

OPTTEK

QC5000 Calibration

Video

Calibration of the VideoMic in QC5000

Calibration Procedure Overview

Do the squareness and camera rotation first. Parallax adjustments follow, and then software adjustments to the imaging system using the probe library. The transport movement is then determined and incorporated into the calibration using NLEC (Non Linear Error Correction).

Adjustments to the Camera System (4) See details below.

Camera Rotation: A mechanical adjustment.

Pixel calibration: Software compensation.

Camera Rotation Calibration: Software compensation.

Camera Offset: For multiple Magnification Systems

Adjustments to the Transport system (5) See details below.

Preparations: Remove any tooling, which might interfere.

Grid Alignment: Mechanical adjustment.

Grid Measurement: Determine the errors, Software compensation by NLEC calibration.

Implementation of NLEC Calibration: Software compensation for errors.

Verification: The calibration check program: Software verification of the compensation by NLEC.

Calibration Procedure

Do squareness or camera rotation first. Pixel cal can be approximate at this point.

Adjusting the Camera Squareness (A Mechanical Rotation)

The first step in the alignment process is to ensure the camera is square to the X-axis travel. With a large crosshair on the video monitor, place a sharp image all the way to the left side of the screen just touching the horizontal line of the crosshair. Move the image to the right side of the screen with the joystick. The object should follow the line. If it does not follow the crosshair line, loosen the two camera mount set screws (Also used in adjusting Parfocality) and rotate the camera until the image stays on the line from left to right. Tighten the setscrews when the image touches the line from left to right.



Camera Rotation Correction (Software Alignment)

Position the 0.5 mm dot on the horizontal centerline of the monitor at the left side of the field of view.

From the CNC toolbar choose Axis Lock

Tools \ Options \ Password \ Enter the security code to access the supervisor functions.

Choose: Probe \ Probe library \ Camera\ Orientation (Camera Skew)

Click on set zero. Click the Learn button. A calibration circle tool will appear on the left monitor. An instruction box will appear on the right. Follow these instructions to complete the Camera Rotation Correction.

This completes the Camera Rotation Correction. Exit this window by pressing OK.

Pixel Calibration

Pixel Calibration: Assuring that the feature measures at the correct size.

All measurements are made by calculating pixels. These pixels have a set value that is determined through a simple calibration process. **If the pixels are not calibrated, any measurements made will be incorrect.**

The pixel calibration is based upon the Calibration Slide. The standard Calibration Slide shipped with the system is for reference only. This is not a traceable item. If a traceable Calibration Slide is needed, please contact your OPTEK representative or contact Operations Technology, Incorporated for more information.

Calibration slides come in both Optical and X-ray varieties.

Set the OPTEK session to **Metric Mode**.



The actual size of the dot is found on the back of the calibration slide case. To perform a calibration, the light levels must be set correctly. If it is white it is too bright. Set the light to an moderate level.

Position the slide under the camera so the dot can be seen on the video monitor.

Adjust the light settings until the image is clear on the video monitor.

A Quick Overview of pixel calibration: Use Supervisor Password

Position the dot as close as possible to the center of the Field of view (FOV).

Go to : Probe \ Probe library\ click the magnification of interest \ and chose resolution tab..

Select "Teach" to edit the calibration.

Enter the size of the calibration dot.

Arrange the calibration probe to cover the circle and double click to cause the probe to **shoot** from dark to light.

Check the feature view to determine if the dot diameter matches the slides given diameter

The Turret Position is set at the factory for the programmable zoom lens. For all other systems, Turret Position 1 is used.



Detail:

When you do a pixel calibration, this dialog box will come up to prompt you to enter the size of the artifact, which you are using to calibrate. The size usually comes from the VED glass slide supplied with the system. If you select continue the system will prompt you to measure the specified artifact. If you say cancel, it will return you to

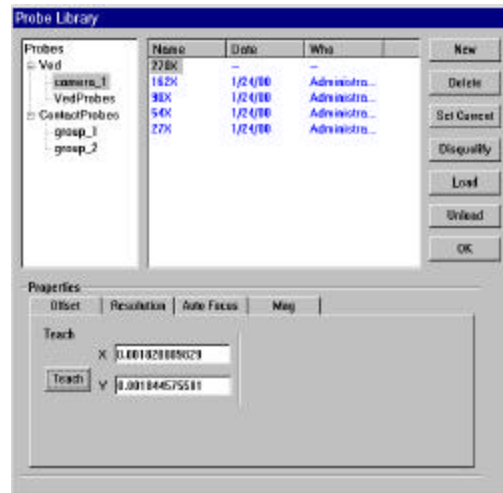
Fill in the Standard Size for the dot this size should be taken from the information found on the rear of the slide case. After the appropriate information has been placed in the Standard Size area, click on **“Cal. X and Y” (Circle)**. The circle tool will appear on the video monitor in the center of the screen. Using the digital positioner, (track ball), move the transport system until the dot is as close to the center of the circle tool as possible.

Size the circle tool to fit over the dot properly. **Click the right mouse button**. The system will measure the dot three times. From this the X and Y pixel dimensions will be determined. The present pixel value can be seen in the Pixel Size window. **Click OK** to exit the Learn VED Pixel Size window. **Click OK** to exit the Edit Calibration window.

QC5000 Calibration procedure for the Probe Library

This operation is for factory representatives who are installing new QC5000 operating system computers to existing machines.

1. Setup your Magnifications.
2. Assign Zoom Positions.
3. Teach Autofocus and Video Edge Detection.
4. Pixel Calibration.
5. Camera Skew.
6. Parcentricity Calibration.
7. Go back and check all the calibrations by measuring the appropriate artifacts.



This is an **extremely important** part of the QC5000.

This is the place to set up your Camera / Magnifications / VED tools and do all your video calibrations.

Probe Library works a lot like Windows/NT explorer. Click something on the left, it opens up and expands to the right.

If you turn on AutoFinish, it will make calibrating easier. (Right click in video area)

Remember anything you want to calibrate must be on the right side!



Probe Library: Mag Tab

Selecting “new” creates a new magnification.

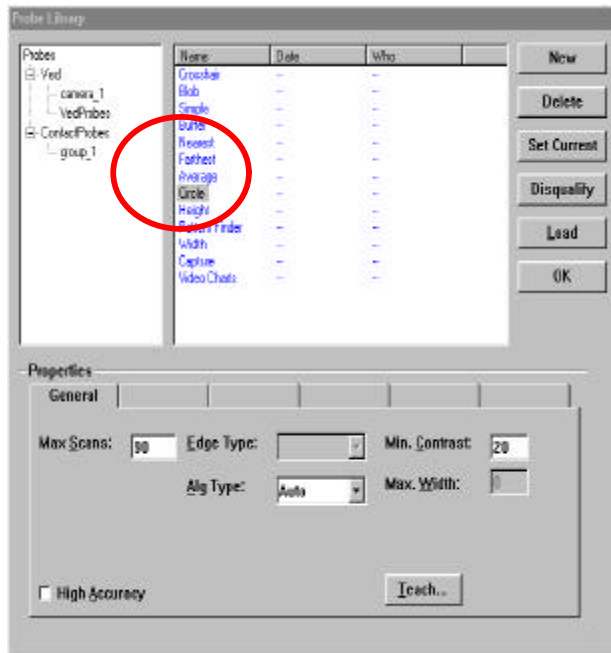
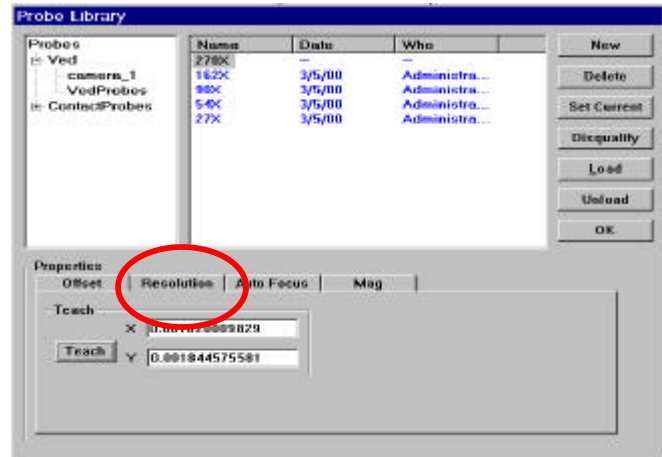
Selecting delete, removes a magnification.

Disqualify erases the data in the current calibration.

Selecting “load” loads a TP20 into the Probe Rack.

Warning, do not select load unless the rack has been properly setup

Selecting OK exits Probe Library



Probe Library - VED Probes

This is the section of Probe Library where video probe tools are configured.

You set up how many points will be taken when you fire a video probe.

Max scans tell you how many points per firing.

Edge type indicates dark to light, light to dark-or first edge

Algorithm Type, describes which algorithm will be used, Auto, Strongest or First.

Teach performs an edge teach.

Probe Library: Autofocus Tab

This is where you teach the AUTOFOCUS range of each magnification.

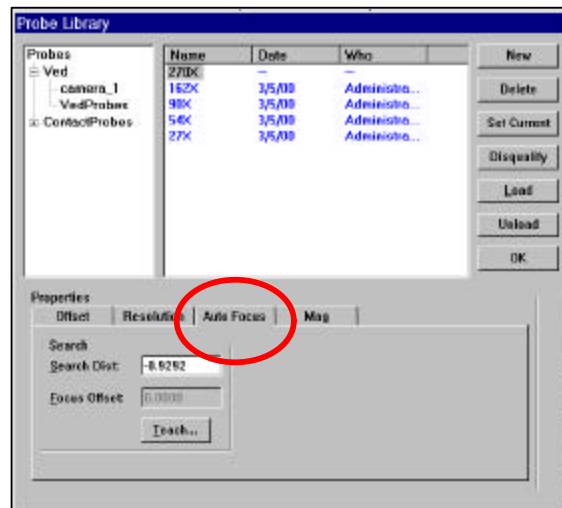
You must do a TEACH for each Magnification.

You can also set a search Distance manually.

If you teach from here, you can use most VED Tools.

Remember a safe distance is in the up direction.

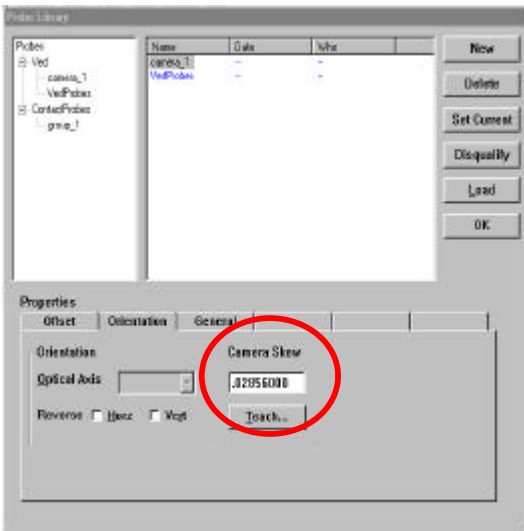
Make sure your “Z” is counting positive in the up direction.



Probe Library: Resolution **Tab** Select teach to do your Video Pixel Calibration.
 You **MUST** calibrate each magnification.
 Notice the size of a pixel at each magnification.
 Remember we do sub-pixel edge detection.
 The QC5000's edge detection is far superior to the QC4000.
 The edge detection is extremely sensitive in low light settings.

Camera Calibration

SKEW



This is the section of Probe Library where you do your Camera Calibration.

If you click on "Teach" Probe Library walks you through doing a camera Skew calibration.

If your camera image is backwards or opposite you can change the **Orientation** here.

"Camera Calibration - Skew" works very similar to the QC4000.

Remember to make this one of your first calibrations

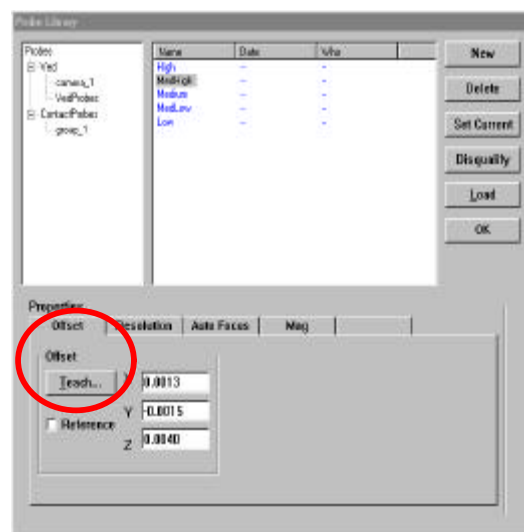
Probe Library-Offset Tab

This picture shows the offset from magnification Med High to the master mag High. These offset are also known as Parcentricity and Parfocality.

If you click on teach the system will walk you through the calibration. You should start this procedure at Med High.

Notice reference is not checked. Only the master probe (HIGH) in the group is checked.

The same calibration needs to be done for each of the other magnifications except High which is the Master Probe in this group.



Transport Movement Calibration in QC5000

QC5000 Grid Calibration Procedure

OVERVIEW

1. Start QC5000 (Ensure that all other optical and mechanical adjustments and calibrations have been done first.)
2. Turn OFF NLEC (Go To TOOLS\OPTIONS\NLEC, Uncheck "enable")
3. Open the grid program. This should be in C:\Optek\Calibration\ Calcheck.5pa.
4. Place toggle breakpoint after skew and zero steps. (Record Mode)
5. Open NLEC controller (Tools / Options / NLEC, Click Calibrate)
6. Right click in background between grid stations.
7. File import from the ACF file matching the Grid s/n. (Certified Grids Only). File "new" for others.
8. Verify columns / rows correct for grid stations to be used.
9. Right click in background between grid stations.
10. Click \ Calibrate \ Start
11. Measure the "Skew & Zero" points. File \ "New Run". Measure zero point and measure skew point, Zero on Left most point. (Breakpoint on first measured dot) adjust measurement locations if machine is not in Power Assist mode. Machine must stop after the skew and Zero steps.
12. Click on lower left grid station in NLEC controller to see both bottom corners green.
13. Run the calibration program from first measured dot. Program toolbar \ Run from current step. the tolerances should be red because NLEC is disabled.
14. When done: right click in gray area, File\ Save in: C:\ QC5000 as – ("date of cal ".txt) this save is just for a calibration record
15. **Right click in gray area**, File export as nlec.txt. Nlec.txt file is created
16. Turn ON NLEC (Tools / Options / NLEC, Check box "**enable**")
17. Shut down QC5000 and restart

Verify the Calibration

Choose the calibration program. (File / Open / "calibration check .5pa")

Add Fields to the features template check the calibration, note the x difference from nominal and y difference from nominal fields to the feature window.

Measure the grid with the same program as in calibration with no changes in edge teach or lighting.

The tolerances should now be green with NLEC enabled. Export the data.

Save as "CAL Data and date of calibration" csv file

Recalibrate if necessary.

Calibration Data	Operator	<u>SUP</u>
Record the best Calcheck tolerance "All Green Dots" _____	_____	_____
Grid used G-a _____ - _____ Cal slide	_____	_____
Issued _____	_____	_____
Save "part file" as _____ .5pa with all data & deviations.	_____	_____
Export a file " * ". Csv" _____ .csv file with deviations.	_____	_____
Grid Issued to customer G-a _____ - _____	_____	_____

The calibration is acceptable if 95% of all points are within u95 spec for the model provided in OPTEK brochure.