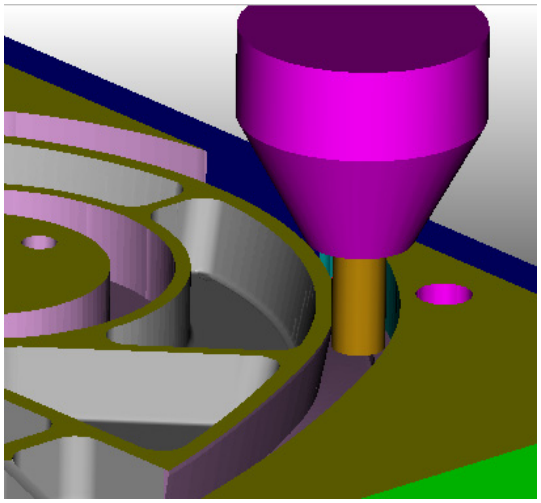
Numerical Control Computer Sciences

NCL/IPV

In-Process Verification

Version 10.1 On-line Reference



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Warning and Disclaimer

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Introduction

NCL/IPV (***NCL*** In-Process-Verification) is ***NCL's*** integrated numerical control simulation and verification module. ***NCL/IPV*** is a fast, accurate and fun way to simulate the material removal process of NC tool paths. The user can instantly verify tool paths at any time during a part programing session. ***NCL/IPV*** can also be used to verify existing toolpaths from ***NCL*** or other CAM systems.

NCL/IPV significantly reduces the need for costly tape prove-outs on expensive CNC equipment and insures accurate, safe, and productive NC programs.

Product Features

The following are some of the main features of ***NCL/IPV***.

- Solids-based NC verification integrated into the CAM environment.
- The model can be dynamically zoomed, panned and rotated at any time during the ***NCL/IPV***. session.
- Several types of errors are detected automatically: rapid cuts, cuts into fixtures, and tool-holder collisions. Errors are displayed on the screen and logged to a file.
- The cursor can be used to point to any location on the model to inspect the precise coordinates, the surface normal vector, the material thickness, the motion responsible for the cut, and the cutter used to make the cut. Other advanced inspection capabilities include the ability to compare the cut part to individual surfaces or an entire solid model.
- Cutters are either APT 7-parameter cutters or free-form solids of revolution; holders may also be modeled as solids of revolution.
- ASCII or binary format Stereo lithography (STL) files can be read, and the geometry from the file can be imported as a fixture or stock model. Stock and fixture models can also be created interactively.
- Material removed by each cutter can be automatically displayed in a different color.
- The current volume can be displayed during or after the simulation.
- The ***NCL/IPV***. model can be saved and re-loaded in subsequent ***NCL/IPV***. sessions.
- Models can be sectioned through any specified plane.
- Machining of deep features can be observed by making the stock translucent.

Quick Session

For a quick session follow these steps:

- Start ***NCL*** and load an existing part program.
- **Run** the program to the end.
- Click **Tools > NC Verification**.
- Click **Stock > Box Bound**.
- You might want to adjust the upper Z value down a bit.
- Click **OK**.
- Click **Start Session**.
- Adjust the size of the simulation window by clicking and dragging on the border.
- Click **Simulation**.
- Click **OK**.
- Click **Dynamic**.
- Rotate, zoom, and pan using the mouse buttons.
- Press the **Space** bar to continue.
- To stop the simulation at any time, place the cursor inside the simulation window and right-click.
- To continue click **Simulation**. Set the **Start** field to **Current**. Click **OK**.

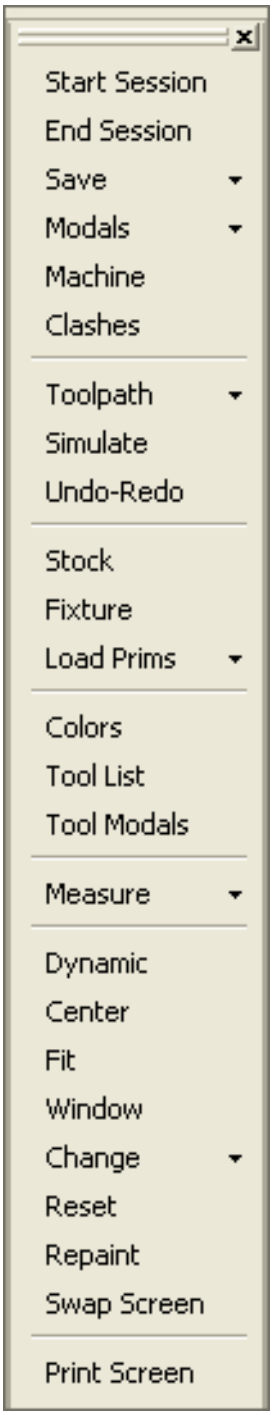
Main Menu

To access the ***NCL/IPV*** main menu panel:

- Start ***NCL***.
- Click **Tools > NC Verification**.

Or click the  icon from the ***NCL*** toolbar.

The following menu panel will appear:



[Start A *NCL/IPV* Session]
[End A *NCL/IPV* Session]
[Save, Load, And Reset Session]
[*NCL/IPV* Main Modals]
[Load Machine Definition]
[Clashes]

[Select Toolpath For Simulation]
[Start Simulation]
[Undo-Redo Cut]

[Stock Management]
[Fixture Management]
[Load, Save Stock/Fixture Primitives]

[Color Options]
[List Of Tools]
[Tool Modals]

[Inspection Motions]

[Dynamic Pan, Zoom And Rotate]
[Set Dynamic View Center]
[Fit View To Viewport]
[Window Zoom]
[Static View Options]
[Align View With *NCL* Viewport]
[Repaint View]
[Swap Windows]

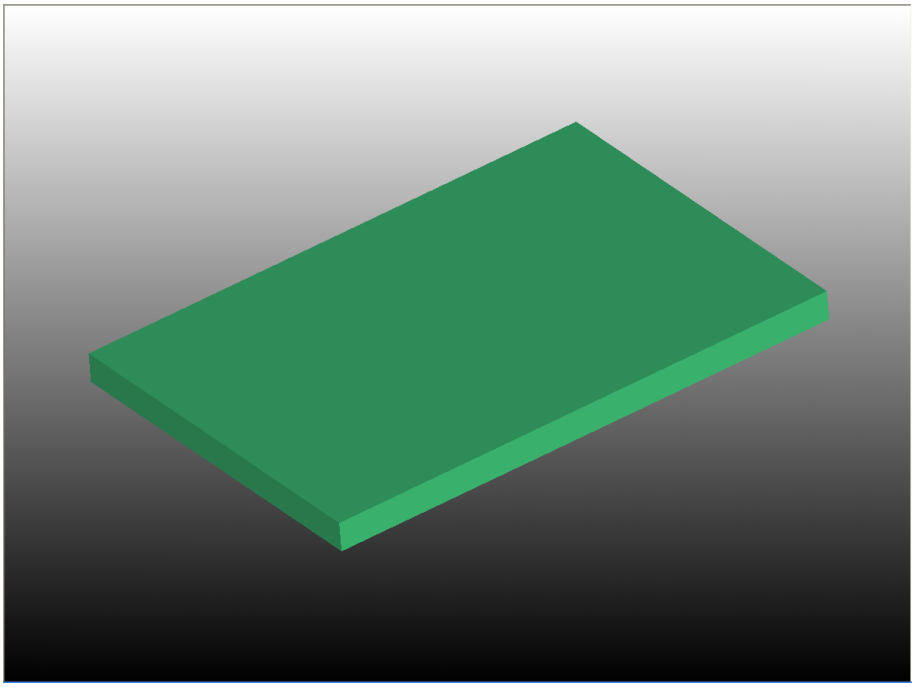
[Print Screen]

Menus and Functions

Start Session

Click this menu to start a ***NCL/IPV*** session. The simulation window will either start in a pop up window on top of the ***NCL*** graphics window, or replace the ***NCL*** graphics window and the ***NCL*** graphics window will appear in a popup window. If no stock or fixture geometry has been defined, or no previous session had been started, the window will be empty. Otherwise the ***IPV*** model will be displayed. The model orientation will be the same as the current ***NCL*** graphics window.

The window will look something like this:



Use the **View** menus to change the view orientation.

End Session

Click this menu to end your ***NCL/IPV*** session. If you want to return to the model in its current state in a subsequent session then make sure the **Reset Session on Exit** option in the **Modals** form is set to **No**. Otherwise the session will be reset and all cuts will be lost.

Save

Clicking on the ▾ next to the **Save** menu will produce the following pull-down menu. Clicking on any of these menu options will activate that function and will make the selected function the default selection for the **Save** menu.

Save

Click this menu to save the ***NCL/IPV*** model as it currently appears. The model could then be restored using the **Restore** menu. The **Save** button stores the ***NCL/IPV*** model in memory. When the ***NCL/IPV*** model has been **Reset** or when ***NCL*** is exited any saved ***NCL/IPV*** models will be lost. To save an ***NCL/IPV*** model to disk use the **Export** option.

It is good practice to use the **Save** option prior to simulating each operation. If you need to make modifications to the operation you can restore the ***NCL/IPV*** model and simulate the operation again after the modifications have been made.

Restore

Click this menu to restore an ***NCL/IPV*** model that was saved using the **Save** option.

Export

Click this menu to save an ***NCL/IPV*** model to disk. A file browser will appear allowing you to enter a file name. The default extension for ***NCL/IPV*** models is "*.ipv*". Exported models can be imported in future ***NCL/IPV*** sessions using the **Import** option. A number of work files (depending on how many stock and fixture models were defined) are also created. The work file extensions are "*.wf#*", where # is a number starting at 1.

Import

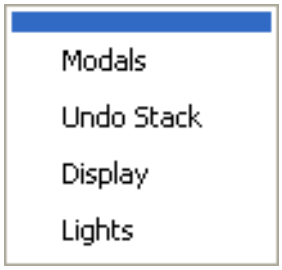
Click this menu to import an ***NCL/IPV*** model that had been saved to disk using the **Export** option. A file browser will appear allowing you to select an ***NCL/IPV*** model for import. Only ***NCL/IPV*** models can be imported using this function.

Reset

Click this button to reset your current ***NCL/IPV*** session. This will cause all stock and fixture models to be reset to their original state (all cuts will be lost). Saved models (made using the **Save** option) will also be lost.

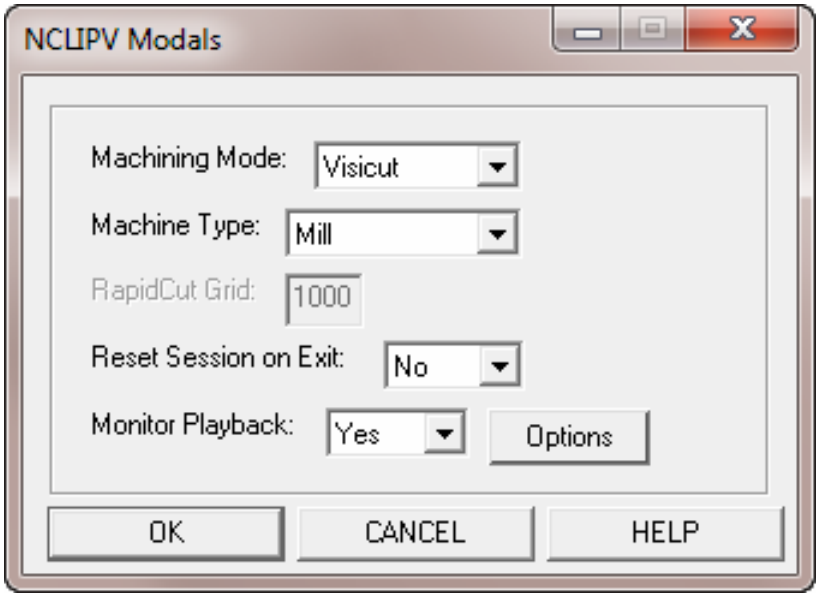
Modals

Clicking on the ▾ next to the Modals menu will produce the following pull-down menu. Clicking on any of these menu options will activate that function and will make the selected function the default selection for the Modals menu.



Modals

Click this button to bring up the following ***NCL/IPV*** Modals form:



Machining Mode

Determines what machining mode will be used during subsequent simulation sessions. Choose between **Visicut** and **RapidCut**.

Visicut is the most accurate machining mode and will dynamically simulate the material removal process. Simulations will take longer using **Visicut**.

RapidCut is less accurate but much faster than **Visicut**. The material removal process is not simulated when using **RapidCut**, only the final result is displayed. **RapidCut** does not currently support 4 or 5-axis toolpaths which, when present, are treated as fixed tool axis positions. Use **RapidCut** to get quick results of 3-axis roughing operations, to see if your toolpath is oriented correctly to your stock/fixture models, or to quickly identify any obvious errors in the toolpath.

A “Bell” type tool with -ve side angle will not be used by **RapidCut**, instead a straight side tool with the same diameter will be used.

Machine Type

This option is only available for **Visicut**. Specifies which type of machine motion to simulate. Choose between **Auto**, **Mill**, **Lathe** **Mill/Turn** or **Stringer**.

Auto will automatically determine the machine type based on the types of tools used during the program.

For lathe programming, it is assumed that the part is cut in the XY-plane, with the center of the part at Z=0. When machine simulation is active, then lathe programming will be in the standard coordinate system, typically in the ZX-plane.

RapidCut Grid

Enter the grid size used for **RapidCut** simulations. **RapidCut** uses a z-level layering (grid) scheme for material removal calculations. A larger grid size will produce more accurate results but will increase simulation time. The valid grid size range is 300-1500.

Reset Session on Exit

Determines what action to take when the **End Session** menu is selected.

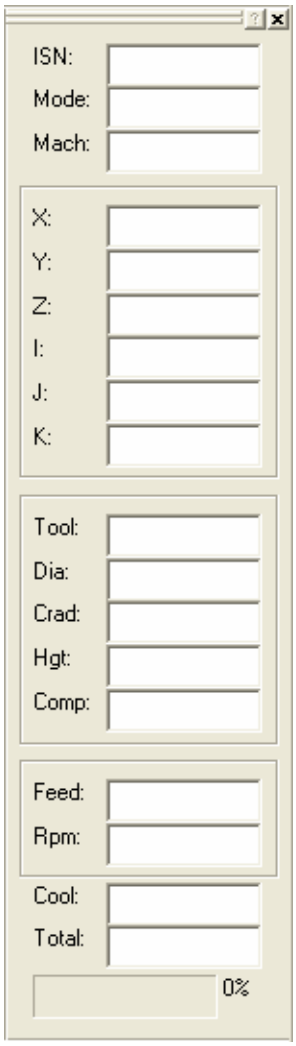
Set to **Yes** to restore stock/fixture models to their original state (all cuts will be lost).

Set to **No** to save the ***NCL/IPV*** model in its current state. When the **Start Session** menu is selected the saved ***NCL/IPV*** model will be displayed in the simulation window.

Monitor Playback

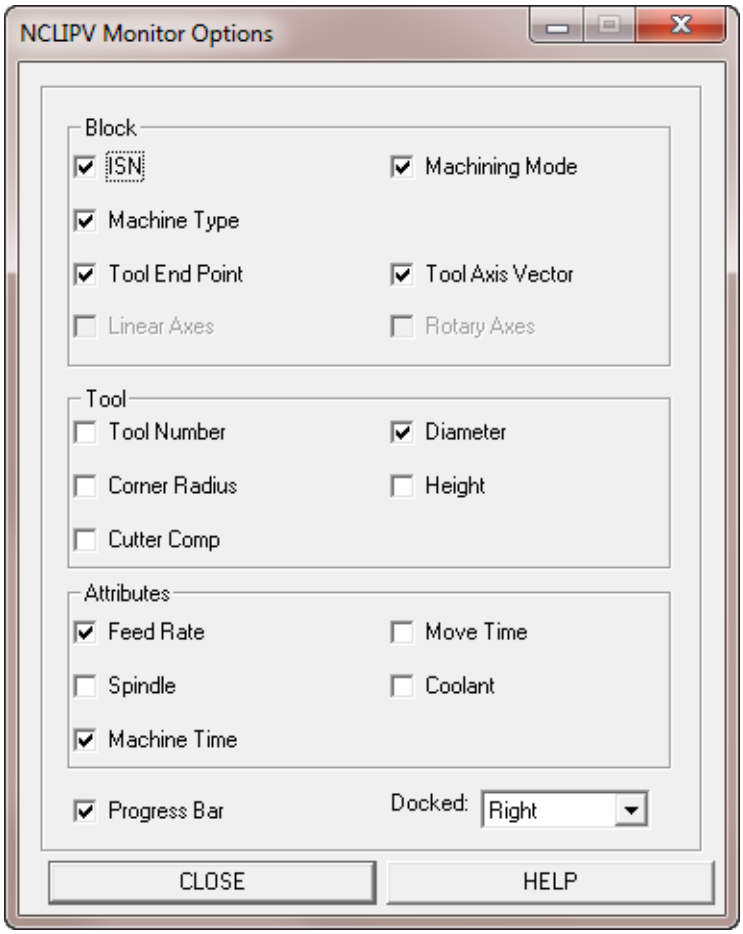
Enabling the **Monitor Playback** field will display a control panel during ***NCL/IPV*** simulation that contains current block data, including the tool position, cutter definition, feed rate, spindle, and coolant settings, along with the machining time and a progress bar representing the percentage of simulation that has been completed.

An example of this control panel is shown below.



Options

Click this button to bring up the **Monitor Playback Options** form as shown below



This Monitor Options form controls which fields will be displayed in the ***NCL/IPV*** Monitor Panel during simulation and how the panel is positioned. These settings are saved in the "*nclipv_modals.mod*" file along with the ***NCL/IPV*** modals settings and will be used as the default values the next time the form is displayed.

ISN

Displays the *Input Sequence Number* field in the ***NCL/IPV*** Monitor Panel when enabled.

Machining Mode

Displays the machining mode for the current move in the

NCL/IPV Monitor Panel when enabled. Valid machining modes that can be displayed are **Linear**, **Rapid**, **Circular**, **Cycle**, and **Multi-axis**.

Machine Type

Displays the type of machine used for simulation. Valid machine types are **Mill, Lathe**, **Mill/Turn** and **Stringer** The machine type is set in the ***NCL/IPV*** Modals form and if the machine type does not match what the input cl or simulation file is programmed for, then the simulation process will not be correct.

Tool End Point

Displays the XYZ location of the tool end point in the ***NCL/IPV*** Monitor Panel when enabled.

Tool Axis Vector

Displays the IJK components of the tool axis vector in the ***NCL/IPV*** Monitor Panel when enabled.

Linear Axes

Displays the linear axis positions of the machine in the ***NCL/IPV*** Monitor Panel when enabled. This field can only be enabled when a Simulation file is used as input to ***NCL/IPV***.

Rotary Axes

Displays the rotary axis positions of the machine in the ***NCL/IPV*** Monitor Panel when enabled. This field can only be enabled when a Simulation file is used as input to ***NCL/IPV***.

Head 2 Axes

This field is only available for the **Stringer** machine. Displays the Head 2 axes positions in the ***NCL/IPV*** Monitor Panel when enabled.

Head 3 Axes

This field is only available for the **Stringer** machine. Displays the Head 3 axes positions in the ***NCL/IPV*** Monitor Panel when enabled.

Head 4 Axes

This field is only available for the **Stringer** machine. Displays the Head 4 axes positions in the ***NCL/IPV*** Monitor Panel when enabled.

Tool Number

Displays the active tool number and length as defined by the *LOADTL* statement in the ***NCL/IPV*** Monitor Panel when enabled.

Diameter

Displays the active cutter diameter in the ***NCL/IPV*** Monitor Panel when enabled.

Corner Radius

Displays the active cutter corner radius in the ***NCL/IPV*** Monitor Panel when enabled.

Height

Displays the active cutter height in the ***NCL/IPV*** Monitor Panel when enabled.

Cutter Comp

Displays the active cutter compensation direction in the ***NCL/IPV*** Monitor Panel when enabled. Valid directions are **Off**, **Left**, and **Right**.

Feed Rate

Displays the active feed rate and mode in the ***NCL/IPV*** Monitor Panel when enabled.

Move Time

Displays the machining time (Minutes) that the current move will take in the ***NCL/IPV*** Monitor Panel when enabled.

Spindle

Displays the active spindle speed and direction in the ***NCL/IPV*** Monitor Panel when enabled.

Coolant

Displays the active coolant setting in the ***NCL/IPV*** Monitor Panel when enabled. Recognized coolant settings are **Off**, **Flood**, **Mist**, and **Air**.

Machine Time

Displays the total machining time (Minutes) since the ***NCL/IPV*** *Playback Control Form* was accepted.

Progress Bar

Displays the percentage of simulation completed since the ***NCL/IPV*** *Playback Form* was accepted.

Docked

Determines the default position of the ***NCL/IPV*** Monitor Panel when simulation is started. It can either be floating (**Off**), docked to the left side of the ***NCL*** window (**Left**), or docked to the right side (**Right**). This panel can be manually positioned by the user after it is displayed.

CLOSE

Click this button to accept the settings and close the Monitor Playback Options form.

HELP

Click this button to display a brief description of the Monitor Playback Options form.

OK

Click this button to accept the current entries and close the ***NCL/IPV*** Modals form.

CANCEL

Click this button to exit the form without accepting any changes made to the entries.

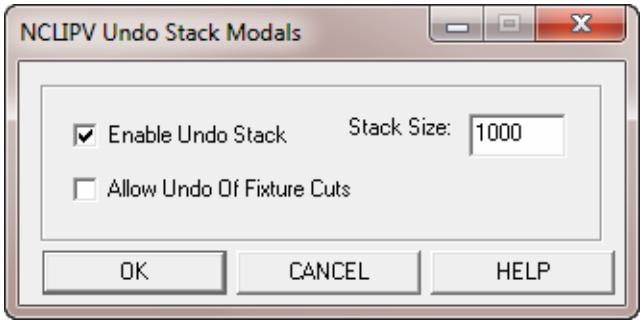
HELP

Click this button to display a brief description of the ***NCL/IPV***

Modals form.

Undo Stack

Click this button to bring up the following ***NCL/IPV*** Undo Stack Modals form.



This enables/disables the ability to interactively Undo and Redo cuts in an ***NCL/IPV*** session.

Enable Undo Stack

Checking this box enables the Undo ability of ***NCL/IPV***. The material removed during cuts will be saved along with the tool definition and position so that it can be added back to the stock when stepping backwards through the simulation. Enabling the Undo Stack will cause the ***NCL/IPV*** simulation to run about 10-15 percent slower than when it is disabled and will also use more memory (the amount of memory used is dependent on the complexity of the cuts and the number of cuts stored).

Stack Size

Defines the maximum number of cuts that will be stored in the Undo stack. You will only be able to undo this number of cuts. A value of 0 defines an unlimited Undo stack. Limiting the size of the Undo stack helps to ensure that you will not run out of memory.

Allow Undo Of Fixture Cuts

Check this box if you want the cuts made to fixtures to be stored on the Undo stack. Allowing the Undo of fixture cuts will slow the simulation process even more, especially if there are a lot of defined fixtures, even if none of the fixtures are cut. Storing fixture cuts will also use up more memory.

OK

Click this button to accept the current entries and close the ***NCL/IPV*** Undo Stack Modals form.

CANCEL

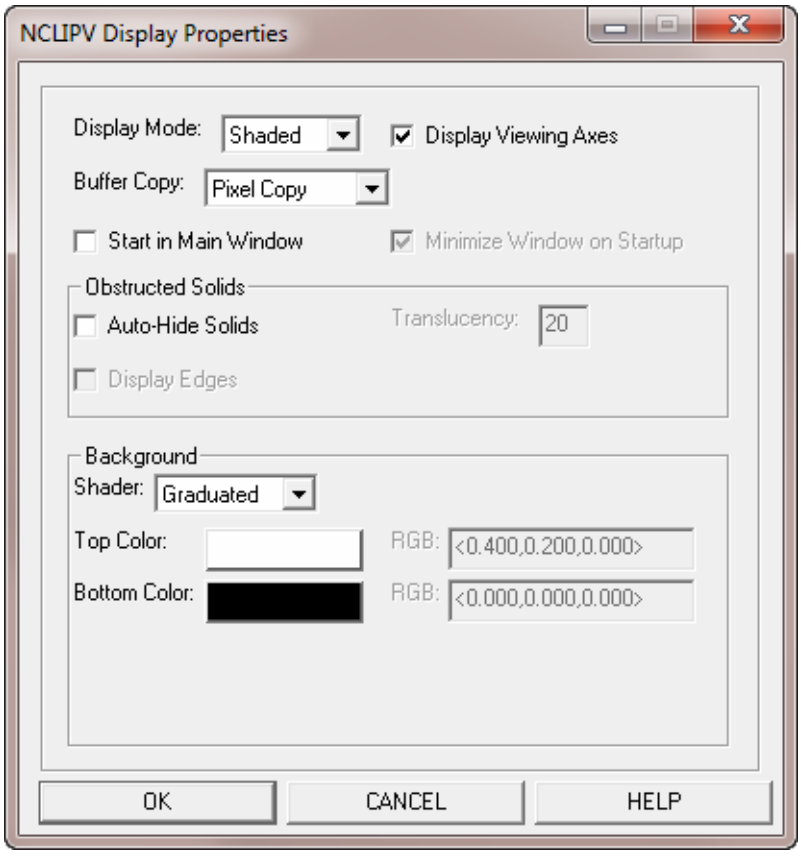
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the ***NCL/IPV*** Undo Stack Modals form.

Display

Click this button to bring up the ***NCL/IPV*** Display Properties form as shown below.



This form controls various ***NCL/IPV*** display properties. These settings are saved in the "*nclipv_display.mod*" file along with the

NCL/IPV modals settings and will be used as the default values the next time the form is displayed.

Display Mode

Visicut supports three different modes for displaying the solid model. These modes are **Shaded**, **Wireframe**, and **Hidden** line removal.

The display mode can be changed at any time during the simulation.

Display Viewing Axes

Check this box if you would like an axes representation of the current view orientation displayed in the bottom left corner of the ***NCL/IPV*** window.

Buffer Copy

Determines the style to use when refreshing the graphics. "**Swap Buffer**" swaps the back buffer with the front buffer. In order to use this mode, the graphics in the back buffer must remain unchanged when swapping the buffers. Most graphics cards on Windows systems support this feature (it may be a setting such as "Force Copy Swap").

"**Pixel Copy**" copies the affected area of the screen from the back to the front buffer. This method should work on all platforms, but may be slower than the "Swap Buffer" method on some platforms.

Start in Main Window

You can display the ***NCL/IPV*** session in either a separate Pocket Window or in the main ***NCL*** window. If you choose to display it in the main window, then the ***NCL*** graphics will be displayed in the Pocket Window. Choose **Yes** to have the ***NCL/IPV*** session displayed in the main window automatically when starting a session. You can swap the ***NCL/IPV*** and ***NCL*** graphics at any time by clicking the **Swap** menu.

Minimize Window on Startup

When the ***NCL/IPV*** session is displayed in the main ***NCL*** window on startup, you have the option of minimizing the Pocket Window, which contains the ***NCL*** graphics, automatically. This provides you with an unobstructed view of the ***NCL/IPV*** graphics

in full window mode.

Obstructed Solids

The Obstructed Solids section defines how solids that obscure a stock or fixture that has been marked as important are displayed.

Auto-Hide Solids

NCL/IPV will dynamically set the translucency and edge display of any solid that obscures an important solid when the **Auto-Hide Solids** box is checked. The solids will only be affected when they obscure the important solid and will revert back to their normal translucency and edge display when the view is such that it does not obscure the important solid anymore.

Translucency

Defines the translucency value between 1-100 that a solid that obscures an important solid will be displayed at.

Display Edges

Determines whether the edges of a solid that obscure an important solid will be displayed. Setting the Translucency to 1 and checking the **Display Edges** box will display the obscuring solids as wireframe.

Background

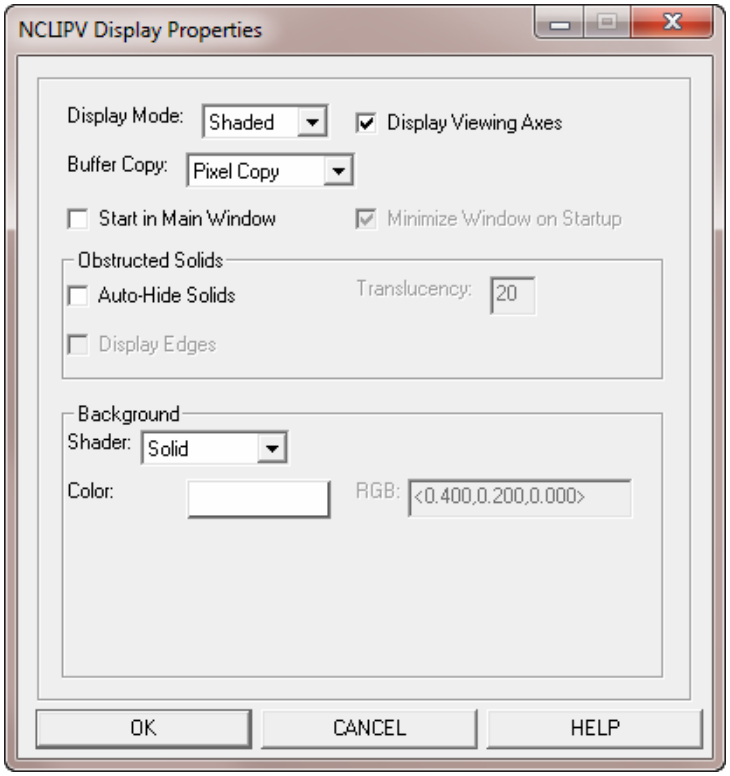
The Background section defines the shader that will be used as the background color and effects. Valid background shaders include a **Solid Color**, **Graduated**, **Four Corner**, and an **Image** file.

Shader

Defines which background shader to use. **Solid** uses a solid color, **Graduated** varies smoothly from the top color to the bottom color, **4-Corner** varies smoothly from colors defined for each corner of the window, and **Image** uses a JPEG image file as the background. The actual fields displayed in this section vary with the shader selected.

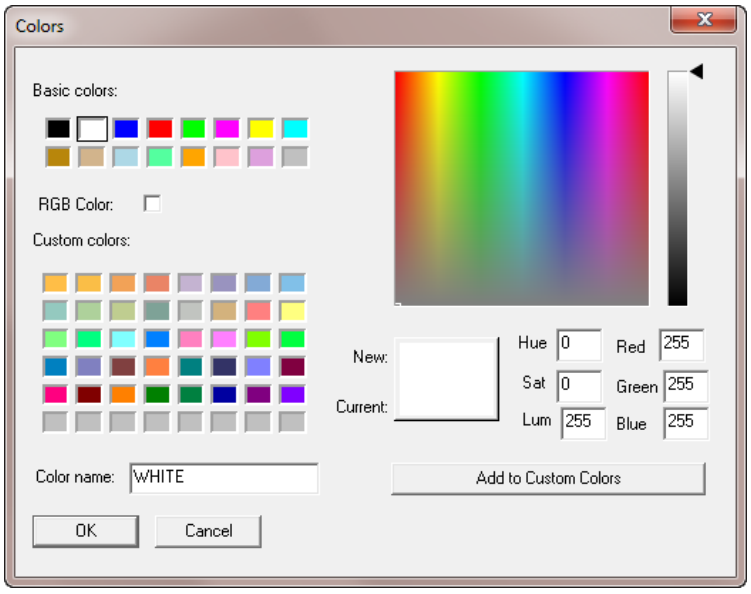
Solid Shader

Toggle the **Shader** button to **Solid** will change the ***NCL/IPV*** Display Properties form to as shown on next page.



Color

Defines the solid color to use as the background. Click this button to open the color forms as shown below.



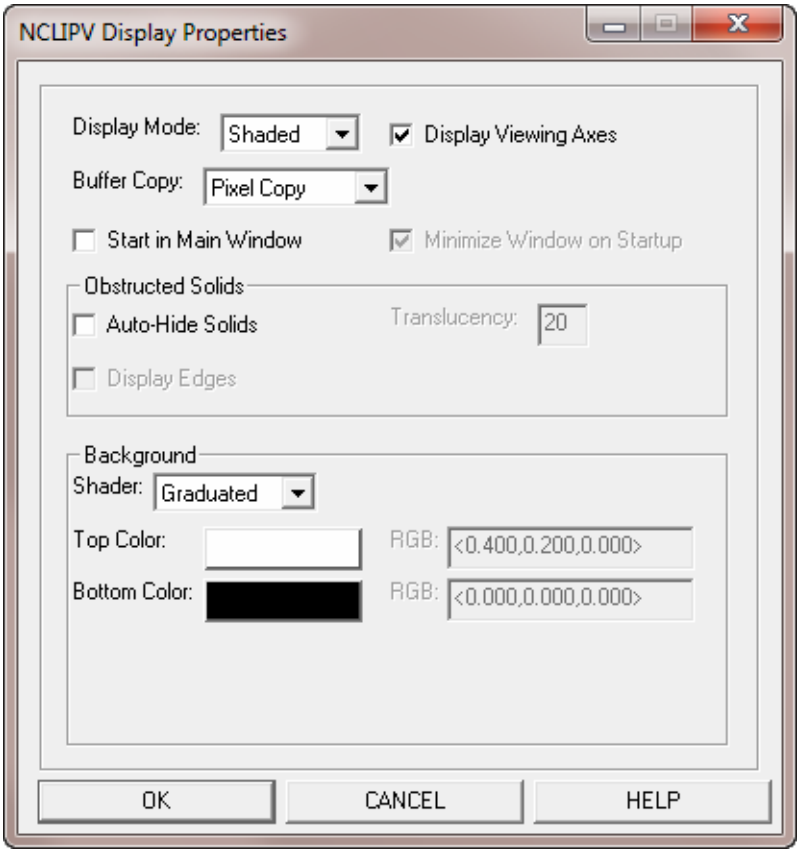
Click on any of the **Basic colors** or the **Custom colors** buttons to pick the desired color or click the **RGB Color** button to activate the RGB field of the main display form.

RGB

The RGB fields in this section define the Red, Green, and Blue color components for the corresponding color field when it is set to RGB instead of a fixed color. These values can be between 0 and 1. This fields can only be activated if the RGB color button is checked in the color form as shown in previous page.

Graduated Shader

Toggle the Shader button to **Graduate** will change the ***NCL/IPV*** Display Properties form to as shown below



Top Color

Defines the color to use at the top of the screen for the background. The color of the background will vary

smoothly between this color and a different color specified for the bottom of the screen. Click the color button to open the color form to choose the desired color or click the **RGB Color** button in the color form to activate the corresponding RGB field.

Bottom Color

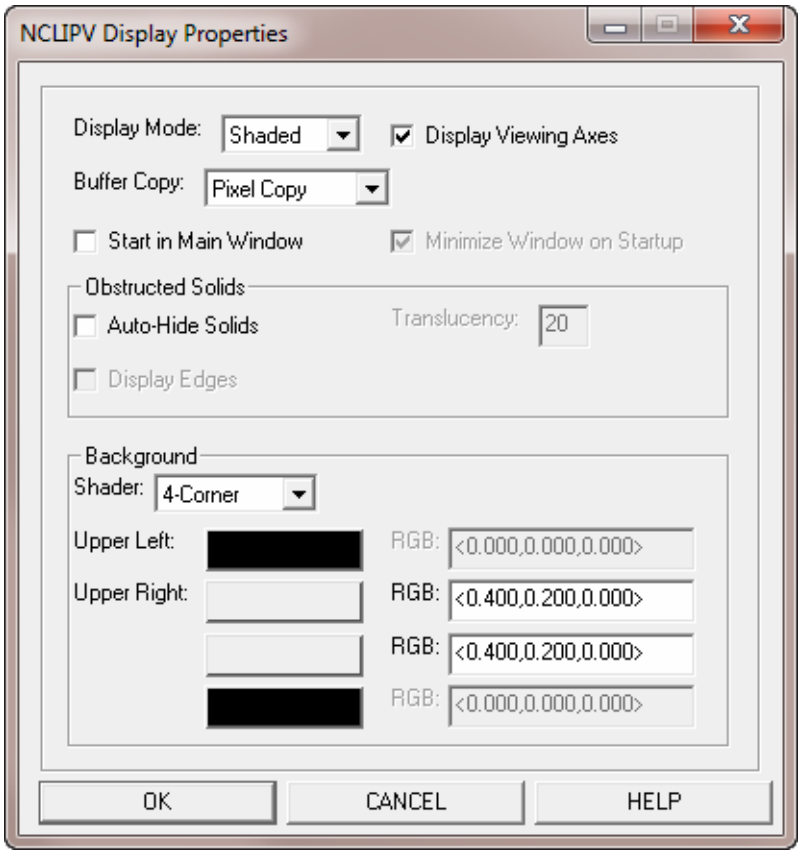
Defines the color to use at the bottom of the screen for the background. Click the color button to open the color form to pick the desired color or click the **RGB Color** button in the color form to activate the corresponding RGB field.

RGB

The RGB fields in this section define the Red, Green, and Blue color components for the corresponding color field when it is set to RGB instead of a fixed color. These values can be between 0 and 1.

4-Corner Shader

Toggle the Shader button to **4-Corner** will change the ***NCL/IPV*** Display Properties form to as shown below.



Upper Left

Defines the color to use at the upper left corner of the screen for the background. The colors of the background will vary smoothly between each of the colors defined at the four corners. Click the Color button to open the color form to choose the desired color or click the **RGB Color** button in the color form to activate the corresponding RGB field.

Upper Right

Defines the color to use at the upper right corner of the screen for the background. Click the Color button to open the color form to choose the desired color or click the **RGB Color** button in the color form to activate the corresponding RGB field.

Lower Left

Defines the color to use at the lower left corner of the screen for the background. Click the Color button to open the color form to choose the desired color or click the **RGB Color** button in the color form to activate the corresponding RGB field.

Lower Right

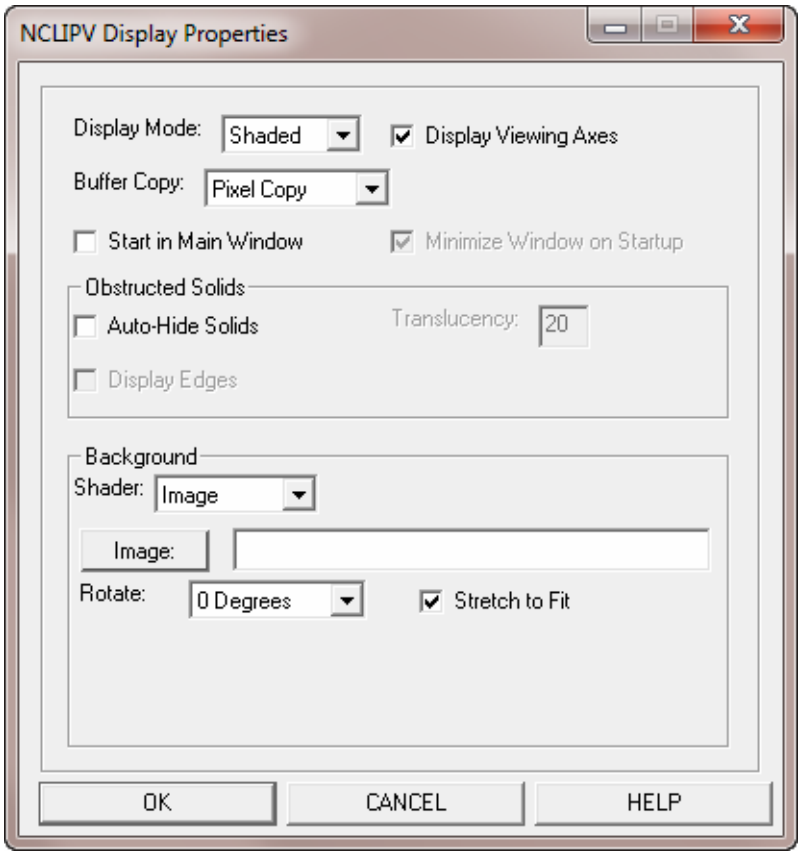
Defines the color to use at the lower right corner of the screen for the background. Click the Color button to open the color form to choose the desired color or click the **RGB Color** button in the color form to activate the corresponding RGB field.

RGB

The RGB fields in this section define the Red, Green, and Blue color components for the corresponding color field when it is set to RGB instead of a fixed color. These values can be between 0 and 1.

Image

Toggle the Shader button to **Image** will change the ***NCL/IPV*** Display Properties form as shown on next page.



Image

Pressing this button will display a file browser that allows you to select a JPEG file to use as the background image. The text field contains the name of the selected file or you can simply type it in.

Rotate

The background image can be rotated 0, 90, 180, or 270 degrees.

Stretch to Fit

When this box is checked, the background image will be stretched to fit the window size, otherwise it will be displayed at its stored aspect ratio.

OK

Click this button to accept the current entries and close the ***NCL/IPV*** Display Properties form.

CANCEL

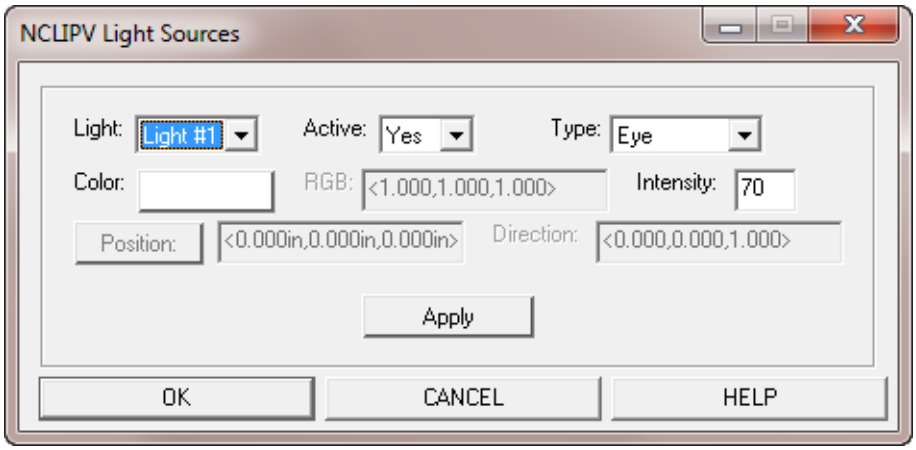
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the ***NCL/IPV*** Display Properties form.

Lights

Click this button to bring up the ***NCL/IPV*** Light Sources form as shown below.



This form is used to define the active lights and their properties for ***NCL/IPV***. These lights determine how the ***NCL/IPV*** solids are shaded. Accepting this form will save the light settings in the modals file "*nclipv_lights.mod*", so that the next time ***NCL/IPV*** is started, these settings will be used as the defaults.

Light

This toggle field determines which light is currently being defined. Up to 4 lights can be defined and active at any given time.

Active

Determines whether this light is On or Off.

Type

Defines the type of light being defined.

Ambient lights illuminate all surfaces in the scene evenly with a constant level of light, irrespective of each surface's position or orientation. If an ambient light is used, it is recommended that the intensity be set low to minimize the effects on shadowing.

Distant lights are defined at a set position and give off parallel rays of light in a given direction across the entire screen. An example of a Distant light is the sun.

Eye lights are always positioned in the center of the screen and will illuminate everything from the same point as the viewing position.

Point lights can be positioned by the user, they display light in all directions, similar to a light bulb.

Color

Defines the color of the light. Using a color other than White will cause the surfaces to "glow" with this color. Click the color button to open the color form to choose the desired color or click the **RGB Color** button in the color form to activate the corresponding RGB field.

RGB

Defines the Red, Green, and Blue color components of the light when Color is set to RGB instead of a fixed color. These values can be between 0 and 1.

Intensity

Defines the intensity or brightness of the light. It can be in the range of 0 to 100 percent.

Position

Selects the position of the light for Distant and Point lights. This position can be selected in the ***NCL/IPV*** window by pressing the **Position** button.

Direction

Defines the vector direction of Distant lights.

Apply

Applies the form light settings to the ***NCL/IPV*** window, so that the results can be viewed without exiting the form.

OK

Click this button to accept the current entries and close the ***NCL/IPV*** Light Sources form.

CANCEL

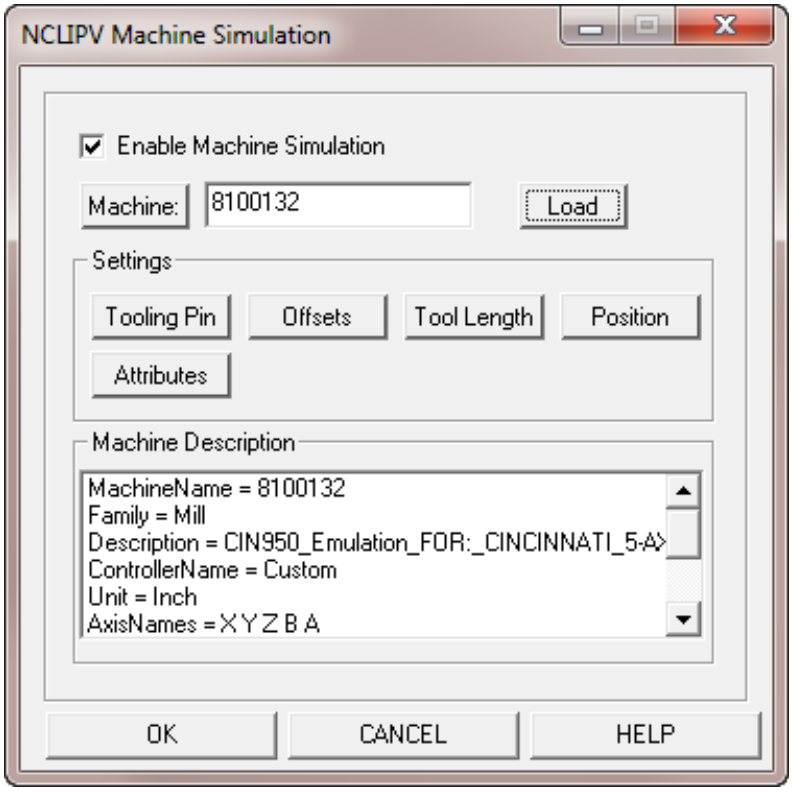
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the ***NCL/IPV*** Light Sources form.

Machine

Click this button to bring up the following ***NCL/IPV*** machine form.



This form handles all aspects of machine simulation within ***NCL/IPV***, except for collisions, which are handled in the ***NCL/IPV*** Diagnostic Handler form. You must be using a Simulation file as input in order to use Machine Simulation.

Enable Machine Simulation

Determines whether machine simulation is active during an ***NCL/IPV*** session. Enabling Machine Simulation will display a representation of the machine and use the kinematics of the machine axes for material removal. Disabling Machine Simulation will use the tool position for material removal, without displaying the machine.

Machine

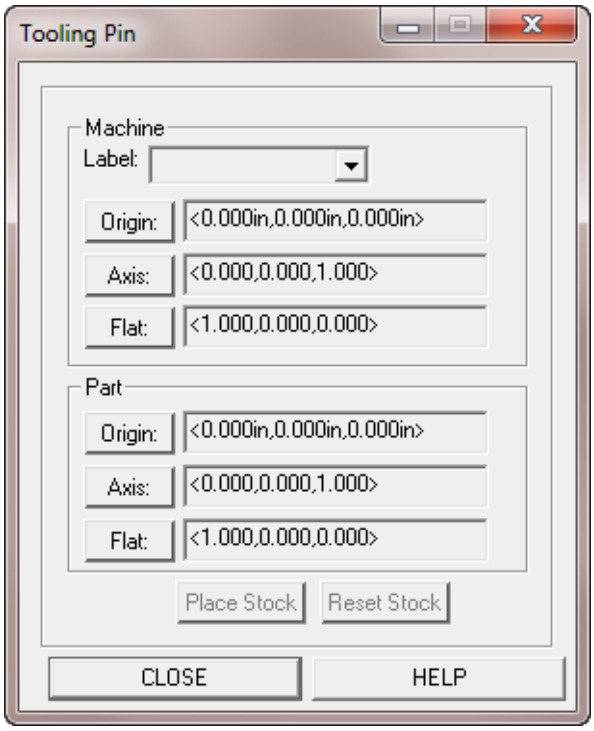
Press this button to bring up a file browser to interactively select the machine definition files. You can also directly type the machine definition directory name into the text field to the right of this button.

Load

Loads the machine definition files. If ***NCL/IPV*** is active, then the machine will be displayed in the ***NCL/IPV*** window. This is an immediate action button, so the **OK** button does not have to be pressed to load the machine, though you do not have to press the Load button, accepting the form (**OK**) will also load the machine files.

Tooling Pin

The **Tooling Pin** button brings up the Tooling Pin form as shown on next page. This form is used to place the stocks and fixtures onto the machine.



The **Tooling Pin** form defines a tooling pin that is used to attach the stocks and fixtures onto the machine in the correct position. The tooling pin is a circular pin with a flat on one side, so that the pin goes into the imaginary tooling holes on the machine and part in a fixed position and direction.

All defined stocks and fixtures will be placed on the machine using the same tooling pin. This allows the solid definitions to be the same whether or not Machine Simulation is enabled.

The *ToolingPin* command in the "postworks.mdl" file can be used to setup the default tooling pin location on the machine.

Label

The **Label** field defines the label of the tooling pin and is typically the same as the label of the axis it is attached to. You cannot change the label of the

defined tooling pins.

Machine Origin

The **Machine Origin** field defines the location of the tooling pin on the machine. The tooling pin attached to the part will be placed at this location.

Machine Axis

The **Machine Axis** field defines the axis of the tooling pin cylinder. The tooling pin will be placed on the machine in such a way that the axis of the imaginary tooling hole will be in this direction. This is considered the Z-axis of the tooling pin.

Machine Flat

The **Machine Flat** field defines a vector that points from the center of the tooling pin to its flat side. This vector is used to determine the rotation of the tooling pin on the machine. This is considered the X-axis of the tooling pin.

Part Origin

The **Part Origin** field defines the location of the tooling pin on the part and is used to place the stocks and fixtures onto the machine at the location of the machine tooling pin.

Part Axis

The **Part Axis** field defines the axis of the tooling pin cylinder on the part. The part will be placed on the machine in such a way that the part axis and machine axis will line up.

Part Flat

The **Part Flat** field defines a vector that points from the center of the tooling pin to its flat side. The part will be placed on the machine in such a way that the part flat and machine flat will line up.

Place Stock

The **Place Stock** button places the stocks and fixtures onto the machine by lining up the Part Tooling Pin with the Machine Tooling Pin. All defined stocks and fixtures will be moved to the new location.

Reset Stock

The **Reset Stock** button removes all stocks and fixtures from the machine and places them back in their original location.

CLOSE

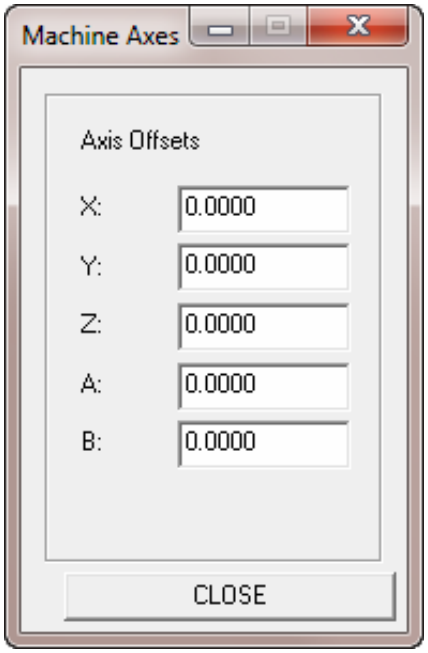
Click this button to accept the current entries and close the Tooling Pin form.

HELP

Click this button to display a brief description of the Tooling Pin form.

Offsets

The **Offsets** button brings up the Axis Offsets form as shown below. This form is used to enter offset values for each of the machine axes. These offsets will be added to the machine positions programmed in the Simulation file.

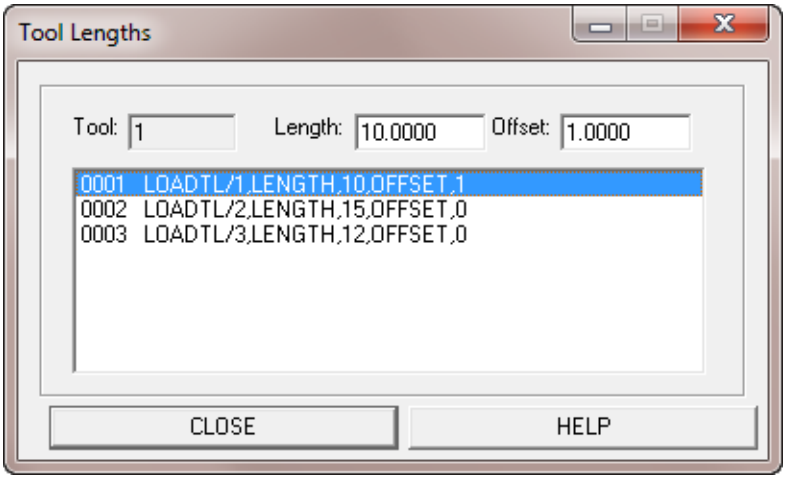


CLOSE

Click this button to accept the current entries and close the Offset form.

Tool Length

The **Tool Length** button will bring up the Tool Lengths form as shown on next page. This form displays all of the tools used in the simulation file along with their programmed too lengths. You can change the length of any tool or add an offset to each tool length.



CLOSE

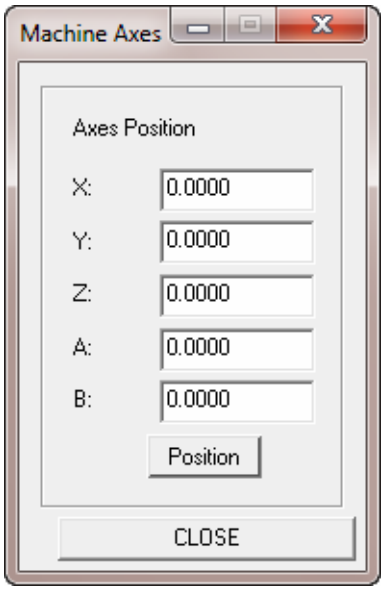
Click this button to accept the current entries and close the Tool Lengths form.

HELP

Click this button to display a brief description of the Tool Lengths form.

Position

The **Position** button brings up the Axes Position form as shown below. This form is used to manually position any of the defined axes.



Position

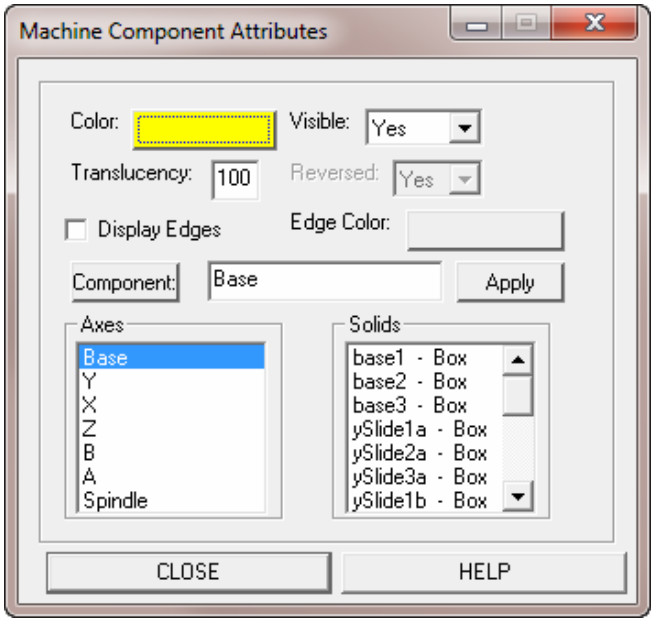
Click this button to accept the current entries and position the axes to the specified location immediately.

CLOSE

Click this button to close the Position form.

Attributes

The **Attributes** button brings up the Machine Component Attributes form as shown below. This form is used to change the display attributes of the various machine components.



Use this form to modify the attributes of existing machine components. You can modify the attributes of an entire machine component (axis) or a single solid within a component.

Color

Defines the color of the machine component or solid. Click the **Color** button to open the color form to pick the desired color.

Visible

Defines whether the machine component or solid is visible or not. Collision checking will still be active for a component that is invisible.

Translucency

Sets the display translucency of the selected machine component or solid. The translucency value can be in the range of 1 to 100, where 100 displays an opaque solid and a lower value displays a more transparent solid.

Reversed

The direction that a component moves on the machine is normally in reference to the tool direction. Therefore, a table type axis will usually move in the opposite direction from its programmed direction, so that the tool moves in the correct direction in relationship to the part. Enabling the **Reversed** attribute causes this axis to move in the opposite direction from its programmed direction. ***NCL/IPV*** will automatically set all table type axes to be reversed when the machine is loaded. There is also a *REVERSE* command that can be placed in the "postworks.mdl" file to manually set the default reversal flag for each axis.

Display Edges

Determines if the selected machine component should be rendered with its edges displayed. Displaying the edges of a solid in essence outlines the solid with a solid color and improves the appearance of extruded solids and solids of revolution.

Edge Color

Defines the color to display the solid edges with. "**Default**" uses the same color as the solid is displayed in, while the other choices select an actual color. This color will be used to display the edges of the machine component when the **Display Edges** box is checked and when the viewing mode is set to wireframe.

Component

Press the **Component** button to interactively select an individual solid to modify the attributes for. The Component text field will show the active machine axis or individual solid that is currently active for modification, whether it was interactively picked or selected from the Axes or Solids lists.

Apply

The **Apply** button must be pressed for any attributes to be

changed for the active component or solid. Pressing the **Close** button on the form will simply close the form without applying any of the changes.

Axes

The **Axes** field contains a list of all defined components (axes) for the loaded machine. Selecting one of these components will make it the active component for modification and any changes made to this component will be applied to all solids contained in the component. All solids within the selected component will be highlighted in the ***NCL/IPV*** window.

Solids

The **Solids** field contains a list of all solids that are part of the currently selected machine component. This list will change whenever another component is selected. Selecting a solid from this list will make it the active solid for modification and any attribute changes made will be applied to this solid only. The selected solid will be highlighted in the ***NCL/IPV*** window.

CLOSE

Click this button to accept the changes and close the Machine Attributes form.

HELP

Click this button to display a brief description of the Machine Attributes form.

Machine Description

The **Machine Description** field contains the definition of the currently loaded machine as described in the “machine.dat” file.

OK

Click this button to accept the current entries and close the Machine form.

CANCEL

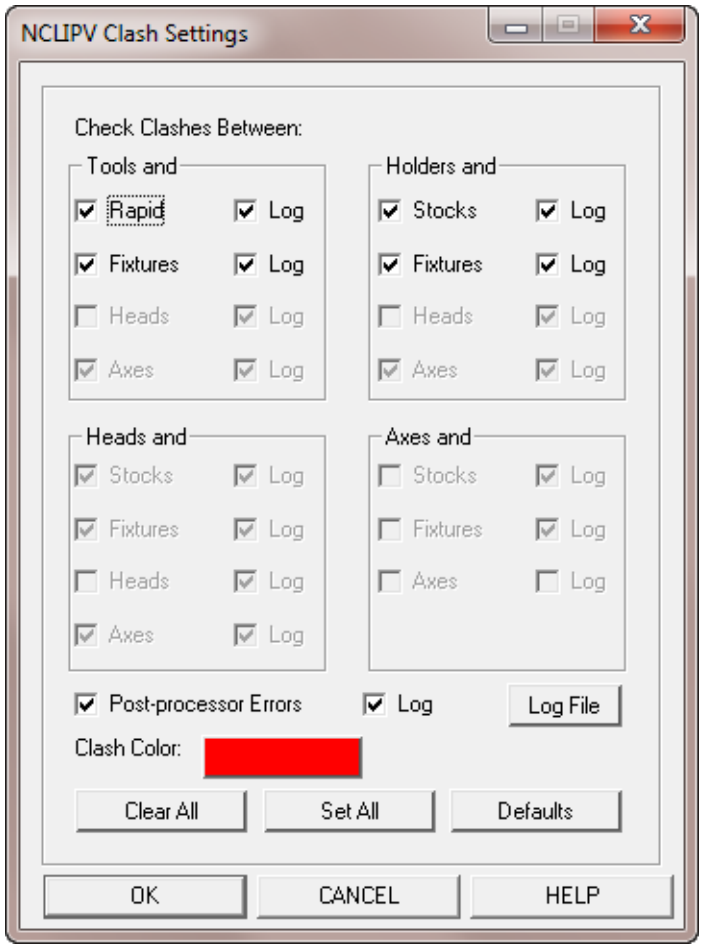
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Machine form.

Clashes

Click this to bring up the following ***NCL/IPV*** Detection Form.



This form controls the processing of clashes during an ***NCL/IPV*** session. Clashes can be detected between all machine components, including Tools, Holders, Stocks, Fixtures, Heads, and Tables. Disabling any clash detection that is not necessary will speed up the performance of ***NCL/IPV***. Some of the items will only be available with the Machine Option.

Tools and Rapid

Check this box if you would like ***NCL/IPV*** playback to stop when the part or fixture is cut during a RAPID move. Checking the Log box will cause this clash to be output to the log file and counted as an error.

Tools and Fixtures

Check this box if you would like ***NCL/IPV*** playback to stop when the fixture is cut during a programmed move. Checking the Log box will cause this clash to be output to the log file and counted as an error.

Tools and Heads

Check the this box if you would like ***NCLI/PV*** playback to stop when the tool and a head axis collide during a programmed move. This type of clash is usually not checked for, since the tool is mounted in the spindle, which is the basis for determining which axes are heads. A head type axis is defined as any axis that is connected to the spindle. This is only available with the Machine Option.

Tools and Axes

Check this box if you would like ***NCL/IPV*** playback to stop when the tool and a table axis collide during a programmed move. A table type axis is defined as any axis that is not connected to the spindle. This is only available with the Machine Option.

Holders and Stocks

Check this box if you would like ***NCL/IPV*** playback to stop when the part is cut by the tool holder during a programmed move. Checking the Log box will cause this clash to be output to the log file and counted as an error.

Holders and Fixtures

Check this box if you would like ***NCL/IPV*** playback to stop when a fixture is cut by the tool holder during a programmed move. Checking the Log box will cause this clash to be output to the log file and counted as an error.

Holders and Heads

Check the this box if you would like ***NCL/IPV*** playback to stop when the tool holder and a head axis collide during a programmed move. This type of clash checking is usually not enabled, for the same reason as for tools and heads. This is only available with the Machine Option.

Holders and Axes

Check the this box if you would like ***NCL/IPV*** playback to stop when

the tool holder and a table axis collide during a programmed move. Checking the Log box will cause this clash to be output to the log file and counted as an error. This is only available with the Machine Option.

Heads and Stocks

Check this box if you would like ***NCL/IPV*** playback to stop when a head type axis collides with the part. Checking the Log box will cause this clash to be output to the log file and counted as an error.

Heads and Fixtures

Check this box if you would like ***NCL/IPV*** playback to stop when a head type axis collides with a fixture. Checking the Log box will cause this clash to be output to the log file and counted as an error.

Heads and Heads

Check this box if you would like ***NCL/IPV*** playback to stop when a head type axis collides with another head type axis. This type of collision is normally not checked for. This is only available with the Machine Option.

Heads and Axes

Check this box if you would like ***NCL/IPV*** playback to stop when a head type axis collides with a table type axis. Checking the Log box will cause this clash to be output to the log file and counted as an error. This is only available with the Machine Option.

Axes and Stocks

Check this box if you would like ***NCL/IPV*** playback to stop when a table type axis collides with the part. This type of collision is usually not checked for, since the part is normally mounted on a table type axis. This is only available with the Machine Option.

Axes and Fixtures

Check this box if you would like ***NCL/IPV*** playback to stop when a table type axis collides with a fixture. This type of collision is usually not checked for, since fixtures are normally mounted on a table type axis. This is only available with the Machine Option.

Axes and Axes

Check this box if you would like ***NCLI/PV*** playback to stop when a table type axis collides with another table type axis. This type of collision is normally not checked for. This is only available with the Machine Option.

Post-processor Errors

Check this box if you would like ***NCL/IPV*** to stop whenever a post-processor error is encountered. Post-processor errors are only reported when a Simulation file is used for playback. Checking the Log box will cause this error to be output to the log file and counted as an error.

Log File

Pressing this button will bring up the ***NCL/IPV*** Log File form.

Clash Color

When two entities clash you can have ***NCL/IPV*** momentarily change the color of the entities during the clash to the color set in this field. The color of the entities will be restored on the next move.

All entity types, fixtures, tools, and machine components will change color during a clash except for stocks. This is because when the color of the entity is restored, then all faces on the entity are reset to the entity's original color, including cut faces.

Clashes must be enabled in order to detect a clash and be represented by the clash color. They can be enabled for stopping and/or logging of the clashes.

Click the color button to open the color form to pick the desired color.

Clear All

The **Clear All** button will clear all check boxes in this form, disabling all clash detection.

Set All

The **Set All** button will set all check boxes in this form, enabling all types of clash detection.

Defaults

The **Defaults** button will set the clash detection fields to their default condition as specified in the “nclipv.mod” file.

OK

Click this button to accept the current entries and close the Clash Detection form.

CANCEL

Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Clash Detection form.

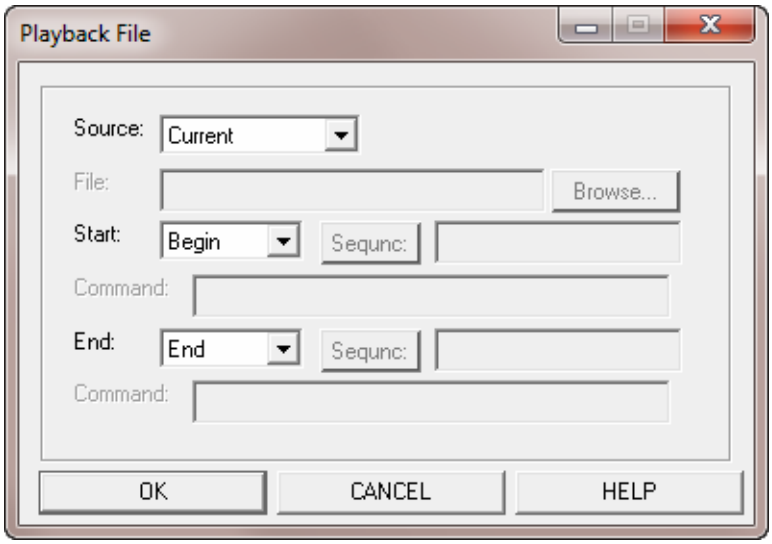
Toolpath

Clicking on the ▾ next to the **Toolpath** menu will produce the following pull-down menu as shown below. Clicking on any of these menu options will activate that function and will make the selected function the default selection for the **Toolpath** menu.

Toolpath

Click this menu to bring up the Playback File form. The Playback File form allows you to select which toolpath you want to simulate and/or to set what portion of the current toolpath to simulate. The Playback File form as shown on next page appears.

Note: Programs written for the **Stinger** machine can only be simulated in Machine Simulation with sim file.

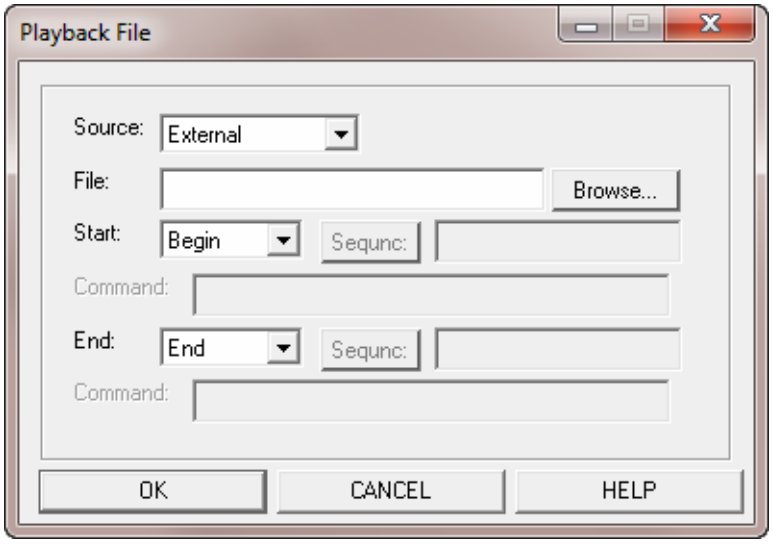


Source

The **Source** toggle field allows you to select the “source” of the toolpath. Choose between **Current**, **External**, **MCD**, **Simulate**, **Posted, APT Source, UG II, Catia V4, Catia V5, Mastercam** and **Reversed**.

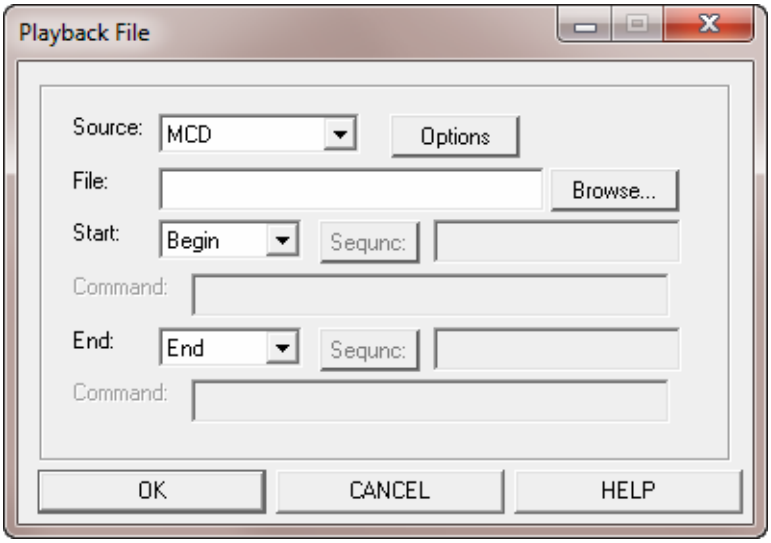
Current specifies to use the current, memory resident, CL file which contains all toolpath data that has been processed since the start of the current ***NCL*** session.

External specifies that you want to simulate a toolpath that is contained in an external file. When **External** is selected the **File** field will be activated allowing you to enter the name of the toolpath file as shown below.

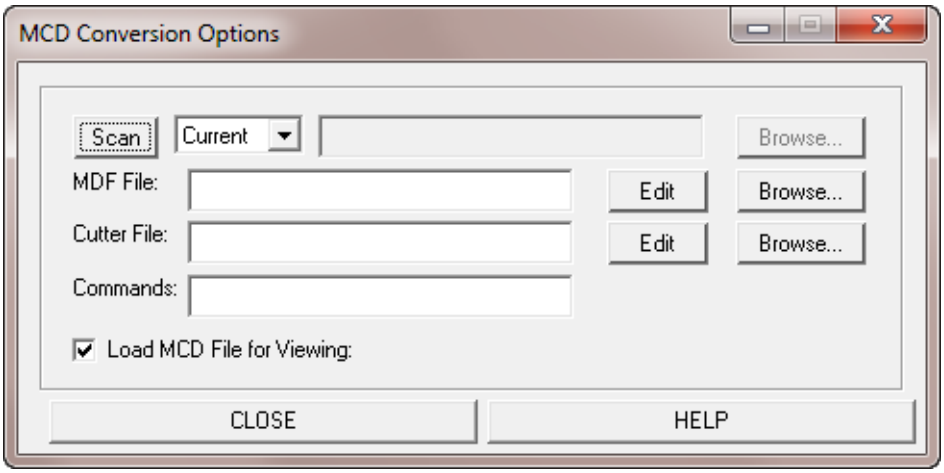


The **Browse** button can be used to browse for and select a toolpath file. Valid toolpath file types are ***NCL*** CL files (.cl), ***PostWorks*** Simulation files (.sim) and ***PostMacro*** CL files (.cln).

MCD specifies that you want to simulate a toolpath that is contained in an external MCD file (Machine Control Data file, usually a file contains G and M codes). This will display the Option button on the form as shown below.



Clicking the *Options* button to open the MCD Conversion Options form as shown below.



This MCD Conversion Options form specifies the ***PostWorks*** Machine Descriptor File, Cutter File, and optional conversion commands to use when importing an MCD file for motion playback.

Scan

Either the current clfile or an external clfile can be scanned to obtain the ***PWorks*** machine number and defined cutters. The defined cutters will be output to the specified Cutter File. Pressing the **Scan** button will perform the scan of the specified clfile.

Browse

The Browse button brings up a file browser to locate the external clfile.

MDF File

This field contains the ***PWorks*** machine number/name to use for converting an MCD file to a simulation file. This field can be entered manually, selected by a file browser (Browse...), or be automatically filled in by performing a clfile scan.

Edit

Brings up ***MPost*** to view and modify the specified MDF file.

Browse

The Browse button brings up a file browser to locate the external MDF file.

Cutter File

This field contains the name of the ***PTed*** cutter file to use when converting an MCD file to a simulation file. This field can be entered manually or selected by a file browser (Browse...). If this field is left blank, then the file “ncltemp.dat” will be created when scanning the clfile and will be automatically deleted after loading the MCD file. A message will still be displayed stating that the “ncltemp.dat” file was created.

Edit

Brings up a text editor to view and modify the specified cutter file.

Browse

The **Browse** button brings up a file browser to locate the external cutter file.

Commands

Optional commands can be entered into this field and will be passed to the conversion routine for use in importing an MCD file. For example, -SET:T(5) will set the initial tool number register to 5.

Load MCD File for Viewing

Checking this box will load the actual MCD file into ***NCL*** and display it when the source file would normally be displayed, such as displaying the source file with motion playback and the source file list in the ***NCL/IPV*** Measure form.

CLOSE

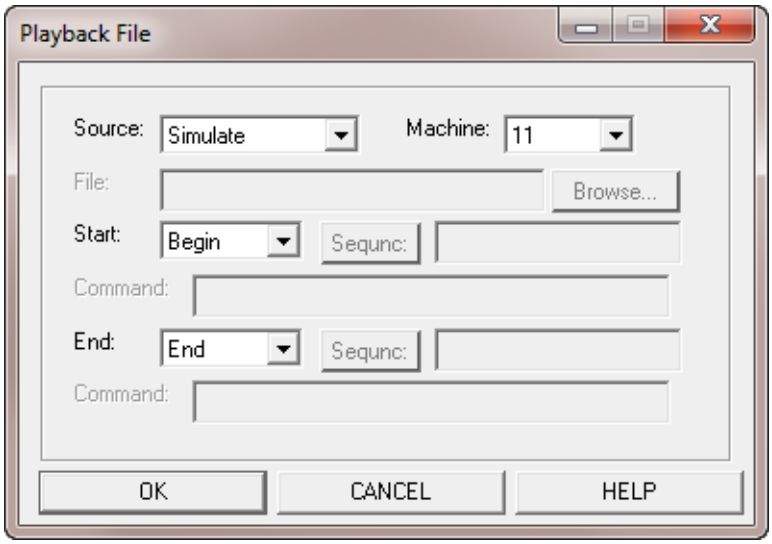
Click this button to accept the changes and close the MCD Conversion Options form.

HELP

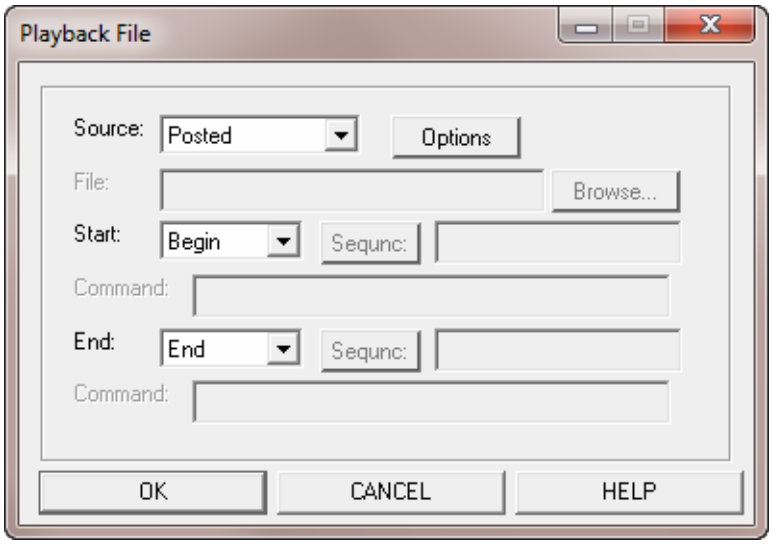
Click this button to display a brief description of the MCD Conversion Options form.

Simulate specifies that you want to simulate a ***PostWorks*** simulation file which will be made from the current, memory resident, CL file. When **Simulate** is selected ***NCL*** will automatically run ***PostWorks*** in a background mode using the current CL file as input (this could take a few minutes). The resulting ***PostWorks*** simulation file is then loaded as the current toolpath file to simulate. If a valid ***PostWorks*** *MACHIN* statement does not appear in the ***NCL*** part program then an error will be displayed as ***PostWorks*** will not know what postprocessor configuration file to use for creating the simulation file.

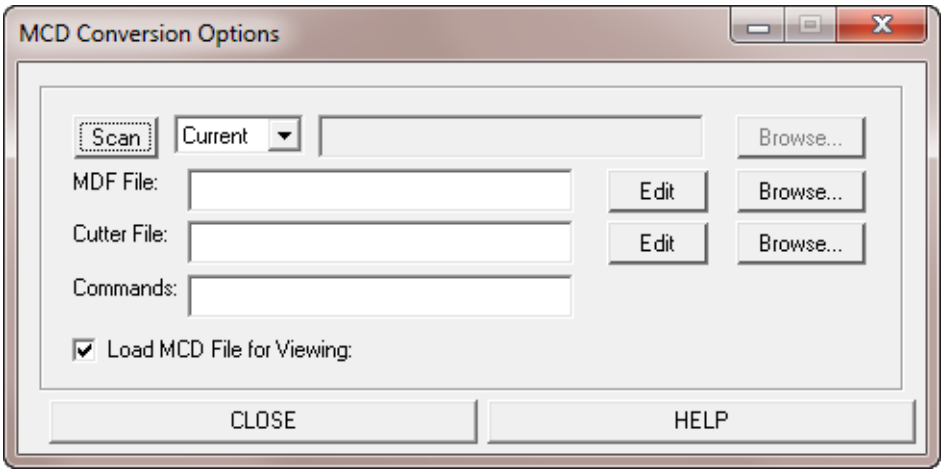
If the *MACHIN/PWORKS* statement specifies more than one machine numbers, the Machine button will display on the form as shown on next page to let you specify which machine to use for the simulation.



Posted specifies an MCD file created automatically from the internal clfile. This will display the Option button on the form as shown below.



Clicking the Options button to open the MCD Conversion Options form as shown on next page.



See the MCD Conversion Options in the MCD section for details of how to use this form.

Reversed is similar to **External** except that the tool path generated between the *REVERS/ON* and *REVERS/OFF* commands will be reversed for the simulation. This choice is only available if the *REVERS/ON* and *REVERS/OFF* statements exist in the program.

APT Source specifies that you want to simulate a toolpath that is contained in an external Apt Source file. The **File** field will be activated to allow you to enter the name of the file. The **Browse** button can be used to browse for and select the file

UG II specifies that you want to simulate a toolpath that is contained in an external Unigraphics II Apt Source file. The **File** field will be activated to allow you to enter the name of the file. The **Browse** button can be used to browse for and select the file

Catia V4 specifies that you want to simulate a toolpath that is contained in an external Catia V4 binary cl file. The **File** field will be activated to allow you to enter the name of the file. The **Browse** button can be used to browse for and select the file.

Catia V5 specifies that you want to simulate a toolpath that is contained in an external Catia V5 binary cl file. The **File** field will be activated to allow you to enter the name of the file. The **Browse** button can be used to browse for and select the file.

MasterCam specifies that you want to simulate a toolpath that is contained in an external MasterCam NCI file. The **File** field will be activated to allow you to enter the name of the file. The **Browse** button can be used to browse for and select the file

Start

The **Start** toggle field allows you to select where in the Toolpath you want the simulation to start. Choose between **Begin**, **Sequnc**, and **Command**.

Begin specifies that the simulation will start at the beginning of the current toolpath file.

Selecting **Sequnc** will activate the **Sequence** field. Enter the name of the toolpath sequence that is to be the start of the simulation. Toolpath sequences can defined using the **Start Seq** menu or within the ***NCL*** part program using the *SEQUNC* command.

To simulate a single toolpath sequence specify the same sequence name for both the start and end sequence.

Selecting **Command** will activate the **Command** field. Enter the postprocessor command (i.e. *LOADL/1, CUTCOM/ON,* etc.) at which you want the simulation to start. The current toolpath is searched from the top of the file until the specified command is found. If the specified command cannot be found an error message will be displayed.

End

The **End** toggle field allows you to select where in the toolpath you want the simulation to end. Choose between **End**, **Sequnc**, and **Command**.

End specifies that the simulation will end at the end of the current toolpath file.

Selecting **Sequnc** will activate the **Sequence** field. Enter the name of the toolpath sequence that is to be the end of the simulation.

To simulate a single toolpath sequence specify the same sequence name for both the start and end sequence.

Selecting **Command** will activate the **Command** field. Enter the postprocessor command (i.e. *LOADL/2, CUTCOM/OFF,* etc.) at which you want the simulation to end. The current toolpath is searched from the top of the file until the specified command is found. If the specified command cannot be found an error message will be displayed.

OK

Click this button to accept the current entries and close the Playback File form.

CANCEL

Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of this Playback File form.

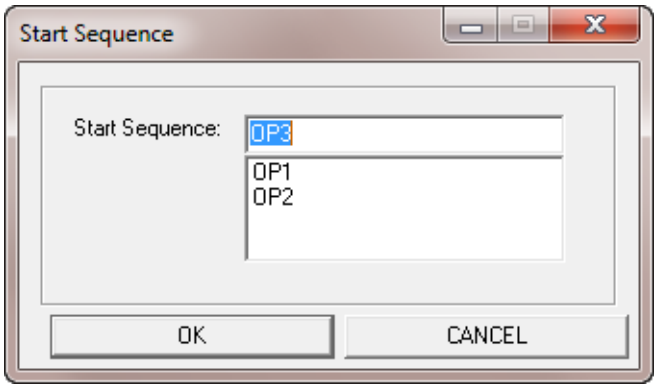
Start Seq

Click this button to begin recording a toolpath sequence. A toolpath sequence is any toolpath data that is processed between a Start Seq and End Seq command. Recording a sequence allows you to simulate a specific toolpath sequence as opposed to simulating all toolpath data that has been processed from the beginning of your ***NCL*** session.

Clicking the **Toolpath** menu allows you to set what toolpath sequences to simulate.

Toolpath sequences can also be defined within the ***NCL*** part program using the *SEQUNC* command.

The form as shown below will appear when you click the Start Seq menu:



Enter the name of the sequence you would like to start recording. A sequence name can consist of up to 32 alphanumeric characters.

To re-record an existing sequence, enter the name of the sequence

to re-record or click on the name in list box.

Click ***OK*** to begin recording the toolpath sequence.

Click ***CANCEL*** to not record the sequence.

Once recording has been started then all subsequently processed tool path data, such as *CUTTER* statements; postprocessor commands; and tool motion, will be recorded.

End Seq

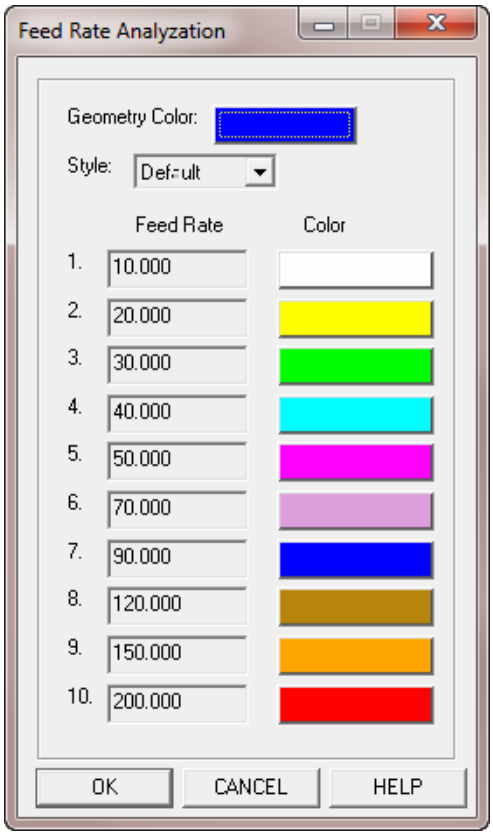
Click this menu to stop recording a toolpath sequence.

List Seq

Click this menu to open the status window to display a list of all the programmed toolpath sequences.

Feed Color

Click this menu to open the Feed Rate Analyzation form as shown below. The Feed Rate Analyzation form sets the color scheme to display motion in based on the feed rate value when playing back motion in ***NCL/IPV*** with Analyzation set to Feed Rate.



Geometry Color

The Geometry Color button is ignored and has no effect on ***NCL/IPV.***

Style

This Style toggle menu is ignored and has no effect on ***NCL/IPV***.

Feed Rate

Defines feed rate ranges that control the color of the displayed motion. Whenever the feed rate is less than or equal to the feed rate, then the corresponding color will be used to display the motion. Any programmed feed rate that is greater than the highest feed rate specified in this form will be displayed using the color assigned to the highest feed rate.

Color

Defines the color used to display the motion within the corresponding feed rate range. Click the corresponding color button to open the color form to pick the desired color.

OK

Click this button to accept the current entries and close the Feed Rate Analyzation form.

CANCEL

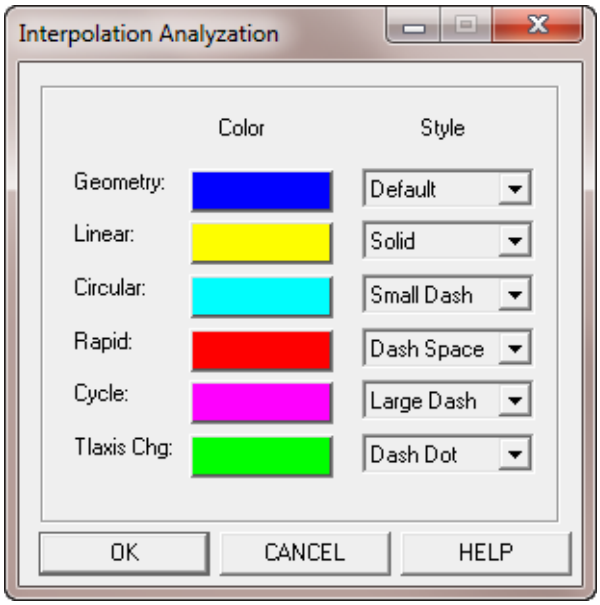
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of this Feed Rate Analyzation form.

Interp Color

Click this menu to open the Interpolation Analyzation form as shown on next page. The Interpolation Analyzation form sets the color scheme to display cuts when Analyzation is set to Interpolation during ***NCL/IPV*** motion playback.



Color

Defines the color used to display the type of cut. Click the corresponding color button to open the color form to pick the desired color.

Style

This item is ignored and has no effect on ***NCL/IPV***.

Geometry

This item is ignored and has no effect on ***NCL/IPV***.

Linear

Defines the color to display fixed tool axis moves during motion playback.

Circular

Defines the color to display circular moves during motion playback.

Rapid

Defines the color to display rapid moves during motion playback.

Cycle

Defines the color to display canned cycle moves during motion playback.

Tlaxis Chg:

Defines the color to display changing tool axis moves during motion playback.

OK

Click this button to accept the current entries and close the Interpolation Analyzation form.

CANCEL

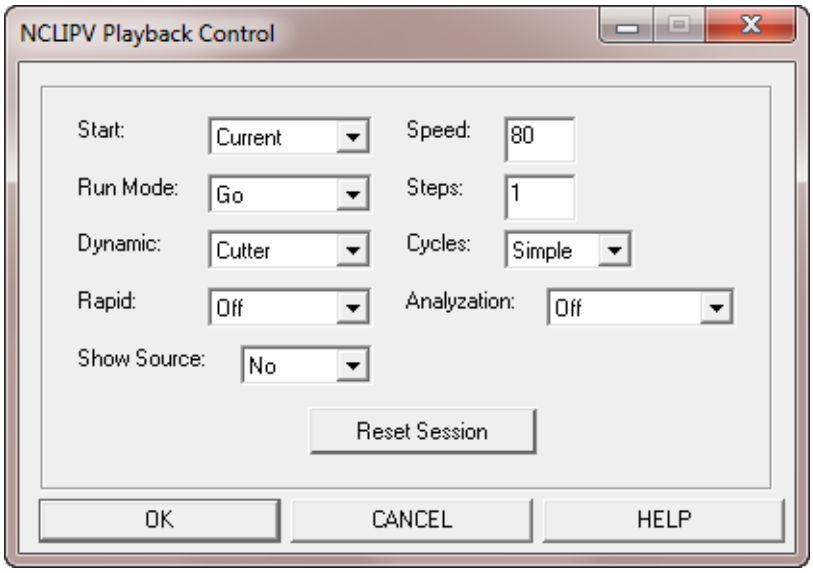
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of this Interpolation Analyzation form.

Simulate

Clicking this menu will bring up the Playback Control form and allow you begin the simulation. The Playback Control form appears as shown below



Start

The Start toggle field allows you select where you want the simulation to start. Choose between **Beginning** and **Current**.

Beginning specifies that the simulation will start at the beginning of the toolpath (which can be controlled by clicking the **Toolpath** menu).

Current specifies that the simulation will resume from the current location in the toolpath. Use **Current** when you have stopped the simulation in the middle of the toolpath, otherwise the simulation will start from the beginning.

Speed

This field allows you to control the speed of the simulation. Enter a number between 1 and 100. 100 means maximum speed.

Run Mode

Toggle between **Go**, **Step** and **Next Tool** mode.

Go specifies continuous simulation from the start to the end of the current toolpath (as specified in the **Toolpath menu**).

Step specifies to simulate one toolpath point at a time. Press the **Enter** key or **middle-click** the mouse to advance the tool to the next point. The **Enter** key can be held down to process multiple points.

Next Tool specifies to simulate the tool motion until the next tool is loaded. The simulation must be started with "Current" instead of "Beginning" if this option is specified.

Steps

Allows you to enter how many toolpath points to process before the display is updated. "1" means to update the display for each point processed. This produces the most realistic simulation. Entering larger numbers will increase the speed of the simulation but you will not see the tool at each toolpath point. The accuracy of the resulting model is not affected regardless of the number entered. If you want to get quick results without seeing a realistic simulation enter a number like 25 or 50.

Dynamic

Setting this field to "**Cutter**" causes the part to be stationary while the tool moves around the part. "**Part**" will display the tool in a

stationary position while the part appears to move about the tool. Either of these display methods will produce exactly the same results.

Cycle Display

Allows you to determine how you would like Cycles to be simulated. Choose between **OFF**, **Simple**, **Detail** and **Lathe**.

OFF specifies that no cycle simulation will be occurred.

Simple specifies that Mill Style Cycle motion will be simulated by simply going to the start and bottom of the hole.

Detail specifies that pecking motion and feedrate changes will be simulated during Mill Style Cycle motion.

Lathe specifies that Lathe Style Cycle motion will be simulated. This is the default method when the machine type is set to “Lathe”.

Rapid

Rapid motion in the clfile can be simulated in different ways. **Off** will display rapid moves in a straight line as they are programmed. Rapid motion will be altered as follows when any other selection is made.

If the selected axis move is in the positive direction, then the tool will move in this axis first and then move in the other 2 axes.

If the selected axis move is in the negative direction, then the tool will move in the other 2 axes first and then in the selected axis.

When **Tlaxis** is selected the major axis will be determined based on the tool axis vector of each point. For example, if the tool axis is 1,0,0, then the major axis for this move is the X-axis.

Analyzation

The simulated cuts can be displayed using the default colors setup for ***NCL/IPV*** or the colors can be set depending on the machining mode or programmed feed rate. **Off** will use the standard colors.

Feed Rate will set the simulation cutters based on the programmed feed rate.

The colors used to represent the various feed rate ranges are defined in the Feed Rate Analyzation form.

Interpolation will set the simulation colors based on the current machining mode. Recognized machining modes are *Linear,*

Circular, *Rapid*, *Cycle*, and *Multi-axis*. The machine mode interpolation colors are defined in the Interpolation Analyzation form.

Show Source:

The clfile records can be displayed in the scrolling window during motion playback by toggle this field to YES..

Reset Session

Click this button to reset your current ***NCL/IPV*** session. This will cause all stock and fixture models to be reset to their original state (all cuts will be lost). Saved models (made using the **Save** option) will also be lost.

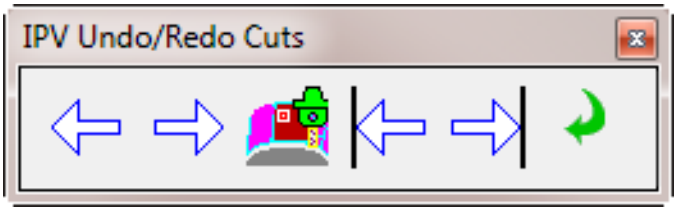
Click **OK** to begin the simulation. To **stop** the simulation before the end of the toolpath is reached, place the cursor in the **Main** window and **right-click**.

Click **CANCEL** to exit the Playback Control Form without starting the simulation.Help

Click **HELP** to display a brief description of this Playback Control form.

Undo-Redo

Clicking this menu will bring up the Undo-Redo menu as shown below.



This allows you to undo or redo the simulation cut. The default number of undo or redo cuts per step is default to 10. This can be modified by editing the “IPV_STEP_BACKWARD” and “IPV_STEP_FORWARD” parameters the file:

ipv_step.menu

in the folder:

C:\NCCS\NCL101\Interface\menu.

Undo

Click the  icon to step the tool backward.

Redo

Click the  icon to step the tool forward.

Undo All

Click the  icon to step the tool backward to start of Undo stack.

Redo All

Click the  icon to step the tool forward to current motion.

Pick Face

Click the  icon to select a face on the model and steps the tool back to when the face was cut.

Reset

Click the  icon to reset (empty) the ***NCL/IPV*** Undo stack.

Stock

Click this menu to create and manage stock models. The pop-up menu as shown on next page will appear.

Box Pt Pt

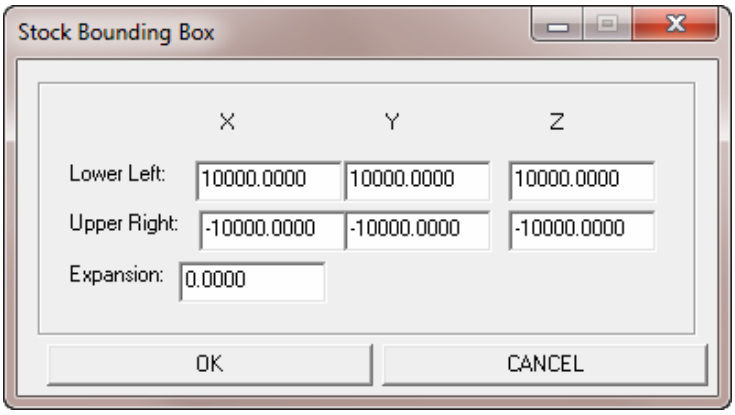
Click this button to create a box shape stock model by entering the coordinates (by *pick*, *locate* or *text*) of opposing corners of a rectangular box. If the selected coordinates do not contain a Z value you will be prompted for the upper and lower z-limits.

Box Pt Lwh

Click this button to create a box shape stock model by entering the xy-center of a rectangular box and then entering the desired Length, Width, and Height of the box.

Box Bound

Click this button to create a box shape stock model that is a rectangular box which contains the current toolpath. The form as shown below will appear.



The **Lower Left** fields contain the coordinates of the lower left corner of the stock model.

The **Upper Right** fields contain the coordinates of the upper right corner of the stock model.

The **Expansion** field specifies how much to offset the stock model from the actual bounding rectangular box.

Click in any of the fields to change the value.

Click **OK** to accept the current values and create the stock model.

Click **CANCEL** to exit the form without creating the stock model.

Solid

Click this button to create a stock model from a ***NCL*** solid.

More

Click this button to display more options of creating stock models. The pop-up menu as shown below will appear.

Cone Pt Pt R

Click this button to create a cone shaped stock model by selecting two points on the screen and entering the desired radii of at both ends.

Cone Pv L R

Click this button to create a cone shaped stock model by picking an existing point-vector and then entering the desired length of the cone and the desired radii at both ends.

Cyl Ci L

Click this button to create a cylindrical shape stock model by picking an existing circle and then entering the desired length of the cylinder.

Cyl Pt Pt R

Click this button to create a cylindrical shape stock model by selecting two points on the screen and then entering the desired radius.

Cyl Pv L R

Click this button to create a cylindrical shape stock model by picking an existing point, an existing vector and entering the desired length and radius of the cylinder.

Sphere Ci

Click this button to create a spherical shape stock model by picking an existing circle.

Sphere Pt R

Click this button to create a spherical shape stock model by selecting a point on the screen and entering the desired radius.

Torus Ci Ci

Click this button to create a torus shape stock model by picking two existing circles.

Torus Ci R

Click this button to create a torus shape stock model by picking an existing circle and entering the desired torus radius.

Torus Pv R R

Click this button to create a torus shape stock model by picking an existing point, an existing vector and entering the two desired torus radii.

Profile

Click this button to create a stock model by extruding a composite

curve. Pick a composite curve, then enter the upper and lower z-limits.

If the composite curve is an open curve, the open end will be joined together in order to generate the resultant model.

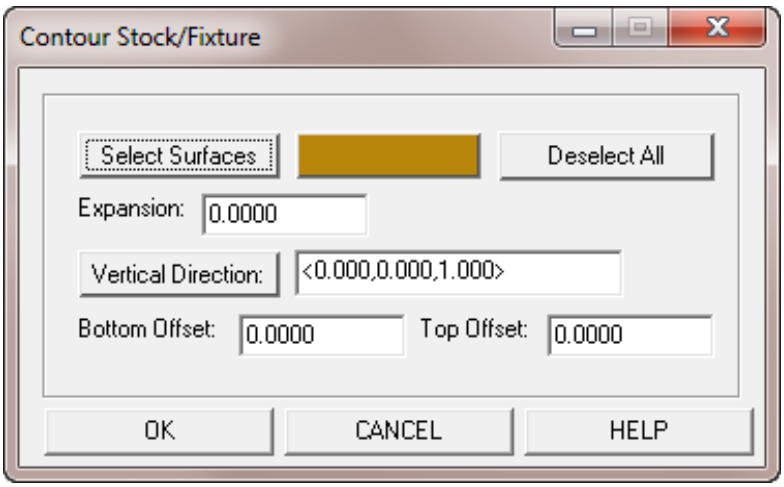
Contour

Click this menu to create a stock model based on the contour of the part.

Pick a list of surfaces representing the part. Specify the vertical direction, the expansion factor, the top and bottom offsets.

First the part is projected onto a plane along the vertical direction. Then the resulting contour is offset in the horizontal plane by the expansion factor. Finally, to create the Contour Stock, the flat horizontal surface bounded by the offset contour is extruded - up to the level above the part by the top offset, and down to the level below the part by the bottom offset.

Click this menu to open the Contour form as shown below.



Select Surfaces

Takes down the form, brings up the *SELECT* menu. Allows selection of surfaces.

Color

Chooses a color to highlight the selected surfaces.

Deselect All

Deselects the currently selected surfaces.

Expansion

The horizontal offset parameter for the stock.

Vertical Direction

Used to define the vertical direction by inputting a vector. <0, 0, 1> is the suggested default.

Bottom Offset

The bottom is defined as the level below the part by the specified parameter.

Top Offset

The top is defined as the level above the part by the specified parameter.

OK

Click this button to accept the current entries and close the Contour Stock form.

CANCEL

Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Contour Stock form.

Revolve

Click this menu to create a stock model as a solid of revolution.

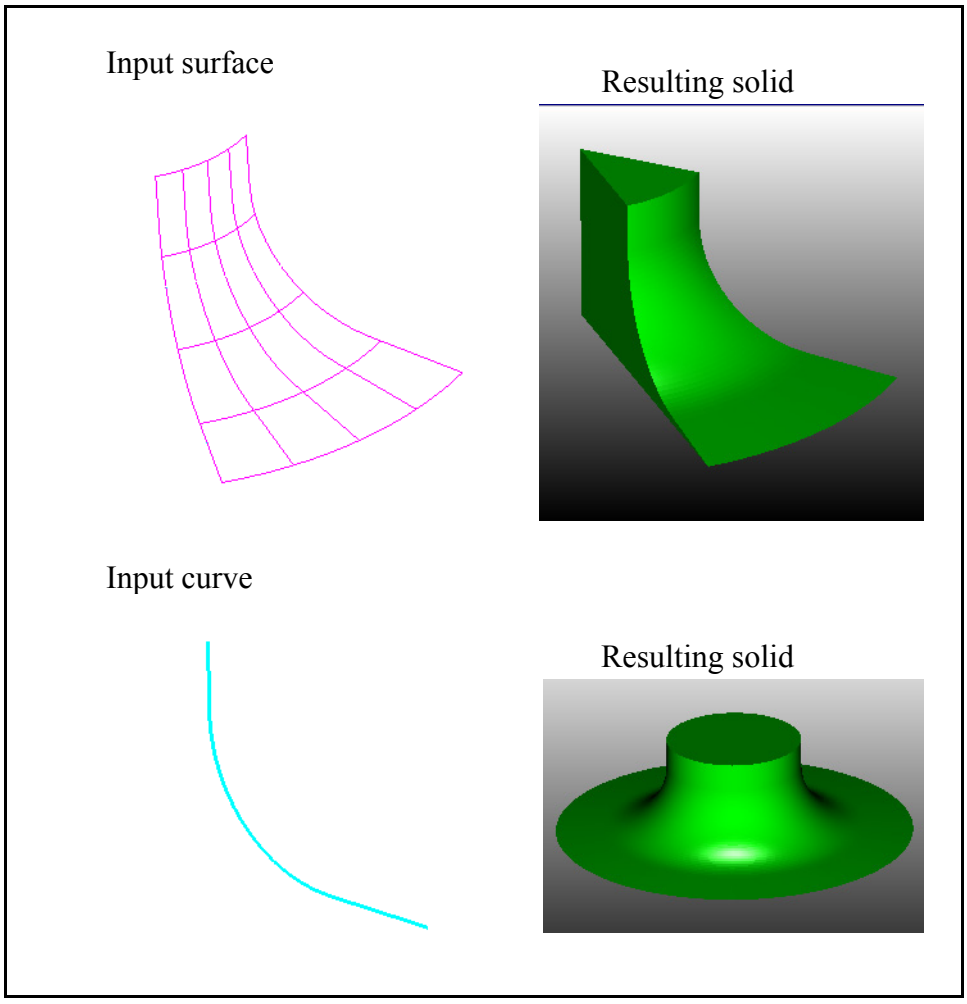
Pick a surface of revolution or a curve.

If a surface of revolution is picked the system will immediately create a solid of revolution. The start and end angles of the solid of revolution will be the same as the selected surface. The system will close open ends to form a closed volume.

If a curve is picked the system will prompt you to enter a point on the axis of the solid to be defined, an axis vector, and the start and end angles. The system will close open ends to form a closed volume.

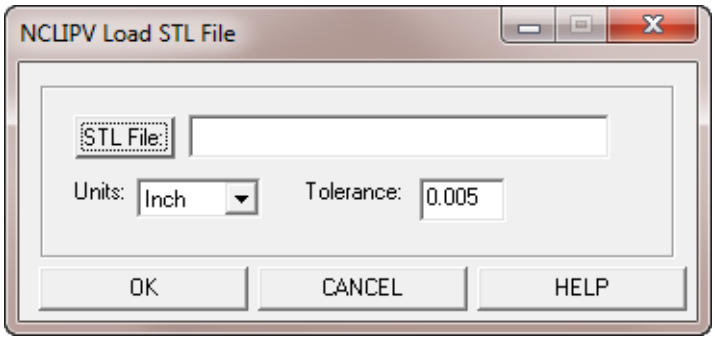
If a surface is picked that is not a surface of revolution an error message will be displayed. You can determine if a surface is a surface of revolution by clicking ***Status > Geometry*** and picking the surface.

Shown below are some example stock definitions:



Load Stl

Click this menu to load a Stereo lithography (STL) model as a stock model. A file browser as shown on next page will appear allowing you to browse for and select a file.



This form loads an STL model from an external file. The STL file can be generated from any CAD system, but it must be a closed solid. This means that there cannot be any gaps or overlapping faces in the STL model. ***NCL/IPV*** will attempt to close the STL model within the specified tolerance.

If the solid cannot be closed, then an error message will be output and the STL solid will be marked as invisible and inactive by default. You can manually visible and activate this solid and it may actually work in the session depending on how badly the STL model was created.

STL File

Enter the external STL file name in this field either by typing it in or by pressing the prompt button and selecting it from the file browser.

Units

Since ***NCL/IPV*** has no way of determining the proper units of the STL model, you must select the units that the STL file was saved in, either Inch or MM.

Tolerance

Specify the tolerance to use to attempt to close the STL model. This tolerance is only used to fix gaps and overlapping faces in the STL model and does not affect the accuracy of the model itself.

OK

Click this button to accept the current entries and close the Load STL form.

CANCEL

Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Load STL form.

Save Stl

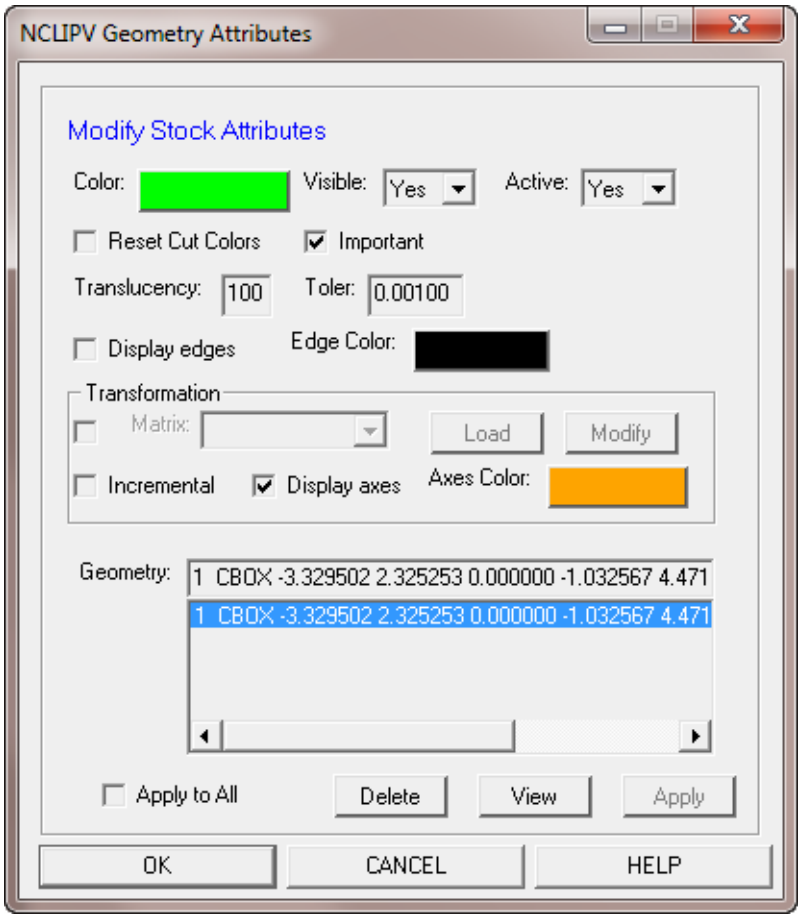
Click this menu to save the current stock model(s) to a STL file. The stock models will be saved as they currently appear in the original position when it was created.

If multiple stock models exist then an STL file will be created for each one. A master STL file will be written that contains the first model and points to the additional STL files. The master file will have the name you enter, the additional STL files will have the name you enter with an "_#" appended to the name. Where "#" is a number starting at 0 and will be increased by one for each additional file. Thus if you have 3 stock models and you save an STL file with the name *test.stl*, the system will create *test.stl* (STL file containing the 1st model and pointing to the additional files), *test_0.stl* (STL file containing the 2nd model), *and test_1.stl* (STL file containing 3rd model).

If you load the *test.stl* using the **Load Stl** menu then all models will be loaded. If you load *test_0.stl* then only the stock model in that file will be loaded.

Modify

Click this menu to bring up the Modify Stock Attributes form as shown on next page.



Color

Sets the color of the stock currently selected in the Geometry list box.

Visible

Determines whether or not the currently selected stock will be visible in the simulation window.

Set to **Yes** to make the stock visible.

Set to **No** to make the stock invisible.

Active

Determines whether or not the currently selected stock will be active when the simulation begins.

Set to **Yes** to make the stock active.

Set to **No** to make the stock inactive.

When a stock is made inactive it remains visible but ***NCL/IPV*** acts as if it isn't there.

Reset Cut Colors

Normally when a solid's color is changed only the uncut faces of the solid are changed, the cut faces remain the same color as when they were generated. Checking this box will cause the cut faces to be set to the same color as the solid color defined in the Color field.

Important

When this box is checked then the solid will be deemed important during the simulation and any unimportant solids that obscure this solid will be made translucent so that this solid can be clearly seen. The dynamic feature of making obscuring solids translucent can be enabled or disabled using the ***NCL/IPV*** Display Properties form.

Translucency

Sets the translucency of the currently selected stock. Enter a value between 1 and 100. 1 means totally translucent, 100 means not translucent.

Toler

Enter the tolerance you would like to apply to the selected model. Only cylindrical and solid of revolution models are affected.

The tolerance is a chordal tolerance that will determine how many facets the model will be made from.

Display Edges

Determines if the selected solid should be rendered with its edges displayed. When a solid has its edges displayed then both the outline of the solid and the cut faces will have edges displayed. This can highlight the complexity of a displayed cut solid, sometimes to an extent that the display is overwhelming.

Edge Color

Defines the color to display the solid edges with. "**Default**" uses

the same color as the solid is displayed in, while the other choices select an actual color. This color will be used to display the edges of the solid when the **Display Edges** box is checked and when the viewing mode is set to wireframe.

Transformation

This allows a transformation matrix to be attached to a stock solid created or loaded into ***NCL/IPV***.

Note: It is recommended that the Modals form be used to define the transformation matrix prior to defining the solids for speed and memory reasons.

Caveats: If a solid with a transformation matrix is saved as an external STL file or to a machining session file, then it will be saved with the transformation matrix applied to it, but when it is reloaded into ***NCL/IPV***, although it displays in the same coordinate system as the transformation matrix, the ***NCL/IPV*** Geometry Attribute Form will show it as not having a transformation matrix.

Matrix

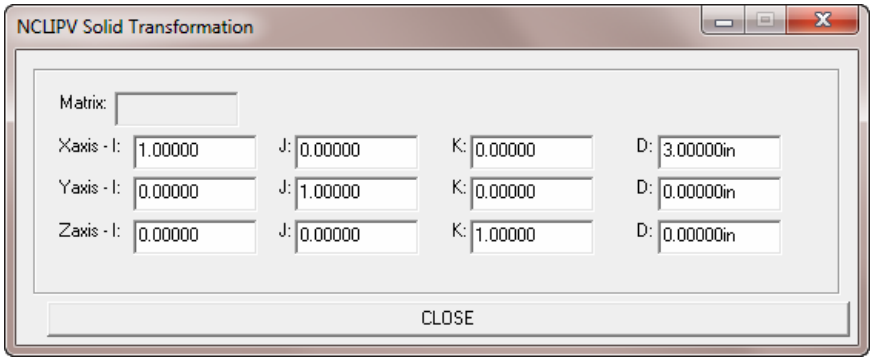
Enabling this checkbox allows the user to enter a transformation matrix. A predefined ***NCL*** matrix can be used or the user can enter the canonical data of the matrix.

Load

If a predefined matrix is used, then after selecting it from the display list, the **Load** button must be pressed to actually load the matrix. If the **Load** button is not pressed, then the **Matrix** field will represent the requested matrix, but the actual matrix canonical data will not be changed.

Modify

Displays a separate form that contains the matrix canonical data as shown on next page. This form can be used for reference or the user can enter the actual canonical data for the transformation matrix.



CLOSE

Click this button to accept the current entries and close the Stock Transformation form.

Incremental

Enabling the **Incremental** check box will cause the specified transformation matrix to be applied to the stock's current position, i.e. it will be multiplied to the stock's active transformation matrix. By default the transformation matrix will apply to the position of the stock as it was originally defined, not to its current position as transformed by any matrix.

Display Axes

Enabling the **Display Axes** checkbox displays the part coordinate system as modified through the transformation matrix associated with the solid. This provides a visual representation on how the solid is transformed from the original coordinate system. These coordinate axes will not be displayed during machine simulation, since the solid can be further transformed through the machine movement.

Axes Color

Sets the color of the display axes.

Geometry

List of stock models that have been defined. Click on the stock model to which you want to apply attribute changes. The selected model will be highlighted and will appear in the top field of the geometry list box.

Apply to All

Check this box if you want attribute changes to be applied to all stock models.

Delete

Click this button to delete the selected stock model.

View

Click this button to view a wireframe image of the selected stock model in the ***NCL*** graphics window.

Apply

Applies the attribute changes to the current solid selection from the Geometry List. If the 'Apply to All' box is checked, then the attributes will be assigned to all defined solids. This is an immediate action, the new attributes are applied without closing the form.

OK

Click this button to accept the current entries and close the Modify Stock Attributes form.

CANCEL

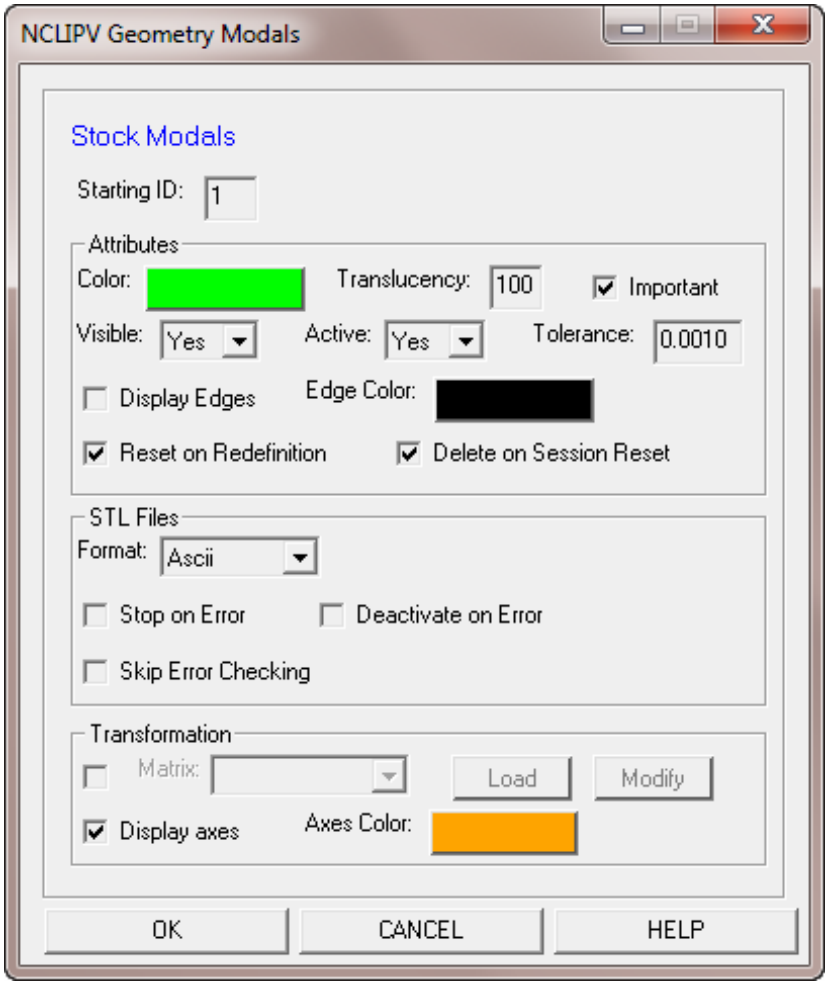
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Modify Stock Attributes form.

Modals

Click this button to bring up the Stock Modals form as shown on next page.



This form determines what attributes subsequently defined stock models will have.

Starting ID

Defines the numeric ID of the next stock to be defined. All subsequent solids will be numbered consecutively. The stock/fixture ID values are used to reference the individual solids in the *STOCK* commands.

Color

Sets the default color. Click the color button to open the color form to pick the desired color.

Translucency

Sets the translucency of subsequently defined stock. Enter a value between 1 and 100. 1 means totally translucent, 100

means not translucent.

Important

When this box is checked then the solid will be deemed important during the simulation and any unimportant solids that obscure this solid will be made translucent so that this solid can be clearly seen. The dynamic feature of making obscuring solids translucent can be enabled or disabled using the ***NCL/IPV*** Display Properties form.

Visible

Determines whether or not subsequently defined stock will be visible in the simulation window.

Set to **Yes** to make the stock visible.

Set to **No** to make the stock invisible.

Active

Determines whether or not subsequently defined stock will be active when the simulation begins.

Set to **Yes** to make the stock active.

Set to **No** to make the stock inactive.

When a stock is made inactive it remains visible but ***NCL/IPV*** acts as if it isn't there.

Tolerance

Enter the tolerance at which you would like the system to create cylindrical and solid of revolution models.

The tolerance is a chordal tolerance that will determine how many facets the model will be made from.

Display Edges

Determines if the selected solid should be rendered with its edges displayed. When a solid has its edges displayed then both the outline of the solid and the cut faces will have edges displayed. This can highlight the complexity of a displayed cut solid, sometimes to an extent that the display is overwhelming.

Edge Color

Defines the color to display the solid edges with. "**Default**" uses the same color as the solid is displayed in, while the other choices select an actual color. This color will be used to display the edges of the solid when the **Display Edges** box is checked and when the viewing mode is set to wireframe.

Reset on Redefinition

Checking this box will cause solids to take on the default attributes as defined in this form whenever they are redefined, either interactively or when restarting the simulation. When this box is not checked, then the solids will maintain their current color, translucency, visibility, active state, tolerance, and edge display when they are redefined.

Delete on Session Reset

This box should be checked if the defined solids should be deleted when the ***NCL/IPV*** session is reset. This ensures that the session will start fresh with no defined solids. If you interactively create any solids, then this setting should not be used, since these solids will not be automatically created when the simulation is rerun. ***NCL/IPV*** will keep all solids defined interactively and through the simulation file when the session is reset if this box is not checked.

STL Files

This defines the default properties of STL files.

Format

Determines the format in which to save STL files. Choose between **Ascii** and **Binary**.

Stop On Error

Enabling this field will cause ***NCL/IPV*** to output an error message whenever an STL file is loaded that contains an invalid solid. The solid could have self intersections or not be closed. An error message will be output to the ***NCL/IPV*** log file regardless of this setting.

Deactivate on Error

Enabling this field will cause ***NCL/IPV*** to deactivate and invisible an invalid solid loaded from an STL file. This is to ensure that the model is not corrupted and a fatal error is not encountered during the material removal process. If you choose to disable this field, then the results of the ***NCL/IPV*** session cannot be guaranteed to be correct. You can also manually activate this solid using the ***NCL/IPV*** Geometry Attributes form.

Skip Error Checking

Enabling this field will disable error checking when loading an STL model.

Error checking consists of making sure that the model does not have any self intersecting patches and ensuring that it is closed. These are requirements for solids that are to be used for simulation (cutting) purposes, but not really required for solids that are used for visual representation only (machine components, fixtures, etc.).

There have been cases of large STL models that are used for a minimal amount of machining that do not pass the required tests. In this case it may be acceptable to skip the error checking to see if the simulation works. If the simulation fails, then you know that error checking is required for this model.

Transformation

This allows a transformation matrix to be attached to all stock solids created or loaded into ***NCL/IPV***.

Matrix

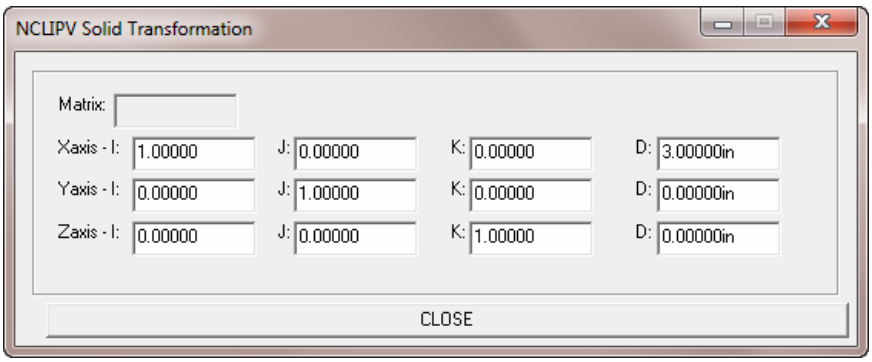
Enabling this checkbox allows the user to enter a transformation matrix. A predefined ***NCL*** matrix can be used or the user can enter the canonical data of the matrix.

Load

If a predefined matrix is used, then after selecting it from the display list, the Load button must be pressed to actually load the matrix. If the Load button is not pressed, then the Matrix field will represent the requested matrix, but the actual matrix canonical data will not be changed.

Modify

Displays a separate form that contains the matrix canonical data as shown below. This form can be used for reference or the user can enter the actual canonical data for the transformation matrix.



CLOSE

Click this button to accept the current entries and close the Stock Transformation form.

Display Axes

Enabling the **Display Axes** checkbox displays the part coordinate system as modified through the transformation matrix associated with the solid. This provides a visual representation on how the solid is transformed from the original coordinate system. These coordinate axes will not be displayed during machine simulation, since the solid can be further transformed through the machine movement.

Axes Color

Sets the color of the display axes.

OK

Click this button to accept the current entries and close the Stocks Modals form.

CANCEL

Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Stock Modals form.

Fixture

Click this menu to create and manage fixture models. The pop-up menu as shown below will appear.

Box Pt Pt

Click this button to create a box shaped fixture model by entering the coordinates (by *pick*, *locate* or *text*) of opposing corners of a rectangular box. If the selected coordinates do not contain a Z value you will be prompted for the upper and lower z-limits.

Box Pt Lwh

Click this button to create a box shaped fixture model by entering the xy-center of a rectangular box and then entering the desired Length, Width, and Height.

Solid

Click this button to create a fixture model from a ***NCL*** solid.

More

Click this button to display more options of creating fixture models.

The pop-up menu as shown below will appear.

Cone Pt Pt R

Click this button to create a cone shaped fixture model by selecting two points on the screen and entering the desired radii of at both ends.

Cone Pv L R

Click this button to create a cone shaped fixture model by picking an existing point-vector and then entering the desired length of the cone and the desired radii at both ends.

Cyl Ci L

Click this button to create a cylindrical shaped fixture model by picking an existing circle and then entering the desired length of the cylinder.

Cyl Pt Pt R

Click this button to create a cylindrical shaped fixture model by selecting two points on the screen and then entering the desired radius.

Cyl Pv L R

Click this button to create a cylindrical shape fixture model by picking an existing point, an existing vector and entering the desired length and radius of the cylinder.

Sphere Ci

Click this button to create a spherical shape fixture model by picking an existing circle.

Sphere Pt R

Click this button to create a spherical shape fixture model by selecting a point on the screen and entering the desired radius.

Torus Ci Ci

Click this button to create a torus shape fixture model by picking two existing circles.

Torus Ci R

Click this button to create a torus shape fixture model by picking an existing circle and entering the desired torus radius.

Torus Pv R R

Click this button to create a torus shape fixture model by picking an existing point, an existing vector and entering the two desired torus radii.

Profile

Click this button to create a fixture model by extruding a composite curve. Pick a composite curve, then enter the upper and lower z-limits.

If the composite curve is an open curve, the open end will be joined together in order to generate the resultant model.

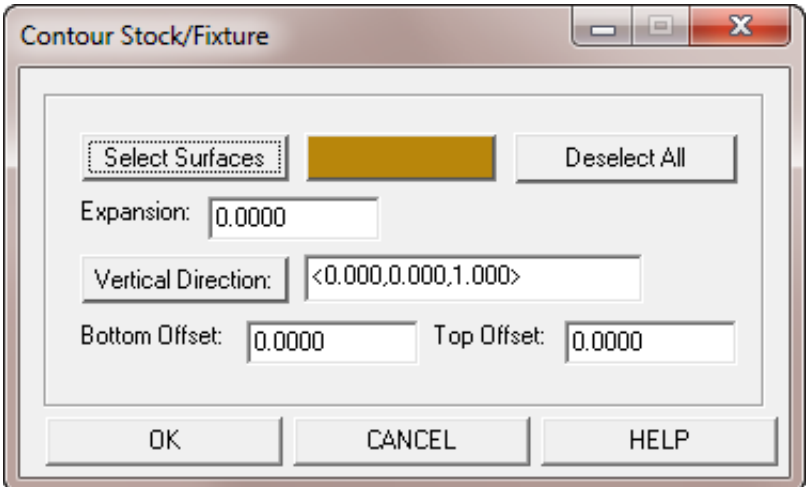
Contour

Click this menu to create a fixture model based on the contour of the part.

Pick a list of surfaces representing the part. Specify the vertical direction, the expansion factor, the top and bottom offsets.

First the part is projected onto a plane along the vertical direction. Then the resulting contour is offset in the horizontal plane by the expansion factor. Finally, to create the Contour Fixture, the flat horizontal surface bounded by the offset contour is extruded - up to the level above the part by the top offset, and down to the level below the part by the bottom offset.

Click this menu to open the Contour form as shown below.



Select Surfaces

Takes down the form, brings up the **SELECT** menu. Allows selection of surfaces.

Color

Chooses a color to highlight the selected surfaces.

Deselect All

Deselects the currently selected surfaces.

Expansion

The horizontal offset parameter for the fixture.

Vertical Direction

Used to define the vertical direction by inputting a vector. <0, 0, 1> is the suggested default.

Bottom Offset

The bottom is defined as the level below the part by the specified parameter.

Top Offset

The top is defined as the level above the part by the specified parameter.

OK

Click this button to accept the current entries and close the Fixture Contour form.

CANCEL

Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Fixture Contour form.

Revolve

Click this menu to create a fixture model as a solid of revolution.

Pick a surface of revolution or a curve.

If a surface of revolution is picked the system will immediately create a solid of revolution. The start and end angles of the solid of revolution will be the same as the selected surface. The system will close open ends to form a closed volume.

If a curve is picked the system will prompt you to enter a point on the axis of the solid to be defined, an axis vector, and the start and end angles. The system will close open ends to form a closed volume.

See **Stock > Revolve** for more details on solids of revolution.

Load Stl

Click this menu to load a Stereo lithography (STL) model as a fixture model. A file browser will appear allowing you to browse for and select a file.

Save Stl

Click this menu to save the current fixture model(s) to a STL file. The fixture models will be saved as they currently appear in the original position when it was created.

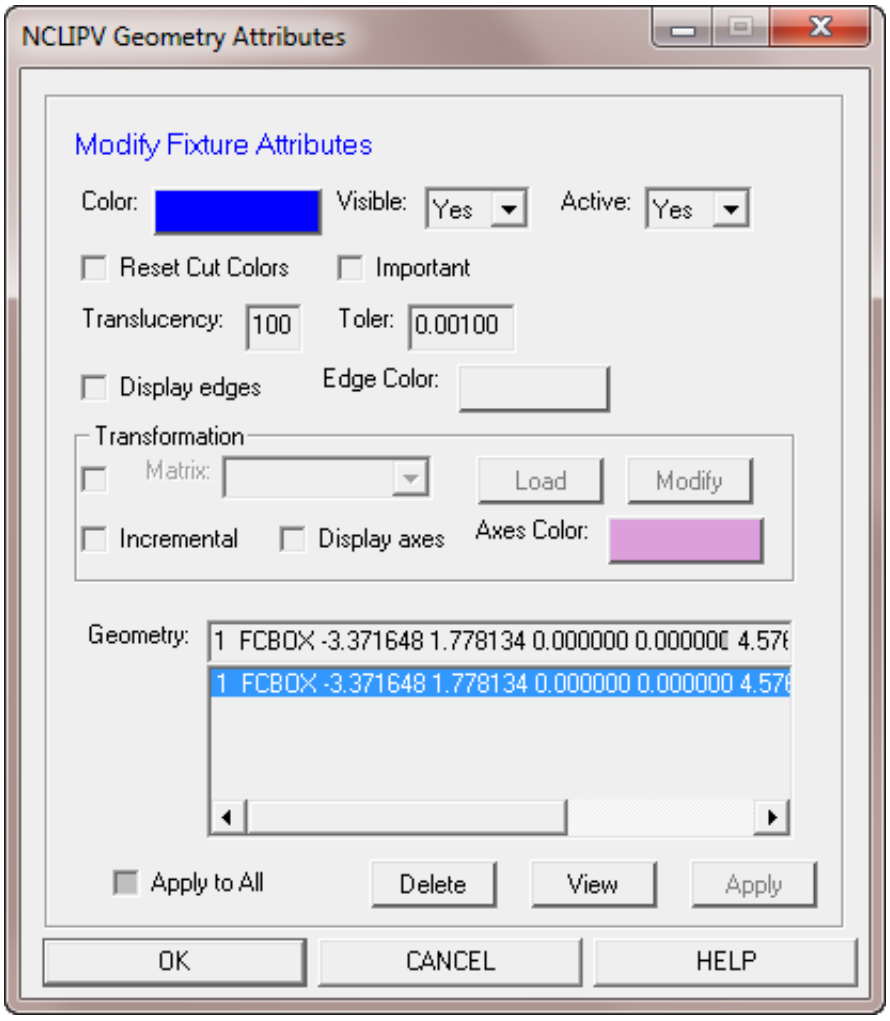
If multiple fixture models exist then an STL file will be created for each one. A master STL file will be written that contains the first model and points to the additional STL files. The master file will have the name you enter, the additional STL files will have the name you enter with an "_#" appended to the name. Where "#" is a number starting at 0 and will be increased by one for each additional

file. Thus if you have 3 fixture models and you save an STL file with the name *test.stl*, the system will create *test.stl* (STL file containing the 1st model and pointing to the additional files), *test_0.stl* (STL file containing the 2nd model), *and test_1.stl* (STL file containing 3rd model).

If you load the *test.stl* using the **Load Stl** menu then all models will be loaded. If you load *test_0.stl* then only the fixture model in that file will be loaded.

Modify

Click this menu to bring up the Modify Fixture Attributes form which will appear as shown below.



Color

Sets the color of the fixture currently selected in the Geometry list box.

Visible

Determines whether or not the currently selected fixture will be visible in the simulation window.

Set to **Yes** to make the fixture visible.

Set to **No** to make the fixture invisible.

Active

Determines whether or not the currently selected fixture will be active when the simulation begins.

Set to **Yes** to make the fixture active.

Set to **No** to make the fixture inactive.

When a fixture is made inactive it remains visible but ***NCL/IPV*** acts as if it is not there.

Reset Cut Colors

Normally when a solid's color is changed only the uncut faces of the solid are changed, the cut faces remain the same color as when they were generated. Checking this box will cause the cut faces to be set to the same color as the solid color defined in the Color field.

Important

When this box is checked then the solid will be deemed important during the simulation and any unimportant solids that obscure this solid will be made translucent so that this solid can be clearly seen. The dynamic feature of making obscuring solids translucent can be enabled or disabled using the ***NCL/IPV*** Display Properties form.

Translucency

Sets the translucency of the currently selected fixture. Enter a value between 1 and 100. 1 means totally translucent, 100 means not translucent.

Toler

Enter the tolerance you would like to apply to the selected model. Only cylindrical and solid of revolution models are affected.

The tolerance is a chordal tolerance that will determine how many facets the model will be made from.

Display Edges

Determines if the selected solid should be rendered with its edges displayed. When a solid has its edges displayed then both the outline of the solid and the cut faces will have edges displayed. This can highlight the complexity of a displayed cut solid, sometimes to an extent that the display is overwhelming.

Edge Color

Defines the color to display the solid edges with. "**Default**" uses the same color as the solid is displayed in, while the other choices select an actual color. This color will be used to display the edges of the solid when the **Display Edges** box is checked and when the viewing mode is set to wireframe.

Transformation

This allows a transformation matrix to be attached to all fixture solids created or loaded into ***NCL/IPV***.

Note: It is recommended that the Modals form be used to define the transformation matrix prior to defining the solids for speed and memory reasons.

Caveats: If a solid with a transformation matrix is saved as an external STL file or to a machining session file, then it will be saved with the transformation matrix applied to it, but when it is reloaded into ***NCL/IPV***, although it displays in the same coordinate system as the transformation matrix, the ***NCL/IPV*** Geometry Attribute Form will show it as not having a transformation matrix.

Matrix

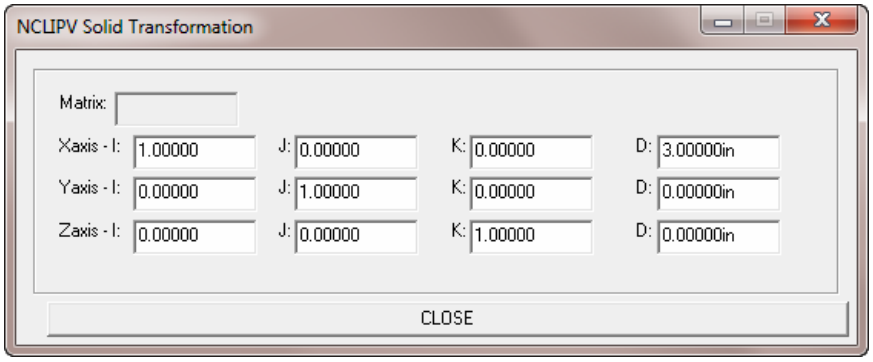
Enabling this checkbox allows the user to enter a transformation matrix. A predefined ***NCL*** matrix can be used or the user can enter the canonical data of the matrix.

Load

If a predefined matrix is used, then after selecting it from the display list, the **Load** button must be pressed to actually load the matrix. If the **Load** button is not pressed, then the **Matrix** field will represent the requested matrix, but the actual matrix canonical data will not be changed.

Modify

Displays a separate form that contains the matrix canonical data as shown below. This form can be used for reference or the user can enter the actual canonical data for the transformation matrix.



CLOSE

Click this button to accept the current entries and close the Fixture Transformation form.

Incremental

Enabling the **Incremental** check box will cause the specified transformation matrix to be applied to the stock's current position, i.e. it will be multiplied to the stock's active transformation matrix. By default the transformation matrix will apply to the position of the stock as it was originally defined, not to its current position as transformed by any matrix.

Display Axes

Enabling the **Display Axes** checkbox displays the part coordinate system as modified through the transformation matrix associated with the solid. This provides a visual representation on how the solid is transformed from the

original coordinate system. These coordinate axes will not be displayed during machine simulation, since the solid can be further transformed through the machine movement.

Axes Color

Sets the color of the display axes.

Geometry

List of fixture models that have been defined. Click on the fixture model to which you want to apply attribute changes. The selected model will be highlighted and will appear in the top field of the geometry list box.

Apply to All

Check this box if you want attribute changes to be applied to all fixture models.

Delete

Click this button to delete the selected fixture model.

View

Click this button to view a wireframe image of the selected fixture model in the ***NCL*** graphics window.

Apply

Applies the attribute changes to the current solid selection from the Geometry List. If the 'Apply to All' box is checked, then the attributes will be assigned to all defined solids. This is an immediate action, the new attributes are applied without closing the form.

OK

Click this button to accept the current entries and close the Modify Fixture Attributes form.

CANCEL

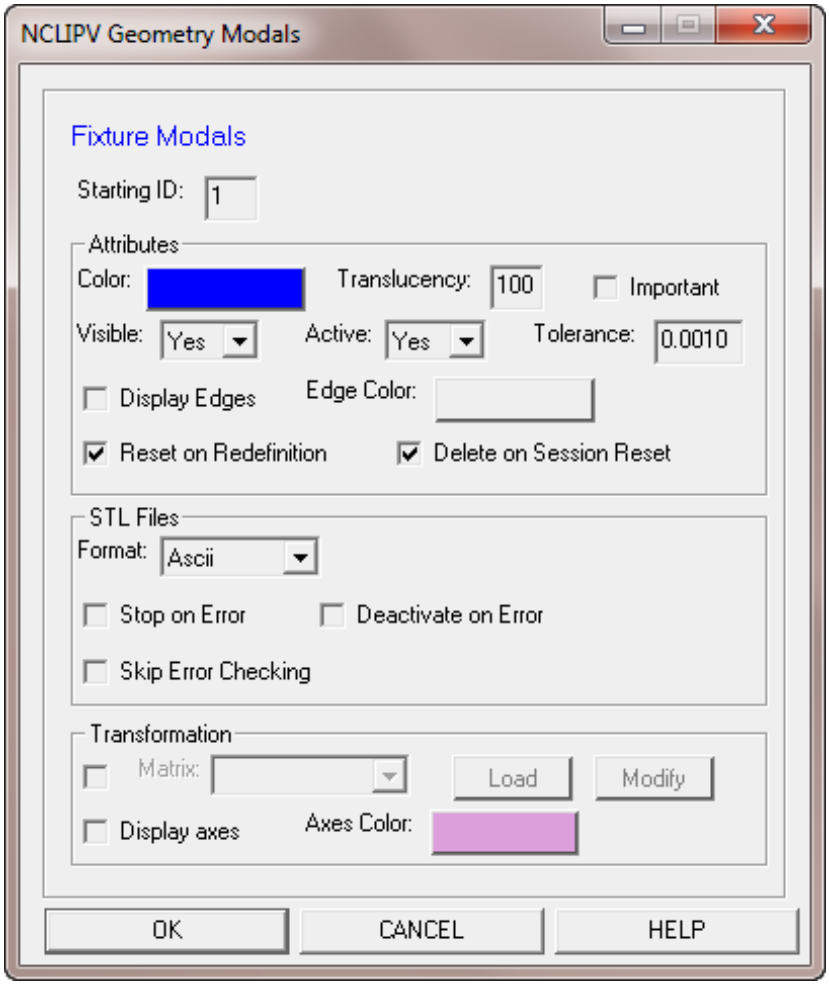
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Modify Fixture Attributes form.

Modals

Click this button to bring up the Fixture Modals form as shown below.



This form determines what attributes subsequently defined fixture models will have.

Starting ID

Defines the numeric ID of the next fixture to be defined. All subsequent solids will be numbered consecutively. The stock/fixture ID values are used to reference the individual solids in the *FIXTUR* commands.

Color

Sets the default color.

Translucency

Sets the translucency of subsequently defined fixture models. Enter a value between 1 and 100. 1 means totally translucent, 100 means not translucent.

Important

When this box is checked then the solid will be deemed important during the simulation and any unimportant solids that obscure this solid will be made translucent so that this solid can be clearly seen. The dynamic feature of making obscuring solids translucent can be enabled or disabled using the ***NCL/IPV*** Display Properties form.

Visible

Determines whether or not subsequently defined fixture models will be visible in the simulation window.

Set to **Yes** to make the fixtures visible.

Set to **No** to make the fixtures invisible.

Active

Determines whether or not subsequently defined fixture models will be active when the simulation begins.

Set to **Yes** to make the fixtures active.

Set to **No** to make the fixtures inactive.

When a fixture is made inactive it remains visible but ***NCL/IPV*** will act as if it isn't there.

Tolerance

Enter the tolerance at which you would like the system to create cylindrical and solid of revolution models.

The tolerance is a chordal tolerance that will determine how many facets the model will be made from.

Display Edges

Determines if the selected solid should be rendered with its edges displayed. When a solid has its edges displayed then both the outline of the solid and the cut faces will have edges displayed. This can highlight the complexity of a displayed cut solid, sometimes to an extent that the display is overwhelming.

Edge Color

Defines the color to display the solid edges with. "**Default**" uses the same color as the solid is displayed in, while the other choices select an actual color. This color will be used to display the edges of the solid when the **Display Edges** box is checked and when the viewing mode is set to wireframe.

Reset on Redefinition

Checking this box will cause solids to take on the default attributes as defined in this form whenever they are redefined, either interactively or when restarting the simulation. When this box is not checked, then the solids will maintain their current color, translucency, visibility, active state, tolerance, and edge display when they are redefined.

Delete on Session Reset

This box should be checked if the defined solids should be deleted when the ***NCL/IPV*** session is reset. This ensures that the session will start fresh with no defined solids. If you interactively create any solids, then this setting should not be used, since these solids will not be automatically created when the simulation is rerun. ***NCL/IPV*** will keep all solids defined interactively and through the simulation file when the session is reset if this box is not checked.

STL Files

This defines the default properties of the STL files.

Format

Determines the format in which to save STL files. Choose between **Ascii** and **Binary**.

Stop On Error

Enabling this field will cause ***NCL/IPV*** to output an error message whenever an STL file is loaded that contains an invalid solid. The solid could have self intersections or not be closed. An error message will be output to the ***NCL/IPV*** log file regardless of this setting.

Deactivate on Error

Enabling this field will cause ***NCL/IPV*** to deactivate and invisible an invalid solid loaded from an STL file. This is to ensure that the model is not corrupted and a fatal error is not encountered during the material removal process. If you choose to disable this field, then the results of the ***NCL/IPV*** session cannot be guaranteed to be correct. You can also manually activate this solid using the ***NCL/IPV*** Geometry Attributes form.

Skip Error Checking

Enabling this field will disable error checking when loading an STL model.

Error checking consists of making sure that the model does not have any self intersecting patches and ensuring that it is closed. These are requirements for solids that are to be used for simulation (cutting) purposes, but not really required for solids that are used for visual representation only (machine components, fixtures, etc.).

There have been cases of large STL models that are used for a minimal amount of machining that do not pass the required tests. In this case it may be acceptable to skip the error checking to see if the simulation works. If the simulation fails, then you know that error checking is required for this model.

Transformation

This allows a transformation matrix to be attached to a fixture solid created or loaded into ***NCL/IPV***.

Matrix

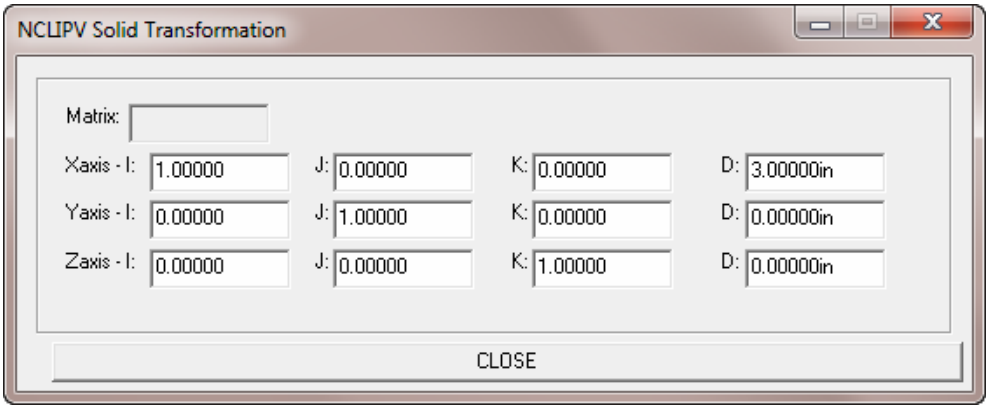
Enabling this checkbox allows the user to enter a transformation matrix. A predefined ***NCL*** matrix can be used or the user can enter the canonical data of the matrix.

Load

If a predefined matrix is used, after selecting it from the displayed list, the Load button must be pressed to actually load the matrix. If the Load button is not pressed the Matrix field will contain the requested matrix label and the requested matrix will not be used.

Modify

Displays a separate form that contains the matrix canonical data as shown below. This form can be used for reference or the user can enter the actual canonical data for the transformation matrix.



CLOSE

Click this button to accept the current entries and close the Fixture Transformation form.

Display Axes

Enabling the **Display Axes** checkbox displays the part coordinate system as modified through the transformation matrix associated with the solid. This provides a visual representation on how the solid is transformed from the original coordinate system. These coordinate axes will not be displayed during machine simulation, since the solid can be further transformed through the machine movement.

Axes Color

Sets the color of the display axes.

OK

Click this button to accept the current entries and close the Fixture Modals form.

CANCEL

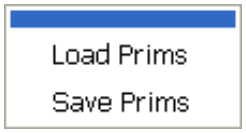
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Fixture Modals form.

Load Prims

Clicking on the ▾ next to the **Load Prims** menu will produce the following pull-down menu. Clicking on any of these menu options will activate that function and will make the selected function the default selection for the **Load Prims** menu.



Load Prims

Click this button to load a previously saved stock file. A file browser will appear allowing you to browse for and select a stock file (.stk).

A stock file is a text file that contains all stock and fixture models that are present at the time the file is saved.

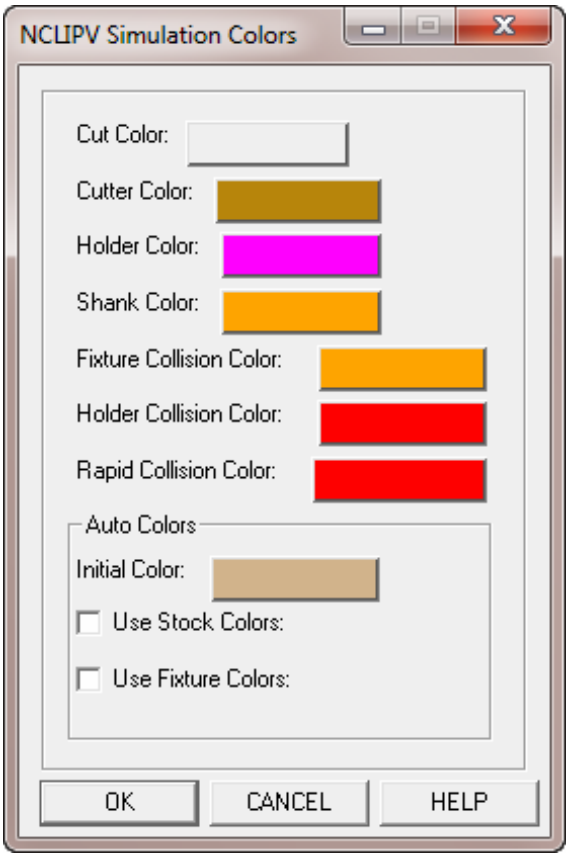
Save Prims

Click this button to save a stock file (.stk). All currently defined stock and fixture models will be saved.

A stock file is a text file that contains all stock and fixture models that are present at the time the file is saved.

Colors

Click this menu to change the default simulation colors. The form as shown on next page will appear:



Cut Color

Sets what color the cut material will be during material removal simulation.

Set to **Auto** to have the system automatically change the cut color each time a tool change is encountered.

Cutter Color

Sets what color the tool will be during simulation.

Holder Color

Sets what color the tool holder will be during simulation.

Shank Color

Sets what color the shank will be during simulation.

Fixture Collision Color

Sets what color to display fixture material that has been collided with by the tool.

Holder Collision Color

Sets what color to display material that has been collided with by the tool holder.

Rapid Collision Color

Sets what color to display material that has been collided with by the tool at a *RAPID* feedrate.

Auto Color

The **Auto Color** settings determine the strategy used when **Cut Color** is set to **Auto**.

Initial color

Determines the initial color to use for displaying the cut material.

Use Stock Colors

Check this box if you want stock colors to be included in the **Auto Color** selections.

If this box is not checked then colors that have been used to display stock models will not be used for displaying the cut material.

Use Fixture Colors

Check this box if you want fixture colors to be included in the **Auto Color** selections.

If this box is not checked then colors that have been used to display fixture models will not be used for displaying the cut material.

OK

Click this button to accept the current entries and close the Simulation Colors form.

CANCEL

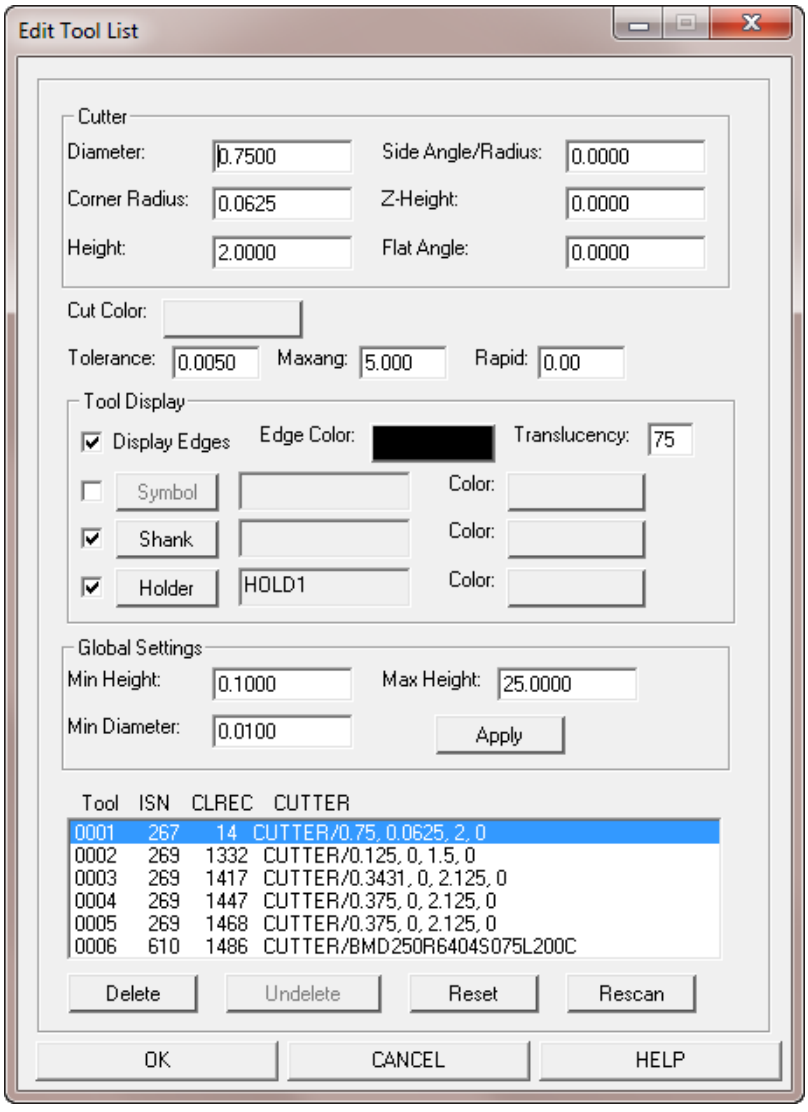
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Simulation Colors form.

Tool List

Click this menu to display the tools contained in the current toolpath file. The form as shown below will appear.



The Tool List form displays a list of all tools in the current tool path. The parameters for the currently selected tool are shown in the various parameter fields.

The parameter fields may be edited to override the default values shown. To save your edits click on another tool or click **OK** to save your changes and exit the form. If you do not want to save your edits, click

the **Reset** button or click the **CANCEL** button to exit the form.

Cutter

Shows the cutter definition parameters of the currently selected tool.

Cut Color

Sets what color the cut material will be when using the currently selected tool during simulation. Choose "**Default**" to use the color specified in the color form or choose a desired color.

Translucency

Sets how translucent the currently selected tool will be during simulation. Enter a value between 1 and 100. 1 means totally translucent, 100 means not translucent. The default value for cutter translucency is set in the **Tool Modals** form.

Tolerance

Sets the chordal tolerance you want to use for the currently selected tool. The cutter is a faceted solid model. The tolerance will determine how accurate the cutter will be. Lower values will naturally be more accurate and produce more accurate results on the cut model. Simulation speed will be somewhat slower. The default value for cutter tolerance is set in the **Tool Modals** form.

Maxang

Sets the maximum tool axis angle change that this tool can make in a single move during simulation. The default value for **Maxang** is set in the **Tool Modals** form.

Rapid

Enter the rapid feedrate threshold for this tool. When material is cut at or higher than the rapid feedrate the material will be displayed in the Rapid Collision Color as specified in the **Colors** form. A warning will also be written to the log file. A value of 0 specifies that only moves programmed using a *RAPID* command will be considered a rapid move.

Tool Display

This section defines a symbol that will be used as the cutter and optional shank and holder definitions. The cutter, shank, and holder

are considered parts of a tool and are referenced as such here.

Display Edges

Determines if the selected tool should be rendered with its edges displayed. Displaying the edges of the tool with a low translucency setting is similar to displaying a wireframe cutter.

Edge Color

Defines the color to display the tool edges with. 'Default' uses the same color as the tool is displayed in, while the other choices select an actual color. This color will be used to display the edges of the tool when the Display Edges box is checked and when the viewing mode is set to wireframe.

Translucency

Sets the display translucency of the selected tool from 1 to 100, where 100 displays a solid tool and a lower number displays a more transparent tool. Changing the value in this field will affect all parts of the tool, i.e., the cutter, shank, and holder. Individual translucency settings can be changed in the Tool Display forms.

Form Tools, Shanks and Holders

Form tools, shanks and holders can be used during toolpath simulation and are specified using the *CUTTER/DISPLY* or *PPRINT IPV CUTTER DISPLY* command in your ***NCL*** part program. For example:

```
CUTTER/DISPLY,FORM1
```

The CUTTER/DISPLY command tells ***NCL*** and ***NCL/IPV*** to display the cutter using the ***NCL/CADD*** symbol *FORM1* or the point-list data *FORM1* in the TOOL.LIB file.

```
CUTTER/DISPLY,HOLD1,0
```

The above command tells ***NCL*** and ***NCL/IPV*** to attach and display the ***NCL/CADD*** symbol *HOLD1* at a distance of 0 from the top of the currently defined tool. This is the technique used for displaying tool holders.

By default ***NCL*** and ***NCL/IPV*** look to the local library directory *Tools_S* to locate the symbol files. You may specify the name of a symbol library on the CUTTER/DISPLY command to locate the symbols in other libraries. For example:

CUTTER/DISPLY,tools,HOLD1,0

Where ‘tools’ is the name of a library either in the local directory or in the symbol system directory which is usually defined as *C:\NCCS\NCL101\symbols*.

Use ***NCL/CADD*** to draw and create a symbol that represents the desired form tool or holder. The symbol must consist of a single surface of revolution to be displayed in ***NCL/IPV***.

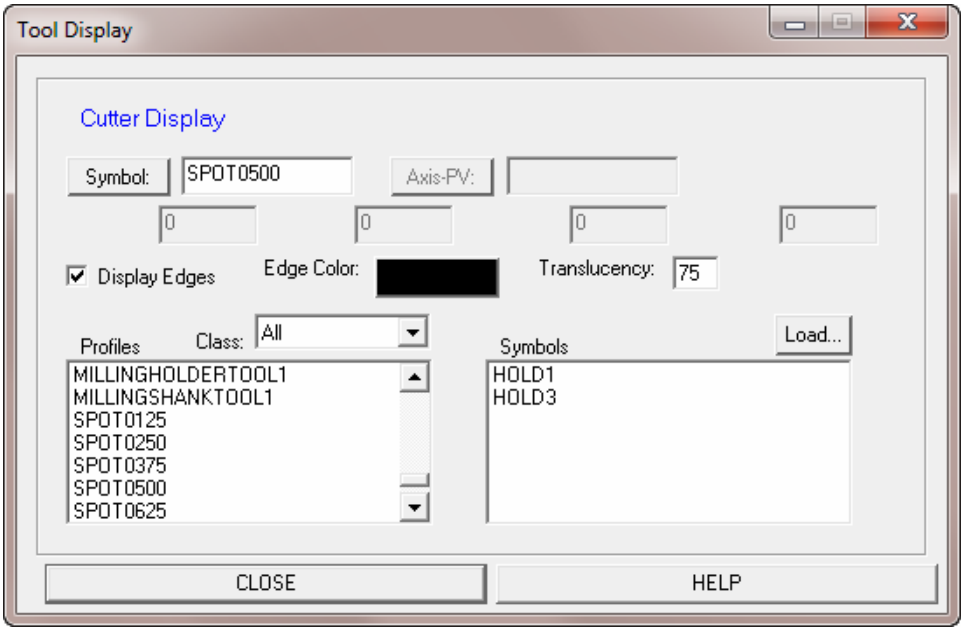
The fields in the Tool List form that control form tools and holders are as follows:

Note:

- The PPRINT IPV CUTTER DISPLY command only works with ***NCL/IPV*** and not ***NCL***.
- By default ***NCL*** and ***NCL/IPV*** look to the local folder to locate the “TOOL.LIB” file for point-list data information, otherwise ***NCL*** and ***NCL/IPV*** will look for “TOOL.LIB” file in the system directory which is usually defined as *C:\NCCS\NCL101\toolib*.

Symbol

Enabling the **Symbol** box will cause this tool to display as a form tool. Click this button to open the Tool Display form as below.



Symbol

Valid entities that can be used for the tool display include curves, surfaces of revolution, external profiles, point-list data, CADD symbols and solids. When a CADD symbol representation of the tool is used as a mill cutter with ***NCL/IPV***, then it should contain only a single surface of revolution, otherwise this symbol will be ignored in ***NCL/IPV***. The symbol is used for display purposes only in ***NCL*** and can contain any geometry. This is the same with Visual Solids, only solids of revolution can be used as mill cutters in ***NCL/IPV***.

With Lathe cutters, the CADD symbol should contain a single composite curve when used with ***NCL/IPV***, otherwise it will be ignored. This composite curve will automatically be extruded in ***NCL*** and ***NCL/IPV*** in order to represent a three dimensional solid shape. The symbol is used for display purposes only in ***NCL*** and can contain any geometry. This is the same with solids, only extruded solids can be used as lathe cutters in ***NCL/IPV***.

Pressing the Symbol: button allows you to pick a curve, a surface of revolution or solids from the screen.

Axis-PV

This field is only active when a curve is used for the tool display. It allows you to specify an axis of rotation for the curve display. By default, the curve should be defined in the XY-plane and a point-vector of 0,0,0,0,1,0 will be used to revolve the curve. Pressing the **Axis-PV:** button allows you to pick a point-vector from the screen.

Display Edges

Determines if the ***NCL/IPV*** tool part should be rendered with its edges displayed. Displaying the edges of the tool with a low translucency setting is similar to displaying a wireframe cutter. This field will only be active when a tool is being edited in the ***NCL/IPV*** Too List.

Edge Color

Defines the color to display the tool edges with. “Default” uses the same color as the tool is displayed in, while the other choices select an actual color. This color will be used to

display the edges of the tool when the Display Edges box is checked and when the viewing mode is set to wireframe.

This field will only be active when a tool is being edited in the ***NCL/IPV*** Tool List.

Translucency

Sets the display transparency of the tool part from 1 to 100, where 100 displays a solid tool and a lower number displays a more transparent tool. Each part of the tool (cutter, shank, holder) can have their own translucency setting. This field will only be active when a tool is being edited in the ***NCL/IPV*** Tool List.

Profiles

The Profiles List contains a list of all profiles contained in the NCL_TOOL_DESC library that pass the Class selection. Selecting one of these profiles will automatically update the Symbol field with the profile name.

Class

The Class field allows you to display only the profiles that belong to the same class as selected in this field. Selecting “All” will display all profiles defined in the library.

Symbols

The Symbols List contains a list of all defined CADD Symbols. Selecting one of these symbols will automatically update the Symbol field with the symbol name.

Load...

The load button brings up the Load Symbol form and allows you to load an external symbol into the active Unibase. This symbol will then be displayed in the Symbols List and will automatically be selected as the tool symbol.

CLOSE

Click this button to exit the form.

HELP

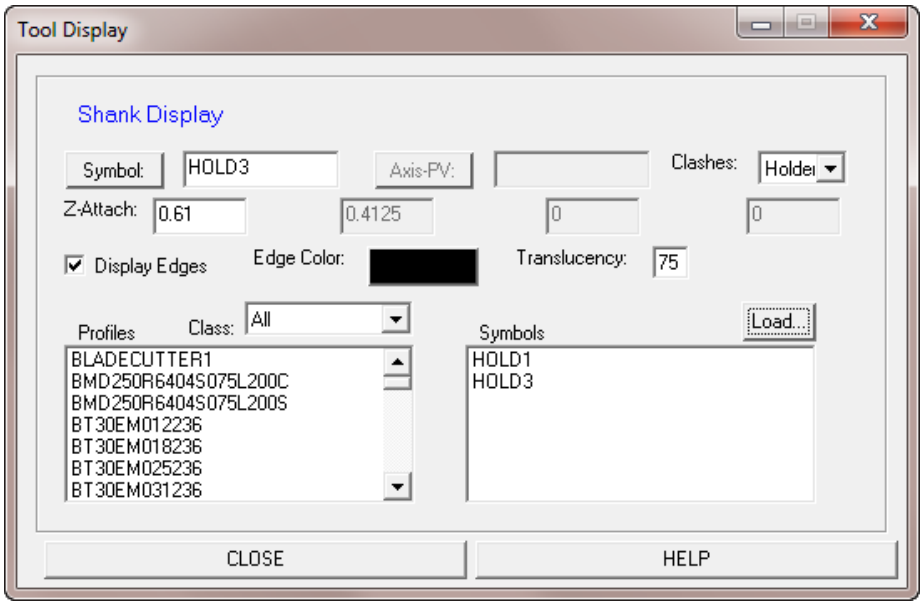
Click this button to display a brief description of the Tool Display form.

Color

Sets what color symbol will be when using the currently selected tool during simulation. Choose "**Default**" to use the color specified in the colors form or choose a desired color.

Shank

Enabling the **Shank** box will cause this tool to include a shank. The shank can be an extension of the cutter or can be a non-cutting portion of the tool holder. Click this button to open the following Tool Display form.



Symbol

Valid entities that can be used for the shank display include curves, surfaces of revolution, external profiles, CADD symbols and solids. When a CADD symbol representation of the shank is used with ***NCL/IPV***, then it should contain only a single surface of revolution, otherwise this symbol will be ignored in ***NCL/IPV***. The symbol is used for display purposes only in ***NCL*** and can contain any geometry. This is the same with solids, only solids of revolution can be used as Mill shanks in ***NCL/IPV***.

With Lathe shanks, the CADD symbol should contain a single composite curve or a single revolved entity when used with ***NCL/IPV***, otherwise it will be ignored. This composite curve will automatically be extruded in ***NCL*** and ***NCL/IPV*** in order to represent a three dimensional solid shape. The symbol is used for display purposes only in ***NCL*** and can contain any geometry.

If a revolved entity is used as Lathe shank and there is a clash between the shank and the part, ***NCL/IPV*** will report the clash as error, however, the part will not cut by the shank.

Pressing the Symbol: button allows you to pick a curve or a surface of revolution from the screen.

Axis-PV

This field is only active when a curve is used for the shank display. It allows you to specify an axis of rotation for the curve display. By default, the curve should be defined in the XY-plane and a point-vector of 0,0,0,0,1,0 will be used to revolve the curve. Pressing the Axis-PV: button allows you to pick a point-vector from the screen.

Clashes

This field controls how the shank is treated during the ***NCL/IPV*** simulation session.

Specifying 'Cutter' causes the tool shank to be treated as a part of the cutting portion of the tool as defined by the cutter parameters. Clashes will only be reported if the tool shank violates a fixture or during Rapid moves.

'Holder' specifies that the tool shank should be classified as a part of the tool holder, causing clashes to be reported whenever it violates a fixture or a stock.

Mill Style Tools

Diameter

Defines the diameter of a Mill style shank. Specifying a value of zero will cause the diameter to be the same as the defined cutter at the top of the tool. This field is only active when a symbol has not been defined as the shank shape.

Height

Defines the height of a Mill style shank. This field is only active when a symbol has not been defined as the shank shape.

Z-Attach

Defines the attachment offset of the shank along the Z-axis. The shank can be offset in either the negative or positive direction.

Lathe Style Tools

Width

The Width parameter defines the width along the X-axis of the tool shank.

Length

The Length parameter defines the length along the Y-axis of the tool shank.

Z-Depth

Defines the Z-axis depth of the shank part. The default depth is the defined cutter height. This field is only valid when the shank shape is a composite curve that will be extruded.

Z-Attach

Defines the starting Z-axis position of the shank part. The default starting position is at the bottom of the cutter.

X-offset

This field will only be active when a symbol is defined as a shank part. It specifies the X-axis offset value for attaching the symbol to the Lathe tool. Specifying an Attach point of 0 will attach the shank part at the center of the inscribed circle for Lathe Inserts or at the top of a Grooving Tool.

Y-offset

This field specifies the Y-axis offset value for attaching the

active shank part to the rest of the Lathe tool. Specifying an Attach point of 0 will attach the shank part at the center of the inscribed circle for Lathe Inserts or at the top of a Grooving Tool.

Display Edges

Determines if the ***NCL/IPV*** shank part should be rendered with its edges displayed. Displaying the edges of the shank with a low translucency setting is similar to displaying a wireframe shank. This field will only be active when a shank is being edited in the ***NCL/IPV*** Too List.

Edge Color

Defines the color to display the shank edges with. "**Default**" uses the same color as the cutter is displayed in, while the other choices select an actual color. This color will be used to display the edges of the shank when the **Display Edges** box is checked and when the viewing mode is set to wireframe.

This field will only be active when a tool is being edited in the ***NCL/IPV*** Tool List.

Translucency

Sets the display transparency of the shank part from 1 to 100, where 100 displays a solid shank and a lower number displays a more transparent shank. Each part of the tool (cutter, shank, holder) can have their own translucency setting. This field will only be active when a shank is being edited in the ***NCL/IPV*** Tool List.

Profiles

The Profiles List contains a list of all profiles contained in the NCL_TOOL_DESC library that pass the Class selection. Selecting one of these profiles will automatically update the Symbol field with the profile name.

Class

The Class field allows you to display only the profiles that belong to the same class as selected in this field. Selecting 'All' will display all profiles defined in the library.

Symbols

The Symbols List contains a list of all defined CADD Symbols. Selecting one of these symbols will automatically update the Symbol field with the symbol name.

Load...

The **Load** button brings up the Load Symbol form and allows you to load an external symbol into the active Unibase. This symbol will then be displayed in the Symbols List and will automatically be selected as the tool symbol.

CLOSE

Click this button to exit the form.

HELP

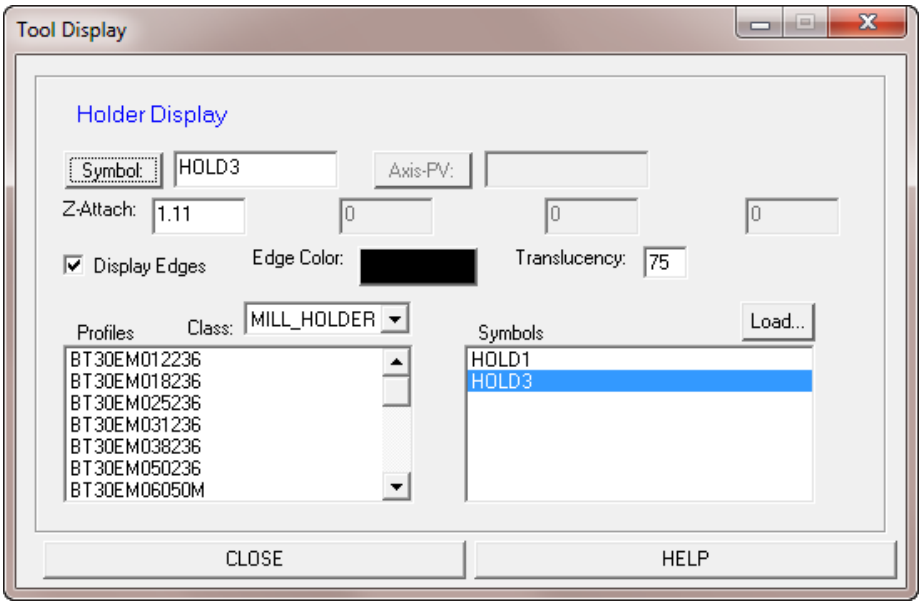
Click this button to display a brief description of the Tool Display form.

Color

Sets what color symbol will be when using the currently selected shank during simulation. Choose "**Default**" to use the color specified in the Colors form or choose a desired color.

Holder

Enabling the **Holder** box will cause this tool to include a holder. Click this button to open the Tool Display form as shown below.



Symbol

Valid entities that can be used for the holder display include curves, surfaces of revolution, external profiles, CADD symbols or solids. When a CADD symbol representation of the holder is used with ***NCL/IPV***, then it should contain only a single surface of revolution, otherwise this symbol will be ignored in ***NCL/IPV***. The symbol is used for display purposes only in ***NCL*** and can contain any geometry. This is the same with solids, only solids of revolution can be used as Mill holders in ***NCL/IPV***.

With Lathe holders, the CADD symbol should contain a single composite curve or a single revolved entity when used with ***NCL/IPV***, otherwise it will be ignored. This composite curve will automatically be extruded in ***NCL*** and ***NCL/IPV*** in order to represent a three dimensional solid shape. The symbol is used for display purposes only in ***NCL*** and can contain any geometry.

If a revolved entity is used as Lathe holder and there is a clash between the holder and the part, ***NCL/IPV*** will report the clash as error, however, the part will not cut by the holder.

Pressing the **Symbol:** button allows you to pick a curve or a surface of revolution from the screen.

Axis-PV

This field is only active when a curve is used for the holder display. It allows you to specify an axis of rotation for the curve display. By default, the curve should be defined in the XY-plane and a point-vector of 0,0,0,0,1,0 will be used to revolve the curve. Pressing the **Axis-PV:** button allows you to pick a point-vector from the screen.

Mill Style Tools

Diameter

Defines the diameter of a Mill style holder. Specifying a value of zero will cause the diameter to be the same as the defined cutter or shank at the top of the tool. This field is only active when a symbol has not been defined as the holder shape.

Height

Defines the height of a Mill style holder. This field is only active when a symbol has not been defined as the holder shape.

Z-Attach

Defines the attachment offset of the holder along the Z-axis. The holder can be offset in either the negative or positive direction.

Lathe Style Tools

Width

The Width parameter defines the width along the X-axis of the tool holder

Length

The Length parameter defines the length along the Y-axis of the tool holder.

Z-Depth

Defines the Z-axis depth of the holder part. The default depth is the defined cutter height. This field is only valid when the holder shape is a composite curve that will be extruded.

Z-Attach

Defines the starting Z-axis position of the holder part. The default starting position is at the bottom of the cutter or the top of the shank.

X-offset

This field will only be active when a symbol is defined as a holder part. It specifies the X-axis offset value for attaching the symbol to the Lathe tool. Specifying an Attach point of 0 will attach the holder part at the center of the inscribed circle for Lathe Inserts or at the top of a Grooving Tool or shank.

Y-offset

This field specifies the Y-axis offset value for attaching the active holder part to the rest of the Lathe tool. Specifying an Attach point of 0 will attach the holder part at the center of the inscribed circle for Lathe Inserts or at the top of a Grooving Tool or shank.

Display Edges

Determines if the ***NCL/IPV*** holder part should be rendered with its edges displayed. Displaying the edges of the holder with a low translucency setting is similar to displaying a wireframe holder. This field will only be active when a holder is being edited in the ***NCL/IPV*** Too List.

Edge Color

Defines the color to display the holder edges with. "**Default**" uses the same color as the cutter is displayed in, while the other choices select an actual color. This color will be used to display the edges of the holder when the **Display Edges** box is checked and when the viewing mode is set to wireframe.

This field will only be active when a holder is being edited in the ***NCL/IPV*** Tool List.

Translucency

Sets the display transparency of the holder part from 1 to 100, where 100 displays a solid holder and a lower number displays a more transparent holder. Each part of the tool (cutter, shank, holder) can have their own translucency setting. This field will only be active when a holder is being edited in the ***NCL/IPV*** Tool List.

Profiles

The Profiles List contains a list of all profiles contained in the NCL_TOOL_DESC library that pass the Class selection. Selecting one of these profiles will automatically update the Symbol field with the profile name.

Class

The Class field allows you to display only the profiles that belong to the same class as selected in this field. Selecting 'All' will display all profiles defined in the library.

Symbols

The Symbols List contains a list of all defined CADD Symbols. Selecting one of these symbols will automatically update the Symbol field with the symbol name.

Load...

The **Load** button brings up the Load Symbol form and allows you to load an external symbol into the active Unibase. This symbol will then be displayed in the Symbols List and will automatically be selected as the tool symbol.

CLOSE

Click this button to exit the form.

HELP

Click this button to display a brief description of the Tool Display form.

Color

Defines the display color for the tool holder. "**Default**" specifies that the color specified in the ***NCL/IPV*** Simulation Colors form should be used.

Global Settings

This section defines minimum and maximum values that certain cutter fields can have. Unlike the other section in this form, the Global Settings fields will apply to all defined tools in the list. Applying the changes in this section will also update the **Tool Modals** form.

Minimum Height

Defines the minimum height to use for the defined tools. Any tool that is defined with a height less than this value will be modified to have this height.

Maximum Height

Defines the maximum height to use for the defined tools. Any tool that is defined with a height more than this value will be modified to have this height. Tools defined with an excessive height will slow down the verification process.

Minimum Diameter

Defines the minimum diameter to use for the defined tools. Any tool that is defined with a diameter less than this value will be modified to have this diameter.

APPLY

Click this button to apply all the minimum and maximum values in the Global Settings section to all of the defined tools. This button will only affect the tools already contained in the list. If tools are constantly being redefined to modify the cutter height, but in reality are a single tool, then set the Minimum Height value to the desired height and use the **Rescan** button to weed out duplicate tools.

Tool List

This field contains the list of active tools for this ***NCL/IPV*** session. This list contains all the defined non-duplicate tools in the clfile. It also reflects any changes that were made to the tools using this form. It will not contain any tools that were deleted by the user, as these tools are no longer active.

Delete

Click this button to delete the selected tool. This tool is no longer active and will not be used during the ***NCL/IPV*** session.

Undelete

Click this button to restore the previously deleted tool to the active tool list. Up to 5 tools can be restored after being deleted. Use the **Reset** button to restore more than 5 tools.

Reset

Click this button to restore all the tools that have been manually deleted from the active tool list. It does not reset the attributes that have been changed by the user.

Rescan

Click this button to rescan the clfile and to create a new active tool list. Any changes to the tool list, including cutter parameters, tool attributes, and symbol modifications will be lost. In this sense, *Rescan* can be considered as a master **Reset** button. All field values set in the Global Settings section will be used during the Rescan.

OK

Click this button to accept the current entries and close the Tool List form.

CANCEL

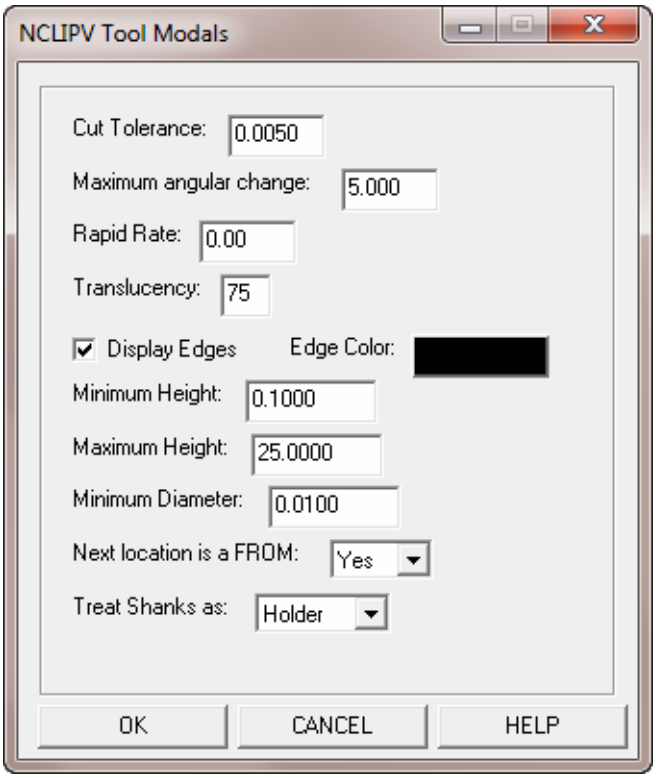
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Tool List form.

Tool Modals

Click this menu to bring up the Tool Modals form as shown below.



Cut Tolerance

Sets the default cutter chordal tolerance. The cutter is a faceted solid model. The tolerance will determine how accurate the cutter will be. Lower values will naturally be more accurate and produce more accurate results on the cut mode. Simulation speed will be somewhat slower.

You can apply a different **Cut Tolerance** for each tool by clicking the **Tool List** menu.

Maximum Angular Change

Sets the default maximum tool axis angle change that can occur in a single move.

You can apply a different Maximum Angle for each tool by clicking the **Tool List** menu.

Rapid Rate

Sets the rapid feedrate threshold. When material is cut at or higher than the rapid feedrate the material will be displayed in the **Rapid Collision Color** as specified in the **Colors** form. A warning will also be written to the log file. A value of 0 specifies that only moves programmed using a *RAPID* command will be considered a rapid move.

You can apply a different Rapid Rate for each tool by clicking the **Tool List** menu.

Translucency

Sets how translucent the tool will be during simulation. Enter a value between 1 and 100. 1 means totally translucent, 100 means not translucent.

You can apply a different Translucency value for each tool by clicking the **Tool List** menu.

Display Edges

Determines if all tools should be displayed with its edges rendered by default. Displaying the edges of the tool with a low translucency setting is similar to displaying a wireframe cutter.

Edge Color

Defines the color to display the tool edges with. "**Default**" uses the same color as the tool is displayed in, while the other choices select an actual color. This color will be used to display the edges of the tool when the Display Edges box is checked and when the viewing mode is set to wireframe.

Minimum Height

Sets the minimum height to use for all the tools. Any tool that is

defined with a height less than this value will be modified to have this height.

Maximum Height

Sets the maximum height to use for all the tools. Any tool that is defined with a height more than this value will be modified to have this height. Tools defined with an excessive height will slow down the verification process.

Minimum Diameter

Sets the minimum diameter to use for all tools. Any tool that is defined with a diameter less than this value will be modified to have this diameter.

Next Location is a FROM

Sets this field to **YES** if the locations immediately following an active tool definition should be treated as a *FROM* location, rather than as a cutting move. Only locations following a tool definition contained in the **Tool List** Form active list will be treated as a *FROM*. Setting this field to **NO** causes the programmed location immediately following an active tool definition to be treated exactly as programmed. If it is a cutting or position motion, then it will be treated as a cutting motion. If it is programmed using the *FROM* statement, then it will be treated as a from location.

Treat Shanks as

Cutter shanks are typically defined as the non-cutting part of a tool, but there are times when the shank can be used for visual representation and actually have a cutting edge, for example, on cone and bell shaped cutters. Set this field to Cutter if the default setting for shanks are to be considered as a cutting portion of the tool. Set it to Holder to have the cutter shanks considered a non-cutting part of the tool. This setting is used for clash detection.

OK

Click this button to accept the current entries and close the Tool Modals form.

CANCEL

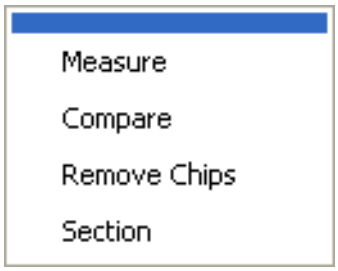
Click this button to exit the form without accepting any changes made to the entries.

HELP

Click this button to display a brief description of the Tool Modals form.

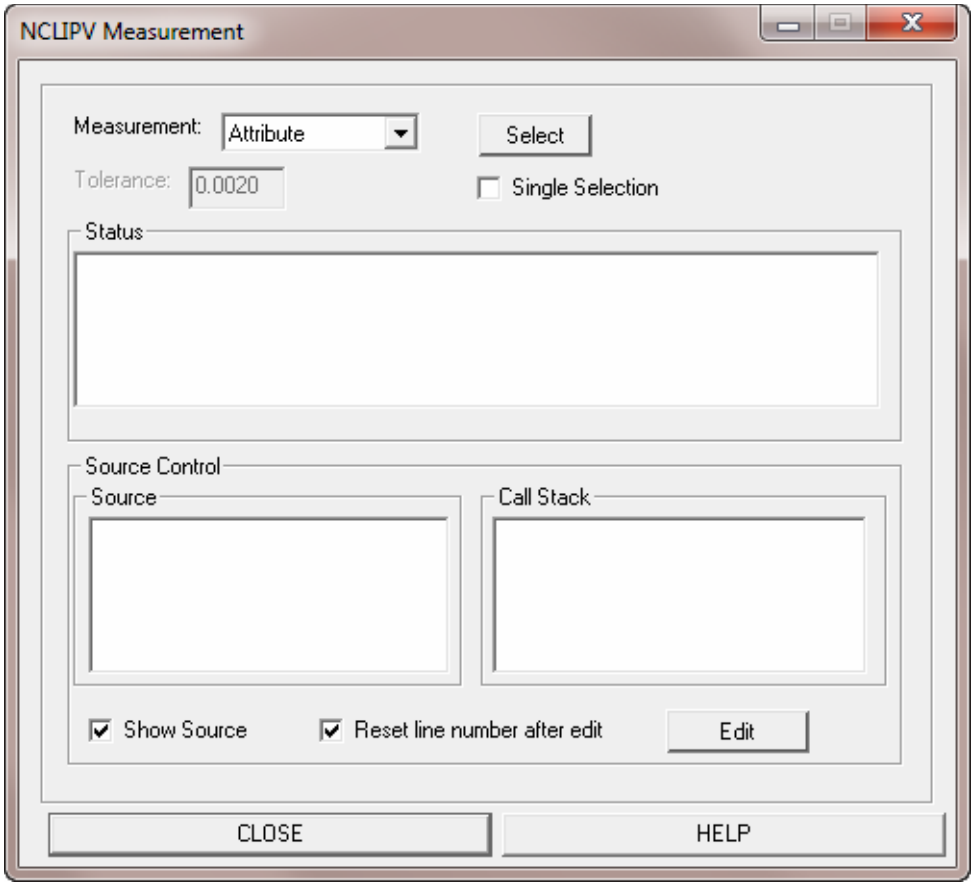
Measure

Clicking on the ▾ next to the **Measure** menu will produce the following pull-down menu. Clicking on any of these menu options will activate that function and will make the selected function the default selection for the **Measure** menu:



Measure

Click this menu to bring up the Measure Form as shown below.



To use the measurement form:

- Click the **Measurement** toggle button to choose the type of measurement you want to do.
- Click the **Select** button to enter *Pick* mode.
- Pick the area of the ***IPV*** model that you want to measure. Some measurement options require that you pick the model twice.

  The results of the measurement will be displayed in the **Status** window.

  The ***NCL*** part program statement responsible for cutting the area you picked will be shown in the **Source** window. Several lines of the ***NCL*** part program will be displayed and the statement responsible for the cut will be highlighted.
- You may pick the model as many times as you like and the **Status** and **Source** window will update accordingly.
- You can click on the ***IPV*** viewing options at any time to change the view of the model.
- Middle-click to exit *Pick* mode and return control to the form.
- Click the **Edit** button to edit the ***NCL*** statement responsible for the cut. ***NCL*** will enter *Command Mode* at the appropriate statement.
- Click the **Reset** button to return to the ***NCL*** part program statement you were on prior to clicking the **Edit** button.

The following explains each of the fields in the Measurement form:

Measurement

Click this toggle field to choose between one of the following measurement options:

Attribute

Choose this option to display the attribute data associated with the area of the model you pick. The following attribute data will be shown in the Status window:

ISN	Integer sequence number
SEQNO	MCD sequence number
CLREC	CL record number
CUT	Cut number

CUTTER	Cutter definition
LOADTL	LOADTL command
FEDRAT	Feedrate
SPINDL	Spindle condition
COOLNT	COOLNT condition
CUTCOM	CUTCOM condition

Point

Choose this option to display the X,Y,Z coordinates and normal vector of the area of the model you pick.

Geometry

Choose this option to display the geometric properties of the area of the model you pick.

Geometric properties include planes and cylinders.

You may enter a tolerance value in the **Tolerance** field to increase the sampling area around the point that you pick. A higher tolerance value will enable the system to more easily calculate cylindrical properties.

Thickness

Choose this option to measure the thickness of the model at the point that you pick. Thickness will be measured along the normal vector (extended into the model) at the point that you pick.

Gap

Choose this option to measure the air gap between the point that you pick and the closest portion of the model to that point. The measurement is taken along the normal vector (extending away from the model) at the point that you pick.

Distance

Choose this option to measure the distance between two selected points on the model. The results show the 3D distance, the X, Y and Z delta distances, and the planar distance if the points lie on parallel planes.

Click the first point.

Click multiple points to measure from the first point.

Middle-click the mouse to return to first point prompt.

Volume

Choose this option to measure the volume of the solid that you pick.

Select

Click this button to enter *Pick* mode. *Pick* mode allows you to pick the ***IPV*** model. The polygon that you pick on will be highlighted.

Click this menu to restore an ***IPV*** model that was saved using the **Save** option.

Tolerance

Enter a tolerance value to use with the **Geometry** measurement option. The tolerance value is used to increase the sampling area around the point that you pick. A higher tolerance value will enable the system to more easily calculate cylindrical properties.

Single Selection

Normally, the ***NCL/IPV*** Measurement form will remain displayed after pressing the **Select** button and the selection process will be modal, which means after a selection is made, the results will be displayed and you will remain in selection mode until you hit either Done or Reject on the mouse.

If the **Single Selection** box is checked, then the form will go away when selection mode is entered and will be redisplayed after the selection is made.

Selection mode will automatically be ended after a valid selection is made.

Status

The **Status** window shows the result of your measurements.

Source

The **Source** window displays the ***NCL*** part program statement responsible for cutting the area you pick. Several lines of the ***NCL*** part program will be displayed and the statement

responsible for the cut will be highlighted. If the part program is not loaded or a solid face is selected that was not cut, then no source will be displayed.

Call Stack

Displays the active call/loop stack when the cut was generated. The call/loop stack consists of the actual command that generated the cut and any *Macro calls* or *DO* loops that were active at the time of the cut.

Macro calls will be display simply as *CALL/macro* and *DO* loops will be displayed as *DO/lable,index=n*, where '*index*' is the name of the controlling *DO* loop variable and '*n*' is its value at the time that the cut was generated.

Selecting a line from the Call Stack list will display the associated source lines in the Source list.

Show Source

Check this box to show the ***NCL*** part program statements responsible for cutting the area of the model you pick in the **Source** window.

Reset Line Number After Edit

Click this button to return to the ***NCL*** part program statement you were on prior to clicking the **Edit** button.

Edit

Click this button to edit the ***NCL*** statement responsible for the cut. ***NCL*** will enter *Command Mode* at the appropriate statement.

CLOSE

Click this button to exit the Measurement form.

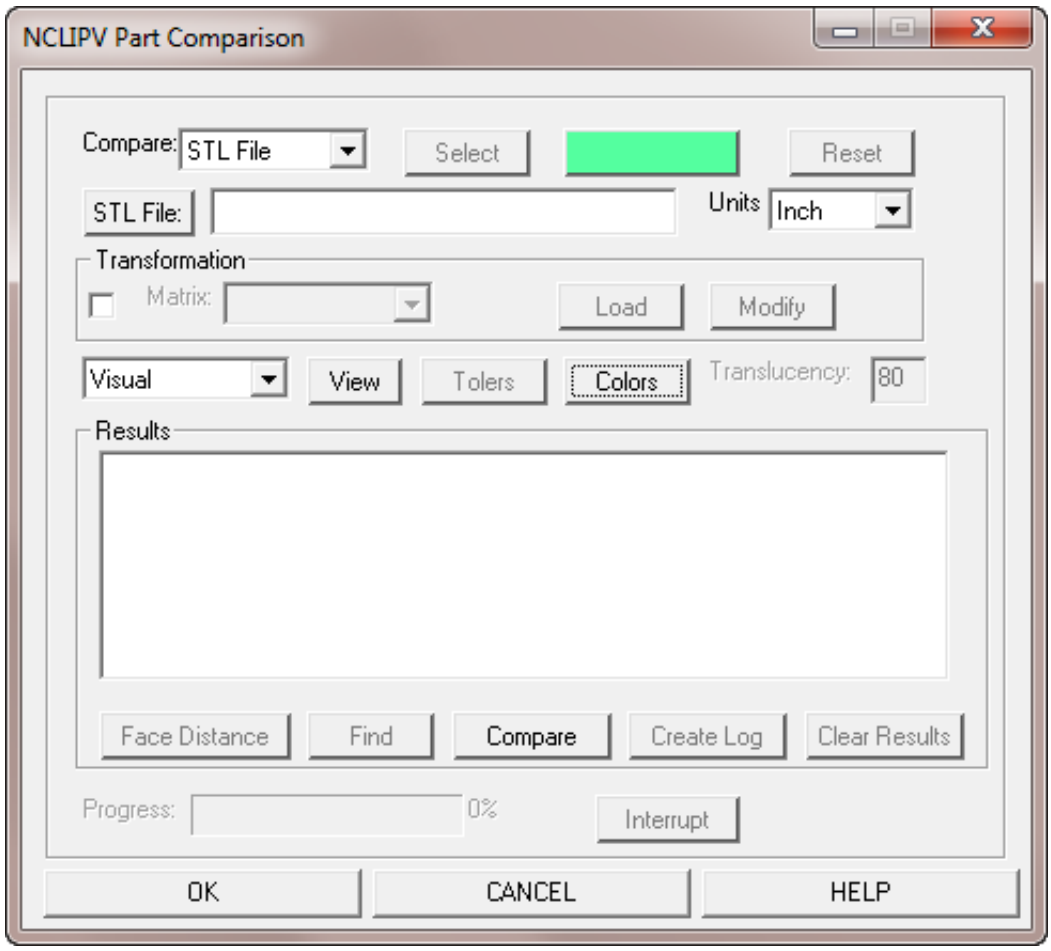
HELP

Click this button to display a brief description of the Measurement form.

Compare

Click this menu to compare ***NCL*** surfaces or a **STL** file to the ***IPV***

model. A form as shown below will appear.



Compare

Toggle between **Surfaces** and **STL File.**

Select **Surfaces** to compare ***NCL*** surfaces to the ***IPV*** model. You must have previously loaded a ***NCL*** unibase file containing the surfaces you want to compare.

Select ***STL File*** to compare a **STL** file to the ***IPV*** model.

Select

Click this button to enter *Pick* mode. The Comparison form will disappear while in *Pick* mode. Pick the surfaces you want to compare. The Select menu will be made available for picking multiple surfaces.

Color

Defines the highlight color for the selected surfaces or shape. The surfaces or shape used in the comparison will be displayed in this color in the ***NCL*** window.

Reset

Click this button to unselect all surfaces that have previously been selected for comparison.

STL File

Loads the requested STL file as the target part. Pressing the STL File button will bring up a file browser.

Units

This specifies the units of the STL file.

Transformation

Enabling the Matrix field applies a transformation matrix to the defined solids.

Matrix

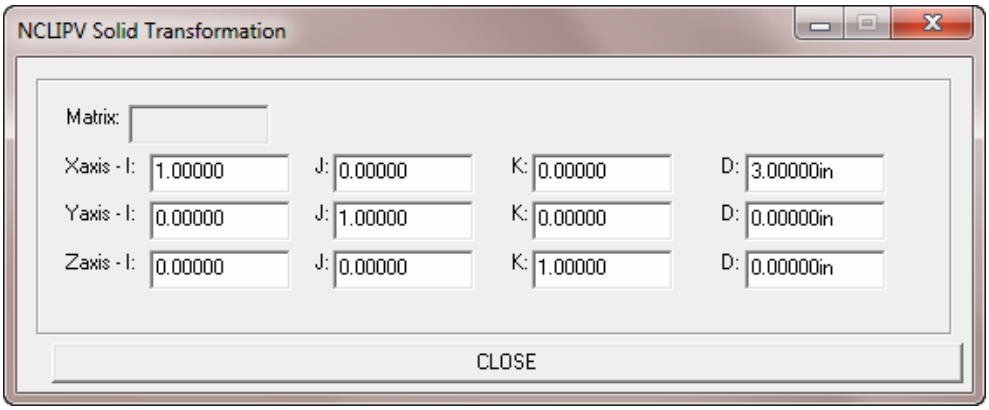
Enabling this checkbox allows the user to enter a transformation matrix. A predefined ***NCL*** matrix can be used or the user can enter the canonical data of the matrix.

Load

If a predefined matrix is used, then after typing in its name or selecting it from the display, the Load button must be pressed to actually load the matrix. If the Load button is not pressed, then the Matrix field will represent the requested matrix, but the actual matrix canonical data will not be changed.

Modify

Displays a separate form that contains the matrix canonical data as shown on next page. This form can be used for reference or the user can enter the actual canonical data for the transformation matrix.



Part Comparison Method

Report

Perform a report style comparison between a surface or a STL file and the cut model. This is accomplished by projecting the surface points onto the cut model. The number of points used for surface comparisons can be set using the ***NCL/IPV*** Comparison Tolerance form. The number of points used for STL comparisons is fixed. This comparison can be quite time consuming with a large amount of surfaces or faces in the STL file and cannot be accomplished with RapidCut Mode.

Visual

Check this box to perform a **Visual** comparison.

Undercuts

Performs a solids Boolean operation on the cut model and a STL file. All undercuts (gouges) will be displayed in the color specified by the largest negative tolerance value in the Colors form. This style is not supported for **RapidCut** Mode.

Overcuts

Performs a solids Boolean operation on the cut model and an STL file. All overcuts (excesses) will be displayed in the color specified by the largest positive tolerance value in the Colors form. This style is not supported for **RapidCut** Mode.

Both

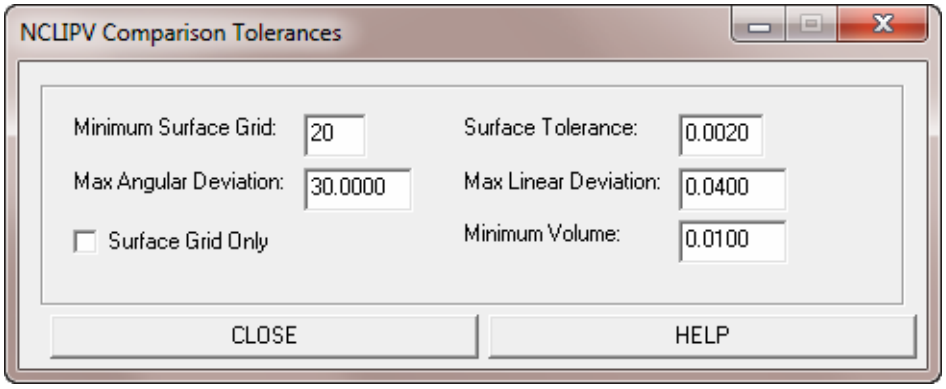
Performs both an Undercuts and Overcuts comparison at the same time.

View

Takes down the form and enters dynamic viewing. The ***NCL/IPV*** Part Comparison form will be taken down while dynamic viewing is in effect and redisplayed when it is exited. Please note that if a Visual only comparison is displayed in the ***NCL/IPV*** window it will be reset to the normal mode during and after dynamic viewing

Tolers

Click this button to bring up the Tolerances form as shown below



Minimum Surface Grid

Minimum Surface Grid defines the minimum grid of points to create when generating points on a surface for comparison.

Surface Tolerance

Defines the tolerance to use when generating the grid of points on the surface.

Max Angular Deviation

Specifies the maximum angular deviation between the surface normal and the face normal when performing a non-visual only comparison. Any face normal vectors which deviate by more than the specified degrees from the surface normal vector will not be considered for comparison at this surface point. This prevents the logic from comparing faces which do not match the surface being compared.

Max Linear Deviation

Specifies the maximum distance between the surface point

and cut model face that will be used in the comparison. Any faces that are calculated to be past this distance from the surface will be ignored.

Surface Grid Only

When this box is checked, the point data on the surface used for comparisons will be generated in a grid pattern only, no tolerance will be used.

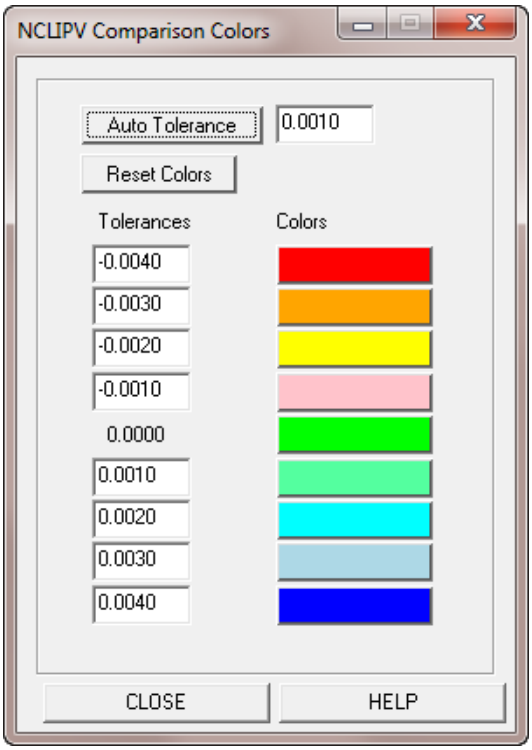
Close

Click this button to exit and close the Comparison Tolerances form.

Colors

This button defines the color coding for the visual representation of the comparison. A color can be assigned to each of the tolerances. You can define up to 4 negative (undercut) tolerances and up to 4 positive (overcut) tolerances. A color is assigned to each tolerance value, including one for an exact match (0.0). These tolerances and colors are used for both visual only and non-visual only comparisons.

Click this button to bring up the ***NCL/IPV*** Comparison Colors form as shown below.



Auto Tolerance

Click this button to set each of the undercut and overcut tolerances as an increment, starting at 0, of the value entered.

Reset Colors

Click this button to reset all colors to the default settings.

Tolerances

The first four entries represent the undercut tolerances. When a Visual comparison is displayed, areas of the ***NCL/IPV*** model that are undercut within a given tolerance will be displayed in the color associated with the tolerance.

The last four entries represent the overcut tolerances. When a Visual comparison is displayed, areas of the ***NCL/IPV*** model that have excess material within a given tolerance will be displayed in the color associated with the tolerance.

Undercuts and Overcuts exceeding the maximum tolerance settings will be displayed in the color associated to the maximum tolerance settings.

Colors

Click the color button to open the Color form to define the tolerance range color.

CLOSE

Click this button to exit the ***NCL/IPV*** Comparison Colors form.

HELP

Click this button to display a brief description of the ***NCL/IPV*** Comparison Colors form.

Translucency

Sets the display translucency of the cut model when performing Report, Undercut, and Overcut comparisons. Visual comparisons cannot be translucent. The translucency value can be from 1 to 100, where 100 displays a solid model and a lower number displays a more transparent tool.

Results

Display the results of a Report, Undercut, or Overcut comparison. It will also display the results of a Face Distance query.

Face Distance

Allows the user to select a face on the ***NCL/IPV*** model and displays the minimum and maximum distances in the **Results** window. Each face will be displayed in a color determined by the maximum distance the cut model is always from the target part at this location. Since Report comparisons use a tessellated list of points for the comparison, a single face can have multiple distances from the target part. By pressing this button and then selecting a face from the cut model, the range of distances for this face will be displayed in the Results window along with information about the motion that performed the cut on this face.

After an undercuts or Overcuts comparison, the Face Distance function will report the volume of the selected difference solid.

Find

Brings up the ***NCL/IPV*** Gouge Finder form as shown below.

This form is used to find and display the various difference solids during Boolean style comparisons. As each gouge is found, the ***NCL/IPV*** view will change so that difference solid fits into the ***NCL/IPV*** window.

Fit Fits the entire model into the ***NCL/IPV*** window.

<< Displays the first difference solid. When this form is first displayed, the view does not change, so pressing this button will display the first difference solid.

< Displays the previous difference solid.

(Text Field) Contains the number of the currently displayed

	difference solid. This field can be changed by the user.
>	Displays the next difference solid.
>>	Displays the last difference solid.
View	Enters dynamic viewing.
Close	Click this button to exit and close the Gouge Finder form.

Compare

Click this button to perform the comparison.

Create Log

Click this button to create a log file which contains the contents of the **Results** window.

Clear Results

Click this button to clears the **Results** window.

Progress

The Progress bar is only active during a Report style comparison, since this comparison can take a long time based on the complexity of the models. It displays the progress of the actual comparison, not including loading of the STL file or tessellation of the selected surfaces.

OK

Click this button to exit and close the Comparison form.

Cancel

Click this button to exit and close the Comparison form.

Help

Click this button to display a brief description of the Comparison form.

Remove Chips

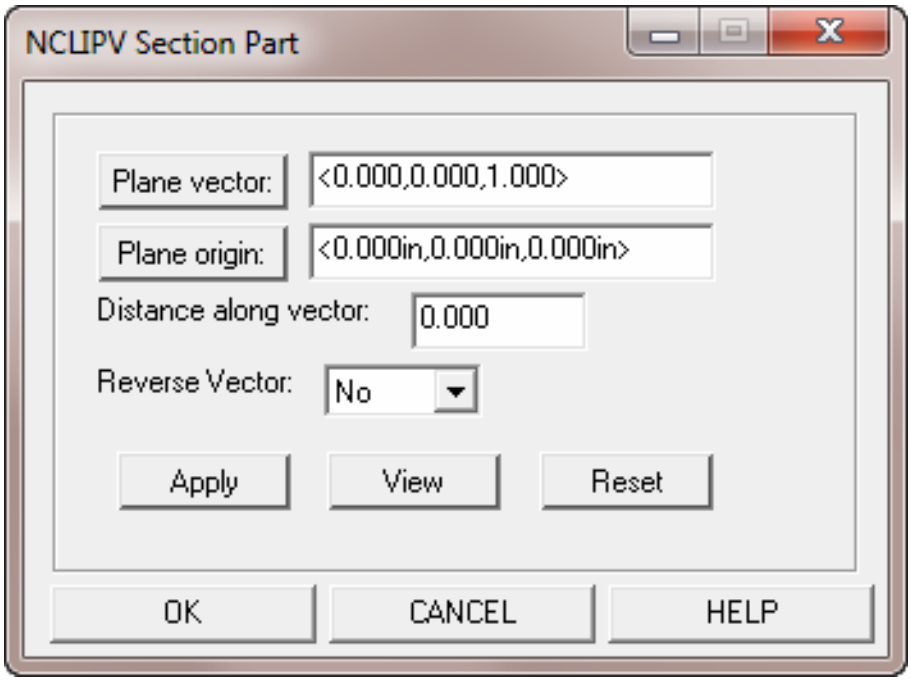
Click this menu to remove material that is disconnected from the

main solid.

Pick the solid you want to keep. All disconnected solids will be removed.

Section

Click this menu to section the model by a plane. The following form as shown below will appear:



Plane vector

Enter the coordinates of a vector that is normal the section plane. Click the **Plane vector** menu label to pick a vector from the ***NCL*** graphics menu.

Plane origin

Enter the coordinates of point that lies on the section plane. Click the **Plane origin** menu label to pick a vector from the ***NCL*** graphics menu.

Distance along vector

Enter a distance from the plane origin point along the normal vector at which to define the section plane.

Reverse Vector

Choose Yes to reverse the normal vector.

Apply

Click this button to section the model.

View

Enters Dynamic Viewing mode so that the view of the sectioned model can be changed without permanently applying the changes. The ***NCL/IPV*** Section Part form will be taken down while Dynamic Viewing is in effect and redisplayed when it is exited.

Reset

Click this button to un-section the model.

OK

Click this button to save the sectioned model and exit the Section form.

Warning: If you click OK when the model is sectioned the model cannot be un-sectioned, it remains sectioned forever.

CANCEL

Un-sections the model and exits the Section form.

Help

Click this button to display a brief description of the ***NCL/IPV*** Section form.

Viewing in *NCL/IPV*

The ***NCL*** graphics and the ***NCL/IPV*** simulation windows have independent viewing functions. Viewing in the ***NCL*** graphics window is controlled, as always, by the various hot keys, toolbar icons, and the View menu selections.

Viewing in the ***NCL/IPV*** simulation window is controlled by the menu options explained below:

Dynamic

Click to activate dynamic viewing using the mouse.

Left-click-hold-move to pan.

Middle-click-hold-move to zoom.

Right-click-hold-move to rotate.

"Left+Middle"-click-hold-move to rotate around the vertical axis of the display window.

"Left+Right"-click-hold-move to rotate around the horizontal axis of the display window.

"Middle+Right"-click-hold-move to rotate around the axis normal to the display window.

Center

Click to select an area on the ***IPV*** model to be the center of rotation for dynamic viewing.

Fit

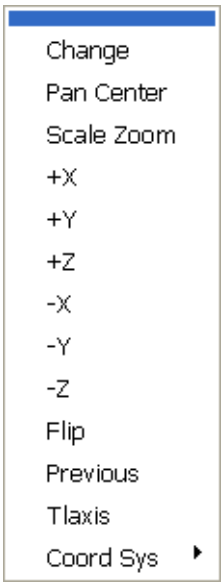
Click to fit the entire ***IPV*** model into the simulation window.

Window

Click to activate the window zoom function.

Change

Clicking on the ▾ next to the **Change** menu will produce a pull-down menu containing the following static viewing functions. Clicking on any of these menu options will activate that function and will make the selected function the default selection for the **Change** menu:



Change

Click to activate the Change view form which allows you to enter the view normal, center, up axis, and magnification factor.

Pan Center

Click to activate a pan function that allows you to pick the desired center of the view.

Scale Zoom

Click to change the view by entering a zoom scale factor.

+X

Click to view down the positive X-axis.

+Y

Click to view down the positive Y-axis.

+Z

Click to view down the positive Z-axis.

-X

Click to view down the negative X-axis.

-Y

Click to view down the negative Y-axis.

-Z

Click to view down the negative Z-axis.

+X

Click to view down the positive X-axis.

Flip

Click to rotate the view 180 degrees around the Y-axis.

Previous

Click to toggle between the previous view and the current view.

Tlaxis

Click to view down the current tool axis.

Coord Sys

Click to bring up the Coord Sys pop-up menu allowing to view by a coordinate system. Choose between **Tracut**, **Refsys**, or **Matrix**.

Click **Tracut** to change the view to the current *TRACUT* coordinate system.

Click **Refsys** to change the view to the current *REFSYS* coordinate system.

Click **Matrix** to change the view to the coordinate system represented by a given Matrix.

Reset

Click to align the ***IPV*** view with the ***NCL*** view.

Repaint

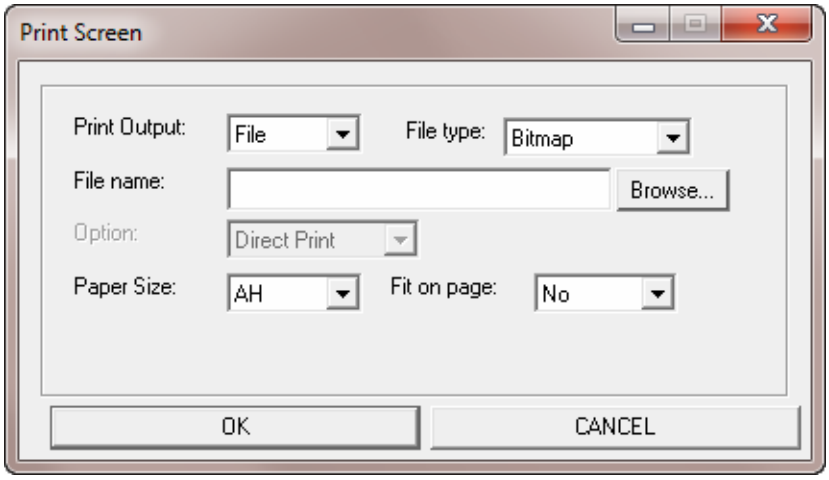
Click to repaint the ***IPV*** viewport.

Swap Screen

Click this button to swap the ***NCL/IPV*** and the ***NCL*** windows.

Print Screen

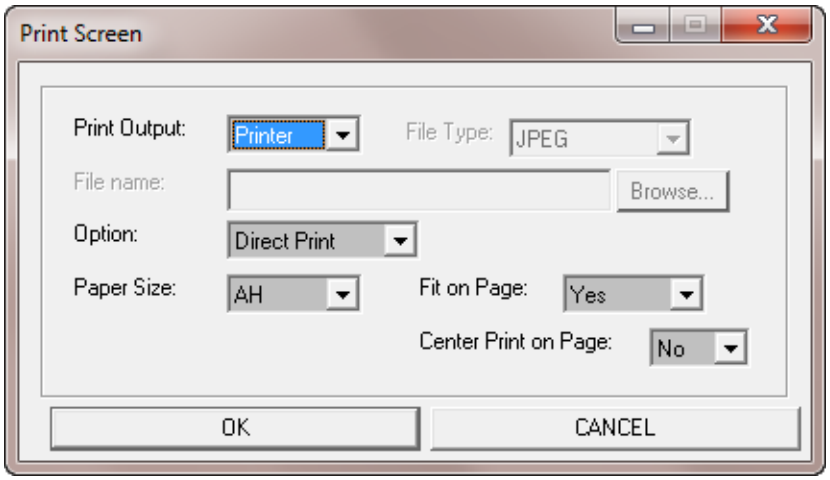
Click this menu to print current ***NCL/IPV*** screen to the printer on the PC Windows platform. Image file types include JPEG, GIF, and Bitmap. A form will appear as shown below.



Print Output

Toggle between File and Printer. “File” specifies that the screen image will be written to a file. “Printer” specifies that the image will be printed on the default printer.

Toggle to Printer changes the form as shown below:



Center Print on Page

Toggle to “YES” to position the screen shot on the center of the page and “NO” to position the screen shot on the upper left corner of the page.

File type

Toggle to the image file type to create when **Print Output** is set to **File**. Choose between **Bitmap** (for Windows only), **JPEG**, **Postscript**, and **GIF**.

File name

Enter the desired name for the image file. Click **Browse** to browse for a file name.

Option

Toggle between **Direct Print** or **Display Print Dialog**. Select **Direct Print** to print the file. Select **Display Print Dialog** to display the Windows print dialog form, in which, among other things, the default printer can be changed. This field is only shown on Windows systems and is active when **Print Output** is set to **Printer**.

Paper Size

Toggle to the desired paper size.

Fit on page

Toggle between **Yes** and **No**. Select **Yes** to adjust the screen image to fit onto the selected paper size. Select **No** to output the actual size. On UNIX systems the JPEG and GIF file types will ignore this field and treat the answer as **No**.

OK

Click this button to start the Print Screen process and close the form.

CANCEL

Click this button to exit the form and cancel the Print Screen Process.

Error log file

At the start of each session ***NCL*** creates an error log file in the current directory. Whenever a warning or an error occurs during a ***NCL/IPV*** simulation, the system writes a diagnostic message to the error log file. The error log file is overwritten each time a new ***NCL*** session begins.

Use a text editor to examine the error log file.

The default name of the error log file is: **`nclipv.log`**

The default error log file name can be changed by modifying the variable **NCLIPV_LOGFILE** in the **`NCCS\NCL101\Interface\ncl.init`** file.

PPRINT IPV Commands

Besides using the interface to control the simulation session such as create and modify stock or fixture solids, modify the simulation setting, you can use the following **PPRINT IPV** commands to create and modify stock or fixture solids, create tool image, modify individual tool attributes and ***NCL/IPV*** modal settings in the ***NCL*** part program file. The **PPRINT IPV** commands only shows the effect in ***NCL/IPV*** and does not affect ***NCL*** motion display, i.e. the tool image specifies in the **PPRINT IPV** command will not use for ***NCL*** motion display.

If the statement is longer than 72 characters (the characters “PPRINT IPV” included), the command can be continued onto the next PPRINT statement by specifying a tilde (~) character at the end of the command and specifying the remaining parameters on the following PPRINT statement(s) without the characters “IPV” specified.

Stock/Fixture Create/Load Commands

PPRINT IPV FIXTUR BOX id x1,y1,z1,x2,y2,z2 STOCK

This command creates a box shaped stock/fixture through two points in space.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

x1,y1,z1 = Defines the first corner of the stock/fixture box to be created.

x2,y2,z2 = Defines the opposite corners of the stock/fixture box to be created.

PPRINT IPV FIXTUR CONE id x,y,z,i,j,k,r1,r2,h STOCK

This command creates a cone shaped stock/fixture through a point, along a vector with height and the upper and lower radius specified.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

x,y,z = Defines the base center of the cone shape stock or fixture.

i,j,k = Defines the cone axis.

r1, r2 = Numerical values define the radius of the cone stock or fixture to be created at each end.

h = A numerical value defines the height of the cone shaped stock/fixture. A negative value means the axis direction will be opposite in direction to the specified “vector”. A positive value means the axis direction will be in the same direction of the specified “vector”.

PPRINT IPV FIXTUR CYLNDR id x,y,z,i,j,k,r,h STOCK

This command creates a cylindrical shaped stock/fixture with its axis going through one point with radius and height specified

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

x,y,z = Defines the center point of one end of the cylindrical shape stock or fixture.

i,j,k = Defines the cylindrical axis.

r = A numerical value defines the radius of the cylindrical stock or fixture to be created.

h = A numerical value defines the height of the cylindrical shaped stock/fixture. A negative value means the axis direction will be opposite in direction to the specified “vector”. A positive value means the axis direction will be in the same direction of the specified “vector”.

PPRINT IPV FIXTUR SPHERE, id x,y,z,r STOCK

This command creates a spherical shaped stock/fixture with the center point and radius of the sphere.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

x,y,z = Defines the center of the spherical shape stock or fixture to be created.

r = A numerical value defines the radius of the spherical stock or fixture to be created.

PPRINT IPV FIXTUR TORUS id x,y,z,i,j,k,r1,r2
STOCK

This command creates a torus shaped stock/fixture using a center point, axis, axial radius, and circular radius.

Where:

id = An integer specifies the ID number of the stock/fixture to be created.

x,y,z = Defines the center of the torus shape stock or fixture.

i,j,k = Defines the torus axis.

r1 = A numerical value defines the axial radius of the torus stock/fixture to be created.

r2 = A numerical value defines the circular radius of the torus stock or fixture to be created. This value cannot be larger than “r1”.

PPRINT IPV FIXTUR LOAD id “file_name.stk“
STOCK

This command will load an ***NCL/IPV*** primitives file "file_name.stk". It does not matter which command is used, either STOCK or FIXTUR, as the primitive file contains the Stock and Fixture designations. ***NCL/IPV*** will first look in the current directory for the file and if it is not found there, it will look in the system directory which is defined by the "NCL_INCDIR" parameter inside the ncl.init file. The stock(s)/fixture(s) loaded will have the ID number specified by "id". If there are multiple stocks/fixtures in the primitive file, then ***NCL/IPV*** will continue numbering them in ascending order.

PPRINT IPV FIXTUR STL id INCHES “file_name.stl“
STOCK MM

This command will load an STL file with the name "file_name.stl". ***NCL/IPV*** will first look in the current directory for the file and if it is not found there, it will look in the system directory which is defined by the "NCL_INCDIR" parameter inside the ncl.init file. The stock or fixture

loaded will have the ID number specified by "id". If there are multiple Stocks/Fixtures associated with this STL file, then ***NCL/IPV*** will continue numbering them in ascending order. "INCHES" or "MM" specifies the unit that the STL file is actually stored in.

PPRINT IPV FIXTUR CLONE id idn,copies [, ~
STOCK

PPRINT AT, x1,y1,z1,d1, x2,y2,z2,d2, x3,y3,z3,d3]
TRANSL, x,y,z
XYROT, ang
YZROT
ZXROT

This command clones a specified stock/fixture “ncopies” times and move them at the same time.

Where:

id = An integer specifies the new ID number of the cloned entity.

idn = The ID of the stock/fixture to be cloned.

copies = Specifies the number of copies to be cloned.

AT, matrix-parameters= Move the cloned copies by the specified matrix

TRANSL,x,y,z = Translates the cloned copies linearly by the specified xyz values.

XYROT,angle = Rotates the cloned copies around the Z-axis by the specified “angle”.

YZDOT,angle = Rotates the cloned copies around the X-axis be the specified “angle”.

ZXROT,angle = Rotates the cloned copies around the Y-axis by the specified “angle”.

PPRINT IPV FIXTUR COMPOS id id-list
STOCK

This command creates a composite of individual stocks/fixtures.

Where:

id = An integer specifies the ID number of the composite

stock/fixture to be created.

id-list = A list of predefined stocks.fixtures separated by a "," that will be combined into a single stock.fixture definition.

Once a stock/fixture is added to a composite definition, it will be removed from the list of active stocks/fixtures and can only be referenced as part of the composite stock/fixture.

PPRINT IPV FIXTUR DECOMP id id-list
STOCK

This command decompose composite stocks/fixtures back into their individually referenced stocks/fixtures.

Where:

id = An integer specifies the starting ID number of the extracted stocks/fixtures. If it is set to "0", then the ID numbers of the extracted stocks/fixtures before they were stored in a composite solid will be used.

id-list = A list of composite stocks/fixtures to decompose.

Stock/Fixture Control Commands

PPRINT IPV FIXTUR MOVE 0 x1,y1,z1,d1,~
STOCK 1
INCR

PPRINT x2,y2,z2,d2,x3,y3,z3,d3,id-list

This command applies the matrix defined by its canonical form (x1,y1,z1,d1,x2,y2,z2,d2,x3,y3,z3,d3) to the stock(s)/fixture(s) with the id-list denoted by "id1 [[[...] [, idn, THRU, idm]] [...]]" in the command.

"0" specifies the matrix will be applied to the original Stock/Fixture and will not be multiplied by any matrix already associated with this Stock/Fixture.

"1" or "INCR" specifies the matrix will be applied to the stocks/fixtures incrementally from the current position.

PPRINT IPV FIXTUR TRANSL 0 x,y,z,id-list
STOCK 1
INCR

This command translates the specified stocks/fixtures linearly.

“x,y,z” specified the translation values along the XYZ axes. “id-list” denotes the list of the stocks/fixtures to translate.

“0” specifies the translation will be applied to the original Stock/Fixture.

“1” or “INCR” specifies the translation will be applied to the stocks/fixtures incrementally from the current position.

PPRINT IPV FIXTUR XYROT 0 angle,id-list
STOCK YZROT 1
ZXROT INCR

This command rotates the stock(s)/fixture(s) about a major axis.

“XYROT” rotates about the Z-axis. “YZROT” rotates about the X-axis. “ZXROT” rotates about the Y-axis.

“0” specifies the rotation will be applied to the original Stock/Fixture.

“1” or “INCR” specifies the rotation will be applied to the stocks/fixtures incrementally from the current position.

“angle” specifies the rotation angle.

“id-list” denoted by "id1 [[[...] [, idn, THRU, idm]] [...]]" specifies the stocks/fixtures to be rotated.

PPRINT IPV FIXTUR REMOVE id-list
STOCK

This command removes the specified stock(s)/fixture(s) denoted by the “id-list” such as "id1 [[[...] [, idn, THRU, idm]] [...]]" in the command.

PPRINT IPV STOCK SAVE id [“file”]
FIXTUR

Saves stocks/fixtures as external STL files. “id” specifies the ID number of the stock or fixture to save. If “id” is set to 0 then all stocks/fixtures will be saved as STL files. “file” is optional and specifies the base filename

of the saved STL file. If “file” is not specified, then the name of the motion playback file will be used. When multiple files are created a number will be appended to this base filename for each subsequent file.

Caveat: User will be asked for the stl file name if the current cl file is used to generate the sim file in an interactive session with no file name specified.

“id-list” such as "id1 [[[...] [, idn, THRU, idm]] [...]]" in the command.

PPRINT IPV FIXTUR MODIFY 0 color,visible,lucency,active,~ STOCK

PPRINT toler, id-list

This command modifies the attributes of the specified stock(s)/fixture(s) with the “id-list” denoted by "id1 [[[...] [, idn, THRU, idm]] [...]]" in the command.

Where:

0	=	A required parameter.
color	=	Specifies the new color of the stock/fixture.
visible	=	Specifies the visibility of the stock/fixture. It can be either "0" or "1".
TOLER	=	Specifies the geometry tolerance.
TRANS	=	Defines the transparency of the stock/fixture and can be in the range of 1 to 100.
ACTIVE	=	Specifies whether the stock/fixture will be used in the simulation. It can be either "0" or "1".

Note:

- Specifying a value of -1 for any of these attributes will result in the solid maintaining its original attribute.

PPRINT IPV STOCK REMOVE_CHIPS 0 x1,y1,z1,i1,j1,k1,~

PPRINT x2,y2,....xn,yn,z,in,jn,kn

This command removes the excess chips from the stock directly within the part program. A list of point-vectors (x,y,z,i,j,k) can be input with this command. These point-vectors will be used to select the portion of the stock to keep. There should be one point-vector per defined stock and each of these should lie within the stock and point towards an edge of the stock to ensure that the correct portion of the stock is retained.

Cutter/Shank/Holder Commands

PPRINT IPV CUTTER parameters

Defines the active cutter. “parameters” are real values used to define the cutter shape. All cutter definitions supported by ***NCL*** are supported by the PPRINT IPV CUTTER command.

PPRINT IPV CUTTER BLADE parameters

Defines a blade cutter. The “parameters” follow the same syntax as the CUTTER/BLADE command.

PPRINT IPV CUTTER LATHE parameters

Defines a lathe cutter. The “parameters” follow the same syntax as the CUTTER/LATHE command.

PPRINT IPV CUTTER DISPLY “pt-list”

Specifies a cutter profile (pt-list) that is stored in the tool profile description file.

PPRINT IPV SHANK parameters [HOLDER] CUTTER

Defines a cutter shank using the standard parameters as supported by the CUTTER/DISPLY,SHANK command.

PPRINT IPV SHANK DISPLY “pt-list” [HOLDER] CUTTER

Defines a cutter shank using a profile (pt-list) that is stored in the tool profile description file.

PPRINT IPV HOLDER parameters

Defines a cutter holder using the standard parameters as supported by the CUTTER/DISPLY,HOLDER command.

PPRINT IPV HOLDER DISPLY “pt-list” parameters

Defines a cutter holder using a profile (pt-list) that is stored in the tool profile description file.

NCL/IPV Modal Commands

PPRINT IPV MODALS AUTO_HIDE [mode] [TRANS tval] ~
PPRINT [EDGES emode]

Determines whether ***NCL/IPV*** will dynamically set the translucency and edge display of any solid that obscures an important solid. "*mode*" can be set to *YES* or *NO* and enables or disables this feature. "*TRANS*" defines the translucency of the obscuring solid. "*EDGES*" can be set to *YES* or *NO* and determines if the edges of an obscuring solid should be displayed.

PPRINT IPV MODALS COLORS [CUT ccol] [CUTTER ctcol] ~
PPRINT [SHANK scol] [HOLDER hcol] [FIXTUR_CUT fcol] ~
PPRINT [HOLDER_CUT hccol] [RAPID_CUT rcol] ~
PPRINT [AUTO_COLOR acol] [USE_STOCK smod] ~
PPRINT [USE_FIXTUR fmod]

"CUT" defines the default cut color. "ccol" can be set to "AUTO", which automatically changes the cut color for each tool, or to a valid color designator. "CUTTER" defines the default display color of all tools. "ctcol" can be set to "DEFAULT", which uses the cut color as the cutter color, or to a valid color designator. "SHANK" defines the default shank color. "scol" can be set to "DEFAULT", which uses the cutter color, or to a valid color designator. "HOLDER" defines the default holder color. "hcol" can be set to "DEFAULT", which uses the cutter color, or to a valid color designator.

"FIXTUR_CUT" defines the color to use when a fixture is cut. "fcol" can be any valid color designator. "HOLDER_CUT" defines the color to use when the tool holder cuts a solid. "hccol" can be any valid color designator. "RAPID_CUT" defines the color to use when a solid is cut while in RAPID mode. "rcol" can be any valid color designator.

"AUTO_COLOR" defines the initial color when the cut color is automatically changed when a new tool is loaded. "acol" can be any valid color designator. "USE_STOCK" determines if colors assigned to stocks should be include in the list of automatic cut colors to use. "smod" can be set to "YES" or "NO". "USE_FIXTUR" is the same as "USE_STOCK" except that it applies to fixtures.

PPRINT IPV MODALS MACHINE type

Defines the machine type to use for simulation. “type” can be MILL, LATHE, MILLTURN or STRINGER.

PPRINT IPV MODALS STACK [mode] [FIXTUR fstate] [size]

Enables/Disables the ability to interactively Undo/Redo cuts in ***NCL/IPV***. “mode” can be set to “ON” or “OFF” and enables/disables the ***NCL/IPV*** Undo/Redo stack. “FIXTUR” determines if fixture cuts are stored in the Undo/Redo stack. “fstate” can either be “YES” or “NO”. “size” defines the maximum number of cuts that can be stored in the Undo/Redo stack.A value of 0 creates an unlimited stack size.

PPRINT IPV MODALS STOCK [COLOR col] ~ FIXTUR

PPRINT [VISIBLE vmod] [TRANS tval] [TOLER tol] ~

PPRINT [IMPORTANT imod] [EDGES ecol] [STL smod] ~

PPRINT [STL_STOP spmod] [STL_DEACT sdmod] ~

PPRINT [STL_SKIP_ERROR skmod]

Defines the default settings for stocks and fixtures. “STOCK” defines the settings for stocks. “FIXTUR” defines the default settings for fixtures.

“COLOR” defines the default color. “col” is any valid color designator. “VISIBLE” defines the initial visibility of stocks. “vmod” can be set to “ON” or “OFF”. “TRANS” defines the default translucency. “tval” can be in the range of 1-100. “IMPORTANT” determines if the solid is important. Important solids can cause solids that obscure an important solid to become translucent. “imod” can be set to “YES” or “NO”. “EDGES” defines the default edge display setting for solids. “ecol” can be “OFF” to disable edges display, “DEFAULT” to use the solid color for the edge color, or any valid color designator.

“STL” determines how STL models will be output. “smod” can be “ASCII” or “BINARY”. “STL_STOP” determines if ***NCL/IPV*** will output an error message when a bad STL file is loaded. “spmod” can be set to “YES” or “NO”. “STL_DEACT” determines whether an STL model will be automatically deactivated if it is bad. “sdmod” can be set to “YES” or “NO”. “STL_SKIP_ERROR” will cause ***NCL/IPV*** to skip the error checking when loading an STL file when skmod is set to “YES”. Setting skmod to “NO” will cause ***NCL/IPV*** to perform standard error checking on STL models.

PPRINT IPV MODALS TOOL [TOLER tol] [MAXANG ang] ~
PPRINT [TRANS tval] [EDGES ecol] [MIN_HEIGHT nhgt] ~
PPRINT [MAX_HEIGHT xhgt] [MIN_DIAMETER ndia] ~
PPRINT [FROM_NEXT fmod] [SHANK smod] [RAPID rap]

Defines the default tool modals. “TOLER” tol defines the default cutting tolerance for defined tools. “MAXANG ang” defines the maximum angular change that the tool axis can make in a single move.

“TRANS” defines the default translucency of the defined tools. “tval” can be in the range of 1-100. “EDGES” defines the default edge display setting for the defined tools. “ecol” can be “OFF” to disable edges display, “DEFAULT” to use the tool color for the edge color, or any valid color designator.

“MAX_HEIGHT” defines the maximum height for defined tools, “MIN_HEIGHT” defines the minimum height for defined tools, and “MIN_DIAMETER” defines the minimum tool diameter. “FROM_NEXT” determines if the move immediately following a tool change should be considered a positioning or cutting move.

“fmod” can be set to “YES” for positioning moves or “NO” for cutting moves. “SHANK” determines if the tool shank should be treated as part of the cutter or as a tool holder. “smod” can be set to “CUTTER” or “HOLDER”. “RAPID” defines the default RAPID rate for defined tools.

Miscellaneous PPRINT IPV Commands

PPRINT IPV DNTCUT

This command causes ***NCL/IPV*** to treat the next motion statement as a *FROM* (positioning) move.

This command is useful when positioning to an opposite side of a rotary table in one example, since the programmed move will result in a straight linear move to the next position, usually right through the part.

This command is ignored if a ***PostWorks*** simulation file is being used for motion playback, since the simulation file will show the actually moves created by rotating the table instead of moving the linear axes.

This *DNTCUT* command is only valid for the next move and will be automatically cancelled after the move.

PPRINT IPV OFFSET "file.ofs"

This command is used to load an external Work Coordinate Offset Systems (WCS) file during machine simulation.

"file.ofs" is the name of the external WCS file.

A WCS system is activated by the use of the CUSTOM/ADJUST and TOOLNO/ADJUST commands. The following command syntaxes are supported by ***NCL/IPV***.

CUTCOM / ADJUST,ON
TOOLNO OFF
n [, PLUS]
MINUS

"ADJUST" is required for proper syntax. "ON" will enable WCS offsets for Register 0. "OFF" disables WCS offsets of this type (CUSTOM, TOOLNO). "n" specifies the register to enable offsets for. "PLUS" enables offsets in the positive direction (default) and "MINUS" enables offsets in the negative direction.

The CUTCOM and TOOLNO WCS offsets are stored in separate registers and can be active at the same time.

In order for the WCS offsets to have any effect on the machine axes positions, a file that contains the type of offset, register number, and axis offsets for this WCS register must be defined. This external file has the following format.

FIXTURE reg label1 ofs1 [label2 ofs2 … labeln ofsn]
TOOL

The file contains multiple lines using this format that define the axes offset values for the WCS registers. FIXTURE defines a CUTCOM style offset register and TOOL defines a TOOLNO style offset register. "reg" defines the register value that the offsets are being defined for. For example, if an H15 code enables WCS offsets 15, then specifies 15 for "reg". "label" specifies the label of the axis which will be offset and "ofs" is the offset value to apply to this axis when the "reg" WCS offsets have been enabled. "label" must match the label of one of the axes in the machine definition file. Each register can be specified for multiple axes.

The external WCS offset file must first be loaded before any WCS offsets will be activated.

PPRINT IPV OFFSET label ofs [label2 ofs2 [...] ~ PPRINT labeln ofsn]

This command is used to directly define axis offset values without referencing an external WCS offset file.

The offset values are treated exactly the same as if they came from the WCS offset file.

PPRINT IPV POSITN label pos [label2 pos2 [...] ~ PPRINT labeln posn]

This command is used to position individual axes on the machine without having to program a motion block.

“label” is the label of the axis to position as defined in the ***NCL/IPV*** machine model file. “pos” is the new position for this axis. Multiple axes can be specified in a single command and all of the axes will move at the same time.

PPRINT IPV PRINT_SCREEN type size [“file”]

Prints the current ***NCL/IPV*** view to an image file. “type” specifies the image type of the file to create and can be “BMP”, “GIF”, “JPG”, or “PS” (PostScript). “size” specifies the size of the paper to format the print image for and can be AH, AV, B, C, D, E, F, A0, A1, A2, A3, A4, USER1, USER2, USER3, or USER4.

“file” is optional and specifies the name of the file to create. If “file” is not specified, then the name of the motion playback file followed by an underscore and an number (_n) denoting the number of print files created during the current run, and with an extension matching the file type (BMP,GIF,JPG,PS) will be used.

PPRINT IPV SESSION EXPORT [“file”]

Exports the active ***NCL/IPV*** session to an external file. “file” is the name of the external file to save the session to and is typically named with a file type of “.ipv”. If file is not specified, then the name of the motion playback file will be used with the file extension of “.ipv”.

PPRINT IPV SESSION IMPORT “file”

Imports an external ***NCL/IPV*** session. “file” is the name of the external session file to import and is typically named with a file type of “.ipv”.

PPRINT IPV SPINDLE n [, n1, n2, ...]

This command defines which spindle(s) to load the next tool(s) into in “Machine Simulation” mode. “n” is the number corresponding to the “ToolSpindle n” command within a machine component definition file. Up to 10 spindles can be defined concurrently in the range of 0 to 9. This command does not have any effect if “Machine Simulation” mode is not active.

PPRINT IPV STOCK RESET_CUTCOLOR [id-list]

Resets the color of cut faces on the list of solid to the current color of the solid. Usually when changing the color of a stock the cut faces do not change color to match the stock color. If “id-list” is not specified, then all stocks/fixtures are modified.

PPRINT IPV TOOL [CUT_COLOR ccol] ~
PPRINT [CUTTER_COLOR ctcol] [CUTTER_EDGES cecol] ~
PPRINT [CUTTER_TRANS ctval] [HOLDER_COLOR hcol] ~
PPRINT [HOLDER_EDGES hecol] [HOLDER_TRANS htval] ~
PPRINT [MAXANG ang] [RAPID rap] [SHANK smod] ~
PPRINT [SHANK_COLOR scol] [SHANK_EDGES secol] ~
PPRINT [SHANK_TRANS stval] [TOLER tol]

The PPRINT IPV TOOL command specifies the attributes for the active tool, therefore this command must be specified after the tool is defined.

“CUT_COLOR” defines the cut color. “ccol” can be set to “AUTO”, which automatically changes the cut color for each tool, or to a valid color designator. “CUTTER_COLOR” defines the display color of the cutter. “ctcol” can be set to “DEFAULT”, which uses the cut color as the cutter color, or to a valid color designator. “CUTTER_EDGES” defines the edge display setting for the cutter. “cecol” can be “OFF” to disable edges display, “DEFAULT” to use the cutter color for the edge color, or any valid color designator. “CUTTER_TRANS” defines the default translucency of the defined cutter. “ctval” can be in the range of 1-100.

“HOLDER_COLOR” defines the display color of the tool holder. “hcol” can be set to “DEFAULT” or a valid color designator. “HOLDER_EDGES” defines the edge display setting for the holder. “hecol” can be “OFF”, “DEFAULT”, or any valid color designator. “HOLDER_TRANS” defines the default translucency of the defined

holder. “htval” can be in the range of 1-100.

“MAXANG ang” defines the maximum angular change that the tool axis can make in a single move. “RAPID” defines the default RAPID rate for the active tool.

“SHANK” determines if the tool shank should be treated as part of the cutter or as a tool holder. “smod” can be set to “CUTTER” or “HOLDER”. “SHANK_COLOR” defines the display color of the tool shank. “scol” can be set to “DEFAULT” or a valid color designator. “SHANK_EDGES” defines the edge display setting for the shank. “secol” can be “OFF”, “DEFAULT”, or any valid color designator. “SHANK_TRANS” defines the default translucency of the defined holder. “stval can” be in the range of 1-100.

“TOLER tol” defines the default cutting tolerance for the active tool.

PPRINT IPV TOOLPN [label] [x,y,z, i,j,k, u,v,w]

This command is used to define the specific tooling pin so that individual stocks and fixtures can be assigned to it on the machine.

Where:

label = specifies the machine tooling pin name that all stocks defined after this command will be attached to. The “label” can be up to 18 characters.

x, y, z = Origin of the tooling pin in relationship to the part.

i, j, k = Axis of the tooling pin cylinder in relationship to the part.

u, v, w = Vector that points from the center of the tooling pin towards its flat side.

The part tooling pin parameters specified in this command (x,yz, i,j,k, u,v,w) will be stored with the machine tooling pin and any stocks/fixtures attached to this machine tooling pin will use these values as the part tooling pin.

If “label” is not specified, then the last designated tooling pin will be used. “label” must be specified if the tooling pin parameters are not specified. In this case the default tooling pin for subsequent stocks/fixtures will be set without modifying its part tooling pin parameters.

PPRINT IPV VIEW FIT

Does an extreme zoom on the ***NCL/IPV*** window.

NCL/IPV Commands

The following commands have been replaced with the implementation of new features and new commands. These older commands will continue to be supported as they currently function for the purpose of running older programs. However, it is recommended that the following commands no longer be used on new projects.

Box, cone, cylindrical, spherical, or torus stock/fixture creation commands:

FIXTUR/BOX, id, 1, point , point [, minz, maxz]
STOCK x1,y1,z1 x2,y2,z2

This command creates a box shaped stock/fixture through two points in space.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

1 = A required integer value to denote the box shaped stock/fixture would be created by going through two points in space.

point or “x,y,z” = Defines the opposite corners of the stock/fixture box to be created.

minz, maxz = Optional parameters required if the two points defining the opposite corners of the stock/fixture are in the same Z-level. "minz" defined the Z-level value of the bottom corner and "maxz" defined the Z-level value of the top corner of the box to be created.

FIXTUR/BOX, id, 2, point, width, length, height
STOCK x,y,z

This command creates a box shaped stock/fixture centered at a point with a specified width, length and height of the box.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

2 = A required integer value to denote the box shaped stock/fixture would be created by specifying the

width, the length, the height and one corner.

point or “x,y,z” = Defines the center point of the box to be created.

width = A numerical value defines the width of the box along the X-axis.

length = A numerical value defines the length of the box along the Y-axis.

height = A numerical value defines the height of the box along the Z-axis.

FIXTUR/ CONE, id, 2, point_1 , point_2 , radius_1, $
STOCK x1,y1,z1 x2,y2,z2

radius_2

This command creates a cone shaped stock/fixture through two points with radius specified.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

2 = A required integer value to denote the cone shaped stock/fixture would be created by going through two points with each end radius specified.

point or “x,y,z” = Defines the two opposite ends of the cone shape stock or fixture. This also defines the cone axis.

radius = A numerical value defines the radius of the cone stock or fixture to be created at each end.

FIXTUR/ CONE, id, 3, point , vector, height, radius_1, $
STOCK x,y,z i,j,k

radius_2

This command creates a cone shaped stock/fixture through a point, along a vector with height and the upper and lower radius specified.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

3 = A required integer value to denote the cone shaped stock/fixture would be created by going through a point along a vector with height and each end radius specified.

point or “x,y,z” = Defines the one end of the cone shape stock or fixture.

vector or “i,j,k” = Defines the cone axis.

height = A numerical value defines the height of the cone shaped stock/fixture. A negative value means the axis direction will be opposite in direction to the specified “vector”. A positive value means the axis direction will be in the same direction of the specified “vector”.

radius = A numerical value defines the radius of the cone stock or fixture to be created at each end.

FIXTUR/CYLNDR, id, 1, circle, length
STOCK

This command creates a cylindrical shaped stock/fixture through a circle with a specified height along the axis normal to the specified circle.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

1 = A required integer value to denote the cylindrical shaped stock/fixture would be created by going through a circle with a specified height along the axis normal to the specified circle.

circle = A circle which defined one end of the circular shaped stock/fixture to be created.

length = A numerical value defines the height of the circular shaped stock/fixture. A negative value means the extrusion will be along a vector opposite in direction to the vector normal to the specified circle. A positive value means the extrusion will be in the same direction of the vector normal to the specified circle.

FIXTUR/CYLNDR, id, 2,point , point , radius
STOCK x1,y1,z1 x2,y2,z2

This command creates a cylindrical shaped stock/fixture with its axis going through two points with radius specified.

Where:

id = An integer specifies the ID number of the stock/fixture to be created.

2 = A required integer value to denote the cylindrical shaped stock/fixture would be created with its axis going through two points with radius specified.

point or “x,y,z” = Defines the two opposite ends of the cylindrical shape stock or fixture. This also defines the cylindrical axis.

radius = A numerical value defines the radius of the cylindrical stock or fixture to be created.

FIXTUR/ SPHERE, id, 1, circle
STOCK

This command creates a spherical shaped stock/fixture with the center point and radius of a circle.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

1 = A required integer value to denote the spherical shaped stock/fixture would be created by using the center point and radius of a circle.

circle = A circle which defined the center point and radius of the spherical shaped stock/fixture to be created.

FIXTUR/ SPHERE, id, 2, point, radius
STOCK x,y,z

This command creates a spherical shaped stock/fixture with a center point and a radius.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

2 = A required integer value to denote the spherical shaped stock/fixture would be created with a center point and radius.

point or “x,y,z” = Defines the center of the spherical stock/fixture to be created.

radius = A numerical value defines the radius of the spherical stock or fixture to be created.

FIXTUR/ TORUS, id, 1, circle_1, circle_2
STOCK

This command creates a torus shaped stock/fixture using a first circle to define the center, axis, inner/outer radius of the torus and a second circle to define the outer/inner radius.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

1 = A required integer value to denote the torus shaped stock/fixture would be created with two circles.

circle_1 = A circle which defines the center, axis and inner/outer radius of the torus.

circle_2 = A circle which defines the outer/inner radius of the torus. This circle does not require to be parallel or concentric with the first circle. Only the radius will be utilized. If the radius of this circle is smaller than the radius of the first circle, this circle specified the inner radius of the torus and the first circle specifies the outer radius of the torus.

FIXTUR/ TORUS, id, 2, circle, radius
STOCK

This command creates a torus shaped stock/fixture using a circle to define the center, axis, axial radius and a value to specify the circular radius.

Where:

id = An integer specifies the ID number of the stock/fixture to be created with this command.

2 = A required integer value to denote the torus shaped stock/fixture would be created.

circle = A circle which defined the center, axis and axial radius of the torus.

radius = A numerical value defines the torus circular radius. This value cannot be bigger than the radius of the specified circle.

FIXTUR/ TORUS, id, 3, point, vector, radius_1, $
STOCK x,y,z i,j,k

radius_2

This command creates a torus shaped stock/fixture using a center point, axis, axial radius, and circular radius.

Where:

id = An integer specifies the ID number of the stock/fixture to be created.

3 = A required integer value to denote the torus shaped stock/fixture would be created.

point or “x,y,z” = Defines the center of the torus shape stock or fixture.

vector or “i,j,k” = Defines the torus axis.

radius_1 = A numerical value defines the axial radius of the torus stock/fixture to be created.

radius_2 = A numerical value defines the circular radius of the torus stock or fixture to be created. This value cannot be larger than “radius_1”.

Loading a Stock or Fixture File

Besides the creation of stock/fixture, the stock/fixture model can be loaded into ***NCL/IPV*** by an external file in the "stk" or "stl" format.

FIXTUR/LOAD, id, [“] file_name [“] [,n]
STOCK

This command will load an ***NCL/IPV*** primitives file "file_name.stk". It does not matter which command is used, either STOCK or FIXTUR,

as the primitive file contains the Stock and Fixture designations. ***NCL/IPV*** will first look in the current directory for the file and if it is not found there, it will look in the system directory which is defined by the "NCL_INCDIR" parameter inside the ncl.init file. The stock(s)/fixture(s) loaded will have the ID number specified by "id". If there are multiple stocks/fixtures in the primitive file, then ***NCL/IPV*** will continue numbering them in ascending order.

“n” is a scalar variable to receive the number of stocks and fixtures defined in the file. When “n” is specified, then it is mandatory that the filename be enclosed in double quotes, otherwise the scalar variable will be assumed to be part of the filename.

The STOCK/LOAD command will return the actual number of stocks and fixtures stored in the external stock file, not just the number of stocks. This is the same for the FIXTUR/LOAD command. So if the external stock file contains both stocks and fixtures, then this number cannot be used to determine the ending stock ID number or the fixture ID number assigned for the loaded file. If you need to know the exact number of stocks or fixtures loaded then you cannot store both stocks and fixtures in the same file.

FIXTUR/STL, id, INCHES, [“] file_name [“]
STOCK MM

This command will load an STL file with the name "file_name.stl". ***NCL/IPV*** will first look in the current directory for the file and if it is not found there, it will look in the system directory which is defined by the "NCL_INCDIR" parameter inside the ncl.init file. The stock or fixture loaded will have the ID number specified by "id". If there are multiple Stocks/Fixtures associated with this STL file, then ***NCL/IPV*** will continue numbering them in ascending order. "INCHES" or "MM" specifies the unit that the STL file is actually stored in.

Miscellaneous STOCK/FIXTUR Commands

FIXTUR/CLONE, id1, id2 [, m]
STOCK

This command creates "m" copies of the stock/fixture specified by "id2".

Where:

id1 = An integer specifies the starting ID number of the stock/fixture to be created. If multiple copies are made,

then ***NCL/IPV*** will continue numbering them in ascending order.

id2 = The ID number of the stock/fixture to be cloned.

m = An optional parameter to specify how many copies to be made. Only one copy will be made if this parameter is not specified.

FIXTUR/MODIFY, id1 [[[...] [, idn, THRU, idm]] [...]] $
STOCK

[, COLOR=color] [, VISIBL=ON] [, TOLER=tol] $
OFF

[, TRANS=tra] [, ACTIVE=ON]
OFF

This command modifies the attributes of the specified stock(s)/fixture(s) with the ID denoted by "id1 [[[...] [, idn, THRU, idm]] [...]]" in the command.

Where:

COLOR = Specifies the new color of the stock/fixture.

VISIBL = Specifies the visibility of the stock/fixture. It can be either "ON" or "OFF".

TOLER = Specifies the geometry tolerance.

TRANS = Defines the transparency of the stock/fixture and can be in the range of 1 to 100.

ACTIVE = Specifies whether the stock/fixture will be used in the simulation. It can be either "ON" or "OFF".

FIXTUR/MOVE, id1 [[[...] [, idn, THRU, idm]] $
STOCK

[...]], AT, matrix

This command applies the specified matrix to the stock(s)/fixture(s) with the ID denoted by "id1 [[[...] [, idn, THRU, idm]] [...]]" in the command. The matrix will be applied to the original Stock/Fixture and will not be multiplied by any matrix already associated with this Stock/Fixture.

FIXTUR/REMOVE, id1 [[[...] [, idn, THRU, idm]] [...]] STOCK

This command removes the specified stock(s)/fixture(s) denoted by the ID numbers "id1 [[[...] [, idn, THRU, idm]] [...]]" in the command.

FIXTUR/SOLID,id1,solid STOCK

This command creates a stock/fixture using a defined solid.

Where:

id = An integer specifies the ID number of the stock/fixture to be created.

solid = Label of the solid specified.

STOCK/REMOVE,CHIPS, pv1 [...]

This command removes the excess chips from the stock directly within the part program. A list of point-vectors can be input with this command. These point-vectors will be used to select the portion of the stock to keep. There should be one point-vector per defined stock and each of these should lie within the stock and point towards an edge of the stock to ensure that the correct portion of the stock is retained.

Miscellaneous *NCL/IPV* Commands

*SET/RAPID,r

This command defines the default rapid feed rate for ***NCL/IPV***. Issuing this command is the same as changing the Rapid Rate field in the ***NCL/IPV*** Tool Modals form, in that any tools added to the tool list after this command has been issued will use this rapid rate.

Enter this command after some tools have already been defined does not necessarily mean that these previous tools will use the old rapid rate, since the tool list is not actually built until either the Edit Tool List form is displayed or an ***NCL/IPV*** simulation is started.

TOOLPN/x, y, z, i, j, k, u, v, w

This command is used to define the tooling pin of the part for placing the stocks and fixtures onto the machine in “Machine Simulation”

mode. This command does not have any effect on the stock and fixtures if “Machine Simulation” mode is not active.

Where:

x, y, z = Origin of the tooling pin in relationship to the part.

i, j, k = Axis of the tooling pin cylinder in relationship to the part.

u, v, w = Vector that points from the center of the tooling pin towards its flat side.

Machine Configuration

A machine must be set up before one can use the Machine Simulation option of ***NCL/IPV***. This chapter describes how to set up such a machine. The machine be named with any combination of alpha and numerical characters.

A machine is described by two or more of the following configuration files:

1. machine.dat (required)
2. postworks.mdl (required)
3. axis.dat
4. file.txt

All these files are in simple ASCII text format and stored in the folder specified by the following environmental variable which is specified in the ncl.init file.

UL_NCLIPV_MACHINES

Each machine is stored in a separate folder under this folder and consists of all the configuration files which describe the machine.

Example:

If the environmental variable UL_NCLIPV_MACHINES is set to C:\NCCS\MACHINE.

The folder C:\NCCS\MACHINE\8100132 will contain all the required configuration files for the machine: 8100132.

machin.dat

This file contains a description of the machine, which is displayed in the ***NCL/IPV*** Machine Simulation form. A typical machin.dat file is shown below.

```
MachineName = 12345
Family = Mill
Description = Sample 5-axis Machining Center
Manufacturer = ABC
ControllerName = ABC
Unit = Inch
AxisNames = X Y Z A B
ToolChangeType = Automatic
NumberOfTools = 9999
ToolChangeAxis = 0, 0, 1
```

The word before the “=” sign is a keyword and is a required field. Only these keywords are allowed in this file. No other keyword is allowed.

The entry after the "=" sign defines the contents of the corresponding keyword and is user assigned.

All keywords in this file are optional except "Family", "Unit" and "AxisNames". "Family" defines the machine type which can be "Mill", "Lathe", "MillTurn or "Stringer". "Unit" defines the unit (Inch or MM) to be used with this machine configuration and "AxisNames" defines the available axes of this machine configuration.

postworks.mdl

This file contains the definition of the machine components. It defines the structure of the machine which includes all the axes of the machine, the base, the spindle and their kinematics relationship. This file can also define the solids that make up the machine and their attributes. The format of this file is shown below.

```
//MachineName = Machine description
Unit = Inch

// Define Base Assembly
AxisName = Base
    Definition of "Base" solids and their attributes

// Define x1 Axis
AxisName = x1
    Definition of "x1" solids, their attributes and x1's kinematics
    relation to Base.

//Define x2 Axis
AxisName = x2
    Definition of "x2" solids, their attributes and x2's kinematics
    relation to either "Base" or "x1".
.....
.....
.....

//Define xx Axis
AxisName = xx
    Definition of "xx" solids, their attributes and xx's kinematics
    relation to any of the previous defined axes, components or
    assemblies.

// Define Spindle
AxisName = Spindle
ToolSpindle  0
    Definition of Spindle solids, their attributes, attach location and
    direction.
```

Where:

1. "//" denotes this is a comment statements.
2. The keyword "UNIT" specified the units for all the numerical values used in this file.
3. "x1", "xx" are the labels of the corresponding axes, The order to define the axes is important. An axis must be defined first before other axes can join on it.

   Example:

   If the command "JOIN X2 ON X1" is used to describe the kinematics relation between X1 and X2 inside the X2 definition, then X1 must be defined before X2.

Following is a list of commands with description that can be used in this file.

AxisLine

Syntax:

AxisLine (x,y,z, i,j,k)

Where:

a) Specified with any axis other than the ToolSpindle Axis.

x, y, z origin of the axis

i, ,j, k vector to specify the positive direction in which the linear axis moves or the axis of rotation for rotary axis

This is used to define how the axis/assembly moves in space. For the linear axes this will be the positive direction in which the axis move, For the rotary axes this will indicate the axis of rotation.

Example:

AxisLine (0,0,0, 1,0,0)

b) Specified with the ToolSpindle Axis.

x, y , z the location where the top of the tool will be positioned in the spindle (tool stop point)

i, ,j, k the default axis direction of the spindle (normally 0,0,1).

Example:

AxisLine (0,0,0, 1,0,0)

c) Specified with the Lathe Machine configuration.

Multiple AxisLine commands are allowed for lathe turret. Each AxisLine command will be applied to the corresponding turret position, the first AxisLine parameters to the first turret position, the second to the second, etc. If there are less AxisLine commands defined than turret positions, then each succeeding turret position will be assigned the ascending AxisLine parameter definitions starting with the first command.

For example, if the lathe has a Z-axis turret with alternating lathe/mill type slots for attaching the tool, then only two AxisLine commands need to be defined and they could look like the following.

AxisLine (0,50,0, 1,0,0)

AxisLine (0,50,0, 0,0,1)

c) Specified with the Mill/Turn configuration.

One more AxisLine command can be specified in the Turret section than the number of turret faces. This extra tool stop position will be used to mount the tools when milling mode is in effect. This feature will typically be used when there is a single face to load lathe style tools and a single spindle for milling tools.

AxisName

Syntax:

AxisName = name

Where:

name name of the axis or component to be defined

This is used to define a specific axis or a component with a specific name. This must be the first line in defining a specific axis. All the other commands between this AxisName statement and the next AxisName statement will be applied to this axis name.

Example:

AxisName = X

AxisOffset

Syntax:

AxisOffset axis_name at val

This is used to define the default offset value for a component. “axis_name” is the name of the component (AxisName) and should be the same name as the component currently being defined and val is the offset value to add to each programmed position for this axis. “at” is required for syntax.

Example:

```
AxisOffset  Z  at  10
```

AxisScale

Syntax:

AxisScale axis_name at scale

This is used to define scale value for a component. “axis_name” is the name of the component (AxisName) and should be the same name as the component currently being defined and scale is the scale value to apply to each programmed position for this axis. “at” is required for syntax.

The scale value is typically set to 1 for all axes for Lathe simulation, except X-axis when diameter programming is used, it should be set to 0.5 for this type of axis.

Example:

```
AxisScale  X  at  0.5
```

AxisType

Syntax:

AxisType = type

Where:

type can be either Linear or Rotary

This defines the corresponding axis as a linear or a rotary axis.

Example:

```
AxisType = Linear
```

Box

Syntax:

component_name = Box (x1,y1,z1,lengthx,widthy,heightz)

Where:

component_name	name of the component to be defined
x1, y1, z1	origin of box
lengthx	length of box along the X-axis
widthy	length of box along the Y-axis
height	length of box along the Z-axis

This is used to define a box solid.

Example:

Box1 = Box (0,0,0, 1,2,3)

Color

Syntax:

Color (name, color_name)

Where:

name	name of the component or assembly
color_name	color name of the specified component or assembly

This is used to specify a color for a component or an assembly.

Example:

Color (Con1, Orange)

Cone

Syntax:

component_name = Cone (xc,yc,zc, i,j,k, len, rad1, rad2)

Where:

component_name	name of the component to be defined
xc, yc, zc	center point for bottom of cone
i,j,k	vector direction of cone axis
len	length of cone

rad1	bottom radius of cone
rad2	top radius of cone

This is used to define a cone solid.

Example:

Con1 = Cone (0,1,2, 0,0,1, 10, 2, 1)

Cylinder

Syntax:

component_name = Cylinder (xc,yc,zc, i,j,k, len, rad)

Where:

component_name	name of the component to be defined
xc, yc, zc	center point for bottom of cylinder
i, j, k	vector direction of cylindrical axis
len	length of cylinder
rad	radius of cylinder

This is used to define a cylindrical solid.

Example:

Cyl1 = Cylinder (0,1,2, 0,0,1, 10, 2)

EdgeDisplay

Syntax:

EdgeDisplay (name, ON ,color_name)
OFF

Where:

name	name of the component or assembly
ON	display the edge of the specified component or assembly
OFF	not to display the edge of the specified component or assembly
color_name	Name of the color used to display the edges with, or the word “DEFAULT” which means the same color as the specified component or assembly

This is used to specify whether to display the edges of a component

or assembly with a specified color.

Example:

EdgeDisplay (Base, On, Orange)

Home

Syntax:

Home = val

Where:

val a numerical number

This is used to define the position of the corresponding axis when the machine is first activated.

Example:

Home = 20

If this is specified inside the definition of the Z axis, then the Z-axis will be positioned at 20 when the machine is first activated.

Join

Syntax:

Join assembly_name on assembly_name

Where:

on	a required word for syntax
assembly_name	the name of the assembly to be joined

This is used to define the kinematics indicating how the assemblies are mounted. “Join Y on X” indicates that the Y assembly is mounted on the assembly X. Hence when the parent assembly X moves, child assembly Y will move with it.

Example:

Join Y on X

Reverse

Syntax:

Reverse axis_name Yes
No

Where:

axis_name	name of the axis to be reversed or not
Yes/No	Yes means reverse the axis motion. No means not to reverse the axis motion.

This is used to determine whether this axis moves in the reverse direction of the programmed move. ***NCL/IPV*** will automatically setup head style axes to not be reversed and table style axes to be reversed. You can use this command to override the default settings per axis.

Example:

```
Reverse  Y  Yes
```

RevolveSolid

Syntax:

component_name = RevolveSolid (file_name)

Where:

component_name	name of the component to be defined
file_name	the name of an external file which contains the revolved profile

This is used to define a solid by revolving a profile around the Y-axis. This file contains a sequential list of lines and arcs. See file.txt for details and example.

Example:

```
Revolv1 = RevolveSolid(profile.txt)
```

Rotate

Syntax:

Rotate (name, rotation_matrix)
axis_name, deg

Where:

name	name of the component or assembly to be rotated
rotation_matrix	A rotation matrix defined by 9 parameters
axis_name	rotate around this axis
deg	rotation amount in degrees

This is used to rotate a component or assembly about an axis by a specified angle. Either a 9 parameters matrix or “axis_name,deg” can be used to define the rotation.

Example:

Rotate (Con1, Y, 45)

Sphere

Syntax:

component_name = Sphere (xc,yc,zc, rad)

Where:

component_name	name of the component to be defined
xc, yc, zc	center point for sphere
rad	radius of the sphere

This is used to define a spherical solid.

Example:

Sphere1 = Sphere (0,1,2, 2)

StlSolid

Syntax:

component_name = StlSolid (file_name [, INCH])
MM

Where:

component_name	name of the component to be defined
file_name	the name of the external stl file to be imported
INCH or MM	optional units specifier

This is used to define a STL solid imported from an external STL data file.

Example:

Stlcomp1 = StlSolid (table.stl,INCH)

StockFile

Syntax:

SubAssembly_name = StockFile (file_name)

Where:

SubAssembly_name	name of the sub-assembly to be defined
file_name	the name of the external stk file to be imported

This is used to define STK solids imported from an external STK data file.

Example:

Stkcomp1 = StockFile (head.stk)

Note: There can be more than one component defined in the stock file. The name of each component in the stock file is specified by adding "_n" to the sub-assembly name and "n" is the order of the components defined in the stock file.

Example:

Stkcomp1 = StockFile (head.stk)

If there are more than one component defined in the stock file "head.stk", the name of each component is defined as "Stkcomp1_n". e.g. The second component defined in the stock file is specified as "Stkcomp1_2". The n-th component is specified as "Stkcomp1_n". If there is only one component defined in the stock file "head.stk", the single component is specified as "Stkcomp1_1".

SweepSolid

Syntax:

component_name = SweepSolid (length, file_name)

Where:

component_name	name of the component to be defined
length	length of the sweep
file_name	the name of an external file which contains the sweep profile

This is used to define a sweep solid along the Z-axis.

Example:

Sweep1 = SweepSolid (2.5,"Profile.txt")

ToolingPin

Syntax:

ToolingPin [pin_label] x,y,z, i,j,k u,v,w

Where:

pin_label	defines the name of the tooling pin being defined and is optional. It can contain up to 18 characters. If a name is not specified, then the name of the axis being defined by the parameter "AxisName" will be used for the name.
x, y, z	location of the tooling pin
i, ,j, k	defines the Z-axis vector of the tooling pin
u, v, w	defines the X-axis vector of the tooling pin

This is used to define the machine tooling pin location. Each tooling pin can be attached to a different machine axis independently of one another. An unlimited number of tooling pins can be defined. The ToolingPin command should be placed with the commands that define the machine component that the part or fixture will be attached to, for example the X-axis.

Example:

```
ToolingPin  X  0,0,0, 0,0,1, 1,0,0
```

ToolSpindle

Syntax:

ToolSpindle n

The ToolSpindle command should be placed with the commands that define the axis where the tool will be attached.

Where:

n	defines the spindle number from 0-9.

Example:

```
ToolSpindle 1
```

ToolTurret

Syntax:

ToolTurret (x, y, z, i, j, k, height, radius, nsides, adjust)

Where:

x, y, z	turret position on machine
i, ,j, k	rotation axis of turret, usually 0, 1, 0
height	height of turret
radius	radius of turret (distance to flat side of turret)
nsides	number of sides that turret has (tool positions)
adjust	position of tool. “ON” specifies positioning the tool at the tool at the top of the holder to the turret stop position. “OFF” specifies positioning the tool end point at the turret tool stop position

A solid representation of the turret will automatically be created using the parameters specified in the ToolTurret command, so the user is not required to define a solid. If either the height or radius of the turret is specified as 0, then the turret solid will not be automatically built and the user must then define a solid to represent the turret.

Example:

```
ToolTurret(11.75,48,0, 0,0,1, 19,0,12,OFF)
```

Translate

Syntax:

Translate (name, x1, y1, z1)

Where:

name	name of the component or assembly to be translated
x1, y1, z1	amount of translation along the X, Y, Z axes.

This is used to translate any component or assembly by a vector with magnitude.

Example:

```
Translate (Sweep1, 3,4,5)
```

Translucency

Syntax:

Translucency (name, val)

Where:

name	name of the component or assembly

val defines the default amount of translucency, can be in the range of 1-100

Example:

Translucency (Con1, 50)

Unit

Syntax:

Unit = Inch
MM

This is optional and used to specify the units used for this file, axis.dat or file.txt is “Inch” or “MM”. This should be the first line in the file. If not specified, it will default to the “Unit” keyword of the machine.dat file.

Example:

Unit = Inch

Visible

Syntax:

Visible (name, Yes)
No

Where:

name name of the component or assembly

This is used to define the default visibility of a component or assembly. “Yes” makes the corresponding entity to be visible. “No” makes the corresponding entity to be invisible.

Example:

Visible (Base, No)

axis.dat

Each machine component (AxisName) can have an associated axis.dat file. This file simply contains commands that are supported in the postworks.mdf file.

file.txt

The file.txt files contain profiles that define swept solids or solid of revolution. Only lines and arcs can be defined in this file. Following is an example of the contents of this type of file.

```
// Profile for define swept solids
Line (0,0,0,   0,-2,0)
Line (0,-2,0,   5,-7,0)
Line (5,-7,0,   45,0,0)
Line(45,0,0,   0,0,0)
Arc (0,0,0,   2,2,0,   0,2,0,   clw)
```

Where:

1. "//" defines a comment statement.
2. Line (xs,ys,zs, xe,ye,ze)

   "xs, ys, zs" specifies the start point of the line
   "xe, ye, ze" specifies the end point of the line
3. Arc (xs,ys,zs, xe,ye,ze, xc,yx,zc, clw)

   "xs, ys, zs" specifies the start point of the arc
   "xe, ye, ze" specifies the end point of the arc
   "xc, yc, zc" specifies the center of the arc
   "clw" or "cclw" specifies the direction of the arc

Changing *NCL/IPV* Default Settings

The default settings for such things as units, tolerance and colors are established in the files:

NCCS\NCL101\Interface\nclipv.mod

NCCS\NCL101\Interface\nclipv_modals.mod

NCCS\NCL101\Interface\nclipv_diplay.mod

NCCS\NCL101\Interface\nclipv_lights.mod

NCCS\NCL101\Interface\nclipv_playback.mod

NCCS\NCL101\Interface\nclipv_stock.mod

NCCS\NCL101\Interface\nclipv_fixture.mod

You can change the defaults by using a text editor to edit these files.

The following settings are included in the file: nclipv.mod with units set to inch.

Default Setting	Description	Choices
/UNITS/ *INCH	Units for numerical values specified in this file such as tolerance, height, diameter, volume, etc.	*INCH or *MM
#TOOLS#	TOOLS section header	
/TOLERANCE/ .005	Cutter tolerance setting	Value
/MAXANG/ 5	Maximum angle change	Value
/TRANSLUCENCY/ 75	Tool translucency	A value between 1 and 100
/RAPID/ 0	Default RAPID feedrate	A value
/MIN_HEIGHT/ 0.1	Minimum height of tool	A value
/MAX_HEIGHT/ 25	Maximum height of tool	A value
/MIN_DIAMETER/ .01	Minimum diameter of tool	A value
/FROM/ *YES	Motion immediately after an active tool definition is a FROM move.	*YES or *NO
/SHANK/ *HOLDER	Define the shank as a holder for clash detection	*HOLDER or *CUTTER
/EDGE_DISPLAY/ *YES	Display tool edges	*YES or *NO
/EDGE_COLOR/ *BLACK	Color for displayed tool edges	A specified color or *DEFAULT
#TOLERANCES#	TOLERANCES section header	
/GEOMETRY/ .002	Tolerance for geo measurements	A value
/STL/ .005	Tolerance for considering STL to be closed	A value

#COLORS#	COLORS section header	
/CUT/ *AUTO	Initial cut color	*AUTO or a specified color
/CUTTER/ *BROWN	Tool color	A specified color
/HOLDER/ *MAGENTA	Holder color	A specified color
/SHANK/ *ORNAGE	Shank color	A specified color
/GOUGE_FIXT/ *ORANGE	Color of a fixture gouges	A specified color
/GOUGE_HOLD/ *RED	Color of a holder gouges	A specified color
/GOUGE_RAP/ *RED	Color of a RAPID collision	A specified color
/HIGHLIGHT/ *PINK	Pick highlight color	A specified color
/INITIAL/ *LTTAN	Initial AUTO cut color	A specified color
/USE_STOCK/ *NO	Use stock colors for AUTO	*NO or *YES
/USE_FIXT/ *NO	Use fixture colors for AUTO	*NO or *YES

#DIAGNOSTICS#

/FILE/ nclipv.log	Name of the clash log file.	
/RESET/ *YES	Automatically reset the log file when starting a new session	*YES or *NO
/TOOL_RAPID_STOP/ *YES	Stop Simulation when a RAPID move clash the part or fixture	*YES or *NO
/TOOL_RAPID_LOG/ *YES	Write to the log file when a RAPID move clash the part or fixture	*YES or *NO
/TOOL_FIXTURE_STOP/ *YES	Stop simulation when the tool clash with the fixture	*YES or *NO
/TOOL_FIXTURE_LOG/ *YES	Write to the log file when the tool clash with the fixture	*YES or *NO
/TOOL_HEAD_STOP/ *NO	Do not stop simulation when the tool clash with the head type axis	*YES or *NO
/TOOL_HEAD_LOG/ *YES	Do not write to the log file when the tool clash with a head type axis	*YES or *NO
/TOOL_AXIS_STOP/ *YES	Stop simulation when the tool clash with a table type axis	*YES or *NO
/TOOL_AXIS_LOG/ *YES	Write to the log file when the tool clash with a table type axis	*YES or *NO
/HOLDER_STOCK_STOP/ *YES	Stop simulation when the holder clash with the part	*YES or *NO
/HOLDER_STOCK_LOG/ *YES	Write to the log file when the holder clash with the part	*YES or *NO
/HOLDER_FIXTURE_STOP/ *YES	Stop simulation when the holder clash with the fixture	*YES or *NO
/HOLDER_FIXTURE_LOG/ *YES	Write to the log file when the holder clash with the fixture	*YES or *NO
/HOLDER_HEAD_STOP/ *NO	Do not stop simulation when the holder clash with a head type axis	*YES or *NO
/HOLDER_HEAD_LOG/ *YES	Do not write to the log file when the holder clash with a head type axis	*YES or *NO
/HOLDER_AXIS_STOP/ *YES	Stop simulation when the holder clash with a table type axis	*YES or *NO
/HOLDER_AXIS_LOG/ *YES	Write to the log file when the holder clash with a table type axis	*YES or *NO
/HEAD_STOCK_STOP/ *YES	Stop simulation when a head type axis clash the part	*YES or *NO

/HEAD_STOCK_LOG/ *YES	Write to the log file when a head type axis clash the part	*YES or *NO
/HEAD_FIXTURE_STOP/ *YES	Stop simulation when a head type axis clash the fixture	*YES or *NO
/HEAD_FIXTURE_LOG/ *YES	Write to the log file when a head type axis clash the fixture	*YES or *NO
/HEAD_HEAD_STOP/ *NO	Do not stop simulation when a head type axis clash with another head type axis	*YES or *NO
/HEAD_HEAD_LOG/ *YES	Do not write to the log file when a head type axis clash with another head type axis	*YES or *NO
/HEAD_AXIS_STOP/ *YES	Stop simulation when a head type axis clash with a table type axis	*YES or *NO
/HEAD_AXIS_LOG/ *YES	Write to the log file when a head type axis clash with a table type axis	*YES or *NO
/AXIS_STOCK_STOP/ *NO	So not stop simulation when a table type axis clash with the part	*YES or *NO
/AXIS_STOCK_LOG/ *YES	Do not write to the log file when a table type axis clash with the part	*YES or *NO
/AXIS_FIXTURE_STOP/ *NO	Do not stop simulation when a table type axis clash with the fixture	*YES or *NO
/AXIS_FIXTURE_LOG/ *YES	Do not write to the log file when a table type axis clash with the fixture	*YES or *NO
/AXIS_AXIS_STOP/ *NO	Do not stop simulation when a table type axis clash with another table type axis	*YES or *NO
/AXIS_AXIS_LOG/ *NO	Do not write to the log file when a table type axis clash with another table type axis	*YES or *NO
/POST_ERROR_STOP/ *YES	Stop simulation whenever a Post-processor error is encountered	*YES or *NO
/POST_ERROR_LOG/ *YES	Write to the log file whenever a Post-processor error is encountered	*YES or *NO
/CLASH_COLOR/ *RED	Define the clash color. Setting this to DEFAULT will disable the clash	A specified color

#INCLUD# Included files header, this section cannot be changed by the user.

```
/FILE/ nclipv_modals.mod
/FILE/ nclipv_display.mod
/FILE/ nclipv_playback.mod
/FILE/ nclipv_lights.mod
/FILE/ nclipv_stock.mod
/FILE/ nclipv_fixture.mod
/FILE/ nclipv_compare.mod
/FILE/ nclipv_undo.mod
/FILE/ nclipv_view.mod
```

The following settings are included in the file: nclipv.mod with units set to MM.

Default Setting	Description	Choices
/UNITS/ *MM	Units for numerical values specified in this file such as tolerance, height, diameter, volume, etc.	*INCH or *MM
#TOOLS#	TOOLS section header	
/TOLERANCE/ .12	Cutter tolerance setting	Value
/MAXANG/ 5	Maximum angle change	Value
/TRANSLUCENCY/ 75	Tool translucency	Value between 1 and 100
/RAPID/ 0	Default RAPID feedrate	A value
/MIN_HEIGHT/ 2	Minimum height of tool	A value
/MAX_HEIGHT/ 650	Maximum height of tool	A value
/MIN_DIAMETER/ .2	Minimum diameter of tool	A value
/FROM/ *YES	Motion immediately after an active tool definition is a FROM move.	*YES or *NO
/SHANK/ *HOLDER	Define the shank as a holder for clash detection	*HOLDER or *CUTTER
/EDGE_DISPLAY/ *YES	Display tool edges	*YES or *NO
/EDGE_COLOR/ *BLACK	Color for displayed tool edges	A specified color or *DEFAULT
#TOLERANCES#	TOLERANCES section header	
/GEOMETRY/ .05	Tolerance for geo measurements	A value
/STL/ .12	Tolerance for considering STL to be closed	A value
#COLORS#	COLORS section header	
/CUT/ *AUTO	Initial cut color	*AUTO or a specified color
/CUTTER/ *BROWN	Tool color	A specified color
/HOLDER/ *MAGENTA	Holder color	A specified color
/SHANK/ *ORNAGE	Shank color	A specified color
/GOUGE_FIXT/ *ORANGE	Color of a fixture gouges	A specified color
/GOUGE_HOLD/ *RED	Color of a holder gouges	A specified color
/GOUGE_RAP/ *RED	Color of a RAPID collision	A specified color
/HIGHLIGHT/ *PINK	Pick highlight color	A specified color
/EDGE/ *BLUE	Color of wireframe edges	A specified color
/INITIAL/ *LTTAN	Initial AUTO cut color	A specified color
/USE_STOCK/ *NO	Use stock colors for AUTO	*NO or *YES
/USE_FIXT/ *NO	Use fixture colors for AUTO	*NO or *YES
#DIAGNOSTICS#		
/FILE/ nclipv.log	Name of the clash log file.	
/RESET/ *YES	Automatically reset the log file when starting a new session	*YES or *NO
/TOOL_RAPID_STOP/ *YES	Stop Simulation when a RAPID move	*YES or *NO

	clash the part or fixture	
/TOOL_RAPID_LOG/ *YES	Write to the log file when a RAPID move clash the part or fixture	*YES or *NO
/TOOL_FIXTURE_STOP/ *YES	Stop simulation when the tool clash with the fixture	*YES or *NO
/TOOL_FIXTURE_LOG/ *YES	Write to the log file when the tool clash with the fixture	*YES or *NO
/TOOL_HEAD_STOP/ *NO	Do not stop simulation when the tool clash with the head type axis	*YES or *NO
/TOOL_HEAD_LOG/ *YES	Do not write to the log file when the tool clash with a head type axis	*YES or *NO
/TOOL_AXIS_STOP/ *YES	Stop simulation when the tool clash with a table type axis	*YES or *NO
/TOOL_AXIS_LOG/ *YES	Write to the log file when the tool clash with a table type axis	*YES or *NO
/HOLDER_STOCK_STOP/ *YES	Stop simulation when the holder clash with the part	*YES or *NO
/HOLDER_STOCK_LOG/ *YES	Write to the log file when the holder clash with the part	*YES or *NO
/HOLDER_FIXTURE_STOP/ *YES	Stop simulation when the holder clash with the fixture	*YES or *NO
/HOLDER_FIXTURE_LOG/ *YES	Write to the log file when the holder clash with the fixture	*YES or *NO
/HOLDER_HEAD_STOP/ *NO	Do not stop simulation when the holder clash with a head type axis	*YES or *NO
/HOLDER_HEAD_LOG/ *YES	Do not write to the log file when the holder clash with a head type axis	*YES or *NO
/HOLDER_AXIS_STOP/ *YES	Stop simulation when the holder clash with a table type axis	*YES or *NO
/HOLDER_AXIS_LOG/ *YES	Write to the log file when the holder clash with a table type axis	*YES or *NO
/HEAD_STOCK_STOP/ *YES	Stop simulation when a head type axis clash the part	*YES or *NO
/HEAD_STOCK_LOG/ *YES	Write to the log file when a head type axis clash the part	*YES or *NO
/HEAD_FIXTURE_STOP/ *YES	Stop simulation when a head type axis clash the fixture	*YES or *NO
/HEAD_FIXTURE_LOG/ *YES	Write to the log file when a head type axis clash the fixture	*YES or *NO
/HEAD_HEAD_STOP/ *NO	Do not stop simulation when a head type axis clash with another head type axis	*YES or *NO
/HEAD_HEAD_LOG/ *YES	Do not write to the log file when a head type axis clash with another head type axis	*YES or *NO
/HEAD_AXIS_STOP/ *YES	Stop simulation when a head type axis clash with a table type axis	*YES or *NO
/HEAD_AXIS_LOG/ *YES	Write to the log file when a head type axis clash with a table type axis	*YES or *NO
/AXIS_STOCK_STOP/ *NO	So not stop simulation when a table type axis clash with the part	*YES or *NO
/AXIS_STOCK_LOG/ *YES	Do not write to the log file when a table type axis clash with the part	*YES or *NO

/AXIS_FIXTURE_STOP/ *NO	Do not stop simulation when a table type axis clash with the fixture	*YES or *NO
/AXIS_FIXTURE_LOG/ *YES	Do not write to the log file when a table type axis clash with the fixture	*YES or *NO
/AXIS_AXIS_STOP/ *NO	Do not stop simulation when a table type axis clash with another table type axis	*YES or *NO
/AXIS_AXIS_LOG/ *NO	Do not write to the log file when a table type axis clash with another table type axis	*YES or *NO
/POST_ERROR_STOP/ *YES	Stop simulation whenever a Post-processor error is encountered	*YES or *NO
/POST_ERROR_LOG/ *YES	Write to the log file whenever a Post-processor error is encountered	*YES or *NO
/CLASH_COLOR/ *RED	Define the clash color. Setting this to DEFAULT will disable the clash	A specified color

#INCLUD#	Included files header, this section cannot be changed by the user.
/FILE/ nclipv_modals.mod	
/FILE/ nclipv_display.mod	
/FILE/ nclipv_playback.mod	
/FILE/ nclipv_lights.mod	
/FILE/ nclipv_stock.mod	
/FILE/ nclipv_fixture.mod	
/FILE/ nclipv_compare.mod	
/FILE/ nclipv_undo.mod	
/FILE/ nclipv_view.mod	

The following settings are included in the file: nclipv_modals.mod

Default Setting	Description	Choices
#SESSION#	SESSION section header	
/MODE/ *VISICUT	Simulation Mode. RAPIDCUT only works for MILL.	*VISICUT or *RAPIDCUT
/MACHINE/ *MILL	Machine Type	*MILL, *LATHE, *STRINGER or *AUTO
/RAPIDCUT_GRID/ 1000	RAPIDCUT Grid Size	A value between 300 and 1500
/AUTO_RESET/ *NO	Reset model at session end	*NO or *YES
/MONITOR/ *YES	Display Simulation Monitor Panel	*YES or *NO
/TITLE/ NCLIPV	2nd Window Banner Title	Some char string
/POSITION/ .1,.15	Location of the 2nd window	A value between 0 and 1
/SIZE/ .75,.75	Window size	A value between 0 and 1
#MONITOR#	MONITOR section header	
/ISN/ *YES	Display Current Input Sequence Number	*YES or *NO

/MODE/ *YES	Display Machining Mode	*YES or *NO
/MACHTYP/ *YES	Display Simulation Machine Type	*YES or *NO
/TOOL_END/ *YES	Display Current Tool End Point	*YES or *NO
/TOOL_AXIS/ *YES	Display Current Tool Axis Vector	*YES or *NO
/LINEAR/ *NO	Display Linear Axes Positions of Machine	*YES or *NO
/ROTARY/ *NO	Display Rotary Axes Positions of Machine	*YES or *NO
/HEAD2/ *YES	Display Head 2 Position of Stringer Machine	*YES or *NO
/HEAD3/ *YES	Display Head 3 Position of Stringer Machine	*YES or *NO
/HEAD4/ *YES	Display Head 4 Position of Stringer Machine	*YES or *NO
/LOADTL/ *NO	Display Current Tool Number	*YES or *NO
/DIAMETER/ *YES	Display Current Cutter Diameter	*YES or *NO
/RADIUS/ *NO	Display Current Cutter Corner Radius	*YES or *NO
/HEIGHT/ *NO	Display Current Cutter Height	*YES or *NO
/CUTCOM/ *NO	Display Current CUTCOM State	*YES or *NO
/FEDRAT/ *YES	Display Current Feedrate State and Value	*YES or *NO
/MOVE_TIME/ *NO	Display Machine Time of Current Move	*YES or *NO
/SPINDL/ *NO	Display Current Spindle RPM and Direction	*YES or *NO
/COOLNT/ *NO	Display Current Coolant State	*YES or *NO
/TOTAL_TIME/ *YES	Display Total Machining Time	*YES or *NO
/PROGRESS/ *YES	Display Percentage of Simulation Completed	*YES or *NO
/DOCK/ *RIGHT	Default Display Position of Monitor Panel	*OFF, *RIGHT, *LEFT

The following settings are included in the file: nclipv_display.mod

Default Setting	Description	Choices
#DISPLAY#	DISPLAY section header	
/DISPLAY/ *SHADED	Display Mode	*SHADED, *WIREFRAME *HIDDEN
/AXES/ *YES	Display Model Space Axes	*YES or *NO
/BUFFER/ *PIXEL	Display Buffer Setting	*SWAP or *PIXEL
/SWAP_SCREEN/ *NO	Start session in Main Window	*YES or *NO
/MINIMIZE/ *YES	Minimize the IPV Window	*YES or *NO
/AUTO_HIDE/ *NO	Auto Hide Obscure Solids	*YES or *NO
/TRANSLUCENCY/ 20	Display Translucency of Obscured Solids	A value
/EDGE_DISPLAY/ *NO	Display the Edges of Obscured Solids	*YES or *NO
#BACKGROUND#	BACKGROUND section header	
/SHADER/ *GRADUATE	Defines the Background Shader Type	*SOLID, *GRADUATE, *4-CORNER, *IMAGE

/COLOR/ *RGB	Defines the Color for Solid Shader	A specified color or RGB value
/RGB/ .4,.2,0	Defines the Red, Green, and Blue Color Components for Solid Shader	3 different values between 0 and 1
/TOP_COLOR/ *WHITE	Defines the Top Color for Graduate Shader	A specified color or RGB value
/BOT_COLOR/ *BLACK	Defines the Bottom Color for Graduate Shader	A specified color or RGB value
/TOP_RGB/ .4,.2,0	Defines the Red, Green, and Blue Color Components for Top Color	3 different values between 0 and 1
/BOT_RGB/ 0,0,0	Defines the Red, Green, and Blue Color Components for Bottom Color	3 different values between 0 and 1
/UL_COLOR/ *BLACK	Defines the Upper Left Corner Color for 4-corner Shader	A specified color or RGB value
/UR_COLOR/ *RGB	Defines the Upper Right Corner Color for 4-corner Shader	A specified color or RGB value
/LL_COLOR/ *RGB	Defines the Lower Left Corner Color for 4-corner Shader	A specified color or RGB value
/LR_COLOR/ *BLACK	Defines the Lower Right Corner Color for 4-corner Shader	A specified color or RGB value
/UL_RGB/ 0,0,0	Defines the Red, Green, and Blue Color Components for Upper Left	3 different values between 0 and 1
/UR_RGB/ .4,.2,0	Defines the Red, Green, and Blue Color Components for Upper RIght	3 different values between 0 and 1
/LL_RGB/ .4,.2,0	Defines the Red, Green, and Blue Color Components for Lower Left	3 different values between 0 and 1
/LR_RGB/ 0,0,0	Defines the Red, Green, and Blue Color Components for Lower RIght	3 different values between 0 and 1
/IMAGE/	Name of the image file	Some char string
/ROTATE/ *0	Rotation Angles	0, 90, 180, 270
/STRETCH/ *YES	Stretch the image to fill the background or not	*YES or *NO

The following settings are included in the file: nclipv_lights.mod

Default Setting	**Description**	**Choices**
#LIGHTS#	LIGHT section header	
/LIGHT/ 1		
/ACTIVE/ *YES	Define Light is ON or OFF	*YES or *NO
/TYPE/ *EYE	Type of Light	*AMBIENT, *DISTANT, *EYE, *POINT
/COLOR/ *WHITE	Define the Light color	A specified color or RGB value
/RGB/ 1,1,1	Defines the Red, Green, and Blue Color Components	3 different values between 0 and 1
/INTENSITY/ 70	Defines Intensity of Brightness	A value between 1 and 100
/POSITION/ 0,0,0	Defines the Position of the Distant or Point Type Light	3 different values
/DIRECTION/ 0,0,1	Defines the Direction of Distant Light	Vector components
/LIGHT/ 2		

/ACTIVE/ *YES	Define Light is ON or OFF	*YES or *NO
/TYPE/ *AMBIENT	Type of Light	*AMBIENT, *DISTANT, *EYE, *POINT
/COLOR/ *WHITE	Define the Light color	A specified color or RGB value
/RGB/ 1,1,1	Defines the Red, Green, and Blue Color Components	3 different values between 0 and 1
/INTENSITY/ 30	Defines Intensity of Brightness	A value between 1 and 100
/POSITION/ 0,0,0	Defines the Position of the Distant or Point Type Light	3 different values
/DIRECTION/ 0,0,1	Defines the Direction of Distant Light	Vector components
/LIGHT/ 3		
/ACTIVE/ *NO	Define Light is ON or OFF	*YES or NO
/TYPE/ *DISTANT	Type of Light	*AMBIENT, *DISTANT, *EYE, *POINT
/COLOR/ *WHITE	Define the Light color	A specified color or RGB value
/RGB/ 1,1,1	Defines the Red, Green, and Blue Color Components	3 different values between 0 and 1
/INTENSITY/ 100	Defines Intensity of Brightness	A value between 1 and 100
/POSITION/ 0,0,0	Defines the Position of the Distant or Point Type Light	3 different values
/DIRECTION/ 0,0,1	Defines the Direction of Distant Light	Vector components
/LIGHT/ 4		
/ACTIVE/ *YES	Define Light is ON or OFF	*YES or *NO
/TYPE/ *POINT	Type of Light	*AMBIENT, *DISTANT, *EYE, *POINT
/COLOR/ *WHITE	Define the Light color	A specified color or RGB value
/RGB/ 1,1,1	Defines the Red, Green, and Blue Color Components	3 different values between 0 and 1
/INTENSITY/ 10	Defines Intensity of Brightness	A value between 1 and 100
/POSITION/ .8,.4,2.5	Defines the Position of the Distant or Point Type Light	3 different values
/DIRECTION/ 0,0,1	Defines the Direction of Distant Light	Vector components

The following settings are included in the file: nclipv_playback.mod

Default Setting	**Description**	**Choices**
#PLAYBACK#	PLAYBACK section header	
/START/ *BEGIN	Defines where to begin Simulation	*BEGIN, *CURRENT
/MODE/ *GO	Defines the Simulation Mode	*GO, *STEP, *TOOL
/SPEED/ 100	Defines the Simulation Speed	A value between 1 and 100

/STEPS/ 1	Defines the Steps	A positive integer
/DYNAMIC/ *CUTTER	Defines to move the Cutter or the Part during simulation	*CUTTER, *PART
/CYCLE/ *SIMPLE	Defines how the CYCLES should be simulated	*OFF, *SIMPLE, *DETAIL, *LATHE
/ANALYZE/ *OFF	Defines types of simulation	*OFF, *FEED, *INTERP
/RAPID/ *OFF	Defines how the RAPID motion should be modified with center line file motion playback. Not recommend to use with simulation file playback or machine simulation.	*OFF, *XAXIS, *YAXIS, *ZAXIS, *TLAXIS

The following settings are included in the file: nclipv_stock.mod with units set to inch

Default Setting	Description	Choices
#STOCK#	STOCK section header	
/ID/ 1	Initial stock ID number	A value
/COLOR/ *GREEN	Color of stock	A specified color
/VISIBLE/ *YES	Stock visible	*YES or *NO
/ACTIVE/ *YES	Stock active	*YES or *NO
/TRANSLUCENCY/ 100	Stock translucency	A value between 1 and 100
/TOLERANCE/ .001	Stock tolerance	A value
/STL_FORMAT/ *ASCII	STL file format	*ASCII or *BINARY
/STL_STOP/ *NO	Output an error message when an STL file being loaded has problems associated with it	*YES or *NO
/STL_INACTIVE/ *NO	Deactivate the STL solid if it encountered problems during loading	*YES or *NO
/EXPANSION/ .25	Auto box expansion	A value
/UNITS/ *INCH	Units of STL file for stock and fixture	*INCH or *MM
/AXES/ *YES	Display stock axes	*YES or *NO
/AXES_COLOR/ *ORANGE	Color of displayed axes	A specified color
/EDGE_DISPLAY/ *YES	Display stock and fixture edges	*YES or *NO
/EDGE_COLOR/ *BLACK	Color of displayed edges	A specified color or *DEFAULT
/STL_SKIP_ERROR/ *NO	Skip STL file error checking	*YES or *NO

The following settings are included in the file: nclipv_fixture.mod with units set to inch

Default Setting	Description	Choices
#FIXTURE#	Fixture section header	
/ID/ 1	Initial fixture ID	A value
/COLOR/ *BLUE	Color of fixture	A specified color
/VISIBLE/ *YES	Fixture visible	*YES or *NO
/ACTIVE/ *YES	Fixture active	*YES or *NO

/TRANSLUCENCY/ 100	Fixture translucency	A value between 1 and 100
/IMPORTANT/ *NO	Enable fixtures autohide	*YES or *NO
/TOLERANCE/ .001	Fixture tolerance	A value
/EDGE_DISPLAY/ *NO	Display fixture edges	*YES or *NO
/EDGE_COLOR/ *DEFAULT	Color of displayed edges	A specified color
/AXES/ *NO	Display fixture axes	*YES or *NO
/AXES_COLOR/ *PURPLE	Color of displayed axes	A specified color

The following settings are included in the file: nclipv_stock.mod with units set to MM

Default Setting	**Description**	**Choices**
#STOCK#	STOCK section header	
/ID/ 1	Initial stock ID number	A value
/COLOR/ *GREEN	Color of stock	A specified color
/VISIBLE/ *YES	Stock visible	*YES or *NO
/ACTIVE/ *YES	Stock active	*YES or *NO
/TRANSLUCENCY/ 100	Stock translucency	A value between 1 and 100
/TOLERANCE/ .03	Stock tolerance	A value
/STL_FORMAT/ *ASCII	STL file format	*ASCII or *BINARY
/STL_STOP/ *NO	Output an error message when an STL file being loaded has problems associated with it	*YES or *NO
/STL_INACTIVE/ *NO	Deactivate the STL solid if it encountered problems during loading	*YES or *NO
/EXPANSION/ 5	Auto box expansion	A value
/UNITS/ *MM	Units of STL file for stock and fixture	*INCH or *MM
/AXES/ *YES	Display stock axes	*YES or *NO
/AXES_COLOR/ *ORANGE	Color of displayed axes	A specified color
/EDGE_DISPLAY/ *YES	Display stock and fixture edges	*YES or *NO
/EDGE_COLOR/ *BLACK	Color of displayed edges	A specified color or *DEFAULT
/STL_SKIP_ERROR/ *NO	Skip STL file error checking	*YES or *NO

The following settings are included in the file: nclipv_fixture.mod with units set to MM

Default Setting	**Description**	**Choices**
#FIXTURE#	Fixture section header	
/ID/ 1	Initial fixture ID	A value
/COLOR/ *BLUE	Color of fixture	A specified color
/VISIBLE/ *YES	Fixture visible	*YES or *NO
/ACTIVE/ *YES	Fixture active	*YES or *NO
/TRANSLUCENCY/ 100	Fixture translucency	A value between 1 and 100
/IMPORTANT/ *NO	Enable fixtures autohide	*YES or *NO

/TOLERANCE/ .03	Fixture tolerance	A value
/EDGE_DISPLAY/ *NO	Display fixtures edges	*YES or *NO
/EDGE_COLOR/ *DEFAULT	Color of displayed edges	A specified color
/AXES/ *NO	Display fixture axes	*YES or *NO
/AXES_COLOR/ *PURPLE	Color of displayed axes	A specified color

The following settings are included in the file: nclipv_compare.mod with units set to inch

Default Setting	**Description**	**Choices**
#COMPARE#	COMPARE section header	
/COMPARE/ *STL_File	Selects stl file as the target part for comparison	Surfaces, an STL file or a Lathe Shape
/SEL_COLOR/ *SEAGREEN	Highlight color of selected surfaces or shape	A specified color
/UNITS/ *INCH	Units of the STL File used for comparison	*INCH or *MM
/TYPE/ *VISUAL	Type of comparison	*BOTH, *OVERCUT, *REPORT, *UNDERCUT or *VISUAL
/VOLUME/ .01	Minimum volume as either an undercut or overcut during Boolean comparisons	A value
/TRANSLUCENCY/ 60	Display translucency of the model when performing Report, Undercut or Overcut comparisons	A value between 1 and 100
/GRID/ 20	Minimum grid to tessellate the surface(s)	A positive integer
/TOLERANCE/ .001	The tolerance for tessellating the surface(s)	A value
/ANGULAR/ 30	Maximum Angular Deviation	A value
/LINEAR/ .04	Maximum Linear Deviation	A value
/GRID_ONLY/ *NO	Tessellate surface with tolerance and optionally grid	*YES or *NO
/NEG_TOLER/ -.005,-.003,-.0025,-.001	Undercut tolerance zones	4 different values
/AUTO_TOLER/ .001	Incremental value for automatic tolerance	A value
/POS_TOLER/ .001,.002,.003,.004	Overcut tolerance zones	4 different values
/NEG_COLOR/ *RED,*ORANGE,*YELLOW,*PINK	Color for each undercut zone	4 specified color
/TOL_COLOR/ *GREEN	In tolerance color	A specified color
/POS_COLOR/ *SEAGREEN,*CYAN,*LTBLUE,*BLUE	Color for each overcut zone	4 specified color

The following settings are included in the file: nclipv_compare.mod with units set to MM.

Default Setting	Description	Choices
#COMPARE#	COMPARE section header	
/COMPARE/ *STL_File	Selects stl file as the target part for comparison	Surfaces, an STL file or a Lathe Shape
/SEL_COLOR/ *SEAGREEN	Highlight color of selected surfaces or shape	A specified color
/UNITS/ *MM	Units of the STL File used for comparison	*INCH or *MM
/TYPE/ *VISUAL	Type of comparison	*BOTH, *OVERCUT, *REPORT, *UNDERCUT or *VISUAL
/VOLUME/ .25	Minimum volume as either an undercut or overcut during Boolean comparisons	A value
/TRANSLUCENCY/ 60	Display translucency of the model when performing Report, Undercut or Overcut comparisons	A value
/GRID/ 20	Minimum grid to tessellate the surface(s)	A positive integer
/TOLERANCE/ .03	The tolerance for tessellating the surface(s)	A value
/ANGULAR/ 30	Maximum Angular Deviation	A value
/LINEAR/ 1.0	Maximum Linear Deviation	A value
/GRID_ONLY/ *NO	Tessellate surface with tolerance and optionally grid	*YES or *NO
/NEG_TOLER/ -.13,-.08,-.06,-.03	Undercut tolerance zones	4 different values
/AUTO_TOLER/ .03	Incremental value for automatic tolerance	A value
/POS_TOLER/ .025,.05,.075,.1	Overcut tolerance zones	4 different values
/NEG_COLOR/ *RED,*ORANGE,*YELLOW,*PINK	Color for each undercut zone	4 specified color
/TOL_COLOR/ *GREEN	In tolerance color	A specified color
/POS_COLOR/ *SEAGREEN,*CYAN,*LTBLUE,*BLUE	Color for each overcut zone	4 specified color

The following settings are included in the file: nclipv_undo.mod.

Default Setting	Description	Choices
#UNDO#	Undo Section Header	
/ACTIVE/ *YES	Enable/Disable Undo stack	*YES or *NO
/SIZE/ 100	Maximum Undo Steps	A value
/FIXTURE/ *YES	Include Fixtures in Undo Stacks	*YES or *NO

Product Installation and Licensing

NCL/IPV is integrated with the Windows version of ***NCL*** V10.1 No separate installation is required. To activate ***NCL/IPV*** with or without the *Machine Simulation Option* you must obtain a valid Software Product Key (SPK) from **NCCS** or your distributor.