



Verisurf Analysis Settings Tutorial REV A1

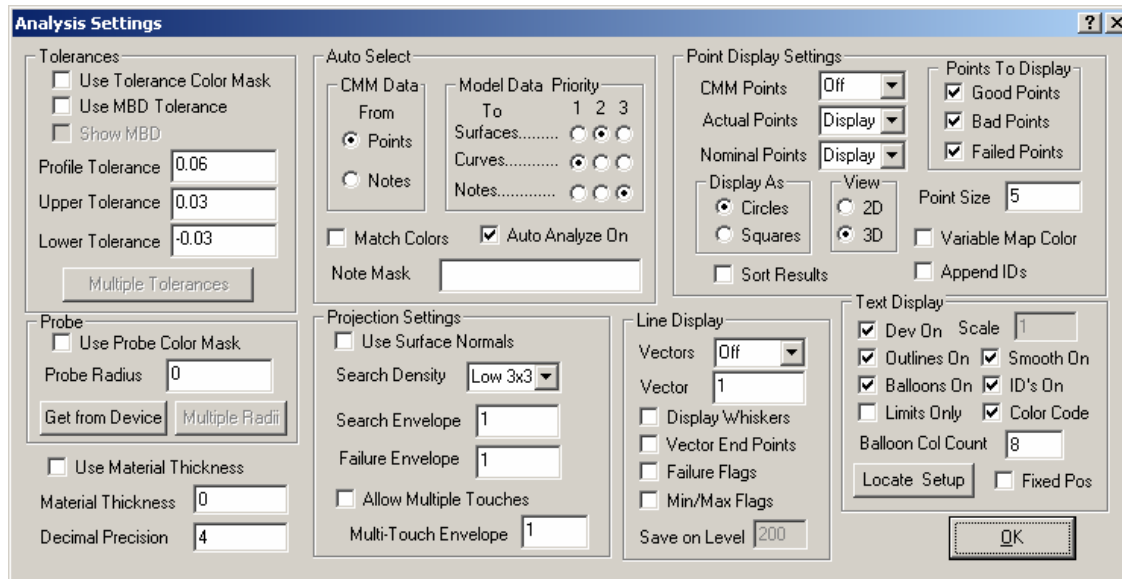
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The Verisurf Analysis Settings Window

The **Analysis Settings** menu contains various settings and features you can use to change the way Verisurf performs certain tasks.

The settings have been organized into these categories:

- **Probe**
- **Tolerances**
- **Auto-Select**
- **Point Display Settings**
- **Line Display Settings**
- **Text Display Settings**
- **Create on Analyze**
- **Projection Settings**
- **General Settings**

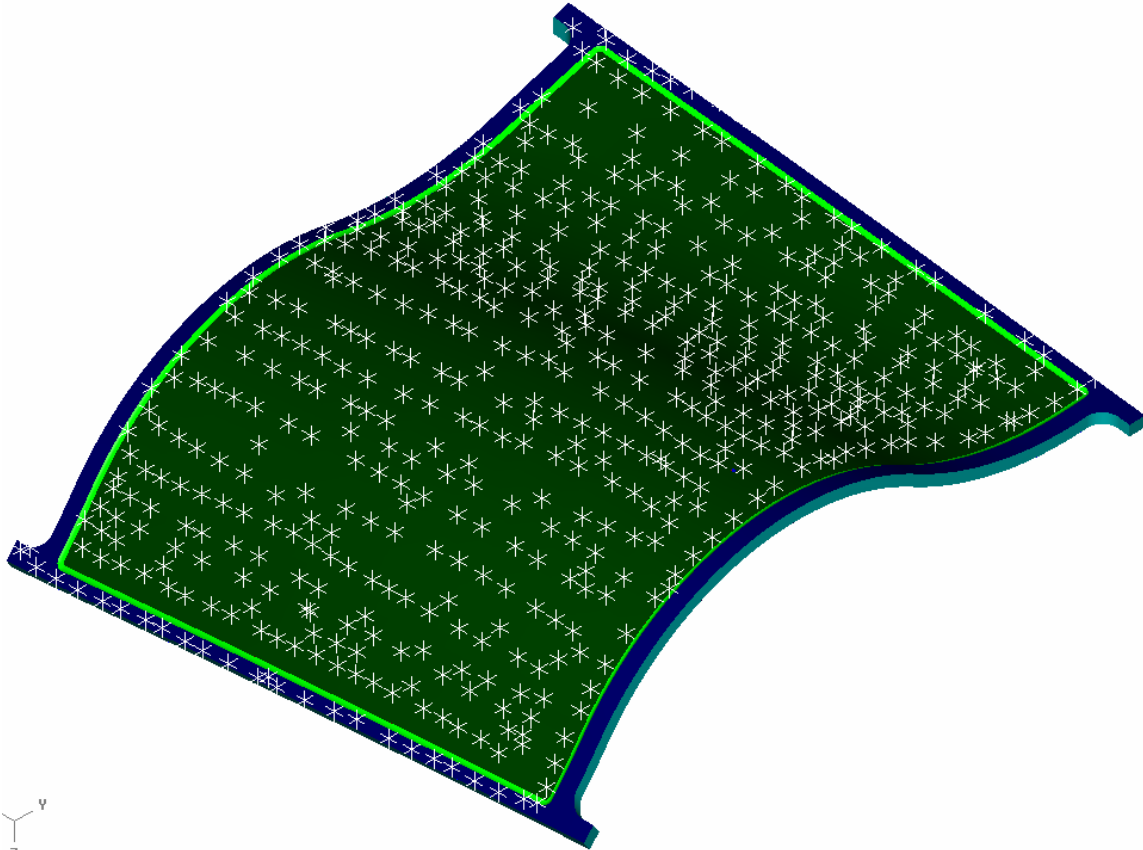


There will be 3 exercises in this tutorial.

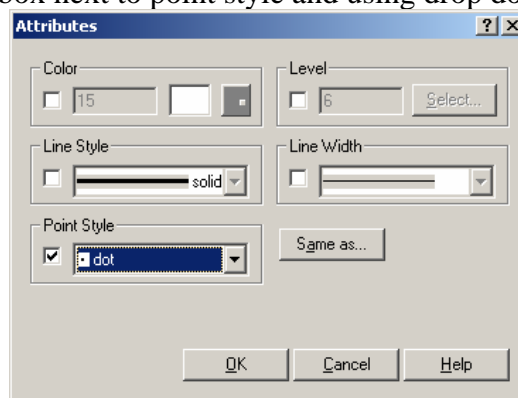
1. **Basic settings** – Tolerancing, probe radius, points to display, decimal precision.
2. **Intermediate settings** – Material thickness, vectors and whiskers, Balloon Col count, Model Data priority.
3. **Advanced settings** - Text display, MDB tolerance, locate setup, sort results, append IDs, surface normals and search and failure envelopes.

Basic settings

1. Open \exercises\analysis.MC9.



2. Choose VERISURF > ANALYSIS > ANALYZE. This should show 570 points.
3. To aid in seeing the part we will change the points which are now 3-D stars to dots. Choose MAIN MENU > SCREEN > CHANGE ATTRIBS.
4. Select the checkbox next to point style and using drop down select dot.



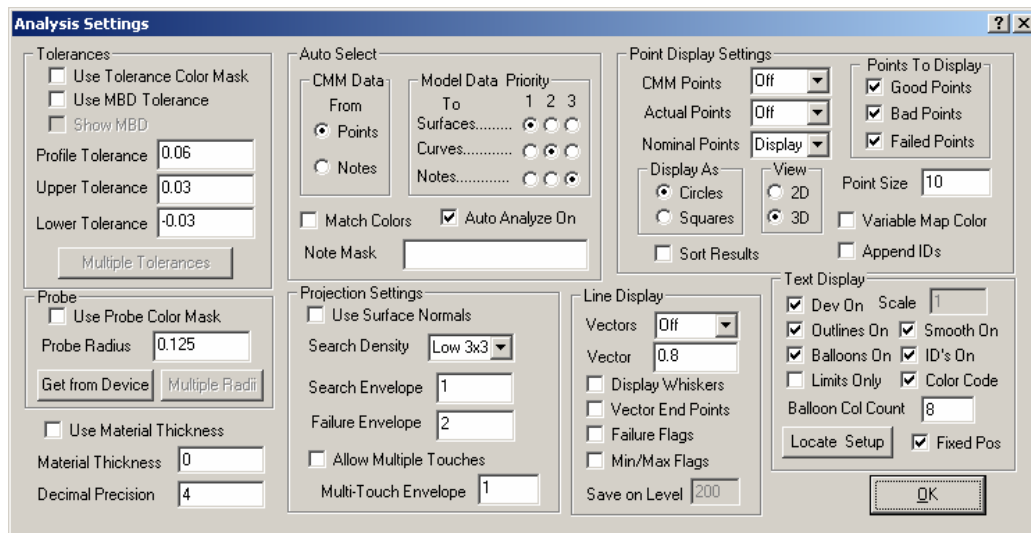
5. Choose ALL > POINTS > DONE.

This will change all points to dots.

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Probe Radius

1. Change settings to match this initially.



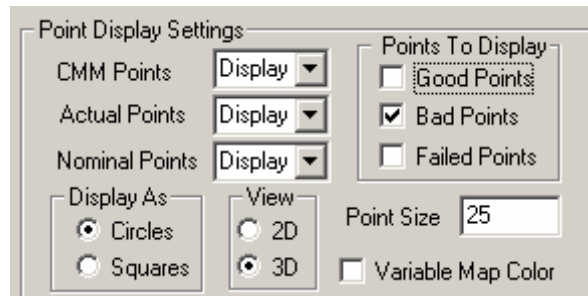
2. Let's adjust the probe radius to zero.
3. Reanalyze and see that the points all seem to be out approximately .7500. This would indicate a 1.50 diameter sphere was used.
4. Adjust the probe radius to .75. Re-analyze.
5. There should be 565 good and 5 bad points.

Tolerancing

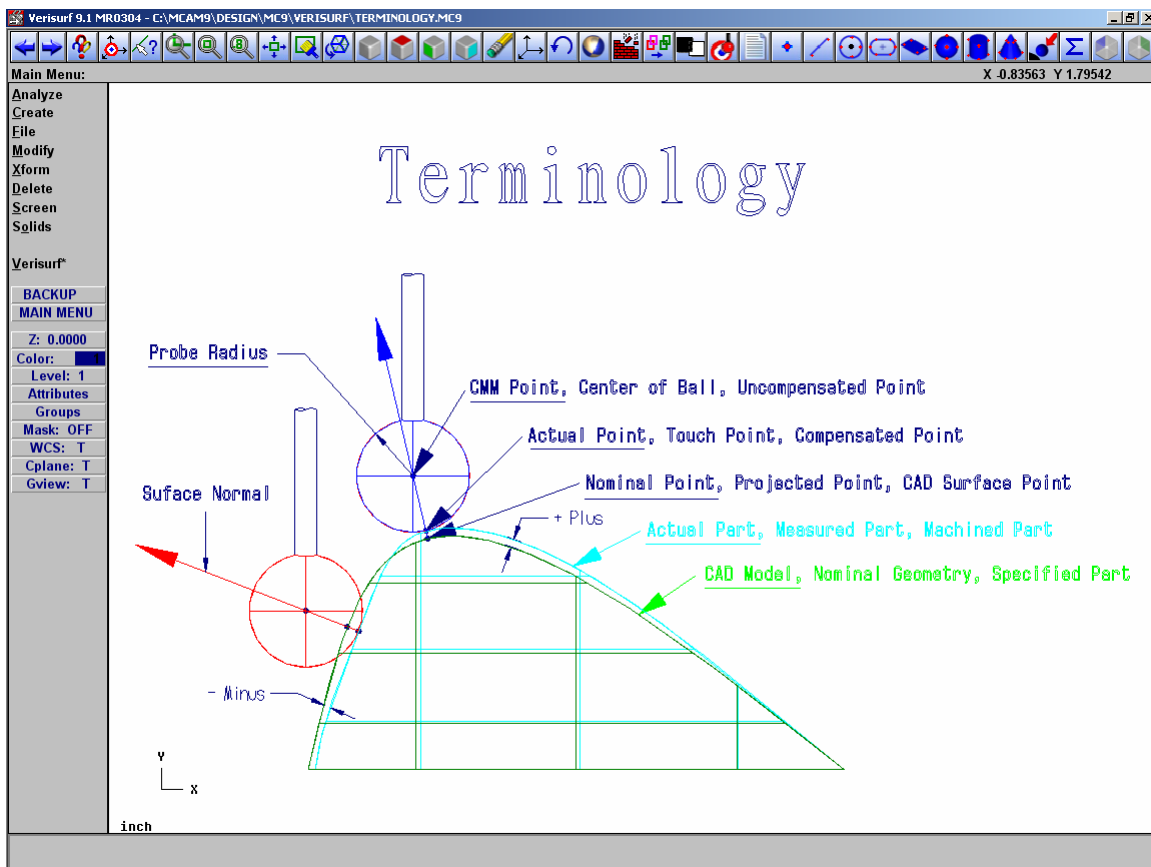
1. Let's adjust the tolerancing down to where it should be. Set the tolerancing to .020 or +/- .010. Note that entering .020 in the profile tolerance and hitting enter automatically splits the upper and lower equally into a bilateral tolerance.
2. To create a uni-lateral type in .015 into the upper tolerance and hit enter. The tolerances automatically adjust. Now there are 499 good and 71 bad.
3. Adjust the tolerance back to +/- .010.

Points to display

1. For demonstration purposes change the search envelope to 0.00 and the failure envelope to 0.02.
2. Adjust the tolerance to +/- .005. This should now output 461 good, 104 bad and 5 failed.
3. Change the settings as shown below.



4. Turn off shading and zoom in on various bad points to see the colored dot display of the Nominal, Actual and CMM points.
5. In Point Display Settings change these to see the differences between Display and Off. Though there is another setting of SAVE we will not use it in the tutorial. It is used to save the display onto a layer of your choosing.
6. You can open the file Verisurf\Terminology.MC9 to see the differences between the types of points.



An item to note is the difference between points to display and point display settings. Points to display (on the right) will determine which points will be included in the analysis and ultimately included in a report. Point display settings will determine at which point the circular color coded display will appear. It can be displayed at the nominal, actual or CMM point.

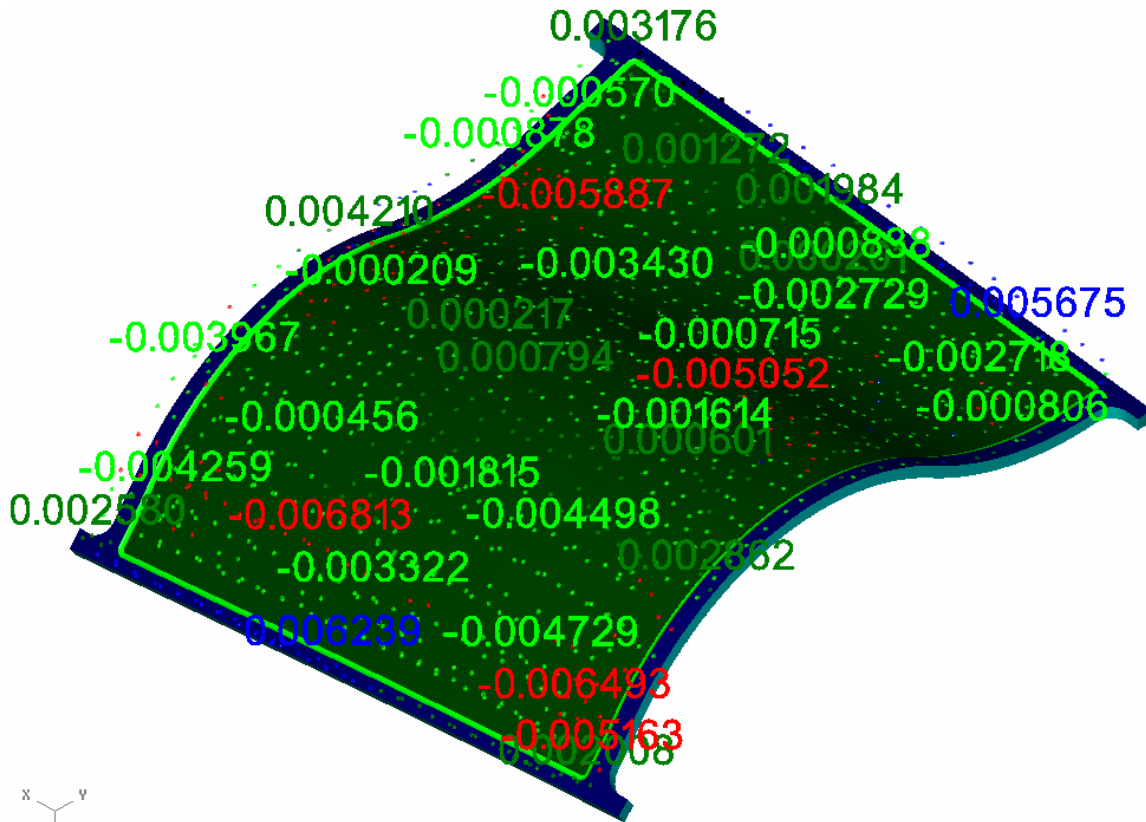
In this graphic we are displaying all 3 point display settings. The CMM point is shown .750 away from the lower 2 points with the point displayed in it. Since this is a minus deviation (red) the lower two points are the nominal is above and actual projected point below or minus.



Decimal Precision

Decimal precision can be changed here. It can also be changed in PREFERENCES. This setting can be adjusted though the typical operator will prefer to use 4 decimal places. (0.0000).

1. Change the precision to six.
2. Re analyze using NO balloons. Note that the output is now 6 places.

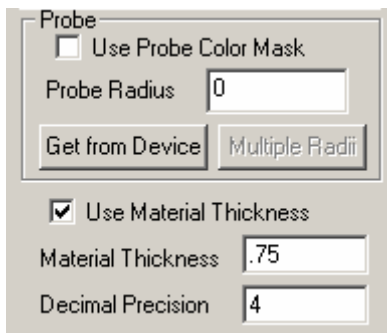


Intermediate settings

Material thickness

The Material Thickness toggle is used when a part needs to be inspected that may still be in a machined plus-stock condition. Perhaps the machinist has left .030 stock on a critical complex surface that will be machined during a future operation. The surface does not match the nominal model definition. A past work-around would be to alter the model. Verisurf Software will now automatically do the calculations. To simulate this we can use a .750 material thickness and then turn off the probe radius of 0.750.

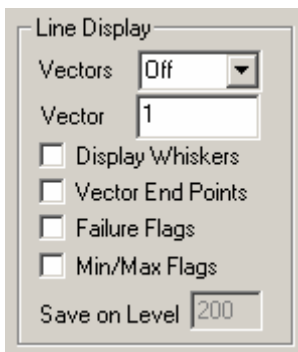
1. Under projection settings check the Use Normals box.
2. In the Probe Radius box change the 0.750 to 0.0
3. Toggle the Material Thickness by checking the box
4. Enter material thickness of 0.750



5. Re-analyze the data. It will be identical.
6. Return these settings to where they were.

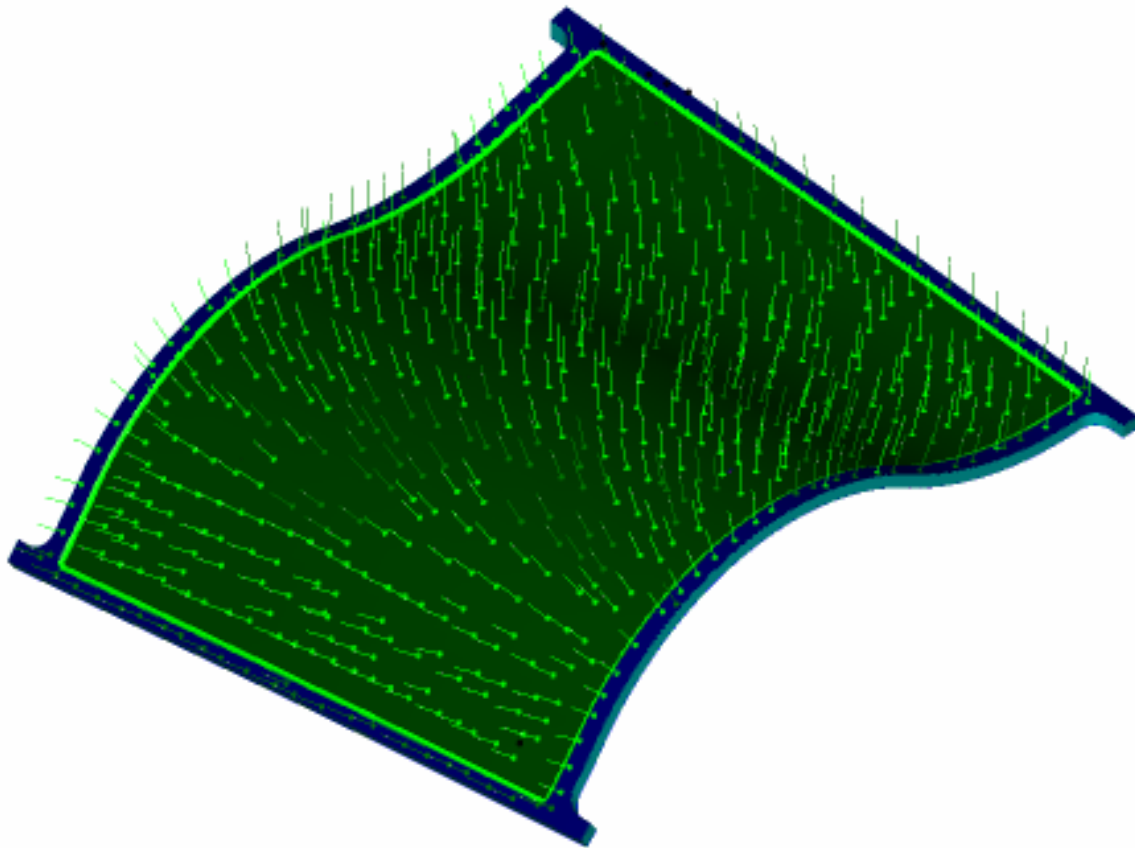
Vectors and whiskers

This is the Line Display panel. As shown here there will be no display at all since Vectors is set to off.



7. Turn the Vectors pull-down menu to Display.

This will show a view similar to this. Each of these vectors is 1 inch long and colored to represent plus or minus stock.



8. Turn on Whiskers. Note that the label Vector has changed to Whisker and the value has changed to a multiple of the actual deviation. Note that the green whiskers are plus stock and the yellow whiskers minus stock.

Line Display

Vectors

Whisker 1164.1532

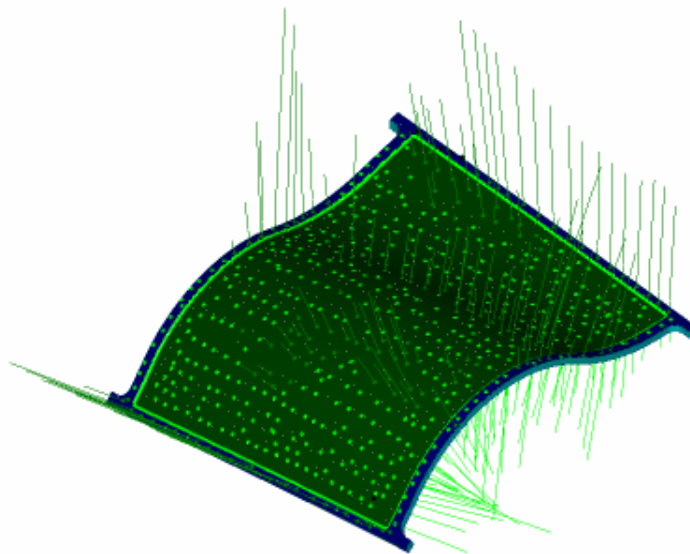
☒ Display Whiskers

☐ Vector End Points

☐ Failure Flags

☐ Min/Max Flags

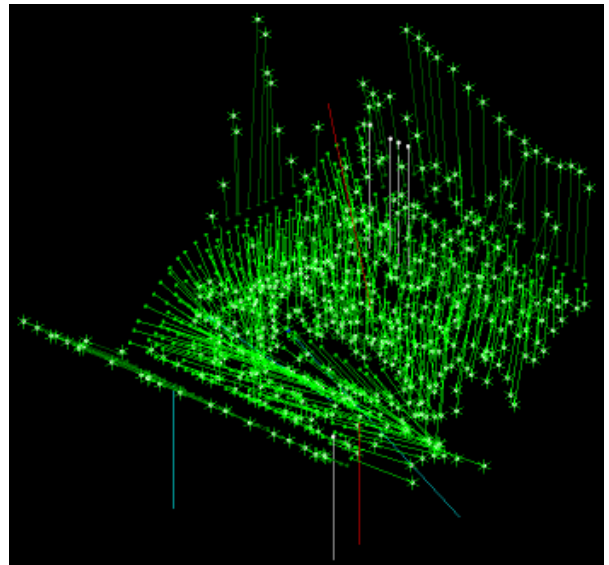
Save on Level 200



9. Now let's also add the next 3 on the menu. Vector end points, Failure flags and Min/Max Flags. Note that the Save on Level box lights up. This indicates that the three choices check marked will be drawn on level 200.
10. Select analyze to process the entities to level 200.
11. Turn level 200 on and all others off.

Note that there are now 5 white flagged failure points. Vector end points at the end of each whisker and 2 flagged min/max points that are color 11 and 12.

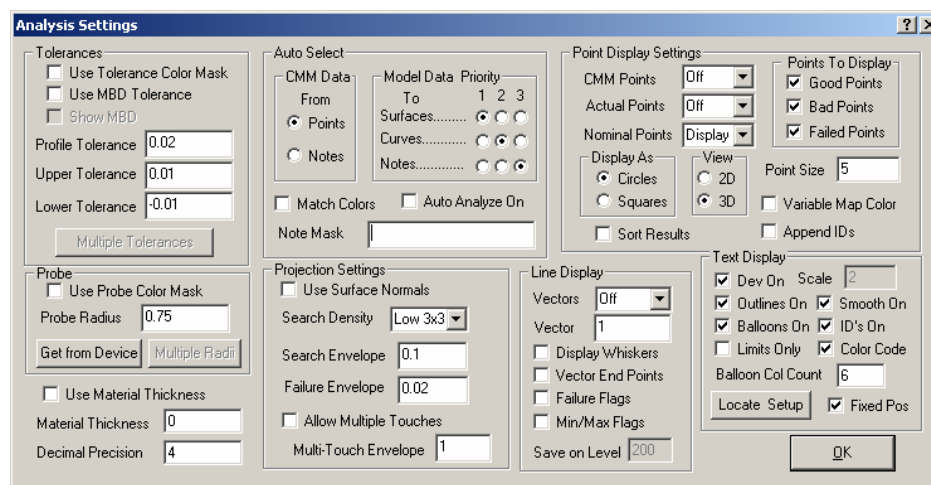
12. Delete all entities on this level and redo this exercise from step 9 doing each flag individually.
13. After you have learned the difference between these settings delete all entities on level 200.



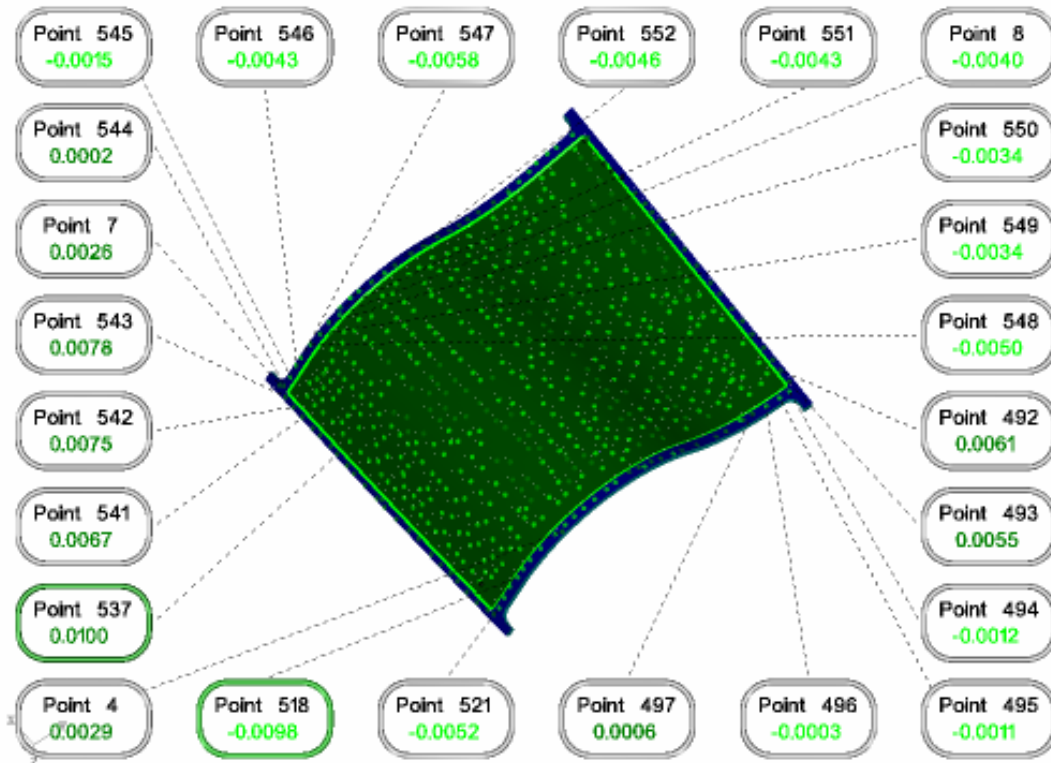
Balloon Col count

The Balloon Col count is short for Column count. This setting is used to format how many balloons will be on the screen. If 6 is the setting then there will be 6 balloons across the top and the bottom of the screen and the right and left side will fill in with what your screen settings will allow.

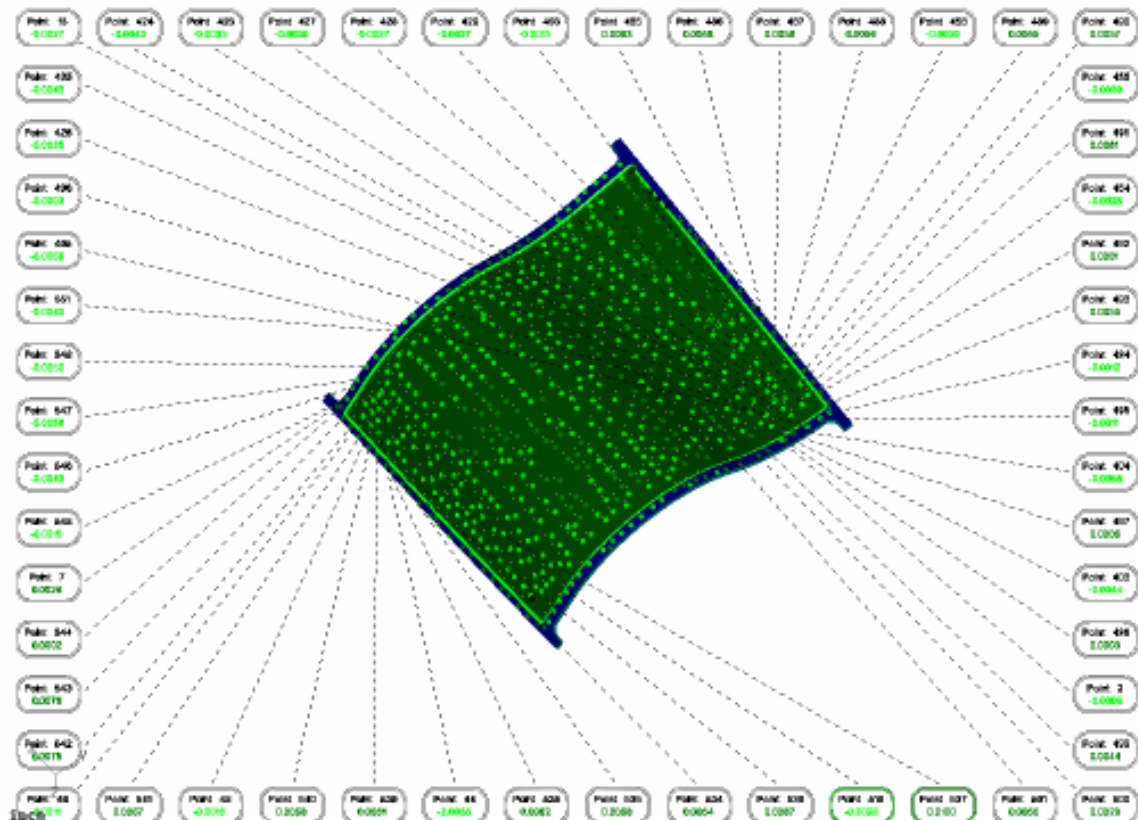
1. Change the settings to match below. Note we are going to display 6 columns of balloons.



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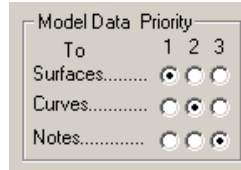


2. Now try 14 on the Balloon Col Count. See the difference?

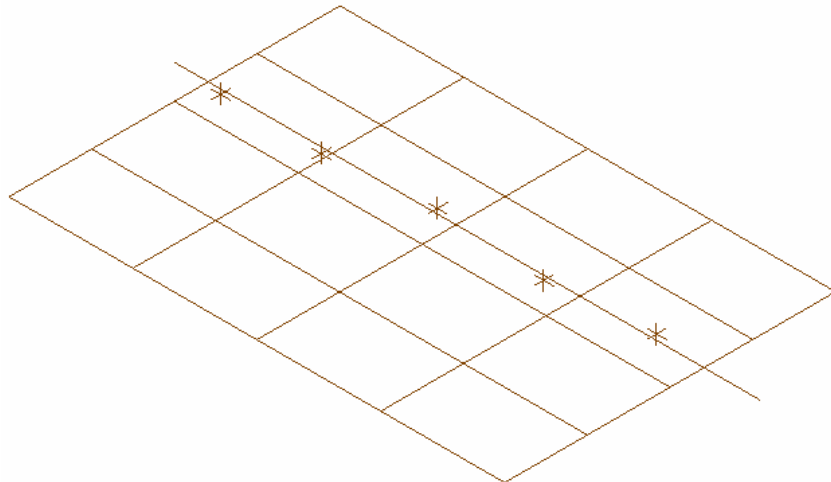


Model Data priority

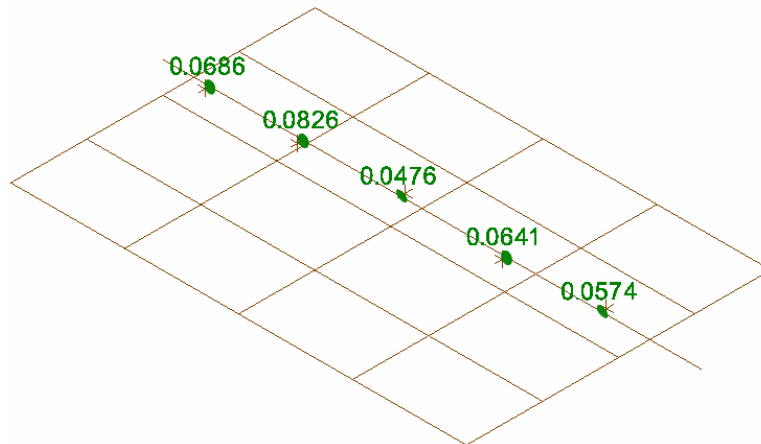
Model Data priority is used to decide what entities the inspected points are analyzed to. The choices are Surface, Curves and Notes. We will now look at the difference between the two. The choice of notes will be discussed during class.



1. Open Analysis_2.mc9.

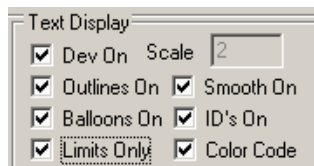


2. This exercise will show the difference between using surface or curves to analyze to. Choose surface as priority 1 and curves as priority 2 as shown above. Set probe radius to .010. Analyze the 5 points. They should all report back as being 0.0000. Points are .010 above the surface.
3. Change this setting to curves as priority 1 and surface as priority 2. Analyze again. Note that the points that are obviously not on the line report to the line now at the respective distances as shown below.



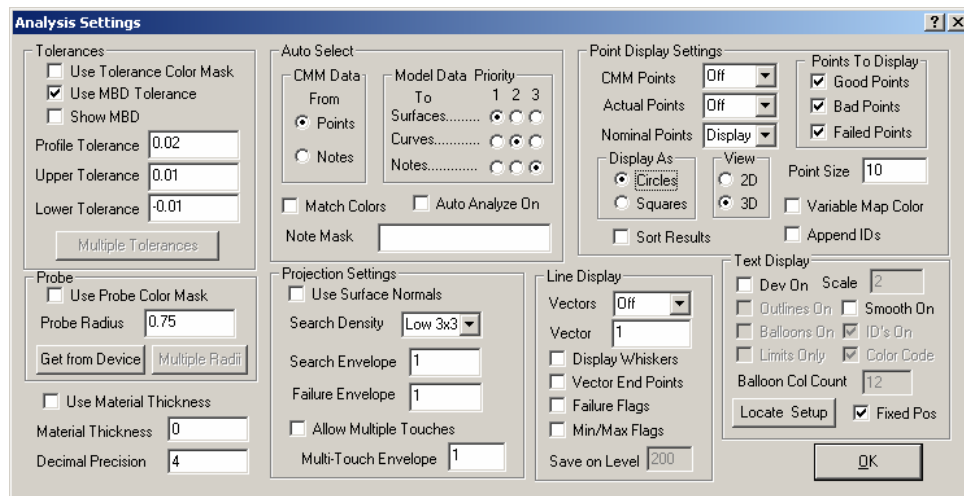
Advanced settings

Text Display Box

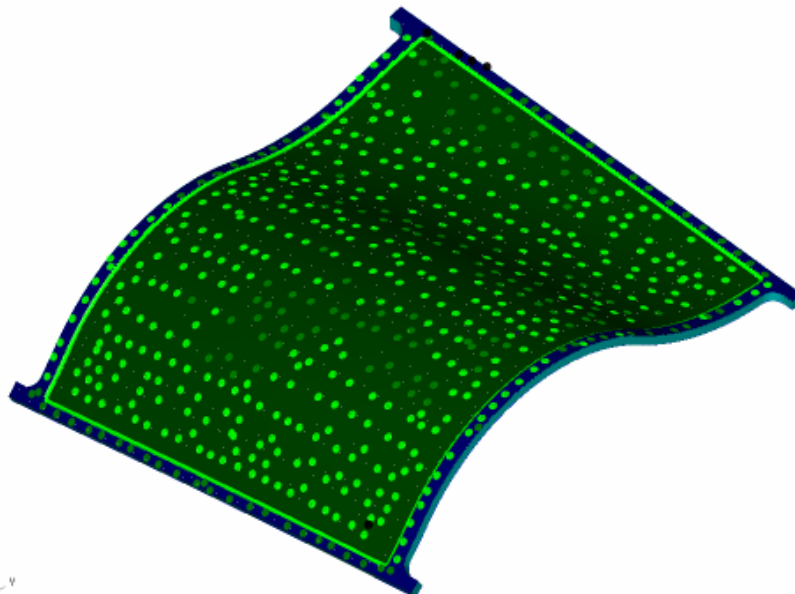


Text Display is a setting for the type and size of the deviation to be shown on the screen. This exercise will both step through each setting and explain what the settings do.

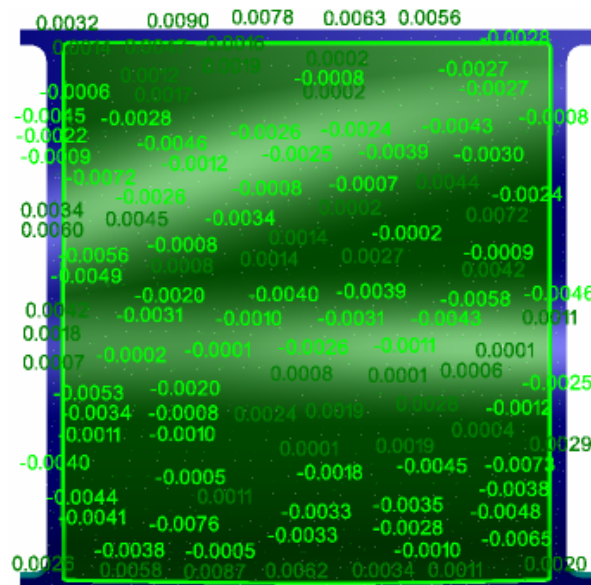
1. GET Analysis1.mc9.
2. Change your analysis settings to match the settings shown below.



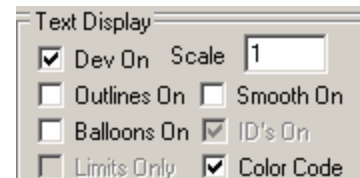
3. Your shot should only show the nominal points at a 10 pixel size with color.



4. Change your settings GView TOP, Point Size to 1, Dev On check box checked. Note the following changes: The Nominal Points shown in color from the previous screen are now 1 pixel and not shown unless zoomed. This 'cleans' the view up. We are also looking at a top view. We also see that deviation is shown on the part. This is due to the DevOn checkbox. We can not see all deviation however. The graphic display would be overlapped with deviation. Zooming and scrolling will show all deviations.



5. Return to GView Top and Fit to Screen. Now Change the scale to 1. See the difference in text size? Try some other values in the Scale Setting. This setting may be used to print an image to a report so finding the correct size to best represent the part may be beneficial to you.



The Smooth On can be toggled to smooth the deviation and / or the balloons. Seeing a difference on the screen is dependent on your display settings and your screen size. What the Smooth On button does is take the pixels that compose the deviation or balloon graphic and drawn a line around the numbers. See enlarged example below.



Smooth Off



Smooth On

Use MBD tolerance

- ☐ Use MBD Tolerance
☐ Show MBD

This setting is used to invoke the tolerances that would have been established prior to measurement using TOOLS / MBD. An explanation of MBD can be found in the MBD reference manual and the MBD exercise called Verisurf Exercise MBD Groups .doc. Briefly MBD stands for **M**odel **B**ased **D**efinition. Surfaces can be grouped together and a tolerance established for the entire group. When Show MBD is selected the MBD previously established will be shown on the screen.

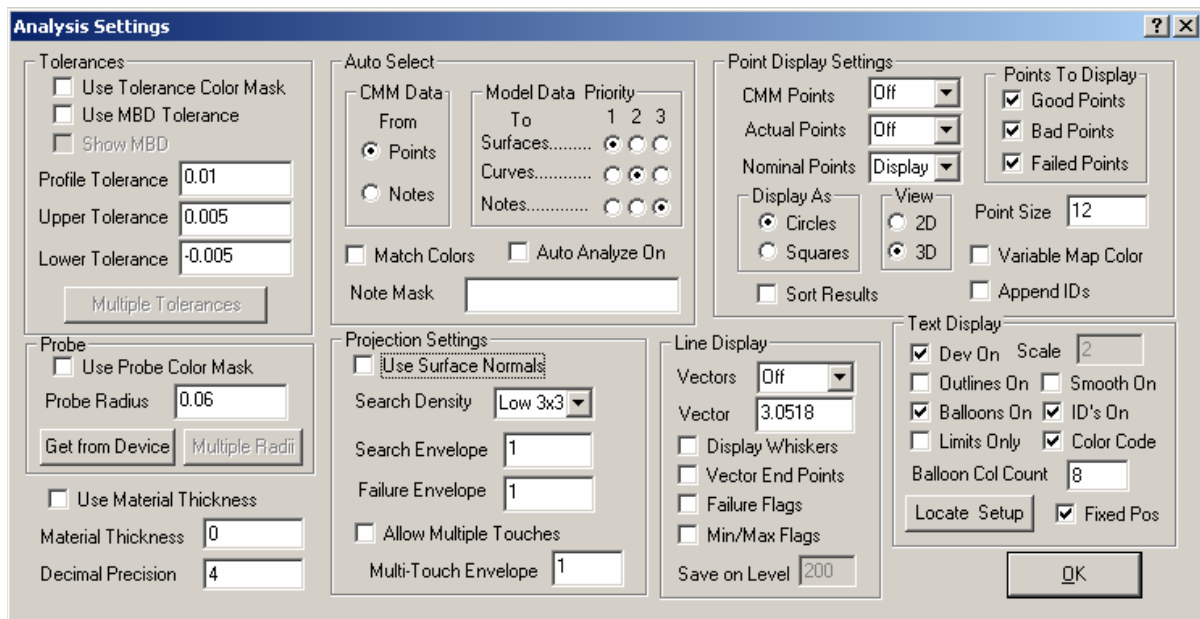
Again this tutorial is a separate one named Verisurf Exercise MBD Groups .doc

Locate setup

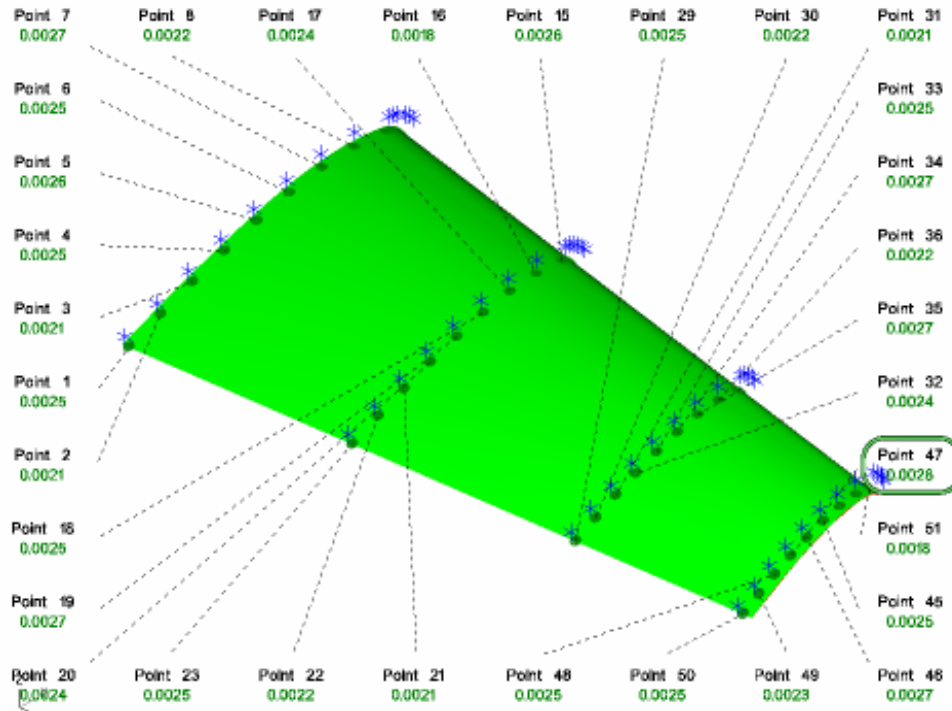
- ☒ Fixed Pos

The Locate Setup button is used to manually position balloons to user defined placements.

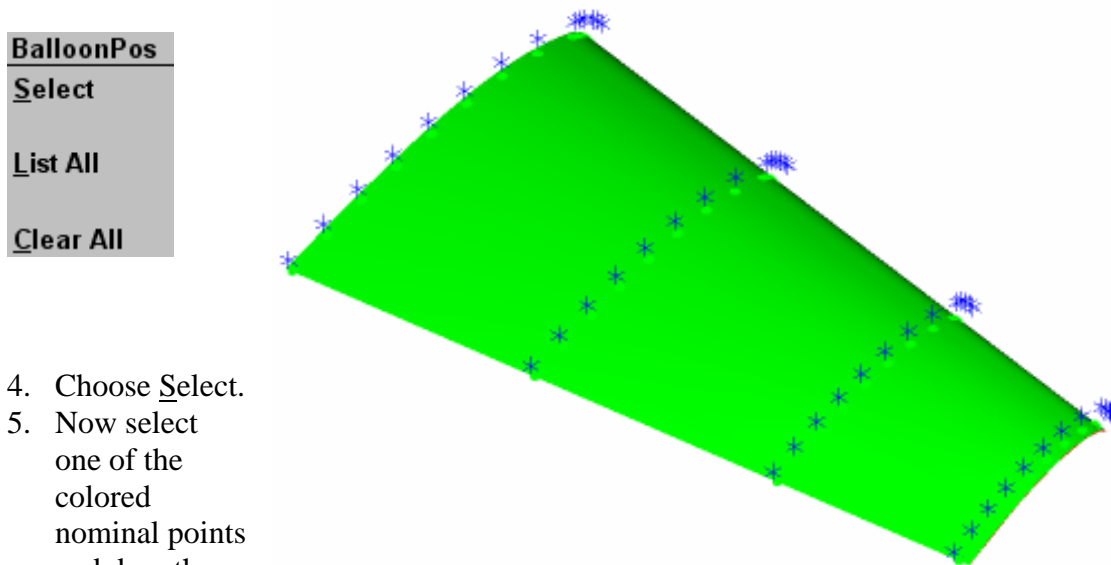
1. Open AIRSLICE.MC9 in the Analysis directory.
2. Modify Analysis settings to match as shown below.



These settings should produce this.

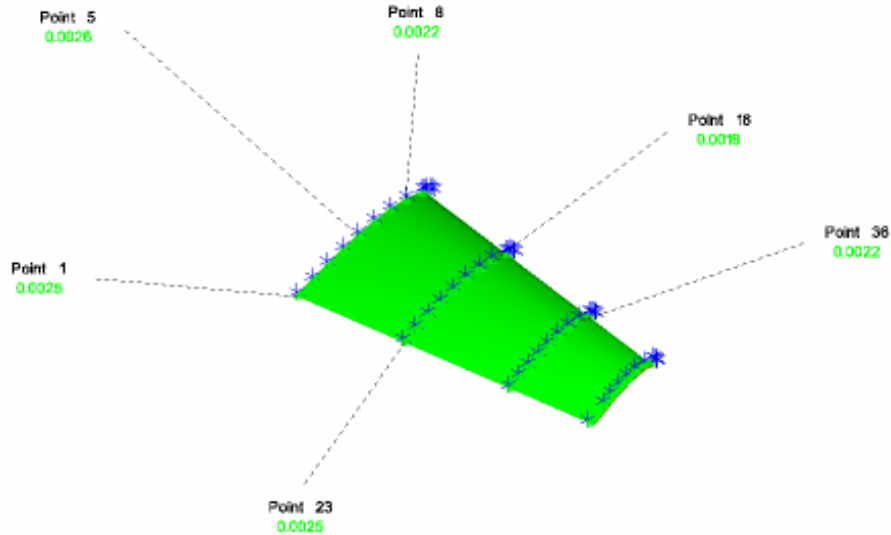


- Enter Settings again and select **Locate Setup**. This will change the part to look like the graphic below and the Main Menu as shown.



- Choose Select.
- Now select one of the colored nominal points and drag the balloon to a position of your choosing.
- Drag 4-6 balloons out to various positions.

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7. This functionality is touchy so if you error on placement use the List All and verify there are no errors. The example to the right has the last point in the list in error.
8. If you have errors, delete them.
9. When table is error free, choose Backup. The settings screen will reappear and the Fixed Pos checkbox will be unchecked.
10. While the checkbox is unchecked the balloons will maintain the positions you chose.
11. Check the box and choose OK. The balloons return to Verisurf Fixed Positions.
12. Toggle between the two.

Locate Setup ☐ Fixed Pos

Num	Index	Name
1	4	Point 5
2	0	Point 1
3	22	Point 23
4	7	Point 8
5	15	Point 16
6	35	Point 36
7	27	!0ewá?0_0#z!¿

The Locate Setup function still has some small bugs to be worked out as evidenced by the errors in the table. It is also slow and very hard to pick when there are a lot of points. As of this writing (R22) it is scheduled to be re-programmed.

Append IDs

Append ID's is used to append, or add, the element number to the point being measured. This ID will then be shown as part of the point name in the deviation balloon and the report.



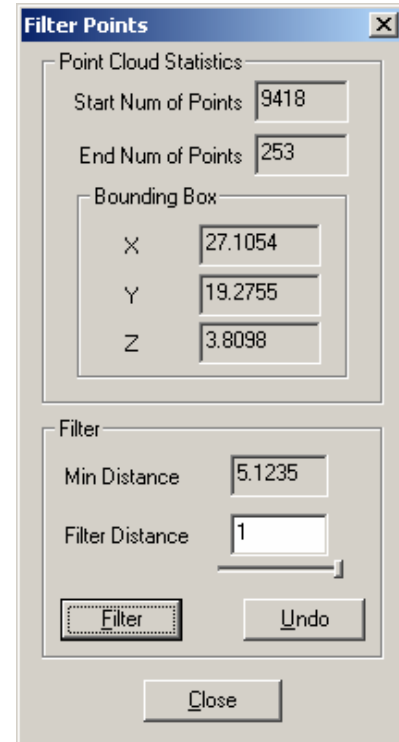
1. Load the part named POINT-CLOUD_NURBS.MC9
2. There are over 9000 points in this file so we will make it more manageable by running POINT FILTER on the points to provide a 1 inch gap between points. Choose VERISURF > REVERSE > POINT CLOUD > POINT FILTER.
3. Make Filter Distance 1 inch and choose Filter. This should leave 253 points remaining to be analyzed.
4. Turn balloons on. The balloons should have deviation text similar to this output.

Point 42
0.0004

5. In Settings choose Append ID and analyze again. The balloons will now have deviation text similar to this output.

P42-ID49
0.0004

If you like go to report and see that the labels are the same too. Please note that the point numbers coincide with the order that the points were taken. In this example the point numbers will be 1 through 253 with the ID added.



Point 2 - ID36
Actual
Nominal
Deviation
Point 3 - ID48
Actual
Nominal
Deviation
Point 4 - ID3

Sort Results

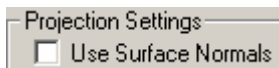
Sort Results is used to arrange the points by ID number. With Append ID on the report outputs in point order. With the addition of Sort Results the report will output in the ID order.

6. Choose Sort Results.
7. Analyze and report.

Note that the report has the points arranged by ID number with the point number restarting at Point 1 for each new ID.

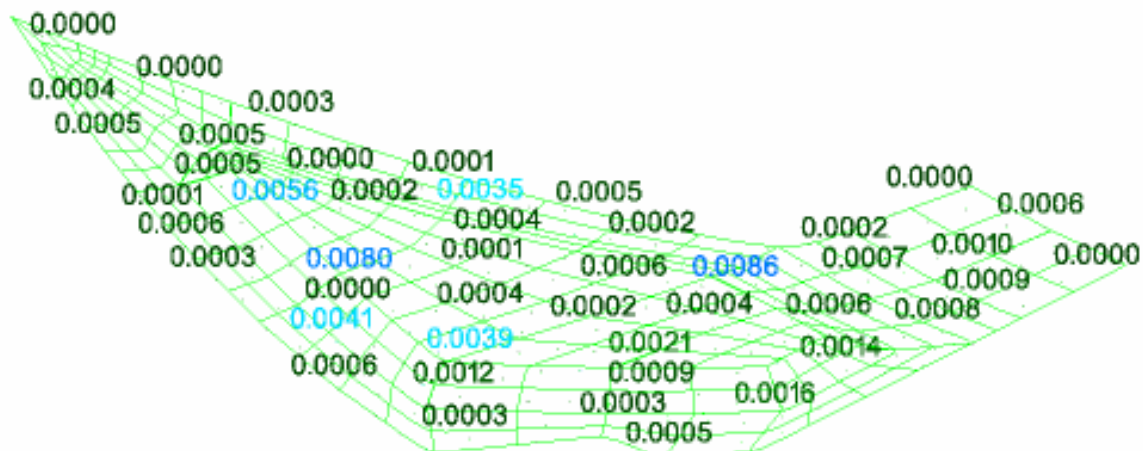
Point 5 - ID1
Actual
Nominal
Deviation
Point 6 - ID1
Actual
Nominal
Deviation
Point 1 - ID3

Use Surface Normals



In the Analysis Settings we can have the point data use the projection normals or not. You may question why the software would not always use the surface normal. We do want to know whether or not the deviation is plus stock or minus stock, right? Of course this is important and MUST be known. If we decide to not use surface normals how can Verisurf know if the deviation is plus or minus stock? That answer lies in the fact that we also have a probe radius that Verisurf uses to know which side of the surface the normal is. This toggle was put in so that if you import an IGES file you do not have to go through the labor intensive exercise of verifying and / or reversing normals in a model that may have hundreds or thousands of surfaces. The only time Use Surfaces Normals is required would be if the points have zero probe radius applied. Then Verisurf does not know which side of the surface would be plus stock or minus stock.

1. Using the same file as used in previous Sort Results exercise turns the balloons off, Use Surface Normals off and analyze. Your part will have deviation that is all absolute values because Verisurf does not know which side is plus stock.



2. Turn on Use Surface Normals.

3. Choose Analyze. Now the points are plus stock and minus stock.

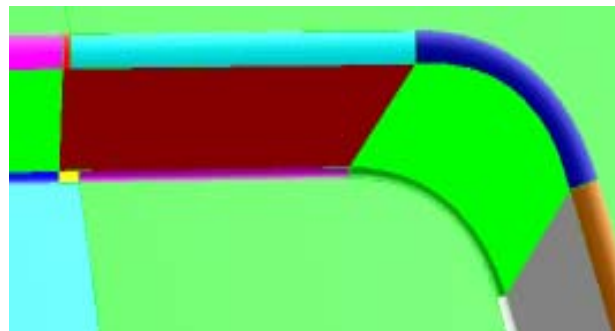


After doing this exercise you may have this question. If it is given that all surface normals are correct why wouldn't you want to Use Surface Normals everytime? This is a valid question if you model contains minimal surfaces and points. The slight problem occurs if you have a model with a few thousand very small surfaces and thousands of points. If Verisurf has to analyze each surface normal prior to analyzing the point the time to analyze may take considerably more time to complete. If Verisurf uses the probe radius to determine plus or minus stock it does not have to look at each individual surface in the search envelope to determine the normal. If you have a search envelope setting that "sees" 20-30 surfaces that the point could possibly analyze to Verisurf has to determine all 20-30 normals before it even begins to analyze deviation.

Search and Failure envelopes

These settings are found in both the Analyze and the Build settings. The SEARCH envelope allows the operator to decide at what distance the point will SEARCH for entities to analyze or build to. The FAILURE envelope allows the operator to decide at what distance the point fails to analyze or build.

To better explain the SEARCH lets look at this graphic. We have approximately 17 surfaces all within 1 inch of each other. If we were to analyze a point that could have been taken in this picture Verisurf will SEARCH and analyze the point to all 17 surfaces prior to reporting the deviation to the best surface it finds. Many times it is advantageous to set your search envelope down to around 50% more than your profile tolerance. This way Verisurf does not spend time searching and finding entities that will not be analyzed.



The FAILURE envelope can be used to flag points that may be analyzed but happen to be operator error points. Many times while scanning a surface the operator may accidentally

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lift the device from the surface while measuring. The device may also go off of the surface. When this happens you may have a few points that are obviously not correct.

Let's look at this graphic. Note that most points are within a ± 0.005 tolerance band but one point right in the middle is somehow at .7214. Visually looking at the part you verify this is not a .7214 peak in that area. This has to be a bad point and should fail. If we were to use this point it would affect our analysis, especially if we were to best fit. We change our FAILURE envelope to .020 and analyze again. Now it shows as failed and will not impact our analysis or be used if we were to best fit.

