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Mightex CCD Line Camera User Manual

Version 1.2.2

Oct. 18, 2018

Relevant Products

Part Numbers
TCN-1304-U, TCE-1304-U, TCE-1304-UW, TCN-1209-U, TCE-1209-U, TCE-133A-U, TCN-1024-U, TCE-1024-U, TCN-1024-UF, TCE-1024-UF

Revision History

Revision	Date	Author	Description
1.0.0	Mar. 8, 2007	JT Zheng	Initial Revision
1.0.1	Apr. 18, 2007	JT Zheng	Correct to “TCN-1304-U”
1.1.0	Jan.18, 2008	JT Zheng	Add TCN-1209-U Modal
1.1.1	Oct.16, 2009	JT Zheng	Add TCE-133A-U Modal
1.2.0	Jan. 12, 2011	JT Zheng	Add TCX-1024-U/UF Modal
1.2.1	Jun. 25, 2011	JT Zheng	Add “Read-Only”
1.2.2	Oct. 18, 2018	JT Zheng	New Logo

Introduction

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

PC Requirement

Mightex CCD Line 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 software. The minimum requirements for PC are:

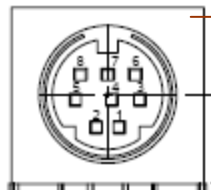
Processor: Pentium III, 900M
OS: Windows 2000 or Windows XP
RAM: 256M (512M or greater recommended)
Hard Disk Space: 10M for software installation.
USB 2.0 Host Controller: Present.

Camera Hardware

Mightex provides board level camera with two connectors, one is the standard USB 2.0 Type B connector, and the another one is a 8 pin Din connector as following:

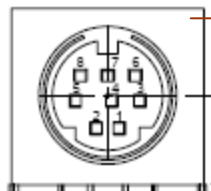
(**Note:** This 8pin trigger cable is not included in the “standard” package and needs to be purchased separately)

For Modal TCN-1304-U:



Pin1 : GPIO1
Pin2 : GPIO2
Pin3 : GPIO3
Pin4: GPIO4
Pin5 : TRIG+
Pin6: TRIG-
Pin7: GND
Pin8: GND

For Modal TCN-1209-U and TCE-133A-U/TCX-1024-U:



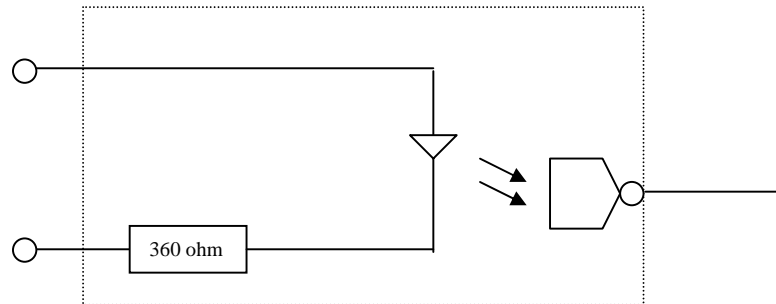
Pin1 : TRIG-
Pin2 : GND
Pin3 : TRIG+
Pin4: GPIO1
Pin5 : RESERVED (STROBE_OUT for 133A and 1024)
Pin6: GPIO2
Pin7: GPIO3
Pin8: GPIO4

Pin	Wire Color
Pin1	BLACK
Pin2	DEEP BROWN
Pin3	RED
Pin4	LIGHT BROWN
Pin5	YELLOW
Pin6	GREEN
Pin7	BLUE
Pin8	PURPLE

Caution: For user wants to use those pins, user must be very careful not to shorten two different signals . Doing so may damage the camera, in worst case, even the PC itself.

Note:

1). **TRIG+ and TRIG-** – External trigger signals are mainly used while the camera is set in **TRIGGER** mode, (however, in **NORMAL** mode, each frame has a related flag to show whether trigger signal occurred during this frame). Internally, the controller has the following opto-coupler based design for each trigger input:



The diode is expected to be working under :

$$I_{\text{forward}} = 6\text{mA} - 25\text{mA}$$

$$V_{\text{forward}} = \sim 1.2\text{V}$$

As we have a 360ohm resistor built in, we expect 3.3 – 10.0V source with 6mA minimum current source capability to be the trigger input. For camera, it's falling edge assertion, so a "H" → "L" edge will be a valid trigger signal. It's recommended to be a positive pulse with its width more than 20us.

2). **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

Application sub-directory includes the following files:

CCDCameraApp.exe – the Executable file for operating Mightex Line camera.

CCD_USBCamera_SDK.dll – the DLL used by EXE file

LinearCameraUsbLib.dll – low level DLL used by CCD_USBCamera_SDK.dll internally.

Driver sub-directory for different windows versions (including 32bit and 64bit windows), each sub-dir finally includes the following files:

MtCCDUsb.inf – the INF file for driver installation

MtUsb.sys – the device driver for Mightex USB Camera.

Mtccdusb.cat – the signing certification file.

Documents sub-directory includes User manual and SDK Guide.

SDK includes the following sub-directories and files:

\LIB directory:

CCD_USBCamera_SDK.h

--- Header files for all data prototypes and dll export functions.

CCD_USBCamera_SDK.dll

--- DLL file exports functions.

CCD_USBCamera_SDK.lib

--- Import lib file, user may use it for VC++ development.

LinearCameraUsbLib.dll --- DLL file used by “MT_USBCamera_SDK.dll” .

\\Documents directory:

 Mightex CCD Line Camera SDK Manual.pdf

\\Examples directory

 \\Delphi --- Delphi 5.0 project example.

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

 \\LabView --- LabView example

Note: The CCD Line camera is developed mainly for user's integration with their own systems, we expect user to use SDK to operate the camera. The application here is only an example for using the camera, so it only has very limited software features to allow user to set work mode and exposure time of a camera, and showing the raw frame data grabbed from a camera.

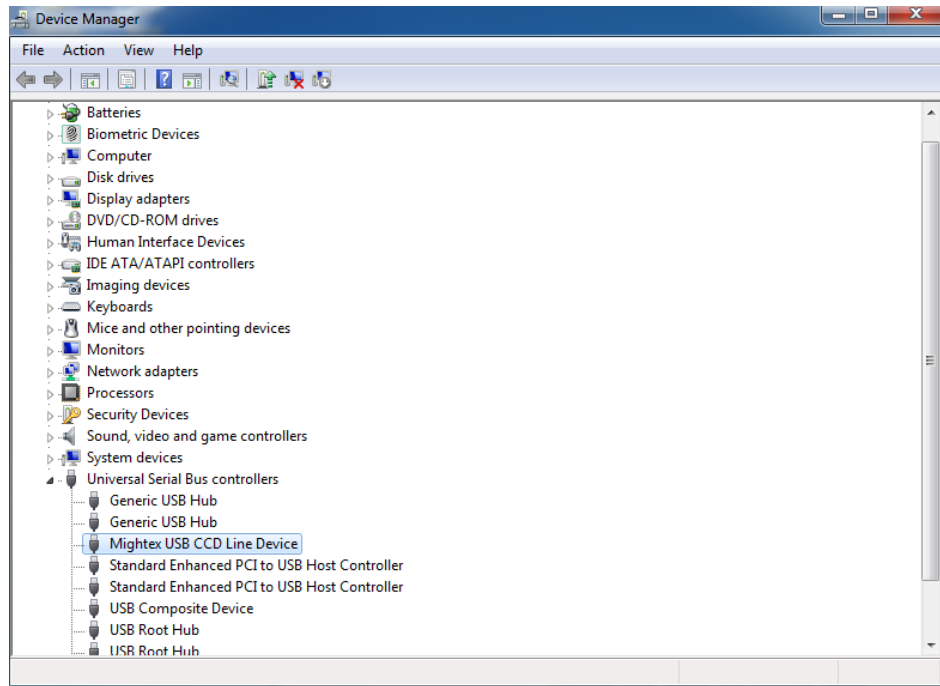
This application is developed with Delphi 5.0, if needed, the source code can be provided.

Software Installation

Driver Installation

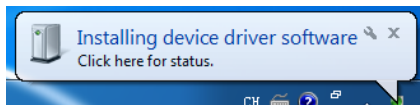
Mightex CCD Line Camera uses high speed USB2.0 port (480M) for data collection, USB 2.0 Enhanced Host controller MUST be present on host PC, user may check this by going to “Control Panel | System | Device Manager | Universal Serial Bus Controllers”, and the “USB Enhanced Host Controller” or “USB2 Enhanced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

**Mightex USB Device
USB2.0 controller**

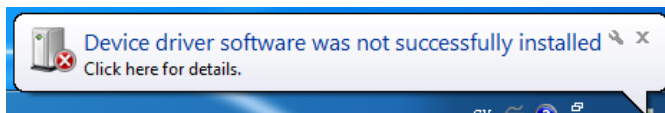


Windows Device Manager

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” and try to install driver automatically as following:

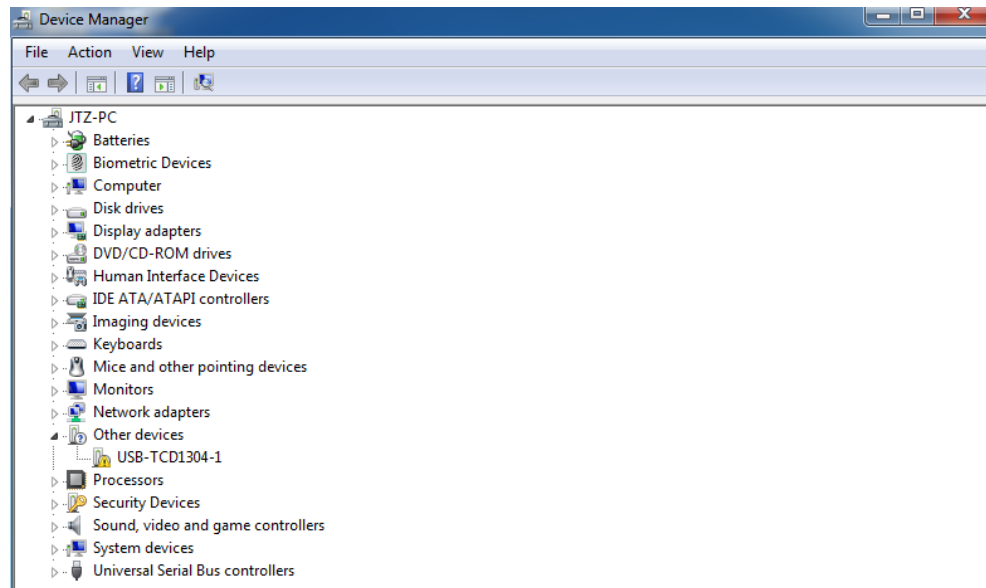


Windows will do all the installation (of the device driver) automatically, however, in many cases, Windows might not be able to install a proper driver and it may show:



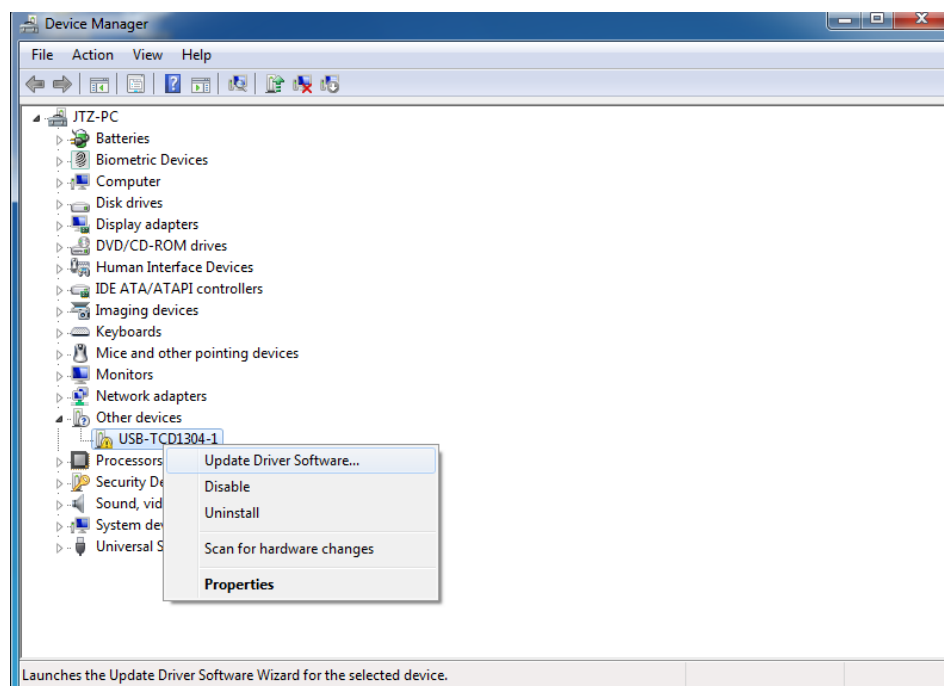
In such case, user has to install the driver manually as following:

- 1) User should go to the “Device Manager” with “Control Panel | System | Device Manager”, when the line camera is being plugged (in this example, the line camera is TCN-1304-U)

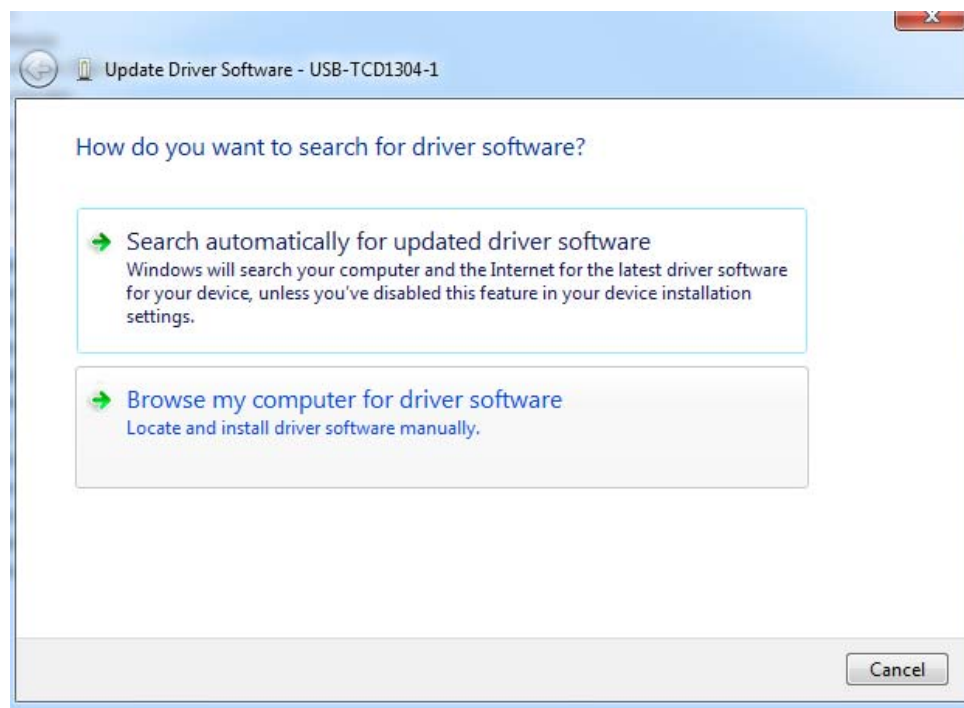


User can see the device “USB-TCD1304-1” is **not** with a correct driver installed.

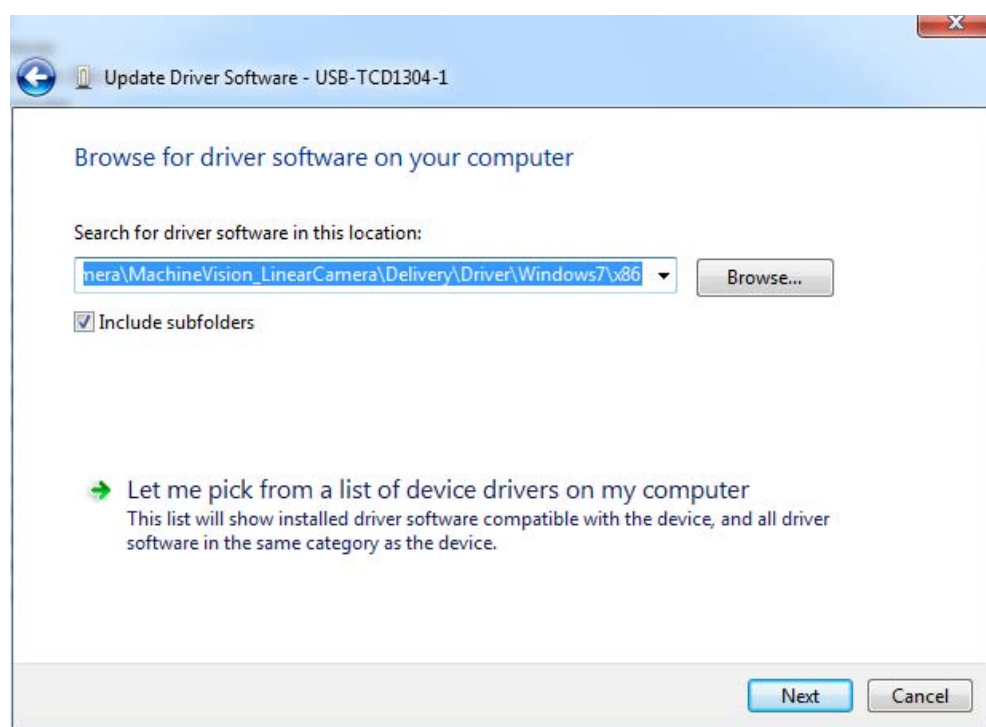
2). User can right click the “USB-TCD1304-1” device and click the “Update Driver Software...” in its popup menu.



3). When click it, it shows the following windows and user should choose the “Browse my computer for driver software”

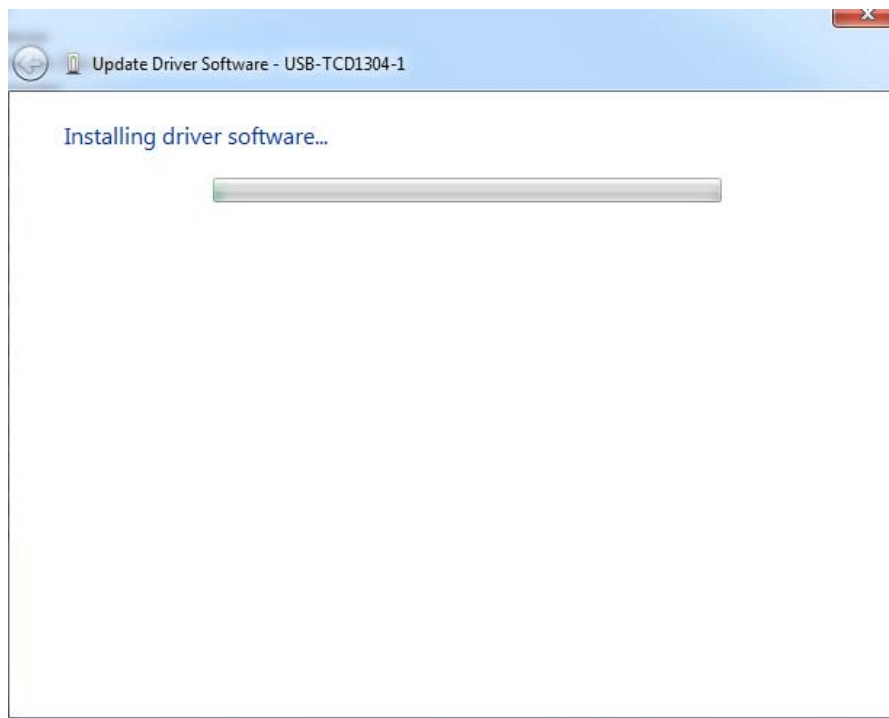


4). When clicking on the “Browse my computer for driver software”, windows will show

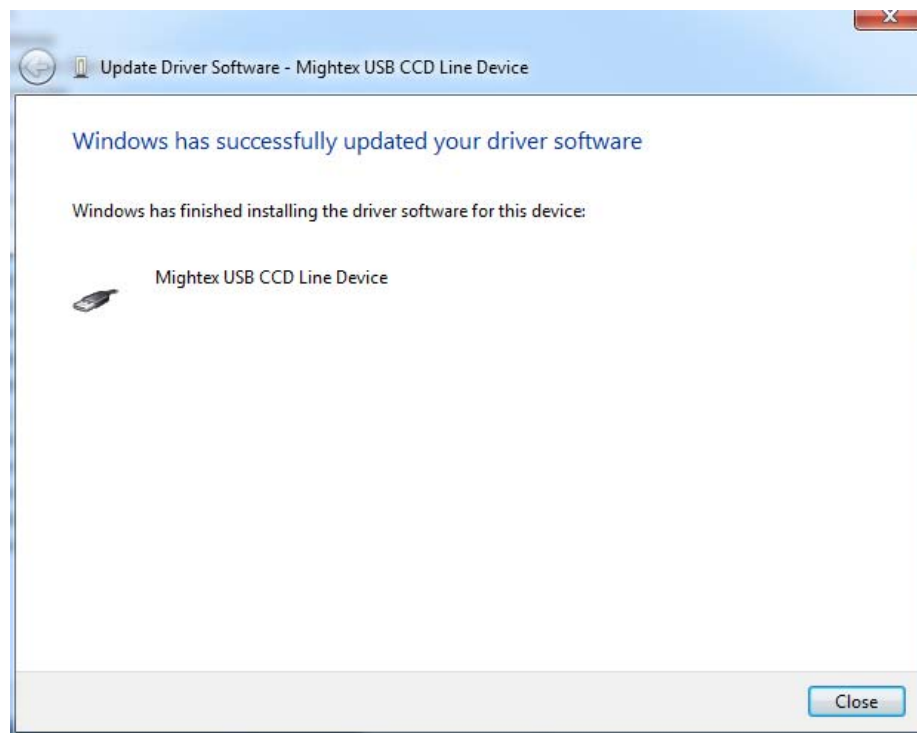


User should click the “Browse” button and go to the path (sub-dir) in which the proper driver is stored, note that the drivers (for different windows versions) are stored in the CD-ROM\drivers\ sub-dir, e.g. for Windows 7, Windows 8.x And Windows 10, the drivers are under CD-ROM\driver\Windows7, for 32bit windows version, user should use the Driver under \x86 sub-dir, for 64bit windows, user should use the driver under \x64 sub-dir.

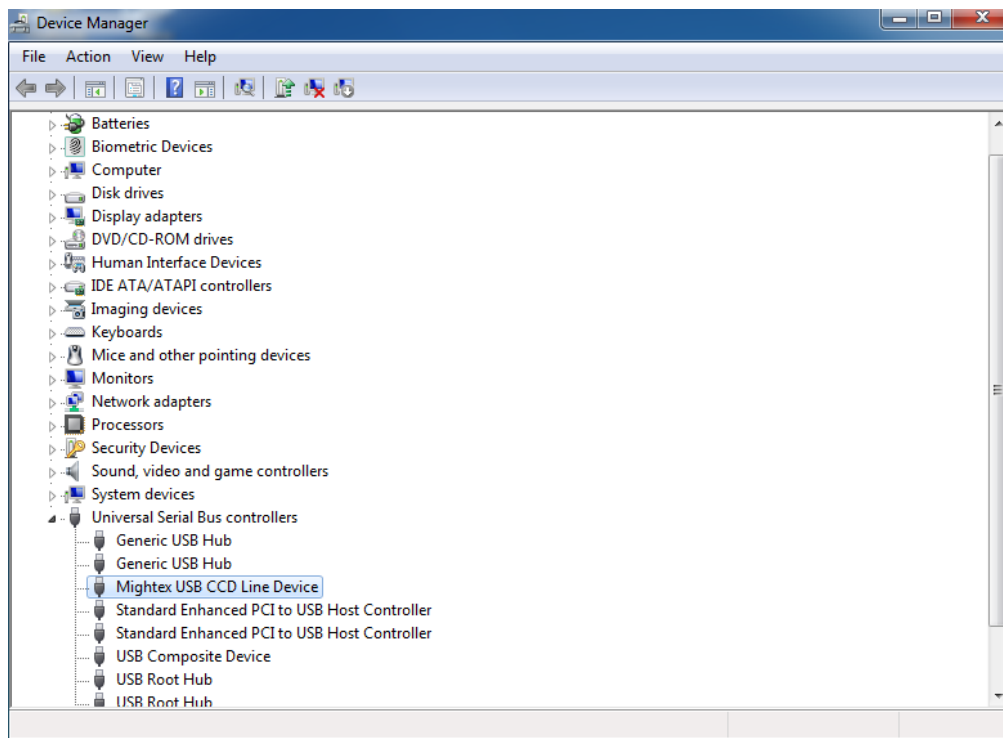
After browsing to the correct path (e.g. \driver\Windows7\x86 for 32bit Windows7, 8.x or 10), user can click “Next” Button and windows will show



That might take some time and then windows will show



5). After installation is completed, user can check the “Device Manager” again and it will show as following:



The “Mightex USB CCD Line Device” is under the “Universal Serial Bus controllers” node, this is the Mightex Line camera device with a driver correctly installed.

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.

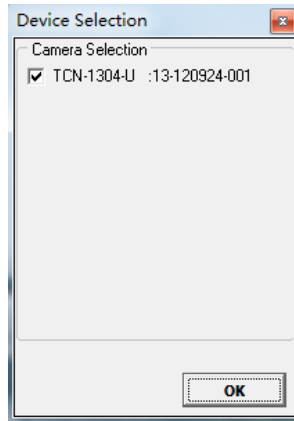
Note that the \Application sub-directory (and all its files) copied from CDROM might be with “Read-Only” attribute, user should remove the “Read-Only” attribute for this directory, user can do this on the property dialog, which shows up by right clicking the sub-directory, choose “property”.

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



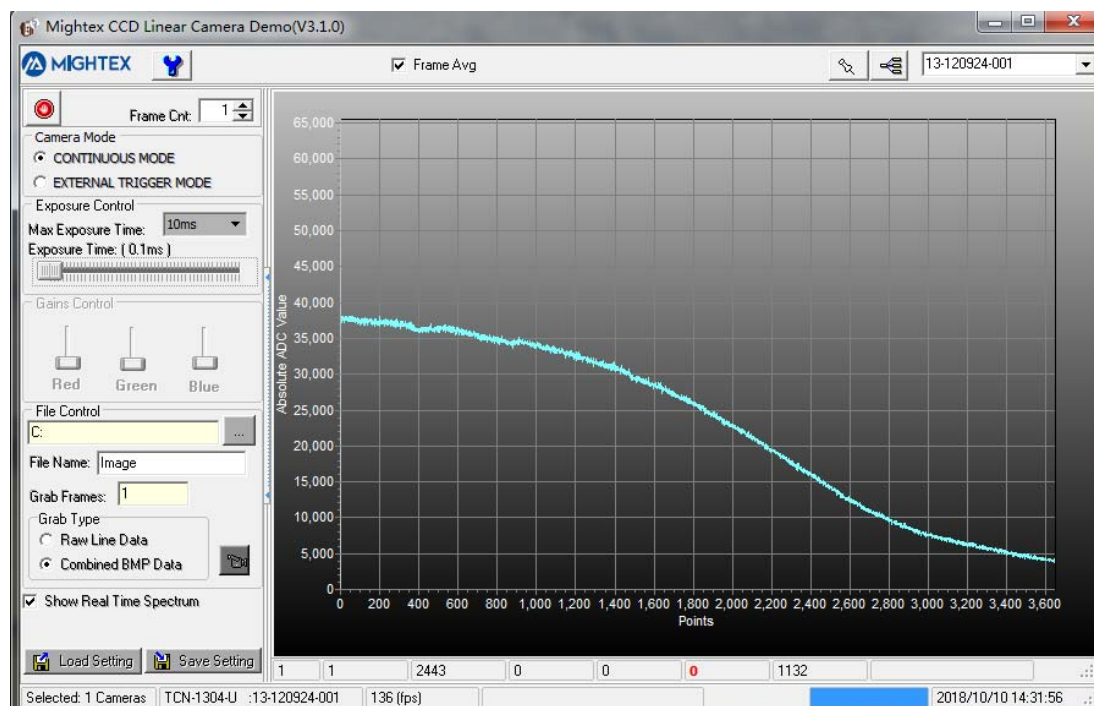
Note that the format of the each module is in “ModuleNo : SerialNo”, in the above example, there are two cameras attached to the USB in this example.



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

IMPORTANT: Only the checked camera will be put in the “working set” of the camera engine. While more than one cameras 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.

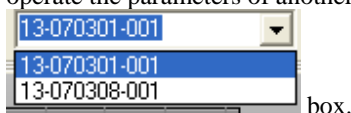
After click [OK] button, the main window of the application is shown (on next page).

Note that while both TCN-1304-U and TCN-1209-U devices are connected to PC, user should only add one type of device (either 1304 or 1209) to the working set (can be multiple devices of the same type), otherwise the camera engine can NOT be started.



User can use  or  to start and stop frame grabbing. Note that this is for the camera engine, which will affect all the cameras in the current working set.

While there're more than one cameras are selected, the combo-box at the right up corner allow user to select the camera to be set with the GUI, for example, there're two cameras in the "working set", they're 13-070301-001 and 13-070308-001, note that Camera engine is grabbing frames from both of them, but the current Main window is only for 13-070301-001. The frame chart is showing the real time frame data from this camera (13-070301-001) if the ☒ **Show Real Time Spectrum** is checked. The "Camera Mode" setting, "Exposure Control" and the "File Control" are only for this camera (13-070301-001). If user wants to operate the parameters of another camera (in this case, 13-070308-001), user should choose it from the



box.

For user wants to show spectrums from multiple cameras on screen simultaneously, it's recommended to use the SDK to achieve it.

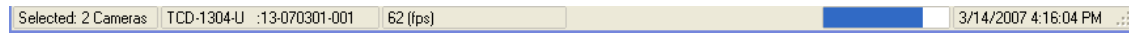
User might use this application to grab frames and save to a file, there're two kinds of files:

"Raw Line Data": each saved file contains one frame (in ASCII format) only, but user might define the frames (thus files) needed to be grabbed in **Grab Frames:** field.

"Combined BMP Data": User might define the grabbed lines in **Grab Frames:** field, and the software will save **ONE** bitmap file whose width is CCD width (e.g. 2048 for TCN-1209), and height it the defined lines (e.g. in this example, it's 2000, so the bitmap is a 2048x2000 image). Note in this case, the software will attach ".bmp" extension name to the user defined file name.

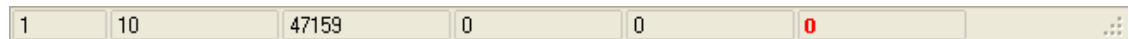
Note: For TCN-133A-U, there's a Gain control panel allowing user to set gain of the camera.

Note that there are two status bars which show the information of the current working set and the information of current frame:



Cameras in Current working set.	Current Camera for display	Frame rate for this Camera	System usage and Date/Time.
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Note that for TCN-1209-U, the minimum exposure time is 0.3ms, when user sets to 0.1ms or 0.2ms, the camera will use 0.3ms instead. For TCE-133A-U, the minimum exposure time is 0.1ms (100us), when user sets exposure shorter than that, the camera will use 0.06ms instead.





Camera ID	Exposure Time	Time Stamp	TriggerOccurred Occurred	Trigger Event Count	Over Saturated Flag
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Please refer to the SDK manual for the further descriptions of these items.

There are other three buttons on the control bar:




While the  button is used for user to reselect cameras in the “working set”, it will show the dialog which is the same as the one while the application starts...and user can select cameras to be added in camera engine. Note that while click the button and show the “Device Selection” dialog, the camera engine will be stopped automatically.

The  button is for operation of GPIO of the current selected camera (in our example, it's the camera 13-070301-001).

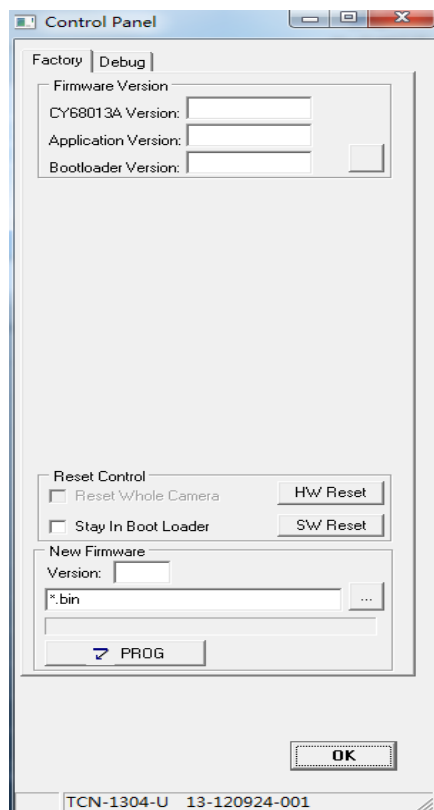


On this dialog, user can configure the 4 pins as Output or Input, for output pins, check the “Outx” box will set the pin to HIGH. For input pins, the “Inx” check box is checked while the input is HIGH. The [Auto Test] and [Simulate Trig] buttons are used for service purpose only.



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



For TCN-1304-U modal, we have the following window show up:


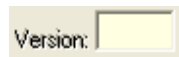



Click to button will get firmware version information from camera.

These two buttons are used for Reset the camera, they're mainly used for upgrading the firmware, please refer to the user manual for the details.

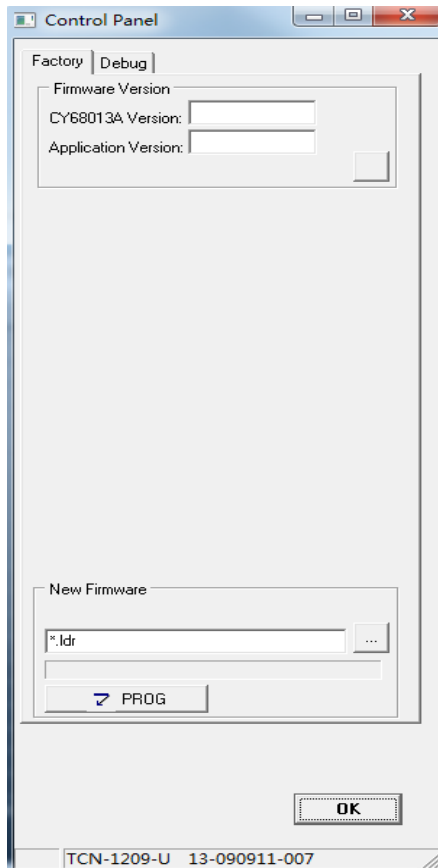
User can upgrade firmware with those controls, for details, please refer to the user manual.

For firmware upgrading, user should go this dialog (which will also stop grabbing the frame) and check the  **Stay In Boot Loader** checkbox and click the  **SW Reset** button, this will let the camera stay in boot loader and wait for new application to be downloaded. Then user can use

 to select the new firmware (*.bin file), the version of this file will be shown on  automatically. And user can click  button to start the downloading.

After downloading is successfully, user should close the application and power cycle the camera (plug off/on the camera from/to the USB port), that will activate the new firmware.

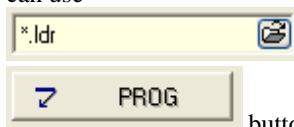
For TCN-1209-U modal, we have:



Click to button will get firmware version information from camera.

User can upgrade firmware with those controls, for details, please refer to the user manual.

For firmware upgrading, user should go this dialog (which will also stop grabbing the frame) and then user can use



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 device (unplug and plug the device from the USB port) this will activate the new firmware.

For TCN-133A-U/TCX-1024-U modal, we have:

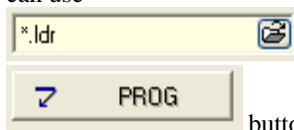


Click to button will get firmware version information from camera.

User can upgrade firmware with those controls.

For TCN-133A-U and TCX-1024-U/UF, before user update the CY68013A (with Cypress Tools), user should check the “Flash Write Allowed” box and click the [Set to Camera] button.

For firmware upgrading, user should go this dialog (which will also stop grabbing the frame) and then user can use



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 device (unplug and plug the device from the USB port) this will activate the new firmware.