicon Vantage cameras) .....	191
EU Declaration of Conformity (Vicon Vantage system) .....	193
EU Declaration of Conformity (Vicon Lock+) .....	195
EU Declaration of Conformity (Vicon Lock Studio) .....	197
EU Declaration of Conformity (Vicon Lock Lab) .....	199
EU Declaration of Conformity (Vicon software) .....	201
Vicon ISO certification .....	202
MDD EC Production Quality Assurance certificate .....	206
Medical device adverse event reporting .....	208
Safety information .....	213
Warranty information .....	214
Further resources .....	215

## About this guide

This guide provides reference, system-building, and technical specifications for the cameras, units and supplies that make up a Vicon Vantage system.

It is intended for those who are using the Vicon Vantage 3D optical marker-based technology to track and analyze movement.

It is assumed that you have already read the Vicon Vantage Quick Start Guide, and have installed your Vicon Vantage system.

## Vicon Vantage hardware

The following topics provide reference information about the cameras, units, and supplies that make up a Vicon Vantage system.

- [Introducing Vicon Vantage systems, page 6](#)
- [Vicon Vantage cameras, page 19](#)
- [Vicon Lock connectivity units, page 43](#)
- [Vicon Vantage host PC, page 59](#)
- [Vicon Vantage system cables, page 67](#)
- [Vicon Vantage calibration device, page 76](#)
- [Vicon Vantage accessories, page 83](#)
- [Set up a simple Vicon Vantage system, page 85](#)



### Note

Except where noted, 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+, Vicon Lock Studio and Vicon Lock Lab).

## Introducing Vicon Vantage systems

A Vicon Vantage system is a suite of networked Vantage motion capture cameras (which may include other compatible Vicon cameras), hardware devices (such as Vicon Vue video cameras, and Vicon Lock for synchronization of third-party devices), and software applications, which provide real-time and offline digital-optical motion capture data. The motion capture data can be applied to life sciences, animation, and engineering applications.

Vicon Vantage systems are flexible, expandable, and easy to integrate into your working environment. You can combine Vantage motion capture cameras with other current Vicon camera ranges and supported third-party devices (such as force plates, EMG, analog and digital HD- and SD-compliant external video for genlocking and associated timecode sources) to create a system that meets your application requirements. This modular approach enables you to expand your Vicon Vantage system as needed.

Motion capture data from the Vicon Vantage cameras (V16, V8, and V5) and the associated data from an optional Lock unit, connects through PoE+ switches to a Vantage host PC, which runs the required Vicon application software. Other third-party devices such as digital force plates, can connect directly to the host PC.

Vicon Vantage cameras can also be added to MX T-Series–Giganet systems with or without Lock. However, if you're upgrading an MX T-Series–Giganet system that requires VESA Stereo genlocking, a Lock unit is required; and if you need digital SDI genlock, a Lock Studio is required.



### Important

A Vicon Vantage system runs on its own dedicated network, rather than being integrated into a general communications network.

Note the following switch requirements:

- Vantage cameras require PoE+ switches.
- Vicon Lock units, and Vicon Vero and Vicon Vue cameras require PoE+ or PoE switches.
- If the system includes any of the following, a Gigabit Ethernet PoE+ switch with a 10 GbE uplink is required:
  - Three or more PoE+ switches; or
  - Two or more PoE+ switches and a Lock; or
  - Two or more Vue video cameras

The following topics list the major components of Vicon Vantage systems and describe example Vantage systems, showing how you can put together such systems, including Vicon Vantage cameras, networking PoE+ switches, Vicon Vantage host PC, connecting cables, and application software, as well as supported external devices.

- [Overview of Vicon Vantage system components, page 7](#)
- [Example Vicon Vantage systems, page 14](#)

## Overview of Vicon Vantage system components

The major components of a Vicon Vantage motion capture system are:

- [Vicon Vantage motion capture cameras, page 10](#)
- [Vicon Vantage networking PoE+ switches, page 10](#), which provide the power source and connectivity
- [Vicon Vantage software, page 11](#) to control the cameras, analyze and present the data
- [Vicon Vantage host PC, page 11](#) to run the software

A Vantage system also includes [Vantage system cables, page 11](#) to connect the hardware devices, a [Vantage calibration device, page 11](#) (a Vicon Active Wand), and [Vantage accessories, page 12](#).

You may also choose to include Vicon video cameras (such as Vicon Vue); and, to support third-party devices such as force plates and accelerometers, a [Vicon Lock unit, page 12](#) (optional) for third-party devices. If your Vantage system requires a current Vicon Lock unit, it will also include a PoE+ switch.

In each Vantage system, one [Vicon Vantage master synchronization device, page 13](#) provides synchronization to the rest of the system.

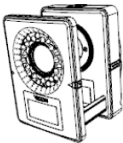






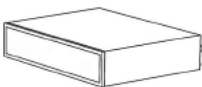


### Note









Except where noted, 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+, Vicon Lock Studio and Vicon Lock Lab).

You can expand and upgrade your Vicon Vantage system as required. In addition to being compatible with current Vicon camera ranges such as Vero and Vue, the Vantage system is also compatible with T-Series cameras and their associated Giganets, so if you have an older system, you can build on your existing investment.

The following table identifies commonly used components of Vicon Vantage systems.

Component	Description	Further information
	Vicon Vantage camera	<a href="#">Vicon Vantage motion capture cameras, page 10</a>
	Vicon Vero	<a href="#">Vicon Vantage motion capture cameras, page 10</a> , <a href="#">Vicon Vero Quick Start Guide (PDF)</a>
	MX T-Series camera (legacy)	The documentation supplied with your Vicon T-Series system and <a href="#">Go Further with Vicon MX T-Series (PDF)</a>
	Vicon video cameras (Vicon Vue)	<a href="#">PC Setup for Vicon Systems (PDF)</a> , <a href="#">Vicon Video Camera Guides (PDFs)</a> , and <a href="#">Add cameras and connectivity to a basic Vantage system, page 91</a>
	Vicon-supplied PoE+ switch (plugged into mains socket)	<a href="#">Vicon Vantage networking PoE+ switches, page 10</a> . Vicon Vantage cameras require PoE+ switches. Vicon Lock, Vicon Vero and Vicon video cameras (Bonita or Vue) require PoE+ or PoE switches
	Vicon-supplied switch: Gigabit PoE+ with a 10 GbE uplink	Needed if the system includes three or more PoE+ switches; or two or more PoE+ switches and a Lock; or two or more Vue video cameras. (See <a href="#">Extended Vicon Vantage system (add cameras and third-party devices), page 16</a> ).
	Vicon Lock unit (plugged into PoE+ switch).	<a href="#">Vicon Lock (optional) for third-party devices, page 12</a>
	MX Giganet (plugged into mains socket)	<a href="#">Integrate MX T-Series components into a Vicon Vantage system, page 18</a>



Component	Description	Further information
	Vicon Vantage host PC (with Vicon application software).	<a href="#">Vicon Vantage host PC, page 11</a> . For the latest full spec, visit <a href="https://www.vicon.com">vicon.com</a> <sup>1</sup> and search for PC specification.
	Vicon-supplied Cat 5e RJ-45 Ethernet cable	Cables used to connect cameras to a PoE+ switch have a ferrite at the camera end. Cables used to connect a Lock unit to a PoE+ switch are shielded. <a href="#">Vicon Vantage system cables, page 11</a>
	Lock to Giganet Link cable	<a href="#">Vicon Vantage system cables, page 11</a>
	Lock to Lock Link cable	<a href="#">Vicon Vantage system cables, page 11</a>
	Weidmüller connector cable for analog capture (force plates, etc)	<a href="#">Vicon Vantage system cables, page 11</a>
	Vicon Vantage software download	<a href="#">Vicon Vantage software, page 11</a>
	Vicon Vantage calibration device (Active Wand)	<a href="#">Vicon Vantage calibration device, page 11</a>
	Motion capture accessories (such as markers)	<a href="#">Vicon Vantage accessories, page 12</a>
Third-party devices (optional)	Third-party devices, such as accelerometers and force plates	<a href="#">Vicon Lock (optional) for third-party devices, page 12</a>

If your particular application requires a more complex configuration, contact [Vicon Support](#)<sup>2</sup>.

<sup>1</sup> <https://www.vicon.com/>

<sup>2</sup> <https://www.vicon.com/support>

## Vicon Vantage motion capture cameras

Vicon offers a wide choice of motion capture cameras which feature multiple high-speed processors that perform real-time image processing.

You can include the following cameras in your Vicon Vantage system:

- **Vantage V16**, with a resolution of up to 16 megapixels (4096 x 4096) and capture speed of 120 fps
- **Vantage V8**, with a resolution of up to 8 megapixels (3328 x 2432) and capture speed of 260 fps
- **Vantage V5**, with a resolution of up to 5 megapixels (2432 x 2048) and capture speed of 420 fps
- Current Vicon video cameras (Vue)
- Current Vicon optical camera ranges (Vero) and legacy (Bonita and T-Series) cameras

For further details of Vantage cameras, see [Vicon Vantage cameras, page 19](#) and [Vicon Vantage camera technical specifications, page 159](#).

For details of T-Series cameras included in your Vicon Vantage system, see the Vicon T-Series documentation supplied with your cameras or download the PDF [Go Further with Vicon MX T-Series](#).

## Vicon Vantage networking PoE+ switches

Each Vicon Vantage camera (or other current Vicon optical camera) and the optional Vicon Lock unit (connected via an additional PoE+ switch), connect to one port of a PoE+ switch. Vicon Vue video cameras can also be connected to a PoE+ switch. In addition:

- Each Vantage camera must connect to a port conforming to the IEEE 802.3at-2009 (25.5W PoE+) standard.
- Vero cameras, Vue cameras, and Lock units (connected via an additional PoE+ switch), can either connect to the same type of port as the Vantage cameras or to a port of lesser standard conforming to IEEE 802.3 af (12.95W PoE). This connectivity through Vicon-supplied RJ-45 cables carries both Gigabit communications and power. (Note that in some legacy systems, Bonita cameras may be connected directly to a Giganet. For information on connecting such a system, see [Integrate MX T-Series components into a Vantage system, page 146](#).)
- The PoE+ switch also connects to the Vicon Vantage host PC running the Vantage software that enables you to capture and analyze your data. Note that no power is required on this particular port of the PoE+ switch.

The number of PoE+ switches required depends on the number of cameras to be supported.

For examples of how to connect a PoE+ switch, see:

- [Simple Vicon Vantage system \(Vantage cameras only\), page 15](#)
- [Extended Vicon Vantage system \(add cameras and third-party devices\), page 16](#)
- [Integrated Vicon Vantage system \(with MX T-Series\), page 18](#)

## Vicon Vantage host PC

The Vicon Vantage host PC runs the Vicon motion capture software that analyzes and presents the data captured by the Vantage cameras.

Current Vicon computers contain dual 10-Gigabit Ethernet ports to enable the Vantage system to communicate with the installed Vicon application software. Depending on your system and your PC configuration, you can either route optical data (eg, from Vantage cameras) through one port and video data (eg, from Vue video cameras) through the other; or video data and optical data can be delivered through a single port. The latter approach requires a Giganet Ethernet PoE+ with a 10 GbE uplink. For more information, see [Vicon Vantage host PC connectors, page 61](#).

Any Vicon motion capture and analysis software to be used with a Vicon Vantage system is installed on this Vicon Vantage host PC. For further details of this computer, see [Vicon Vantage host PC, page 59](#).

Remote PCs may be used for other Vicon software or supported third-party applications.

## Vicon Vantage software

Vicon Vantage supports the following versions of Vicon motion capture software for life sciences, animation, and engineering applications:

- Nexus 2.6 and later
- Shogun 1.1 and later
- Tracker 3.6 and later

The motion capture software is installed on the Vicon Vantage host PC; for further details on the software, see [Vicon software on Vicon Vantage host PC, page 66](#).

Vicon also provides a range of data visualization, analysis, and manipulation software (for details, see the [Software<sup>3</sup>](#) link on the Vicon website).

## Vicon Vantage cables

A combination of proprietary Vicon and commercially available cables is used to connect hardware devices in a Vicon Vantage system.

For further information, see [Vicon Vantage system cables, page 67](#).

## Vicon Vantage calibration device

A Vicon proprietary calibration device is used to calibrate Vicon Vantage systems.

For further information, see [Vicon Vantage calibration device, page 76](#).

---

<sup>3</sup> <https://www.vicon.com/products/software>

## Vicon Vantage accessories

Motion capture accessories such as Vicon retroreflective markers, marker-fixing tape, Micropore and Gaffer tape, and Velcro are available.

For further information, see [Vicon Vantage accessories, page 83](#).

## Vicon Lock unit (optional) for third-party devices

With the addition of a Vicon Lock unit to your Vicon Vantage system, you can directly include the following third-party devices:

- External analog peripheral devices, such as force plates, electromyography (EMG) equipment, and accelerometers
- External devices that require synchronization at a frequency that is related to the motion capture frame rate and/or a device that needs to know when a capture occurs
- External devices that need to start and stop the capture event, (Remote Start and Stop)
- External analog Standard Definition (SD), High Definition (HD) and (with Vicon Lock Studio) 3G SDI broadcast digital video devices to which the Vicon Vantage system must synchronize
- External analog broadcast timecode devices for triggering capture and time-stamping captured data in accordance with LTC and VITC standards
- External VESA Stereo devices to which the Vicon Vantage system must synchronize

For more information on the role of Vicon Lock units in a Vicon Vantage system, see [Vicon Lock connectivity units, page 43](#).

For more information on connecting third-party devices to a Vantage system, see [Add analog capture devices to a Vantage system, page 104](#).

For a list of currently tested and supported third-party devices, contact [Vicon Support](#)<sup>4</sup> or your nearest agent or distributor.

---

<sup>4</sup> <https://www.vicon.com/support>

## Vicon Vantage master synchronization device

As shown in the following table, each Vantage system has one master device that provides synchronization to the system. The master is established automatically during system booting.

If the system includes	The master is
Vicon Lock unit	Vicon Lock unit. Note that if Lock is added to a T-Series system, all Giganets become secondary units.
No Lock	A camera (unless you have an integrated system that includes a Giganet, in which case the Giganet is the master)
Two Lock units	Lock unit with genlock source attached. If no genlock source is attached to either Lock, one is automatically designated the master.

For more information on the role of a Vicon Lock unit in a Vantage system, see [Vicon Lock in a Vicon Vantage system, page 44](#).

## Example Vicon Vantage systems

The following topics explain how to connect various example Vicon Vantage systems, from a basic system to a system where legacy components and Vantage components are combined:

- [Simple Vicon Vantage system \(Vantage cameras only\)](#), page 15
- [Extended Vicon Vantage system \(add cameras and third-party devices\)](#), page 16
- [Integrated Vicon Vantage system \(with MX T-Series\)](#), page 18



### Notes

The above system configurations were current at the time of publication, but may now have been superseded. For up-to-date information, search for PC specification on the [Vicon website](#)<sup>5</sup> or contact [Vicon Support](#)<sup>6</sup>.

In the diagrams in this guide, references to 'Optical data (Ethernet)' indicate the flow of positional data from Vicon cameras, as opposed to 'Video data (Ethernet)', which is used to indicate data from video cameras within a Vicon system. At no point are fiber optics referenced.

For guidance on the number and type of PoE switches needed for the number of cameras in your system, see the Vicon system configuration and connection examples.

<sup>5</sup> <https://www.vicon.com>

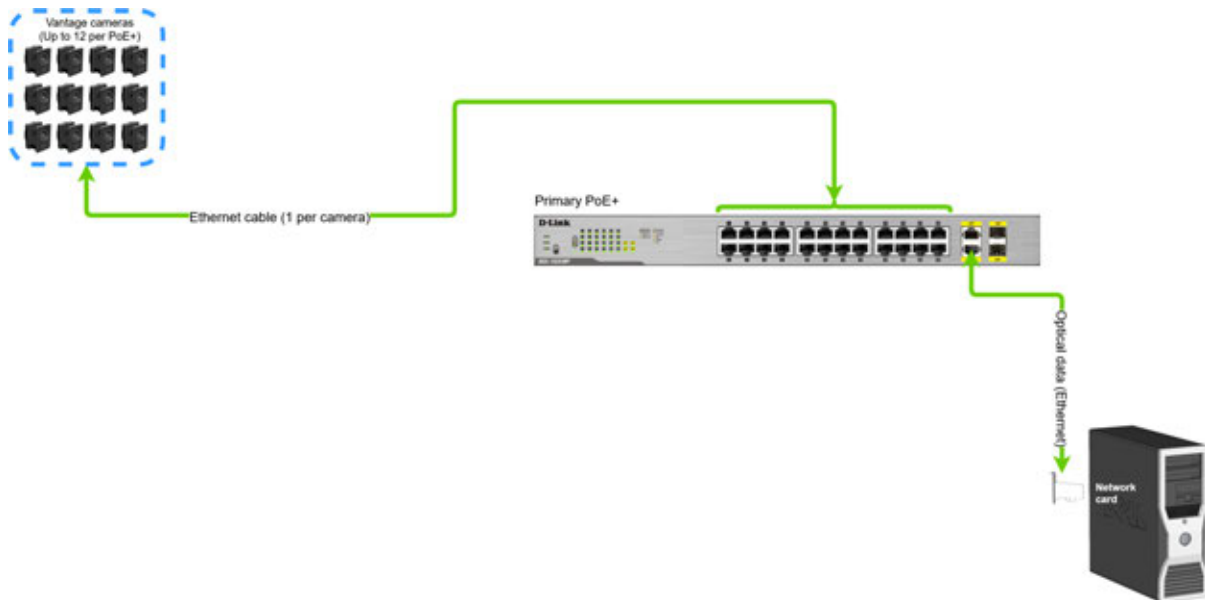
<sup>6</sup> <mailto:support@vicon.com>

## Simple Vicon Vantage system (Vantage cameras only)

The simplest Vicon Vantage system consists of between 1–12 Vantage cameras, a PoE+ switch, and the Vicon Vantage host PC (for descriptions of these components, see [Overview of Vicon Vantage system components, page 7](#)).

The PoE+ switch provides power and data communication for the Vantage cameras. It also routes the Vicon sync (Ethernet sync and time stamp) from the master camera (selectable in your Vicon application software) to all attached secondary cameras. In addition, the PoE+ switch manages the data flow to the Vicon Vantage host PC. This PC runs the Vantage software that you use to process, visualize, and analyze your data.

This diagram shows an example of a simple system.



For further details on setting up a basic Vicon Vantage system, see [Set up a simple Vicon Vantage system, page 85](#).

## Extended Vicon Vantage system (add cameras and third-party devices)

An extended Vicon Vantage system consists of the basic system plus additional hardware, such as additional Vantage cameras, an additional PoE+ switch, a Vicon Lock and a Gigabit PoE+ switch with a 10 GbE uplink, and Vicon Vue video cameras.



### Note

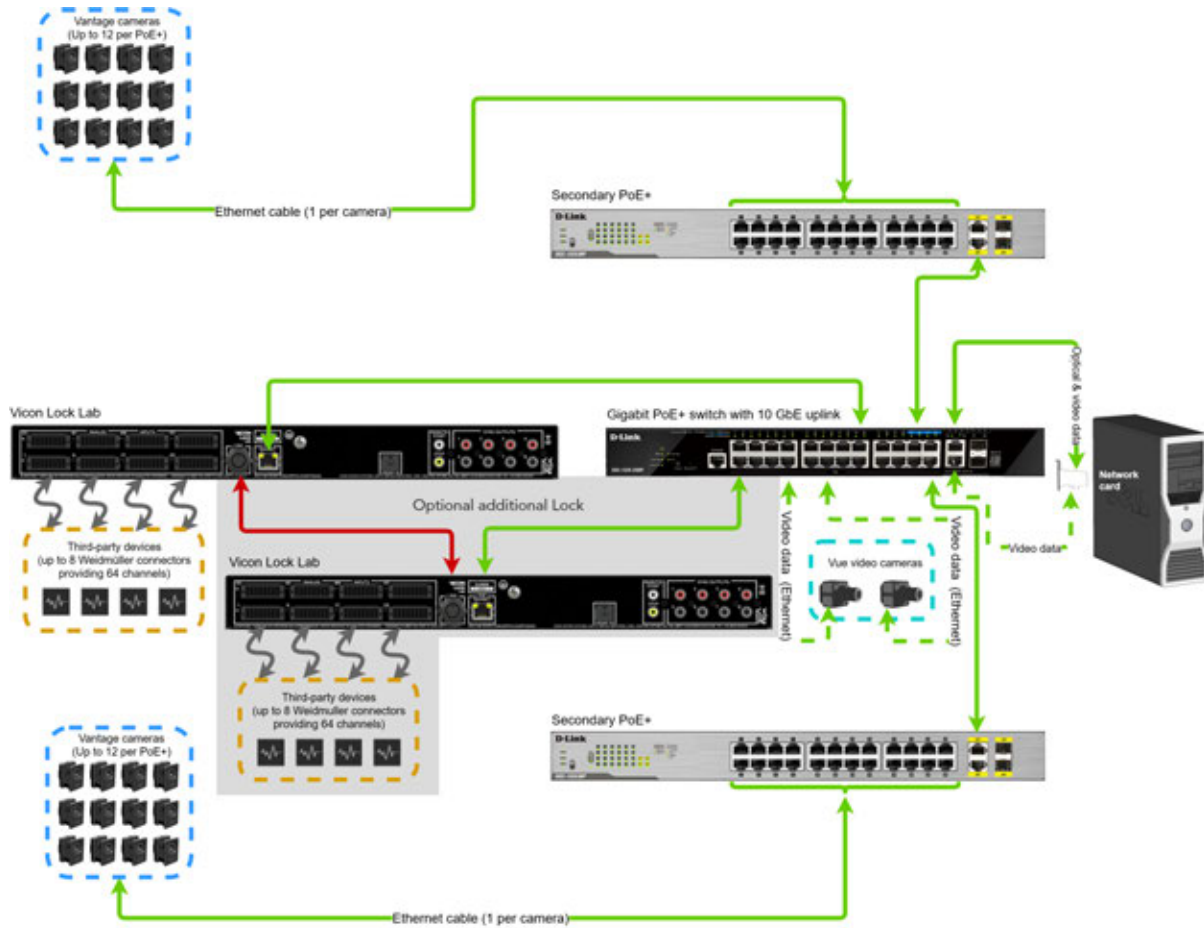
When a Vicon Lock is added to the system, it enables analog capture, synchronization of output devices, interfacing with remote triggering devices, and synchronization to genlock/timecode video sources, as well as VESA stereo video sources (for descriptions of these devices, see [Overview of Vicon Vantage system components, page 7](#)).

When extending your system, bear in mind the following points:

- You need one 26-port PoE+ switch for up to 12 Vicon Vantage cameras in your system.
- One uplink port can be used to connect to the Vicon Vantage host PC. The PoE+ switch that connects to the host PC is known as the primary PoE+ switch.
- The remaining ports can be used to connect a Vicon Lock unit, a Vicon video camera, and/or one or more Vicon optical cameras, Note that:
  - A Lock unit (connected via a PoE+ switch) or a Vicon optical camera takes up one port of a PoE+ switch.
  - Each Vicon video camera takes up two ports on a PoE+ switch.
- If you want to use more than 12 Vicon Vantage cameras, and/or the number of additional devices (such as Vicon video cameras, Lock, etc) require more than the remaining available ports on the primary PoE+ switch, you must add a second PoE+ switch to your system.
- When you add a second PoE+ switch, one uplink port is taken on each switch in connecting the two together (this can be a direct connection or a connection via a PoE switch, as shown in the following diagram).
- In a system that contains multiple PoE+ switches, the sync master must be a camera or a Lock unit that is connected to the primary PoE+ switch.
- If the system includes three or more PoE+ switches; or two or more PoE+ switches and a Lock; or two or more Vue video cameras, a Gigabit PoE+ with a 10 GbE uplink is required. Note that:
  - A Lock unit (connected directly to the Gigabit PoE+ switch) takes up one port of the Gigabit PoE+ switch.
  - Vicon optical cameras take up one port of a PoE+ switch, which is connected to one port of the Gigabit PoE+ switch.
  - Each Vicon video camera takes up one port on a Gigabit PoE+ switch, but in most cases, you will also need to use one of the uplinks to carry video data between the PC and the switch (see the following diagram).

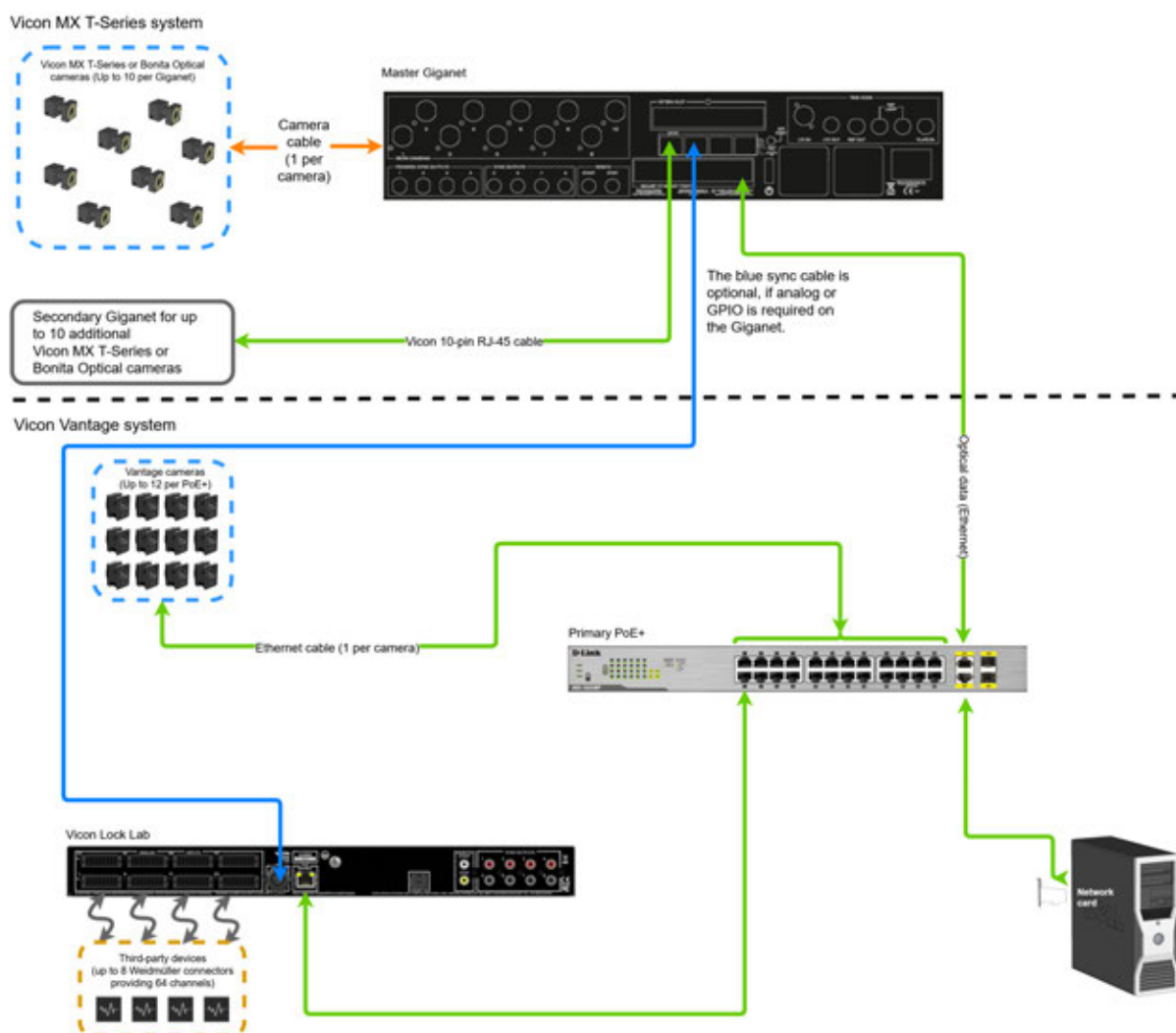


This diagram shows an example of an extended system.



## Integrated Vicon Vantage system (with MX T-Series)

An integrated Vicon Vantage system contains components from MX T-Series systems. You leave the old system as it was and connect the new Vantage system into one of the Gigabit Ethernet ports of the MX Giganet. The primary MX Giganet provides all data communications with any secondary MX Giganets and the new Vantage system. An example integrated Vantage system, with an MX Giganet and T-series cameras, is shown in the following diagram.



For details on setting up a Vicon Vantage system that is integrated with a MX T-Series system, see [Integrate MX T-Series components into a Vantage system, page 146](#).

For further help with connecting large numbers of Vantage cameras into an MX T-Series/Giganet system, contact [Vicon Support](#)<sup>7</sup>.

<sup>7</sup> <https://www.vicon.com/support>

## Vicon Vantage cameras

The following topics describe the role of Vicon Vantage cameras in a Vantage system, list the available types of cameras, describe their physical structure (including lenses, controls and connectors, and associated strobe units) and explain their functional characteristics.

For more information, see:

- [Vicon Vantage cameras in a Vantage system, page 20](#)
- [Vicon Vantage camera range, page 24](#)
- [Vicon Vantage camera controls and connectors, page 29](#)
- [Vicon Vantage camera strobe units, page 31](#)
- [Vicon Vantage camera lenses, page 37](#)

For technical details of Vicon Vantage cameras, see [Vicon Vantage camera technical specifications, page 159](#).



### Caution

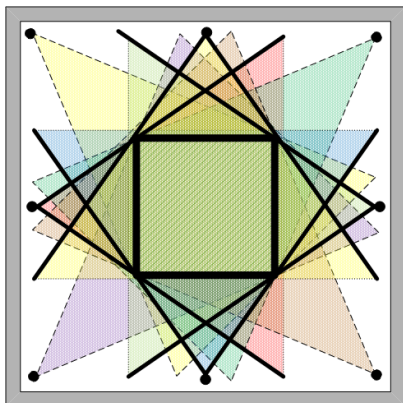
Vicon Vantage cameras contain no user-serviceable components. For all servicing, and any alterations, including lens or strobe change, you must return the camera to Vicon. Any attempt by you or any third party to alter or repair a Vantage camera may invalidate its warranty.

## Vicon Vantage cameras in a Vantage system

Vicon Vantage cameras are purpose-designed motion capture cameras that use multiple high-speed processors to perform real-time proprietary image-processing. When Vicon cameras are set to their normal motion capture mode, they output the movement of Vicon markers, rather than the body to which the markers are attached. This is achieved with the combination of high-powered, narrow-band strobed illumination, retroreflective markers, and a corresponding filter that is tuned to the same wavelength as the strobe. However, to aid setup, Vicon cameras can also be set, one at any one time, to video preview mode. Video preview mode outputs a lower resolution image of the whole scene at approximately 30 fps (the exact rate is the closest multiple of the system frame period). When there is high ambient light, this can aid optimum setup.

Vicon markers are retroreflective spheres that reflect light from the camera strobe units back into the Vicon motion capture cameras. Vicon markers come in a range of sizes that are appropriate for different types of motion capture volumes. The markers are attached to a subject whose motion is to be captured. To obtain accurate results, you must position the markers on the subject at specific anatomical locations. These locations are defined in a Vicon Labeling Skeleton Template (VST) file for a generic type of capture subject or in a calibrated Vicon Labeling Skeleton (VSK) file for a specific capture subject. Your Vicon software documentation describes these files and how you attach markers to your subjects for motion capture in accordance with these files.

You position the cameras around the capture volume to ensure full coverage of the subjects whose motion you will be capturing. Data from at least two cameras is required to produce 3D reconstructions of the Vicon markers, so ensure that the placement and orientation of all cameras results in multiple cameras aimed at the same region of the capture volume, as shown in this diagram.



Camera positions will depend on your volume size, camera type, and camera lens. Remember to include height as well as width and depth in your volume calculations.

Depending on your capture requirements, you may choose to mount the cameras on tripods for floor-based cameras or on a clamp and truss on speed rails for raised cameras.

For more information, see also:

- [Vicon Vantage accelerometer, page 22](#)
- [Vicon Vantage temperature sensors, page 23](#)
- [Vicon Vantage camera performance, page 23](#)

## Vicon Vantage accelerometer

Each camera is fitted with an accelerometer which has several purposes:

- Before the system is calibrated, you can tap the camera to alert the Vicon application software that you are setting up that particular camera. The software then responds accordingly.
- After the system has been calibrated, if the camera is accidentally knocked or bumped, an alert is sent to the Vicon application software so that you can take the appropriate action. You can change how hard the camera has to be knocked to cause it to report a bump by altering the **Bump Detection Sensitivity** control in the Vicon application software.
- The accelerometer also determines the orientation of the images in the OLED display.

Note the following limitations of bump detection:

- Bump detection is active only on calibrated cameras.
- Bump detection cannot detect movement that does not change the gravity vector, for example, slow translation with no rotation.
- Bump detection cannot detect movements that occur when the camera is not connected to a live system.
- The camera is detected as bumped when the reading from the accelerometer is sufficiently different from the last reading. Gradual changes (for example, a slipping camera mount) may not be detected until there is enough of a change to trigger a new notification.

## Vicon Vantage temperature sensors

Electronic temperature sensors in the camera body and strobe relay information back to the Vicon application software. This lets the user of the software know when the system has stabilized and that the system is ready for calibrating. If a problem occurs due to overheating, which is caused by too high an ambient temperature, the Vicon application software can inform the user of a potential problem.

You can change the required temperature range in the Vicon application software.



### Caution

To avoid overheating, ensure that the environment in which the cameras are used is well-ventilated.

## Vicon Vantage camera performance

Vicon Vantage cameras evaluate an entire image in grayscale, rather than applying a black and white threshold. This provides more information and increases motion measurement accuracy over an equivalent resolution black and white camera. The Vicon Vantage cameras perform the majority of data processing. They generate grayscale blobs from the retro-reflective markers in the capture volume and then use centroid-fitting algorithms to determine their accurate centers, or collate the whole grayscale data if the markers are deemed to be merged. This camera data is sent to the Vicon application software for further processing and viewing. For details, see your Vicon software documentation.

A number of factors affect the overall performance of your Vantage system. These include camera resolution, number of cameras, capture rate, and number of markers/subjects captured. All of these factors impact the overall data rate of your system and may affect the specification required for your Vicon Vantage host PC. Understanding the expected data rate can also help to inform you whether a standard single Gigabit Ethernet connection is sufficient or whether a configuration that involves link aggregation may be preferable.

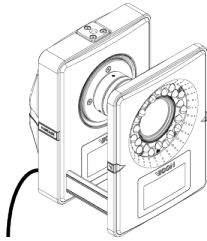
You can specify the required frame rate in your Vicon application software on the Vicon Vantage host PC. Your Vicon application software remembers this setting and re-applies it on power up or from reset. You can also configure the buffering of camera data at the time of capture. For details, see your Vicon software documentation.

For a comparison of the performance of the models in the Vicon Vantage range of cameras, see [Vicon Vantage camera performance comparison, page 26](#).

## Vicon Vantage camera range

Vicon Vantage systems can include any of the Vantage range of proprietary Vicon motion capture cameras: V16, V8, and V5, as well as other current Vicon cameras (optical and video). Vantage cameras also work with MX T-Series cameras.

The camera hardware design consists of a camera body, a strobe head unit, a lens, optical filter, and cable, as shown in the following image.



For more information, see:

- [Vicon Vantage camera resolutions, page 25](#)
- [Vicon Vantage camera performance comparison, page 26](#)



## Vicon Vantage camera resolutions

A single hardware design is built with different types of sensors and lenses to create a range of cameras with different resolutions, as shown in the following table.

Camera	Lens	Resolution
V16	Vicon 18mm / 12.5mm	16 Megapixels
V8	1° C-Mount 12.5mm	8 Megapixels
V5	1° C-Mount 12.5mm / 2/3" C-Mount 8.5mm	5 Megapixels

All Vantage cameras are fitted with sensitive solid-state sensors and are purpose-built to provide high-speed, low-latency motion capture. Vicon applies stringent checks to its cameras for linearity, sensitivity, and absence of jitter.

Different types of strobe units can be attached to cameras to suit specific studio, laboratory, or research unit capture volumes. For further details, see [Vicon Vantage camera strobe units, page 31](#).



### Caution

Vicon Vantage cameras contain no user-serviceable components. For all servicing, and any alterations, including lens or strobe change, you must return the camera to Vicon. Any attempt by you or any third party to alter or repair a Vantage camera may invalidate its warranty.

You can combine the various models of Vicon Vantage cameras within a single Vantage system to meet your application requirements for resolution and/or coverage. The V16 camera offers the highest resolution of the Vicon Vantage cameras. The V8 and V5 cameras can provide higher camera counts within a fixed budget, giving increased coverage.

## Vicon Vantage camera performance comparison

Each Vicon Vantage camera is programmed with firmware to control its operation and to enable it to perform its own onboard grayscale processing. As all Vantage cameras use the same firmware, a mix of Vantage cameras with different image sensors can be connected to and run on the same system. The Vantage system automatically recognizes cameras when they are plugged in. A distributed architecture enables the camera software to be updated across the system network.

With Vantage+ firmware, you can choose the mode (default or high-speed) in which to run Vantage cameras by selecting the relevant option in your Vicon application software (for details, see your Vicon software documentation).

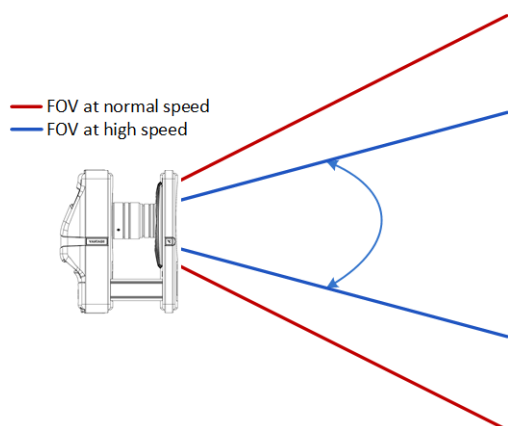
- [Default mode, page 27](#)
- [High-speed mode, page 28](#)

## Default mode

The following table illustrates the performance of each Vantage camera type running in default mode. For full details, see [Vicon Vantage camera technical specifications, page 159](#).

Model	V16	V8	V5
Sensor resolution H x V (pixels)	4096 x 4096	3328 x 2432	2432 x 2048
Sensor size H x V (mm)	18.43 H x 18.43 V26.06 (diagonal)	14.8 H x 10.9 V18.38 (diagonal)	10.94 H x 9.22 V14.31 (diagonal)
Maximum frame rate (fps) at full resolution	120	260	420

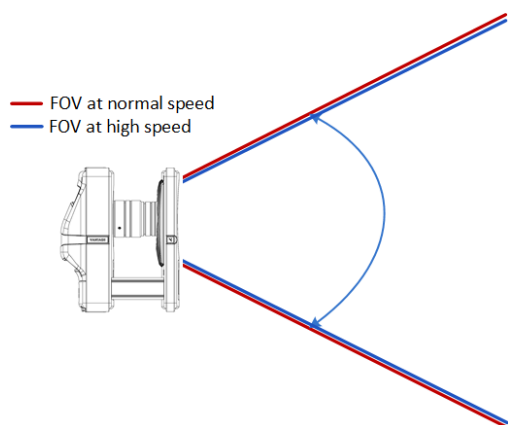
If you select a frame rate that is higher than the maximum listed in the table above, Vicon Vantage cameras use windowing. While the resolution is maintained, the the field of view (FOV) is reduced.



For information on increasing the frame rate without reducing the FOV, see [High-speed mode, page 28](#).

## High-speed mode

In high-speed mode, subsampling (selectively reducing the pixel count) enables increased frame rates with no (or minimal) reduction in the field of view (FOV). While the FOV is maintained, the resolution is reduced. Data accuracy and camera range are also slightly decreased.



The following table illustrates the performance (fps and resolution) of each Vantage camera type running in high-speed mode at the maximum speed at which the field of view is unaffected.

Model	V16	V8	V5
Maximum frame rate (fps) with unaffected FOV	500	900	1060
Resolution (MP)	4.2	2.2	1.8

The following table illustrates the performance of V8 and V5 cameras running in high-speed mode at commonly used speeds, with minimal change in the field of view.

Model	V8	V5
Frame rate (fps)	1000	1200
Resolution (megapixels)	1.8	1
FOV (H) Delta	0	0
FOV (V) Delta	-9.5	-11.3

## Vicon Vantage camera controls and connectors

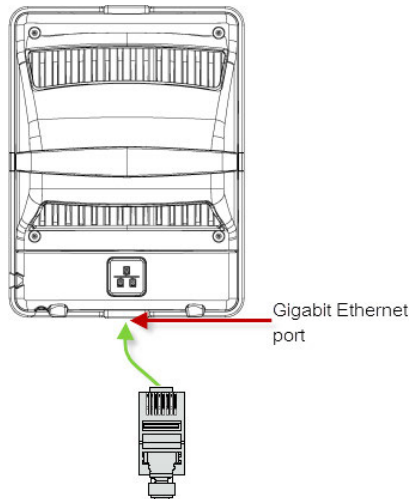
This section describes the physical structure of Vicon Vantage cameras and their connection to a Vicon-supplied PoE+ switch.

For more information, see:

- [Camera rear panel, page 29](#)
- [Tripod mount, page 30](#)

### Camera rear panel

The following image shows the camera connection beneath the rear panel of a Vicon Vantage camera for connecting to a PoE+ switch.



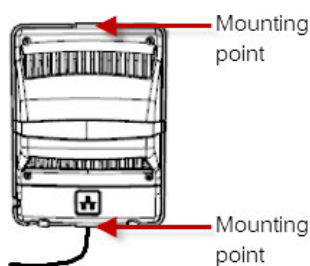
The following single connection point is beneath the rear panel:

- Gigabit Ethernet port  
RJ-45 socket. Held in the housing mechanism, a Vicon-supplied Cat 5e RJ45 Ethernet cable connects the Vicon Vantage camera to a PoE+ switch. The cable carries power, all data communications and sync.

## Tripod mount

Both the underside and the top of the camera body contain mounting points, which have ¼" 20 UNC threaded holes. These are designed to match the common thread found on most tripod and wall mount fixing screws.

An optional mounting bracket that fits between the two mounting points is also available. This enables the camera to be mounted in various ways, for optimum positioning. It also provides a convenient way of handling the camera, avoiding touching the heat sinks, which may become warm during camera operation.



### Caution

For safety and optimum performance, Vicon recommends that you use only stable tripods and wall mounts. For recommendations, contact your local Vicon office.

## Vicon Vantage camera strobe units

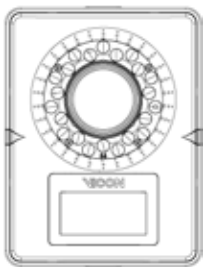
The strobe unit on the front of a Vicon Vantage camera uses very powerful surface-mounted light-emitting diodes (LEDs) to illuminate the capture volume. The standard LEDs fitted to Vicon Vantage camera strobe units emit infrared (IR) light at 850nm. This is only slightly visible to the naked eye in very dark surroundings. For information about other LED wavelengths, please contact Vicon Sales or your nearest agent or distributor.

In your Vicon application software on the Vicon Vantage host PC, you can set each camera's strobe duration individually or set all the camera strobes together. From then on, your Vicon application software remembers these settings and re-applies them on power up or from reset.



### Warning

Do not look directly at the source when an Infrared (IR) strobe unit is in operation.



The strobe unit emits a powerful flash of light once per video frame at precisely the same time as the image sensor's global electronic shutter opens. This flash illuminates the retroreflective markers attached to the motion capture subject. The reflected light passes back through the lens and optical filter. The spectral characteristics of the filter ensure that only light with the same wavelength as the LEDs passes back into the camera.

In the camera, the lens collects the light and forms a focused image of the markers on the camera's image sensor plane. The camera electronically converts the pattern of light into data that ultimately represents the position and radius of each marker in the image. For more information on the filters and lenses supplied, see [Vicon Vantage camera lenses, page 37](#).



### Tip

When the cameras are used outdoors, try to position the cameras to minimize the ambient light as the filter cannot distinguish ambient light of the same wavelength as that of the strobe.

To match and therefore optimize the field of view of the light from the LEDs to that of the lens and therefore the capture volume, secondary optics fit over the LEDs. Each LED effectively sits inside its own secondary lens. This converts the natural wider field of illumination of the LED to that of the fitted lens. In this way the same strobe can be optimized to different lenses through different secondary optics. For more information, see [Field of View, page 37](#).

**Caution**

Vicon Vantage cameras contain no user-serviceable components. For all servicing, and any alterations, including lens or strobe change, you must return the camera to Vicon. Any attempt by you or any third party to alter or repair a Vantage camera may invalidate its warranty.

For more information, see:

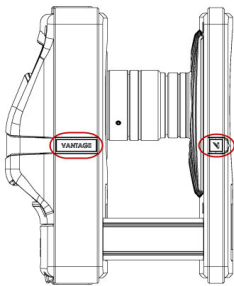
- [Strobe unit and camera status LEDs, page 33](#)
- [OLED display, page 34](#)



## Strobe unit and camera status LEDs

Two pairs of tri-color LEDs provide feedback on camera operation. One pair is situated on either side of the camera, and the second pair is situated on either side of the strobe. All four LEDs operate simultaneously, and display the same color at the same time. These status LEDs can be disabled through the Vicon application software.

**Note**  
In certain camera modes and in certain system configurations, the status LEDs on the camera are automatically turned off to ensure maximum power is available to the strobe.



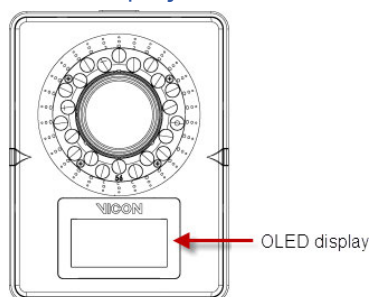
While the camera is booting, the OLED display shows the Vicon logo (unless a connected application causes it to display something else) and the status LED color changes from magenta during booting, to red when booting is complete.



When the cameras are communicating with Vicon application software, the status LEDs turn blue.


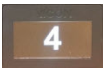


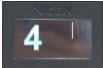

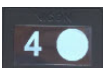

After the camera has booted, you can view the cameras' status by observing the status LEDs and the OLED display on each camera), and also by monitoring the cameras in the Vicon application software. For information on the significance of the status LEDs' colors in combination with the symbols on the OLED display, see [OLED display, page 34](#).

## OLED display













The OLED display comprises 128 x 64 alphanumeric characters, which, combined with the LED color, give information about the current camera status.

As shown in the following table, when the camera has booted, and unless the display has been disabled in the Vicon application software, the display shows the camera number. Other common display states are also shown.

Display	Description	Camera status
	Vicon logo	Booting
	Camera number	Booted
	Camera number and bumped icon	Bumped
	Camera number and disabled icon	Disabled
	Camera number and start calibration icon	Calibration started
	Camera number and pie chart	Calibration in progress
	Camera number and complete pie chart	Calibration complete
	Display turned off in Vicon application software	NA

Additional information is available when you view the OLED display in combination with the color of the status LEDs. (Note that the status LED colors listed below are subject to change.)

Display	Status LED color	Status
	Blue	Enabled (default)
	Red	Not contributing
	Red (flashing)	Bumped
	Off	Disabled
	Magenta	Selected
	Off	Calibration (Wand count == 0) (The start calibration icon indicates that calibration has started.)
	Magenta (flashing, period decreases with wand count)	Calibration (0 < Wand count < Required wands) The pie chart indicates the fraction of the required wands that have been received from this camera.

Display	Status LED color	Status
	Green	Calibration (Wand count >= Required wands)
	Cyan	Automasking
	Off	Status LEDs disabled

The order of priority is from top of the above table (lowest) to bottom (highest), so that the LEDs for a camera that is both bumped and selected are magenta.

Unless accelerometry is switched off in the Vicon application software, the image on the display rotates based on the orientation of the camera.



## Vicon Vantage camera lenses

The function of the camera lens is to collect reflected light from a scene and to form a focused image on the camera's sensor plane. The lenses that have been chosen and fitted to your Vicon Vantage cameras offer optimal data quality and provide several view angle choices/options that are appropriate for your requirements. The type of lens that will provide optimum performance for a particular application depends on factors such as the field of view (FOV), image circle, aperture and depth of field, and any lens filter fitted. For descriptions of these, see [Camera lens characteristics, page 38](#), which is included to provide you with a basic understanding of the most important functional lens characteristics.

The proprietary Vicon lenses designed for Vicon Vantage cameras have been custom-built for motion capture. They have a large image circle to ensure that the entire image—not just the center—is evenly illuminated. Other C-Mount lenses recommended for Vantage cameras have been selected based on this criteria for image format size suitable for high-resolution sensors.

Other commercially available lenses are not necessarily designed to work with high resolution cameras; they tend to have a limited resolving power, and are more suitable for sensors with a resolution of less than two megapixels. As a result, when capturing with markers close together, the lens can have difficulty resolving the gap between the markers, causing merging even when the focus is optimal. For further details of Vantage camera lens specifications, see [Vicon Vantage camera technical specifications, page 159](#).



### Caution

Vicon Vantage cameras contain no user-serviceable components. For all servicing, and any alterations, including lens or strobe change, you must return the camera to Vicon. Any attempt by you or any third party to alter or repair a Vantage camera may invalidate its warranty.

## Camera lens characteristics

The following topics describe the factors that affect lens types:

- [Field of View, page 38](#)
- [Image circle, page 39](#)
- [Aperture and depth of field, page 41](#)
- [Camera lens filters, page 42](#)

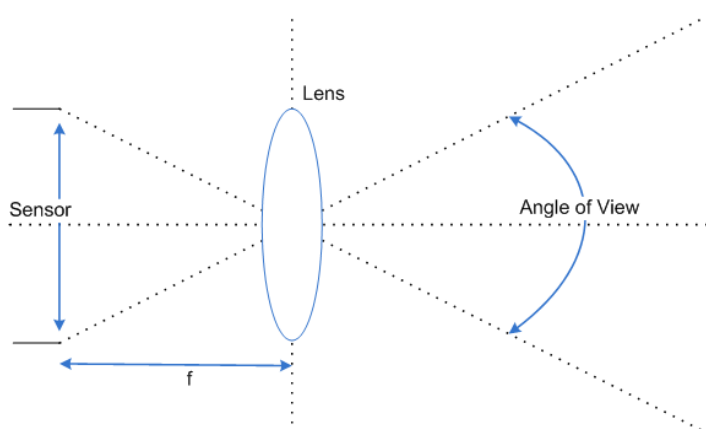
## Field of View

The most important factor that distinguishes Vicon Vantage camera lenses is the total area that the camera can see. This is called the Field of View (FOV).

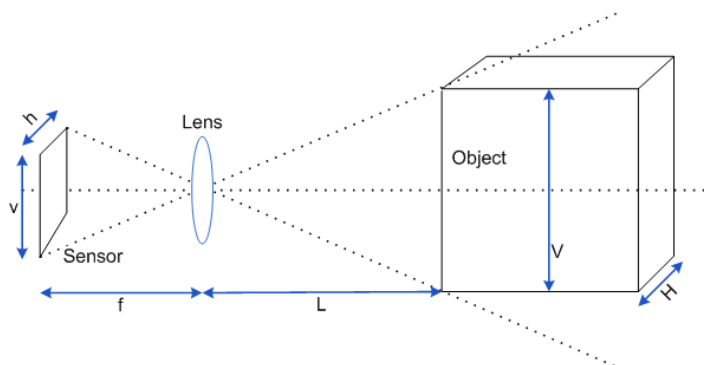
The scene that comprises the FOV has horizontal width (H) and vertical height (V). Knowing the distance (L) between the camera and a plane that defines the total FOV helps to select the type of lens to meet a particular application.

Lenses are described in terms of their focal length (f), defined as the distance in millimeters that the center of the lens must be from the sensor plane surface to project a sharp image on the sensor. The focal length of a lens is often given on the body of the lens or around the surround of the glass element at the front of the lens as well as in the lens documentation and packaging.

The focal length determines the angle of view (AOV) through the lens, as shown in the following diagram:



Normally, the AOV is calculated based on the known focal length and sensor size. This in turn determines the FOV, based on the distance ( $L$ ) to the object being captured, as shown in the following diagram.

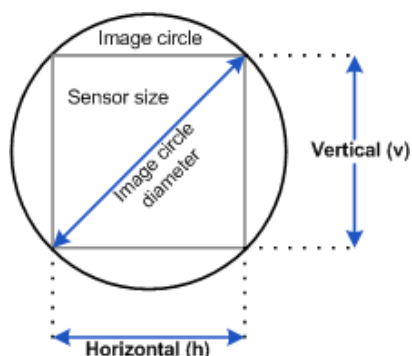


The sensor area used for capturing data through each Vicon Vantage camera determines the maximum FOV available for a particular combination of camera and lens. The area of the sensor is determined by its horizontal width ( $h$ ) and vertical height ( $v$ ).

The capture frame rate for each Vicon Vantage camera can be configured in the Vicon application software. The configured frame rate will also affect the field of view. Higher camera frame rates may make windowing of the sensor necessary, such that the sensor area used for capture is reduced in comparison to lower camera frame rates. For full details, see [Vicon Vantage camera technical specifications, page 159](#). If you are using Vantage+ firmware or later, you can also select [High Speed mode, page 28](#) in your Vicon application software to increase the camera frame rate with little or no reduction in the field of view.

## Image circle

Another characteristic of the camera sensor is the image circle. This is the sharp circular image that the camera lens casts onto the sensor, as shown in the following image.



The diameter of this image circle is the maximum area of usable quality image that the lens can produce. Most lenses produce their best image at the center of the lens, dropping off in performance towards the outer extremes of the lens. This results in a gradual darkening towards the edges of the image, known as vignetting. Vignetting gets worse for wider angle lenses and for wider open apertures, but the area at which vignetting starts to occur depends on the lens.

Thus, for optimum performance, the image circle projected should be larger than the sensor area used by the camera. This ensures that the entire sensor is utilized and eliminates the fall-off of light that occurs towards the edge of the image circle. If the image circle of a lens is too small for the sensor size, then the camera image around the edges and corners is lost. Vicon Vantage cameras are fitted with lenses that have an appropriately sized image circle for the sensor.



### Caution

Vicon Vantage cameras contain no user-serviceable components. For all servicing, and any alterations, including lens or strobe change, you must return the camera to Vicon. Any attempt by you or any third party to alter or repair a Vantage camera may invalidate its warranty.

The relationship between image circle (sensor size) and lens defines two of the most important optical properties: Field of View and Angle of View.

The following table gives the formulae used to calculate the angle of view (AOV) and field of view (FOV) for camera and lens combinations. These formulae require the dimensions of the sensor area used for each of the Vantage cameras at different frequencies.

Horizontal AOV (°)	Vertical AOV (°)	Horizontal FOV Width H (m)	Vertical FOV Height V (m)
$2 \times \tan^{-1} (h/2f)$	$2 \times \tan^{-1} (v/2f)$	$h \times L/f$	$v \times L/f$

where:

f = focal length of the lens (mm)

h = horizontal width of sensor (mm)

v = vertical height of sensor (mm)

L = distance from the lens to the object (m)

For sensor size details, see [Vicon Vantage camera range, page 24](#).



As an example, consider a Vantage V16 camera with an 18mm lens operating at 120fps at a distance of 9m from the target markers. Given the V16 sensor size (18.43mm (H), 18.43mm (V)), you would calculate:

Horizontal AOV:	$2 \times \tan^{-1} (18.43/(2 * 18)) = 54.22^\circ$
Vertical AOV:	$2 \times \tan^{-1} (18.43/(2 * 18)) = 54.22^\circ$
Horizontal FOV at 9m:	$0.0183 \times (9/0.018) = 9.15 \text{ m}$
Vertical FOV at 9m:	$0.0183 \times (9/0.018) = 9.15 \text{ m}$



### Important

These formulae take into account only the optical components of the camera and lens, thus they calculate the maximum possible theoretical Field of View from this combination. Poor illumination of the volume by camera strobes, less than optimal aperture or gain settings, or poor marker surface quality might all reduce the FOV in which a camera can recognize a marker below this maximum theoretical level.

When using these formulae, note that for frame rates above the full-resolution rates given for Vantage cameras in [Vicon Vantage camera performance comparison, page 26](#), the sensor area is reduced due to windowing, as described in [Field of View, page 38](#).

## Aperture and depth of field

Another significant factor that differentiates lens types is the aperture (also known as the f-stop value, f-number, and F#).

The aperture is the ratio of the focal length of the lens to the diameter of the lens opening, which determines the amount of light that can pass through the lens. Smaller f-stop values (e.g. f2, f2.8) represent wider apertures that allow more light to pass through, while larger f-stop values (e.g. f11, f16, f22) represent narrower apertures that allow less light to pass through. Typically, faster lenses have larger diameter optics that can pass more light.

Each f-stop value changes the lens opening from the next f-stop by a factor of 2. For example, decreasing the aperture from f11 to f8 allows twice as much light to pass through. Increasing the aperture from f11 to f16 allows half as much light to pass through.

The aperture and magnification affect the depth of field, that is, the portion of the image that has sharp focus. Immediately surrounding this area, there is a region in which the image remains in focus. Outside of this area, moving towards or away from the lens, the focus becomes progressively less sharp and the image appears out of focus. Thus, as the aperture and focal length decrease, the depth of field increases. Conversely, as the aperture and focal length increase, the depth of field decreases.

## Camera lens filters

To optimize the performance of the Vantage cameras, each lens is fitted with an optical filter that attenuates wavelengths of light other than the narrow passband required to pass the light emitted by the light-emitting diodes (LEDs) from the Vantage strobe unit and reflected back from the markers to the camera.



### Tip

When the cameras are used outdoors, try to position the cameras to minimize the ambient light as the filter cannot distinguish ambient light of the same wavelength as that of the strobe.

## Vicon Lock connectivity units

The following topics describe the role of the Vicon Lock in a Vicon Vantage system and its physical structure (including controls and connectors), and explain its functional characteristics.

- [Vicon Lock in a Vicon Vantage system, page 44](#)
- [Vicon Lock front panel, page 46](#)
- [Vicon Lock rear panel, page 47](#)

For a brief introduction to Vicon Lock and instructions on setting up a Lock for the first time, see the PDF *Quick Start Guide* that was supplied with your Vicon Lock and can also be downloaded.



### Note

Except where noted, 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+, Vicon Lock Studio and Vicon Lock Lab).

## Vicon Lock in a Vicon Vantage system

Vicon Vantage and other current Vicon cameras can synchronize themselves over their Ethernet network. A Vicon Lock unit provides additional synchronization in systems that use Vicon Vantage and other current Vicon capture cameras. The Lock unit can synchronize all Vicon cameras as well as being able to synchronize to external sources itself, and also to provide synchronization to third-party devices.



### Note

Except where noted, 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+, Vicon Lock Studio and Vicon Lock Lab).

A Lock unit provides the following functionality in a Vicon Vantage system:

- Synchronization to connected Vicon cameras.
- Interface between the Vicon system and third-party analog sources for capture, such as force plates, electromyography (EMG) equipment, and other analog devices. (Lock, Lock+ and Lock Lab only)
- Synchronization/trigger out functionality for up to eight third-party peripheral devices.
- Interface to external hardware to allow remote data capture by the Vicon system.
- Synchronizes to external industry-standard video sources as used by the broadcast industry. (Lock, Lock+ and Lock Studio only)
- Triggers capture and timestamps captured data in accordance with the input timecode, LTC and VITC. (Lock, Lock+ and Lock Studio only)
- Synchronizes to VESA Stereo source signals used in stereoscopic vision systems. (Lock+, Lock Studio and Lock Lab only)
- VESA stereo output used to synchronize multi-GPU display walls. (Lock Studio only)
- Synchronizes to SDI broadcast digital video signals (Lock Studio only)
- Synchronization to Vicon MX T-Series–Giganet systems.
- Synchronizes to another Lock.



### Important

Synchronization and remote triggering functionality are application-dependent. For details of supported functionality, see your Vicon application software documentation.

Systems that require Lock functionality generally only require one Lock unit. However, if additional functionality is required, you can add a further unit.

When connecting a second Lock:

- If possible, connect both devices to the primary PoE+ switch via an additional Gigabit PoE+ switch.
- If one Lock connects to a broadcast genlock or VESA genlock device, this is the primary Lock and must connect to the primary PoE+ switch.
- If neither one of the Lock units is connected to a genlock source, both must connect to the primary PoE+ switch.

The Lock unit connects to the Vicon system (via a Gigabit PoE+ switch) to the PoE+ switch. All data, power, and camera synchronization are carried over this Gigabit Ethernet interface. The unit does not function over 100 baseT PoE. For more information, see [Extended Vicon Vantage system \(add cameras and third-party devices\)](#), page 16.

In any system that contains a Lock unit, the Lock is automatically made the sync master by the system application software. This is also the case when connecting to an MX T-Series–Giganet system. Lock can also synchronize with other video systems.

The Lock unit is 1U high and can be rack-, wall-, or floor-mounted and stacked either horizontally or vertically. The unit contains no convection fans, but it should still be sited so that it is not overheated by other external equipment.

## Vicon Lock front panel

The following illustration shows the front panel of a Lock unit:



**Note**  
 Except where noted, 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+, Vicon Lock Studio and Vicon Lock Lab).

The Vicon logo illuminates to indicate that it is receiving power via PoE. When the unit is switched on, the color changes to reflect the state of the boot cycle:

Color	Status
Red	Booting
Green	Booted but not connected
Blue	Communicating with software
Cyan	Lock selected in software

The unit contains no switch, so to turn off the power, either disconnect the RJ45 Ethernet cable or switch off the connected PoE+ switch.

## Vicon Lock rear panel

The rear panel of the Vicon Lock contains all the connectivity to third-party peripherals, PoE, and for synchronizing to other Lock and MX Giganet units.

In Vicon Vantage documentation, the terms socket and plug are used for female and male connectors respectively.



### Note

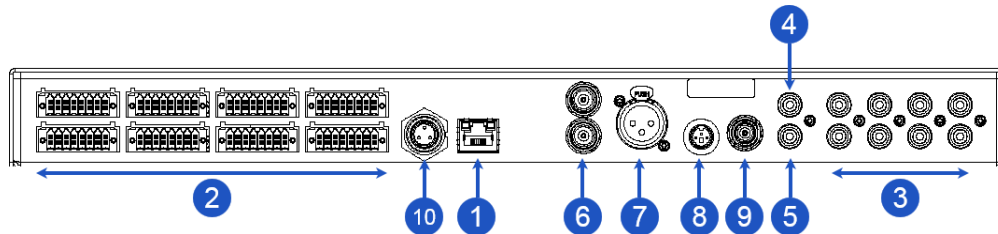
Except where noted, references to Vicon Lock, Lock units, and Lock apply to all current models of the Vicon Lock unit (at the time of publication, this includes Vicon Lock+, Vicon Lock Studio and Vicon Lock Lab).

For details of the connectors for Lock, Lock+ and Lock Studio see the following topics and/or the *Quick Start Guide* that was supplied with your connectivity unit (the current PDFs are also available for download).

- [Vicon Lock+ rear panel, page 48](#)
- [Vicon Lock Studio rear panel, page 52](#)
- [Vicon Lock Lab rear panel, page 56](#)

## Vicon Lock+ rear panel

The following illustration shows the Lock+ rear panel connectors.



In Vicon Vantage documentation, the terms socket and plug are used for female and male connectors respectively.

For additional details of the connectors, see the *Lock+ Quick Start Guide* that is supplied with Lock+ and is available for download.

## Lock+ rear panel connectors

- [PoE Gigabit connector, page 49](#)
- [Analog input connectors, page 49](#)
- [Sync output connectors, page 49](#)
- [Remote start/stop connectors, page 49](#)
- [Genlock and timecode connectors, page 50](#)
- [Link Input/Output \(IO\) connectors, page 51](#)

For information on all interfacing cables, see [Vicon Vantage system cables, page 67](#).



## PoE Gigabit connector

The Gigabit Ethernet Port 8-pin RJ-45 socket **1** connects to an appropriate Vicon-supplied 10 GbE PoE+ switch that is also connected to Vicon Vantage/Vero cameras and the Vicon Host PC directly, or through further switches. For more information, see [Example Vicon Vantage systems, page 14](#).

As well as carrying all the communications to the appropriate Vicon software, the Lock+ also receives its power over the same connections. Additionally, this port also transmits synchronization and time-stamping through special Ethernet packets to all other connected Vicon peripherals.

## Analog input connectors

Vicon Lock+ provides 64 channels of analog signal capture **2**, made up from eight separate connectors, each carrying eight signals. (The older model, Vicon Lock, provides 32 channels, made up from four connectors.) Each connector can be portioned to connect to individual force plates. Each connector contains 16 individual connections, eight signal and their eight respective grounds.

Data from third-party devices such as force plates, electromyography (EMG) equipment, potentiometers, and accelerometers can be captured and synchronized to the video capture data. The connectors supplied are used to interface to these third-party devices. Pre-configured cables can also be supplied separately for the more common force plate interfaces (for more information on suitable cables, see [Vicon Vantage system cables, page 67](#)).

For more information on including analog capture devices in your Vicon Vantage system, see [Add analog capture devices to a Vantage system, page 104](#). For information on configuring your system for analog data capture, see the documentation for your Vicon software.

## Sync output connectors

Eight RCA sockets **3** provide sync outputs to external third-party devices for synchronizing to the Vicon Vantage system.

Each sync output consists of a configurable TTL-type drive signal which is set up through the appropriate Vicon application software. Each output can be configured individually.

There are two signal types, one for repetitive signals and one for the duration of capture. A typical signal configuration for a repetitive signal allows for a signal at frame rate or multiples and sub-multiples of the Vantage system capture frame rate to be set up. A duration event allows the signal to be active during the capture period. Both signal type setups allow for a delay of up to one frame to be programmed and the setting of the polarity of the signal. The mark space ratio can be set with the former type. For more information, see [Add synchronized output devices to a Vantage system, page 108](#).

## Remote start/stop connectors

To trigger capture by the Vicon Vantage system from a remote control device, you must configure your Vicon Vantage software to use the device connected to the Remote Start and Stop sockets; for details on doing this, see the documentation for your Vicon software. For details on enabling third-

party remote devices to trigger your Vicon system, see [Add remote triggering devices to a Vantage system, page 128](#).

- **Remote start** This RCA socket **4** provides the external input for the start of capture, which can be activated by momentarily connecting this input to ground through either a mechanical or electronic switch. Capture is started on the first frame boundary after this event is detected.
- **Remote stop** This RCA socket **5** provides the external input for stopping capture, which can be activated by momentarily connecting this input to ground through either a mechanical or electronic switch. Capture is stopped on the first frame boundary after this event is detected.

## Genlock and timecode connectors

For details on using external Genlock and Timecode devices to synchronize your Vicon Vantage system to an external video system, see [Add genlock/timecode devices to a Vantage system, page 132](#).


- **Ref Loop (Composite Video)** Two BNC sockets **6** provide loop-through connection to an external composite video signal, which may carry VITC (Vertical Interval Timecode), thus allowing genlocking. This video source is usually referred to as the house reference or the master video source. This connection allows Lock to synchronize to analog SD (standard definition) bi-level and analog HD (high definition) tri-sync video sources. Note that VITC is only supported by the former.

### Important

If the Vicon Lock is the only device, or the last device in the chain, the Ref Loop connection that is not being used for signal output must be terminated using a 75  $\Omega$  (ohm) terminator.

- **LTC In** The XLR socket **7** provides the balanced input for LTC (Longitudinal Time Code) to the Lock. The timecode is only valid when it is correctly frame-aligned to the accompanying analog SD or HD composite video signal.
- **VESA Stereo In** The 3-way, mini-DIN socket **8** provides the input to the VESA Stereo In signal. When selected as the genlock source by the Vicon software, the Lock unit locks to this signal.
- **VESA Stereo Out** **9** Reserved for future use (see [Vicon Lock Studio rear panel, page 52](#)). For details on using external VESA Stereo signal to synchronize your Vicon Vantage system to an external video system, see [Add VESA stereo to a Vantage system, page 142](#).

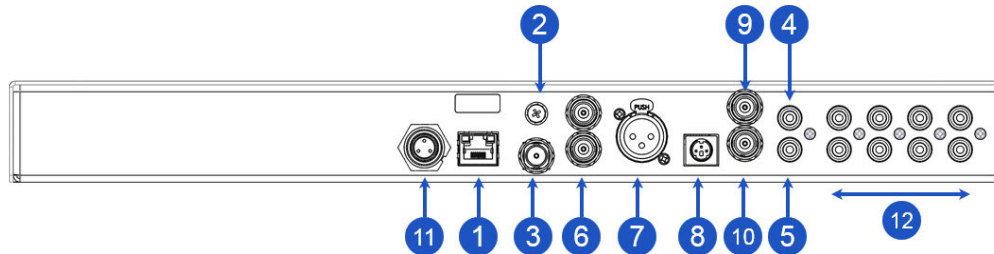
## Link Input/Output (IO) connectors

**Vicon System Connector - Link** The Link socket  provides a dedicated output signal to synchronize MX T-Series–Giganet systems to a Lock+. Alternatively, as well as being able to be made an output it can also be made to be an input under software control. Configured this way, it then enables another Lock unit to be connected to it, thus creating further functionality:

- When connecting to an MX T-Series–Giganet system, the appropriate Vicon software will make the Lock+ the master for the combined system. Any legacy reference video input signal should be transferred to the Lock unit. The master sends the Vicon Ethernet sync and timestamp packet once per frame to all Vicon peripherals attached to that network.
- When expanding a Lock system with a further Lock unit, the Lock with a reference video signal or VESA input signal will be made the sync master by the appropriate Vicon software. In this case the software will control which unit is master and which one is secondary. The secondary unit does not transmit the Vicon Ethernet sync and timestamp packet when acting in this mode.

## Vicon Lock Studio rear panel

The following illustration shows the Lock Studio rear panel connectors.



In Vicon Vantage documentation, the terms socket and plug are used for female and male connectors respectively.

For additional details of the connectors, see the *Lock Studio Quick Start Guide* that is supplied with Lock Studio and is available for download.

## Lock Studio rear panel connectors

- [PoE Gigabit connector, page 53](#)
- [Earthing point, page 53](#)
- [SDI \(Serial Digital Interface\) input, page 53](#)
- [Remote start/stop connectors, page 53](#)
- [Genlock and timecode connectors, page 53](#)
- [Link Input/Output \(IO\) connectors, page 54](#)
- [Sync output connectors, page 55](#)

For information on all interfacing cables, see [Vicon Vantage system cables, page 67](#).

## PoE Gigabit connector

The Gigabit Ethernet Port 8-pin RJ-45 socket **1** connects to an appropriate Vicon-supplied PoE (Power over Ethernet) or PoE+ switch that is also connected to Vicon Vantage/Vero cameras and the Vicon Host PC directly, or through further switches. See [Example Vicon Vantage systems, page 14](#).

As well as carrying all the communications to the appropriate Vicon software, the Lock Studio also receives its power over the same connections. Additionally, this port also transmits synchronization and time-stamping through special Ethernet packets to all other connected Vicon peripherals.

## Earthing point

Dedicated earthing point **2**. Ensure this is used to ground the Lock Studio.



### Important

The earthing point is provided to solve ground loop issues that can degrade signal quality on connections to third-party equipment. It is not intended for earth safety.

## SDI (Serial Digital Interface) input

Fixed 75  $\Omega$  (ohm) terminated BNC input **3** for connecting to Standard Definition (SD), High Definition (HD) and 3G SDI broadcast digital video signals.

Used to genlock to external video broadcast signals and to extract embedded timecode data. Lock Studio can be phased with respect to the selected input broadcast signal in increments of 37 nS through a whole frame period. See also Vicon Lock genlock support information.

## Remote start/stop connectors

To trigger capture by the Vicon Vantage system from a remote control device, you must configure your Vicon Vantage software to use the device connected to the Remote Start and Stop sockets; for details on doing this, see the documentation for your Vicon software. For details on enabling third-party remote devices to trigger your Vicon system, see [Add remote triggering devices to a Vantage system, page 128](#).

- **Remote start** This RCA socket **4** provides the external input for the start of capture, which can be activated by momentarily connecting this input to ground through either a mechanical or electronic switch. Capture is started on the first frame boundary after this event is detected.
- **Remote stop** This RCA socket **5** provides the external input for stopping capture, which can be activated by momentarily connecting this input to ground through either a mechanical or electronic switch. Capture is stopped on the first frame boundary after this event is detected.

## Genlock and timecode connectors

For details on using external Genlock and Timecode devices to synchronize your Vicon Vantage system to an external video system, see [Add genlock/timecode devices to a Vantage system, page 132](#).

- **Ref Loop (Composite Video)** Two BNC sockets **6** provide loop-through connection to an external composite video signal, which may carry VITC (Vertical Interval Timecode), thus allowing genlocking. This video source is usually referred to as the house reference or the master video source. This connection allows Lock to synchronize to analog SD (standard definition) bi-level and analog HD (high definition) tri-sync video sources. Note that VITC is only supported by the former.

### **Important**

If the Vicon Lock Studio is the only device, or the last device in the chain, the Ref Loop connection that is not being used for signal output must be terminated using a 75  $\Omega$  (ohm) terminator.

- **LTC In** The XLR socket **7** provides the balanced input for LTC (Longitudinal Time Code) to the Lock.  
The timecode is only valid when it is correctly frame-aligned to the accompanying analog SD or HD composite video signal.
- **VESA Stereo In** The 3-way, mini-DIN socket **8** provides the input to the VESA Stereo In signal. When selected as the genlock source by the appropriate Vicon software, the Lock unit locks to this signal.
- **LTC Out** The BNC socket **9** enables output of a single-ended LTC signal (23.98, 24, 25, 29.97 and 30 fps) through a 100  $\Omega$  (ohm) resistor.  
The timecode is only valid when it is correctly frame-aligned to the accompanying analog SD or HD composite video signal.
- **VESA Stereo Out** The BNC socket **10** provides a TTL 50:50 duty cycle signal that allows external video systems to lock to the Vicon Vantage system.

For details on using external VESA Stereo signal to synchronize your Vicon Vantage system to an external video system, see [Add VESA stereo to a Vantage system, page 142](#).

## Link Input/Output (IO) connectors

**Vicon System Connector - Link** The Link socket **11** provides a dedicated output signal to synchronize MX T-Series–Giganet systems to a Lock Studio. Alternatively, as well as being able to be made an output it can also be made to be an input under software control. Configured this way, it then enables another Lock unit to be connected to it, thus creating further functionality:

- When connecting to an MX T-Series–Giganet system, the appropriate Vicon software will make the Lock Studio the master for the combined system. Any legacy reference video input signal should be transferred to the Lock unit. The master sends the Vicon Ethernet sync and timestamp packet once per frame to all Vicon peripherals attached to that network.
- When expanding a Lock system with a further Lock unit, the Lock with a reference video signal or VESA input signal will be made the sync master by the appropriate Vicon software. In this case the software will control which unit is master and which one is secondary. The secondary unit does not transmit the Vicon Ethernet sync and timestamp packet when acting in this mode.

## Sync output connectors

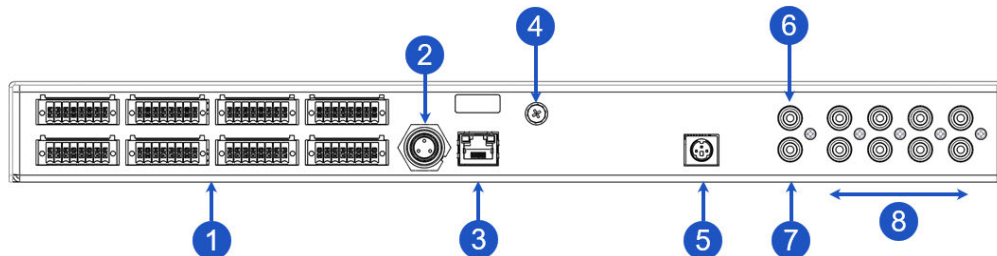
Eight RCA sockets <sup>12</sup> provide sync outputs to external third-party devices for synchronizing to the Vicon Vantage system.

Each sync output consists of a configurable TTL-type drive signal which is set up through the appropriate Vicon application software. Each output can be configured individually.

There are two signal types, one for repetitive signals and one for the duration of capture. A typical signal configuration for a repetitive signal allows for a signal at frame rate or multiples and sub-multiples of the Vantage system capture frame rate to be set up. A duration event allows the signal to be active during the capture period. Both signal type setups allow for a delay of up to one frame to be programmed and the setting of the polarity of the signal. The mark space ratio can be set with the former type. For more information, see [Add synchronized output devices to a Vantage system, page 108](#).

## Vicon Lock Lab rear panel

The following illustration shows the Lock Lab rear panel connectors.



In Vicon Vantage documentation, the terms socket and plug are used for female and male connectors respectively.

For additional details of the connectors, see the *Lock Lab Quick Start Guide* that is supplied with Lock Lab and is available for download.

## Lock Lab rear panel connectors

- [Analog input connectors, page 57](#)
- [Link Input/Output \(IO\) connectors, page 57](#)
- [PoE Gigabit connector, page 57](#)
- [Earthing point, page 58](#)
- [VESA connector, page 58](#)
- [Remote start/stop connectors, page 58](#)
- [Sync output connectors, page 58](#)

For information on all interfacing cables, see [Vicon Vantage system cables, page 67](#).



## Analog input connectors

Vicon Lock Lab provides 64 channels of analog signal capture <sup>1</sup>, made up from eight separate connectors, each carrying eight signals. Each connector can be portioned to connect to individual force plates. Each connector contains 16 individual connections, eight signal and their eight respective grounds.

Data from third-party devices such as force plates, electromyography (EMG) equipment, potentiometers, and accelerometers can be captured and synchronized to the video capture data. The connectors supplied are used to interface to these third-party devices. Pre-configured cables can also be supplied separately for the more common force plate interfaces. For more information on suitable cables, see [Vicon Vantage system cables, page 67](#).

For more information on including analog capture devices in your Vicon Vantage system, see [Add analog capture devices to a Vantage system, page 104](#). For information on configuring your system for analog data capture, see the documentation for your Vicon software.

## Link Input/Output (IO) connectors

**Vicon System Connector - Link** The Link socket <sup>2</sup> provides a dedicated output signal to synchronize MX T-Series–Giganet systems to a Lock Lab. Alternatively, as well as being able to be made an output it can also be made to be an input under software control. Configured this way, it then enables another Lock unit to be connected to it, thus creating further functionality:

- When connecting to an MX T-Series–Giganet system, the appropriate Vicon software will make the Lock Lab the master for the combined system. Any legacy reference video input signal should be transferred to the Lock unit. The master sends the Vicon Ethernet sync and timestamp packet once per frame to all Vicon peripherals attached to that network.
- When expanding a Lock system with a further Lock unit, the Lock with a reference video signal or VESA input signal will be made the sync master by the appropriate Vicon software. In this case the software will control which unit is master and which one is secondary. The secondary unit does not transmit the Vicon Ethernet sync and timestamp packet when acting in this mode.

## PoE Gigabit connector

The Gigabit Ethernet Port 8-pin RJ-45 socket <sup>3</sup> connects to an appropriate Vicon-supplied PoE (Power over Ethernet) or PoE+ switch that is also connected to Vicon Vantage/Vero cameras and the Vicon Host PC directly, or through further switches. For more information, see [Example Vicon Vantage systems, page 14](#).

As well as carrying all the communications to the appropriate Vicon software, the Lock Lab also receives its power over the same connections. Additionally, this port also transmits synchronization and time-stamping through special Ethernet packets to all other connected Vicon peripherals.

## Earthing point

Dedicated earthing point **4**. Ensure this is used to ground the Lock Lab.



### Important

The earthing point is provided to solve ground loop issues that can degrade signal quality on connections to third-party equipment. It is not intended for earth safety.

## VESA connector

- **VESA Stereo In** The 3-way, mini-DIN socket **5** provides the input to the VESA Stereo In signal. When selected as the genlock source by the appropriate Vicon software, the Lock unit locks to this signal.

For details on using external VESA Stereo signal to synchronize your Vicon Vantage system to an external video system, see [Add VESA stereo to a Vantage system, page 142](#).

## Remote start/stop connectors

To trigger capture by the Vicon Vantage system from a remote control device, you must configure your Vicon Vantage software to use the device connected to the Remote Start and Stop sockets; for details on doing this, see the documentation for your Vicon software. For details on enabling third-party remote devices to trigger your Vicon system, see [Add remote triggering devices to a Vantage system, page 128](#).

- **Remote start** This RCA socket **6** provides the external input for the start of capture, which can be activated by momentarily connecting this input to ground through either a mechanical or electronic switch. Capture is started on the first frame boundary after this event is detected.
- **Remote stop** This RCA socket **7** provides the external input for stopping capture, which can be activated by momentarily connecting this input to ground through either a mechanical or electronic switch. Capture is stopped on the first frame boundary after this event is detected.

## Sync output connectors

Eight RCA sockets **8** provide sync outputs to external third-party devices for synchronizing to the Vicon Vantage system.

Each sync output consists of a configurable TTL-type drive signal which is set up through the appropriate Vicon application software. Each output can be configured individually.

There are two signal types, one for repetitive signals and one for the duration of capture. A typical signal configuration for a repetitive signal allows for a signal at frame rate or multiples and sub-multiples of the Vantage system capture frame rate to be set up. A duration event allows the signal to be active during the capture period. Both signal type setups allow for a delay of up to one frame to be programmed and the setting of the polarity of the signal. The mark space ratio can be set with the former type. For more information, see [Add synchronized output devices to a Vantage system, page 108](#).

## Vicon Vantage host PC

The following topics describe the role of the Vicon Vantage host PC in a Vicon Vantage system and describes the ports used to enable communications between the Vicon software installed on this PC and other components in the Vantage system.

For more information, see:

- [Vicon Vantage host PC in a Vantage system, page 60](#)
- [Vicon Vantage host PC connectors, page 61](#)
- [Vicon software on Vicon Vantage host PC, page 66](#)

## Vicon Vantage host PC in a Vantage system

The Vicon Vantage host PC receives data from your Vantage system and runs the Vicon motion capture and analysis software. If your Vantage system includes more than one PoE+ switch, the PoE+ switch connected to the Vicon Vantage host PC is the primary switch. Depending on your system configuration, you may also install additional Vicon hardware, Vicon application software or third-party applications on the same PC or on other, remote PCs in a distributed system. Vicon software is licensed on the Vicon Vantage host PC.

The computer used as the Vicon Vantage host PC in your Vicon Vantage system may be supplied by Vicon, or it may be one that you provide yourself. If you are providing your own PC, the computer specification depends upon your Vantage system and your application requirements. Processor speed and memory are the most important factors for system performance. Hard drive speed and RAM requirements are greater for high camera-count or high marker-count applications. A high-quality graphics card is required for any PC on which you have installed visualization software that makes high graphics demands. For details on minimum requirements for the Vicon Vantage host PC for your Vicon application software, search for PC specification on the [Vicon website](https://www.vicon.com)<sup>8</sup>, or contact [Vicon Support](mailto:support@vicon.com)<sup>9</sup>.



### Important

In all cases, Vicon application software requires a PC with an Intel or AMD processor. Because these processors are used in Vicon development and testing, Vicon applications are optimized for these processor types.

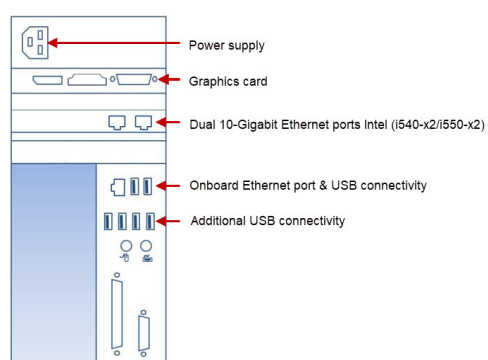
<sup>8</sup> <https://www.vicon.com>

<sup>9</sup> <mailto:support@vicon.com>

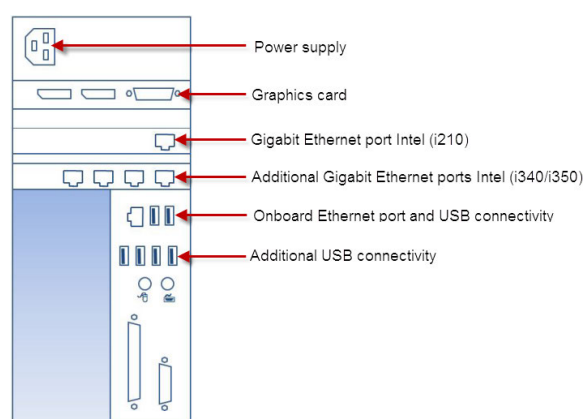
## Vicon Vantage host PC connectors

This section describes the connectors on your Vicon Vantage host PC that you use to connect to other components in your Vicon Vantage system. It does not cover standard connectors for your mouse, keyboard, speakers, etc. The following images show example Vicon Vantage host PCs; the location and type of connectors depends on your PC and the year in which it was obtained. For details, see the documentation supplied with your PC.

Current Vicon host PC



Pre-2020 Vicon host PC



## Vicon Vantage system network ports

A Vicon Vantage system runs on its own dedicated network, rather than being integrated into a general communications network. This Vantage system network uses Gigabit Ethernet communications, so the Vicon Vantage host PC requires an appropriate network adapter card. For details of recommended network cards, search for PC specification on the [Vicon website](https://www.vicon.com)<sup>10</sup>.

Vicon Vantage systems require at least a Gigabit Ethernet card, supporting data transfer rates up to 1000 Mbps. To attain the high-performance of which Vicon Vantage systems are capable, you should use a PCIe network card. This is because most embedded network cards built into PC motherboards cannot manage the network traffic involved when performing measurements at high frame rates with analog at high speed, or capturing high marker counts with many cameras.

You will use this Vantage system network port to connect the Vicon Vantage host PC to the primary PoE+, which controls the data flow between the Vicon Vantage host PC and other devices in the Vantage system.

This section describes the network ports on a Vicon host PC and how to configure them for use with your Vicon application software.



### Tip

If you obtained your Vicon Vantage host PC from Vicon, an appropriate network card will already have been installed, the IP address set, and the Receive Buffers parameter optimized.

Depending on your PC and your intended usage, you may need to configure one or both network ports:

- [PCs with dual 10-Gigabit Ethernet ports, page 62](#)
- [PCs with a single Gigabit Ethernet network port, page 65](#)

## PCs with dual 10-Gigabit Ethernet ports

The current Vicon host PCs have dual 10-Gigabit Ethernet ports. We recommend that if your system includes Vicon Vue video cameras, you should route optical data through one of the two 10 GbE ports and video data through the other (see [Configure a single network port, page 63](#) and [Configure a second network port, page 64](#)).

For examples of systems from simple setups in which data is routed through a single port on the PC to larger systems with multiple Vicon video cameras, in which optical data is routed through one port and video data through the other, see [Add more Vicon Vantage cameras with secondary PoE+ switches, page 95](#). You can find further examples in the Vantage system diagrams on the Vicon documentation website ([docs.vicon.com](https://docs.vicon.com)).

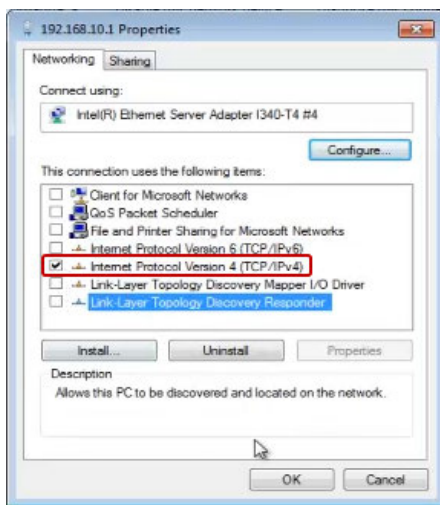
<sup>10</sup> <https://www.vicon.com>

For information on when to add secondary PoE+ switches and when a Gigabit Ethernet PoE+ switch with a 10 GbE uplink is required, see also [Understand when additional PoE+ switches are required](#), page 92.

## Configure a single network port

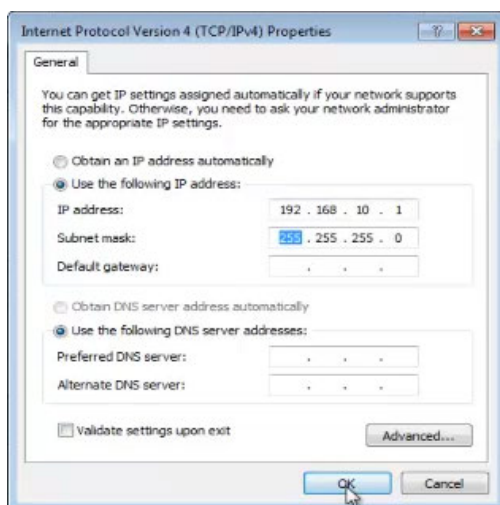
You must configure the Gigabit Ethernet network adapter card for the Vicon Vantage system. To do this:

1. Disable all protocols other than Internet Protocol Version 4 (TCP/IPv4) for this network adapter card.



2. Use the following IP address settings for this network port:

- IP address: 192.168.10.1
- Subnet mask: 255.255.255.0
- Default gateway: Leave blank



### 3. Reboot the Vicon Vantage host PC.

When the system is booted, an IP address in the range 192.168.10.10 to 192.168.10.254 is assigned to each camera via DHCP (Dynamic Host Configuration Protocol), which centrally manages the assignment of IP addresses.

The Vicon Vantage system maintains an internal connection map, which uniquely identifies each IP address with a particular camera. This makes it possible for you to plug active cameras into different ports on the rear of the PoE+ switch without having to recalibrate the cameras. Vicon DHCP will not interact with the DHCP on the local network. This IP address range does not go through routers, so Vicon data and communications traffic do not affect Internet or other network communications.

Data is streamed from the camera to the Vicon Vantage host PC as User Datagram Protocol (UDP) packets. Commands are sent via Telnet to individual cameras or broadcast to all cameras using a proprietary protocol.

If you have installed a PCIe card for this Vantage system network, you must increase the Receive Buffers parameter for each card to its maximum setting to optimize its performance when your Vicon Vantage system is running under high network load.

For more detailed information on configuring network ports for Vicon Vantage systems and Vicon video devices, and for instructions on setting the Receive Buffers parameter, see *Configuring network card settings* or download the PDF *PC Setup for Vicon Systems*.

### Configure a second network port

If your PC has dual 10 GbE ports, like the current Vicon host PCs, and if your system includes video cameras, you can make efficient use of the available resources by routing optical data through one port and video data through the other.

To use the second port for video data, you need to set its IP address. To do this, follow the same procedure as you did for a single network port (see [Configure a single network port, page 63](#)), but set the IP address to 192.168.10.2.

To send video data through the second port, in your Vicon application software, in the Properties pane for each video camera, set the **Destination IP Address** to the same IP address as the second connector (normally 192.168.10.2, as explained above).

For an example of a system where both ports are used in this way, see [Vicon Vantage system with Vicon video cameras., page 102](#)



## PCs with a single Gigabit Ethernet network port

You will typically use the following connectors on your Vicon Vantage host PC:

- [Vicon Vantage system network port, page 65](#)
- [Additional network ports, page 65](#)

## Vicon Vantage system network port

You must configure the Gigabit Ethernet network adapter card for the Vicon Vantage system. To do this, follow the instructions in [Configure a single network port, page 63](#).

## Additional network ports

In addition to the Vicon Vantage system network card, if you need to make any of the following optional connections, you will need to install additional Ethernet network cards in the Vicon Vantage host PC:

- **Local area network (LAN):** A separate, dedicated Ethernet port is required to connect the Vicon Vantage host PC to your LAN.
- **Vicon video cameras:** A second dedicated Ethernet port is required to connect Vicon Vue video cameras.
- **Link aggregation (if required):** Link aggregation is required only for systems that include a large number of cameras.

As the Vantage system is independent of your communications network, no guidance is offered for LAN network cards.

For secondary PoE+ switches or video cameras, to attain the high performance of which Vicon Vantage systems are capable, Vicon recommends that you use a PCIe network card rather than the embedded network card that may be built into the PC motherboard.

When you have installed any PCIe network cards, you must increase the Receive Buffers parameter for each card to its maximum setting to optimize its performance when your Vicon Vantage system is running under high network load.

For details on recommended network cards search for PC specification on the [Vicon website](#)<sup>11</sup>.

For instructions on setting the Receive Buffers parameter, see [Configuring network card settings](#) or download the PDF *PC Setup for Vicon Systems*.

---

<sup>11</sup> <https://www.vicon.com>

## Vicon software on Vicon Vantage host PC

You install your Vicon motion capture and analysis application software on the Vicon Vantage host PC. Vicon produces software for various applications including those in the life sciences, entertainment, and engineering fields. Vicon's software platforms for processing and capturing data include Vicon Nexus, Vicon Shogun and Vicon Tracker.

If you have implemented a distributed Vicon Vantage system architecture or client-server application, you may also have this Vicon motion capture and analysis software, or other Vicon or third-party data visualization, analysis, or manipulation software on a remote PC.

For further details on these Vicon software applications, including the versions providing support for specific Vicon Vantage hardware components, see the [Vicon website](https://www.vicon.com)<sup>12</sup>.

For details on configuring Vicon Vantage cameras and data capture and processing through these Vicon software applications, see your Vicon software documentation.



### Note

Vicon software is licensed on the Vicon Vantage host PC. For details of the software licensing method, see the documentation supplied with your Vicon software.

---

<sup>12</sup> <https://www.vicon.com>

## Vicon Vantage system cables

The following topics describe the cables used to connect hardware components in a Vicon Vantage system.

- [About Vicon Vantage cables in a Vantage system, page 68](#)
- [Vicon Vantage system cable descriptions, page 69](#)
- [Vicon Vantage cable ordering information, page 75](#)

## About Vicon Vantage cables in a Vantage system

A number of cables are supplied with Vicon Vantage systems to connect Vantage hardware components. The majority of these are network cables (RJ45 connectors joined by Cat5e cable), which carry the power, all the communication data, and synchronization.



### Important

Where Ethernet cable is required to connect cameras, use only Vicon-supplied cable. Vicon-supplied cables that connect cameras to a PoE+ switch include a ferrite at the camera end. For details of the cables supplied with your Vicon Vantage system, see the bill of materials accompanying your product shipment. If any cables are missing on receipt, or if you require additional cables later, please contact Vicon or your nearest agent or distributor.

Note the following cable requirements for various Vantage systems:

- Systems containing a Vicon Lock include the eight Weidmüller connectors necessary to connect the Lock to third-party analog capture devices.
- Systems containing two Lock units require a Lock-to-Lock Link cable.
- Systems supporting T-Series cameras with a Giganet require an additional Lock-to-Giganet Link cable.

Depending on your Vantage system components, you may also require commercially available cables to connect a Lock to third-party devices.

Such cables may be:

- Created by you:
  - To connect the provided Weidmüller connectors to the analog source connector
  - For remote triggering devices
- Obtained from video specialist distributors (such as for timecode, video devices such as broadcast and VESA Stereo video)

## Vicon Vantage system cable descriptions

The following topics describe the cables you will need for various types of Vicon Vantage system. It does not describe all the cables supplied with MX T-Series systems; it is assumed that any MX T-Series system cameras and Giganets are already connected with the originally supplied cables.

- [Simple Vicon Vantage system cables, page 70](#)
- [Extended Vicon Vantage system cables, page 71](#)
- [Integrated Vicon Vantage system cables, page 74](#)

For descriptions and uses of MX T-Series cables, see the documentation supplied with your Vicon MX T-Series system.



## Simple Vicon Vantage system cables

The following tables list the cables that are used in a simple Vicon Vantage system. For details of this type of system, see [Simple Vicon Vantage system \(Vantage cameras only\)](#), page 15.



- [Vicon Vantage camera to PoE+ cable](#), page 70
- [Vicon Vantage host PC to PoE+ cable](#), page 70

You can use the following information to identify the correct cables and connection points to use when setting up your Vantage system.

### Vicon Vantage camera to PoE+ cable

Cable name / part no.	Vantage camera end	PoE+ end	Description
Vantage camera to PoE+ RJ45 Ethernet cable (snagless) Vicon part no: BEH011AA-30 (30 m) and BEH011AA-50 (50 m)	 8-pin RJ-45 plug	 8-pin RJ-45 plug	A Vicon-supplied RJ-45 Standard 1000Base-T Gigabit Ethernet network cable. Includes a ferrite at the camera end.

### Vicon Vantage host PC to PoE+ cable

Cable name / part no.	Host PC end	PoE+ end	Description
Host PC to PoE+ RJ45 Ethernet cable (Cat 5e) Vicon part no: 0470600	 8-pin RJ-45 plug	 8-pin RJ-45 plug	A Vicon-supplied RJ-45 Standard 1000Base-T Gigabit Ethernet network cable.

For information on cable lengths, see [Vicon Vantage cable order information](#), page 75.

## Extended Vicon Vantage system cables

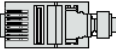

The following tables list the cables that can be used in an extended Vicon Vantage system and that are in addition to those described in [Simple Vicon Vantage system cables, page 70](#).

- [Vicon Lock to PoE+ cable, page 71](#)
- [Vicon Lock to third-party devices cables, page 72](#)
- [Lock to Lock cable, page 73](#)







You can use this information to identify the correct cables and connection points to use when setting up your Vantage system to include third-party devices such as analog capture devices, synchronized output devices, remote triggering devices, and genlock/timecode video devices.

For details of this type of system, see [Extended Vicon Vantage system \(add cameras and third-party devices\), page 16](#).





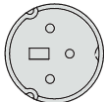

### Vicon Lock to PoE+ cable

Cable name / part no.	Vicon Lock end	PoE+ end	Description
Lock to PoE+ RJ45 cable (Cat 5e) Vicon part no: 0470600	 8-pin RJ-45 plug (plugs into PoE socket)	 8-pin RJ-45 plug	A Vicon-supplied, shielded RJ-45 Standard 1000Base-T Gigabit Ethernet network cable.

## Vicon Lock to third-party devices cables



Cable name / part no.	Vicon Lock end	Third-party device	Description
<p>OMNIMATE Signal connector (3.5mm) cable: Vicon part no: BEH007A D-25-M (for AMTI Gen5, MSA-6 and OPT-SC amplifiers)</p> <p>BEH008A D-15-M (for Kistler 9865B amplifiers)</p> <p>BEH009A D-37-M (for Kistler 5233A2 amplifiers)</p> <p>BEH012A D-15-M (for Bertec amplifiers)</p>	 <p>Weidmüller connector (plugs into Analog Input (8 channels) x8)</p>	 <p>Device dependent</p>	<p>Enables cables to connect to the 64 channels of analog capture. Each individual connector allows for eight connections to eight analog sources with their associated grounds. A force plate can connect through one connector. For information on how to make the connection, see <a href="#">Add analog capture devices to a Vantage system, page 104</a>.</p>
<p>Phono (RCA) cable (plus device-dependent plug)</p>	 <p>RCA phono plug (plugs into Sync Out (GPO) x8)</p>	 <p>Device dependent</p>	<p>Enables connection to third-party devices that require synchronization or triggering.</p>
<p>Phono (RCA) cable (plus device-dependent plug)</p>	 <p>RCA phono plug (plugs into Remote Control In Start and Stop x2)</p>	 <p>Device dependent</p>	<p>Enables connection to third-party devices that can trigger (start and stop) capture.</p>



Cable name / part no.	Vicon Lock end	Third-party device	Description
BNC cable	 <p>BNC – 75 <math>\Omega</math> (ohm) (plugs into Broadcast Sync (VITC) In)</p>	 <p>BNC – 75 <math>\Omega</math> (ohm)</p>	Enables connection to an external analog video source for genlocking to. Analog SD bi-sync video may also carry VITC timecode in.
Male to Female XLR cable	 <p>XLR plug (male) (plugs into LTC (Timecode) balanced In)</p>	 <p>XLR plug (female)</p>	Enables the connection of balanced LTC – In. Note that for correct operation, a synchronized video signal must accompany this signal.
VESA Stereo In cable Manufacturer: CUI Inc Part no: MD-30 CP-2030-ND (Digi-Key part no.) VESA standard IEC10764105 stereoscopic connection type	 <p>3-pin mini-DIN (plugs into VESA Sync In)</p>	 <p>Device dependent</p>	Enables the connection of VESA Stereo devices for genlocking.

## Lock to Lock cable

If you want to use an additional Lock in your Vicon Vantage system, you also need the following cable:

Cable name / part no.	Vicon Lock end	Vicon Lock end	Description
Lock to Lock synchronizing cable Vicon part no: BEH010A	 <p>3-pin plug (plugs into Link Input/Output)</p>	 <p>3-pin plug (plugs into Link Input/Output)</p>	Proprietary cable for synchronizing an additional Lock. Mini cord connector with 3 male contacts.



## Integrated Vicon Vantage system cables

The following tables describe the cables (additional to those listed in [Simple Vicon Vantage system cables, page 70](#)) for connecting hardware components in an integrated Vantage system. You can use this information to identify the correct cables and connection points to use when setting up your Vantage system to integrate components from MX T-Series systems.

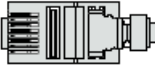
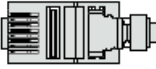
- [Vicon Lock to MX Giganet cable, page 74](#)
- [Vicon Lock to PoE+ cable, page 74](#)

For details of this type of system, see [Integrated Vicon Vantage system \(with MX T-Series\), page 18](#).

### Vicon Lock to MX Giganet cable

Cable name / part no.	Vicon Lock end	MX Giganet end	Description
Lock to Giganet synchronizing cable Vicon part no: BEH004A (1m) BEH005A (20m) BEH006A – 4-pair (1m)	 3-pin plug (plugs into Link Input/Output)	 10-pin RJ45 plug	Vicon-supplied cable for synchronizing an MX T-Series Giganet system.

### Vicon Lock to PoE+ cable

Cable name / part no.	Vicon Lock end	PoE+ end	Description
Lock to PoE+ RJ45 cable (Cat 5e) Vicon part no: 0470600	 8-pin RJ-45 plug (plugs into PoE socket)	 8-pin RJ-45 plug	A Vicon-supplied, shielded RJ-45 Standard 1000Base-T Gigabit Ethernet network cable.

When you integrate Vicon T-Series cameras and hardware into a Vantage system, you use cables from your existing architecture. For descriptions and uses of these other cables, see the Vicon T-Series documentation supplied with this system.

## Vicon Vantage cable ordering information

This table lists the Vicon cables used in Vicon Vantage systems. Use these details to order cables from Vicon or your nearest agent/distributor.

Cable description	Product order code	Length
Host PC to PoE+ and Lock to PoE+RJ45 cable (Cat 5e)	0470600	5m
Vantage camera to PoE+ RJ45 cable (snagless) with ferrite	BEH011AA-30	30m
	BEH011AA-50	50m
Lock to Lock synchronizing cable	BEH010A	1m
OMNIMATE Signal connector (3.5mm) cable – for analog capture (force plates, etc)	BEH007A D-25-M (for AMTI Gen5, MSA-6 and OPT-SC amplifiers)	1.5m
	BEH008A D-15-M (for Kistler 9865B amplifiers)	1.5m
	BEH009A D-37-M (for Kistler 5233A2 amplifiers)	1.5m
	BEH012A D-15-M (for Bertec amplifiers)	1.5m
Lock to Giganet synchronizing cable	BEH004A	1m
	BEH005A	20m <sup>1</sup> , <a href="#">page 75</a>
	BEH006A	1m (4-pair)

<sup>1</sup>Do not leave this cable coiled while in use, as it may cause interference.

Note that the above product order codes are correct at the time of publication, but for the most up-to-date information, please refer to the latest revision of the current Vicon price list.

## Vicon Vantage calibration device

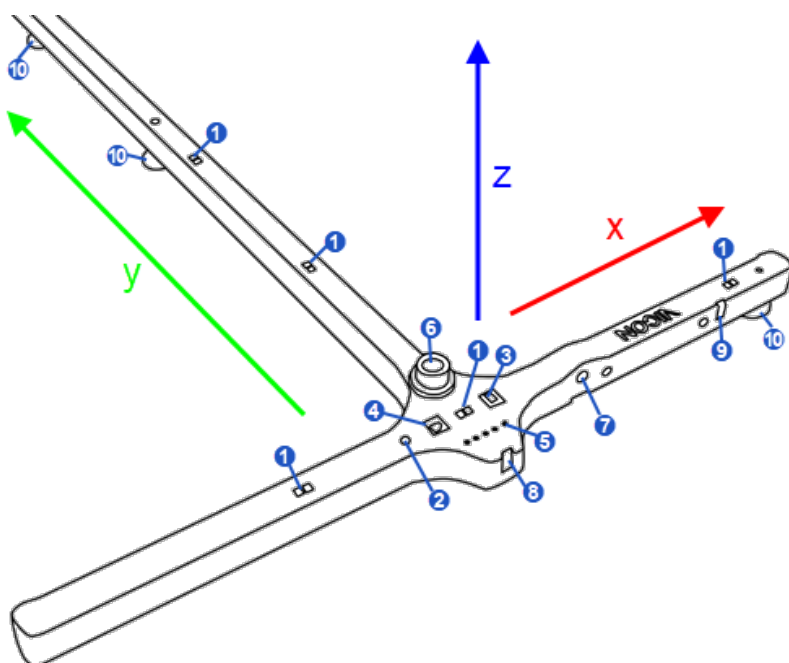
The following topics describe the Vicon Vantage calibration device (Active Wand) used to prepare your Vicon Vantage system for motion capture.

- [About the Vicon Vantage calibration device, page 77](#)
- [Calibration process, page 80](#)

## About the Vicon Vantage calibration device

You use the Vicon Vantage calibration device (Active Wand) to calibrate both optical and reference video cameras in your Vantage system. Calibration enables the Vicon Vantage cameras to capture the subject's movements throughout the volume. You use the Active Wand in your capture volume to identify the volume origin and axes, so the virtual cameras and volume in your Vicon application software reflect the positions of the cameras in relation to the capture volume and to one another.

The Active Wand is an electronic motion capture calibration device that contains five pairs of LEDs, as shown in the following illustration and described in the table below.



Key	Part	Description
1	Pairs of LEDs	Used to calibrate both optical and reference video cameras. As some reference video cameras do not have strobes, these LEDs make it easier to identify and locate markers from reference video images.
2	On/Off switch	Power switch
3	LED mode switch	Changes between Strobe and Continuous mode. Use Strobe mode whenever possible. In some cases, Continuous mode may give better results (see the <i>Active Wand User Guide</i> PDF).
4	Intensity adjustment screw	Changes the brightness of the LEDs.
5	Battery charge indicator LEDs	Indicates the amount of charge left in the battery.
6	Bubble level	When adjusting the feet, check the bubbles to ensure device is flat on the floor.
7	Battery charger connection	Charge the battery by plugging the supplied Active Wand charger into this socket.
8	Camera strobe sensor	A photodiode detects the strobes from the cameras, enabling the Active Wand to synchronize to the cameras.
9	NIR On/Off switch	Turn on/off the NIR LEDs on NIR wands, or IR LEDs on IR wands.
10	Adjustable feet	Position the wand flat on the floor when setting the volume origin by turning the adjuster screw for each foot.

In addition to the above features, the following features are also available, but are not illustrated:

- **Handle:** Hold this end when performing a wand wave. Also contains the battery. For information on charging and replacing the battery, see the *Active Wand User Guide* PDF, which is available from the Vicon website.
- **Pivot screw** (center underside): Align the adjustable feet with this fixed point when setting the volume origin. To enable the Active Wand to lie level, you may need to change the position of the pivot screw from the default position to the alternative position on the wand's arm.
- **Force plate alignment guides** (can be fitted along the lengths of the wand): If you are placing the wand at the global origin while setting the volume origin, screw each alignment plate into the relevant set of holes and align the guides with the edge of a force plate.

This single calibration device is used for both dynamic calibration and setting the volume origin, as described in [Calibration process, page 80](#).

For further details about the Active Wand, see the *Active Wand User Guide* PDF, which is available from the Vicon website.



#### Tip

The Active Wand is the instrument used to define system accuracy. To ensure continued accuracy, please take care of it and store it safely when not in use.

## Calibration process

Vicon system performance depends on the accuracy with which the cameras and the capture volume are calibrated during a two-stage system calibration process:

- [Camera calibration, page 81](#)
- [Setting the volume origin, page 82](#)

Both stages of the system calibration process depend on the Vicon application software knowing the dimensions and relative marker positions of a specified calibration device. This definition of a calibration device is contained in a Vicon Labeling Skeleton (VSK) file. When you configure the calibration process in your Vicon application software, you load its VSK file.

The following sections provide a general overview of the calibration process. For details on calibrating your Vicon cameras and the capture volume, see the *Vicon Vantage Quick Start Guide* and the documentation for your Vicon application software.



### Important

To calibrate your Vicon Vantage system, you must have a calibration device definition file (VSK) that matches your device. By default, only Vicon Active Wand definitions are pre-installed in the software. To use legacy or custom calibration devices, you must import a definition file that fully describes your device into your Vicon application software.



## Camera calibration

During camera calibration, the Vicon application software calculates the physical position and orientation of each Vicon camera in the capture volume based on the movement of a calibration wand. This stage calculates internal (focal length and image distortion) and external (position and orientation) camera parameters in two simultaneous phases:

- **Linearization phase**  
The optical distortion of the camera lenses and any other non-linearity in the system are measured, and a correction matrix is calculated. Corrections are applied to every frame of data subsequently acquired by each camera.
- **Photogrammetric calibration phase**  
The physical locations and orientations of the cameras are calculated, referring to a user-defined set of coordinates.

The objective of this stage is to describe the capture volume to the Vicon Vantage system.

To calibrate the Vicon Vantage cameras:

1. Turn on the Active Wand.
2. If necessary, move the **LED Mode** switch to **Strobe** mode.  
The LEDs begin to flash.
3. Place the Active Wand in the capture volume where it is visible to the Vicon cameras.  
When the LEDs appear to stop flashing, the Active Wand is synchronized to the cameras.
4. Wave the calibration wand throughout the empty capture volume, ensuring that the LEDs on the wand are visible to the cameras, until sufficient wand frames are spread evenly across the field of view for each camera.  
The Vantage camera display and your Vicon application software provide feedback to help you determine when enough wand data has been acquired to calibrate each camera. For details, see the documentation for your Vicon software.

## Setting the volume origin

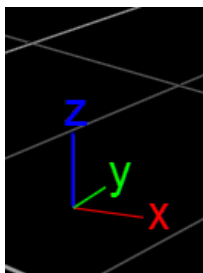
In setting the volume origin, the Vicon application software measures the position of a calibration device in the capture volume and sets the global coordinate system.

The objective of setting the volume origin is to set the global coordinate system so that subjects are displayed the right way up and so that you can change the way data is visualized in the Vicon application software workspace. Place the calibration device flat on the floor to identify the coordinates of the global origin (0,0,0), which represents the center of the capture volume, and the global axes (X,Y,Z), which represent the horizontal and vertical axes of the capture volume.

If you are using force plates, choose one of the force plate corners to be the position of the origin of the global coordinate system. This enables your force plates and the Vicon capture volume to share a common coordinate system. To do this, attach the supplied force plate alignment guides to the Vicon Vantage calibration device. The alignment guides ensure that you place the Vantage calibration device on the same position on top of one of the force plate corners each time you perform a calibration.

If you are not using force plates, adjust the feet of the Vantage calibration device to ensure that they are all flat on the floor. Start with the handle and adjust the foot between the fixed foot and the hand grip, and then adjust the other foot until the bubble in the spirit level is in the center. Next, on the top edge of the wand, adjust the foot on the left end until the bubble in the spirit level is in the center. To adjust the feet, first loosen the locking nut next to the metal frame and then turn the screw left to lower the calibration device or right to raise it. Then tighten the locking nuts to fix the feet in position.

Next place the Vantage calibration device either on top of the force plates or flat on the floor in the center of the capture volume in the field of view of at least three cameras. Position the left corner of the calibration device where you would like the volume origin to be and in the orientation that you would like the horizontal X and Y axes to be (for details of the Vicon Vantage calibration device, see [About the Vicon Vantage calibration device, page 77](#)). The calibration process will calculate the vertical Z axis from the positions of the X and Y axes, as shown in the following image.



## Vicon Vantage accessories

Vicon Vantage accessories are motion capture consumables that you will use and replace as required.

The following table lists the accessories available for Vicon Vantage systems.

Accessory	Description
Retroreflective paint	Applies directly to miniature subjects that are too small to have markers attached.
Scissors	Cuts tape.
Tape Marker-fixing tape	Secures markers directly to a subject's skin. This double-sided tape is specially designed to adhere well to human skin without creating an allergic reaction. It can only be used once. The tape does not perform well if the skin becomes very wet with sweat. Under these circumstances, Vicon Motion Systems recommends the use of medical grade elastic strips.
Micropore tape	Temporarily secures smaller markers to fingers. Some studios cut a small hole in a strip to poke the marker through, then wrap the remainder of the tape around a finger.
Gaffer tape	Secures marker bases to objects or props, and enables you to mark out the edges and origin of the capture volume in the lab or studio to help capture subjects visually identify the perimeter.
Tweezers	Enables you to carefully apply markers to avoid transfer of fingerprints and smudges to the retroreflective markers.
Velcro roll/strips/dots	Secures marker bases to objects or props. Many studios keep these on props and then add/detach markers as required.
Vicon retroreflective markers in various sizes, such as: 3.0 mm, 4.0 mm, 6.4 mm, 9.5 mm, 14.0 mm, and 25.0 mm	Smaller markers are typically used for facial, finger, or small object/prop capture. Larger markers are typically used for general body or object/prop capture. Additional marker sizes may be available.
Vicon PECS suit	3x3 Motion Capture Suit, including hat, gloves, and booties

Accessory	Description
<p>Vicon Rigid Bodies in three kits:</p> <ul style="list-style-type: none"> <li>• Full body kit</li> <li>• Hands and head kit</li> <li>• Object kit</li> </ul>	<p>Enable you to track and measure people and objects using a set of fixed, accurate markers. The markers are easy to apply and comfortable to wear, providing six-degrees-of-freedom tracking of human body segments or objects. Compatible with Vicon Tracker. For more information, see the <i>Vicon Rigid Bodies User Guide</i> PDF.</p>
Vicon Apex	<p>A precise, robust, hand-held tracking tool that enables users to interact intuitively with virtual objects in a 3D environment, For more information, see the <i>Vicon Apex User Guide</i> PDF or visit the Vicon website.</p>

The number and type of accessories supplied depend on the Vicon application that you have ordered.



### Important

For details of the type and number of items supplied with your Vicon Vantage system, see the bill of materials accompanying your product shipment. If any items are missing on receipt, or if you require additional accessories later, please contact Vicon or your nearest agent or distributor.

## Set up a simple Vicon Vantage system

The following topics describe how to put together a Vicon Vantage system, based on the simple system described in [Simple Vicon Vantage system \(Vantage cameras only\)](#), page 15.

- [About simple Vicon Vantage systems](#), page 86
- [Put together the Vicon Vantage hardware](#), page 87
- [Set up the software](#), page 89

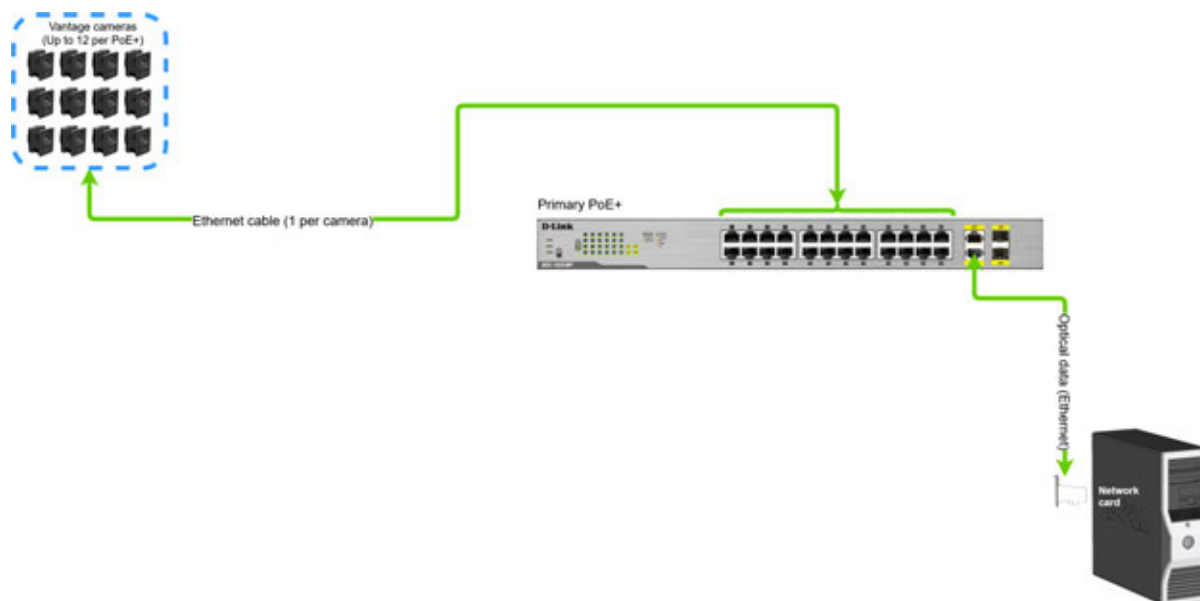
When you have set up a simple Vicon Vantage system with Vantage cameras, a PoE+ switch and a Vicon Vantage host PC, you can:

- Extend the system to include [additional Vantage cameras with secondary PoE+ switches](#), page 91; [add Vicon video cameras](#), page 91; and add a Vicon Lock+ to include supported third-party devices such as [analog capture devices](#), page 104, [synchronized output devices](#), page 108, [remote triggering devices](#), page 128, [genlock/timecode video devices](#), page 132, and [VESA Stereo video devices](#), page 142.
- Integrate MX T-Series cameras and Giganets into your new Vantage system.  
For details of the Vicon MX T-Series components and third-party devices that you can integrate in your Vicon Vantage system, see [Integrate MX T-Series components into a Vantage system](#), page 146.

## About simple Vicon Vantage systems

A simple Vicon Vantage system consists of a primary PoE+ switch, up to 12 Vantage cameras, and a Vicon Vantage host PC, as shown in the following illustration.

For details of these elements, see [Overview of Vicon Vantage system components, page 7](#).



For instructions on setting up a simple Vantage system, see the Vicon Vantage Quick Start Guide. A printed version of this guide is included in your product box. For your convenience, the steps described in the Quick Start guide are briefly outlined in the following topics.

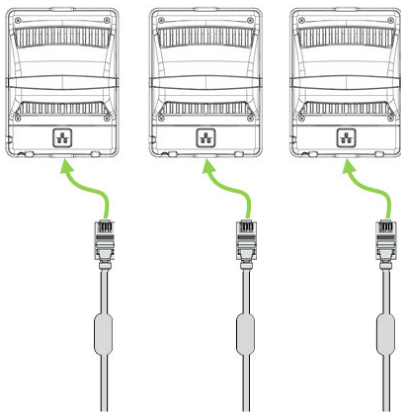
- [Put together the Vicon Vantage hardware, page 87](#)
- [Set up the software, page 89](#)

## Put together the Vicon Vantage hardware

The first step in putting together a Vicon Vantage system is to set up your hardware. Gather the hardware components, supplies, downloaded Vicon application software installer, and documentation for your Vicon Vantage system. For details of the components supplied with your particular system, see the Bill of Materials that accompanied the shipment.

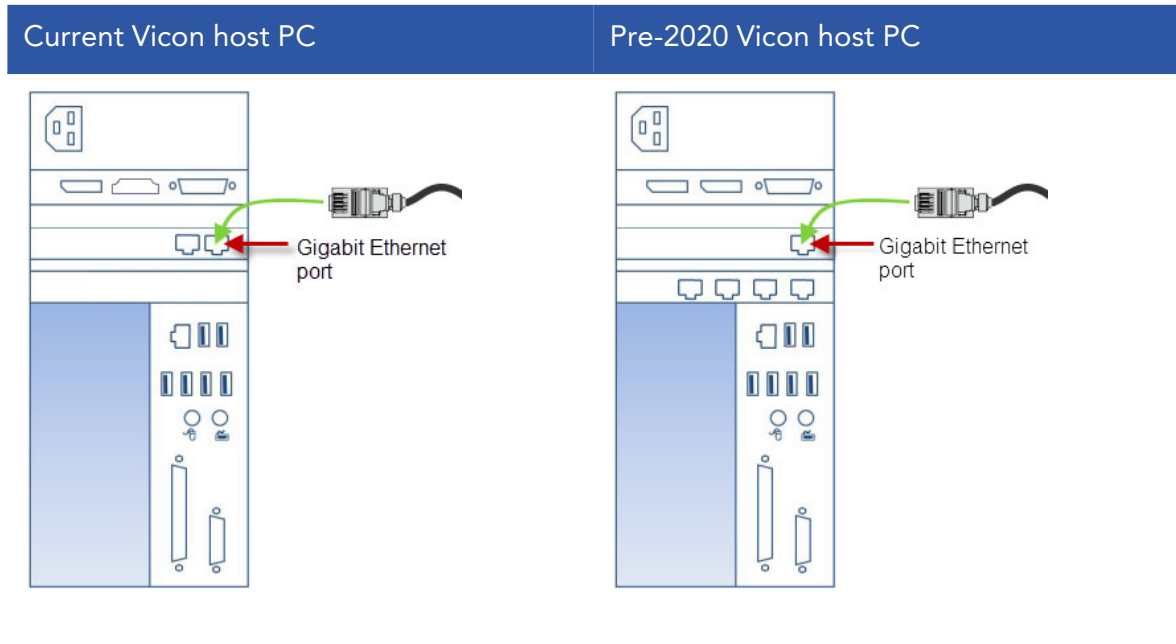
### Assemble and connect the Vantage hardware components:

1. For each Vantage camera, assemble the head block and connect the camera and base plate to it.
2. Mount the Vantage camera and head block assemblies on tripods or on a clamp and truss on a speed rail, and then position them around the capture volume.
3. For each Vantage camera, plug one end of a Vicon-supplied Cat 5e RJ45 Ethernet cable (the end furthest away from the ferrite) into one of the available RJ-45 sockets in the PoE+ switch. Although there are 26 sockets in total, remember that:
  - One socket is required to connect to the Vicon Vantage host PC, which can be connected to one of the uplink ports.
  - The 24 Ethernet ports on the PoE+ switch can support up to 12 Vantage cameras. The remaining ports can support any of the other Vicon components required in your system, such as a Vicon Lock or Vicon Vue video cameras.
  - If you are connecting a Gigabit Ethernet switch with 10 GbE uplink (only needed if your system requires three or more PoE+ switches; or two or more PoE+ switches and a Lock; or two or more Vue video cameras), connect it to one of the uplink ports. (For an example, see [Vicon Vantage system with additional cameras & Vicon Lock unit, page 98.](#))
4. Plug the other end of the Ethernet cable (the end with the ferrite) into the RJ-45 socket on the rear of each Vantage camera.



5. Plug one end of the Vicon Vantage host PC cable into one of the two uplink sockets in the PoE+ switch.

6. Plug the other end of the cable into the appropriate PCIe network Gigabit Ethernet port for the Vantage system network on the rear of the Vicon Vantage host PC (for details, see [Vicon Vantage system network port, page 61](#)).



For details of the Vicon Vantage host PC cable, see [Vicon Vantage system cable descriptions, page 69](#).

7. Switch on the Vicon Vantage host PC, and allow it to boot up.
8. Switch on the PoE+ unit.



## Set up the software

After you have put together the Vicon Vantage hardware, you install, configure, and start your Vicon application software.



### Note

If you bought your Vicon Vantage host PC from Vicon, the software is installed. You do not need to install it again. You can check that the Vicon software folders and icons have been added to the standard locations on the Windows desktop or Start menu.

To set up the software:

1. Run the downloaded Vicon application software installer.  
After your Vicon application software has been installed, program folders and icons are added to the standard Windows locations, according to the installation options you selected.
2. Activate the software license. For information on how to do this, see the installation and licensing instructions supplied with your Vicon application software.
3. On the Vicon Vantage host PC, configure the Vicon Vantage system IP address:
  - IP address: 192.168.10.1
  - Subnet mask: 255.255.255.0
  - Default gateway: Leave blank

For detailed instructions on configuring your PC network card, including how to change the Jumbo Packet setting to its maximum value and other necessary steps, see [Configuring network card settings](#) on the Vicon website or the Vicon PDF *PC setup for Vicon systems*. If you are setting up dual network ports on your Vicon Vantage host PC (recommended if your system includes Vicon video cameras), see also [Vicon Vantage host PC connectors](#), page 61.
4. Start the Vicon application software.  
The application software splash screen is displayed.
5. To start real-time streaming of data from the Vantage cameras, connect the Vicon application software to the Vantage system:
  - **Shogun Live** On the System tab, in the Cameras section, check that the cameras are connected (indicated by a cyan icon if not yet calibrated) and at the bottom of the Workspace, the displayed information (eg, Frames, Seconds) is updating.
  - **Nexus and Tracker** In the Resources pane, click the Go Live button. When the system is connected, the button label changes to Go Offline and the camera icon changes color.

## Build a Vicon Vantage system

The following topics explain how to build on the basic Vicon Vantage system described in [Set up a simple Vicon Vantage system](#), page 85.

- [Add cameras and connectivity to a basic Vantage system](#), page 91
- [Add analog capture devices to a Vantage system](#), page 104
- [Add synchronized output devices to a Vantage system](#), page 108
- [Add remote triggering devices to a Vantage system](#), page 128
- [Add genlock/timecode devices to a Vantage system](#), page 132
- [Add VESA stereo to a Vantage system](#), page 142
- [Integrate MX T-Series components into a Vantage system](#), page 146
- [Focus a Vicon Vantage camera lens](#), page 151
- [Include a Steam VR source to genlock](#), page 157

## Add cameras and connectivity to a basic Vantage system

The following topics explain how to connect additional PoE+ switches to scale your Vicon Vantage system to add Vantage cameras, Vicon Lock units and Vicon video cameras to the simple system described in [Set up a simple Vicon Vantage system, page 85](#).

- [Understand when additional PoE+ switches are required, page 92](#)
- [Add more Vicon Vantage cameras with secondary PoE+ switches, page 95](#)

## Understand when additional PoE+ switches are required

If your motion capture application requires more than 12 Vicon Vantage cameras, you must add one or more additional PoE+ switches.

A Vicon Vantage camera, Lock unit, and the Vicon Vantage host PC each connect to one Ethernet port on the PoE+ switch. This connection to the Vantage host PC carries all the control data as well as all the motion capture data from the cameras. Vicon video data is routed separately.

Each Vicon video camera requires two ports on a PoE+ switch:

- One port powers the camera and carries the video data back to the PoE+ switch.
- Because the data load can reach 95% of the total Gigabit bandwidth at high frame rates, you must allocate a second port to carry this video data back to an additional Ethernet port on the host PC.

For more information, see [Vicon Vantage host PC, page 59](#) and the PDF *PC Setup for Vicon Systems*, which explain how video data is routed correctly through the PoE+ switch. Note that the ports connected to host PC ports do not draw any power.

This table shows the number of 26-port PoE+ switches required to support various example systems.

Vantage camera	Lock unit	Vicon Video cam.	PoE+ unit	Gigabit PoE+ switch with 10 GbE uplink	See
1–12	0	0	1	0	<a href="#">Simple Vicon Vantage system, page 96</a>
1–12	1	1	1	0	<a href="#">Simple Vantage system with up to 12 cameras &amp; one Lock and Vicon video camera, page 100</a>
1–11	0	2	0	1	<a href="#">Small Vantage system with Gigabit PoE+ with 10 GbE uplink, page 101</a>
13–24	0	0	2	0	<a href="#">Simple Vicon Vantage system with additional cameras, page 97</a>
13–24	1	0	2	1	<a href="#">Vicon Vantage system with additional cameras &amp; Vicon Lock unit, page 98</a>
13–24	2	0	2	1	<a href="#">Vicon Vantage system with additional cameras &amp; 2 Vicon Lock units, page 99</a>
13–24	0	2	2	1	<a href="#">Vicon Vantage system with Vicon video cameras, page 102</a>
13–24	1	2	2	1	
25–36	1	2	3	1	<a href="#">Vicon Vantage system with 3 PoE+ switches, page 103</a>

For further information on the requirements of different configurations, see the Vantage system diagrams.

For information on integrating an MX T-Series system with a Vicon Vantage system, see [Integrate MX T-Series components into a Vantage system, page 146](#).

## Add more Vicon Vantage cameras with secondary PoE+ switches

The following example systems are described:

- [Simple Vicon Vantage system, page 96](#)
- [Simple Vicon Vantage system with additional cameras, page 97](#)
- [Vicon Vantage system with additional cameras & Vicon Lock unit, page 98](#)
- [Vicon Vantage system with additional cameras & 2 Vicon Lock units, page 99](#)
- [Simple Vantage system with up to 12 cameras & one Lock and Vicon video camera, page 100](#)
- [Small Vantage system with Gigabit PoE+ with 10 GbE uplink, page 101](#)
- [Vicon Vantage system with Vicon video cameras, page 102](#)
- [Vicon Vantage system with 3 PoE+ switches, page 103](#)

The PoE+ switch connected to the Vicon Vantage host PC is referred to as the primary PoE+ and is directly connected to the assigned sync master. One additional PoE+ switch (known as a secondary PoE+ switch) can be daisy-chained to the primary PoE+ switch.

If the system includes three or more PoE+ switches; or two or more PoE+ switches and a Lock; or two or more Vue video cameras, a Gigabit PoE+ with a 10 GbE uplink is required (for an example of how to connect this type of switch, see [Vicon Vantage system with additional cameras & Vicon Lock unit, page 98](#)).

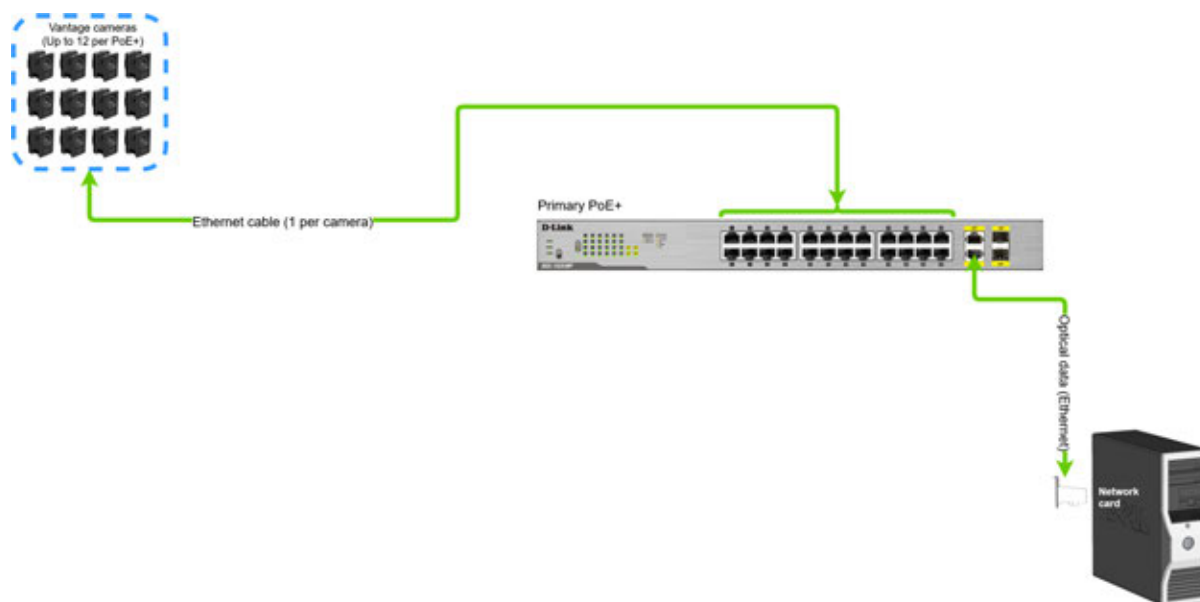


### Caution

Do not daisy-chain secondary PoE+ switches through other secondary PoE+ switches, as this routes too much data through the final destination port of the primary PoE+ switch.

## Simple Vicon Vantage system

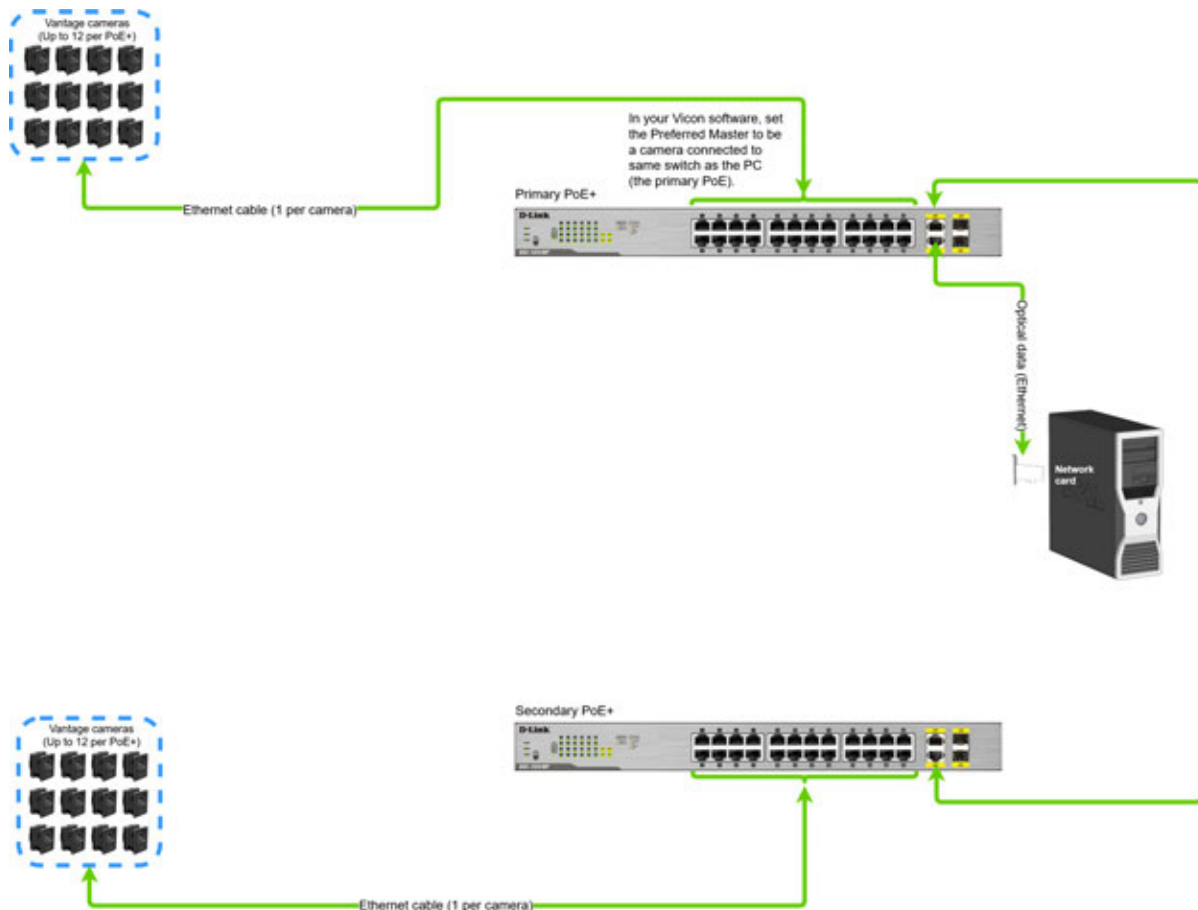
The following diagram shows a simple Vicon Vantage system supporting up to 12 Vantage cameras. The Vantage application automatically selects one of the cameras to be sync master, causing it to transmit an Ethernet sync packet and timestamp once per frame.





## Simple Vicon Vantage system with additional cameras

The following diagram shows a further 12 Vicon Vantage cameras added to the above system with one more PoE+ switch.

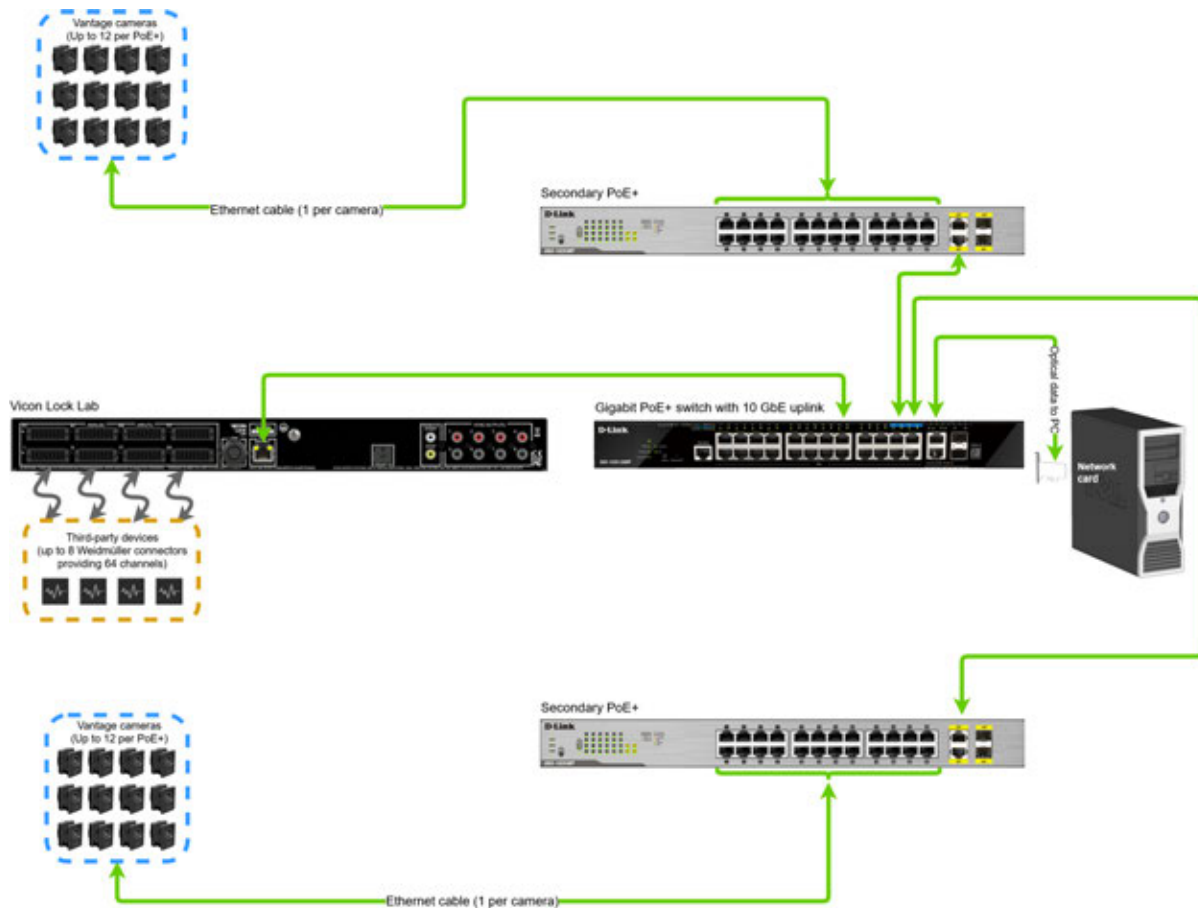


In a system that requires more than one PoE+ switch, you must ensure that:

- The master camera (the one that outputs the Vicon Ethernet sync packet) is attached to the primary PoE+ switch, which is connected to the Host PC.
- To ensure correct synchronization of your system when multiple PoE+ switches are used, you must either add a Lock+ to the primary PoE+ switch, or ensure that a camera connected to the primary PoE+ switch is selected in the Vicon application software to be synchronization master.

## Vicon Vantage system with additional cameras & Vicon Lock unit

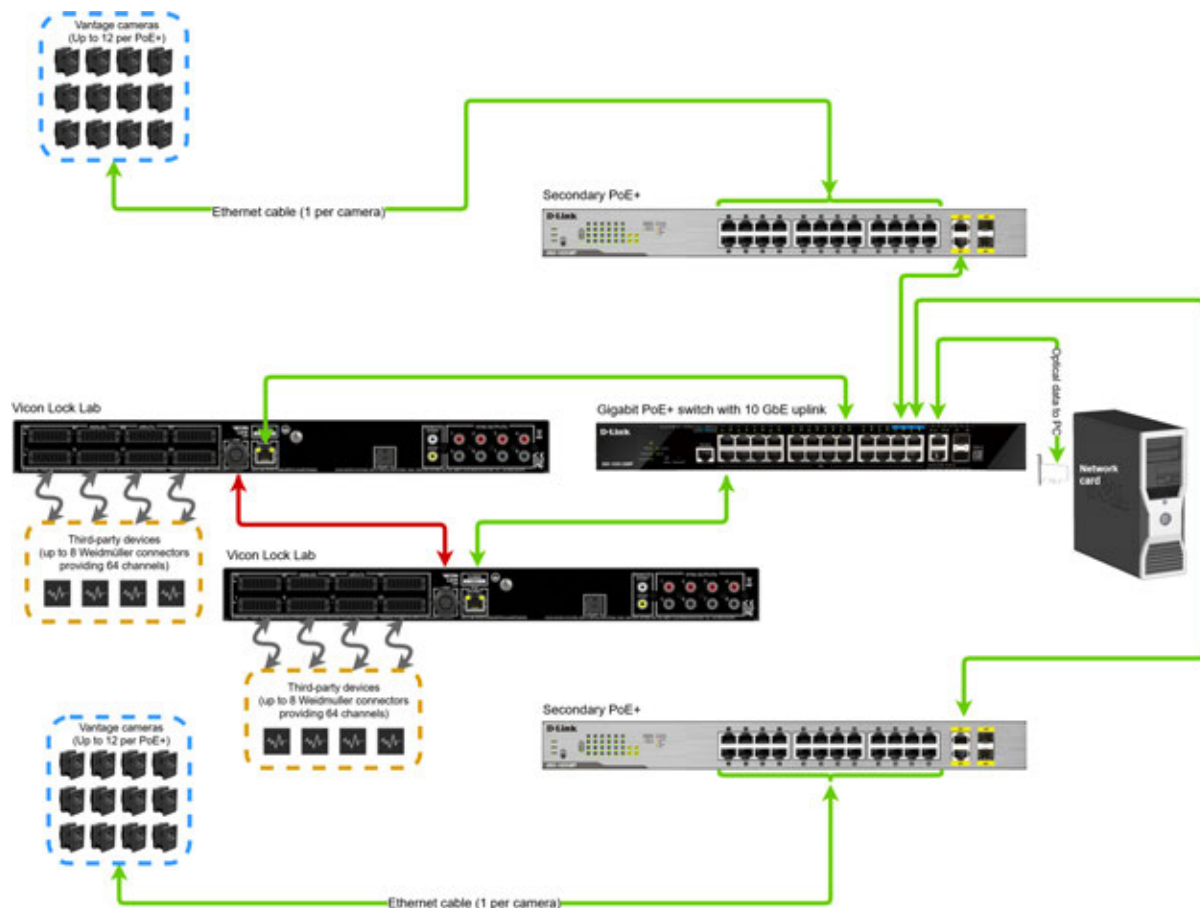
The following diagram shows a Vicon Lock Lab added to via a Gigabit PoE+ switch with a 10 GbE uplink. (Other current Vicon Lock units can be added in the same way.)



The Lock is made sync master and is connected to the Gigabit PoE+ switch.

## Vicon Vantage system with additional cameras & 2 Vicon Lock units

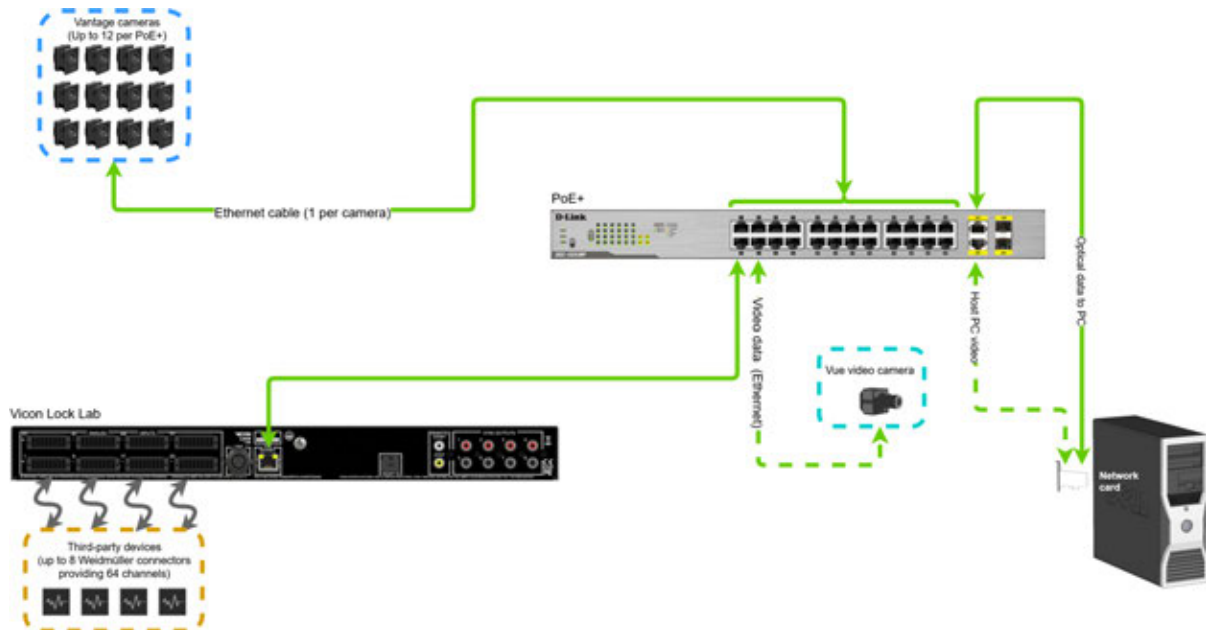
The following diagram shows two Lock Lab units added via a Gigabit PoE+ switch with a 10 GbE uplink. (Other current Vicon Lock units can be added in the same way.)



Two Lock units are added to the Gigabit PoE+ switch. Connecting a genlock source such as **Reference Video In** or **VESA Stereo In** will determine which Lock is sync master. If both sources are to be used, connect them both to the same Lock unit.

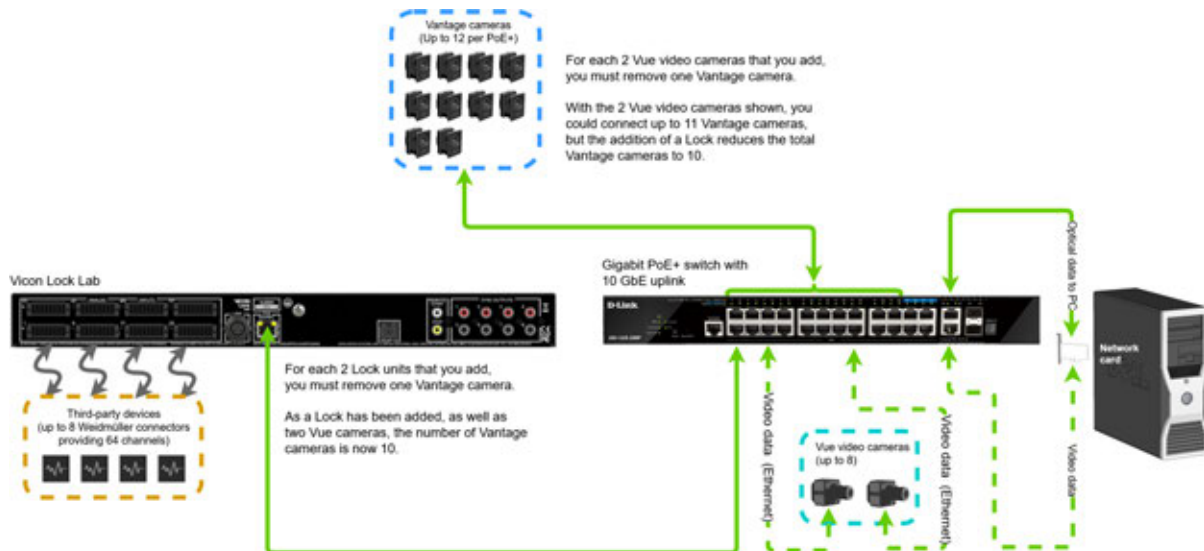
## Simple Vantage system with up to 12 cameras & one Lock and Vicon video camera

The following diagram shows a system with up to 12 Vantage cameras, a single Lock and a Vue camera connected to a PoE+ switch. With 10 GbE dual-port PCs, video data can be routed separately from optical data.



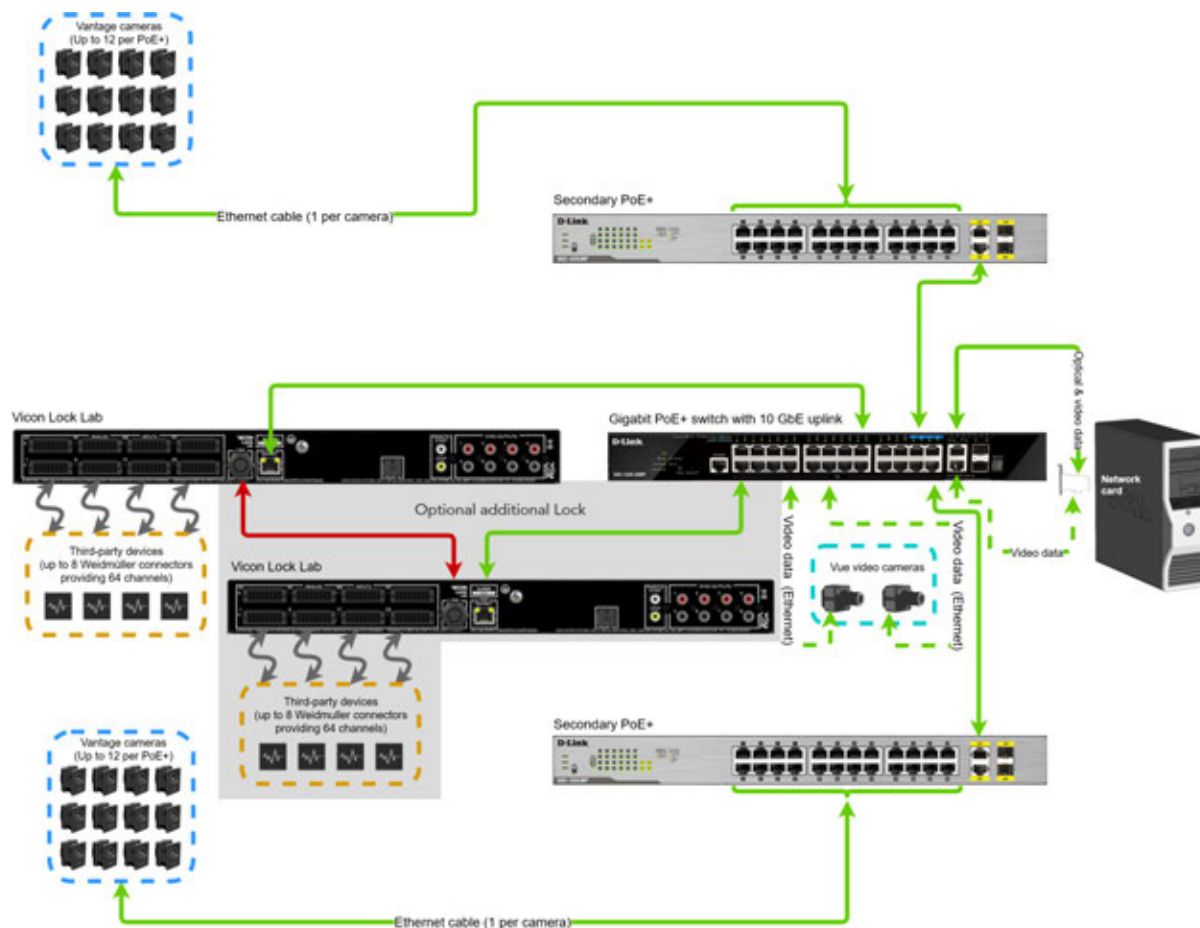
## Small Vantage system with Gigabit PoE+ with 10 GbE uplink

The following diagram shows a small Vantage system with Vantage cameras, Vue video cameras and a Lock connected to a single Gigabit PoE+ switch with 10 GbE uplink.



## Vicon Vantage system with Vicon video cameras

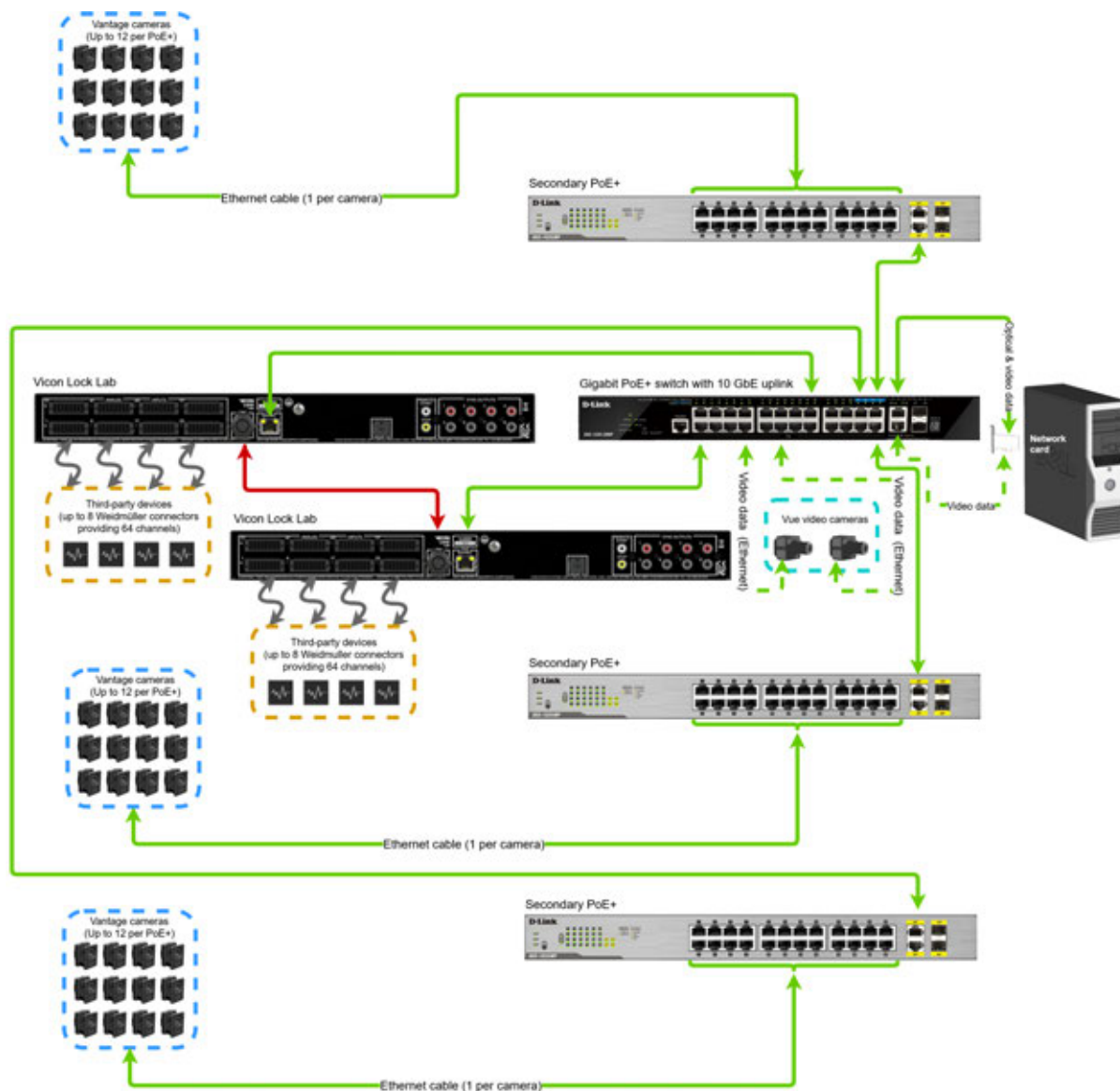
The following diagram shows two Vicon video cameras added to an extended Vantage system.



The Vicon video cameras are added to the Gigabit PoE+ switch so they do not add to the bandwidth of the interconnection to the PoE+ switches. In this example, the optical and video data are carried by two separate connectors between the PC and the Gigabit PoE+ switch.

## Vicon Vantage system with 3 PoE+ switches

The following diagram shows a system requiring three PoE+ switches and a Lock unit.



## Add analog capture devices to a Vantage system

The following topics cover how to connect supported third-party analog capture devices, such as force plates, electromyography (EMG) equipment, potentiometers, and accelerometers, to your Vicon Vantage system.

- [About analog to digital converter \(ADC\) functionality, page 105](#)
- [Analog ADC sockets and pin allocation, page 106](#)
- [Connect analog devices to a Vicon Lock unit, page 107](#)



## About analog to digital converter (ADC) functionality

To capture data from third-party devices, such as force plates and electromyography (EMG) equipment, to a Vicon Vantage system, your Vantage system must include a Vicon Lock unit, which provides analog to digital converter (ADC) functionality.

Vicon Lock+ (and the later Lock units that provide ADC functionality) support up to 64 analog channels. You can extend the number of analog channels in your Vicon Vantage system by adding a further Lock (see [Vicon Vantage system with additional cameras and two Vicon Lock+ units, page 99](#)).

The ADC captures up to 64 separate inputs for generating 16-bit offset binary conversions from the analog sources. The input impedance is 1 MΩ (ohm). The data sampling frequency is common to all channels; you can set the sampling rate to be a multiple of the camera base rate up to 192,000 samples/second (192 KHz). The capture frequency you can specify depends on the total number of channels to be sampled, as shown in the following table.

No. of channels available	Max. capture frequency (KHz)	Allocated channel input no.
64	3	1–64
32	6	1–32
16	12	1–16
8	24	1–8
4	48	1–4
2	96	1–2
1	192	1

As the table shows, increasing the sample rate above 3 KHz automatically reduces the number of channels available for capturing. Irrespective of the sampling rate selected, there is always a fixed 5.2uS timing offset (one period of 192KHz) between physically adjacent channels.



### Important

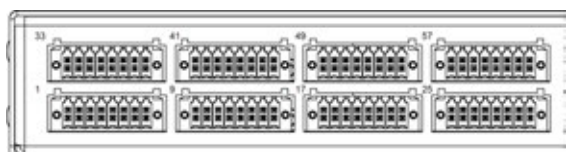
When sampling at capture frequencies greater than 3KHz, the upper channels can no longer be sampled, so the remaining channels to be sampled must be justified to the first channel positions (that is, they must begin at the first channel).

Each channel has a programmable gain, which can be set to +/-10 volts, +/-5 volts, +/-2.5 volts, or +/-1.25 volts. This gain (or attenuation) automatically scales the input signal to the dynamic range of the ADC sampling device (which is +/- 2.5 volts) thus guaranteeing the best signal-to-noise ratio. For details on specifying these settings, see your Vicon software documentation.

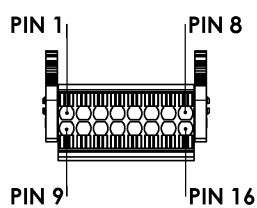
## Analog ADC sockets and pin allocation

To connect supported third-party analog devices into a Vicon Vantage system via a Vicon Lock unit, you use the supplied Weidmüller connectors. For instructions on using the connectors, see [Connect analog devices to a Vicon Lock unit, page 107](#).

As shown in the following image, in a Lock+ and the later Lock units that support analog connectivity, the 64 channels of analog signal capture are made up from eight separate connectors.



Each connector can be ported to connect to individual force plates. Each connector contains 16 individual connections, eight signal and their eight respective grounds:



Note that the pins are assigned as follows:

- Pins 1–8 (top row): Ground
- Pins 9–16 (bottom row): Signal inputs

In this diagram, the bottom of the image represents the wire side of the connector.



### Tip

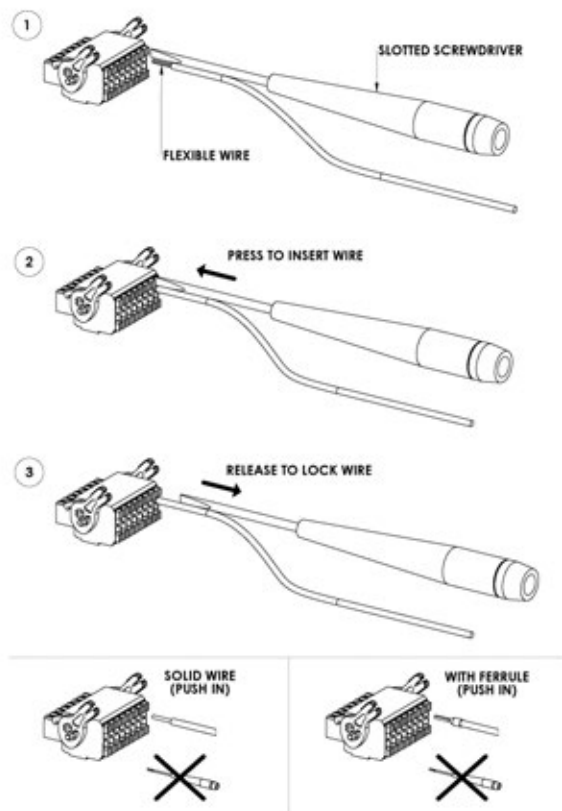
For each socket, the duplicate pin numbers do not correlate with the analog channel input. That is, on connector one (leftmost), pin 9 is channel 1, pin 16 is channel 8. On connector four (rightmost), pin 9 is channel 25, pin 16 is channel 32.

For the more common force plate interfaces, you can also obtain pre-configured cables from Vicon (see [Vicon Vantage cable ordering information, page 75](#)).

## Connect analog devices to a Vicon Lock unit

The Weidmüller connectors enable you to connect third-party devices for capturing analog data, such as force plates and accelerometers to a Vicon Lock unit.

When inserting flexible wire cables into a connector or extracting them from a connector, use a slotted screwdriver as shown in the following illustration.



If your cables are rigid (solid wire or ferrule), you do not need to use a screwdriver and can push the ends of the cables into the required connector.

## Add synchronized output devices to a Vantage system

The following topics explain how to connect and synchronize third-party devices with output from your Vicon Vantage system.

- [Understand synchronization output functionality, page 109](#)
- [Include a synchronized device, page 127](#)

## Understand synchronization output functionality

The **Sync Output** sockets on the rear panel of a Vicon Lock unit can output synchronization signals that can be used by supported third-party devices, such as reference video cameras. With this functionality, you can synchronize all Vicon Vantage and supported third-party devices in your Vicon Vantage system to the master system frame rate. Some third-party devices do not run at as high a speed as the Vicon optical cameras, so you can specify what fraction or multiple of the master frame rate will be used for connected devices. You can also use these output signals to trigger third-party devices based on Vantage system events.

To activate the synchronization output signals, you must specify a synchronization configuration file (GPO) in your Vicon application software. You will need to know what type of output signal your third-party device expects, so that you can activate the required signal type.

The following topics explain what you need to know to synchronize your external device with the Vicon Vantage system:

- [System events and synchronization output signals, page 110](#)
- [Synchronization output \(GPO\) configuration files, page 112](#)

## System events and synchronization output signals

You can configure a Vicon Lock unit to output a particular synchronization signal for a third-party device connected to one or more of the eight **Sync Output** sockets on the rear of the Vicon Lock unit, based on Vantage system events.

Vantage system events relevant to GPO are identified in the following table.

System event	Description
Start System	Synchronously start data flow from Vicon hardware devices. This Vicon System event can be used to activate the GPO file using the GPO StartEvent <b>MXDVStart</b> . For details, see <a href="#">StartEvent section, page 124</a> .
Start Capture	Start capture with the Vantage cameras and any optional third-party devices, such as reference video cameras. This Vicon System event can be used to activate the GPO file using the GPO StartEvent <b>StartCapture</b> . For details, see <a href="#">StartEvent section, page 124</a> .
Stop Capture	Stop capture with the Vantage cameras and any optional third-party devices, such as reference video cameras. This Vicon System event can be used to activate the GPO file using the GPO StopEvent <b>StopCapture</b> . For details, see <a href="#">StopEvent section, page 124</a> .
Stop System	Stop data flow from Vicon hardware devices (either to resynchronize or shut down the system). This Vicon System event can be used to activate the GPO file using the GPO StopEvent <b>MXDVStop</b> . For details, see <a href="#">StopEvent section, page 124</a> .

When one of these system events occurs, the specified General Purpose Output (GPO) configuration file is activated, and the defined synchronization signal is produced (for details, see [Synchronization output \(GPO\) configuration files, page 112](#)). The devices connected to these sockets can then respond to the synchronization signal (for details of the type of signal expected to trigger an action, see the documentation for your device).

The types of synchronization signal that can be produced are described in the following table.

Signal Type	Description
Duration (event-based)	<p>A single signal that is either on or off. When on, the signal can either stay high or low.</p> <p>This signal changes state based on a specified event and then changes state back based on another specified event, independent of frames or times.</p>
Repeating (frame based)	<p>Repetitive signal that can be locked to a frame-based (synchronous) period.</p> <p>This signal uses rectangular waves with a mark-space ratio determined by the settings in the GPO file.</p> <p>Frame-based periods will have their edges referenced to frame boundaries with any offsets from these specified in the GPO file.</p> <p>The pulse period for frame-based signals can be set as either a multiple or fraction of the frame length and for time-based signals in microseconds or clock ticks.</p> <p>This signal type can be used to synchronously align supported devices that respond to a clock pulse.</p>

## Synchronization output (GPO) configuration files

A General Purpose Output (GPO) configuration file specifies the characteristics of a synchronization signal to be output from the **Sync Outputs** sockets on the rear panel of the Vicon Lock unit.

In your Vicon application software, you specify the GPO configuration file that you want to use:

- **Supplied GPO file**

The GPO files supplied with your Vicon application software specify the relationship of the frame rate of a connected device with that of Vantage cameras. For details, see [Supplied synchronization configuration \(GPO\) files, page 113](#).

- **Custom GPO file**

You can write a GPO file to specify the type of signal to have the Vicon Lock unit produce when a specified Vantage system event occurs. For details, see [Custom synchronization \(GPO\) files, page 115](#).

Your connected device can then perform the action it is defined to do on receipt of that type of signal (for details, see the documentation supplied with your device)

For details on specifying a GPO file, see your Vicon software documentation.



## Supplied synchronization configuration (GPO) files

Some synchronization configuration files may be supplied with your Vicon application software. For example, the GPO files supplied with Vicon Nexus are used to synchronize the frame rates of connected reference video cameras to the frame rate used by the Vantage system as shown in the following tables. For details on the installation location of these files, see your Vicon Nexus documentation.

### Duration signals

Synchronization configuration file	Description
Duration.gpo	<p>On a StartCapture event, the synchronization output latches high for the duration of the capture.</p> <p>On a StopCapture event, the output latches low. Further details: <a href="#">StartEvent section, page 124</a> and <a href="#">StopEvent section, page 124</a>.</p> <p>This GPO file is used to synchronize supported third-party devices connected to your Vantage system.</p>
SyncDuration.gpo	<p>On an MXDVStart event the synchronization output latches high until an MXDVStop event is received.</p> <p>Further details: <a href="#">StartEvent section, page 124</a> and <a href="#">StopEvent section, page 124</a>.</p> <p>This GPO file is for use with ZeroWire Digital devices.</p>

## Repeating signals

Synchronization configuration file	Description
DV_Double.gpo	<p>On an MXDVStart event produces two high and two low pulses for each Vicon frame.</p> <p>The pulse period is one-half of a Vicon frame, and the pulse width is one-quarter of a Vicon frame. Further details: <a href="#">StartEvent section, page 124</a> and <a href="#">PulsePeriod section, page 126</a>.</p> <p>This GPO file is used to align reference video cameras with Vantage cameras at twice the Vicon Vantage system frame rate.</p>
DV_Half.gpo	<p>On an MXDVStart event sends a high pulse followed by a low pulse on every other Vicon frame.</p> <p>The pulse period is two Vicon frames, and the pulse width is one Vicon frame. Further details: <a href="#">StartEvent section, page 124</a> and <a href="#">PulsePeriod section, page 126</a>.</p> <p>This GPO file is used to align reference video cameras with Vantage cameras at half the Vicon Vantage system frame rate.</p>
DV_Normal.gpo	<p>On an MXDVStart event sends a high pulse followed by a low pulse within every Vicon frame.</p> <p>The pulse period is one Vicon frame, and the pulse width is one-half of a Vicon frame. Further details: <a href="#">StartEvent section, page 124</a> and <a href="#">PulsePeriod section, page 126</a>.</p> <p>This GPO file is used to synchronize reference video cameras to the Vicon Vantage system at the same frequency as the Vantage cameras.</p>
DV_Quarter.gpo	<p>On an MXDVStart event sends a high pulse followed by a low pulse on every fourth Vicon Vantage system frame.</p> <p>The pulse period is four Vicon frames, and the pulse width is two Vicon frames. Further details: <a href="#">StartEvent section, page 124</a> and <a href="#">PulsePeriod section, page 126</a>.</p> <p>This GPO file is used to align reference video cameras with Vantage cameras at one-quarter of the Vicon Vantage system frame rate.</p>

## Custom synchronization (GPO) files

You can write your own GPO file to specify the type of synchronization signal to be output from the Sync Output sockets for a specified Vantage system event.

The following sections illustrate the two types of synchronization signals that can be output and show how you can specify each in a GPO file:

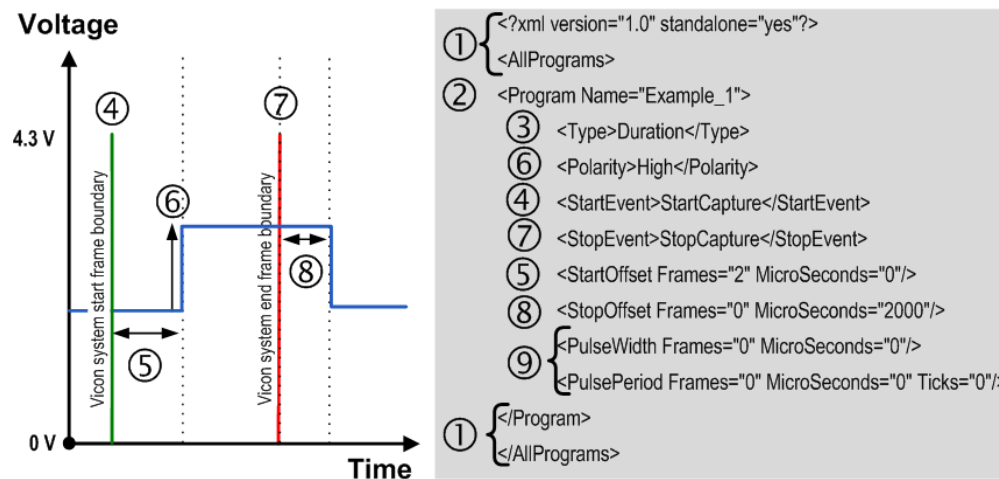
- [Custom GPO file for a fixed duration synchronization signal, page 116](#)
- [Custom GPO file for a repeating synchronization signal, page 118](#)

The examples use wave form diagrams to illustrate the signal characteristics and provide cross-references to the relevant GPO file syntax sections.

## Custom GPO file for a fixed duration synchronization signal

The following diagram illustrates the characteristics of a fixed duration synchronization signal and a custom GPO file that would generate this signal.

Note that timing offsets are taken from the frame boundaries (indicated by green (4) and red (7) lines) and are measured in 27MHz increments (ticks).



where:

- 1 are lines of code required to maintain full XML conformity for starting and ending a program. Further details: [XML header, page 121](#) and [AllPrograms, page 121](#) section.
- 2 are lines of code required to maintain full XML conformity. Note that Vicon software uses the GPO filename rather than this program name. In this example, the Program Name is Example\_1. Further details: [Program Name section, page 122](#).
- 3 specifies the type of synchronization signal the GPO is to produce. In this example, it is a signal with a defined start and stop rather than a repeating signal. Further details: [Type section, page 122](#).
- 4 is the system event that has been defined to start the GPO program. In this example, it sets the signal to be active referenced to the start of capture. Further details: [StartEvent section, page 124](#).
- 5 is the amount of time to wait after the start event has occurred before sending the signal to its specified polarity. In this example, it sets the delay of signal activation to two frames after the start of capture. Further details: [StartOffset section, page 125](#).

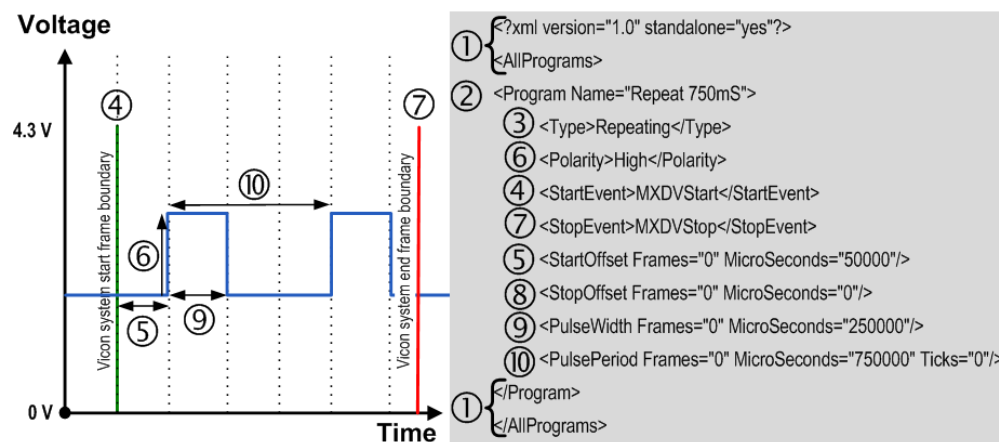
- 6 is the direction the synchronization signal moves when started. In this example, it sets the signal to start low, go high on activation, and then reset low on completion.  
Further details: [Polarity section, page 123](#).
- 7 is the event that has been defined to end the GPO program. In this example, it sets the signal to stop being active referenced to the end of capture.  
Further details: [StopEvent section, page 124](#).
- 8 is the stop offset to be applied in the GPO file. In this example, it resets the signal 2 milliseconds (2000 microseconds) after the end of capture.  
Further details: [StopOffset section, page 125](#).
- 9 are the length and frequency of the signal to be produced. In this example, they are set to 0 (zero) as they are not required for duration signals.  
Further details: [PulseWidth section, page 126](#) and [PulsePeriod section, page 126](#).

## Custom GPO file for a repeating synchronization signal

The following diagram illustrates a custom GPO file that sends a repetitive signal from the time the system becomes synchronized after boot up. The signal is not locked to the video frame rate but to time and is, therefore, described as asynchronous. For examples of synchronous signals refer to the supplied GPO files (DV\_\*.gpo). Further details: [Supplied synchronization configuration \(GPO\) files](#), page 113.

The repeating synchronization signal GPO file described here will be active until the system reboots or is resynchronized. After resynchronization, the GPO will restart in the same way it does after system boot.

Note that timing offsets are taken from the frame boundaries (indicated by green (4) and red (7) lines) and are measured in 27MHz increments (ticks).



where:

- 1 are lines of code required to maintain full XML conformity for starting and ending a program. Further details: [XML header](#), page 121 and [AllPrograms section](#), page 121.
- 2 are lines of code required to maintain full XML conformity. Note that Vicon software uses the GPO filename rather than this program name. In this example, the Program Name is Repeat 750mS. Further details: [Program Name section](#), page 122.
- 3 specifies the type of synchronization signal the GPO is to produce. In this example, it is a repeating signal that will be active as long as the system is running and is not booting up, resynchronizing, or shutting down, rather than a duration signal. Further details: [Type section](#), page 122.
- 4 is the system event based on which you want to start the GPO program. In this example, the signal is set to start as soon as the system has finished synchronizing after it has booted up. Further details: [StartEvent section](#), page 124.

- 5 is the amount of time to wait after the start event has occurred before sending the signal to its specified polarity. In this example, it sets the delay of signal activation to 50 milliseconds (50000 microseconds) after the start event.  
Further details: [StartOffset section, page 125](#).
- 6 is the direction the synchronization signal moves when started. In this example, it sets it to start low and go high when active.  
Further details: [Polarity section, page 123](#).
- 7 is the event that has been defined to end the GPO program. In this example, it's set to the system suspending dataflow pending either a resynchronization being performed or a software shutdown.  
Further details: [StopEvent section, page 124](#).
- 8 is the stop offset to be applied in the GPO file. In this example, it sets the stop offset to zero.  
Further details: [StopOffset section, page 125](#).
- 9 is the width of the active part of the signal. In this example, it sets it to 0.25 seconds (250000 microseconds).  
Further details: [PulseWidth section, page 126](#).
- 10 is the period between two pulse signals. In this example, it sets the cycle period of the signal to 0.75 seconds (750000 microseconds). The ratio of 0.75 to 0.25 means that the rectangular waveform produced has a 3:1 (33 1/3%) mark-space ratio.  
Also, by defining the cycle period in seconds instead of frames, the signal is asynchronous with respect to system frequency.  
Further details: [PulsePeriod section, page 126](#).

## Synchronization configuration (GPO) file format

General Purpose Output (GPO) configuration files are written in eXtensible Markup Language (XML) file format. These XML files are used to store structured information and to enclose or encapsulate information so that it can be passed between different computing systems. As in any XML file, GPO file sections are delimited with start and end section tags, and subsections are nested beneath main sections to reflect their hierarchical relationship, for example:

```
<XML header>
  <SectionStart>
    <SubsectionStart ATTRIBUTE="value">
      <Keyword>Value</Keyword>
      <Keyword ATTRIBUTE="value"/>
    </SubsectionEnd>
  </SectionEnd>
```

The GPO file can be viewed in most Web browsers or standard text editors like any other XML file.

You may find it helpful to view the examples in [Custom synchronization \(GPO\) files, page 115](#) or one of the sample GPO files provided with your Vicon application software while you read this description of the general format and content of a GPO file. You are assumed to have a basic understanding of the use and presentation of XML files.



## Synchronization configuration (GPO) file structure

The full structure of a GPO file is outlined below:

```
<?xml version="1.0" standalone="yes"?>
<AllPrograms>
  <Program Name="gpo_name">
    <Type>signal_type</Type>
    <Polarity>signal_direction</Polarity>
    <StartEvent>gpo_start</StartEvent>
    <StopEvent>gpo_stop</StopEvent>
    <StartOffset Frames="" MicroSeconds=""/>
    <StopOffset Frames="" MicroSeconds=""/>
    <PulseWidth Frames="" MicroSeconds=""/>
    <PulsePeriod Frames="" MicroSeconds="" Ticks=""/>
  </Program>
</AllPrograms>
```

### XML header

The header `<?xml version="1.0" standalone="yes"?>` is essential for the file to be recognized as XML format by Vicon applications and other XML file viewing packages. You must include this section at the top of your GPO file.

### AllPrograms section

The program start and end section tags `<AllPrograms>` and `</AllPrograms>` delimit the details of the synchronization signal to be sent. You must include the start section immediately after the XML header and the end section at the end of your GPO file.

Each option in a given section within the `<AllPrograms>` section consists of a keyword and a single value or one or more `ATTRIBUTE="value"` pairs, which are written in the following ways in an XML file:

```
<Keyword>value</Keyword>
<Keyword ATTRIBUTE="value"/>
```

The Keyword identifies the element with which the Vicon application is to be concerned, the ATTRIBUTE is a characteristic of the specified keyword, and the value is the actual data that the Vicon application is to use. For most options, you must specify the value required for your specific implementation of the GPO file. To help you understand how to construct these definitions in your GPO file, when giving the syntax for a section, the following information includes the Keyword and any ATTRIBUTE words, and describes the type of data you must supply for the value.

## Program Name section

The syntax for the Program Name section is:

```
<Program Name="gpo_name">
```

where:

gpo_name	is the name for your GPO program. <b>Tip:</b> The base of the GPO file name is used as the program display name in your Vicon application software. Therefore, Vicon recommends that you use the file name base as the GPO program name. For example, the sample GPO program <i>Duration.gpo</i> , has the display name <i>Duration</i> in the Vicon application software.
----------	---

## Type section

The syntax for the Type section is:

```
<Type>signal_type</Type>
```

where:

signal_type	specifies the type of synchronization signal the Vicon Lock unit is to produce, one of:	
	Duration	A single signal that lasts from a given start event until a given stop event.
	Repeating	A repetitive pulse signal that begins on a given start event and ends on a given stop event.
	Start	A type of duration signal that occurs on a given start event; no signal occurs on a given stop event.
	StartStop	A type of duration signal that occurs on a given start event and then again on a given stop event.
	Stop	A type of duration signal that occurs on a given stop event; no signal occurs on a start event.

## Polarity section

The syntax for the Polarity section is:

```
<Polarity>signal_direction</Polarity>
```

where:

signal_direction	specifies the direction the synchronization signal is to start and then move when the GPO file is activated:
High	Starts low (0 V) and moves high (5 V). For a duration signal type, the signal latches high until the start event occurs, whereupon the signal starts with a positive-going edge. When the stop event occurs, the signal is latched low. Further details: <a href="#">StartEvent section, page 124</a> and <a href="#">StopEvent section, page 124</a> . For a repeating signal type, the signal starts its repetitive cycle in this direction.
Low	Starts high (5 V) and moves low (0 V). For a duration signal type, the signal latches low until the start event occurs, when the signal starts with a negative-going edge. When the stop event occurs, the signal is latched low. Further details: <a href="#">StartEvent section, page 124</a> and <a href="#">StopEvent section, page 124</a> . For a repeating signal type, the signal starts its repetitive cycle in this direction.

## StartEvent section

The syntax for the StartEvent section is:

```
<StartEvent>gpo_start</StartEvent>
```

where:

gpo\_start specifies the Vantage system event that activates the GPO file:

StartCapture The Start Capture event.

MXDVStart The Start System event.

Further details: [System events and synchronization output signals, page 110](#).

**Important:** The StartCapture event type does not synchronize reference video cameras or the ZeroWire EMG system. Use the MXDVStart event to synchronize such external devices.

## StopEvent section

The syntax for this StopEvent section is:

```
<StopEvent>gpo_stop</StopEvent>
```

where:

gpo\_stop specifies the Vantage system event that stops the GPO file:

StopCapture The Stop Capture event.

MXDVStop The Stop System event

Further details: [System events and synchronization output signals, page 110](#).

## StartOffset section

The syntax for the StartOffset section is:

```
<StartOffset Frames="" MicroSeconds=""/>
```

where:

**StartOffset** specifies how long to wait after the start event ([StartEvent section, page 124](#)) has occurred before sending the signal to its desired polarity:

**Frames** A specified number of frames.

**MicroSeconds** A specified number of microseconds

**Important:** If you specify both Frames and MicroSeconds, the two values are added together to determine the offset.  
The maximum time-based offset you can define is 65 milliseconds (16 bits times microseconds). Frame-based offsets are unlimited.

## StopOffset section

The syntax for the StopOffset section is:

```
<StopOffset Frames="" MicroSeconds=""/>
```

where:

**StopOffset** specifies how long to wait after the stop event ([StopEvent section, page 124](#)) has occurred before sending the signal to its desired polarity:

**Frames** A specified number of frames

**MicroSeconds** A specified number of microseconds.

**Important:** If you specify both Frames and MicroSeconds, the two values are added together to determine the offset.  
The maximum time-based offset you can define is 65 milliseconds (16 bits times microseconds). Frame-based offsets are unlimited.

## PulseWidth section

The syntax for the PulseWidth section is:

```
<PulseWidth Frames="" MicroSeconds=""/>
```

where:

**PulseWidth** specifies the fixed duration of the pulse for a repeating synchronization signal as either one or the sum of both the following:

**Frames** The number of frames the pulse signal is to last.

**MicroSeconds** The number of microseconds the pulse signal is to last.

**Important:** If you specify both Frames and MicroSeconds, the two values are added together to determine the pulse width; however, you are recommended to use either Frames and MicroSeconds rather than adding these values.

## PulsePeriod section

The syntax for the PulsePeriod section is:

```
<PulsePeriod Frames="" MicroSeconds="" Ticks=""/>
```

where:

**PulsePeriod** specifies the total period of the pulse for a repeating synchronization signal, that is, the time from one rising edge to the next rising edge, as either one or the sum of two or more of the following values converted to 27 Mhz:

**Frames** The number of frames after which the pulse is to be repeated.

**MicroSeconds** The number of microseconds after which the pulse is to be repeated.

**Ticks** The number of 27 Mhz clock ticks of the Vantage timing reference after which the pulse is to be repeated.

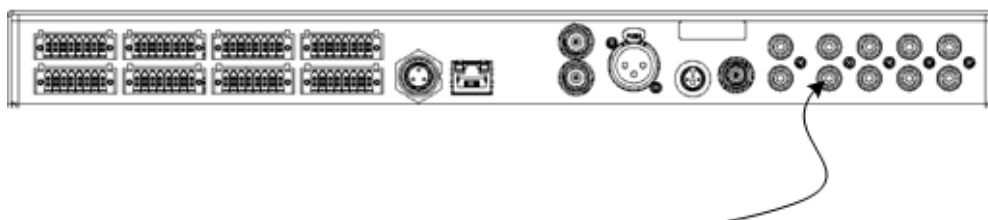
**Important:** If you specify Frames, MicroSeconds, and Ticks, all values are added together to determine the offset; however, you are recommended to add either MicroSeconds or Ticks to frames rather than adding all three values.

## Include a synchronized device

You can include supported third-party devices whose operation is to be synchronized with your Vicon Vantage system, such as reference video cameras.

To include third-party synchronized devices in a Vantage system:

1. Plug one end of your synchronized device cable into one of the **Sync Output** sockets on the rear of a Vicon Lock unit. (The following image shows the rear panel of a Lock+.)



2. Plug the other end of the cable into the appropriate socket in your synchronized device.
3. To manage the synchronization of your external devices, or to trigger your external devices based on Vantage system events, identify an appropriate GPO configuration file supplied with your Vicon application software, or create a GPO file of your own. For details on these, see [Supplied synchronization configuration \(GPO\) files, page 113](#) and [Custom synchronization \(GPO\) files, page 115](#).
4. In the Vicon application software, specify this GPO configuration file for your external device. For details on doing this, see your Vicon software documentation.

For details of these connectors, see the relevant [Lock rear panel, page 47](#).

For details of the synchronized device cable, see [Extended Vicon Vantage system cables, page 71](#).

## Add remote triggering devices to a Vantage system

The following topics explain how to connect external devices to a Vicon Lock unit to remotely trigger capture by your Vicon Vantage system.

- [Understand remote functionality, page 129](#)
- [Include a remote triggering device, page 131](#)



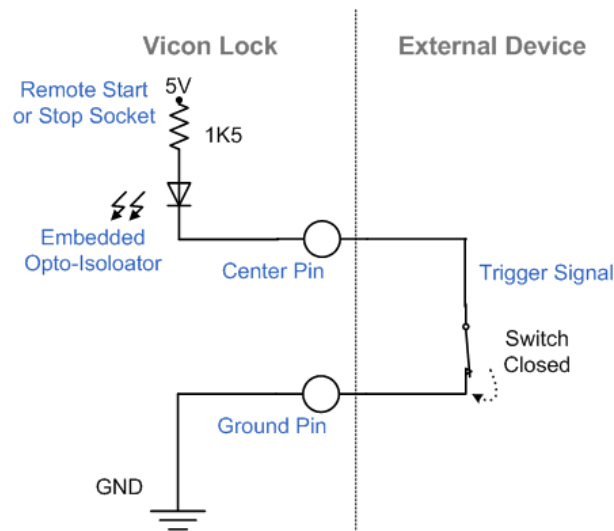
## Understand remote functionality

You can remotely trigger the Vicon Vantage system to capture data based on input signals that a Vicon Lock unit receives from a supported third-party device that is connected to the Remote Start or Stop sockets.

Before you can remotely start or stop your Vantage system, you must first arm it for capture and activate the start/stop functionality in your Vicon application software. For details, see your Vicon application software documentation.

You must create your own cable to plug into the Remote Start or Stop sockets in the rear of a Vicon Lock unit, using RCA plugs. To activate the start or stop trigger, you must force the pin to the outer GND (that is, short circuit it) in the Remote Start or Stop socket. You can do this with a relay that you can connect to a photosensor, or wire to a foot pressure switch.

The following diagram illustrates how this relay would force the center pin to GND to send an input signal to the Vicon Lock unit to start or stop the capture. As illustrated, the Remote Start and Stop functions can be activated either by plugging in a standard TTL gate-to-ground signal or by using a simple mechanical switch, normally open, wired across the pin and ground of the RCA plug.



The following table shows the TTL settings to which your external switch must pull the Remote Start or Stop input pins in order to trigger the remote capture.

Input Signal		Trigger Action
Remote Start	Remote Stop	
High	High	Signal held high until the pin is pulled to GND. This is also the default system setting when no device is connected.
Low	High	Remote Start pin is pulled to GND and capture starts at next video frame.
High	Low	Remote Stop pin is pulled to GND and capture stops at the next video frame.
Low	Low	Undefined (do not use).

For details on the circuitry involved and electrical specifications for the connector, contact [Vicon Support](#)<sup>13</sup>.

<sup>13</sup> <https://www.vicon.com/support>

## Include a remote triggering device

You can include supported third-party devices to trigger your Vicon Vantage system to start capture, stop capture, or both. You can also have the Vicon Lock unit trigger the external device. You must obtain your own cable to plug into the Remote Start or Stop connectors on the rear of the Lock unit and into your remote triggering device (further details: [Understand remote functionality, page 129](#)).

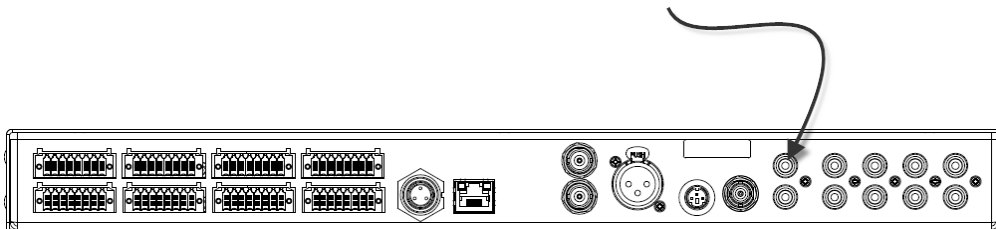


### Tip

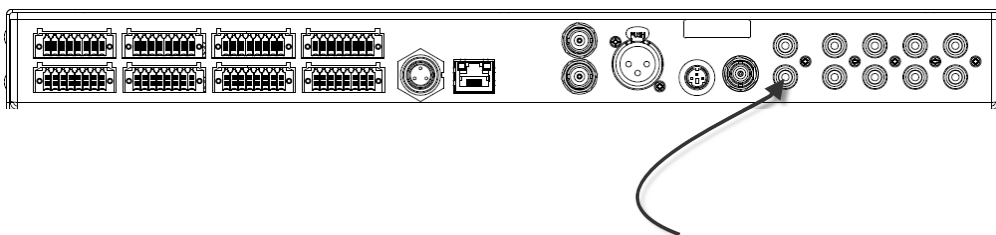
In your Vicon application software, you can configure a buffer to capture for a specified amount of time before the start is triggered (for details, see your software documentation). The data from that buffer is added to your raw data (X2D) file. You can also configure the software to stop capture after a specified duration, rather than using a remote stop trigger.

To include remote triggering devices in a Vantage system:

1. For a device to remotely trigger capture to start, plug your device cable into the **Remote Control Input Start** connector on the rear of a Vicon Lock unit. (The following illustrations show a Lock+ unit.)



2. For a device to remotely trigger capture to stop, plug your device cable into the Remote Control Input Stop input connector on the rear of a Vicon Lock unit.



3. Plug the other end of your device cable into your remote triggering device.

Further details: [Lock rear panel, page 47](#).

## Add genlock/timecode devices to a Vantage system

The following topics describe how to connect external EBU/SMPTE SD and HD analog video sources for genlocking to your Vicon Vantage system, with or without associated timecode.

- [Understand Vicon Vantage genlock functionality, page 133](#)
- [Understand Vicon Vantage timecode functionality, page 134](#)
- [Include a genlock and/or timecode device, page 138](#)

## Understand Vicon Vantage genlock functionality

This topic describes genlock functionality provided by a Vicon Vantage system when you connect external video sources to a Vicon Lock unit.

From the Vicon application software on the Vicon Vantage host PC, you can configure the Vicon Lock unit to genlock to an external PAL, SECAM, NTSC, or HD video source that is connected to one of the **Ref Loop** sockets. Genlock synchronizes the Lock unit and hence the Vantage cameras to the frame rate of the incoming video signal.

This also allows uplocking (running at a higher multiple of frame rate) from lower-speed broadcast cameras to Vicon's higher-speed motion capture cameras, where necessary.

The genlock source controls the master timing of Lock unit and the frame rate. The number of lines per frame has no significance other than locking the clock. You can enable genlock functionality in your Vicon application software.

If no external video source is connected, the primary Lock unit still provides master synchronization by 'free running'.

You can also synchronize VESA Stereo sources. For more information, see [Add VESA stereo to a Vantage system, page 142](#).

Note that genlock can be used without timecode.



### Caution

Video from a non time-base corrected source may cause high levels of jitter, which prevents reliable synchronization. The signal quality and hence Lock unit performance is affected if the loop is not correctly terminated. If the Vicon Lock unit is the only device or the last device in the chain, a 75  $\Omega$  (ohm) terminator must be attached to the other Ref loop video BNC connector.

## Understand Vicon Vantage timecode functionality

This topic describes the timecode functionality that is available when you connect external video sources to a Vicon Lock unit.

Timecode is a time stamp that can be present in video or audio signals to provide timing information (i.e. time and frame number reference). Within a 24-hour period, each frame has its own unique timecode. You can configure the Vicon Lock unit to trigger from a connected video source containing embedded VITC (Vertical Interval Timecode) or a video source in conjunction with LTC (Longitudinal Timecode). You do this using the Vicon application software on the Vicon Vantage host PC.

The following table shows the international SD and HD video formats supported by Vicon Vantage systems.

Format	Description	Variant supported
<b>EBU (European Broadcasting Union):</b> Based on cameras operating at a multiple of 25 Hz. In Vicon documentation, the term EBU is used interchangeably with the following terms:		
PAL (Phase Alternating Line)	The color standard used in Europe, except France.	PAL 50 2:1 (Interlaced)
SECAM (Sequential Couleur avec Mémoire)	The color standard used in France, the Middle East, and most of Eastern Europe.	SECAM 50 2:1 (Interlaced)
CCIR (Consultative Committee for International Radio)	The black and white standard.	2:1 (interlaced)
<b>SMPTE (Society of Motion Picture &amp; Television Engineers):</b> Based on cameras operating at a multiple of 29.97 Hz. In Vicon documentation, the term SMPTE is used interchangeably with the following terms:		
NTSC (National Television System Committee)	The color standard used in the United States.	NTSC 59.94 2:1 (Interlaced)
EIA (Electronic Industry Association)	The black and white standard.	2:1 (interlaced)
<b>HD (High Definition film):</b> Based on cameras operating at a multiple of 24 fps, 23.98 fps, or 30 fps.		
24 fps	Cameras operating at a multiple of 24 fps	1920 x 1080 24 1:1 (Progressive)
23.98 fps	Cameras operating at a multiple of 23.98 fps	1920 x 1080 23.98 1:1 (Progressive)
30 fps	Cameras operating at a multiple of 30 fps	1920 x 1080 30 1:1 (Progressive)

Vicon Lock units do not use any color sub-carrier if present. For each of the EBU and SMPTE formats, Vicon Lock units support the use of both LTC and VITC forms of timecode:

- LTC signal characteristics are compatible with standard audio channels so that they can be recorded onto audio tracks or to an audio track on video. Lock units are intended to be used with industry-standard balanced signals which are terminated in 600  $\Omega$  (ohm). LTC frame rates supported are 30, 29.97, 25, 24 and 23.98 fps.
- VITC is encoded directly into spare lines in the vertical interval of the analog SD video signal.

For the analog HD formats, which inherently do not support VITC, LTC timecode must be used in conjunction with the synchronized genlock source.

The Vicon Lock unit can take the timecode from a LTC source connected to the LTC In socket, and timestamp the associated synchronized video signal connected to the Ref Loop Input. It can also take the timecode from a Ref Loop Input itself, if it has embedded VITC, which may be the case with SD analog video. You can select the timecode source in your Vicon application software.

Within a 24-hour period, each video frame has an associated timecode which is encoded in hours, minutes, and seconds, along with a sequential frame number.

Standard timecode format is:

hh:mm:ss:ff

where:

hh	=	hours	00–23
mm	=	minutes	00–59
ss	=	seconds	00–59
ff	=	frames	00–23 for HD (FILM) 00–24 for EBU (PAL/SECAM) 00–29 for SMPTE (NTSC) and HD (30)

For NTSC, the separator character changes between a colon (:) for non-drop frames and a semicolon (;) for drop frames.

The Vicon Vantage system reads the sequential timecode from the selected timecode source and subsequently timestamps the Vicon raw (X2D) data, along with any reference Vicon Vue video, with that of the external timecode. This can then be used to locate a precise reference point for editing your data.



## Timecode triggering

From the Vicon application software on the Vicon Vantage host PC, you can configure Timecode triggering to automatically cause the Vicon Lock unit to start and/or stop data capture based on the timecode.

You can set the data capture start time to the required timecode and trigger the capture process to that particular timecode number. The Vicon Lock unit then starts the capture when the specified timecode is reached.

## Include a genlock and/or timecode device



### Important

The following information applies to all Vicon Lock units except Lock Lab.

You can include in your Vicon Vantage system supported third-party external video devices that provide HD- and SD-compliant genlock and timecode to an external PAL, SECAM, NTSC, or HD video standard. In addition, Lock Studio supports SDI video, which can carry embedded timecode.

For information on genlock and timecode support, see [Understand Vicon Vantage genlock functionality, page 133](#) and [Understand Vicon Vantage timecode functionality, page 134](#).

You can include such devices to synchronize your Vicon Vantage system using genlock (a third-party device acts as the master video-timing generator).

If no external video sources are connected (including a VESA Stereo source), the Vicon Lock unit acts as the synchronization master for the Vicon Vantage system by controlling its own reference clock. For details on genlock support, see [Understand Vicon Vantage genlock functionality, page 133](#).

To timestamp your Vantage system with external timecode, you must have a genlock device connected to the system. You can use a single genlock/timecode video source with its embedded VITC, a synchronized video source with an associated LTC source, or (with Lock Studio only) SDI video with embedded timecode. You need specialist cables to connect these third-party devices to the Vicon Lock unit. For details, see [Vicon Vantage system cable descriptions, page 69](#).

The connections you use depend on whether you are using a separate timecode device:

- [Connect a genlock source with embedded VITC timecode, page 139](#)
- [Connect a genlock source with a separate LTC timecode, page 140](#)
- [Connect an SDI genlock source, page 141](#)

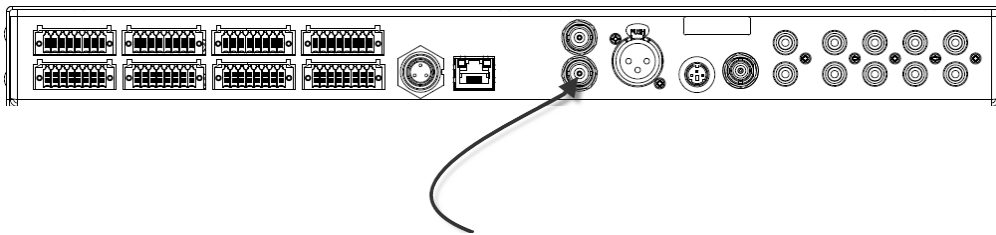
For details on Vicon Lock connectors, see the relevant [Lock rear panel, page 47](#). For details on genlock and timecode cables, see [Vicon Vantage system cable descriptions, page 69](#). For details on connectors on your genlock/timecode device, see the documentation supplied by the device manufacturer.

## Connect a genlock source with embedded VITC timecode

The following steps describe how to connect a genlock source with embedded VITC to your Vicon Vantage system.

To include a genlock source with embedded VITC timecode:

1. Plug the end of your video cable from your external video source with its embedded VITC signal into one of the two Video Reference Input BNC sockets. (The following image shows the rear panel of a Lock+.)



2. Depending on whether the Vicon Lock unit is the terminal device or not, connect the other BNC connector appropriately:
  - If a Vicon Lock unit is the only or end device in the chain, place a 75  $\Omega$  (ohm) terminator on the other BNC connector.
  - If a Lock unit is mid-chain, connect the other BNC connector to the next device.



### Important

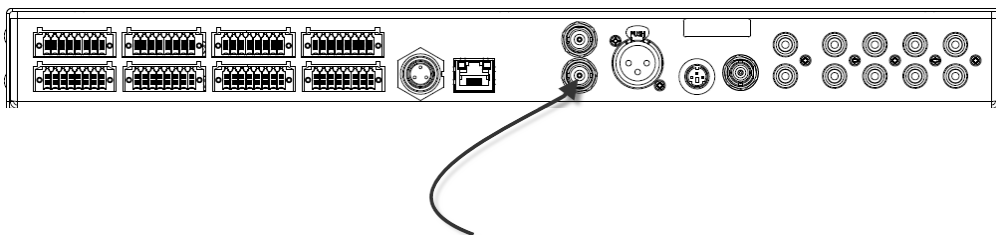
Always make sure the chain is ultimately terminated in 75  $\Omega$  (ohm).

## Connect a genlock source with a separate LTC timecode

The following steps explain how to connect a genlock source with a separate LTC timecode to your Vicon Vantage system.

To include a genlock source with a separate LTC timecode:

1. Plug the end of your video cable from your external video source into one of the two Video Reference Input BNC sockets. (The following images show the rear panel of a Lock+.)

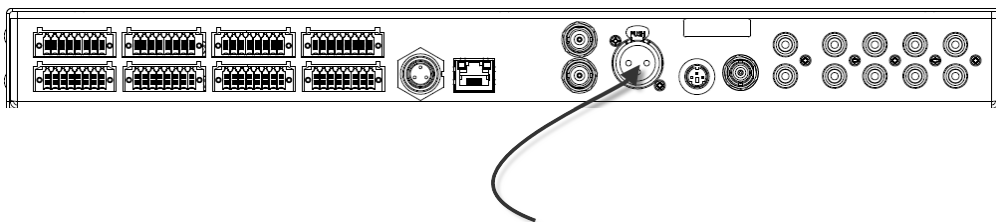


2. Depending on whether the Vicon Lock unit is the terminal device or not, connect the other BNC connector appropriately:
  - If a Vicon Lock unit is the only or end device in the chain, place a 75  $\Omega$  (ohm) terminator on the other BNC connector.
  - If a Lock unit is mid-chain, connect the other BNC connector to the next device.

### Important

Always make sure the chain is ultimately terminated in 75  $\Omega$  (ohm).

3. Plug the male LTC XLR connector from your external timecode device into the LTC In.

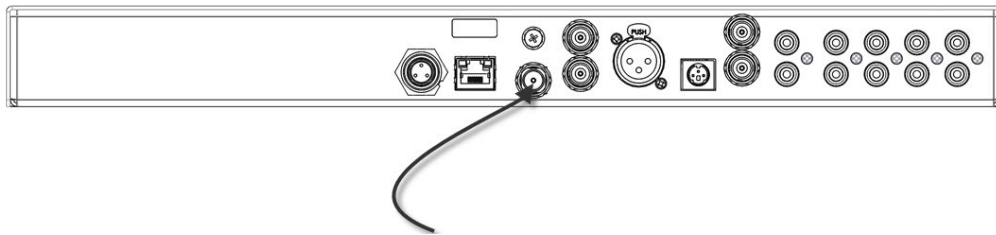


## Connect an SDI genlock source with embedded timecode

The following step describes how to connect a genlock source with embedded timecode to your Vicon Vantage system.

To include an SDI source with embedded timecode:

Plug the end of the video cable from your external SDI source with its embedded timecode signal into the SDI In BNC socket on a Lock Studio.



## Add VESA stereo to a Vantage system

The following topics describe how to connect an external VESA Stereo source for genlocking to and/or syncing an external VESA Stereo device.

- [Understand VESA Stereo, page 143](#)
- [Include a VESA Stereo source to genlock, page 144](#)
- [Include a VESA Stereo device for syncing, page 145](#)

## Understand VESA Stereo

VESA Stereo is a way to synchronize displays with stereoscopic 3D glasses for visualization systems. For certain types of stereoscopic glasses, particularly those that synchronize using IR light, it is important to match the timing of the Vicon system to the 3D signal using the VESA Stereo In on the Lock unit.



### Note

Vicon Shogun 1.1.1, Vicon Nexus 2.2, Vicon Tracker 3.1 and later versions support this interface.

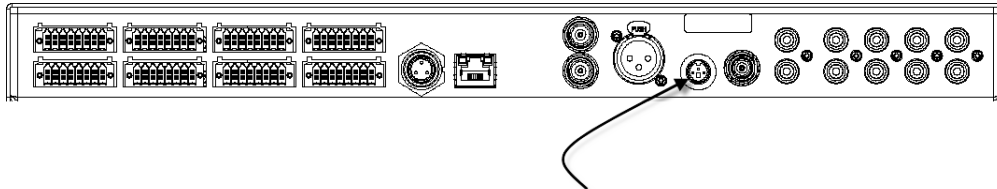
LCD shuttered glasses are used to view the stereo monitor with the aid of the VESA Stereo signal. This signal allows the image to be displayed in one eye while blanking the other eye on one frame. The selection is then reversed on the next frame. One combination is allowed when the signal is low and the other when high. This 'tricks' the brain into combining the two images from slightly different perspective points into one 3D image.

Vicon Lock units can genlock to this VESA Stereo signal, thus synchronizing the system. The VESA Stereo signal runs at half the frame rate of the monitor being used to view the image. Therefore a 60 fps VESA Stereo square wave allows 60 left-hand and 60 right-hand images per second and consequently genlocks the Vicon Lock to 120 fps. The Vicon Vantage camera can run at this fundamental frame rate or at higher harmonics such as 240 fps.

Lock units can synchronize to the fundamental frame rates of 50 and 60 fps and are controlled by the Vicon application software.

## Include a VESA Stereo source to genlock

Connect the VESA Stereo signal from a video source, such as a graphics card, which supports this feature, to the VESA Stereo In connector. (The following image shows the rear panel of a Lock+.)



Using the VESA Stereo signal to genlock the Vicon Vantage system offers benefits such as enabling you to eliminate optical interference between illuminating sources, for example, Vicon camera strobes and third-party devices within the system.

You can use your Vicon application software to phase-shift the time when the camera strobes turn on for each frame, with respect to the incoming VESA Stereo signal. This enables the strobe to be turned on at a different time from that of other potentially interfering sources. For example, you could offset the synchronizing pulse used by IR LCD shuttered glasses, or the Vicon Apex hand-tracking tool. For information on how to do this, search for **VESA Offset** in the online help of your Vicon application software.

The Vicon Apex uses photodiodes to synchronize its own LEDs to those of the camera strobes. Systems that are free-running (not genlocked, as described above) have inherent problems with the interfering signal from the IR LCD shuttered glasses' sync illumination. This requires the Apex device to be set to Continuous illumination mode, which results in shorter battery life and dimmer illumination, with a shorter viewing distance.

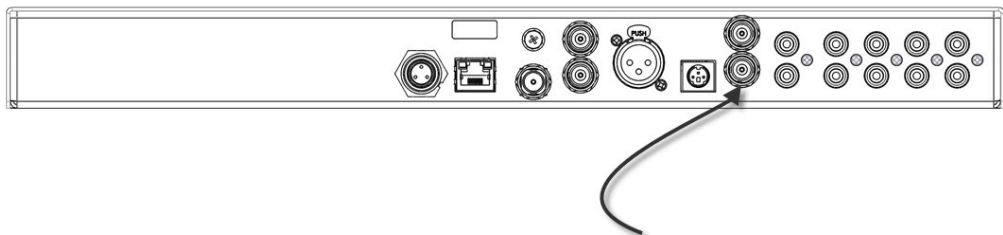
If you genlock the system, you can set the Apex device to Strobe mode, enabling it to operate with a greater viewing distance.



Include a VESA Stereo device for syncing


**Important**  
The following information applies to Vicon Lock Studio only.

Connect the output VESA Stereo signal from the VESA Stereo Out connector to the device requiring synchronization.



The VESA Out signal is only provided if the system frame rate is set to a compatible multiple of a VESA signal. The following table gives example frame rates:

System frame rate	VESA Out signal
50 fps	No signal provided
100 fps	VESA 100 Hz signal (50 Hz square wave, 50% duty cycle)
120 fps	VESA 120 Hz signal (60 Hz square wave, 50% duty cycle)
200 fps	VESA 100 Hz signal, etc.

**Note**  
The VESA Out signal is independent of the VESA In signal. Therefore, if you are synchronizing to an external VESA stereo input source, you can still use the VESA Out. VESA stereo input is not required for VESA Out to work.

## Integrate MX T-Series components into a Vantage system

The following topics explain how to integrate components of Vicon MX T-Series systems into your Vicon Vantage system.

For more information, see:

- [Understand integrated Vicon Vantage systems, page 147](#)
- [Integrate an MX T-Series system without a Vicon Lock unit, page 148](#)
- [Integrate an MX T-Series system with a Vicon Lock unit, page 150](#)

## Understand integrated Vicon Vantage systems

If you are integrating components from a Vicon MX T-Series system into a Vicon Vantage system, it is assumed that your MX T-Series cameras are already set up and connected to MX Giganet unit(s). It is also assumed that you have already set up your Vantage cameras and PoE+, as described in [Set up a simple Vicon Vantage system, page 85](#) or [Add cameras and connectivity to a basic Vantage system, page 91](#).

The way in which the MX T-Series system is connected to the Vantage system depends upon whether you are adding a Vicon Lock unit with your Vantage cameras:

- If you are adding only Vantage cameras, the existing T-Series system stays intact and the additional Vantage cameras and associated PoE+ switches are added in the same way as if you were adding more Giganets to the system. For more information, see [Integrate an MX T-Series system without a Vicon Lock unit, page 148](#)
- If you are also adding a Lock+ unit, you must make the changes described in [Integrate an MX T-Series system with a Vicon Lock unit, page 150](#).



### Important

When the integrated system requires a Lock unit, you may need to transfer any broadcast video reference signal and any associated LTC-In signal from the primary Giganet to the Lock unit.

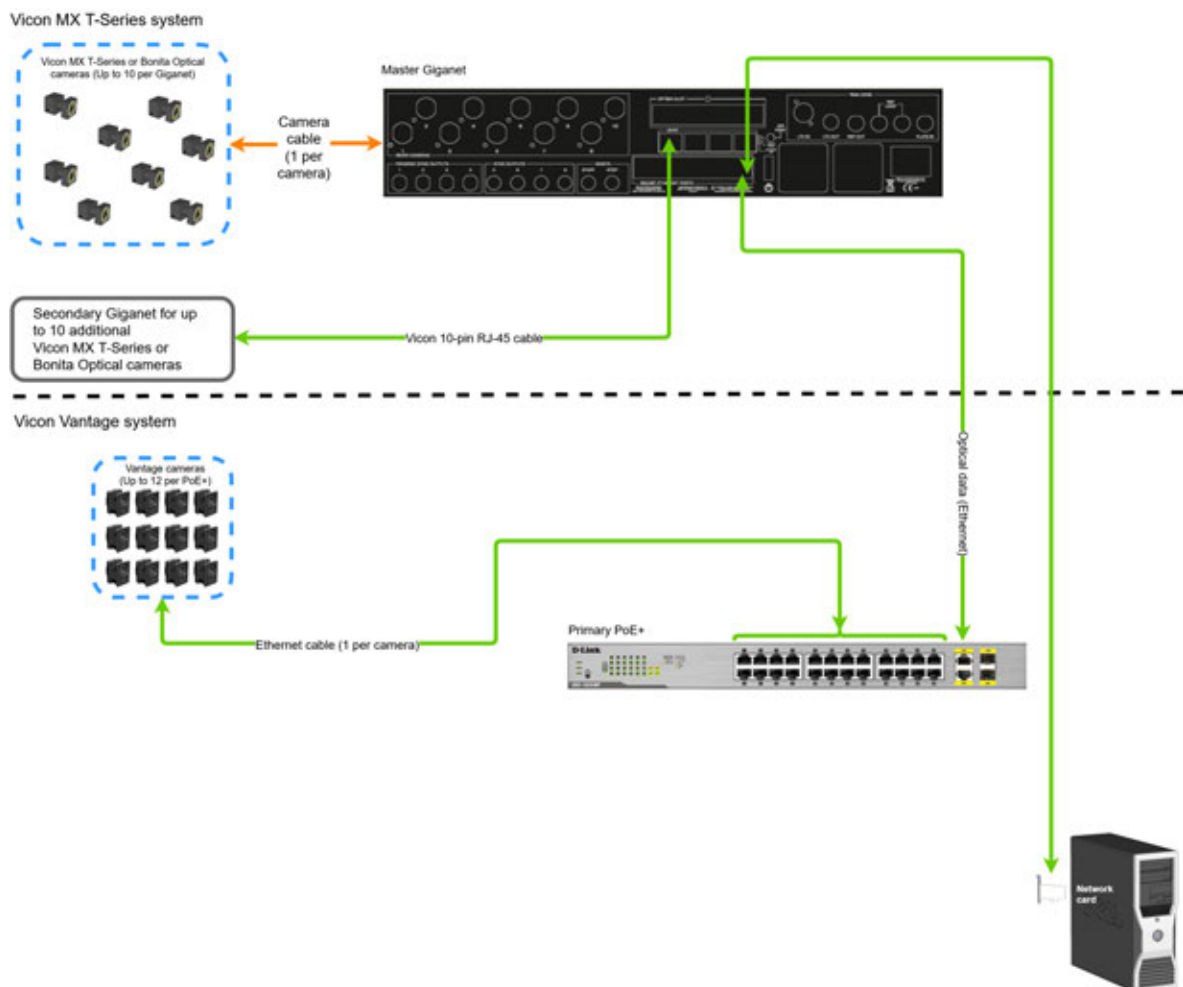
## Integrate an MX T-Series system without a Vicon Lock unit

The following information describes how to integrate an MX Giganet unit into a Vicon Vantage system.

To integrate a T-Series system into a Vicon Vantage system without a Lock unit:

- Connect one port of the primary PoE+ switch in the Vantage system into one of the Ethernet ports of the primary Giganet.

In the following diagram, the primary PoE+ switch is connected to a Gigabit Ethernet port on the master Giganet.



The primary Giganet is the sync master and hence outputs the Vicon sync data (Ethernet sync and time stamping).

Data flows from the cameras, through their respective Giganets, through the primary Giganet to the host PC.

The Vicon sync packets travel in the opposite direction, with only accompanying light control data. This causes known deterministic switcher delay without jitter and possible packet loss. The Vantage PoE+ switch acts as a Giganet in this respect too.

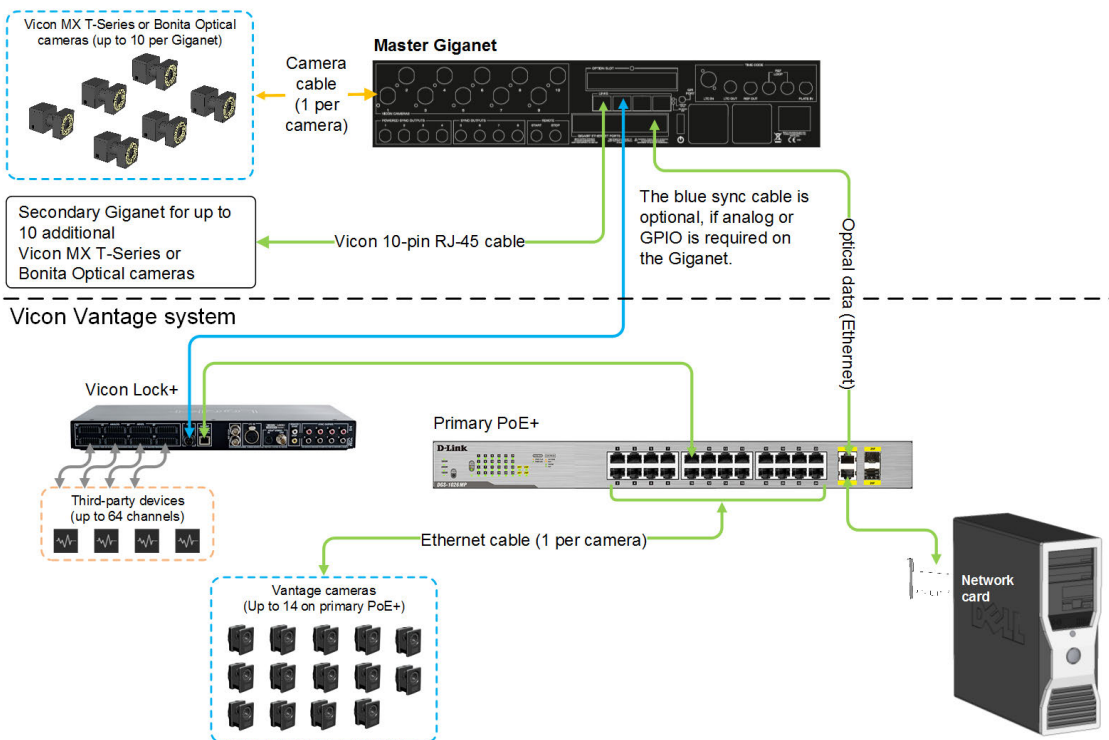
## Integrate an MX T-Series system with a Vicon Lock unit

If you want to add VESA Stereo synchronization functionality to an MX T-Series system, you must add a Vicon Lock unit. You can also add further Vicon Vantage cameras at the same time.

In mixed systems of this type, the Lock unit is automatically made sync master by the Vicon software. Both analog data and Vicon sync travel in the same direction initially. This is not problematic as the Lock manages the analog data transfer and Vicon sync data. Because the Lock controls the system timing, it knows when to transmit the sync packet and therefore when it can transmit analog data outside of this period.

The Vantage Link to Giganet Link connection (shown in blue in the following diagram) is necessary to maintain correct Giganet synchronization to the Lock. Giganets and Lock units do not use Vicon sync packets for synchronization. All Link ports use a Vicon proprietary signal for synchronization. (The following image shows a Lock+.)

### Vicon MX T-Series system



### Note

Except where noted, 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+, Vicon Lock Studio and Vicon Lock Lab).

## Focus a Vicon Vantage camera lens

The following topics explain how to focus a Vicon Vantage camera lens.

- [Understand lens focus methods, page 152](#)
- [Adjust camera lens focus with front focus ring, page 153](#)
- [Check camera lens focus, page 155](#)

## Understand lens focus methods

Vicon Vantage cameras are in focus when the images of markers seen by the camera at a distance representative of the capture distance (that is, the distance between subject and camera) are clear and sharp. The degree of focus of the lens on a Vantage camera can be controlled by altering two characteristics of the lens:

- Front (or forward) focus  
This is set by adjusting the focus ring at the front of the lens. This type of adjustment is typically made when initially configuring and subsequently checking your cameras for capture. This procedure is described in [Adjust camera lens focus with front focus ring, page 153](#).
- Back focus  
This is set by adjusting the position of the entire lens closer to or further away from the camera sensor along the axis of the lens. This sets the distance between the rear lens element and the sensor. This type of adjustment is required only to ensure that the lens focus ring matches what is actually in focus. Vicon makes this adjustment when initially setting the camera up.

### **Caution**

As back focusing is a delicate operation, it must be performed by qualified and experienced persons only. For this reason, if you require a change in the back focus of your cameras, please contact Vicon Support.

You can see the results in real time while you are focusing the camera by viewing the marker images in your Vicon application software.



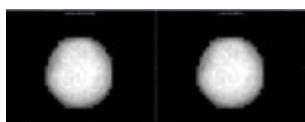
## Adjust camera lens focus with front focus ring

You can sharpen the camera lens focus by adjusting the focus ring at the front of the lens.

You can see the results while you are focusing the camera by viewing the marker images in your Vicon application software, in a **Camera** view pane. The following procedure briefly describes how to view the live camera data in your Vicon application software. For full details of the software steps, see the documentation for your Vicon application software.

To adjust camera lens focus with the front focus ring:

1. Mount the camera on a tripod within reach of the Vicon Vantage host PC on which the Vicon application software is installed.
2. Ensure that you can view the camera data from the Vicon application software on the Vicon Vantage host PC. For details on doing this, see the documentation for your Vicon application software.
3. Place a selection of markers of the type you will use during motion capture central to the camera Field of View and at a distance from the camera representative of the capture distance, for example, some in the middle of the capture volume and some at a greater distance from the camera.
4. Ensure that the lens aperture is at its most open setting, that is, it is set to the lowest numerical value on the aperture ring.  
This lets more light into the camera and minimizes the depth of field (for details, see [Aperture and depth of field, page 41](#)).
5. In the Vicon software, check the marker images from this camera (for details, see [Check camera lens focus, page 155](#)).
6. In the Vicon software, observe the sharpness of the image of the markers; slowly adjust the front focus ring of the camera lens until the markers appear in sharp focus in the software, as shown in the following illustration.



7. In the Vicon software, zoom out and check that other markers of interest distributed around the volume are also in focus.

8. When focusing is complete, if your lens has screws for locking the focus ring, turn them to ensure the focus stays at the desired level.

**Caution**

To avoid damaging the rings, do not over-tighten the locking screws.

9. Return the Vicon software to the default capture settings (for details, see [Check camera lens focus, page 155](#)).

## Check camera lens focus

You can check the focus of your camera in your Vicon application software as you adjust it. To optimize your focusing, adjust your camera settings to get clear, bright images of the markers.

The following topics provide a summary of the procedure in each software application:

- [Check camera lens focus in Vicon Shogun Live, page 155](#)
- [Check camera lens focus in Vicon Nexus and Vicon Tracker, page 156](#)

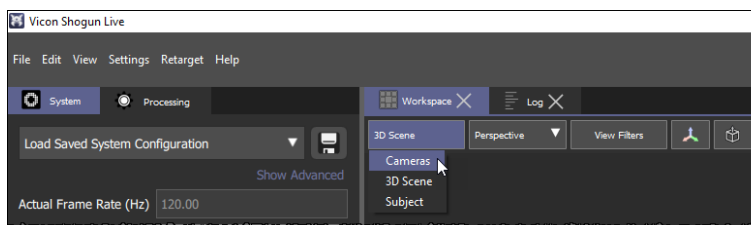
For further details, see your Vicon application software documentation.

## Check camera lens focus in Vicon Shogun Live

You can check the image of the markers from the camera that you are focusing in real time in Shogun Live.

To adjust camera settings for checking camera focus in Shogun Live:

1. In Shogun Live, on the **System** tab, ensure the **Cameras** section is expanded and click on the relevant camera.
2. In the **Optical Mode** section below, click in the **Grayscale Mode** list and select **All**.
3. Ensure the **Strobe Intensity** slider is set to its maximum level (1.0).
4. In the **Workspace** on the right, set the view to **Cameras**.



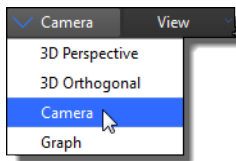
5. Right-click and drag to zoom in on a target marker pair.
6. If the image of the markers is not bright enough to allow confidence in the level of focus achieved, increase the intensity of the grayscale from the camera. To do this, in the **Optical Mode** section, click the **Gain** list and select a level above 1.
7. In the **Cameras** view, observe the sharpness of the image of the two markers.
8. After focusing the lens, return Shogun to its default capture settings (above the **General** section, click **Set to Defaults**).

## Check camera lens focus in Vicon Nexus and Vicon Tracker

You can check the image of the markers from the camera you are focusing in real time in Vicon Nexus and Vicon Tracker.

To adjust camera settings for checking camera focus in Nexus:

1. In the **View** pane, select the **Camera** view type.

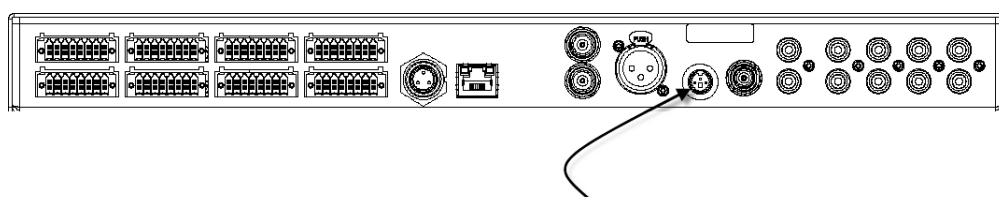


2. In the **Resources** pane, ensure **Live** mode is activated (ie that **Connected** is displayed).
3. On the **System** tab, expand the **Vicon Cameras** node and select the required Vantage camera.
4. In the **Properties** pane at the bottom of the **System Resources** tab, go to the **Settings** section and set **Grayscale Mode** to **All**.
5. Right-click and drag in the **Camera** view pane to zoom in on the target marker pair.
6. If the image of the markers is not bright enough to allow confidence in the level of focus achieved, increase the intensity of the grayscale from the camera. To do this, in the **Properties** pane, ensure **Advanced** properties are displayed and in the **Settings** section, increase the value for **Gain** to a level above x1.
7. In the **Camera** view pane, observe the sharpness of the image of the markers.
8. After focusing the lens, return the Vicon application software to its default capture settings. In the **Properties** pane at the bottom of the **System Resources** tab, set **Grayscale Mode** to **Auto**.

## Include a Steam VR source to genlock

An HTC Vive base station has a 3.5 mm jack that can be used as synchronization output. Base stations are usually used in pairs, with one set as mode-B and the other as mode-C. You can connect the base station set to mode-B to the VESA Stereo In connector on the Vicon Lock unit, to provide a genlock source.

(The following image shows the rear panel of a Lock+.)



Using the Steam VR signal to genlock the Vicon Vantage system offers the benefit of eliminating optical interference between illuminating sources, for example, Vicon camera strobes and the HTC Vive base stations.

In your Vicon application software, you can phase-shift the time when the camera strobes turn on for each frame with respect to the incoming Steam VR signal, by adjusting the **VESA Offset** property. This enables the strobe to be turned on at a different time from that of other potentially interfering sources.

## Vicon Vantage technical specifications

Find out about the technical details of the Vicon Vantage cameras and Vicon Lock units.

- [Vicon Vantage camera technical specifications, page 159](#)
- [Vicon Lock unit technical specifications, page 185](#)

## Vicon Vantage camera technical specifications

The following topics provide technical specifications for Vicon Vantage cameras, including their lenses and strobe units.

- [V16 camera specifications, page 160](#)
- [V8 camera specifications, page 166](#)
- [V5 camera specifications, page 172](#)
- [Vicon Vantage cameras lens specifications, page 178](#)
- [Vicon Vantage cameras strobe unit specifications, page 183](#)

## V16 camera specifications

The following table provides technical specifications and performance indicators for the V16 camera. Superscripted numbers indicate additional information provided in the [V16 specification table notes, page 164](#).

Component	Specification
<b>Performance:</b>	
Maximum frame rate (fps) at full resolution	120 <sup>1</sup> , <a href="#">page 164</a>
Maximum frame rate (fps) at partial scan	2,000 <sup>1</sup> , <a href="#">page 164</a>
Frame rates (fps)	30–2,000
<b>Sensor:</b>	
Sensor type	CMOS
Sensor resolution (pixels)	4096 H x 4096 V
Number of pixels	16,777,216
Pixel size	4.5 microns x 4.5 microns
Optical format	~4/3"
Physical sensor size (mm)	18.43 mm (H) x 18.43 mm (V), 26.06 mm (Diagonal)
Shutter type	Global shutter <sup>2</sup> , <a href="#">page 164</a>
Aspect ratio	1:1



Component	Specification
On camera processing:	
256 shades and grayscale processing	Yes <sup>3</sup> , page 164
Grayscale depth	8-bit
Sub pixel resolution	1,048,576 x 1,048,576 (1/256 pixel resolution)
On-board processors	3 processors
On-camera masking	Yes <sup>4</sup> , page 164
In-camera dynamic large blob eliminator	Yes <sup>5</sup> , page 164
Software masking	Yes
Auto masking	Yes
On-camera thresholding	Yes
Threshold grid size (tiles)	256 x 256
Threshold grid tile dimensions (pixels)	16 x 16
Camera output modes	5 <sup>6</sup> , page 164
Full frame preview output	Yes <sup>7</sup> , page 165

Component	Specification
Strobe/Ringlight:	
Types available	850 nm (Infrared (IR))
Number of LEDs	22
Cover type available	Secondary Optics (Standard factory fit)
Strobe electronics	Integrated, software reprogrammable and controlled
Adjustable illumination	Yes
Adjustable levels	1,000 (software controlled)
View angle (Set by secondary optics)	56° or 70°
Physical:	
Camera housing	Complex mold custom die-cast aluminum
Camera body dimensions	166.2 mm (H) x 125 mm (W) x 134.1 mm (D)
Weight (including strobe, excluding lens)	1.6 kg
Number of mount points	2
Camera mount fixing bracket	Optional

Component	Specification
Camera architecture:	
Software and firmware upgradable	Yes
Upgrade methods	Through the Vicon application software. Firmware files can be placed on the Vicon Vantage host PC using any standard transmission method. The files are then uploaded from the Vicon Vantage host PC to the Vantage system hardware through the <b>Reprogram Firmware</b> option in the software.
Connector	A single RJ-45 connector to the PoE+ switch.
Cabling	Cat5e (Gigabit Ethernet with power and sync over Ethernet)
Power supply	48V, 24 Watts max Conforms to IEEE 802.3at-2009 (25.5W) standard.
Maximum number of cameras supported per PoE+ switch	Switch-dependent (see <a href="#">Understand when additional PoE+ switches are required, page 92</a> ).
Lens type supported	Proprietary Vicon 18 mm and 12.5 mm focal length.
Plug and play compatibility	Yes
Mixed camera system compatibility	Interoperable with all Vero, Vue, Bonita Optical and Video and MX T-Series cameras
System connectivity/communication	Gigabit Ethernet
Communication status indicators	Yes
Camera number indicator / information display	Yes
Camera status indicators	On camera and strobe unit and in software
Knock detection indicator	Yes
Tap for Select notification	Yes
IP addressable	Yes

Component	Specification
IP reconfigurable	Yes
Cooling	Advanced thermal design
Operating temperature:	
Maximum temperature	35°C <sup>8</sup> , <a href="#">page 165</a>
Minimum temperature	-5°C <sup>8</sup> , <a href="#">page 165</a>
Environmental regulations:	
RoHS compliant	Yes

## V16 specification table notes

- Increased frame rates:** Selecting a frame rate greater than full resolution automatically reduces image size by windowing. This keeps the pixel rate the same by transmitting a greater number of smaller images per second. You specify the capture frame rate of the Vantage cameras in the Vicon application software. Vantage cameras are capable of capturing up to a maximum of 2,000 fps, but the actual frame rate you can specify depends on the Vicon application software you are using. For details, see your Vicon software documentation. Above 120 fps the amount of light emitted per frame is linearly reduced. The light emitted per frame at 240 fps is half that output per frame at 120 fps. (The total strobed light output remains the same).  
With Vantage+ firmware, instead of (or in addition to) windowing, you can use high-speed mode, which uses subsampling to increase the frame rate without reducing the field of view, but with some reduction in resolution. For details, see [High-speed mode, page 28](#) and your Vicon software documentation.
- Shuttering:** The global shutter overcomes the negative effects of using rolling shutters for motion capture.
- Full marker grayscale:** Marker centers are calculated based on every pixel of grayscale available for the marker, not just the detected marker edges. An on-camera circularity test ensures merged or partially occluded markers which need high-level processing are sent in full grayscale to the Vicon Vantage host PC.
- On-camera masking:** This removes areas of the sensor where undesirable static light sources are recorded, for example strobes from other cameras.
- Blob elimination:** Camera firmware automatically removes undesirable image data including both large blobs (e.g. sunlight reflections) and/or an unusually large number of blobs.
- Output modes:** Automatic (centers for circular markers, grayscale for overlapping/partially occluded markers), Centers Only, Grayscale Only, Centers/Grayscale, and Preview (the entire sensor image).

7. **Preview mode:** The full image is lightly filtered, decimated and transmitted to the Vantage host at 30 fps. This reduces the quantity of preview video data to a level that can be transmitted over Gigabit Ethernet to the Vicon Vantage host PC. Only one camera at a time is allowed to be sent in Preview mode as it requires most of the system bandwidth to transmit this one signal.
8. **Operating temperature:** While Vicon cameras may operate outside the given limits, these are the temperatures to which Vicon has tested the cameras. If the cameras are operated outside of these limits, image quality may be degraded, the external surface temperatures may exceed the relevant safety limits, and any failures are not covered under warranty.

## V8 camera specifications

The following table provides technical specifications and performance indicators for the V8 camera. Superscripted numbers indicate additional information provided in the [V8 specification table notes, page 170](#).

Component	Specification
<b>Performance:</b>	
Maximum frame rate (fps) at full resolution	260 <sup>1</sup> , <a href="#">page 170</a>
Maximum frame rate (fps) at partial scan	2,000 <sup>1</sup> , <a href="#">page 170</a>
Frame rates (fps)	30–2,000
<b>Sensor:</b>	
Sensor type	CMOS
Sensor resolution (pixels)	3328 H x 2432 V
Number of pixels	8,093,696
Pixel size	4.5 microns x 4.5 microns
Physical sensor size (mm)	14.8 mm (H) x 10.9 mm (V), 18.38 mm (Diagonal)
Optical format	1"
Shutter type	Global shutter <sup>2</sup> , <a href="#">page 170</a>
Aspect ratio	1:1

Component	Specification
On camera processing:	
256 shades and grayscale processing	Yes <sup>3</sup> , <a href="#">page 170</a>
Grayscale depth	8-bit
Sub pixel resolution	851,968 x 620,544 (1/256 pixel resolution)
On-board processors	3 processors
On-camera masking	Yes <sup>4</sup> , <a href="#">page 170</a>
In-camera dynamic large blob eliminator	Yes <sup>5</sup> , <a href="#">page 170</a>
Software masking	Yes
Auto masking	Yes
On-camera thresholding	Yes
Threshold grid size (tiles)	208 x 152
Threshold grid tile dimensions (pixels)	16 x 16
Camera output modes	5 <sup>6</sup> , <a href="#">page 170</a>
Full frame preview output	Yes <sup>7</sup> , <a href="#">page 171</a>

Component	Specification
Strobe/Ringlight:	
Types available	850 nm (Infrared (IR))
Number of LEDs	22
Cover type available	Secondary optics (standard factory fit)
Strobe electronics	Integrated, software reprogrammable and controlled
Adjustable illumination	Yes
Adjustable levels	1,000 (software controlled)
View angle (Set by secondary optics)	70°
Physical:	
Camera housing	Complex mold custom die-cast aluminum
Camera body dimensions	166.2 mm (H) x 125 mm (W) x 134.1 mm (D)
Weight (including strobe, excluding lens)	1.6 kg
Number of mount points	2
Camera mount fixing bracket	Optional



Component	Specification
Camera architecture:	
Software and firmware upgradable	Yes
Upgrade methods	Through the Vicon application software. Firmware files can be placed on the Vicon Vantage host PC using any standard transmission method. The files are then uploaded from the Vicon Vantage host PC to the Vantage system hardware through the <b>Reprogram Firmware</b> option in the software.
Connector	A single RJ-45 connector to the PoE+ switch
Cabling	Cat5e (Gigabit Ethernet with power and sync over Ethernet)
Power supply	48V, 24 Watts max Conforms to IEEE 802.3at-2009 (25.5W) standard.
Maximum number of cameras supported per PoE+ switch	Switch-dependent (see <a href="#">Understand when additional PoE+ switches are required, page 92</a> )
Lens type supported	Ricoh Pentax 12.5 mm focal length
Plug and play compatibility	Yes
Mixed camera system compatibility	Interoperable with all Vero, Vue, Bonita Optical and Video and all MX T-Series cameras
System connectivity/ communication	Gigabit Ethernet
Communication status indicators	Yes
Camera number indicator / information display	Yes
Camera status indicators	On camera and strobe unit and in software
Knock Detection indicator	Yes
Tap for Select notification	Yes
IP addressable	Yes

Component	Specification
IP reconfigurable	Yes
Cooling	Advanced thermal design
Operating temperature:	
Maximum temperature	35°C <sup>8</sup> , <a href="#">page 171</a>
Minimum temperature	-5°C <sup>8</sup> , <a href="#">page 171</a>
Environmental regulations:	
RoHS compliant	Yes

## V8 specification table notes

- Increased frame rates:** Selecting a frame rate greater than full resolution automatically reduces image size by windowing. This keeps the pixel rate the same by transmitting a greater number of smaller images per second. You specify the capture frame rate of the Vantage cameras in the Vicon application software. Vantage cameras are capable of capturing up to a maximum of 2,000 fps, but the actual frame rate you can specify depends on the Vicon application software you are using. For details, see your Vicon software documentation. Above 120 fps the amount of light emitted per frame is linearly reduced. The light emitted per frame at 240 fps is half that output per frame at 120 fps. (The total strobed light output remains the same).  
With Vantage+ firmware, instead of (or in addition to) windowing, you can use high-speed mode, which uses subsampling to increase the frame rate without reducing the field of view, but with some reduction in resolution. For details, see [High-speed mode, page 28](#) and your Vicon software documentation.
- Shuttering:** The global shutter overcomes the negative effects of using rolling shutters for motion capture.
- Full marker grayscale:** Marker centers are calculated based on every pixel of grayscale available for the marker, not just the detected marker edges. An on-camera circularity test ensures merged or partially occluded markers which need high-level processing are sent in full grayscale to the Vicon Vantage host PC.
- On-camera masking:** This removes areas of the sensor where undesirable static light sources are recorded, for example strobes from other cameras.
- Blob elimination:** Camera firmware automatically removes undesirable image data including both large blobs (e.g. sunlight reflections) and/or an unusually large number of blobs.
- Output modes:** Automatic (centers for circular markers, grayscale for overlapping/partially occluded markers), Centers Only, Grayscale Only, Centers/Grayscale, and Preview (the entire sensor image).

7. **Preview mode:** The full image is lightly filtered, decimated and transmitted to the Vantage host at 30 fps. This reduces the quantity of preview video data to a level that can be transmitted over Gigabit Ethernet to the Vicon Vantage host PC. Only one camera at a time is allowed to be sent in Preview mode as it requires most of the system bandwidth to transmit this one signal.
8. **Operating temperature:** While Vicon cameras may operate outside the given limits, these are the temperatures to which Vicon has tested the cameras. If the cameras are operated outside of these limits, image quality may be degraded, the external surface temperatures may exceed the relevant safety limits, and any failures are not covered under warranty.

## V5 camera specifications

The following table provides technical specifications and performance indicators for the V5 camera. Superscripted numbers indicate additional information provided in the [V5 specification table notes](#), [page 176](#).

Component	Specification
<b>Performance:</b>	
Maximum frame rate (fps) at full resolution	420 <sup>1</sup> , <a href="#">page 176</a>
Maximum frame rate (fps) at partial scan	2,000 <sup>1</sup> , <a href="#">page 176</a>
Frame rates (fps)	30–2,000
<b>Sensor:</b>	
Sensor type	CMOS
Sensor resolution (pixels)	2432 H x 2048 V
Number of pixels	4,980,736
Pixel size	4.5 microns x 4.5 microns
Physical sensor size (mm)	10.94 mm (H) x 9.22 mm (V), 14.31 mm (Diagonal)
Optical format	2/3" and 1"
Shutter type	Global shutter <sup>2</sup> , <a href="#">page 176</a>
Aspect ratio	1:1

Component	Specification
On camera processing:	
256 shades and grayscale processing	Yes <sup>3</sup> , <a href="#">page 176</a>
Grayscale depth	8-bit
Sub pixel resolution	1,048,576 x 1,048,576 (1/256 pixel resolution)
On-board processors	3 processors
On-camera masking	Yes <sup>4</sup> , <a href="#">page 176</a>
In-camera dynamic large blob eliminator	Yes <sup>5</sup> , <a href="#">page 176</a>
Software masking	Yes
Auto masking	Yes
On-camera thresholding	Yes
Threshold grid size (tiles)	152 x 128
Threshold grid tile dimensions (pixels)	16 x 16
Camera output modes	5 <sup>6</sup> , <a href="#">page 176</a>
Full frame preview output	Yes <sup>7</sup> , <a href="#">page 177</a>

Component	Specification
Strobe/Ringlight:	
Types available	850 nm (Infrared (IR))
Number of LEDs	22
Cover type available	Secondary optics (standard factory fit)
Strobe electronics	Integrated, software reprogrammable and controlled
Adjustable illumination	Yes
Adjustable levels	1,000 (software controlled)
View angle (Set by secondary optics)	56° or 70°
Physical:	
Camera housing	Complex mold custom die-cast aluminum
Camera body dimensions	166.2 mm (H) x 125 mm (W) x 134.1 mm (D)
Weight (including strobe, excluding lens)	1.6 kg
Number of mount points	2
Camera mount fixing bracket	Optional

Component	Specification
Camera architecture:	
Software and firmware upgradable	Yes
Upgrade methods	Through the Vicon application software. Firmware files can be placed on the Vicon Vantage host PC using any standard transmission method (e.g. FTP, e-mail, CD, USB stick). The files are then uploaded from the Vicon Vantage host PC to the Vantage system hardware through the <b>Reprogram Firmware</b> option in the software.
Connector	A single RJ-45 connector to the PoE+ switch.
Cabling	Cat5e (Gigabit Ethernet with power and sync over Ethernet)
Power supply	48V, 24 Watts max Conforms to IEEE 802.3at-2009 (25.5W) standard.
Maximum number of cameras supported per PoE+ switch	Switch-dependent (see <a href="#">Understand when additional PoE+ switches are required, page 92</a> )
Lens type supported	Ricoh Pentax 12.5 mm and 8.5 mm focal length.
Plug and play compatibility	Yes
Mixed camera system compatibility	Interoperable with all Vero, Vue, Bonita Optical and Video and all MX T-Series cameras
System connectivity/ communication	Gigabit Ethernet
Communication status indicators	Yes
Camera number indicator / information display	Yes
Camera status indicators	On camera and strobe unit and in software
Knock detection indicator	Yes
Tap for Select notification	Yes
IP addressable	Yes

Component	Specification
IP reconfigurable	Yes
Cooling	Advanced thermal design
Operating temperature:	
Maximum temperature	35°C <sup>8</sup> , <a href="#">page 177</a>
Minimum temperature	-5°C <sup>8</sup> , <a href="#">page 177</a>
Environmental regulations:	
RoHS compliant	Yes

## V5 specification table notes

- Increased frame rates:** Selecting a frame rate greater than full resolution automatically reduces image size by windowing. This keeps the pixel rate the same by transmitting a greater number of smaller images per second. You specify the capture frame rate of the Vantage cameras in the Vicon application software. Vantage cameras are capable of capturing up to a maximum of 2,000 fps, but the actual frame rate you can specify depends on the Vicon application software you are using. For details, see your Vicon software documentation. Above 120 fps the amount of light emitted per frame is linearly reduced. The light emitted per frame at 240 fps is half that output per frame at 120 fps. (The total strobed light output remains the same).  
With Vantage+ firmware, instead of (or in addition to) windowing, you can use high-speed mode, which uses subsampling to increase the frame rate without reducing the field of view, but with some reduction in resolution. For details, see [High-speed mode, page 28](#) and your Vicon software documentation.
- Shuttering:** The global shutter overcomes the negative effects of using rolling shutters for motion capture.
- Full marker grayscale:** Marker centers are calculated based on every pixel of grayscale available for the marker, not just the detected marker edges. An on-camera circularity test ensures merged or partially occluded markers which need high-level processing are sent in full grayscale to the Vicon Vantage host PC.
- On-camera masking:** This removes areas of the sensor where undesirable static light sources are recorded, for example strobes from other cameras.
- Blob elimination:** Camera firmware automatically removes undesirable image data including both large blobs (e.g. sunlight reflections) and/or an unusually large number of blobs.
- Output modes:** Automatic (centers for circular markers, grayscale for overlapping/partially occluded markers), Centers Only, Grayscale Only, Centers/Grayscale, and Preview (the entire sensor image).



7. **Preview mode:** The full image is lightly filtered, decimated and transmitted to the Vantage host at 30 fps. This reduces the quantity of preview video data to a level that can be transmitted over Gigabit Ethernet to the Vicon Vantage host PC. Only one camera at a time is allowed to be sent in Preview mode as it requires most of the system bandwidth to transmit this one signal.
8. **Operating temperature:** While Vicon cameras may operate outside the given limits, these are the temperatures to which Vicon has tested the cameras. If the cameras are operated outside of these limits, image quality may be degraded, the external surface temperatures may exceed the relevant safety limits, and any failures are not covered under warranty.

## Vicon Vantage cameras lens specifications

This topic provides technical specifications for the different types of lenses that are used in Vicon Vantage cameras. For details of specific lenses, contact Vicon or your nearest agent or distributor.

Vantage cameras are fitted with lenses suitable for the system use you specified on ordering. The lens fitted to the camera is determined by various factors, including the focal length, which defines the Field of View (FOV), and the aperture range. The latter affects the amount of light seen by the image sensor and also governs the depth of field, the distance from the camera where the image is in focus.



### Caution

Vicon Vantage cameras contain no user-serviceable components. For all servicing, and any alterations, including lens or strobe change, you must return the camera to Vicon. Any attempt by you or any third party to alter or repair a Vantage camera may invalidate its warranty.

## Lenses used in Vicon Vantage cameras

The following table shows the lenses fitted to Vantage cameras.

Lens	Image format size	Vicon Vantage camera		
		V16	V8	V5
Vicon 18 mm	4/3"	x		
Vicon 12.5 mm	4/3"	x		
Ricoh Pentax 12.5 mm	1"		x	x
Ricoh Pentax 8.5 mm	2/3"			x

## Camera lens specifications

The following tables provide technical specifications for the physical characteristics of the lenses available for V16, V8, and V5 cameras.

- [Vicon 18 mm lens specification, page 180](#)
- [Vicon 12.5 mm lens specification, page 180](#)
- [Ricoh Pentax 12.5 mm lens specification, page 181](#)
- [Ricoh Pentax 8.5 mm lens specification, page 181](#)

For a summary of the lenses that are fitted to a particular Vicon Vantage camera, see [Lenses used in Vicon Vantage cameras, page 178](#). For Angle of View details for these lenses, see [Angle of view information for Vicon Vantage cameras, page 182](#).

## Vicon 18 mm lens specification

This lens is used with the V16.

Component	Specification
Focal Length	18 mm
Format	Proprietary Vicon ~4/3"
Aperture (f-stop) range	2–16
Dimensions	51 mm (diameter) x 75 mm (length)
Weight	0.28 Kg

## Vicon 12.5 mm lens specification

This lens is used with the V16.

Component	Specification
Focal Length	12.5 mm
Format	C-mount 4/3"
Aperture (f-stop) range	2.0–22
Dimensions	48 mm (diameter) x 67 mm (length)
Weight	0.23 Kg

## Ricoh Pentax 12.5 mm lens specification

This lens is used with the V8 and V5.

Component	Specification
Focal Length	12.5 mm
Format	C-mount 1"
Aperture (f-stop) range	1.4–Closed
Dimensions	42 mm (diameter) x 58 mm (length)
Weight	0.135 Kg

## Ricoh Pentax 8.5 mm lens specification

This lens is used with the V5.

Component	Specification
Focal Length	8.5 mm
Format	C-mount 2/3"
Aperture (f-stop) range	1.5 to fully closed
Dimensions	42 mm (diameter) x 40 mm (length)
Weight	0.12 Kg

## Angle of view information for Vicon Vantage cameras

The following table gives information on the Angle of View at full resolution for the V16, V8, and V5 cameras. For details on Angle of View and Field of View (FOV), see [Camera lens characteristics, page 38](#).



### Important

The Angle of View examples are specific to the referenced camera type. As is shown in the table, the angle of view changes if the lens is attached to a different camera type.

Lens type	V16	V8	V5
Vicon 18 mm	54.22 x 54.22 deg		
Vicon 12.5 mm	72.8 x 72.8 deg		
Ricoh Pentax 12.5 mm		61.36 x 47.15 deg	47.28 x 40.47 deg
Ricoh Pentax 8.5 mm			65.54 x 56.93 deg

## Vicon Vantage cameras strobe unit specifications

This topic provides technical specifications for the Infrared strobe unit that is available for the Vicon Vantage cameras (V16, V8, V5):

- [Camera strobe \(shutter\) durations, page 183](#)
- [Infrared strobe specifications, page 184](#)

All Vantage strobe units use surface-mounted LEDs, have a built-in temperature sensor, and are fitted with dedicated secondary optics to match the fitted lens.

### Camera strobe (shutter) durations

The following table shows camera strobe duration for different specifications:

Maximum duration	Specification
0.5 ms	at 120 Hz progressive
0.25 ms	at 240 Hz progressive
0.125 ms	at 480 Hz progressive
0.0625 ms	at 960 Hz progressive

The strobe light-ring emits light once per video frame and is precisely aligned with the global shutter of the image sensor. The duration is controlled in the camera's strobe settings in your Vicon application software. The strobe intensity, which controls the duration of the light being emitted, can be adjusted in 1/1000 increments from zero through to the maximum allowed. When increasing the strobe intensity, remember that very fast motion produces more motion blur, so you may have to compromise between lens aperture and strobe intensity settings.

The total power drawn from the PoE+ source is the sum of the power drawn by the strobe and the camera itself. At a constant strobe intensity setting, the strobe power taken is proportional to the frame rate. Up to 120 fps, the strobe duration can be adjusted from zero to the maximum of 0.5 mS. In order not to exceed the allowable total maximum power taken, the strobe duration is automatically reduced as shown in the above table.

**Note**  
At frame rates above 120 fps, there will be a corresponding fall in light output and therefore a possible reduction in the distance that markers will be seen.

## Infrared strobe specifications

The following table provides technical specifications and performance indicators for Vicon Vantage Infrared (IR) strobe units.

Component	Specification
Strobe active source (AlGaAs LEDs)	22
Wavelength	850 nm
Strobe viewing angle (to half luminous intensity).Set by secondary optics	56° and 70°
Time averaged radiance (in mW.mm-2.sr-1 per array)	128.89 <sup>1</sup> , <a href="#">page 184</a>
Time averaged irradiance (in W.m-2)	50.69 <sup>1</sup> , <a href="#">page 184</a>
Maximum power consumption (per camera)	24 W (running at 120 fps, maximum strobe setting)
RoHS compliant	Yes

### Table notes

- Given the following assumptions:
  - Ideal overlap of radiation characteristics of array diodes
  - IEC 62471-1 classification distance is 200 mm
  - Ambient temperature is 25 degrees C.
  - Low visual stimulus at 850nm
  - Calculation is for >1000 seconds.



## Vicon Lock unit technical specifications

The following table provides technical specifications for Vicon Lock units.

Component	Specification		
	Lock+	Lock Studio	Lock Lab
1U dimensions			
Height	44.5 mm (1 RU)		
Width	445 mm		
Depth	200 mm		
Weight	1.6 kg		
Power supply ratings (Power over Ethernet – PoE)			
Input voltage	48V DC nominal. Conforms to IEEE 802.3 af		
Input current	218 mA DC nominal	207 mA DC nominal	183 mA DC nominal
Power	10.5 W nominal	10 W nominal	9 W nominal
Fuse	No externally accessed fuses		
Input connector	RJ-45		
Maximum length	100 m		
Environmental regulations			
RoHS compliant	Yes		

## Vicon Vantage regulatory, safety and warranty information

The following topics provide important and required consumer information on how Vicon Vantage hardware complies with regulatory standards, including product recycling. The certification that Vicon Vantage systems have achieved for meeting stated international standards is included. You can also find regulatory notices and incident report forms to complete in the event of an adverse event involving the use of Vicon Vantage systems in the United Kingdom and the United States of America. Guidance on the safe operation of your Vicon Vantage system, as well as information regarding the system warranty, is also provided.

For more information, see:

- [Radio and television interference, page 187](#)
- [Environmental regulations \(EU customers\), page 189](#)
- [EU Declaration of Conformity \(Vicon Vantage cameras\), page 191](#)
- [EU Declaration of Conformity \(Vicon Vantage system\), page 193](#)
- [EU Declaration of Conformity \(Vicon Lock+\), page 195](#)
- [EU Declaration of Conformity \(Vicon Lock Studio\), page 197](#)
- [EU Declaration of Conformity \(Vicon Lock Lab\), page 199](#)
- [EU Declaration of Conformity \(Vicon software\), page 201](#)
- [Vicon ISO certification, page 202](#)
- [MDD EC Production Quality Assurance certificate, page 206](#)
- [Medical device adverse event reporting, page 208](#)
- [Safety information, page 213](#)
- [Warranty information, page 214](#)

<https://accessgudid.nlm.nih.gov/B548VICONVANTAGESYSTEM0>



## Radio and television interference

This topic contains information concerning compliance with regulations of radio and television interference.

For United States of America customers

Federal Communications Commission (FCC) Part 15 Information



This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules (CFR 47:Part 15:B:2013). These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Vicon Motion Systems Ltd is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For Canadian customers

Conformity to the Canadian Interference-Causing Equipment Regulations

This Class A digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations ICES-003:2004.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada ICES-003:2004.

## Environmental regulations (EU customers)

This section lists the directives that apply to Vicon Vantage systems.

This information applies only to European Union member states.

Vicon meets these European Commission directives concerning waste electrical and electronic equipment:

- Directives 2002/95/EC and 2011/65/EU (for details, see [Restriction of the use of certain hazardous substances in electrical and electronic equipment – RoHS and recast \(RoHS 2\)](#), page 189).
- [REACH Declaration of Conformity](#), page 190
- Directive 2002/96/EC (for details, see [Waste Electrical and Electronic Equipment \(WEEE\)](#), page 190).

### Restriction of the use of certain hazardous substances in electrical and electronic equipment – RoHS and recast (RoHS 2)

This equipment is fully RoHS- and RoHS 2- compliant. RoHS Directive 2002/95/EC provides that new electrical and electronic equipment put on the market for the first time from 1 July 2006 should not contain lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBB), or polybrominated diphenyl ethers (PBDE). The European Union Directive [2011/65/EU](#)<sup>14</sup> provides that new electrical and electronic equipment put on the market for the first time from 3rd January 2014 shall not contain more than permitted levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBB), or polybrominated diphenyl ethers (PBDE; PentaBDE, OctaBDE; DecaBDE), Mercury (Hg).

<sup>14</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32011L0065>

## REACH Declaration of Conformity

Vicon Motion Systems Ltd is a manufacturer of electronic hardware. We are therefore considered a "downstream user" as far as the REACH document is concerned. Vicon Motion Systems Ltd is therefore not obligated to register with the European Agency for Chemicals 'ECHA'.

Products sold by Vicon Motion Systems Ltd are "articles" as defined in REACH (Article 3 Definitions). Moreover and under normal and reasonably foreseeable circumstances of application, the articles supplied shall not release any substance. For that, Vicon Motion Systems Ltd is neither obligatory for registration nor for the creation of material safety data sheets.

In order to assure our customers of the continual supply of reliable and safe products, we ensure that our suppliers fulfill all requirements regarding chemical substances and prepared materials.

## Waste Electrical and Electronic Equipment (WEEE)

(Applicable in the European Union and other European countries with separate collection systems)



The use of the symbol as a marking on the equipment, accessories or literature indicates that this product and its electronic accessories (e.g. USB cable) may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product.

Household users should contact either the retailer where they purchased this device, or their local government office, for details of where and how they can take these items for environmentally safe recycling.

Business users should contact their supplier and check the terms and conditions of the purchasing contract. This device and its electronic accessories should not be mixed with other commercial waste for disposal.

## EU Declaration of Conformity (Vicon Vantage cameras)



### Declaration of Conformity

Medical Devices Directive 93/42/EEC as amended by  
EU Council Directive 2007/47/EC of 5th September 2007  
Electromagnetic Compatibility to EMC Directive 2014/30/EU  
Electrical Safety to Low Voltage Directive 2014/35/EU

We, Vicon Motion Systems Limited  
Unit 6, Oxford Industrial Park  
Mead Road, Yarnton, Oxford, OX5 1QU  
UNITED KINGDOM

declare that the cameras as part of a Vantage system manufactured by VICON MOTION SYSTEMS LIMITED contribute to meet ANNEX V and VII, Section 5 of the Medical Devices Directive 93/42/EEC in that the Quality Management System has been approved by Dare!! Services B.V, a notified body of the European Union (Reg No. 1912) for the manufacture and support of the aforementioned CLASS 1(m) Medical device. Product configurations and software options (Vicon Vantage cameras) detail the product configurations and software options that conform to the metrological requirements of the Directive.

This declaration of conformity is issued under the sole responsibility of the manufacturer.

VICON MOTION SYSTEMS LIMITED has tested and demonstrated that all products of its own manufacture meet 2014/30/EU:

Electromagnetic Compatibility to:  
EN60601-1-2:2007

General Requirements for Safety to:  
EN60601-1:2006 + A12:2014

Software Development, Conformity and Support  
EN ISO 13485:2016  
EN ISO 14971:2019  
BS EN 62304:2006 + A1:2015, IEC 62304:2006/A1:2015

Thomas Shannon, TD PhD FIE (Aust), CPEng (Biomed.)  
Director of Compliance

4<sup>th</sup> May 2021

Date of Expiration 17<sup>th</sup> August 2023 (Article 120, EU 2017/745), subject to meeting the continued surveillance obligations, Section 4, Annex V.  
Certificate Number 20M00097CRT05 8<sup>th</sup> September, 2020.

Not for use in an operating theater, anesthetic gas environment, or oxygen-rich environments. Not for use where there is a risk of compromising the essential performance of medical electrical equipment. Not suitable for use in high magnetic flux, ionizing radiation, sterile, or life- or safety-critical environments.

**Note:** The overall system classification is defined by the highest risk device installed, which may include the connection of approved third-party equipment such as electromyography apparatus by clients.

## Product configurations and software options (Vicon Vantage cameras)

This topic provides information relating to the EU Declaration of Conformity (Vicon Vantage).

Conformity of the Metrological Performance of CLASS 1 Products Manufactured in Accordance with Annex VII, Section 5 of the Medical Devices Directive 93/42/EEC of 14th June 1993.

As amended by EU Council Directive 2007/47/EC of 5th September 2007.

We, Vicon Motion Systems Limited  
Unit 6, Oxford Industrial Park  
Mead Road, Yarnton, Oxford, OX5 1QU  
UNITED KINGDOM

declare that the VICON Vantage System manufactured by VICON MOTION SYSTEMS LIMITED has been tested prior to shipment and meets the following metrological performance:

### Measurement criteria

- Supporting software Nexus 2.10 or later, Tracker 3.8 or later, Shogun 1.4 or later.
- Using a minimum of four cameras, resolution of the distance between the centers of two static 14 mm spherical markers located within a volume no less than 4 m x 4 m x 1.5 m to within 1 mm Mean; 1 mm Standard Deviation; sample size no less than 1,000.



## EU Declaration of Conformity (Vicon Vantage system)



### Declaration of Conformity

Medical Devices Directive 93/42/EEC as amended by  
EU Council Directive 2007/47/EC of 5th September 2007  
Electromagnetic Compatibility to EMC Directive 2014/30/EU.  
Electrical Safety to Low Voltage Directive 2014/35/EU.

We, Vicon Motion Systems Limited  
Unit 6, Oxford Industrial Park  
Mead Road, Yarnton, Oxford, OX5 1QU  
UNITED KINGDOM

declare that the VICON Vantage system manufactured by VICON MOTION SYSTEMS LIMITED meets ANNEX V and VII, Section 5 of the Medical Devices Directive 93/42/EEC in that the Quality Management System has been approved by Dare!! Services B.V, a notified body of the European Union (Reg No. 1912) for the manufacture and support of the aforementioned CLASS 1(m) Medical device. Product configurations and software options (Vicon Vantage system) detail the product configurations and software options that conform to the metrological requirements of the Directive.

This declaration of conformity is issued under the sole responsibility of the manufacturer.

VICON MOTION SYSTEMS LIMITED has tested and demonstrated that all products of its own manufacture meet 2014/30/EU:

Electromagnetic Compatibility to:  
EN60601-1-2:2007

General Requirements for Safety to:  
Vantage Cameras, Active Wand and Lock + EN60601-1:2006 + A12:2014  
Accessory Network Hub BS EN 62368-1:2014 + A11:2017

Software Development, Conformity and Support  
EN ISO 13485:2016  
EN ISO 14971:2019  
BS EN 62304:2006 + A1:2015, IEC 62304:2006/A1:2015

Thomas Shannon, TD PhD FIE (Aust), CPEng (Biomed.)  
Director of Compliance

4<sup>th</sup> May 2021

Date of Expiration 17<sup>th</sup> August 2023 (Article 120, EU 2017/745), subject to meeting the continued surveillance obligations, Section 4, Annex V.  
Certificate Number 20M00097CRT05 8<sup>th</sup> September, 2020.

Not for use in an operating theater, anesthetic gas environment, or oxygen-rich environments. Not for use where there is a risk of compromising the essential performance of medical electrical equipment. Not suitable for use in high magnetic flux, ionizing radiation, sterile, or life- or safety-critical environments.

**Note:** The overall system classification is defined by the highest risk device installed, which may include the connection of approved third-party equipment such as electromyography apparatus by clients.

## Product configurations and software options (Vicon Vantage system)

This topic provides information relating to the EU Declaration of Conformity (Vicon Vantage system).

Conformity of the Metrological Performance of CLASS 1 Products Manufactured in Accordance with Annex VII, Section 5 of the Medical Devices Directive 93/42/EEC of 14th June 1993.

As amended by EU Council Directive 2007/47/EC of 5th September 2007.

We, Vicon Motion Systems Limited  
Unit 6, Oxford Industrial Park  
Mead Road, Yarnton, Oxford, OX5 1QU  
UNITED KINGDOM

declare that the VICON Vantage System manufactured by VICON MOTION SYSTEMS LIMITED has been tested prior to shipment and meets the following metrological performance:

### Measurement criteria

- Supporting software Nexus 2.10 or later, Tracker 3.8 or later, Shogun 1.4 or later.
- Using a minimum of four cameras, resolution of the distance between the centers of two static 14 mm spherical markers located within a volume no less than 4 m x 4 m x 1.5 m to within 1 mm Mean; 1 mm Standard Deviation; sample size no less than 1,000.

### Analogue Digital Conversion

Resolution to  $\pm 10$  mV mean and  $\pm 10$  mV (1 Standard Deviation).

### Synchronization

Difference within one video frame.

## EU Declaration of Conformity (Vicon Lock+)



### Declaration of Conformity

Medical Devices Directive 93/42/EEC as amended by  
EU Council Directive 2007/47/EC of 5th September 2007 and  
Electromagnetic Compatibility to EMC Directive 2014/30/EU  
Electrical Safety to Low Voltage Directive 2014/35/EU.

We, Vicon Motion Systems Limited  
Unit 6, Oxford Industrial Park  
Mead Road, Yarnton, Oxford, OX5 1QU

Declare that the Lock+ providing analogue-digital conversion within the VICON Vantage or Vero Gait Analysis System manufactured by VICON MOTION SYSTEMS LIMITED meets ANNEX V and VII, Section 5 of the Medical Devices Directive 93/42/EEC in that the Quality Management System has been approved by Dare!! Services B.V., a notified body of the European Union (Reg No. 1912) for the manufacture and support of the aforementioned CLASS 1(m) Medical device. Product configurations and software options (Vicon Lock+) detail the product configurations and software options that conform to the metrological requirements of the Directive.

This declaration of conformity is issued under the sole responsibility of the manufacturer.

VICON MOTION SYSTEMS LIMITED has tested and demonstrated that all products of its own manufacture meet 2014/30/EU:

Electromagnetic Compatibility to:  
EN60601-1-2:2007

General Requirements for Safety to:  
Lock+ EN60601-1:2006 + A12:2014  
Accessory Network Hub BS EN 62368-1:2014 + A11:2017

Software Development, Conformity and Support  
EN ISO 13485:2016  
EN ISO 14971:2019  
BS EN 62304:2006 + A1:2015, IEC 62304:2006/A1:2015

Thomas Shannon TD PhD FIE (Aust) CPEng (Biomed.)  
Director of Compliance

4<sup>th</sup> May 2021

**Date of Expiration** 17<sup>th</sup> August 2023 (Article 120, EU 2017/745), subject to meeting the continued surveillance obligations, Section 4, Annex V.  
Certificate Number 20M00097CRT05 8<sup>th</sup> September, 2020.

Not for use in an operating theatre anaesthetic gas or oxygen-rich environments. Not for use where there is a risk of compromising the essential performance of medical electrical equipment. Not suitable for use in high magnetic flux, ionising radiation, sterile, or life- or safety-critical environments.

**Note:** The overall installed system classification is defined by the highest risk device connected which may include the connection of approved third-party equipment such as electromyography apparatus by clients.

## Product configurations and software options (Vicon Lock+)

This page provides information relating to the EU Declaration of Conformity (Vicon Lock+)

Conformity of the Metrological Performance of CLASS 1 Products

Manufactured in Accordance with Annex VII, Section 5 of the

Medical Devices Directive 93/42/EEC of the 14<sup>th</sup> June 1993.

As amended by EU Council Directive 2007/47/EC of 5<sup>th</sup> September 2007.

We, Vicon Motion Systems Limited

Unit 6, Oxford Industrial Park

Mead Road, Yarnton, Oxford, OX5 1QU

declare that the VICON Lock+ providing analogue-digital conversion within the VICON Vantage or Vero Gait Analysis System manufactured by VICON MOTION SYSTEMS LIMITED has been tested prior to shipment and meets the following metrological performance:

### Measurement Criteria

- Supporting software: Nexus 2.10 or later, Shogun 1.4 or later, Tracker 3.8 or later.

### Analog Digital Conversion

- Resolution to  $\pm 10$  mV mean and  $\pm 10$  mV (1 Standard Deviation).

### Synchronization

- Difference within one video frame.

## EU Declaration of Conformity (Vicon Lock Studio)



### Declaration of Conformity

Medical Devices Directive 93/42/EEC as amended by  
EU Council Directive 2007/47/EC of 5th September 2007 and  
Electromagnetic Compatibility to EMC Directive 2014/30/EU  
Electrical Safety to Low Voltage Directive 2014/35/EU

We, Vicon Motion Systems Limited  
Unit 6, Oxford Industrial Park  
Mead Road, Yarnton, Oxford, OX5 1QU

Declare that the VICON LOCK STUDIO providing analogue-digital conversion within the VICON Vantage or Vero Gait Analysis System manufactured by VICON MOTION SYSTEMS LIMITED meets ANNEX V and VII, Section 5 of the Medical Devices Directive 93/42/EEC in that the Quality Management System has been approved by Dare!! Services B.V., a notified body of the European Union (Reg No. 1912) for the manufacture and support of the aforementioned CLASS 1(m) Medical device. Product configurations and software options (Vicon Lock Studio) detail the product configurations and software options that conform to the metrological requirements of the Directive.

This declaration of conformity is issued under the sole responsibility of the manufacturer.

VICON MOTION SYSTEMS LIMITED has tested and demonstrated that all products of its own manufacture meet 2014/30/EU:

Electromagnetic Compatibility to:  
EN60601-1-2:2007

General Requirements for Safety to:  
Lock Studio EN60601-1:2006 + A12:2014  
Accessory Network Hub BS EN 62368-1:2014 + A11:2017

Software Development, Conformity and Support  
EN ISO 13485:2016  
EN ISO 14971:2019  
BS EN 62304:2006 + A1:2015, IEC 62304:2006/A1:2015

Thomas Shannon TD PhD FIE (Aust) CPEng (Biomed.)  
Director of Compliance

4<sup>th</sup> May 2021

**Date of Expiration** 17<sup>th</sup> August 2023 (Article 120, EU 2017/745), subject to meeting the continued surveillance obligations, Section 4, Annex V.  
Certificate Number 20M00097CRT05 8<sup>th</sup> September, 2020.

Not for use in an operating theatre, anaesthetic gas or oxygen-rich environments. Not for use where there is a risk of compromising the essential performance of medical electrical equipment. Not suitable for use in high magnetic flux, ionizing radiation, sterile, or life- or safety-critical environments.

**Note:** The overall installed system classification is defined by the highest risk device connected which may include the connection of approved third-party equipment such as electromyography apparatus by clients.

## Product configurations and software options (Vicon Lock Studio)

This page provides information relating to the EU Declaration of Conformity (Vicon Lock Studio).

Conformity of the Metrological Performance of CLASS 1 Products  
 Manufactured in Accordance with Annex VII, Section 5 of the Medical Devices  
 Directive 93/42/EEC of the 14<sup>th</sup> June 1993  
 As amended by EU Council Directive 2007/47/EC of 5<sup>th</sup> September 2007

We, Vicon Motion Systems Limited  
 Unit 6, Oxford Industrial Park  
 Mead Road, Yarnton, Oxford, OX5 1QU  
 UNITED KINGDOM

declare that the VICON LOCK STUDIO providing analogue-digital conversion within the VICON Vantage or Vero Gait Analysis System manufactured by VICON MOTION SYSTEMS LIMITED has been tested prior to shipment and meets the following metrological performance:

### Measurement Criteria

- Supporting software: Nexus 2.10 or later, Shogun 1.4 or later, Tracker 3.8 or later.

### Analogue Digital Conversion

- Resolution to  $\pm 10$  mV mean and  $\pm 10$  mV (1 Standard Deviation).

### Synchronization

- Difference within one video frame.

## EU Declaration of Conformity (Vicon Lock Lab)



### Declaration of Conformity

Medical Devices Directive 93/42/EEC as amended by  
EU Council Directive 2007/47/EC of 5th September 2007 and  
Electromagnetic Compatibility to EMC Directive 2014/30/EU  
Electrical Safety to Low Voltage Directive 2014/35/EU

We, Vicon Motion Systems Limited  
Unit 6, Oxford Industrial Park  
Mead Road, Yarnton, Oxford, OX5 1QU

Declare that the VICON LOCK LAB providing analogue-digital conversion within the VICON Vantage or Vero Gait Analysis System manufactured by VICON MOTION SYSTEMS LIMITED meets ANNEX V and VII Section 5 of the Medical Devices Directive 93/42/EEC in that the Quality Management System has been approved by Dare!! Services B.V., a notified body of the European Union (Reg No. 1912) for the manufacture and support of the aforementioned CLASS 1(m) Medical device. Product configurations and software options (Vicon Lock Lab) detail the product configurations and software options that conform to the metrological requirements of the Directive.

This declaration of conformity is issued under the sole responsibility of the manufacturer.

VICON MOTION SYSTEMS LIMITED has tested and demonstrated that all products of its own manufacture meet 2014/30/EU:

Electromagnetic Compatibility to:  
EN60601-1-2:2007

General Requirements for Safety to:  
Lock Lab EN60601-1:2006 + A12:2014  
Accessory Network Hub BS EN 62368-1:2014 + A11:2017

Software Development, Conformity and Support  
EN ISO 13485:2016  
EN ISO 14971:2019  
BS EN 62304:2006 + A1:2015, IEC 62304:2006/A1:2015

Thomas Shannon TD PhD FIE (Aust) CPEng (Biomed.)  
Director of Compliance

4<sup>th</sup> May 2021

**Date of Expiration** 17<sup>th</sup> August 2023 (Article 120, EU 2017/745), subject to meeting the continued surveillance obligations, Section 4, Annex V.  
Certificate Number 20M00097CRT05 8<sup>th</sup> September, 2020.

Not for use in an operating theatre, anaesthetic gas or oxygen-rich environments. Not for use where there is a risk of compromising the essential performance of medical electrical equipment. Not suitable for use in high magnetic flux, ionizing radiation, sterile, or life- or safety-critical environments.

**Note:** The overall installed system classification is defined by the highest risk device connected which may include the connection of approved third-party equipment such as electromyography apparatus by clients.

## Product configurations and software options (Vicon Lock Lab)

This page provides information relating to the EU Declaration of Conformity (Vicon Lock Lab).

Conformity of the Metrological Performance of CLASS 1 Products  
Manufactured in Accordance with Annex VII, Section 5 of the Medical Devices  
Directive 93/42/EEC of the 14<sup>th</sup> June 1993  
As amended by EU Council Directive 2007/47/EC of 5<sup>th</sup> September 2007

We, Vicon Motion Systems Limited  
Unit 6, Oxford Industrial Park  
Mead Road, Yarnton, Oxford, OX5 1QU  
UNITED KINGDOM

declare that the VICON LOCK LAB providing analogue-digital conversion within the VICON Vantage or Vero Gait Analysis System manufactured by VICON MOTION SYSTEMS LIMITED has been tested prior to shipment and meets the following metrological performance:

### Measurement Criteria

- Supporting software: Nexus 2.10 or later, Shogun 1.4 or later, Tracker 3.8 or later.

### Analogue Digital Conversion

- Resolution to  $\pm 10$  mV mean and  $\pm 10$  mV (1 Standard Deviation).

### Synchronization

- Difference within one video frame.



## EU Declaration of Conformity (Vicon software)



### Declaration of Conformity

Medical Devices Directive 93/42/EEC as amended by  
EU Council Directive 2007/47/EC of 5<sup>th</sup> September 2007

We, Vicon Motion Systems Limited  
Unit 6, Oxford Industrial Park  
Mead Road, Yarnton, Oxford, OX5 1QU

declare that VICON NEXUS Software utilized within the Vantage or Vero Gait Analysis Systems and manufactured by VICON MOTION SYSTEMS LIMITED meets ANNEX V of the Medical Devices Directive 93/42/EEC in that the Quality Management System has been approved by Dare!! Services B.V., a notified body of the European Union (Reg No. 1912) for the manufacture and support of the aforementioned CLASS 1(m) medical device.

declare that the medical devices listed below and bearing the CE marking, conform with the essential requirements of the Directive 93/42/EEC as amended by Directive 2007/47/EEC. Applicable harmonized standards have been used to demonstrate the safety and efficacy of the device when used in accordance to the Software Instructions for Use. The following standards were applied:

EN ISO 9001:2015  
EN ISO 13485:2016  
EN ISO 14971:2012  
BS EN 62304:2006 + A1:2015, IEC 62304:2006/A1:2015

NEXUS Data capture software for clinical gait, biomechanics, and sports sciences. Incorporates implementation of independently validated biomechanical Models. CLASS I(m).

Polygon Tool for reporting and presentation, enabling communication and sharing of data. Legacy Supported CLASS I.

Each version of software is released in accordance with records certifying compliance with the specifications.

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Thomas Shannon TD PhD FIE (Aust) CPEng (Biomed.)  
Director of Compliance

The Declaration is valid from 4<sup>th</sup> May 2021

Date of Expiration 17<sup>th</sup> August 2023 (Article 120, EU 2017/745), subject to meeting the continued surveillance obligations, Section 4, Annex V.  
Certificate Number 20M00097CRT05 8<sup>th</sup> September, 2020.

## Vicon ISO certification

- [ISO 13485:2016 Certificate of Approval \(Life Science applications\), page 203](#)
- [ISO 9001:2015 Certificate of Approval, page 204](#)
- [Certificate Schedule 727312, page 205](#)

The following certification relates to Vicon systems.

## ISO 13485:2016 Certificate of Approval (Life Science applications)



# Certificate of Registration

**QUALITY MANAGEMENT SYSTEM - ISO 13485:2016 & EN ISO 13485:2016**

This is to certify that:

Vicon Motion Systems Ltd t/a Vicon  
Unit 6 Oxford Industrial Park  
Mead Road  
Yarnton  
Kidlington  
OX5 1QU  
United Kingdom

Holds Certificate Number: **MD 727611**

and operates a Quality Management System which complies with the requirements of ISO 13485:2016 & EN ISO 13485:2016 for the following scope:

Design, manufacture and support of motion capture systems for life science applications, including development of related software.

Transfer from Lloyd's Register Quality Assurance Limited Certificate Issue Number: 10117806.



By Royal Charter



For and on behalf of BSI:

Gary E Slack, Senior Vice President - Medical Devices

Original Registration Date: 2020-09-25

Latest Revision Date: 2020-09-25

Effective Date: 2020-09-25

Expiry Date: 2021-08-16




Page: 1 of 1

...making excellence a habit.™

This certificate was issued electronically and remains the property of BSI and is bound by the conditions of contract.  
An electronic certificate can be authenticated [online](http://www.bsigroup.com/ClientDirectory).  
Printed copies can be validated at [www.bsigroup.com/ClientDirectory](http://www.bsigroup.com/ClientDirectory)

Information and Contact: BSI, Kitemark Court, Davy Avenue, Knowlhill, Milton Keynes MK5 8PP. Tel: + 44 345 080 9000  
BSI Assurance UK Limited, registered in England under number 7805321 at 389 Chiswick High Road, London W4 4AL, UK.  
A Member of the BSI Group of Companies.

## ISO 9001:2015 Certificate of Approval

		 	
<h3>Certificate of Registration</h3>			
<p>QUALITY MANAGEMENT SYSTEM - ISO 9001:2015</p>			
<p>This is to certify that:</p>		<p>Vicon Motion Systems Ltd t/a Vicon Unit 6 Oxford Industrial Park Mead Road Yarnton Kidlington OX5 1QU United Kingdom</p>	
<p>Holds Certificate Number:</p>		<p>FS 727312</p>	
<p>and operates a Quality Management System which complies with the requirements of ISO 9001:2015 for the following scope:</p>			
<p><b>Design, Manufacture and support of motion capture systems. Development of software for motion capture systems, measurement and analysis of three-dimensional structures.</b></p>			
<p>For and on behalf of BSI:</p>		 <p>Andrew Launn, EMEA Systems Certification Director</p>	
<p>Original Registration Date: 2006-08-17</p>		<p>Effective Date: 2020-08-26</p>	
<p>Latest Revision Date: 2020-08-26</p>		<p>Expiry Date: 2021-08-16</p>	
  		<p>Page: 1 of 2</p>	
<p>...making excellence a habit.™</p>			
<p><small>This certificate was issued electronically and remains the property of BSI and is bound by the conditions of contract. An electronic certificate can be authenticated <a href="https://www.bsigroup.com/ClientDirectory">online</a>. Printed copies can be validated at <a href="https://www.bsigroup.com/ClientDirectory">www.bsigroup.com/ClientDirectory</a></small></p>			
<p><small>Information and Contact: BSI, Kitemark Court, Davy Avenue, Knowlhill, Milton Keynes MK5 8PP. Tel: + 44 345 080 9000 BSI Assurance UK Limited, registered in England under number 7805321 at 389 Chiswick High Road, London W4 4AL, UK. A Member of the BSI Group of Companies.</small></p>			

## Certificate Schedule 727312

Certificate No: FS 727312	
Location	Registered Activities
Vicon Motion Systems Ltd t/a Vicon Unit 6 Oxford Industrial Park Mead Road Yarmton Kidlington OX5 1QU United Kingdom	Design, manufacture and support of motion capture systems, development of software for motion captures systems, measurement and analysis of three-dimensional structures.
Vicon Motion Systems Inc 7738 Sth. Revere Parkway Suite 901 Centennial Colorado 80112 USA	Configuration, sales and support of motion capture systems ; including development of related software.
<p>Original Registration Date: 2006-08-17      Effective Date: 2020-08-26</p> <p>Latest Revision Date: 2020-08-26      Expiry Date: 2021-08-16</p> <p style="text-align: right;">Page: 2 of 2</p> <p><small>This certificate was issued electronically and remains the property of BSI and is bound by the conditions of contract. An electronic certificate can be authenticated <a href="#">online</a>. Printed copies can be validated at <a href="http://www.bsigroup.com/ClientDirectory">www.bsigroup.com/ClientDirectory</a></small></p> <p><small>Information and Contact: BSI, Kitemark Court, Davy Avenue, Knowlhill, Milton Keynes MK5 8PP. Tel: + 44 345 080 9000 BSI Assurance UK Limited, registered in England under number 7805321 at 389 Chiswick High Road, London W4 4AL, UK. A Member of the BSI Group of Companies.</small></p>	

### Production Quality Assurance

Directive 93/42/EEC on MEDICAL DEVICES, Annex V

The certificate : 20M00097CRT05

issued by: **DARE!! Services B.V.**  
**Vijzelmolenlaan 7**  
**3447 GX Woerden**  
**The Netherlands**

**to:**  
**Manufacturer** : Vicon Motion Systems Ltd  
**Address** : 6 Oxford Industrial Park, OX5 1QU  
 Yarnton, United Kingdom

regarding the product categories, sub categories and groups Gait analysis systems and their associated software (Class I measuring function) and grants the right to use the EC Notified Body Identification Number as represented below to accompany the CE Marking on the product(s) meeting the provisions of the EC Directive which apply to these product(s).

1912

**This certificate is based on the following documents:**  
20M00097ARR03 and LRO 4003146/B (transferred certificate of LROA)

DARE!! Services B.V. hereby declares that it has audited the quality in accordance with MDD Annex V and that the relevant provisions of the Directive 93/42/EEC dated June 14, 1993 concerning Medical Devices, including all subsequent amendments and transposed into Dutch legislation under the name "Besluit Medische Hulpmiddelen" are fulfilled. The validity of this certificate includes the surveillance obligations of Annex V, section 4.

Issued for the first time: August 17, 2006  
Reissued: September 8, 2020  
Valid to: August 17, 2023

**DARE!! Services B.V.**

Dr. ir. W. Sjoerdsma  
Certification decision maker

  
Ing. D. van der Vlugt  
Director

Certificate number: 20M00097CRT05



## Medical device adverse event reporting

This following information provides required regulatory notices and incident report forms relating to the supply and use of Vicon systems in the United Kingdom and in the United States of America.

- [MHRA Adverse Incident Reporting \(UK\), page 209](#)
- [FDA MedWatch Adverse Event Reporting Program \(US\), page 211](#)

Should an adverse event occur, complete the appropriate form and forward it within one working day to Vicon Motion Systems Limited:

### Denver, CO

Vicon Denver  
7388 S. Revere Parkway  
Suite 901, Centennial  
CO 80112, USA  
T: 303.799.8686  
F: 303.799.8690  
E: [support@vicon.com](mailto:support@vicon.com)<sup>15</sup>

### Los Angeles, CA

Vicon LA  
3750 S. Robertson Boulevard  
Suite 100, Culver City, Los Angeles  
CA 90232, USA  
T: 310.437.4499  
E: [support@vicon.com](mailto:support@vicon.com)<sup>16</sup>

### Oxford, UK

Vicon Oxford  
Unit 6, Oxford Industrial Park  
Mead Rd, Yarnton, Oxford  
OX5 1QU, United Kingdom  
T: +44.1865.261800  
E: [support@vicon.com](mailto:support@vicon.com)<sup>17</sup>

---

<sup>15</sup> <mailto:support@vicon.com>

<sup>16</sup> <mailto:support@vicon.com>

<sup>17</sup> <mailto:support@vicon.com>



## MHRA Adverse Incident Reporting (UK)

The information in this section covers the reporting of incidents involving medical devices to the UK Medicines and Healthcare products Regulatory Agency (MHRA).



### Notice to agents

For inclusion in all Vicon systems supplied from the United Kingdom for use outside of the United States of America (for supply and use in the US, see [FDA MedWatch Adverse Event Reporting Program, page 211](#)).

The master Medicines and Healthcare products Regulatory Agency (MHRA) file is located at Vicon Motion Systems Limited. Should an adverse event occur, the MHRA Adverse Incident Report is to be completed and forwarded within one working day to Vicon Motion Systems Limited.

Full information and guidance on reporting Adverse Incidents is available on the [MHRA Yellow Card website](#)<sup>18</sup>. For details on reporting requirements, contact the MHRA:

### Medicines and Healthcare products Regulatory Agency

151 Buckingham Palace Road  
Victoria, London SW1W 9SZ  
UK

Tel: +44 (0)20 3080 6000

Fax: +44 (0)20 3118 9803

Web:

[www.mhra.gov.uk](http://www.mhra.gov.uk)<sup>19</sup>

For additional information and guidance, refer to the latest revision of MEDDEV 2.12-1 on The European Commission Web site ([http://ec.europa.eu/health/medical-devices/files/meddev/2\\_12\\_1\\_ol\\_en.pdf](http://ec.europa.eu/health/medical-devices/files/meddev/2_12_1_ol_en.pdf)).

<sup>18</sup> <https://yellowcard.mhra.gov.uk/>

<sup>19</sup> <http://www.mhra.gov.uk>



## MHRA Adverse Incident Report Form

You report adverse incidents on the MHRA web site (<https://yellowcard.mhra.gov.uk/>). You can either report the problem online or use a printed version of the MHRA Adverse Incident Report, which is also available from that web site.

If you have any difficulty obtaining the MHRA Adverse Incident Report, contact Vicon Support immediately to receive the form.

To complete the MHRA Adverse Incident Report Form:

1. On the MHRA web site (<https://yellowcard.mhra.gov.uk/><sup>20</sup>), click the **Devices** button.
2. Complete the subsequent parts of the form, including an email address to which your own printer-friendly version of the report can be sent. Remember to complete the **Email copy of report to** field with Vicon's email address.
3. Finish completing all sections of the report (you must complete all entries flagged with a red asterisk) and submit the form online.
4. If you want to work with a printed copy, retrieve the printer-friendly copy from your email. If required, you can print and fax the form to the [nearest Vicon office, page 208](#).



### Tip

In section **Type of device**, select **General Report Form / All other devices** and on the next page, in the **Type of device** field, specify your Vicon system and device.

<sup>20</sup> <https://yellowcard.mhra.gov.uk/>

## FDA MedWatch Adverse Event Reporting Program (US)

This section covers the reporting of incidents to the US Department of Health & Human Services.



### Notice to agents

For inclusion in all Vicon systems supplied to the United States of America (for supply and use outside the US, see [MHRA Adverse Incident Reporting, page 209](#)).

The master Medical Device Reporting (MDR) file is located at Vicon Motion Systems Limited. Should an adverse event occur, MEDWATCH Form FDA 3500A is to be completed and forwarded within one working day to Vicon Motion Systems Limited.

Department of Health & Human Services,  
US Food and Drug Administration  
Medical Device Reporting System—Reportable Events

Code of Federal Regulations

Title 21, Volume 8

Revised as of April 1, 2014

Cite: 21CFR803.50

Under 803.50(a) device user facilities and manufacturers must report deaths and serious injuries that a device has or may have caused or contributed to. Should such an event occur, please complete the form specified in this section and forward it in accordance with the applicable regulations and time limits to your [nearest Vicon office, page 208](#).

## FDA Adverse Event Report Form

You can obtain the FDA Adverse Event Report Form (MEDWATCH form FDA 3500A) from the FDA's MedWatch Adverse Event Reporting program on their web site (<https://www.accessdata.fda.gov/scripts/medwatch/>). The form can be completed online or printed out.



### Important

To download a PDF of the form, click the **Download Forms** link at the bottom of the page. If you have any difficulty obtaining the FDA Adverse Event Report Form, contact Vicon Support.

To complete the Adverse Event Report form (MEDWATCH form FDA 3500A):

1. Go to <https://www.accessdata.fda.gov/scripts/medwatch/>.
2. Either complete the online MedWatch Voluntary Report or print and complete the PDF form. Then:
  - Send it to [support@vicon.com](mailto:support@vicon.com)<sup>21</sup>, including **Adverse Event Report** in your email subject line; or
  - Fax it to the [nearest Vicon office, page 208](#).



### Tip

Section C. Suspect Product(s) is not applicable to Vicon systems. For further guidance on completing the form, see the instructions contained in the PDF form.

<sup>21</sup> <mailto:support@vicon.com>

## Safety information

To avoid introducing a safety hazard and possibly damaging the system, please ensure that an adequate and good-quality alternating current (AC) power source is available. Please refer to the ratings statement on the rear of the relevant Vicon-supplied PoE+ switch for guidance. Also ensure that any computers and peripheral devices are set to be electrically rated to operate with the AC power available in your location.

When working with Vicon Vantage systems, observe these safety precautions:

- To prevent electric shock, plug all system components into properly grounded power sources. These cables must be equipped with three-prong plugs to ensure proper grounding. Do not use adapter plugs or remove the grounding prong from a cable.
- Ensure nothing rests on the system cables and that cables are not located where they can be stepped on or tripped over.
- Do not spill food or liquids onto any electrical component of the system. If any component gets wet, immediately contact Vicon Motion Systems or your nearest agent or distributor for advice.
- Do not push any objects into the slots of any unit of the system. Doing so can cause fire or electric shock by shorting out internal components.
- Keep all system components away from radiators and heat sources, and do not block cooling vents. Avoid placing loose papers beneath components. Do not place any components on closed-in units or on a bed, chair, etc.
- Replace fuses with the same type and rating for continued fire protection.
- Do not use outside, near water, in an environment exposed to anesthetic or other explosive gases, or in mobile applications.
- Use only hypoallergenic tape to affix Vicon markers to a subject's skin. Vicon supplies specially designed marker fixing tape; medical grade elastic strips are also suitable.
- Do not apply any products containing latex to the subject while using the Vicon system. Vicon products do not contain latex.
- Do not look directly at the source when a Near Infrared (NIR) or Infrared (IR) strobe unit is in operation and note the following warnings.



### Caution

Although it is theoretically possible for a strobe single fault condition to fully on to occur when an operator's eyes are within 100 mm of the Light Emitting Diodes for longer than 17 seconds, the likelihood of any such failure resulting in an emission of light that exceeds the Maximum Permissible Exposure defined by standard EN 62471:2008 to infrared light is extremely unlikely in practice, due to the design of the product.



### Warning

Under abnormal usage conditions, the Maximum Permissible Exposure defined by standard EN 62471:2008 to infrared light may be exceeded if your eyes are within 100 mm of the Light Emitting Diodes for longer than 400 seconds.

## Warranty information

The warranty for your Vicon Vantage system begins after installation.

For full details on warranty scope and conditions, refer to the Vicon Terms and Conditions of supply for your Vicon Vantage system.

## Further resources

If you need more information than that supplied in the documentation or on the [Vicon Support web pages](#)<sup>22</sup>, please contact Vicon:

### Denver, CO

Vicon Denver  
7388 S. Revere Parkway  
Suite 901, Centennial  
CO 80112, USA  
T: 303.799.8686  
F: 303.799.8690  
E: [support@vicon.com](mailto:support@vicon.com)<sup>23</sup>

### Los Angeles, CA

Vicon LA  
3750 S. Robertson Boulevard  
Suite 100, Culver City, Los  
Angeles  
CA 90232, USA  
T: 310.437.4499  
E: [support@vicon.com](mailto:support@vicon.com)<sup>24</sup>

### Oxford, UK

Vicon Oxford  
Unit 6, Oxford Industrial Park  
Mead Rd, Yarnton, Oxford  
OX5 1QU, United Kingdom  
T: +44.1865.261800  
E: [support@vicon.com](mailto:support@vicon.com)<sup>25</sup>

---

<sup>22</sup> <https://www.vicon.com/support>

<sup>23</sup> <mailto:support@vicon.com>

<sup>24</sup> <mailto:support@vicon.com>

<sup>25</sup> <mailto:support@vicon.com>