



Verisurf Align Device™

Table of Contents

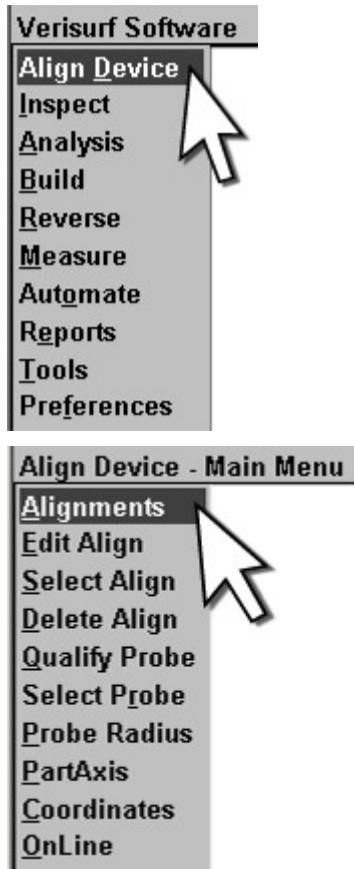
ALIGNMENTS.....	4
<i>Auto Align</i>	5
<i>Origin -</i>	6
<i>Feature Align</i>	7
<i>3 Points</i>	7
<i>Plane-Line-Point</i>	7
<i>Pln-Line-Line</i>	7
<i>Plane- Plane- Plane</i>	8
<i>Pln-Axis-Org</i>	8
<i>Org-Axis-Surf</i>	8
<i>Best Fit</i>	8
<i>Align Values</i>	8
STANDARD ALIGNMENTS INPUT MENU	9
<i>SmartPoint Mode</i>	10
<i>Plane, Line, Point</i>	13
<i>Plane, Line, Line</i>	14
<i>Plane- Plane- Plane</i>	16
<i>Plane, Axis, Origin</i>	16
<i>Plane, Axis, Origin</i>	17
<i>Origin, Axis, Surface</i>	18
<i>Best Fit</i>	18
<i>Align Edit</i>	20
EDIT ALIGNMENTS	22
<i>Translate</i>	22
<i>Rotate</i>	23
<i>Mirror</i>	23
<i>Scale CTE</i>	24
<i>Scale ALN</i>	24

2 Verisurf Align Device

<i>Matrix</i>	25
<i>XYZ-ABC</i>	25
<i>Rename</i>	26
<i>Move Geo</i>	26
SELECT ALIGN	27
DELETE ALIGN.....	27
QUALIFY PROBE.....	28
SELECT PROBE	28
PROBE RADIUS.....	28
PART AXIS	29
<i>Blank (UnBlank)</i>	30
<i>Move Geo</i>	30
<i>Translate (Part Axis)</i>	35
<i>Move Geo(metry)</i>	38
COORDINATES.....	40

Verisurf's Device Alignments allows you to align a Coordinate Measuring Machine to your CAD models coordinate system. It is desirable, but not necessary, to perform this alignment before collecting any data for analysis. Alignments are required when performing real-time measurements of your manufactured products.

The **Align Device – Main Menu** looks like this:



These options are discussed in detail following this synopsis.

Alignments

Provides methods of defining a device alignment system

Edit Align

Provides methods of modifying the definition of an existing device alignment system

Select Align

Allows you to change to another device alignment system by selecting it from a list of previously defined alignment

Delete Align

Allows you to delete existing device alignment systems

Qualify Probe

This option provides tools that enable you to calculate the exact size of the probe radius.

Probe Radius

Allows you to directly enter a known probe radius

Part Axis

Provides methods for defining a Local Coordinate System

Coordinates

Displays the current device coordinates and displays the **Align Device - Input Menu**. All points generated by the data collection device are created relative to the current device alignment, regardless of the current construction plane and Z settings.

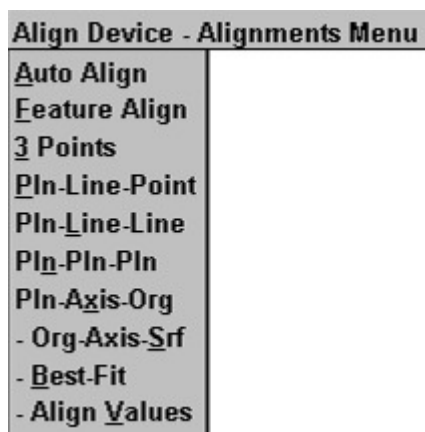
OnLine

This option toggles between **OnLine** and **OffLine** to indicate when Verisurf is communicating with your data collection device. When your device is on-line it can collect points. Otherwise, you can select data from the CAD model.

Alignments

The **Align Device - Alignments Menu** provides a variety of methods for matching the CMM device to the CAD model. The first seven options are automated routines that assist you with this task. The last three options work without the use of a data collection device, the data selected must be in the device base position as points when using these features.

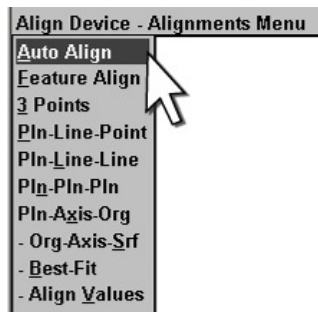
This is what the **Align Device - Alignments Menu** looks like:



Automated Alignment Routines

Auto Align

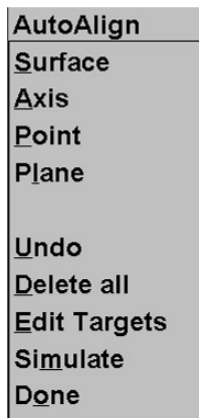
Auto Align is used to create an automated routine for aligning your manufactured part to the CMM device and the CAD model. Auto Align is a preferred method of alignment due to its speed, ease of use, and accuracy. It is utilized by creating targets on the CAD model, setting the target type, and simply running the user-prompted routine.



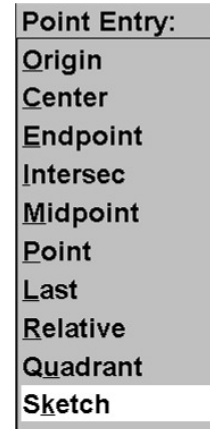
or Auto
Align icon



Selecting Auto Align will bring up one of two menus. If a CAD surface is detected the alignment target menu will be bypassed and you will be taken directly to the surface point entry menu. Otherwise, you will first see the AutoAlign target type selection menu.



Auto Align
Target Type Selection



Surface Point Select

Surface

The most frequently used Auto Align target type is a surface point. Use the mouse to create or select a point on the surface of the CAD model via numerous optional methods:

Origin -

Creates target at the origin of the axis system if located on the model.

Center -

To create a target at the center of an arc.

Endpoint -

To create a target at the endpoint of a line, arc or spline.

Intersec -

To create a target at the intersection of two entities; lines, arcs or splines.

Midpoint -

To create a target at the midpoint of a line, arc or spline.

Point -

To create a target at an existing point.

Last -

Creates a target at the last point as previous.

Relative -

To create a target at coordinates at a position designated by you relative to another point.

Quadrant -

To create a target at a quadrant of an arc.

Sketch -

To create a target on a surface freehand, projected to a surface from the mouse location.

Point Entry:

Origin

Center

Endpoint

Intersec

Midpoint

Point

Last

Relative

Quadrant

Sketch

Axis

To align to holes. Will seek an arc on a surface including cone or cylinder.

Point

To create a target at an existing point in the model such as datum targets.

Plane

To create a target on the construction plane at a specific Z height such as the surface plate.

Feature Align

This option allows you to use predefined named features to align a part. Using primary, secondary and tertiary features an alignment can be established. In the graphic to the right Plane 1 is used for primary alignment and Z origin. Circle 1 and Circle 2 establish the clocking axis. Circle 1 establishes the X and Y origin.

You will then be prompted if you want to Accept the alignment.

3 Points

This option allows you to use three points on your manufactured part to align your CMM device with your CAD model.

Plane-Line-Point

This option allows you to use a plane, a line, and a point on your manufactured part to align your device with your CAD model.

Application: Used to align the corner of three planes when all three sides are perpendicular

Pln-Line-Line

This option allows you to use a plane and two lines on your manufactured part to align your device with your CAD model.

Application: Used to align the corner of three planes when the first and second sides that you collect points from are perpendicular, but the second and third sides are not perpendicular

Plane- Plane- Plane

This option allows you to use three planes on your manufactured part to align your device with your CAD model.

Application: Used to align the corner of three planes when there are no perpendicular sides

Pln-Axis-Orig

This option allows you to use a plane, an axis line and a point on your manufactured part to align your device with your CAD model.

Application: Used to align parts when a feature other than a corner will be the origin of the alignment

Org-Axis-Surf

This option allows you to use an origin point, an axis point and a surface point to align your CMM device with your CAD model.

Best Fit

This option allows you to use many measured tooling points and best-fit them to known nominal reference points, in order to find the best possible alignment.

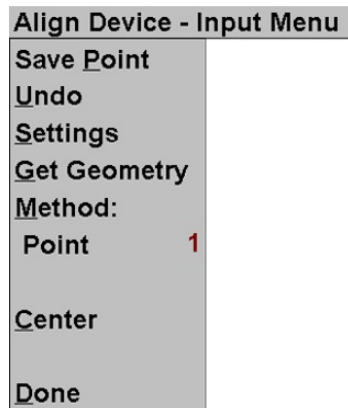
Align Values

This tool allows you to enter known X, Y or Z values for each point selected to calculate an alignment.

Standard Alignments Input Menu

The first six options of the **Align Device Alignments Menu** are used to align your data collection device with the features of your work piece. The **Align Device - Input Menu** is displayed when input is needed from your data collection device.

Here is what the **Align Device - Input Menu** looks like, followed by a description of the options.



Save Point

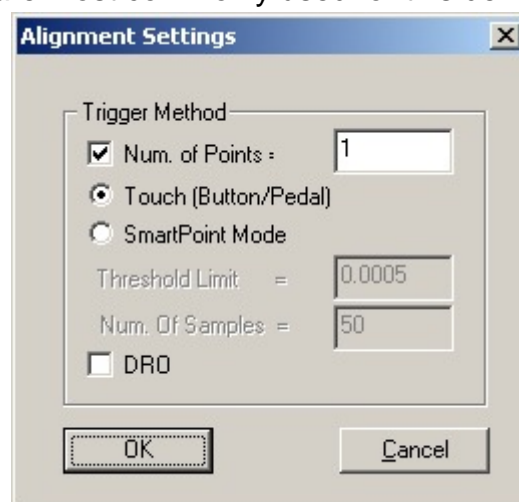
Selecting this option will cause Verisurf to collect a point from the data-collection device at its current position. This feature is intended for data collection devices that have no “button”, such as laser trackers. Most CMM and articulating arm type data collection device devices have a button or switch and do not require that you select **Save Point** to collect a point. This feature will work for all devices.

Undo

This feature will cause Verisurf to remove the last collected point. Repeated use of this command will remove points in a reverse order to which the points were collected.

Settings

This option provides you with a dialog box that contains various settings related to collecting data with your device. Most of these options are global; they apply in all areas of Verisurf. The default settings are most commonly used for this device alignment.



Trigger Method

Number of Points

This setting indicates the number of points that will be collected to calculate an axis or some other geometric feature. If the check box is not checked, Verisurf will continue to collect points for the current definition until you press **Esc** on the keyboard or select **Done** from the **Align Device – Input Menu**.

Touch (Button/Pedal)

The **Touch (Button/Pedal)** trigger method indicates to Verisurf that your data-collection device has some type of switch that you will press or activate when you want to collect a point. For example, a standard probe has a switch built-in. Deflection of the probe causes Verisurf to collect a point at that position. Most of the articulating arm data-collection devices have a button near the probe, which the operator can press when point collection is desired.

SmartPoint Mode

SmartPoint Mode will collect a specified number of samples, at points within the threshold limit, from a stationary probe and create a point from the average of the values collected. This is useful for collecting points with devices that lack a button and take a point when the probe stops moving.

Number of Samples

This is the quantity of observations that Verisurf will collect before averaging the values and producing the point.

Threshold Limit

All of the sample observations must be within this distance to each other in order for Verisurf to consider the observations valid. If the probe moves more than this distance, while the observations are being collected, Verisurf will restart the observation collection process.

DRO

Verisurf can display a digital read-out on the graphics screen, in a separate window. This window can be resized or repositioned on the screen. Select this check box to view the DRO.

Get Geometry

This option allows you to select (off-line) previously measured points or features that are in the CAD database. These points or features should be in the base coordinate system of the data collection device.

You can also align the features of a CAD model on your screen. When you select **Get Geometry**, you are prompted to select the features (lines, points, planes, etc.) of the open geometry file, that are required for the selected alignment technique.

Method

When defining an alignment, Verisurf will prompt you with the feature on which the point(s) will be collected and the entity from which a point will be calculated. This entity is referred to as the “method” because there are different methods for calculating a point from a feature. You could collect a single point, a point at the center of a circle or at the center of a sphere. For example, the default method for defining the origin of an alignment is the circle method. If you were using a sphere to calculate the origin, you would change the method to the sphere method. The method also determines how many points must be collected. More points must be collected to calculate the center of a sphere than need be collected to calculate the center of a circle.

You change the method by clicking the **Method** option until the desired option is displayed. You can then proceed with the collection of the point(s) for the next feature. The **Method** options are **Point**, **Circle**, **Sphere**, and **Fit Point**.

Center

This feature repositions the geometry on the drawing screen such that the current position of the data collection device is at the center of the drawing screen.

Repaint

This feature repaints the drawing screen.

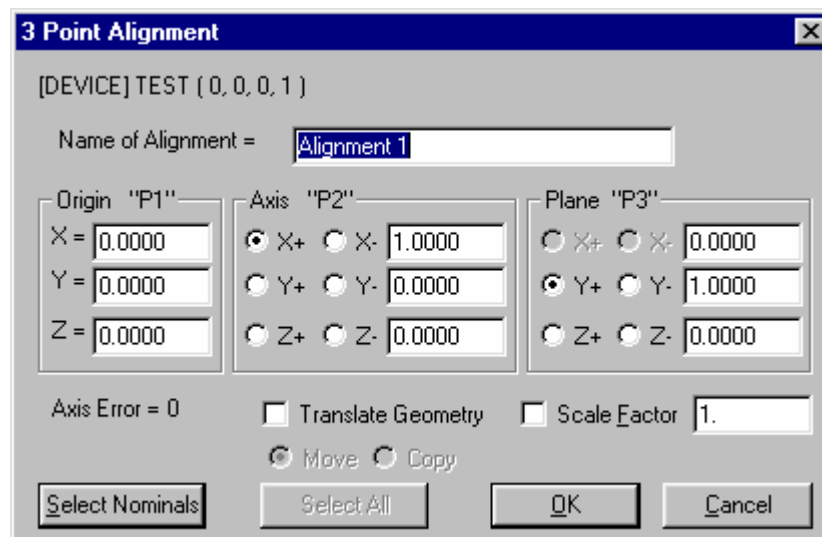
Done

Select **Done** when you are finished collecting points for the sphere that you are measuring. **Backup** or **ESC** can be used instead of **Done**.

3 Points

The 3 Points alignment allows you to define (or select) three tooling points on your manufactured part and align them with the corresponding three points on your CAD model. When you select this feature, the **Align Device - Input Menu** is displayed with the **Method** defaulting to **Point**. All of the input features may be selected and adjusted as previously described in this chapter.

Simply measure three points on your manufactured part. Verisurf will then display the **3 Point Alignment** dialog box, as seen here.



Note: The origin and rotation matrices will be reoriented to the active part axis coordinates.

The default settings:

- **Origin** point Placed at XYZ origin
- **Axis** point Placed on the X+ axis line, this value shows the actual distance from the origin point to the axis point.
- **Plane** Point Placed on the Z plane (the XY plane) and will be in the Y+ direction. The values show the actual distance from the origin point to the plane point

Functions of the **3 Point Alignment** dialog box:

- Reorient the alignment by setting the axis direction buttons to be the axis direction
- Input the known values for the three points.
- Check the **Scale Factor** box to add the correction scale to the alignment.
- By inputting the known axis length, the **Axis Error** displays the differences of length, which can then be scaled for correction.
- The **Translate Geometry** feature lets you move selected geometry into the alignment.
- **Select Nominals** prompts you to select the three points from the CAD model to get the known values.

After making the desired adjustments, select **OK**. If **Translate Geometry** is checked, Verisurf will then prompt you to select geometry to move into the new alignment system. If **Copy** is selected, a copy of the selected geometry is moved into alignment. The selected geometry remains in its original base coordinate position. The **Move** option moves the selected geometry into alignment. The geometry moved or copied will be displayed in the result color.

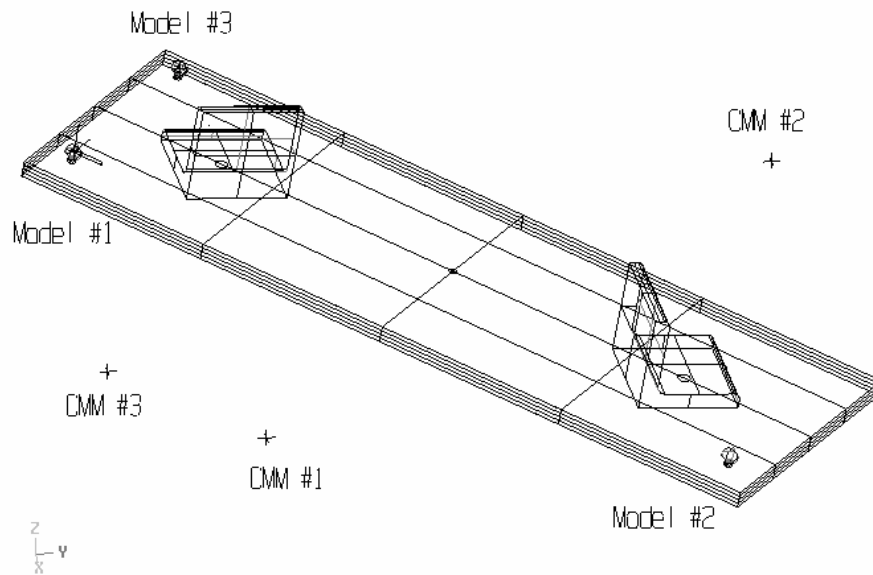
If you are translating all of the geometry on the screen, it is faster to click the **Select All** button. This becomes available when **Translate Geometry** is checked. After you click **Select All**, the geometry is moved or copied to the new alignment.

In the following example the points labeled “CMM #” 1 through 3 are selected in order, followed by selecting the “Model #” points in order.

The CMM #1 point will be exactly matched to the Model #1 point.

The CMM #2 point will be positioned exactly on the line formed by Model #1 and Model #2 points.

The CMM #3 point will be positioned exactly on the plane formed by the three Model points.



Plane, Line, Point

The **Pin-Line-Point** alignment allows you to define (or select) three features on your manufactured part and align them with the corresponding part axis of your CAD model.

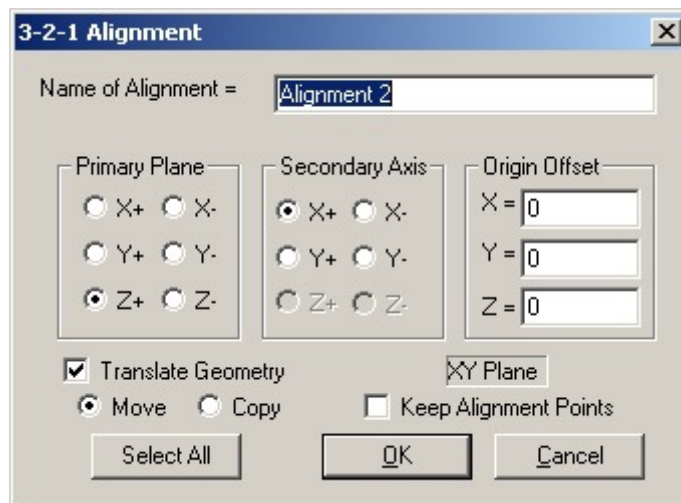
All of the input features may be selected and adjusted as previously described in this chapter.

When you select this feature, the **Align Device - Input Menu** is displayed with the **Method** defaulting to **Point**. You are prompted to select points.

1. Select points that define the plane that represents the XY plane at Z Zero (also known as the *Z plane*).
2. Select points that define the axis line. You are prompted to select a point along the -X axis, then the +X axis.
3. Select the Y point. This point is projected perpendicularly onto the measured X-axis and the projected point becomes the origin of the alignment system.

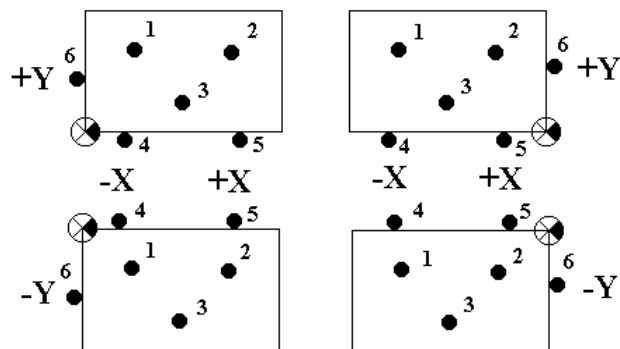
Probe compensation is performed for all three features when using the point method.

All of the alignment methods that align with a plane and one or more other features of the work piece display the **3-2-1 Alignment** box. This has a subset of the features found in the 3 Point alignment.



Note: The origin and rotation matrix will be reoriented to the active part axis coordinates.

Samples of how to make your part data match the CAD origin



Plane, Line, Line

The **Pin-Line-Line** option allows you to define (or select) three features on your manufactured part to align with the corresponding part axis of your CAD model.

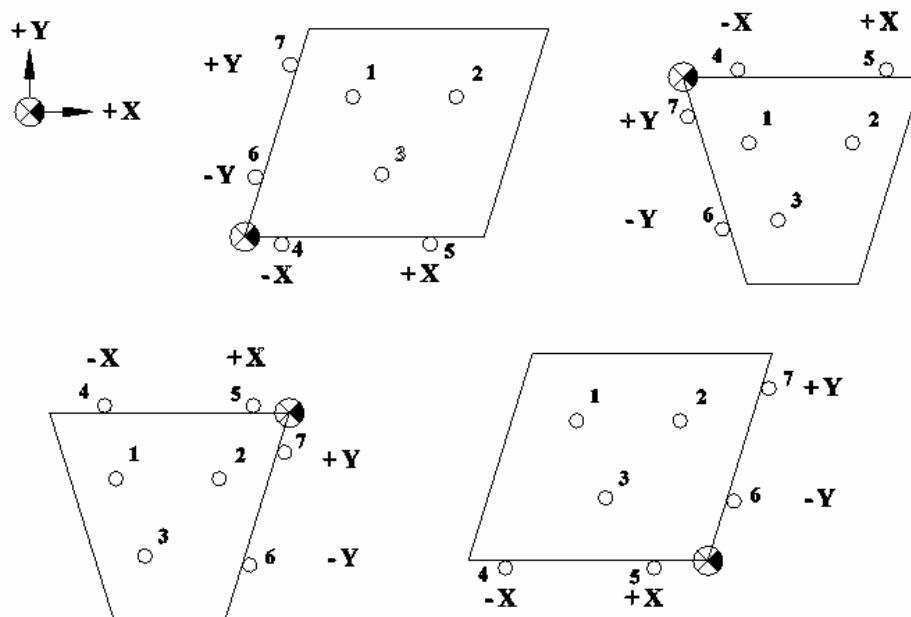
All of the input features may be selected and adjusted as previously described in this chapter.

When you select this feature the **Align Device - Input Menu** is displayed with the **Method** defaulting to **Point**. You are prompted to select points.

1. Select points that define the plane that represents the XY plane at Z Zero (also known as the *Z plane*). Then click **Done**.
2. Select points that define the axis line. You are prompted to select a point along the -X axis, and then the +X axis. Select these points and click **Done**.
3. Select points that define the second line. You are prompted to select a point along the -Y axis, and then the +Y axis. Select these points and click **Done**.
4. The intersection of the two lines becomes the origin of the alignment system. Probe compensation is performed for all three features when using the point method.

Note: The origin and rotation matrix will reorient to the active part axis coordinates.

Samples of how to make your part datum's match the CAD zero



Plane- Plane- Plane

The **3 Planes** alignment allows you to define (or select) three planes or planar features on your manufactured part to align with the corresponding part axis of your CAD model.

All of the input features may be selected and adjusted as previously described in this manual.

The first plane measured represents the XY plane at Z Zero (also known as the Z plane).

The second plane selected forms an intersecting line with the first plane. That line becomes the X-axis of the alignment system.

The third plane selected forms an intersecting line with either of the first two planes. The intersection of this intersecting line and the intersecting line formed by the first two planes becomes the origin of the alignment system.

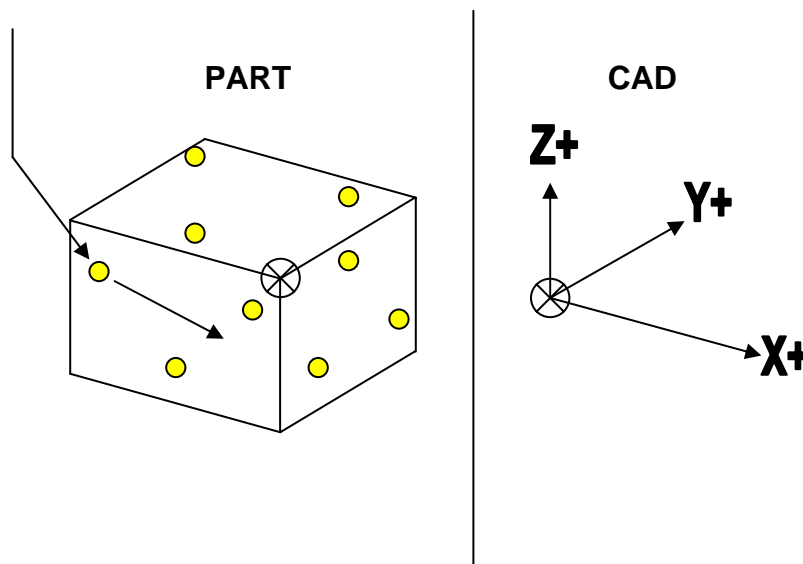
Probe radius compensation is performed for all three planes when using the point method.

Note: The origin and rotation matrix will reorient to the active part axis coordinates.

Tip: The order the points are taken on the second plane determines the positive X direction.

Sample of how to make your part datum's match the CAD zero

The first point on the second plane defines the negative X position, as the other points are presumed to be in the positive X direction.



Plane, Axis, Origin

The **Pln-Axis-Org** alignment option allows you to define (or select) three features on your manufactured part to align with the corresponding part axis of your CAD model.

All of the input features may be selected and adjusted as previously described in this chapter.

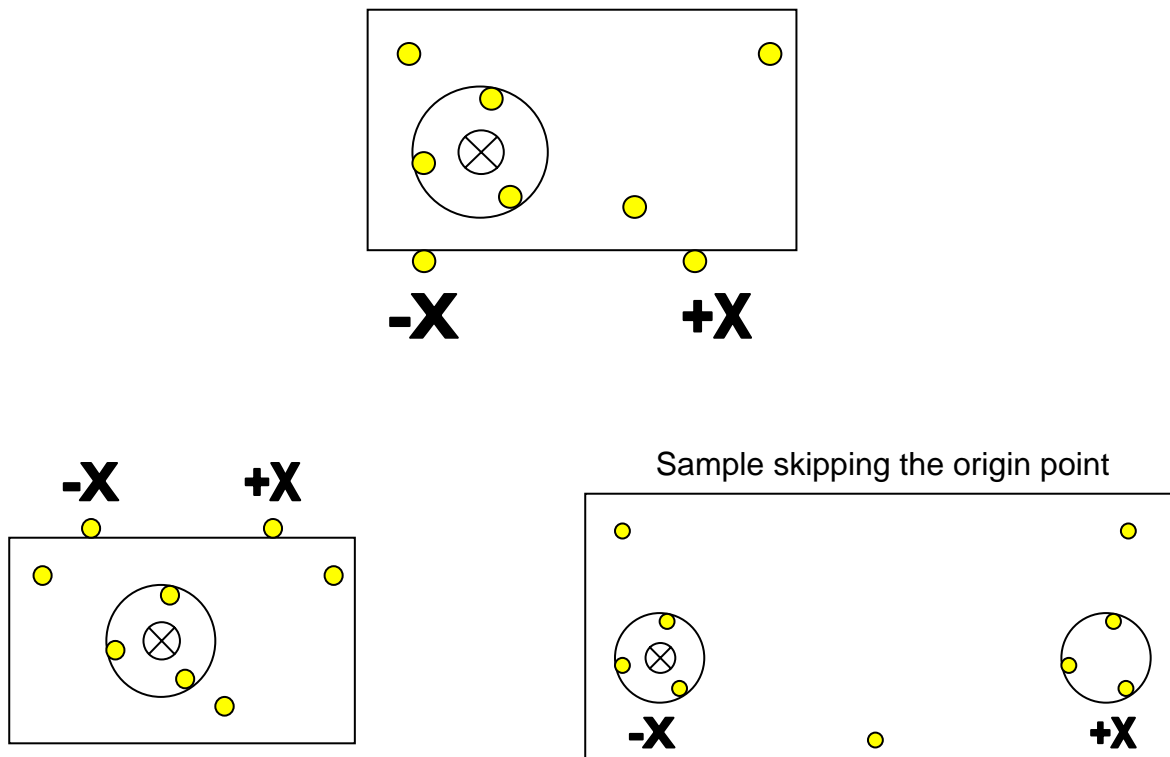
When you select this feature, the **Align Device - Input Menu** is displayed with the **Method** defaulting to **Point**, and you are prompted to select points.

1. Select points that define the plane. This plane is the XY plane at Z Zero (also known as the Z plane).
2. Select the axis-line. You are prompted to select a point along the -X axis, then the +X axis.
3. Select the Origin-point. The method defaults to circle. This point becomes the origin of the alignment system.

Tip: If you don't measure the third point (hitting Done or ESC instead), the point selected along the -X axis becomes the origin.

Probe compensation is performed for the plane when using the point method.

Note: The Origin and rotation matrix reorient to the active part axis coordinates.



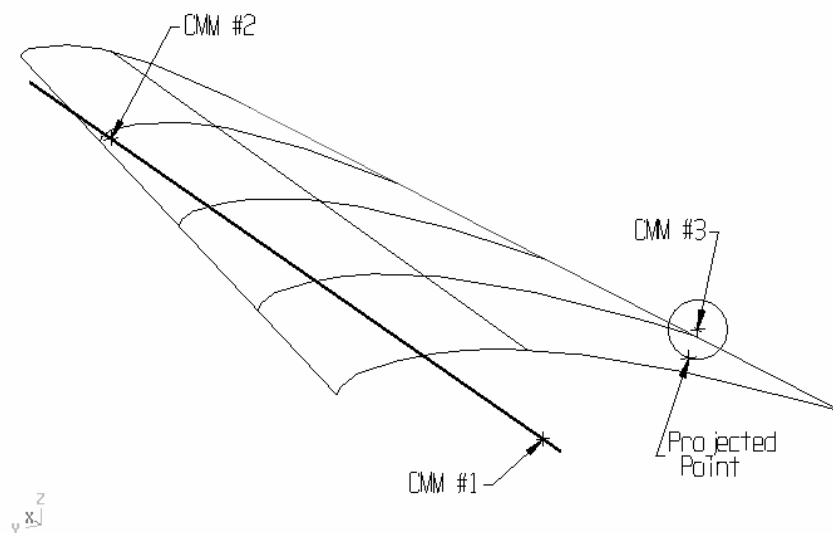
Origin, Axis, Surface

The **Org-Axis-Surf** option allows you to select three pre-measured points on your manufactured part and align them with the corresponding three nominal points and surface on your CAD model.

When you select this feature, the **Point Entry** menu comes ups. You are prompted to select the pre-measured Origin point. Next, you are prompted to select the pre-measured Axis point, and then a pre-measured Surface point. After the surface point is selected, you are prompted to enter the probe radius for compensating the surface point.

You are then prompted to select each of three-target points that will be used for the alignment fit to the nominal (CAD) data. When you get to surface point selection, try to pick a point on the surface near the spot measured. If there is no point on the surface, you may press the “E” key to select the endpoint of the surface.

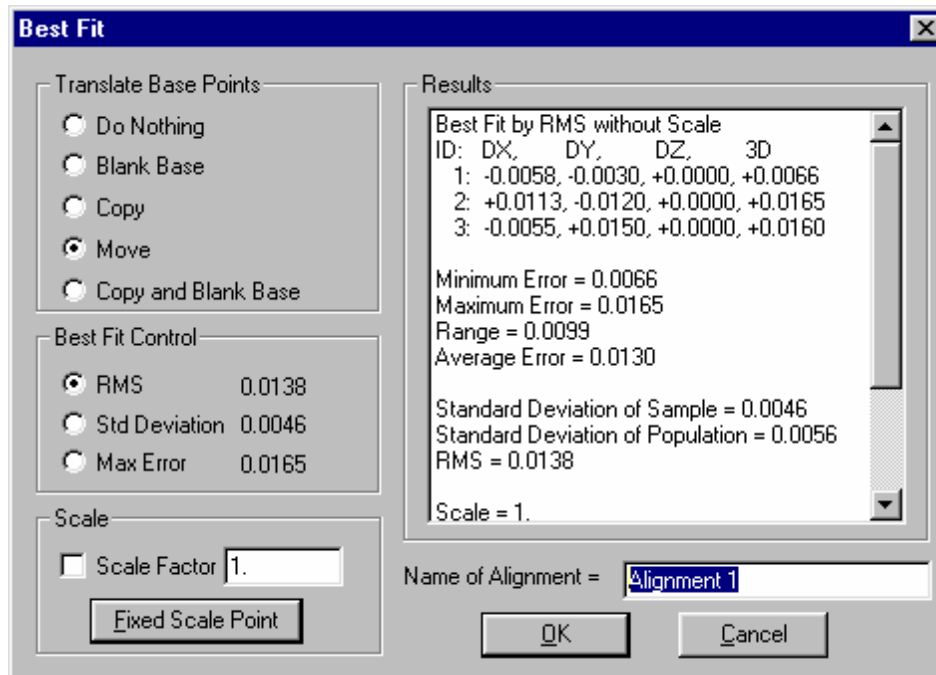
After all alignment data have been selected, you are given the opportunity to select the points to be moved into the new alignment system.



Best Fit

The **Best-Fit** Device Alignment feature allows you to define (or select) a set of points for both the manufactured part and for the CAD model.

Verisurf will then perform a best-fit calculation on the two sets of points and provide you with an optimum device alignment, which is then stored in the database.



The dialog box shown above appears after the data is selected. You may adjust the **Translation Base Points** options, the **Best-Fit Control** options, and the **Scale** option with this dialog.

Here is a brief description of the features on this dialog box:

Translate Base Points

These switches control the action taken on the base (actual) points. The options include **Do Nothing**, **Blank Base**, **Copy**, **Move**, and **Copy and Blank Base**.

Best Fit Control

These switches allow you to select the component of the best-fit calculation that is the most critical for your application.

Scale

These controls allow you to apply a scale factor and select a fixed point about which to apply the scale factor. This is used primarily for thermal expansion.

Name of Alignment =

You have the option to name the new alignment system.

Note: This feature works “offline”; all data selected must exist in the CAD geometry before using this feature.

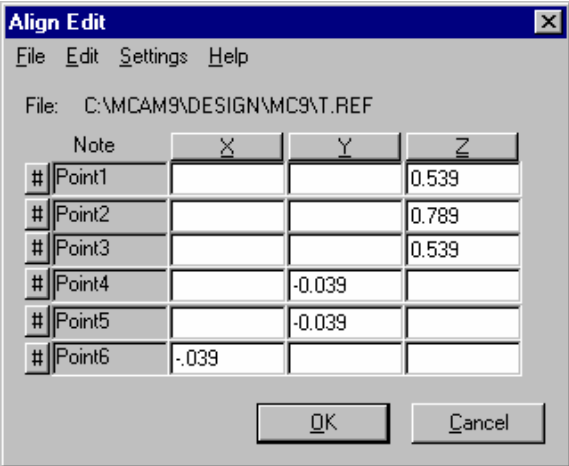
Align

There are times when it is impossible to collect a reliable number of points on a given axis. Two points might be on a plane, while a third is at the bottom of a step. If the nominal depth of the step is known, you can use the Align feature to calculate the correct plane.

When you select the **Align** command, you are prompted to select the points from which an alignment will be best-fit. Select the points from which the X, Y and Z-axes will be calculated and click **Done**. The **Align Edit** box is displayed with no values in the X, Y, and Z columns.

Align Edit

Note: This feature only works when you know the axis along which each point was collected, the distance from the plane of each point deviant point and the probe radius. In the



The screenshot shows the 'Align Edit' dialog box with a menu bar (File, Edit, Settings, Help) and a file path 'C:\MCAM9\DESIGN\MCS\T.REF'. Below is a table with columns for 'Note', 'X', 'Y', and 'Z'. The table contains six rows of data for Point1 through Point6. At the bottom are 'OK' and 'Cancel' buttons.

Note	X	Y	Z
# Point1			0.539
# Point2			0.789
# Point3			0.539
# Point4		-0.039	
# Point5		-0.039	
# Point6	-.039		

example above, points 1 and 3 were one half inch above the Z plane. This half inch, plus a probe radius of .039 equals the .539 figure that was typed in this box. Point 2 was collected three-quarters of an inch above the Z plane. The numbers typed for the points on the X and Y-axes are equal to the negative values of the probe radius. When you click **OK**, the **Datum Alignment Settings** box is displayed.

Datum Alignment Settings

Device Alignment Name: Alignment 1

Part Axis Name: WORLD Select

Rotate about Axis

X = 0 Y = 0 Z = 0

Alignment Files

Data = T.REF Select

Alignment = T.ALN Select

Report = T.RPT Select

☒ Read in Data file after alignment ☐ List Results

OK Cancel

Device Alignment Name

You can accept the default alignment number or name the new alignment as you choose.

Part Axis Name

Click the **Select** button to choose a coordinate system in which the data will be manipulated.

Rotate about Axis

Use this to enter the rotational angle of any of the axes.

Alignment Files

Click **Select** to change the name of, or create a new file for alignment ASCII text reports.

The **Data** file contains the measurements, which are stored as a reference file, the format of which is described in the Verisurf Point Reports chapter. The **Report** file will contain the results of the transformation. The **Alignment** file contains the nominal values of the points that were typed in the **Edit Align** box.

Read in Data File

If this switch is selected, Verisurf will store the data file points as geometry. The points will be transformed through the new device alignment matrix and the part axis.

List Results

This check box brings up a Wordpad file, which displays the Report file. The Alignment and Data files will be included in this list if their options were checked in the **Align Settings** Box.

Edit Alignments

The **Align Device - Edit Alignments Menu** provides several different methods of modifying the original definition of your alignment system.

Align Device - Edit Alignments Menu

Translate
Rotate
Mirror
Scale CTE
Scale ALN
Matrix
XYZ-ABC
Rename
Move Geo

Each of these features is discussed in detail on the following pages.

Translate

Translating a device alignment can be accomplished with any of the following methods:

Align Device - Translate Menu

Rectang
Polar
Between Pts

Rectang(ular)

Prompts you to enter an incremental distance in Cartesian coordinates

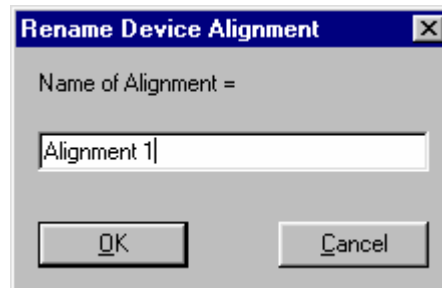
Polar

Prompts you to enter an incremental distance and an angle in decimal degrees. These are considered to be polar coordinates.

Between Pts

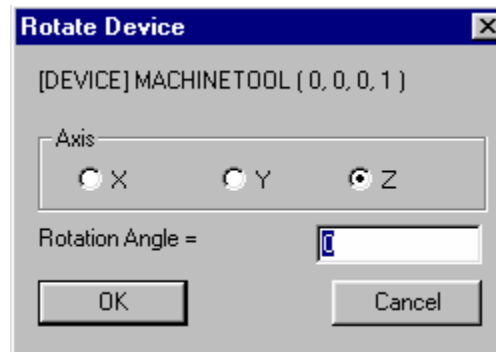
Prompts for two points and uses the 3D distance between those points as the translation vector

After the translation is performed by the system, you may rename the alignment system. The following dialog box prompts you with the current name of the alignment. Click **OK** to accept the current name or type a new name and select **OK**.



Rotate

The rotate feature allows you to rotate an alignment about one of its axes



Select the axis to rotate about, enter the rotational angle in decimal degrees, and select **OK**. After the rotation is performed by the system, you may rename the alignment system. The following dialog box prompts you with the current name of the alignment. Click **OK** to accept the current name or type a new name and select **OK**.

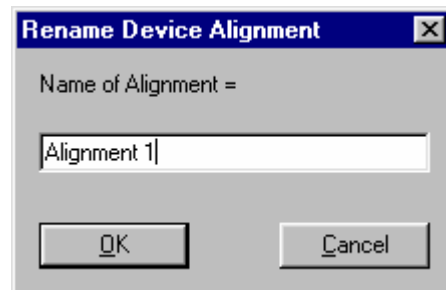
Mirror

The Mirror feature allows you to mirror an alignment about one of its axes.



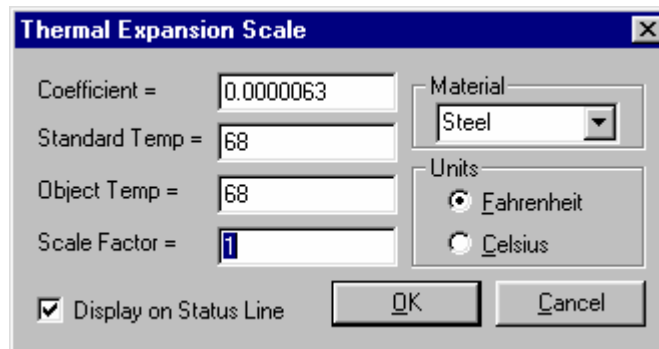
Select the axis to mirror about and click **OK**.

After the mirroring is performed by the system, you may rename the alignment system. The following dialog box prompts you with the current name of the alignment. Click **OK** to accept the current name or type a new name and select **OK**.



Scale CTE

The **Scale** Alignment feature allows you to define the working temperature and coefficient for scale transformation use. Verisurf will scale all values collected from your data collection device before placing that information into the geometry database.



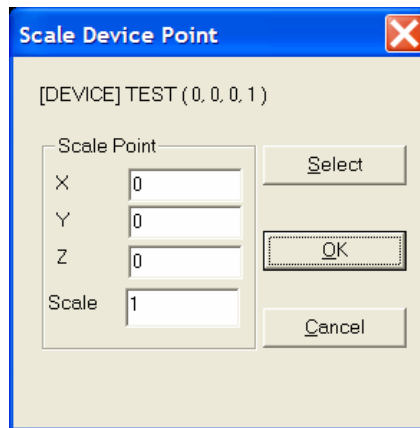
Options are provided for selecting the material (along with standard temperatures for those materials), selection between Fahrenheit and Celsius, and a switch to display the scale factor on the status line.

Enter the appropriate values in the various boxes or select a material type to automatically update the values.

Note: This feature is intended to affect the active device-alignment system. If you have not created an alignment-system, this feature has no effect.

Scale ALN

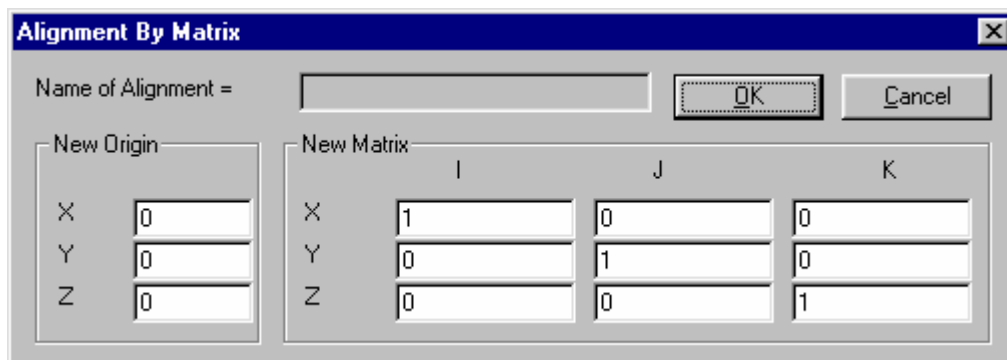
This feature selects a point about which the alignment system is scaled by the previous feature, **Scale**.



Enter the values, or press the **Select** button to pick a point from the screen. Press **OK** to accept or **Cancel** to ignore the changes.

Matrix

This feature allows you to define the alignment system mathematically, using the actual vectors of the alignment matrix.



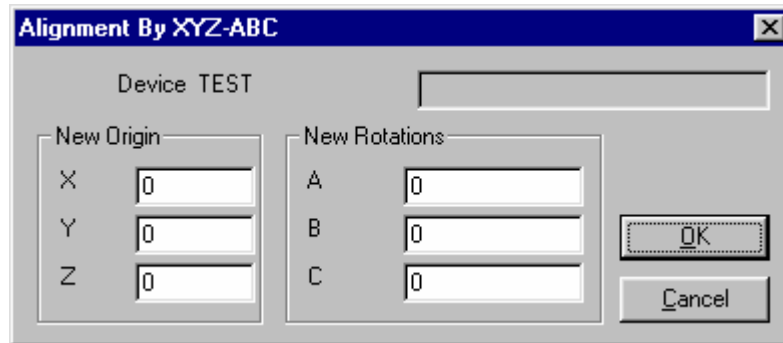
The values displayed in this dialog box represent the current device alignment, if any.

The values must all be entered manually. Select **OK** to accept or **Cancel** to ignore your changes.

XYZ-ABC

The by **XYZ-ABC** device alignment feature allows you to define a translation and a rotational offset from the world origin and orientation. You will use this feature when the information provided to you is in this form.

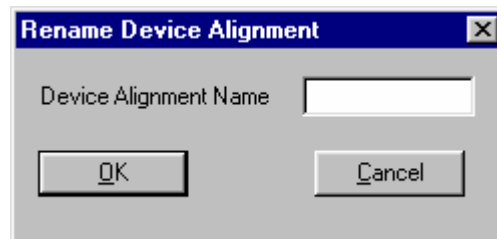
The **Alignment By XYZ-ABC** dialog box looks like this:



The values for **New Origin** are the translation vector. The values for **New Rotations** are the rotational values used to align the device with your CAD model.

Rename

This feature provides the opportunity to give the current alignment system a new name. The following dialog box prompts you with the current name of the alignment. Click **OK** to accept the current name or type a new name and select **OK**.

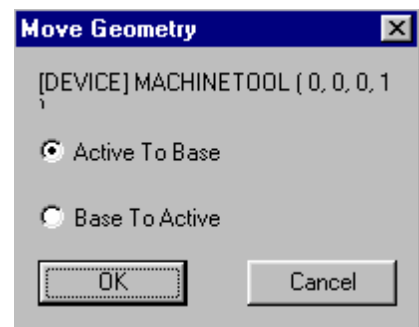


Move Geo

The Move Geo feature allows you to select existing geometry and reposition that geometry in space according to the current device alignment values.

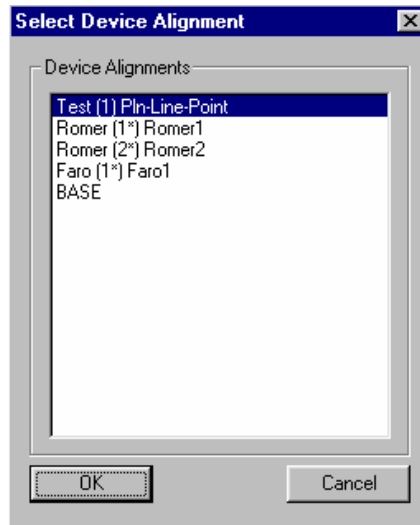
You may move the geometry from the aligned system to the base system or from the base system to the aligned system.

Here is the dialog box with the choices:



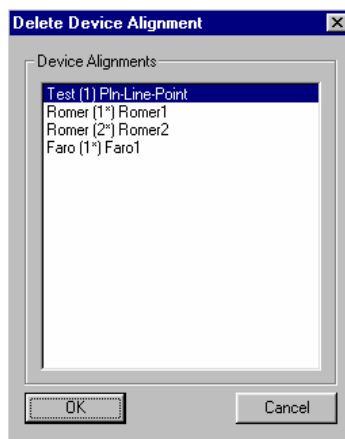
Select Align

This feature presents a list of all of the defined device alignment systems. Select the alignment system to activate and then select **OK** to accept, or **Cancel** to ignore your changes.



Delete Align

This feature allows you to delete existing device alignment systems. Simply select the alignment that you want to delete and click **OK** to accept.



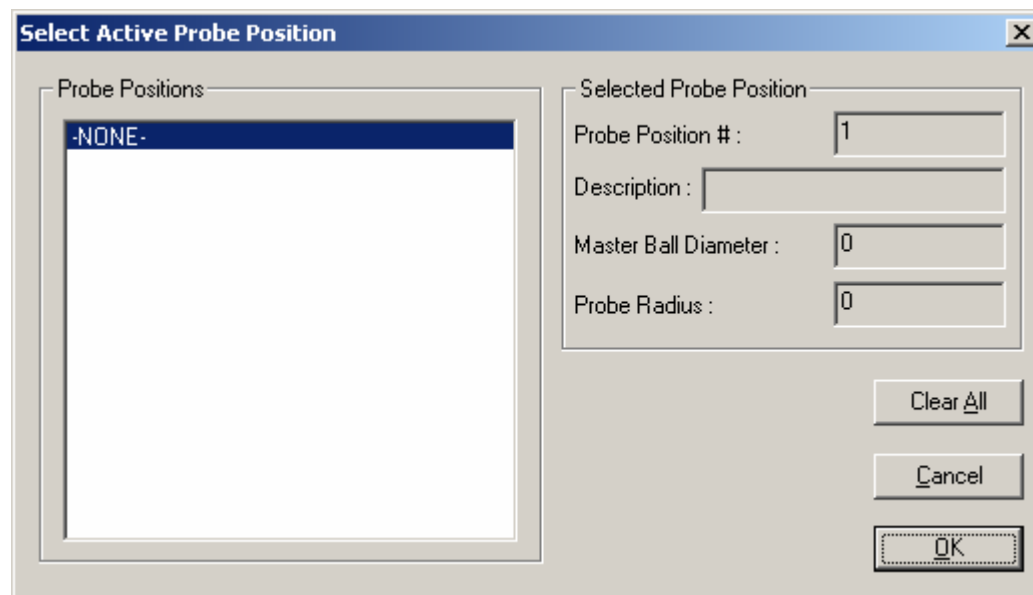
Qualify Probe

The **Qualify Probe** option on the **Align Device - Main Menu** allows you to use your data collection device to measure a master sphere, of known size, in order to calculate the exact size of the probe. You may collect as few as five points, or as many points as you desire, in order to define the sphere. Collecting more points will provide a more accurate measurement of the sphere.

After the **Align Device - Input Menu** appears, you may begin collecting points on the known sphere. After a sufficient number of points had been collected, you will be prompted for the radius of the master sphere. Enter this information in the prompt area and hit the Enter key. The size of the probe radius will be set and displayed.

Select Probe

Select active probe position.

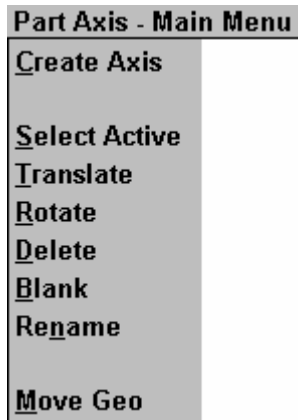


Probe Radius

If you know the radius of your probe, you can use the **Probe Radius** option, from the **Align Device - Main Menu**, to input this dimension. A standard edit box appears at the bottom of the screen. Type the value of the probe radius into the edit box and then press ENTER. Verisurf will begin using the entered value for all subsequent measurements.

Part Axis

The **Part Axis – Main Menu** provides options to create and manipulate different align-



ment axes related to your CAD model. Here is the menu and a description of the options.

Create Axis

The **Create Axis** command allows you to create alignment axes related to your CAD model's geometry. These alignments can be assigned text names that are stored with your CAD model. Examples and detailed discussion will follow later in this chapter.

Select Active

The **Select Active** feature allows you to select an existing part axis from a list of named alignments. There are also options to set the current construction plane and graphics view to the selected alignment axis. Samples and discussion will follow.

Translate

This command will allow you to perform a linear transformation on an existing alignment system.

Rotate

This command will allow you to perform a rotational transformation on an existing alignment system.

Delete

This function allows you to delete an existing alignment system from the database. Be careful with this command, as you will not be able to easily recover a deleted alignment.

Blank (UnBlank)

This function allows you to blank and unblank existing alignment systems. You can select these alignment systems from a list of named systems.

Rename

Use this option to change the name of a part axis.

Move Geo

This function allows you to select geometry from your CAD model and translate that selected geometry between existing alignments. Examples and detailed discussion will follow later in this chapter.

Create Axis

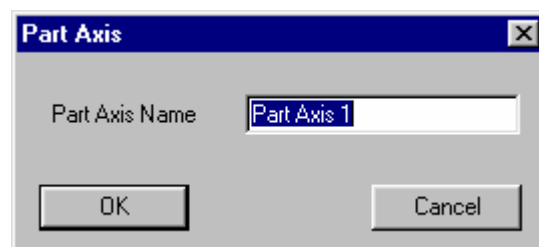
The **Create Axis** command allows you to create alignment axes related to your CAD model's geometry. These alignments can be named and are stored with your CAD model. Here is the menu you will see when you select **Create Axis** from the **Part Axis – Main Menu**.



3 Points

This method of part axis definition is similar to the 3 Points method for device alignments in that the first point selected represents the origin of the new alignment axis, the second point selected represents the positive X axis, and the third point selected represents the positive Y axis.

After the three points have been selected, Verisurf will present you with the following dialog box:



This dialog is used to name the new alignment axis. The default name is **Part Axis #**, where “#” is one greater than the highest alignment axis in the database. You may rename this alignment to anything appropriate to your situation, or use the default name. Select **OK** to accept the new alignment, or select **Cancel** to abort the definition of this alignment system.

Once the alignment axis has been defined and named, Verisurf will create geometry in the database that represents the new alignment system. This geometry may be blanked or placed on an inactive drawing level. Verisurf will still be able to find it and use it for reference purposes.

2 Lines

This method of part axis definition is the easiest to use. Simply select an existing line entity that represents the X-axis. The endpoint closest to your selection location will be considered to be the negative X-axis. The second line that you select will represent the Y-axis. As with the X-axis, the endpoint closest to your selection locations will be considered to be the negative Y-axis, and the point farthest from your selection location will be considered to be the positive Y-axis.

After the two lines have been selected, Verisurf will present you with the dialog box that is used to name the new alignment axis. The default name is **Part Axis #**, where “#” is one greater than the highest alignment axis in the database. You may rename this alignment to anything appropriate to your situation. You may also use the default name. Select **OK** to accept the new alignment, or select **Cancel** to abort the definition of this alignment system.

Once the alignment axis has been defined and named, Verisurf will create geometry in the database that represents the new alignment system. This geometry may be blanked, or placed on an inactive drawing level. Verisurf will still be able to find it and use it for reference purposes.

3 Planes

The 3 planes method works by selecting one plane to indicate the Z direction, a second plane for the X axis and a third plane for the origin. The planes can be selected in any order. But the third plane selected must intersect the first two planes.

After the third plane is selected, you are prompted to name the axis you created.

Plane-Line-Pt

This method of part axis definition is similar to the Plane-Line-Point method for device alignments. The first three points selected represent the plane of the new alignment axis. The next two points selected represent the negative and positive X-axis. The final point selected represents the positive Y-axis.

After the plane, line, and point have been selected, Verisurf will present you with the dialog box that is used to name the new alignment axis. Once again, the default name is **Part Axis #**, where “#” is one greater than the highest alignment axis in the database. You may rename this alignment to anything appropriate to your situation. You may also

use the default name. Select **OK** to accept the new alignment, or select **Cancel** to abort the definition of this alignment system.

Once the alignment axis has been defined and named, Verisurf will create geometry in the database that represents the new alignment system. This geometry may be blanked, or placed on an inactive drawing level. Verisurf will still be able to find it and use it for reference purposes.

Plane-Axis-Origin

This method of part axis definition is similar to the Plane-Axis-Origin method for device alignments. The first three points selected represent the plane of the new alignment axis, the next two points selected represent the negative and positive X-axis, and the final point selected represents the positive Y-axis, as well as the origin of the alignment system.

After the plane, axis, and origin have been selected, Verisurf will present you with the dialog box that is used to name the new alignment axis. Once again, the default name is **Part Axis #**, where “#” is one greater than the highest alignment axis in the database. You may rename this alignment to anything appropriate to your situation, or you may use the default name. Select **OK** to accept the new alignment, or select **Cancel** to abort the definition of this alignment system.

Once the alignment axis has been defined and named, Verisurf will create geometry in the database that represents the new alignment system. This geometry may be blanked, or placed on an inactive drawing level. Verisurf will still be able to find and use it for reference purposes.

Best-Fit

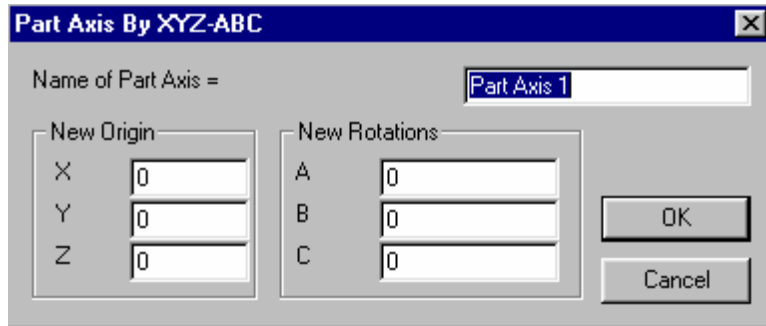
This method of part axis definition is similar to the Best-Fit method for device alignments in that the first set of points selected will be fit to the second set of points selected.

After the points have been fit together, Verisurf will present you with the dialog box that is used to name the new alignment axis. Once again, The default name is **Part Axis #**, where “#” is one greater than the highest alignment axis in the database. You may rename this alignment to anything appropriate to your situation, or you may use the default name. Select **OK** to accept the new alignment, or select **Cancel** to abort the definition of this alignment system.

Once the alignment axis has been defined and named, Verisurf will create geometry in the database that represents the new alignment system. This geometry may be blanked, or placed on an inactive drawing level. Verisurf will still be able to find it and use it for reference purposes.

By XYZ-ABC

This method of part axis definition is similar to the XYZ-ABC method for device alignments in that the values for XYZ represent the linear displacement of the origin and the values for ABC represent the rotational displacement about the origin.



Part Axis By XYZ-ABC

Name of Part Axis =

New Origin		New Rotations	
X	<input type="text" value="0"/>	A	<input type="text" value="0"/>
Y	<input type="text" value="0"/>	B	<input type="text" value="0"/>
Z	<input type="text" value="0"/>	C	<input type="text" value="0"/>

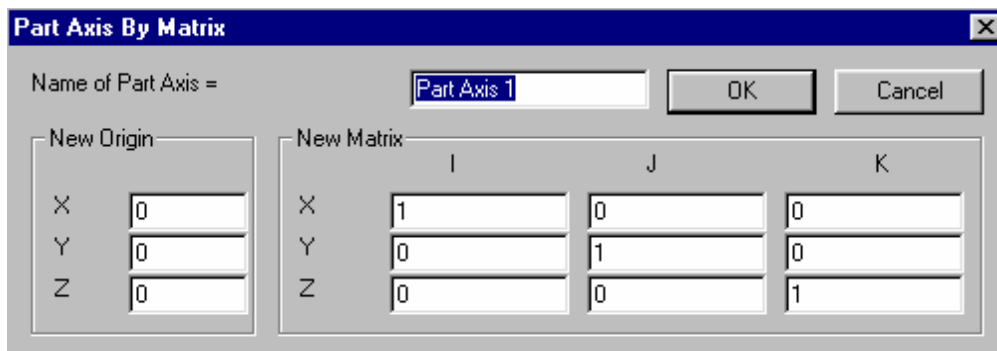
OK Cancel

After the linear and rotational transformation values have been defined, Verisurf will present you with the dialog box that is used to name the new alignment axis. Once again, the default name is **Part Axis #**, where “#” is one greater than the highest alignment axis in the database. You may rename this alignment to anything appropriate to your situation, or you may use the default name. Select **OK** to accept the new alignment, or select **Cancel** to abort the definition of this alignment system.

Once the alignment axis has been defined and named, Verisurf will create geometry in the database that represents the new alignment system. This geometry may be blanked, or placed on an inactive drawing level. Verisurf will still be able to find it and use it for reference purposes.

By Matrix

A matrix is a standard definition of an alignment in many CAD systems. Verisurf also allows you to define an alignment using this method. The dialog box for **Part Axis By Matrix** is shown here. Simply enter the values that you have determined to be appropriate, name the alignment, and click on **OK**.



Part Axis By Matrix

Name of Part Axis =

New Origin		New Matrix		
		I	J	K
X	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Y	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="0"/>
Z	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="1"/>

OK Cancel

After the matrix has been defined, Verisurf will present you with the dialog box that is used to name the new alignment axis. Once again, the default name is **Part Axis #**, where “#” is one greater than the highest alignment axis in the database. You may rename this alignment to anything appropriate to your situation, or you may use the default name. Select **OK** to accept the new alignment, or select **Cancel** to abort the definition of this alignment system.

Once the alignment axis has been defined and named, Verisurf will create geometry in the database that represents the new alignment system. This geometry may be blanked,

or placed on an inactive drawing level. Verisurf will still be able to find and use it for reference purposes.

Point Set

The Point Set alignment is one of the simpler methods of defining an alignment system. Simply select points from the screen. Verisurf will best-fit a plane through the points and use that plane as the alignment.

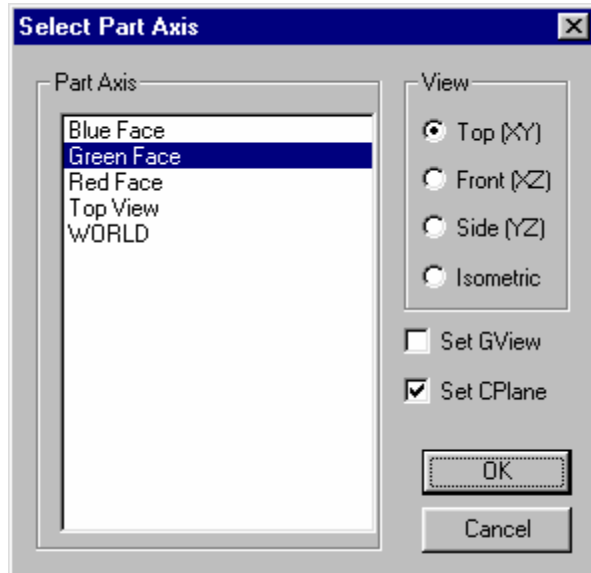
This feature does not set the alignment origin or permit you to rename the alignment.

Select Active

This feature is used to select an existing alignment system.

The dialog box displayed will allow you to select the alignment by its name. You may also select the current graphics view, which is relative to the selected alignment. For example, if your alignment system is 0,1,0,0,0,1,1,0,0 (right side) and you select **Front (XZ)**, the view will be 0,1,0,0,0,1,-1,0,0, the bottom-view with the right-edge of the part at the top of the view. This could also be described as the front-view relative to the side-view.

There are two toggle switches on this dialog box. When the **Set Gview** switch is active, Verisurf will set the graphics view according to the other settings in this dialog box. When the **Set Cplane** switch is active, Verisurf will set the construction plane to be equal to the selected alignment system.



Make the selections that you desire and click on **OK** to accept the settings. Click **Cancel** to ignore the settings and close the dialog box.

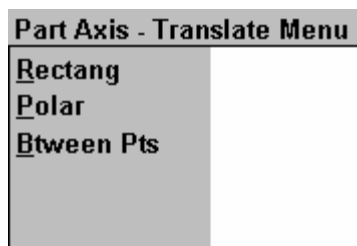
Translate (Part Axis)

This feature is used to translate an existing alignment system to a different location in space.

The dialog box displayed will allow you to select the alignment by its name. Make the selection that you desire and click on **OK** to continue. Click **Cancel** to close the dialog box and return to the **Part Axis – Main Menu**.



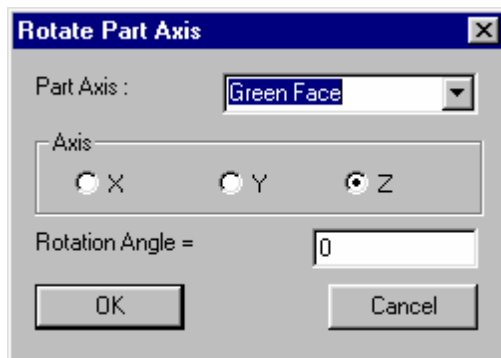
If you click on **OK** you are presented with the following menu:



Each of these options provides you with a way to define the translation relative to the alignment system's current position. These translations are defined in a manner identical to the translations for geometry. See the *Mastercam Design Reference Manual* for more information.

Rotate (Part Axis)

This feature is used to rotate an existing alignment to a different location in space.



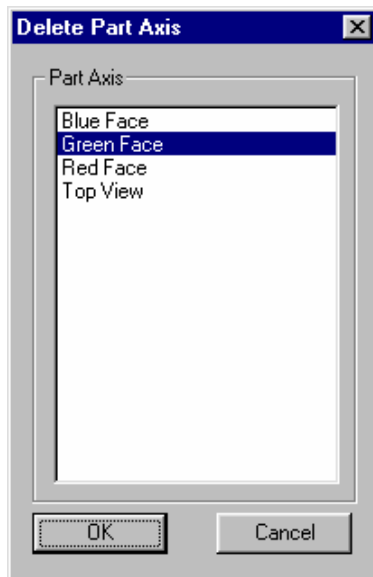
Select the alignment system name from the **Part Axis** list box (click the arrow to the right of the displayed alignment name). Select the **Axis** to rotate about, and enter the **Rotation Angle**.

Click on **OK** to accept the settings and perform the rotation. Click **Cancel** to ignore the settings and close the dialog box.

Delete (Part Axis)

This feature is used to remove an existing alignment system from the database.

Select the alignment system to delete, by name, from the list.



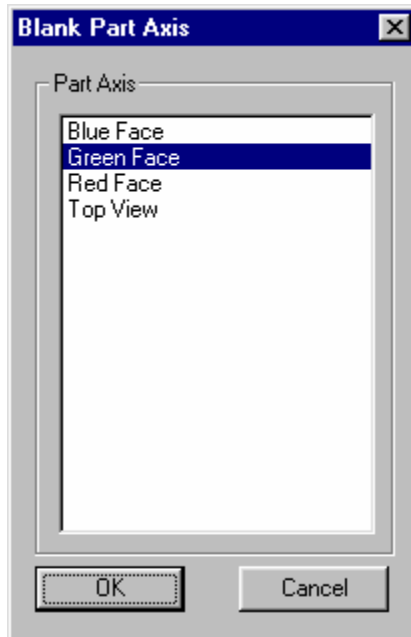
Click on **OK** to perform the deletion. Click **Cancel** to close the dialog box and abort the deletion. Be aware that once an alignment has been deleted there is no way to undo or recover that alignment. You will have to redefine the alignment if you need it again.

Blank

This feature is a toggle to blank (hide) and un-blank (show) the geometry that represents the part axes that you have created with Verisurf.

It is often desirable to remove the notes and lines created by **Part Axis** from the geometry screen. This method is recommended because of its ease of use.

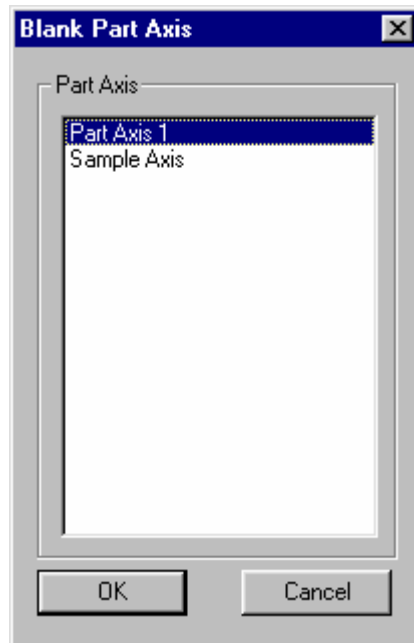
When you select **Blank**, you will see a list of the part axes.



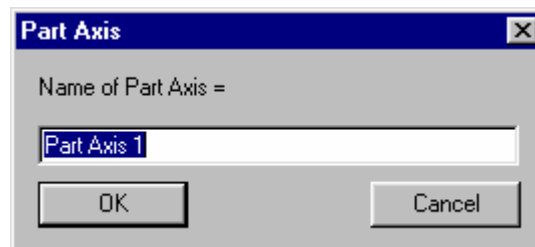
Select the desired part axis name from the list and click on **OK**. If the part axis is visible, it will become blanked. A blanked part axis will become visible.

Rename

Click this option to display a list of the named part axis. Highlight a part axis and click **OK**.



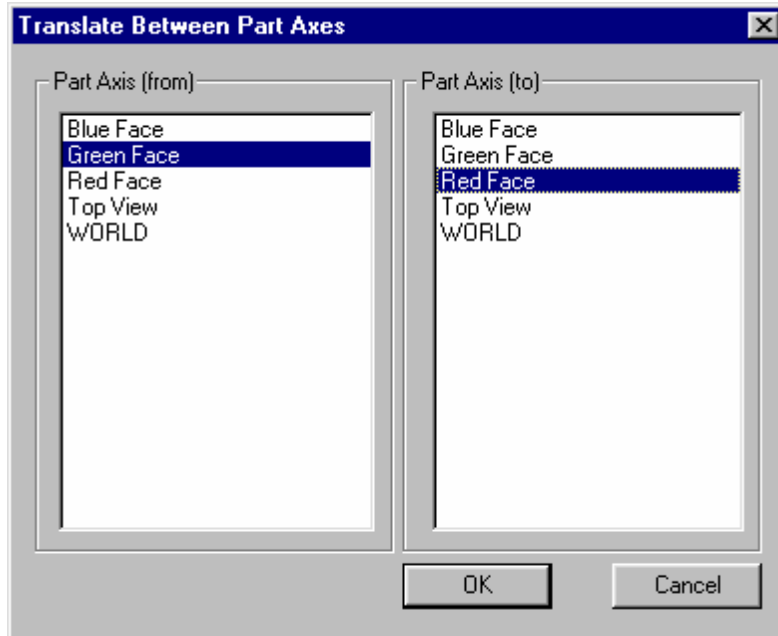
Type the new name for the part axis and click **OK**.

***Move Geo(metry)***

This feature is used to move existing geometry from one alignment system to another.

You are first prompted to select the geometry that you want to move. All of the standard entity-selection methods may be used for this feature. Click **Done** when you have selected the desired geometry.

Next, a dialog box is displayed that allows you to select the starting and ending alignments by name.



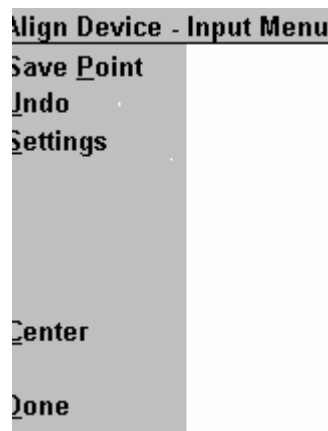
Make the selections that you desire and click on **OK** to continue. Click **Cancel** to close the dialog box and return to the **Part Axis – Main Menu**, without moving any geometry.

Coordinates

The Coordinates feature performs two functions. It displays the coordinates of the

BW X = +0.6357, Y = -9.6257, Z = -0.0128

probe location. The first character represents the device alignment. The letter “B” indicates that the positions of the Z, Y and X points are measured relative to the Base alignment. If the active alignment system is one that has been aligned to the CAD model, this first character would be an “A.” The second character represents



the active part axis; “W” means World and “P” means that a part axis has been defined.

The Coordinates command simultaneously displays the **Align Device – Input Menu**. You can use this to create 3d points relative to the current device alignment, regardless of the current construction plane and Z settings.

OnLine

This option toggles between **OnLine** and **OffLine** to indicate when Verisurf is communicating with your data collection device. When your device is on-line it can collect points. Otherwise, you can select data from the CAD model.