Surfscan and Optiscan Calibration Manual

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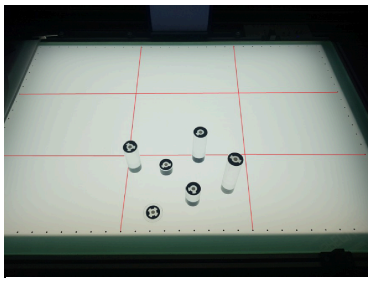
15300 25th Avenue North * Suite 100
| Plymouth | MN | 55447 | (763) 249-8130
productivityqualiy.com | planarinspect.com

Surfscan Camera Position and Trim (Pillars)

You will need the SurfScan Calibration Pillars as well as the .opp file associated with those pillars. The Pillars are used to ensure the Surfscan can accurately determine the Z-height of the known objects across the entire table. It is important to make sure that scans of the pillars utilize the entire table so that there are no “dead areas”.

1. Divide the table into a 3X3 grid, as shown below. Place the pillars into one section of the grid. Try to place the pillars as randomly as possible but take care to not allow the taller pillars to overshadow the smaller ones.
2. Go to Calibration->3D->Marker Plate->Load and load the .OPP file associated with the pillars.
3. Go to Calibration->3D->Position to open the dialog box.
4. Take a scan of the pillars in their position on the glass. Adjusting the exposure prior to scanning to see the markers as green, with little to no red.



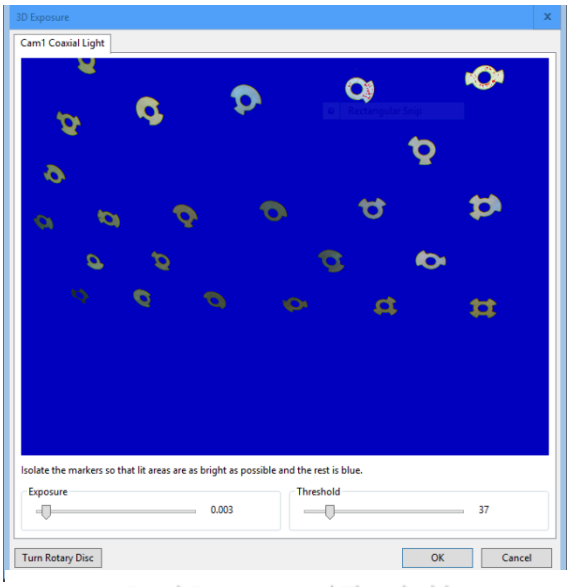
Calibration Pillars and Grid

5. Move the pillars to another section of the grid section on the glass. Again arrange the pillars in a random fashion, without allowing the taller pillars to overshadow the smaller ones.
6. Repeat this process until you have taken scans in each of the 9 grid sections. Additional scans may be taken if there are areas of the table which were not covered by markers, such as corners of the table or grid borders.
7. Select Calibrate.
8. A dialog box will appear showing you the Intrinsic Error and asking to accept the calibration. Average Error should be 0.2 or less.
9. The software will then show you the average measured height deviation. This deviation should be less than 0.250mm.

Optiscan Camera Position

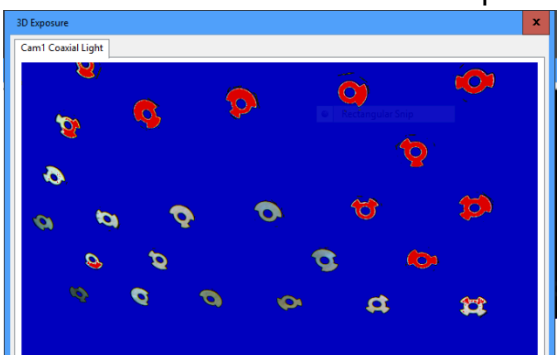
The camera position calibration for the Optiscan will use the black position plate to calibrate the projector and camera in locating markers on a known artifact. It is important to get many different angles and distances from the camera to ensure that markers are located throughout the entire field of view for the camera.

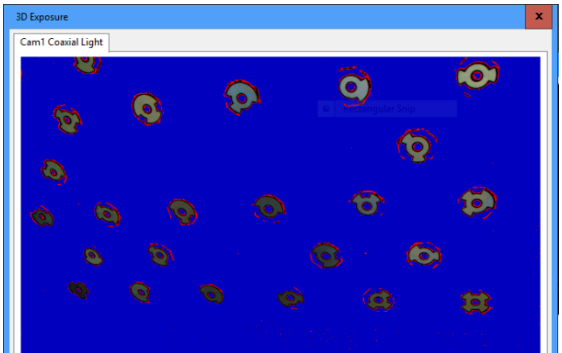
1. Withdraw the turntable from the glass table.
2. Locate the Optiscan Calibration plate and stand. (black steel plate with reflective markers and a black steel stand)
3. Load the marker plate file. Calibration->3D->Marker Plate->Load. Locate the Marker plate file. The file should be located in the “C:\PQI Service\.opp files” folder. The file extension is .opp and the name should have your machine number as well as “OSCP” in the file name.
4. Once the marker plate is loaded. Go to Calibration->3D->Position.
5. Place the Calibration plate and stand directly in front of the Optiscan so the plate is perpendicular to the camera. Position the plate so that the camera can see as many markers as is possible (it will not be able to see all the markers)
6. A Dialog box will open, select Capture.
7. Two sliders will appear, exposure and threshold.
8. First set the threshold near the middle of the slider scale.



Good Exposure and Threshold

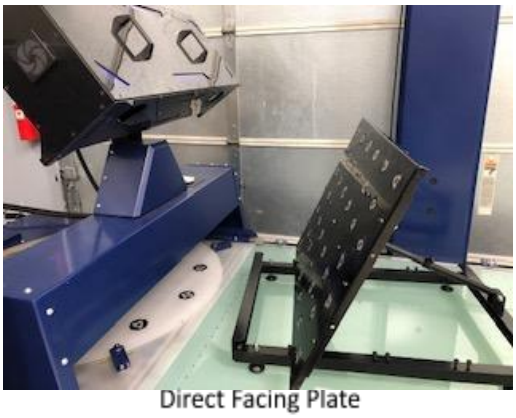
9. Adjust the exposure so that the markers appear white with little to no red.
10. Then adjust the threshold so more markers are visible, but there is no noise around the markers and capture the image.

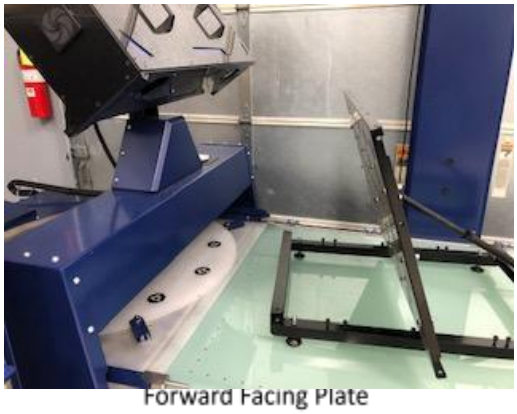


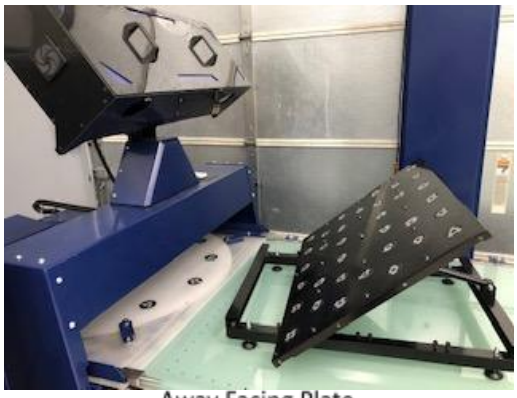


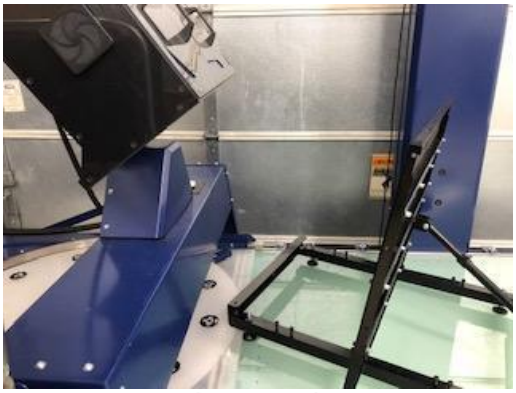
11. Move the plate to a new location and angle and capture another image, making sure to adjust the exposure and threshold each time. It is also important to make sure a marker is visible in a corner of the field of view during each scan, this will ensure proper coverage of the entire field of view throughout the scan process.

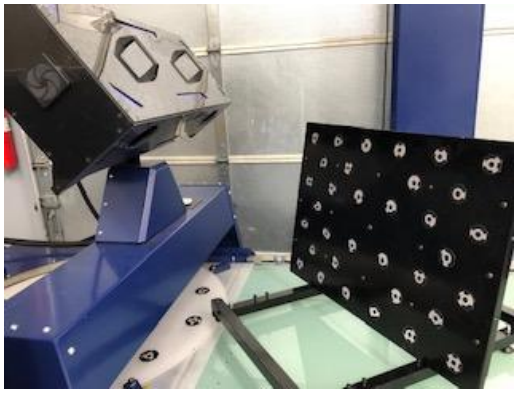
12. A minimum of 20 images is required. These scans should be taken at different


Direct Facing Plate


Forward Facing Plate


Away Facing Plate


Right Facing Plate


Left Facing Plate

angles, both left and right, as well as forward and backwards with the plate.

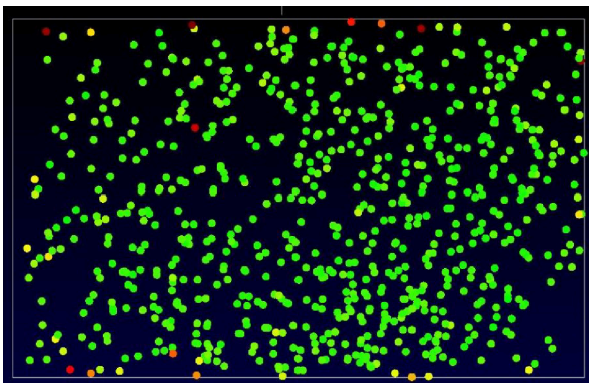
13. Once the scans are complete, select Calibrate.

14. A dialog box will appear showing you the **Intrinsic Error** and asking to filter points from your total. Average Error should be 0.2 or less.

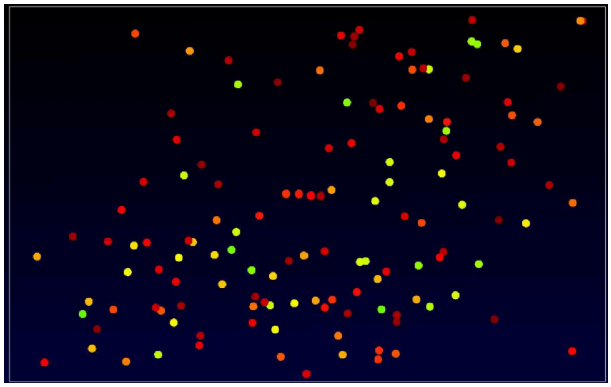
15. If Average Error is greater than 0.2, you may filter points from your total. Total number of filtered points should not exceed 10% of your total points. (If your total is 600 points, you may filter a TOTAL of 60). The dialog box to filter points will appear multiple times, be sure that your filtering does not exceed this guideline.

16. Once you have achieved acceptable results, or have reached your filtering limit, select “no” to filtering points, you will receive your final indication of **Intrinsic Error**. Again, this average should be 0.2pels or less.

17. The machine will then calculate the Extrinsic Error. This process for filtering points and accepting calibration is similar to the Intrinsic Error process and the same guidelines apply. (do not filter more than 10% of the total number of points).



Good Point Spread



Bad Point Spread

18. Extrinsic Error Average should be 1.0pels or less.

Optiscan Backlight Calibration

The Optiscan Backlight calibration is similar to the 2D Backlight with some important things to note.

1. The .opp file must be loaded for the repositioning turntable so that the markers on the turntable are recognized.

2. The backlight calibration must be performed with the turntable in place. This is so the machine can see the repositioning markers of the turntable, as well as the rest of the mechanical components of the turntable and remove them from the measurements.

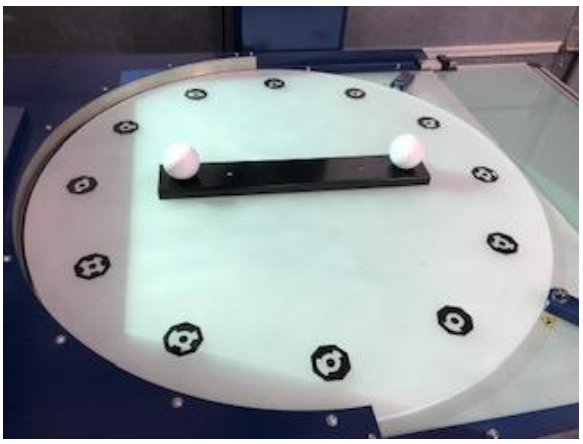
3. If the 3D camera is adjusted using the available swivel adjustment to see a taller part, or focus down onto a smaller part, the Backlight calibration must be performed prior to scanning the part. This is so the machine can properly locate the turntable (as it has now been moved within its field of view).

4. The process for performing the Backlight calibration in 3D is the same as the process in 2D. Go to Calibration->Backlight. The machine will then automatically run through the Backlight calibration.

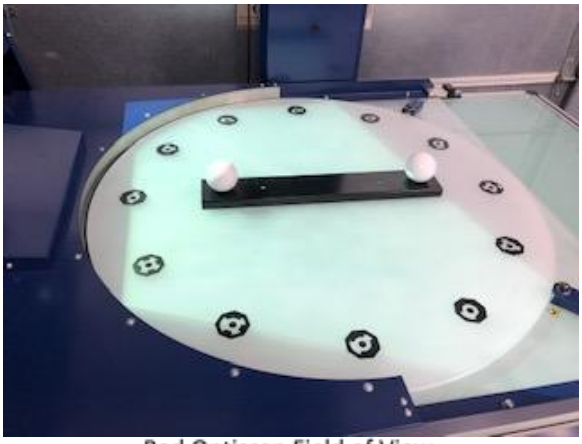
Optiscan Trim

The trim calibration will be used to locate two known spheres as well as their distance to each other. It will also be used to determine the location of the markers on the turntable as the spheres are rotated. This will ensure that multiple scans of a 3D part are aligned to each other.

1. The Optiscan Trim will be performed with the turntable extended onto the glass.
2. Place the Trim Bar onto the center of the rotary table.
3. Go to Calibration->3D->Trim->Select Scanner and Plate.
4. A Dialog box will appear. Select Capture.
5. The 3D scanning dialog box will appear showing the Trim Bar on the stage as well as the projector lighting. Rotate the rotary table all the way around, to ensure the spheres are visible throughout the entire rotation. The tops of the spheres should not be cut off at any point by the light from the projector.



Good Optiscan Field of View



Bad Optiscan Field of View

6. If the spheres are cut off, the camera will need to be adjusted using the provided swivel. **After the field of view is adjusted, a Backlight calibration MUST be performed.**
7. Once the field of view is determined to be acceptable, adjust the exposure setting so that the spheres are green with little to no red. Once your exposure is set, select OK to take a scan.
8. After the scan is complete, Rotate the rotary table and take another scan.

9. A minimum of 12 scans is required. The turntable must complete one full rotation in the course of these scans.

10. Once the scans are complete the machine will give Volumetric and Repeatability Average accuracies for your machine. These numbers should be at or lower than the numbers for your specific machine mode. See the table below.

11. A second calibration will take place. This calibrates the trim of the marker positions. The average figure should be below 1.0mm. (0.5mm for an OS350.10).

Machine Model	Volumetric	Repeatability
OS350.10	0.015mm	0.010mm
OS800.35	0.070mm	0.035mm
OS1000.35	0.075mm	0.035mm