PLEORA TECHNOLOGIES INC.

eBUS Player

eBUS SDK Version 4.0

User Guide

Pleora Technologies

Document Number

EX001-017-0009 Version 2.0, 7/2/14

Table of Contents

Chapter 1

About this Guide

This chapter describes the purpose and scope of this guide, and provides a list of complimentary guides.

The following topics are covered in this chapter:

What this Guide Provides

This guide provides in-depth details about setting up and using the eBUS Player software application to control your GigE Vision or USB3 Vision compliant video transmitters (cameras) and receivers.

Related Guides

The *eBUS Player User Guide* is complemented by the following guides:

Table 1: Related Guides

Guide	Details	Consult this guide when...
eBUS Player Quick Start Guide	Provides introductory information to familiarize you with eBUS Player and provides initial setup steps.	You are using eBUS Player for the first time and want information about performing common tasks.
vDisplay HDI-Pro External Frame Grabber User Guide	Provides you with the information you need to efficiently set up and start using a vDisplay HDI-Pro External Frame Grabber to transmit images to a display monitor.	You want to add a vDisplay HDI-Pro External Frame Grabber to your system, or want to change the configuration settings of a vDisplay HDI-Pro External Frame Grabber that is already part of your system.
Vision SDK to eBUS SDK Migration Guide	Provides information about migrating vision system applications from Pleora's legacy Vision SDK to its new eBUS SDK.	You are migrating an existing system that is based on the Vision SDK to one based on the eBUS SDK.
iPORT™ Embedded Video Interface User Guides and *iPORT External Frame Grabber User Guides*	Provide you with the information you need to efficiently set up and start using an iPORT embedded video interface or external frame grabber to capture images from a camera.	You want to add an iPORT embedded video interface or external frame grabber to your system, or want to change the configuration settings of an embedded video interface or external frame grabber that is already part of your system.
iPORT Advanced Features User Guide	Provides you with the information you need to configure Pleora's powerful, advanced video interface features, which allow you to control and synchronize the external devices in your vision system solution.	You want to configure your system to trigger, route, time, and add data to the general purpose inputs and outputs (GPIO) signals that interface to camera heads and industrial sensors. You want to use the device's Programmable Logic Controller (PLC).

Chapter 2

About eBUS Player

eBUS Player, part of the Pleora Technologies eBUS™ SDK, is a sample application that allows you to control the parameters of GigE Vision and USB3 Vision compliant devices by providing access to the GenICam-compliant XML files built into all GigE Vision and USB3 Vision compliant devices. The XML file provides access to the GigE Vision and USB3 Vision device features, which are controlled with the GenICam API and a GenICam node map.

eBUS Player allows you to save GenICam XML information retrieved from a device; you can also load the saved GenICam XML file information to a device.

Not just a controller, eBUS Player also receives and allows you to view streaming data. While viewing the image data, you can use eBUS Player to adjust the image color and white balance, and save images and device configuration settings.

You can use the tools in eBUS Player to determine the optimal settings for your Vision system.

As you become more familiar with GigE Vision, USB3 Vision, and GenICam, you can continue to control your GigE Vision and USB3 Vision devices using eBUS Player, or you can build your own software application using the eBUS SDK.

Ensure that you have installed version 4.0 (or later) of the eBUS SDK with eBUS Player on the computer.

The following topics are covered in this chapter:

GigE Vision and USB3 Vision Support

eBUS Player provides the flexibility to communicate with both GigE Vision devices and USB3 Vision devices. As you work with eBUS Player, you will notice that the available options in the user interface vary, depending on the type of device to which eBUS Player is connected.

eBUS Player can communicate with GigE Vision devices using either a direct Ethernet connection or through a GigE switch. For USB3 Vision devices, eBUS Player uses a direct USB 3.0 connection.

Installing and Launching eBUS Player

The eBUS Player application is installed with the eBUS SDK. Follow the installation wizard prompts to install the eBUS SDK on your computer. Two separate installation packages are available for the Windows® operating system: 32-bit and 64-bit.

You can access installation files from the Pleora Support Center at www.pleora.com.

System Requirements

Ensure the computer on which you install the eBUS SDK meets the following recommended requirements:

- At least one Gigabit Ethernet NIC (if you are using GigE Vision devices) or at least one USB 3.0 port (if you are using USB3 Vision devices).
- One of the following operating systems:
  - Microsoft® Windows 8, 32-bit or 64-bit
  - Microsoft Windows 7 with Service Pack 1 (or later), 32-bit or 64-bit
  - Microsoft Windows XP, 32-bit with Service Pack 3 (or later)*
  - Windows 2008 Server with Service Pack 3 (or later), 32-bit or 64-bit*
  - Red Hat Enterprise Linux 6, 32-bit or 64-bit
  - CentOS 6, 32-bit or 64-bit
  - Ubuntu 12.04 LTS, 32-bit or 64-bit

* This operating system is only supported for GigE Vision devices (USB3 Vision is not supported on Windows XP).

For supported USB 3.0 host controller chipsets, consult the *eBUS SDK 4.0 Release Notes*, available on the Pleora Support Center.

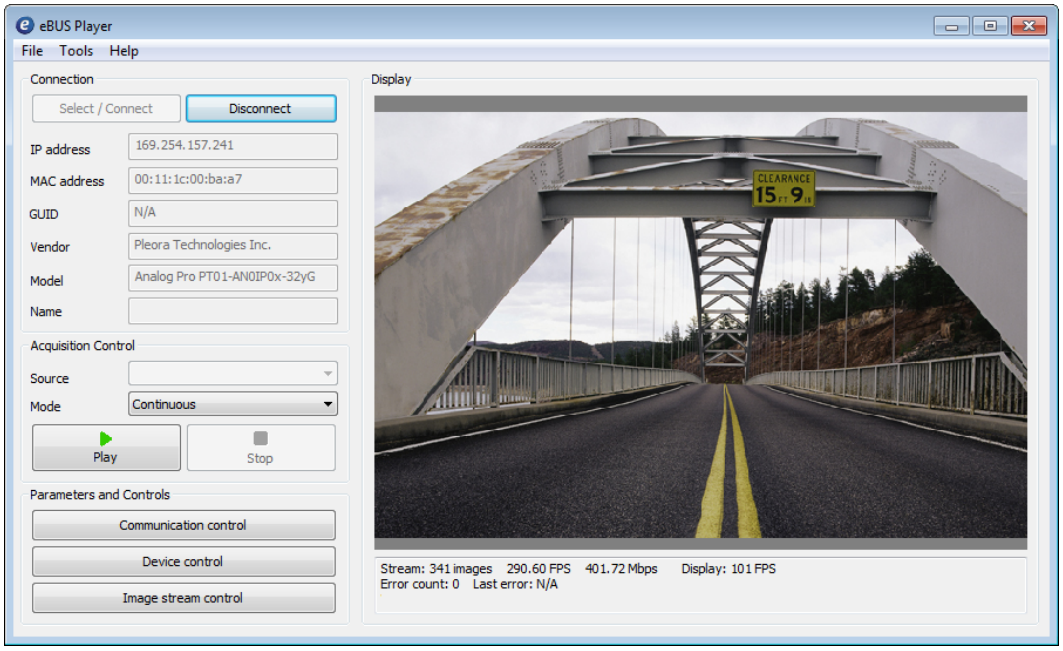
If you use the Linux operating system, you must install the SDK as superuser.

Launching eBUS Player

You can launch eBUS Player from the Windows Start menu, in the **Pleora Technologies Inc** folder.

Understanding eBUS Player

The main screen of eBUS Player consists of two main sections. You can select, connect to, and acquire images from your GigE Vision or USB3 Vision device using the functions in the Connection section on the left side of the main screen, and you can view video in the Display section on the right side of the main screen.



For more detailed information about how to use eBUS Player to control your GigE Vision or USB3 Vision devices, please see "Controlling GigE Vision and USB3 Vision Devices" on page 15.

Chapter 3

Choosing a Driver

This chapter describes the drivers that are available, and provides guidance on selecting the driver that is best suited for your system.

The following topics are covered in this chapter:

Comparing Drivers

The eBUS SDK provides you with drivers you can install to:

- Optimize the performance of your GigE Vision system
- Connect to, control, and receive images from USB3 Vision devices

As part of the eBUS SDK installation wizard, you can choose which driver to install. Or, you can use the eBUS Driver Installation Tool to install or change drivers. The Driver Installation Tool can be launched from the Pleora Technologies Inc folder on the Windows start menu.

Table 2: Available Drivers

Driver	Description
Manufacturer Driver	Provides functionality developed by the card's manufacturer. **For GigE Vision systems**, you can use the default network stack on your computer or laptop when it is not desirable or possible for you to install a driver. The network stack offers acceptable performance in most scenarios, but applications will consume greater processor resources during operation, and throughput may be limited. **For USB3 Vision systems**, if you are using a USB3 Vision device without installing the USB3 Vision driver, eBUS Player will detect a USB3 Vision device, but you cannot connect to the device, control the device, or stream images. To perform these activities, you must install the USB3 Vision Driver.
GigE Vision Driver	Provides the best performance and excellent compatibility with most network adapters. For use with GigE Vision devices.
USB3 Vision Driver	Provides control and streaming capabilities. For use with USB3 Vision devices. **Note:** Some USB 3.0 host controllers allow you to enable or disable power management. We recommend that you disable power management.

Using the eBUS Driver Installation Tool

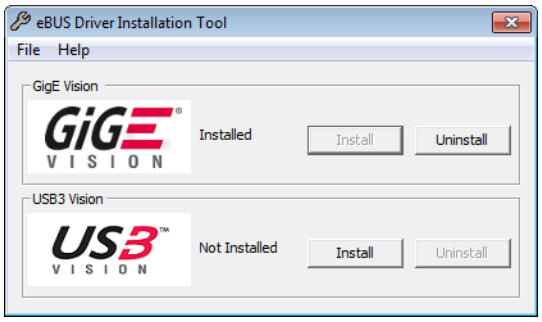
Included in the eBUS SDK is the eBUS Driver Installation Tool. You can use this tool to install or uninstall a Pleora driver.

You can choose to install Pleora drivers as part of the eBUS SDK installation wizard, or you can use the eBUS Driver Installation Tool to install or uninstall a driver.

To install a Pleora driver

1. Click **Start** > **All Programs** > **Pleora Technologies Inc** > **eBUS SDK** > **Tools** > **eBUS Driver Installation Tool**.
2. Under the driver that matches the types of devices you will connect to, click **Install**.

   The USB3 Vision driver is installed across all USB3 Vision devices on your computer. The GigE Vision driver is installed across all network adapters on your computer.



3. Close the eBUS Driver Installation Tool.

   You may be required to restart your computer.

To see the versions of the installed drivers, click **Help** > **About**.

Chapter 4

Configuring Firewalls to Allow Communication With GigE Vision Devices

It is important to note that in most cases, you do not need to disable the computer firewall.

Some third-party GigE Vision devices do not support the optional features introduced in version 1.1 (and later) of the GigE Vision standard, which ensure compatibility with firewalls. This restriction requires you to disable the computer firewall to properly use devices that do not support the optional features.

This chapter provides you with instructions for disabling the firewall in the Windows 8, Windows 7, and Windows XP operating systems. This chapter only applies to systems that include GigE Vision devices; it does not apply to systems that use USB3 Vision devices.

For more detailed information about how firewalls function, including how firewalls can affect GigE Vision devices, see the Pleora Technologies Technical Note, *Correcting Firewall Issues with 3rd Party GigE Vision Devices,* available on the Pleora Support Center at www.pleora.com.

The following topics are covered in this chapter:

Pleora GigE Vision Devices Support Firewall Compatibility Features

Pleora GigE Vision devices support the firewall compatibility features introduced in version 1.1 (and later) of the GigE Vision standard. These features allow devices to report the device-side UDP ports they use for streaming and messaging channels. This reporting feature allows the SDK to know exactly where to send the packets that are used to keep the firewall open.

The eBUS SDK operates correctly with Windows firewalls when used with Pleora GigE Vision devices. You should not have to lower the firewall or take any specific action.

GigE Vision 1.0

GigE Vision 1.0 does not provide any standard device-side UDP port side reporting mechanism. However, because Pleora developed both the eBUS SDK and the iPORT devices, the device-side UDP port numbers used by the devices are known to the SDK.

When the eBUS SDK is used with a Pleora device, it knows where to send the packets to keep the firewall open. For streaming, the device uses port 20202 + channel number. The streaming channel 0 (first, default) uses port 20202. For the messaging channel, the device uses port 4.

Third-Party Devices

As mentioned previously, version 1.1 of the GigE Vision standard added optional features, allowing devices to report which device-side UDP port is used for streaming each available streaming channel, and for the messaging channel. This mechanism allows the eBUS SDK to know exactly where to send the packet that is used to keep the firewall open.

It is important to understand that this GigE Vision 1.1 feature is optional. Not all third-party devices support it, even if they report using GigE Vision 1.1 (or later).

If your third-party devices support the firewall compatibility features, your system should work without having to disable the firewall.

If your third-party devices do not support the firewall compatibility features, the firewall needs to be de-activated for your system to stream, or use the messaging channel.

Disabling the Windows 8 Firewall

The following procedure explains how to disable the Windows 8 firewall.

To disable the Windows 8 firewall

1. Open Windows Firewall by pointing to the upper-right corner of the screen, moving the mouse pointer down, and then clicking **Search**.
2. In the search box, type **firewall**.
3. Click **Settings**.
4. Click **Windows Firewall**.
5. In the left pane, click **Turn Windows Firewall on or off**. You might be asked for an admin password or to confirm your choice.
6. Click **Turn off Windows Firewall (not recommended)** for the appropriate network locations.
7. Click **OK**.

Disabling the Windows 7 Firewall

This section provides you with the steps to take to disable the Windows 7 firewall. In the Windows 7 operating system, you can control the firewall setting for domain networks (corporate), home or private networks (behind a secured router, such as a home or SOHO network), or a public network.

We recommend that you do not deactivate the firewall on a public network, such as a wireless access point at a coffee house or hotel. If you are on a corporate or home network, but Windows behaves as if you are on a public network, you might need to set the correct type of network used by your NIC.

To set your network type

1. Click **Start** > **Control Panel**.
2. Click **Network and Internet**.
3. Click **Network and Sharing Center**.
4. Adjust the network settings.
5. Close the **Control Panel**.

To disable the Windows 7 firewall

1. Click **Start** > **Control Panel**.
2. Click **System and Security**.
3. Click **Windows Firewall**.
4. In the **Control Panel Home**, click **Turn Windows Firewall On or Off**.
5. Select **Turn Off Windows Firewall** for the appropriate network locations.
6. Close the **Control Panel**.

Disabling the Windows XP Firewall

Unlike the Windows 7 operating system, Windows XP does not allow you to configure the firewall for different types of networks. There is only one master control.

To disable the Windows XP firewall

1. Click **Start** > **Control Panel**.
2. Click **Windows Firewall**.
3. On the **General** tab, click **Off**.
4. Click **OK**.

Chapter 5

Controlling GigE Vision and USB3 Vision Devices

After you have assembled and powered up the GigE Vision and USB3 Vision compliant devices in your video network system, you can connect to and adjust the settings of the devices using the eBUS Player.

The following topics are covered in this chapter:

Connecting to a Device

When you click **Select/Connect** on the main page of eBUS Player, eBUS Player automatically detects:

- GigE Vision devices connected to your computer's NIC(s) or switch
- USB3 Vision devices connected to your computer's USB ports

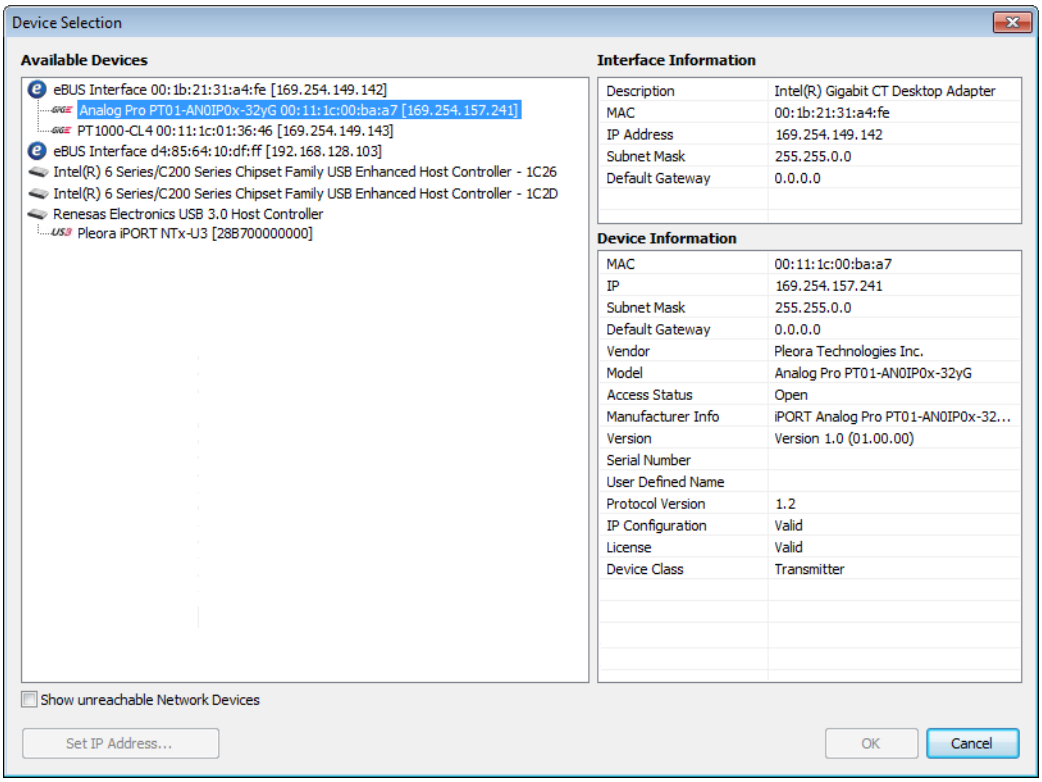
For GigE Vision devices, it is important for eBUS Player to be installed on a computer that is configured for the same subnet as the GigE Vision device to which you want to connect. If the computer running eBUS Player and the GigE Vision device are not on the same subnet, the device might not appear in eBUS Player.

To connect to a device

1. Click **Start** > **All Programs** > **Pleora Technologies Inc** > **eBUS SDK** > **eBUS Player**.
2. Under **Connection**, click **Select/Connect**.

3. Click the GigE Vision or USB3 Vision device in the **Available Devices** list, and then click **OK**.
4. If you are using the manufacturer driver, a message may appear, indicating that you are not using an eBUS driver. Keep in mind the following information about drivers:
   - **GigE Vision devices.** For optimal streaming performance, we recommend you use the GigE Vision driver.
   - **USB3 Vision devices.** The manufacturer driver allows eBUS Player to detect USB3 Vision devices, but you cannot control the devices or stream images. To perform these activities, you must install the USB3 Vision driver.

For more information, see "Choosing a Driver" on page 7.

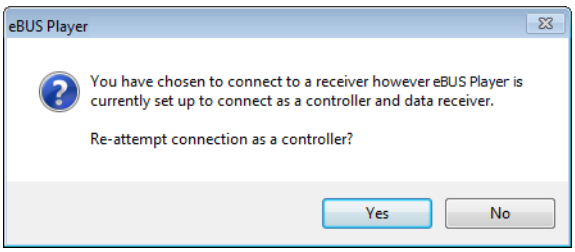


If your GigE Vision device does not appear in the **Available Devices** list (possibly because eBUS Player and the GigE Vision device are not on the same subnet) you can locate the device by clicking **Show unreachable Network Devices**.

Warnings and errors related to the USB3 Vision device and host controller may appear in the right-hand panel of the **Device Selection** dialog box. For example, a warning may appear if you have connected your USB3 Vision device to a USB 2.0 port.

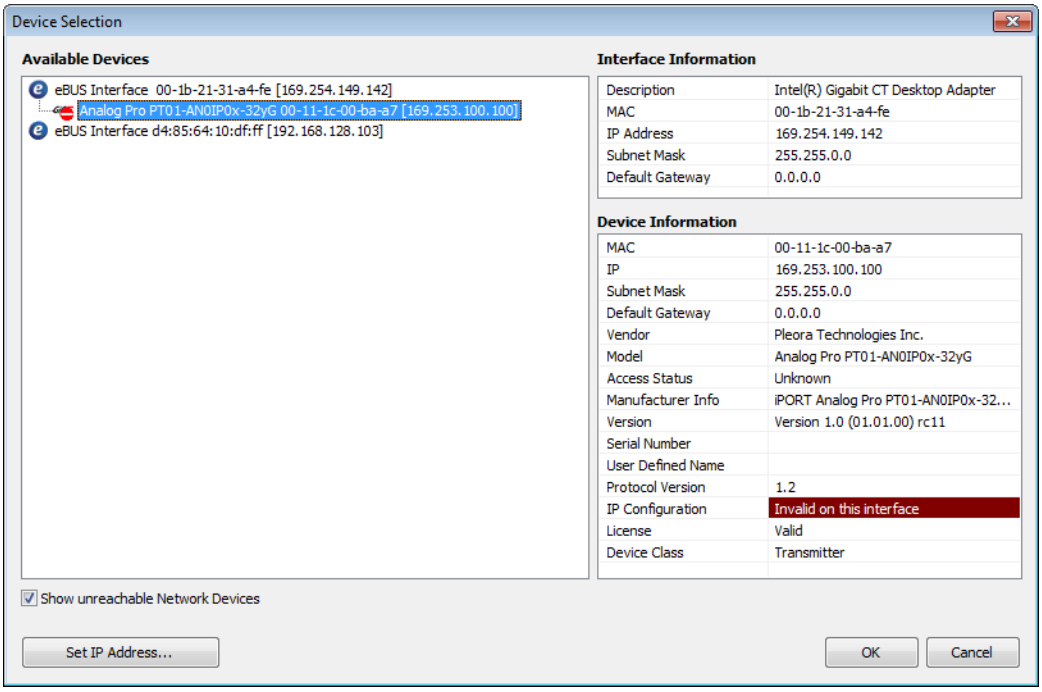
5. Click **OK**.

   If you are using the vDisplay HDI-Pro External Frame Grabber with your GigE Vision device, the first time you start eBUS Player and connect to a vDisplay HDI-Pro External Frame Grabber, the following message may appear. Click **Yes**. Roles are discussed later in this guide, in "Configuring eBUS Player as a Controller or Data Receiver" on page 30.



Configuring a Valid IP Address for a GigE Vision Device

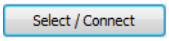
If the GigE Vision device does not have a valid IP address, an error message appears, as shown in the following image.



To configure a valid IP address for a GigE Vision device

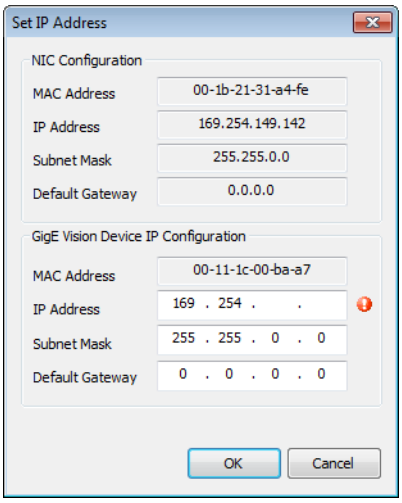
This procedure allows you to set a valid IP address for initial access, but not a persistent IP address for the GigE Vision device. After you power down the device, the IP address is reset. Configuring a persistent IP address that is permanently used on the GigE Vision device is discussed later in this guide, in "To configure a persistent IP address for a GigE Vision device" on page 20.

1. Start **eBUS Player** and click **Select/Connect**.

2. Click the GigE Vision device in the **Available Devices** list.
3. Click **Set IP Address** in the bottom left corner.

4. In the **Set IP Address** dialog box, enter a valid IP address, subnet mask, and default gateway.



The red exclamation mark disappears if the IP address is valid, taking into consideration the subnet mask, as well as the IP address and subnet mask of the computer.

5. Click **OK**.

Configuring a Persistent IP Address for a GigE Vision Device

By default, Pleora devices are configured to automatically acquire an IP address using Dynamic Host Configuration Protocol (DHCP) and Link Local Addresses (LLA), provided no persistent IP address has been assigned. This allows you to immediately connect to the device at first-time deployment, and then, if you choose to, provide it with a persistent IP address. If you provide the device with a persistent IP address, it will use this persistent IP address each time it is powered up and connected to the network.

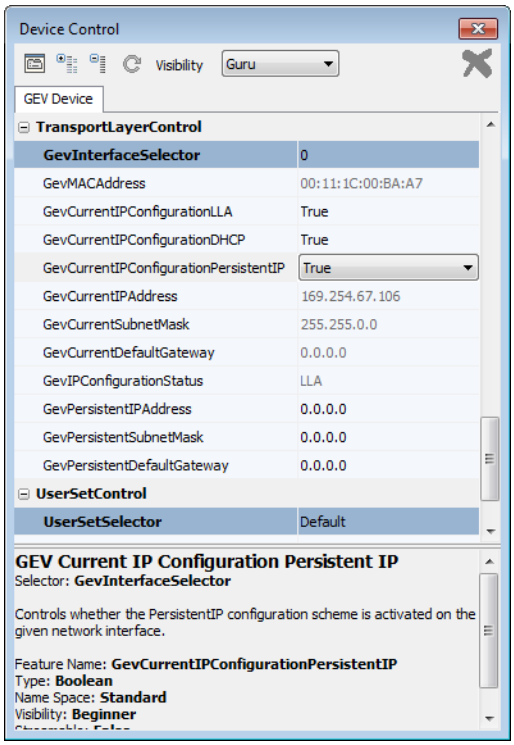
The device can use the persistent IP address each time it is powered up as long as the IP address is valid and there were no IP address conflicts at the time the IP address was configured.

To configure a persistent IP address for a GigE Vision device

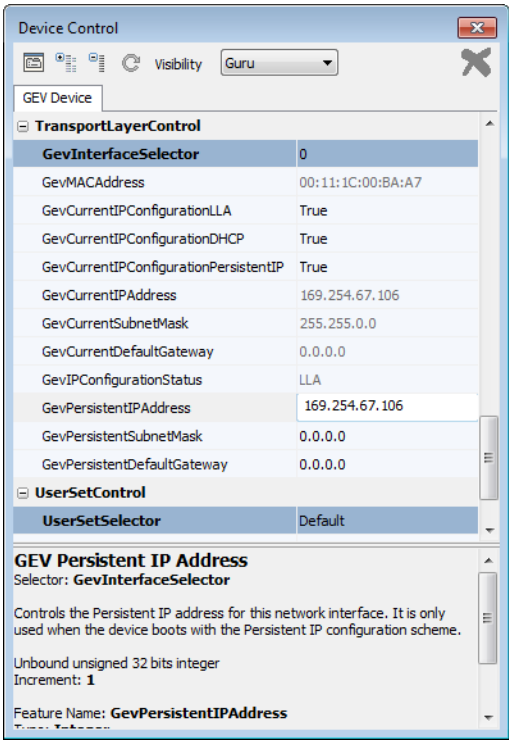
1. Start eBUS Player and click **Select/Connect**.
2. Click the device in the **Available Devices** list.
3. Click **OK** in the bottom right corner.
4. Under **Parameters and Controls** click **Device control**.
5. In the **TransportLayerControl** section of the **Device Control** dialog box, enter a subnet mask in the **GevPersistentSubnetMask** box.
6. Enter a default gateway in the **GevPersistentDefaultGateway** box.

The subnet gateway value can remain at 0.0.0.0.

7. Click **True** in the **GevCurrentIPConfigurationPersistentIP** list.



8. Enter the persistent IP address in the **GevPersistentIPAddress** box.



9. Close the **Device Control** dialog box.

The device uses the persistent IP address first, but if this option if set to **False**, it uses the IP address provided by DHCP next, and if this fails, uses LLA to find an available IP address. LLA cannot be disabled and is **True** by default.

Acquiring Images

Because the GigE Vision standard and USB3 Vision standard require that compliant transmitters start up in a state that is ready to send images, you can start acquiring images as soon as you apply power and connect the transmitter to the network (for GigE Vision devices) or USB 3.0 port on your computer (for USB3 Vision devices with the USB3 Vision driver installed). Pleora GigE Vision and USB3 Vision devices can transmit a test pattern (most devices transmit a test pattern by default). You can turn the test pattern on or off as required.

If you are using eBUS Player to connect to a vDisplay HDI-Pro External Frame Grabber, this section does not apply. A vDisplay HDI-Pro External Frame Grabber acts as a controller and/or receiver, which means that it does not transmit video over the network. Instead, skip this section and go to "Configuring eBUS Player as a Controller or Data Receiver" on page 30.

To turn the test pattern on or off

1. Start eBUS Player and click **Select/Connect**.
2. Click the device in the **Available Devices** list.
3. Click **OK** in the bottom right corner.
4. Under **Parameters and Controls**, click **Device Control**.
5. Under **ImageFormatControl**, click a test pattern option in the **TestImageSelector** list.
6. Close the **Device Control** dialog box.

To acquire images

1. Start eBUS Player and click **Select/Connect**.
2. Click the device in the **Available Devices** list.
3. Click **OK** in the bottom right corner.
4. For multi-source GigE Vision devices, click the source to which a camera is connected under **Acquisition Control**. If you do not have a camera connected, you can use the test pattern. For more information, see "To turn the test pattern on or off" on page 22.
5. In the **Mode** list, click **Continuous**, which configures the device to send a stream of continuous images (instead of a single image).
   For other acquisition modes, see "Configuring How Images are Acquired" on page 24.
6. Click **Play**.
   The images appear in the **Display** section.

Adjusting Images

eBUS Player provides you with tools to adjust your images.

To adjust the display frame rate

- Select **Tools** > **Display** and then click a display rate.
  - Or -
  Click **Disabled** to turn off the display of images.

To zoom the image in or out

- Right-click the image and click a zoom setting.

To use RGB filtering to adjust the image color

1. Select **Tools** > **Image Filtering**.
2. Under **RGB Filtering**, select the **Enabled** check box.
3. Adjust the image color.
   The image updates as you adjust the colors.

4. Click the **X** to close the dialog box when your adjustments are complete.

To change Bayer interpolation

1. Select **Tools** > **Image Filtering**.
2. Under **Bayer Interpolation**, click an interpolation method to display images: **Simple** or **3 x 3 Interpolation**.
3. Click the **X** to close the dialog box.

Displaying Chunk Data

If Extended Chunk Mode is enabled for your GigE Vision or USB3 Vision device, you can choose to overlay the chunk data as text on top of images in the Display section. Chunk data is often used to provide the status of external devices at the moment that the image was captured. The ability to overlay chunk data on images is available for devices that are compatible with version 2.0 (and later) of the GigE Vision standard or version 1.0 (and later) of the USB3 Vision standard.

Examples of chunk data

In a quality inspection system where a rotary encoder (or shaft encoder) is used on a conveyor belt, chunk data can include the position of the conveyor belt at the moment that the image was captured or a count of position changes.

For systems that pre-process images, such as systems that perform edge detection, chunk data can include the result of the pre-processing operation (for example, chunk data can indicate where the edges are).

To use this feature, your GigE Vision or USB3 Vision device must be configured for chunk data. For more information, see the documentation accompanying your device. For detailed information about the extended chunk mode feature, see the *iPORT Advanced Features User Guide*, available on the Pleora Support Center at www.pleora.com.

To display chunk data

- Select **Tools** > **Display Chunk Data**.

  Chunk data is overlaid on top of the image in eBUS Player.

Saving Images

eBUS Player allows you to save acquired images, in addition to your configuration settings.

To save the current image

- Select **Tools** > **Save Current Image**.

To save images periodically

1. Select **Tools** > **Save Images**.
2. Select the **Enable Image Saving** check box.
3. Click the browse button to select a location to save images and then click **OK**.
4. In the **Format** list, click the format in which you want to save images (either BMP or raw binary data).
5. Under **Throttling options**, specify when you want to save images.
   - **Save one image out of every [ ] captured images.**
   - **Save a maximum of one image every [ ] ms.** The display thread saves an image to the save folder if at least *X* ms has elapsed since the last image was saved.
   - **Throttle throughput to HDD. Maintain [ ] Mbits/s average.** The throughput of saved images is monitored to stay as close to *X* Mbits/s as possible.
   - **No throttling (Limited by CPU, HDD, etc. Images may be dropped).** The display thread attempts to save every image to the save folder.
6. Click **OK**.

   The display section changes to red, the word **RECORDING** appears, and statistics about the image recording appear, including the image count, the size of the image file, the frame rate, and the data rate.

   The file name of the saved image(s) contains an internal counter, the image timestamp, and the system tick count.

If you are displaying chunk data, only the image is saved (because the chunk data is overlaid on top of the image, it is not part of the image).

To save eBUS Player and device settings to disk

- Select **File** > **Save**.

Configuring How Images are Acquired

Depending on the device you use, eBUS Player provides you with a list of image acquisition modes. The modes allow you to acquire images continuously or frame-by-frame. You can also save images to the device's onboard memory so that you can retrieve them later.

Modes Standard on Most GigE Vision and USB3 Vision Compliant Devices

Continuous, SingleFrame, and MultiFrame modes are usually standard for devices. Acquisition starts when the **Play** button is pressed (the **AcquisitionStart** command is executed).

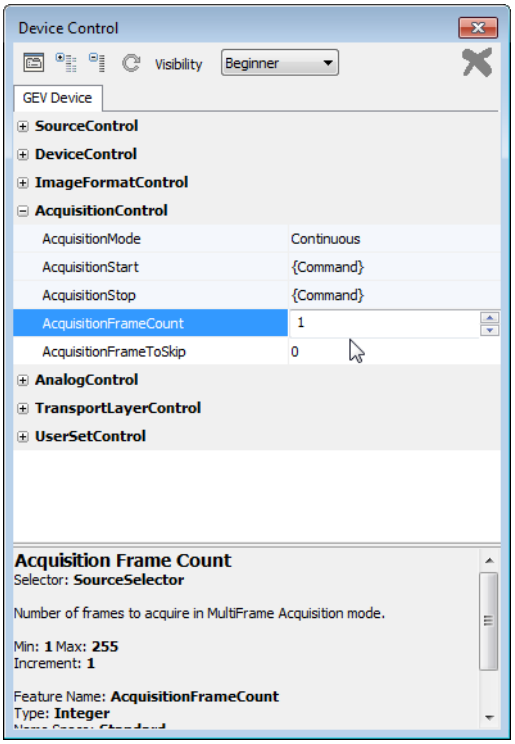
Continuous Mode

This mode allows you to acquire images continuously and is the default mode for most devices.

MultiFrame Mode

This mode allows you to acquire a fixed number of images. To configure the number of images, set the device's **AcquisitionControl** > **AcquisitionFrameCount** feature.

You can set the **AcquisitionControl** > **AcquisitionFrameCount** feature in the **Device Control** dialog box, as shown in the following image.



SingleFrame Mode

This mode allows you to acquire a single image.

Recording and Readout Modes, Available on Pleora Devices

The **recording** acquisition modes allow you to capture images from a camera and store them in the Pleora device's onboard memory. The **readout** acquisition modes allow images to be acquired from the device's memory at a slower rate, ensuring images are not lost.

These modes are helpful when you are working with a camera that transmits images at a rate that exceeds the connection between the Pleora device and the computer, resulting in dropped images. For example, a Camera Link Medium camera transmits images at up to 4.08 Gbps (4 taps, 12 bits) but the connection to the computer might be only 3 Gbps. By using the recording and readout modes in this example, you can capture and stream images from the camera without losing any images (as long as there is space in the onboard memory).

The recording acquisition modes (**ContinuousRecording**, **MultiFrameRecording**, and **SingleFrameRecording**) support back-to-back recording, which allows you to click the **Stop** and **Play** buttons multiple consecutive times without the onboard memory being cleared.

Acquisition starts when the **Play** button is pressed (the **AcquisitionStart** command is executed) when one of the recording modes is selected.

Images can be stored in the external frame grabber's onboard memory as long as there is space or until there are 512 images in memory. For information about calculating how many images you can store, see "Calculating How Many Images Can be Stored in Onboard Memory" on page 29.

Understanding When Images are Removed from the Onboard Memory

The following actions remove the images from the external frame grabber's onboard memory:

- Streaming images from the onboard memory using one of the readout acquisition modes (**ContinuousReadout** or **SingleFrameReadout**).
- Power cycling the device, which clears all images from the onboard memory.
- Making any of the following **AcquisitionMode** changes and then clicking the **Play** button (**AcquisitionStart** command), which clear all images from the onboard memory:

Table 3: Changes that Clear Images from the Onboard Memory

First you acquire images with...	And then you change the Acquisition mode to...
ContinuousRecording, MultiFrameRecording, or SingleFrameRecording	Continuous, MultiFrame, or SingleFrame
SingleFrameReadout or ContinuousReadout	SingleFrame, MultiFrame, or Continuous
SingleFrameReadout or ContinuousReadout	ContinuousRecording, MultiFrameRecording, or SingleFrameRecording

ContinuousRecording Mode

With this mode, images are acquired continuously and are stored in the device's onboard memory until the memory is full (or 512 images are stored in onboard memory). When this limit is reached, the Pleora device stops acquiring new images from the camera.

We recommend that you observe **AcquisitionControl** > **BlockBufferCount** (**Expert** or **Guru** visibility level is required). When the value for this feature stops increasing, the memory is full. For information about the actions that clear the images from onboard memory, see "Understanding When Images are Removed from the Onboard Memory" on page 27.

To determine how many images can be stored in memory, see "Calculating How Many Images Can be Stored in Onboard Memory" on page 29.

ContinuousReadout Mode

With this mode, images are continuously read (and removed) from the device's onboard memory. The readout begins at the first image in memory. To see the number of images stored in onboard memory, see **AcquisitionControl** > **BlockBufferCount** in the **Device Control** dialog box (**Expert** or **Guru** visibility level is required).

Readout continues until the **Stop** button is pressed (**AcquisitionStop** command is executed) or until the last image has been sent by the device (**BlockBufferCount** will be **0**).

MultiFrameRecording Mode

With this mode, a fixed number of images are stored in the device's onboard memory. To configure the number of images, set the **AcquisitionControl** > **AcquisitionFrameCount** feature in the **Device Control** dialog box. Images can be read out from memory using **ContinuousReadout** mode.

A maximum of 255 images can be acquired at one time in MultiFrameRecording mode.

If **AcquisitionControl** > **AcquisitionFrameCount** is set to a value that exceeds the amount of available memory, the Pleora device stops acquiring new images when the onboard memory is full (or 512 images are stored in onboard memory).

BlockBufferCount shows the number of images currently in memory. In MultiFrameRecording mode, this number is cumulative: If the memory is empty and you acquire an image, **BlockBufferCount** will match the **AcquisitionFrameCount**. If you stop and restart recording, **BlockBufferCount** will increment (to a maximum of 512 images, depending on the image size) and will no longer match the **AcquisitionFrameCount**.

For information about the actions that clear the images from onboard memory, see "Understanding When Images are Removed from the Onboard Memory" on page 27.

To determine how many images can be stored in memory, see "Calculating How Many Images Can be Stored in Onboard Memory" on page 29.

SingleFrameRecording Mode

With this mode, a single image is saved in the device's onboard memory after each **AcquisitionStart** command. When the onboard memory is full (or 512 images are stored in onboard memory), images received by the Pleora device are dropped.

For information about the actions that clear the images from onboard memory, see "Understanding When Images are Removed from the Onboard Memory" on page 27.

To determine how many images can be stored in memory, see "Calculating How Many Images Can be Stored in Onboard Memory" on page 29.

SingleFrameReadout Mode

With this mode, a single image is acquired from the device's onboard memory.

Calculating How Many Images Can be Stored in Onboard Memory

For the recording modes, you can calculate the size of each image to determine how many images can be stored in onboard memory.

First, take note of the **PixelSize**. The **PixelSize** appears under **ImageFormatControl** in the **Device Control** dialog box (**Expert** or **Guru** visibility level is required). The **PixelSize** is automatically calculated based on the selected **PixelFormat**.

Perform the following calculation:

$$\frac{\textbf{PixelSize}}{\textbf{8}} = \textbf{Bytes Per Pixel}$$

Round the bytes per pixel, if required:

If the result is a **multiple of 8**, no rounding is required.
For **Packed PixelFormats**, round the result up to the nearest multiple of 0.5 (for example, 1.5 or 2).
For **Unpacked PixelFormats**, round the result up to the nearest whole number (for example, 2).

Perform the following calculation:

Width x Height x Bytes Per Pixel (Rounded) = Image Size

For example, for a device configured to use **Mono10Packed** with images that are **1920 x 1080**, the equation would look like this:

1920 x 1080 x 1.5 = 2.966 MB Per Image

Then, use the following equation to determine the number of images that can be saved in onboard memory.

$$\frac{\textbf{Available Onboard Memory}}{\textbf{Image Size}} = \textbf{Number of Images that can be Saved}$$

Using our example, the equation would look like this:

$$\frac{\textbf{120 MB}}{\textbf{2.966 MB}} = \textbf{40 images}$$

Reviewing the Acquisition Status

During image acquisition, information about the stream appears under the image, in addition to any errors or warnings that have occurred.

In most cases, errors will not appear if you are connecting to a device for the first time. If an error appears, click **Image stream control** and review the information in the **Counters** section. If anything other than zero appears in the features within this section and you are using a GigE Vision device, consult the *Stream Control Technical Note*, available at the Pleora Support Center, to determine which feature is causing the error and for guidance on how to correct the error.

Configuring eBUS Player as a Controller or Data Receiver

Depending on your system, you may need to configure the eBUS Player role, which lets you specify whether you want to use eBUS Player to control a GigE Vision or USB3 Vision compliant device or receive images. The following roles are available:

Table 4: Roles

Role	Description
Controller and data receiver	Select this role if you are using eBUS Player to connect to and control a GigE Vision or USB3 Vision compliant transmitter AND if you want eBUS Player to receive streaming video from the transmitter. This setting is ideal when you want to control an iPORT device and see streaming video with eBUS Player. This is the default setting.
Controller	Select this role if you are using eBUS Player to connect to and control a GigE Vision or USB3 Vision compliant device. eBUS Player does not receive streaming video from the device if this option is selected. This setting is often used to connect eBUS Player to a receiver, such as the Pleora vDisplay HDI-Pro External Frame Grabber (for use with GigE Vision devices).
Data Receiver	Select this role if you are using eBUS Player to connect to and receive streaming video from a GigE Vision or USB3 Vision compliant device. You cannot control the device if this option is selected.

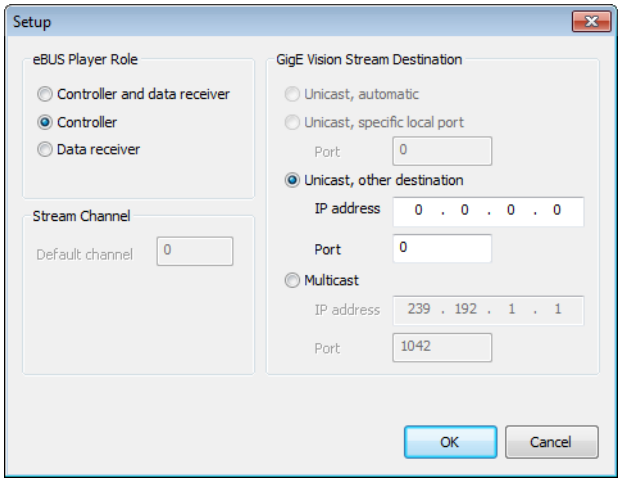
The vDisplay External Frame Grabber receives video from the GigE Vision network and makes it available for display on an attached monitor.

To configure eBUS Player as a controller or data receiver

1. Start eBUS Player and select **Tools** > **Setup**.
2. Select a role.
3. For multi-channel GigE Vision devices, select the default channel under **Stream Channel**.

For multi-channel GigE Vision devices, eBUS Player queries the GenICam interface of the device (in most cases) to determine which channel should be used with the source. In cases where eBUS Player cannot determine the channel to use, the default channel that you specify is used. This can occur when you are using a data receiver that does not have access to device control. If you are multicasting and want to set up a pure data receiver, you need to specify the channel on which to listen by typing the **Default channel**.

4. Click **OK**.



If eBUS Player is already connected to a device, you must close the **Setup** dialog box and disconnect from the device before you can select an eBUS Player role.

Configuring the Stream Destination for GigE Vision Devices: Unicast or Multicast

You can configure a GigE Vision stream destination to send images to a single location or to multiple locations.

Table 5: GigE Vision Stream Destination Options

Option	Description
Unicast, automatic	Select this option to configure the camera to stream video directly to the eBUS Player computer using an automatically-selected port.
Unicast, specific local port	Select this option to configure the camera to stream video directly to a user-defined port on the eBUS Player computer.
Unicast, other destination	Select this option to configure the camera to stream video directly to a computer or a vDisplay External Frame Grabber (a destination other than the eBUS Player computer).
Multicast	Select this option to configure the camera to join a multicast group (specified by the IP address and port), and to begin streaming to that group. The vDisplay External Frame Grabber or any other receiver (such as a computer), must be configured to receive streaming video at the same multicast address. If eBUS Player is configured as a multicast receiver, it allows you to view video from the camera streaming video to the same multicast address.

Accessing the Communication Settings

You can access the communication settings to adjust how the host computer connects to, and communicates with, GigE Vision or USB3 Vision devices.

Before you connect to a GigE Vision or USB3 Vision device, you can set the default communication parameters that will be used for the connection. If the connection is already established, you can adjust the communication settings as required.

To set the default communication parameters for the initial device connection

1. Start eBUS Player and click **Tools** > **Default GigE Vision Communication Parameters** or **Default USB3 Vision Communication Parameters**.

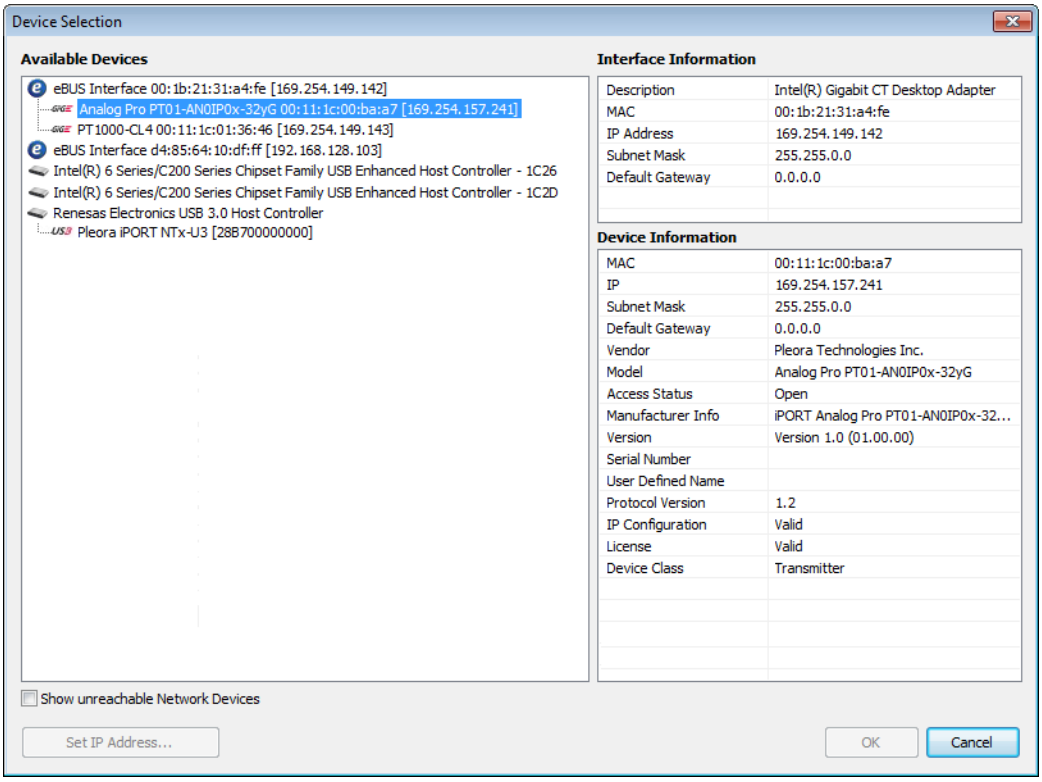
   The **Default GigE Vision Communication Parameters** or **Default USB3 Vision Communication Parameters** dialog box appears.

2. Customize the communication settings as required and then close the dialog box.

   When you connect to the GigE Vision or USB3 Vision device, the communication settings that you specified will be used. For information about connecting to a device, see "To connect to a device" on page 16.

To change the communication settings

1. Start eBUS Player and click **Select/Connect**.
2. Click the GigE Vision or USB3 Vision device in the **Available Devices** list.



3. Click **OK** in the bottom right corner.
4. Under **Parameters and Controls**, click **Communication control**.
5. The **Communication Control** dialog box appears. Customize the communication settings as required by adjusting the features in the dialog box.

The **Communication control** button is only available when eBUS Player is connected to a device. To configure the communication settings before a connection is established with a GigE Vision or USB3 Vision device, see "To set the default communication parameters for the initial device connection" on page 32.

Accessing the Device Settings

By changing the values of controls in the eBUS Player control dialog boxes, you can change how the GigE Vision or USB3 Vision device (and connection between the device and the host computer) performs.

eBUS Player breaks system configuration into the following three categories, and provides a set of controls for each category in a separate dialog box:

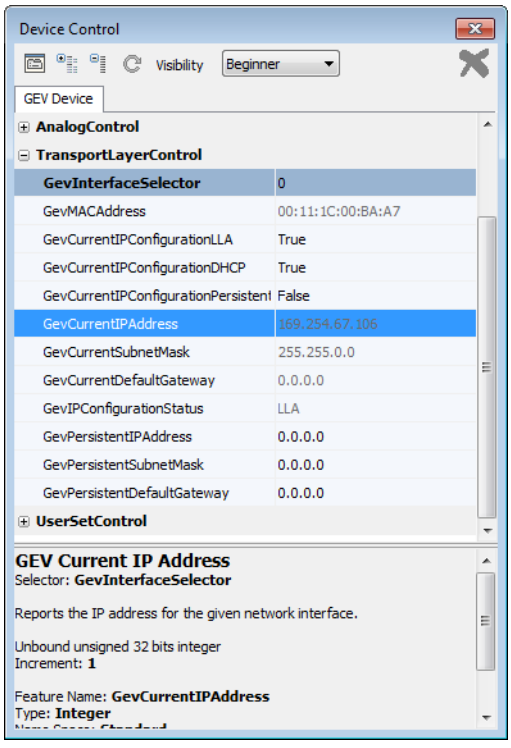
- **Communication Control** dialog box. Controls connection and communication settings between the host computer and the GigE Vision or USB3 Vision device. For information about the communication settings, see "Accessing the Communication Settings" on page 32.
- **Device Control** dialog box. Controls all device settings, including transport layer settings, image processing settings, image mode and formatting settings, display timing settings, channel settings, autonomous control settings, and messaging settings.
- **Image Stream Control** dialog box. Controls image stream settings and provides performance statistics.

Connection Section

The following table shows the relationship between the controls in the Device Control or Communication Control dialog box and the controls in the Connection section.

Table 6: Connection Section Controls and Features

Connection section control	Corresponding feature
IP address field (GigE Vision devices only)	Device Control dialog box > TransportLayerControl / GevCurrentIPAddress
MAC address field (GigE Vision devices only)	Device Control dialog box > TransportLayerControl / GevMACAddress
GUID field (USB3 Vision devices only)	Communication Control dialog box > Connection / DeviceGUID (not shown below)
Manufacturer field	Device Control dialog box > DeviceControl / DeviceVendorName (not shown below)
Model field	Device Control dialog box > DeviceControl / DeviceModelName (not shown below)

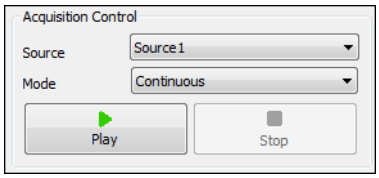


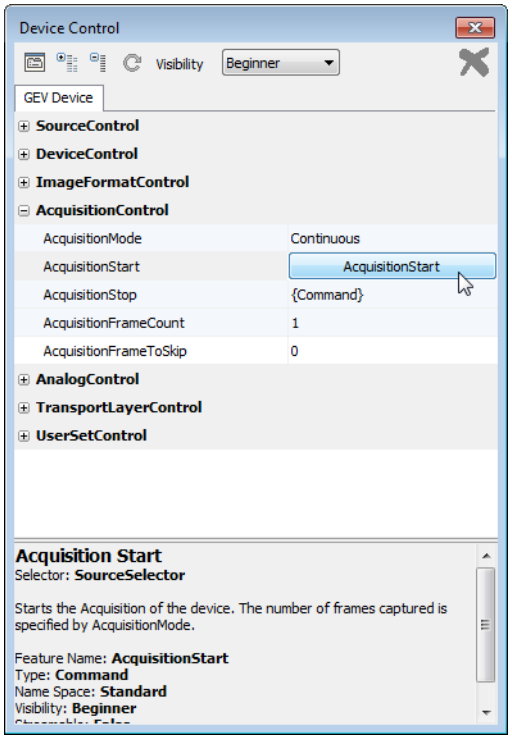
Acquisition Control Section

The following table shows the relationship between the controls in the Device Control dialog box and the controls in the Acquisition Control section.

Table 7: Acquisition Control Section Controls and Features

Acquisition Control section control	Feature in the Device Control dialog box
Mode list	AquisitionControl / AcquisitionMode
Source list (for multi-source GigE Vision devices)	TransportLayerControl / GevStreamChannelSelector
Play button	AquisitionControl / AcquisitionStart (GigE Vision devices only)
Stop button	AquisitionControl / AcquisitionStop (GigE Vision devices only)





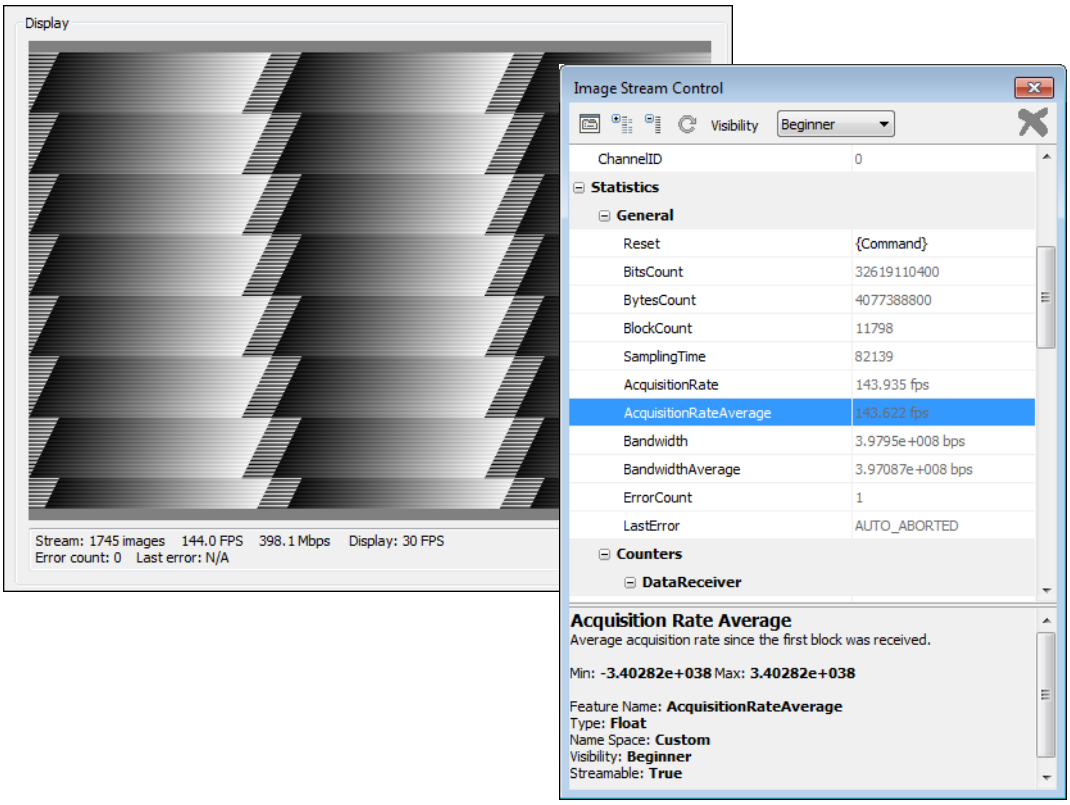
If you use the **AcquisitionStart** and **AcquisitionStop** features in the **Device Control** dialog box to start and stop streaming from a GigE Vision device, please note that the **TLParamsLocked** feature is not activated, allowing you to change features that are normally locked during image streaming, such as width and height. This may cause unexpected results. Whenever possible, we recommend that you use the **Play** and **Stop** buttons to start and stop streaming.

Display Section

The following table shows the relationship between the information in the Device Control dialog box and the controls in the Display section.

Table 8: Display Section Controls and Features

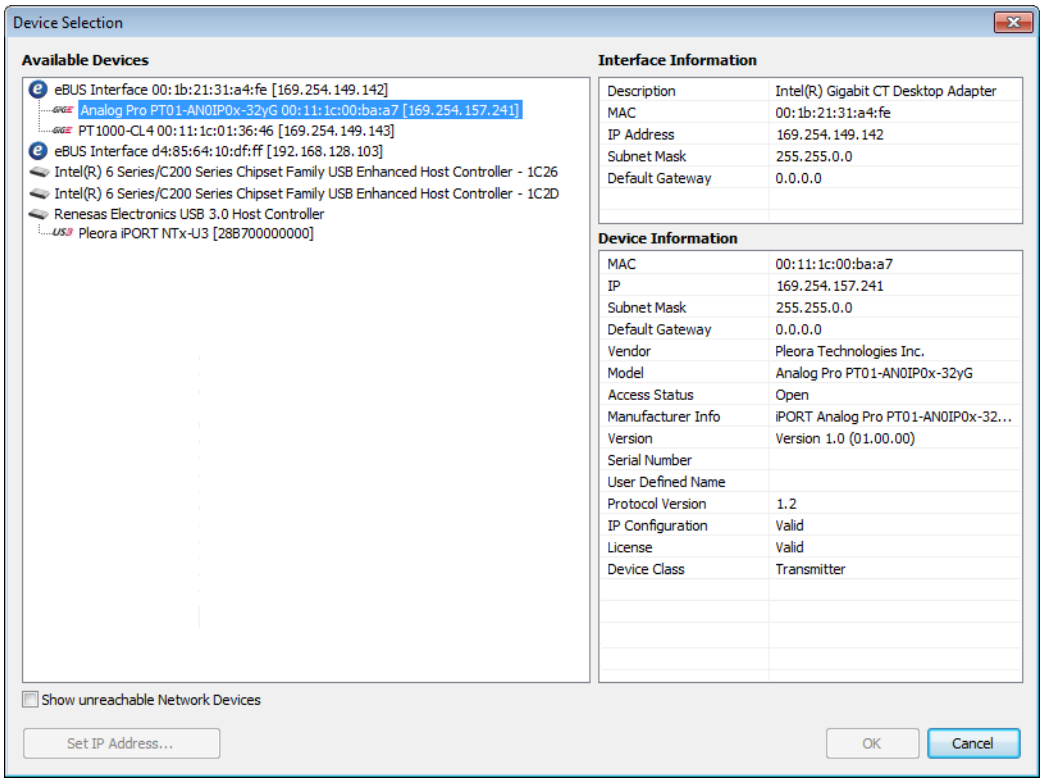
Display section information	Feature in the Image Stream Control dialog box
Image count (nnn images)	Statistics / General / BlockCount
Frame rate (xxxFPS)	Statistics / General / AcquisitionRateAverage
Data rate (yyy Mbps)	Statistics / General / BandwidthAverage



For transmitters that do not timestamp packets, an asterisk (*) appears next to the **frame rate** (**FPS**) and **data rate** (**Mbps**) in the Display section, which indicates that these values could not be calculated. You can set the SDK to use the receiving computer's time to do the calculation by clicking **Image Stream Control** and setting the **Statistics** > **General** >**TimeStampSourcePreferred** feature to **Software**.

To change the device settings

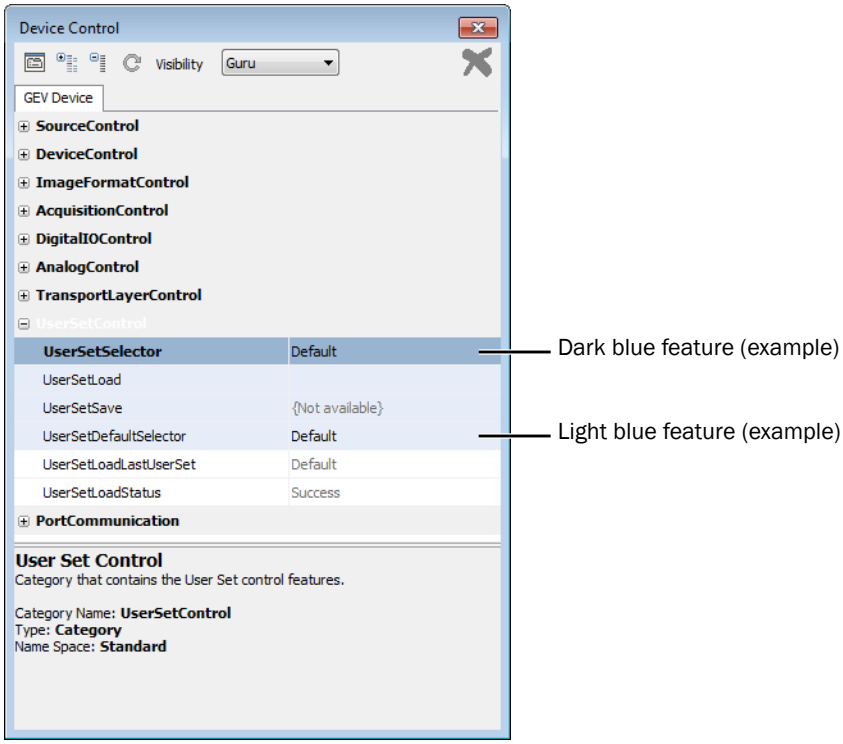
1. Start eBUS Player and click **Select/Connect**.
2. Click a GigE Vision or USB3 Vision device in the **Available Devices** list.



3. Click **OK** in the bottom right corner.
4. Under **Parameters and Controls**, click **Device control**.

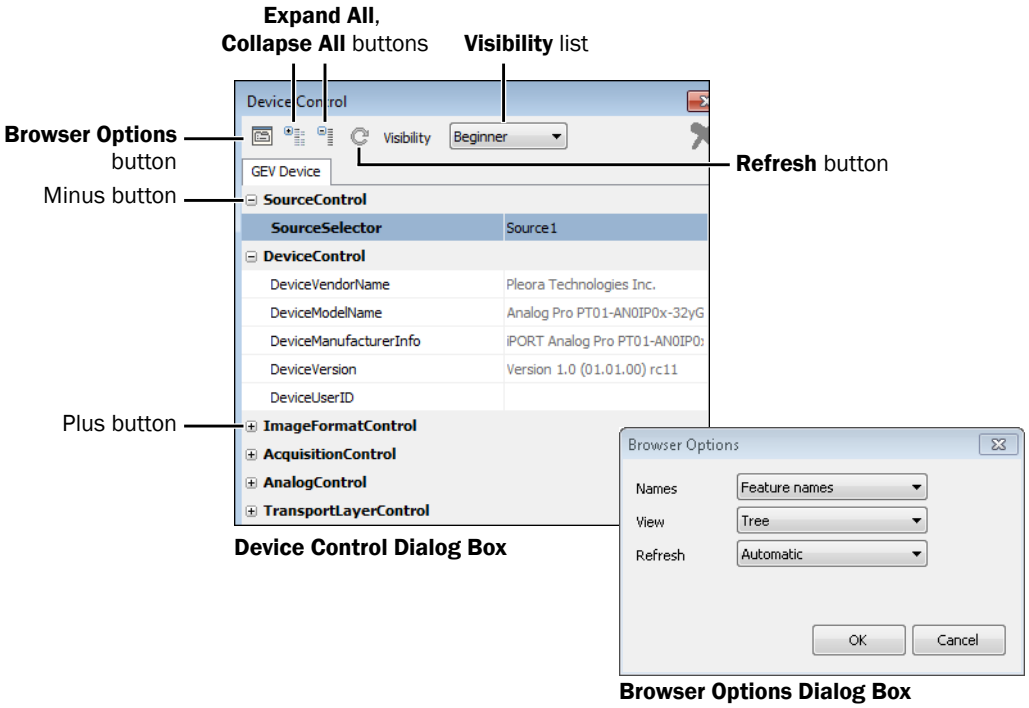
   The **Device Control** dialog box appears. Customize the settings as required by adjusting the features in the dialog box.

Features that are light blue are dependent on features that are dark blue in eBUS Player. For example, the **UserSetLoad** feature depends on the option that is selected in the **UserSetSelector**. If **Default** is selected, the default User Set is loaded when this command is executed. If **UserSet1** is selected, User Set 1 is loaded.



To adjust the display of features

- Perform any of the tasks listed in the following table to adjust the display of features.



Device Control Dialog Box

Browser Options Dialog Box

Table 9: Adjusting the Display of Features

Adjustment tool	Description
Expand All button	Expands the headings (when the **Tree** view is selected in the **Browser Options** dialog box).
Collapse All button	Collapses the headings (when the **Tree** view is selected in the **Browser Options** dialog box).
Visibility list	Filters the list of features to suit your level of video network responsibility and understanding. There are more controls available for the **Guru** level than the **Beginner** level; some controls are not available in the **Beginner** level.
Browser Options button	Opens the **Browser Options** dialog box, which allows you to show the features using either the feature name (as per the GenICam standard) or the display name, and allows you to choose whether the features are displayed as an alphabetical list or a feature tree. Also allows you to specify whether the device features are refreshed automatically, based on polling time, or manually refreshed.

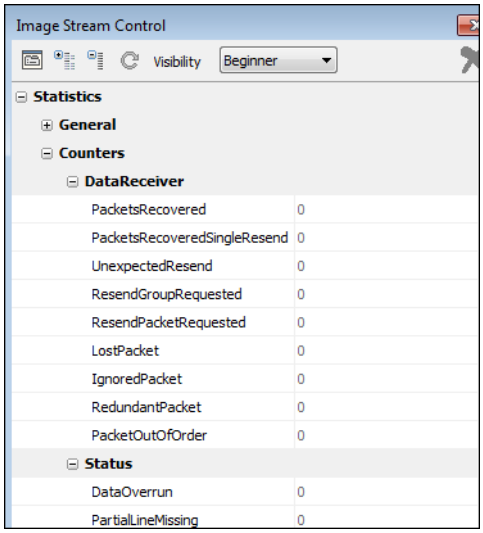
Table 9: Adjusting the Display of Features (Continued)

Adjustment tool	Description
Refresh button	Refreshes the features of a GigE Vision or USB3 Vision device (such as a transmitter or receiver) that are displayed in the **Device Control** dialog box. The following refresh options are available in the **Browser Options** dialog box: • **Polling**. Features that are defined for polling are automatically refreshed (if the polling time configured for the feature has elapsed). • **Automatic**. The features are automatically refreshed every few seconds. This is the default setting. • **Manual**. You can manually refresh the features in the **Device Control** dialog box.
Minus button	Collapses a heading (when the **Tree** view is selected in the **Browser Options** dialog box).
Plus button	Expands a heading (when the **Tree** view is selected in the **Browser Options** dialog box).

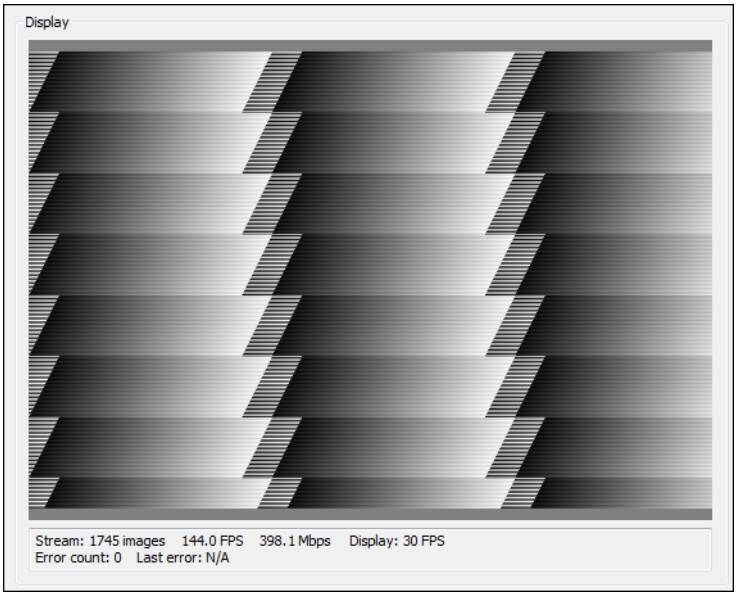
Monitoring Performance

As your device receives images from your camera and sends them to your computer, it keeps track of image errors (such as missing lines), network errors (such as lost packets), and other performance-related statistics.

You can view a complete list of error counts in the **Image Stream Control** dialog box. Performance metrics are grouped under **Statistics**.



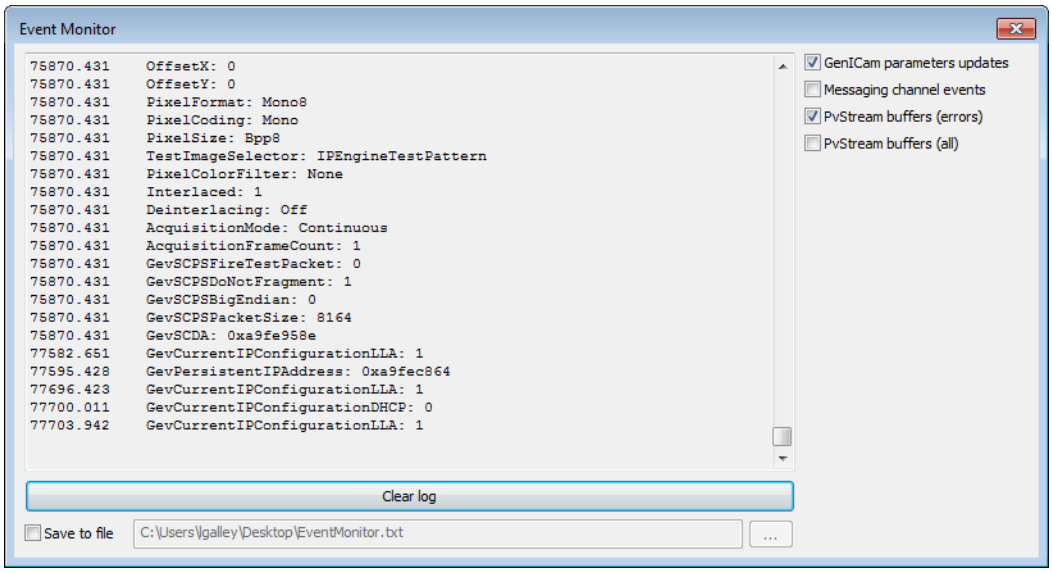
You can view a summarized list of error counts at the bottom of the **Display** section. The **Display** section shows the total number of images displayed (**BlockCount**), the instantaneous frame rate (**AcquisitionRateAverage**), and the data rate (**BandwidthAverage**).



Using the Event Monitor

The Event Monitor is a valuable tool that you can use to determine causes of issues that may occur during the use of your device. When enabled, you can view time-stamped records of all GenICam parameter updates and PvStream buffer errors, as well as the successful PvStream buffers.

You can clear the log content, and you can save the content to your hard drive.



To access the Event Monitor

1. Start eBUS Player and connect to the device.
2. Click **OK**.
3. Click **Play**.
4. Click **Tools** > **Event Monitor**.
5. Review the event monitor information:
   - **GenICam parameters updates.** Reports all device GenICam parameter invalidation/update events (as triggered by GenApi) as event monitor log events.
   - **Messaging channel events.** Reports all device messaging channel events as GenICam events.
   - **PvStream buffers (errors).** Reports all buffers retrieved from the PvPipeline by the application display thread that have an operation result other than OK.
   - **PvStream buffers (all).** Reports all buffers retrieved from the PvPipeline by the application display thread, regardless of the operation result. Please note that a large number of events will appear.

To save events in the monitor

1. Open the **Event Monitor**.
2. Select the **Save to file** check box, browse to the desired location, and then click **Save**.

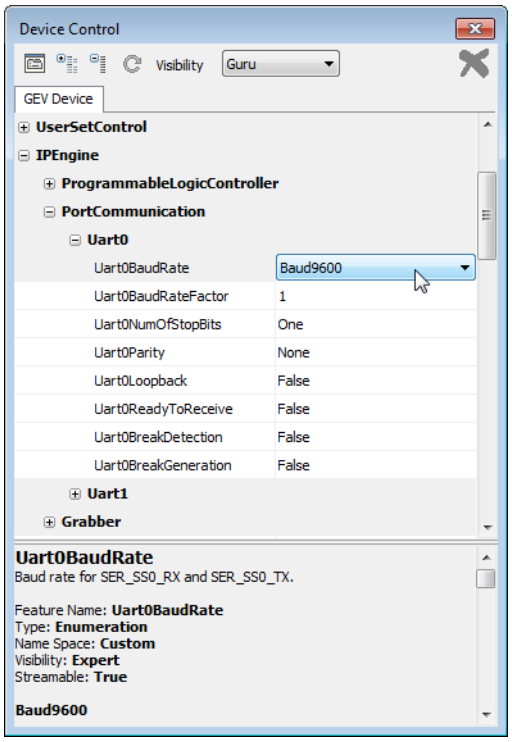
Modifying Camera Parameters Through Serial Ports

If you have a thorough understanding of the serial protocol to be used, you might want to communicate with a camera or other external devices through serial ports connected to your Pleora device.

eBUS Player allows you to control the serial ports of a GigE Vision or USB3 Vision camera that is integrated with a Pleora device.

Configuring the Serial Ports

The controls to configure the serial ports are available in the Device Control dialog box, as shown in the following image.



Setting the Baud Rate for Serial Ports

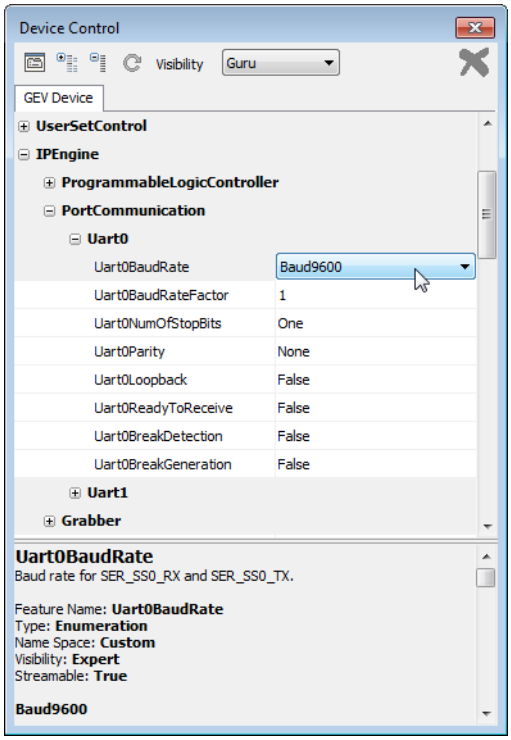
You must set the baud rate for the serial ports if the default value is not acceptable.

To set the baud rate for serial ports

1. Start **eBUS Player** and connect to your camera.
2. Click the **Device control** button to open the **Device Control** dialog box.
3. Scroll to the **PortCommunication** section.

   Ensure you are using the **Guru** visibility level.

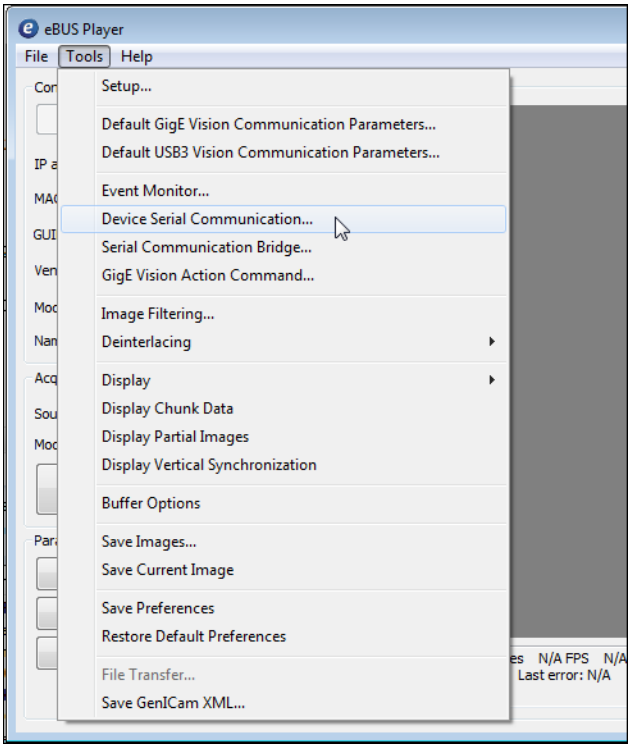
4. Depending on the type of device you are controlling, do one of the following:
   - In the **Uart0** section, set the baud rate using the **Uart0BaudRate** control.
   - In the **Uart1** section, set the baud rate using the **Uart1BaudRate** control.
   - In the **PortCommunication** section, set the baud rate using the **BulkBaudRate** control.



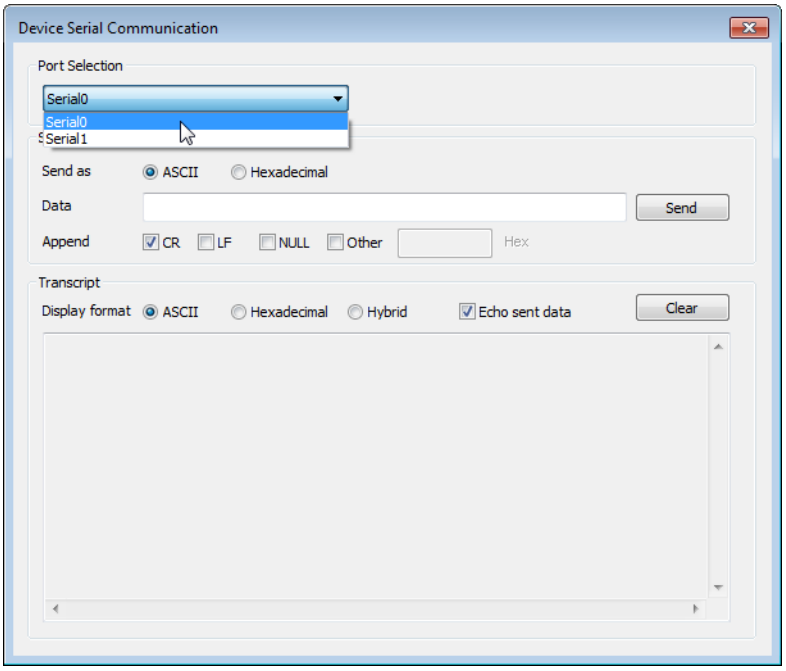
Other settings, such as parity and the number of stop bits, should also be configured by entering the appropriate values for the settings in the **PortCommunication** section.

To communicate with a camera or other external device using a serial port

1. Start **eBUS Player** and select **Tools** > **Device Serial Communication**.

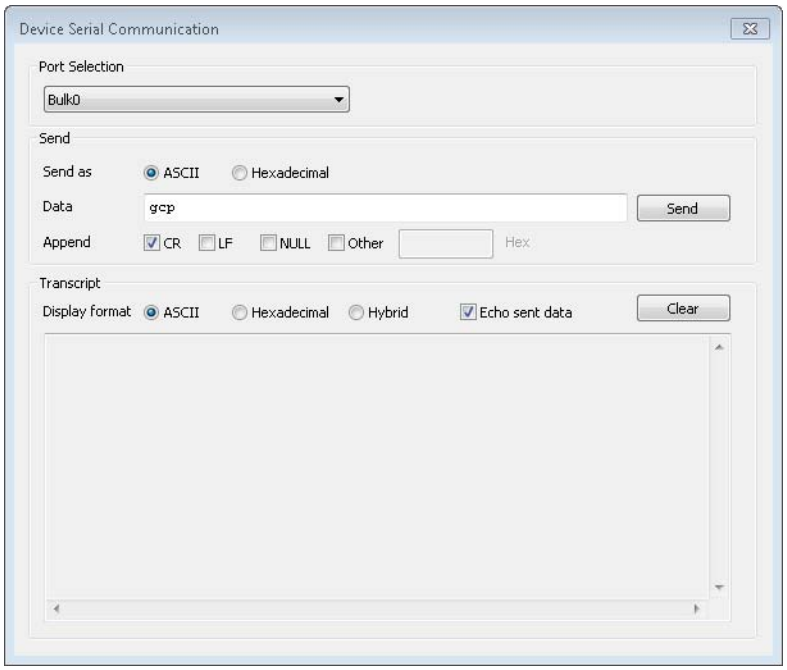


2. In the **Port Selection** list, click a Serial or Bulk port, depending on your device.



3. Under **Send**, select the data transmission sequence format by clicking either **ASCII** (text only) or **Hexadecimal**.

   For hexadecimal, enter a pair of hexadecimal digits for each byte, separated by spaces.



4. Type the data string in the **Data** field.
5. Select one of the trailer options beside **Append**.

   Trailer options are not mutually exclusive; they append in the order shown.

   Select **Other** for ASCII and hexadecimal sequences in custom trailers for camera heads that do not use the trailer options in the order shown, for example, **CR** and **LF**.
6. Click **Send** to transmit the data sequence.
7. Wait for the camera head to reply.
8. Close the **Device Serial Communication** dialog box.

Chapter 6

Saving eBUS Player and Device Settings

There are several options to save eBUS Player and device settings:

- **Save current session settings to a configuration file.** Save the eBUS Player preferences and device settings to a configuration file, which you can load during future sessions.
- **eBUS Player preferences only.** Save the eBUS Player preferences, such as the frame rate used to display video in eBUS Player, as your default eBUS Player settings. This method also saves the **Communication control** settings, which are used to communicate with your device, such as a specific default heartbeat interval and answer timeout value.
- **Device settings.** Save the settings to the device's flash memory, allowing the device settings to persist over power cycles.

The following topics are covered in this chapter:

Saving Your eBUS Player and Device Settings to a Configuration File

As you work with eBUS Player, you can save the eBUS Player preferences and device settings to a configuration file, which you can load during future sessions.

When you save your settings to a configuration file, all of the eBUS Player preferences, **Communication Control** settings, **Image Stream Control** settings, and device settings are saved.

To save your eBUS Player and device settings to a configuration file

1. Select **File** > **Save As**.
2. Select the location in which you want to save the configuration file.

To load eBUS Player and device configuration settings from a configuration file

1. Select **File** > **Open**.
2. Select the configuration file that you want to open.

   If eBUS Player *is not connected* to a GigE Vision or USB3 Vision device, eBUS Player opens the file and attempts to connect to the device from which the configuration file was created. Please note, eBUS Player attempts to establish a connection based on the MAC address or USB 3.0 GUID of the device. For GigE Vision devices, using the MAC address (instead of the IP address) allows eBUS Player to connect to the device even if its IP address has changed.

   If eBUS Player *is connected* to a GigE Vision or USB3 Vision device, a message appears to warn you that the settings will be applied to the device. Click **Yes** to apply the settings that are stored in the configuration file, or **No** to cancel the operation (and then disconnect from the device and connect to a different device).

Saving Your eBUS Player Preferences

eBUS Player allows you to save the eBUS Player preferences as your default eBUS Player settings. This feature is useful when you prefer certain settings, for example you like to use a high frame rate to display video in eBUS Player. It is also useful if you use **Communication control** settings to communicate with your GigE Vision or USB3 Vision devices, such as a specific heartbeat interval and answer timeout value.

If you want to revert back to the original eBUS Player default preferences, you can do so at any time.

To save your eBUS Player preferences

- On the eBUS Player **Tools** menu, click **Save Preferences**.

  All of the eBUS Player preferences, including the **Communication control** options, are saved.

The **Device control** settings and the **Image stream** control settings are not saved when you click **Save Preferences**. The **Device control** settings can be saved as part of the device "user sets". For more information, see "Saving Your Device Configuration Settings to the Device's Flash Memory" on page 52. If the **Image stream control** settings do not meet your needs, you must configure them every time you connect to a device.

You can revert back to the original eBUS Player default preferences by clicking **Restore Default Preferences** on the **Tools** menu.

Saving Your Device Configuration Settings to the Device's Flash Memory

You can use the options available in the **UserSetControl** section of the **Device Control** dialog box to save the changes you make to your GigE Vision or USB3 Vision device settings. Once saved, the changes (saved as "User Sets") can persist across power cycles.

Most iPORT devices support two User Sets: **UserSet1**, which consists of the user-configured settings, and **Default**, which consists of the pre-configured settings, to which you can always revert. Settings identified as **Default** in the **Device Control** dialog box cannot be changed.

The following table describes the options available in **UserSetControl**.

Table 10: Saving Configuration Settings to a GigE Vision or USB3 Vision Device

Setting	Description
UserSetSelector	Selects the User Set to load or save.
UserSetLoad	Loads the User Set specified by **UserSetSelector** to the device and makes it active.
UserSetSave	Saves configuration data to the User Set specified by **UserSetSelector**, which is part of the non-volatile memory of the device.
UserSetDefaultSelector	Selects the User Set to load and make active when the device is reset.
UserSetLoadLastUserSet	Shows the last User Set executed by the device from a **UserSetLoad** command, or as a result of a reset of the device.
UserSetLoadStatus	Indicates the success or failure of the last User Set applied. The User Set can be applied through a power cycle or through user selection.

To save a configuration change to UserSet1

1. In the **Device Control** dialog box, make the required configuration changes.
2. Scroll to the **UserSetControl** section and change the **UserSetSelector** setting to **UserSet1**.
3. Click **UserSetSave**.

To load the default configuration settings (one-time)

1. In the **UserSetControl** section of the **Device Control** dialog box, select **Default** in the **UserSetSelector** box.
2. Click the **UserSetLoad** setting and then click the **UserSetLoad** button that appears to the right.

   The default settings are applied to the GigE Vision or USB3 Vision device.

To specify the persistent settings that are loaded every time the device is reset

- In the **UserSetControl** section of the **Device Control** dialog box, select a User Set in the **UserSetDefaultSelector** box and then close the **Device Control** dialog box.

  The next time the GigE Vision or USB3 Vision device is reset, the User Set that you selected is loaded.

Chapter 7

Technical Support

On the Pleora Support Center, you can:

- Download the latest software.
- Log a support issue.
- View documentation for current and past releases.
- Browse for solutions to problems other customers have encountered.
- Get presentations and application notes.
- Get the latest news and information about our products.
- Decide which of Pleora's products work best for you.

To visit the Pleora Support Center

- Go to www.pleora.com and click **Support Center**.

  If you have not registered yet, you are prompted to register.

  Accounts are usually validated within one business day.