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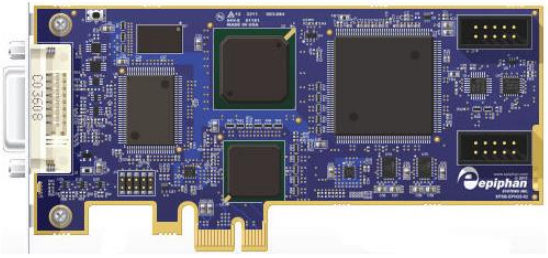
DVI2PCIe™ User Guide



Epiphan Technical Documentation

February 2017

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- Technical description of the signal source including resolution, refresh rate, synchronization, type of hardware.
- Complete description of the problem you are experiencing.

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1. Introduction

Epiphan Systems' DVI2PCIe™ is Epiphan's capture card internal frame grabber with a single-link DVI/VGA input. It is installed in a video capture workstation's PCI Express (PCIe) slot and transmits captured data to the video capture workstation over the PCIe bus.

DVI2PCIe can capture video from any single link DVI, unencrypted HDMI video, VGA, or BNC/component video source. Full HD can be captured at a capture rate of 30 frames per second for 1080p video and video sources at any resolution up to 1920x1200 are supported. The DVI2PCIe capture card driver is fully compatible with DirectShow in Windows, Video4Linux in Linux, and can be used in conjunction with any third party software.

Besides being able to capture from DVI, VGA, HDMI video sources, DVI2PCIe supports DisplayPort, Mini DisplayPort, and Thunderbolt sources using a converter cable, sold separately. Resolutions up to 1920x1200 are supported, with a minimum capture rate of 30 frames per second.

DVI2PCIe is part of Epiphan's complete line of video signal capture products. For more information about all of Epiphan's video signal capture products, please see the Frame Grabbers Overview on the Epiphan website.

1.1 Package Contents

Epiphan DVI2PCIe device package includes the following:

1. DVI2PCIe board (with tall PCIe bracket attached)
2. DVI cable
3. DVI-VGA cable
4. HDMI to DVI adapter

5. ½ bracket

Package contents for the DVI2PCIe is available on the DVI2PCIe specifications page on the Epiphan website.

2 Physical Attributes

2.1 System Hardware Features

The Epiphan DVI2PCIe frame grabber is a PCIe x4 card that includes a single DVI-I type connector and three activity LEDs. The DVI2PCIe card can be installed in a 4x, 8x or 16x PCIe slot on the motherboard of the video capture workstation.

Figure 1 DVI2PCIe Capture card

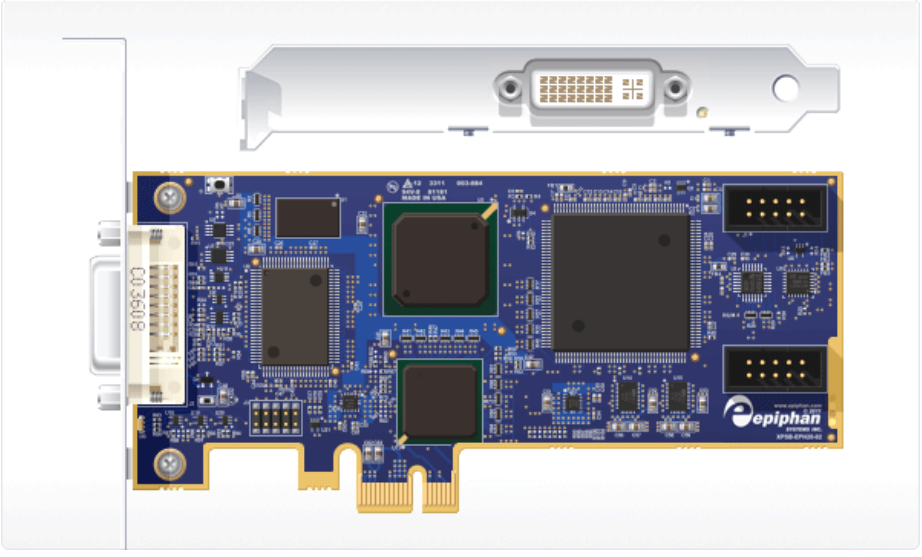


Figure 2 DVI2PCIe connectors and LEDs

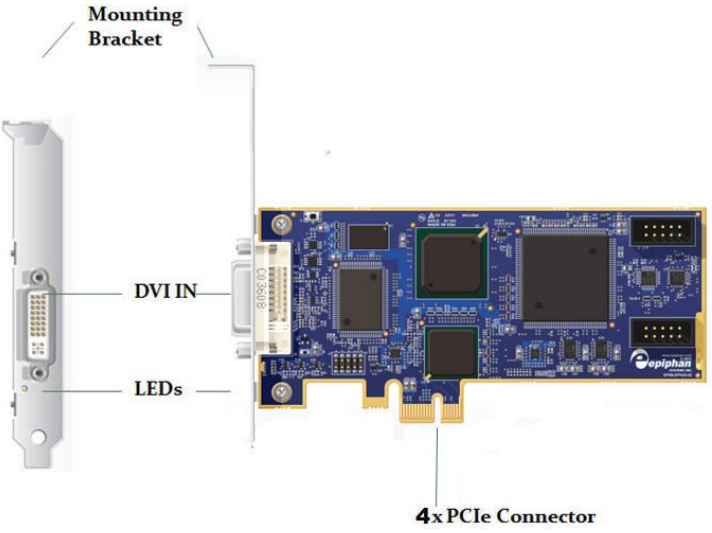
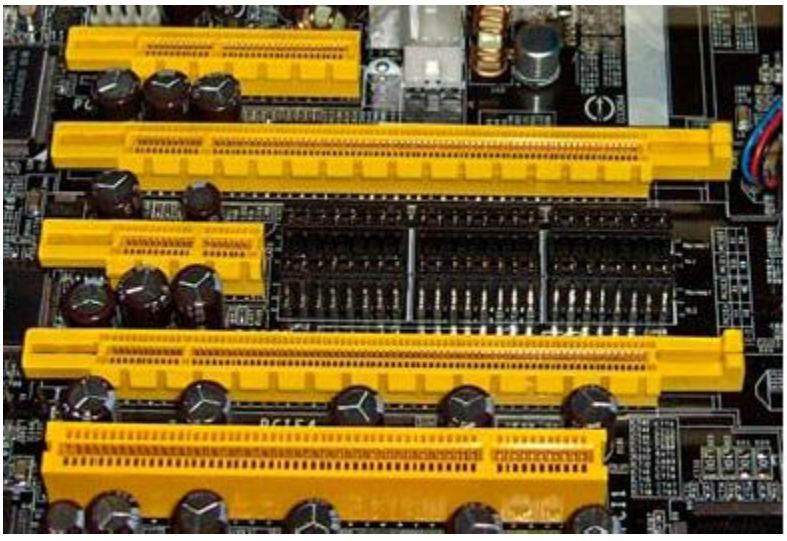


Figure 3 shows an example of different PCIe slots on a single PC motherboard.

Figure 3 PCIe slots (from top to bottom: 4x, 16x, 1x and 16x), compared to a traditional 32-bit PCI slot (bottom)



When installed, the DVI2PCIe card adds a single DVI IN port and three LED indicators on the back of the PC. You can connect a DVI source directly to this DVI IN port using a standard DVI cable. To connect a VGA source, use a VGA to DVI cable. To connect an HDMI source, use an HDMI to DVI adapter.

Table 1 LED Descriptions

Interface	Description
LEDs	**Red LED:** During operation the red LED blinks each time the DVI2PCIe captures an image. You can use the red LED as an indicator that the DVI2PCIe is capturing images. **Green and blue LEDs**: When the PC starts up the DVI2PCIe blue LED lights up. A few seconds later the green LED lights up. After about another 20 seconds the blue LED turns off, leaving the green LED on indicating that the device has started up and can start capturing images. During operation the blue LED blinks during the signal test operation and when the system tunes the parameters.

DVI In	Connect a DVI, VGA, or HDMI source to the DVI2PCIe card. See the DVI2PCIe Specifications on the Epiphan web site for information about the video inputs supported by the DVI2PCIe card.

2.2 Cables, Connectors and Adapters

The DVI2PCIe can be connected to a number of different types of equipment using a variety of cables, and adapters. This section describes a subset of connectors, cables and adapters that are known to be compatible with the DVI2PCIE.

2.2.1 VGA to DVI Cable

Connects a VGA source to the DVI2PCIE DVI port. This cable is included with the DVI2PCIe.

Figure 4 VGA to DVI Cable

2.2.2 DVI to DVI Cable

Connects a DVI source to the DVI2PCIe DVI port. This cable is included with the DVI2PCIe.

Figure 5 DVI to DVI Cable

2.2.3 HDMI to DVI Adapter

Connects an HDMI source to the DVI2PCIe DVI port. This adapter is included with the DVI2PCIe.

Figure 6 HDMI to DVI Adapter

2.2.4 *DisplayPort Cable*

Connects a source's DisplayPort to the DVI2PCIe DVI port.

Figure 7 DisplayPort Cable

2.2.5 *Mini DisplayPort Cable*

Connects a source's Mini DisplayPort to the DVI2PCIe DVI port.

Figure 8 Mini DisplayPort Cable

*2.2.6 **Thunderbolt Port Cable***

Connects a source's Thunderbolt port to the DVI2PCIe DVI port.

Figure 9 Thunderbolt Port Cable

3 System Requirements

Epiphan's DVI2PCIe internal frame grabber has the following hardware and software requirements:

Video source	any VESA-compatible VGA, DVI, or HDMI source
Video capture workstation	4x PCIe slot (4x, 8x or 16x are supported)
Processor frequency	2 GHz or faster 32-bit (x86) or 64-bit (x64) processor
RAM memory	2 GB RAM (32-bit and 64-bit)
Available hard disk space	16 GB available hard disk space (32-bit) or 20 GB (64-bit)
Video capture workstation OS	Windows 7, 8, 10 (i386, x64); Linux (x86, x86_64); A list of precompiled drivers is available on the Software Download page.

To download the latest versions of the DVI2PCIe's drivers and application, browse to http://www.epiphan.com/products/dvi-frame-grabbers/dvi2pcie/software-download/.

4 Installing DVI2PCIe

This section describes how to install the DVI2PCIe and to connect a DVI/VGA/HDMI source to it.

Note: It is recommended that you download and install the latest drivers for the video capture workstation motherboard from the motherboard manufacturer's website after installing the DVI2PCIe internal frame grabber into the video capture workstation.

To connect the DVI2PCIe card, in addition to the frame grabber itself you need:

- A video capture workstation with an available 4x, 8x or 16x PCIe slot.
- A DVI/VGA/HDMI video source.
- For VGA and HDMI video sources, the appropriate cable or adapter to connect the video source input to the DVI IN port.
- An antistatic wrist strap to protect sensitive electronic components.

4.1.1 To install a DVI2PCIe Frame Grabber:

This procedure describes how to install the DVI2PCIe in a video capture workstation.

1. Shut down and power off the video capture workstation.
2. Disconnect all cables from the video capture workstation.
3. Open the system unit to expose the PCIe slots (usually located at the back of the PC).
4. Attach the antistatic wrist strap to the metal casing of the PC power supply and to your wrist according to the instructions supplied with the wrist strap.
5. Select a PCIe slot and remove the corresponding filler panel from the PC slot opening.
6. Holding the DVI2PCIe card by the edges, align the card edge connector with the PCIe slot.

7. Slide the card mounting bracket into the small slot at the end of the PCIe opening.
8. Applying even pressure at both corners of the card, push the card down until it is firmly seated in the slot.

Caution: Do not use excessive force when installing the card into the PCIe slot. You might damage the card's PCIe connector. If the card does not seat properly when you apply even pressure, remove the card and carefully reinstall it.

9. Secure the card mounting bracket to the system unit using a screw at the top of the mounting bracket.
10. Detach the wrist strap and close the system unit.
11. Power on the video capture workstation.
12. Install the DVI2PCIe drivers and application as described below.

5 Installation Steps for the Windows Video Capture Workstation

Follow the step-by step procedures provided in this section if you are going to use a Windows PC as the video capture workstation in order to view and record images captured by a DVI2PCIe frame grabber.

Note that you should install the drivers and application on the Windows video capture workstation **after** installing the DVI2PCIe in a PCIe slot of the Windows video capture workstation.

5.1 To Install the Windows Drivers and Capture Application

The drivers and application software includes the Epiphan device drivers and the capture application.

1. Find the latest Windows drivers and Epiphan Capture software. Browse to http://www.epiphan.com/products/dvi-frame-grabbers/dvi2usb-3-0//software-download/. Then scroll down to the Windows section of the download page.
2. Download the latest version of the drivers and application that will run on the video capture workstation.
   Make sure you note the download destination folder.
3. Unzip the downloaded file. Right-click on the .zip file and choose **Extract All**.
4. Select the Setup Utility (setup.exe) from the list of extracted files and follow the prompts to install the software.

The Windows drivers and application software are now installed. If you have installed the drivers and application software, the video capture workstation after powering on should automatically recognize the frame grabber and install drivers for it.

5.2 Upgrading to the Latest Windows Software Version

From time to time Epiphan makes new versions of all Epiphan Frame Grabber software available from the Epiphan web site. To confirm that you have the latest video capture application version, select the Check for Updates command from the Help menu.

Note: Check for Updates will only recommend an update if Epiphan recommends that you install a new version. This will happen if the latest version contains significant bug fixes or enhancements. If a new video capture application version only contains minor changes, Check for Updates may not recommend that you install a new version.

In most cases you can upgrade the Epiphan software on your Windows video capture workstation by using normal procedures for your operating system to download the latest version and install it without uninstalling the previous version. If you have problems upgrading Windows software, see the detailed driver update instructions and install/uninstall instructions available from the Windows section of the Download page.

5.3 Finding Software Updates

To find the latest versions of all Epiphan software for Windows, go to http://www.epiphan.com/downloads. You can also browse to the download page for your DVI2PCIe product. To do so, browse to http://www.epiphan.com and select **Products > DVI Frame Grabbers > DVI2PCIe**. On these pages you will find the most recent versions of:

• this Epiphan DVI2PCIe User Guide.
• the Epiphan USB device driver and video capture application for Windows 2000, Windows XP, and Windows Vista.

5.4 Troubleshooting a Windows Installation

If you experience any difficulty viewing captured images with the Windows capture application, review the following items prior to contacting technical support.

If you experience any difficulty viewing captured images with the Windows capture application, review the following items prior to contacting technical support.

Confirm that the DVI2PCIe is properly installed in its PCIe slot and confirm that the Windows Device Manager displays the DVI2PCIe status under **System Devices > PCIe Bus**. Finally, observe the behavior of the frame grabber LED indicators.

If, after following the installation steps, you are still having problems, close all applications and restart the video capture workstation. When the video capture workstation has started up, open the Windows Device Manager to confirm that the frame grabber is detected.

6 Linux Video Capture Workstation Software

Epiphan provides the Epiphan USB device driver and the Epiphan capture API for Linux. Epiphan does not provide a video capture application for Linux. However, the USB device driver is compatible with Video4Linux so you can use Video4Linux compatible applications to receive and process captured images. You can also use the Epiphan Linux SDK to write your own custom video capture application that receives captured images from the Epiphan capture API. The following software components operate on a video capture workstation running Linux:

- The Epiphan USB device driver
- Video4Linux
- The Epiphan capture API
- V4L custom video capture applications

6.1 The Epiphan USB Device Driver

The Linux Epiphan USB device driver receives images from an Epiphan DVI2PCIe and delivers the images to the Epiphan capture API and to Video4Linux. Before delivering the images the Epiphan USB device driver also performs image adjustment to improve the quality of the image. Image adjustments include setting the sampling phase, PLL adjustments, and horizontal shift. The USB device driver can also change the color depth of the captured image before sending the image to the video API. For example, if the DVI2PCIeis capturing the frames at a color depth that is different than that required by the video capture application, the USB device driver converts the images to the required color depth.

The Epiphan USB device driver may not be available for your version of Linux. Epiphan does not provide source code for the Epiphan USB device driver. But you can contact Epiphan if you need an Epiphan USB device driver compiled for a specific

Linux kernel version or kernel setting. Using the Epiphan software development kit (SDK) you can also create custom USB device drivers that incorporate the functions that you need.

6.2 Video4Linux

Video4Linux (V4L) is a Linux video capture API. The Epiphan USB device driver can send captured images directly to Video4Linux. This means that any Video4Linux-compatible application can receive captured images. You can use a Video4Linux-compatible application to record a series of captured images as a video in the video format supported by the Video4Linux application. You can also create your own custom Video4Linux-compatible video capture application to record captured images from Video4Linux.

6.3 The Epiphan Capture API

The Epiphan Capture API also receives captured images from the Epiphan USB device driver. It is optimized for processing Epiphan DVI2PCIe captured images. The Epiphan Capture API analyzes individual images, performs on-device cropping, and handles video mode changes. It is an alternative to using Video4Linux to capture images on Linux video capture workstations. You can use the Epiphan software development kit (SDK) to create your own custom video capture application to record captured images from the Epiphan Capture API.

6.4 V4L Custom Video Capture Applications

Epiphan does not provide a video capture application for Linux. However, you can use Video4Linux-compatible applications to perform many video capture operations such as recording images or video, copying, printing and saving images, or broadcasting images across the Internet. You can also use the Epiphan Linux SDK to create your own custom video capture application. The SDK along with some example

applications is available from the downloads page of the Epiphan Web Site. To download the latest version, browse to http://www.epiphan.com/products and locate the downloads page for your product.

7 Connecting DVI2PCIe to a Video Source

This section describes how to connect a DVI/VGA/HDMI source to the DVI2PCIe.

Make sure that the following steps are completed:

1. The frame grabber and the capture application are properly installed on the video capture workstation.
2. The video capture workstation is powered on.

Now connect the DVI2PCIe to the video source using the provided cables. If necessary, you can use a high-quality VGA or DVI splitter to split the VGA or DVI signal between an external monitor and the frame grabber in order to control the output signal quality.

You can connect a DVI source directly to the frame grabber's DVI In port using a standard DVI cable, Figure 5 DVI to DVI Cable.

To connect a VGA source, use a VGA to DVI cable, Figure 4 VGA to DVI Cable.

To connect an HDMI source, use an HDMI to DVI adapter, Figure 6 HDMI to DVI Adapter.

8 Windows Video Capture Application

This chapter describes common functions and features of the Epiphan Capture Tool. It supports the Windows 2000, XP, Vista and 7 versions. This chapter assumes that you have followed the installation and connection instructions in this Guide. To start using this chapter you should have:

- A video signal source started.
- A video capture workstation running Windows with connected DVI2PCIe.
- The DVI2PCIe drivers and application installed on the video capture workstation.

8.1 Starting the Windows Video Capture Application

To start the application, from the Windows Start menu select **Start > Epiphan Capture Tool**. The application starts up and looks for the DVI2PCIe frame grabber connected to your PC.

If the DVI2PCIe is operating, the capture application should find it. The image being captured by the DVI2PCIe should immediately appear on the application display.

If the DVI2PCIe device is not capturing images, the application displays the following message: **No signal**.

As the application starts, the following messages may appear:

- **Capture device not found** - as the application attempts to connect with DVI2PCIe device.
- **Detecting Video Mode** - as the application connects to a device and then determines the video mode of the device.

- **Tuning Capture Parameters** - as the application synchronizes and tunes capture settings and image adjustments.
- **No Signal Detected** - if the application connects to the DVI2PCIe that is not connected to an active video source.

If the application successfully connects to and synchronizes with the DVI2PCIe device, it begins displaying captured images.

8.2 Pausing, Copying, Saving, and Printing Images

Once the application is displaying images captured by the frame grabber, you can pause, copy, save, and print the current image.

8.2.1 To pause and resume the image capture:

1. Select **Pause Capture** from the **Capture** menu or from the toolbar click  .
2. While image capture is paused, the application stops receiving new images from the device. Pause also pauses video recording and image recording. While paused, you can save, print, and copy the captured image.
3. To resume image capture select **Resume Capture** from the **Capture** menu or from the toolbar click  again. You can use the following procedure to copy the image currently displayed by the application to the video capture workstation clipboard.

8.2.2 To copy a snapshot of the current image:

1. Select **Copy** from the **Edit** menu or select  from the toolbar. You can also use the key combination **CTRL+C**. The current image is copied to the clipboard.
2. Paste the image into a document or other application as a bitmap image. The image is pasted as a device independent bitmap image.

8.2.3 To save a snapshot of the current image as an image file:

You can use the following procedure to save the current image as a .bmp, .png, or .jpg file on the video capture workstation. You can optionally pause the image capture before saving an image.

1. Select **Save** from the **File** menu or from the toolbar select  or use the key combination **CTRL+S**.
   The status bar shows the location and name of the saved file.
   The first time you save an image, the **Save As** dialog appears and you can specify the file name, file type, and location of the saved image file.
2. When you select **Save** again, the application saves the new image with the same file name and location, overwriting the previously saved file. You can select **Save As** to save the image with a different file name, file type, or location or use the key combination **CTRL+Shift+S**.
3. You can open the saved image file with most bitmap image editing applications.

8.2.4 To print a snapshot of the current image:

You can use the following procedure to print the current image on any printer that is connected to the video capture workstation. You can optionally pause the image capture before printing an image.

1. Select **Print** from the **File** menu, select  from the toolbar or use the key combination **CTRL+P**. The current image is sent to the default printer set in your computer. You can select **Print Setup** from the file menu or use the key combination **CTRL+Shift+P** to select a different printer and set printer options.

Note: You can also configure the application to invert colors for printing. From the **Tools** menu select **Options,** then select the **Display** tab and select **Invert colors for printing**. By reversing or inverting the colors of an image, the colors are made

complementary of the original value. After performing picture color inversion, black becomes white, yellow becomes blue, and red becomes aqua.

8.3 Recording Captured Images

You can record captured images as a video file or as a series of image files.

8.3.1 To record captured images as a series of image files

Before recording captured images as a series of image files, you must configure the recording options by selecting **Options** from the **Tools** menu, then selecting the **Recording** tab, and finally selecting **Record** as **Images**. You should also select the image file format and other image file settings. Refer to **Configuring Recording Options**.

1. Select **Start Recording** from the **Capture** menu, from the toolbar select  or use the key combination **CTRL+R**. As images are captured by the frame grabber, they are recorded as a series of image files according to the image file settings on the **Recording** tab (**Tools** – **Options)**. The Status bar shows the name and location of the last saved file. You can pause recording by using the key combination **CTRL+U,** by selecting **Pause** from the **Capture** menu or  from the toolbar. You can stop recording by selecting repeatedly **Stop Recording** from the **Capture** menu or  from the toolbar. When you stop recording images, the status bar displays the number of image files saved.

8.3.2 To record captured images as a video file:

Before recording captured images as a video file, you must configure the recording options by selecting **Options** from the **Tools** menu, then selecting the **Recording** tab, and finally selecting **Record** as **Video**. Refer to **Configuring Recording Options**.

1. Select **Start Recording** from the **Capture** menu or from the toolbar select

 .

2. In the **Save as** dialog box enter the file name, select the location for saving the video file, and click **Save**. You can record video in AVI format only.

As images are captured by the frame grabber, they are recorded to the video file. The status bar shows the name and location of the video file. The status bar also displays the amount of time that the video has been recording and the number of frames (or images) being recorded.

When the size of the video file reaches the AVI file size limit, refer to the **AVI file size limit** field description in the **Configuring Recording Options section** on how this is set.

Based on the configurable behavior in that same section, the DVI2PCIe user interface does one of the following:

- stops recording
- starts a new video file and continues recording (the **Configuring Recording Options** section describes how to specify the file name)
- overwrites the original video file and continues recording.

You can pause a recording by selecting **Pause Capture** from the **Capture** menu or  from the toolbar.

You can stop recording by selecting **Stop Recording** from the **Capture** menu or  from the toolbar.

When you stop recording, the Status bar shows the name and location of the saved video file, the amount of time that the video file was recording, and the number of frames or images that were recorded. For example: **Wrote c:\temp\example.avi (85 sec, 464 frames)**.

8.4 Menus

This section describes the commands available from the following Windows DVI2PCIe user interface menus:

8.4.1 File Menu

Use the File menu commands to save and print the current image displayed by the DVI2PCIe user interface and to exit the DVI2PCIe user interface.

Save	Save a snapshot of the current image to a file on the video capture workstation. Select a location for the file and select a file format. You can save the snapshot as a bitmap (*.bmp), portable network graphics (*.png), or JPEG (*.jpg) file. The first time you select **Save** after starting the DVI2PCIe user interface, you are prompted for a file name and you can change the file location and format. After saving the first file, every time you select **Save**, the video capture software saves a snapshot using the same file name in the same location replacing the previously saved file. When you select **Save**, the status bar shows the location and name of the saved file.
Save As	Save a snapshot of the current image to a file on the video capture workstation. Using **Save As** you can enter a file name and select a file location and format. **Save As** resets the file name, location, and file format used by the **Save** command and the **Save snapshot** toolbar button. When you select **Save As** the status bar shows the location and name of the saved file.
Print Setup	Configure printer settings used when you select the **Print** command or the **Print snapshot** toolbar button. You can also configure the DVI2PCIe user interface to invert colors for printing. By reversing or inverting the colors of an image, the colors are made complementary of the original value. After performing picture color

	inversion, black becomes white, yellow becomes blue, red becomes aqua. From the **Tools** menu select **Options**, then select the **Display** tab and select **Invert colors for printing**.
Print	Print a snapshot of the current image using the configured printer.
Exit	Close the DVI2PCIe user interface.

*8.4.2 **Edit Menu***

From the Edit menu you can copy a snapshot of the current image. You can also use the key combination **CTRL+C.**

Copy	Copy a snapshot of the current image to the video capture workstation clipboard. You can paste this image into a document or other application as a bitmap image.

*8.4.3 **View Menu***

Use the commands on the **View** menu to control the parts of the DVI2PCIe user interface window that are displayed.

Toolbar	Change the size of the toolbar icons or hide the toolbar. You can select small, large, or huge icons. You can also hide the toolbar. If the toolbar is hidden, select an icon size to display the toolbar.
Status Bar	Enable or disable displaying the status bar.
Full Screen	Enable full screen mode, **Ctrl+F**.
Image Only	Change the DVI2PCIe user interface to operate in the **Image only** mode. In the **Image only** mode the DVI2PCIe user interface displays the captured image only. The window borders, toolbar, status bar and menu bar are not displayed. Scroll bars are displayed if required.

	The **Image only** mode can be useful for applications such as integrating the DVI2PCIe user interface into a custom system. You can still use all of the shortcut keys to save and print images, start and stop recordings, and to exit from the **Image only** mode. You can always press **Alt+F4** to exit from the DVI2PCIe user interface. You can also use the **--borderless** command line option to start the DVI2PCIe user interface in image only mode. Refer to **Windows command line options**.

8.4.4 Capture Menu

Use the commands on the Capture menu to start, stop or pause the capturing and recording of images. From the Capture menu you can also select the device that the DVI2PCIe user interface receives captured images from if you have more than one DVI2PCIe or other Epiphan frame grabbers connected to the network. You can also view image adjustment settings and VGA mode settings for the selected device.

The record functions on the Capture menu record the current image as a video or as a series of consecutive image files. Select **Options** from the **Tools** menu and use the settings on the **Recording** tab to configure what the DVI2PCIe user interface records.

Start recording	Start recording the current image to a video file or a series of image files.
Pause capture	Pause or resume image capturing. If you select pause, the DVI2PCIe user interface stops displaying newly captured images and the image captured when you selected Pause is displayed. Pause also pauses the recording of video and the saving of image files. Select pause again to resume the displaying of captured images and to resume recording.
Select device	You can use **Select Device** or the key combination **Ctrl+D** to choose the device that the DVI2PCIe user interface receives captured images from. The command finds and lists available

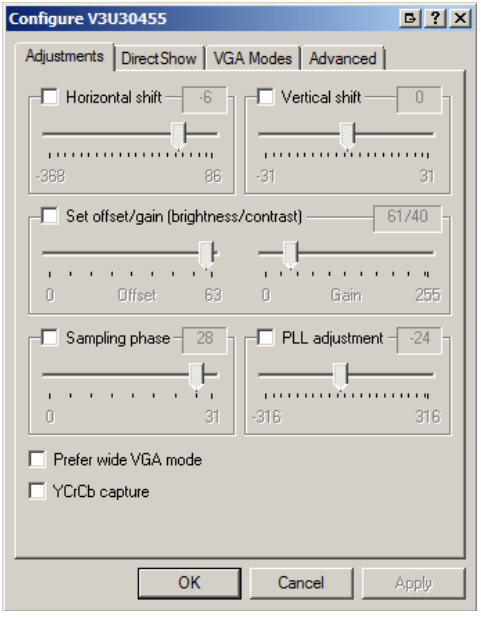
	DVI2PCIe devices. The list displays the serial number, device type, captured image resolution and frequency or status and location of each device. You can also use this command to select the device to configure with the **Configure Device** command.
Connect network device	Connect a device recognized on the network.
Disconnect network device	Disconnect current device.
Recent network devices	Displays a list of recently viewed devices.
Enable audio capture	Not used.
Audio input device	Not used.
Play captured audio	Not used.
Configure device	You can view image adjustments for the selected device. You can configure image adjustments from the Web admin interface or from the Network Discovery Utility. You can also select and configure VGA modes for the selected device. See the **Configure Device** section for more information regarding this function.

8.4.5 Configure Device

This window allows you to perform various image adjustments and select a required VGA mode. The following section illustrates and describes what can be configured using which tab.

Adjustments tab:

Figure 10 Adjustments tab

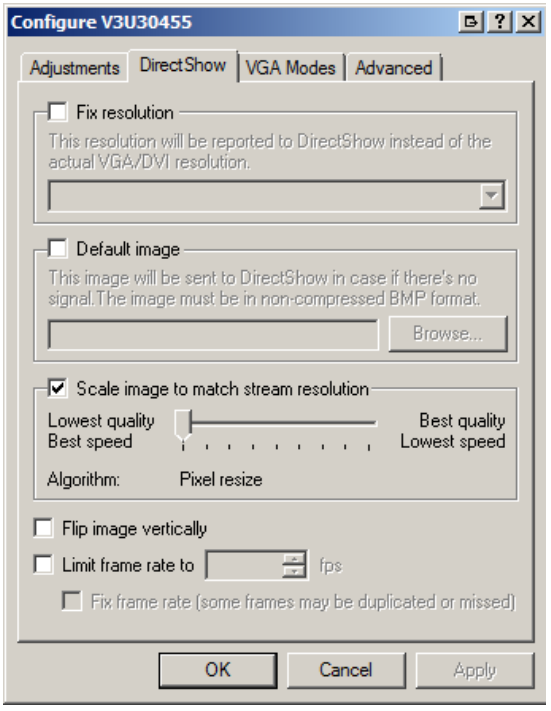


Horizontal shift	Configure horizontal shift to offset the captured image position. For example, a captured image shifted slightly to the right (horizontally) can be corrected with minor adjustments to the horizontal shift settings. Increasing or decreasing the value entered in the Horizontal Shift field shifts the image to the right or left.
Vertical shift	Configure vertical shift to offset the captured image position. For example, a captured image shifted slightly downward (vertically) can be corrected with minor adjustments to the vertical shift settings.

	Increasing or decreasing the value entered in the Vertical Shift field shifts the image up or down.
Set offset/gain (brightness/contrast)	The offset and gain settings control the image brightness and contrast respectively. Increasing the offset control causes the image to become darker. Increasing the Gain control gives the image more contrast.
Sampling phase	This setting adjusts the vertical synchronization properties of the image. You may need to change it when there is a repetitive distortion or blurriness on the horizontal axis of the image. Adjust the setting in small steps until a sharper image is displayed.
PLL adjustment	This setting is used to squeeze or stretch the image horizontally.
Prefer wide VGA mode	This checkbox, when enabled, allows Wide Aspect Ratio VGA modes to be displayed by the video capture application window. The Epiphan USB device driver may not be able to determine whether the video source is sending a wide video mode signal. You can select this option if your video source uses a wide video mode to make sure that the Epiphan USB device driver selects a wide video mode.
YCrCb capture	Select this checkbox when you need to capture analogue component video with the YCrCb encoding.

DirectShow tab:

Figure 11 DirectShow tab



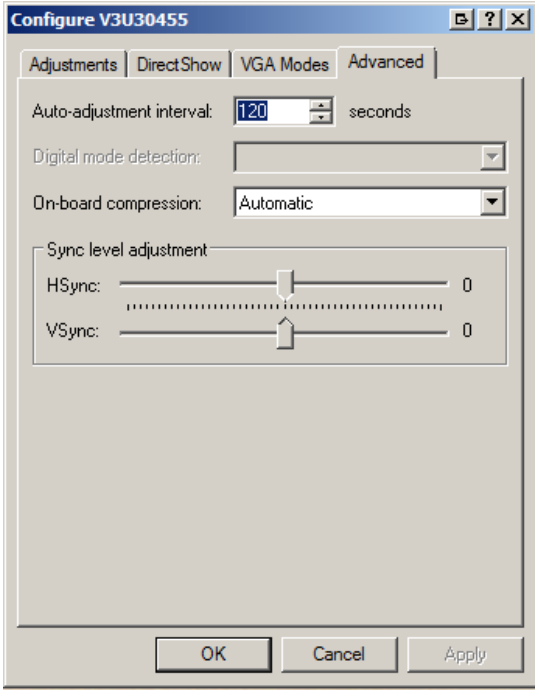
Fix resolution	Resolution that is reported to DirectShow
Default image	Image sent to DirectShow if there is no signal
Scale image to match stream resolution	Use the slider to scale the image
Flip image vertically	Select the checkbox to flip the image
Limit frame rate to	Specify the frame rate limit
Fix frame rate	Select the checkbox to fix frame rate

VGA Modes tab

VGA Modes tab is not applicable to the DVI2USB 3.0 device.

Advanced tab:

Figure 12 Advanced tab



Auto-adjustment interval	Specify the interval value
Digital mode detection	- Automatic - Single Link - Dual Link
On-board compression	Select his checkbox to enable on-board compression of the incoming signal
Sync level adjustment	Adjust sync level (HSync and VSync)

8.4.6 ***Tools Menu***

Use the Tools menu to customize basic DVI2PCIe user interface operating settings.

Web Broadcasting	Use this command to broadcast the captured signal, refer to Chapter 5, **Web Broadcasting**, for more details.
Upload EDID to device	Use this command to upload an extended display identification data (EDID) file to your device. Refer to the section **EDID**. Extended display identification data (EDID) is a data structure provided by a digital display to describe its capabilities to a video source. It is what enables a modern personal computer to know what kinds of monitors are connected to it. EDID is defined by a standard published by the Video Electronics Standards Association (VESA).
Read EDID from device	Use this command to read an extended display identification data (EDID) file from the device.
Measure VGA Mode	When requested by Epiphan technical support, you can use this command to display low-level information about the VGA mode that you are capturing with your Frame Grabber. You can copy this information into an email to send it to Epiphan technical support.
Options	Configure video recording and display settings. See the section **Capture, Recording, and Display Options** for more information.

8.4.7 Help Menu

Use the Help menu to check for updates and to display information about the version of the DVI2PCIe user interface that you are running.

Note: **Check for Updates** function will only recommend an update if Epiphan recommends that you install a new version. This will happen if the latest version contains significant bug fixes or enhancements. If a new DVI2PCIe user interface version only contains minor changes or if you are running the current version, **Check for Updates** may not recommend that you install a new version and will not display any information.

8.5 Toolbar

The toolbar can be used to save, print, or copy the current captured image; to start, pause, and stop the recording of the currently captured image. You can use the **Toolbar** command on the **View** menu to change the size of the toolbar icons or to hide the toolbar. You can select small, large, or huge icons. If the toolbar is hidden, you can select an icon size to display the toolbar.

	Save a snapshot of the current image captured by the DVI2PCIe user interface to a file on the video capture workstation. Select a location for the file and select a file format. You can save the snapshot as a Windows bitmap (*.bmp), portable network graphics (*.png), or JPEG (*.jpg) file.
	Print a snapshot of the current image to the configured printer.
	Copy a snapshot of the current image to the video capture workstation's clipboard. You can paste this image into a document or other application as a bitmap image.
	Start or stop recording the images being captured by the DVI2PCIe user interface. When you start recording, the status bar displays RECORDING and also displays information about the image or video file

	being recorded. When you stop recording, the status bar displays information about the saved image files or video file.
	Pause or resume image capturing. If you select pause, the DVI2PCIe user interface stops displaying captured images. Pause also pauses the recording of a video and the saving of image files. Select pause again to resume the displaying of captured images and to resume the recording of a video.
	Not used.
	Enable web broadcasting of the captured signal. Refer to Chapter 5, Web Broadcasting, for details.

8.6 Status Bar

The status bar displays information about the DVI2PCIe user interface:

- The location and file name of image or video files saved while recording.
- Recording status. “RECORDING” means that the DVI2PCIe user interface is recording captured images.
- The data rate is the rate (in MB/s, KB/s, Mbps, and Kbps) of data transfer to the DVI2PCIe user interface when it is capturing images.
- The frame rate that the DVI2PCIe user interface is operating at in frames per second (fps).
- The number of frames or images that the DVI2PCIe user interface has displayed since the DVI2PCIe user interface was last started. The number of frames is only visible if you select **Number of captured frames** on the status bar from the **Display** tab of the **Options** dialog. The number of frames stops incrementing and starts flashing if you have paused the image capture. Use the **Reset counter button** to reset the number of frames from the **Display** tab of the **Options** dialog.
- The VGA mode and refresh rate of the video source.

8.7 Capture, Recording, and Display Options

This section introduces the options available from the **Tools** menu when you select the **Options** command. These options control how the DVI2PCIe user interface records images, displays images. This application is common to a number of different products.

Note: The functionalities located on the **KVM** tab are not applied to the DVI2PCIe product.

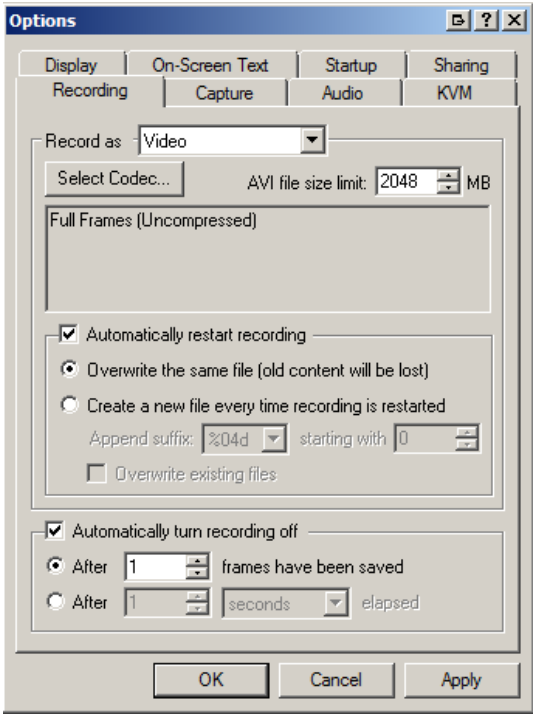
8.7.1 Configuring Recording Options

To control how the DVI2PCIe user interface records captured images, select **Options** from the **Tools** menu and then select the **Recording** tab. You can record captured images as a series of consecutively saved graphic files or as a video file. How the DVI2PCIe user interface records images when you start recording from the Toolbar or the capture menu depends on how you set the recording options.

On this tab you can select a codec which is used to encoding the captured video stream. Codecs are not included in the software package provided by Epiphan for the DVI2PCIe frame grabber. You must download them before using the frame grabber. For example, you can download an x264 codec pack - a free library for encoding H.264/MPEG-4 AVC video streams.

If your computer is running under the 32-bit OS, download 32-bit codecs. For the 64-bit OS, download 64-bit codecs.

Figure 13 The Recording tab of the Options window



You can select the following options:

Record as	Specify whether video or images are recorded.
Select Codec	Select the codec that is applied for compressing the signal.
AVI file size limit	Specify the size limit of the .AVI file where the data is recorded to.
Automatically restart recording	Select the checkbox to restart recording automatically. This checkbox enables the five fields below.
Overwrite the same file (old content will be lost)	After the video file size limit is reached, delete the original file and start recording a new video

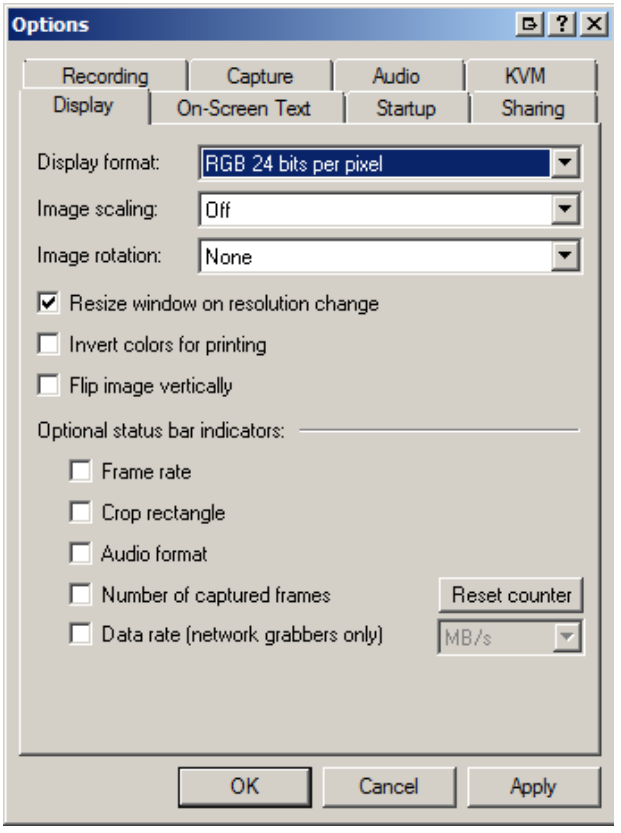
	file with the same name. If you select this option the original saved video data is lost.
Create a new file every time recording is restarted	After the video file size limit is reached, start a new video file. You can use the append suffix setting to create a unique name for the new file or files.
Append suffix…	When you start a video recording session you are prompted to enter a file name. If the file exceeds the AVI file size limit, the DVI2PCIe user interface starts another file named with the original file name appended with a sequential numeric suffix. Use the append suffix options to specify the format of this suffix. Each suffix starts with a % sign and can include the following characters: 02, 04, 06, or 08 indicates the number of digits to use in numbering the suffix. You can specify 2, 4, 6, or 8 digits. “d” means decimal numbers are used in the suffix. “X” means hexadecimal numbers are used in the suffix. The suffix %02d means the saved file names would end with two-digit decimal numbers, for example: 01, 02, 03, ..., 10, 11 and so on. The suffix %04X means the saved file names would end with 4-digit hexadecimal numbers, for example: 0001, 0002, 0003, ..., 000A, 000B and so on.
…starting with	Enter the starting number used in the file name suffixes in decimal format. If the suffixes

	include hexadecimal numbering this decimal number is automatically converted to hexadecimal. For example, if you named the video file VID, set the suffix to %02d and set starting with to 1, the video file names would be VID.avi, VID01.avi, VID02.avi, etc.
Overwrite existing files	If you select overwrite existing files, files are saved according to the video file recording options. Existing files are replaced with the new files. If you do not select overwrite existing files, the file number in the suffix of the file name is incremented until a file can be saved without overwriting an already saved file.
Automatically turn recording off	Specify under what conditions recording turns off automatically.
After … frames have been saved	Enter a number of frames.
After … elapsed	Enter a number of time units elapsed.

8.7.2 Configuring Display Options

To change display options from the **Tools** menu, select **Options** and then select the **Display** tab.

Figure 14 The Display tab of the Options window



The following display options are available:

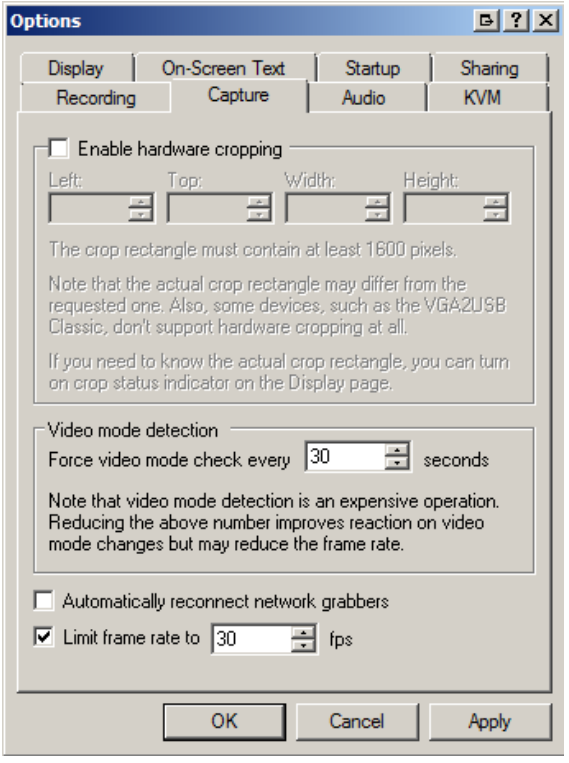
Display format	Specify the format video or image are displayed in
Image scaling	Specify whether the image should be scaled and how
Image rotation	Specify whether the image should be rotated and how
Resize window on resolution change	Select the checkbox to resize window when the image resolution is changed

Invert colors for printing	Select the checkbox to change dark colors to light colors and light colors to dark colors
Flip image vertically	Flip the image at its vertical axis
Select the check boxes below to add optional indicators to the status bar…	
Frame rate	Displays frame rate
Crop rectangle	Displays crop status
Audio format	Not used
Number of captured frames	Displays number of captured frames
Data rate (network grabbers only)	The data rate is the rate (in MB/s, KB/s, Mbps, and Kbps) that the DVI2PCIe user interface is receiving data from the device capturing images.

8.7.3 *Configuring Capture Options*

Use this tab to configure multiple capture options.

Figure 15 The Capture tab of the Options window



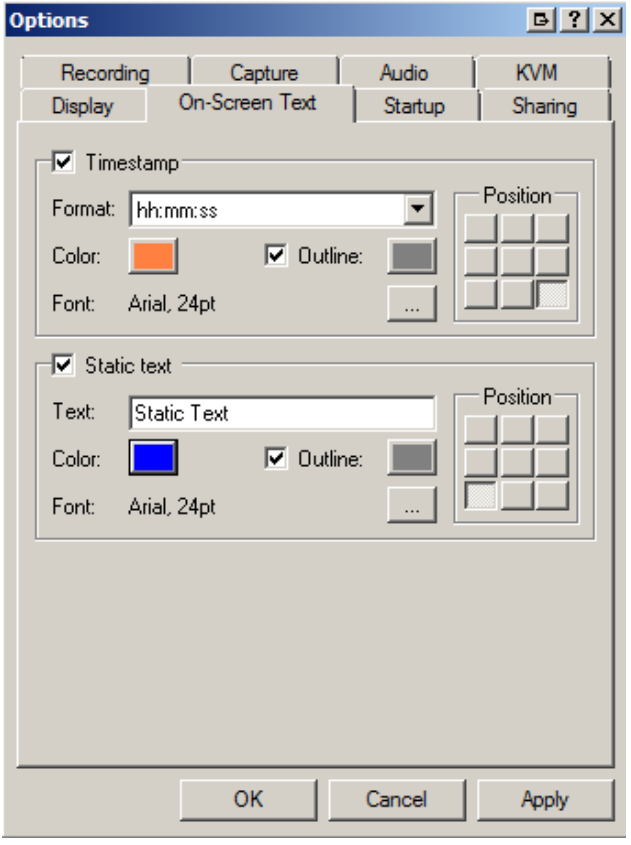
Enable hardware cropping	Select this checkbox to enable cropping functionality
Left, Top, Width, Height	Enter the values for the crop rectangle
Force video mode check every … seconds	Specify how often the application indicates the type of the video signal being received. Note that although frequent video mode detection decreases reaction

	time when changing video mode, it may reduce the frame rate.
Automatically reconnect network grabbers	Select this checkbox to restore connection with the remote frame grabbers in case the connection has been lost. Otherwise the system connects to the local frame grabber, if one exists or displays a warning “No frame grabbers found”. In this case you need to restore connection manually.
Limit frame rate to … fps	Set up the maximum frame rate for the video signal

8.7.4 Setting On-Screen Text Parameters

By using this tab you can timestamp the captured video and add some static text.

Figure 16 The On-Screen Text tab of the Options window

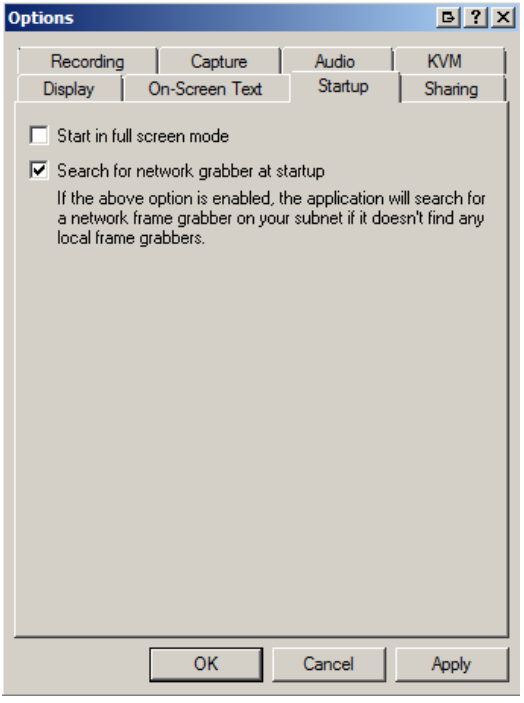


Timestamp	Select this checkbox to enable setting timestamp parameters
Static text	Select this checkbox to enable setting static text parameters
Format	Specify the timestamp format
Color	Set the color
Font	Set the font and the font size
Position	Set the position for the timestamp or text
Outline	Add an outline to the timestamp or text

8.7.5 *Configure Startup*

Use this tab to specify what actions the application should perform during startup.

Figure 17 The Startup tab of the Options window

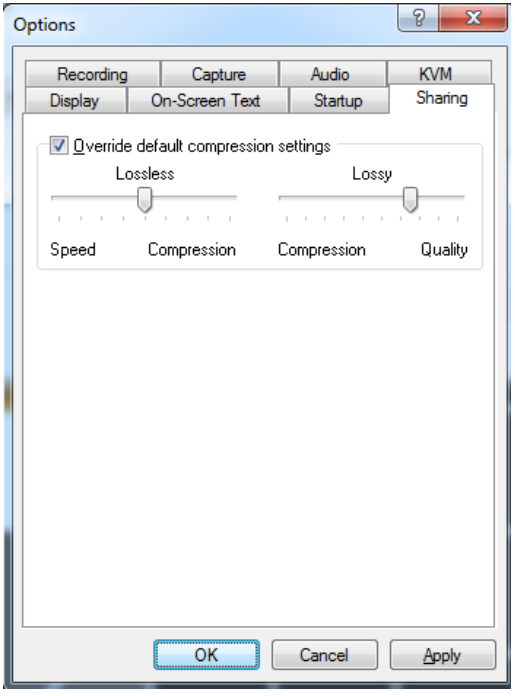


Start in full screen mode	When the application starts, it resizes to the current resolution of the screen
Search for network grabber at startup	Not used

8.7.6 *Sharing*

Use this tab to change web broadcasting compression. Select **Override default compression settings** and adjust the **Lossless** and **Lossy** settings.

Figure 18 Web Broadcasting Compression Options



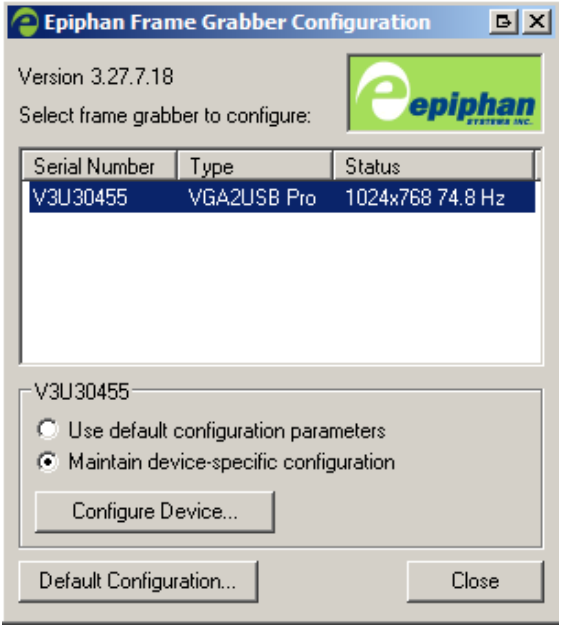
Lossless compression	Lossless compression compresses the images being broadcasted without reducing image quality. Increasing lossless compression can use a considerable amount of the video capture workstation's CPU resources.
Lossy compression	Lossy compression compresses the images being broadcasted by reducing image quality. Lossy compression is not as CPU intensive as lossless compression.

9 Configuring DVI2PCIe from the Windows Control Panel

Your DVI2PCIe can be configured from the Windows Control Panel using the **Epiphan Frame Grabbers** icon - 

. Here you can verify the device's serial number, type and status as well as setup configuration parameters.

Figure 19 Frame Grabber Configuration Window



To edit the default configuration of the device:

1. Select a frame grabber you want to configure.
2. Click the **Default Configuration** button.
   It is similar to the Tools > Options > Configure command in the Epiphan Capture Tool.
3. Edit parameters.

4. After editing click OK and select the **Use default configuration parameter** radio button to activate settings. Then click **Close**.

To maintain device-specific configuration:

1. Select the **Maintain device-specific configuration** radio button.
2. Click the **Configure Device…** button. It is similar to the Tools > Options > Configure command in the Epiphan Capture Tool.
3. Edit parameters.
4. After editing click OK and select the **Maintain device-specific configuration** radio button to activate settings. Then click **Close**.

10 Web Broadcasting

You can use the information in this chapter to share or broadcast the images captured by your DVI2PCIe over the Internet. Note that web broadcasting is available only on video capture workstations running Windows.

To broadcast captured images over the Internet, the video capture application sends captured images to an Epiphan web broadcasting portal. Each web broadcast session is labelled with the serial number of the DVI2PCIe that is capturing the images. The card's serial number appears on the video capture application title bar.

Web broadcasting sends the currently captured image only. You cannot broadcast saved recordings and the DVI2PCIe's web broadcasting feature does not include sound.

Note: The web broadcasting feature included with the Epiphan video capture application is intended as a demonstration only and has a 10-hour time limit.

It is important to note that the images broadcasted over the Internet are not secure. Potentially anyone can view the web broadcast if they know the correct URL. The web broadcasting supported by the video capture application is a relatively limited feature. Epiphan's broadcasting products provide a richer web broadcasting feature set.

10.1 To set the display format for web broadcasting

1. Open the DVI2PCIe capture tool application on a video capture workstation running Windows.
2. From the **Tools** menu select **Options**.
3. Select the **Display** tab.
4. Set **Display Format** to **RGB 24 bits per pixel**.

5. Optionally limit the frame rate to reduce the number of images sent over the Internet reducing the amount of bandwidth being used. Depending on your requirements you may not have to change any other display settings. Refer to section, **Configuring Display Options** for all available display settings.
6. Select OK to save your changes.

10.2 Starting a web broadcasting session

No special setup is required for web broadcasting except that the video capture workstation must be able to connect to the Internet. The video capture workstation can be connected directly to the Internet or to a LAN that is connected to the Internet.

Before broadcasting captured images over the Internet you need to set the display format to 24 bits per pixel. Please refer to the previous section **To set the display format for web broadcasting**.

To start a web broadcast:

1. Connect the Epiphan Frame Grabber to the video source that you want to broadcast and to the video capture workstation.
2. Start the Epiphan capture tool application.
3. Select **Web Broadcasting** from the **Tools** menu or from the toolbar select  .

   The **Start web broadcasting** dialog appears.

Figure 20 Start Web Broadcasting Dialog

10.3 Viewing a web broadcasting session

You can view a web broadcasting session from a web browser running under Windows 2000, XP, Vista and 7 versions. The following browsers are now supported:

- Internet Explorer
- Firefox
- Opera
- Chrome
- Safari.

Mobile browsers are also supported if the mobile device is compatible with Java SE. The working station and web browser should be running the most recent version of the Java plug-in. You can download the plug-in's latest version from http://www.java.com.

To view a web broadcast:

1. Open a web browser and browse to the required URL, for example: http://www.vga2web.com/D2P00000. This URL is supplied by the vga2web application as shown on the Figure 20 Start Web Broadcasting Dialog and can be advertised to potential viewers of the broadcast.

   A second web browser window appears displaying the message **Applet is loading. Please wait…** The broadcasted image should appear within 10 to 20 seconds.

The first web browser window in which the web broadcast URL address was entered, displays a message indicating that the web presentation has been opened in a new window. You can also use the first window to refresh the broadcast or re-open the broadcast window if it is accidentally closed.

10.4 Changing web broadcasting compression and performance

Normally you should not need to change the default web broadcasting compression settings. The default settings reduce the amount of Internet bandwidth used for web broadcasting by applying a combination of lossless and lossy compression to the images being broadcasted.

To change the web broadcasting compression, from the **Tools** menu of the DVI2PCIe capture tool select **Options** and then select **Sharing**. Select **Override default compression** settings and adjust the **Lossless** and **Lossy** settings.

10.5 Troubleshooting web broadcasting performance

Here are three typical reasons for adjusting web broadcasting compression:

- If you have a slow Internet connection or if viewers of the web broadcasts notice delays you can increase lossless or lossy compression to reduce Internet bandwidth usage.
- If viewers of the web broadcast notice poor image quality you can reduce the amount of lossy compression.
- If the video capture workstation CPU usage is too high during web broadcasts or if viewers of the web broadcasts notice delays and you have determined that the delays are not caused by low Internet bandwidth. The delays could be caused by high CPU usage on the video capture workstation resulting in the video capture workstation not being able to process all image

data. Lossless compression increases CPU usage, so you can reduce CPU usage during web broadcasting by reducing lossless compression.

Note: You cannot change web broadcasting compression during a web broadcast. You must stop the broadcast, adjust the settings and then start the broadcast again.

Changes made to default web broadcast compression settings are only visible to viewers of the web broadcast. Changing these settings does not change how the video capture application displays, records, or prints captured images.

11 Advanced Topics

11.1 EDID

Extended display identification data (EDID) is data provided by a video display device (usually a monitor) to describe its capabilities to a video source. The video source uses the EDID to determine the capabilities of the monitor and, therefore, to determine the resolution, color depth and other settings that the monitor will accept.

11.1.1 About EDID

EDID is defined by a standard published by the Video Electronics Standards Association (VESA). The EDID includes manufacturer name, product type, phosphor or filter type, timings supported by the display device, display size, luminance data and (for digital displays only) pixel mapping data. EDID is crucial for DVI sources but mostly ignored by VGA sources.

When you connect a DVI2PCIe to a video source, the video source sees the DVI2PCIe as a monitor. Just like a monitor, the DVI2PCIe contains EDID that is used by the video source to determine the video signal to send to the DVI2PCIe.

Usually you would operate a DVI2PCIeusing the factory installed default EDID. However, in some cases when you connect a DVI2PCIe to a video source, the video source may operate using video settings that you do not want it to operate at. For instance, you can control the video source output settings by uploading a custom EDID file to the DVI2PCIe. The EDID information in the file restricts the video signal that can be accepted by the DVI2PCIe. For example, you can upload a custom EDID file to your DVI2PCIethat reports that the DVI2PCIeonly operates at 1040x768. When the video source reads the EDID from the DVI2PCIe, the video source will reset to operate at 1024x768 as set in the EDID.

You can obtain custom EDID files from Epiphan Support. You can also download custom EDID files for DVI2PCIe frame grabber from the frame grabber product page of the Epiphan web site. This page contains custom EDIDs for single video resolutions (for example, 640x480 only, 800x600 only, and 1024x768 only) for each DVI2PCIe. This page also contains default EDIDs for each DVI2PCIe. You can use the custom EDIDs to restrict the video resolution of the video source connected to the DVI2PCIe. You can use the default EDIDs to return your DVI2PCIe to normal operation.

11.1.2 Changing the EDID on your Frame Grabber

Use the following steps to upload a new EDID to your DVI2PCIe. The uploaded EDID is permanently installed in the DVI2PCIe and the DVI2PCIe will always share this EDID with the video source.

1. Download an EDID file from the Epiphan web site or obtain an EDID file from Epiphan Support.
2. Disconnect the DVI cable from the DVI2PCIe. Keep the DVI2PCIe connected to the video capture workstation USB port.
3. From the video capture application Tools menu, select Upload EDID and select the EDID file.
4. Wait for the EDID update to complete. This can take several minutes.
5. Reconnect the DVI cable to the DVI2PCIe.
6. Set the required resolution on the video source. You may need to disable/re-enable or reset the DVI port.

11.1.3 An EDID example

In this example, a user was viewing the video output from a system using a flat panel monitor. The monitor displayed video images at a screen resolution of 640x480. When the user replaced the flat panel monitor with a DVI2PCIe, the system changed to produce video images at a screen resolution of 720x400.

It turned out that the video source preferred to output 720x400, but because the original monitor did not support 720x400, the video source was forced to operate at 640x480. The DVI2PCIe supported 720x400 so the system changed to this resolution when the DVI2PCIe was connected to it.

The user wanted to return the video source to operating at 640x480 but could not manually adjust the screen resolution. To solve the problem, Epiphan created a custom EDID for the DVI2PCIethat excluded support for 720x400. When the user uploaded the custom EDID to the DVI2PCIe, the video source returned to operating at 640x480.

11.2 Windows command line options

You can use the following command line options to control how the Windows video capture application starts up. You can add as many command line options as you want in any order. All command line options must start with two dashes. Separate command line options with spaces.

--borderless	Start the video capture application in image only mode. You can press Esc to exit from image only mode.
--sn <sn>	To specify which Frame Grabber to use if more than one Frame Grabber is connected to the PC. Similar to the Capture menu Select Device command. <sn> is the serial number of the Frame Grabber.
--hs <#>	Set the horizontal shift*. The range is -100 to 100.
--vs <#>	Set the vertical shift*. The range is -80 to 80.
--phase <#>	Set the sampling Phase*. The range is 0 to 31.
--pll <#>	Set the PLL adjustment*. The range is -50 to 50.
--offset <#>	Set the offset (brightness)*. The range is 0 to 63.
--gain <#>	Set the gain (contrast)*. The range is 0 to 255.
--noesc	Enter this parameter so that you can disable exiting image only mode by Pressing the Esc key. You can

	always press Alt+F4 to exit from the video capture application.
--topmost	To keep the video capture application window on top.
"*" – Refer to the **Configure device** section for more details.	

11.2.1 Creating a Windows Shortcut that Uses Command Line Options

You can use video capture application command line options by creating a Windows shortcut to the video capture application executable file and editing the shortcut to add command line options. In the following procedure, the video capture application executable file v2ugui2.exe has been installed in the folder C:\Program Files\DVI2USB30:

1. Open Windows Explorer and navigate the following path:
   C:\Program Files\DVI2USB30
2. Right click on the file v2ugui2.exe and select Create Shortcut. Windows creates a shortcut file that, depending on your Windows settings, may be named "Shortcut to v2ugui2.exe.lnk". The ".lnk" may not appear if Windows does not display file extensions. You can change the name of this file and copy it to another location if required. Don't change the file extension.
3. Right click on the shortcut file and select Properties.
4. Edit the Target field and add command line options after the closing quote. For example, to add the --topmost command line option:
   "C:\Program Files\DVI2USB30\v2ugui2.exe" –topmost
   For example, to add --topmost and --borderless, set the horizontal shift to -67, and the vertical shift to 10:
   "C:\Program Files\DVI2USB30\v2ugui2.exe" –topmost --borderless --hs -67 --vs 10
5. Select OK to save your changes to the shortcut.
6. Double-click on the shortcut to start the video capture application with the command line options.

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February 2017

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