

Matrox® Capture Works

User Guide

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1055 St-Regis Blvd. Dorval, Quebec, Canada H9P 2T4
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Chapter

1

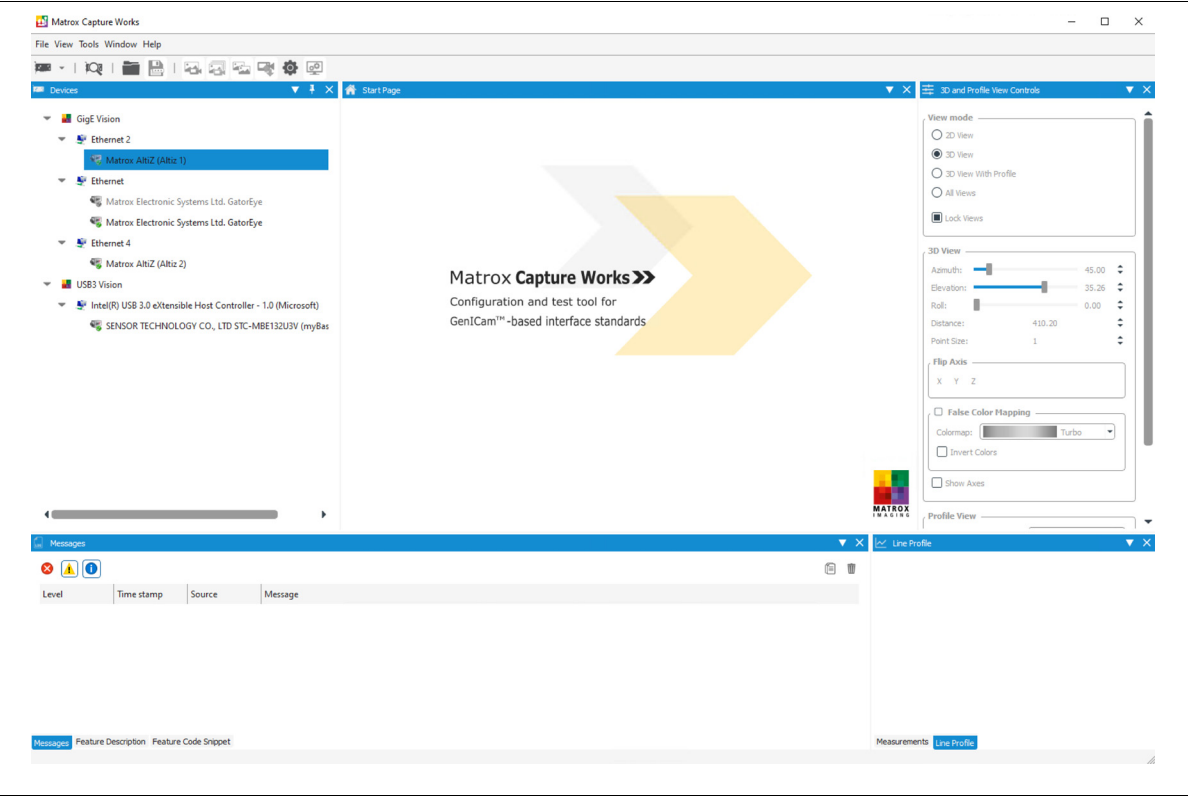
Before you begin

This chapter describes the basic features of Matrox Capture Works, minimum requirements, and resources for more help.

Matrox Capture Works overview

Matrox Capture Works is a GUI for 2D and 3D GenICam-compliant imaging devices that use standard interfaces like GigE Vision, USB Vision, CoaXPress, or GenTL. With this utility, you can rapidly evaluate the performance and functionality of virtually any GenICam-compliant camera or 3D sensor (or other device). You can also allocate your device, start or stop acquisitions, analyze and visualize captured data, save grabbed data, send a software trigger, as well as browse and control the selected device's features. Matrox Capture Works is distributed with MIL and Matrox Design Assistant; it is also available with MIL-Lite.

When using Microsoft Windows, Matrox Capture Works is launched from the **MIL Control Center** (found under **Matrox Imaging** in the **Windows Start** menu) or by typing "Capture Works" in the **Windows Start** menu. If using Linux, Matrox Capture Works is launched by typing "Capture Works" in the activities bar.



Matrox Capture Works features

Matrox Capture Works offers the following features:

- **Matrox device discovery service.** Matrox Capture Works can automatically detect when compatible devices (such as, Matrox Altiz or a third-party compliant device) are connected to or removed from your computer/network.
- **Support for multiple interfaces.** Matrox Capture Works supports 2D and 3D imaging devices with the following interfaces, provided that their corresponding MIL drivers are installed: GigE Vision, USB3 Vision, GenTL, and CoaXPress.
- **Built-in feature browser.** Matrox Capture Works provides a built-in feature browser to control/inquire about a connected device that has GenICam support. It also allows you to control/inquire about the digitizer/frame grabber used to interface with the device.
- **Dynamic window layout.** The windows in Matrox Capture Works can be customized to fit your specific workflow.

Minimum requirements

The minimum requirements to run Matrox Capture Works are the same as those for MIL.

For Microsoft Windows

To run under Microsoft Windows, you will need a minimum hard disk space of 6 Gbytes for the MIL development environment and a minimum of 250 Mbytes of free hard disk space to install the MIL runtime environment without any boards selected. Also, you will need a computer with a CPU that supports the SSE4.2 instruction set.

For Linux

To run under Linux, you will need a minimum hard disk space of 5 Gbytes for the MIL development environment and a minimum of 772 Mbytes of free hard disk space to install the MIL runtime environment without any boards selected. Also, you will need a computer with a CPU that supports the SSE4.2 instruction set.

Matrox Capture Works installation

To install Matrox Capture Works, you need to install MIL or Matrox Design Assistant with a driver for a GigE Vision, USB3 Vision, or GenTL, Matrox Rapixo CXP. If you already have MIL installed with any of the listed drivers and you don't see Matrox Capture Works, you can update those drivers and Matrox Capture Works will be installed.

Documentation conventions and notes

When the term Host is used in this manual, it refers to the host computer.

The term component refers to a component of a container. The color bands of an image are stored in the same component (typically, the intensity component).

Useful to know

Note it is useful to use the bookmarks at the left (PDF TOC) and **CTRL+Shift+F** to navigate this PDF. The latter displays all instances of the searched term(s) in the PDF with a bit of context.

Need help?

If you experience problems during installation or while using this product, you can refer to the support page on the Matrox Imaging web site: <https://www.matrox.com/en/imaging/support/tech-support>. The support page provides information on how to contact technical support.

To request support, you should first complete and submit the online Technical Support Request Form, accessible from the above-mentioned web page. Once you have submitted the information, a Matrox support agent will contact you shortly thereafter by email or phone, depending on the problem.

Matrox Vision Academy

Matrox provides the Matrox Vision Academy online training resource to help customers visualize the steps involved in using various products. If using Matrox Altiz, specialized Matrox Vision Academy videos provide guidance on basic and advanced steps used in working with Matrox Capture Works. For access to these videos, visit https://www.matrox.com/en/imaging/apps/vision_academy/course.



Chapter

2

Using Matrox Capture Works

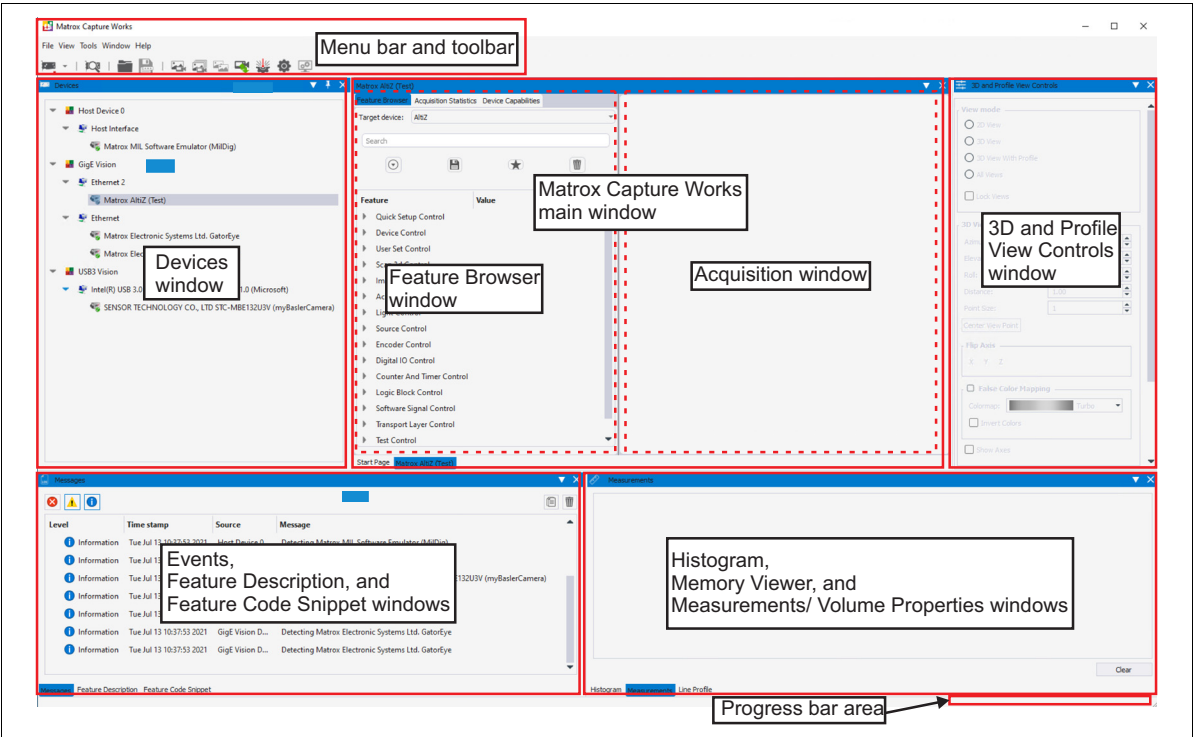
This chapter describes the Matrox Capture Works interface and how it is used.

Navigating Matrox Capture Works

To launch Matrox Capture Works, open the MIL Control Center (found under **Matrox Imaging** in the **Windows Start** menu) and select Matrox Capture Works. Once open, the windows of Matrox Capture Works can be pinned, removed, and re-sized. To reset the default window layout, select **Window**, and then select **Reset Window Layout**; alternatively, press CTRL+Z.

Matrox Capture Works windows

The image below shows the default layout of the Matrox Capture Works windows, as well as the standard areas of the Matrox Capture Works interface.

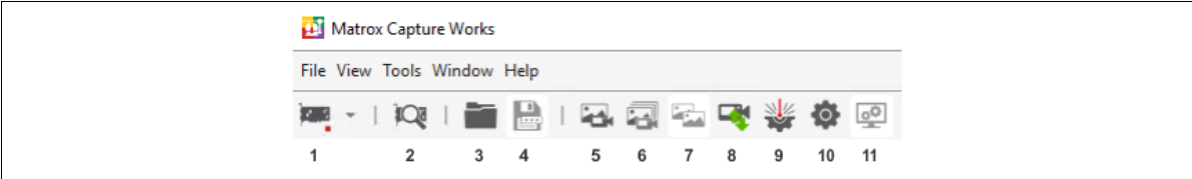


The Matrox Capture Works interface is divided as follows. Note that some windows are initially hidden, but can be displayed using the **View** menu.

Interface element	Description
Menu bar and toolbar	Provide typical options and device control functionality. See below for a description of the toolbar buttons.
Devices window	Displays all compatible devices connected to your computer/network. From this window, you are able to find and allocate a device (using the right-click context menu).
Matrox Capture Works main window (Feature Browser and Acquisition windows)	Displays information related to the allocated device and 2D and/or 3D views of the acquired data. Note that the name of this window will change depending on the selected device. There are two windows inside the Matrox Capture Works main window: Feature Browser window and Acquisition window. The Acquisition window presents three additional windows that are enabled when a 3D device is allocated: 2D View window, 3D View window, and Profile View window.
Matrox Altiz Setup window	Allows you to validate and interactively optimize features related to laser intensity, exposure, peak extraction, and fusion. It is also available to set up your scan area and offset. This window is accessible by clicking on the Matrox Altiz Setup toolbar button when a Matrox Altiz is connected.
Events window	Displays events such as errors, warnings, and information messages logged by Matrox Capture Works.
Feature Description window	Displays information related to the selected feature.
Feature Code Snippet window	Displays a code snippet of the selected features, which shows how to control/inquire these feature in MIL.
Histogram window	Displays a histogram that reports the frequency of the values found in the selected component of the currently displayed data. To select a component, use the dropdown list at the top of this window. Only the components that are enabled for transmission from the device are listed.
Measurement/ Volume Properties window	Displays the distance between two selected points. This window is visible when the Profile View window is selected, and either points have been selected in the profile or markers have been set in the horizontal or vertical ruler.
Memory Viewer window	Displays the numerical values at specific rows and columns of the selected component.
3D and Profile View Controls window	Provides quick access to settings that modify the display of the acquired 3D data. These settings allow you to modify the view mode, window layout, 2D View window, the Profile View window, and the 3D View window. This window is only available when acquiring 3D data.
Progress bar area	Shows the progress of the acquisition.

Main toolbar buttons

The top of the Matrox Capture Works interface includes toolbar buttons that are used to interact with your connected device. The toolbar buttons have the following functionality:



Toolbar button name	Description
Allocate device/Free device (1)	Allows you to allocate or free the device currently selected in the Device window. This button is disabled until you select a device. Once a device is selected, you can click on the arrow to allocate the device using a predefined configuration file (DCF file), a custom DCF, or a SDCF (Simulated DCF). To select a custom DCF, chose Browse... and navigate to the location where the custom DCF is found. After a device is allocated, a red dot will appear on the button.
Perform Device Discovery (2)	Allows you to initiate a device discovery.
Load (3)	Allows you to load 2D or 3D data in any supported format into Matrox Capture Works. Supported formats include .bmp, .gencd, .jpg, .mim, .ply, .png, .raw, .stl, .tif, and proprietary MIL files (.muf or .mbufc).
Save (4)	Allows you to save your 2D or 3D data to a file in any of the supported file formats. Note that, depending on how your data is represented, you might not be able to save to some file types. Also, be aware that this save button is not the same as the one found in the Feature Browser (D in the Feature Browser toolbar buttons table of the <i>Feature Browser window</i> section later in this chapter).
Single Grab (5)	Allows you to grab a frame of data from your device.
Continuous Grab (6)	Allows you to play or pause a live feed from your device.
Copy into New Buffer (7)	Allows you to copy the acquired data to a new tab. This allows you to compare new acquisitions with the copied data, or save it for later inspection.
File access (8)	Allows you to upload or download a previously saved device-specific file (such as a user set file).
Matrox AltIZ Setup (9)	Allows you to validate and interactively optimize features related to laser intensity, exposure, peak extraction, and fusion. It is also available to set up your scan area and offset. This toolbar button only appears when a Matrox AltIZ is allocated.
Grab Settings (10)	Allows you to specify the number of frames that can be buffered, and the grab timeout, in msec.
Display settings (11)	Allows you to make changes to the display settings of the displayed images or 2D data. This button is accessible after an acquisition has been made or an image has been loaded. It should be noted that the maximum display refresh rate is 60 Hz, even if the grab is much faster.

2D toolbar buttons

When 2D data is displayed, the 2D toolbar buttons become available next to the main toolbar buttons. The 2D toolbar buttons have the following functionality:

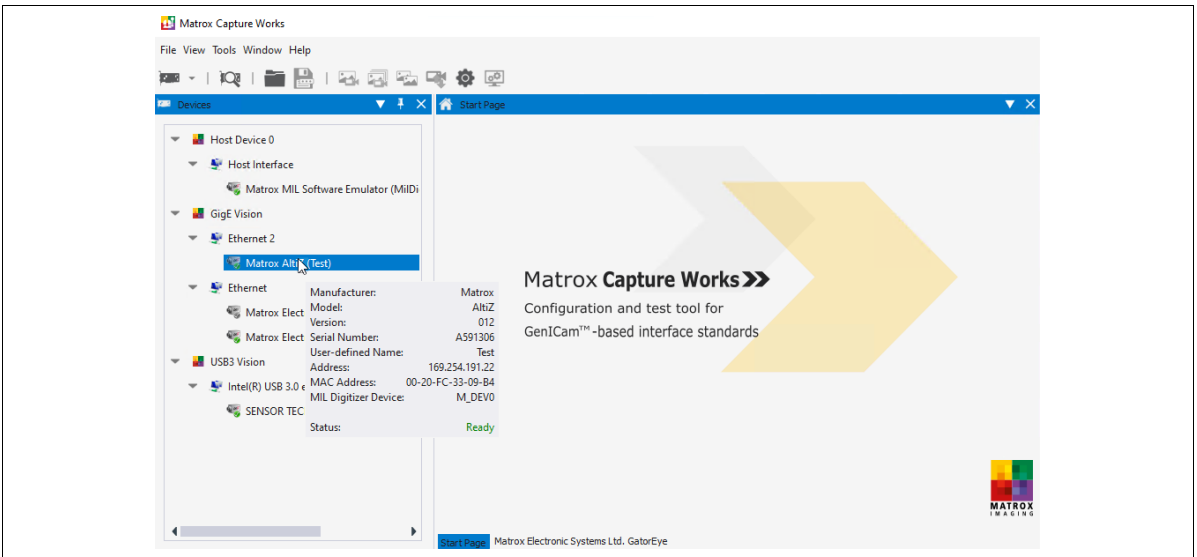


Toolbar button name	Description
View Finder Grid (1)	Adds a grid to the Acquisition window to help with camera position adjustments. The rows, columns, and intensity of the lines can be adjusted using a sliding bar or by manually entering values.
View Finder Crosshair (2)	Adds a crosshair to the middle of the Acquisition window to help identify the center of the acquisition. The size and intensity of the crosshair lines can be adjusted by a sliding bar.
Draw Line Profile (3)	Adds a line between two selected locations in the Acquisition window. You can click on different parts of the line to get the RGB or Mono values of a pixel at that particular location. The number of pixels along the line determines the length of the X-axis of the Line Profile graph. Clicking on a point in the Line Profile graph will make a point appear on the line, which represents the location of the selected pixel.
Draw Arc Profile (4)	Adds an arc between two selected locations in the Acquisition window. You can click on different parts of the arc to get the RGB or Mono values of a pixel at that particular location. The number of pixels along the arc determines the length of the X-axis of the Line Profile graph. Clicking on a point in the Line Profile graph will make a point appear on the arc, which represents the location of the selected pixel.

Allocating and naming devices with Matrox Capture Works

To set device features with Matrox Capture Works, perform the following:

1. Launch Matrox Capture Works from the **MIL Control Center** (found under **Matrox Imaging** in the **Windows Start** menu) or by typing "Capture Works" in the **Windows Start** menu.
2. Select the required standard interface from the tree structure (for example, select GigE Vision). This tree will show all the cameras and 3D sensors connected to your computer/network that use the selected standard. Double-click on your connected device to allocate it. You can also allocate a device by right-clicking on your connected device and selecting **Allocate**, or by selecting it and pressing the **Allocate device** toolbar button. You can allocate more than one device and they will appear as tabs at the bottom of the **Matrox Capture Works** main window. If a target device is not connected, you can use a simulated device, see the *Allocating simulated devices* subsection later in this section.



- ❖ Note that you can hover your mouse over the required device in the devices list to see information about the device (for example, its IP address).

3. Click on the **Feature Browser** tab. The list of available configurable and/or inquirable features is displayed in a tree structure. To expand the tree structure, double-click on any item. The description of each feature is given in the **Feature Description** window, and a code snippet is generated in the **Feature Code Snippet** window; the code snippet can be copied directly into MIL C++ code, or if not using C++, copied and appropriately adjusted.
4. Optionally, if you have not already done so, name your selected device. Open the **Device Control** item in the **Feature Browser** structure tree. Enter the name for your device in the **Device User ID** feature and press enter to apply changes.
5. If required, modify the setting of a feature listed in the **Feature Browser** tab, using the presented edit field or dropdown list.
6. To save the changes made with Matrox Capture Works to a user set, use the **User Set Selector** and the **User Set Save** features. These features allow you to select a user set and then save the device's current configuration to this user set, respectively. To reload it, select it using the **User Set Selector** feature and then use the **User Set Load** feature. If you want to load this user set every time you power up your device, set it as the default user set using **User Set Default Selector**.

Allocating simulated devices

If you don't have any compatible, connected devices, you can test Matrox Capture Works functionality using a simulated device. A simulated device can grab automatically generated images/3D data at a specified frame rate, resolution, and pixel format. The resolutions and frame rates available for simulated devices are indicated in the names of their SDCFs: 2D_SIMULATOR, 3D_SIMULATOR, 1024_100fps_Mono, Bayer_HD, FullHD, HD, and Mono. A simulated device can also grab images/3D data from a folder or from an AVI file.

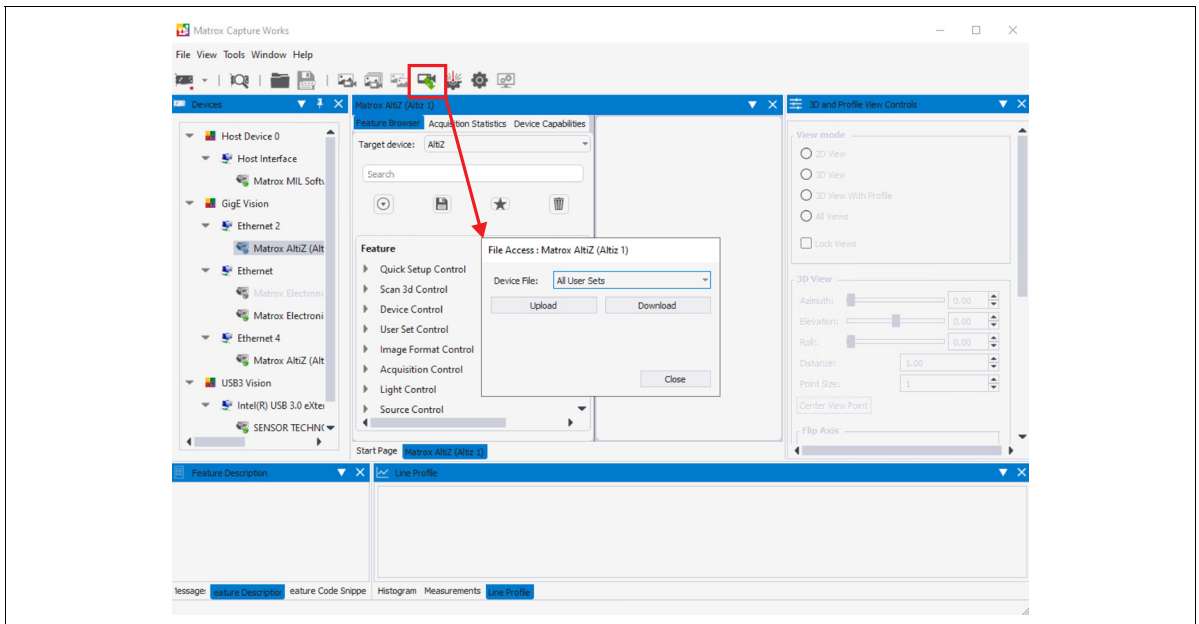
If you do not have any devices connected when you first start Matrox Capture Works, a default simulated device will appear in your device list. If your devices are already connected when you start Matrox Capture Works, the simulated device will be disabled by default and you will have to enable it manually.

To enable simulated devices, perform the following:

1. Select **Options** from the **Tools** menu. In the presented dialog, click on the **Simulated Device** tab
 2. Select **Enable simulated devices**.
 3. Once a simulated device is enabled, expand the **Host Device** system, expand **Host Interface**, and select **Matrox MIL Software Emulator**.
 4. To select what type of simulated device you will allocate, use the dropdown arrow on the **Allocate device** toolbar button; you will see a list of the SDCF's available for allocation.
- ❖ Note that simulated devices do not display the Feature Browser.

Uploading/downloading user sets and other files to/from a device

To download files (for example, user sets) from your device to your computer or to upload files (for example, user sets) from your computer to a device, use the **File Access** toolbar button in the **Matrox Capture Works** main window. After clicking on the **File Access** toolbar button, a dialog box opens for you to select whether to upload or download files to or from the device. Once you select the required operation, a window opens that allows you to select the location or destination for the files on your computer.



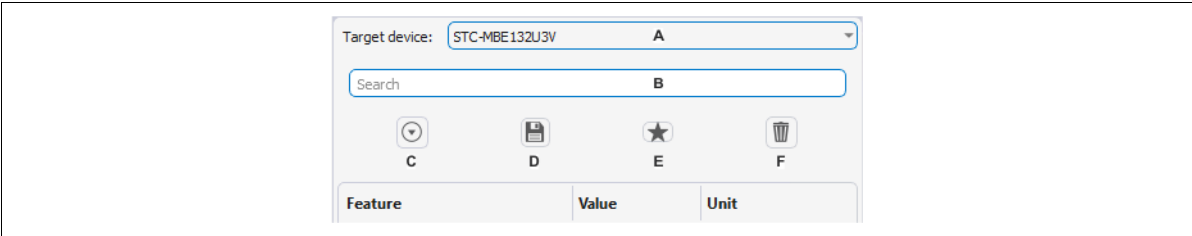
❖ Note that if a user set is loaded onto the device, it will also have to be selected using **UserSetSelector** and initialized using **UserSetLoad**.

Feature Browser window

The Feature Browser allows you to control/inquire about a connected device that has GenICam support. It also allows you to control/inquire about the digitizer/frame grabber used to interface with the device. You can add features accessed regularly to your favorites. If you need specific features of your device to have certain values, and you want to deploy multiple devices with the same feature settings, you can also use the Feature Browser to create a custom DCF. When you select or modify a feature, the Code Snippet window provides a corresponding snippet of MIL code that you can use to do the same at runtime.

Feature Browser toolbar

The Feature Browser toolbar has its own toolbar, as described below.



Interface element	Description
Target device dropdown list (A)	Allows you to select the device, MIL digitizer, or MIL system from which to list features in the Feature Browser.
Feature search field (B)	Allows you to search for a specific feature by its name.
Expand all toolbar button (C)	Allows you to expand all feature categories. If all the feature categories are already expanded, you can also press this button to collapse all feature categories.
Generate DCF toolbar button (D)	Allows you to generated a DCF with the camera features or digitizer controls that you have manually selected to include in your DCF from the Feature Browser. To select a feature for inclusion, select Add to DCF from the feature's context menu. When you click on the Generate DCF toolbar button, you will be able to choose the file name of the DCF and the location in which to save it. Note that this save button is not the same as the one found in the main toolbar (#4 in the main toolbar buttons table). For information on how to set features to be included in a DCF, see the <i>Creating a custom DCF</i> section later in this chapter.
Favorites toolbar button (E)	Opens the Favorites page. Selecting it a second time will return you to the complete Feature Browser features list.
Remove all favorites toolbar button (F)	Removes all features that were added to the Favorites page.

Adding features to the Favorites page

Some devices have many features, which can make it hard to find features quickly. If you use certain features regularly, you can add them to your favorites to save time when searching for them. To add a feature to your favorites, right-click on the feature and select **Add to favorites**. This will add the feature and its selector node to the **Favorites** page. To access the **Favorites** page, click on the **Favorites** toolbar button (star) found in the **Feature Browser** window.

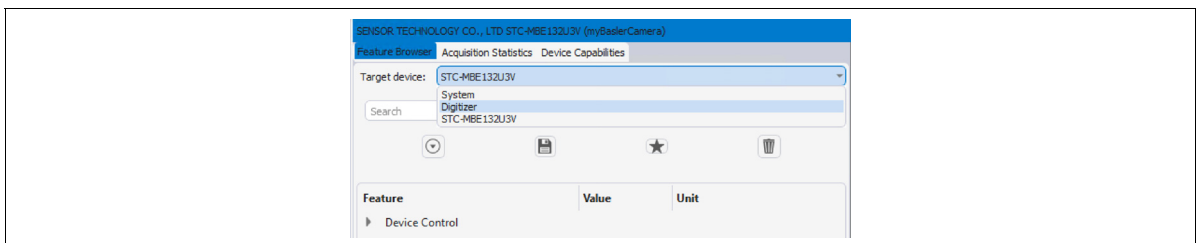
Creating a custom DCF

A custom DCF is useful for simplifying set up. It is ideal in cases where you only need specific features of your device to have certain values, and you want to deploy multiple devices with the same feature settings. A custom DCF is similar to a user set, but it allows you to change specific feature values instead of changing all of them. Although initially the features will have the same settings, they can be changed. A custom DCF can include both camera features and digitizer controls, but only writable features and controls can be added.

- ❖ Note that adding a persistent feature (for example, Persistent IP or Device User ID) to a DCF might cause conflicts when connecting multiple devices, since the persistent feature value will be the same for all devices.


To create a custom DCF, perform the following:

1. Allocate your device.
2. If you need to include features that are specific to the digitizer of your device, select **Digitizer** from the **Target device** dropdown list.



3. Once you have selected the required target device, right-click on the camera feature or digitizer control to be added and select **Add to DCF** from the context menu. The value that is set for each feature or control will be the value that is saved in the custom DCF. If you require a different value, you will need to change the value and re-save the DCF.

You can identify which features or controls have been selected for the custom DCF by the save icon that appears next to them:

Feature	Value	Unit
Usage Mode	Surface	
 Length World	1	mm
Number of Profiles	2	

- 4. After all of the required features are selected for your custom DCF, select the **Generate DCF** button to save the DCF. You will be able to change the name of the file and select where to save the DCF file.

To load a custom DCF, perform the following:

- 1. Select the dropdown arrow of the **Allocate device** toolbar button.
 - 2. Select **Browse...** and navigate to the location with your custom DCF.
 - 3. After selecting the custom DCF, your device will be allocated with the new DCF.
- ❖ Note that, if you try to load a DCF on a device that does not support the features or controls found in the DCF, then the allocation will fail.

You can modify the features included in an existing DCF. To change which features are included, load the required DCF, add or remove features as described above, and save the DCF.

Code snippets

The **Feature Code Snippet** window is available by selecting **Feature Code Snippet** from the **View** menu. This window provides snippets of code for the currently selected features in the Feature Browser. These snippets can be copied directly into your MIL C++ code, or if not using C++, copied and appropriately adjusted.

Feature Code Snippet

```
// The following code can be used to control feature values.  
MIL_INT64 LaserBrightness = 50;  
MdigControlFeature(MilDigitizer, M_FEATURE_VALUE, MIL_TEXT("LightLaserBrightness"), M_TYPE_INT64, &LaserBrightness);  
  
// The following code can be used to inquire feature values.  
MIL_INT64 LaserBrightness = 0;  
MdigInquireFeature(MilDigitizer, M_FEATURE_VALUE, MIL_TEXT("LightLaserBrightness"), M_TYPE_INT64, &LaserBrightness);
```

Events Feature Code Snippet

Acquisition window

The **Acquisition** window is where data captured by your allocated device is displayed. Both 2D and 3D data are displayed in this window. In the **Acquisition** window, you can add a grid and cross hair, select between multiple components, and copy the acquired data to another tab. Depending on which type of data is displayed, some of the options will not be available (for example, **View Finder Grid** and **View Finder Crosshair** are only available when displaying 2D data). When displaying data acquired with a 3D device, additional options are available; see the *3D and Profile View Controls* section for information these options.

View Finder Grid and View Finder Crosshair tools

The **View Finder Grid** and **View Finder Crosshair** tools are available when allocating a 2D device, or when using the 2D **View** mode for an allocated 3D device. These tools are specific to the selected component.

Adding a grid to the **Acquisition** window will help you section off the acquired data into quadrants, which is useful for camera position adjustments. You can manually select the number of rows and columns your grid has by clicking the on the dropdown arrow on the **View Finder Grid** toolbar button. Adding a crosshair to the **Acquisition** window will help identify the center of the acquired data. The size and intensity of the crosshair can be modified by clicking on the dropdown arrow on the **View Finder Crosshair** toolbar button and changing the settings.

Selecting between multiple components

When you allocate a multi-stream device or a 3D device, your acquired data is composed of multiple components. Non-image/non-range components are not displayed by default. However, to display these components, select **Options** from the **Tools** menu; then, select **View** and enable **Display All Components**.

You can switch between components using tabs at the bottom of the **Acquisition** window. Only components that are enabled during acquisition are available. If you don't see a component that you would like to display, you will need to enable it before acquisition.

Copying the grabbed image/3D data

You can copy the grabbed image or 3D data to another tab using the **Copy into New Buffer** toolbar button. This allows you to compare new acquisitions with the copied data, or save it for later inspection.

3D and Profile View Controls

The **3D and Profile View Controls** window provides a number of options for displaying the data acquired with a 3D device. To access this window, select **3D and Profile View Controls** from the **View Mode** menu. The options found in the **3D and Profile View Controls** window are grouped under **View Mode** and include the following modes: **2D View**, **3D View**, and **3D View With Profile**. **Lock Views** is another option available in the **3D and Profile View Controls** window, but is discussed in the *Comparing and locking multiple windows* section later in this chapter. Note that, no settings will be available in this window when grabbing 2D data.

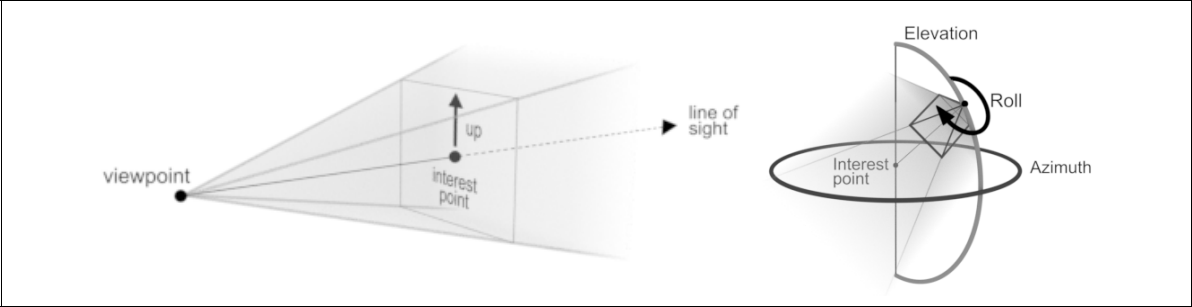
2D View mode

When **2D View** mode is selected, all the acquired 2D components are displayed in a **2D View** window. The same options are available as when displaying images from a 2D device. See the *Acquisition window* section for information on these options.

3D View mode

When the 3D View mode is selected, acquired 3D data is displayed in a 3D View window; options include: position and orientation of the view, thickness of the points (**Point Size**), and the color mapping of the points.

To change the position and orientation of the view of the acquired object, you can left-click, right-click, or center click and drag your mouse to drag-rotate, drag-pan, or zoom the view, respectively. Alternatively, you can set: **Azimuth**, **Elevation**, **Roll**, and **Distance**.








You can also use the number keys on the number row.

Number key	Description	
	Reference mode and Distance mode	Height mode
1	Top-tilted view	Bottom-tilted view
2	Top view	Bottom view
3	Front view	Rear view
4	Left side view	Left side view
5	Rear view	Front view
6	Right side view	Right side view
7	Bottom-tilted view	Top-tilted view
8	Bottom view	Top view

Depending on the selected Anchor coordinate system mode, you might also need to flip the Z-axis in the view, so that the acquired data appears right side up. You can flip any of the three axes in the view by selecting the corresponding checkbox next to the one to flip. Note that, flipping only changes the position and orientation of the view; it does not change the data nor the direction of the axes relative to each other (right-handedness).

For better visibility, you can also select a specific color mapping and chose to invert the mapping. All color mapping is relative to the Z-axis. The possible options available for colormaps are listed in the table below:

Colormap option	Definition
Heat	<div>This colormap transitions from black, to red, to yellow, and then, to white along the RGB cube as the indices increase.</div> <div></div>
Hue	<div>This colormap transitions from red, to yellow, to green, to cyan, to blue, to magenta, and then, to red along the edge of the hue circle as the indices increase.</div> <div></div>
Jet	<div>This colormap transitions from dark blue, to blue, to cyan, to yellow, to red, and then, to dark red along the RGB cube as the indices increase.</div> <div></div>
Spectrum	<div>This colormap transitions from red, to yellow to green, to blue, and then, to violet along the RGB cube as the indices increase. This is a representation of the visual spectrum according to wavelengths.</div> <div></div>
Turbo	<div>This colormap transitions from dark blue, to blue, to green, to yellow, to orange, to red, and then, to dark red along the RGB cube as the indices increase.</div> <div></div>

3D View With Profile mode

When **3D View With Profile** mode is selected, two windows are displayed: the **3D View** window (which is described in the *3D View mode* section above), and the **Profile View** window. In **3D View With Profile View** mode, options include: how to display individual profiles and measuring points along a profile.

Selecting a profile in the Profile View window

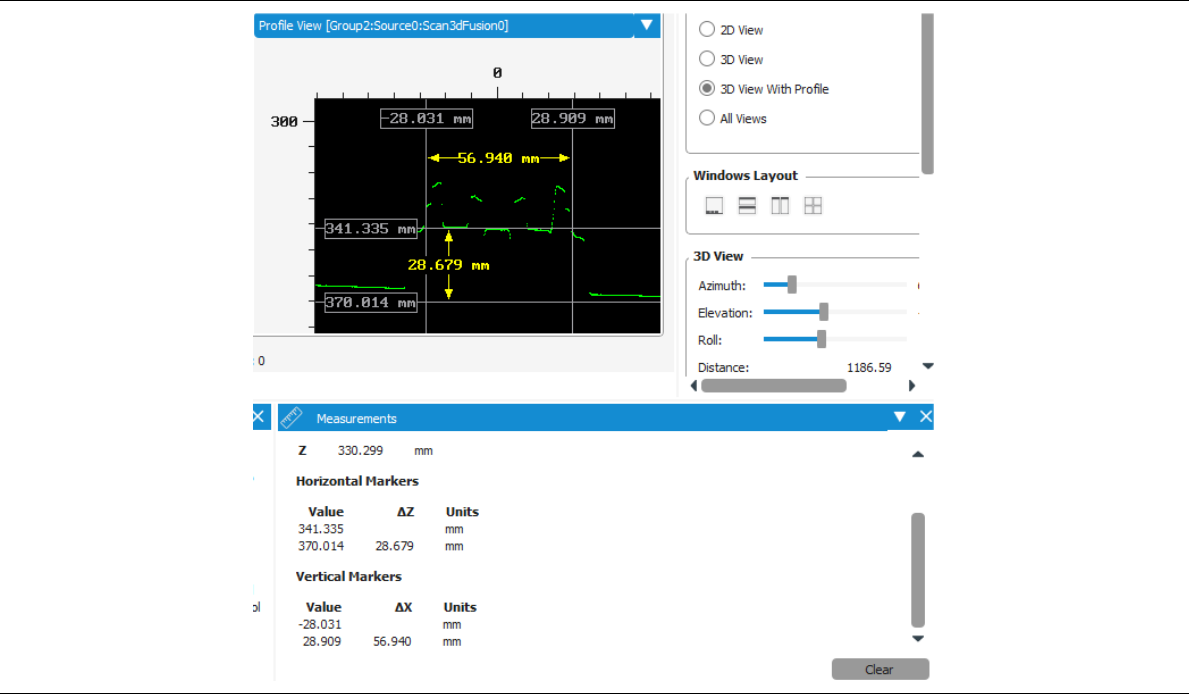
You can select which profile of the acquired data to display in the **Profile View** window by enabling **Show profile plane in 3D view** and setting **Profile Number** to the profile of the acquired data to display in the **Profile View** window. Profile numbers range from 0 (first profile taken) to **NumberOfProfiles** - 1. You can select to show or hide a profile plane in the **3D View** window as a visual indication of which profile is displayed. There is also the option to flip the Z-axis of the profile in the **Profile View** window, if the object appears upside down.

Measuring points in the Profile View window

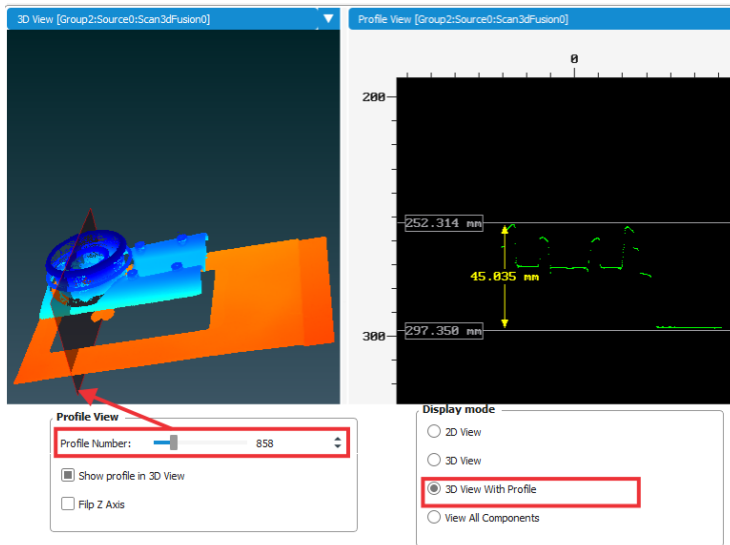
You can measure the distance between two selected points, in real world units, in the **Profile View** window. With an acquired profile in the **Profile View** window, click along a measurement axis to create a marker that displays the distance along the selected axis. This can be done in either the X-axis or Z-axis. Once the marker is placed, you can drag it along its axis, add additional markers to the measurement axis, or delete all markers by pressing the **Delete** key.

- ❖ Note that when taking measurements, you can only measure along the axes of the profile plane.

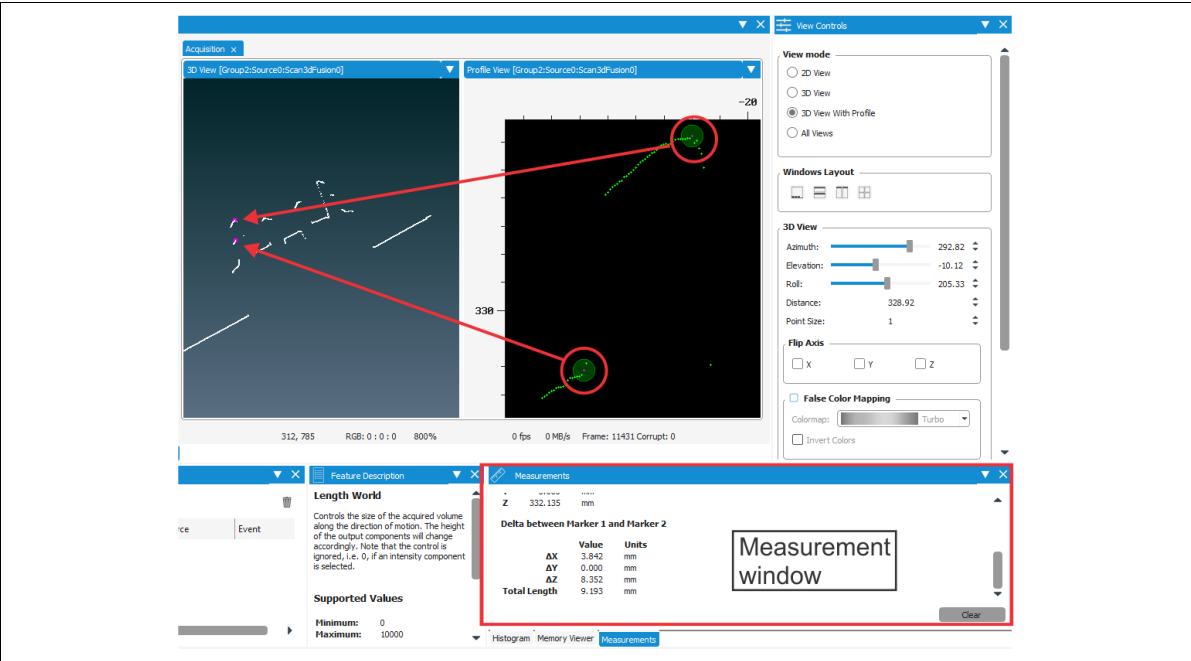
The values for these distances are displayed in the **Measurements** window, as shown below.



For a multi-profile surface scan, first select a specific profile, as outlined in the *Selecting a profile in the Profile View window* subsection above. Now, you can click and drag the measurement marker along its axis to measure points on the selected profile, as displayed below.



Another way to take measurements, which is more accurate, is by selecting the **individual points**. If you zoom in on your profile, you will notice that the intensities of the profile have selectable points. To measure the distance between two points, click to select one point, and then hold **Ctrl** and click to select a second point. The distance between the two points will be displayed; the location of these points will also be shown in the **3D View** window.



Windows layout

If you have selected **3D View with Profile** or **All Views**, then the **Windows Layout** buttons become available in the **3D and Profile View Controls** window, as long as there is more than one component grabbed. These are used to quickly organize the windows that display your acquired data. The options for organizing your windows are: tabbed, vertical, horizontal, and tiled. You can also find these options by navigating to the **Windows** menu and selecting **Manage View Layouts**.

Comparing and locking multiple windows

If you have allocated more than one device, you can display and compare the acquired 2D or 3D data across multiple windows. To do this, you will need to allocate the first device; then, undock the device's main window by clicking and holding on the outer edge of the window, and then dragging it to where you like. Allocate the next device, and undock the device's main window in the same way. Do this for all the devices whose windows you need to compare. If you free any of the devices, you will lose the acquired data. You can resize the undocked windows by clicking and dragging the edges to the required location.

You can also use this undocking technique to compare the different components of acquired data with the components of data loaded from a specified file.

- ❖ Note, if required, you can also undock component tabs. This is useful if you need to visually compare the information in different components.

Once you have multiple windows undocked and sized appropriately, you can also lock all views together when using a 3D device. This will apply any movement in one window to all of the windows that are open. This is useful when comparing multiple acquisitions and you need to move the object around in the acquisition window. To lock the views, select **Lock Views** in the **3D and Profile View Controls** window. To reset the windows to their default locations, you can either use **Ctrl+Z**, or select **Reset Window Layout** from the **Window** menu item.

- ❖ Note that **Lock Views** is only available for a device that grabs multiple components. Also, **Lock Views** is not able to lock views across different devices.

For information on how to navigate the **3D and Profile View Controls** window, see the *3D and Profile View Controls* section earlier in this chapter.

Inspecting your data

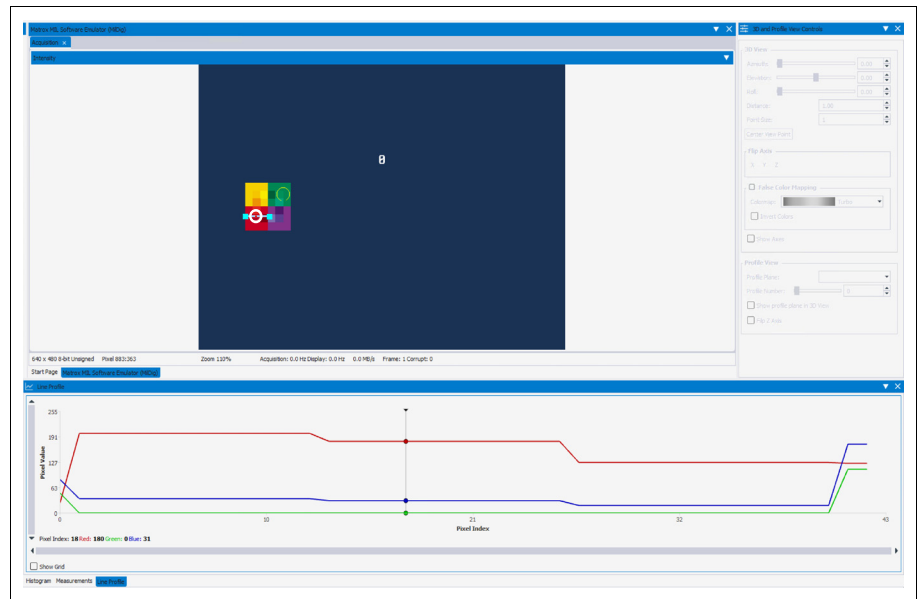
After acquisition, Matrox Capture Works allows you to inspect the data by taking a line or arc profile, taking the histogram, or viewing the data in the memory viewer.

Line profile and arc profile

The **Draw Line Profile** and **Draw Arc Profile** tools are available when working with 2D data. These allow you to establish the value of each pixel along a line or arc, respectively. The X-axis represents the distance along the line/arc, in pixels, and the Y-axis represents the pixel intensity. The location of these toolbar buttons is described in the *2D toolbar buttons* section earlier in this chapter.

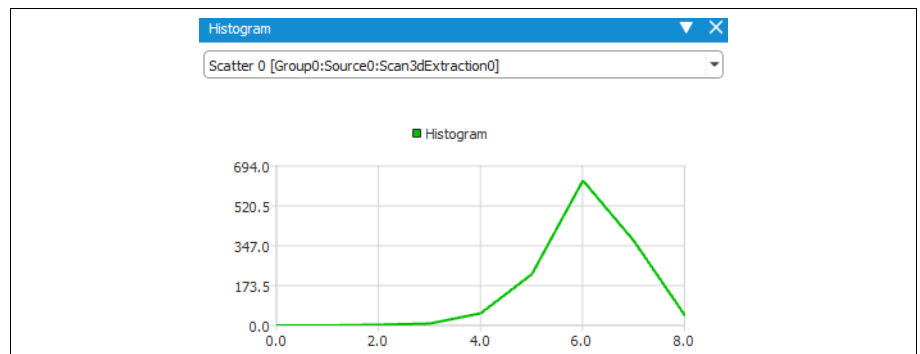
To use the **Draw Line Profile** tool, select the **Draw Line Profile** toolbar button, and then click your mouse and drag a line across your area of interest in the **2D View** window. Similarly, to use the **Draw Arc Profile** tool, select the **Draw Arc Profile** toolbar button, click your mouse and drag it to define the diameter of the circle around your area of interest, and then click again to set it. Once the diameter for the **Draw Arc Profile** tool is set, drag your mouse to enlarge, shrink, or join the arc into a circle. After the **Draw Line Profile** or **Draw Arc Profile** tools are placed in the **2D View** window, a graph appears in the **Line Profile** window, where you can hover your mouse over the graph to find the RGB or Mono pixel values at specific parts of the line or arc. When you hover your mouse over the graph, a small circle appears on the drawn line or arc to identify exactly where along the line or arc the pixel values are being taken.

In the image below, the **Draw Line Profile** tool is selected. A location is selected on the graph in the **Line Profile** window, as shown by the dots on the Red, Blue, and Green lines, and its corresponding position on the **Draw Line Profile** tool is visible.



Histogram

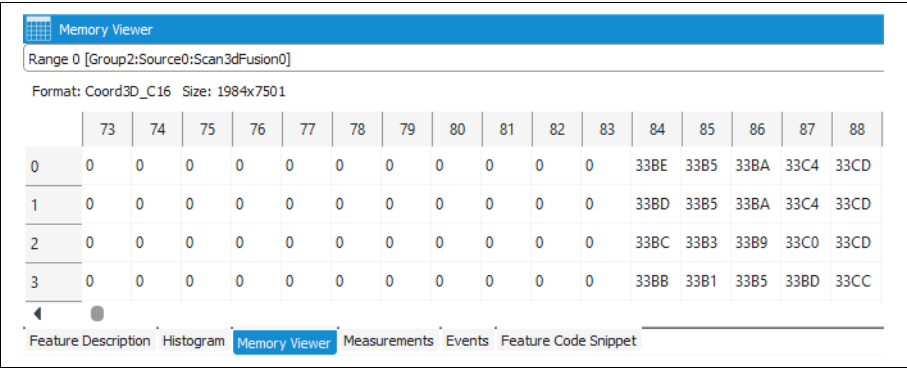
The **Histogram** window is available by selecting **Histogram** from the **View** menu. This window displays a histogram that reports the frequency of the values found in the selected component. The component selected in the **Histogram** window is not necessarily displayed in the **Acquisition** window.



Memory Viewer

The **Memory Viewer** window is available by selecting **Memory Viewer** from the **View** menu. This displays numerical values at specific rows and columns of a component. In the memory viewer, values of the component are displayed in hexadecimal by default; from the right-click context menu, you can select to display the values in decimal. The memory viewer can display the data of any image/component and is useful if you need to see the data of components that cannot be displayed.

In the image below, the acquired pixel values are displayed in hexadecimal.



Firmware updates

Matrox Capture Works allows you to update the firmware of your connected device, as long as it supports the GenICam firmware update protocol. To update your firmware, first ensure that you have freed the device whose firmware you will be updating. Then, select **Firmware Update** from the **Tools** menu; the **Firmware Update** window is presented. From this window, select **Firmware File** and navigate to the firmware file (.guf) to use to update your device. Once the file is chosen, specify which device to update by selecting the checkbox next to the device's name. If a device is not compatible with the selected firmware file, then the device will appear grayed out. You can update multiple devices at the same time with the same firmware file by selecting their corresponding checkboxes.

- ❖ Note that a firmware update is only available if it is supported by the connected device.

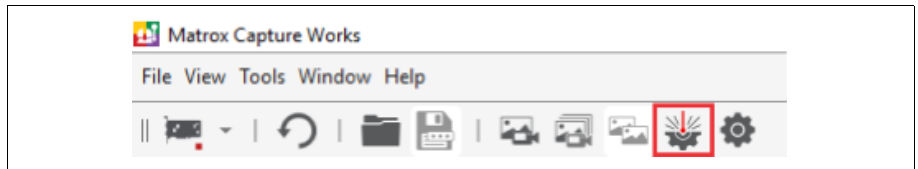
Warning

If you are doing a firmware update, be aware that there is the possibility of losing your user sets. It is advised for you to write down the feature values of any user set you need to backup, since they might be reset to their default values after the firmware update.

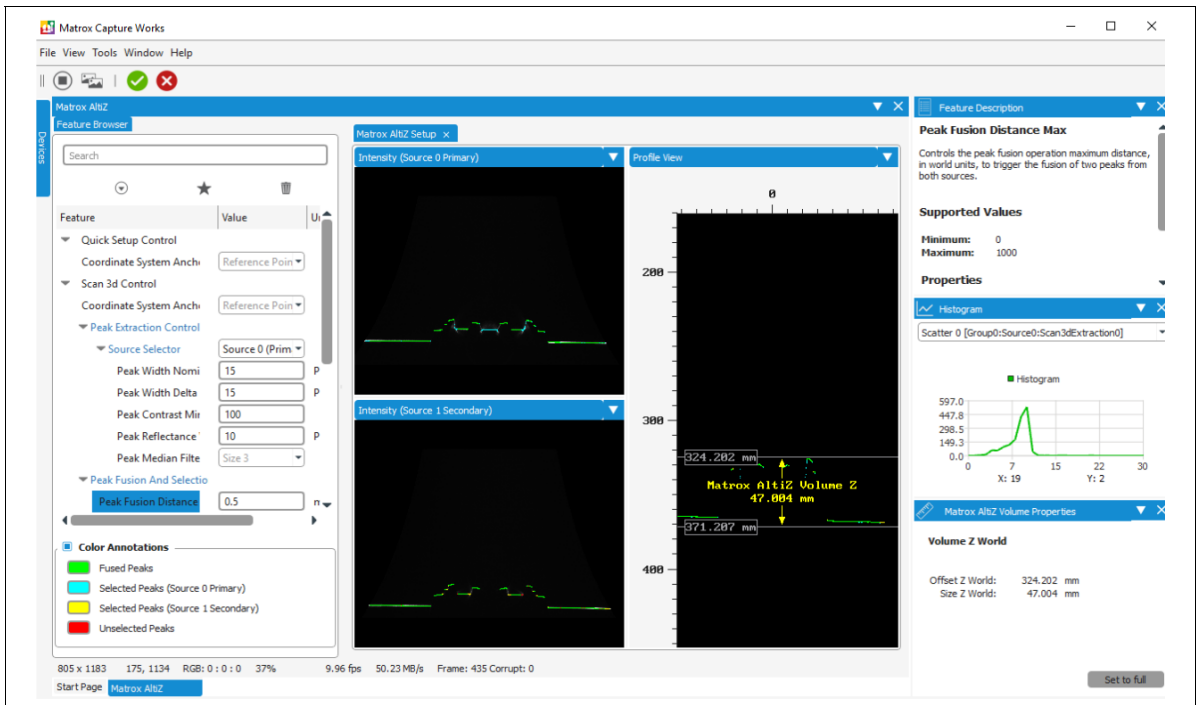
Matrox AltiZ Setup window

The **Matrox AltiZ Setup** window is only available when Matrox AltiZ is connected to Matrox Capture Works. For detailed information on how to adjust the Matrox AltiZ settings used in this section (for example, adjusting the available range, setting laser brightness and exposure, and adjusting peak extraction and fusion settings), see the **Matrox AltiZ Installation and Technical Reference** manual.




The **Matrox AltiZ Setup** window is accessible by clicking on the **Matrox AltiZ Setup** toolbar button (outlined in red below).



This window is available in Matrox Capture Works to validate and interactively optimize features related to laser intensity, exposure, peak extraction, and fusion. It is also available to set up your scan area and offset. When you click on the **Matrox AltiZ Setup** toolbar button, a continuous single-profile scan begins and the window opens. The window presents a collection of pertinent features, the intensity components from both image sensors (the images of the laser line), as well as the acquired profile data (from the 3D reconstruction pipeline).



Since the **Matrox Altiz Setup** toolbar button automatically puts your device in continuous capture mode, you will need to manually stop the capture before you can make a change to some features (for example, the Anchor coordinate system mode). To do so, click on the **Stop** toolbar button.

Once all your settings provide appropriate results, click on the check mark in the toolbar (||   ), and the corresponding Matrox Altiz features will be updated with these values. This will only change the values for the features that you have modified through the **Matrox Altiz Setup** window; all of your other settings will remain the same.

Laser brightness, exposure, and the extraction, fusion, filtering, and selection of peaks

The default values provided for laser brightness, exposure, extraction, fusion, filtering, and selection of peaks are appropriate for most cases, but if you need to modify these values, follow the steps below:

1. If no peaks are detected, the object could be outside the available range (either too far from Matrox AltiZ or too close to Matrox AltiZ). Adjust Matrox AltiZ so that the object is found within the available range.
2. Adjust your laser brightness and exposure to ensure that you can see the laser line. The adjustments that you make to these settings are dynamic; you can see their effect in the two intensity component windows, making it easier for you to know when the settings are appropriate for your setup.
3. Set peak extraction features so that only peaks of interest are captured. For most use cases, the default peak extraction values are appropriate. If you need to change these values, you can use the **Matrox AltiZ Setup** window to validate and optimize laser intensity, exposure, peak extraction, and fusion features. You can also acquire data and view the histogram of the scatter component to help with further optimization. The scatter component's histogram reports how many points/depths in the acquired data have a given scatter. The scatter of a point corresponds to the approximate width of the laser line, measured in pixel units, in the column from which its corresponding peak was extracted. Use the X-axis value of the highest peak to set the **Peak Width Nominal** feature to a more appropriate value.
4. Set peak fusion settings, so that only the most appropriate peaks are fused into a single peak. Also, set fused peak filter and selection settings so that the peaks in each column of the two images are properly processed to establish which peak is the correct peak for a particular column and what its corresponding depth and position are. The fused peaks are shown in the **Profile View** window. Different colors in this window represent whether a peak is fused and from which image sensor it originates, or whether the peak was not selected. Fused peaks are green, selected non-fused peaks from Source0 are blue, selected non-fused peaks from Source1 are yellow, and unselected peaks are red. As you make your changes to these features, the colors will also change, further allowing you to make a better decision on which settings to use.

Scan area

You can also reduce and offset the scan area along the Z-axis, using the **Matrox Altiz Setup** window, to include only the area of interest (for example, the top part of your object) instead of the entire available Z-range; this reduces the grabbed laser line image size and increases the acquisition speed. Have the highest point, and ideally the lowest point, of the object under Matrox Altiz when you do the setup, so that you do not miss part of your object when scanning.

To reduce and offset the scan area along the Z-axis, navigate to the **Profile View** window and drag the first measurement marker above the profile, so that it is slightly above. Now, drag the second measurement marker below the profile, so that it appears slightly below. In the **Matrox Altiz Volume Properties** window, you will see the numbers that will be used for both **Size Z World** (**Scan3dVolumeSizeZWorld**) and **Offset Z World** (**Scan3dVolumeOffsetZWorld**).

Chapter

3

Step-by-step example use case with Matrox Capture Works

This chapter provides an overview of how to configure Matrox Capture Works for a common use case.

Example use case with Matrox Capture Works


This chapter provides steps for an example use case. The example use case is taken with a JAI SP-25000C-CXP4A area scan camera connected to a Matrox Rapixo CXP board. The JAI camera can be configured using Matrox Capture Works. You can use any other compatible device to perform these actions, although the settings and values might be different. When you install your Matrox software (MIL, MIL-Lite, or Matrox Design Assistant), Matrox Capture Works is automatically installed. You can then launch the utility from the **MIL Control Center** (found under **Matrox Imaging** in the **Windows Start** menu) or by typing "Capture Works" in the **Windows Start** menu.

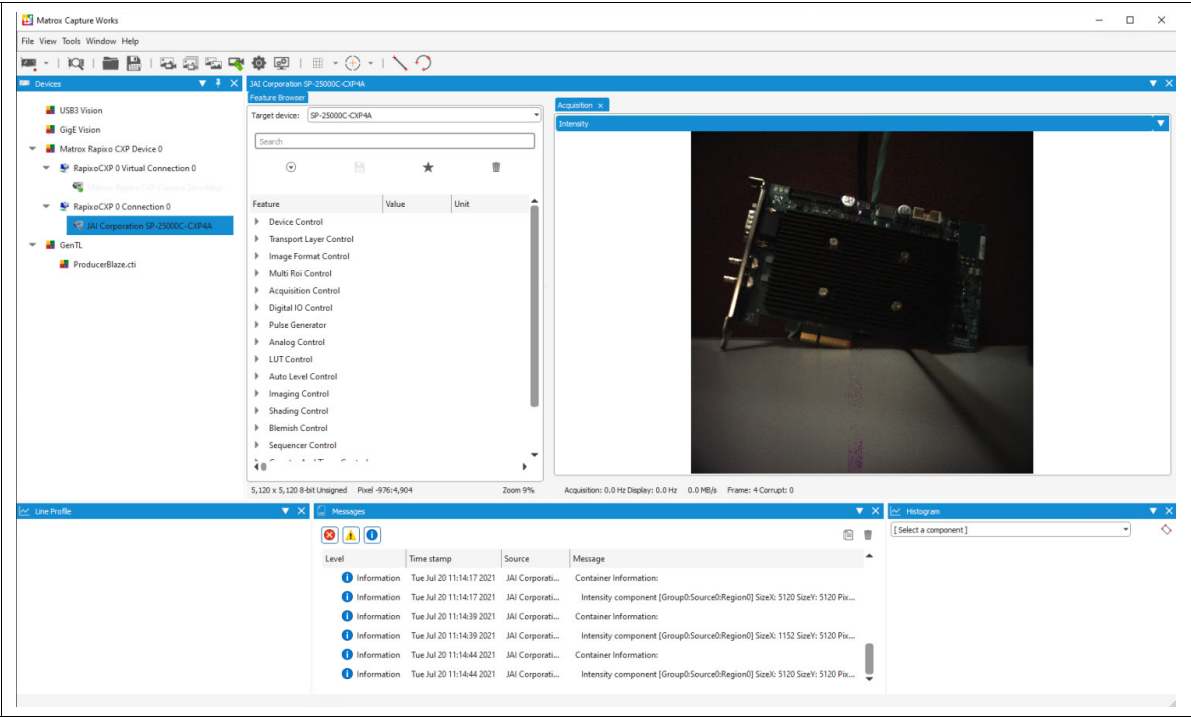


Matrox Vision Academy also provides videos for some of the Matrox AltiZ 3D use cases (not covered in this manual). To follow along with the videos, visit https://www.matrox.com/en/imaging/apps/vision_academy/course and go to the **Using the Matrox AltiZ series** under the **Hardware** section. For detailed 3D use cases, you can also see the **Matrox AltiZ Installation and Technical Reference** manual.

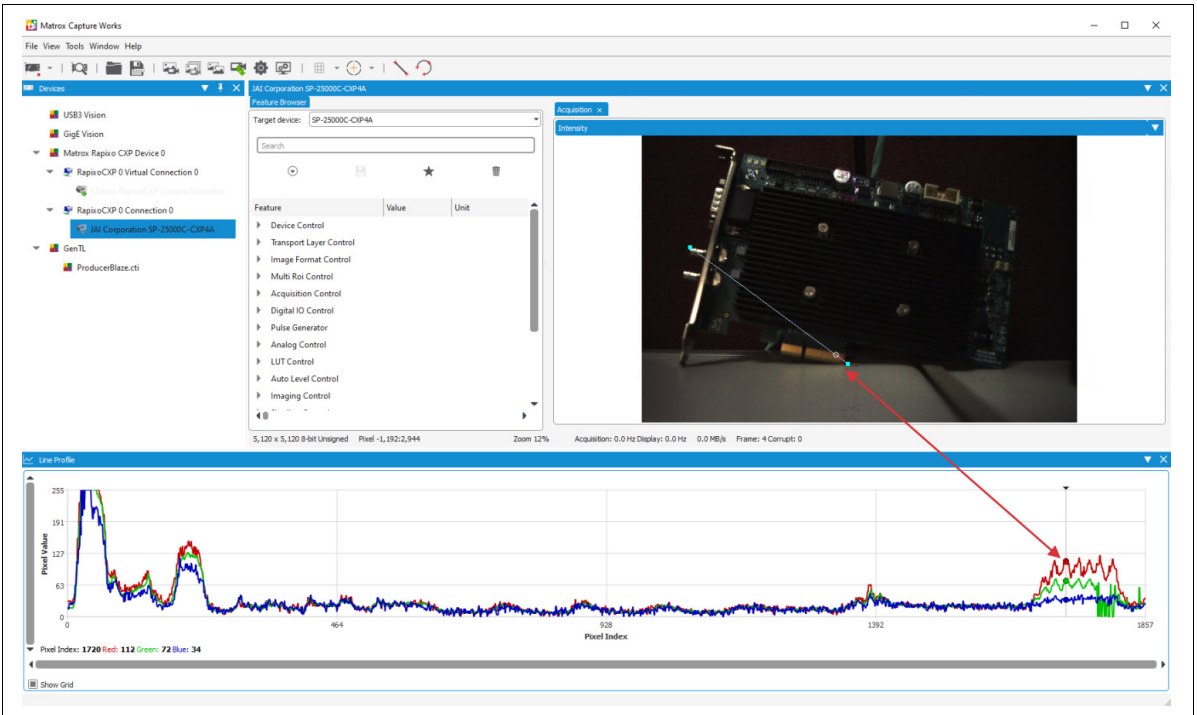
Use case: Performing a basic acquisition and taking a line profile

To quickly set up the JAI SP-25000C-CXP4A to perform a single 2D acquisition using default settings, do the following.

- ❖ Note, in this example, we used a Matrox Rapixo CXP board as the scanned item.
- 1. Open Matrox Capture Works and allocate the SP-25000C-CXP4A by double-clicking on it in the presented list of available devices or by right-clicking on it and selecting Alloc.
- 2. Once your camera is allocated, click on the **Single Grab** toolbar button () to initiate an acquisition. Depending on your light settings, you might need to make adjustments to enhance the quality of the image.



- After a 2D image is acquired, you can now measure the pixel values in the image. Click on the **Draw Line Profile** toolbar button, and then click and drag the line over a location in the image along which to view the pixel values. Since our camera is a color camera, we will be able to see the RGB values of the pixels that are found along this line. Notice that when you hover over the graph in the **Line Profile** window, a circle appears on the line profile to indicate from where the pixel values are being taken. In this case, we are hovering over the pixel values from the gold finger of the board, as indicated by the red arrow seen in the image below.



4. If you find that your acquisition is running at such a high frame rate that some of the frames are missed, you can also disable the image display. To do so, click the **Display Settings** toolbar button and deselect **Display grab image**, as shown below.

