

**COGNEX**

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# VisionPro<sup>®</sup> with 3DExpress

## Integration Guide

04/26/2018

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The following symbols indicate safety precautions and supplemental information.

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 **WARNING:** This symbol indicates the presence of a hazard that could result in death, serious personal injury or electrical shock.

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 **CAUTION:** This symbol indicates the presence of a hazard that could result in property damage.

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 **Note:** Notes provide supplemental information about a subject.

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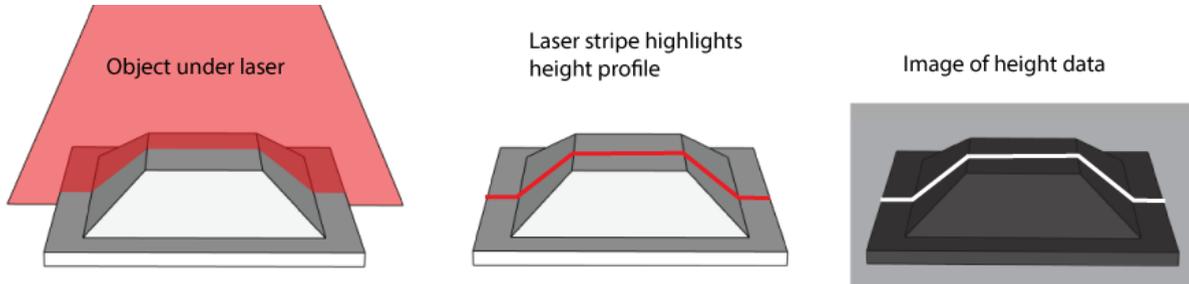
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 **Tip:** Tips provide helpful suggestions and shortcuts that may not otherwise be apparent.

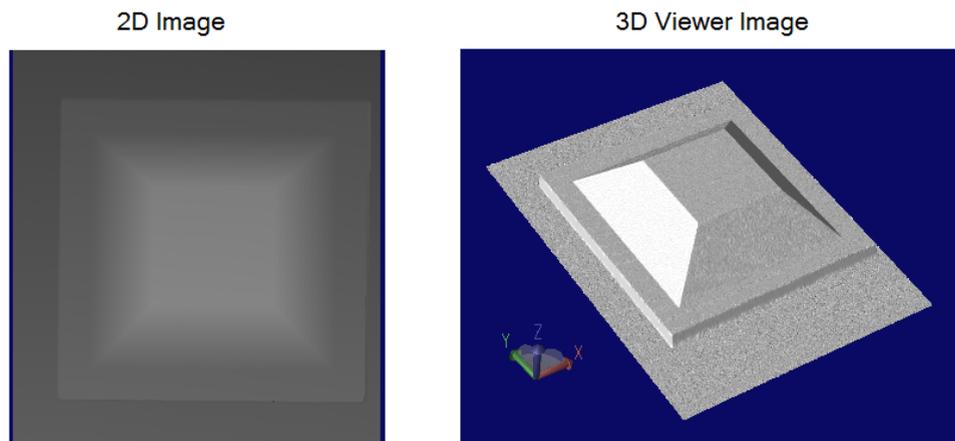
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# Cognex 3D Sensors

Typical Cognex 3D sensors combine GigE Vision cameras and laser-stripe illumination to generate information about three-dimensional objects as they pass within the field of view. The illumination of the laser plane generates a laser stripe whose shape is determined by the height profile of the object.



Cognex software can combine a series of height-data images and generate a 3D range image, which can then be viewed as a static 2D image or dynamically through a 3D viewing option:



Once you have a 3D range image, VisionPro supports a variety of 3D vision tools for performing tasks such as:

- Generating information about a planar surface
- Generating height or volume calculations
- Analyzing a cross-section of the object

See your installed VisionPro documentation for details.

## Cognex 3DExpress

Use Cognex 3DExpress to configure an area scan camera as a 3D sensor for applications that require a larger field of view than the standard Cognex 3D displacement sensors support, or in production environments where a 3D displacement sensor cannot be incorporated due to space constraints.

3DExpress supports a separate user interface for configuring acquisition properties and calibrating the software to report results in real-world units. The software also provides an Acquisition Integration Kit (AIK) server that communicates with VisionPro and allows it to access the configured acquisition parameters set in 3DExpress. Both VisionPro and 3DExpress run simultaneously as your vision application executes.

See the topic [Configure a 3DExpress AIK Server on page 11](#) for details on configuring 3DExpress for your image acquisitions.

As you use 3DExpress, be aware it supports its own documentation set, available through the Start menu (**Cognex->VisionPro 3DExpress Documentation**) or installed by default at `%ProgramFiles%\Cognex\3DExpress\doc`.

## Supported Cameras

The VisionPro image acquisition module for 3DExpress supports the following Cognex Industrial Cameras:

Model Number	Resolution	Frame Rate	Color / Mono
CAM-CIC-300	0.3MP	120fps	Mono
CAM-CIC-1300	1.3MP	60fps	Color, Mono
CAM-CIC-2000-60	2MP	60fps	Mono
CAM-CIC-4000	4MP	25fps	Color, Mono
CAM-CIC-5MR/5000R	5MP	14fps	Color, Mono
CAM-CIC-5000-20	5MP	20fps	Mono
CAM-CIC-10MR	10MP	10fps	Color, Mono

In addition, the module supports the following monochrome cameras from Photonfocus:

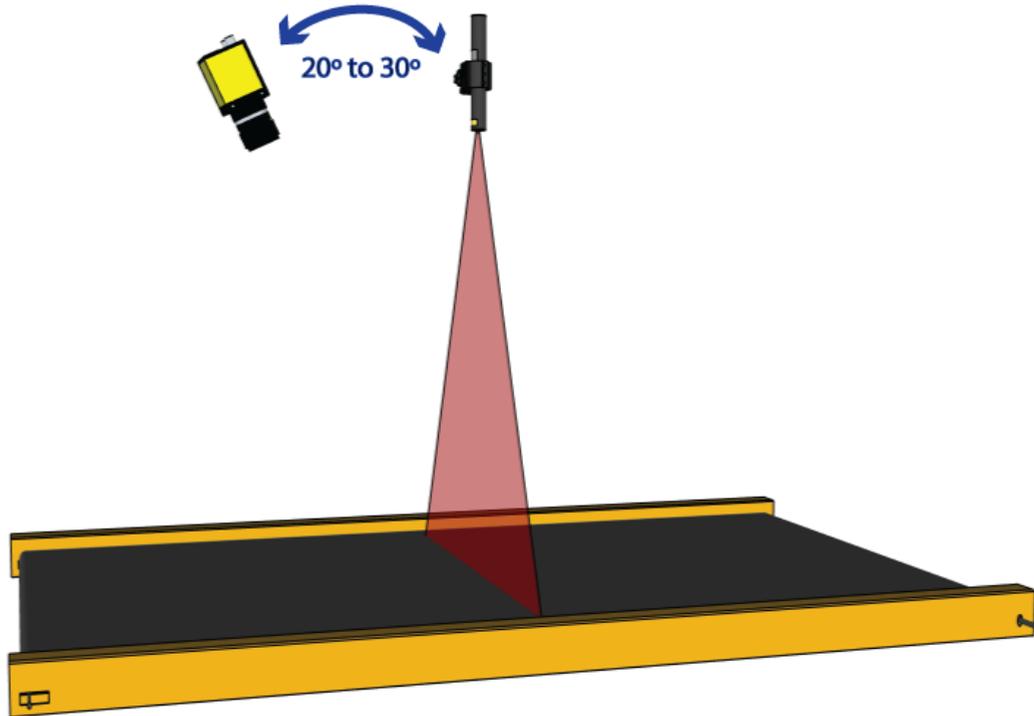
Model Number	Resolution	Frame Rate
MV1-D2048x1088-3D03-760-G2	2MP	386fps
MV1-D2048x1088-3D03-760-G2-S10	2MP	386fps

Contact your Cognex sales engineer for questions about additional camera support.

## Camera and Laser Orientation

For measurements returned in metric units, a VisionPro application using 3DExpress must use a vertical laser. If your application does not need to return metric measurements, such as a surface inspection application, then both the camera and laser can be positioned at an angle to the motion surface.

Typical applications using a vertical laser use a camera angle between 20 to 30 degrees to capture a field of view within the laser profile:



The precise angle you use will depend on your vision application. Because the camera views the object at an angle, some areas cannot be in the field of view as it passes through the laser. This results in 3D range images with portions of missing pixels where the height information is not known.

A smaller camera angle produces 3D range images containing fewer missing pixels but less height data resolution, while larger camera angles produce good height information at the risk of missing height data. You may need to experiment in order to find the best angle for your vision application.

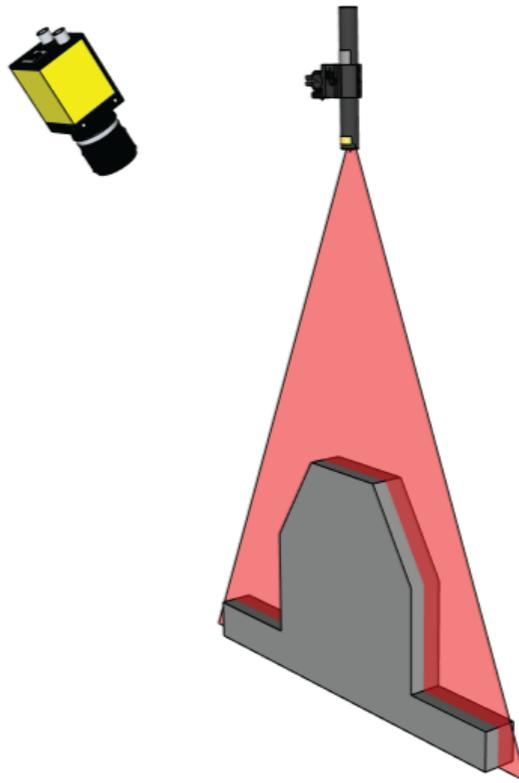
Refer to your installed 3DExpress documentation for much more information on choosing the right camera, laser, and motion system for your vision application. Be aware that the laser must be active during every image acquisition, but that control over the laser is independent of your VisionPro application. Contact your Cognex sales representative for possible laser solutions depending on your production environment.

3DExpress also supports multi-camera usage for applications that require multiple images of the same field of view, as well as multi-cameras and multi-lasers for applications where the cameras use a shared coordinate space. Your 3DExpress documentation contains guidance on such applications.

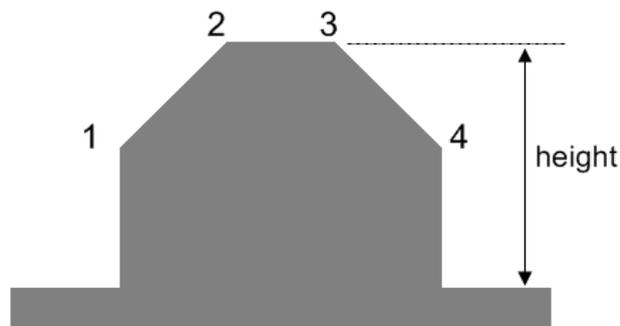
## Calibration Target

3DExpress supports metric calibration to relate camera pixels with metric units by creating a coordinate system attached to the plane of the laser.

To calibrate you must acquire an image of a non-moving calibration target shaped as shown in the following figure:



The 3DExpress calibration interface allows you to specify the location and dimension, in the desired metric units, for the following vertices of the target:



The calibration target must be user-supplied, with a height and width based on your field of view. In general, given a width  $W$  for the field of view, your calibration target would ideally be, at least, between  $1/3W$  and  $2/3W$ . In addition, Cognex makes the following recommendations about creating a calibration target:

- Keep the shape of the object as shown in the preceding figure.
- Ensure the base plane contains enough area on both sides of the peak.
- The angled slopes of the target should be at or close to 45 degrees for good results.
- In applications where the height of the field of view is small when compared to the width, the vertical walls of the calibration target can be removed so that points 1 and 4 rest on the base plane.

Your 3DExpress installation includes the VisionPro 3DExpress Target Designer utility, available from the Start menu, for creating a calibration target based on your field of view:

**Target Designer**

FOV Width: 0

FOV Height: 0

**Target Dimensions**

Width top	0
Width bottom	0
Width base	0
Height 1	0
Height 2	0

**calibration Points**

#	Y	Z
1	0	0
2	0	0
3	0	0
4	0	0
Height	0	

Calibration target must be matte.  
 This application does not consider applications with significant perspective distortion. In that case, you should decrease top and bottom width to ensure you are observing the base plane

Cognex makes the following recommendations regarding construction materials:

- For metal targets, choose a material to minimize specular highlights or choose a white anodized or sand blasted finish.
- Matte resin can generate good results for certain large field of view requirements.
- Take expansion into consideration in high-accuracy vision applications. The pattern might have to be accurately measured to get its 3D coordinates instead of trusting the design measures. With temperature variations between the measurement time and the scan time, low thermal expansion coefficient materials may be preferred to decrease errors due to pattern expansion.

Be aware that not all vision applications require metric calibration. For example, applications involving surface inspection generally do not require the 3D-location of results.

## Encoder Resolution and Camera Frame Rate

Many 3D vision applications rely on electrical pulses from a rotary encoder attached to the motion system, allowing the camera to capture image information based on the speed of motion rather than predetermined exposure settings.

As you configure the 3DExpress AIK server you will need to know the distance, in metric units, the motion system travels between encoder pulses. Refer to your encoder documentation for details.

If your encoder documentation lists the number of pulses per metric unit, invert this value to determine the distance per pulse. For example, if your encoder generates 50 pulses per millimeter, the distance traveled per pulse is  $1/50 = 0.02$  millimeters.

The topic [Perform a Metric Calibration on page 20](#) describes where you set the encoder resolution for 3DExpress.

Ensure that your camera acquisition rate is greater than the rate of encoder pulses to avoid lost images. You may need to perform one or more of the following steps:

- Reduce the encoder rate.
- Use an electronic module to divide the encoder rate by a predetermined integer value.
- Reduce the exposure time for your camera. You may need to change aperture settings to allow more light to reach the sensor.
- Specify a region of interest to capture a smaller image available to the camera sensor.

The topic [Accessing Camera Properties on page 12](#) describes how you can access the custom properties of your selected camera.

# Configure a 3DExpress AIK Server

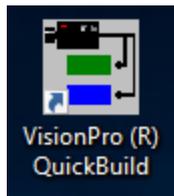
You must configure a 3DExpress Acquisition Integration Kit (AIK) server before you can attach it to a VisionPro AIK client to accept incoming 3D images. Both VisionPro and 3DExpress execute simultaneously as part of your vision solution.

Be aware this document concentrates on using 3DExpress with cameras supplied by Cognex. Your installed 3DExpress documentation contains specific content on using 3DExpress with a Photonfocus camera.

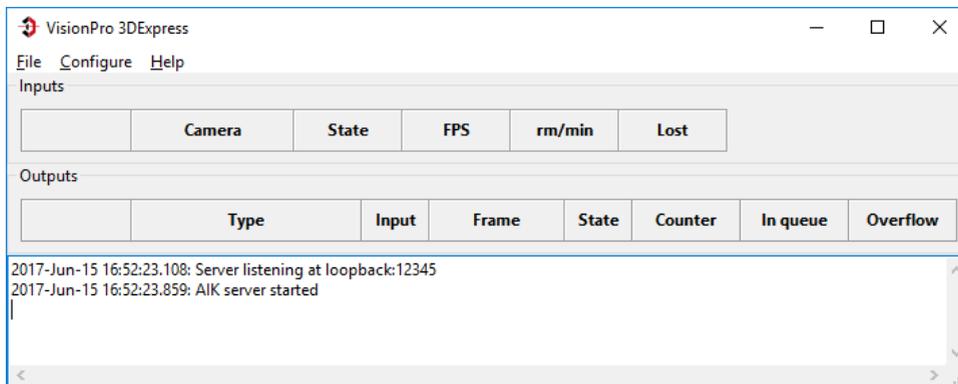
Establish the location of camera and laser combination, and enable power to your camera, laser and motion system before you begin.

## Launching VisionPro and 3DExpress

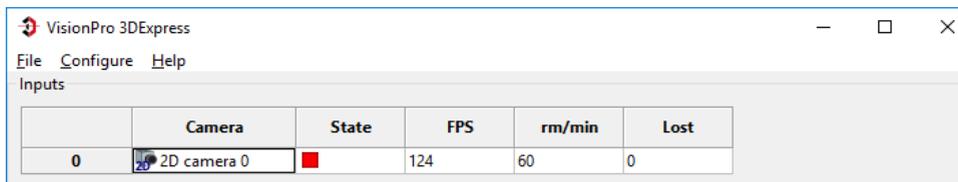
Launch VisionPro QuickBuild from the Start menu or double-click the VisionPro QuickBuild icon on the desktop:



QuickBuild launches and automatically launches the 3DExpress main panel:



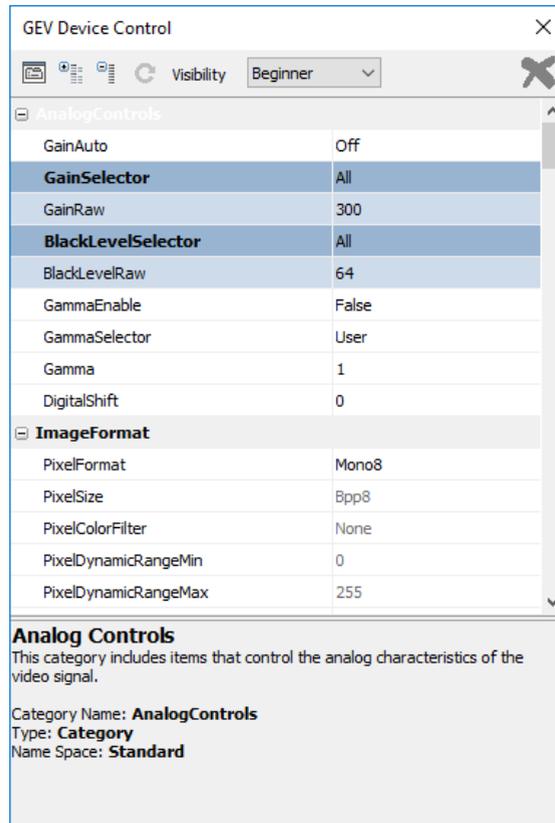
Use the 3DExpress main panel to configure the input source(s) you want to use in your VisionPro application. Each input source appears in its own row:



The 3D Express main panel also allows you to configure several types of output image formats to examine the images you capture as you configure the AIK server. Your 3DExpress documentation has more information on how to use the main panel.

## Accessing Camera Properties

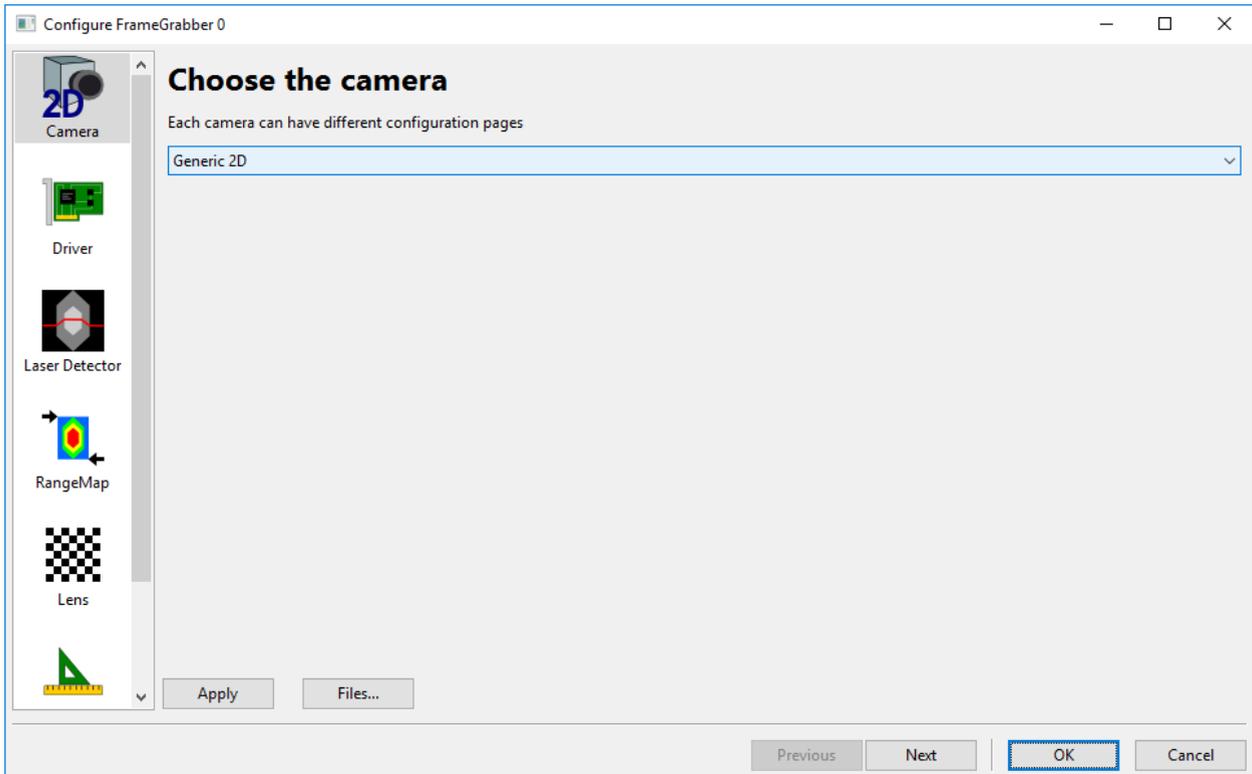
As you work through the 3DExpress configuration, you may need to access the custom properties of your selected camera. From the 3DExpress main panel, right-click on the image source and choose **Show Device Config**. 3DExpress displays a dialog similar to the following to access all the custom properties your camera supports:



For example, you may need to enable/disable hardware trigger detection, limit the region of interest the camera acquires, and more.

## Configuring a New Image Source

Select **Configure->New Input** from the 3DExpress main panel to open a single display for configuring all the properties of the image source:



Start by selecting the type of camera you are using. The topic [Supported Cameras on page 6](#) lists the cameras this release supports. 3DExpress offers two options:

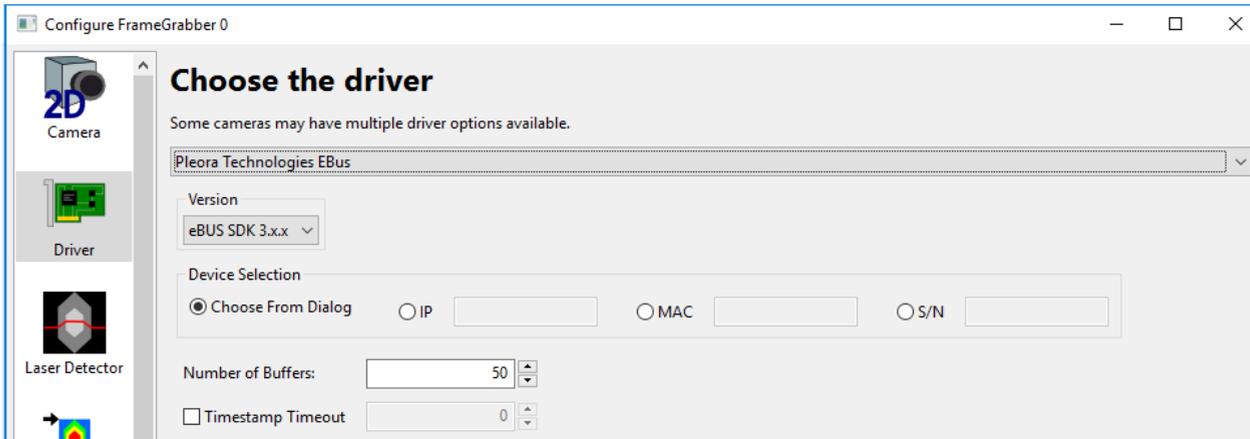
- **Generic 2D**: All supported Cognex cameras
- **Photonfocus 3D03**: For supported Photonfocus cameras

See the installed 3DExpress documentation for information on using Photonfocus cameras.

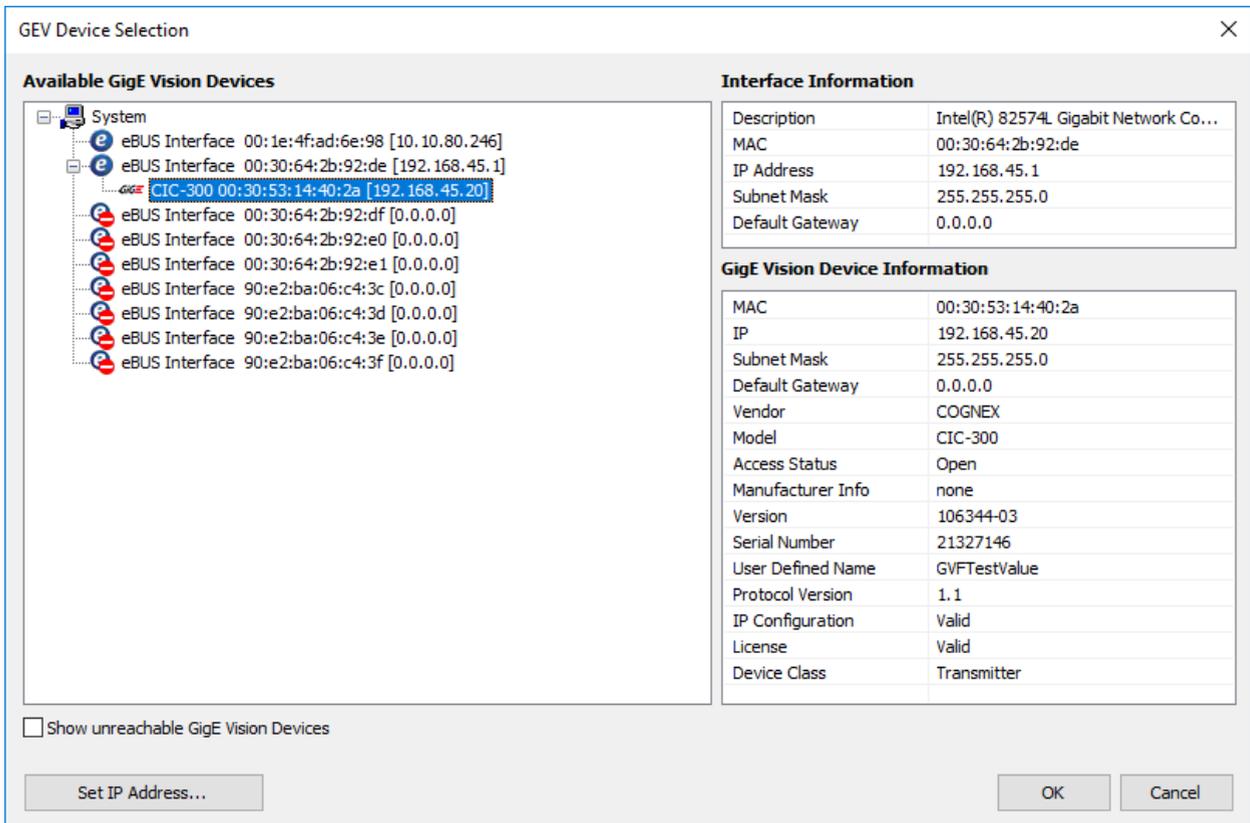
Click **Next**.

## Choose the Camera Driver

For Photonfocus cameras, the interface highlights the correct driver automatically. Install the driver from the Photonfocus web site if necessary. For all Cognex cameras, choose the **Pleora Technologies EBus** and the **eBUS SDK 3.x.x** driver:



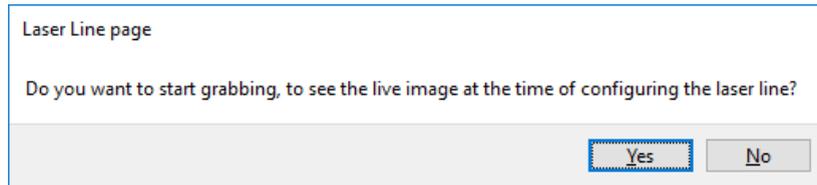
You may have several cameras connected to the PC. The interface allows you a number of ways to select the particular camera. If you know the IP address, the MAC address, or the serial number of the camera you can enter it here. If you select **Choose From Dialog** and click **Next**, the interface offers a dialog similar to the following for choosing the desired camera:



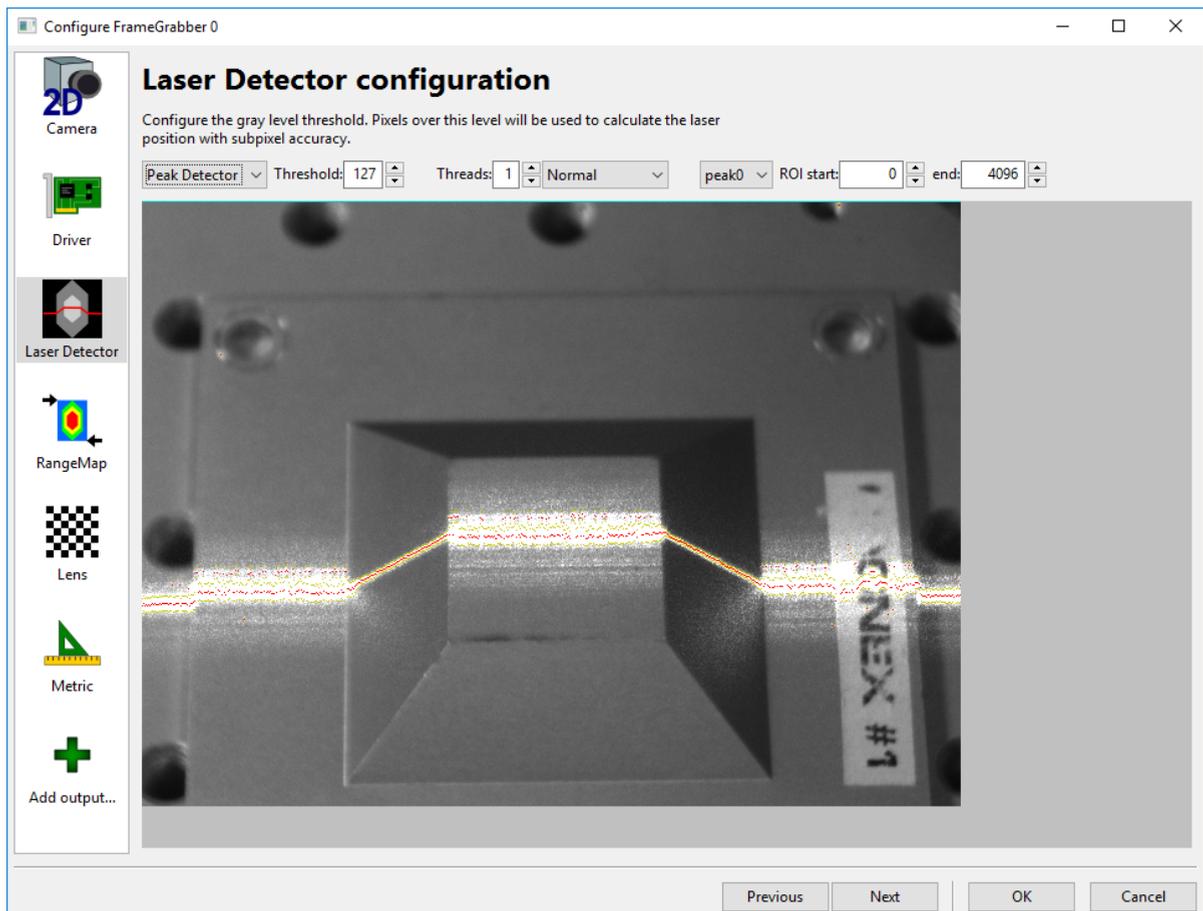
Click **Next** when you have configured all the driver settings.

## Detect the Laser Line

After setting the driver properties of the camera of a Cognex camera, the 3DExpress interface prompts you to acquire a live image:



The topic [Launching VisionPro and 3DExpress on page 11](#) describes how you can access the custom properties of your camera. Disable any hardware trigger detection on your camera and click **Yes** to acquire a live image of your production environment. The following figure shows an example live image of a Cognex calibration frustum:



The preceding image shows an over-saturation in the pixels representing the laser line. Ideally you want the image to contain only pixels representing the laser and how it changes shape as your object moves past the camera.

Finding the proper settings to detect the laser involves a combination of your production environment, your camera settings, and the 3DExpress interface.

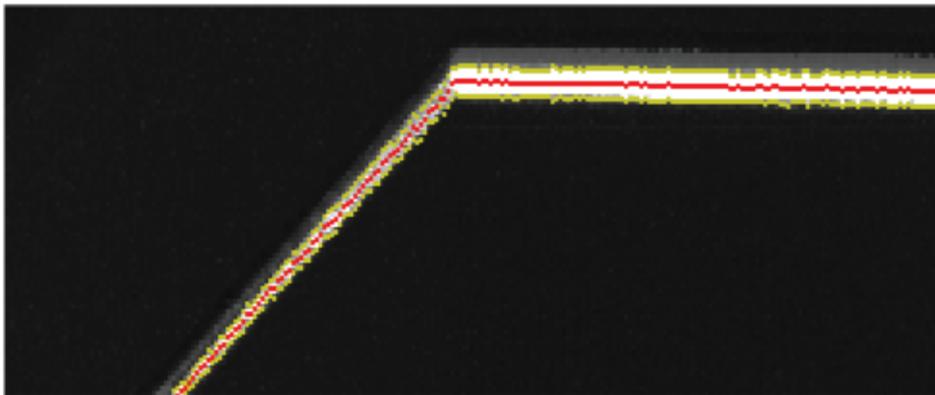
- Change the settings on the camera hardware to limit the amount of light on the scene.
- Introduce a laser filter to restrict unwanted light wavelengths.
- Use the 3DExpress **Threshold** parameter and set it to the highest background pixel value that does not represent

the laser.

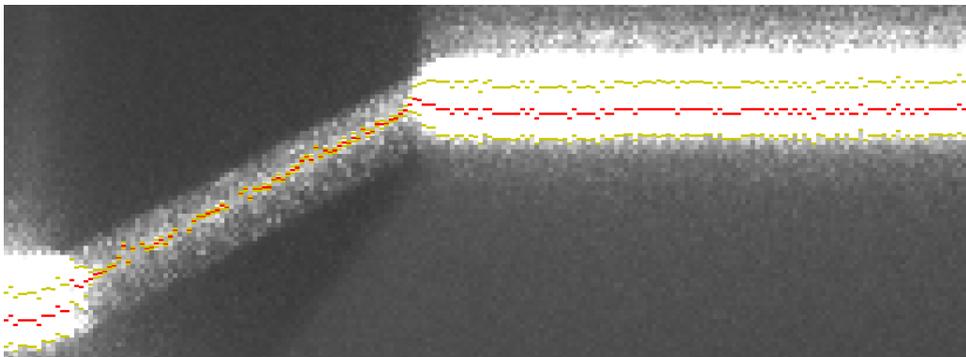
Use your PC mouse button to zoom in on the image to read the individual pixel values in your live image for guidance in setting the **Threshold** parameter: :

60	56	78	83	75	78	55	51	70	75	78	86	53	67	51	99	92	63	53	63	52	81	49	88	57	4
57	76	79	86	95	60	56	58	118	86	66	134	67	70	79	211	146	152	149	62	63	107	44	95	54	6
147	117	135	211	76	87	62	114	121	119	255	152	89	90	89	123	98	77	62	66	42	60	62	44	57	7
86	80	49	84	66	57	55	54	110	110	115	81	99	79	85	94	61	110	71	94	40	50	51	104	54	6
48	44	44	58	48	53	46	60	49	63	82	50	74	60	72	78	70	47	56	45	51	50	66	101	41	7
61	43	58	50	46	67	93	167	60	92	101	97	71	117	73	54	141	60	83	67	107	61	121	79	48	6
78	65	99	50	75	71	72	69	68	82	83	75	104	62	68	46	66	81	53	101	76	110	68	65	82	6
66	102	78	57	102	78	75	94	157	88	68	125	163	134	96	112	100	183	69	98	72	93	91	96	98	9
186	107	68	69	72	98	52	81	65	112	90	92	115	115	72	63	63	107	111	97	79	82	84	144	126	7
140	116	162	138	180	156	145	60	81	117	172	102	160	116	164	202	151	137	109	255	79	95	255	219	144	7
126	179	231	79	104	198	141	126	98	121	101	122	114	99	71	97	80	74	94	133	159	250	153	202	81	5
84	177	108	96	161	222	123	177	87	156	255	102	152	145	105	218	113	67	111	247	195	118	135	255	131	8
208	208	207	218	255	138	196	191	255	255	218	191	232	255	254	141	230	195	184	179	255	255	255	240	162	2
255	183	255	255	255	255	255	249	255	255	255	255	255	255	255	255	248	255	255	255	255	255	255	255	255	2
255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	2
255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	2

Use the zoom feature to examine your laser line across your object. Cognex recommends you see a near contiguous red line across the width of the laser, as shown in the following close-up:



The following image shows a laser line that is not adequately detected across the object and will not properly detect features in your vision application.

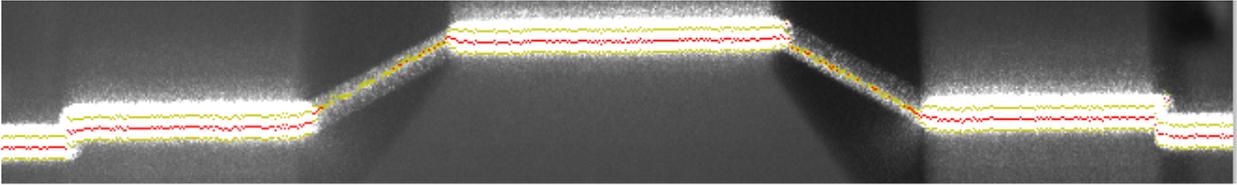


Click **Next** when you are satisfied your laser will adequately illuminate your object as it passes the field of view of the camera.

## Restrict the Region of Interest

By default, your area scan camera captures the entire image of the field of view, but you can specify a region of interest to isolate just the laser line. Specifying a region of interest allows the camera to acquire individual images faster, which can allow you to increase the speed of your motion system.

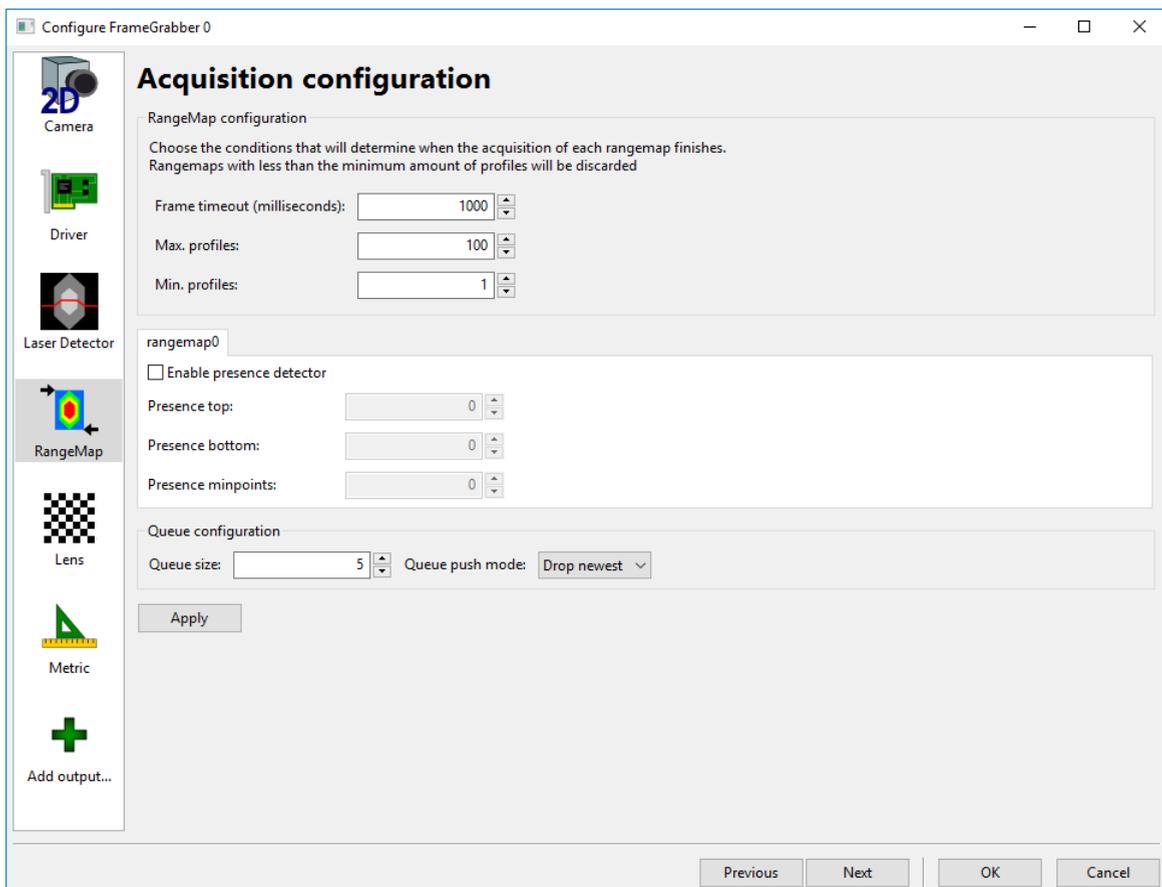
The topic [Launching VisionPro and 3DExpress on page 11](#) describes how to access the custom properties your camera supports. The following figure shows an acquired image of the laser line after 3DExpress has been configured to limit the height of the image and specify a Y-offset that ensures the image captures the features of the laser:



Be sure to specify a region of interest large enough to enclose the laser line as it changes shape over the object under inspection.

## Acquisition Configuration

3DExpress acquires a series of profile images and combines them to form three-dimensional data about an object as it passes within the field of view of the camera. 3DExpress offers acquisition parameters that determine the number of profiles it will acquire and the ability to use the laser to perform presence detection:



## Profile Parameters

3DExpress offers two options for ending an image acquisition:

- **Frame timeout:** 3DExpress stops acquiring profiles if the time between profile acquisitions exceeds this value.
- **Max. profiles:** The maximum number of profiles the output image can have.

If your application continues to acquire profiles after this maximum value, 3DExpress divides the total number of profiles into separate output types.

Specify a value greater than the number of encoder pulses per metric unit multiplied by the length of the object under inspection.

- Presence Detection

See the section [Presence Detection on page 18](#) for more information.

Experiment with these values to get the best settings for your production environment.

Cognex also recommends you specify a **Min. profiles** value greater than 1 to prevent an image acquisition from starting due to vibrations or other noise in your production environment.

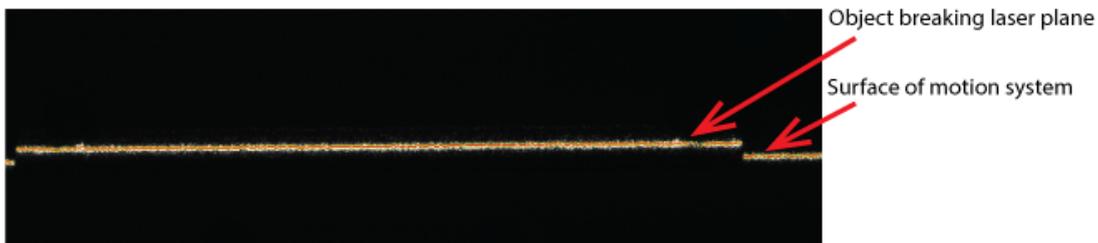
## Presence Detection

As your application executes the objects on your motion system will intersect the laser plane and cause it to change shape. 3DExpress allows you to use the changing shape of the laser to determine when to begin building a 3D image.

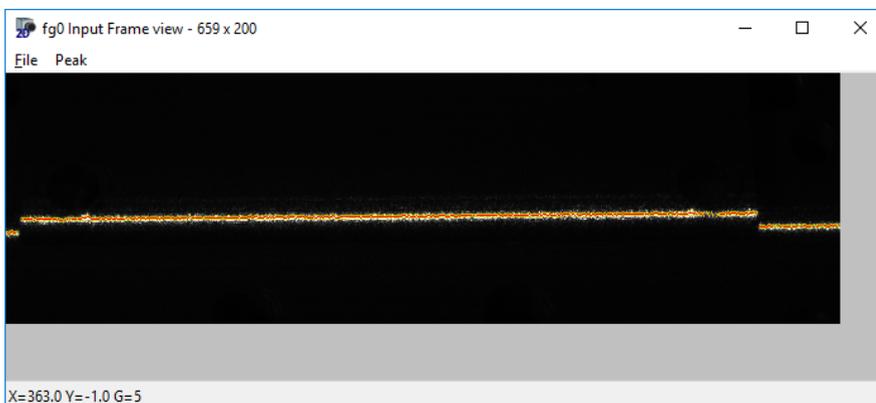
Check **Enable presence detector** and use the parameters **Presence top** and **Presence bottom** to define the top and bottom, respectively, of a region of interest where the profile of the laser will appear as the object breaks the laser plane.

You might perform the following steps to determine the best values for **Presence top** and **Presence bottom**:

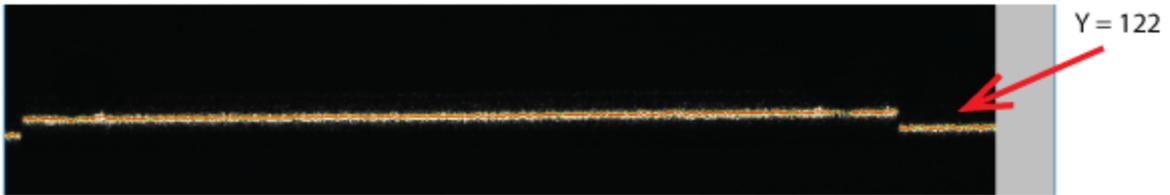
- Capture a single profile image showing the laser plane on the surface of the motion system and as your object begins to break the laser plane:



- Use the main panel to open a view of the image:



- Use your mouse to hover over the image and discover the Y-value for the location of the laser plane on the surface of the motion system:

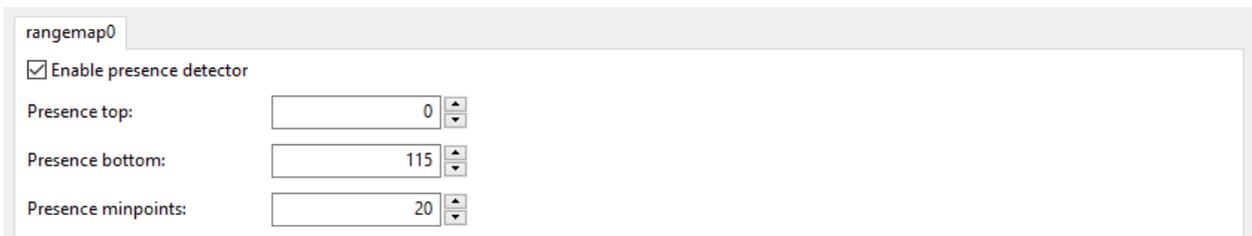


- Set values for **Presence top** and **Presence bottom** above the Y-value to define the region of interest where the object will break the laser plane.

For example, in the preceding figure you might set a **Presence top** of 0 and a **Presence bottom** of 115. If the object broke the laser plane at a higher value of Y, you could choose a lower value for **Presence bottom**.

- Choose a value for **Presence minpoints** to capture the first profile with more points than the value you set. 3DExpress stops the image acquisition if fewer points than **Presence minpoints** are detected. This parameter works in coordination with the **Frame timeout** and **Max profiles** parameter, so ensure these values are high enough to capture the entire object.

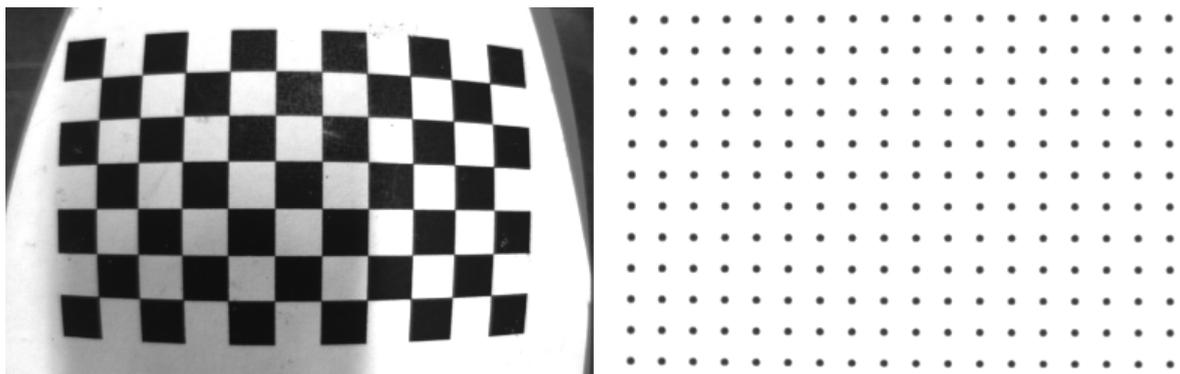
The following figure shows how the presence absence detection could be configured:



## Lens Calibration

3DExpress allows you to remove radial distortion due to the camera lens. Lens calibration is not a requirement, but recommended if the lens distortion is greater than the required accuracy of your vision application.

Calibrate your image source to remove radiant distortion by capturing an image of a checkerboard or dot pattern:



Cognex recommends the checkerboard pattern in cases of high distortion, but only if the pattern is a high-quality print. For many applications the dot pattern will be sufficient.

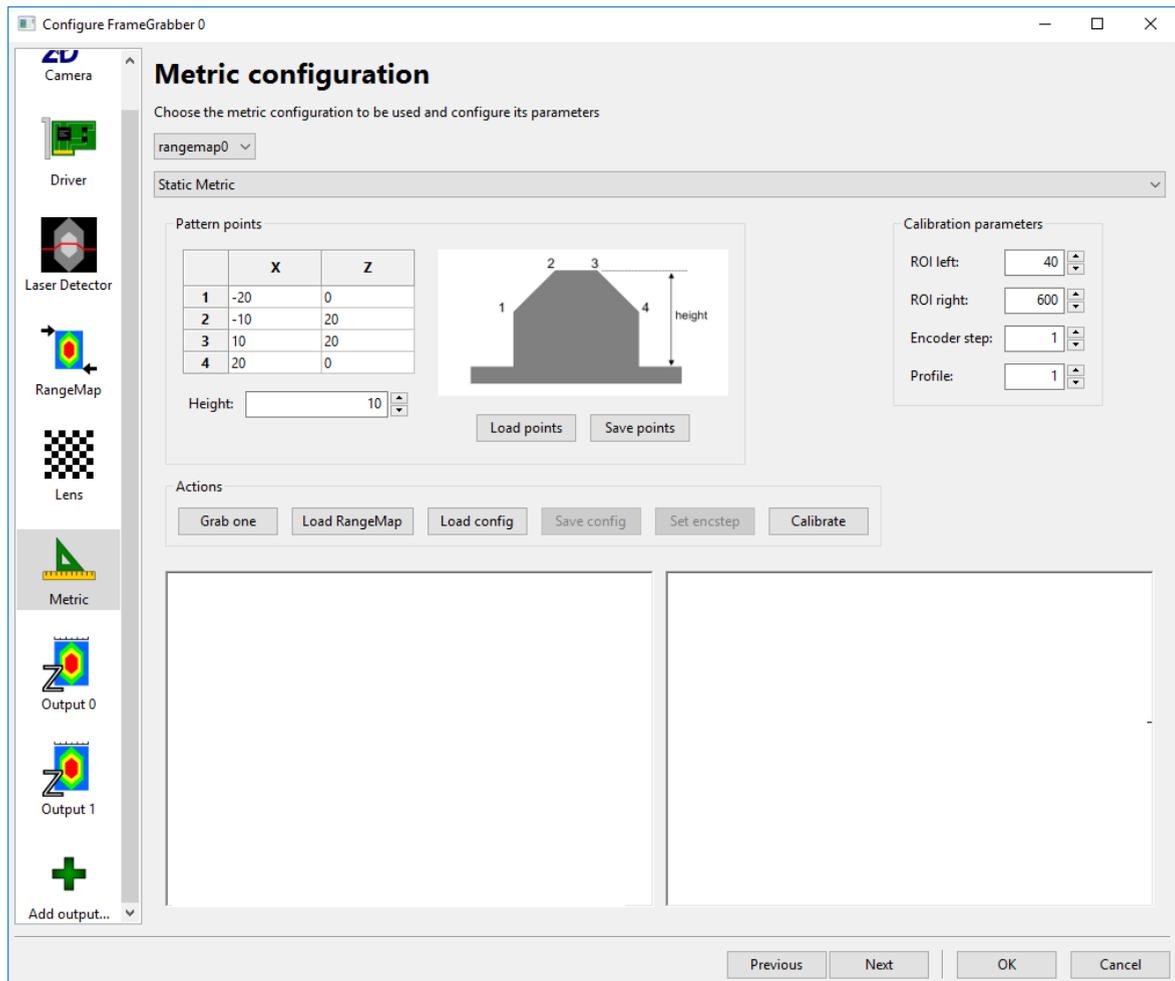
If you calibrate for lens distortion and later change the aperture or focus settings for the camera, then you must perform a new lens calibration.

The Lens Calibration interface allows you to save the lens calibration parameters to a file for later reuse.

## Perform a Metric Calibration

The topic [Calibration Target on page 7](#) describes the calibration target you can use to perform a metric calibration and convert pixel measurements to metric units. After a metric calibration your vision application can perform metric measurements over your 3D range image.

3DExpress provides the following interface to metric calibration:



Perform the following steps to perform a metric calibration:

1. Place the target under the laser.  
The calibration requires a single image of a non-moving target.
2. Enter the metric coordinates of the points highlighted in the graphic, along with the desired height, with respect to your desired 3D coordinate system.

By specifying symmetrical measurements on either side of the target, the center along the bottom of the target defines the origin of your coordinate system.

3. Change the **Profile** value from the default of 1 to choose which profile of the calibration target you want to use.  
Some profiles in your 3D image can exhibit noise from a variety of factors in your production environment. Capturing multiple profiles allows you to select which profile in the 3D image represents the best profile to use when performing a calibration.
4. Click **Grab One** to acquire a 3D image of your calibration target.  
The interface displays an upside-down outline of the calibration target.
5. Use the **ROI left** and **ROI right** parameters to isolate just the features of the calibration target before you calibrate.  
Extraneous features can cause the calibration to fail.
6. Use the **Encoder step** parameter to enter the distance, in metric units, the motion system travels for each encoder step.

Refer to your encoder documentation for details. See the topic [Encoder Resolution and Camera Frame Rate on page 10](#) for more information.

If you do not know the encoder resolution, Cognex recommends the following:

- a. Set the **Encoder step** to a value of 1.
- b. Continue the process of generating a calibration result and adding an output ZMap ([ZMap Output for 3D Range Images on page 21](#)).
- c. Use 3DExpress to scan an object of known length.  
Scan the object several times to ensure you get a consistent measurement. Refer to the topic [Resolving Issues on page 27](#) for resolving issues when using 3DExpress.
- a. Compare the expected length with the measured length in the ZMap and use that comparison to determine the correct value for **Encoder step**. You do not have to recalibrate.

You must click **Set encstep** to have the **Encoder step** parameter take effect.

7. Click **Calibrate**.  
3DExpress generates a calibration result and displays the error values. Lower values indicate a better calibration.
8. Click **Next** when you are done.

The interface provides additional options such as saving the metric units of your target to an external file. Refer to your installed 3DExpress documentation for details.

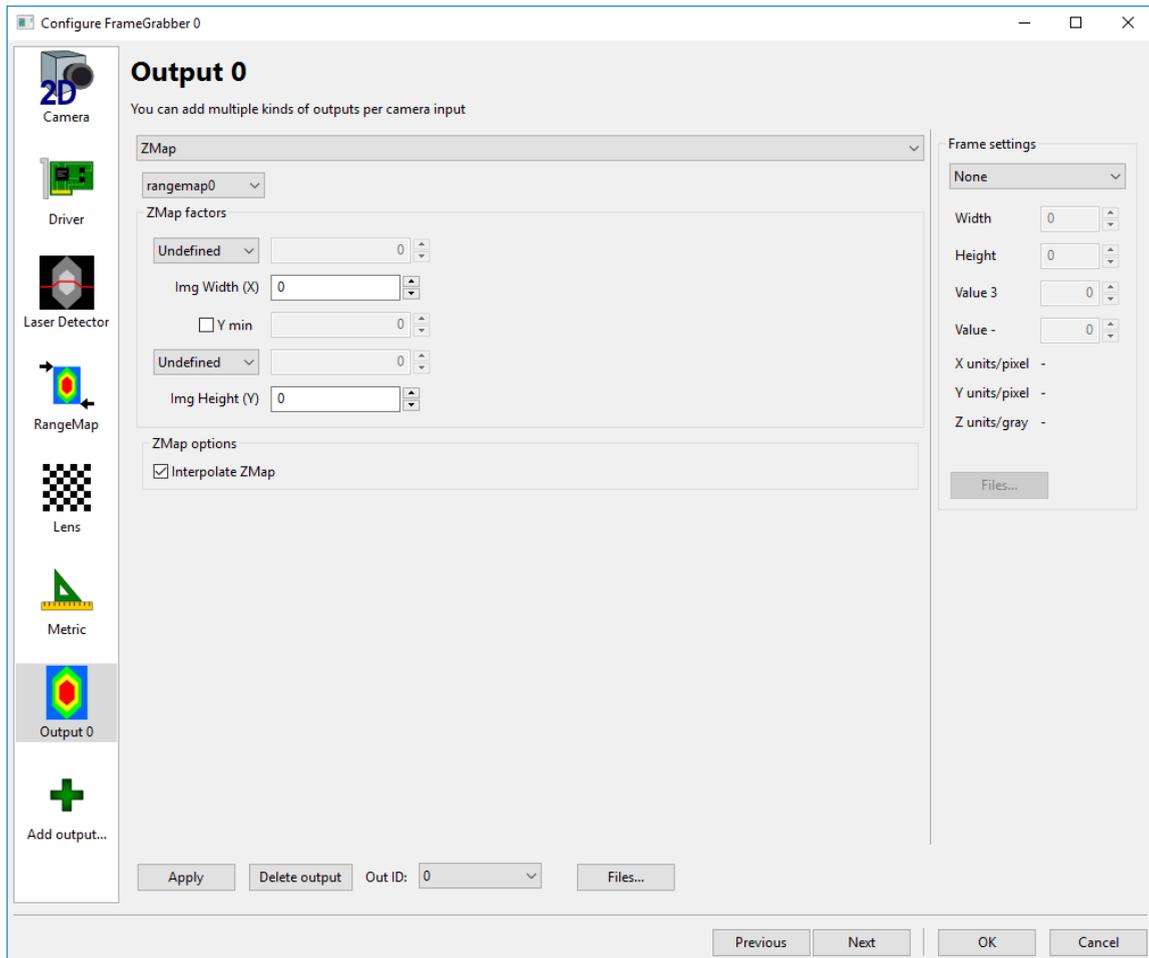
## Create Output Sources

You must configure the output image sources to pass to the VisionPro AIK client. Which output sources you create depends on the type of data you want your VisionPro application to receive.

### ZMap Output for 3D Range Images

The VisionPro AIK client requires that you create an output ZMap to receive the 3D images you acquire from the 3DExpress AIK server. As you create the ZMap you must specify the size of the image 3DExpress creates. Larger images contain more 3D feature information but require more execution time to generate, potentially limiting the speed of your vision application. Smaller images contain less 3D information but can be generated quickly.

1. Click the **Add output** icon in 3DExpress to create a new output source.
2. Choose the **ZMap** output type.



3. Choose **16-bit unsigned** from **Frame Settings**.

Choose values for **X units/pixel** and **Y units/pixel** for both of the **ZMap factors**, which map your metric units to pixels along the x-axis and y-axis, respectively.

For example, a value of 1 maps the metric unit you are using to one pixel in the ZMap, while a value of 0.5 maps half the metric unit to one pixel in the ZMap. Specify a value of 0.10 to create a ZMap where 10 rows of pixels contain 1 metric unit of 3D feature information.

You may choose to use different values for **X units/pixel** and **Y units/pixel** in vision applications where you want to emphasize the 3D features along one particular axis.

## ZMap Texture Output for RangeWithGrey Images

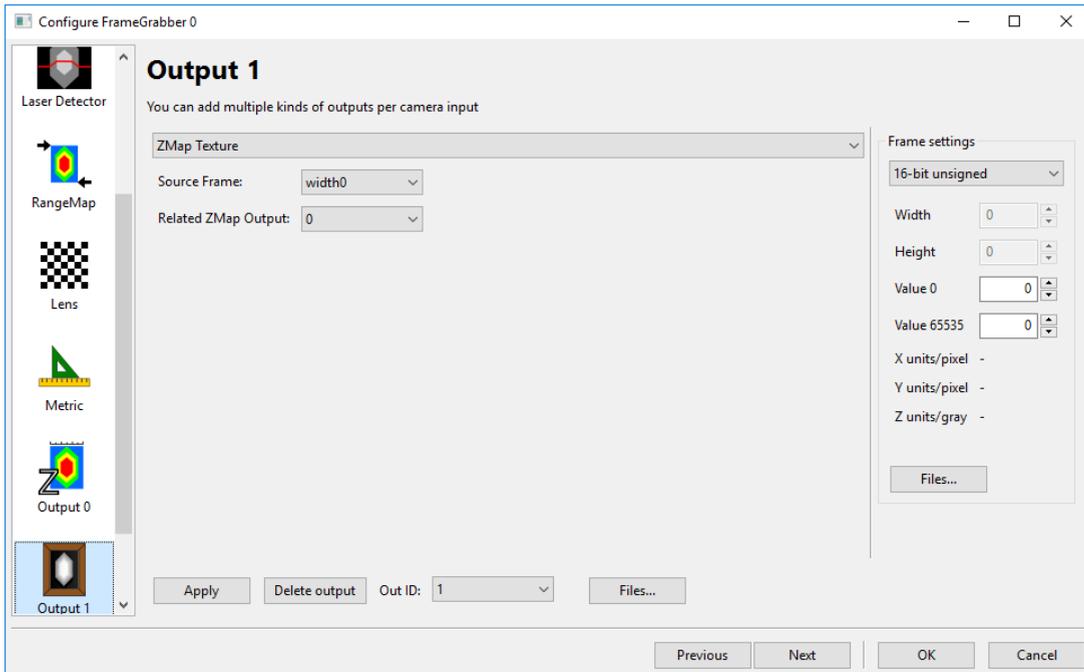
As your laser and camera combination scan each object in the field of view, it is possible for VisionPro to capture both the 3D height-profile information of the object as well as the greyscale intensity of features on the object surface.

VisionPro supports a RangeWithGrey image type combining 3D range image information with 16-bit greyscale information and the mechanism for separating that into two into distinct images that can be analyzed by 3D vision tools and 2D vision tools, respectively.

Use a ZMap output source to generate 3D range image data for VisionPro, as described in the topic [ZMap Output for 3D Range Images on page 21](#). By adding a separate ZMap Texture output source to your 3DExpress AIK server, you can also generate greyscale information about the object and add that to the images you send to the VisionPro AIK client. VisionPro combines the ZMap and ZMap Texture output sources to generate a single RangeWithGrey image type.

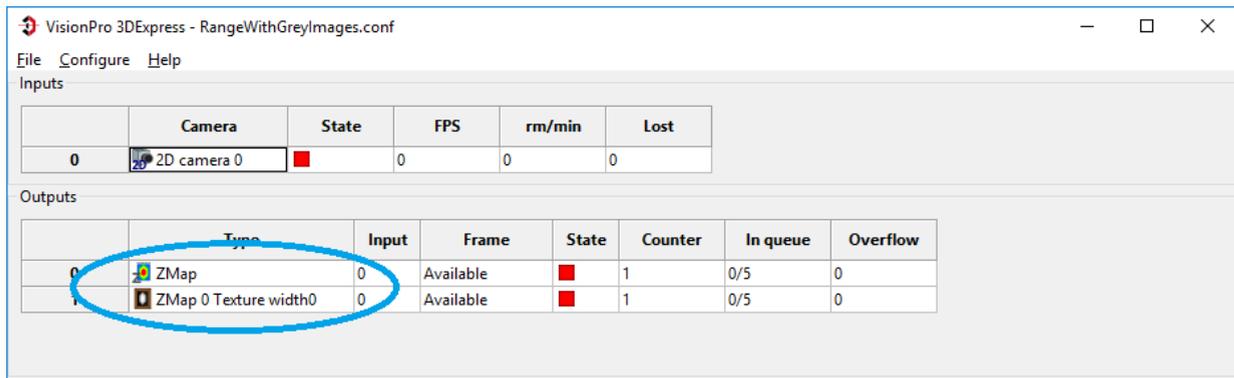
Perform the following steps to add a ZMap Texture to your 3DExpress AIK server configuration:

1. Click the **Add output** icon in 3DExpress to create a new output source.
2. Choose the **ZMap Texture** output type:



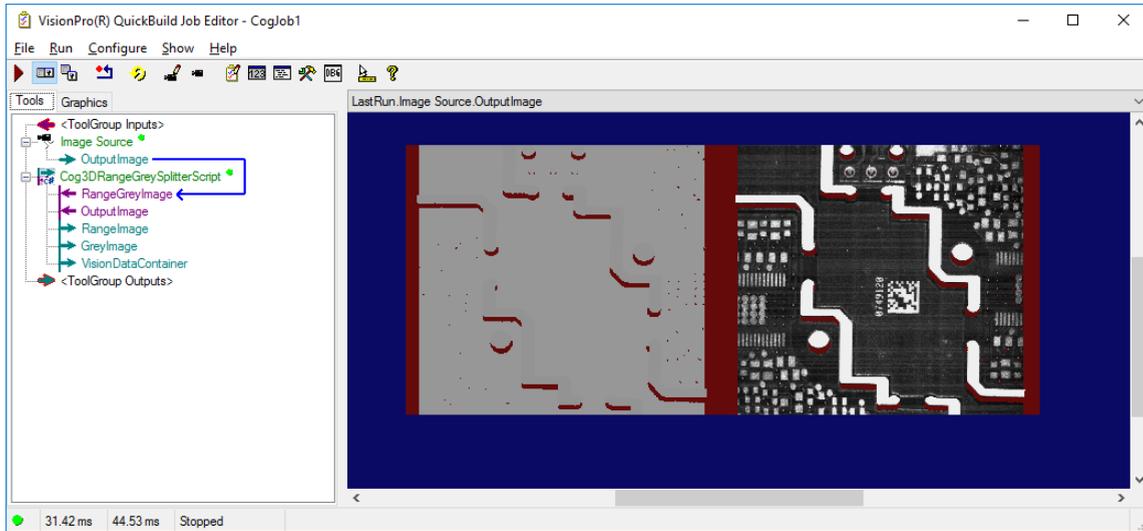
3. Choose **16-bit unsigned** from **Frame settings**.
4. Choose **width** for **Source Frame**.
5. Ensure that **Related ZMap Output** reflects the ZMap output source containing the 3D height-profile data.

The 3DExpress main panel should contain only the ZMap and ZMap Texture output sources:



Configuring the VisionPro AIK client either for 3D range images or combined RangeWithGrey images is identical except you must specify a width for the VisionPro image at least twice the width of the ZMap. See the topic [Configure the VisionPro AIK Client on page 25](#) for more information.

When complete, your VisionPro application will display both the 3D Range image and the 16-bit greyscale image side-by-side, as shown:



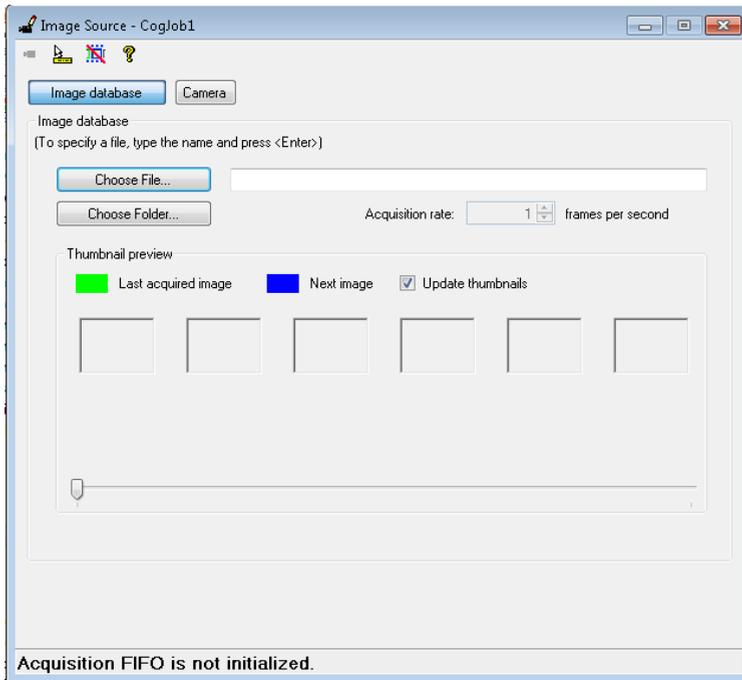
See your installed VisionPro documentation for details on how to split a RangeWithGrey images for additional image processing.

# Configure the VisionPro AIK Client

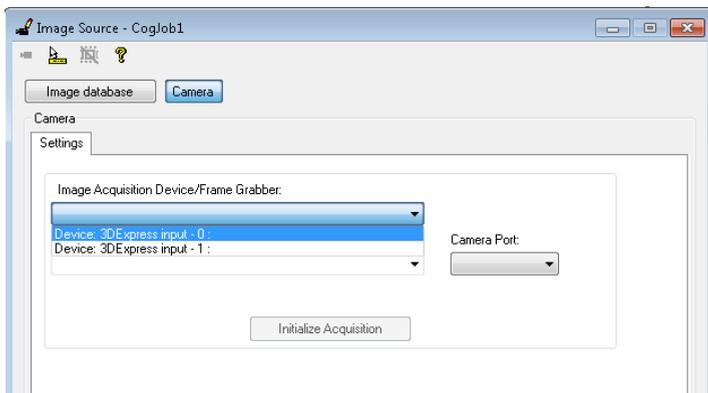
After you configure the 3DExpress AIK client you can configure the VisionPro AIK server.

1. Switch to VisionPro QuickBuild and double-click the **Image Source**.

VisionPro displays an interface for choosing the source of images in a VisionPro application:



2. Choose **Camera**.
3. Choose the 3DExpress input source and click **Initialize Acquisition**.

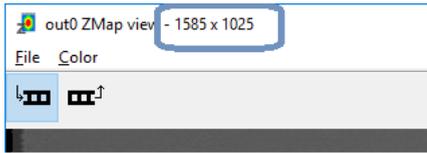


The numeric value of the input source in QuickBuild matches the value of the input source from 3DExpress. For example, choose **3DExpress input 0** if the 3DExpress input also has an index of 0.

4. Select the **Strobe & Trigger** tab and select the **Free Run** option.

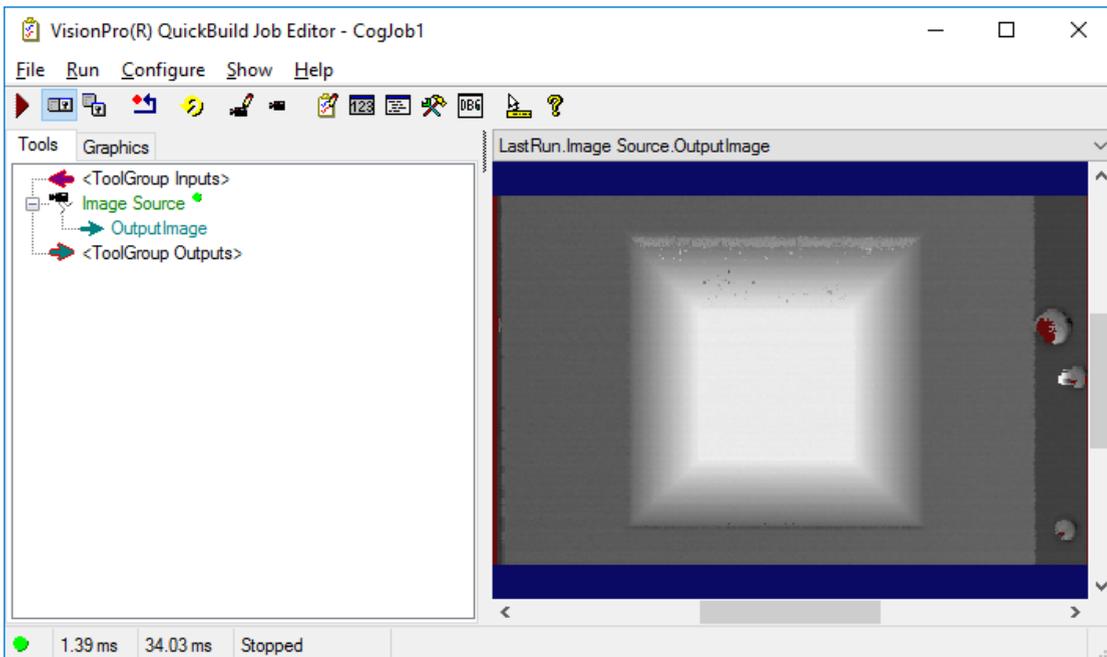
5. Select the **Image Properties** tab and choose a **Width** and **Height** for the 3D range image in VisionPro.

Open the ZMap to view the width and across the top if you want to use the same values for the dimensions of the VisionPro 3D range image:



**Note:** If you are acquiring RangeWithGrey images, which combine 3D range image information with 16-bit greyscale information about the object, then specify a **Width** at least double the width of the ZMap. See the topic [ZMap Texture Output for RangeWithGrey Images on page 22](#) for more information.

6. Run the Job once to test that the VisionPro AIK client receives an image from the 3DExpress AIK server.



# Resolving Issues

Contact your Cognex sales representative or Cognex customer support for additional assistance.

## 3DExpress Software Does Not Launch

Both VisionPro and 3DExpress need to execute simultaneously for your vision application. The topic [Launching VisionPro and 3DExpress on page 11](#) describes how to start the VisionPro and 3DExpress software. Refer to the following list if the 3DExpress software does not launch:

- A dialog box appears that you do not have the proper security.

Cognex software uses a security system to ensure that the software is properly licensed. VisionPro security licenses can be set in non-volatile memory on a Cognex USB security key attached to the PC.

Contact your Cognex sales representative for details, and see the topic *Understanding VisionPro Security* in your installed Cognex VisionPro documentation for more details on Cognex software security.

- VisionPro launches but no interface for 3DExpress appears.

In some instances the 3DExpress software has launched but the user interface does not appear on the display.

Check your Windows system tray for the 3DExpress icon:



Clicking the icon should re-enable the user interface on the display.

- No interface for 3DExpress appears and there is no 3DExpress icon in the taskbar.

If the 3DExpress software fails to launch completely, contact Cognex support. You might want to examine the Windows registry for the particular error message at the following location:

```
Computer\HKEY_CURRENT_USER\Software\Cognex\AIK\Errors
```

## Missed Acquisition Triggers

A missed acquisition trigger indicates that the camera was in the process of acquiring an image when a trigger arrived to signal a new acquisition should begin. This causes the camera to ignore the incoming trigger and miss a 3D profile that should become a part of your 3D image.

The 3DExpress main panel indicates if your vision application is missing acquisition triggers. Any value for **lost frames counter** above the value of 0 indicates missed acquisition triggers, as shown in the following example:

The screenshot shows the VisionPro 3DExpress application window. It features a menu bar (File, Configure, Help) and two main data tables: 'Inputs' and 'Outputs'. The 'Inputs' table has columns for Camera, State, FPS, rpm/min, and Lost. The 'Outputs' table has columns for Type, Input, Frame, State, Counter, In queue, and Overflow. Below these tables is a log window showing system messages. A red circle highlights the text 'lost frames counter: 21742' in the log output.

	Camera	State	FPS	rpm/min	Lost
0	2D camera 0	■	0	0	0

	Type	Input	Frame	State	Counter	In queue	Overflow
0	ZMap	0	Available	■	1	1/5	0
1	RangeMap	0	Available	■	1	1/5	0
2	ZMap 0 Texture light0	0	Available	■	1	1/5	0

2017-Jun-27 20:05:55.449: input 0: New element 0 arrived, 2138 profiles, lost frames counter: 21742 timestamp: 100331079 timestamp\_hw: 552813381  
 2017-Jun-27 20:05:55.449: input 0: freezing  
 2017-Jun-27 20:05:55.918: input 0: Rangemap 0 processing finished

To prevent lost profiles and inaccurate 3D range images, Cognex recommends you perform some combination of the following:

- Reduce the speed of your motion system.
- Change the exposure time for your camera. You may need to change aperture settings to allow more light to reach the camera sensor.
- If your motion system uses an encoder, introduce a method through which you can divide the encoder rate and acquire images after a larger multiple of encoder pulses.

# Precautions

Observe these precautions when installing the Cognex product, to reduce the risk of injury or equipment damage:

- To reduce the risk of damage or malfunction due to over-voltage, line noise, electrostatic discharge (ESD), power surges, or other irregularities in the power supply, route all cables and wires away from high-voltage power sources.
- Changes or modifications not expressly approved by the party responsible for regulatory compliance could void the user's authority to operate the equipment.
- Cable shielding can be degraded or cables can be damaged or wear out more quickly if a service loop or bend radius is tighter than 10X the cable diameter. The bend radius must begin at least six inches from the connector.
- This device is a business-use (Class A) EMC-compliant device. The seller and user are advised to be aware of this fact. This device is intended for use in areas outside the home.
- This device should be used in accordance with the instructions in this manual.
- All specifications are for reference purpose only and may be changed without notice.

