

COGNEX®

Cognex Vision Software

GigE Vision Cameras

User's Guide

June 2008

Cognex Software and GigE Vision Cameras

Cognex VisionPro and CVL software provide support for acquiring, processing, and displaying images from GigE Vision cameras. This document describes how to install and configure the drivers to support this capability under Windows XP and Windows Vista.

For information on using a GigE Vision camera with your Cognex vision software, see the VisionPro or CVL documentation.

The Cognex technical support site may contain additional documentation about using GigE Vision for your machine vision application.

This section describes the steps to set up GigE Vision cameras for use with Cognex software. You will:

1. Install Cognex software
2. Install the network adapters and their manufacturer's drivers
3. Connect the cameras
4. Set each adapter's IP address
5. Set each camera's IP address
6. Tune each adapter
7. Disable the Windows firewall for each adapter

System Requirements

In addition to the standard software and hardware requirements listed in your Cognex software documentation, your PC must include a Gigabit Ethernet adapter and one of the following (set with the appropriate security bits) to allow your vision application to run without issuing security violations:

- A Cognex frame grabber
- A Cognex dongle
- A Cognex software license

Cognex recommends Gigabit Ethernet adapters that use the PCI Express bus. Cognex recommends the following Gigabit Ethernet devices:

- Intel PRO/1000 PT Desktop Adapter (EXPI9300PT)
- Intel PRO/1000 PT Dual Port Server Adapter (EXPI9402PT)
- Advantech EKI-2725 Unmanaged Gigabit Ethernet Switch

The Gigabit Ethernet adapter or switch that you choose should support Jumbo Frames. If it does not, your application's performance may suffer. The Cognex-recommended adapters and switches support Jumbo Frames.

Install Cognex Vision Software

The CVL and VisionPro installer programs install utilities that will make setting up your GigE Vision camera easier. The installer also installs special drivers that may improve the performance of GigE Vision image acquisition.

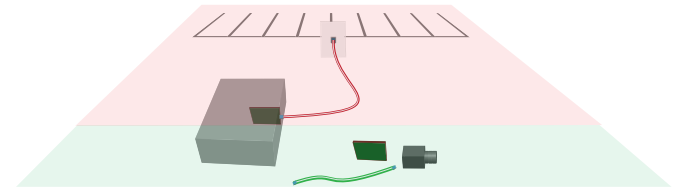
Be sure to install your Cognex vision software, CVL or VisionPro, including Cognex drivers, before continuing.

Install Gigabit Ethernet Network Adapter

Install the Gigabit Ethernet network adapter(s) you will be using for image acquisition according to the manufacturer's instructions.

Install any drivers that came with your Gigabit Ethernet adapter.

Your PC may already have a network adapter that is used to connect your PC to a local area network or to the Internet. The network adapters you use for image acquisition should be dedicated only for GigE Vision cameras and not connected to your local area network.



Connecting GigE Vision Cameras to Your System

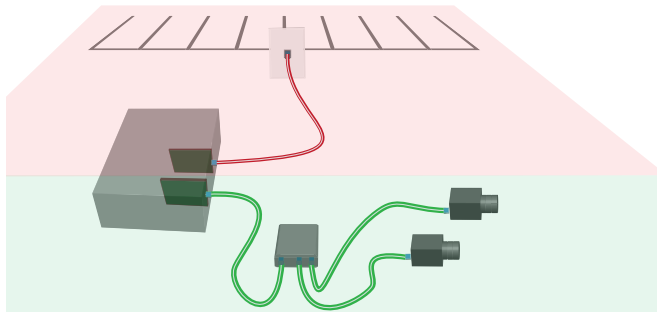
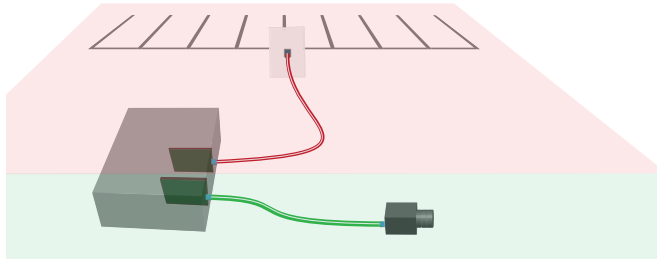
If your camera included the manufacturer's drivers or software development kit, Cognex recommends that you do not install them. If you have already installed such drivers, you should uninstall them.

For an application that uses only one camera, the GigE Vision camera network will consist only of a Gigabit Ethernet network adapter and the camera. If you are using more than one camera, you can use a dual-port network adapter or a Gigabit Ethernet switch.

In either case, your camera should be on its own network and not connected to your Local Area Network or to the Internet.

Although you can use either Cat 5e or Cat 6 Ethernet cables to connect your cameras to the network adapter or to the switch, Cognex strongly recommends Cat 6 Ethernet cables.

The following diagrams illustrate good network configurations for GigE Vision applications.



When you are using a network switch, as in the lower illustration, the network bandwidth is shared among all the cameras connected to it.

The next step is to assign IP addresses to the network adapter and to the camera.

Setting the Network Adapter's IP Address

You will use the **Cognex GigE Vision Configuration Tool** to assign IP addresses to the Gigabit Ethernet network adapter and any camera connected to it.

Each network adapter (and each port of a multi-port adapter) must have its own IP address on its own subnet. Each camera must have its own IP address on the same subnet as its network adapter, otherwise the camera will not be able to communicate with the network adapter.

Make sure that there are no vision applications running that use CVL or VisionPro. Start the **GigE Vision Configuration Tool** by choosing it from the **Start** menu:

CVL

Start->Programs->Cognex->CVL->Cognex Utilities->GigE Vision->Cognex GigE Vision Configuration Tool

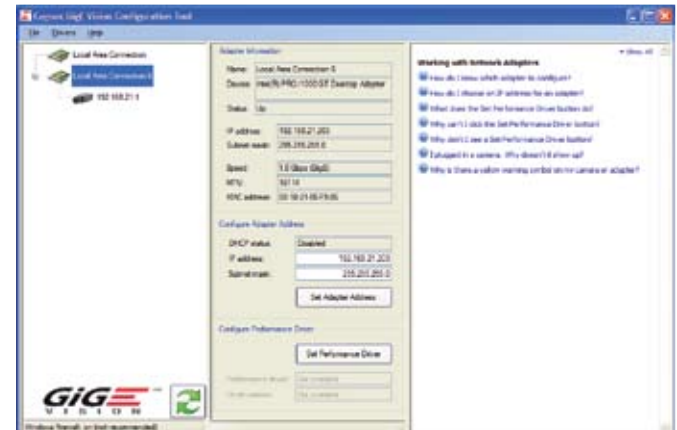
VisionPro

Start->Programs->Cognex->VisionPro->Utilities->GigE Vision Configuration Tool

If you are using Windows Vista, a prompt may appear asking you to approve running the **GigE Vision Configuration Tool**, or you may need to right-click the **GigE Vision Configuration Tool** icon and choose **Run as administrator** from the pop-up menu to run the tool with the appropriate permissions.

If you are using Windows XP, you must use the GigE Vision Configuration Tool from an account with administrative privileges.

The **Cognex GigE Vision Configuration Tool** displays all the network connections that correspond to the network adapters installed on your PC and the GigE Vision cameras connected to them in the left most pane:



To set a network adapter's IP address, follow these steps:

1. Select the **Local Area Connection** that corresponds to the network adapter that your camera is connected to.

The center panel displays information about the network adapter. Note that it is likely that at least one of your **Local Area Connections** is associated with the network adapter used for the data network used to connect your PC to your company's network.

Check with your network administrator if you are not sure which one it is.

2. Enter an IP address and subnet mask for the adapter in the **IP Address** and **Subnet** fields.

If you are not familiar with TCP/IP networking, Cognex recommends that you use the following values:

Network Adapter	IP Address	Subnet Mask
1st GigE Network Adapter	192.168.21.203	255.255.255.0
2nd GigE Network Adapter	192.168.22.203	255.255.255.0
3rd GigE Network Adapter	192.168.23.203	255.255.255.0

3. Click **Set Adapter Address** to set the address.

Next, set the IP addresses for the cameras connected to the network adapter.

Selecting IP Addresses for GigE Vision Cameras

Each camera must have an IP address in the same subnet as its network adapter:



1. Select a camera from the left most pane. The center panel displays information about the camera.
2. Enter an IP address and a subnet mask for the camera in the **IP Address** and **Subnet mask** fields.

The IP address of the camera must have the same first three numbers as the network adapter. The network adapter's address is given as **Host IP address**. You can use any unused value from 1 to 254 for the last number. Note that the address 192.168.21.203 is already used by the network adapter, so it cannot be assigned to a camera.

The camera's subnet mask should be the same as the **Host subnet mask**.

In the example above, the network adapter's IP address is 192.168.21.203. The cameras connected to this network adapter can be numbered from 192.168.21.1 to 192.168.21.254.

3. Click **Set Camera Address**.

CVL and VisionPro order cameras according to their network addresses.

If you change a camera's IP address while your vision application is running, you must exit the vision application and restart it.

Tuning the Adapter for Best Performance

Once you have configured the network adapter, connected the cameras, and set the camera's IP address, you can take some steps to tune the network adapter.

The Cognex driver installation program installs a set of special GigE Vision drivers that may improve the performance of your vision application when the application acquires images using free running or automatic triggering.

To use the high-performance drivers:

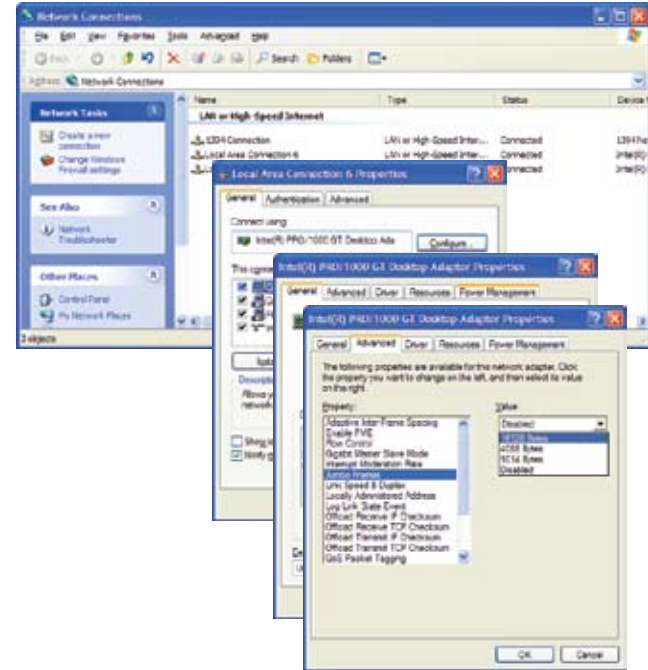
1. Select the **Local Area Connection** that your cameras are connected to.
2. Select **Set Performance Driver**
3. The **Cognex GigE Vision Configuration Tool** will prompt you to restart your PC if necessary.

Using Jumbo Frames can improve performance even if you application uses other trigger models.

If you are using the performance drivers with an Intel network adapter, you do not need to enable Jumbo Frames.

To enable Jumbo Frames under Windows XP:

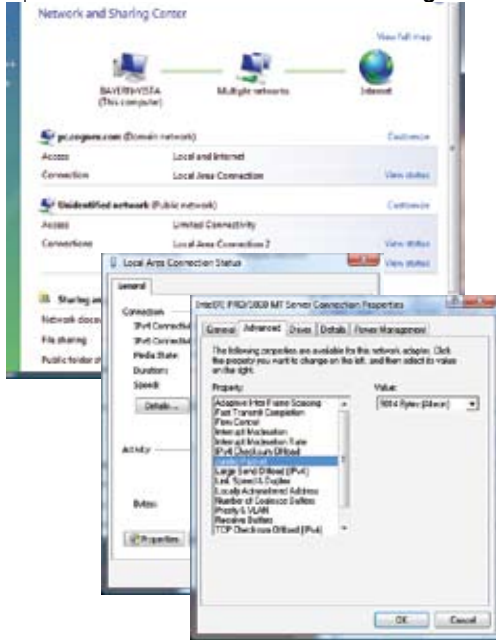
1. Open the **Network Connections** control panel.



2. Right-click the icon that corresponds to the Gigabit Ethernet adapter you are using for the GigE Vision network and choose **Properties**
3. Click the **Configure** button.
4. Select the **Advanced** tab.
5. From the **Property** list on the left, select **Jumbo Frames**.
If you do not see an entry for **Jumbo Frames**, your adapter may not support them, or you may need to update the network adapter's driver.
6. Choose the highest value offered from the drop-down **Value** list.
7. Click **OK**.

To enable Jumbo Frames under Windows Vista:

1. Open **Control Panel->Network and Sharing Center**.



2. Click the **View Status** of the network you wish to configure.
3. Click the **Properties** button.
4. Click the **Configure** button of the network adapter to open its property page.
5. Select the **Advanced** tab.
6. Select **Jumbo Frames** or **Jumbo Packet**.

If you do not see an entry for **Jumbo Frames**, your adapter may not support them, or you may need to update the network adapter's driver.

7. Choose the highest value offered from the drop-down **Value** list.
8. Click **OK**.

Disabling the Firewall

Disable the Windows Firewall for the network adapters you use for image acquisition. If you do not disable the firewall, you may not be able to acquire images or your application may time out.

Image acquisition performance is affected by the presence of a firewall, but camera discovery and setup is not. Your camera may appear to work fine when you're configuring it, but if the firewall is not disabled, image acquisition will not work.

You can disable the firewall for an individual network adapter without disabling the firewall system-wide. If your firewall settings are set by group policy, you will need to ask the person who manages your group network for assistance.

To disable the firewall on Windows XP:

1. Open the **Windows Firewall** control panel
2. Click the **Advanced** tab
3. Disable the firewall for the **Local Area Connections** that correspond to the network adapters you are using for image acquisition.
4. Click **OK**.

To disable the firewall on Windows Vista:

1. Open the **Windows Firewall** control panel
2. Click **Change Settings**. If you have User Access Control enabled, you will be asked to confirm this step.
3. In the **Windows Firewall Settings** dialog, select the **Advanced** tab
4. Disable the firewall for the **Local Area Connections** that correspond to the network adapters you are using for image acquisition.
5. Click **OK**.

You will need to reset the per-adapter firewall setting if you update a driver on a network adapter. If you change the performance driver setting, for instance, be sure to disable the firewall for that network adapter again.

Using GigE Vision Cameras

The manufacturer's camera documentation is the best source of information for your GigE Vision camera.

Video Formats

All GigE Vision cameras use one of two video formats:

- Generic GigE Vision (Mono)
- Generic GigE Vision (Bayer Color)

There are no camera-specific CCF files for GigE Vision cameras.

Supported GigE Vision Features

Cognex vision software supports the following GigE Vision features through the Cognex vision software API. A "feature" is a camera setting defined in the GenICam standard or by the camera manufacturer.

GigE Vision features supported in Cognex API

AcquisitionMode	AcquisitionStart	AcquisitionStop
PixelFormat	TriggerMode	
ExposureTimeAbs	ExposureTimeRaw	
BlackLevelRaw	GainRaw	
OffsetX	OffsetY	
Width	Height	

See the *Acquiring Images: Application Notes* chapter of the *CVL User's Guide* for a complete list. For VisionPro see the *Acquisition:GigE Vision* section of the *User's Guide*.

Always set GigE Vision features with a Cognex API if one exists. However, if a Cognex API does not exist for a GigE Vision feature, you can read and write directly using the VisionPro class **ICogGigE-Access** or the CVL class **ccGigE VisionCamera**.

Adapters and Cables

To ensure the best performance, make sure that all components in your GigE Vision network conform to Gigabit Ethernet standards and that you are using Cat 5e or Cat 6 cables.

Sample Programs

Your Cognex software includes several sample programs that will help you learn how to use VisionPro or CVL with your GigE Vision camera.

You can find VisionPro sample programs in

`%VPRO_ROOT%\Samples\Programming\Acquisition`

If you are using QuickBuild scripting, you can find examples QuickBuild job files in the following directory:

`%VPRO_ROOT%\Samples\QuickBuild\`

The QuickBuild job files that illustrate GigE Vision techniques are named beginning with **Script_GigE**.

You can find CVL sample programs in

`%CVL_ROOT%\sample\cvl`

Triggers, Strobes, and Bandwidth

In most cases your vision application will use strobes to illuminate the scene and freeze motion and triggers to control image acquisition. To ensure reliable operation, you may also be concerned about the bandwidth of your GigE Vision network.

In general the properties that control strobes, triggers, and bandwidth differ from manufacturer to manufacturer and from camera to camera, which makes it impossible to support them directly in the Cognex vision API.

You can use the timestamps included with each acquired image to detect missed images or missed triggers. You can learn more about timestamps from the *Using Timestamps with GigE Vision Cameras* topic in the *VisionPro User's Guide*. If you are using CVL, see the sample program `%CVL_ROOT%\sample\cvl\gige_timestamp.cpp`.

The sample programs installed with your software include examples of how to use triggers, strobes, and how to control bandwidth on GigE Vision cameras.

Third Party Considerations

If your camera included the manufacturer's drivers or software development kit, Cognex recommends that you not install them. If you have already installed such drivers, you should uninstall them before installing Cognex software.

All systems that use GigE Vision set the environment variable %GEN-ICAM_ROOT_V1_1% to point to the location of the GenICam libraries. When you install Cognex vision software, the installer sets this environment variable to the location where it installs its libraries. If you have installed another vendor's GigE Vision product, it may have already set the environment variable. In this case, the installer will warn you and ask you to confirm the change or to quit the installer.

Troubleshooting

In most cases, image corruption or failure to create acquisition FIFOs is the result of using incompatible Gigabit Ethernet adapters. The best way to correct or avoid such problems is to use one of the Cognex-recommended adapters, and to use the performance driver.

Some versions of Windows XP Service Pack 2 may crash or lock up when running the GigE Vision Performance Drivers. Microsoft offers a hotfix that corrects the issue. To learn more, see <http://support.microsoft.com/kb/921337>.

During the installation of GigE Vision Performance Drivers on Vista, Windows may display a Security Alert dialog. To permanently accept Pleora's Microsoft Authenticode certificate, when the dialog appears, click **Pleora Technologies Inc > Install Certificate > Next**. Select **Place all certificates in the following store**. In the **Certificate store** field, type **Trusted Publishers**. Click **Next > Finish > OK**. The Security Alert dialog will no longer appear.

When multiple identical network adapters are installed in a single PC, they must all use the same version of the manufacturer's network adapter driver.

Aborting GigE Vision Performance Driver installations may leave the network adapter in an invalid state. To recover, reinstall the manufacturer's network adapter driver.

For the most reliable installs and upgrades, reinstall the manufacturer's network adapter driver, and reboot before installing the GigE Vision Performance Drivers.

Due to an issue with the **Intel ProSet** software, the GigE Vision Performance Drivers. The issue occurs because the software continually tests for drivers and attempts to reinstall them. We recommend that you not install **Intel ProSet** or other software that behaves similarly.

The GigE Vision Performance Drivers do not support power management. To turn off your PC, use **Shut down** rather than **Standby** or **Hibernate**.

Due to an issue with the Pacific Instruments USB driver installer, some GigE Vision Performance Drivers may be removed during the installation. To fix the issue, reinstall the GigE Vision Performance Drivers after installing the USB drivers.

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