NanoSight LM10 HS

Operating Manual

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The information in this Operating Manual is correct of May 2009. Our instruments are continually being developed. Consequently, we reserve the right to alter the information without prior notice. Ver 2.26 (May 2009)

Contents

1. Important Notes

The LM10HS option for NanoSight LM10 systems is designed to supply the user with higher sensitivity allowing users to see small particles.

Technical Specification
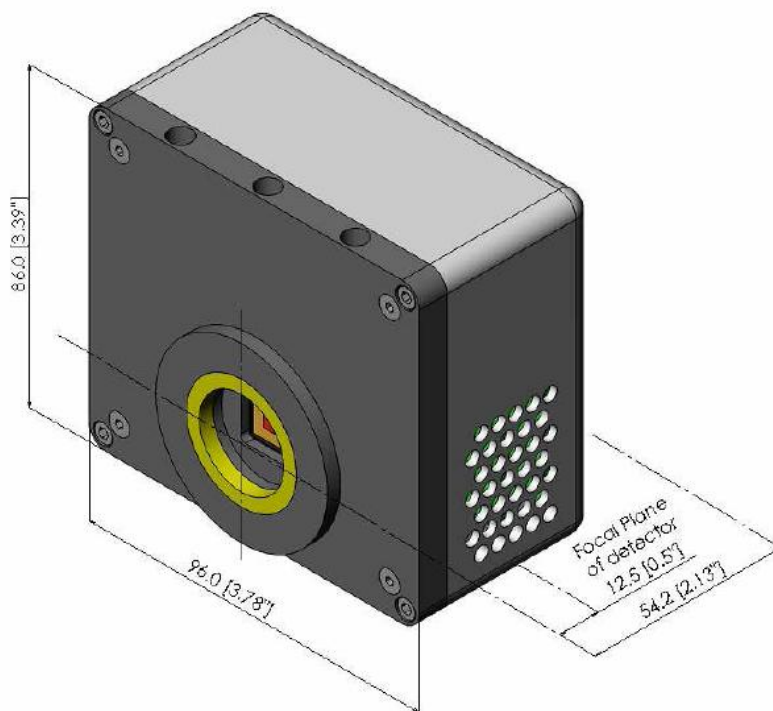
Camera: Andor Luca DL-658M-OEM
Weight: 700g
Operating temperature: 0degC to 30degC
Storage temperature: -25 to 55degC
Humidity: <70%
Max frame rate: 37.2fps
Dimensions:

Unpacking and Initial Inspection

The following are required for operation of the Andor Camera. Please ensure all are present when unpacking.

1. EMCCD Camera with optical attachment
2. Installation CD
3. Power Lead
4. USB lead

Inspect shipping container when goods are received. Carefully check the contents for completeness and condition. Please notify NanoSight if you find the contents to be incomplete or if any parts appear to be damaged in any way. Keep all damaged packaging, materials and goods for inspection by the carrier.

Returning Equipment

In the unlikely event you experience a problem with the Andor Camera system, it must be returned to NanoSight for repair following contact with us.

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...seeing is believing

Prior to returning any goods to NanoSight, call to obtain a Material Return Number for inclusion on all correspondence. All returned goods should be packed securely in the original packaging, or sufficient to prevent damage.

The following information is to be included with any return.

1. Sender's name and address.
2. Sender's contact telephone number and email address.
3. Complete list of equipment being returned including serial numbers.
4. A detailed description of the problem or reason why the equipment is being returned.
5. The Material Return Number.

2. Set up and Operation

The assembly and operation of the laser viewing module and microscope is unchanged by the use of the EMCCD Camera. For assistance in these areas please refer to the LM10 System Manual NTA 2.0 provided with purchase of the unit. The aim of this manual is to provide a step-by-step guide to installation of the Andor Camera and using it to capture videos. The videos are then processed using NTA software according to guidelines outlined in the LM10 System Manual.

Software Installation

Note on PCs supplied by NanoSight all files/drivers will be pre-installed and software installation can be skipped. Below is a summary, Appendix A goes through this in full detail.

1. Insert EMCCD installation CD.
2. Install camera drivers – Run Setup (setup.exe).
3. Copy 'EMCCD.exe' and 'Atmcd32d.dll' to the desktop.
4. Install NTA 2.0 Software (See NTA 2.0 installation instructions, supplied with instrument for details on this).

Hardware set-up

The setting up of the hardware is simply a case of removing the standard camera and attaching the EMCCD camera to the microscope. This is achieved by removing the Firewire cable from the standard camera and unscrewing the clasping screw on the microscope.

1. Unscrew clasping screw.
2. Replace standard camera with EMCCD camera.
3. Tighten clasping screw.
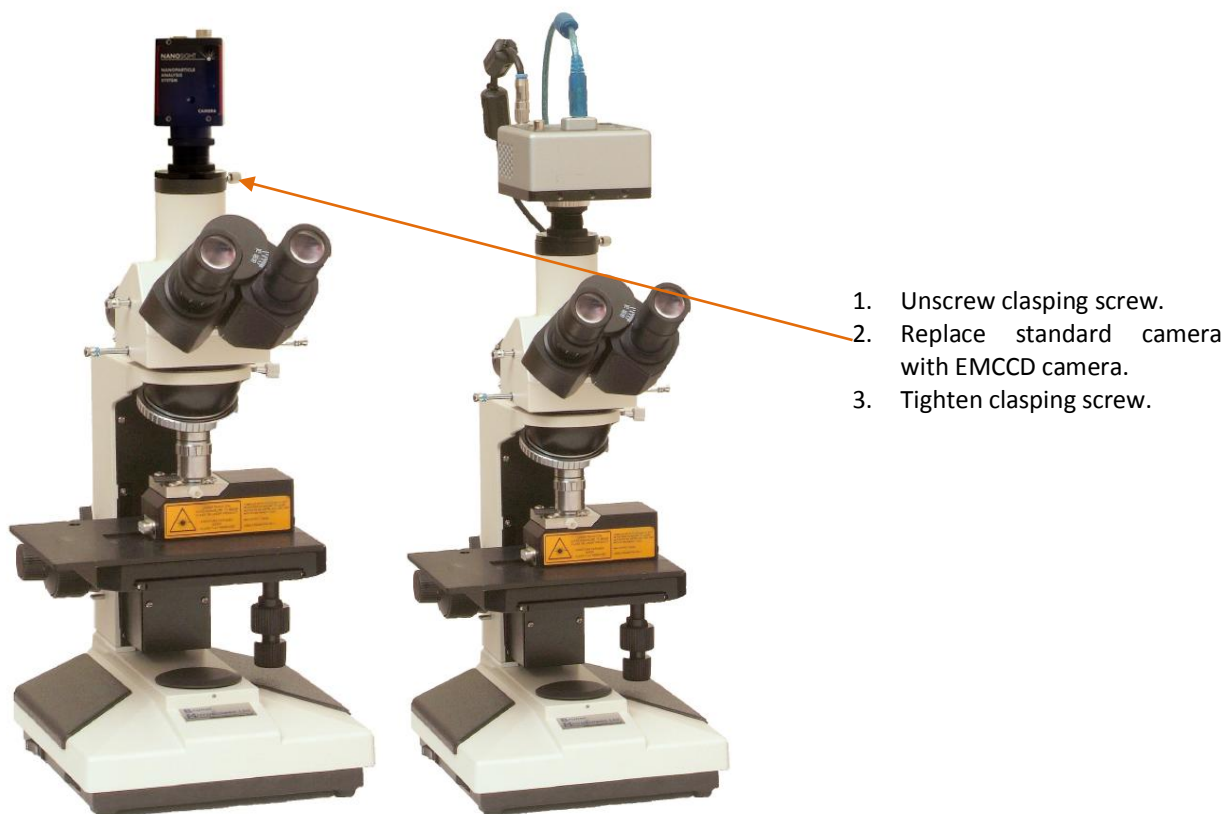
Attach camera power supply lead taking care to ensure alignment stub in connector lines up with socket on camera.

USB lead should be attached to camera and PC.

Operation

Double click on the 'EMCCD' icon on the software. This will cause the fan on the camera to reset, this is normal. The screen shot below demonstrates the key differences to the standard camera

File lag: lag from buffer to hard disk

To file: number of frames written
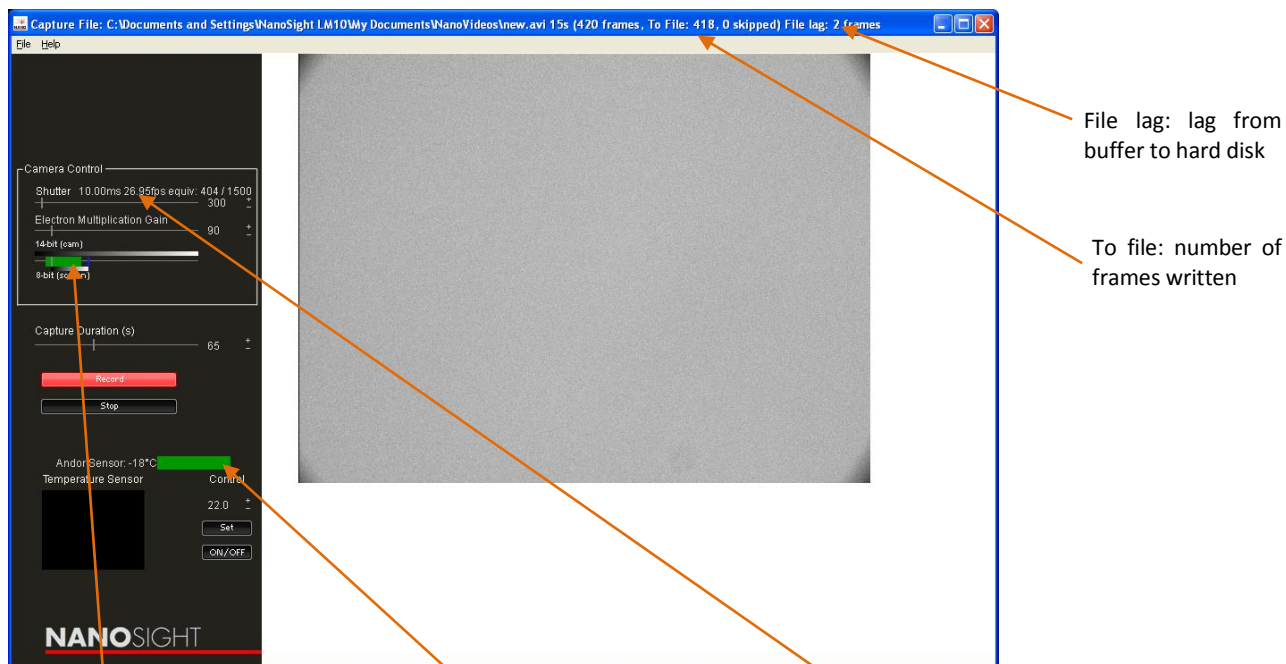
Green bar depicts greyscale range of image. Blue/grey lines depict 0/255 grey scale cut-off points.

CCD sensor temperature. Green bar indicates in ideal condition to record.

Frame rate is shutter dependent.

Video Capture

Many features are the same or similar to that of the LM10 system and for instructions on how to visualise, set correct concentration and suitable capture settings, see the LM10 system manual.

Locate the image on the screen using the microscope adjustments – as usual.

Shutter

Determines the length of time the shutter is open for and therefore how much light is captured from the particles. Dim particles (associated with small particles or particles with a low refractive index) need to be captured with a longer shutter open time.

To avoid over exposure, bright particles (larger or high refractive index particles) should be captured with a shorter exposure time. The software will not allow the user to record with too high a shutter (shutter bar will turn red) as this shutter duration causes the camera to reduce its frame rate too significantly.

Gain

Unlike the standard camera, this is an electron multiplying (EM) gain which works to magnify the signal prior to a readout noise having an effect. If the readout noise is comparable with the signal in standard CCD the image is hard to interpret, if electron multiplication applied, an improved signal to noise ratio can be achieved. The camera should not be left with the gain at a high value for a prolonged period (i.e. when the camera is not being used) to restrict current flow and thus extend camera lifetime.

Thresholding Pixels

This determines the range of pixel greyscales captured during the recording. The green fluctuating bar shows the range of greyscale values being detected by the camera. The range of pixel intensities recorded is user-controlled and is set by altering the positions of the grey and blue cursors using the left and right mouse

buttons respectively. The range of pixel intensities to be recorded is then defined as the range now enclosed between the cursors.

When setting the pixel thresholds, it is desirable for the range selected to be restricted as small as possible whilst still allowing all particles to be visualised.

The optimal threshold range is achieved by setting the minimum to a level which allows the dimmest particles to still be encaptured (move the grey cursor into position with the left-hand mouse button) and the maximum to a level at which the largest particles are not overly saturated (move the blue cursor into its maximum position using the right-hand mouse button).

Set Capture Duration

This determines the length of video which is captured as with the standard camera.

Record

This starts the video capture. The video can be stopped at any time by using the 'Stop' button. Dropped frames are usually associated with a slow processor speed, hard discs which are nearly full, or with high computer activity. It is important to record a video clip with no dropped frames as this will affect the calculated particle sizes. If the computer drops (skips) frames whilst the video is capturing, the preview screen can be switched off in order to help reduce the computer workload. This option is located in the 'Camera' section of the toolbar under 'Display Video During Capture.'

There is also a buffer to help preserve data integrity, here 'file lag' written next to the skips should for the majority of the time be less than 10. Greater than 300 will cause the capture to be terminated.

At the end of the video capture the user is prompted to choose the destination where the file is saved.

Temperature

The EMCCD camera is cooled and the temperature is displayed in the EMCCD capture program. The camera can cool down to -20degC but can take some minutes to obtain this temperature. When the temperature is close to target temperature a green bar will indicate appropriate conditions for recording are reached.

Processing captured videos

Once a video has been captured it can be analysed in NTA 2.0 as usual. Simply select open file to locate the file as normal.
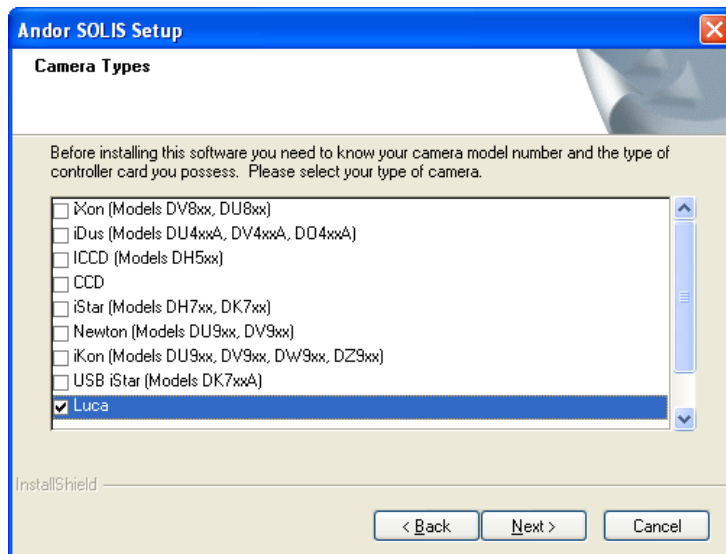
3. Technical Support and Feedback

If, for any reason, you experience problems with your instrument, please contact your local distributor. Contact details can be found at www.nanosight.com.

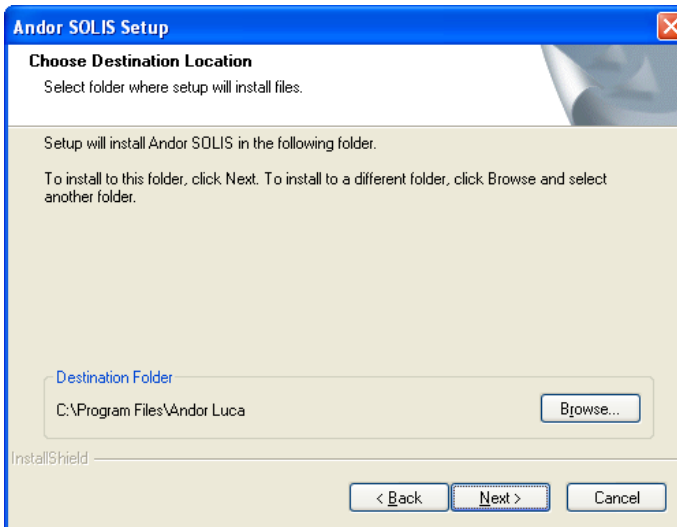# 4. Appendix A – Software installation: Step-by-Step guide

1. Insert EMCCD installation CD
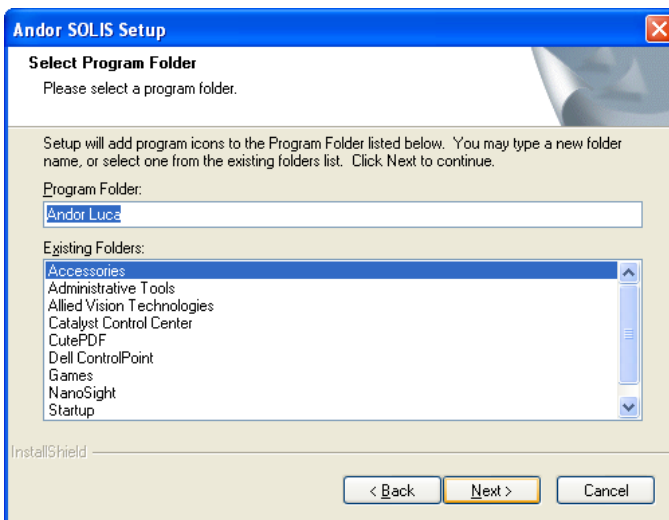2. Browse to 'EMCCD drivers' folder
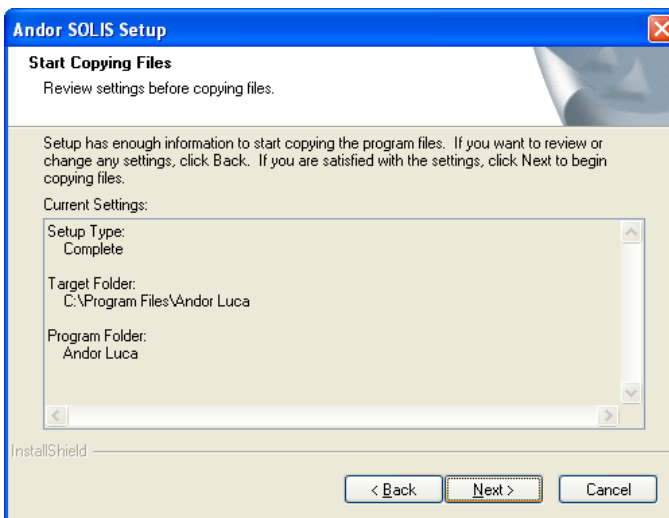3. Run setup.exe file.
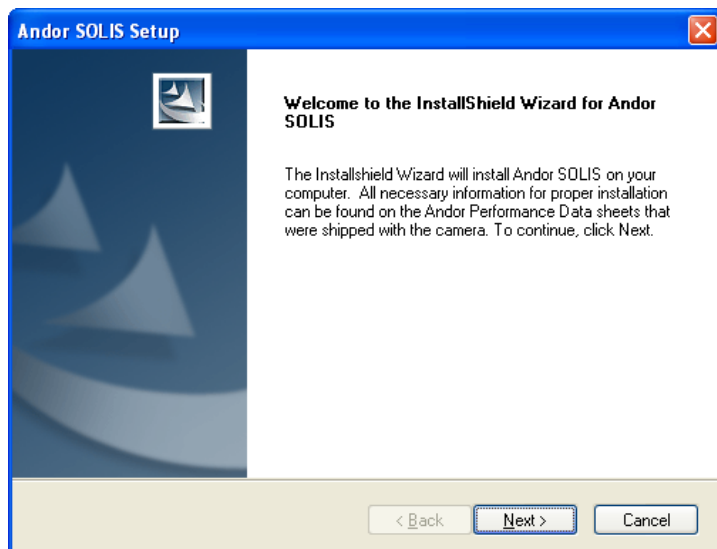
i. Click Next >

ii. Select 'Luca' and click Next >

iii.   Click Next >
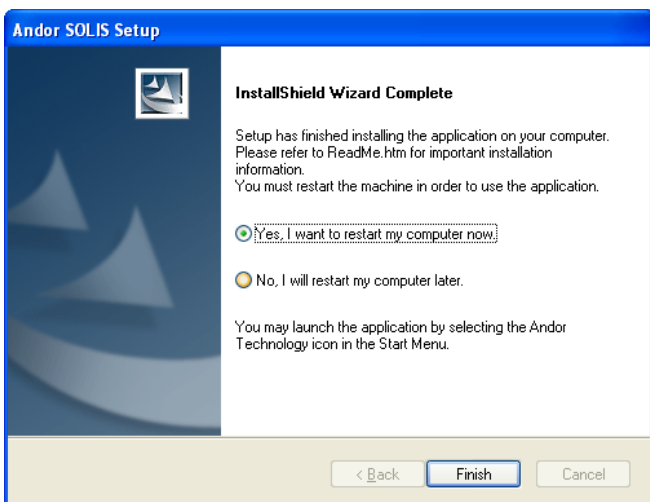

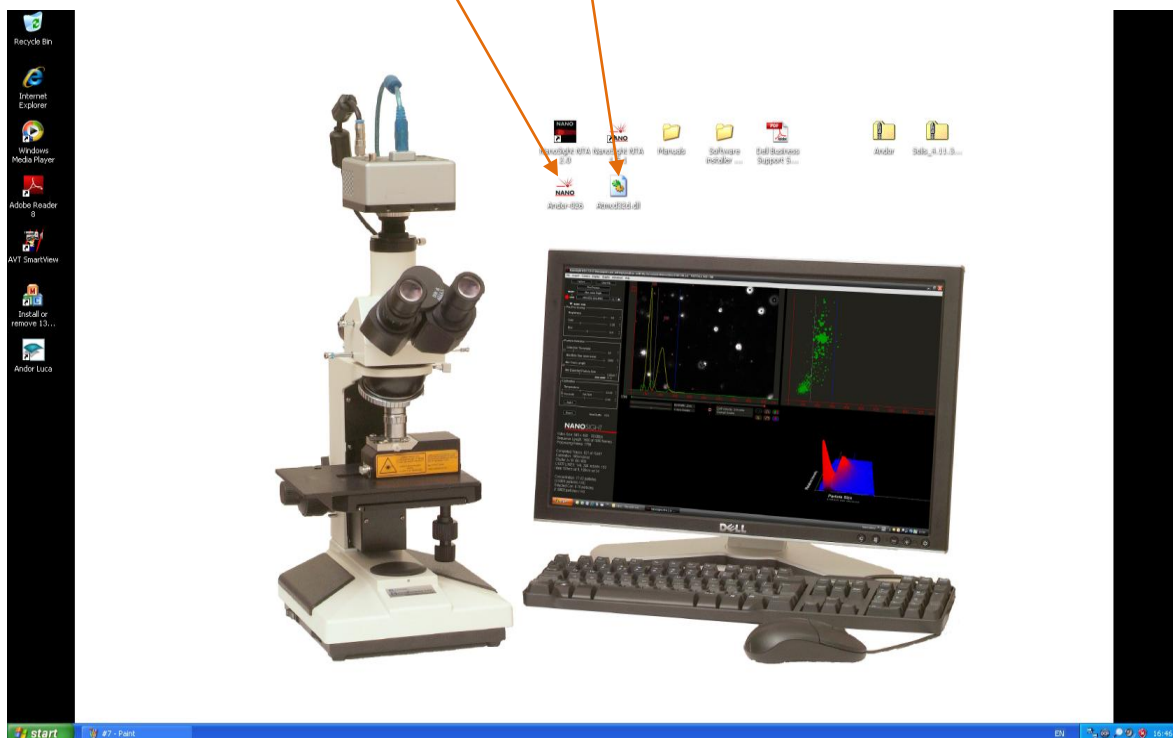iv.   Click Next >

v.   Click Next >

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vi.   Click Continue Anyway

vii.   Select Yes and click Finish
viii. On restart browse to CD and select EMCCD NTA folder.
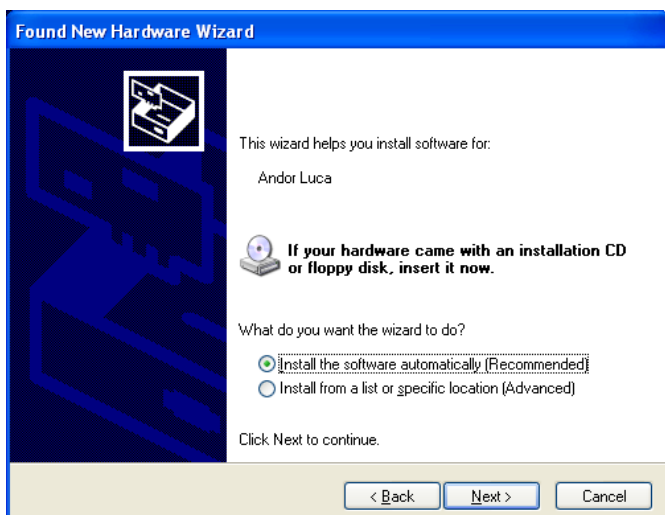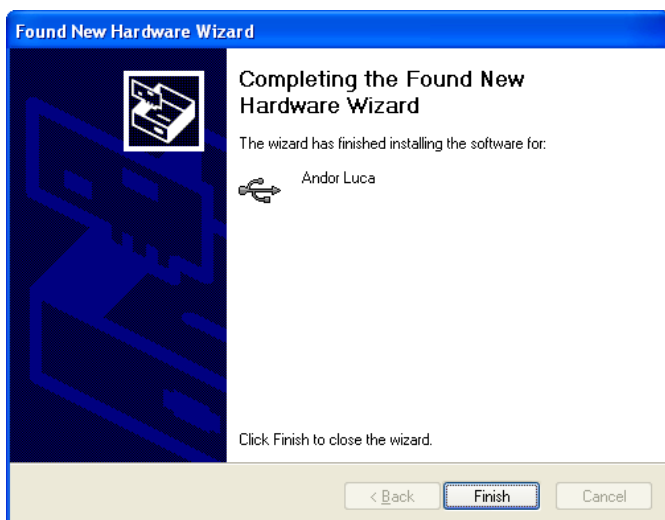ix.   Copy two files enclosed 'EMCCD.exe' and 'Atmcd32d.dll' to desktop.

x.   Assemble camera hardware as described above and connect power and USB lead. Windows will locate the new hardware.

xi.   Select 'Yes , this time only' and click next >.

xii. Click Next>.

xiii. Click Finish.

All software and drivers are now installed.