

Measurement & Automation Explorer Help for NI-IMAQdx™

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NI-IMAQdx gives you the ability to acquire images with gigabit ethernet (GigE) cameras and industrial IEEE 1394 digital video cameras. The cameras may operate at various resolutions and frame rates, depending on camera capabilities. This help file explains how to configure the NI-IMAQdx driver software, gigabit ethernet cameras, 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

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

Using Help

Related Documentation

Important Information

Technical Support and Professional Services

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Related Documentation

Some NI-IMAQdx documents also are available as PDFs. You must have Adobe Reader with Search and Accessibility 5.0.5 or later installed to view the PDFs. Refer to the <u>Adobe Systems Incorporated Web site</u> at www.adobe.com to download Adobe Reader. Refer to the <u>National Instruments Product Manuals Library</u> at ni.com/manuals for updated documentation resources.

The following documents contain information that you may find helpful as you use this help file:

- NI Vision Acquisition Software Release Notes—Contains information about new functionality, minimum system requirements, and installation instructions for NI-IMAQdx driver software.
- NI-IMAQdx VI Reference Help—Contains reference information about the LabVIEW palettes and VIs for NI-IMAQdx driver software.
- NI-IMAQdx Function Reference Help—Contains reference information about the LabWindows/CVI functions for NI-IMAQdx driver software.
- *NI-IMAQdx Help*—Contains fundamental programming concepts for NI-IMAQdx driver software.

Using Help

Conventions

Navigating Help

Searching Help

Printing Help File Topics

Conventions

This help file uses the following formatting and typographical 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.

This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.

bold Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

dark red Text in this color denotes a caution.

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

italic Italic text denotes variables, emphasis, cross-references, or an introduction to a key concept. Italic text 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.

Navigating Help (Windows Only)

To navigate this help file, use the **Contents**, **Index**, and **Search** tabs to the left of this window or use the following toolbar buttons located above the tabs:

- **Hide**—Hides the navigation pane from view.
- Locate—Locates the currently displayed topic in the Contents tab, allowing you to view related topics.
- **Back**—Displays the previously viewed topic.
- **Forward**—Displays the topic you viewed before clicking the **Back** button.
- **Options**—Displays a list of commands and viewing options for the help file.

Searching Help (Windows Only)

Use the **Search** tab to the left of this window to locate content in this help file. If you want to search for words in a certain order, such as "related documentation," add quotation marks around the search words as shown in the example. Searching for terms on the **Search** tab allows you to quickly locate specific information and information in topics that are not included on the **Contents** tab.

Wildcards

You also can search using asterisk (*) or question mark (?) wildcards. Use the asterisk wildcard to return topics that contain a certain string. For example, a search for "prog*" lists topics that contain the words "program," "programmatically," "progress," and so on.

Use the question mark wildcard as a substitute for a single character in a search term. For example, "?ext" lists topics that contain the words "next," "text," and so on.



Note Wildcard searching will not work on Simplified Chinese, Traditional Chinese, Japanese, and Korean systems.

Nested Expressions

Use nested expressions to combine searches to further refine a search. You can use Boolean expressions and wildcards in a nested expression. For example, "example AND (program OR VI)" lists topics that contain "example program" or "example VI." You cannot nest expressions more than five levels.

Boolean Expressions

Click the ▶ button to add Boolean expressions to a search. The following Boolean operators are available:

- **AND** (default)—Returns topics that contain both search terms. You do not need to specify this operator unless you are using nested expressions.
- **OR**—Returns topics that contain either the first or second term.
- **NOT**—Returns topics that contain the first term without the second term.
- **NEAR**—Returns topics that contain both terms within eight words of each other.

Search Options

Use the following checkboxes on the **Search** tab to customize a search:

- **Search previous results**—Narrows the results from a search that returned too many topics. You must remove the checkmark from this checkbox to search all topics.
- Match similar words—Broadens a search to return topics that contain words similar to the search terms. For example, a search for "program" lists topics that include the words "programs," "programming," and so on.
- Search titles only—Searches only in the titles of topics.

Printing Help File Topics (Windows Only)

Complete the following steps to print an entire book from the **Contents** tab:

- 1. Right-click the book.
- 2. Select **Print** from the shortcut menu to display the **Print Topics** dialog box.
- 3. Select the **Print the selected heading and all subtopics** option.
 - Note Select Print the selected topic if you want to print the single topic you have selected in the Contents tab.
- 4. Click the **OK** button.

Printing PDF Documents

This help file may contain links to PDF documents. To print PDF documents, click the print button located on the Adobe Acrobat Viewer toolbar.

Connecting the Camera

You can connect a camera to a local Windows machine or a LabVIEW Real-Time target machine.



Note Before you connect a camera, make sure the hardware and NI-IMAQdx software is installed.

Local Connection

Complete the following steps to connect a GigE camera or an IEEE 1394 camera to a local Windows machine:

- 1. Connect the camera to the 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-IMAQdx Devices to obtain a list of available cameras.



Note If an IEEE 1394 camera fails to initialize as an 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 IEEE 1394 digital camera, right-click the camera and select **Driver»NI-IMAQdx IIDC Digital Camera**.

4. Select the appropriate camera from the list.

Remote Connection

Complete the following steps to connect an IEEE 1394 camera to a LabVIEW Real-Time target machine:

- 1. Connect the camera to the IEEE 1394 port on the real-time (RT) target machine.
- 2. In the MAX configuration tree, expand **Remote Systems**. A short delay occurs while MAX locates all the remote devices.
- 3. 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-IMAQdx RT software is installed on the remote device.
- 5. If the NI-IMAQdx 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-IMAQdx 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-IMAQdx Devices** to obtain a list of available cameras. If the NI-IMAQdx Devices folder is not present, the NI-IMAQdx software failed to initialize.
- 8. Select the appropriate camera from the list.



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

Configuring the Camera

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

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

- 1. Connect the camera to the port on the computer.
- 2. In the MAX configuration tree, expand **Devices and Interfaces** to obtain a list of installed devices.
- 3. Expand NI-IMAQdx 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.

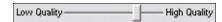
- 6. Use the **Acquisition Parameters** and **Camera Attributes** tabs to modify the camera video parameters.
- 7. Click **Snap** after adjusting the parameters to view how these changes affect the image.
- 8. Click **Save** to save the current configuration. These settings become the default settings 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»NI Vision»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.



 $\textbf{Note} \ \ \text{Currently, the video display supports only Intel i815 and i845 graphics chipsets.}$

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 $60,000 \, \text{ms}$, 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

Camera Information Tab

Acquisition Attributes Tab

Camera Attributes Tab

Bayer Color Tab

Ethernet Attributes Tab

Camera Information Tab

View camera properties from the **Camera Information** 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.
- **Bus Type** is the bus type of the camera.
- **IP Address** is the IP address of the camera.

Acquisition Attributes Tab

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

- Video Mode displays a list of all available video modes for the camera.
- **Pixel Format** displays a list of available pixel format modes for the camera. Refer to the camera documentation for the appropriate pixel formatting.
- **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. These parameters affect the amount of data sent across the bus and then 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 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. Use the toolbar on the Camera Attributes tab to modify the appearance of the attribute tree control. The toolbar contains the following buttons:

- **Expand All/Collapse All**—Expands/collapses all of the subcategories in the tree control. The top-level categories are always expanded.
- Refresh—Updates all of the attribute values. This button can be useful for updating readonly attributes while an acquisition is in progress.
- View Options—Configures the view options of the attributes.
 - All Attributes/Camera Attributes—Displays all of the attributes available for the current session or filters all of the attribute categories except the Camera Attributes category in the tree control.
 - Simple/Intermediate/Advanced—Specifies the visibility of the attribute to display. Only attributes with the specified visibility will be displayed. Select Advanced to return all the visible attributes.
 - Actual Names/Display Names—Displays the actual or display names of the attributes. The display name is a human readable version of the actual name.
- Show Help/Hide Help—Displays/hides the tooltip window that appears at the bottom of the tree control. This window is used to display helpful information about the selected attribute in the tree control.

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.

Ethernet Attributes Tab

Change ethernet parameters from the **Ethernet Attributes** tab.

- Resends Enabled determines if resends will be issued for missing packets.
- Max Resends Per Packet is the maximum number of resend requests that will be issued for a missing packet.
- Memory Window Size (KB) is the window size to use for packet processing.
- **Resend Threshold Percentage** is the threshold of the packet processing window that will trigger packets to be resent. The threshold is expressed as a percentage.
- Missing Packet Timeout (ms) is the time to wait for a missing packet before issuing a resend.
- New Packet Timeout (ms) is the time to wait for new packets to arrive in a partially completed image before assuming the rest of the image was lost.
- **Resend Response Timeout (ms)** is the time to wait for a resend request to be satisfied before sending another request.
- Resend Timer Resolution (ms) controls the resolution of the packet processing system that is used for all packet-related timeouts.
- **Resend Packets Requested** is the number of packets that have been requested to be resent in the current acquisition.
- Resend Packets Received is the number of packets that have been requested.
- Lost Packet Count is the number of packets that have been lost in the current acquisition.

Important Information

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Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Branch Offices

Office	Telephone Number
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Austria	43 662 457990-0
Belgium	32 (0) 2 757 0020
Brazil	55 11 3262 3599
Canada	800 433 3488
China	86 21 5050 9800
Czech Republic	420 224 235 774
Denmark	45 45 76 26 00
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Israel	972 0 3 6393737
Italy	39 02 41309277
Japan	0120-527196 / 81 3 5472 2970
Korea	82 02 3451 3400
Lebanon	961 (0) 1 33 28 28
Malaysia	1800 887710
Mexico	01 800 010 0793
Netherlands	31 (0) 348 433 466
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