



Verisurf Tools™

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About Verisurf Tools

The **Verisurf Tools** menu provides various options to make your projects progress more smoothly. Here is the **Verisurf Tools** menu and a brief description of each tool. Detailed descriptions will follow.

Planes

The **Planes** command allows you to create planes using a variety of methods.

Centre

Calculates the center point of various geometric entities, such as a sphere, circle, plane, or cylinder

Hole Axis

Returns the centerline of a surface that is of a cylinder shape.

Pierce

Calculates the pierce point of a vector and a surface.

Surface Grid

Provides methods for creating a grid of points on CAD surfaces.

Tool Ball

Returns a point that is an offset from a face surface on the centerline of a surface that is of a cylinder shape (Hole).

Levels

Provides dozens of utilities to manipulate the drawing levels of CAD entities.

Name Points

An easy way to create point labels.

MBD

Due to the extent of this manual Model Based Definition will be covered under a separate manual.

Point Filter

An obsolete tool to filter points by distance. The new filter is located in the POINTCLOUD menu under REVERSE.

Verisurf Tools

Planes

Centre

Hole Axis

Pierce

Surface Grid

Tool Ball

Levels

Name Points

MBD

Point Filter

Planes

Analyze
Create
LSQ Fit
Fit w/i Tol
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Grow
Shrink

The Verisurf **Planes** tool provides many useful tools to analyze, create, and manipulate planer surfaces. Here is the **Planes: Main Menu** and a description of each feature.

Analyze

The **Analyze Menu** contains features that measure the angle or distance between planes, and the flatness, parallelism, and perpendicularity between a group of points and an existing plane entity. These tools are described below.

Planes: Analyze Menu

Angle
Distance
Flatness
Parallelism
Perpendicular

Angle

This feature will prompt you to select two different planes or planar entities. Verisurf will calculate the angle between the two planes and display the angular value on the status line, at the bottom of the graphics screen.

Verisurf will also display the calculated error per inch that the angle represents.

Distance

This feature will prompt you to select two different plane or planer entities. Verisurf will calculate the distance between the two planes and display the value on the status line, at the bottom of the graphics screen.

If the planes are not parallel, Verisurf will display the angle between the planes and the error-per-inch that the angle represents.

Flatness

The flatness feature compares a group of point entities against an existing plane or planer entity.

Select a group of points using the standard entity selection methods. Next, select a plane or planer entity. Verisurf will calculate a best-fit plane through the selected points, calculate the flatness of the selected plane against the calculated plane, and display the results in the status line, at the bottom of the graphics screen.

Parallelism

The parallelism feature compares a group of point entities against an existing plane or planer entity.

Select a group of points using the standard entity selection methods. Next, select a plane or planer entity. Verisurf will calculate a best-fit plane through the selected points, calculate the parallelism of the selected plane against the calculated plane, and display the results in the status line at the bottom of the graphics screen.

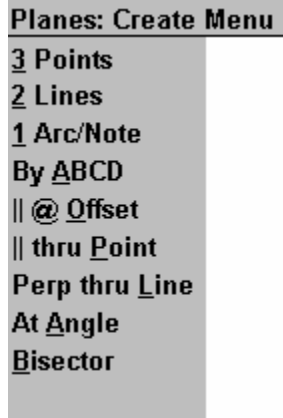
Perpendicular

The perpendicular feature compares a group of point entities against an existing plane or planer entity.

Select a group of points using the standard entity selection methods. Next, select a plane or planer entity. Verisurf will calculate a best-fit plane through the selected points, calculate the perpendicularity of the selected plane against the calculated plane, and display the results in the status line at the bottom of the graphics screen.

Create

Verisurf provides many versatile tools for creating plane entities. Here is the **Planes: Create Menu**, along with a description of each option.



3 Points

3 Points creates a plane defined by three points. The normal direction of the plane is determined by the order of selection of the three points. The first point is considered to be a vertex, the second point is considered to be in the positive X direction, and the third point is considered to be in the positive Y direction.

2 Lines

The **2 Lines** option creates a plane defined by two lines. The two lines must be coplanar. The normal direction of the plane is determined by the order and location of selection of the two lines. The intersection of the two lines is considered to be a vertex. The endpoint farthest from the selection location of the first line is considered to be in the positive X direction. The endpoint farthest from the selection location of the second line is considered to be in the positive Y direction.

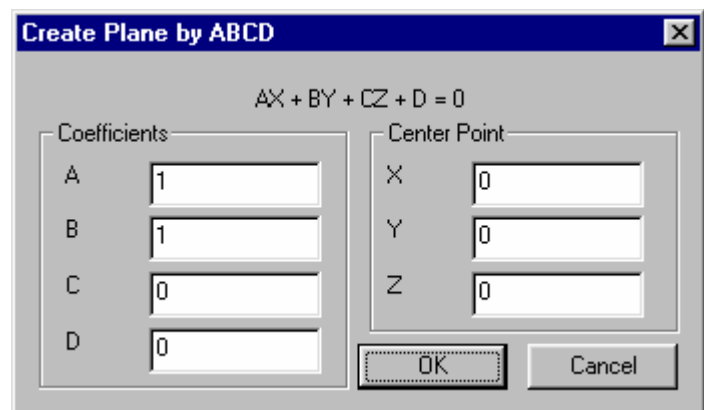
1 Arc or Note

1 Arc/Note creates a plane defined by an arc or note entity. All arc and note entities are considered planar entities. The normal direction of the plane is defined by the selected entity.

By ABCD

Click **By ABCD** to create a plane defined by the mathematical expression: $AX + BY + CZ + D = 0$. The following dialog box is displayed for you to input the coefficients of the formula. There are also settings for the origin of the plane.

Enter the values for the **Coefficients** and **Center Point**. Click on **OK** to accept the values and create the plane entity. Click **Cancel** to ignore the values and return to the **Planes: Create Menu**.



Parallel at Offset

|| @ Offset creates a plane parallel to an existing plane, at a distance from the existing plane.

Click **|| @ Offset** and select a plane entity. Type the offset distance and hit ENTER. A new plane entity will be created at the specified distance from the selected plane entity. The offset direction will be in the direction of the surface normal of the selected plane entity.

Parallel thru Point

|| thru Point creates a plane parallel to an existing plane, through a point in space.

Select a plane entity. Select a point. A new plane entity will be created at the selected point. The surface normal of the new plane will be the same as the surface normal of the selected plane regardless of the direction of offset indicated by the selected point's position relative to the selected plane.

Perpendicular through Line

Perp thru Line creates a plane that is perpendicular to an existing plane entity, and passing through an existing line entity.

Click **Perp thru Line** and select a plane entity. Then select a line entity. A new surface will be created at the midpoint of the selected line. The surface normal of the new plane will be the same as the surface normal of the selected plane regardless of the direction of offset indicated by the selected line's position relative to the selected plane.

At Angle

At Angle creates a plane at an angle to an existing plane, through an existing line.

Click **At Angle**. Select a plane entity. Select a line entity. Type the angular value and hit ENTER. A new plane entity will be created at the midpoint of the selected line. The surface normal of the new plane will be the same as the surface normal of the selected plane regardless of the direction of offset indicated by the selected line's position relative to the selected plane.

Bisector

Creates a plane that is the bisector of two existing plane entities.

Click **Bisector**. Select two plane entities. If the two planes are not co-planar then a new plane will be created. The new plane will bisect the angle formed by the two selected planes.

LSQ Fit

This feature creates a plane from a cloud of points. The plane is calculated using a least-squared formula.

Click the **LSQ Fit** command. Use the point selection options to select three or more points. Click **Done**. A new plane is created at the centroid of the selected points.

Fit w/i Tol

This feature creates a plane from a cloud of points. The plane is calculated using a tolerance-controlled formula.

Click the **Fit w/i Tol** command. Use the point selection options to select three or more points. Type the plane tolerance and hit ENTER. A new plane is created at the centroid of the selected points. The new plane will have all of the selected points within the specified tolerance.

Intersect

This feature will create a line at the intersection of two planes or planer entities.

Select a plane. Select another plane. If the selected planes are not co-planar, Verisurf will calculate the intersection of the two planes and create a line entity at that location.

Trim

This feature trims one plane entity to another plane entity. Select a plane. Select another plane. Verisurf will shrink or grow the first selected plane such that it touches the intersection of the two planes.

Grow

This feature causes a selected plane entity to grow by 10% of its current size. All directions are affected by this command. Click **Grow** and select a plane or planer entity. Verisurf will calculate the new plane and replace the selected plane with the new plane. You can select the plane again to further increase its size.

Shrink

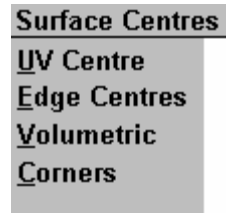
This feature causes a selected plane entity to shrink by 10% of its current size. All directions are affected by this command.

Click **Shrink** and select a plane or planer entity. Verisurf will calculate the new plane and replace the selected plane with the new plane. . You can select the plane again to further decrease its size.

Centre

The **Centre** command gives you several methods of creating points at various locations in you CAD model. Examples for the use of this feature include finding the centerpoint of a circle, the centerline of a cylinder, etc.

Here is the **Surface Centres** menu and a description of the options:



UV Centre

Creates a point at the U and V center of a selected surface.

Edge Centres

Creates points at the midpoint of selected surface edges.

Volumetric

Creates a point at the volumetric center of a selected surface.

Corners

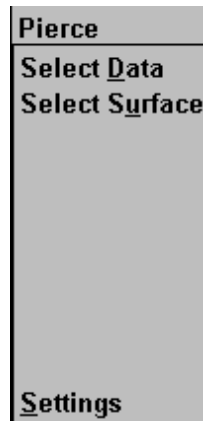
Creates points at the endpoints of selected surface edges.

Pierce

The Pierce feature creates points at the intersection of line entities and surface entities. There are a few options to control the behavior of Pierce.

It is not necessary to select any of the menu options to use Pierce. Simply begin selecting line entities with the mouse, and Verisurf will automatically find the closest surface(s) and create point(s). See the options menu to control the number of points created.

Here is the **Pierce** menu and a description of the options



Select Data

Choose this option when you want to select many lines at once. You may use any of the standard Design entity-selection methods, such as **Window** or **Only**. Click **Done** when you have finished selecting entities. Verisurf will create all of the pierce-points that it can find.

Select Surface

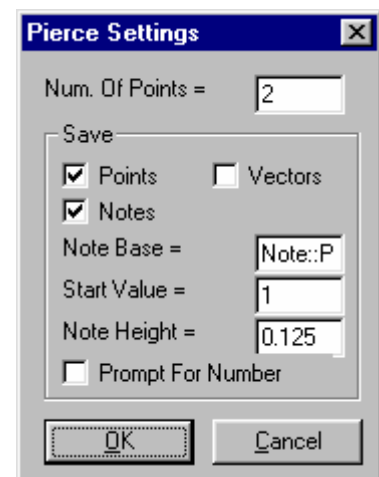
This option enables you to specify individual surfaces on which pierce-points are created. Select **Done** when finished and Verisurf will return to the **Pierce** menu, shown above. Proceed with the line selection as described.

Verisurf provides options for Pierce that you can control with the **Pierce Settings** dialog, as shown here:

Settings

Num. Of Points =

This is the maximum number of points that Pierce will create for each selected line entity. Usually, you will want only the pierce point closest to the selected line. However, sometimes it is desirable to pierce more than one surface with the same line.



Points

Select this checkbox to cause Verisurf to save point entities in the database. The points will be on the pierced surfaces.

Vectors

Select this checkbox to cause Verisurf to save one line, with a length of one inch, at each pierce location. These lines will have the same direction as the originally selected lines.

Notes

Select this checkbox to cause Verisurf to save note entities at the pierce locations.

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.

Save: Note Height

This is the physical height of the notes that are created at the pierce locations.

Save: Prompt for Number

If this checkbox is selected, Verisurf will prompt you for the note number (value) each time a note is to be saved.

Surface Grid

Surface Grid is a utility that creates a uniform grid of points across selected surfaces. These grids are usually used for quickly programming a DCC inspection device. There are a few different options that affect the way that this tool operates. Here is a brief description of the **Surface Grid Main Menu**:

Surface Grid

This option creates a grid that begins at the origin and progresses along the selected surfaces, creating a point at each grid location.

Project Grid - Obsolete

This option creates a grid that begins at the origin and progresses across the construction plane, projecting and creating a new point onto the selected surfaces at each grid location.

Make Outside

This utility analyzes the selected surfaces and attempts to set the surface normal of each surface to point away from the current construction plane.

Reverse Norms

This utility reverses the direction of the surface normal for all of the selected surfaces.

Sort Curvature

This is another utility that can be useful for organizing your data prior to inspection.

Color at Depth

This feature is used to assist in visualizing the depths of 3D point clouds. The selected points are analyzed to determine the extents of the Z values. This range is then divided evenly into eight sections and the points are recolored to match the different Z range values.

Depth at Color

This feature is used to separate the different colored points of a 3D point cloud. The selected points are analyzed to determine which color is used, and then the Z value of each point is set to equal the "Grid Step" multiplied by the color number.

Surface Grid

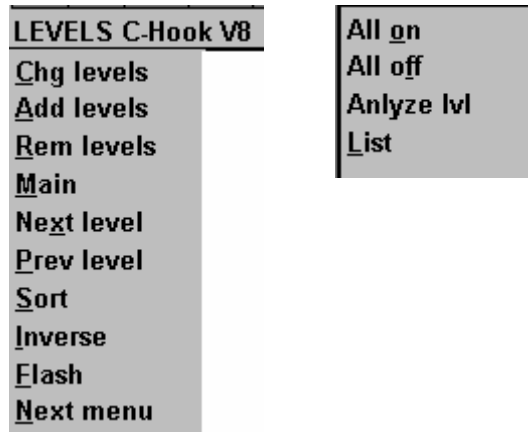
**Make Outside
Rev Normals
Sort Curvature**

**Color At Depth
Depth At Color**

Tool Ball

Levels

This feature contains dozens of useful utilities for manipulating and organizing the drawing levels of your CAD entities. Here are the **Verisurf LEVELS** menus and descriptions of each feature.



Chg (Change) Levels

Chg levels moves selected entities to a specified drawing level. This function is an improved version of the standard Design **Screen, Chg levels** function. It is intended to provide a replacement for the standard function, as this manual recommends that you replace the standard function with Levels.dll.

Click **Chg levels** and then select entities using any of the standard entity selection methods provided by Design. Select **Done** when finished or press ESC to cancel the procedure. Type the new level number for the selected entities and hit ENTER.

The default level for this feature is the current drawing level. However, this feature is modal and will remember any level that you enter until you ESC or **BACKUP**.

Add Levels

Add Levels activates drawing levels with simple keyboard input. This is faster than using the **Level** button in the Secondary menu. This feature provides the same functionality that was in the Design Version 4 software.

Click **Add levels** and then type the number of the drawing level that you want to turn on. Hit ENTER and the specified level will be displayed on the graphics screen.

You may select multiple drawing levels by separating the level numbers with a comma. For example, to turn on levels 3 and 15 you would type "3,15."

You may specify a range of levels by separating the starting level number and the ending level number with a hyphen. For example, to turn on all of the levels from 6 through 23 inclusive, you would type "6-23."

You may mix these methods of input for very specific selections. For example, you might enter something like “3,6-12,27,29.” This would add levels 3, 6 through 12, 27 and 29.

Rem(ove) Levels

Rem Levels deactivates drawing levels with simple keyboard input. This is faster than using the **Level** button in the Secondary menu. This feature provides the same functionality that was in the Design Version 4 software.

Type the number of the drawing level that you want to turn off. Then hit ENTER. The specified level will be removed from the graphics screen.

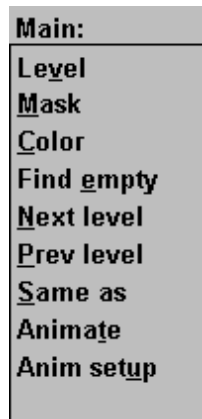
You may select multiple drawing levels by separating the level numbers with a comma. For example, to turn off levels 3 and 15 you would enter:” 3,15.”

You may specify a range of levels by separating the starting level number and the ending level number with a hyphen. For example, to turn off all of the levels from 6 through 23, inclusive, you would enter “6-23.”

You may mix these methods of input for very specific selections. For example, you might enter something like “3,6-12,27,29”. This would remove levels 3, 6 through 12, 27 and 29.

Main

Select **Main** from the **Verisurf LEVELS** menu to access these features. The **Main** option provides a sub-menu with several related features. These features will allow you to select the main drawing level using a variety of selection methods.



Level

Level activates drawing levels with simple keyboard input. This is faster than using the Level button in the Secondary menu. This feature provides the same functionality that was in the Design Version 4 software.

Click **Level** and then enter the number of the drawing level that you want to be the active drawing level. You may enter a number from 1 to 255 inclusive.

Mask (Level)

Allows selecting the active masking level with simple keyboard input, instead of using the standard dialog box. This feature provides the same functionality that was in the Design Version 4 software.

Click **Mask** and then enter the number of the drawing level that you want to be the active masking level. You may enter a number from 0 to 255, inclusive. Enter zero (0) to turn off the masking feature.

Color

Allows selecting the active drawing color with simple keyboard input, instead of using the standard dialog box. This feature provides the same functionality that was in the Design Version 4 software.

Click **Color** and then type the number of the drawing color that you want to be the active drawing color. You may enter a number from 0 to 255, inclusive.

Find Empty

Changes the main drawing level to the next empty level found.

Simply selecting **Find Empty** will cause the routine to perform its function.

The main drawing level will be set to the next level, higher than the current drawing level, which contains no entities.

Next Level

Turns off the current drawing level and changes the main drawing level to the next higher used level.

Simply selecting **Next level** will cause the routine to perform its function. The current drawing level is first turned off. The drawing level is then reset to the next higher level. Each time you click **Next level** this process is repeated. If the current level is 255, this feature will look for the next used level number starting with level 1.

Prev(ious) Level

Turns off the current drawing level and changes the main drawing level to the next lower level.

Simply selecting **Prev level** will cause the routine to perform its function. The current drawing level is first turned off. The drawing level is then reset to the next lower level. Each time you click **Prev level** this process is repeated. If the current level is 1, this feature will look for the next used level number starting with level 255.

Same As

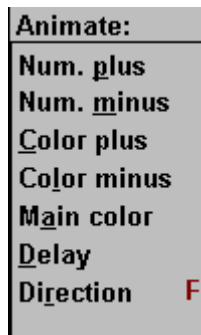
Changes the active drawing level and the active drawing color to the same as that of a user selected entity.

Click **Same as** and then select an entity with the mouse. The active drawing level, the active drawing color and the active line style will be changed to that of the selected entity.

The active Z height will be set to the Z coordinate of the endpoint closest to where you select the entity.

Animate

Animate Setup



Next Level

Turns off the current drawing level and changes the main drawing level to the next highest level number that contains entities.

Simply selecting **Next level** will cause the routine to perform its function. The current drawing level is first turned off. The drawing level is then reset to the next higher level. Each time you click **Next level** this process is repeated. If the current level is 255, this feature will look for the next used level number starting with level 1.

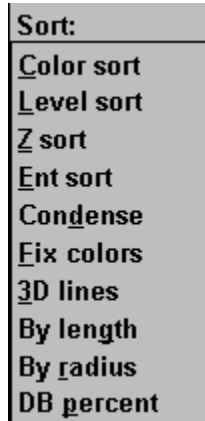
Prev(ious) Level

Turns off the current drawing level and changes the main drawing level to the next lower used level.

Simply selecting **Prev level** will cause the routine to perform its function. The current drawing level is first turned off. The drawing level is then reset to the next lower level. Each time you click **Prev level** this process is repeated. If the current level is 1, this feature will look for the next used level number starting with level 255.

Sort

The **Sort** option provides a sub-menu with several features related to sorting the entities and the levels.



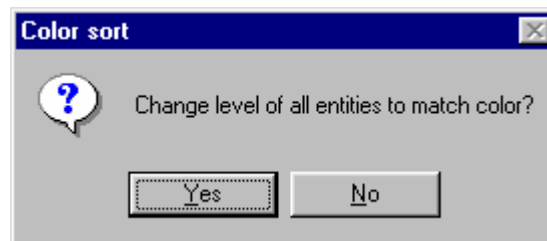
There is also a convenient tool to find entities created in the screen background color.

Select **Sort** from the **Verisurf LEVELS** menu to access these features.

Color Sort

Changes the drawing level number of all visible entities to be the equal to the selected entity's color number.

Select **Color sort** from the menu. You will be prompted with the **Sort Color** dialog



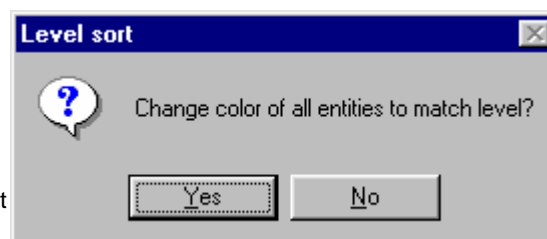
box.

Select **Yes** to change the entity drawing levels. Select **No** to cancel the procedure.

Level Sort

Changes the color number of all visible entities in the database to be the same as the entity drawing level number.

Select **Level sort** from the menu. You will be prompted with the **Level sort** dialog



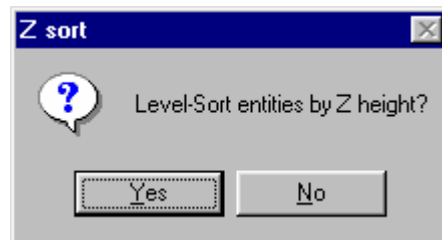
box.

Select **Yes** to change the entity colors. Select **No** to cancel the procedure.

Z Sort

Changes the level number of all visible entities in the database according to the Z height of their 2nd endpoints. The Z height of each entity is relative to the current construction plane.

Select **Z sort** from the menu. You will be prompted with a **Z sort** dialog box.

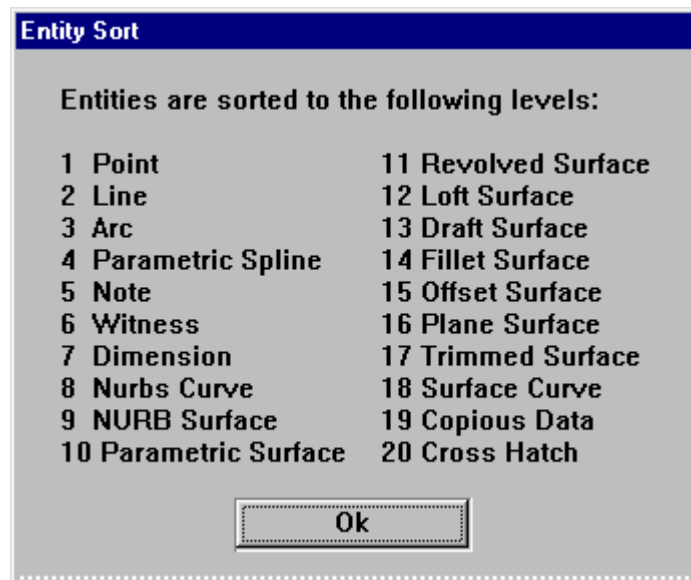


Select **Yes** to change the entity levels. Select **No** to cancel the procedure. Type the starting level and hit ENTER.

Entity Sort

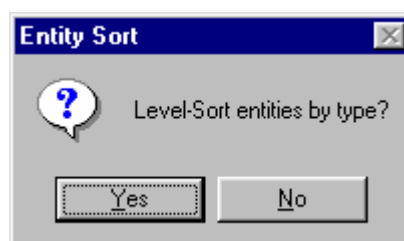
Changes the level number of all entities in the database according to the type of the entity. Each type entity will be assigned to a separate level number as specified in the **Entity Sort** display.

Select **Ent sort** from the menu. The **Sort:** menu has options for **Help** and **Do it**.



Select **Help** to view the **Entity Sort** display.

Select **Do it** to start the sorting procedure. You will be prompted with the **Entity Sort** dialog box.



Select **Yes** to change the entity levels. Select **No** to cancel the procedure.

Condense Level

Moves entities at each drawing level to the lowest numbered empty level. As level numbers are shifted downward, intervening empty levels are eliminated.

Select **Condense** from the **Sort:** menu. You will be prompted with the **Are You Sure?** dialog box. Select **Yes** to remove the empty levels. Select **No** to cancel the procedure.

Fix Colors

Changes the color of all entities that are the same color as the drawing background color.

Simply selecting this feature from the menu will cause it to perform its function. Any entity that has the same color as the background will be changed to the active drawing color. The total number of entities changed by this program will be displayed at the bottom of the screen. Press ENTER to continue.

3D Lines

By Length

By Radius

DB Percent

Inverse

Turns off all active drawing levels and turns on all inactive drawing levels.

Select **Inverse** to perform this function. All of the drawing levels that are currently turned on will be turned off and all of the drawing levels that are currently turned off will be turned on.

Flash

This feature causes all entities, on a user selected drawing level, to flash on and off.

Click **Flash** to start the selection process. The **Flash:** menu will present the **Number** and **Select** options.

Click **Number** and type the drawing level number (from 1 through 255) that you want to flash on and off. All entities of the specified level will begin to flash.

Click **Select** and pick an entity with the mouse. All entities, at the same drawing level as the entity selected, will begin to flash.

Press any key or the left mouse-button to stop the flashing.

All On

Click **All On**. All drawing levels will be displayed.

All Off

Click **All Off**. All of the drawing levels will be turned off, except for the active drawing level.

Analyze lvl (Level)

Displays the entity type of a user-selected entity, along with the total number of this entity type and the total number of all entities in the file.

Click **Analyze lvl** and then select an entity. The entity's type and summary data will be displayed at the bottom of the screen. Click additional entities to display pertinent information. The **Analyze lvl** remains active until you press ENTER.

List lvl (Level Statistics)

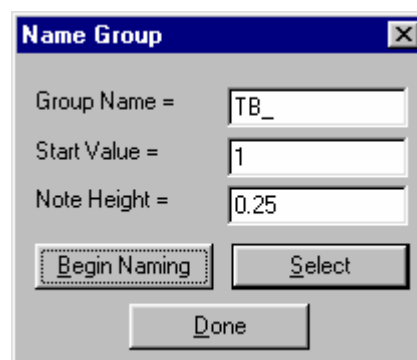
Displays a count of entity types for each drawing level. The list will also show how many blanked entities are on each level. A summary is shown at the end of the list.

Click **List lvl**. The list of level statistics will appear in a scrollable viewing window. Use the scrollbar to view the entire list.

Name Points

This feature is a convenient way to create labels to identify various points in your database, such as tooling ball locations. Verisurf will consider note entities as points, and can compare those notes to your CAD model. When notes are used instead of points, the reports generated by Verisurf will contain the text of the notes. This makes the reports easier to read and understand.

Note: These labels are created as separate entities from the points that they represent, and are not associated with the points in any way, other than that they have the same location in space. Use the **Name Entity** feature for permanent names.



Here is the dialog box for this feature, along with a description of each option.

Group Name

This is a string of text characters that each new note will begin with.

Start Value

This is the value of the number that will be added to the group name for the first point created. The value of each successively created note will be incremented by one. You may place any value greater than zero here.

Note Height

This is the actual size of the notes when they are created. There are tools to change the size of notes after they are created and this setting is not a restriction on future modifications.

Click **Begin naming** to create notes with this name group. You may then begin selecting locations at which to create the notes. You can select points individually or use the option in the **Point Entry:** menu.

Click **Select** to begin naming points with the options in the **Select Points** menu.

Press the ESC key to return to the **Name Group** dialog box. Click **Done** to exit this routine and return to the **Verisurf Tools** menu.

MBD

Due to the extent of this manual Model Based Definition will be covered under a separate manual.

Point Filter

An obsolete tool to filter points by distance. The new filter is located in the POINTCLOUD menu under REVERSE.