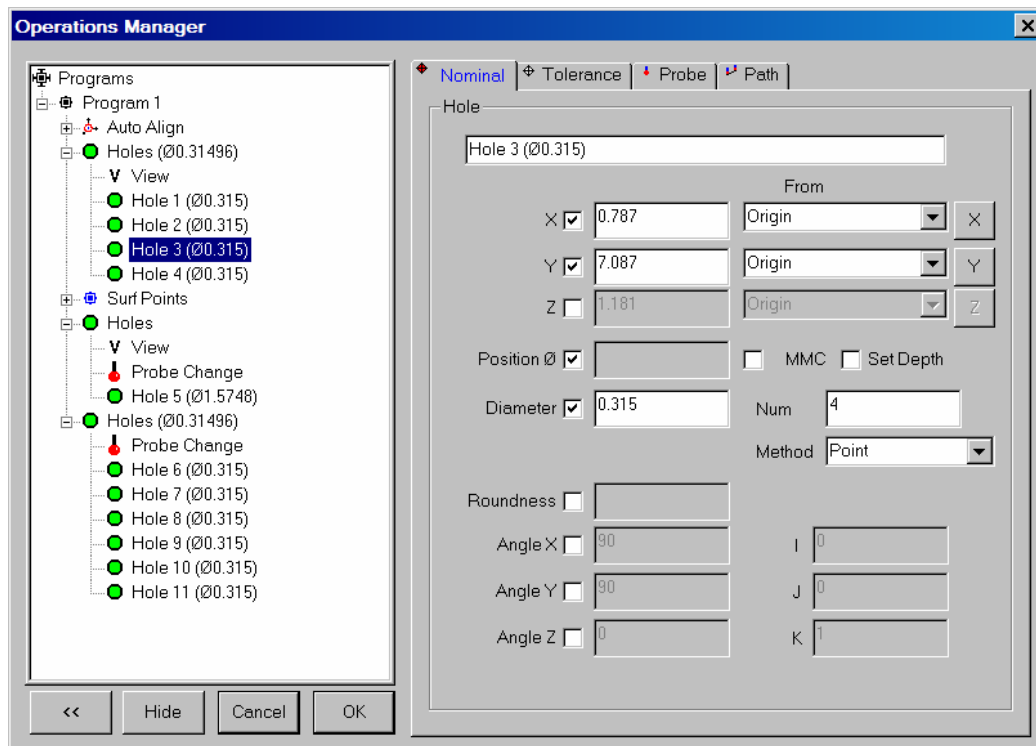




## Automate R27a

**Automate provides a model based inspection tool for a systematic method of creating inspection programs. Together with Auto Align the entire process can be created and replayed.**

Auto Inspect Icon

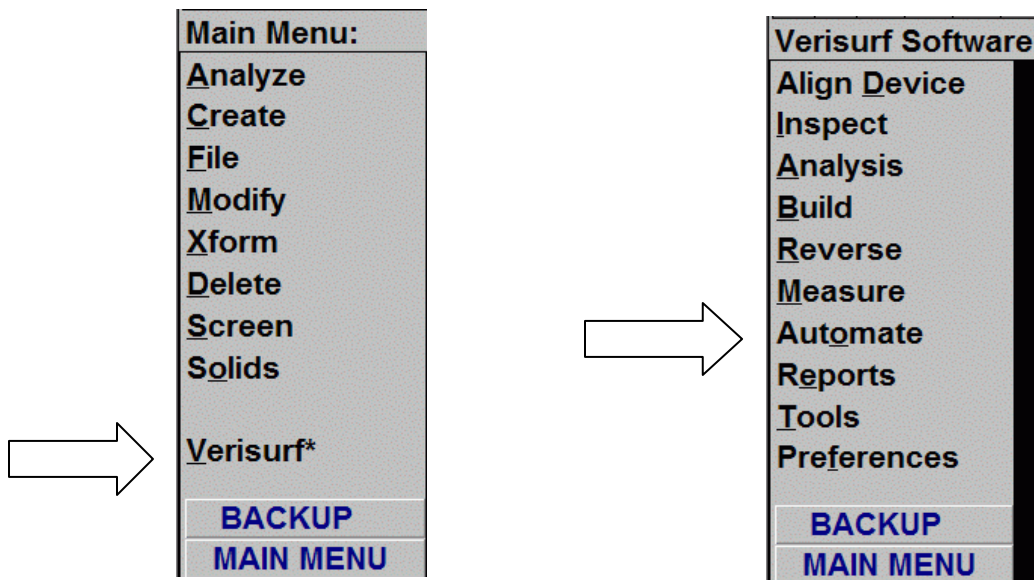


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## Creating an Automated Program

- Before running Automate the MC9 model / file must be on screen with the appropriate levels turned on. select the file thru the Main Menu and File Get.
- Automate is found thru the Main Menu / Verisurf / Automate

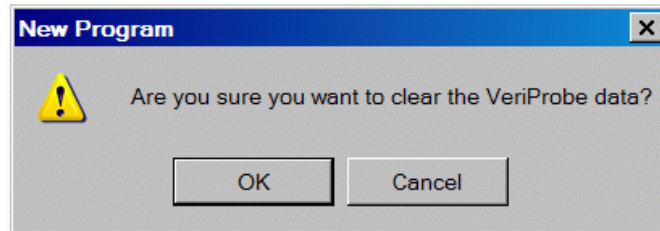


- The Automate Measurements Menu contains the commands necessary to create the inspection plan.



## New

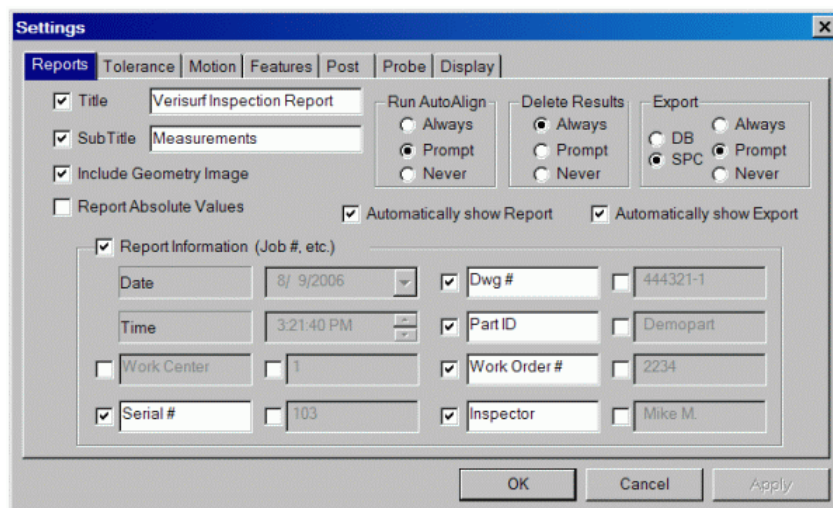
- If the file already contains an Auto Mate or Auto Align program selecting **New** will prompt ‘are you sure you want to clear the veriprobe data?’ giving the operator the opportunity to check the existing program.



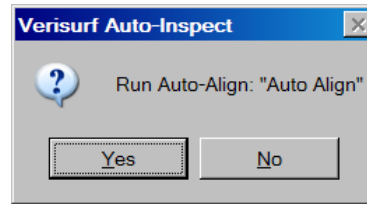
- When the file does not contain Automate data or if the operator selects OK at this prompt the Automate Measurements Menu will remain.
- If the project already contains an Auto Align program it is not necessary to clear the current program. To add features to the program select Cancel and jump ahead to ‘Selecting Features’ on page 6.

## Setup

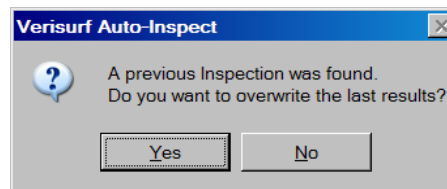
- Selecting **Setup** will open the **Settings** dialog box for input of the report parameters, default tolerances and behavior settings. Note that some features shown here such as Motion, Post and Probe are works in progress and have no impact on current Automate functions.



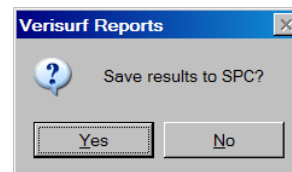
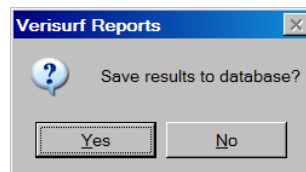
- **Run Auto Align** this setting allows the user to select whether to **always** run Auto Align each time Auto Inspect is executed, to **never** run or **prompt** the operator (as shown here) before running auto inspect.



- **Delete Results** Selecting **always** will cause a new report to overwrite the previous results, **prompt** will cause this dialog at the start of the run and **never** will cause the new data to append to the previous report. Note; Selecting No at this prompt will also cause the new data to append to the previous report.



- **Export** allows saving the measured data **always** or **never** to a Data Base or output to an SPC (.spc) ASCII file. Prompt will cause one of these dialog boxes to display.

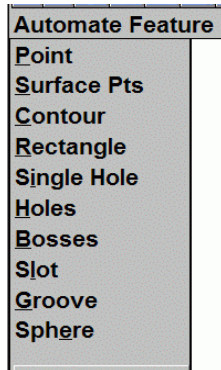


## Auto Align

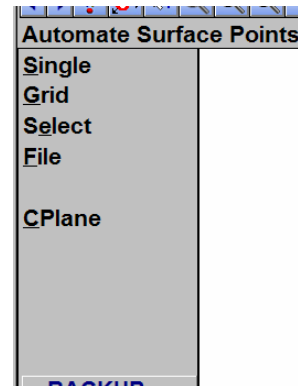
- Selecting this item from the Automate Measurements Menu will execute **Auto Align** and is explained in detail in the 'Verisurf Auto Align' Manual. Normally Auto Align is run prior to automate however not necessarily, there are other methods that can be utilized in the alignment process see the manual 'Align Device'.

## Selecting Features

- From the Automate Measurements Menu Select **Features**. This option presents the feature selection menu for characteristics that will be included in the automate inspection plan.

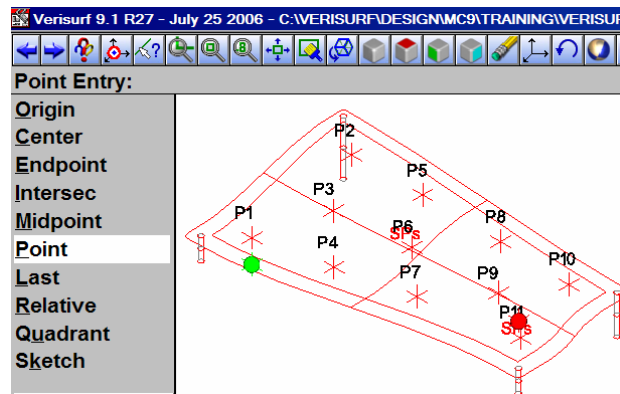


(Surface points)



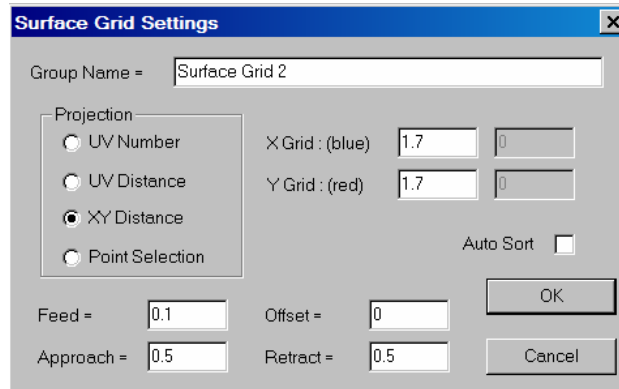
## Surface Pts

- Single** will prompt the operator to select a previously created point or points that exist in the database. Usually these points are locations specified by customer quality requirements and are included or can be added to the model. Click on BACKUP when finished with selections.



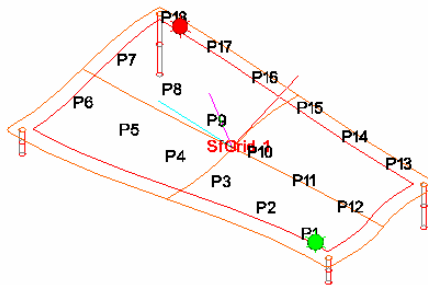
- Once the points have been selected it is not necessary for them to remain on screen to run the automate program. They may be stored on a different level and turned off, blanked or deleted.

- **Grid** will prompt the operator to select a surface then presents a dialog box to set the grid variables.

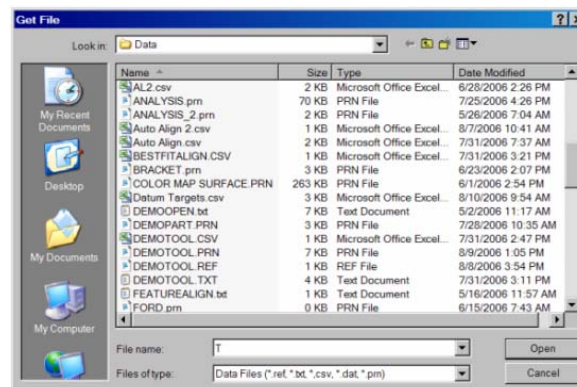


The 'Surface Grid Settings' dialog box is shown. It has a title bar with 'Surface Grid Settings' and a close button. The 'Group Name' field is set to 'Surface Grid 2'. Under the 'Projection' section, there are four radio buttons: 'UV Number', 'UV Distance', 'XY Distance' (which is selected), and 'Point Selection'. To the right of these are two input fields: 'X Grid : (blue)' with a value of 1.7 and 'Y Grid : (red)' with a value of 1.7. There is an 'Auto Sort' checkbox which is unchecked. At the bottom, there are four input fields: 'Feed =' with 0.1, 'Offset =' with 0, 'Approach =' with 0.5, and 'Retract =' with 0.5. There are 'OK' and 'Cancel' buttons at the bottom right.

- After entering your settings select OK and a grid of targets will be created on the surface.



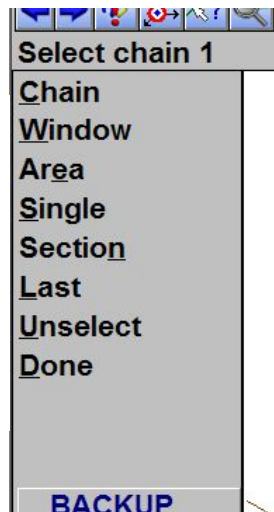
- **File** will prompt the operator to select a saved data file (.txt, .ref, .csv, .dat, .prn) that contains the point coordinate data. To create a data file see the manual 'Point Reports'.



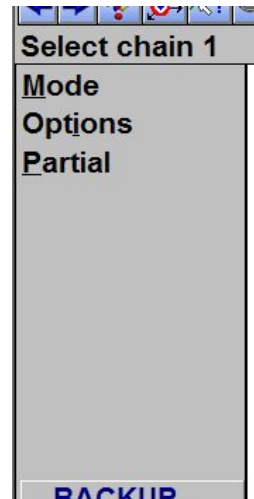
## Contour

- This option will construct a path and target points around a periphery or contour.
- Selecting Contour will open the following, in this example we will create a path around the periphery using a spline.

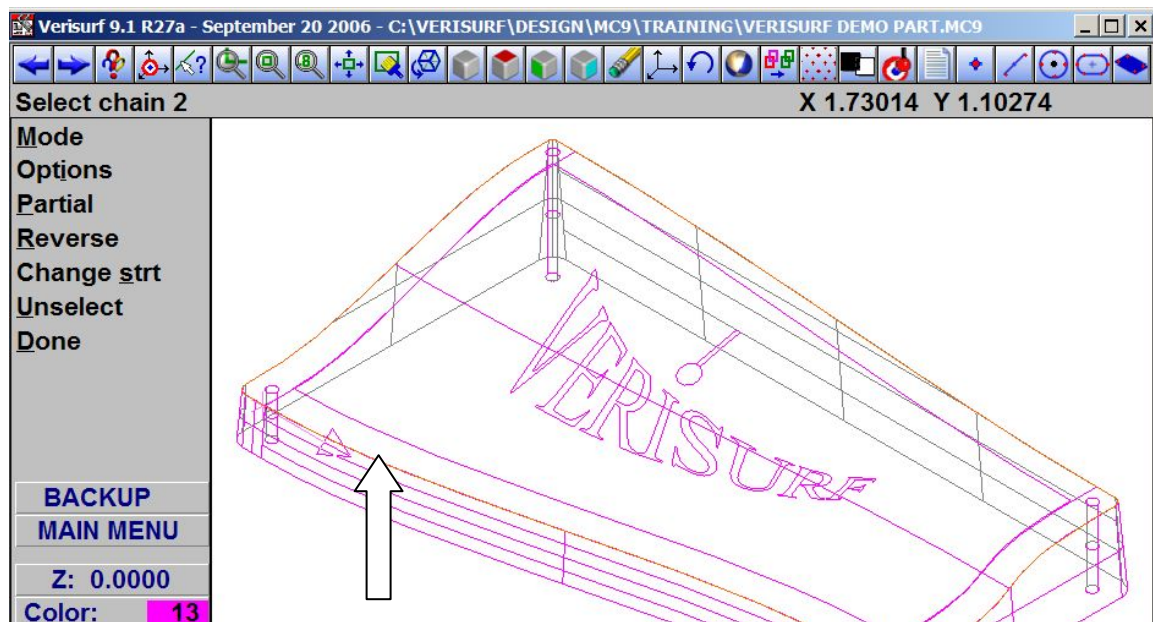
Select chain  
spline, lines,  
arcs or surface  
curves



Select chaining  
options



- Click on the chain, an edge curve around the periphery of the top surface in this example.



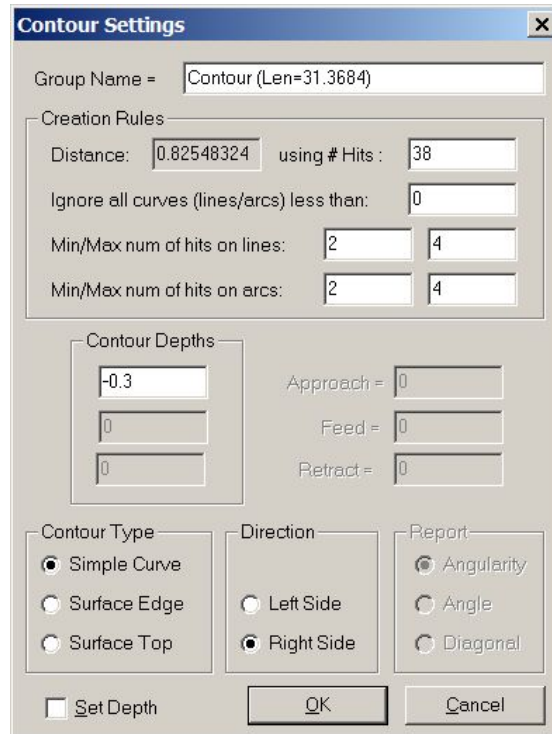
- When chaining is complete select done.



- When the Contour Settings dialog box opens make the appropriate adjustments.

Distance between points is determined by the # of hits

Contour Depth is the distance from the edge to create the target points



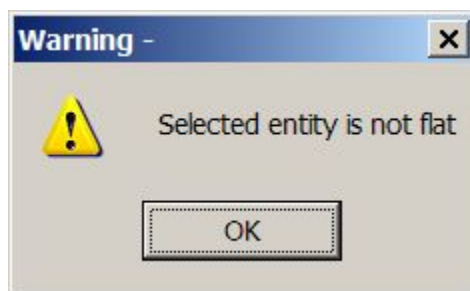
The Contour Settings dialog box contains the following fields and options:

- Group Name:** Contour (Len=31.3684)
- Creation Rules:**
  - Distance: 0.82548324 using # Hits: 38
  - Ignore all curves (lines/arcs) less than: 0
  - Min/Max num of hits on lines: 2 4
  - Min/Max num of hits on arcs: 2 4
- Contour Depths:**
  - 0.3
  - 0
  - 0
- Approach:** 0
- Feed:** 0
- Retract:** 0
- Contour Type:**
  - ☒ Simple Curve
  - ☐ Surface Edge
  - ☐ Surface Top
- Direction:**
  - ☐ Left Side
  - ☒ Right Side
- Report:**
  - ☒ Angularity
  - ☐ Angle
  - ☐ Diagonal
- ☐ Set Depth
- Buttons:** OK, Cancel

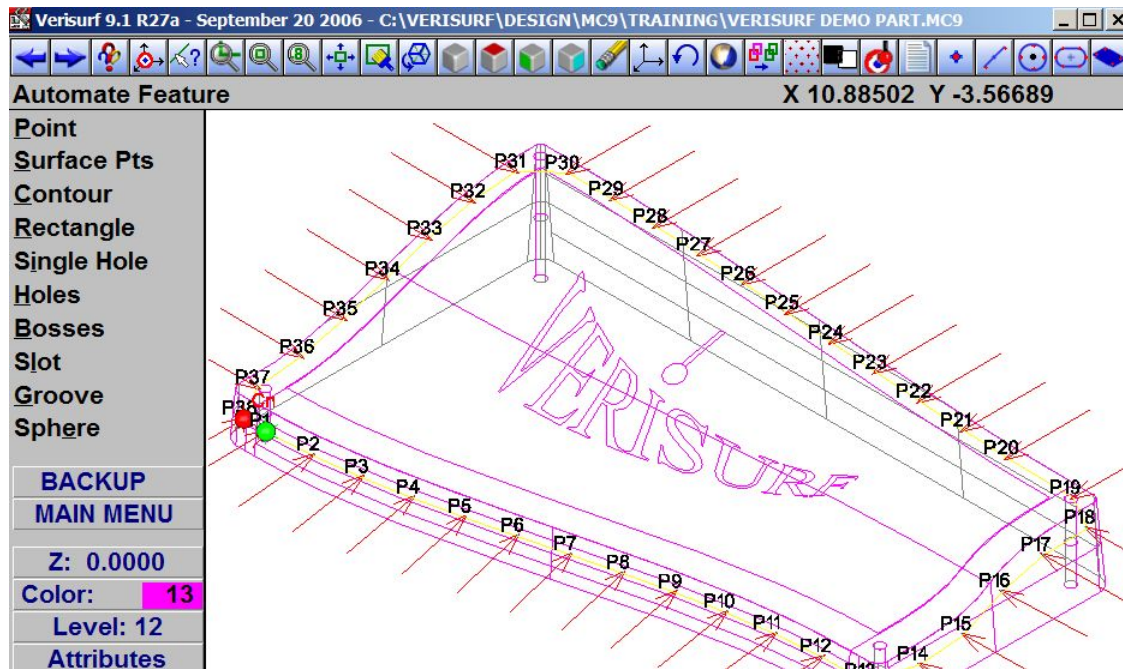
Adjusting the # of hits will update the distance between points.

If the chain is made up of arcs and lines these settings are for setting # of hits on these entities

- In this case the chain does not reflect a flat entity, the following warning is displayed, click OK.

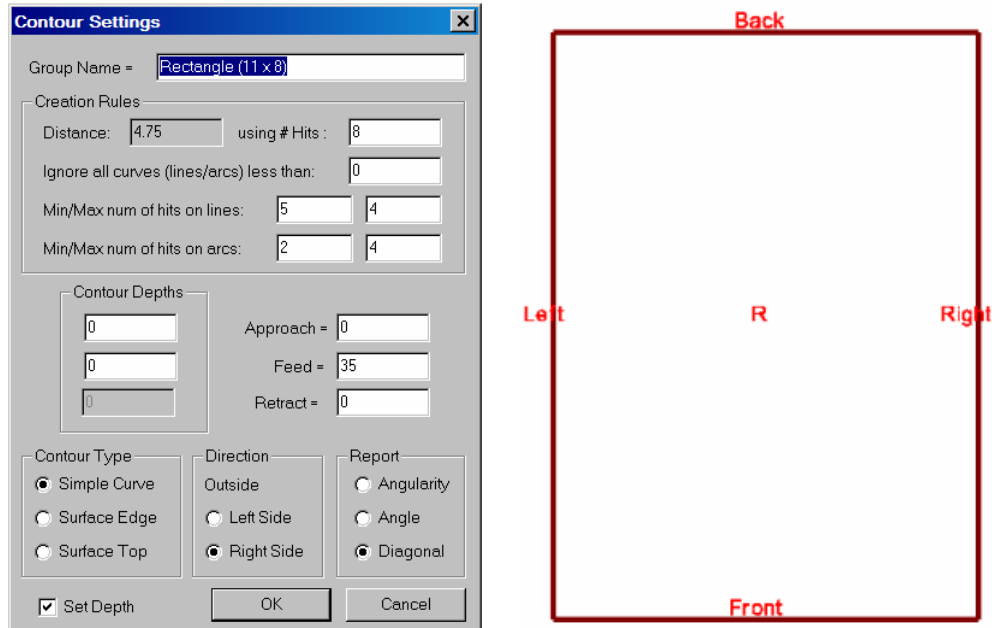


- A series of points are created for replay in Auto Inspect



## Rectangle

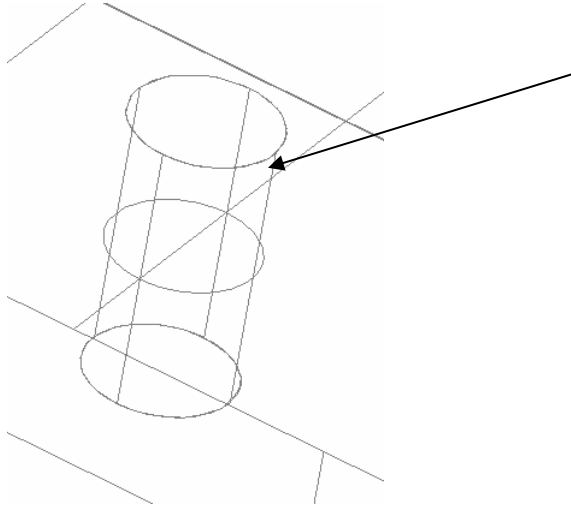
- This option prompts the operator to select four lines in the data base that make up the rectangle or square. After selection this dialog box will open.



- The **Group name** will indicate the geometric shape, Square or rectangle, and size from the nominal data selected. Note this feature is only applicable to squares and rectangles and reports deviation from nominal.
- At **Reports** select the method of error reporting, Angularity will report the error over the longest distance measured, Angle will report the deviation from 90 deg. And Diagonal will report the skew error of the feature.
- Check the **Set Depth** box will cause the playback to prompt for a point in the appropriate axis then the points for the rectangle measurement. Click OK when finished.

## Holes

- **Single hole**, selecting this option prompts the operator to select a cylindrical surface or arc / circle on the screen. This option is used when a hole or holes of different size and / or tolerance exist. Click on BACKUP when finished.



- **Holes**, this option provides for the selection of a group or set of holes that have the same size and tolerance. Select DONE when finished. After selection the operator will be prompted to accept the size and number of probe hits.

**Hole Settings**

Group Name =

Hole Depths

Dist:

# Hits:

Approach =  Feed =  Retract =

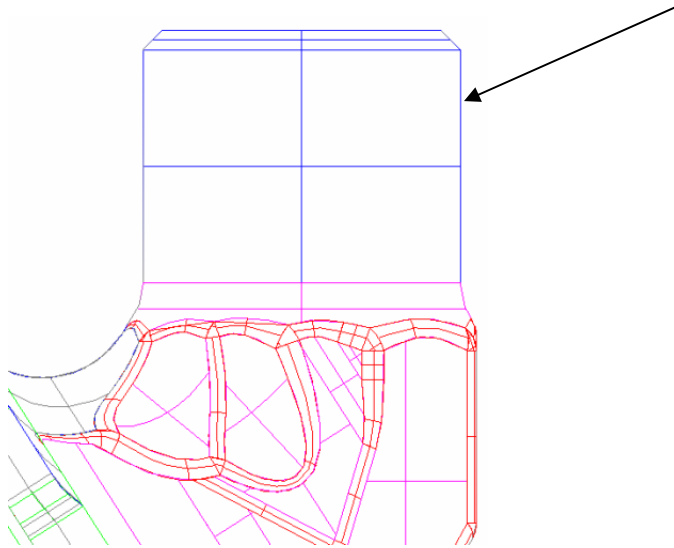
☐ Set Depth

OK Cancel

- Check the Set Depth box will cause the playback to prompt for a point in the appropriate axis then the points for the feature measurement. Click OK when finished.

## Bosses

- As with holes the operator will be prompted to select the cylindrical features from the data base / model select DONE when finished with selection and this dialog box will open.



**Hole Settings**

Group Name =

Hole Depths:

Dist:

# Hits:

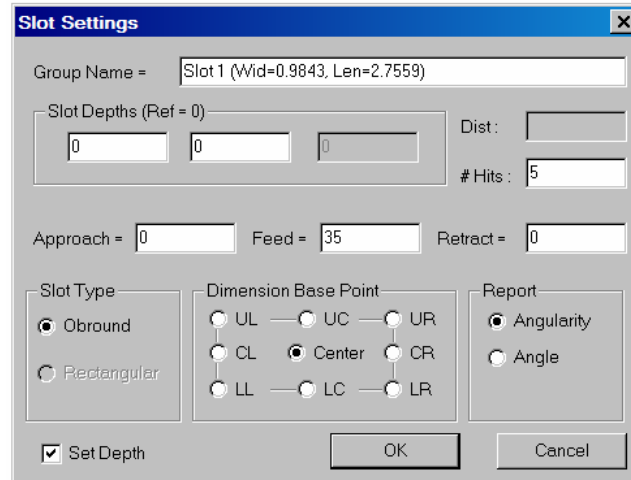
Approach =  Feed =  Retract =

☒ Set Depth

- Check the Set Depth box will cause the playback to prompt for a point in the appropriate axis then the points for the boss measurement. Click OK when finished.

## Slot

- Prompts the operator to select the two lines along the sides of the slot. After selections this dialog box will open.



The Slot Settings dialog box contains the following fields and controls:

- Group Name = Slot 1 (Wid=0.9843, Len=2.7559)
- Slot Depths (Ref = 0): Three input fields, each containing 0.
- Dist: Input field.
- # Hits: Input field containing 5.
- Approach = 0, Feed = 35, Retract = 0.
- Slot Type: Radio buttons for Obround (selected) and Rectangular.
- Dimension Base Point: Radio buttons for UL, UC, UR, CL, Center (selected), CR, LL, LC, LR.
- Report: Radio buttons for Angularity (selected) and Angle.
- Set Depth: Checked checkbox.
- OK and Cancel buttons.



- Dimension Base Point specifies the point to report, note if selecting point UL the report will give the coordinates of S2 in the above sketch, UC = S3, etc.
- Check the set depth box will cause the playback to prompt for a point in the appropriate axis then the points for the slot measurement. Click OK when finished.

## Groove

- Prompts the operator to select the two lines along the sides of the groove. After selections this dialog box will open.
- Selecting Groove Type 'Centered' allows for the instance where the probe diameter is greater than the groove width and only two points will be required.
- Groove type '2 Sided' requires 2 points on each side of the groove.

**Groove Settings**

Group Name =

Groove Depths (Ref = 0)

Dist:

# Hits:

Approach =  Feed =  Retract =

Groove Type

☐ Centered

☒ 2 Sided

Dimension

☐ +1/2 Width

☒ Center

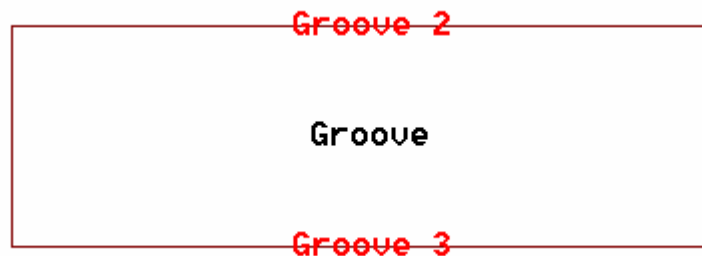
☐ -1/2 Width

Report

☐ Angularity

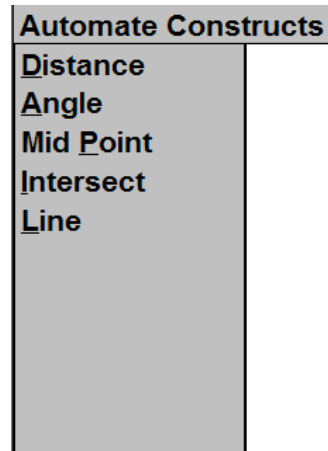
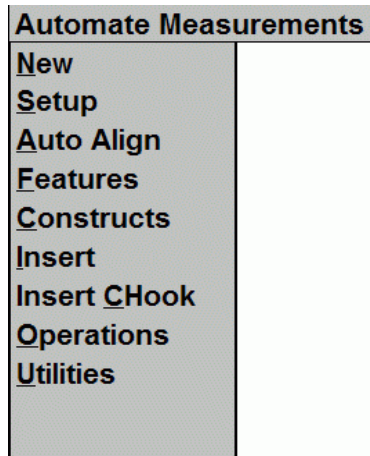
☒ Angle

☐ Set Depth



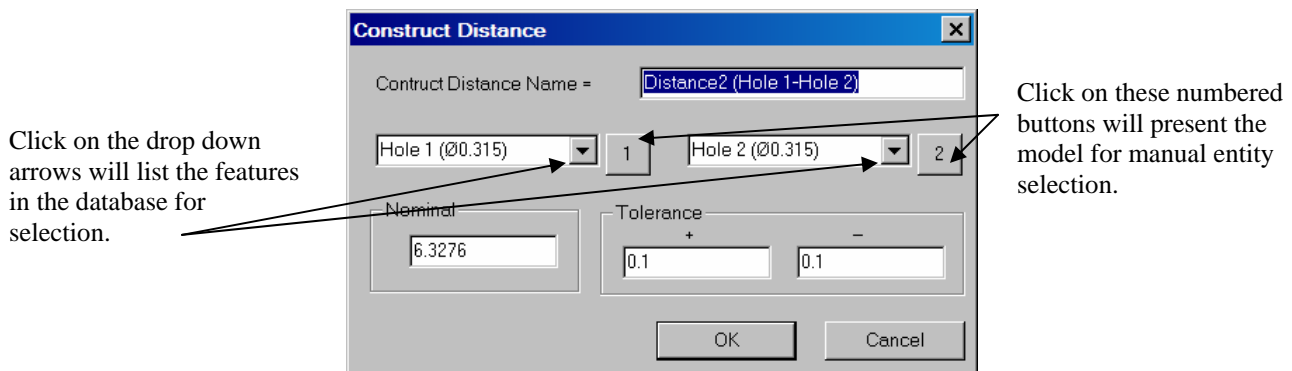
- Dimension '+1/2 Width' will return the value of the line here labeled groove 2 selecting 'Center' will return the center line of the groove while '-1/2 width' will report the value illustrated here by groove 3.
- Check the set depth box will cause the playback to prompt for a point in the appropriate axis then the points for the slot measurement. Click OK when finished.

## Additional Tools



## Constructs

- **Distance, Angle, Mid Point, Intersect and Line** allows the operator to pick two features to construct the 2D result between them. Each option presents this dialog box for the operator to pick the features to perform the function.

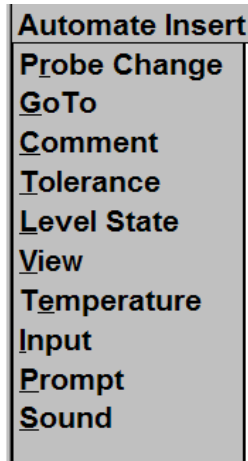


- When executing the construct commands the program defaults to pick an entity from the model. By clicking on an entity or on the open field will cause this menu to open. Here the operator can select items from the feature tree or return to the model for selection. Note the features selected must be previously measured and on the tree for calculations to be performed.

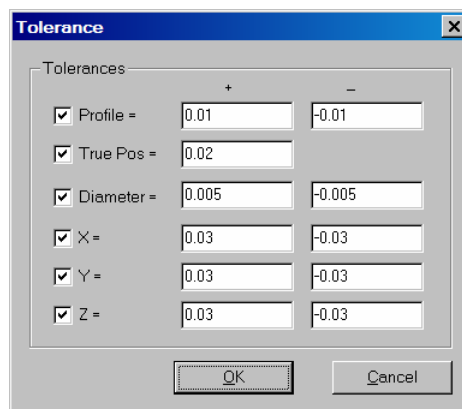


## Insert

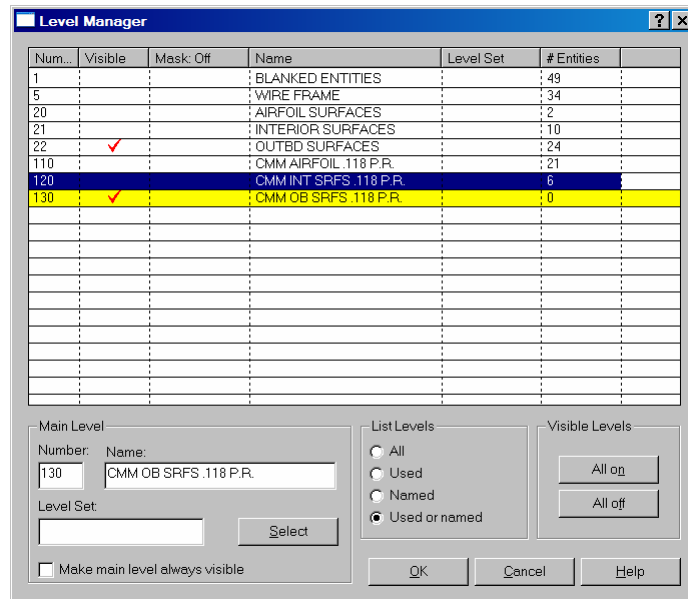
- **Insert** allows the operator select commands to enhance the execution of the program and add commentary to the report output. Note that Probe Change and Go To are settings reserved for future use on DCC machines.



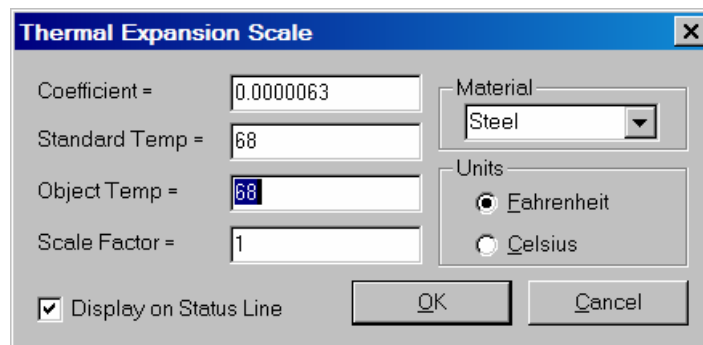
- **Comment** allows the operator to key in commentary that will appear on the report. Selecting Comment will open an entry box that appears in the prompt area at the bottom of the screen in the playback mode. Note; this feature is preprogrammed and cannot be accessed during playback.
- Comments Keyed in here by the operator will appear on the report at the insertion point on the tree.
- **Tolerance** will open the tolerance settings default dialog box, here the operator can make changes to the defaults.



- **Level State** will open the Levels Manager Allowing the operator to change levels; turn on or off levels to occur automatically during the course of replay.



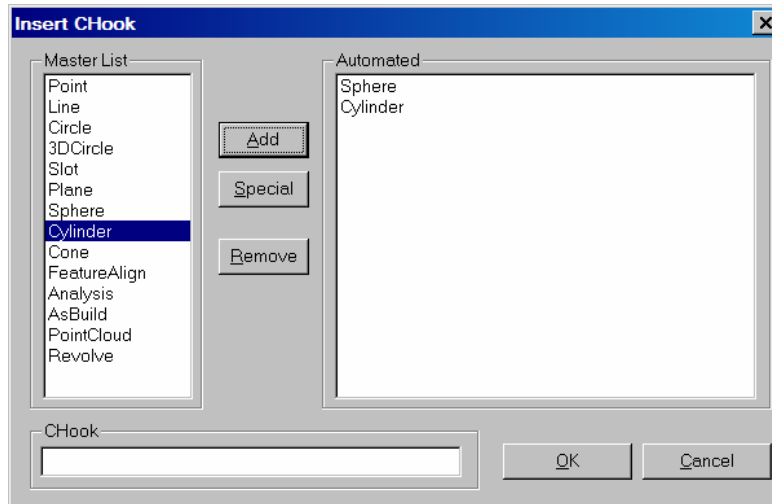
- **View** creates a view change on the tree to recall during playback the view on screen when the View button was pressed.
- **Temperature** when this command is entered into the tree the Thermal Expansion Scale dialog box will open during playback for the operator to key in the current temperature and material to scale the measurements to compensate for the expansion or contraction of the material being measured.



- **Input** provides the programmer the ability to pose a question to the operator who can provide a response that will appear on the report.
- **Prompt** provides the programmer to send an instruction to the operator during the playback mode.

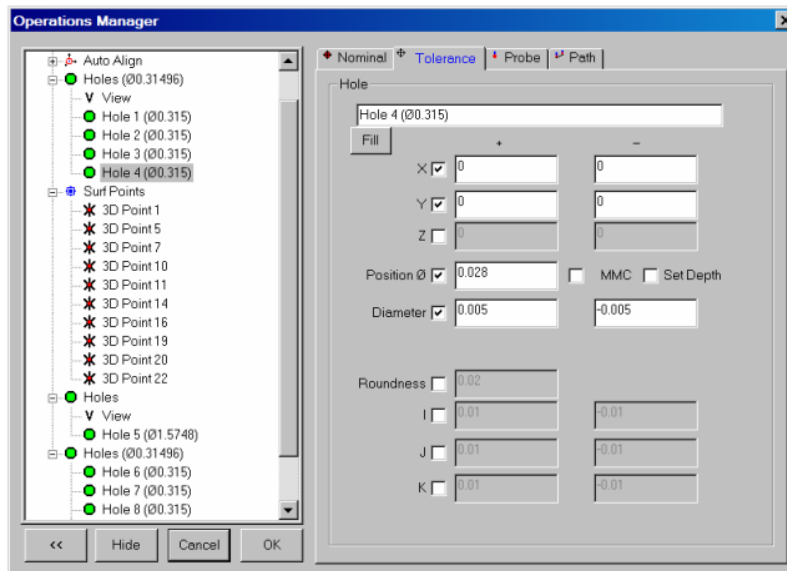
## Insert Chooks

- More measurement options can be added from here. These are standard Measure Functions and other Verisurf routines that will replay along with the automate program.



## Operations Manager

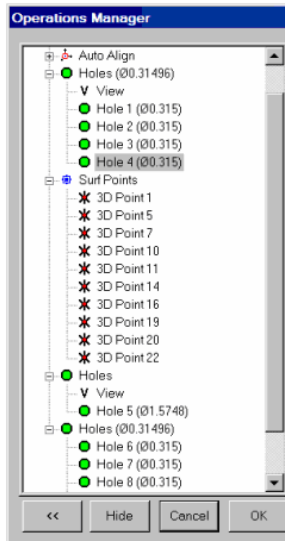
- The Operations Manager is found at Verisurf / Automate / Operations



- Of the four tabs shown Probe and Path are under development to be released at a later date. The Nominal and Tolerance tabs will be discussed here.

## The Feature Tree

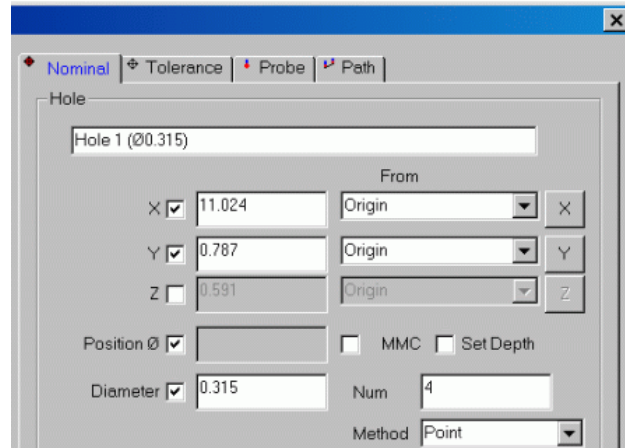
- The feature tree lists all the functions and features added by the operator during the course of creating the Automate Plan. Selecting a feature or function on the tree will cause the right side to expand as shown here.



- Objects on the feature tree may be 'Drag and Dropped' as needed. For example if a feature needs to be added higher in the tree simply add the feature to the bottom of the tree and drag it up to the desired location. Select OK.
- Features may also be moved down or deleted at any time. Select OK when edits are completed.

## Nominals Tab

- The Nominals Tab is completed automatically by the program as the modeled data is normally the product definition.



- The report output can be adjusted by checking or un-checking the appropriate boxes here. The feature description, target origin and method of toleranceing may also be adjusted.
- Checking the Position  $\varnothing$  causes the output as True Position Dia., checking the MMC box will apply the Maximum Material Condition principle.
- By using the dropdown boxes under 'FROM' the operator can specify from what feature the item is to be compared such as from Origin or from hole # 5 etc...
- The X, Y and Z buttons to right of the 'From' column allow the operator a method to select features directly from the model as measure 'From' features.
- Set Depth, Checking this option causes the playback to prompt for a point in the appropriate Axis to set the depth of projection.

## Tolerance Tab

- The Tolerance is completed by the operator based on blueprint or MBD tolerancing.

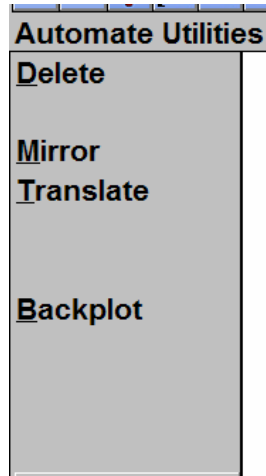
- The applied tolerance can be adjusted here by checking or un-checking the appropriate boxes and modifying the parameters.
- Checking the Position  $\checkmark$  causes the output as True Position Dia., checking the MMC box will apply the Maximum Material Condition principle.
- In this example True Position is the desired output so the tolerancing for the X and Y have been zeroed out. With these settings the report output will contain the actual as well as the positional results.

	Measured	Nominal	+Tol	-Tol	Dev	Over	OOT
Hole 2 (Ø0.315) (4)							
X	0.7773	0.7874					
Y	0.7787	0.7874					
Position Ø	0.0267	0	0.0280	RFS	0.0267	95%	

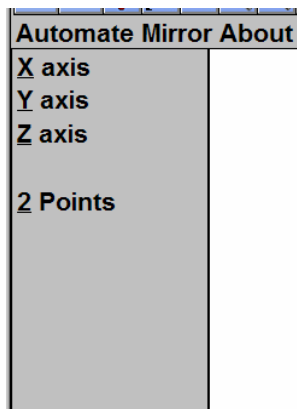
- The X, Y and Z buttons to right of the 'From' column allow the operator a method to select features directly from the model as measure 'From' features.
- Set Depth, Checking this option causes the playback to prompt for a point in the appropriate Axis to set the depth of projection.

## Utilities

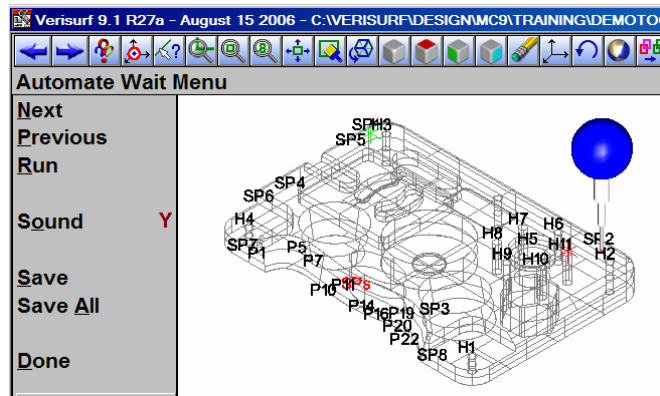
- **Delete** allows the operator to delete items from the Program Tree by selecting the feature on screen. While the feature is deleted from the Tree it is not deleted from the data base or model.



- **Mirror** opens the Mirror about Menu and will mirror the data on the operations tree. While this tool will mirror the data about the selected axis it does not mirror the model.

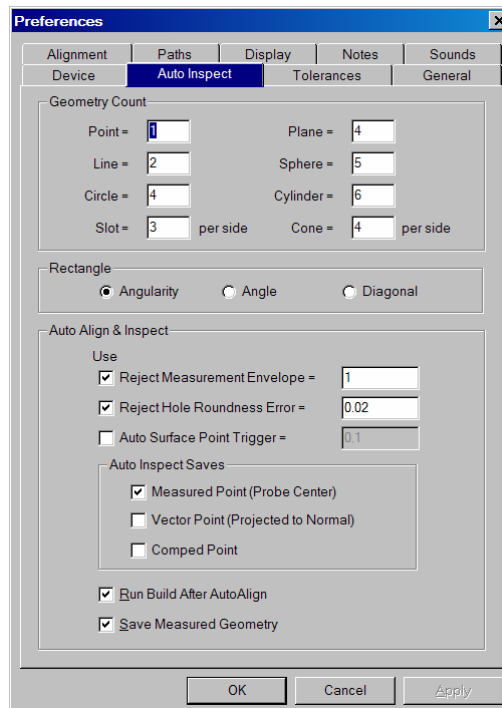


- **Backplot** will graphically run the Automate Program. You will see a simulated probe that will execute the moves on screen.



## Preferences

- Preferences found at Verisurf / Preferences will open this dialog box, click on the Auto Inspect tab.



- The settings here have an affect certain behaviors in the Automate module.



- **Geometry Count** specifies the number of points required to measure a given feature.

Alignment	Paths	Display	Notes	Sounds
Device	<b>Auto Inspect</b>	Tolerances	General	
Geometry Count				
Point =	<input type="text" value="1"/>	Plane =	<input type="text" value="4"/>	
Line =	<input type="text" value="2"/>	Sphere =	<input type="text" value="5"/>	
Circle =	<input type="text" value="4"/>	Cylinder =	<input type="text" value="6"/>	
Slot =	<input type="text" value="3"/> per side	Cone =	<input type="text" value="4"/> per side	

- At **Rectangle** select the method of error reporting, Angularity will report the error over the longest distance measured, Angle will report the deviation from 90 deg. And Diagonal will report the skew error of the feature.

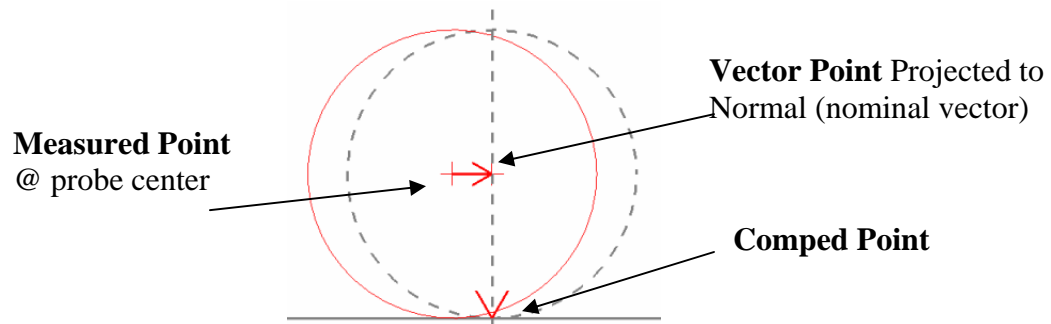
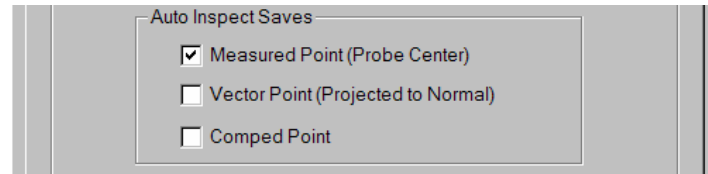
Rectangle
<input checked="" type="radio"/> Angularity <input type="radio"/> Angle <input type="radio"/> Diagonal
Auto Align & Inspect

- **Auto Align & Inspect**, these settings specify how the program responds during the execution of the automated functions.

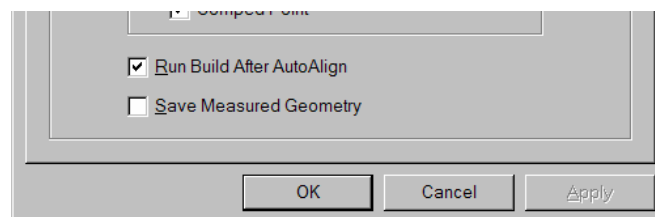
Auto Align & Inspect	
Use	
<input checked="" type="checkbox"/> Reject Measurement Envelope =	<input type="text" value="0.03"/>
<input checked="" type="checkbox"/> Reject Hole Roundness Error =	<input type="text" value="0.02"/>
<input checked="" type="checkbox"/> Auto Surface Point Trigger =	<input type="text" value="0.1"/>

- **Reject Measurement Envelope** specifies the alignment maximum error when AutoAlign will reject the Alignment.
- **Reject Hole Roundness Error** setting rejects the current measurement and waits for the operator to remeasure the feature if beyond this setting.
- **Auto Surface Point Trigger** allows for the automatic triggering of surface points input by the operator. The probe (less probe radius) must pass within this distance in order to trigger the auto point. Note, care should be exercised when using this feature to ensure the probe is in contact with the surface being measured when the point is triggered.

- **Auto Inspect Saves** specifies the point to save to the data base.



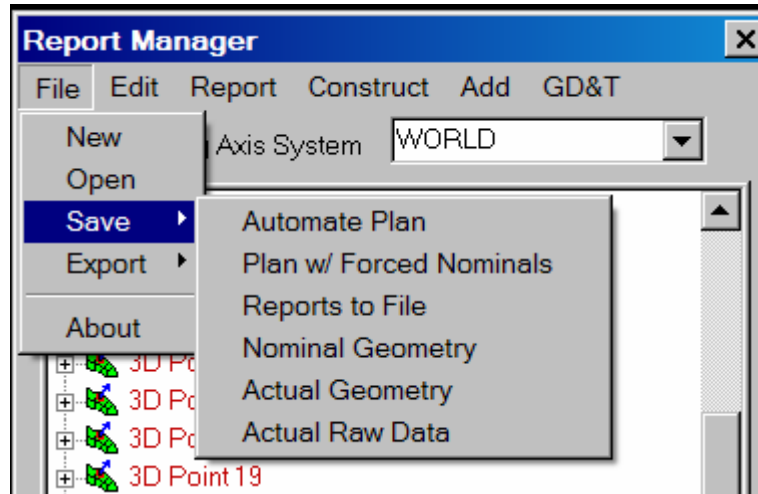
- **Run Build after AutoAlign** sets the routine to always run Build after an auto alignment. Note; this does not affect Auto Inspect



- For more information on **Preferences** see the Verisurf Preferences Manual.

## Automate and Report Manager

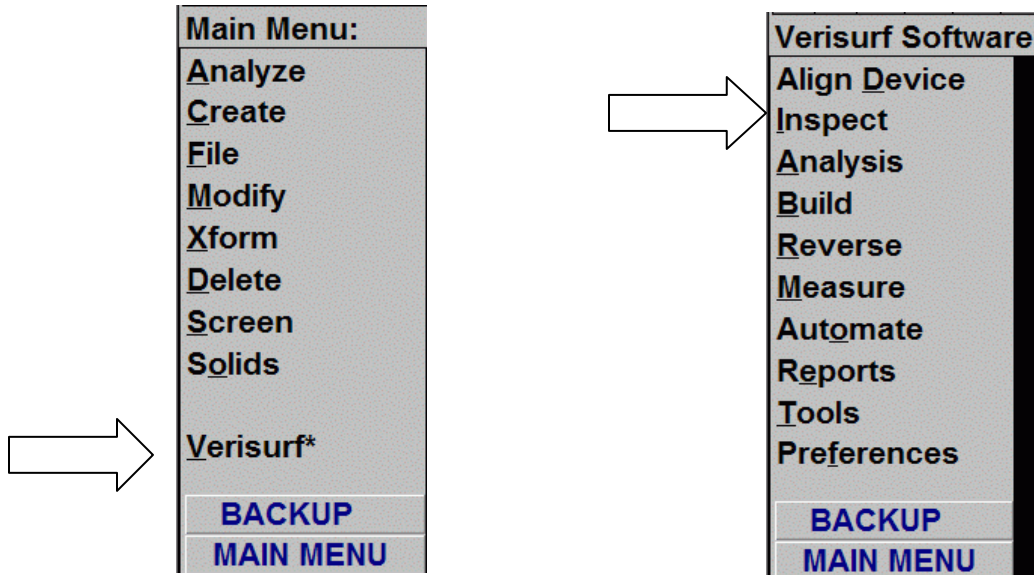
- Automated plans may also be created or appended from measurements made or created geometry by use of the Report Manager.



- Automate Plan** will save the alignments and measured data as a programmed inspection plan.
- Plan w/ Forced Nominals** will save the automated plan as above using the default nominals as the nominal data. Executing this saved plan will prompt the operator with targets as a guide through the inspection plan.
- See the Report Manager manual for more information on using this module.

## Executing the Automate Program

- The automated program can be executed thru the Main Menu go to Verisurf then Inspect.



- The program can also be executed from the Inspect icon on the upper tool bar.

