Biolin Scientific
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Theta

Installation manual – OneAttension

Optical Tensiometer

Revision 1.7

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1. Introduction

This installation manual describes the detailed hardware and software installation procedure for the Theta instrument.

The modular design of the Theta enables many equipment combinations, allowing the user to configure the instrument in a way that meets their requirements. Optional hardware modules can be purchased and easily installed at a later date.

As this manual only contains information concerned with the installation procedure, please see the Operation Manual for information on calibration, taking measurements and data analysis.

1.1 Features of the Theta

Once installed on your computer the Theta with OneAttension software will offer the following:

- Sessile drop contact angle measurements

- Dynamic contact angle measurements

- Surface free energy calculations

- Surface and interfacial tension measurements by pendant drop analysis

- Pulsating-drop measurements for dilatational interfacial rheology studies *

- Ultra-fast imaging (up to 2315 fps) e.g. of rapid droplet spreading and absorption into samples*

- Picoliter sized droplet dispensing and high-zoom optics for characterization of extremely small or irregularly shaped samples*.

- Automated multi-liquid dispensing, droplet placement, sample -stage movement, instrument tilting (for advancing and receding contact angles) and image capture & analysis for fully automated experiment control*.

- Topography measurements for enhanced contact angle measurement results for rough surfaces*.

 *Requires additional optional hardware module.

The latest range of additional modules can be viewed in www.biolinscientific.com/attension

1.2 Equipment overview

The basic setup of the operational Theta is shown below.
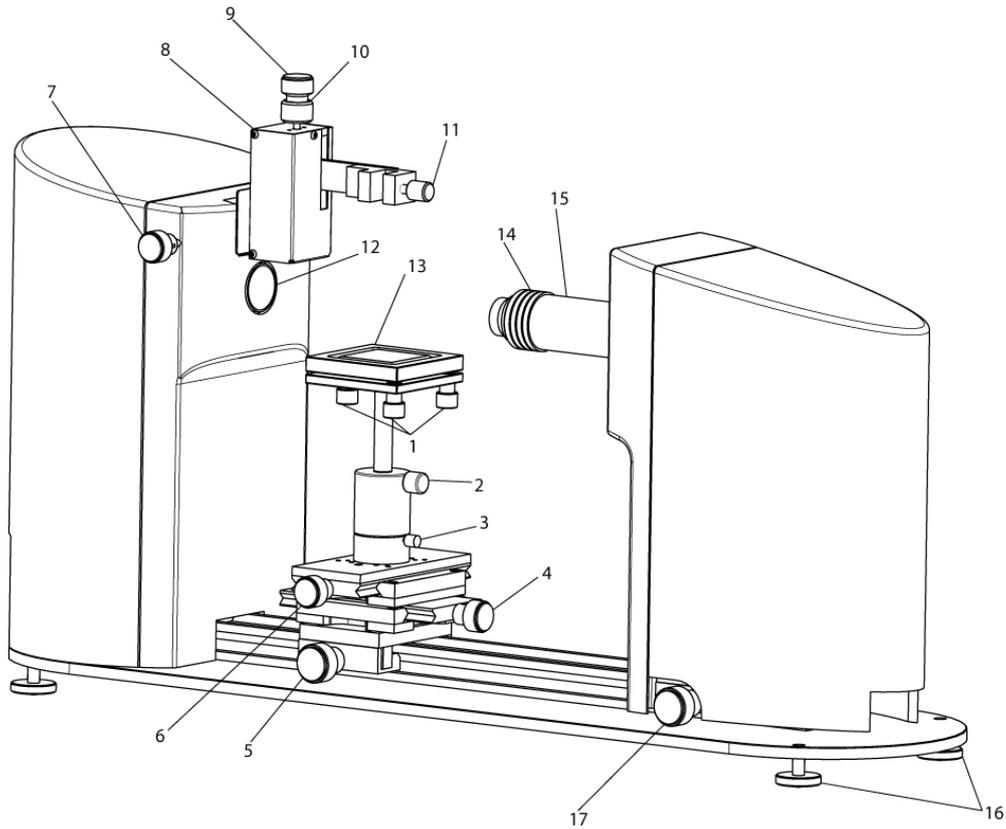
Figure 1.1. *Physical features of a basic Theta.*

1) Stage level adjustment

2) Stage height adjustment

3) Stage height lock

4) Stage linear adjustment

5) Stage rail lock

6) Stage lateral adjustment

7) Syringe lateral adjustment

8) Liquid dispense holder

9) Syringe height adjustment

10) Manual dispenser adjustment

11) Syringe clamp

12) LED light source

13) Sample stage

14) Camera lens focus adjustment

15) Camera lens zoom adjustment

16) Level adjustment feet

17) Camera rail lock

2. Mechanical installation

2.1 Unpacking

The Theta is delivered in one crate. The crate should be opened carefully and checked to see that it contains:

- Theta instrument consisting of base with four adjustable feet, interface unit (which houses the one-touch dispenser and LED light source) and camera stage.
- Sample stage mounting with thumb screw
- Power cable
- Necessary communication cables
- Manual dispensing syringe
- Calibration ball and magnet
- Bubble leveling disk.
- DVD with software, license file (.xml) and manuals

As well as any optional items, which may include for example:

- Automatic single/multi liquid dispenser
- Motorized dispenser movement module
- Motorized x/y-stage
- Tilting cradle
- Interconnect cables for additional modules
- Sample chambers/cuvettes

2.2 Positioning of the instrument and components

The instrument should be placed on a vibration free table in an area where local air currents are at a minimum. Unwrap all plastic wrapping carefully, taking care not to scratch the components if you cut through the wrapping with a knife. Place the bubble leveling disk on the instrument base and adjust the leveling feet until the bubble sits in the central marked circle.

You are then required to align all components in the optical path and to give the sample stage large freedom of movement from its mounted position by following the instructions below.

Place the sample stage mounting mechanism on the central rail of the instrument base. Use the x and y-position adjustment screws (#4 and #6 in Figure 1.1) to adjust the sample stage x and y positions so that the sample stage is positioned in the centre of the available travel range in both directions. With the manual syringe dispenser in place, adjust the horizontal position of the one-touch dispenser so that the syringe tip appears near to the centre of the LED light source (when viewed from the camera end of the instrument). Adjust the vertical position of the syringe tip either by loosening the syringe clamp, coarsely adjusting position then retightening the syringe clamp or make fine adjustments using the syringe height adjustment screw (#9 in Figure 1.1). Position the whole of the sample stage mounting mechanism under the syringe tip so that the centre of the square sample stage is positioned centrally beneath the syringe tip. Do this by sliding the sample stage mounting mechanism along the rail while the stage rail lock screw (#5 in Figure 1.1) is loose. Once in position, firmly tighten the stage rail lock screw.

Exact positioning of the camera stage along the rail is user-application specific and depends on the required zoom and focus settings of the camera. This part of the setup is only possible once the software has been installed and is explained in the user manual.

All the additional modules operate with simple plug and play installation, therefore the plug in instructions are included in the user manual together with the operating instructions.

2.3 Connecting cables

Theta requires a computer with one free USB port, and either a Gigabit Ethernet port or a FireWire port depending on your camera type. If the computer does not have a FireWire port available then the FireWire PCI card supplied should be installed

Connect the Theta's **USB1** port to the computer USB port using the supplied USB cable. Connect the Theta's **Ethernet** port to your computer's Gigabit Ethernet port or the Theta's **FW1** port to your computer FireWire port using the supplied cables. Connect the power cable to the three-pin IEC connector beneath the power switch and plug in to the mains power supply.

2.4 Firewire connectivity information

On-board Firewire ports such as those connected to the front-panel of a desktop PC or built-in mini 4-pin ports in laptops are often problematic and may not work correctly with the Theta camera. If during the software installation or initial software loading phase the camera is not detected, even though the cables are connected and the instrument is turned on, then there may be a problem with the type of Firewire port that you are trying to use.

If you are using a desktop computer it is strongly recommended that you install the supplied Firewire PCI card into an available PCI slot on your computer motherboard. As this requires the computer housing to be opened up, it is advisable to contact your I.T. department for this part of the installation unless you are a competent/qualified computer system builder.

If your laptop computer is not equipped with any type of Firewire port, or if the built-in port just doesn't work, it is recommended that you obtain and insert a suitable Firewire expansion card (PC Card or ExpressCard, depending on the laptop). The crucial factor is the controller chip that the Firewire port is built around. Unfortunately, Firewire card manufacturers often don't specify what controller chips their cards use. It can be manually checked from the Device Manager, from "IEEE Bus Host Controllers". The device name is usually in the form "[Chipset name] 1394 OHCI Compliant Host Controller". Texas Instruments and VIA chips are known to work well.

It is also known that a laptop computer running in a lower power state, such as when unplugged from the mains and running from batteries, may not allow successful Firewire communication with the Theta camera. Keeping the laptop computer connected to the mains power supply may solve this class of communication problems.

When experiencing more or less random camera detection problems with **Windows 7 + ImagingSource** (60 FPS) camera, switching to the legacy 1394 bus driver as follows may help (this is not needed with the high-speed (420 FPS) Basler camera, as a special bus driver will automatically be installed for it):

1. In the Device Manager, select 'Properties' for the 1394 controller.

2. Select the 'Driver' page and 'Update Driver' button.

3. Select 'Browse my computer for driver software.'

4. Select 'Let me pick from a list of device drivers on my computer.'

5. Within the list of devices, you will see a device with '(Legacy).' This is the 1394 bus driver that previously shipped in Windows. Select this device and select 'Next.'

This will install the legacy 1394 bus driver on Windows 7.

It is possible to ascertain if the camera is successfully identified by your computer by checking the Windows Control Panel/ System/ Device Manager. When connecting the Firewire cable with the instrument power turned on, an extra item should appear in the hardware list. When the camera drivers are installed later on, the camera will be labeled correctly but for now it may simply be labeled as a 'generic 1394 camera'. If after software installation the camera is still only labeled as a 'generic 1394 camera', instead of being correctly identified as an 'Imaging Source' or 'Basler' (high-speed) camera, then there may have been a problem with driver installation. Even if everything seems to be all right in the Device Manager, it's possible that OneAttension can't properly communicate with the camera. It could behave as the camera didn't exist at all, or a message "Camera found, but initialization failed" may pop up. If the usual restart / reboot / reinstall attempts or the "Windows 7 + ImagingSource" bus driver

trick above don't help, then the problem is almost certainly caused by a defunct Firewire controller. A Firewire adapter should be installed then, as described above.

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3. OneAttension software installation

3.1 Computer requirements

The computer attached to the Theta is required to have

- Windows Vista (32 bit), Windows 7 (32 or 64 bit), Windows 8 (32 or 64 bit) or Windows 10 (32 or 64 bit, only available for the Basic Ethernet camera and Basic FireWire camera).

- During installation the user must have **administrative privileges** to the computer.

- One free USB port.

- One free **Gigabit Ethernet** port or an IEEE 1394 **FireWire** port (if unavailable use the supplied PCI adapter) depending on the camera you have in your Theta.

3.2 Software Installation with Gigabit Ethernet cameras

First, **turn Theta power off**. Connect the USB and Ethernet cables between Theta and the computer. **Do not turn Theta power on yet.**

Insert the OneAttension installation DVD into the optical disk drive. Access the disk (typically drive D:\) and double-click on **OAsetup.exe**. In case the **OAsetup.exe** is copied from the DVD e.g. in the computer's desktop before installation, please note that you need to copy also a **license.xml** file in the computer. The **license.xml** file is a unique file for each licensed OneAttension copy.

The installation will now begin. Follow the instructions on screen.

During the installation it is **extremely important** to choose the correct drivers from the list of drivers:
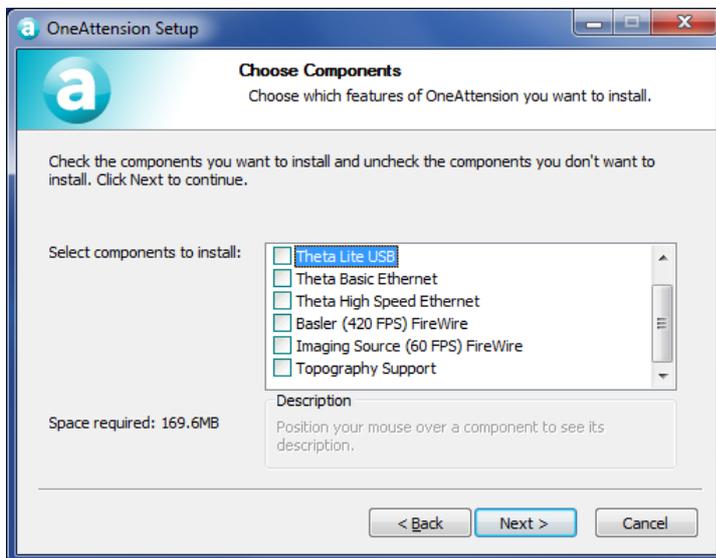
Choose either "**Theta Basic Ethernet**" in case you have the basic camera that goes up to 344 fps or "**Theta High Speed Ethernet**" in case you have the high speed camera that goes up to 2315 fps. If you have the 3D Topography module, choose **also** the "Topography support".

If for some reason the Windows cannot verify the publisher of the driver software, choose "Install this driver software anyway".

The installer may also ask you to turn your instrument on during installation. This also applies to the optional 3D Topography module.
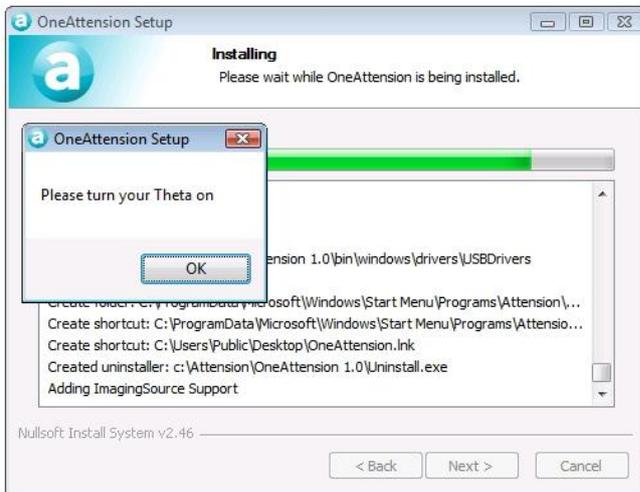
Some of the drivers open a separate driver installation wizard in order to install the drivers. In this case, choose next and wait until the drivers have been installed.

If the installer asks you to connect your video capture device, the camera cannot be detected. In this case, please check that the instrument is on and all cables are connected.

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Finally, choose "Finish" in order to finish the OneAttension installation.
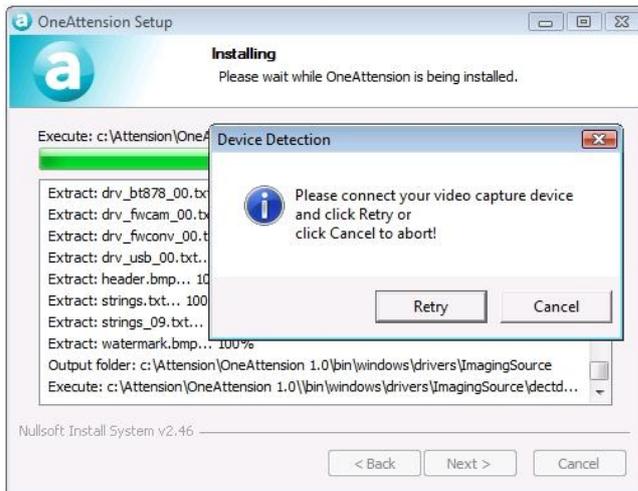
Possible issues

In most cases, OneAttension installation goes very easily and all software components are installed automatically. However, occasionally the drivers won't install properly.

Basic Gigabit Ethernet camera

In some cases, the IP address for the camera has to be set manually. If you installed OneAttension with the "Theta Basic Ethernet" drivers and OneAttension cannot locate the camera, please try the following actions:

Open "pylon IP Configurator" program in your computer. The program should locate your camera. Choose your camera and write the following IP addresses to the Static IP cells:

IP Address: 169.254.1.0

Subnet Mask: 255.255.0.0

Gateway: 0.0.0.0
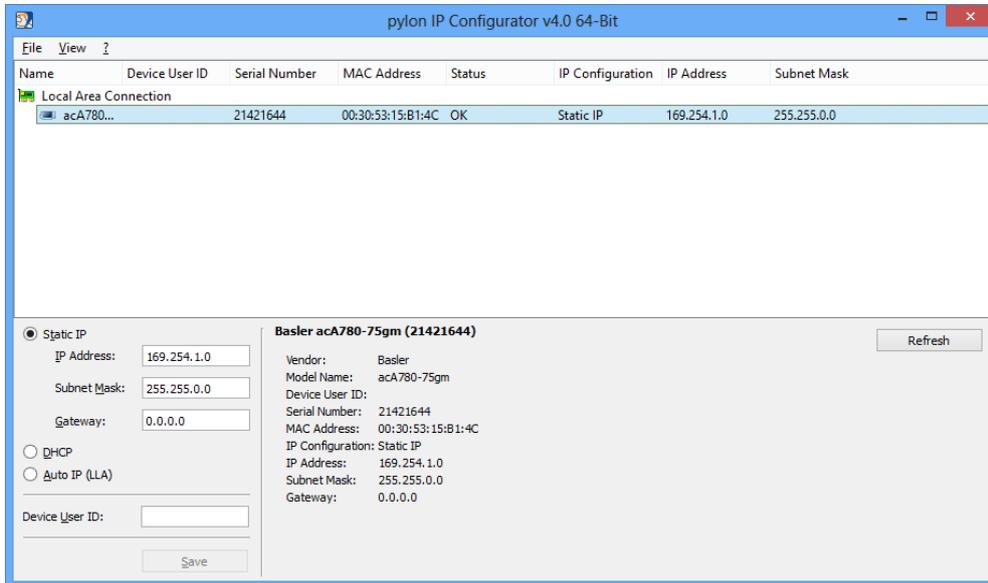
Click the Refresh. The IP addresses have now been updated and the camera should be located by OneAttension.

High speed Gigabit Ethernet camera

High speed Gigabit Ethernet camera drivers cannot be installed, if they already exist in the computer. However, there might sometimes be a need to install the drivers again. In this case, the old drivers need to be removed first.
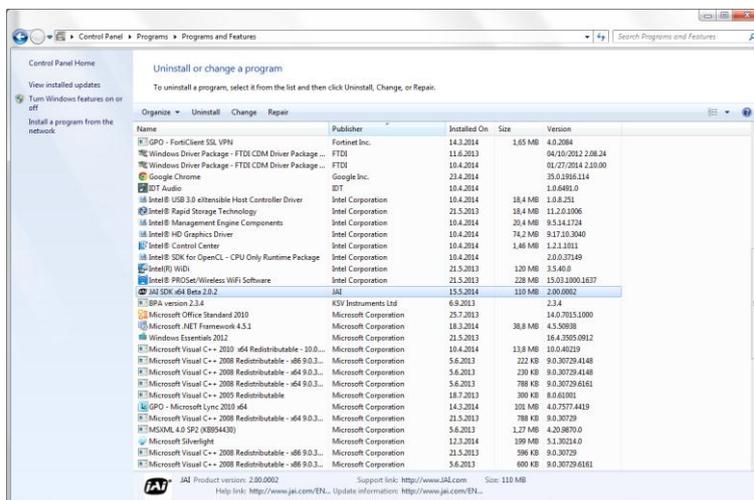
Go to Start → Control Panel → Programs → Programs and Features. You will see a list of all installed software. Go to JAI SDK and uninstall it. Windows will ask you to restart your computer, but do not do this yet.

Then go to the folder where you have installed your OneAttension. By default the path is C:\Attension\OneAttension\bin\windows\cameras. There you will find a folder called JAI which you need to delete. After deleting, restart your computer so that the changes will be taken into effect.

After the computer has been restarted, you can install the high speed camera drivers again normally.

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3.3 Software Installation with FireWire cameras

First, **turn Theta power off**. Connect the USB and FireWire cables between Theta and the computer. **Do not turn Theta power on yet.**

If you have the high-speed (420fps) **Basler** camera option **and** a laptop with a FireWire extension card, the *FireWire extension card* must be connected to the laptop during OneAttension installation, because a special bus driver will be installed for it.

Insert the OneAttension installation DVD into the optical disk drive. Access the disk (typically drive D:\) and double-click on **OAsetup.exe**. In case the **OAsetup.exe** is copied from the DVD e.g. in the computer's desktop before installation, please note that you need to copy also a **license.xml** file in the computer. The **license.xml** file is a unique file for each licensed OneAttension copy.

The installation will now begin and the following series of pop-ups will appear on screen.

Click *Next* to continue

Click *I Agree* to accept the terms of the license agreement
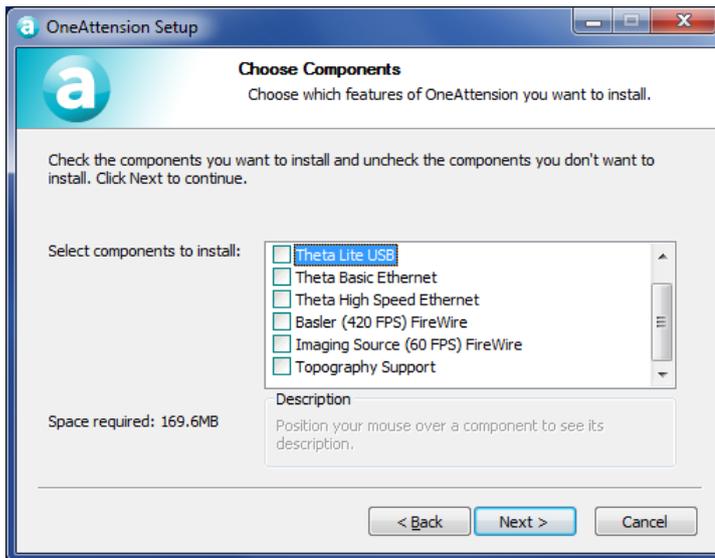
Select the appropriate camera drivers to install. If you have the standard-speed (60fps) ImagingSource camera check the *ImagingSource camera* box. If you have the high-speed (420fps) Basler camera option check the *Basler camera* box.
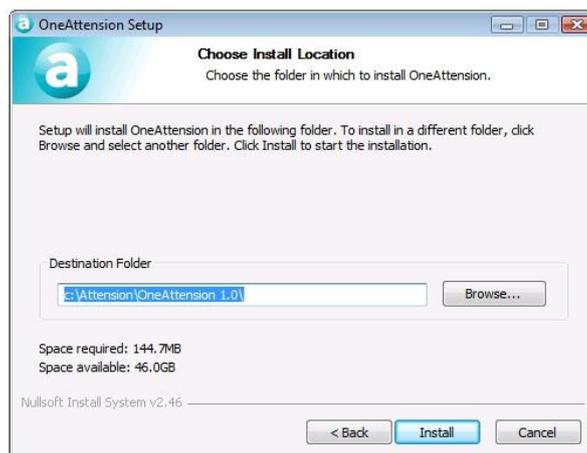
An installation directory needs to be chosen. It is strongly recommended that you proceed with the default installation directory as shown above. Do not install to your *Program Files* folder as this may cause problems when running the OneAttension program.
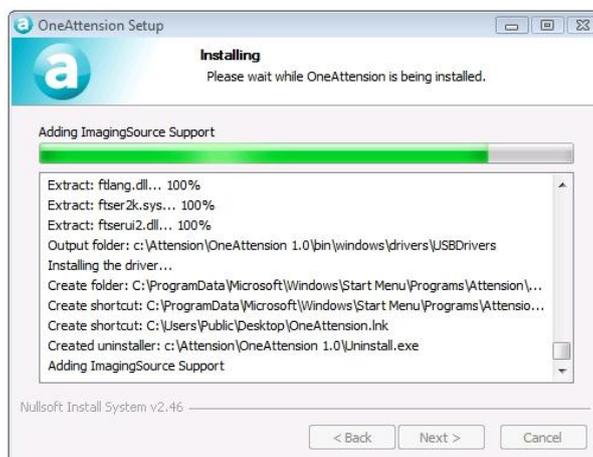
The installation progress can be monitored with the progress bar. Please allow several minutes for this stage of the installation to complete.

If Windows informs you that it can't verify the publisher of the driver software, select *Install this driver software anyway*.
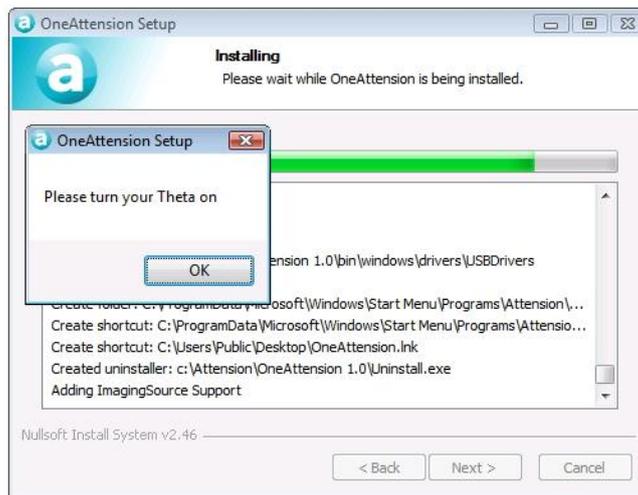
When the ImagingSource camera driver is being installed you will be asked to turn on your Theta instrument. Ensure that the USB and FireWire cables are connected to the computer first and that the power supply is plugged in. Switch the 0/1 power switch to the 1 position on the Theta interface panel then click *OK*.
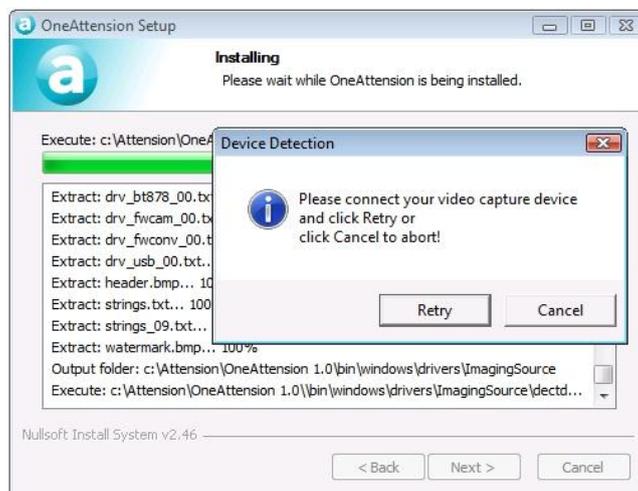
If there is a problem detecting the camera you will see the *Device Detection* error message above. Please check all FireWire cable connections and click Retry. If the software does not proceed beyond this screen click *Cancel* and refer to **Section 2.4 FireWire connectivity information** for further support.

If you are installing the Basler camera driver the installation will automatically proceed through to completion without any further action required.

If the ImagingSource camera driver was selected a Driver Installation Wizard will start up. All the connected & detected ImagingSource cameras will be listed. Usually only the Theta ImagingSource camera will be listed (but named as shown above). Ensure that the tickbox is checked and click *Next*.
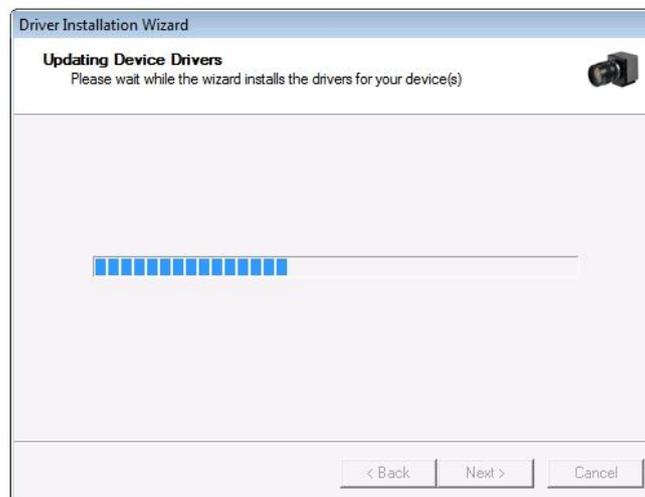
The progress of the ImagingSource driver installation will be indicated by the progress bar.

When the ImagingSource camera driver installation is completed you will see the above screen. Click *Finish*.

Following camera driver installation you will be informed that OneAttension has been installed on your computer. Click *Finish* to complete the software installation.

4. Contact information

If any problems arise please feel free to contact a local distributor or Attension directly.

Attension can be contacted from this address:

Attension, Biolin Scientific

Tietäjäntie 2

FI-02130 Espoo

Finland

Tel. +358-(0)9-5497 3300

Fax +358-(0)9-5497 3333

info@biolinscientific.com for sales requests

support@attension.com for service or technical support and maintenance

http://www.biolinscientific.com/attension

Local distributors are listed at our website, **http://www.biolinscientific.com/attension**