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Mightex Buffered USB CCD Camera User Manual

Version 1.0.8

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Relevant Products

Part Numbers
CCN-B013-U, CCE-B013-U,CCN-C013-U, CCE-C013-U, CGN-B013-U, CGE-B013-U,CGN-C013-U, CGE-C013-U, CXN-B013-U, CXE-B013-U,CXN-C013-U, CXE-C013-U CCN-B020-U, CCE-B020-U, CCN-C020-U, CCE-C030-U

Revision History

Revision	Date	Author	Description
1.0.0	Aug. 28, 2008	JT Zheng	Initial Revision
1.0.1	Oct. 21, 2008	JT Zheng	C-Mount Modals only
1.0.2	Dec. 21, 2008	JT Zheng	Add CGX modals
1.0.3	Jan. 16, 2010	JT Zheng	Add CXX modals
1.0.4	Apr. 26, 2010	JT Zheng	Add B020/C020 Modules
1.0.5	Oct. 22, 2010	JT Zheng	Con8 Long Cable Color Description
1.0.6	Jun. 25, 2011	JT Zheng	Add removing “Read Only”
1.0.7	July 06, 2011	Zoaib Khan	Revision and editing
1.0.8	Dec. 24, 2018	JT Zheng	New Mightex Logo

INTRODUCTION

Mightex USB 2.0 Buffer CCD camera is designed for low cost machine vision applications. With high speed USB 2.0 interface and powerful PC camera engine, the camera delivers image data at high frame rate. GUI demonstration application and SDK are provided for user's application developments.

PC Requirement

Mightex USB Camera is using USB 2.0 for data collection, USB 2.0 hardware MUST be present on user's PC and Mightex device driver MUST be installed properly before using Mightex demonstration application OR developing application with Mightex SDK.

The minimum requirements for PC are:

Processor: Pentium III, 900M

OS: Windows 2000, Windows XP, Windows Vista

RAM: 256M (512M or greater recommended)

Hard Disk Space: 40M for software installation.

USB 2.0 Host Controller: Present.

As the camera draws ~360mA from USB port, user should use AC powered PC and self powered USB Hub (if connected) to connect with the camera.

Camera Modules:

Please refer to the following table for camera modules and their main features:

Module	Max Resolution	Color/Mono	Shutter	Exposure Time (ms)	Bit	Enclosure	GPIO	Buffer ** (frames)	Trigger In /Strobe out
CCN-B013-U	1392x1040	Mono(1/2")	Global	0.05-200,000	8/12	None	4	8	Yes
CCE-B013-U	1392x1040	Mono(1/2")	Global	0.05-200,000	8/12	Yes	4	8	Yes
CGN-B013-U	1280x960	Mono(1/3")	Global	0.05-200,000	8/12	None	4	24	Yes
CGE-B013-U	1280x960	Mono(1/3")	Global	0.05-200,000	8/12	Yes	4	24	Yes
CXE-B013-U	1392x1040	Mono(2/3")	Global	0.05-200,000	8/12	Yes	4	8	Yes
CXE-C013-U	1392x1040	Color(2/3")	Global	0.05-200,000	8/12	Yes	4	8	Yes
CCN-C013-U	1392x1040	Color(1/2")	Global	0.05-200,000	8/12	None	4	8	Yes
CCE-C013-U	1392x1040	Color(1/2")	Global	0.05-200,000	8/12	Yes	4	8	Yes
CGN-C013-U	1280x960	Color(1/3")	Global	0.05-200,000	8/12	None	4	24	Yes
CGE-C013-U	1280x960	Color(1/3")	Global	0.05-200,000	8/12	Yes	4	24	Yes
CCN-B020-U	1616x1232	Mono(1/1.8")	Global	0.05-200,000	8/12	None	4	8	Yes
CCE-B020-U	1616x1232	Mono(1/1.8")	Global	0.05-200,000	8/12	Yes	4	8	Yes
CCN-C020-U	1616x1232	Color(1/1.8")	Global	0.05-200,000	8/12	None	4	8	Yes
CCE-C020-U	1616x1232	Color(1/1.8")	Global	0.05-200,000	8/12	Yes	4	8	Yes

*, "-U" modules are with C mount interface, it's actually with CS mount interface plus a CS-C adapter.

**, Buffer means the camera built-in frame buffer, the value shown is frame buffer under maximum resolution at 8bit, at higher bit (e.g. 12bit), the maximum buffer is less.

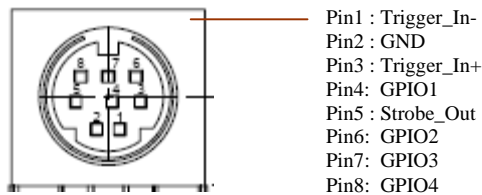
Mightex might provide "-US" modules and an additional CS-C adapter as the "-U" cameras, functionally, "-US" module plus a CS-C adapter is the equivalent to "-U" module.

Camera Hardware

Mightex USB CCD camera is with two connectors, one is the standard USB 2.0 Type B connector, and the other one is an 8 pin Din connector as following:

*. CCN, CCE, CXN and CXE Modules:

(The following figure is the **receptacle of the 8pin connector on the camera module**)



Please pay attention that the pin layout above is for the receptacle on the module, the Din 8 connector has the reversed pin layout.

The 8pin cable provided by Mightex has the following color mark for each pin:

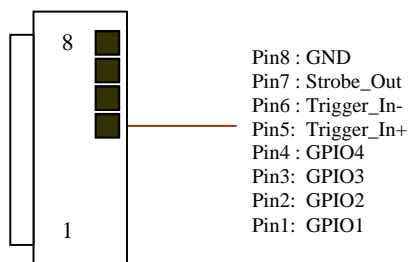
(**Note:** This 8pin trigger cable is not included in the “standard” package and needs to be purchased separately)

Pin	Signal Description	Color
Pin1	Trigger_In-	BLACK
Pin2	GND	DEEP BROWN
Pin3	Trigger_In+	RED
Pin4	GPIO1	LIGHT BROWN
Pin5	Strobe Out	YELLOW
Pin6	GPIO2	GREEN
Pin7	GPIO3	BLUE
Pin8	GPIO4	PURPLE

*.CGN, CGE Modules

Mightex CGN and CGE CCD camera come with two connectors, one is the standard USB 2.0 Type B mini connector, and the other one is a 8 pin connector as following:

(The following figure is the **receptacle of the 8pin connector on the camera module**)



The 8pin cable provided by Mightex has the following color mark for each pin:
(**Note:** This 8pin trigger cable is not included in the “standard” package and needs to be purchased separately)

Pin	Signal Description	Color(Long Cable)
Pin1	GPIO1	RED
Pin2	GPIO2	BLACK
Pin3	GPIO3	YELLOW
Pin4	GPIO4	BROWN
Pin5	Trigger_In+	GREEN
Pin6	Trigger_In-	BLUE
Pin7	Strobe_Out	PURPLE
Pin8	GND	GRAY

Signal Description:

Trigger In

The Trigger In signal is used for Synchronization of the frame grabbing with external event. There is one on camera, a high speed optocoupler (HCPL0600) for signal isolation.

The Trigger In Signal is a LVTTTL signal, the positive edge of the Trigger In signal will assert an effective “External Trigger” which starts a frame grabbing when camera is in “TRIGGER” mode.

Timing Specification:

Timing	Minimum	Typical	Maximum	Time
Trigger Pulse Width	100*			us
Trigger Delay			25**	us

*. Pulse Width should be more than 100us at full CCD clock (e.g. 28MHz for CCX), for CCD running at lower clock, the width should be longer (proportionally to the clock, e.g. 200us for 14MHz for CCX)

**. Trigger Delay is defined as latency between the assertion of the trigger in signal to sensor starts to expose. It's related to the current frequency of CCD sensor, 25us is the maximum trigger delay at maximum CCD clock (e.g. 28MHz for CCX camera or 32MHz for CGX camera), for lower frequency, the trigger delay is longer (proportionally).

Strobe Out

The Strobe Out Signal is used to indicate the exposure period of the sensor, so it might be used to synchronize an external lighting source. It's a positive pulse synchronized with the exposure period. The Signal is a LVTTTL signal.

GPIO

4 GPIO pins are provided, each GPIO pin provides LVTTTL level and 8mA source/sink current while it's configured as output, it can also be configured as Input pin.

Files on CD

The CD contains the following directories:

\Application
\Driver
\SDK
\Documents
\DirectShow
\TWAIN

Application sub-directory includes the following files:

- BUFCDCCameraApp.exe – the Executable file for operating Mightex Line camera.
- BUF_USBCCDCamera_SDK.dll – the DLL used by EXE file
- BufferCameraUsbLib.dll – low level DLL used by BUF_USBCCDCamera_SDK.dll internally.

Driver includes sub-dir for different window versions, each has the following files:

- MtUsbBufferCCDCamera.inf – the INF file for driver installation
- Mtbufccdusb.cat – the signing file
- MtBufCCDUsb.sys – the device driver for Mightex Buffer USB Camera.

Documents sub-directory includes User manual and other Guides.

SDK includes the following sub-directories and files:

\LIB directory:

- BUF_USBCCDCamera_SDK.h --- Header files for all data prototypes and dll export functions.
- BUF_USBCCDCamera_SDK.dll --- DLL file exports functions.
- BUF_USBCCDCamera_SDK.lib --- Import lib file, user may use it for VC++ development.
- BufferCameraUsbLib.dll --- DLL file used by “MT_USBCCDCamera_SDK.dll” .

\Documents directory:

Mightex Buffer USB Camera SDK Manual.pdf

\Examples directory

\Delphi --- Delphi 5.0 project example.

\VC++ --- VC++ 6.0 project example.

\VB_Application --- VB6 example, it uses stdcall Dll for VB developers.

\Csharp_Application --- C# example code, it uses stdcall dll too.

TWAIN and **DIRECTSHOW** directories: TWAIN and DirectShow Drivers for Mightex Buffer CCD camera.

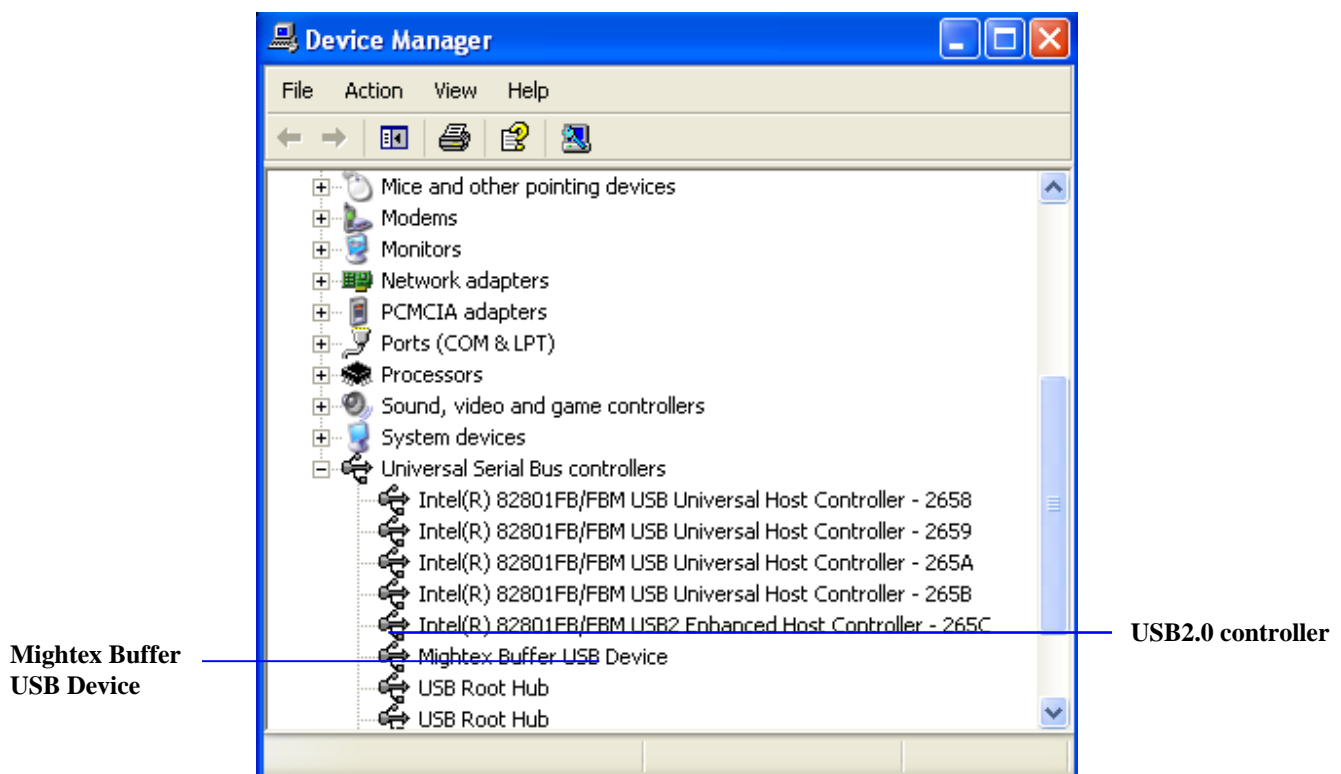
Note: The Buffer CCD camera is developed mainly for user’s integration with their own systems, we expect user to use SDK to operate the camera. The Mightex application in CD ROM is only an example for using the camera, so it only shows ways of setting basic attributes of cameras.

Software Installation

Note: Please follow the steps for installing the Mightex device from page 8 to page 9 if you see the message “Found New Hardware” upon plugging the device to your PC, and you are using Windows 2003/ XP. If you do not see the “Found New Hardware” message upon plugging in your device to your PC and you are using Windows 7 or Vista, please follow the pages 10-11.

Driver Installation

Mightex Buffer USB CCD Camera uses high speed USB2.0 port (480M) for data collection, USB 2.0 Enhanced Host controller MUST be present on host PC, user may check this by going to “Control Panel | System | Hardware | Device Manager | Universal Serial Bus Controllers”, and the “USB Enhanced Host Controller” or “USB2 Enhanced Host Controller” should be present as following:



Windows Device Manager

On a PC with USB Enhanced Host Controller (USB2.0 hardware), user can plug the camera into one of its available USB2.0 port. For the first time, Windows will prompt with “Found New Hardware” as following:

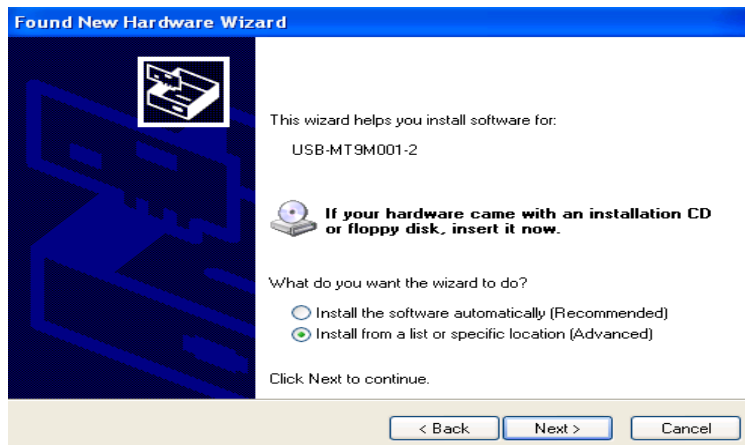


Please follow these steps in order to install the driver for your C series Mightex camera:

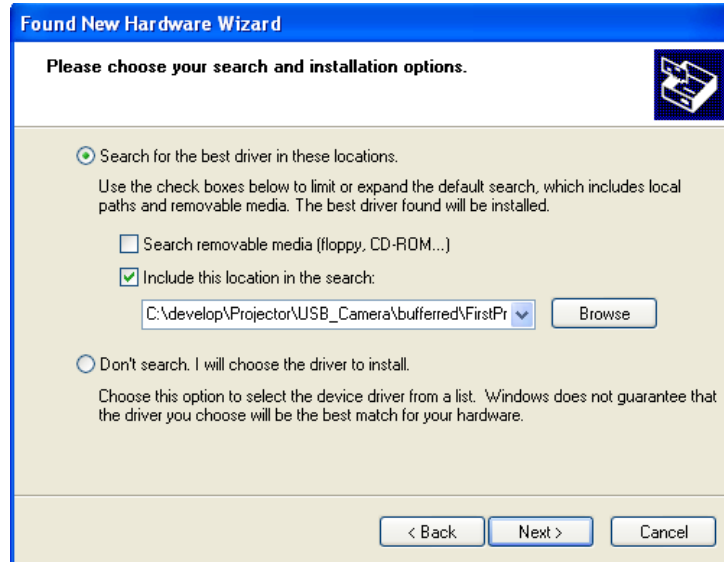
1. Please plug in your Mightex device to your PC. A message should pop up that says “Found New Hardware”.
2. Immediately you will see another window pop up that says “ Welcome to the Found New Hardware Device” as shown below



3. Please check “No, not this time”, and click next
4. When you see the following window, please click on “Install from a list or specific location”. Please note that prior to clicking on “Install from a list or specific location” you should have your CD ready in the PC, and in case you don’t have the CD you can always go to our website at www.mightex.com and download the software package from the download page of the device (on the search box, just type in the serial number of the device that you will find on the back side of the camera, and clicking on it will take you to the device page)



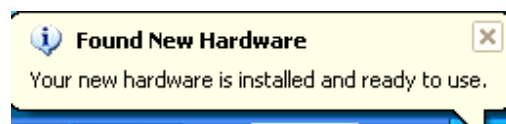
- When you see the following window, first select “Include this location in the search” and Browse for the location of the driver. While you are browsing please click on the driver folder, and then click on “Next”.



- When you see the following window, please click on “Continue Anyway”.



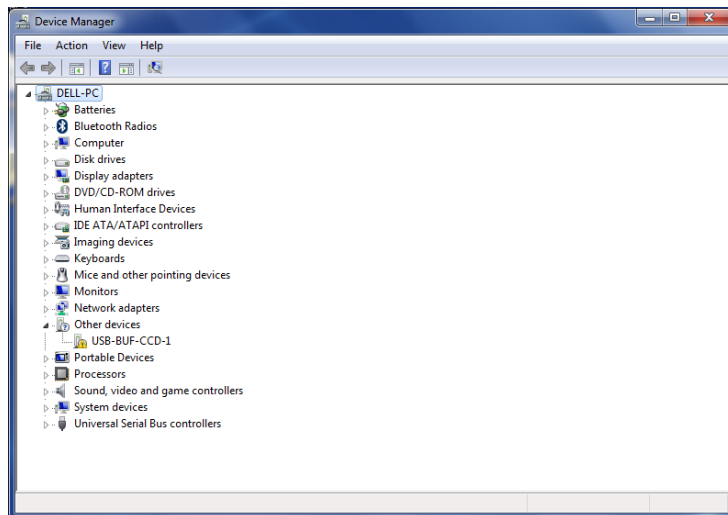
- You will see the following showing the Mightex camera has been successfully installed



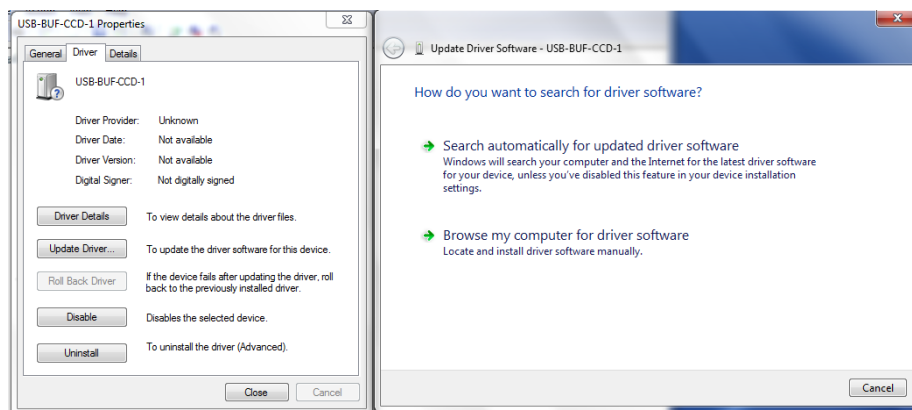
:

Please follow the below steps if Windows Vista/7/10 is unable to automatically install the drivers

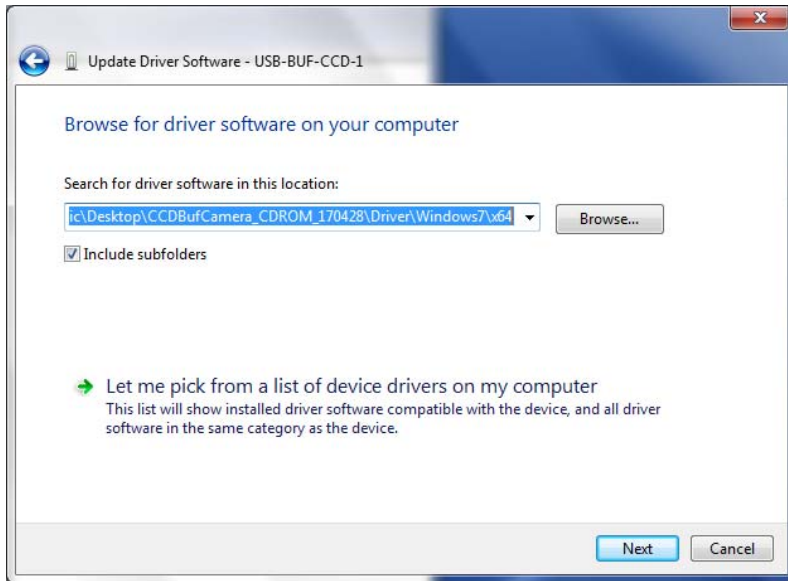
1. Go to the search box and type “Device Manager”. You can also find the “Device Manager” in the Control Panel. After clicking on “Device Manager”, the Mightex camera will be located under “Other devices” if the driver is not yet installed, as shown in the below image.



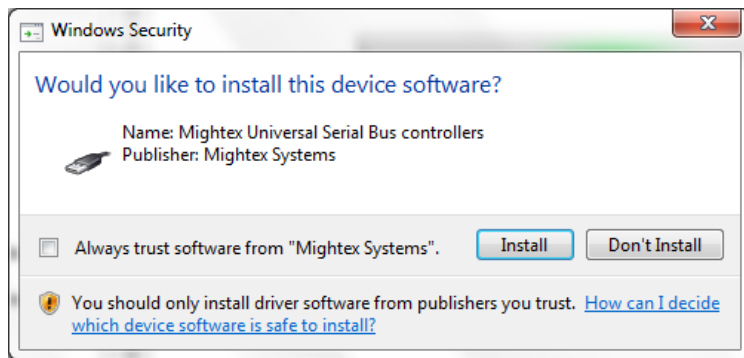
2. Double-click on the device that appears under “Other devices”. Go to the “Driver” tab and click on “Update Driver...” as shown below.



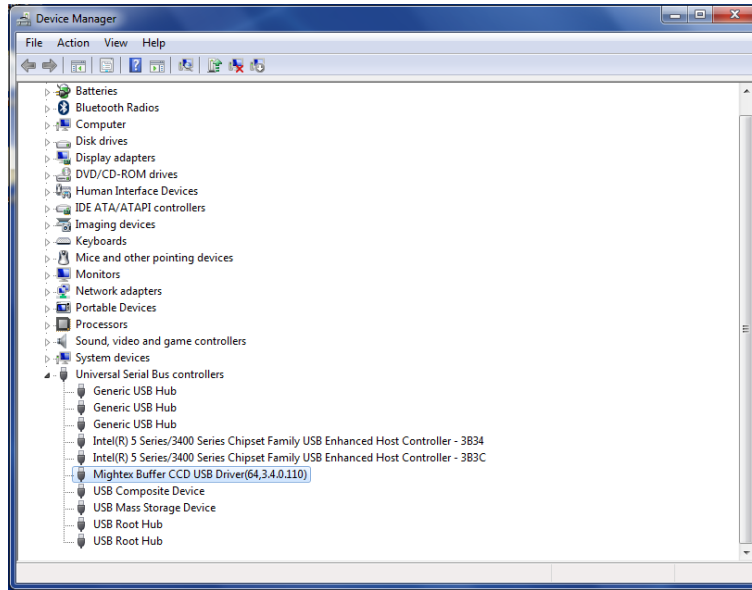
3. Please click on the option “Browse my computer for driver software”, which will bring up the following screen (below image taken on a 64-bit computer).



4. Browse to the folder location in the software package (downloaded from www.mightex.com or included with the camera package) for your specific Windows version and type (32-bit or 64-bit), and click on the “Next” button.
5. Windows will prompt you to install the driver, as shown below.



6. After installing the driver, you will find the camera listed under the “Universal Serial Bus controllers” in “Device Manager”, as shown below (64-bit computer).



Application Installation

User can simply copy all the files under the \Application sub-directory of the CD into a target directory of your local disk.

Note that the \Application sub-directory (and all its files) copied from CDROM might be with “Read-Only” attribute, **user should remove the “Read-Only” attribute for this directory**, user can do this on the property dialog, which shows up by right clicking the sub-directory, choose “property”.

- After you click on the application file, you will see “Device Selection” window pop up
- Click OK in the device selection box. Now you will see the application ready for use.

Application Un-Installation

User may simply delete the whole directory to un-install the software package.

Software Operation

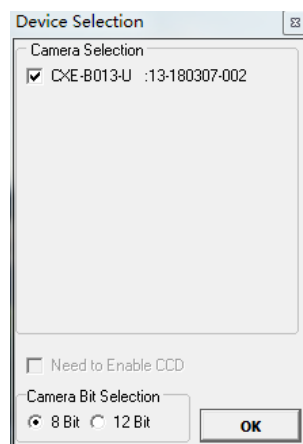
After proper installation of the device driver and the application, user can simply run the application (EXE file) from your installed directory.

Important: For Windows Vista/7 users, two important notes:

1). User should run the application “Run as Administrator”, user can click the right button on the application (EXE file), and choose “Run as Administrator” on its popup menu.

2). When user wants to grab image files and save to disk, user should NOT use the root path (e.g. C:\) or system path (e.g. C:\Windows)

The application will search all the Mightex Buffer USB CCD Cameras currently attached to the USB bus of your PC, and list them in the “Device Selection” dialog:



Note that the format of the each module is in “ModuleNo : SerialNo”, in the above example, there is only one camera attached to the USB in this example. Note that the camera engine allows different type of camera to be attached, up to 8 cameras can be supported by the camera engine, however, if there’re more than ONE camera is added in the working set, these cameras have to share the USB2.0 data bandwidth, this means that the frame rate will be decreased while there’re more than one cameras in working set.

User should choose the camera he wants to operate by checking the checkbox and click [OK].

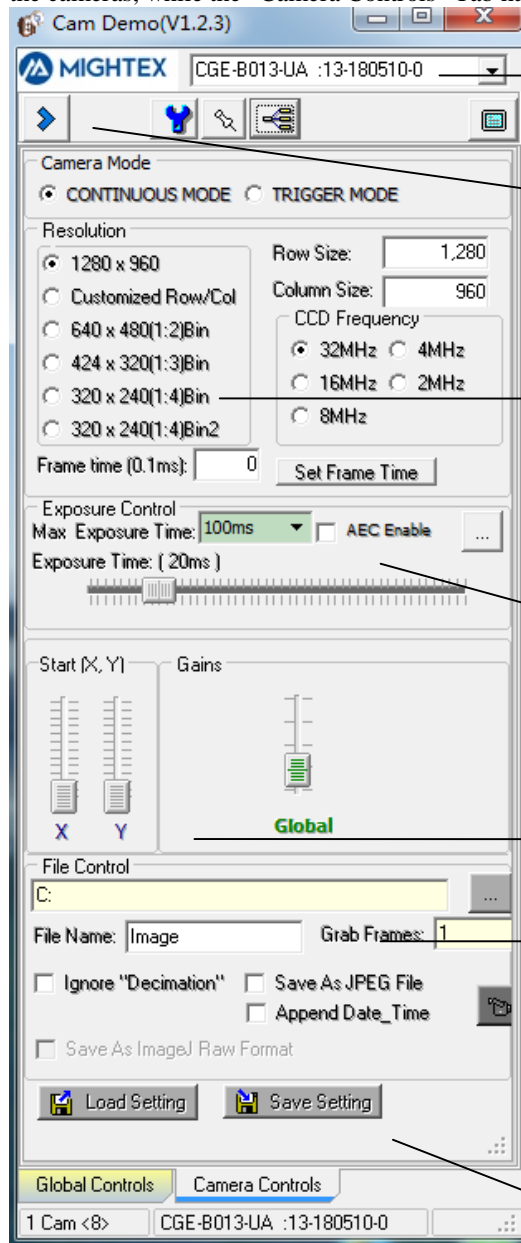
IMPORTANT: Only the checked cameras will be put in the “working set” of the camera engine. While when more than one camera are selected, the camera engine will grab frames from them simultaneously, however, with the limit of the PC and USB bandwidth, the frame rate will be reduced in this case.

The 8/12bit selection is only allowed for certain types of cameras.

Note: 8 or 12 bits selection is for Mightex Camera Engine, which is a global function to all the selected cameras, for 12bit camera engine, it grabs frames from camera with 12bit Pixels, in this case, if user chooses “Bitmap Image” in the “Grab Frame Type” option, the camera engine will only use the 8 MSB of the 12bit. If user chooses “Raw Data”, the camera engine will return 12bit pixels for user to save it to files.

After clicking [OK] button, the main window of the application is shown

The main window has two Tabs, the “Global Controls” Tab has all the controls which are effective to all the cameras, while the “Camera Controls” Tab has controls which is only effective to the current camera.



All the cameras (selected for adding in the working set) are listed in this combo box, only one of them will be selected as “current” camera, the controls in “Camera controls” tab (e.g. Working Mode, Resolution, Exposure Time...etc.) are only effective to this current camera.

: Start/Stop Frame Grabbing. : Show Video window.

: Show factory panel. : Show GPIO panel. : Show Device select panel. (This panel allow user to re-select the cameras in working set).

Mode selection for current camera

Resolution, CCD frequency and Frame Time selection for current camera, before user select the “Customized Row/Col” resolution, user must input proper Row/Column Size (Must be multiples of 8). For CCX Color cameras, Bin mode is not available.

User might select a new CCD Frequency, this is useful in some cases*. User might also set Frame time, the camera engine will do “best effort” to set the frame to the setting time precisely, however, as the actual frame rate is affected by the resolution, exposure time...etc. The final frame rate might not be the one user sets. User might set frame time and then click the [Set Frame Time] button to set the new frame time.**

Exposure Time for current camera.

When “Auto Exposure Enable” is checked, the current camera will be automatically controlled by the application for optimized exposure time according to the exposure detection of a small rectangle area in the center of the image, this small rectangle area can be shown while the “ShowAEMark “ is checked (in “Global Controls” Tab).

X,Y and Gain Control of current camera, Note that (X,Y) control is only effective while the resolution set to “Customized Row/Col”, while the resolution is set to a sub-region of the sensor, X,Y slide bar allows user to move the region (ROI) on the sensor.

For Color Cameras, it's global gain for Red, Green and Blue which can be controlled in 6 – 41 range. For Mono camera, it's global gain applied to all pixels. Note that set high gain will increase the camera noise. Please refer to the following for the recommended Gains for each resolution setting***.

: It's for “Auto White Balance” feature, while doing this, please make sure the focus, exposure time are properly set and user can put a WHITE paper on the focus object...and then click this button. Camera engine will figure out proper R, G, B gains to make the “White paper” looks white. **Note that it's ONLY effective for color camera.**

User might use the button to save frames to files, here, user might select the directory, filename, frame number, and also has the following controls:

“Ignore decimation” : If it's checked, the saved frame is always in full resolution, even the resolution for current camera is in Bin/Skip mode.

“Save As JPEG File” : The file saved is in JPEG format, otherwise is in BMP format.

Note that here we assume the “Grab Frame Type” in “Global Controls” is set as “Bitmap Image”, if it's “Raw Data”, these two checkboxes are disabled, as the saved file is always in RAW data format under the current resolution/decimation setting.

“Append Date_Time”: When it's checked, a string of “YYMMDD_HHMMSS” is attached to the File Name for each frame file.

These two buttons are used for user to save/load the settings (of current camera) to/from a “.set” file. User might save all the current settings (e.g. after “Auto White Balance”) to a file...and later load it from the file.

The status bar here show how many cameras in working set, and whether the current camera engine is selected as 8 or 12 bits. It also shows which camera is selected as “current” camera, note that all the camera settings in “Camera Controls” tab is “local” to this camera only, while user selects another camera, all these settings are switched to the settings of the new selected camera.

Note:***. CCD Frequency:**

In most cases, CCD is working at default frequency (e.g. for CCX camera, it's 28MHz), however, user might want to set it to a lower frequency in some cases. For example, if user wants to get better frame rate at a certain exposure time, it might be needed to set CCD Frequency lower. As the CCD sensor's output frame is very related to its frame time and current exposure time, take CCX camera as an example, at 1392x1040@28MHz, the frame time is ~68ms, while ET is less than the frame time (68ms); the frame rate is 15fps. However, if the ET is longer than frame time, the frame rate downs to 5fps (Due to the hardware/firmware design). User might set CCD Frequency to 14MHz in this case, so the frame time is ~136ms at the same resolution, and the frame rate is $(15/2) = 7.5\text{fps}$ while ET is less than 136ms.

****. Frame Time:**

By default, the frame time is set to minimum internally to make the camera generate maximum frame rate under current resolution at setting exposure time. For example, for CCX-B013-U camera, at 1392x1040 resolution, the frame rate is 15fps @ET<68ms, user might set frame time to 100ms, so the frame rate will be set to 10fps precisely. User can't get frame rate more than 15fps even with the frame time set to less than 68ms as 15fps is the physical output rate of the CCD sensor at this resolution. Similarly if the ET is longer than 100ms, in the above example, set frame time to shorter than 100ms won't generate 10fps rate. So setting frame time works in a "best effort" way.

*****. Gains:**

1). For setting proper exposure for an image, it's recommended to adjust exposure time prior to the gain, as setting high gain will increase the noise (Gain is similar to the ISO settings on consumer camera). For applications which the SNR is important, it's recommended to set Gain not more than 16dB.

2). For **CCX** modules, although the minimum Gain is 6dB, user might have to set it to 14dB when the camera is not in BIN mode, with the current hardware/firmware design, the CCD output (Sony ICX205) is only up to 0.45V as its saturation voltage, even with 6dB gain (2x), it's ~0.9V signal, while the CCD processor is with a 2V reference ADC, only set the Gain to 14dB will let the ADC generate full range data. However, we leave this feasibility to users as in some cases user might still want to set Gain to 6dB to get optimized SNR (rather than the ADC range). In most of the applications, the Minimum Gain recommended for CCX-B013-U is as following:

No Bin mode (Bin = 0, or Bin = 0x83), gain = 14 (dB)

1:2 Bin mode (Bin = 1), Gain = 8 (dB)

1:3 Bin mode (Bin = 2), Gain = 6 (dB)

1:4 Bin mode (Bin = 3), Gain = 6 (dB)

3). For **CXX** modules, although the minimum gain is 6dB, user might have to set it to 9dB. When the camera is NOT in BIN mode, with the current hardware/firmware design, the CCD output (Sony ICX285) is only up to ~0.8V as its saturation voltage, even with 6dB gain (2x), it's ~1.6V signal. While the CCD processor is with a 2V reference ADC, only setting the Gain to 9dB will let the ADC generate full range data. However, we leave this feasibility to users as in some cases, user might still want to set Gain to 6dB to get optimized SNR (rather than the ADC range). In most of the applications, the Minimum Gain recommended for CXX-B013-U is as following:

No Bin mode (Bin = 0, or Bin = 0x83), Gain = 9 (dB)

1:2 Bin mode (Bin = 1), Gain = 6 (dB)

1:3 Bin mode (Bin = 2), Gain = 6 (dB)

1:4 Bin mode (Bin = 3), Gain = 6 (dB)

4). For **CGX** modules, although the minimum gain is 6dB, user might have to set it to 15dB when the camera is not in BIN mode. With the current hardware/firmware design, the CCD output (Sony ICX445) is only up to 0.38V as its saturation voltage, even with 6dB gain (2x), it's ~0.76V signal. While the CCD processor is with a 2V reference ADC, only setting the Gain to 15dB will let the ADC generate full range data. Here, we leave this feasibility to users, as in some cases, user might still want to set Gain to 6dB to get optimized SNR (rather than the ADC range). In most of the applications, the Minimum Gain recommended for CGX-B013-U/CGX-C013-U is as following:

No Bin mode (Bin = 0) , Gain = 15 (dB)

1:2 Bin mode (Bin = 0x81), Gain = 8 (dB)

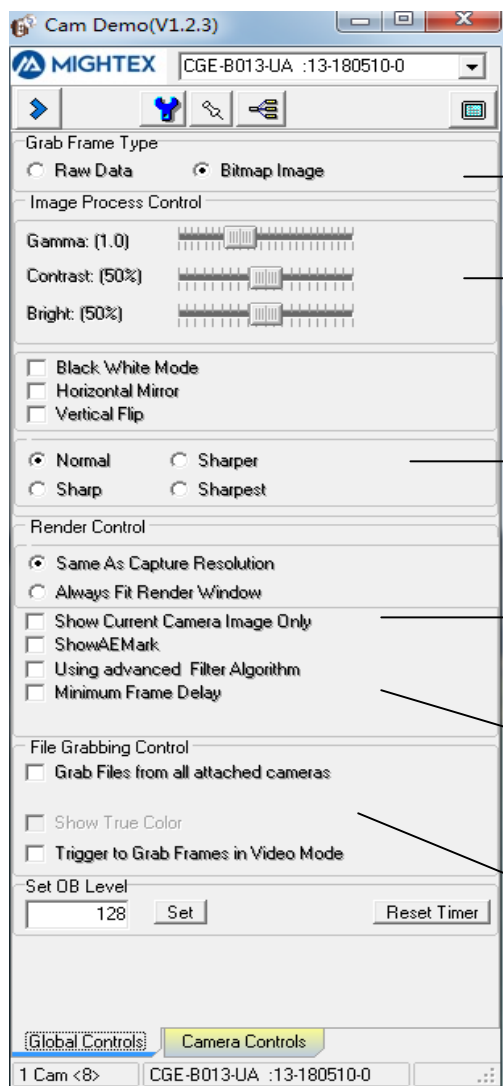
1:3 Bin mode (Bin = 0x82), Gain = 6 (dB)

1:4 Bin mode (Bin = 0x83), Gain = 6 (dB)

1:4 Bin mode2 (Bin = 0x03), Gain = 6 (dB)

******. Resolution:**

For some models, they have "1:4 Bin mode2" instead of "1:4 Skip mode". This mode is slightly different from "1:4 Bin mode". For Bin mode, the pixel is the sum of the bin area (e.g. for 1:2 bin, the pixel value is the sum of the 2x2 area, which is actually 4 pixels, it's Row Bin and Column Bin). For Bin mode2, it's sum of the first column pixel of the rows of the bin area, thus it's sum of 2 pixels for a 2x2 area (in 1:2 bin mode), so it's Row Bin and Column Skip.



Frame Data Format for all cameras. While it's set as "Bitmap Image", the image data from camera engine (and thus shown on video window and might be saved to files) are always 8bit no matter the camera bit selection is 8 or 12 bit. While it's set as "Raw Data", there's no video will be shown on video window, however, the data saved to file will be according to the camera bit selection, it might be 8 or 12 raw data.

Global Gamma, Contrast and Brightness control for BMP image of all cameras. These parameters are used in camera engine while converting the Raw image data to bitmap image.


Global control for images display attributes for all camera, user might click the check boxes to Horizontally mirror or Vertically Flip the image. User might also select the Sharp algorithm to be disable/sharp/sharper/sharpest.

Set the show style of the video window, while **"Same As Capture Resolution"** show the image in 1:1 style, the **"Always Fit Render Window"** will stretch the image to fit the current video window size. (This needs much more PC resources, and thus will affect the final frame rate).


"Show Current Camera Image Only": while it's checked, the camera engine will only grab and show frame from the current camera, otherwise, camera engine will grab and show frames from all selected cameras.

"ShowAEMark" : This is for controlling of appearance of the "Automatic Exposure Control" detection area mark.

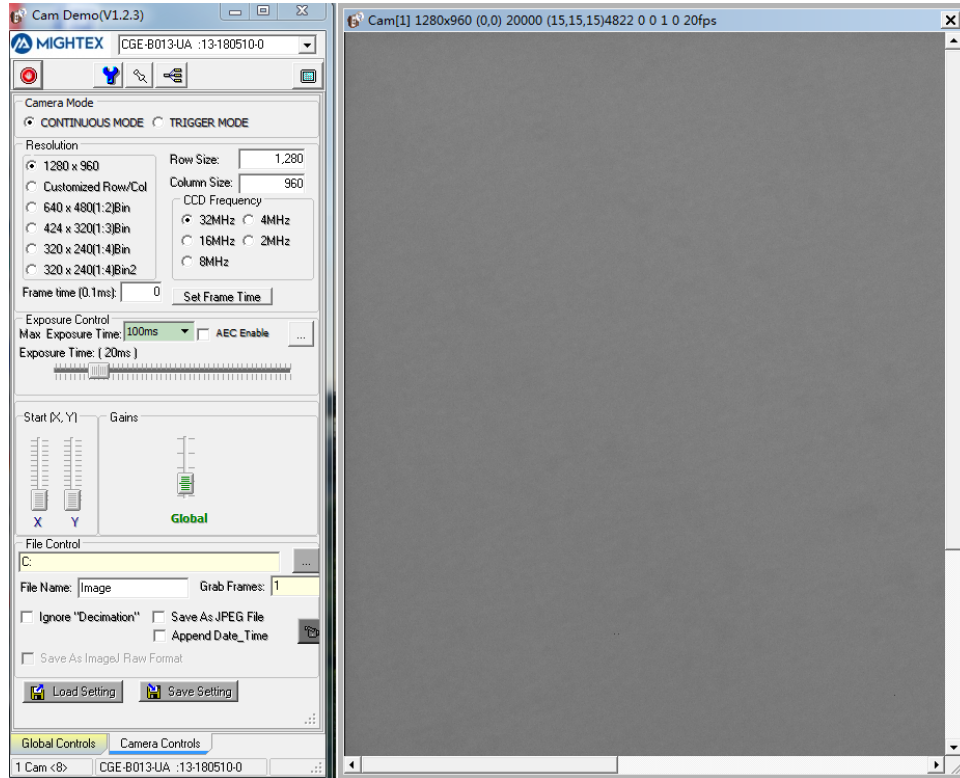
These are two special features for frame grabbing, when the **"Grab Files From all attached cameras"** is checked, the application will take the

"Frame Grabbing" (click of  button of the current camera) as global action, that is, clicking this button for current camera will be equivalent to clicking this button for each camera (one by one) in working set. Before doing that, user might need to set proper File grabbing parameters for each camera in its own "Camera Controls" tab.

"Trigger To Grab Frames in Video Mode" is used in CONTINUOUS mode only, while it's checked, an external trigger signal on the current camera is

the equivalent to the click of  button.

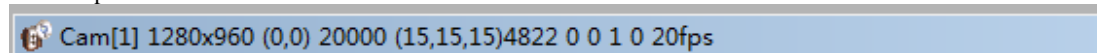
There's a video window for each camera in working set, user can use the **“Show Current Camera Image Only”** to control showing of the current camera's video window only OR showing of all video windows. One example is as following (in this case, there're two cameras in working set, and their video windows are all shown):



The title of the video window has the following format:

Camera No Resolution (Bin Mode) (X,Y) ExposureTime (Rgain, Ggain, Bgain) TimeStamp FrameRate.


An example from above is:

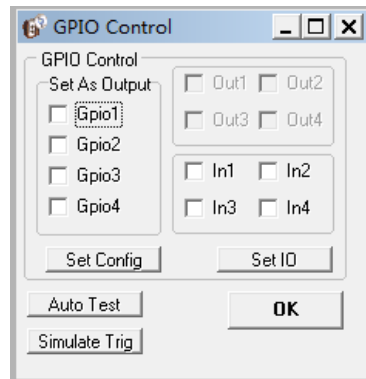


Camera No "[]" on the No. means It's the current Selected Camera	Resolution	Xstart Ystart	Exposure Time(in us)	Gains (R,G,B)	TimeStamp (in ms)	Frame Rate
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*.Note: for color camera, the R and B in Gains () contains the actual Gain Ratio of the Red and Blue pixels.

There are some other windows as following:

The  button is for operation of GPIO of the current camera.




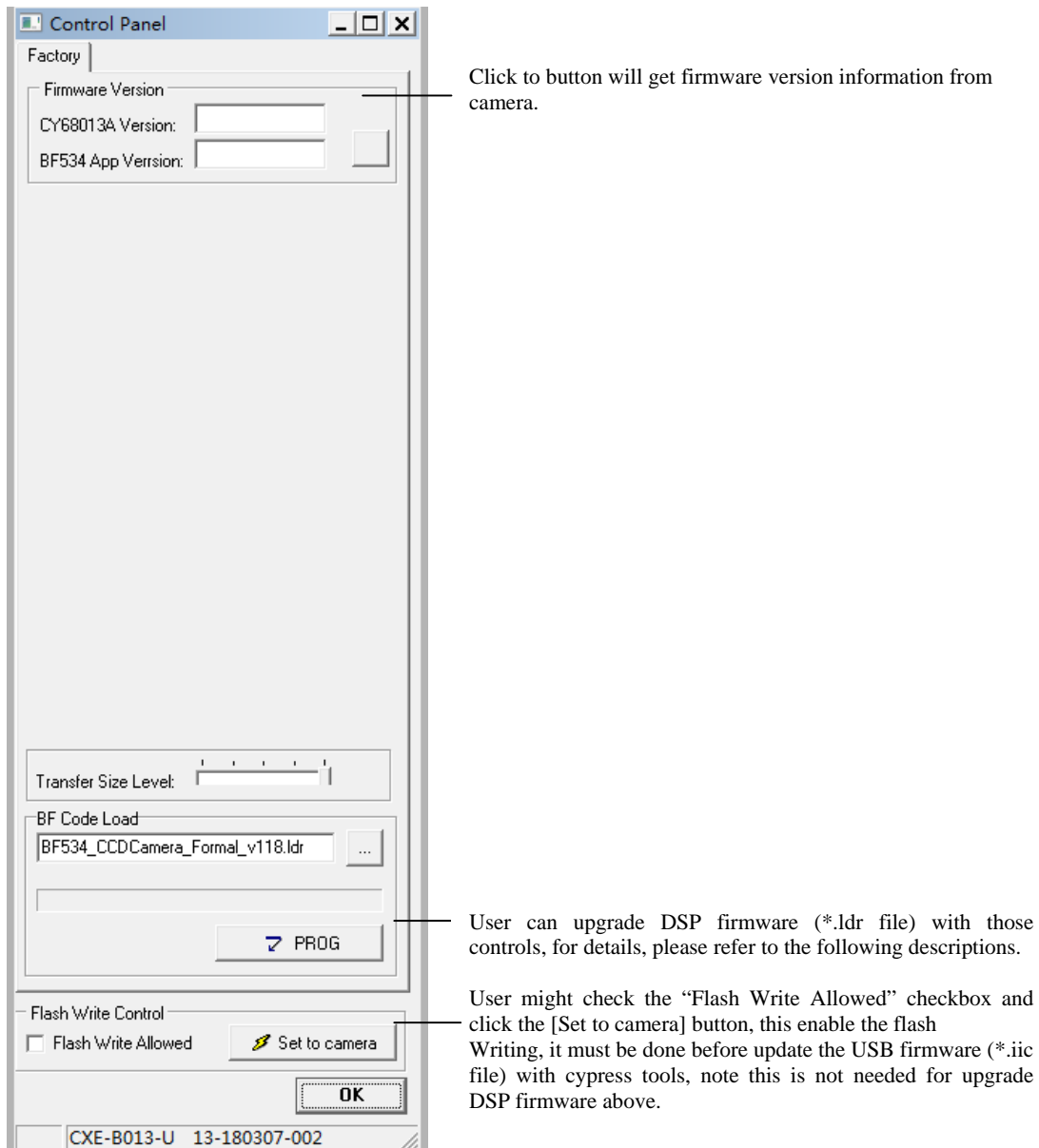
On this dialog, user can configure the 4 pins as output or input, for output pins, checking the “Outx” box will set the pin to HIGH. For input pins, the “Inx” check box is checked while the input is HIGH. The [Auto Test] and [Simulate Trig] buttons are for service only.

The  button allow user to re-select cameras in working set. Note that while doing this, the application will stop the camera engine first....and then allow user to select cameras again, the device selection window will show up (the same window showing up while starting the application) and user can check the camera if he wants to add it in working set, otherwise, leave it unchecked.




Note that this is similar to re-start of the application.

The  button is used for show the factory control dialog; user might use it for firmware version query and firmware upgrade.



For DSP firmware upgrading, user should go this dialog, and then use

 *.ldr to select the new firmware (*.ldr file), And user can click button to start the downloading.

After downloading is successfully, user should power cycle the camera (simply plug Out/In the camera from the USB port), this will activate the new DSP firmware.