NI-IMAQ™ for IEEE 1394 Cameras Help

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NI-IMAQ for IEEE 1394 Cameras gives you the ability to acquire images with industrial IEEE 1394 digital video cameras. The cameras may operate at various resolutions and frame rates, depending on camera capabilities. NI-IMAQ for IEEE 1394 Cameras works with the LabVIEW Real-Time Module 7.0 and later, and Windows XP/2000.

This help file explains how to configure the NI-IMAQ for IEEE 1394 Cameras driver software and IEEE 1394 cameras using Measurement & Automation Explorer (MAX). You can use MAX to perform the following operations:

- Configure the device attributes
- Display a histogram to help configure the device
- Perform snap and grab image acquisitions for diagnostics and verification
- Save acquired images as bitmap (BMP), tagged image file (TIFF), or Portable Network Graphic (PNG) files

To navigate this help file, use the **Contents**, **Index**, and **Search** tabs to the left of this window.

For more information about this help file, refer to the following topics:

Conventions—formatting and typographical conventions in this help file

Important Information

Technical Support and Professional Services

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Conventions

This help file uses the following conventions:

The » symbol leads you through nested menu items and dialog box options to a final action. The sequence File»Page Setup»Options directs you to pull down the File menu, select the Page Setup item, and select Options from the last dialog box.



This icon denotes a tip, which alerts you to advisory information.

This icon denotes a note, which alerts you to important information.

bold Bold text denotes items that you must select or click on in the software, such as menu items and dialog box options. Bold text also denotes parameter names, emphasis, or an introduction to a key concept.

green Underlined text in this color denotes a link to a help topic, help file, or Web address.

- *italic* Italic text denotes variables or cross references. This font also denotes text that is a placeholder for a word or value that you must supply.
- monospace Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.

Connecting the IEEE 1394 Camera

You can connect an IEEE 1394 camera to a local Windows machine or a LabVIEW Real-Time (RT) target machine.



Note Before you connect a camera, make sure the IEEE 1394 hardware and NI-IMAQ for IEEE 1394 Cameras software is installed.

Local Connection

Complete the following steps to connect the camera to a local Windows machine:

- 1. Connect the camera to the IEEE 1394 port on the local machine.
- 2. In the MAX configuration tree, expand **Devices and Interfaces** to obtain a list of installed devices.
- 3. Expand **NI-IMAQ IEEE 1394 Devices** to obtain a list of available cameras.
- 4. If the camera fails to initialize as an NI-IMAQ IEEE 1394 digital camera, a warning dialog box opens, and a red circle with a white X appears next to the camera. To configure the camera as an NI-IMAQ IEEE 1394 digital camera, right-click the camera and select Driver»NI-IMAQ IEEE 1394 IIDC Digital Camera.
- 5. Select the appropriate camera from the list.

Remote Connection

Complete the following steps to connect the camera to a LabVIEW RT target machine:

- 1. Connect the camera to the IEEE 1394 port on the RT target machine.
- 2. In the MAX configuration tree, expand **Remote Systems**. A short delay occurs while MAX locates all the remote devices.
- Expand the remote device you want to target. If the device is not configured, refer to the MAX Remote Systems Help topics (Help»MAX Help) for information about adding a remote device.
- 4. Expand **Software**. Confirm that the NI-IMAQ for IEEE 1394 RT software is installed on the remote device.
- 5. If the NI-IMAQ for IEEE 1394 RT software is not installed, complete the following steps to install the software:
 - a. Click **Software**.
 - b. Click **Install Software** on the MAX toolbar to launch the LabVIEW Real-Time Install Wizard.
 - c. Select **NI-IMAQ for IEEE 1394 RT**, as well as any additional software you would like to install on the target machine.
 - d. Click **Next**. Review the list of software you selected to install.
 - e. Click **Next** to begin downloading the software to the target machine. When MAX has finished downloading the software, it restarts the remote device.
 - f. Click Finish.
 - g. Press <F5> to refresh the MAX configuration tree. Your IEEE 1394 camera should be listed under the Remote Systems branch.
- 6. Expand **Devices and Interfaces**.
- 7. Expand **NI-IMAQ IEEE 1394 Devices** to obtain a list of available cameras. If the IMAQ IEEE 1394 Devices folder is not present, the NI-IMAQ for IEEE 1394 Cameras software failed to initialize.

8. Select the appropriate camera from the list.

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Note When you connect a new device to a local or remote system, press <F5> to refresh the configuration tree and update the list of cameras in the NI-IMAQ IEEE 1394 Devices folder.

Configuring the IEEE 1394 Camera

When the camera is successfully connected, you can configure the camera in MAX to perform acquisitions.

Complete the following steps to configure the IEEE 1394 camera for a snap acquisition:

- 1. <u>Connect</u> the camera to the IEEE 1394 port on the computer.
- 2. In the MAX configuration tree, expand **Devices and Interfaces** to obtain a list of installed devices.
- 3. Expand **NI-IMAQ IEEE 1394 Devices** to obtain a list of available cameras.
- 4. Click the camera name to select the appropriate camera.
- 5. Click **Snap** to acquire a single image.
 - **Tip** Click **Grab** to acquire images continuously while focusing the camera. Click **Grab** again to stop the acquisition.
- 6. Use the **Acquisition Parameters** and **Camera Attributes** tabs to modify the camera video parameters.
- 7. Click **Snap** after adjusting the parameters to view how these changes affect the image.
- 8. Click **Save** to save the current configuration. These settings become the default settings for the camera.

Setting Remote Image Options

When performing a snap or grab from a remote system, images are transferred across the network and displayed on your local machine.

Complete the following steps to balance network performance and image quality.

- 1. Select Tools»IMAQ»Remote Image Options.
- 2. Select Transfer images from remote target to local host.
- 3. Select Compress images before transfer.
- 4. Adjust the image quality slider as shown in the following figure.
- 5. Select **Display images on remote monitor**.
- 6. Set **Timeout** to 60,000 ms.

Transfer

Select the **Transfer images from remote target to local host** checkbox to display images in the MAX window. Clear the checkbox to disable image transfer. Select the **Compress images before transfer** checkbox to perform lossy JPEG compression. Adjust the quality slider to set the JPEG compression rate. Higher quality images take longer to transfer. This option is useful if you are unable to transfer images at full frame rate. Clear the checkbox to transfer images without compression. The default settings are Transfer selected, Compress selected, and moderate compression.



Note Changes to the default compression and image quality settings remain on the remote target until you reboot the target or programmatically change the settings.

Display

Select the **Display images on remote monitor** checkbox to display the image on the remote video controller in the default video mode. Ensure that a video monitor is connected the remote system. Clear the checkbox to disable the display on the remote monitor. By default, the Display checkbox is selected.



Note Currently, the video display supports only Intel i815 and i845 graphics chipsets.

Timeout

Specify the amount of time for the local host to wait for an image from the remote target. This timeout applies only to transfers from the remote target to the local host. The default is 60,000 ms, or 1 minute.

Toolbar

The toolbar contains the following buttons:

- **Save** commits all of the camera configuration parameters and stores the information on the system to which the camera is connected. This button is disabled if none of the parameters have changed.
- **Revert** returns all parameters to the values before the last time you clicked **Save**.
 - Note The Save Changes? dialog box opens if you attempt to close MAX without saving the parameter changes. If you do not save the changes, the camera will not be configured as expected.
- **Snap** performs a single-buffer, single-shot acquisition and displays the result in the image viewer.
- **Grab** performs a multiple-buffer, continuous acquisition and updates the image viewer. Click **Grab** again to stop the continuous acquisition.
 - Note Snap and Grab use the latest parameters to perform an acquisition, allowing you to preview parameter changes before saving them to the camera file.
- **Histogram** displays a quantitative distribution of the pixels in the most recently acquired image per gray-level value. During a continuous acquisition, the histogram continuously updates.
- **Save Image** writes the most recently acquired image to a user-specified location.
- **Show/Hide Help** displays/hides the topic and context sensitive help to the right of the image viewer.

Camera Properties

<u>General Tab</u> <u>Acquisition Parameters Tab</u> <u>Camera Attributes Tab</u> <u>Bayer Color Tab</u>

General Tab

View camera properties from the **General** tab. This information is also reflected in the MAX configuration tree.

- **Name** is the interface name used to open the camera through the programming interface. Interface names are assigned by the driver. The first attached device is assigned cam0. Subsequent devices are named cam1, cam2, and so on.
- Vendor is the name of the camera manufacturer.
- **Model** is the model name of the camera.
- Serial Number is the 64-bit unique ID of the camera.

Acquisition Parameters Tab

Change video acquisition parameters from the **Acquisition Parameters** tab.

- Video Mode displays a list of all available video modes for the camera. Select the appropriate video mode. If you select Format 7, you also must set the **Color Coding** mode.
- **Color Coding** displays a list of available color coding modes for the camera in Partial Image Format (Format 7) mode. For non-Format 7 modes, this parameter returns the default color coding for the camera. Refer to the camera documentation for the appropriate color coding.
- **Speed** displays a list of available transfer speeds for the camera. The default is 400 Mbps.
- **Region of Interest** controls the acquisition window of the camera. The four parameters are Left, Top, Width, and Height. For Format 7 mode, these parameters affect the amount of data sent across the IEEE 1394 bus. For non-Format 7 modes, these parameters affect the amount of data decoded by the driver.
- **Timeout** sets the number of milliseconds the driver waits for the acquisition to complete before returning a timeout error. The default is 5,000 ms.
- **Packet Size** specifies the number of bytes transferred in each data packet. Changes to this parameter affect the number of packets required to transmit an image over the IEEE 1394 bus. Larger values transfer images faster. Smaller values allow more cameras to coexist on the same bus.
- **Ignore First Frame** pauses for a frame interval before returning an image. Set this option if a snap acquisition returns an incorrectly exposed image.
- Actual Bit Depth specifies the number of bits per pixel that contain image information. This parameter applies only to images with 16-bit components.
- **Bit Alignment** specifies the alignment of pixel information in memory. Refer to the camera specifications for the correct alignment. The default is Least Significant Bit (LSB). This

parameter applies only to images with 16-bit components.

• **Byte Order** specifies the order in which multibyte data is stored. Refer to your camera specifications for the correct byte order. The default is Big Endian. This parameter applies only to images with 16-bit components.

Camera Attributes Tab

View and modify camera attributes from the **Camera Attributes** tab. Select a feature, and use the slider or textbox to view and modify the attribute value.

Use Auto to allow the camera to always control a feature.

Use **One Push** to allow the camera to control a feature once and then return to the manual control state with adjusted values.

Use **Off** to disable the selected feature.

Use **Manual (Absolute)** to set the selected feature to use 32-bit floatingpoint numbers that map to real-world units.

Use **Manual (Relative)** to set the selected feature to use 12-bit integers that do not map to real-world units.

Use **Ignore** to prevent the driver from writing any values for the selected feature to the camera.

The feature set of the camera is defined by the manufacturer and can include the following features:

- Auto-Exposure performs a single acquisition and calculates the optimum white and black reference levels based on the dynamic range of the image.
- Brightness adjusts the black level of the acquired image.
- **Focus** controls the lens focus for the camera.
- Gain controls the intensity of the image.
- **Gamma** adjusts the gamma of an acquired image. Gamma is a nonlinear change in the difference between the video signal brightness level and the voltage level needed to produce that brightness.
- Hue adjusts the color phase of the acquired image.
- **Iris** controls the iris of a mechanical lens. Adjust this value to increase or decrease the amount of light that passes through the camera lens.
- **Optical Filter** changes the optical filter of the camera lens function.

- Pan controls the horizontal movement of the camera.
- **Saturation** adjusts the richness of the color. A saturation of zero corresponds to no color, or a gray pixel. For example, pink is red with low saturation.
- **Sharpness** adjusts the sharpness of the picture. Increasing sharpness produces better-defined edges in the image.
- **Shutter Speed** adjusts the integration time of the camera sensor. Integration time is the duration per frame that the sensor is exposed to light.
- **Temperature** gets the temperature inside the camera or controls the temperature.
- Tilt controls the vertical movement of the camera.
- White Balance adjusts the white color of the image along the U (blue) and V (red) color planes.
- **Zoom** controls the lens magnification for cameras with a motorized lens.
- **Trigger Delay** sets the delay between the incoming external trigger and the start of frame exposure.
- White Shading Compensation adjusts the white shading compensation.
- Frame Rate Prioritize sets the frame rate priority within the current video mode. This attribute corresponds to an absolute value in frames/s.

Reset to Defaults resets all camera attributes to the manufacturer default values.

Bayer Color Tab

Change Bayer color parameters from the **Bayer Color** tab.

- **Bayer Pattern** sets the variation of the Bayer encoder pattern used to encode the image.
- **Red Gain** adjusts the red gain of the RGB image. The default is 1.000.
- **Green Gain** adjusts the green gain of the RGB image. The default is 1.000.
- **Blue Gain** adjusts the blue gain of the RGB image. The default is 1.000.
- White Level sets the white level to optimize the input signal range. Monitor the image histogram to choose the appropriate white offset level. The white level is programmable in the range of 0 to 255. Higher values produce brighter images. The default is 220.
- Auto Calculate Gains calculates the values for Red, Green, and Blue Gain. Complete the following steps to calculate the appropriate gains:
 - 1. Set White Level to the desired value.
 - 2. Point the camera at a predominately white object, such as a sheet of paper.
 - 3. Click Auto Calculate Gains.

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