Quick Start Probe Parameter Guidelines

Probe Overview

The programs that come with the AKI SAZ probe are very simple sample programs. These have several main purposes:

1. To help in the setup of the probe and let the user understand how to use the probe.
2. The sample source code will help the customer integrate the probe software into their own, customized program.
3. To help troubleshoot any probe problems (take the user's software out of the equation)
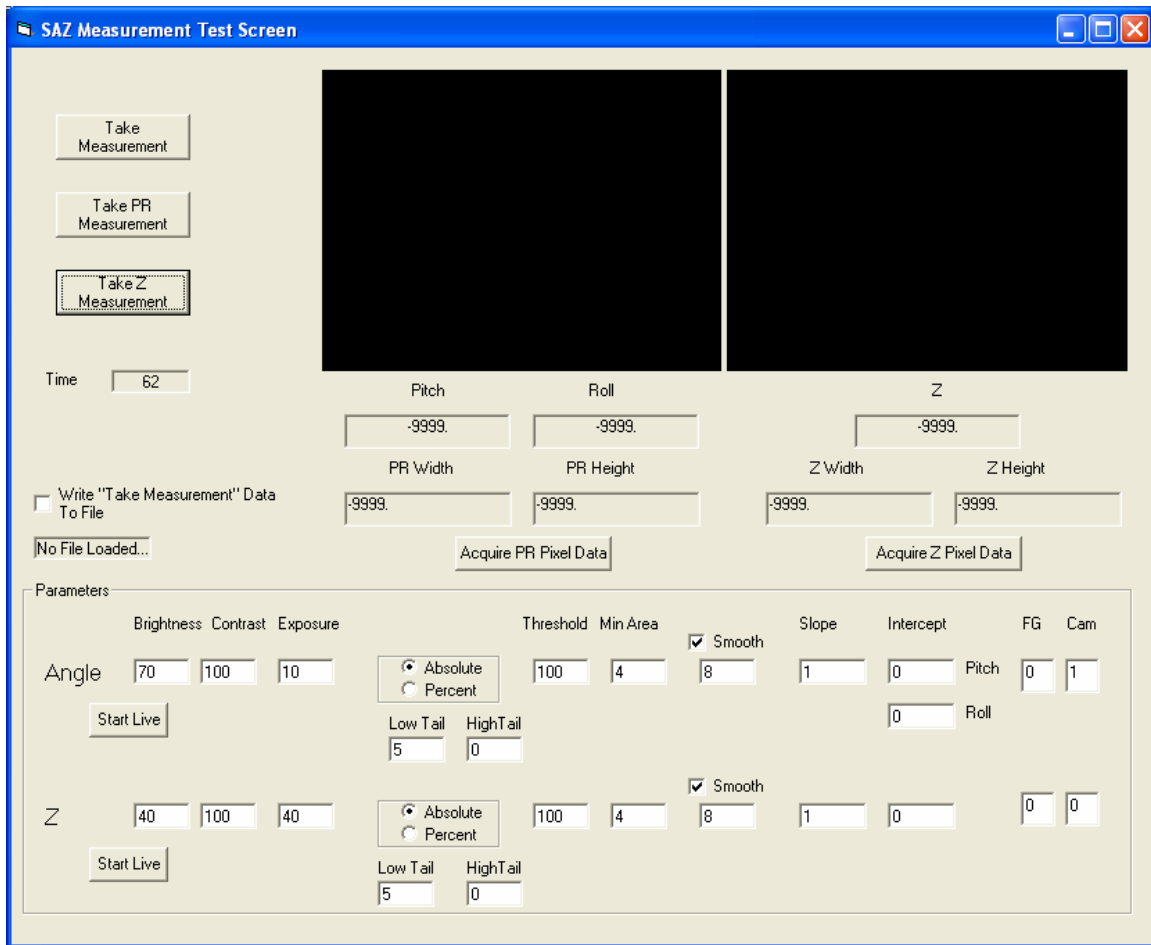
If the customer is not planning on writing their own program, and would like AKI to modify the sample program in any way, please contact AKI.

This manual gives basic definitions and parameters suggestions. Of course, parameters vary depending on the parts being measured etc.

This probe has been designed to measure static attitude angles on both conventional suspensions and Head Gimbal Assemblies. The probe parameters should be optimized for each specific material type in order to achieve adequate measurement results. A thorough explanation of each of the available probe parameters is detailed in the "AKI Module OCX Reference".

An example of the measurement signals is shown below for both the Z-height CCD Sensor, and the Angle CCD Sensor.

SAZ Measurement Test Screen

Take Measurement

Take PR Measurement

Take Z Measurement

Time   62

☐ Write "Take Measurement" Data To File

No File Loaded...

Pitch   Roll   Z
-9999.   -9999.   -9999.

PR Width   PR Height   Z Width   Z Height
-9999.   -9999.   -9999.   -9999.

Acquire PR Pixel Data   Acquire Z Pixel Data

Parameters

	Brightness	Contrast	Exposure		Threshold	Min Area		Slope	Intercept		FG	Cam
							☑ Smooth					
Angle	70	100	10	⊙ Absolute ○ Percent	100	4	8	1	0	Pitch	0	1
	Start Live			Low Tail 5 HighTail 0					0	Roll		
							☑ Smooth				0	0
Z	40	100	40	⊙ Absolute ○ Percent	100	4	8	1	0			
	Start Live			Low Tail 5 HighTail 0								

1. **An optimized Z-height signal should look comparable to the one shown in Figure 2.** To optimize the signal, first set the Contrast to 80, and the Brightness to 95. Verify that a Z-height signal is present (the part being measured is within the measurement range of the Z-height sensor). Then reduce the brightness value until the signal does not saturate the CCD Sensor, and still has a cohesive, oblong
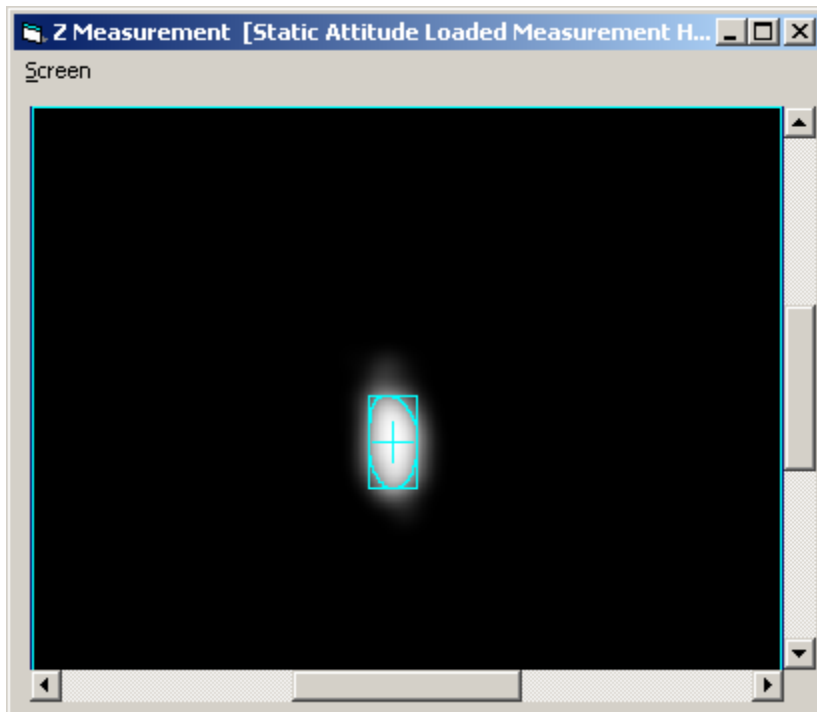
return signal as shown in Figure 2.
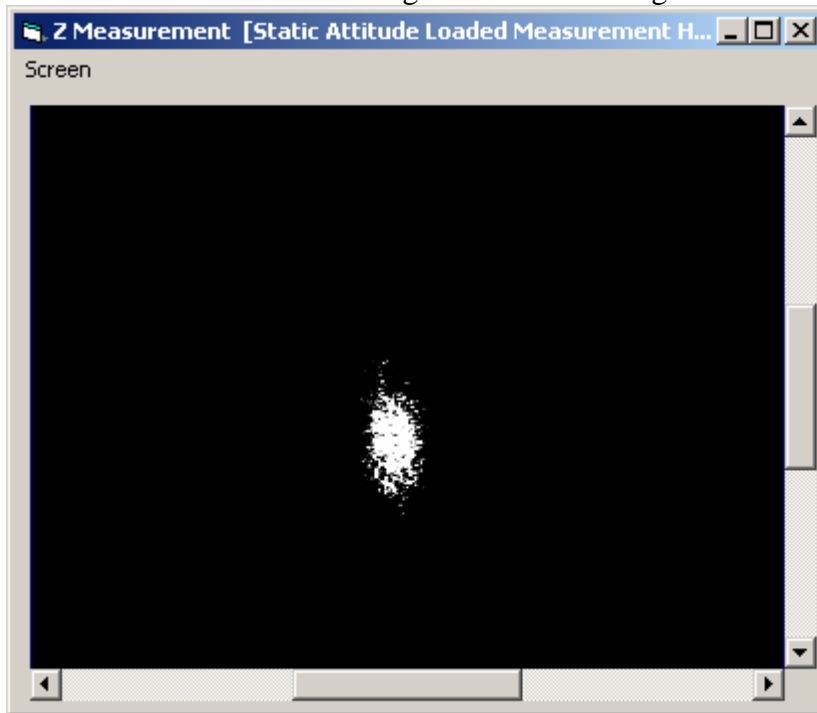
FIGURE 2

2. **Utilize the smoothing function for the Z-height signal to further improve the cohesiveness of the return signal.** Figure 3 provides an example of smoothing to 16 pixels on the Z-height signal shown in Figure 2.
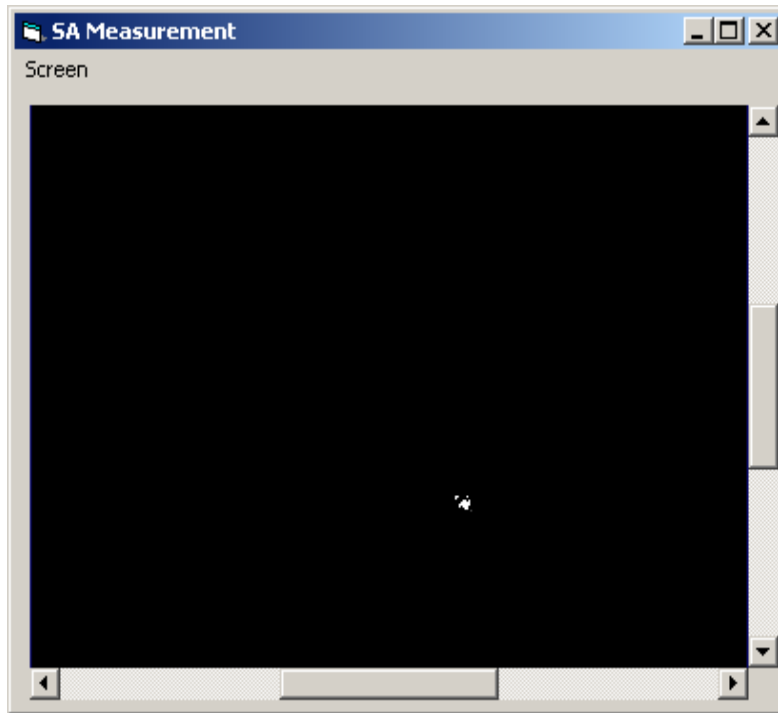
FIGURE 3

3. **The brightness and contrast need to also be optimized for the angle CCD measurement signal.** To start, set the contrast to 100, and the Brightness to 95. Verify that a return signal is present, and that the surface being measured is within the measurement range of the Angle CCD sensor. Lower the brightness value until angle measurement signal is a small cohesive spot similar to that shown in Figure 4.
   If you are using an updated OCX/sample program, you should try and use the "AutoFindBrightness" routine (see below). This routine will help you find the best brightness setting, for a specified contrast value.

FIGURE 4

Basic Definitions

Contrast:

Range: 0 to 100.

Specifies the contrast of the image to be acquired. 0 (low contrast) and 100 (high contrast).

Brightness:

Range: 0 to 100.

Specifies the brightness of the image to be acquired. 0 (dark) and 100 (bright).

The Contrast and Brightness values control how different light levels are mapped to pixel values. All the light levels entering the camera must be mapped to a pixel value from 0 to 255 (for an 8 bit image).

Contrast determines how the light levels are mapped to the 256 light levels. A low value closer to 0 maps more light values to the pixel value range. A high value closer to 100 maps fewer light values to the pixel value range. Light values that are below or above the contrast threshold are mapped to the lowest and highest pixel values, respectively.
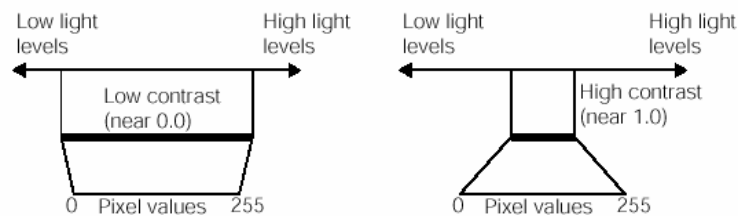
Brightness determines where the center of the contrast mapping window falls relative to the range of light levels. Brightness values closer to 0 place the center of the mapping window toward the higher light levels, resulting in a darker image. Brightness values closer to 100 place the window toward the lower light levels, resulting in a brighter image.
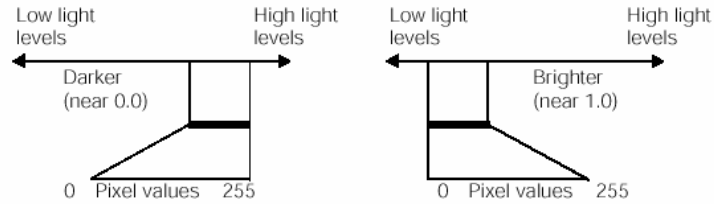
Exposure Time:

Units are msec. You may use a fraction of a millisecond. (i.e. a standard value is 0.2 msec).

Do not confuse this with the **Brightness** variable. This will give a brighter image, but not for the same reason. (see the description on brightness). This is how long the CCD is imaged: shutter time.

If the camera is not a shuttered camera (such as a Sony HR 70, then this value is ignored; just send in a 0.00)

Threshold Type:

Absolute Thresholding:

The simplest technique for segmenting an image is to pick an absolute threshold pixel value. All pixels with grey-scale values (0 to 254 range) below the threshold are assigned as background pixels, while all pixels with values above the threshold are assigned as object pixels. During analysis, background pixels are ignored and object pixels are analyzed.

Percentage Thresholding:

The absolute thresholding technique requires that you determine the appropriate value for the segmentation threshold. The most common method is trial and error. However, if the images used by your application contain image-to-image variations in brightness, then a static threshold value does not segment the variety of different images correctly.

A percentage threshold is specified using two sets of parameters. First, you specify the percentage of the pixels within the image that you want the tool to treat as tail pixels. Tail pixels are those pixels within the image that have the lowest and the highest values. In a histogram plot of pixel values, the tail pixels appear at the left and right sides of the histogram. The vision tool determines the pixel values above and below which the percentages of pixels that you specify lie. These pixel values are

called the right tail pixel value and the left tail pixel value. The second parameter you specify for a percentage threshold is the threshold percentage (1 to 100 range). The vision tool determines the pixel value that lies at the specified percentage of the distance between the two tail pixel values, and the tool uses this pixel value as the threshold pixel value. The following figure shows how the Blob tool computes a percentage threshold. In this example the following values were used:

Low Tail: 5 %
High Tail: 5 %
Threshold: 40 %
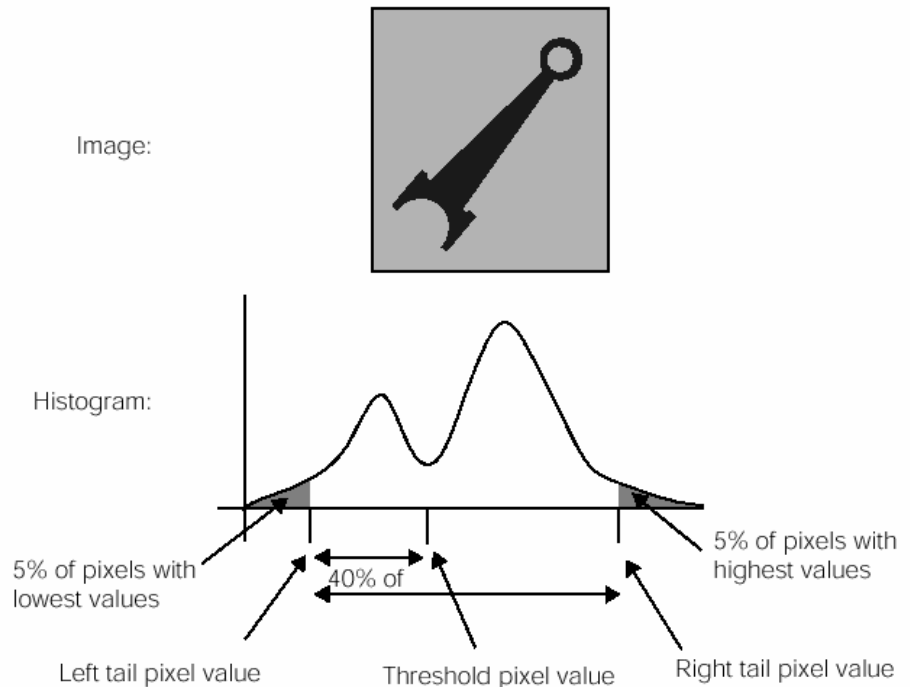
Note that when using Percentage Thresholding, the Contrast and Brightness can really influence the outcome. For example, you may have the contrast too high, and it will seem as if the percentage thresholding routine is not working (it might be selecting the entire field of view as the spot). In fact it is working, you just need to use "trial and error" to determine the correct Contrast and Brightness values.

Threshold Value:

0 to 254 for Absolute Thresholding

1 to 100 for Percentage Thresholding

This is the Threshold Value. See the explanation on "Threshold Type" for a description of how this value is used for both "Absolute Thresholding" and "Percentage Thresholding".

Low Tail:

The percentage of low-value pixels to exclude as tail pixels. See the explanation on "Threshold Type" for a description of how this value is used for "Percentage Thresholding".

High Tail:

The percentage of high-value pixels to exclude as tail pixels. See the explanation on "Threshold type" for a description of how this value is used for "Percentage Thresholding".

Min Area:

Specify the minimum size, in pixels, for a spot. Only features with a number of pixels greater than or equal to the value you specify are considered as spots.

Smoothing:

True: A Gaussian sampling tool will be applied to the image before Analysis.

False: The acquired image will be analyzed.

Using this option can help analyze a spot that has areas of small pixel noise around it or within it.

The Gaussian Sample Tool will smooth the image with a process of removing or attenuating high spatial frequency information (i.e. features 1 or 2 pixels in size).

The smoothness value (SmoothPixelSize) should correspond to the feature size, in pixels, below which you wish to attenuate features.

In general, you should start with a smoothing value of 1 or 2 and increase it until you obtain the desired smoothing.

Smooth Pixel Size:

Range: 0 to 20

When using the "Smoothing" option, the smoothness value (SmoothPixelSize) should correspond to the feature size, in pixels, below which you wish to attenuate features.

See the "Smoothing" explanation for more information on Smoothing.

Area Output:

This is the output value for the Z or Angle area. The value will be in pixels.

This is an area measurement of the detected spot. Normally, this is used in conjunction with the "Percentage Thresholding" option in order to ensure that a "real" spot was found. For example, if the area is very large, the parameters (eg contrast) may not be set correctly and a large, dark area is being analyzed instead of the real spot.

Height Output:

This is the output value for the height of the Spot. This can be used in conjunction with the Width value to detect erroneous or bad spots. The value will be in pixels.

Width Output:

This is the output value for the width of the Spot. This can be used in conjunction with the Height value to detect erroneous or bad spots. The value will be in pixels.