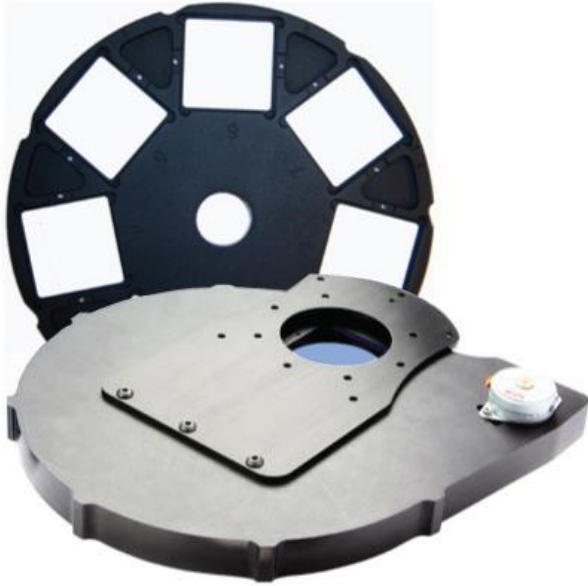# Apogee Imaging Systems
Camera Installation Guide

Version 1.6

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The specifications contained in this document are subject to change without notice.

Support

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1 Introduction and Setup

Thank you for purchasing an Apogee camera system. This installation guide covers installing, discovering, and configuring Apogee cameras on the Microsoft Windows family of operating systems. Apogee USB and Ethernet camera systems are designed and tested using the Windows XP 32 bit, Vista 32 and 64 bit and Windows 7 32 and 64 bit operating systems, in order to assure the best possible user experience and performance. Apogee Imaging Systems, Inc. has not verified or tested, and has no plans to support, cameras on previous versions of Microsoft Windows.

Apogee Imaging Systems recommends the following process for getting your new camera up and running as quickly as possible:
1) Install Maxim DL/CCD application software
2) Install/Update Apogee Drivers, if required
3) Apply Power and Data Connections to the USB or Network camera
4) Begin using your Apogee camera!

1.1 Install MaxIm DL/CCD

Your Apogee camera may have included a copy of MaxIm DL/CCD image capture and processing software, developed by Diffraction Limited. If you will be using the MaxIm DL/CCD software, we recommend that you install it prior to setting up your Apogee camera. Please see the MaxIm documentation for specific instructions related to installation of this software.

Apogee cameras are supported by MaxIm DL/CCD version 3.21 and beyond.

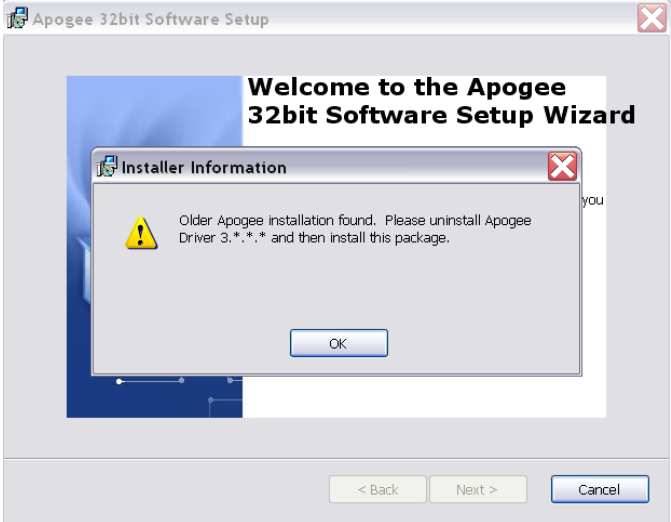## 1.2 Install/Update Apogee Camera Driver

1.2.1 Windows XP

WARNING: Do not connect your Apogee device to a PC before installing the drivers. If you do and the "Add New Hardware Wizard" appears, please select the Cancel button.
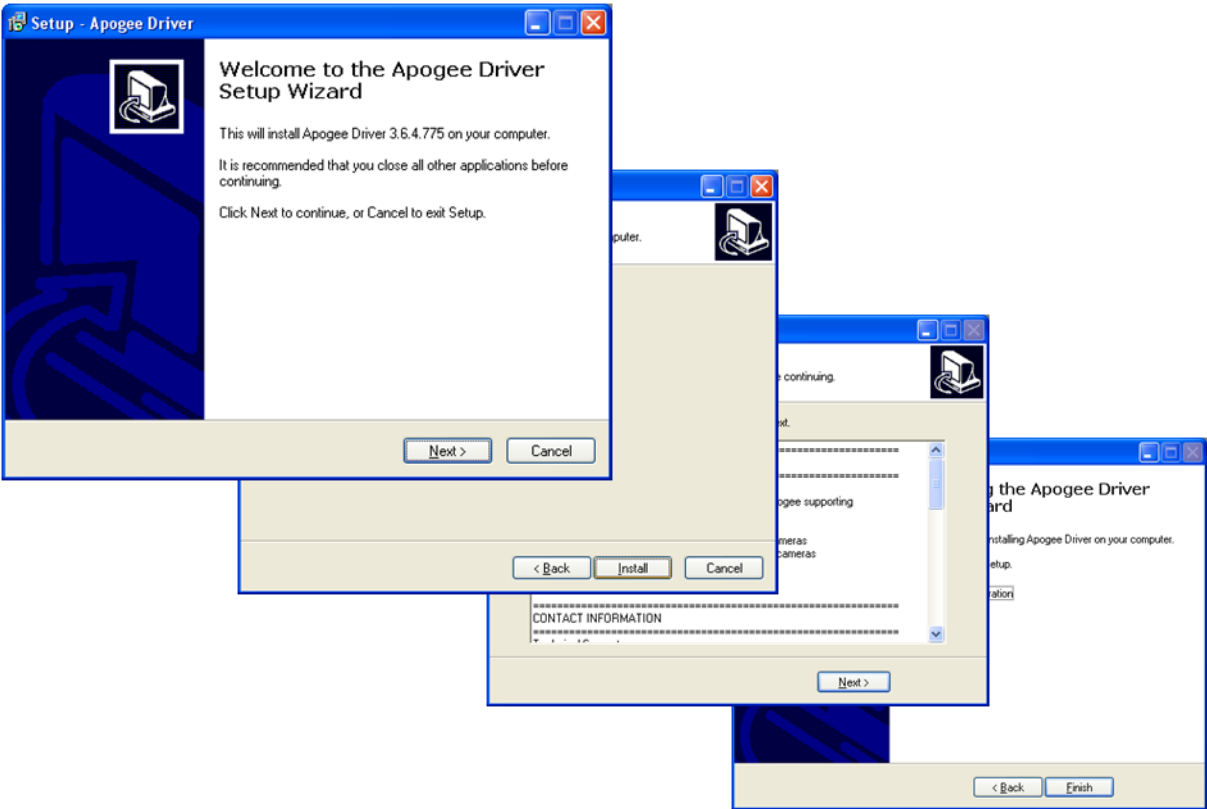
Make sure your Windows user account has administrator privileges. Double click on the setupApogeeSoftware.exe.
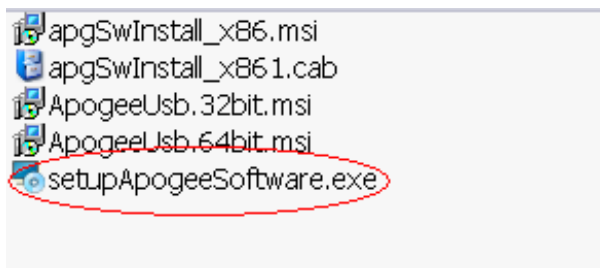

If you see the following error dialog, then please refer to section *1.3 Upgrading from Version 3 to Version 5 Software* below. After removing v3 software, try executing the setupApogeeSoftware.exe again.
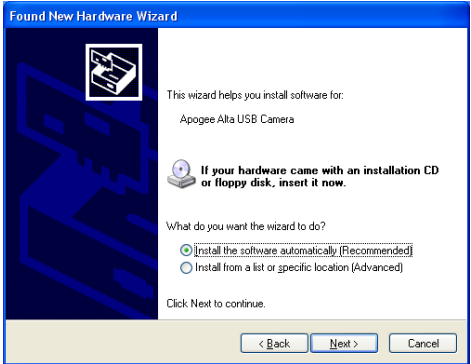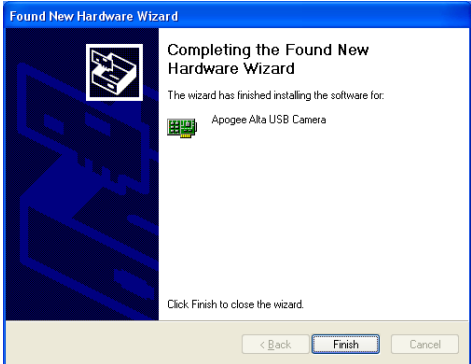
Follow the installation wizard instructions.

Upon successful driver installation connect the Apogee camera to your PC. The "New Hardware Wizard" window will appear. On the dialog select the "No, not a this time" radio button. Press the "Next" button.
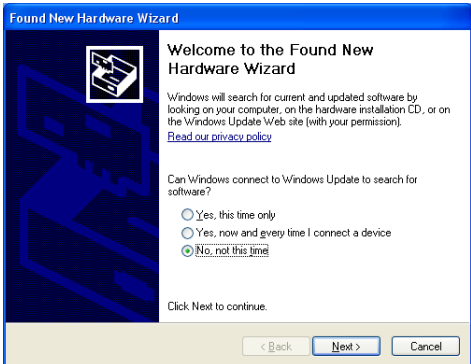
Make sure the "Install software automatically (recommended)" radio button is selected and press "Next".

The New Hardware Wizard states it has completed installing software for the Apogee Alta USB Camera and USB Filter Wheel. Press the "Finish" button.
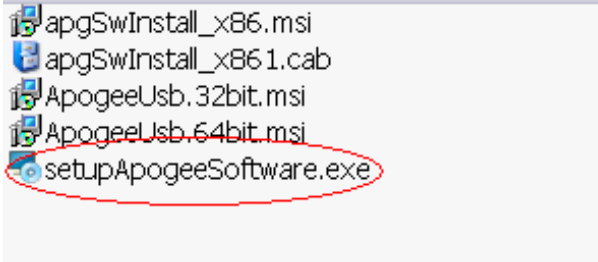
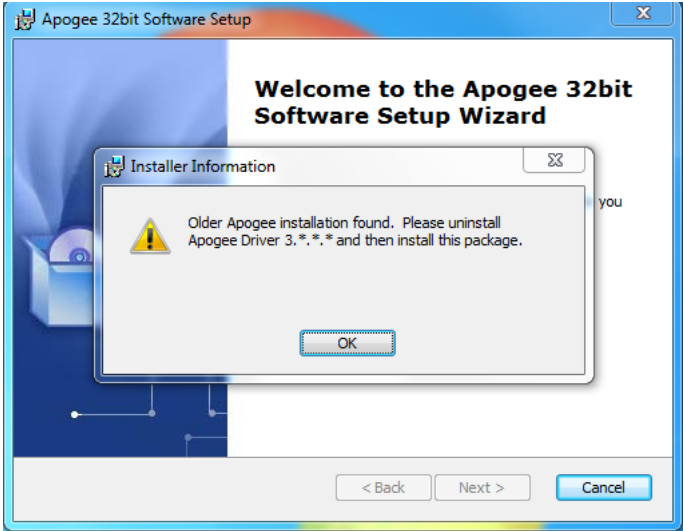The drivers for your Apogee camera are now installed on your PC.

1.2.2 Windows Vista/7

WARNING: Do not connect your Apogee device to a PC before installing the drivers. If you do and the "Add New Hardware Wizard" appears, please select the Cancel button.
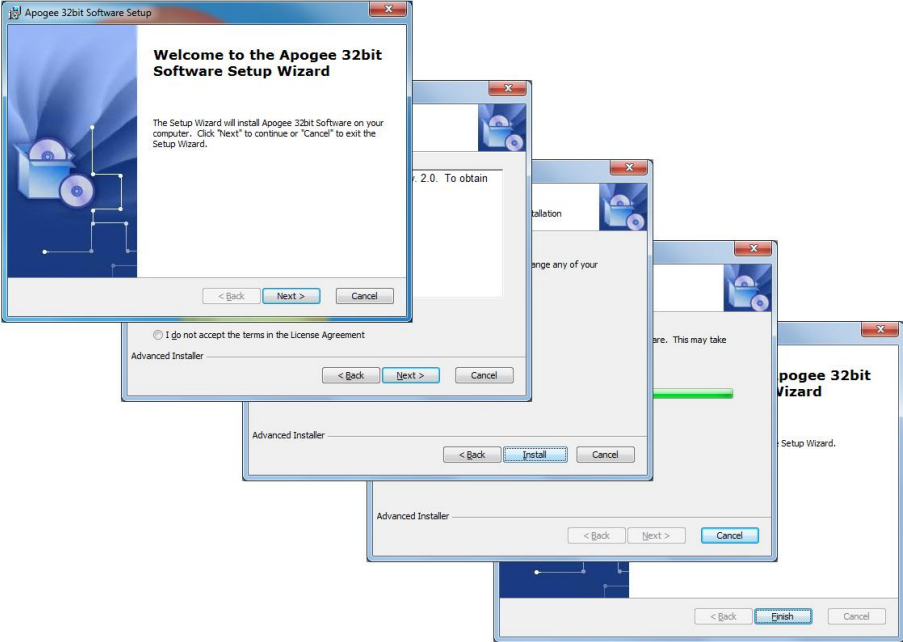
Make sure your Windows user account has administrator privileges. Double click on the setupApogeeSoftware.exe.

If you see the following error dialog, then please refer to section *1.3 Upgrading from Version 3 to Version 5 Software* below. After removing v3 software, try executing the setupApogeeSoftware.exe again.

Follow the installation wizard instructions.

Upon successful driver installation connect your camera to the PC. Watch the message balloon in the lower right corner state the OS, search for and successfully install the drivers for the Apogee USB camera.
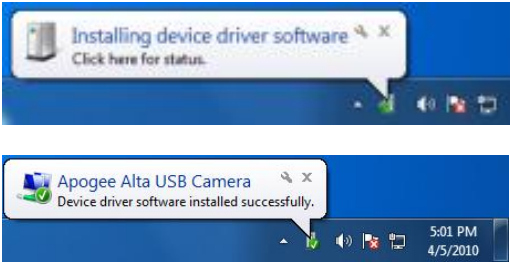
The drivers for your Apogee camera are now installed on your PC.

1.3 Upgrading from Version 3 to Version 5 Software

Due to installer incompatibility v3 software must be manually uninstalled first, before upgrading to v5 software.

For XP go to the *Add and Remove Programs* dialog from the *Control Panel* and remove the **Apogee Driver 3.*.*.*** software package as shown below.

For Windows Vista/7 *Programs* dialog from the *Control Panel* and uninstall the **Apogee Driver 3.*.*.*** software package as shown below.
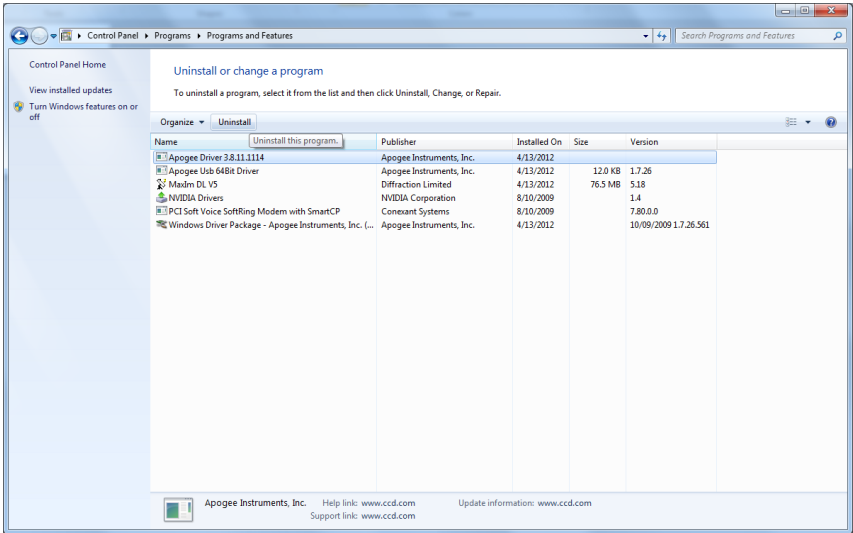
1.4 Uninstalling Apogee Software

Using the Windows control panel is the recommend method for completely uninstalling Apogee software.

For XP go to the *Add and Remove Programs* dialog from the *Control Panel* and remove the *Apogee USB 64 or 32 bit Driver* and the *Apogee 32bit Software*.
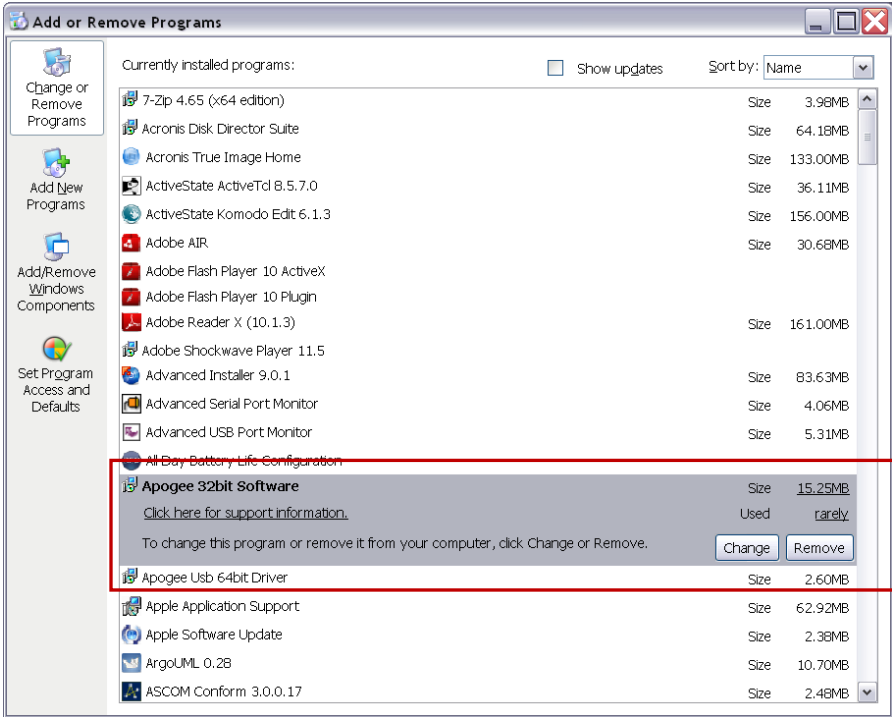
For Windows Vista/7 *Programs* dialog from the *Control Panel* and remove the *Apogee USB 64 or 32 bit Driver* and the *Apogee 32bit Software*.
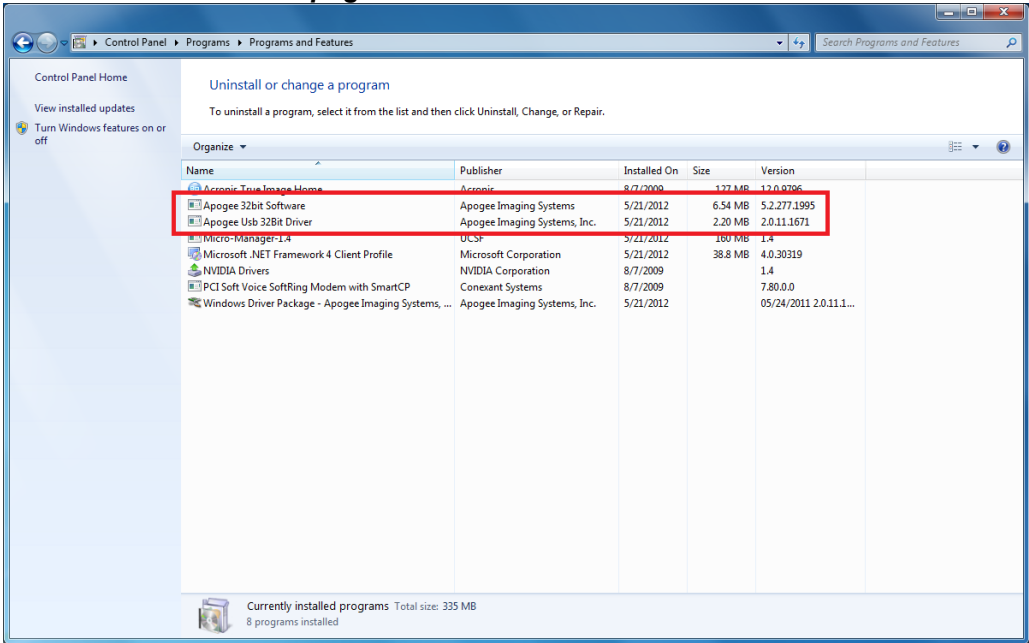

2 Network Camera Settings

Apogee Alta Network cameras are configured through any common web browser on the computer. In order to access the camera settings, you need to know the camera's IP address. If you do not already know the address, you can use the AltaInfo utility to help locate the camera.

Once you have obtained the IP address, enter it into the **Address** bar of your Internet browser. The camera will reply with its own web page of settings, as shown in the screen capture below.
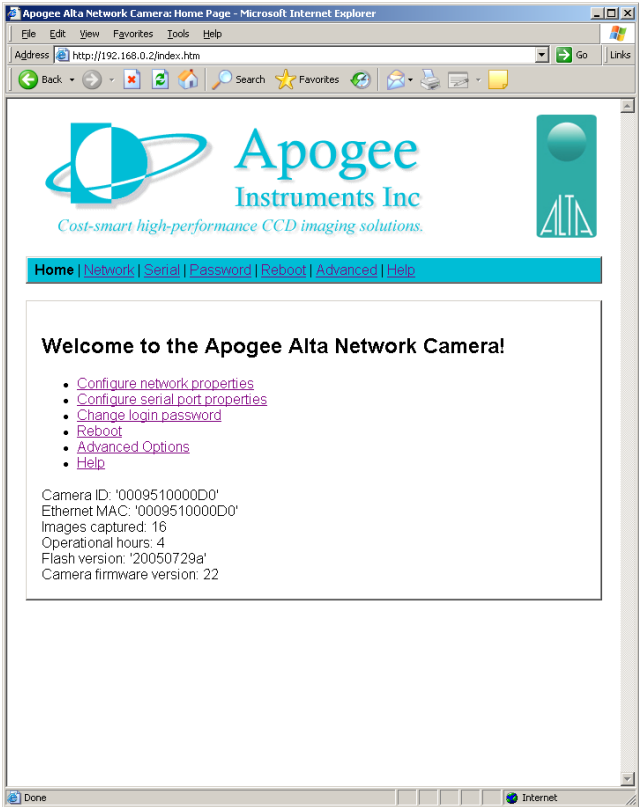
The camera home page contains a snapshot of useful information about the system, including the number of images the system has captured, hours it has been operational, and versions of the internal firmware. This information may assist Apogee's technical support, should you ever require service on your camera system.

The camera home page also contains links to other page for configuring network settings, serial ports, reboots, etc. When you click one of these links, the camera will present you with an authentication dialog box.

The default user name is **admin**. The default password is **configure**. Enter these into their respective fields and press the **OK** button.

.
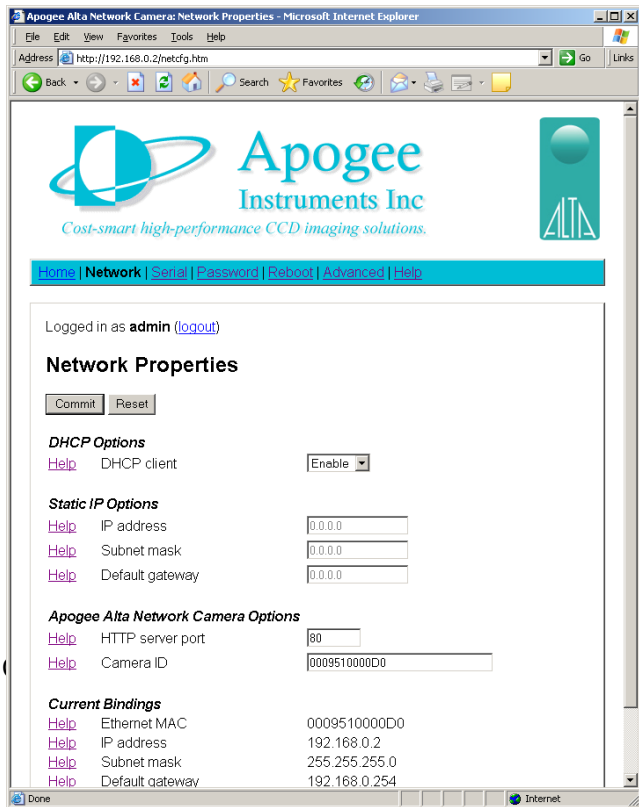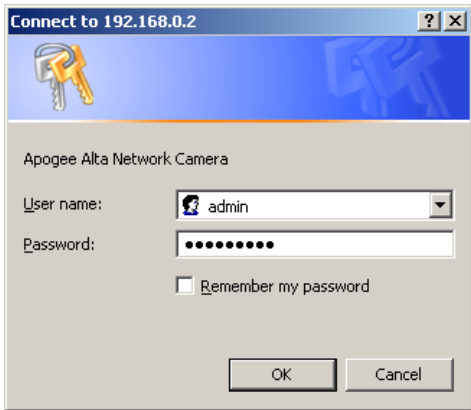
The **Network** page contains the TCP settings for the camera. From this page, the camera can be configured for a static IP network setup. Also on this page, the camera name can be selected (the

camera name/ID defaults to the system's Ethernet MAC address).
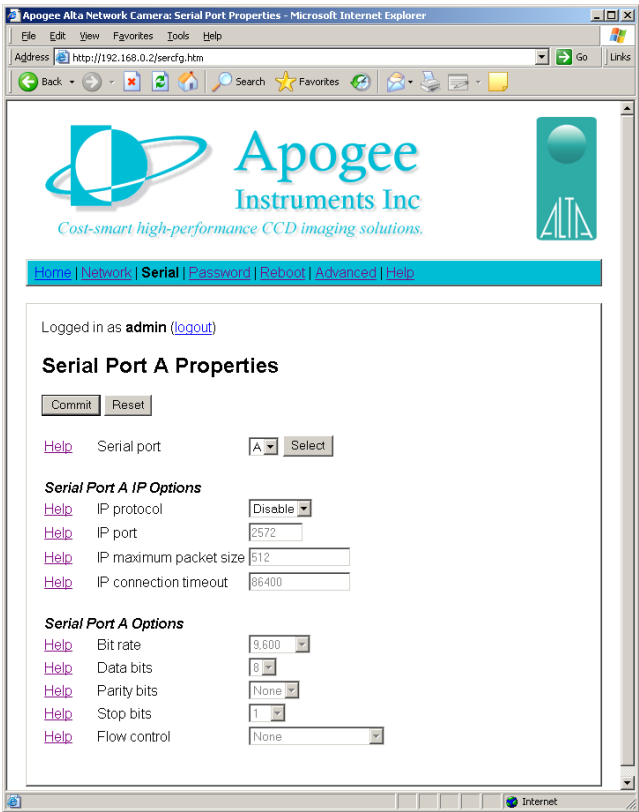
The **Serial** page lists all of the settings related to controlling the camera's on-board serial ports. The user can switch between Serial Port A and Serial Port B by changing the port from the drop down list.

The **Password** page is used for setting a new password on the camera system. This page also contains a network timeout number. The timeout can be used to control how long a session can remain inactive before it is automatically closed. This is useful when the camera is in a remote location, and being controlled by multiple users. By setting an appropriate timeout value, a user will not inadvertently retain control of the camera system because the session was never closed.

The **Reboot** page may be used to issue a software reboot to the camera system. This may be used as an attempt to clear a camera network error, although a power cycle is the most thorough solution.
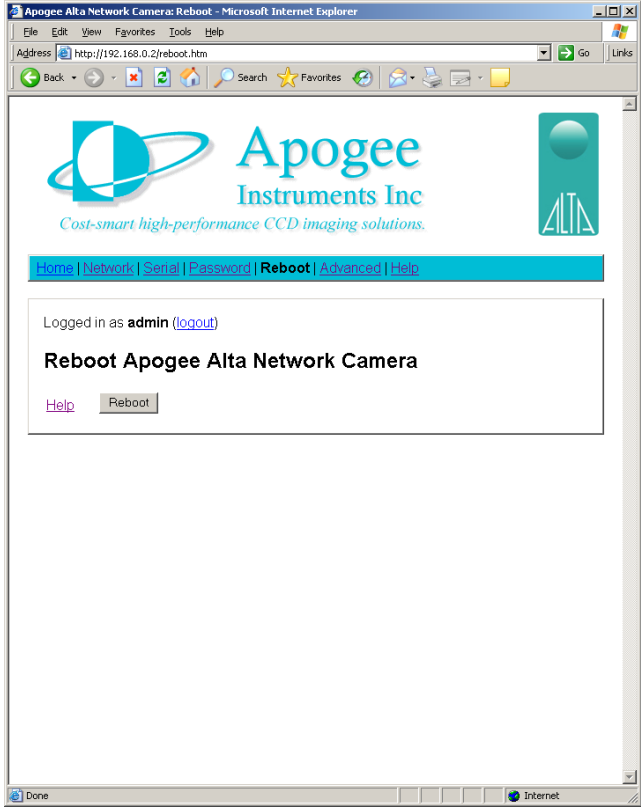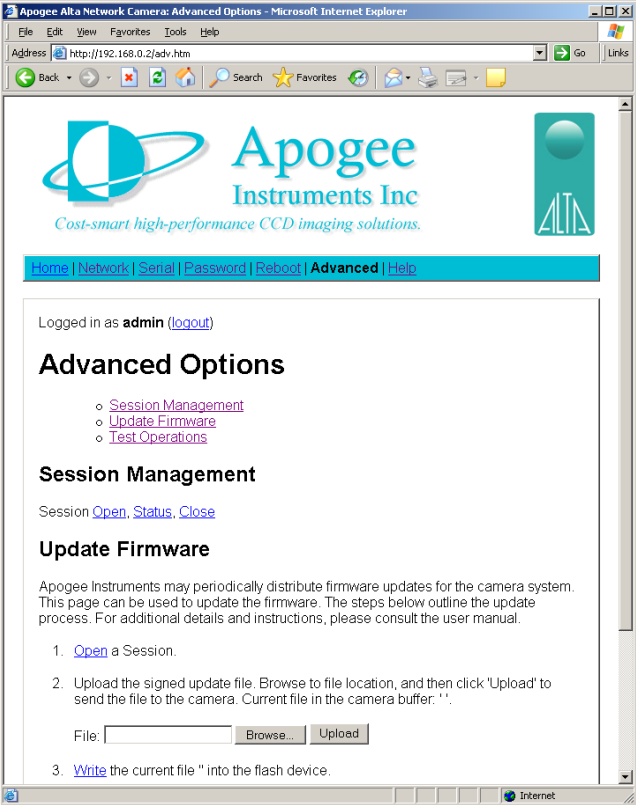
The **Advanced** page is primarily used for updating the camera's firmware. This page can also be used for opening and closing camera sessions, or sending simple read/write operation to verify connectivity.

The **Help** page contains useful information regarding the usage of the other configuration web pages, and how to modify the camera settings.

Consult the **Help** page for additional details regarding the configuration of your Alta network camera.
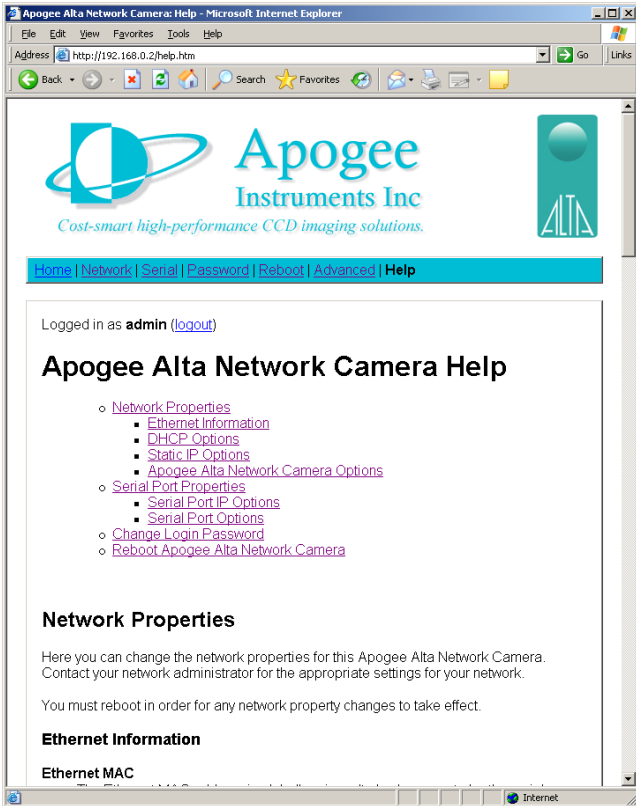
3   Using MaxIm DL/CCD

MaxIm DL/CCD, a product from Diffraction Limited, is a powerful camera control and image processing package. The MaxIm DL/CCD software package has an extensive user's guide, which provides details into setting up the software and getting started. This section covers a quick reference of the specific Alta functionality in MaxIm.

The information in this section contains specific MaxIm DL/CCD screenshots. These screenshots were correct and accurate as of MaxIm v5.06, the current shipping version at the time of writing this document. It is possible that users with other versions of MaxIm DL/CCD may notice slight layout changes from what is described here.

To begin, consult your MaxIm documentation and launch the MaxIm CCD Control window. This window contains a **Setup** button. Click the **Setup** button and then select "Apogee USB/Net" from the list of camera models.

For this driver, please select **Apogee USB/Net** on the **Setup** tab.

All settings for the Apogee camera are in the **Apogee Configuration** dialog, accessed from the **Advanced...** button. This dialog is also available while the camera is connected, by clicking the **Options** button on the Settings Tab and selecting the **Camera Settings** command.

The first step is to specify the location of the camera. For cameras with a network interface, select **Ethernet**, enter the **IP address** of the camera, and set **Device Number** to its TCP port number. If the camera is selected as **USB,** only the **Device Number** control is available; set it to the camera identifying number, as enumerated by the operating system.

While the camera is connected, the **Interface** controls are not available; they are replaced by a **Status** area.

If you do not know the location of the camera, you can search for it using the **Discover** button. See below for an explanation of the camera discovery feature.
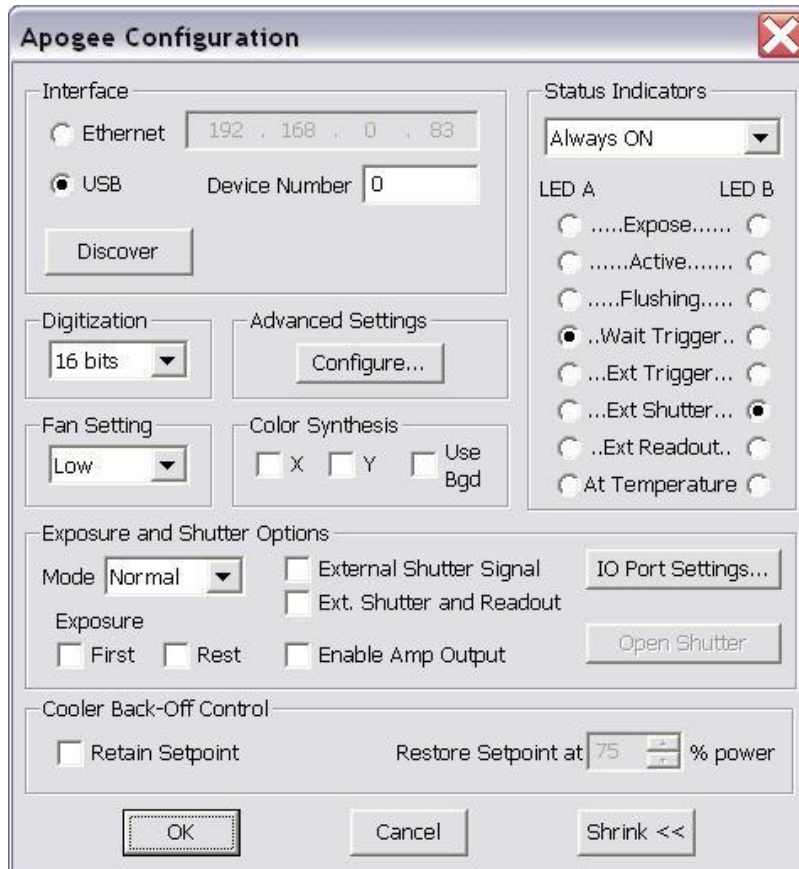
Alta cameras connected via USB can operate in two **Digitization** modes. The **12-bit** mode provides the highest speed, while the **16-bit** mode provides the highest dynamic range. Cameras connected via Ethernet support only **16-bit** mode.

Fan Setting controls the camera's fan speed. Higher speeds provide better cooling, but may result in slightly more noise and vibration.

The **Configure…** button in the **Advanced Settings** group allows you to access some advanced camera control parameters, described below. Note that most of these are intended for laboratory environments, and inappropriate use may adversely affect camera performance and image quality.

Color Synthesis is used to adjust automatic color generation settings. Some cameras include Bayer matrix color filters, and are capable of "one shot color". If the Bayer matrix is not properly aligned, the color may come out wrong. This can be corrected adjusting the **X** and **Y** offset controls. The **Use Bgd** option automatically tries to adjust the background level to neutral during the conversion process.

The **Exposure and Shutter Options** include a camera **Mode** dropdown whose entries depend on the specific camera in use. In **Normal** mode the software controls both the start time and duration of the exposure. In **TDI** (Time Delayed Integration) mode, the camera operates continuously, shifting out new row of data at a specified interval: this is appropriate if the image is moving smoothly across the CCD sensor. In **Kinetics** mode the sensor must be masked so that a specified number of full-width but reduced-height images known as sections can be rapidly acquired on a single CCD frame. Readout occurs only after all requested sections have been imaged. For further information, consult the documentation for your camera.

For cameras with firmware v17 and later, the exposure process can be further modified by the **Exposure Triggering** options. The instrument waits for a TTL signal pulse before starting the exposure if **First** is checked. A separate pulse is required for each subsequent TDI row or Kinetics section if **Next** is checked. Cameras with earlier firmware do not support TDI or Kinetics, but provide a separate **Triggered** exposure mode equivalent to **Normal** with **First** checked.

The next two options modify the duration of the exposure. **External Shutter Signal** allows the shutter to be gated open by an external TTL-level signal, with readout occurring at the trailing edge of this pulse. **Ext. Shutter and Readout** is similar but readout is controlled by a separate TTL-level signal, allowing the shutter to open and close more than once during the same exposure. In either external shutter mode, the **Enable Amp Output** checkbox disables the CCD voltage while the shutter strobe input is high.

IO Port Settings displays the **Apogee Alta I/O Port Settings** dialog box. This allows you to configure each I/O pin for a predefined function. These should be self-explanatory; for advanced use please contact Apogee Imaging Systems for assistance.

Open Shutter opens the shutter for inspection or cleaning.

The two **Status Indicator** lights can be configured to provide basic status information. To prevent light contamination under very low-light imaging conditions, you can select **OFF when exposing**. You can also select **Always OFF** or **Always ON**.

The two Light Emitting Diodes (**LED A** and **LED B**) can be configured individually. They can be set to illuminate when the camera is in **Expose** mode (unless disabled by **OFF when exposing**), when the camera is **Active**, during **Flushing** to remove charge from the array, at **Wait Trigger** to show when the camera is waiting for a trigger, when an **Ext Trigger** is received, **Ext Shutter** to show the state of the external shutter, **Ext Readout** to show the state of the external readout trigger, and when the camera has stabilized **At Temperature**.

The Shrink button toggles between the full size dialog box and just the **Interface** or **Status** section.

NOTE: In earlier versions of this plug-in, a **Readout on Stop** checkbox specified the disposition of exposures aborted via the **Stop** button. This capability is now controlled from the **Options** menu of the Settings tab in the MaxIm CCD window.

The settings on the **Apogee Alta/Ascent Advanced Setup** dialog are intended for advanced users.
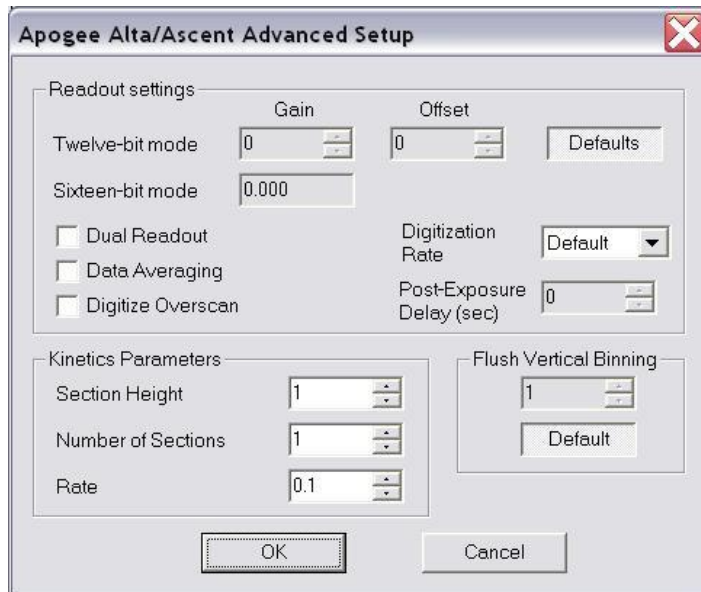
The **Gain** and **Offset** for Twelve-bit digitization mode can be changed from their factory values: you must unclick the **Defaults** button to unlock the edit boxes. The Gain for Sixteen-bit mode is not adjustable, but its value is displayed. You can also indicate whether to **Digitize Overscan** (the part of the CCD sensor surrounding the imaging area which is covered by an opaque mask). In some applications the overscan region is used as part of the calibration process.

Post-Exposure Delay (s) allows you to set the time delay at the end of the exposure, in seconds. The time delay ensures that the shutter is completely closed before readout commences. For certain camera models this may be fine-tuned to accelerate readout; please consult Apogee Imaging Systems for more information.

Use the **Kinetics Parameters** to specify the **Section Height** in pixels and the **Number of Sections**; these values will be determined by how your CCD chip is masked. Set the **Rate** to the time interval in seconds per section. Note that the timing implied by these controls takes precedence over the exposure time specified elsewhere in MaxIm CCD.

Flush Vertical Binning allows you to override the vertical binning factor used during camera flushing. Ordinarily you should use the **Default** setting.

The **Apogee Alta Camera Selection Dialog** is displayed when the **Discover...** button is clicked. Select **USB 2.0** and/or **Ethernet**. If Ethernet, you must specify a **Network Mask**, which limits the subnet that is searched.

When you click **Search...** the software will generate a list of available cameras, if any. You can select the camera by clicking on it in the **list** and then clicking **OK**.

4 Updating USB camera firmware

The Apogee Camera Update program updates the firmware for the AltaU and Ascent camera lines. This program is available at http://ccd.com/downloads.html. A screenshot of this utility is provided below, along with the firmware update procedure.

- Close all applications that connect to the camera, MaxIm DL for example
- Power up the camera
- Wait for the red LEDs to start to blink
- Connect the camera to the host PC via USB.
- Launch the ApogeeCamUpdateWindows.exe
- Select the camera you wish to update from the list box
- Press the update button
- Wait for the firmware download to complete
- Close the ApogeeCamUpdateWindows program
- Power cycle the camera to complete the firmware update

# 5   Updating Ethernet camera firmware

Ethernet camera firmware is updated directly from the camera's internal web page. To update the firmware, first the user must know the IP address of the camera on the local network, enter the IP address into a browser and go to the **Advanced** page.
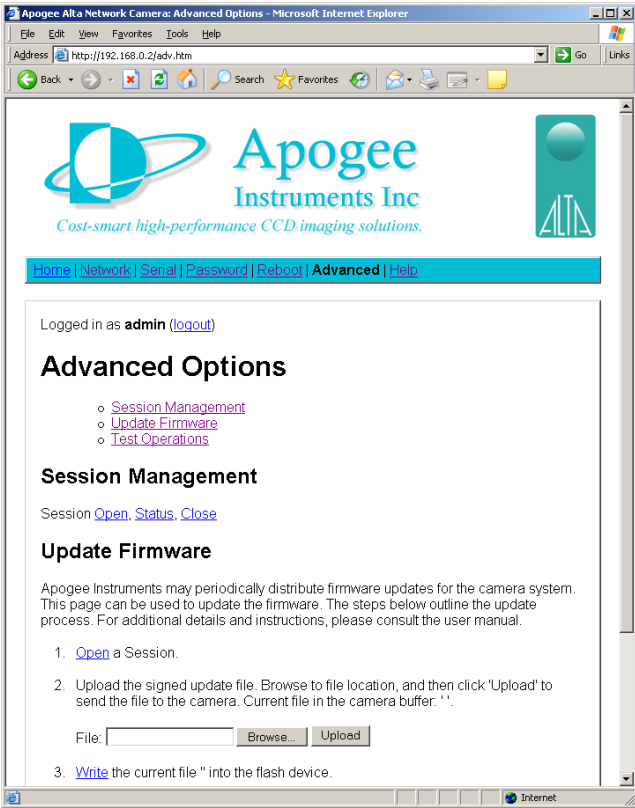

Under "Update Firmware" click **Open** to start a session. If successful, a screen similar to the following will be returned (the *SessionId* will vary).
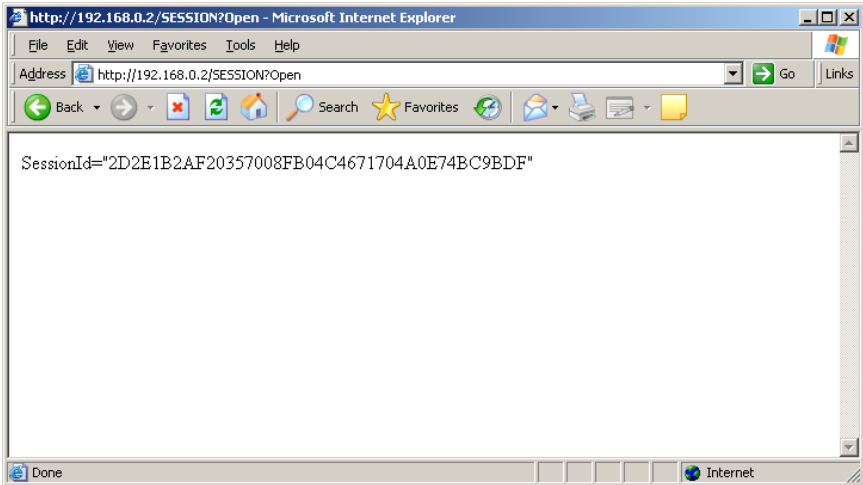
Press the browser's **Back** button. Browse to the firmware update file and click **Upload**. A new screen will be returned to the user, indicating the file name that was uploaded.
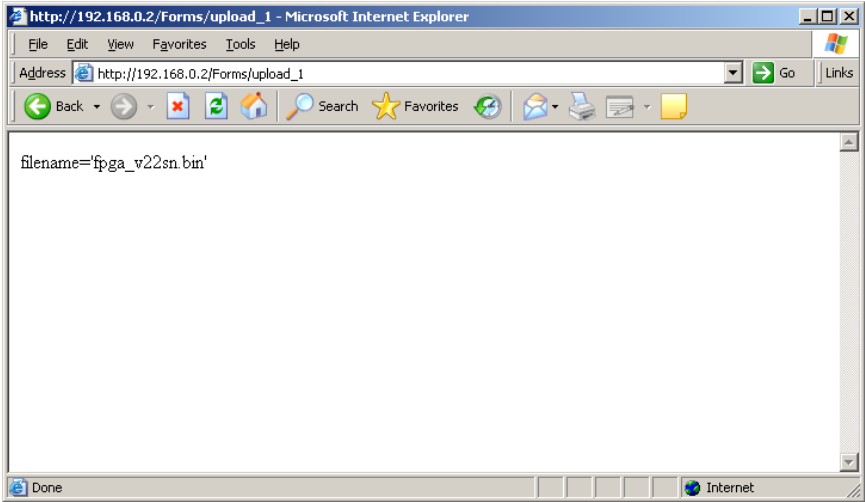
Again, press the browser's **Back** button. Now click the **Write** link in the update firmware section. The camera will send back the final confirmation screen below.
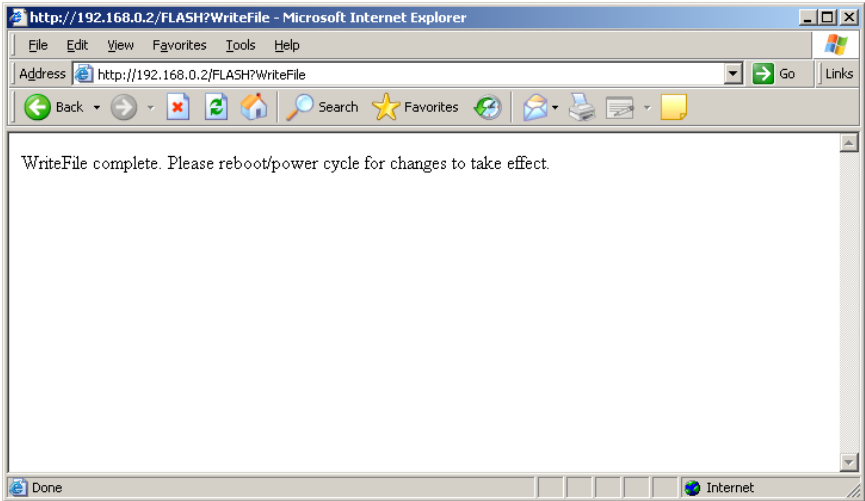
At this point, the new firmware has been loaded into the camera. The camera system should be power cycled for the new update to take effect, and the process will then be complete. On the next power up of the camera, the new firmware will automatically be loaded.

6   Installing Micro-Manager (µManager) Software

Micro-Manager software runs under ImageJ to provide control of automated microscopes, supporting time-lapses, multi-channel imaging, z-stacks, and combinations thereof. Micro-Manager works with microscopes from all four major manufactures (Leica, Nikon, Olympus, and Zeiss), and peripherals such as stages, filter wheels, and shutters. Free and open source.

Important: The **32-bit** version of Micro-Manager must be installed regardless of operating system. Apogee driver **v3.10** or greater must be installed.

Install the Apogee driver from http://www.ccd.com/downloads.html

Install Micro-Manager (32-bit **only**) from http://www.micro-manager.org/downloads.php

Once installation is complete start the program with the demo configuration. This is the default.

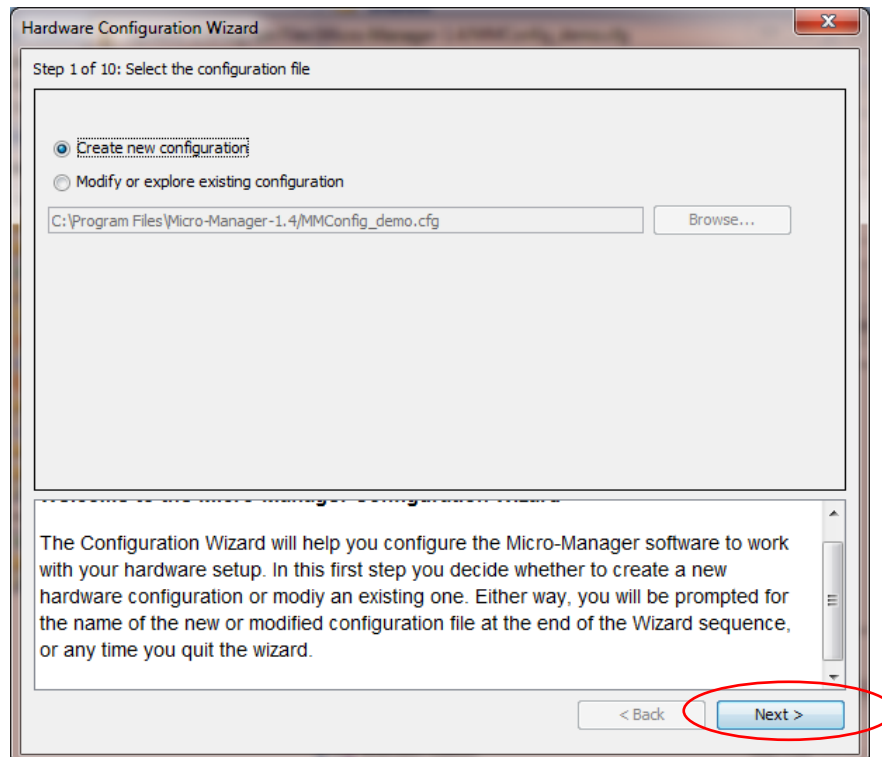Create a configuration file.

>   Connect the Apogee system to the PC.

>   Power up the system and wait for the red LED's to flash.

>   Go to **Tools** and select **Hardware Configuration Wizard**.
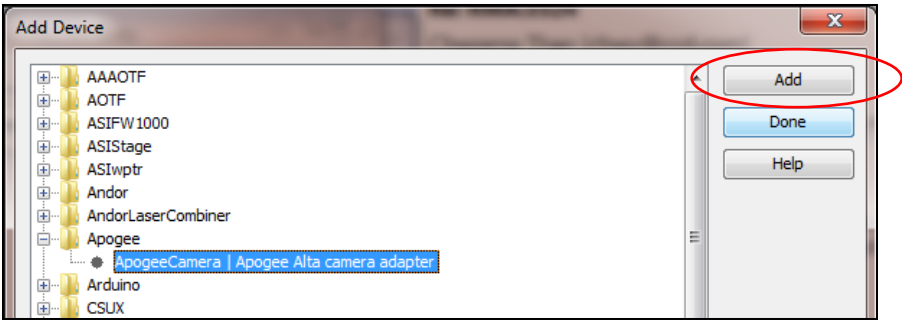
>   Step 1 of 10:

>>   Select *Create New Configuration* and press next.
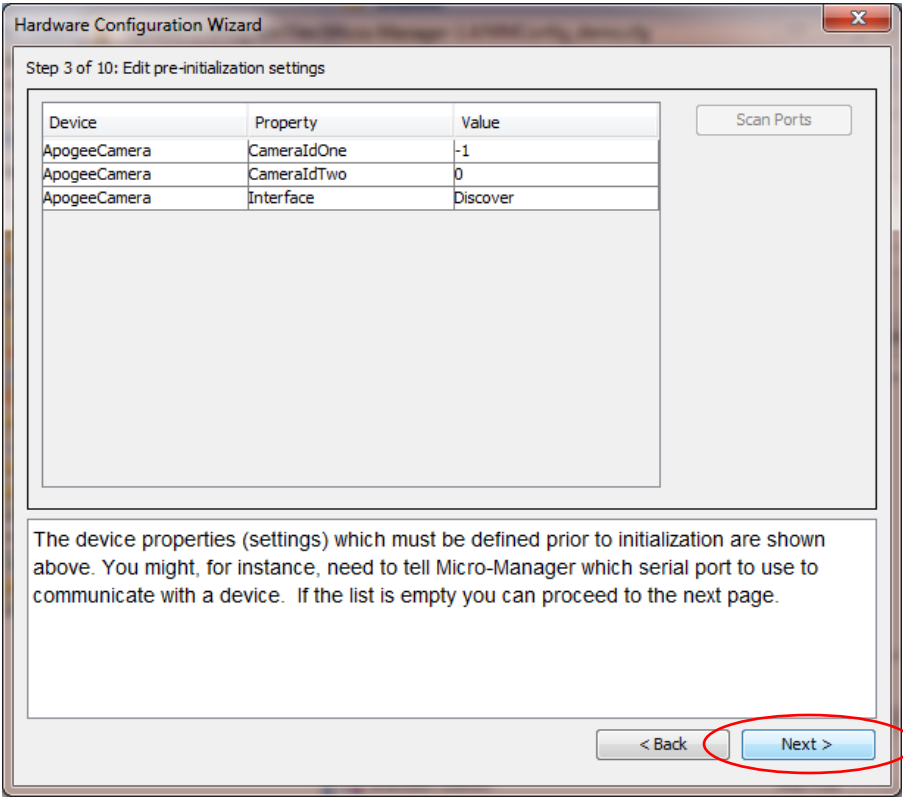
Step 2 of 10:

Select **Add.....**

Highlight Apogee Camera/Apogee Alta camera adapter and select **Add**

Enter a device name and press **OK.** Select **Done.** Note the Apogee system will now be in the list of devices. Select **Next.**
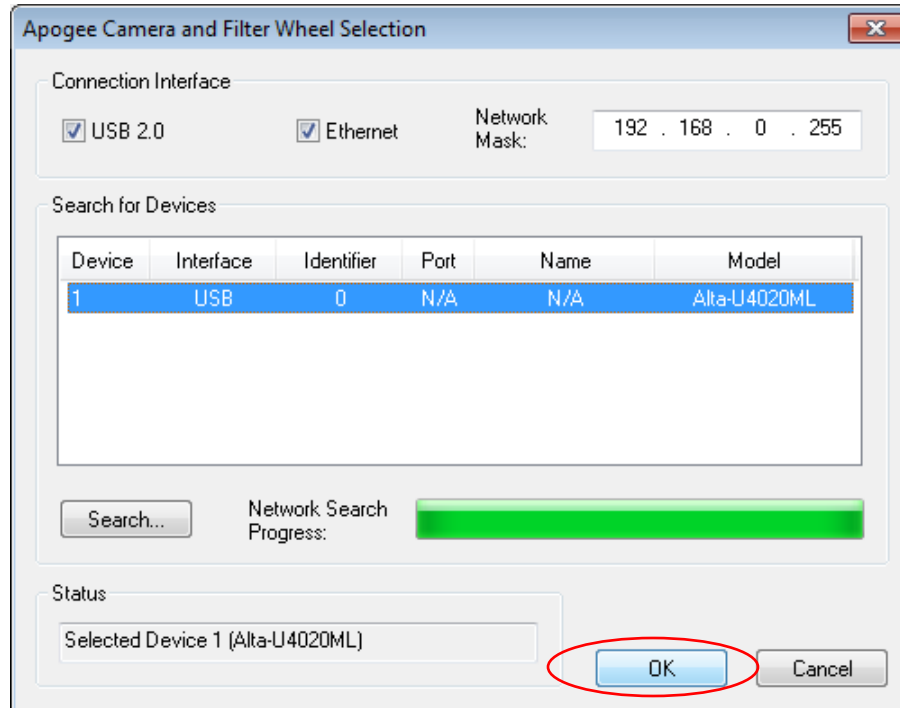
Step 3 of 10:

Select **Next.**

Step 4 of 10:

Select **Next**, and note the Apogee *Camera and Filter Wheel Selection* dialog appears.
Select the **Search** button, and select the identified Apogee camera. Press **OK.**

Step 5 of 10:

Select **Next.**

Step 6 of 10:

Leave the Property values as the default values listed. Select **Next.** Note the **Apogee
*Camera and Filter Wheel Selection*** dialog appears.
Select the **Search** button, and select the identified Apogee camera. Press **OK**.

Step 7 of 10:

Select **Next.**
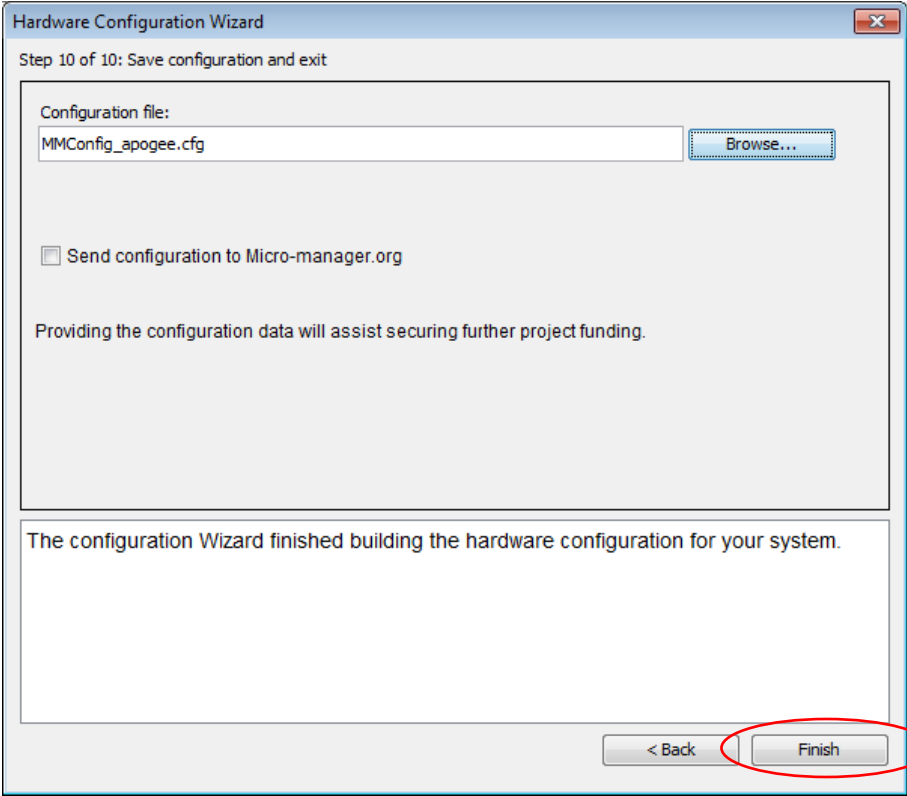
Step 8 of 10:

Select **Next.**
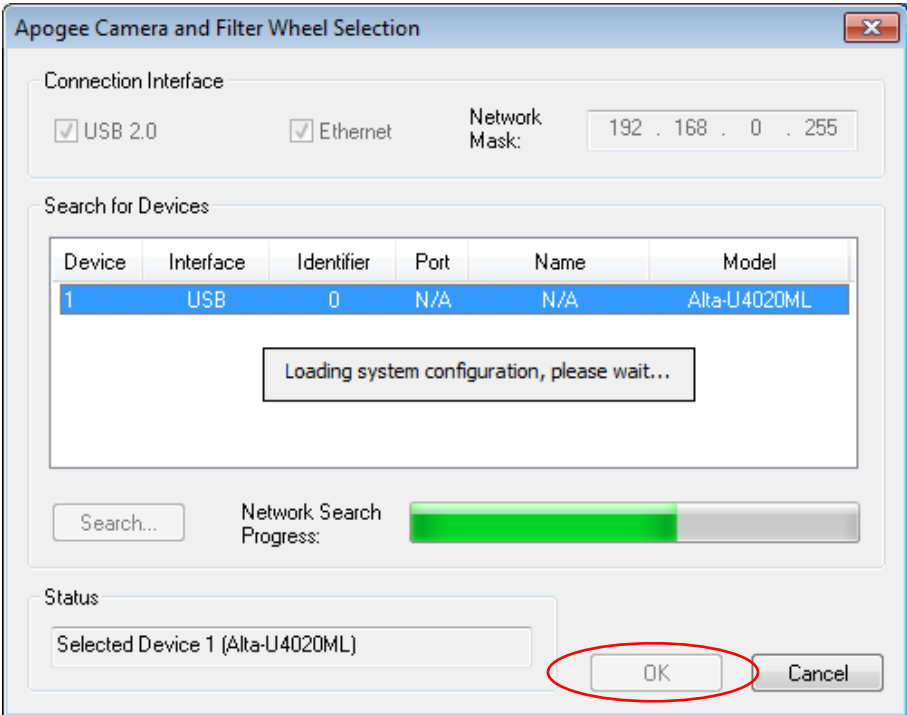
Step 9 of 10:

Select **Next.**

Step 10 of 10:

Modify the configuration file name to MMConfig_apogee.cfg and press the *Finish* button.

Note the **Apogee** *Camera and Filter Wheel Selection* dialog appears.
Select the *Search* button, and select the identified Apogee camera. Press *OK.*

Micro-Manager is now setup of use with an Apogee digital imaging system!

For more information, visit:
http://mirco-managter.org/documenation.php?object=Configguide

7   Frequently Asked Questions (FAQs)

7.1 Network Cameras

No lights/No fans
Check to make sure the device is powered.

One of the green lights keeps blinking and does not turn off
First make certain that the camera is connected to the network using a network cable.
If the connection appears okay, it is possible that the camera is not being assigned an IP Address. When a camera is first connected to a network, it requests to be automatically given an IP Address by the local network server or router that assigns addresses. This process is called DHCP (Dynamic Host Configuration Protocol). The blinking green light indicates that the camera is requesting an address. Make sure you have a router or server on your network that is capable of assigning new IP addresses using DHCP.

Cannot find camera when using AltaInfo
The AltaInfo search process takes approximately 10 seconds to complete. In extremely rare circumstances, the camera may take longer than 10 seconds to respond. If the first attempt to find the camera fails, try a second time. If the second attempt fails, the "Network Mask" field may be incorrect. Verify the correct network mask and try again.

Can the camera be assigned a Static IP address?
Yes. See the previous section on the web page settings for the Ethernet cameras. Note, however, the first time the camera is connected to the local network it *must* be assigned a DHCP address by a router or server.

7.2 USB Cameras

No lights/No fans
Check to make sure the device is powered.