Verisurf Build™

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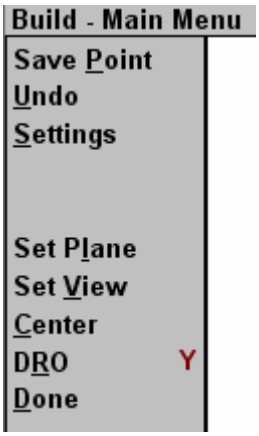
Build - Main Menu

The Verisurf Build program is designed to eliminate fixed tooling for assembly purposes. The “graphical tool building” capability of this software means that you can assemble your products dynamically, instantly comparing the assembly to the CAD model. You can also use these tools to dynamically inspect products as the individual components are manufactured (yes, measure it on the machine!) This is the Virtual Gage™

Here is the **Build - Main Menu**. A description of the options will follow.



Build

The **Build** option, on the **Build - Main Menu**, was originally intended to start the dynamic point collection process for all data-collection devices. However, the software has been modified to begin the dynamic point collection process for all data-collection devices that do not require a “start” command.

For data-collection devices that do require a start command, simply selecting **Build** will cause Verisurf to send the appropriate signal to your data-collection device.

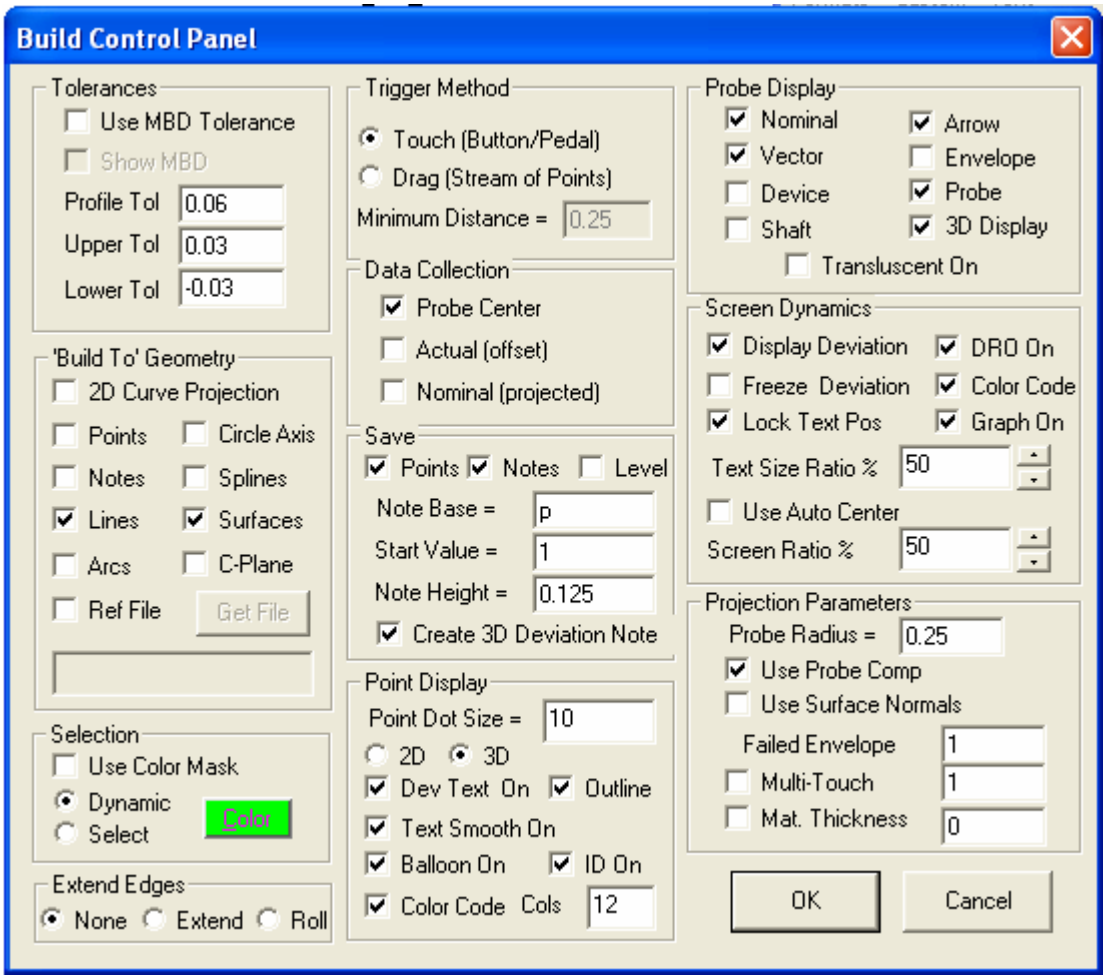
You will see a circle (or sphere) on the graphics screen. This circle represents the probe on your data-collection device. The circle has the radius that you have specified as the **Probe Radius**. As you move the stylus (Probe) of your data-collection device through space, the circle or shaded sphere also moves in a corresponding direction.

You will also see a wire frame or shaded arrow that is drawn on the graphics screen next to the probe circle. This arrow will either point away from or toward the CAD model. The direction of the arrow is intended to show which direction the work piece needs to move in order to match the CAD model. The arrow is colored either red (too close to the CAD model), yellow or green (in tolerance), or blue (too far away).

Settings

The **Build Control Panel** contains many different types of settings that affect the way that Verisurf interprets, and stores data collected by your measuring device. There are settings for tolerances, types of geometry to project to, switches for types of points to save, display settings, compensation settings, and more.

Here is the **Build** Control Panel and a description of each setting:



Tolerances

Use MBD Tolerance
MDB tolerance refers to Model Based Definition. This enables the operator to use feature names and geometric tolerance annotations that are associated to the model entities.

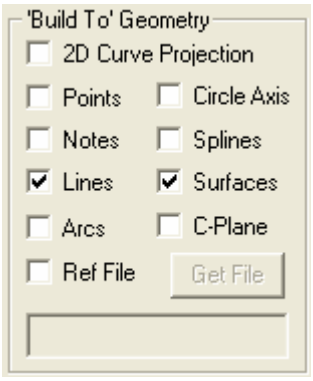
Show MBD
Show MDB tolerance allows the operator to view the real-time visual true-to-view dynamic text display

Profile
Profile tolerance refers to the full bilateral or unilateral form tolerance to be inspected. This tolerance is logically "linked" together with the Upper and Lower Tolerance. That is to say, the Profile Tolerance is always the difference between the Upper Tolerance and the Lower Tolerance. If you change the Profile tolerance, the Upper and Lower Tolerance are automatically adjusted to be half of the Profile Tolerance. If you change either the **Upper** or **Lower** Tolerance, it's counterpart is adjusted to be the **Profile** Tolerance minus the tolerance that you have changed.

Upper
The Upper Tolerance is the maximum upper deviation allowed for any CMM data point before it is considered to be a "bad" or "blue" point.

Lower
The Lower Tolerance is the maximum lower deviation allowed for any CMM data point before it is considered to be a "bad" or "red" point.

'Build To' Geometry



This collection of check boxes allows you to specify which types of geometric entities that you want Build to project to. Check only the geometry that you want to build with.

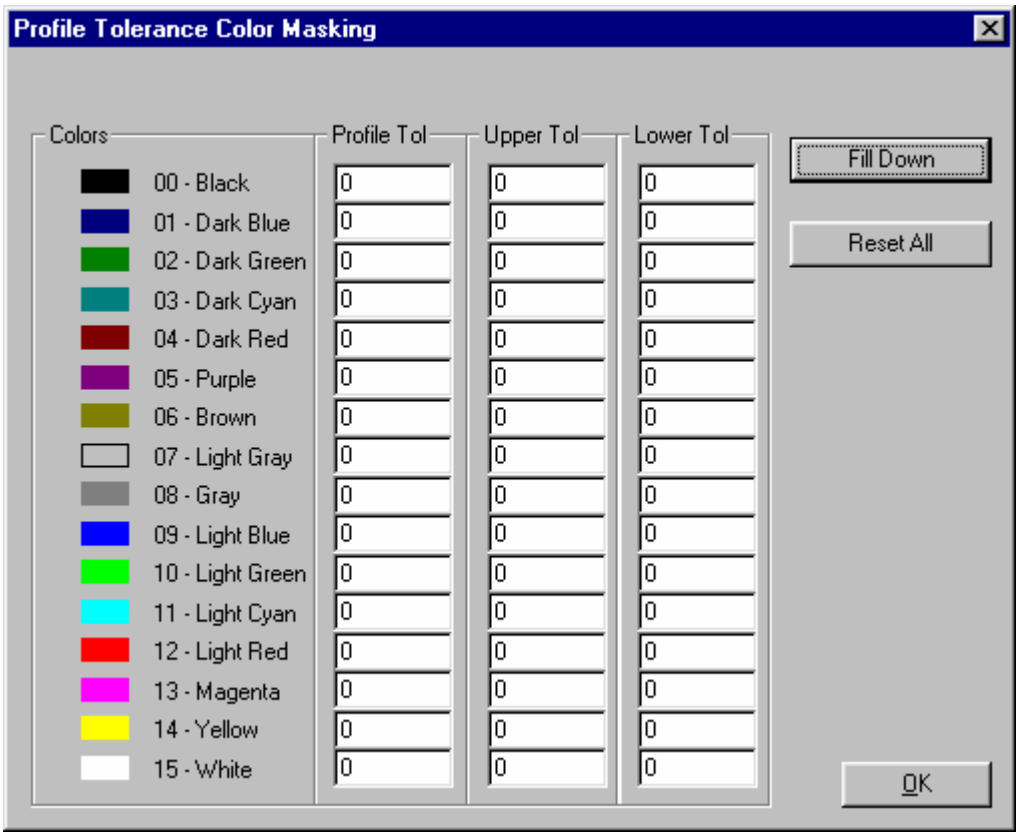
2D Curve Projection
2D Curve Projection allows you to inspect splines, lines, and arcs in a 2D environment. The view on the screen will be viewed as a 2D view and eliminate any measurement error that may be occurring due to the thickness or thinness of the part. Only the vertical and horizontal directions will be used to calculate the 2D distance to the element being "built to" in Build settings. This enhancement will work in conjunction with the new Set View and Set Plane features recently installed in Build menu. It is used primarily for the aiding of scribing trim lines on check fixtures. Many check fixtures are prone to having surface profile that may be off .250 or more. The operator will be able to tilt his probe arm to where he is perpendicular to the surface he is "laying out". Using the Set View and Set Plane the screen display will rotate so that the surface being "layed out" is visible. Using Build the operator can then move the probe along the surface until the point of the probe is within the tolerance zone of the view.

Ref File
Ref File lets you read screen Geometry from a reference file created with Verisurf's **Reports** option, on the **Verisurf Family of Products** menu. A reference file could also be created with a text editor. But it must end with and extension of .REF.

After you check the **Ref File** box, you can click the **Get File** button to navigate to the location of the reference file. You can also use the text box to type the path to the reference file. By default, reference files are stored at C:\Mcam9\Design\MC9\Verisurf.

Selection

Tolerance Mask
Verisurf Build will soon allow the definition of multiple tolerances. To activate this feature select the **Use Tolerance Mask** check box. Then click the **Tolerance Mask** button to display the Profile Tolerance Color Masking box.



To Define Multiple Tolerances:
Type the profile tolerance for each color that your project uses. This tolerance is logically "linked" together with the **Upper** and **Lower Tolerance** and the **Weight**. **Weight** is used in the Best-Fit routine of Verisurf Analysis.

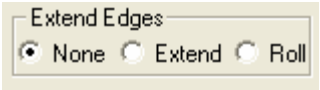
Fill Down
Enter a new probe radius for any color and click this button.

This is a convenient way to automatically fill in the probe radius from the point that is highlighted to the bottom.

Reset All
This will set all fields to the probe radius typed using the **Probe Radius** command.

Type the probe radius for each color that your project uses.

Edges



None
Selecting this box will cause Build to stop projecting once the probe moves past either end point of the entity.

Note: This only works for the lines, arcs and surfaces geometry types.

Roll Around
Selecting this box will cause Build to "attach" itself to the endpoint of an entity once the probe has moved past that endpoint. As the probe moves through space, near the end point of the entity in question, Verisurf will remain focused on that endpoint. It will report the deviation to that endpoint until the probe becomes closer to another entity or the probe moves past the "failed envelope" relative to that entity.

Note: This only works for the point, note, line, arc, and spline geometry types.

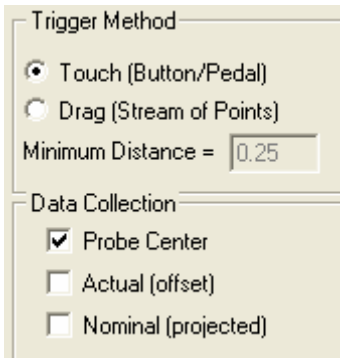
Extend
Selecting this box will cause Build to project onto the mathematical extension of a geometric entity.

Note: This only works for the point, note, line, arc, and spline geometry types.

Dynamic
This setting will cause Verisurf to use all of the visible geometry on the screen that matches any selection in the **'Build To' Geometry** section of the dialog box.

Select
This setting will cause Verisurf to prompt you to select the CAD model geometry with which to make all comparisons.

Trigger Method



Touch (Button/Pedal)
The **Touch (Button/Pedal)** trigger method indicates to Verisurf that your data-collection device has some type of switch and 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 a point collection is desired.

You can also collect a point by selecting the **Save Point** command, in the **Build – Main Menu** or by the left mouse button in the graphics screen.

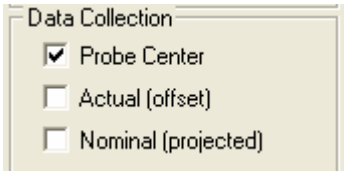
Drag (Stream of Points)
Most data-collection devices have the ability to output a constant stream of positional data to the Verisurf computer. Verisurf can constantly read the positional data and record points, as they are collected. This type of trigger method is most commonly used where a solid or hard stylus is attached to the data-collection device.

Note: Most devices require a button to be pressed and held to use the drag method.

Number of Points
This setting indicates the number of points that will be collected. This feature works for both the trigger and drag methods of data collection. 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 **Build - Main Menu**.

Min. Distance
This option becomes available when the **Drag (Stream of Points)** option button is selected. Use this feature to limit the collection of points to those points that are separated by the distance that you specify.

Data Collection

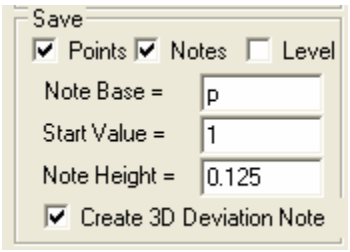


Probe Center
Check this box to save points at the center of the probe. In other words, this point is uncompensated. This is the raw **CMM Point.**

Actual (offset)
Check this box to save points that are compensated by the probe radius. This compensation is in the direction of the normal projection to a geometric feature. This can be considered to be the touch point. Note that this feature only works when the **Enable Probe Comp** is checked, in the **Projection Parameters** group box.

Nominal (projected)
Check this box to save points at the perpendicular projection point on the geometric feature. This is considered to be the "nominal point."

Save



Points
Check this box to create point entities at the locations saved by the data-collection device.

Notes
Check this box to create note entities at the locations saved by the data-collection-device.

Check both boxes to save points and notes.

Level
Check this box to have the point and/or note placed on the same level as the entity being measured.

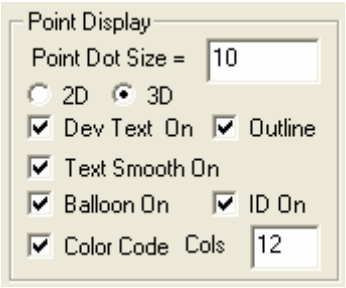
Note Base
This string of characters is inserted at the beginning of the text created for saved notes. It serves as a label to describe the note that succeeds it. The text of each note is added to the end of these characters to form the entire note string.

Start Value
This integer value is inserted before the first note that is created. It serves as a way of consecutively numbering the notes. With the creation of each new note, it's value will be incremented by "1." If a **Note Base** string has been specified, this number will be positioned between the Note Base and the note.

Note Height
This is the physical height of the notes that are created at the data collection locations.

Create 3D Deviation Note
Check this box to create notes at the point location that displays the 3D deviation.

Point Display



Point Dot Size
This will set the size of the point being displayed during data collection. The point will turn to the predetermined size when data collection ends.

2D/3D
2D will take the points in a 2 dimensional environment. The points will appear on the Construction Plane, therefore appearing in a flat pattern.

3D will take the points in a 3 dimensional environment. The points will appear in their actual position in relationship to the CAD model.

Dev Text On
Checking this box will display the deviation value at the actual points location during build mode. Values will disappear when measuring is completed. **Outline** will put a box around the numbers.

Text Smooth On
Checking this box will create a clearer display of the deviation on the projected point.

Balloon On

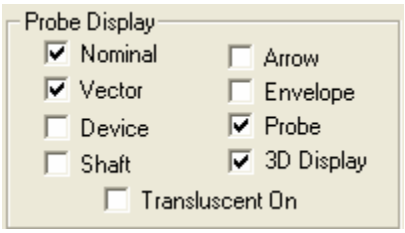
Checking this box will create the deviation away from the projected point and place a leader to the point. Checking the **Outline** box will create a balloon around the numbers.

ID On
Checking this box will attach the identification of the entity being measured to the balloon.

Color Code
The **Color code** display is used to show the user which points are in tolerance (good points) or out of tolerance (bad points). Green is good. Red and blue are bad. Red means that the surface is undersize and blue means its oversize.

Cols
This feature set the maximum number of balloons in a column around the screen.

Point Display



Nominal
This check box tells Verisurf to display a point at the nominal location. The nominal location is the projected point on the CAD model.

Vector
This check box tells Verisurf to display a vector line from the CAD model to the probe center at a length equal to the distance of the 3D deviation.

Device
This check box tells Verisurf to display an image of the measuring device.

Shaft/Beam
Check this box to show the shaft of a probe or the beam of a laser. Displays a red dotted line from the CMM device zero position (base position) to the current location of the probe center. This dotted line simulates a laser tracker beam.

Arrow
This check box tells Verisurf to display an arrow at the current data-collection device location. This arrow will indicate, with its direction and color, which way to move the workplace so that it will more accurately match the CAD model. When **Enable Auto Point** is selected, it will guide the probe to a line.

Envelope
This check box tells Verisurf to display a circle at the current data-collection device location. This circle will have the radius specified by the **Failed Envelope** setting on this control panel. The circle will be shown with a dashed line.

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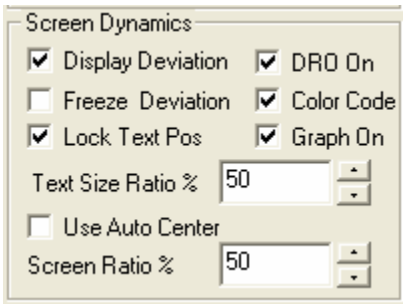
3D Display

A three dimensional probe can be displayed as either **Shaded**  or **Wireframe** 

Screen Dynamics



DRO On
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. Set this check box to view the DRO.

Projection On
This causes the display of the coordinates of the probe position.

Text Ratio %
This controls the size of the displayed coordinates.

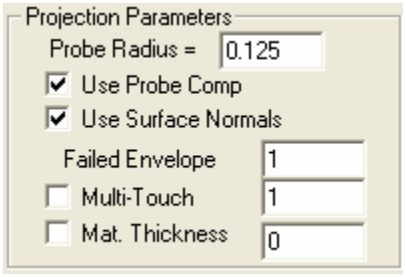
Color Code
When Color Code is turned on, the coordinates are displayed in the same color as the probe.

Enable Auto Center

This option causes Verisurf to automatically shift the graphics screen in a way that keeps the data-collection device position at the center of the screen**.**

Screen Ratio %
When **Screen Ratio %** is set to a lower number, less movement of the probe is required before the graphics screen will shift. This caused the graphics screen to redraw more frequently.

Projection Parameters



Probe Radius
It is important to set the **Probe Radius** before using Verisurf. This setting is for the display of the probe ball and the amount used for probe compensation.

Use Probe Comp
Check this box to subtract the probe radius from the true 3D distance of the probe center to the CAD Model.

Use Surface Normals
When Verisurf projects a point onto a CAD model surface, the error is assumed to be less than the probe radius. That is to say, Verisurf will consider the probe to be on the same side of the surface as the collected point. This may or may not be the case with your model.

Verisurf has the ability to use the geometrically defined surface normal of each surface in your CAD model. The benefit of this method is to ensure that Verisurf correctly understands which “side” of the surface the probe was on when the point was collected. If a point is on the “wrong” side of the surface, Verisurf will understand and calculate the correct deviation for that point. When surfaces are developed from a solid modeling system, the chances are good that all of the surface normals are pointing “outward” from the solid part of the model. You may have the habit of creating all of your CAD surfaces with the normals pointing “out”. There is always the option of manually setting the surface normal for each surface.

Regardless of the method used to ensure the surface normal integrity, the **Use Surface Normals** method, which ensures proper calculation, is the preferred technique. When using a very large probe (such as a tracker ball), the surface normals are not as important because the chances of your part being out of tolerance more than the probe radius (typically 0.750) are diminished (depending on your process), but not eliminated.

Failed Envelope
When a point is successfully projected onto a CAD model entity, Verisurf checks to see if the calculated deviation is within this range. If the entity is outside of the **Failed** envelope, it is considered a failed projection.

Multi-Touch
Verisurf projects each collected point onto each CAD entity. Verisurf will normally consider the entity that is the closest to the collected point to be the only valid answer.

Many CMM users like to collect points at the intersections of multiple surfaces. For example, a tracker user may drag the tracker ball along a crease in the part, thereby collecting points that are valid for more than one surface. If you put the probe in the bottom corner of a pocket and collect a point, that point is valid for at least three surfaces (two sides and the floor).

Because of the accuracy of your part and your CMM, the collected point may be (and probably is) closer to one of the surfaces than the other(s). In this case, Verisurf will use only that closest surface for analysis.

Verisurf has the ability to retain knowledge of all the entities that each collected point can successfully project onto. Successful projections must lie within the specified "Multi-Touch Envelope" to be considered valid projections.

When using the Multi-Touch feature, set the **Multi-Touch** entry field value to be equal to at least one probe radius.

Mat. (Material) Thickness
Some applications require the back-side of a "skin" type of part to be digitized when the CAD model contains surfaces of the front side of the skin.

You may adjust this value to reflect the thickness of the skin. Verisurf will automatically adjust all calculations and projections by this amount.

Save Point

This menu option exists for those types of data-collection devices that do not have a button, trigger, or switch to activate Verisurf's data collection function. When you are not using one of the automatic collection capabilities, you are required to use this menu item to perform the collection.

Simply press the "P" key, or click **Save Point** with the mouse and Verisurf will record the current data-collection device position. Whether a point is created in the database or not is dependent on the **Save** settings on the **Build Control Panel** (see Settings). Be sure that the box for **Points** is checked.

Undo

This command causes Verisurf to erase the last collected point.

You must use the **Undo** command before you exit the current data collection function. You may use **Undo** consecutively until all points in the current collection have been erased. **ALT "U"** will erase all collected point taken in that session.

Center

This command shifts the graphics screen with the current data-collection device position at the center of the screen.

This can be useful for larger CAD models where you work with smaller areas and you do not have the entire model on the screen.

Simply press the “C” key, or click on the **Center** menu item with the mouse and Verisurf will perform the repositioning of the probe to the center of the screen.

Now you can cause Verisurf to automatically perform this centering function. The **Enable Auto Center** feature can be turned on in the **Build Control Panel**.

Done

This command is used to stop the build process.

This command duplicates the function of the **BACKUP** menu operation button and the ESC key.

Probe Radius
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Enable Probe Comp
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You may adjust this value to reflect the thickness of the skin. Verisurf will automatically adjust all calculations and projections by this amount.

Quick Build
Activating this check box will cause Verisurf to search only those surfaces that are very close to the current CMM probe location. If you find that data collection is slower than desired, you can turn this switch on and Verisurf will run faster. This setting has no effect on CAD points and curves.

Screen Dynamics

DRO On
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. Set this check box to view the DRO.

Projection On
This causes the display of the coordinates of the probe position.

Text Ratio %
This controls the size of the displayed coordinates.

Color Code
When Color Code is turned on, the coordinates are displayed in the same color as the probe.

Enable Auto Center

This option causes Verisurf to automatically shift the graphics screen in a way that keeps the data-collection device position at the center of the screen**.**

Screen Ratio %
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Save Point

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Undo

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Set Plane

This command shifts the graphics screen with the current data-collection device position at the center of the screen.

This can be useful for larger CAD models where you work with smaller areas and you do not have the entire model on the screen.

Simply press the “C” key, or click on the **Center** menu item with the mouse and Verisurf will perform the repositioning of the probe to the center of the screen.

Now you can cause Verisurf to automatically perform this centering function. The **Enable Auto Center** feature can be turned on in the **Build Control Panel**.

Set View

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DRO

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This command duplicates the function of the **BACKUP** menu operation button and the ESC key.