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Mightex UnBuffered USB Camera

M-Series User Manual

Version 1.1.5

Nov. 08, 2011

Relevant Products

Part Numbers
MCN-B013-U, GLN-B013-U, MLE-B013-U, MCE-B013-U, MCN-C013-U, GLN-C013-U, MLE-C013-U, MCE-C013-U, MCN-C030-U, GLN-C030-U, MLE-C030-U, MCE-C030-U MCN-B013-US, GLN-B013-US, MLE-B013-US, MCE-B013-US, MCN-C013-US, GLN-C013-US, MLE-C013-US, MCE-C013-US, MCN-C030-US, GLN-C030-US, MLE-C030-US, MCE-C030-US

Revision History

Revision	Date	Author	Description
1.0.0	2006.6.26	JT Zheng	Initial Revision
1.0.1	2006.7.18	JT Zheng	External Trigger Mode
1.0.2	2006.8.17	JT Zheng	GPIO feature added
1.0.3	2006.8.27	JT Zheng	TWAIN Support, BG/FG support
1.0.4	2006.9.11	JT Zheng	Multiple Cameras support
1.0.5	2006.9.22	JT Zheng	Description of LED pins
1.0.6	2006.10.9	JT Zheng	Add Module table, “About…” item
1.0.7	2006.11.30	JT Zheng	Maximum Rate Option
1.0.8	2007.2.27	JT Zheng	Recommended Intel USB Host Controller
1.0.9	2007.3.8	JT Zheng	Strobe Signal for 1.3M Camera
1.1.0	2007.4.9	JT Zheng	“No Module” description
1.1.1	2007.7.19	JT Zheng	Add “-US” modules
1.1.2	2010.7.6	JT Zheng	M-Series
1.1.3	2011.6.25	JT Zheng	Adding “Read-Only”
1.1.4	2011.7.05	Zoaib Khan	Revision and editing
1.1.5	2011.11.08	JT Zheng	Removing the system tray features

Introduction

Mightex USB 2.0 color camera is mainly designed for microscopy and other scientific applications, in which cost-effective and ease of use are important. With USB 2.0 high speed interface and powerful PC software processing, the camera delivers excellent quality images at high frame rate. GUI 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 running Mightex application. The minimum requirements for PC are:

Processor: Pentium III, 900M (Pentium IV @ 1.8G or greater is recommended)
OS: Windows 2000 or Windows XP
RAM: 256M (512M or greater recommended)
Hard Disk Space: 10M for software installation, plus additional space for captured images. **Display:** 24bit True Color.
USB 2.0 Host Controller: Recommended Intel Integrated Host Controller. (PC Card base USB 2.0 adapter is not recommended)

Camera Hardware

"-U" and "-US"
"-U" camera is with C-mount interface and "-US" camera is with CS-mount interface, Mightex might provide "-US" camera and an additional CS-C adapter to customers who order "-U" cameras, as functionally, "-US" camera plus CS-C adapter is completely equivalent to "-U" camera.

Module Table:

Module	Enclosure	Strobe/Trigger	GPIO	LED Driver
MCN	*No*	*Yes*	*Yes (8pin)*	*No*
GLN	*No*	*Yes*	*Yes (8pin)*	*Yes (MiniDin)*
MCE	*Yes*	*Yes*	*Yes (MiniDin)*	*No*
MLE	*Yes*	*Yes*	*No*	*Yes (MiniDin)*

Mightex provides board level camera and enclosed camera, provide GPIO or LED Driver or Both. Basically they have the same hardware/firmware and have the following connectors (in addition to the standard USB 2.0 Type B connector):

GPIO connector (for module MCN, GLN and MCE)

Extension Connector: This is a 4 pins connector or 8 pin connector on the board.
For the 4 pin connector version (obsolete), it provides:

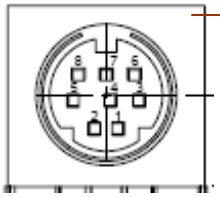
Pin1 : [Square Pad]VCC (3.3V), capable of outputting 250mA current.
Pin2 : GND
Pin3 : Strobe Out
Pin4 : External Trigger In

For **MCN** and **GLN**, as they're non enclosed camera, it has 8pin (2x4) connector on board:

Pin1 : VCC (5.0V), capable of outputting 250mA current.
Pin2 : GND
Pin3 : External Trigger In
Pin4 : Strobe Out
Pin5: GPIO1
Pin6: GPIO2
Pin7: GPIO3
Pin8: GPIO4

For **MCE**, it is enclosed camera, the GPIO is provided via the 8 pin mini din connector:

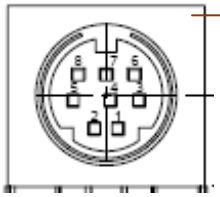
The following figure is the receptacle on the camera module



Pin1 : VCC (5.0V), capable of outputting 250mA current.
Pin2 : GND
Pin3 : External Trigger In
Pin4: GPIO1
Pin5 : Strobe Out
Pin6: GPIO2
Pin7: GPIO3
Pin8: GPIO4

LED Driver (for module **GLN** and **MLE**):

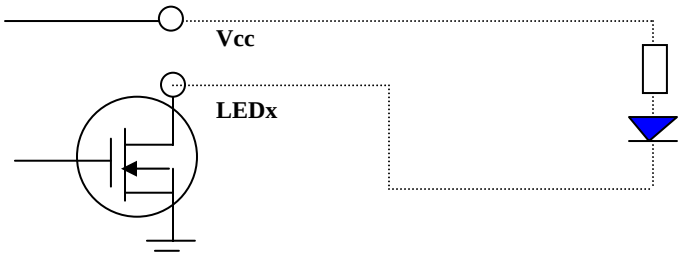
The following figure is the receptacle on the camera module



Pin1 : VCC (5.0V), capable of outputting 250mA current.
Pin2 : GND
Pin3 : External Trigger In
Pin4: LED1
Pin5 : Strobe Out
Pin6: LED2
Pin7: LED3
Pin8: LED4

Caution: For user who wants to use those pins, user must be very careful not to shorten two different signals (especially the VCC and GND pin), shortening may damage the camera, even the PC. If user has both MCE and MLE, user must be extremely careful not to connect incorrect external circuit to them, as they have the same MiniDin interface.

Note:
1). VCC and GND: the camera itself uses the power from USB port, no external power is needed, and the power consumption of it is less than 1W. (< 200mA). So basically, VCC can still provide 300mA, but 250mA or less are recommended.
2). Strobe Out – Camera automatically output a positive pulse for each frame capture. For 3M camera, the pulse starts when the first ROW starts to exposure and ends when the last ROW ends to exposure, as the camera is with ERS (Electrical Rolling Shutter), the Strobe pulse will be approximately the same as the frame time. This might be OK for external constant LED light source, but it's NOT proper for external flash (which can only light for around tens of Micro seconds). For 1.3M Camera (Mono and Color), the Strobe has different timing logics, the strobe is a short pulse (one row time), which is generated 8 row times before whole frame is read out. For user who wants to use this signal for input trigger of any external Flash, user should set exposure time longer than the frame time, so at the time STROBE is generated, all rows will be active for exposure, this gives an "equivalent" of a Global shutter.
3). Trigger In – While Camera is set in "External Trigger Mode", camera will capture one frame while there's a falling edge on this PIN. However, attention has to be taken that the external trigger signal might be ignored if it's too frequent, while the camera is still capturing the previous frame.
Strobe Out and **Trigger In** Signals are with LVTTL level, relative to the **GND**.
4). For GPIO module, 4 more GPIO pins are provided, each GPIO pin provides LVTTL level and 8mA source/sink current while it's configured as output, it can also be configured as Input pin.
5). For LED Driver module, the LED1 to LED4 are pins for connecting with Mightex LED Light Head, in this way, the camera can also control up to 4 channels of LED lights. The LEDx pins are Open-Drain output as following; user may also connect their own circuit to it. Each channel can sink up to 300mA, however, Vcc from PC can only provide around 250mA (USB port can provide 500mA as maximum, camera circuit used ~200mA already). LED driver provides PWM dimmer which runs at 97 KHz (8bit for duty cycle control), so the flicking of the dimmer can be negligible even the exposure time is set to very short.



Files on CD

The CD contains the following directories:

\Application
\Driver
\SDK
\Documents
\TWAIN

Application sub-directory includes the following files:

- SDKApplication.exe – the Executable file for operating Mightex camera.
- MT_USBCamera_SDK.dll – the DLL used by EXE file
- MTUsbLib.dll – low level DLL used by MT_USBCamera_SDK.dll internally.
- CatchCamera.wav – Used by EXE file internally
- Examples.set – Example of Camera setting file.

Driver sub-directory includes the following files:

- MtUsb.inf – the INF file for driver installation
- MtUsb.sys – the device driver for Mightex USB Camera.

Documents sub-directory includes User manual and SDK Guide.

SDK includes the following sub-directories and files:

\LIB directory:

- T_USBCamera_SDK.h --- Header files for all data prototypes and dll export functions.
- MT_USBCamera_SDK.dll --- DLL file exports functions.
- MT_USBCamera_SDK.lib --- Import lib file, user may use it for VC++ development.
- MtUsblib.dll --- DLL file used by "MT_USBCamera_SDK.dll" .

\Documents directory:
MighTex USB Camera SDK Manual.pdf

\Examples directory
\Delphi --- Delphi 5.0 project example.
\VC++ --- VC++ 6.0 project example.

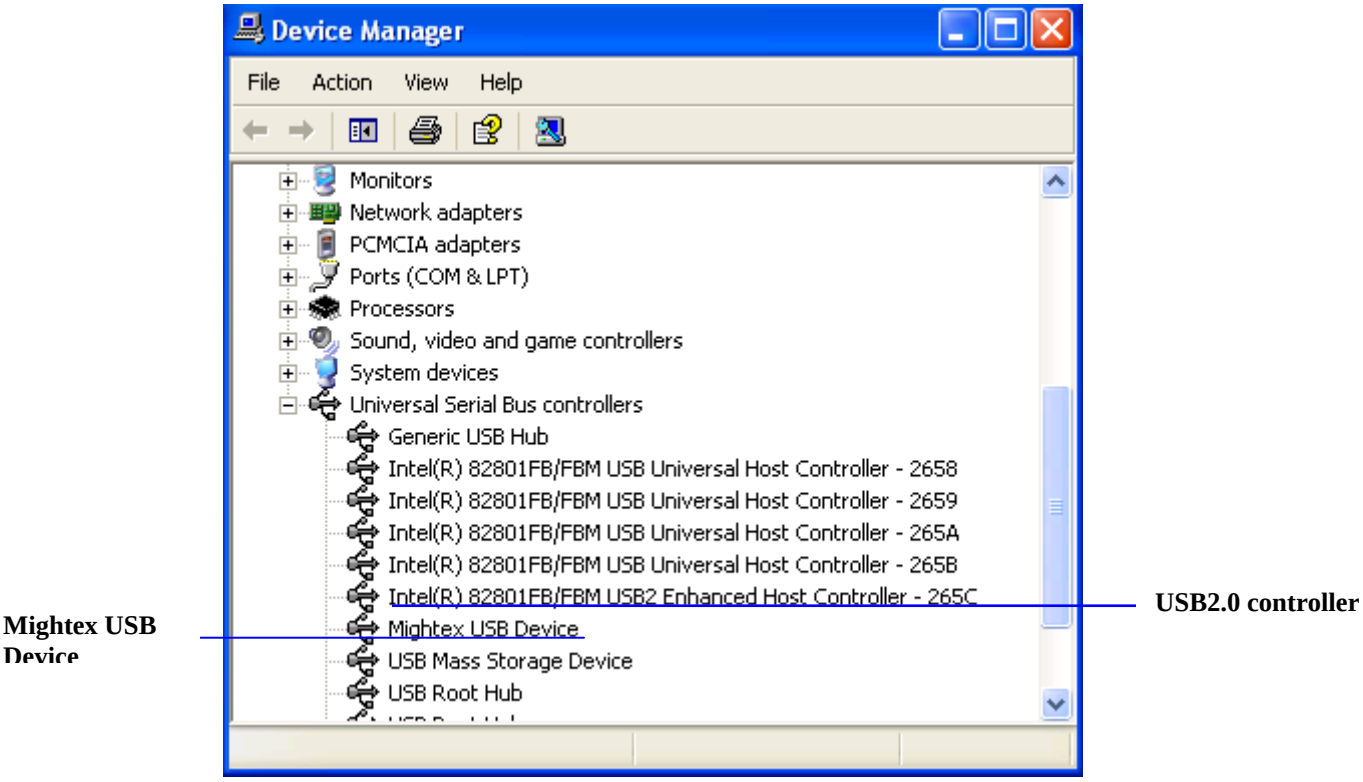
TWAIN includes the TWAIN Data Source Driver and its document
\MightexDS : The Data Source Driver
\Documents : TWAIN Application Guide

Software Installation

Note: Please follow the steps for installing the Mightex device from page 7 to page 8 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 instructions in pages 9-10.

Driver Installation

Mightex USB 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

Note that the following installation steps are on Windows XP, for Windows Vista/7 users, there might be slight differences. If windows doesn't prompt user for the location of the driver during the installation, user might have to go to Device Manager and right click the Mightex Device (it is marked with a exclamation mark as the device was not Installed with a proper driver), choose the Property|Driver|Update Driver to install the driver manually.

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:

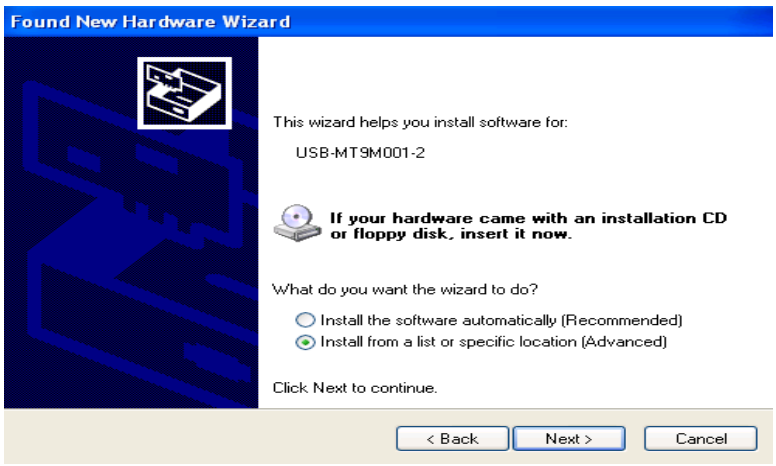
Please follow these steps in order to install the driver for your M series Mightex camera:

1. Please plug in your Mightex device to your PC. A message should pop up that says “Found New Hardware”.

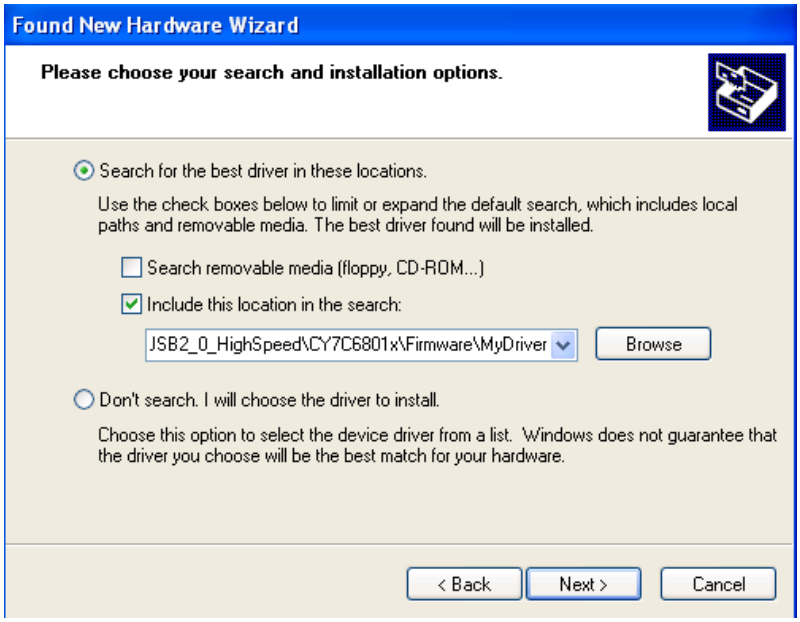
2. Immediately you will see another window pop up that says “ Welcome to the Found New Hardware Device” as shown below

3. Please check “No, not this time”, and click next

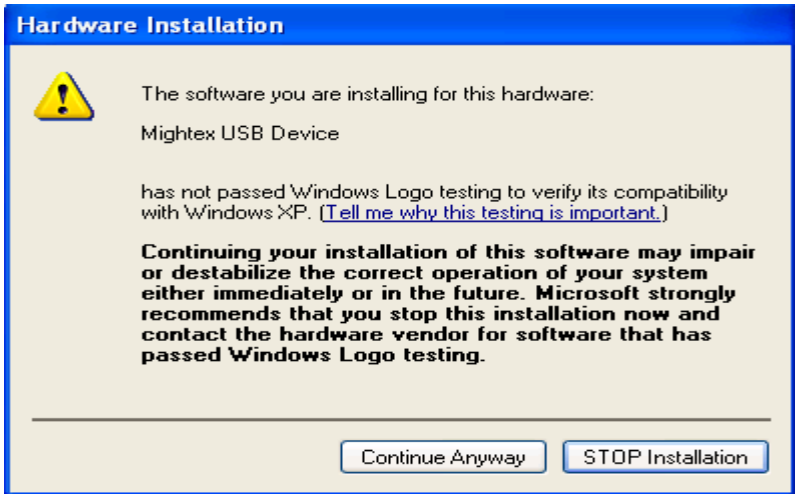
4. When you see the following window, please click on “Install from a list or specific location”. Please note that prior to clicking on ““Install from a list or specific location” you should have your CD ready in the PC, and in case you don’t have the CD you can always go to our website at www.mightex.com 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)



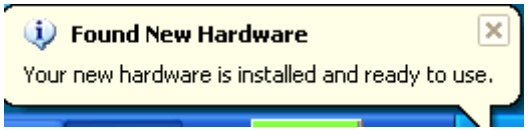
5. When you see the following window, first select “Include this location in the search” and Browse for the location of the driver. While you are browsing please click on the driver folder, and then click on “Next”.



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



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



If user change the device to another USB port on PC after installation, PC may prompt again with the same new hardware wizard (On XP only), please following the same sequence but, as we had already installed the driver, this time you should go with “install the software automatically (recommended)

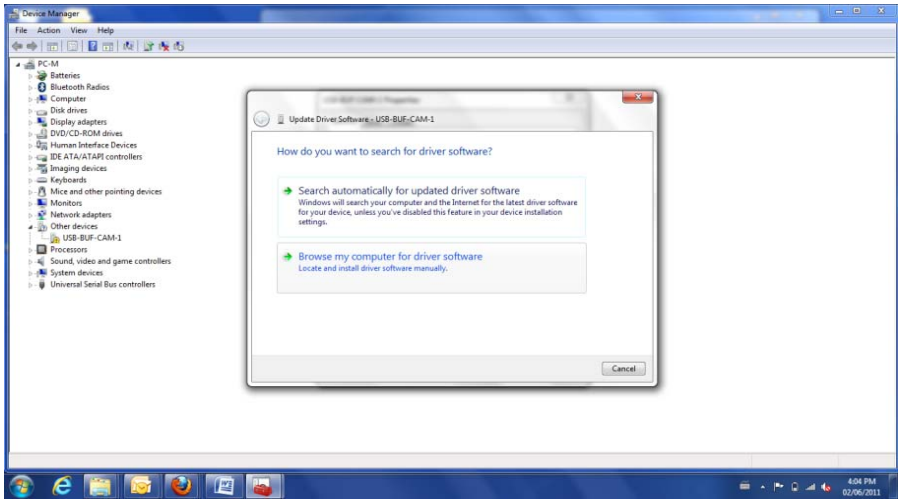
Please follow these steps if the message saying "Found New Hardware" doesn't pop up, and the operating system is Windows 7 or Vista

1. Go to the search box and type "Device Manager". You will find the "Device manager" under Control Panel. Please click on the "Device Manager".

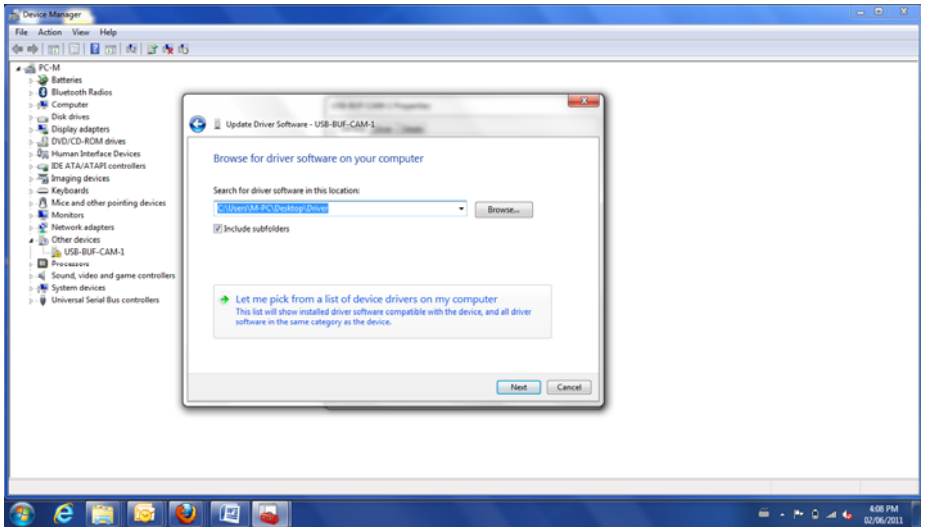
2. You may locate the USB device inside the Universal bus serial controller or outside the "Universal bus serial controller" under "other devices" as shown in the figure below. Please click on the device that appears under "other devices"

3. Once you click on the device that appears on the "other devices", Please click on "update driver".

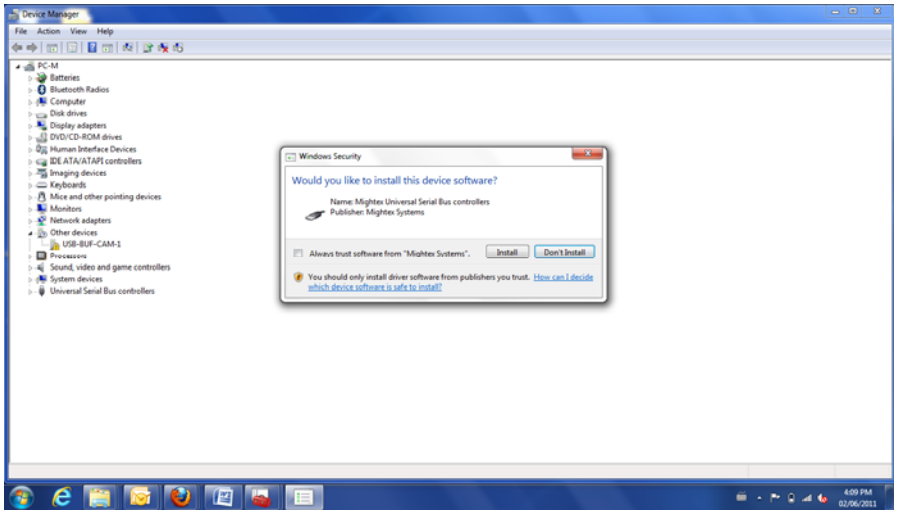
4. Once you click "update driver", another window will pop up as following. Please click on the option "Browse my computer for driver software".



5. The window will prompt you to select the driver. You can copy the driver to your desktop from the website (go to www.mightex.com, search for the device with the modal number, and once you find the device go to download page and download the software package) **or** from the CD and then select the driver from the desktop. Once you select the driver from the desktop or any drive you prefer, please click on "next" as shown below:



6. You will see the following window that will prompt you to install the driver. Click “Install”.

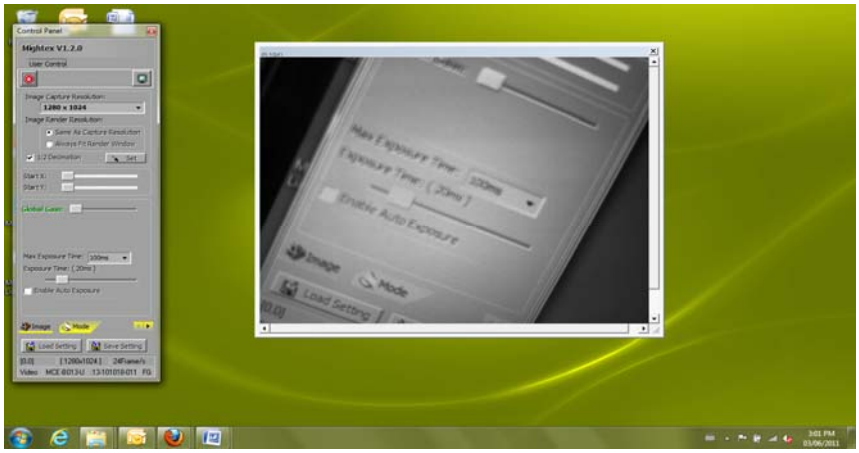


Application Installation

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. The figure below shows the GUI.



Application Un-Installation

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

Software Operation

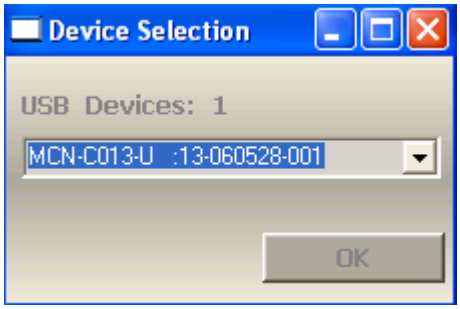
After proper installation of the device driver and the application, user can simply run the application (EXE file) from your installed directory.

Important: For Vista user, 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 pop up 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 Camera currently attached to the USB bus of your PC, and list them in the “Device Selection” dialog:
- User should choose the camera he wants to operate and click [OK].

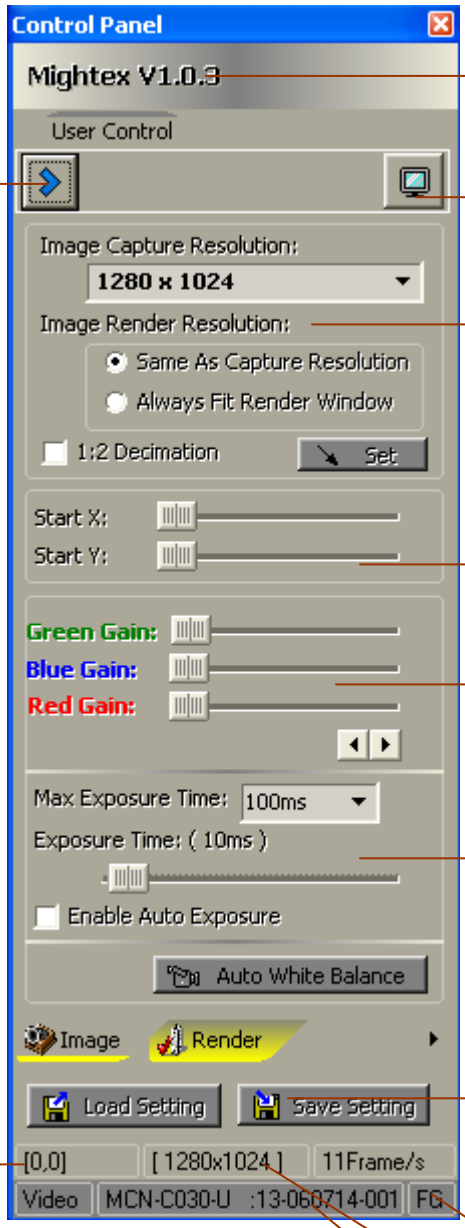


Note that the format of the each module is in “ModuleNo : SerialNo”, in the above example, there’s only ONE camera attached to the USB, and its module no. is “MCN-C013-U”, its serial no. is “13-060528-001”.

IMPORTANT: Currently, user can only choose ONE of the cameras (assume that user has multiple Mightex cameras attatched on the USB) for operation, for switch camera, user has to exit the application and run it again for choosing another camera, on the other hand, as the application uses PC resources very intensively, it’s not proper to operate two cameras (e.g. for running two instances of the application) simultaneously.

The main control panel will show up for user’s operation, the control contains three main pages: (See next page)
“Image” page – Mainly for the image settings, including resolution, gain, exposure time…etc.
“Render” page – Mainly for the controlling of display of the frames.
“Mode” page – Mainly for “External Trigger” mode feature and File catching settings.

The main panel is as following, *in the "Image" page, it has the controls:*



Start (and Stop) Frame Grab button

The Title, I use "Mightex V1.0.0" as example

The "Show Video Window" button, click it show the Video window.

User may select the resolution here, currently, the provided resolution includes 32x32, …, 640x480, 800x600,1024x768 and 1280x1024(for 1.3M series)
And the selectable "1:2 Decimation"(2x skip) mode. User may also select the resolution of rendering, it can be always fit the video window, OR always keep the same resolution as the capture image. User must use Set button to set the settings to camera engine. (Note that for minimum resolution 32x32, the 1:2 Decimation is not allowed)
User may use these two slider to select the start position of the capture image. (ROI feature) While it's NOT in full resolution.

User may use these three slider to manually adjust the RGB gains (0x – 16x). The ◀ ▶ is used for adjusting all gains (RGB gains) proportionally.

User may use these controls to select the maximum exposure time range and the current exposure time*, the Auto White Balance button is used for Automatic White Balance (AWB) set, user needs to set proper exposure time and put a white paper as the object, click this button will automatically set the RGB gains to get ideal white color. The "***Enable Auto Exposure***" checkbox allows user to enable auto exposure feature.

These two buttons are used to save/load all the current settings to/from a user defined file, user may set proper parameters (exposure time, gains…etc.) under a certain environment and save the parameters to a file named this environment, e.g. "Sunny Outside.set" or "In Room.set", And user may load them back later.

Start Position of ROI

The Software is running in "Foreground"**.

Current selected resolution and frame rate.
The opening device's Module No. and Serial No.***

While the Video window is showing, user might choose "Same as capture resolution" or "Always fit the render window", If it is chosen as "Same as Capture Resolution", the Video window may not bigger enough to show the whole frame, user can move the image around by moving the mouse with the left button down. While "Always fit the render window" is chosen, the image is always fully fit the video window no matter what the resolution is. In this setting, user may double-click the video window to get a **Full Screen Window**, double-click again will restore the normal video window.

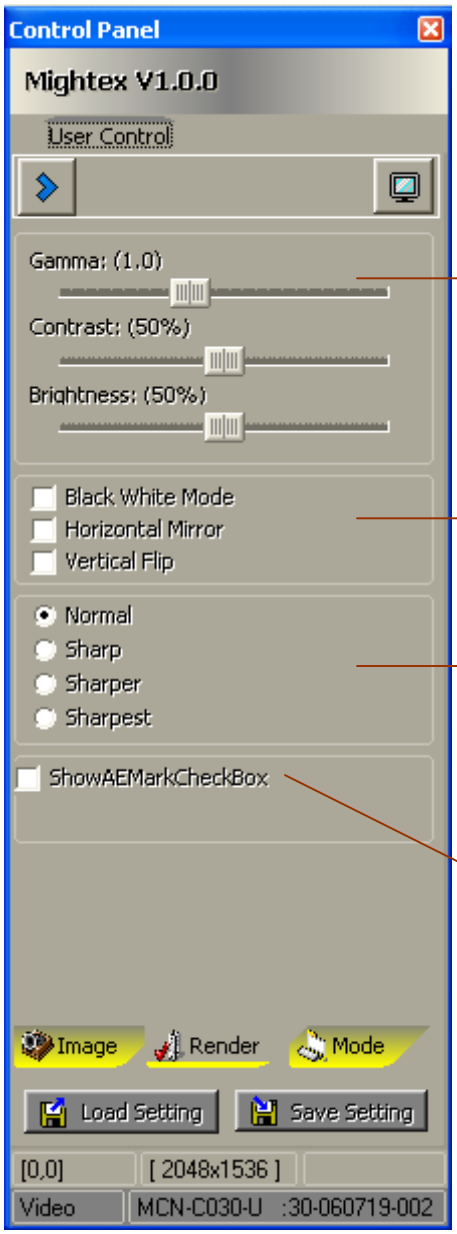
**. Exposure Time: There're 4 ranges totally, they're 0.05ms – 5ms, 0.1ms – 10ms, 1ms – 100ms and 7.5ms – 750ms, we expect in most cases, user should use 1ms – 100ms range. And while it's in 7.5ms – 750 ms range, the resolution is 7.5ms.*

Another point is that under certain lighting condition, there might be light flick from AC power (220V@50Hz, and 110V@60Hz), in this case, user should select proper Exposure time to avoid these flicks appearing in the Video window (though actually it won't be in still image anyway). Less than 50Hz lighting condition, the exposure time should be a multiple of 1/100 second (10ms), and similarly, less than 60Hz lighting condition, the exposure time should be set as a multiple of 1/120 second. Of course, it's recommended to use lighting source WITHOUT AC flicking

***. "Foreground" and "Background": As the camera application does all the image processing on PC, it might use most of PC's CPU and Memory resources, however, this is only the case while it's in "FG" way, which means this application is the windows application get the focus (user's key or mouse input). While user operates on other applications, this application automatically turns to "BG", which uses much less resources. Click on any of its windows will bring it back to "FG".*

****. During normal operation, if the camera is power off (or power off/on), the software will lose the communication with the camera and shows "***No Module***" instead of the "ModuleNo:SerialNo", this also occurs while the PC is In/Out of standby mode while the software is operating. In this case, user may right click the application icon in the Task Tray and click the "Camera Re-select" menu item, this will let software to re-initialize the camera and bring the camera back to normal operation.*

The control panel has the second page of “Render” as following:



Gamma, Contrast and Brightness control for the video window.

User may set the display frame (in video window) in “Black and White” mode, “Horizontal Mirror” mode and “Vertical Flip” mode by checking these boxes.

User may select the “Sharp” level, however, as the Sharp algorithm needs considerable PC resources, while selecting Sharp, Sharper or Sharpest, PC’s resource will be almost 100% occupied by the it. Not only the frame rate will reduce significantly and that will affect the running speed of other PC applications.
So it’s recommended to use “Normal” in most cases.

ShowAEMarkCheckBox will show the auto exposure detecting area on the image, while auto exposure feature is enabled, camera will detect the illumination of this area and figure the optimized exposure time.

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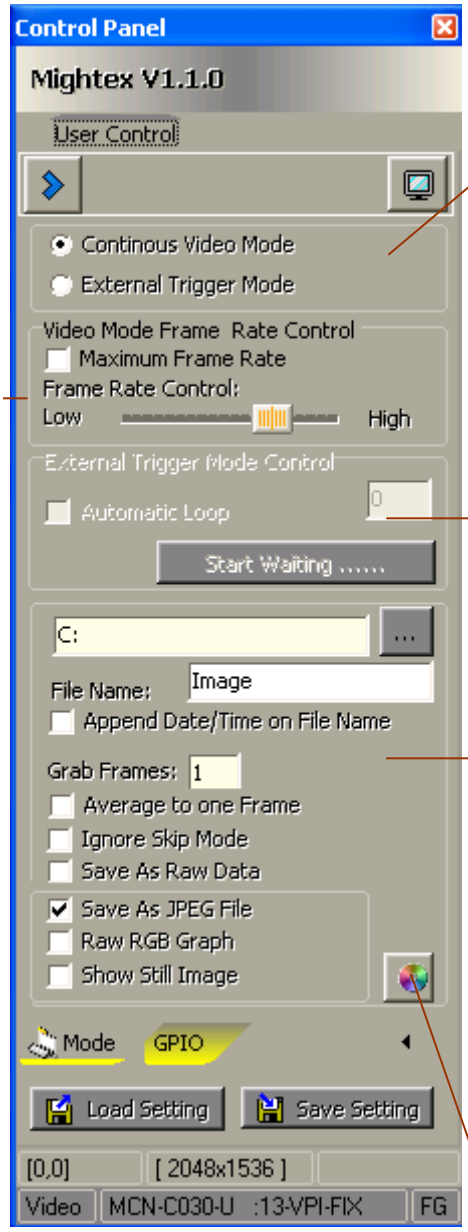
The control panel has the third page of “Mode” as following:



In Video Mode, the actual frame rate is very depending on the PC resources, while we set the default of each resolution to a moderate frame rate, that will give user the proper frame rate, it might use some CPU’s resources (for data collection from USB and image data processing), user may use this slider to adjust the frame rate to another level, to let PC has some more (or less) bandwidths for other applications. As different PC may have different frame rates under the same settings of this slider, this slider gives user a easy way to control on a particular PC..
The actual frame rate is shown on the pane below.
Note that this is only effective while the application is in Foreground, while it’s in Background, the application will release most of the resources for other Foreground application and the frame rate if very low.
“Maximum Rate Control” is an aggressive option to let user to get maximum frame rate, it’s **NOT** recommended to be turned on in most cases.

Camera Mode selection, the default is “Video” mode, user may also select “External Trigger” mode.

While camera is in “External Trigger” mode, user can click 

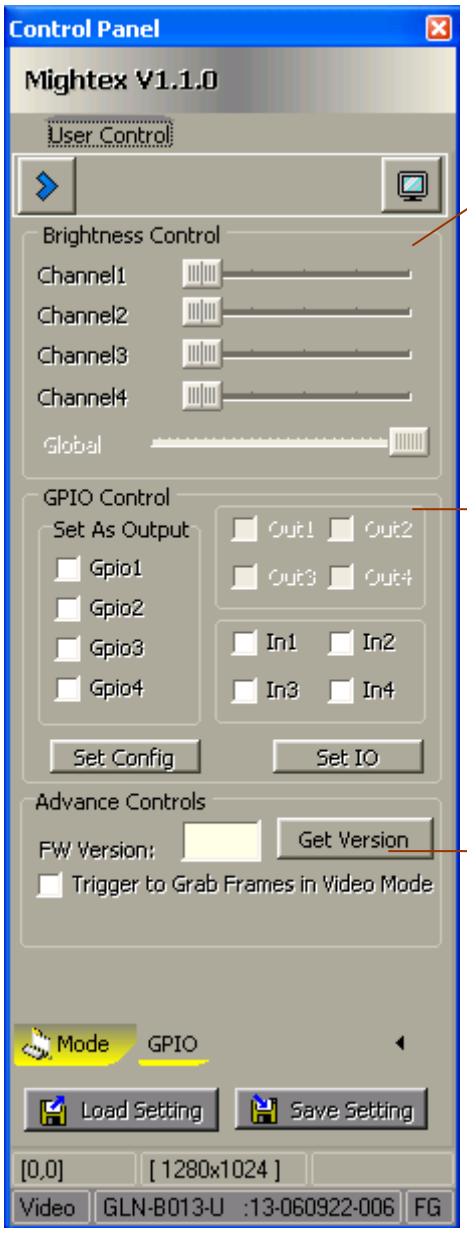
button, that will make software keeps to wait for an external signal (hard connected to the external trigger pins on camera’s connector), a falling edge of the trigger signal will start ONE frame of snapshot catching, and PC will save it to the specified location. If “Automatic Loop” is checked, the software will remain in the “waiting” state even after a frame is captured, waiting for the next capture. If “Automatic Loop” is NOT checked, it finishes the “waiting” after ONE capture, and user has to re-click the button for next capture.

The directory to store the captured files. While in “Video” mode, the camera engine continuously grabbing frames from camera, and user may ask it to save the grabbed frames to file in “Raw”, “JPEG” or “BMP” format. In “External Trigger” mode, only **ONE** frame in “JPEG” or “BMP” format can be saved for each external trigger.

User can specifies directory, filename and file number, as well as other settings:
“Append Date/Time on File Name” – Automatically append Date/Tim to file name.
“Average to one frame” – Save one image only, but it’s the average of all grabbing frames.
“Ignore Skip Mode” – user can check it if user wants to get a full resolution frame (e.g. 1280x1024), while the current video resolution is in 1:2 Decimation mode (e.g. 1280x1024 with 1:2 decimation).
“Save As Raw Data” – the Frame is save as RAW data file (Only valid for “Video” mode).
“Save As JPEG file” – Save file as JPEG image. Otherwise, the default is BMP image.
“Raw RGB Graph” – Ignore the Gamma/Contrast/Bright adjustments)
“Show Still Image in Form” – If this is checked, a still image window will be display after frames grabbing, and user can view them instantly. (Valid for “Video” mode only)

In “Video” mode, user can use this button for taking snapshots.

The GPIO page has the following:



For camera with LED driver, this LED brightness control will be shown, User can slide these bars to control the brightness of each LED channel or all 4 channels.

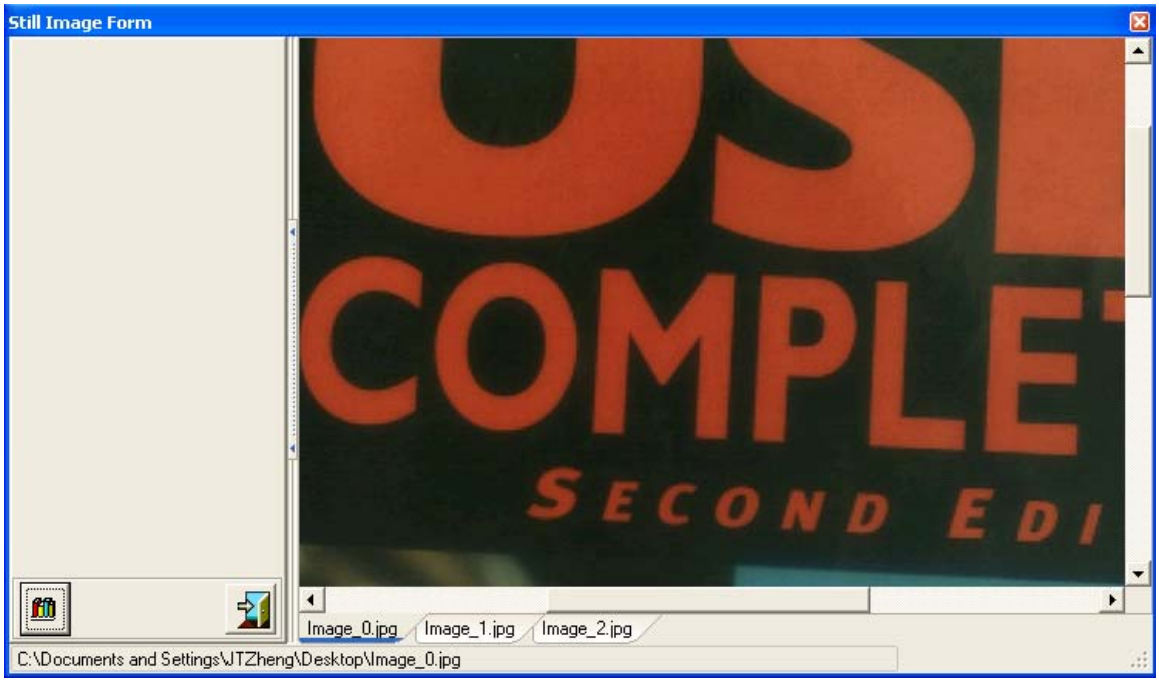
For camera with GPIO, this GPIO control will be shown, user can select each certain pin as Input or output (check the checkbox in "Set As Output" group), for the pin set as output, check it in the OutX box will set this pin to High, otherwise it's output Low. The InX box shows the current input level, checked means input high, otherwise It's Low.

Get Firmware Version Info.

"**Trigger to Grab Frames in Video Mode**" – while this is checked, a trigger signal occurrence will be an equivalent to the  button click, this enables user to use an external device (e.g. push button) to grab frames in "Video" mode.

The Video Window

If the “Show Still Image” is checked, after frames are caught, these images will be shown on a separate window:



User may have immediate view of these images, and  button is provided to start Microsoft Paint tool locally for edit the current image (image on the selected tab). While this “Still Image Form” is shown, the video window will be automatically resized to smaller and put on the left top corner of screen.