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Introduction

Product Description
PathFinder3D automates the processes needed to prepare a Solidworks assembly for processing by a CAM system. PathFinder3D offers these features:

- **Freeform design in Solidworks.** Many woodworking CAD products require a specific design style for their automated features to work. With PathFinder3D, designers have the freedom to use all the power of SolidWorks in whatever way they choose.
- **Automated component layout.** PathFinder3D automatically "flattens" an assembly to prepare the components for nesting on sheet material.
- **Automated tool path generation inside SolidWorks.** PathFinder3D automatically draws the tool path geometry inside SolidWorks for all the components in the assembly and displays it in a manner that is easy for the user to review and edit. Because this is done within Solidworks you don't need to learn yet another CAM tool's interface.
- **Tool path geometry constrained to components.** Tool path geometry is constrained to the component so that changes to the Solidworks model will automatically be reflected in the tool path geometry.
- **DWG/DXF Export to nesting/CAM system.** Many CAM and nesting solutions take 2D polylines as input geometry and use layers to determine information needed to correctly nest the components and generate the G-Code. PathFinder3D generates DWG/DXF files and cut lists and passes these on to your nesting or CAM solution of choice.

How to use this document
If you are looking for instructions on how to install and configure the application for first time use, read the Installing and Configuring section. If you are new to PathFinder3D, skim through the Procedures section to find instructions on how to perform various tasks. If you know what to do but have questions about how a particular screen works then go to the Screen Reference section for detailed information about how each screen works.

Terms
The following are some terms to make communication clearer:
**Tool Path** – Many CAM systems will take 2D poly lines as input and convert this geometry to G-Code that moves the CNC tooling along the lines specified by the geometry. This geometry is commonly called “tool path” geometry. In PathFinder3D this same geometry is drawn as surfaces in SolidWorks and later exported to 2D poly lines and stored as a dxf/dwg format file. In this document both the surface geometry and the 2D poly lines are called “tool paths”.

**Tool Path Bounding Box** – PathFinder3D sketches a rectangle around each component’s tool path(s). This rectangle is called the “tool path bounding box” or just “bounding box” if the context implies it is the bounding box for the tool path(s).

**Procedures**

**Installing**

To install PathFinder3D for the first time you will need to close SolidWorks and run the setup .exe file. Follow the setup wizard to install the application. Once the application is installed, open SolidWorks. You should see a new menu called “PathFinder3D” at the top of the screen.
Configuring

Licensing
If you have installed the “Lite” version of PathFinder3D you will only see a subset of the menu items (Assign Materials, Print Cut List, Options and Manage Materials). If, however, you have installed the Professional version then you will see all the menu items shown in Figure 2 but will need to activate it before you can use the Generate Tool Paths or Export Tool Paths functions. The process to activate is as follows:

1. Click “License” on the main menu to open the License Manager (see Figure 3)
2. Copy and paste the Serial Number and send it by e-mail to: sales@pathfinder3d.com
3. As soon as possible your request will be processed and you will receive an activation code in a response e-mail. Copy and paste the activation code into the activation code fields on the License Manager screen and then click “Activate”.
4. If you have purchased the application “Licensed Full Version” should show up in green beneath the activation code. If you are using a trial version then the length of the trial should be printed below the activation code.
Figure 3 PathFinder3D License Manager

**Options**
Click the “Options” menu item to open the Options screen where you can configure PathFinder3D to suite your needs. See the [Options Screen section](#) for more information about what each of these configuration settings does. You will probably be able to leave most of these settings at their system defaults. You will, however, want to configure the TexturesRootPath and Configuration File Path. Other than that you will want to focus your configuration energies on setting up materials and layers.

**Materials**
PathFinder3D uses the SolidWorks custom materials databases and adds custom properties useful to the wood industry such as a finished face texture and backing texture. To configure materials click “Manage Material” on the menu. If you already have a custom materials database setup in SolidWorks then you should see this show up on the materials tree view on the left side of the screen. If you do not have a custom materials database then right click in the tree view on the left and select “New Library”. Browse to the file folder you want to store this library in, type in a name and save. The materials library is an XML file so it is easy to edit in a text document editor like Notepad. You can also copy and paste it to another computer or send it to other users as an e-mail attachment. Once you have a materials library you will want to add some categories and some materials. For more information about configuring materials see the [Materials Manager Screen section](#).

**Layers**
PathFinder3D can automatically generate tool path geometry for use by CAM software and store it in DWG\DXF format files. The tool paths outputted are 2d polylines drawn on specific layers. The layer the polyline is drawn on is used by the CAM software to determine what tool to use as well as whether the geometry defines a contour, a hole, a pocket, etc. To configure these layer open the Layers Manager (by clicking “Manage Layers” on the menu). PathFinder3D comes with some common layers. You may need to change the names of these layers to match with the layer names you have configured for your CAM system. You may also need to add some new layers or add/modify Bit Specs for some of the existing layers to match the tooling on your CNC. Read the [Layers Manager Screen section](#) for more information on performing these tasks.
Machines
PathFinder3D uses the machine assigned to a part to create cut lists organized by machine. It also will only generate tool paths for components that are assigned to a machine of machine type “CNC”. PathFinder3D comes with three machines already configured: CNC, Panel Saw and Other. You can add your own machines to this list or modify names from the Machines Manager screen.

Workflow for Generating Tool Paths
The following is a typical workflow for using PathFinder3D to generate tool paths. Go to the section describing each step for more information.

1. Assign a material and machine to components as you design or as the last step in your design process.
2. Adjust grain direction and finished face orientation of components where necessary
3. Execute the Generate Tool Paths function to create a “flat” layout of the assembly and generate tool paths.
4. Review the generated tool paths and make any necessary modifications using the Solidworks interface and the Tool Path Layers Editor.
5. Execute the Export Tool Paths function to export the tool paths to dwg/dxf files and create a CNC cut list.
6. (Optional) Combine Assembly Data. You can use the single assembly data files you have already generated but sometimes you can make better use of material by nesting components from multiple assemblies and cutting them together.
7. Print cut lists

Assign Material and Machine
At the very least you need to select a machine for each component so that PathFinder3D knows which components to generate CNC tool paths for. Assigning material information is also useful for generating cut lists and for making sure you have the components correctly oriented when they are laid flat. PathFinder3D provides several useful screens for assigning each component to a machine and material. Click on the link for detailed instructions on how to use each screen.

- Material PropertyManager - Assign material and machine info
- Material FeatureManager Tab - Show components grouped by material or machine for easy selection and review

Adjust Component Layout Orientation
PathFinder3D automates “flattening” the assembly and in most cases it will get it right. There are two cases where it does not have enough information to properly pick the correct orientation when the part is laid flat:

1. When the sheet material has a grain direction and the grain needs to run a certain direction on the finished component
2. When the sheet material has a finished face and the component has no cuts or drill holes in it that would indicate to PathFinder3D what face needs to be up in order to get the right cut. Of course, this scenario only matters if the component is non-symmetrical.

If you have setup up your materials with textures that show grain direction and have a different texture for the finished face then the back and core then you should be able to visually identify these cases before the parts are laid out. To correctly orient the part, select it, and click “Assign Material” on the menu. This will open the Material PropertyManager tab where you can adjust the grain direction and finished face properties in the “Layout Orientation” section.

Generate Tool Paths
Click “Generate Tool Paths” on the menu to create a “flat” layout of the assembly and generate tool paths for the components. The tool paths for each component need to be given a unique name so that when they are exported to a dwg/dxf file there won’t be any naming conflicts. See the Generate Tool Paths screen section for more information about the options available. Also, to see more information about configuration options available for automatically generated tool paths, see the Options Screen section.

Edit Tool Paths
PathFinder3D automatically does most of the work for generating tool paths. However, there are always those corner cases where you want to do something custom. Here are some of the changes you may need to make:

1. Modify the layer of an existing tool path
2. Modify the geometry of an existing tool path
3. Create new tool paths and assign them to a layer
4. Manually nest components by combining tool paths for multiple parts
5. Redraw tool paths for a specific component

Modify Layer Name
You can change the layer of any of the generated tool paths by clicking on them and selecting “Edit Tool Path Layer” from the menu. This will open the Tool Path Layer PropertyManager where you can change the layer.

Modify Tool Path Geometry
The tool paths that PathFinder3D generates are native SolidWorks surfaces. You can use all the power of SolidWorks to change the generated geometry in any way you choose including adding mates and constraints so that the tool path will change if you modify the component.

Create New Tool Paths
Since the tool path geometry is a SolidWorks surface, follow instructions in the SolidWorks help for creating and editing surfaces. It doesn’t matter whether or not you add the surface as a body to an existing tool path component or create a new tool path component of your own. What matters is that the tool path geometry is placed inside the tool path bounding box labeled with the ID you want to use.
the geometry for. You will also need to assign the geometry to a layer by selecting the surface and clicking “Edit Tool Path Layer” on the menu.

**Combine Tool Paths for Multiple Parts**
In some cases you want to pre-nest components. For example, if you want a matching grain pattern on drawer faces you will want to nest them together in a specific order. Do so by moving all the components and tool path geometry you want to cut together into the same tool path bounding box and arrange them as you would like them to be cut. Then delete the bounding boxes that no longer contain any components or tool path geometry. You may also need to modify the quantity. Do so by editing the text at the top of the bounding box and typing in the quantity you desire.

**Redraw Tool Paths**
Some changes to the components geometry, such as resizing a hole, will automatically change the tool path geometry when the model is re-built. However, other changes, such as adding a new hole to a component will not automatically be reflected in the tool path geometry unless it is re-generated. To re-generate tool path geometry delete the old tool path geometry component, select the component, and then run “Redraw Tool Paths” from the menu.

**Export Tool Paths**
Click “Export Tool Paths” on the menu to open the [Export Tool Paths screen](#). You are given some options such as the location for the dwg/dxf files and a location for the “data” file. Then click “Export” to create individual dwg/dxf files containing the tool path geometry within each bounding box. PathFinder3D uses the text above the tool path bounding box for naming these files. Whatever text is included between the “#” and the first space is used as the name of the file.
In addition to the tool path files, the export function creates a comma separated (CSV) CNC “data” file that is saved to the folder you specify. The “data” file contains the list of dxf files generated, part quantities, material information, etc. The number listed at the top of the tool path bounding box after “QTY:” is the quantity listed in the CNC data file.

See the Export Tool Paths Screen section for information about more options available on this screen.

**Combine Assembly Data for Nesting**

Sometimes you want to combine components from several assemblies and cut them together in order to make better use of material. To do this first export the tool paths for each assembly individually. Make a note of each CSV data file name and file path. Next click the “Combine Assembly Data” menu item to open the Combine Assembly Data screen. Select the file name for the combined data file. Now
add the list of CSV data files you want to combine and the quantity of each. Optionally, you can also substitute materials in this screen. For example, if you originally saved the material type as material A but you no longer have material A in stock then you can change material A to material B from this screen. Finally, click the “Create” button to generate the combined data file.

**Create Assembly Cut List**
Click “Print Cut List” to preview the cut list for all components in the assembly. This will open the Cut Lists screen where you can preview the list and then print it or export it to Excel or a CSV format file. See the [Cut List Screen section](#) for more information about the fields included in the cut list. See the [CSV Export Format Screen](#) section for more information about how you can customize the format of the outputted CSV file.

**Utility Functions**

**Open Layout**
Use the “Open Layout” function on the PathFinder3D main menu as a quick way to open the layout and toolpaths assembly file from an assembly model file when working with an assembly that you have already generated toolpaths for.

**Save As**
The “Save As” function, accessed from the PathFinder3D main menu, is a useful way to create a separate copy of a model assembly and any linked layout assembly. Open the model assembly that you want to copy. Click “Save As” and will create a copy of this assembly, create a copy of all referenced parts, and create a copy of the layout assembly (if one exists). The part names will be appended with a new unique assembly ID to keep the part files uniquely named.

**Save Out Virtual Parts**
Use the “Save Out Virtual Parts” function to save all the virtual parts in the current assembly as external part files and append a unique assembly ID to the part names.

**Screen Reference**

**Combined Assembly Data Screen**
Access this screen by clicking “Combine Assembly Data” on the PathFinder3D menu. This screen contains functionality to combine tool paths from several CSV data files together to improve nesting and so to improve material utilization.
Figure 5 Combined Assembly Data Screen

Here is a description of what each entry in the form should contain:

**New File Path** – Specify the name of the combined cut list file you wish to create

**Combined CSV Files**
The grid displays the list of comma delimited assembly tool path data files to combine and the quantity of each.

**Add** – Click “Add” to add a new assembly data file to the combined list. This will open another screen where you will be prompted to specify the location of the file you want to add.
**Delete** – To delete a data file from the combined list select the file you want to delete from the grid and click the “Delete” button.

**Quantity** – The grid contains a Quantity field where you can specify the quantity of each assembly to include in the combined list.

**Substitute Materials** – This is optional. In some cases you may want to switch to using a different material type without having to go back to your drawing and change the material assignment. If so, click the “…” button to browse the material library for a material to substitute in. You can also change whether the material face is required to be UP, Down or NA (not applicable) in this same grid.

**CSV Export Format Screen**

If you click the button at the top of the Cut List Screen you will see the CSV Export Format screen shown in Figure 6 below. You can either use an export format that comes out of the box or design your own. The formats available out of the box are the standard PathFinder3D format and formats to make it easy to export to common saw optimizer software such as MaxCut, Smart2DCutting, etc.

![Figure 6 CSV Export Format Screen](image)

You can also create your own custom format and store your settings in an xml file. Click the “Open Editor” button to create and edit format configuration files. See the CSV Format Editor Screen section for more information about how this screen works.

**CSV Format Editor Screen**

The CSV Format Editor Screen is used to create and edit CSV format files used to customize the cut list CSV export.
Here are some more details on how the various lists and buttons work:

**Available Fields and Include Fields Lists** – Select the data fields you want to include from the Available Fields list and then click the “Add” button to add them to the “Include Fields” list which shows all fields which will be included in your CSV export.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>This field is blank until you Export Toolpaths. The Export Toolpaths function fills it with a part number</td>
</tr>
<tr>
<td>Part Name</td>
<td>Part name with configuration and body name appended to it if the part has multiple configurations or multiple bodies</td>
</tr>
<tr>
<td>Quantity</td>
<td>Quantity of this component in the assembly</td>
</tr>
<tr>
<td>Machine</td>
<td>Name of machine this part is assigned to</td>
</tr>
<tr>
<td>Material Name</td>
<td>Name of the material this part is assigned to</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Material Code</td>
<td>In the materials manager you can assign a material both a name and a code (although the code is not required). Use this field if another system requires you to include a material ID.</td>
</tr>
<tr>
<td>Material Orientation</td>
<td>For sheet materials with a finished face this field specifies whether the finished face should be Up or Down when the part is cut or NA if it doesn't matter. Note that if the system you are exporting to uses some other convention then (Up,Down,NA) then you can edit the values in the properties list of this screen.</td>
</tr>
<tr>
<td>Material Name and Orientation</td>
<td>This field has the material orientation appended to the end of the material name. For nesting systems you will need to have a separate material type for each possible material and orientation pair.</td>
</tr>
<tr>
<td>Material Code and Orientation</td>
<td>This field has the material orientation appended to the material code</td>
</tr>
<tr>
<td>Thickness</td>
<td>Thickness of the sheet material this part must be cut out of</td>
</tr>
<tr>
<td>Grain</td>
<td>This field specifies whether the grain direction needs to go along the &quot;Long&quot; side of the part, the &quot;Short&quot; side of the part or &quot;NA&quot; if it doesn't matter or there is no grain on the material. If the system you are exporting to uses some other convention then</td>
</tr>
<tr>
<td>Length</td>
<td>Length dimension</td>
</tr>
<tr>
<td>Width</td>
<td>Width dimension</td>
</tr>
<tr>
<td>Notes</td>
<td>Notes (this is set in the Notes field of the Assign Materials function)</td>
</tr>
</tbody>
</table>

Table 1 Cut List CSV Export Field Descriptions

Use the and buttons to order the list and the “Remove” button to remove any fields from your Include list. If you choose to include a header row you can also customize the header text by editing the value in the “Header” column of the Include Fields list. You can add a custom field by clicking the “Custom” button.

![Add Custom Field](image)

Figure 8 Custom Fields Add Dialog

Custom fields will of course not be filled with any data but you can optionally set there default value in the Custom Fields Add Dialog that pops up when you click the “Custom” button. Every row for these custom fields will contain the default value or will be blank if there is no default value set.
CSV Export Settings – The export settings control things like whether or not a header will be included in the CSV export. See Table 2 for a list of settings and a description of what they do.

<table>
<thead>
<tr>
<th>Category</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain Direction Convention</td>
<td>Short</td>
<td>Convert the Grain Direction value 'Short' to the specified text value when exporting</td>
</tr>
<tr>
<td></td>
<td>Long</td>
<td>Convert the Grain Direction value 'Long' to the specified text value when exporting</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>Convert the Grain Direction value 'NA' to the specified text value when exporting</td>
</tr>
<tr>
<td>Material Orientation Convention</td>
<td>Up</td>
<td>Convert the Material Orientation value 'Up' to the specified text value when exporting</td>
</tr>
<tr>
<td></td>
<td>Down</td>
<td>Convert the Material Orientation value 'Down' to the specified text value when exporting</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>Convert the Material Orientation value 'NA' to the specified text value when exporting</td>
</tr>
<tr>
<td>UOM</td>
<td>Label</td>
<td>Append this value to the end of measurements in the length, width and thickness fields</td>
</tr>
<tr>
<td>Misc</td>
<td>Include Header</td>
<td>Set to True to include a header in the output file</td>
</tr>
<tr>
<td></td>
<td>Quotes Around Text</td>
<td>Set to True to include quotes around text fields</td>
</tr>
<tr>
<td></td>
<td>Column seperator character</td>
<td>By default a ',' character is used to separate columns in the CSV export file. You can customize this to any character, such as ';', by changing this value.</td>
</tr>
</tbody>
</table>

Table 2 Cut List CSV Export Settings Descriptions

Format File – The CSV formal settings are saved to an XML file so that you can keep several different custom formats available. Click “New” to reset all fields and settings to their default values and start working on a new XML file. Click “Save” to save your current settings to the file name shown at the top of the screen. If the “Format File” shown at the top of the screen then the system will prompt you for the file name and location to save the settings to. Click “Save As” to save your settings to a new file name.

Cut List Screen
Access the Cut List screen from the PathFinder3D menu by clicking “Print Cut List”. This screen provides functionality for printing and exporting assembly cut lists.
**Figure 9 Cut List Screen**

**Cut List Columns**

The following table describes each column in the cut list in more detail:

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Only for CNC components if a tool path bounding box exists for them in the current assembly. The ID is the text above the bounding box between the “#” sign and the first space</td>
</tr>
<tr>
<td>Part</td>
<td>The Solidworks name for the part. If this is a multi-bodied part or there are more than 1 configurations then the body name and configuration name will also be listed so as to be able to uniquely identify the part</td>
</tr>
<tr>
<td>Qty</td>
<td>The quantity of this component in the assembly.</td>
</tr>
<tr>
<td>Machine</td>
<td>The machine this component is assigned to or blank if it is not assigned to a machine</td>
</tr>
<tr>
<td>Material</td>
<td>Material Name that this component is assigned to or blank if it is not assigned</td>
</tr>
<tr>
<td>Thickness</td>
<td>The shortest dimension for the bounding box for this component</td>
</tr>
<tr>
<td>U/D</td>
<td>Orientation of finished face of sheet material when cut on CNC (Up/Down/NA)</td>
</tr>
<tr>
<td>Grain</td>
<td>Grain direction. Long – grain runs along the long side of the part. Short – grain runs along the short side of the part. NA – the material does not have a grain OR grain direction doesn’t matter for this part.</td>
</tr>
<tr>
<td>Length</td>
<td>The longest dimension of the bounding box for this component</td>
</tr>
<tr>
<td>Width</td>
<td>The second longest dimension for the bounding box for this component</td>
</tr>
</tbody>
</table>
Notes. Enter these in the Material PropertyManager screen.

Table 3 Cut List Column Descriptions

Filter by machine – Select a machine in the “Filter by machine” selector to show only parts with that machine name.

Include Parts with No Data – It is possible to print the dimensions and names of each part even without specifying machine and material information. To include parts in your cut list that do not have material or machine data select this check box.

Include Sub-Assemblies – You may have a master assembly file with sub-assemblies in it. Click the “Include Sub-Assemblies” check box if you wish to include parts from those sub assemblies in your cut list. Note that the quantity listed will be the total number of parts in the master assembly (not the total number in the sub assembly).

Printing – This screen provides the standard Print and Print Preview functionality.

CSV – Click the button at the top of the screen to export the cut list to a comma delimited file. CSV is a common file format that can be opened by Microsoft Excel and many other applications. See the CSV Export Format Screen section for more information about the formatting options available.

Export Tool Paths Screen

Access this screen by clicking “Export Tool Paths” on the PathFinder3D menu. Use the functionality of this screen to export the tool paths inside each bounding box to separate DWG/DXF files.

Figure 10 Export Tool Paths Screen
Here is a description of how to use the available options on this form:

**Assembly Unique Identifier** – Some users have requested a way to generate a unique identifier for each assembly and to append this identifier to the files generated by this screen. You can either have the system generate a unique ID for you or type in a custom ID of your choosing. More detail on how the unique identifier works and what options are available can be found in the Export section of the Options Screen help.

**Data File** – Check the “Data File” check box and supply a data file path and name (or use the default path and name) to export a CSV file that lists each exported tool path file location and data for that part. The CSV file contains the following fields:

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>File Path</td>
</tr>
<tr>
<td>2</td>
<td>Material Name</td>
</tr>
<tr>
<td>3</td>
<td>Material Face Orientation</td>
</tr>
<tr>
<td>4</td>
<td>Notes</td>
</tr>
<tr>
<td>5</td>
<td>Material Name and Face Orientation</td>
</tr>
<tr>
<td>6</td>
<td>Material Code</td>
</tr>
<tr>
<td>7</td>
<td>Material Code and Abbreviated Face Orientation</td>
</tr>
<tr>
<td>8</td>
<td>Length</td>
</tr>
<tr>
<td>9</td>
<td>Width</td>
</tr>
<tr>
<td>10</td>
<td>Thickness</td>
</tr>
</tbody>
</table>

Table 4 CSV data file containing information about exported tool paths

**Geometry Files** – The exported tool path geometry file(s) will be placed in this file folder. See the options screen to configure how the default path is set.

**File Type** - The file type (DWG or DXF) and version is not specified on this screen but is a system option. See the Options Screen section for more information about setting the file type and version.

**Generate Tool Paths Screen**
To access the Generate Tool Paths screen from the PathFinder3D menu click “Generate Tool Paths”. On this screen click “Process” to lay out components and generate tool paths.
Here is a description of the options available on this screen:

**Tool Path ID** - PathFinder3D lays out the parts, draws tool paths, and draws a tool path bounding box around each part. The tool paths inside each bounding box will eventually be exported to separate files. In order to avoid file naming conflicts an identifier needs to be given to each of these components that will be unique for this assembly. You can either call them by their component name or PathFinder3D can generate a component number for each tool path that is unique within the assembly. You can also add a prefix or suffix to the component name or component number which may be useful if you want all tool path documents from a given assembly to start with some characters that define the assembly. That way you will be able to tell which assembly each component belongs to.

**Layout Assembly** - If the current assembly has only virtual components then laying out the components in the current assembly is the only option the will maintain the link between the laid out parts and the parts in the original assembly. If, however, the components are external files referenced by this assembly then a second option is available. That is, to create a new assembly or select an existing assembly and insert the components and tool paths into that assembly. If the “External Assembly”
option is selected then an assembly file name is required. If the file does not exist then it will be created.

**Components to layout** - If you select components before running the “Generate Tool Paths” command then you can choose to run the command for all the components or for only the selected components.

**Layers Manager Screen**
Access the Layers Manager screen by clicking “Manage Layers” on the PathFinder3D menu. Each tool path drawn is assigned a layer name and a color. When PathFinder3D is drawing the geometry it uses the LayerType and Bit Specs configured on this screen to choose which layer name to assign to each tool path. For example, when PathFinder3D is drawing the geometry that defines the outer limits of the part, it looks for a layer of type “Contour” to assign to that geometry. In the case of the “Contour” type there should only be one layer of this type and the Bit Specs are not relevant. However, for some other layer types, “ThroughCutters” for example, you can have multiple layers of that type defined and the system will use the Bit Specs to determine which layer to use. Reference the Layer Types table below for more information on how this works.

![Layers Manager Screen](image)

**Figure 12 Layers Manager Screen**

Here is a description of the options available on this screen:

**Select layer to edit** – At the top of the screen you will find controls for navigating and editing the layers list. Use the selection box to select the layer you want to edit.
Add - Click the “Add” button at the top of the screen to add a new layer.

Delete - Select the layer you would like to delete using the layer dropdown at the top of the screen and then click the “Delete” button at the top of the screen.

Name – This is the layer name and is required.

Color – Set the layer color by clicking the “Edit” button next to the color box on the top right of the screen. This will open a color palate where you can select a color.

Layer Type and Bit Specs
PathFinder3D uses the **Layer Type** and **Bit Specs** to pick the layer to draw each kind of tool geometry on. The Layer Type is NOT a required field. If you do not define a layer type the system will not auto-select this layer when drawing Tool path geometries but you can manually select it using the tool path editor. The following table shows the layer types supported and how PathFinder3D uses them.

<table>
<thead>
<tr>
<th>Layer Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contour</td>
<td>Used for component contour geometry. Only one layer of this layer type is allowed.</td>
</tr>
<tr>
<td>ThroughCutters</td>
<td>For inside cuts that go completely through the component. <em>Bit Specs diameter required</em> for auto-selection. PathFinder3D will find the smallest segment or smallest radius in the tool geometry and then find the biggest bit diameter that is still less than or equal to that geometry.</td>
</tr>
<tr>
<td>ThroughDrills</td>
<td>For cylindrical holes that go completely through the component. <em>Bit Specs diameter required</em> for auto-selection. Bit Specs determine which ThroughDrills layer to use. The cylinder diameter needs to match the bit diameter. If no matching bit is found then the hole geometry is drawn using a ThroughCutters layer if the ThroughCutters layer has a bit diameter equal to or less than the hole diameter.</td>
</tr>
<tr>
<td>NotThroughCutters</td>
<td>For dados (inside cuts that don’t go all the way through). <em>Bit Specs diameter required</em> for auto-selection. PathFinder3D will find the smallest segment or smallest radius in the tool geometry and then find the biggest bit diameter that is still less than or equal to that geometry. On the other hand, if the smallest segment is equal to or greater than twice the diameter of the largest available bit then PathFinder3D will use a Pocket layer.</td>
</tr>
<tr>
<td>NotThroughDrills</td>
<td>Same as ThroughDrills but for cylindrical holes that do not go all the way through. <em>Bit Specs diameter required</em> for auto-selection.</td>
</tr>
<tr>
<td>Pocket</td>
<td>For inside cuts that do not go through and are large enough to require the tool to use a spiral pattern in order to ream out the whole area. <em>Bit Specs diameter required</em> for auto-selection. The Pocket layer type is unique in that PathFinder3D will not use the same layer twice for the same component.</td>
</tr>
<tr>
<td>Angle</td>
<td>For component edges that are angled. <em>Bit Specs diameter AND angle required</em> for auto-selection.</td>
</tr>
<tr>
<td>Profile</td>
<td>When angle cuts or t-slot cuts exist it’s important to ensure adequate spacing between this component and other components so that the cutter doesn’t cut into other components. The Profile layer is drawn around the component and then gives adequate spacing around angle cuts to ensure components are</td>
</tr>
</tbody>
</table>
correctly nested. Only one layer of this type is allowed. The Bit Specs diameter is used by this layer to specify the “bridge” or the default spacing the nesting software will leave between the profile layer and any other parts.

<table>
<thead>
<tr>
<th>Layer Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSlotCutter</td>
<td>This layer is used for drawing the tool path for the T-Slot cutter when cutting slatwall. Set the Bit Specs diameter to the largest diameter of the T-slot cutter.</td>
</tr>
</tbody>
</table>

Table 5 Layer Types

The diagram below illustrates how these layer types are used.

![Figure 13 Layer types diagram](image-url)
**Slatwall**

Slatwall is a rather unique toolpathing function so we will go over it in more detail in this section. Slatwall (aka. Slotwall) slats are cut using a T-Slot Cutter. The cutter must enter at the side of the material, must stay inside the material (no popping up) while all the slats are cut and then exit out of the side of the material. The toolpath for slatwall looks like a snake where each slat is linked by a connecting curve and the toolpath runs down the center of the slat. Figure 15 illustrates what this looks like.

![Figure 15 T-Slot cutter toolpath when cutting slats out of a piece of slatwall](image)

Automatically nesting slatwall parts among other parts can be a challenge because of the requirement that the part must be nested along the edge of the sheet material such that the tool path begins and ends outside the material. A technique for forcing this condition is to draw “profile” geometry around the part and have a thin extension drawn off of one corner that is the width of the sheet material and will thus force the part to be nested a certain way in the sheet material by the automatic nesting software. Figure 16 illustrates what this looks like. Note that the profile is also drawn around the connecting segments of the t-slot cutter path where it passes through the material to ensure that other parts are not nested in areas the t-slot cutter will travel through.
See the Slatwall Params section for various configuration settings for slatwall toolpath generation.

**Machine Manager Screen**

Access the Machine Manager screen by clicking “Manage Machines” on the PathFinder3D menu. The Machine Manager screen is the place to go to edit the list of machines to make cut lists for.

Here is a description of the options available on this screen:

**Select machine to edit** – Use the selection box at the top of the screen to view the list of machines and select the one you wish to edit or view more details on.
**Add** - Click the “Add” button at the top of the screen to add a new machine. Enter a name, select the machine type and then click “Save” at the bottom of the screen.

**Delete** - To delete a machine first select the machine name in the machine selector at the top of the screen. Then click the “Delete” button.

**Name** – Call the machine by whatever name makes sense to you. It just needs to be unique so that no two machines are named the same.

**Machine Type** – PathFinder3D uses the machine type to determine what components need tool paths. There are currently two options: CNC and Other. All components assigned to a machine of type CNC will have tool paths generated for them when you run “Generate Tool Paths”.

**Materials FeatureManager Tab**
The SolidWorks FeatureManager is typically docked to the left side of the SolidWorks user interface. There are tabs at the top of the FeatureManager tree. When the PathFinder3D add-on is enabled a PathFinder3D Materials tab will be available that lists the components in the assembly sorted either by machine or material.

![PathFinder3D Materials FeatureManager Tab](image)

**Figure 18 PathFinder3D Materials FeatureManager Tab**

Here is a description of the options available on this tab:

**Machine Button** - To group by machine first and then material click the icon at the top of the panel.
Materials Button - To group by material first and then machine click the icon at the top of the panel.

Tree View Selection - When you click on a machine or material branch node, all the components with that material or machine are selected. This should make it easy for you to visually verify that you have correctly assigned each component to the correct material and machine. Also, this selection method makes it easy to perform batch functions like changing all the components on one material type to another material. Simply click on the branch node of the first material type to select all the components of that material type. Then assign all the selected components to a different material type either by selecting “Assign Material” on the PathFinder3D menu to open the Materials PropertyManager or by right clicking on the selected items in the tree view and clicking the “Assign Materials” menu item.

NO DATA - Components with no material or machine information selected are listed under the “NO DATA” branch.

Materials Manager Screen
To access the Materials Manager screen from the PathFinder3D menu click “Manager Materials”. The Materials Manager screen contains functionality for creating, editing and deleting materials and their properties.

![Materials Manager Screen](Image)

Figure 19 Materials Manager screen
Here is more information about the options available on this screen:

Materials Tree View – The materials that populate the tree view on the right are loaded from any SolidWorks custom material libraries that you have configured.
**Materials Tree View Right Click Menus**

By right clicking on various parts of the materials tree view on the left side of the Materials Manager screen you can perform several key functions.

**New Library** – The “New Library” right click menu item is available if you right click anywhere in the materials tree view. Click “New Library” to create a new Solidworks custom materials library. You will be prompted for the path and file name for this new library.

**New Category** – The “New Category” right click menu item is available if you right click on a “Material Library” node. Click “New Category” to create a new materials category.

**Delete** – The “Delete” right click menu item is available if you right click on a material library node, a category node or a material node. Click “Delete” to delete the library, category or material you have right clicked on.

**Rename** – Applies to materials and material categories. Click “Rename” to rename the category or material in question. To rename a material library you will need to find the material library file and change its name. Note that if you assign materials to parts and then change the material library name then the link is broken and you will lose material data for those parts until you re-assign the material. For that reason we don’t recommend changing the name of the material library file after you have used materials from it.

**New Material** – This option is only available when you right click on a material category node. Click it to create a new material.

**Import** – Click Import to import materials from a CSV comma delimited text file. This option is available when you right click on a library node. The table below shows the required format for the CSV file:

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
<th>Field Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Category</td>
<td>Text</td>
</tr>
<tr>
<td>2</td>
<td>Name</td>
<td>Text</td>
</tr>
<tr>
<td>3</td>
<td>Description</td>
<td>Text</td>
</tr>
<tr>
<td>4</td>
<td>Material code</td>
<td>Text</td>
</tr>
<tr>
<td>5</td>
<td>Core texture image file path</td>
<td>Text</td>
</tr>
<tr>
<td>6</td>
<td>Core texture image grain direction (Horizontal/Vertical)</td>
<td>Text</td>
</tr>
<tr>
<td>7</td>
<td>Face texture image file path</td>
<td>Text</td>
</tr>
<tr>
<td>8</td>
<td>Face texture image grain direction (Horizontal/Vertical)</td>
<td>Text</td>
</tr>
<tr>
<td>9</td>
<td>Backing texture image file</td>
<td>Text</td>
</tr>
<tr>
<td>10</td>
<td>Backing texture image grain direction (Horizontal/Vertical)</td>
<td>Text</td>
</tr>
<tr>
<td>11</td>
<td>Default material orientation (Up/Down/NA)</td>
<td>Text</td>
</tr>
<tr>
<td>12</td>
<td>Texture scale</td>
<td>Number</td>
</tr>
</tbody>
</table>

*Table 6 Material Import/Export CSV file format*

Each column is separated by a comma. Text fields that can be optionally put inside double quotes. I.E. “This is the material name” so that commas in the name won’t cause a problem. To include a double
quote as part of the data you will need to duplicate it. I.E. a material that is named [MDF 1” X 3/4] should be written as “MDF 1”” X 3/4”. The following is an example:

<table>
<thead>
<tr>
<th>Material</th>
<th>Specifications</th>
<th>Image Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDF, MDF FSC Fire Rated</td>
<td>49 x 121 x 11/16,</td>
<td>MDF.jpg, Horizontal, NA, 1</td>
</tr>
<tr>
<td>MEL, Mel Almond</td>
<td>49 x 97 x 1/2 G2S,</td>
<td>Almond.jpg, Horizontal</td>
</tr>
</tbody>
</table>

Table 7 Sample materials import / export CSV file content

Export – You can also export a material library to a CSV file with the same format. CSV files can be opened in MS Excel or used to copy material information to other applications. This menu item is only available when you right click on a material library node.

Material Properties

Category – Material category used for sorting the material in the tree view and as a way to organize your materials for easy look up.

Name – Material name. This must be unique.

Description – Longer name. Put a more verbose description of the material here.

Mat Code – Optional. This field is not used by PathFinder3D but is listed in the tool path CSV data file exported when preparing tool path data for processing by a CAM system. You can use this field to identify materials in the CAM system or for part labeling purposes.

Orientation – This is the default orientation for this material if it is a sheet material that is cut on a CNC machine. The options are “Up”, “Down” or “NA” (not applicable). For example, a sheet good that has a finished face and a backing face may typically be cut with the face down on the CNC machine. You would specify the “Down” option in that case. Note that this value is also editable on the Materials PropertyManager screen and that the orientation value on the Materials Manager screen sets the default used by the Materials PropertyManager screen.

Image Path – You can assign textures to materials in order to visually identify them and to make realistic looking models. Use a standard image file (bmp, jpeg, png) to define the texture to use for the material. PathFinder3D makes it easy to define a root folder where these image files are kept. Then, if you later want to change the root folder to a network drive or to a different folder, you only need to change the root folder path on the options screen and need make no other changes. Click the “…” button to open the options screen and change the root folder from there.

Scale – Different images make look better using a different image scale. Start by trying the image with a scale factor of 1. If that doesn’t look quite right then adjust the scale factor and find the scale factor that looks best for this image.

Core – Select the texture file to use for the core material. The texture file is simply an image file type that will display in the preview box once you have selected it. The “Grain Direction Button” to the right of the texture preview window is a toggle button used to indicate the direction of the grain in the
texture file. Click “=” if the grain runs left to right. Click “||” if the grain runs up and down. The texture you specify here will be applied to the part body.

**Face** – Texture file for the finished face of the material. Set the same way you set the core material.

**Back** - Texture file for the back face of the material. Set the same way you set the core material.

**Apply** – The “Apply” button is only enabled if you accessed this screen from the Materials PropertyManager tab. Clicking it will add this material to your recently used materials list and select it in the materials selector on the Materials PropertyManager tab.

**Save** – Save any change you made to the material properties.

**Material PropertyManager**

When you click “Assign Materials” on the PathFinder3D menu, the Material PropertyManager appears on top of the FeatureManager. Use the Material PropertyManager to set material and machining information for components individually or as a group.
Figure 20 Materials PropertyManager
Here is information on how to use the options available on this screen:

- **This is a Hide/Show toggle button.** When “Hide” is selected, all components that have material and machine data already assigned will be hidden in the main SolidWorks display. Use this as a tool to help you find and select materials you have not assigned data to.

**Selected Components** – If you selected components before running “Assign Materials” then they will be listed here. While the command is running you can modify the selected components list by selecting more components or remove components from the list by clicking on the component in the SolidWorks graphical interface or right clicking on the Selected Items list and selecting “Clear Selection” from the right click menu.

**Remove Data** – This button removes all material and machine data from components in the Selected Components list. Make sure to click the ❌ if you want to leave the components without data or you will re-assign the data after clearing it.

**Remove Appearance** – Remove all appearance settings for the selected components.

**Machine Selector** – Select a machine to assign to the selected components. If you select multiple components and the components are assigned to different machines then the machine selector will default to the machine assigned to the first component in the list. Click the icon to the left of the machine selector to manage the list of machines.

**Material Selector** – Select the material to assign to the component from a list of 15 recently used materials. The recently used materials list will include any materials used in this assembly and materials last used in other assemblies to make up a total of 15 items. If the desired material is not in this list then click the Material Manage Icon to open the Materials Manager and make your selection from there.

Click the icon for quick access to the [Materials Manager screen](#) where you can browse in the tree view, add materials, edit, etc. and then once you have made your selection click “Apply”.

**Material Face** – This is to indicate what direction the finished face of the sheet material will be facing when it is placed on the CNC for cutting. The options are: “Up”, “Down”, and “NA” for Not Applicable. The default for this setting is set by material in the Materials Manager screen. This property is used in correlation with the “Bottom Face” property to determine which face of the component to draw the finished face material texture on. Click the icon to toggle between “Up” and “Down”.

**Grain Direction** – Use the Grain Direction selector to set the orientation of the component when it is laid flat. There are three options:

- **Long** – The grain runs along the long side of the bounding box of the component (if there is a long side
• **Short** – The grain runs along the short side of the bounding box of the component (if there is a short side)
• **NA** – The grain direction doesn’t matter. The material does not have a grain or you are content to let the system choose a grain direction.

The default grain direction is set by the [GrainDirectionDefault system configuration setting](#).

Click the ![image](image) icon to toggle between the Long and Short grain directions.

**Bottom Face** – Use the Bottom Face selection to manually select the component face that will be facing down when the component is positioned for cutting by a CNC. The system automatically picks the face that has the least holes, dados, etc. as the bottom face as this face needs the least CNC work. Use the ![image](image) icon to pick the opposite face of the currently selected face. Note that in order to select a face using the Solidworks graphics area, first click on this selection box and then select the face. Also note that this setting is only available when you have a single part selected at a time.

**Notes** – Any text typed into the component notes will be printed on the [materials cut lists](#).

**Apply material texture to body** – Check this box to apply material textures to the part body and faces. The textures applied configured by material on the [Materials Manager screen](#).

**Clear existing appearances** – If this box is checked, all existing appearances will be cleared from the part before the textures are applied.

**Options Screen**
The options screen is where you go to configure settings. To access it, from the PathFinder3D menu click “Options”.
**Figure 21 PathFinder3D Options**

**Configuration File Path** - The configuration settings are stored in an XML file so that if you wish you can post the file on a network drive and share the settings among multiple computers. Click “Switch” to browse to and select a different configuration file to use. Click “Save As...” to save the current XML config file to another location and / or to save it under a different name.

**Sorting** - The configuration settings have a group name to make finding and identifying them easier. Click the icon to arrange the settings by group. Click the icon to remove grouping and to arrange the options in alphabetic order.

Here is more information about the options available on this screen, organized by group:

**Export**
The export options control the functionality of the Export Tool Paths screen.

**AppendAssemblyIDToDataFileName** – When set to “Yes” the assembly ID is appended to the default name of the data file.

**AppendAssemblyIDToDataFileSubFolder** – When set to “Yes” the assembly ID is appended to the default name of the data file sub folder.

**AppendAssemblyIDToGeometryFiles** - Append assembly ID to geometry files

**AppendAssemblyIDToGeometryFilesSubFolder** - Append assembly ID to geometry file path's sub folder name
**AppendDepthToLayerName** - This setting appends a depth to the layer name. For example, a tool path with a depth of 0.75 drawn on the 'CONTOUR' layer will be exported on the 'CONTOUR0.75' layer.

**DataFileCreateSubFolder** - Should a new folder, named [ASSEMBLY NAME] be created and the data file stored in that folder?

**DataFileFixedPath** - The default folder to place your data file in if DataFilePathType is set to Fixed.

**DataFilePathType** - Should the file path for the exported data file default to the assembly file path (Relative) or a fixed location (Fixed).

**DXFPrecision** - This is the precision used when exporting to the DXF file type.

**ExportEnrouteXML** - Export Enroute XML files. Enroute takes XML input rather than CSV for the CNC data file and needs one file per material. Setting this to true causes the Export Toolpaths function to create an XML file in addition to the CSV file. When combining CNC data files from multiple assemblies you will combine the CSV files and export a combined CSV and XML file.

**ExportFileType** - This is used by the Export Tool Paths function to pick the file type to export to. Either DWG or DXF.

**ExportFileVersion** – This is used by the Export Tool Paths function to pick the DWG/DXF file version to export to.

**GeometryFileFixedPath** - The default folder to place your geometry files in if GeometryFilePathType is set to "Fixed".

**GeometryFilePathType** - Should the file path for the exported tool path files default to the assembly file path (Relative) or a fixed location (Fixed).

**GeometryFilesCreateSubFolder** - Should a new folder, named [ASSEMBLY NAME] be created and the geometry files stored in that folder?

**NoSpaceInDataFileName** - If true, this option removes all spaces in the data file name and replaces them with "_".

**UserID** - The UserID is used as a prefix to the assembly ID to make an assembly ID that is unique system wide as long as each user on each computer uses a unique ID.

**General**

**ConfigOptionsLengthUnit** - There are multiple tolerance and layout settings that are measured in length. This sets the units for the length specified.

**Layout Formatting**

These options apply to the [Generate Tool Paths screen] layout functionality.

**BoundingBoxBottomTextHeight** – The height of the text below the tool path bounding box.
**BoundingBoxPadding** – The distance between the component and the bounding box wall.

**BoundingBoxSpacing** – The distance between tool path bounding boxes.

**BoundingBoxTopTextHeight** – The height of the text above the tool path bounding box.

**CutDisplayStateName** – The display state name used for displaying tool paths when parts are laid out within the original assembly. Tool paths and bounding boxes will be hidden in all other display states.

**LayoutStartPoint** – The distance in inches between the origin and the first tool path when components are being laid out in an assembly drawing.
Material

GrainDirectionDefault – Set the default grain direction on the Materials PropertyManager screen to “Long”, “Short” or “NA”.

MaterialFaceOrientationDefault – Set the default material face orientation (Up/Down/NA) for sheet material when it is cut on the CNC. This is used as the default on the Materials Manager screen.

TexturesRootPath – The root folder for your textures image files. You may want to have sub-folders inside this root folder to organize your textures. Then, when you assign a texture to a material you will set the relative path (from this root folder). For example, if you set your root folder to a network drive such as “Z:\textures” and in this folder you have a sub folder called “Melamine” with the texture “WhiteMel.jpeg” then when you assign the texture to the material you will use the path “\Melamine\WhiteMel.jpeg”. Now if at a later point you want to run the software while not connected to the network you can copy all your textures to “C:\textures” and only need to change this setting and all your textures will still work.

TextureScale - The scale factor for the texture image when applied to a part

Slatwall Params

LeadInLength - The length of the tool path lead in for T-slot cutter programs

LeadOutLength - The length of the tool path lead out for T-slot cutter programs

ReturnSlatOffset - For T-slot cutter programs. If there are an odd number of slats then a return tool path in the final slat needs to be added to force the tool to exit out of the end of the material. This setting controls the offset of the return tool path from the original tool path. It should be as small as possible to prevent the slat from being much wider than the others

ExtensionLength - For T-slot cutter programs a thin extension line is added to the profile layer to force the part to be nested to the end of the sheet material. This parameter controls the length of this extension. It should be set to the width of the sheet material minus the bridge with of the profile layer

ExtensionWidth - For T-slot cutter programs a thin extension line is added to the profile layer to force the part to be nested to the end of the sheet material. This parameter controls the width of this extension. It should be set to the smallest dimension that will still be recognized by the nesting program

Tool Path Tolerances

These options apply to the Generate Tool Paths screen tool path geometry.

AngleCutterSelectionTolerance – This setting is used by the system to auto-select the right CNC angle cutter to use if the component edge is angled. If the angle at the edge of the component is not exactly equal to the cutter angle but within the tolerance (in degrees) set by this setting then that angle cutter will be selected and the angle tool path geometry will be drawn on the layers specified for that tool.
**CNCDrillSelectionTolerance** – This setting is used by the system to auto-select the right CNC drill to use for a given hole. If the hole diameter is within the specified tolerance (in inches) of the CNC drill bit diameter, then this drill bit will be selected and the drill hole geometry will be drawn on the layers specified for that tool.

**DadoEdgeBubbleLimit** - This defines how much a drill hole can hang over the edge of a part before it is cut as a dado or through cut rather than a drill hole

**ThroughTolerance** – This tolerance (in inches) is used by the system to determine how close to completely through the component a drill hole or cut must be before it is considered a “through hole” or “through cut”.

**Tool Path Layer PropertyManager**

When you click “Edit Tool Path Layer” on the PathFinder3D menu, the Tool Path Layer PropertyManager appears on top of the FeatureManager. Use the Tool Path Layer PropertyManager to set the layer for tool path surfaces.
**Selected Tool Paths** – List of tool path surfaces that are selected. If you pre-selected tool path surfaces before running the “Edit Tool Path Layer” function then those surfaces will show up in this list. You can continue to select/deselect surfaces using the SolidWorks UI.

**Layer** – Layer selector. If the currently selected item has a layer then this will default to that layer. If it does not then it will default to the first layer in the list. If there are multiple surfaces selected it will default to the layer of the first surface in the list that has a layer assigned.