Part 3 of 3

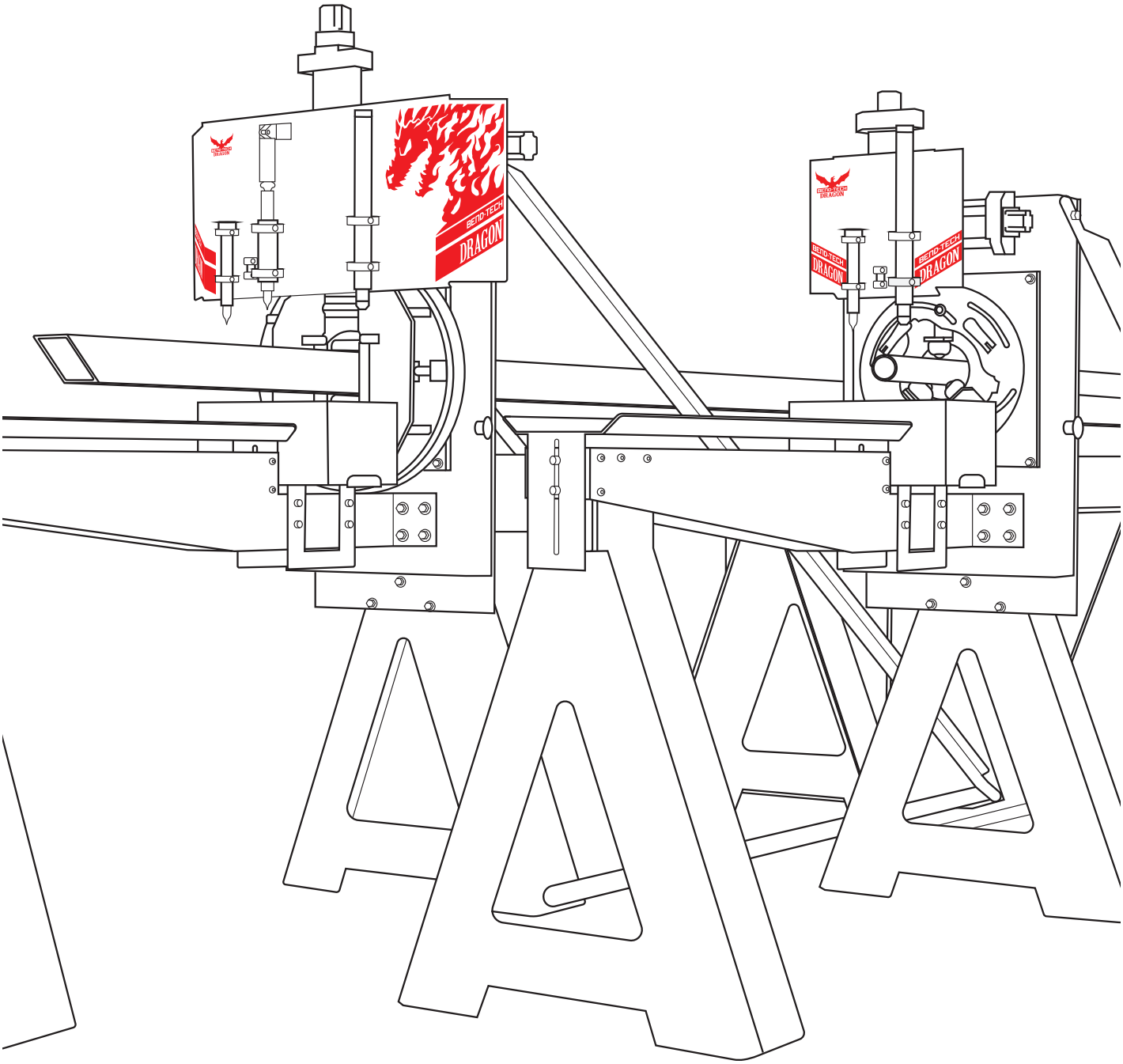
Dragon CAM v1.0

BEND-TECH

DRAGON MACHINES

Operator's Manual

Part 3: Tutorials & Calibration



Revision 004 | English

Dragon Machines

Operator's Manual
Revision 004

English
Original Instructions

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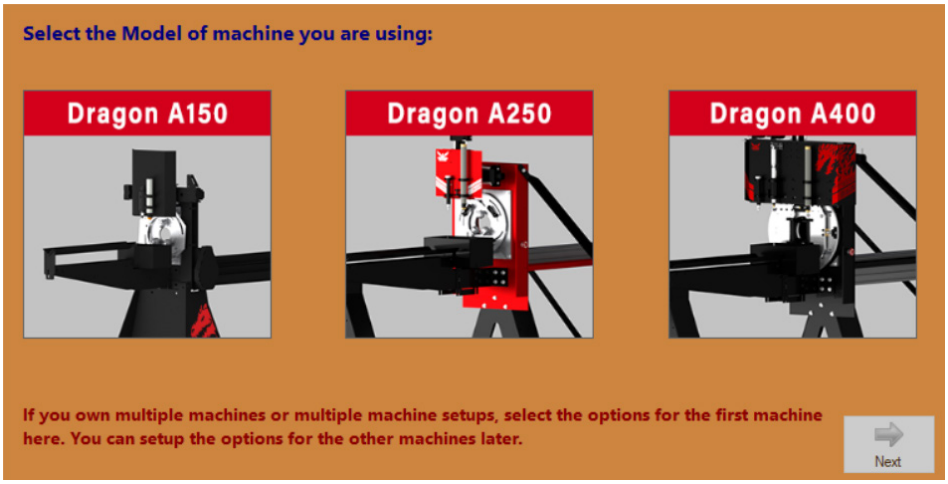
3. Select the Machine Model
Select the appropriate Dragon model. Click NEXT. For adding a Dragon A400 continue to Step 4. For adding a Dragon A250 skip to Step 6. For adding a Dragon A150 skip to Step 7.

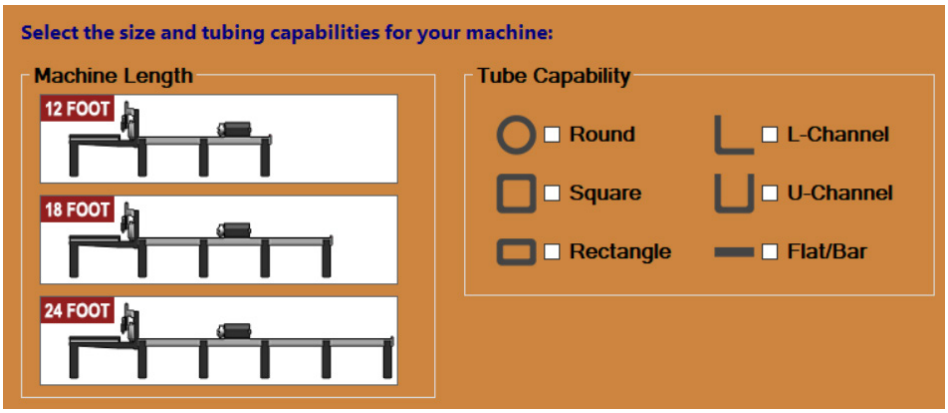


Important

A warning will appear when selecting the Dragon A250 or Dragon A400. When adding a new machine, it is recommended to CLONE the Factory Calibrarted Machine and use those values as a starting point.

4. Dragon A400 - Select the Machine Length and Tube Capabilities

For the Dragon A400, select the Machine Length and Tube Capabilities. Click NEXT.

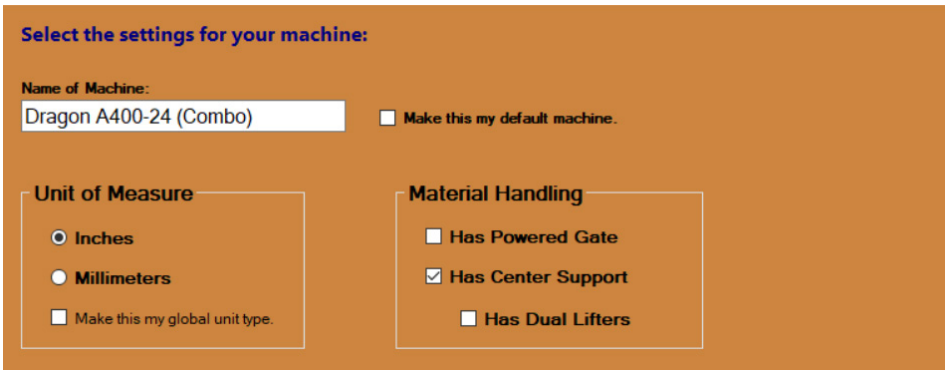


Important

Only Dragon A400 machines equipped with a Powered Gate can accomidate L-Channel (Angle Material) and U-Channel (Channel Material). The Dragon A400 does not support Flat/Bar material.

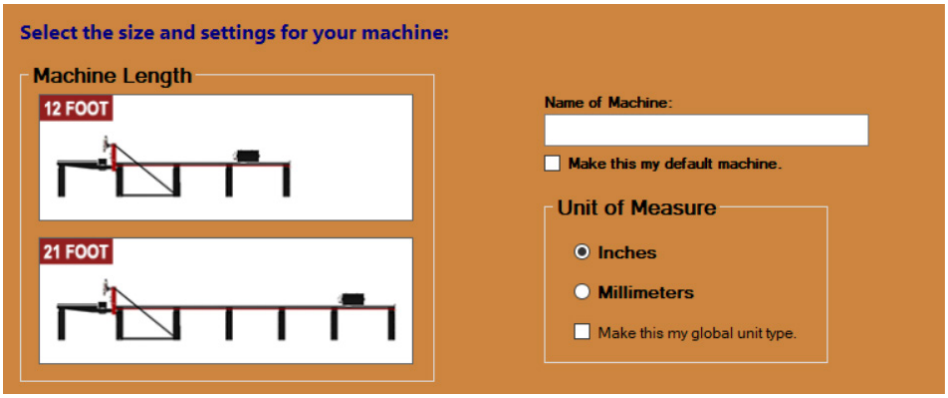
5. Name the Machine and select Options

Give the new machine a descriptive and unique name. Select the appropriate Unit of Measure to use. Select any optional features that the new machine includes. Click DONE. Continue to Step 9.



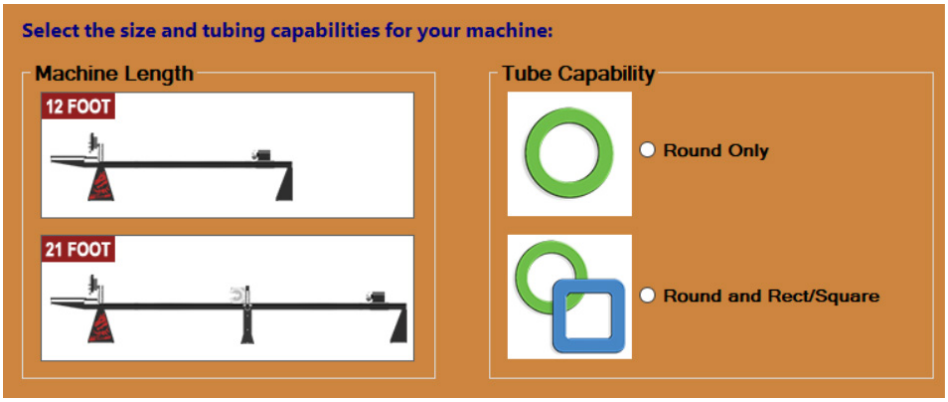
6. Dragon A250 - Name the Machine, select Length, and Unit of Measure

For the Dragon A250, select the Machine Length, Unit of Measure, and give the machine a descriptive and unique name. Click DONE. Continue to Step 9.



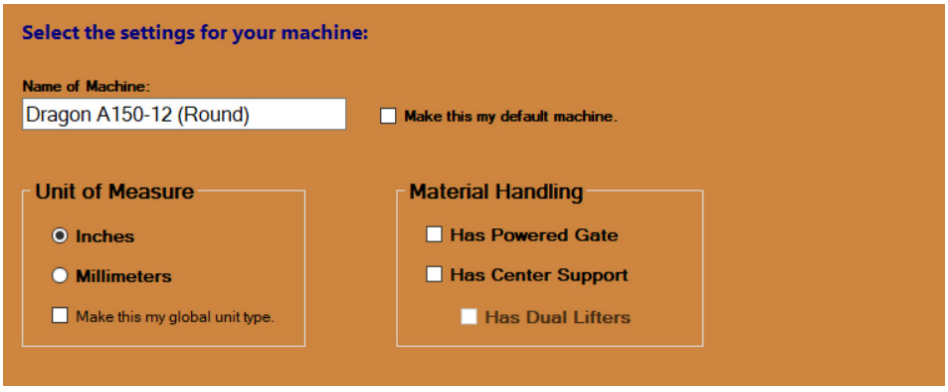
7. Dragon A150 - Select Machine Length and Tube Capability

For the Dragon A150, select the Machine Length and Tube Capability. Click NEXT.



8. Name the Machine and select Options

Give the machine a descriptive and unique name and select the appropriate Unit of Measure. Please note, the Dragon A150 does not support a Powered Gate or Center Support option. Click DONE.



9. Click Save

The new machine information will populate into a new temporary record in the Machine Library. Click SAVE to add the new machine to the Machine Library.

9. Adjust other Settings

Once the new machine has been saved to the Machine Library, the other machine settings can be edited as desired.

1.2 How to Add a New Material

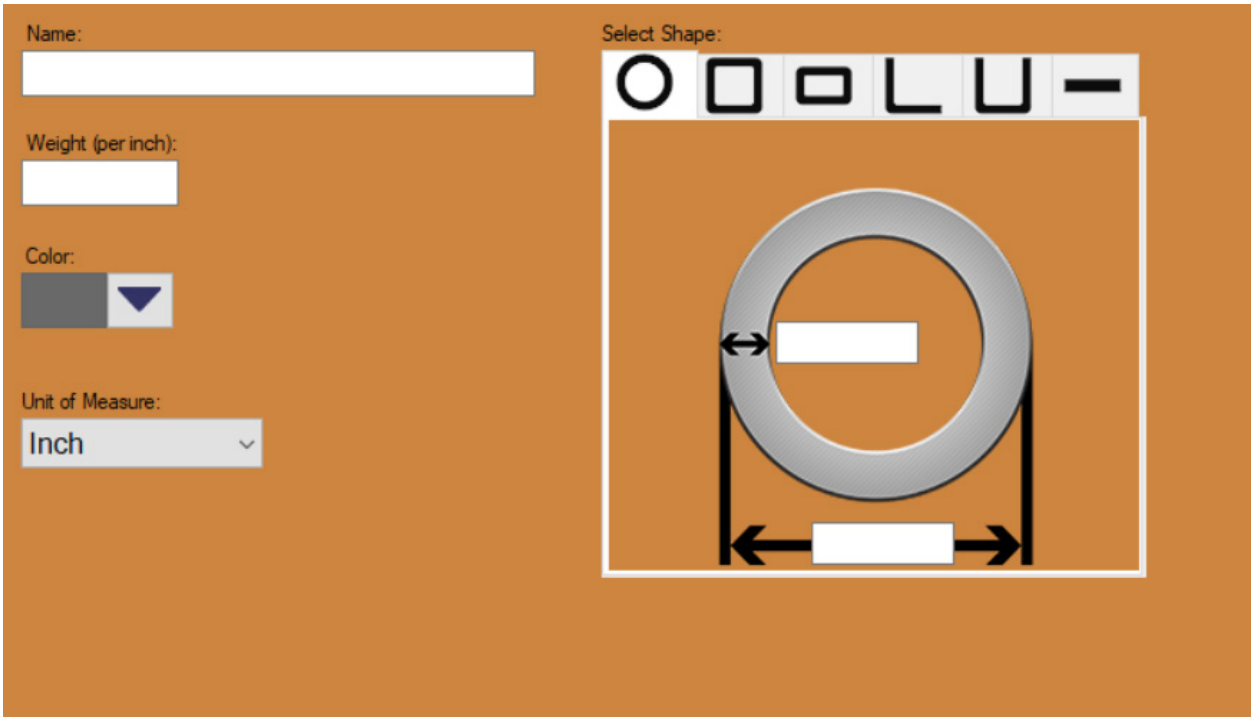
1. Open the Material Library

Open the Material Library from the Dragon CAM Task Menu.

2. Click Add New

Click the ADD NEW button. This will add a new blank record to the Material Library.

General Tab Information



3. Name the Material

Give the new material a descriptive name.

4. Select the Unit of Measure

Select the appropriate Unit of Measure.

5. OPTIONAL. Record the Material Weight

Record the Weight per Inch of the material. This is used for pricing projects and is not necessary for operation.

6. OPTIONAL. Choose the Material Color

Select a color for the material. This will change the color of the material during part design and is not necessary for operation.

7. Choose the Material Profile

Select the Material Profile. The Dragon A400 supports Round, Square, and Rectangle. Dragon A400's equipped with a Powered Gate also support Angle and Channel. The Dragon A250 only supports Round material.

Important

Flat Bar may be listed as a material profile option. The Dragon machines are not programed to cut Flat Bar at this time, and Bend-Tech does not recommend cutting Flat Bar material on the Dragon machines.

8. Input the Material Dimensions

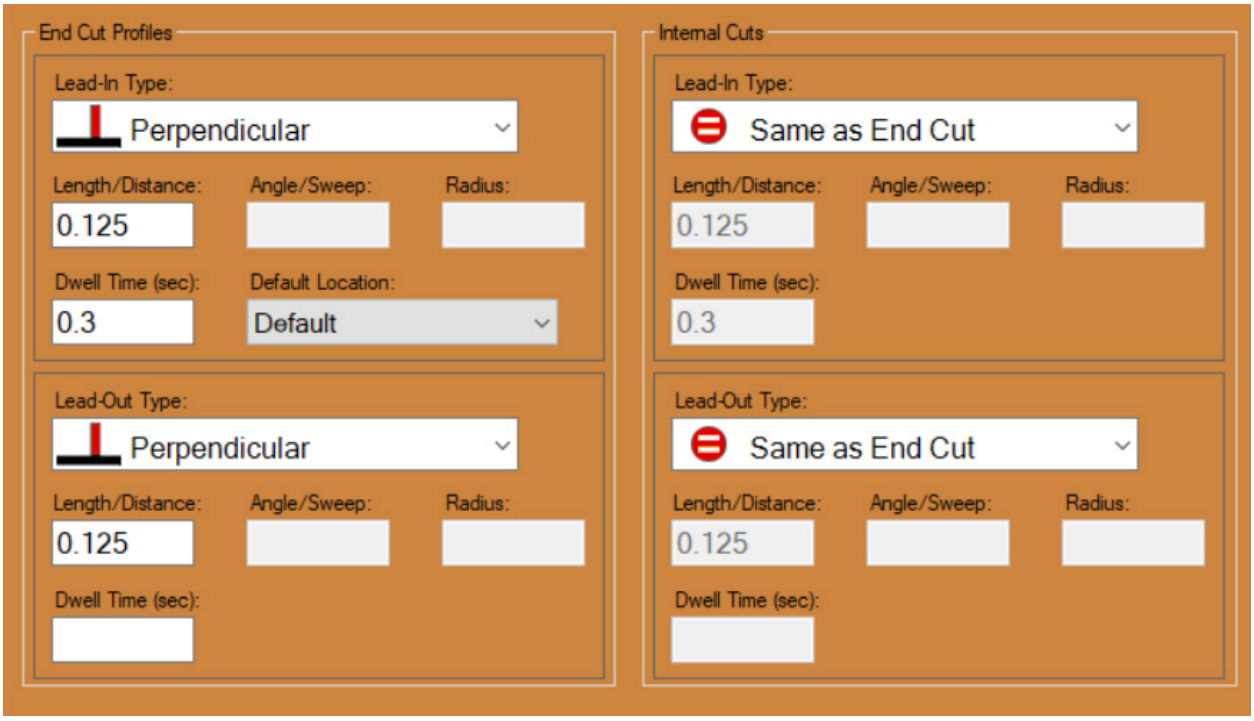
Fill in the correct dimensions for the selected material. If dimensions are unknown, use a calipers, tape measure, and corner radius gauges to obtain the dimensions.

Machine Tab Information

9. Navigate to the Machine Tab

Edit the Machine specific information for the material. Most of these settings can be left as default.

Lead In / Out Information



11. Navigate to the Lead In / Out tab.

Select the style of Lead In and Lead Out to be used as default for the material. Unless the material is Angle or Channel, Perpendicular Lead types can be used for both End Cuts and Internal Cuts. For Angle and Channel material, Bend-Tech recommends Angle.

NRC, Pricing, and Advanced Information

12. Adjust Other Settings

The options available on the remaining tabs are optional. Refer to the Operator's Manual Part 1, Sections 2.6 - 2.8 for detailed information.

Saving the Material

13. Save the Material

Once the settings are completed and set appropriately, click SAVE.

1.3 How to Add a New Die

1. Open the Die Library

Open the Die Library from the Dragon CAM Task Menu.

2. Click Add New

Click the ADD NEW button. This will add a new blank record to the Die Library.

3. Start the Die Calibration Wizard

Click the WIZARD button to begin adding a new die. The Die Wizard will walk through calibrating the die.

4. Read the Calibration Introduction

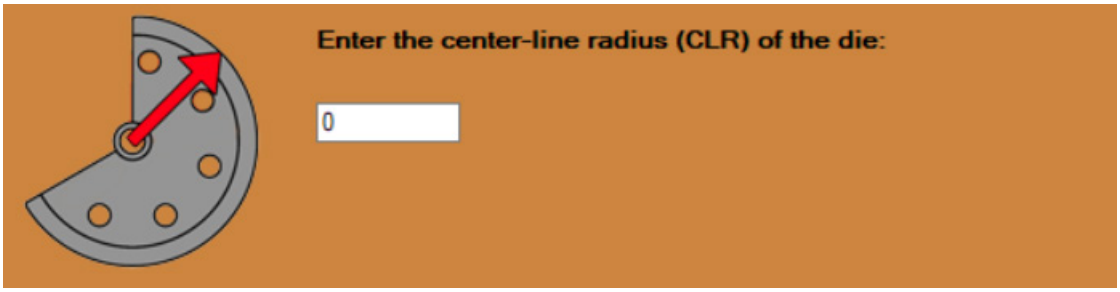
After reading the introduction to the Die Wizard, click NEXT.

5. Select the Bender Model

Select the model of the bender being used from the drop down menu. If the bender model is not listed or unknown, select the model based on the type of bender: 'Any Rotary Draw', 'Any Rotary Compression', or 'Any Center Compression'. Click NEXT.

6. Enter the CLR

Enter the Center Line Radius (CLR) of the die. This value is usually stamped on the die. Do not confuse the CLR with the material diameter of the die. Click NEXT.



What is Center Line Radius?

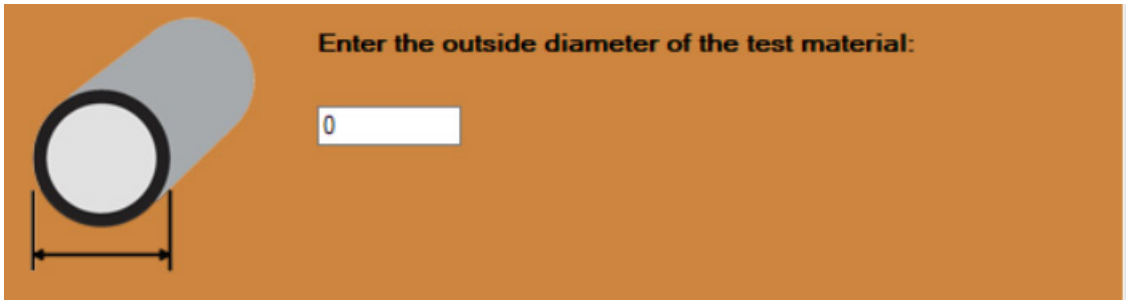
By definition, Center Line Radius is the distance from the center of the bending die to the middle of the tube. The smaller the die, the shorter the Center Line Radius, the tighter the bend.

Important

If using standard measurement, ensure the correct Unit of Measure is used. Many dies are stamped in millimeters.

7. Enter the OD of the Material

Enter the outside diameter of the test material. Click NEXT.

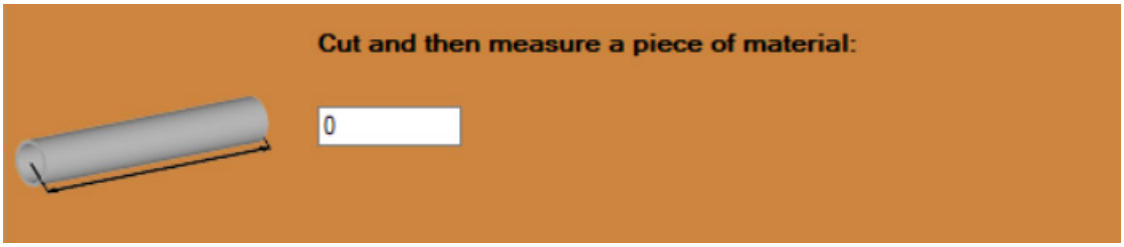


Pipe vs. Tube

Pipe is designed to carry things through it, such as liquid or gas. Pipe is sized by its I.D. Tube is structural, and is designed to build. Tube is sized by its O.D.

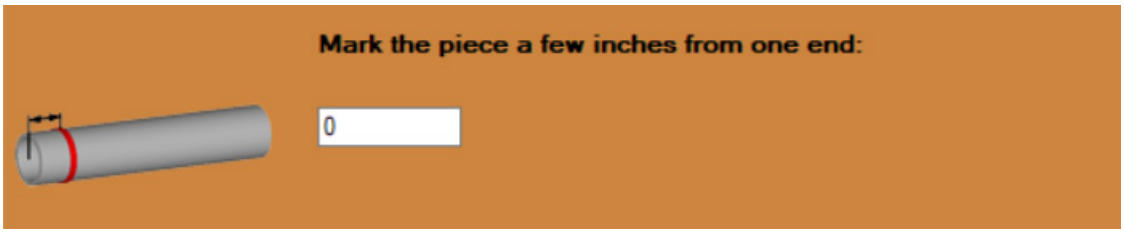
8. Enter the Length of the Material

Enter the length of the material being used. Ensure that the piece is long enough to create a 90 degree part with the die being calibrated. Click NEXT.



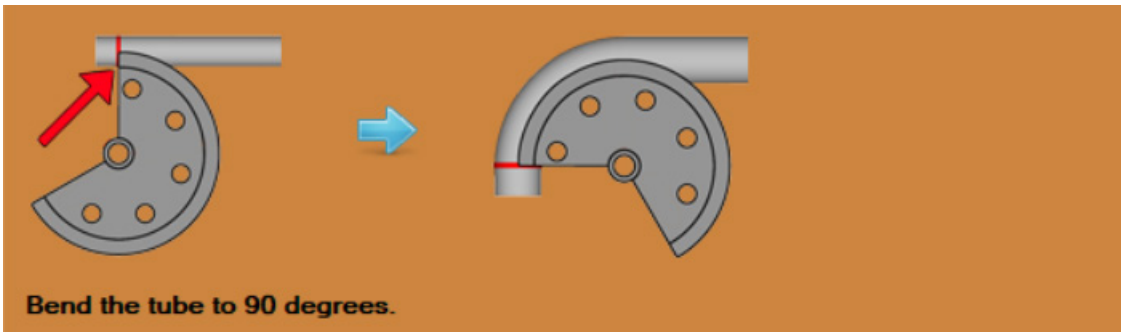
9. Mark the End of the Tube

Mark the end of the tube a few inches from the end. Enter the distance from the end of the tube to the mark into the text box. Bend-Tech recommends 3 - 4 inches. Click NEXT.



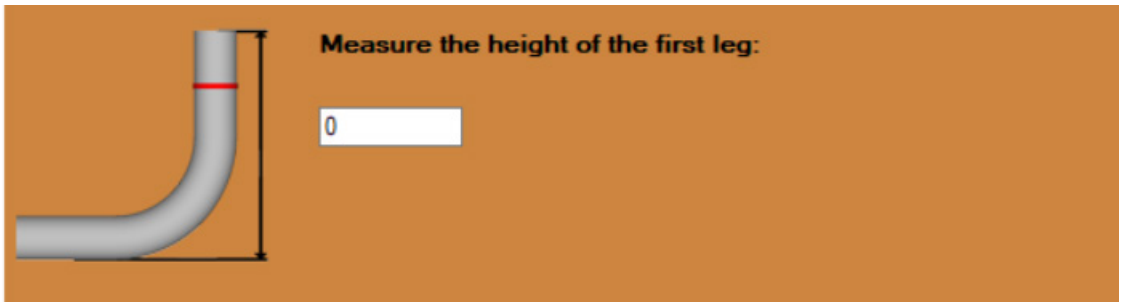
10. Bend the Tube

Bend the tube to 90 degrees. Ensure that after bending the part is within 1 degree of 90 degrees. The part may need to be over-bent to compensate for spring back. Click NEXT.



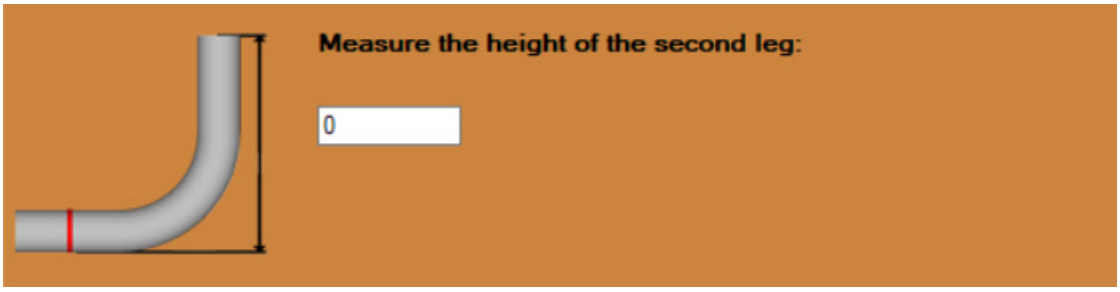
11. Measure the First Leg

Measure the height of the first leg and enter the value into the text box. Click NEXT.



12. Measure the Second Leg

Measure the height of the second leg and enter the value into the text box. Click NEXT.



13. Add the Calibrated Die

The calibration results are listed on the next screen. Click ADD DIE. If the calibration has no errors, a popup will appear. Enter a unique and descriptive name for the die. Click OK.

Another popup will appear stating that the Die has been added to the Die Library. Click OK and close out of the Die Calibration Wizard. The new die will now be listed in the Die List.

1.4 How to use Rotation Calibration Wizard

The Rotation Wizard calibrates the Bend Rotation Offset. The Rotation Wizard will calibrate the machine to place bend marks that compensate for bender configuration.

1. Open the Die Library and Select a Die

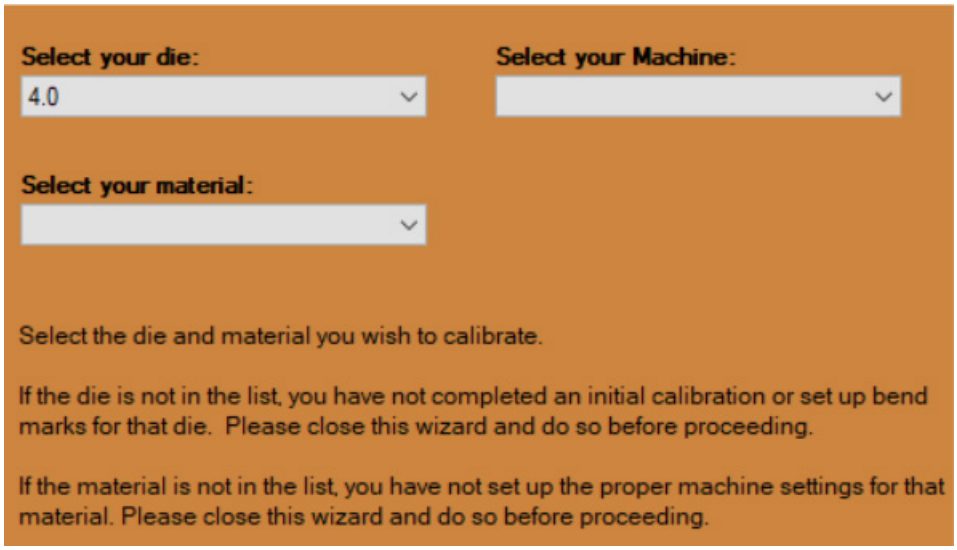
Open the Die Library and select a die from the Die List.

2. Start the Rotation Calibration Wizard

Navigate to the Bend Marks tab and click the Rotation Wizard button. The Rotation Calibration Wizard will appear. Click NEXT.

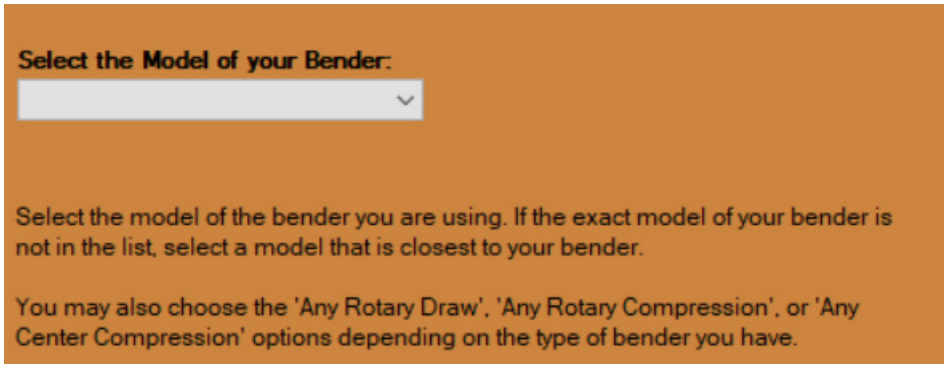
3. Select the Machine and Material

In the Rotation Calibration Wizard interface, the die will already be selected. Select the machine and select the material. Click NEXT.



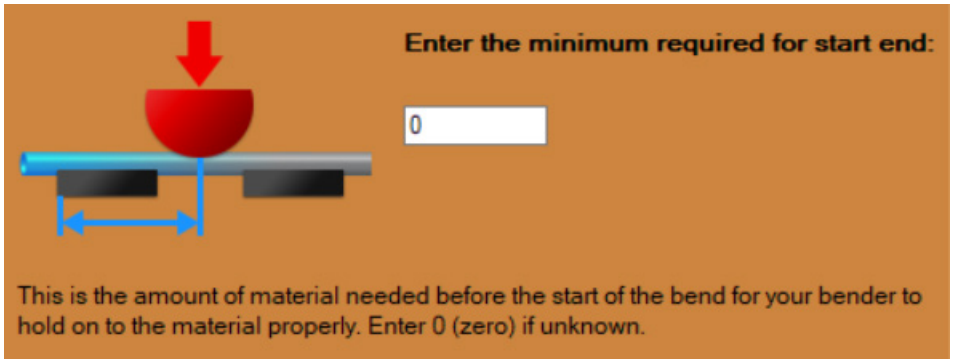
4. Select the Bender model

Select the model of bender, click NEXT.



5. Enter the Length of Material needed before the bend

Enter the amount of material needed before the start of the bend in order for the bender to hold the material. Enter this value in the text box. Click NEXT.

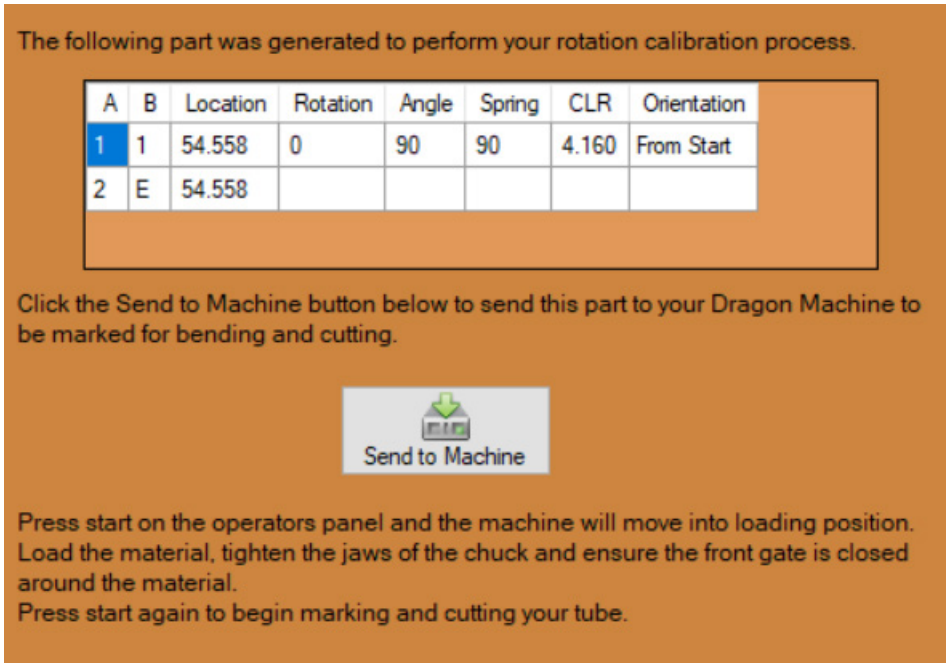


6. Enter the Material Length

The software will display the minimum required part length that can be used for the calibration process. Ensure the part being used for the Rotation Calibration Wizard process is long enough. Enter the length of the material in the text box. Click NEXT.

7. Send to Machine

The software will automatically program the Dragon to perform the required operations to carry out the Rotation Calibration Wizard. Click SEND TO MACHINE.



8. Press Start and Load the Material

Press START on the Machine Control interface. Load the material into the machine, tighten it in the Chuck, and ensure the Gate jaws are snug to the material.

9. Press Start

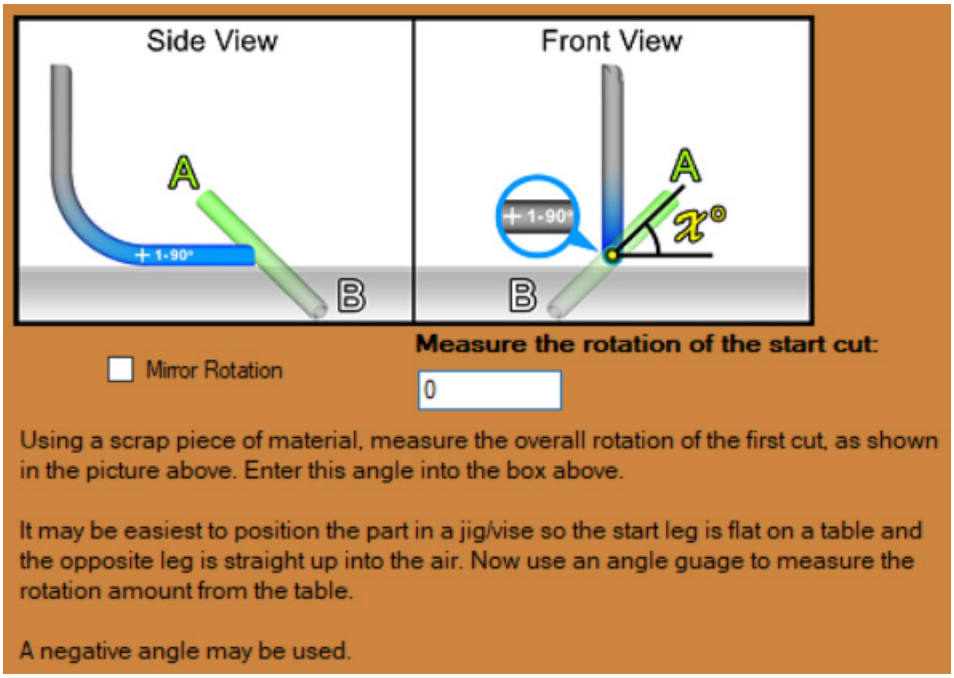
Click START a second time on the Machine Control interface. The Dragon will cut and mark the material appropriately.

10. Bend the Part

During the cutting and marking procedure, the machine marks a crosshair on the material. Line the crosshair up with the start of the die. Bend the part to 90-degrees. Click NEXT.

11. Measure the Rotation of the Start Cut

Place the part on a flat surface such as a table. Ensure the bent piece of material is vertical to the flat surface. Place a second piece of material in the cope and measure the degree of the material in relation to the table as shown in the diagram. Enter the measured value in the text box. Click NEXT.



12. Ensure the Part Visually Matches the Calibration Image

The next interface will display a 3D image of the part showing bend rotation. Rotate the part using the computer mouse. Ensure it visually matches the calibration and the actual part. Click NEXT.

13. Finish the Calibration

The final interface will display the Rotation Offset. Depending on the rotation direction of the bender, the final value will be either 270-degrees or 90-degrees, or a value close to one of these. If the value does not match, the software compensates for that. For example, if the final value is 272-degrees, the machine will compensate for the two-degrees.

Click FINISH to apply this to the selected die. The software will use this calibration information to correct for bend rotation when processing material.

1.5 Side Offsets Calibration

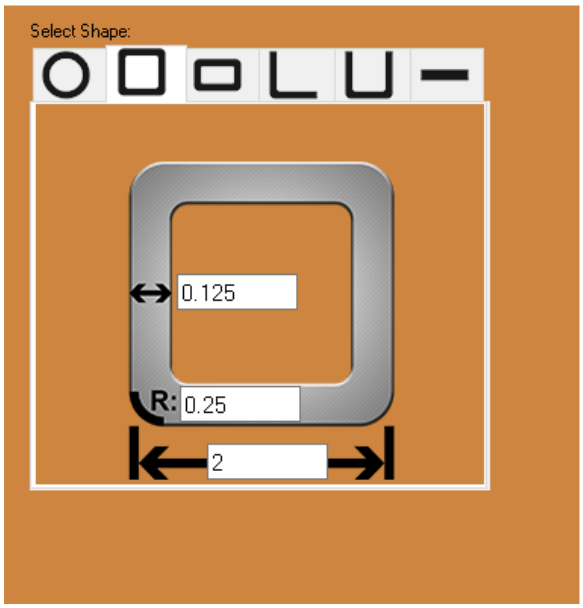
Square, rectangle, angle, and channel materials have measurable sides which makes the procedure for setting up these materials in the Dragon A400 CAM software different than setting up round material. The following process will walk the operator through the Side Offsets Calibration procedure for square material. The process for settings up rectangle, angle, and channel material will be similar.

1. Open Dragon CAM

Open the Bend-Tech Software and select Dragon CAM from the menu.

2. Add Material

The material will need to be added to the Tube / Pipe Library before continuing with the Side Offsets Calibration. Select the Tube / Pipe Library from the Task Menu and add the new material. Click SAVE.



3. Chuck Grip Settings

Before proceeding with Side Offsets Calibration, it is important to ensure the Chuck Grip option is set appropriately for the type of material being calibrated.

Select the material being calibrated and navigate to the Machine tab. Select the appropriate CHUCK GRIP option from the drop down menu in the Basic Settings section. To reference which Chuck Grip to choose, click the question mark icon next to drop down menu for a visualization of the different options.

4. Corner Rotation Extension

Corner Rotation Extension is the distance before the tool reaches the corner of the material, prior to the material rotating. It simulates a larger corner radius, which can ensure that the Torch avoids cutting parallel to the inner wall of the material. If the Corner Rotation Extension is not set correctly it can lead to Torch collision, or the Torch cutting vertically into the wall of the material. It can also cause Torch failure.

Select the material being calibrated and navigate to the Machine tab. Locate the Corner Rotation Extension text field. Use the formula to calculate the value to enter in the DISTANCE text box.

Corner Rotation Extension

If the Corner Rotation Extension value is negative or less then .1, leave it set to 0.

Formula

(wall thickness + kerf) - radius = Corner Rotation Extension

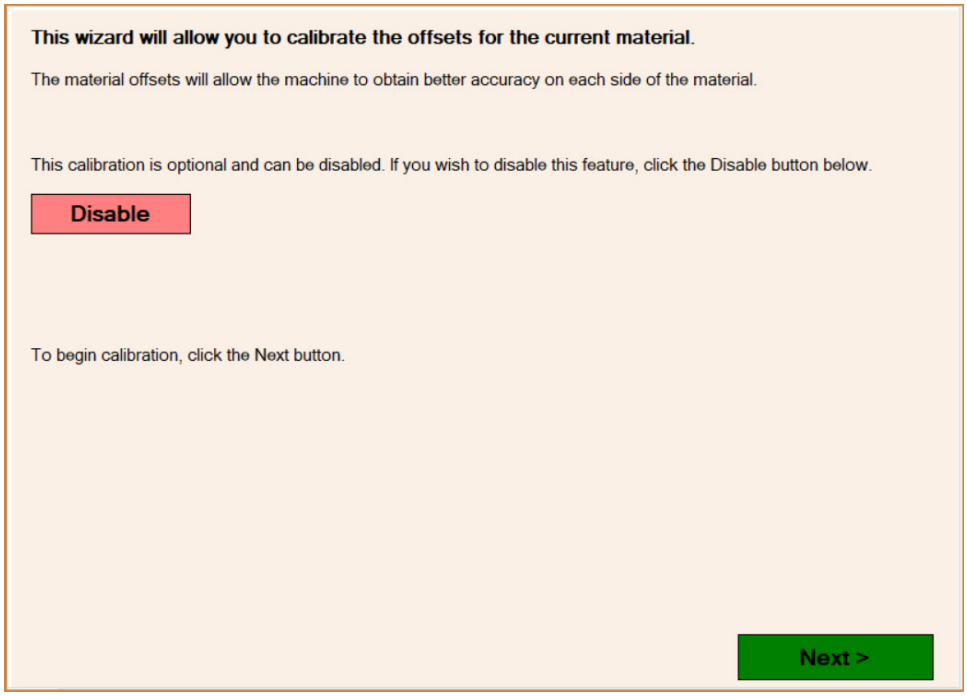
For example, if the wall thickness is .120, the kerf width is .06, and the radius is .15 the Corner Rotation Extension will be .03. Since this number is less than .1, leave the DISTANCE setting set to 0. -- [(.120 + .06) - .15 = .03]

5. Open Side Offset Calibration

Select the material being calibrated and navigate to the Advanced tab. Locate Side Offsets and click CALIBRATE. This will open the Side Offsets Calibration Wizard.

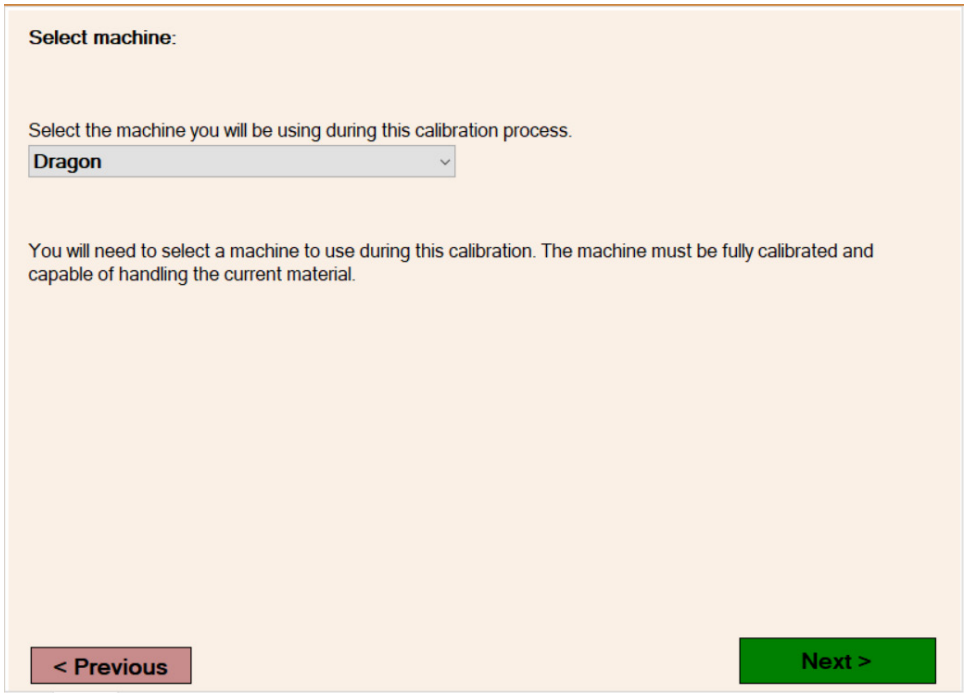
6. Disable Feature

The first page of the calibration wizard will give the operator the option to Disable the Side Offset Calibration feature and use the machine's default measurements. Bend-Tech requires performing the Side Offset Calibration to achieve more accurate results when cutting square, rectangle, angle, or channel material. Do not disable the Side Offsets Calibration feature if accurate cuts are required. Click NEXT.



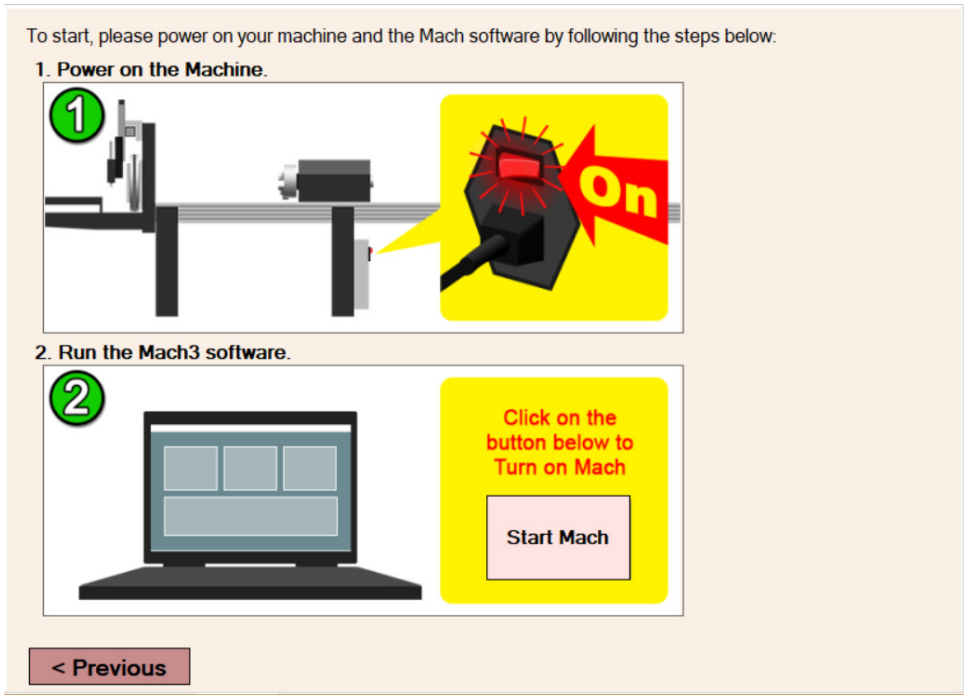
7. Select the Machine

Select the machine being used for the calibration from the drop down menu. Click NEXT.



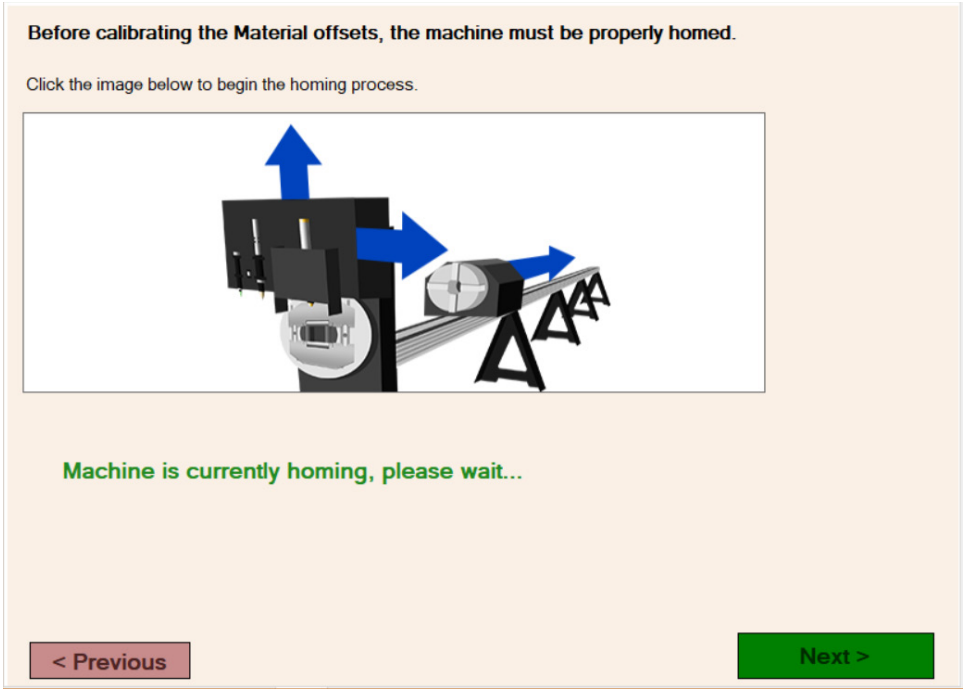
8. Start Mach3

Ensure the machine is powered on. The wizard will then prompt the operator to start Mach3 Click START MACH.



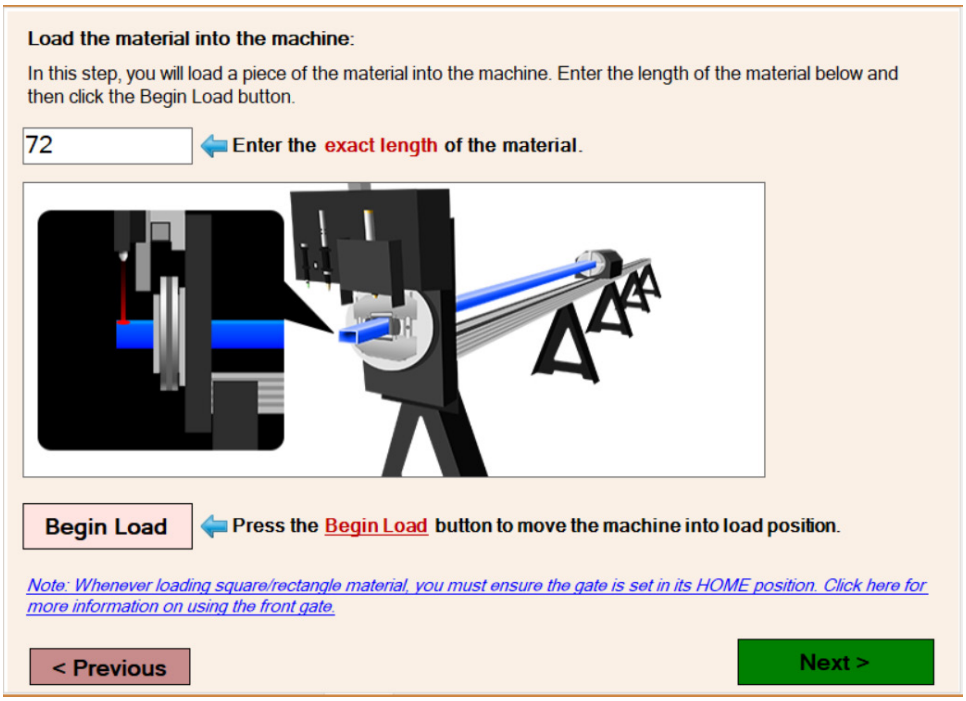
9. Homing Procedure

The next page of the wizard goes through the homing process. To begin, click the image on screen. Text will appear informing the operator that the 'Machine is currently homing, please wait'. After the Homing process is complete the text will disappear; click NEXT.



10. Load the Material

Enter the length of the material being used for the calibration. The Side Offsets Calibration should use a piece of material between 3 ft. and 6 ft. in length. Click BEGIN LOAD. This will move the Trolley into Load Position, so that the material can be loaded into the machine.



Load the material into the machine. Chuck it up securely using spacers as needed. Square material will not require spacers but rectangle, angle, and channel material will. See the information regarding Material Spacers for more information.

After chucking up the material, adjust the Gate. Tighten the Gate Rollers so that they are snug but not tight against the material. The rollers should be able to be rolled by hand with no play in the material. Before continuing, return the Gate Lead Screw positions to the 12 o'clock and 3 o'clock positions. Click NEXT.

Material Spacers

Rectangle, Angle, and Channel material require spaces to be used when chucking the material into the Dragon A400. Use solid stock material like aluminum blocks to center the material in the Chuck.

Important

The machine grounds through the Chuck. Ensure that a minimum of two sides of the material or metal spacer connect with the chuck teeth.

Rectangle Material Spacers.

When loading rectangle material, spacers are needed to center the material in the Chunk. Use the following formula to determine the height of each spacer.

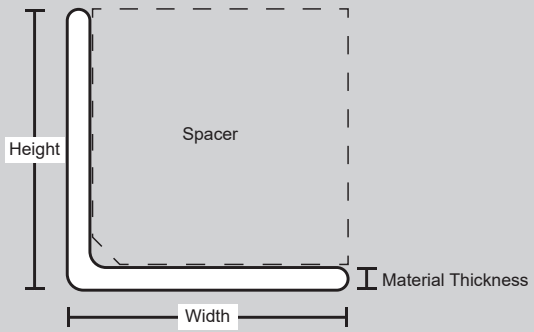
Formula

(Long side of the material - the short side of the material) / 2

For example, for 2" by 6" material will result in 2" spacers. -- [(6 - 2) / 2 = 2]

Angle Material Spacers

When loading angle material, the operator will need to use a spacer to ensure the material is securely clamped in the Chuck. This may require fabricating a piece that fits the material. The spacer should fit the angle material so it essentially creates a square.



Formula

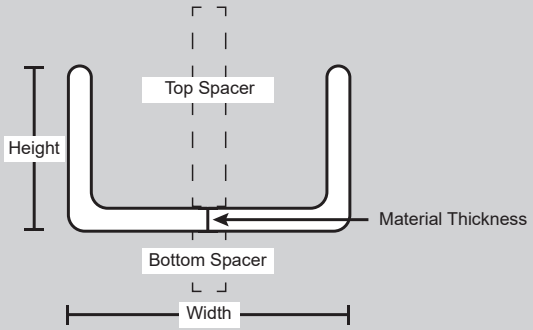
Size of material - material thickness

For example, if the material is 2 in. angle, and is .25 thick, the spacer would measure 1.75 in. x 1.75 in.

[2.0 - .25 = 1.75]

Channel Material Spacers

When loading channel material, the Operator will need to use a spacer to ensure the material is securely clamped in the Chuck. This may require fabricating a piece that fits the material. Channel material will have a spacer above and below the material.



Formulas

Bottom Spacer: ((Width - Height) / 2)

Top Spacer: (Bottom Spacer + (Height - Material Thickness))

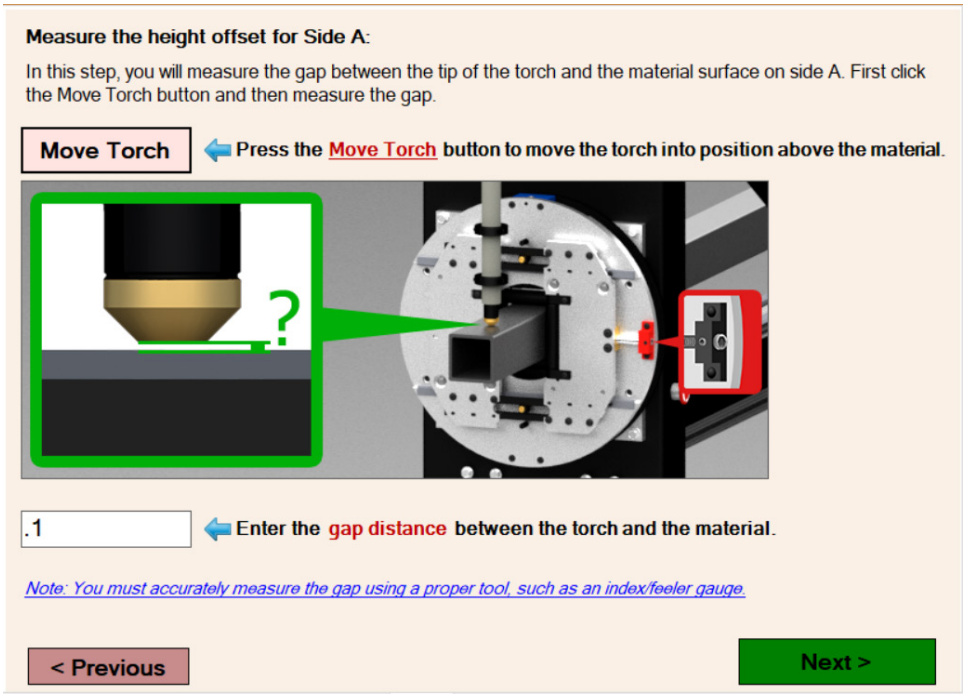
For example, if the material is 3 in. x 2 in. channel, and is .25 thick, the top spacer would measure 2.25 in. and the bottom spacer would measure .5 in.

[(3 - 2) / 2 = .5] and [.5 + (2 - .25) = 2.25]

11. Torch Distance

The next section of the Calibration involves measuring and recording the gap distance between the Torch and the surface of the material. Click MOVE TORCH. This will move the Torch into position for the first side (A) of the material.

Use a set of feeler gauges to measure the distance between the Torch and the material. Measure the feeler gauges with a Vernier calipers. Record the measurement for the GAP DISTANCE in the provided text field. Click NEXT.

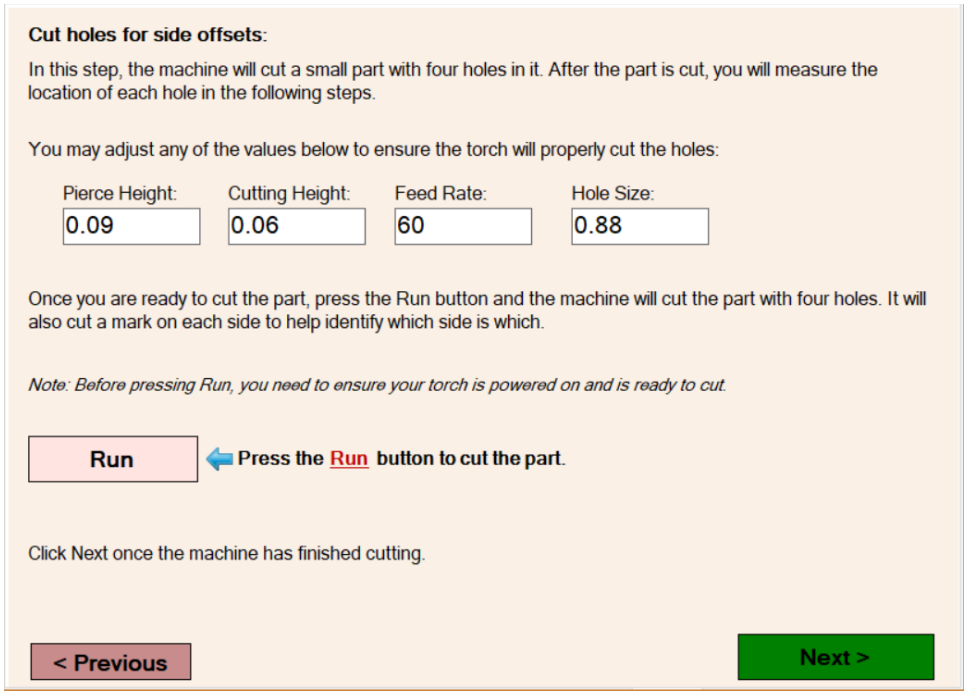


The machine will automatically move to the next side of the material. Perform this measurement for all sides of the material.

12. Run Test Cuts

The machine will now perform a test cut based on the Torch height values entered by the operator. The default values for Pierce Height, Cutting Height, Feed Rate, and Hole Size should be appropriate for the material being used because they are based off of the material information, but can be adjusted if needed.

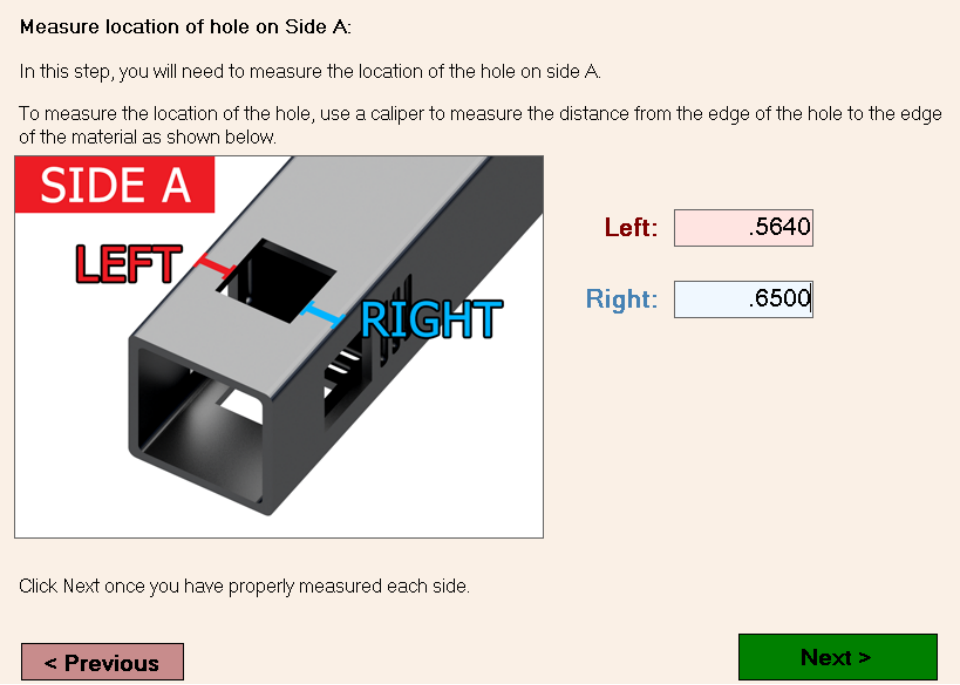
Click RUN to start the cutting process. When the machine finishes cutting out the calibration part, click NEXT.



13. Measure Test Cuts

The program will ask the operator to measure the distance of the left hand and right hand side of the hole to the edge of the material.

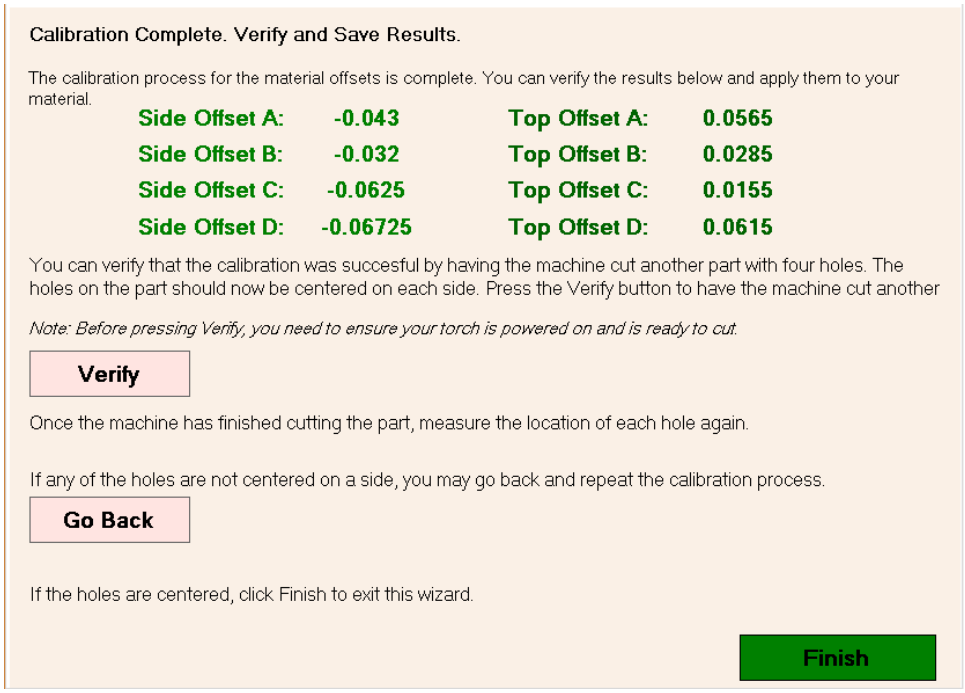
Use the image on the interface as a reference regarding which side to measure. Enter the appropriate values in the text boxes. Click NEXT.



Perform this measurement for all sides of the material. After performing this for all of the necessary sides, click NEXT.

14. Verify Test Cuts

The calculated offsets will appear on the screen. To verify that these are correct, click VERIFY. The machine will perform the test cut procedure again.



Once the second test part is finished cutting, verify that the holes are centered on each side of the material. If the holes are still not centered after the second test cut. Click GO BACK to repeat the calibration process. If the holes are centered, click FINISH.

13. Save Calibration

Once the calibration is finished, the program will return to the Tube / Pipe Library. The SIDE OFFSETS will now display the calibrated values determined during the Side Offset Calibration.

Click SAVE to record the calibration values for that material. These values will be used every time the calibrated material is run through the machine.

Part Design Tutorials

2.1 Create a Straight Part

This tutorial will go over the basics for creating a 12-inch part with a cope on one end, a 45-degree miter on the other, a grid of 4 evenly spaced round holes, and a square pass through hole.

1. Open Create Straight Part

From the Bend-Tech CAM Task Menu, select STRAIGHT. This will open the Straight Part Designer.

2. Select the Material

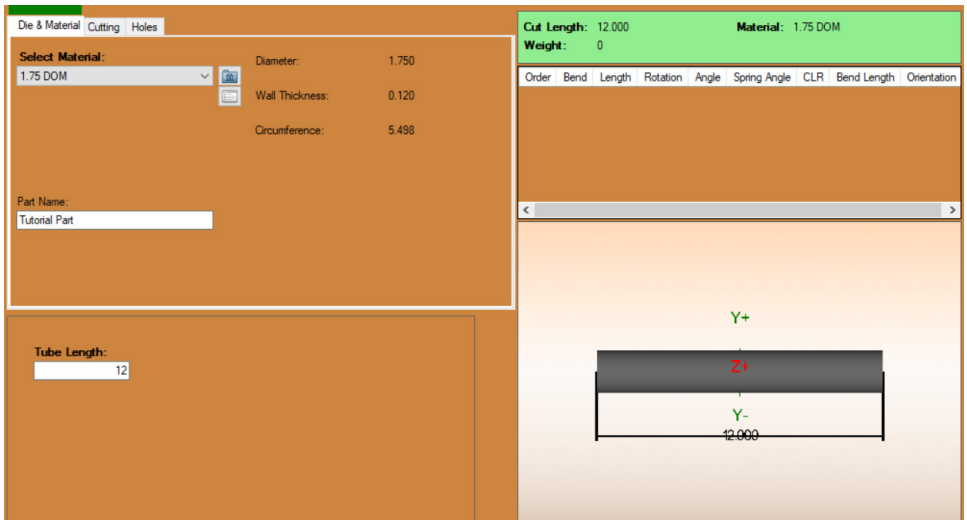
Select the part material from the MATERIAL drop down menu. The material needs to be added to the Tube / Pipe Library before it can be selected.

3. Name the Part

The Part Name will default to ‘New Straight Part’. For this tutorial, change this to ‘Tutorial Part’. This will appear as a Part ID that can be marked or engraved in Edit Flat.

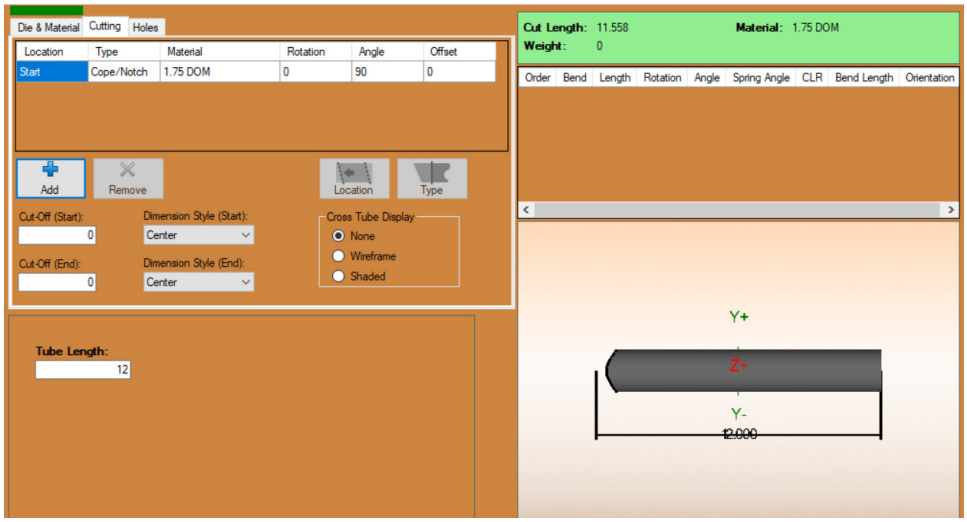
4. Enter the Tube Length

Enter the Part Length in the TUBE LENGTH text box. This is the length of the part, not the stock length. For this example 12 inches.



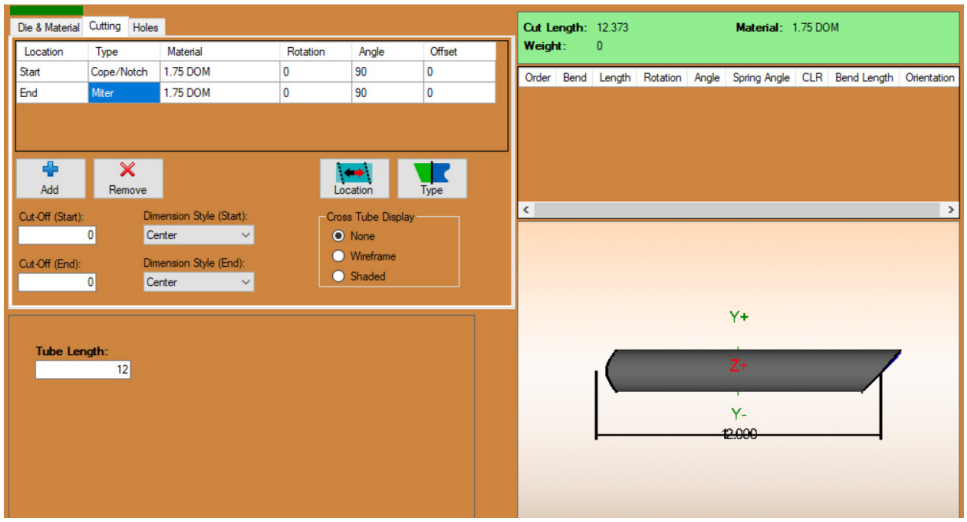
5. Add the Cope End Cut

Navigate to the Cutting Tab. Click the ADD button to add a Cope to the start of the part. Leave the other settings as default for the purpose of the tutorial.



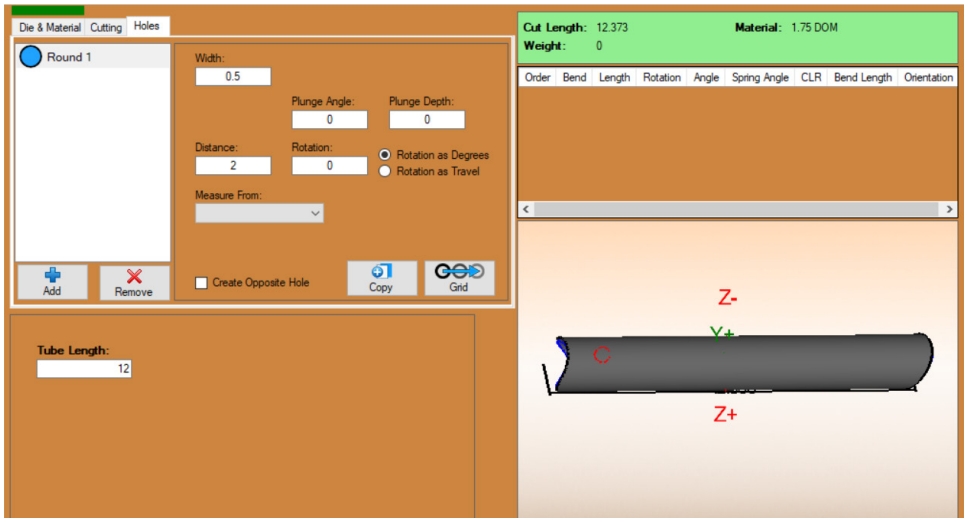
6. Add the Miter End Cut

Click the ADD button to add a second cut to the end of the part. Click the TYPE button, or double click the TYPE cell on the Cutting Table, for the end cut to change the cut to a Miter. Leave the other settings as default for the purpose of the tutorial.



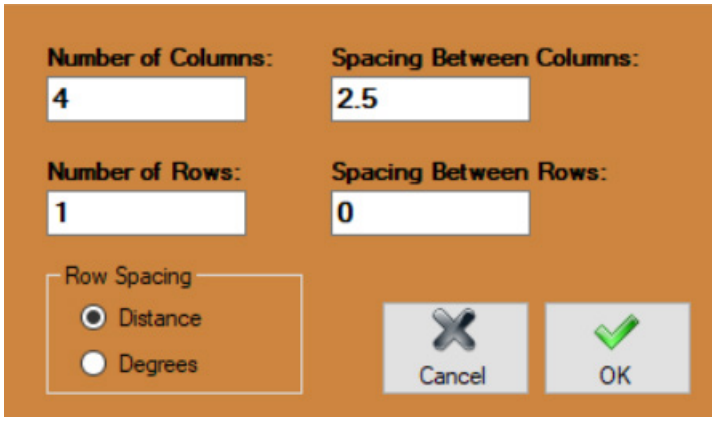
7. Add the First Round Hole

Navigate to the Holes Tab. Click ADD. From the Hole Type pop-up menu, select ROUND. Change the DISTANCE to 2. This will adjust the hole location to be 2 inches from the start of the part. Leave the rest of the settings as default.



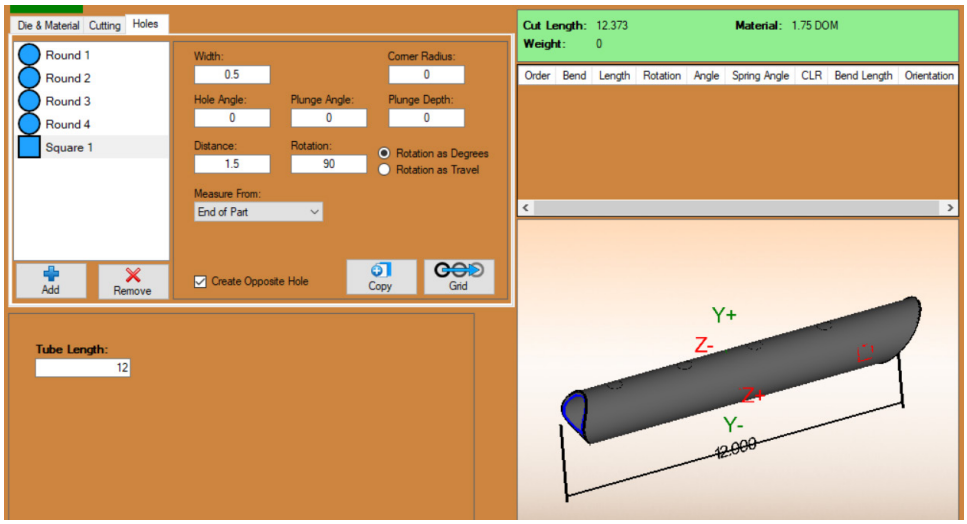
8. Add the Rest of the Holes

Next, click GRID. This will open a pop-up interface used to grid out series of holes. NUMBER OF COLUMNS adjusts the number of holes along the length of the part. Set this to 4. SPACING BETWEEN COLUMNS adjusts the distance between the column holes. Set this to 2.5”. NUMBER OF ROWS is the number of holes around the material. Set this to 1. Leave the other settings as their defaults.



8. Add the Square Hole

Click ADD and select SQUARE from the Hole Type pop-up menu. Set the MEASURE FROM option to End of Part. Enter 1.5” for the DISTANCE. Set the ROTATION to 90 degrees. Check the CREATE OPPOSITE HOLE.



9. Save the Part

Once the part is completed, go to File > Save As to save the part. From here the part can be set to the Flat Designer for further edits or the Nest Part to create a nesting project that can be sent to the Dragon machine for cutting.

2.2 Create a Bent Part

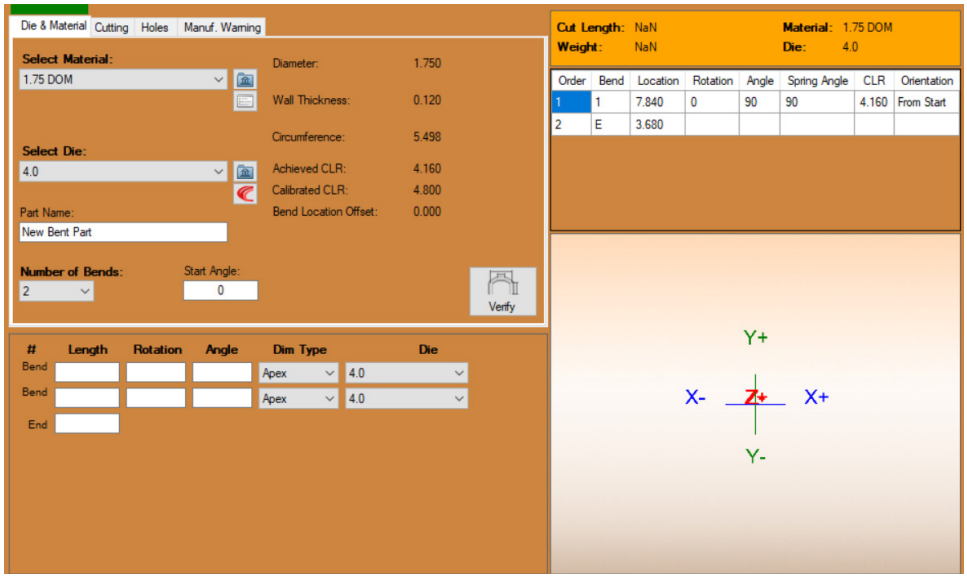
This tutorial will go over the basics for creating a 3-foot long part with 2 bends rotated 180-degrees from each other, with copes on both ends.

1. Open Create Bent Part

From the Bend-Tech CAM Task Menu, select BENT. This will open the Bent Part Designer.

2. Select the Material and Die

Select the Material from the drop down menu. This material will need to be added to Tube / Pipe Library before it will be available as an option from the list. Select the Primary Die that will be used in making the part from the drop down menu. The Die(s) will need to be added to the Die Library before it is available to select from the list.



3. Name the Part

The Part Name will default to New Bent Part. Change this as necessary.

4. Set the Number of Bends

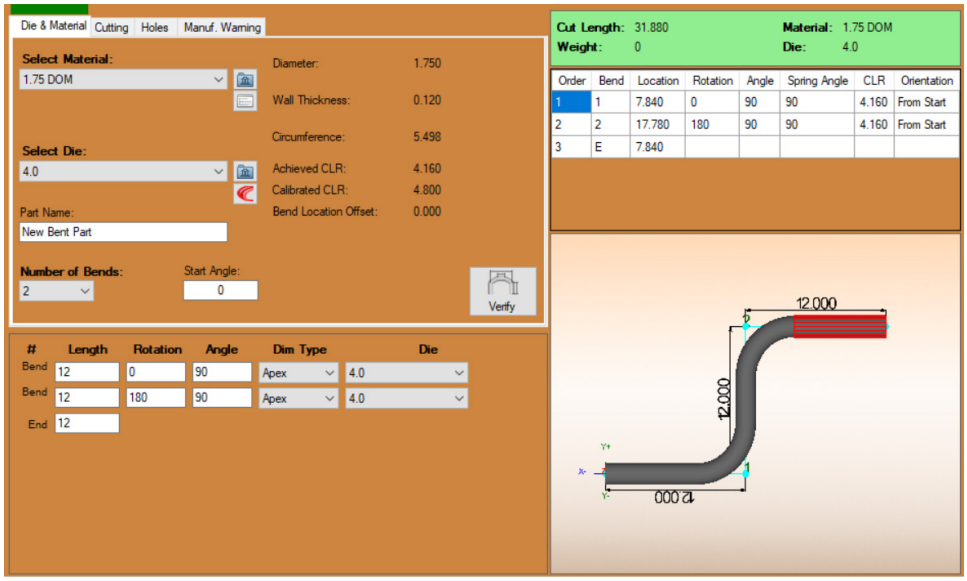
Select the Number of Bends needed from the drop down menu. For this example, 2 bends are needed.

5. Set the Starting Angle

For this part, the STARTING ANGLE can remain at 0-degrees. If a part needs a specific starting angle, enter the angle into the text field.

6. Enter the dimensions of the Part

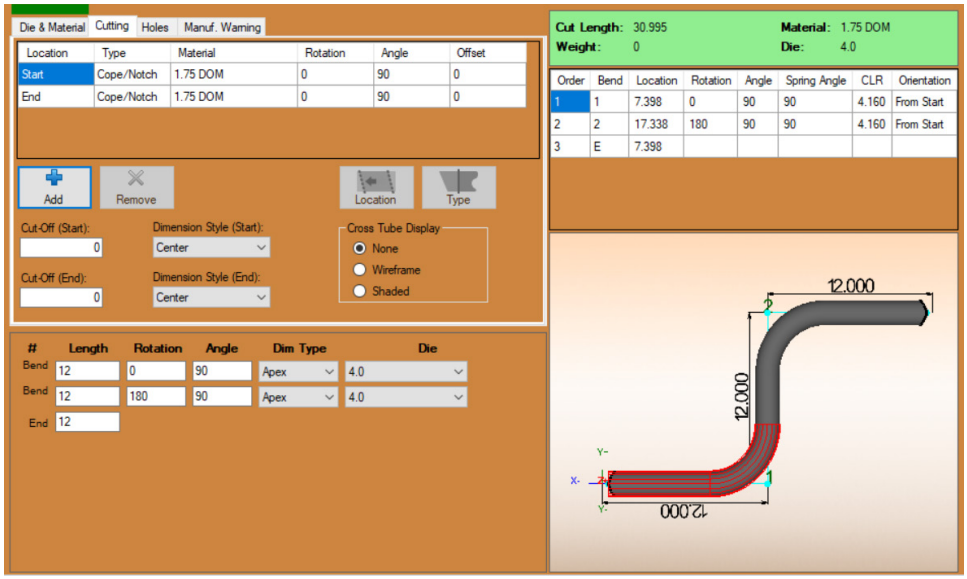
After the number of bends are selected, a table will appear below the Die & Material Tab. Fill in the dimension of the part, leg lengths, bend rotations, and bend angles. If the part requires the use of multiple die sizes, select the specific dies from the drop down menus. The Part will appear in the 3D Display Interface once all the dimensions are entered.



For this part, enter 12-inches for all three LENGTHS. First ROTATION is 0-degrees and second ROTATION is 180-degrees. ANGLE is 90-degrees for both.

7. Add End Cuts

Navigate to the Cutting Tab to add End Cuts to the part. Click ADD to add the Start Cut. This will default to a cope. Click ADD a second time to add an End Cut.



8. Send to Edit Flat or Nest Part

Once the bending information in entered and the part that appears in the Display Window looks accurate, the part can be sent to either Edit Flat or Nest Part. EDIT FLAT is used for editing in custom geometry or adding/removing a Part ID. NEST PART is used to nest the part onto a stick for cutting on the Dragon machine.

2.3 Custom End Cuts

This tutorial will go over how to create a part with a custom end cut, such as a cope with a notch. To begin, open Bend-Tech CAM and click STRAIGHT from the Task Menu.

1. Create the Base Part

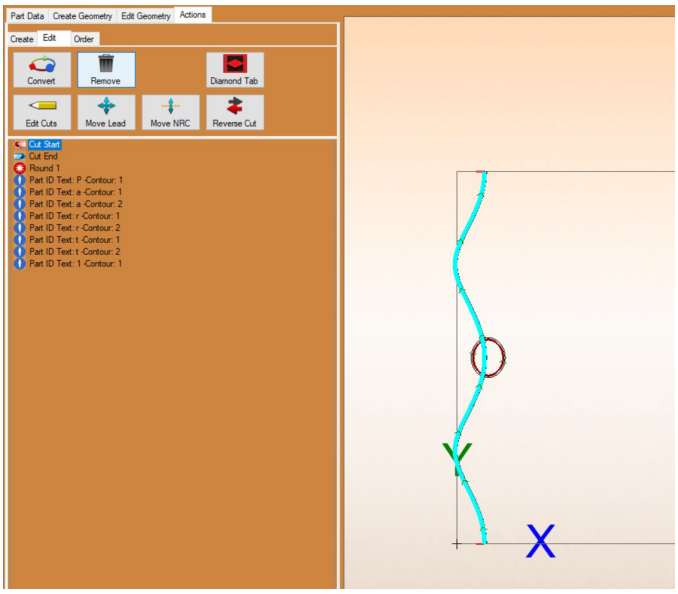
Select round material of any size. Enter an appropriate TUBE LENGTH.

2. Add a Cope

Navigate to the Cutting Tab. Add a Cope to the start of the part.

3. Open in Edit Flat

Click the EDIT FLAT button from the menu at the top. This will open the part in the Flat Designer which is used to add/edit custom geometry.



4. Add New Geometry

Navigate to the Create Geometry tab and select the Holes tab. Add a round hole to the center of the Cope using Free Select.

5. Edit Geometry

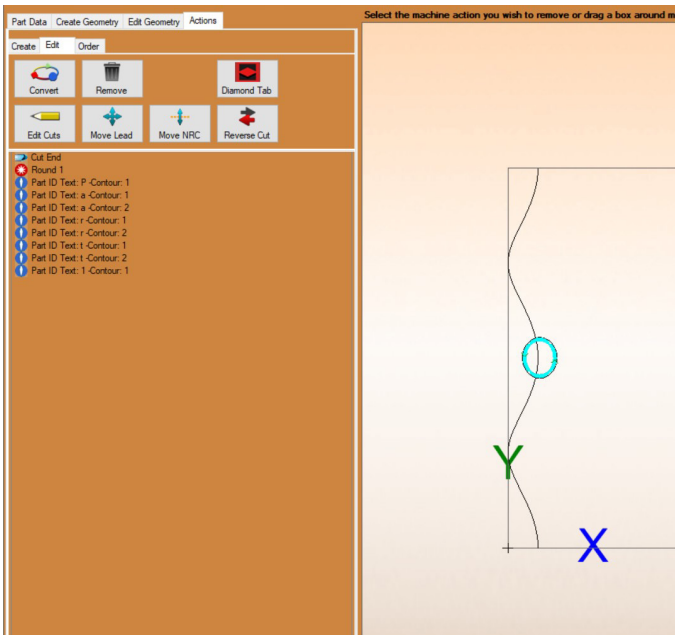
Under Actions, click the Edit Tab. The Edit Tab is used to edit or remove current geometry.

Tip

When unique or non-typical geometry has been created, the software may not recognize a programmed cut properly. This may cause errors such as the software choosing cut paths that contradict each other. When this happens the cut actions will need to be reassigned.

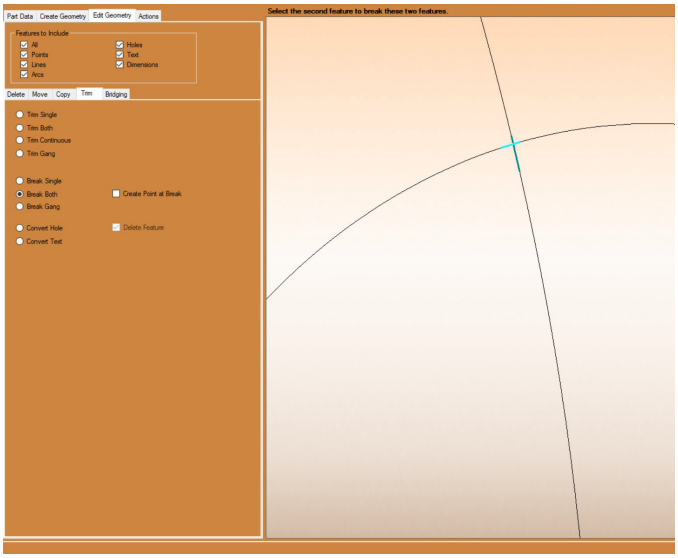
6. Delete Actions

Click the Remove icon, then click each action in the Actions Panel that need to be removed. When actions are removed, the cutting indicators will disappear and the part will be displayed as simple lines.



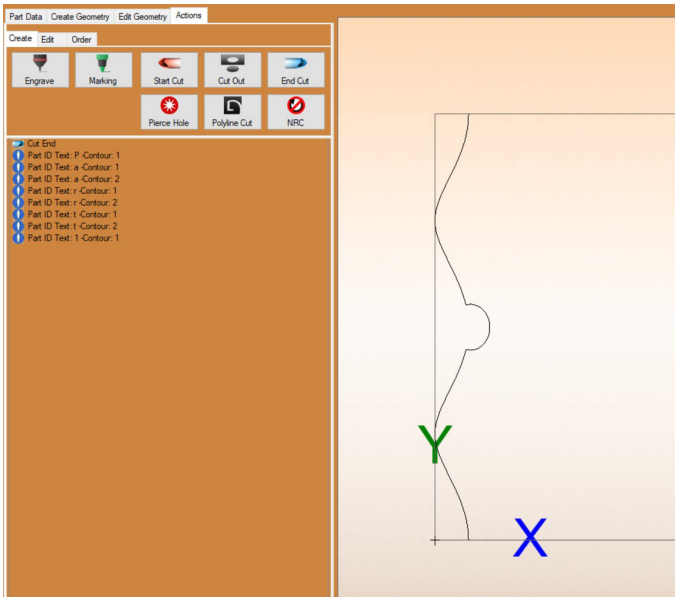
7. Break the Line at the Intersection

Navigate to the Trim tab located under Edit Geometry and select Break Both. Next, select the first line of the intersection, followed by the second line. This will break the lines at the intersection. Do this for all intersections.



8. Delete Unneeded Lines

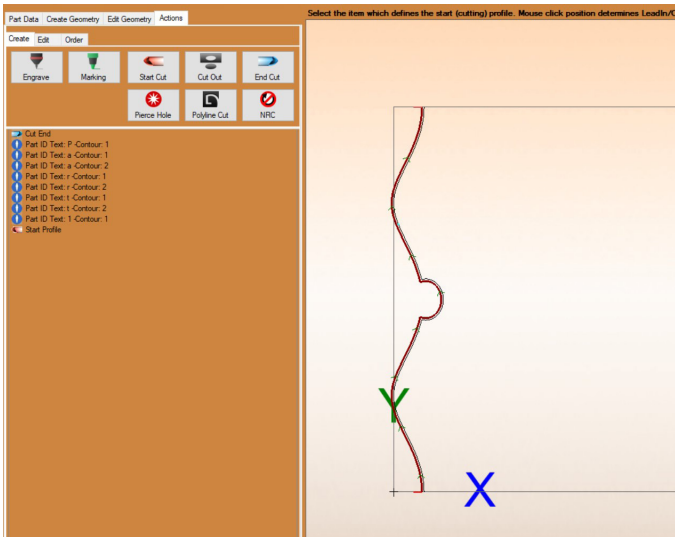
To delete the lines that are no longer needed for the new geometry, select Delete and use the options available to delete all unnecessary lines.



9. Create a New Cut

Return to the Actions Tab, open the Create Tab. Click Start Cut, then click on the new geometry to create a cutting path.

If the geometry is done properly, the software will populate a new cutting action.



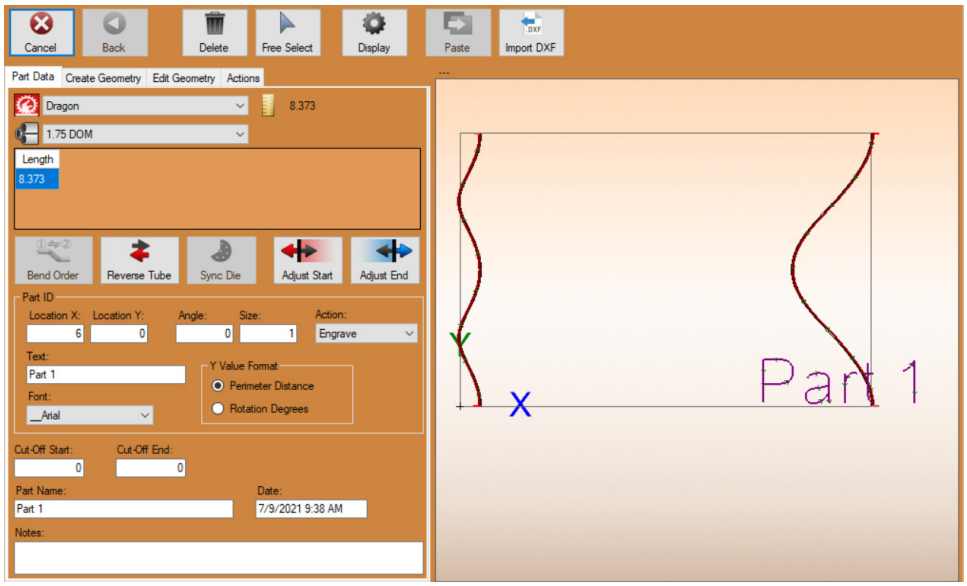
03 Text and Part ID Tutorials

3.1 Adding a Part ID

In Edit Flat, a Part ID can be added to the part and programmed to be marked, engraved, or cut during production.

1. Open a Part in Edit Flat

Open or Create a new part in Dragon CAM. Open it in Edit Flat by clicking the button at the top of the screen. Remain on the Part Data tab.



2. Adjust the Location X and Location Y

Edit the value in the Location X text box to position the Part ID on the material from the start of the part. Edit the value in the Location Y text box to position the Part ID on the circumference of the material.

Note

The Y Value Format is used to choose the type of measurement the software uses to program how the machine places the text on the circumference of the part. Perimeter Distance will place the text from the start of the part as viewed in Edit Flat, Rotation Degrees will place the text according to Y Axis rotation.

3. Adjust the Angle

Enter the angle at which the Part ID should appear on the material in the Angle text box. A value of 0 will align the text lengthwise along the material.

4. Adjust the Size of the Text

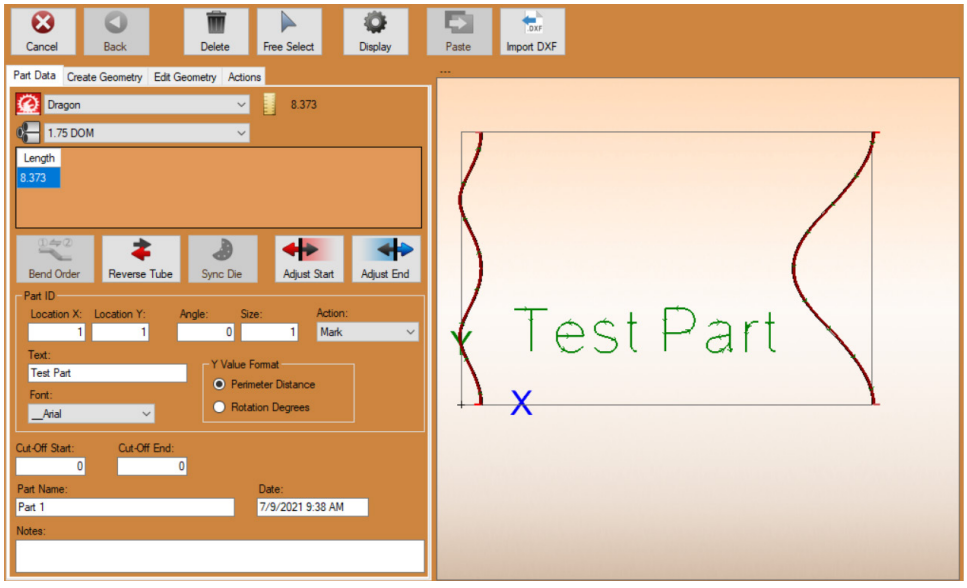
Enter the size of the font as it should appear on the material in the size text box. The part display interface will size the text accordingly on the part. This will give the operator a visual of the size of the text in relation to the part.

5. Set the Action type

In the ACTION drop down menu, choose how the machine will apply the Part ID to the material. Typically the Part ID will be set to Mark or Engrave.

6. Change the Text

In the TEXT text box, enter the text that should appear on the material. This defaults to the Part Name that was created during initial part creation.



7. Select the Font

Choose the desired font that will be used with the Part ID from the font drop down. Bend-Tech recommends either __Arial or __Time New Roman since they are single-line fonts.

8. Set the Part Name

At the bottom of the interface, choose a name for the part by typing the desired name in the text box under Part Name. The Part Name is not necessarily the same as the Part ID. This defaults to the Part Name that was created during the initial part creation.

3.2 Placing Text on a Part

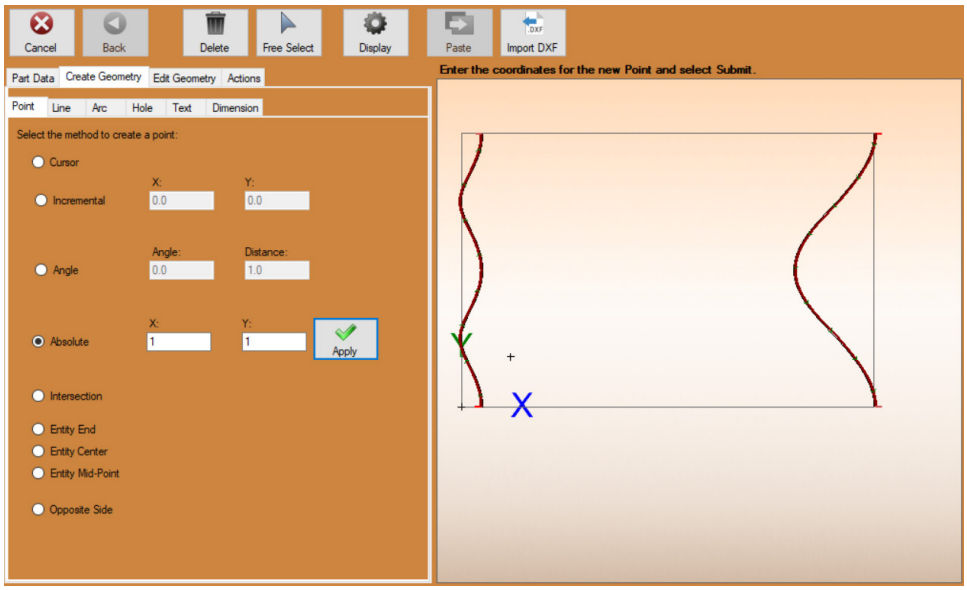
It is not uncommon for designers to include additional text on the part aside from a Part ID.

1. Open Edit Flat

Open or Create a new part in Dragon CAM. Open it in Edit Flat by clicking the button at the top of the screen.

2. Open Create Geometry

With the part open in Edit Flat, click the Create Geometry Tab.



3. Identify the Location for the Text

Before placing the text, a placement point needs to be identified. Use CURSOR to place a point at the cursor location. To place the text at a specific position, use the various other methods available.

ABSOLUTE, for example, will set the text at a specific point according to the X-Axis and Y-Axis. The distances are measured from the lower left corner of the part. Click APPLY to set the point.

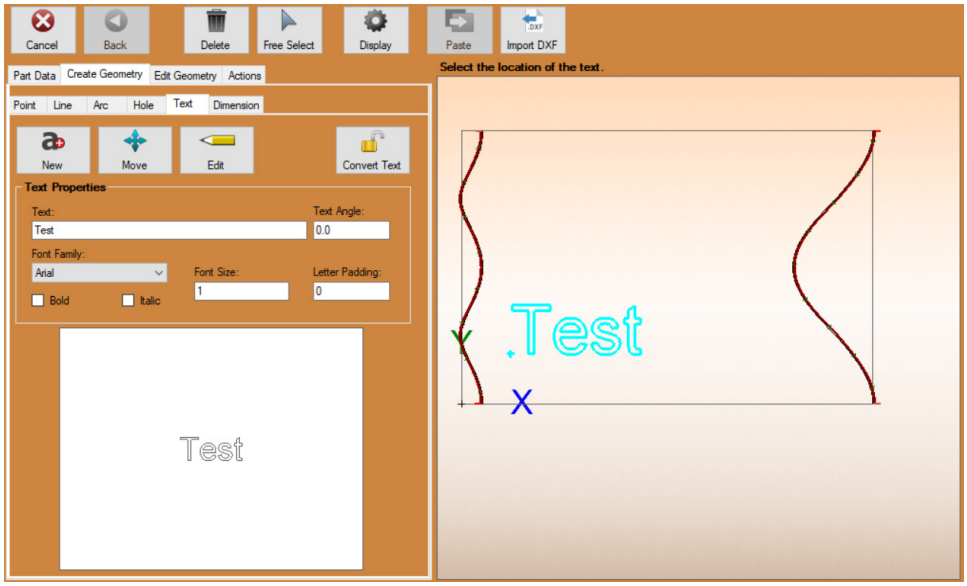
4. Create New Text

To create text, open the Text subtab and click the NEW icon. Under Text Properties, type the text that will appear on the part into the TEXT text box. Choose the desired Font Family, Font Size, and Letter Padding. Letter Padding adjusts the spacing between letters.

Polyline lettering is recommended for engraving or marking text. Bend-Tech Dragon Software comes with two polyline fonts: __Arial and __Times New Roman. These are found at the top of the drop down font list.

5. Place the Text

Click to place the text onto the material. If a specific point was chosen under the Point tab, place the text on that point. The text can be placed using Free Select if it does not need to be placed at a specific point.



6. Convert the Text

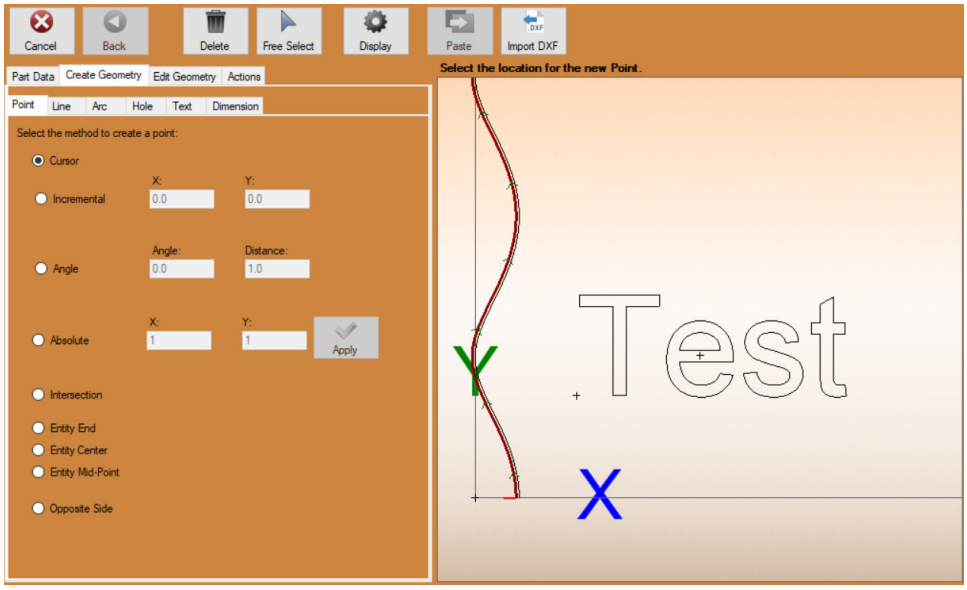
Click CONVERT TEXT, then click on the text that was created. Convert Text turns the text into lines and arcs the cutting software recognizes. This is required in order to apply Actions.

3.3 Placing Bridge Cuts

When cutting out text, bridge cuts are required on letters that have pieces that may drop out.

1. Placing Bridge Locations

Before placing Bridges, points need to be set. These points will serve as the center point of the bridge. Navigate to the Create Geometry > Point Tab. Use CURSOR to set the center point of each bridge that is needed.

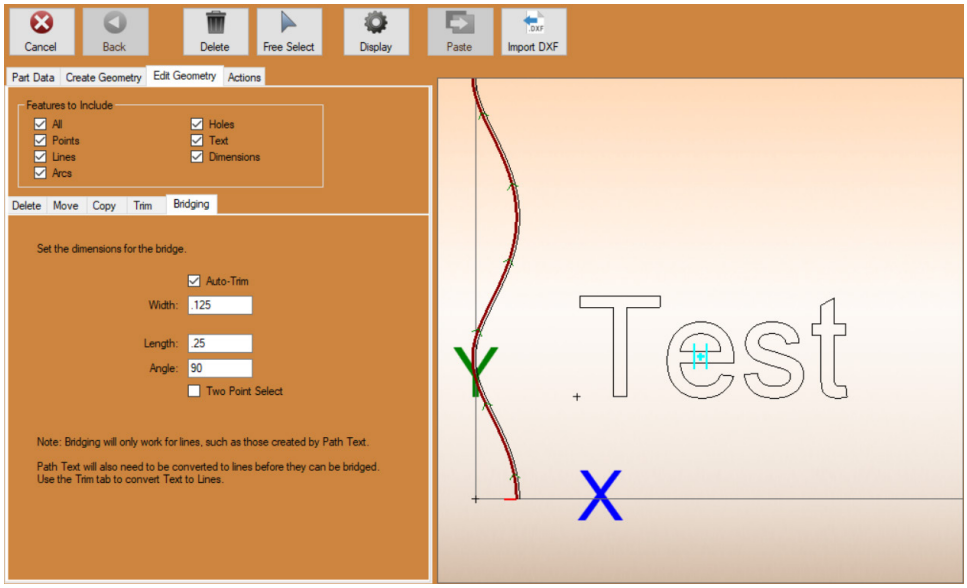


2. Navigate to the Bridging Tab

Navigate to the Edit Geometry tab. Open the Bridging subtab.

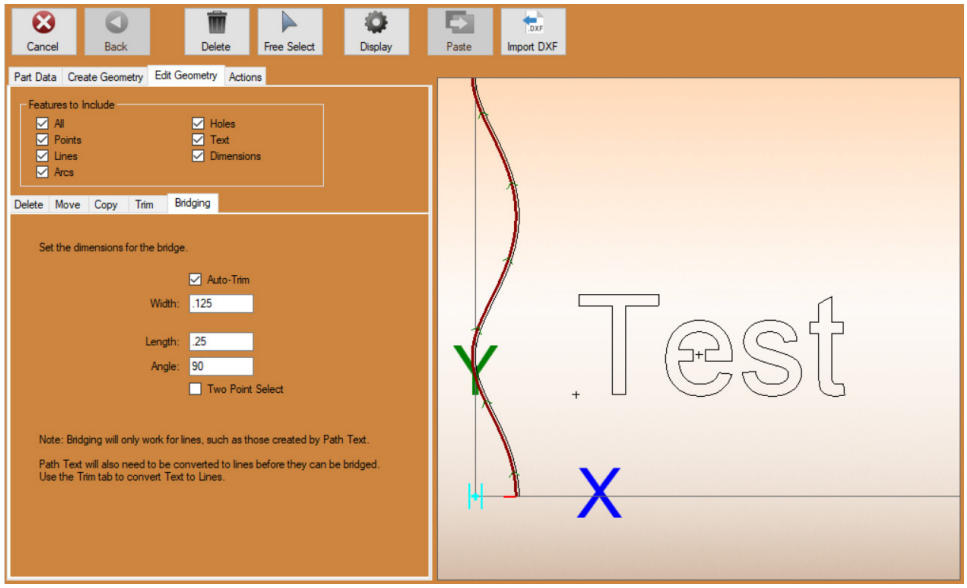
3. Set the Dimensions

Set the dimensions for the bridge such as Width, Length, and Angle. Adjust the settings to achieve the appearance desired.



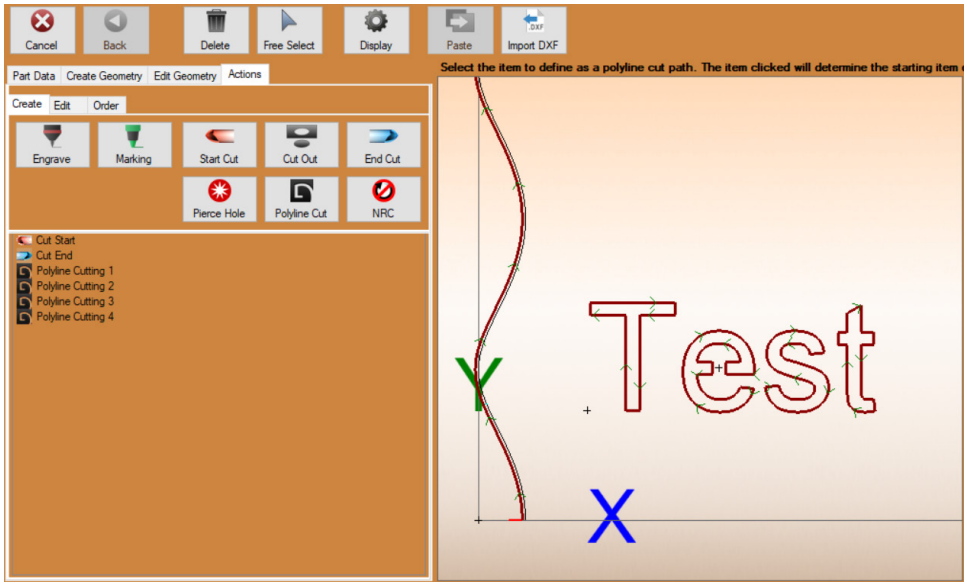
4. Place the Bridge

With the settings chosen, two lines will appear alongside the mouse cursor. If the lines appear at the correct width and angle according to the dimensions for the bridge, click on the desired letter to place the bridge in the appropriate place.



5. Apply Polyline Cut Actions

Navigate to the Actions Tab, click POLYLINE CUT. Click each letter to apply the Polyline Cut action. A “Process Name” popup will appear after each Polyline Cut is applied. Use the default name, or enter a name for the action if desired. Click OK.



Important

It is recommended to use Polyline Cut for actions such as letters. Lead-Ins are used with Cut Outs, which is not necessary and could affect the quality of the cut.

6. Nest Part

Click Nest Part. The part is now ready to be cut on the Dragon.

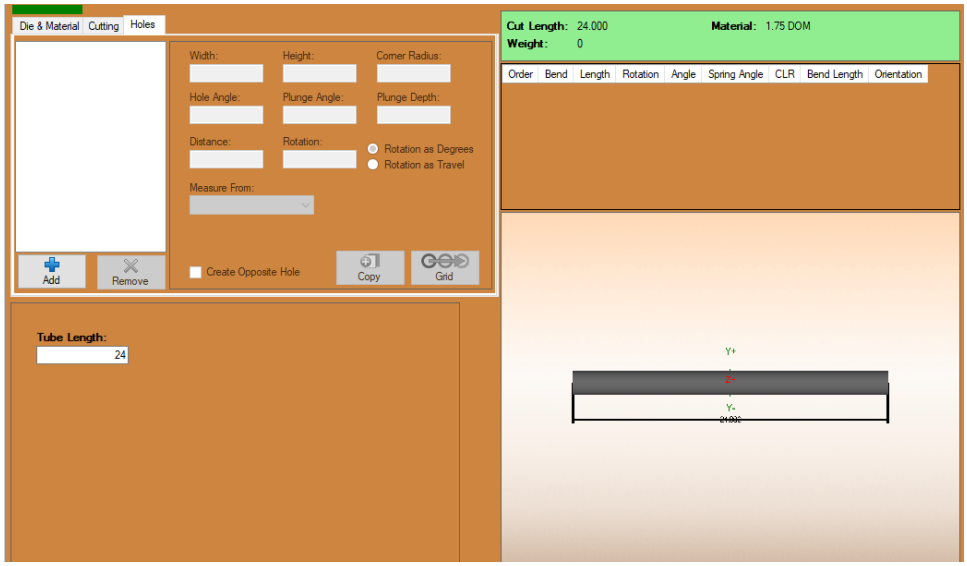
Internal Cut Tutorials

4.1 Creating a Series of Holes

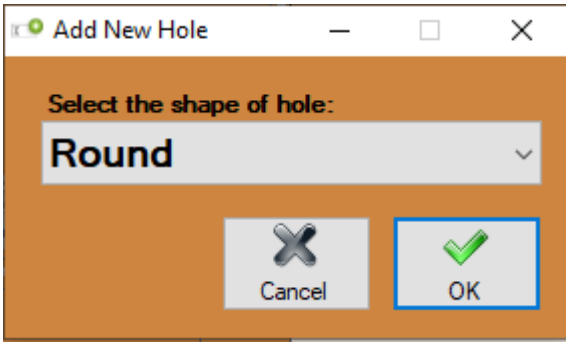
The Grid feature is used to create a series or line of holes in Dragon CAM. This is a helpful feature when creating hand rails where the part designer may want to create multiple holes at a fixed size and distance. This is also helpful when the project requires the part designer to countersink certain features of the design.

1. Open the Holes Tab

With a part open in the Dragon CAM Part Designer, click the Holes tab.



2. Add a New Hole



Click the ADD icon. It should be the only icon not grayed out in the interface.

When ADD is clicked, an Add New Hole popup will appear. From the dropdown menu, choose the type of hole that needs to be created. Click OK.

3. Select the Measuring Point

In the MEASURE FROM dropdown, choose the measuring point where the holes should begin.

4. Set the Hole Location

In the DISTANCE text box, enter the distance the holes should begin from the Measure From point chosen in the previous step.

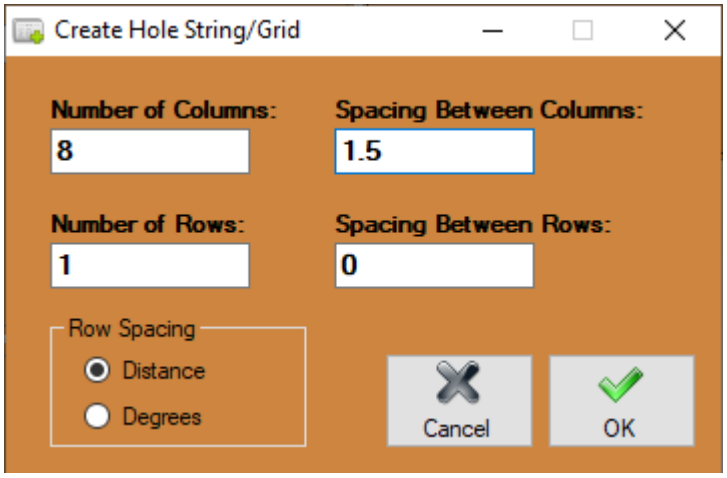
5. Adjust the Settings

Adjust the hole settings until the desired shape, angle, size, and rotation are correct.

Hole Settings

- In the Width text box, enter the desired Width, or diameter of the hole.
- To place holes on a different rotation than a cope or miter cut, enter the Rotation value in the Rotation text box. Rotation can be entered as Degrees or linear Travel.
- If cutting square, rectangle, angle, or channel, enter the Corner Radius of the material.
- If creating plunge holes, enter Plunge Angle and Plunge Depth in the text boxes.
- If passthrough holes are needed, or two sets of holes 180-degrees apart on the material, click Create Opposite Hole.

6. Setting the Holes to a Grid

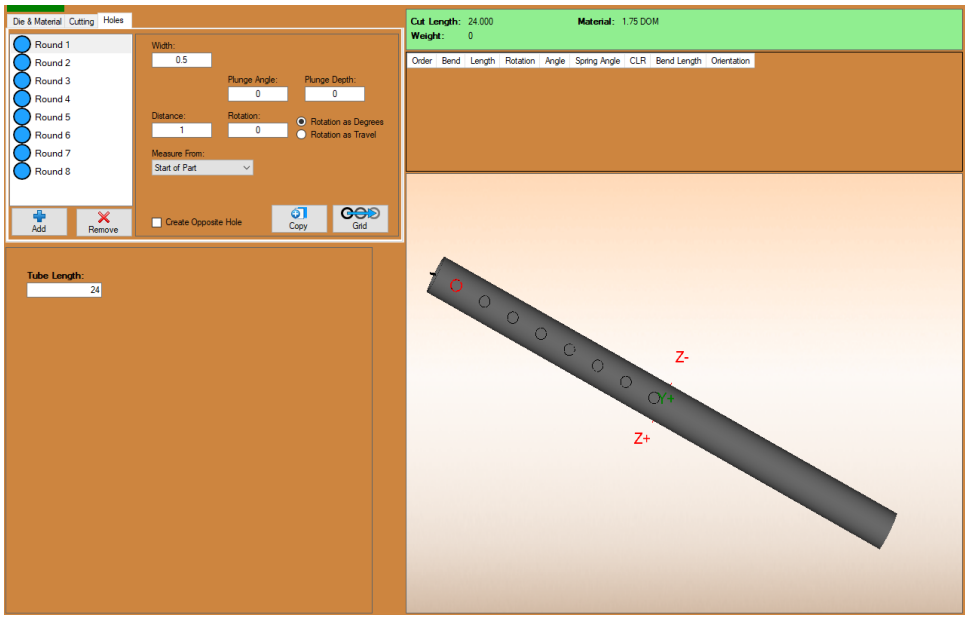


Click the GRID icon. A Create Hole String/Grid pop-up will appear. Two different sets of data can be entered in the pop-up. NUMBER OF COLUMNS will be the number of holes created along the length of the material, such as when creating railing pickets.

SPACING BETWEEN COLUMNS is the spacing between the holes, measured on center.

NUMBER OF ROWS will be the number of rows of holes created on the material, such as when pickets need to pass through a material it would require two rows of holes.

SPACING BETWEEN ROWS is how far the rows are spaced apart on the material. In the Row Spacing box within the Create Hole String/Grid popup, choose Distance or Degrees regarding how rows are spaced around the circumference of the material. Once the desired values are entered in the text boxes, click OK.



Important

If a mistake is made when adding gridded holes to the part, such as wrong size or spacing, each hole will need to be highlighted and deleted. click REMOVE to delete the highlighted holes and re-enter the correct values.

4.2 Slot & Tab

A unique feature of the Dragon machines is the ability to create Slot and Tab. The Slot and Tab feature makes putting assemblies together for mock-up and welding easier. Slot and Tab also ensures accurate placement of parts when putting assemblies together. Ensuring that Slot and Tab is done properly is key to creating professional assemblies with the Dragon. Slot and Tab can only be created in Dragon CAD.

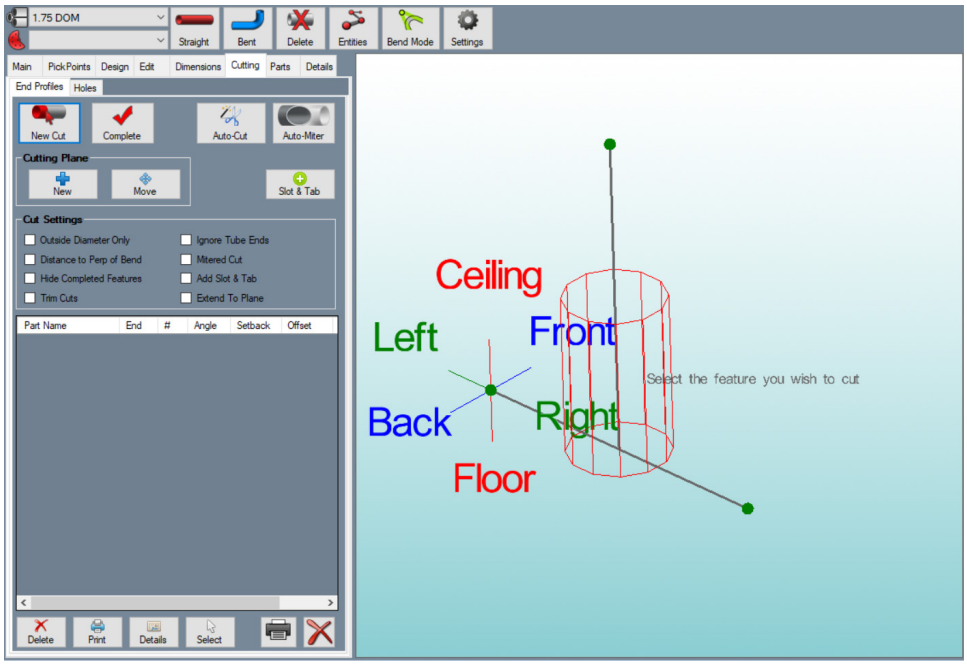
4.2.1 Creating Slot and Tab

1. Open Dragon CAD

Open or design an assembly in Dragon CAD.

2. Create a New Cut

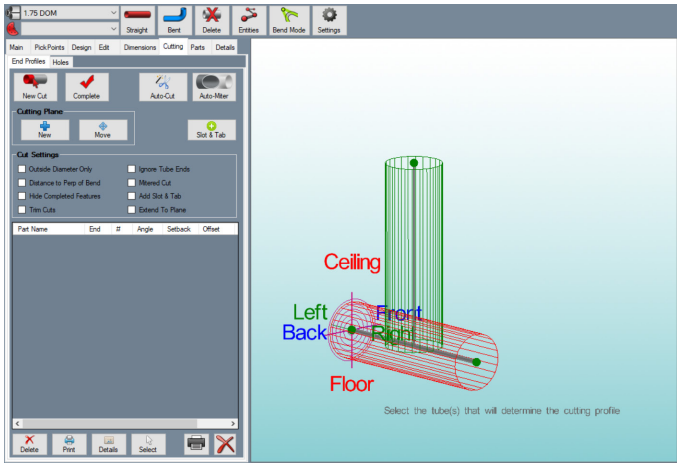
Select the Cutting tab, then click New Cut. The software will prompt the user to select the feature in the 3D interface that is being cut. Click on that part.

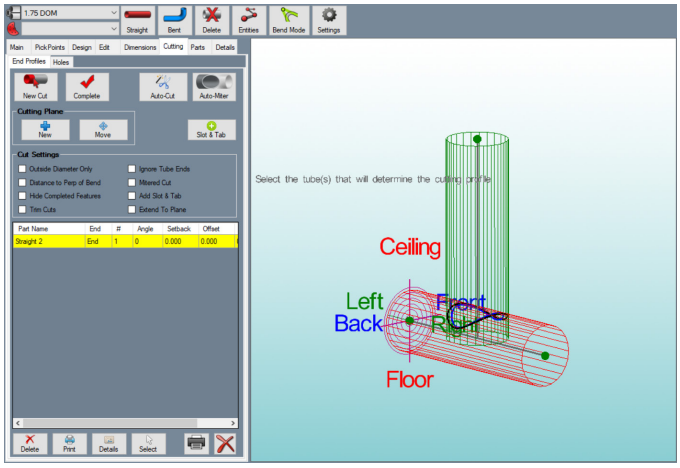


3. Select the Tubes to Slot and Tab

The program will then ask the user to select the tube(s) that will determine the cutting profile. This is the material the New Cut will be profiled to fit. Once the profile tube is selected, click complete.

The interface will now display the cut in the assembly. The software has added a cope to the selected material. The next step is to create a Slot & Tab.

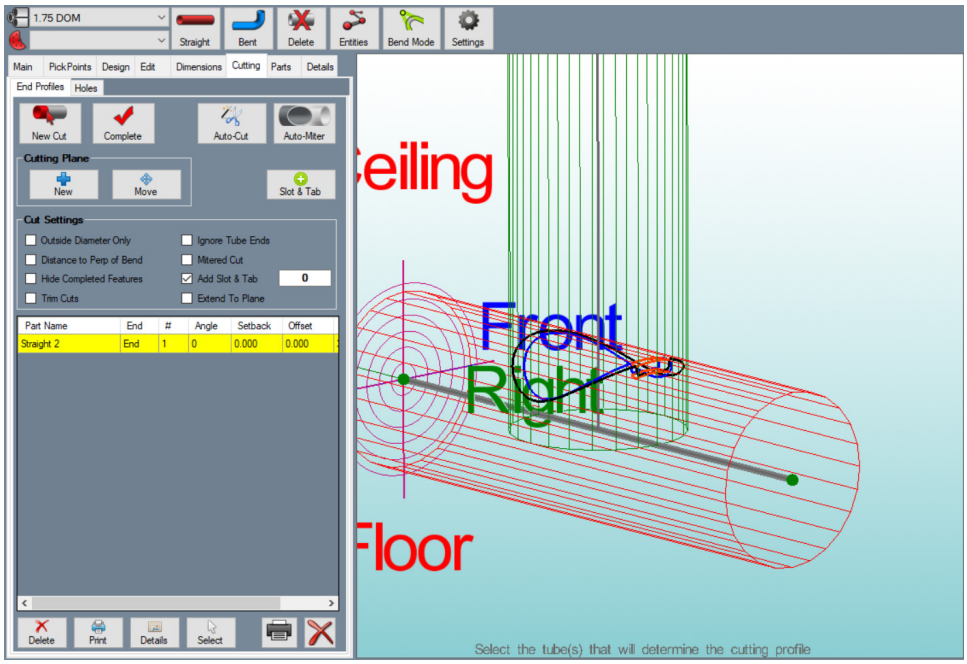




4. Add Slot & Tab

Click Add Slot & Tab from the Cut Settings options and click New Cut. Repeat the procedure of selecting the feature to cut and the tube that will determine the cutting profile. Click Complete.

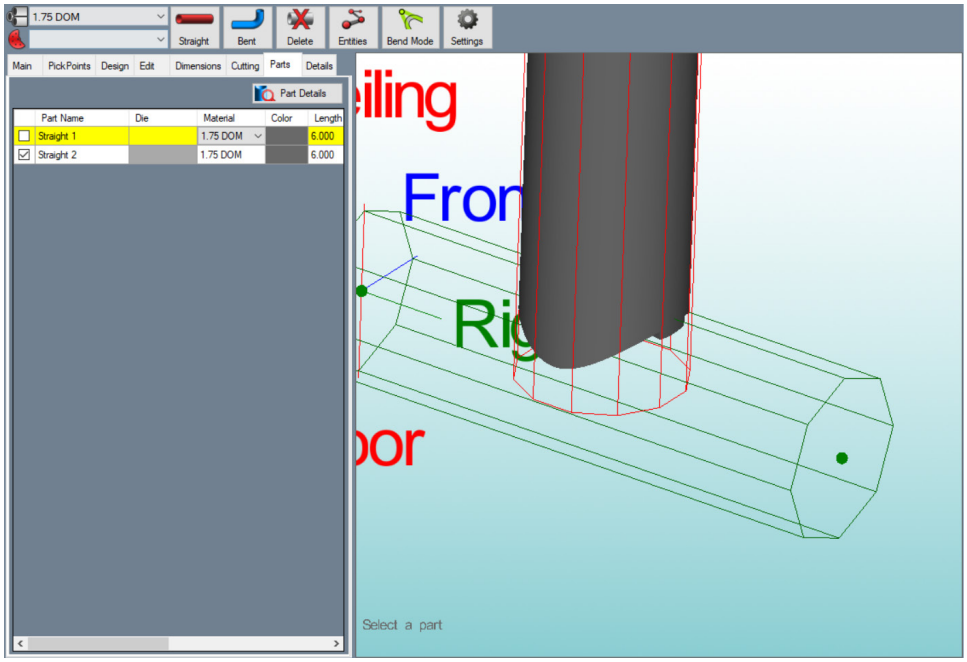
The interface will now display the Slot & Tab.



5. Change the Display

At the top of the interface click Display. This will change the wire frame and line view to a shaded view of the parts, which is easier to see the completed cuts.

Click the Parts tab at the top of the box next to the 3D parts display. The user can check and uncheck the parts, next to the part names to view them individually. When this is done the part can be viewed with the Slot & Tab cuts visible.



5. Moving the Slot & Tab Location

When the Add Slot & Tab in checked under the Cut Settings options, a text box will appear next to Add Slot & Tab with a zero in it. The user can change the value in this text box to move the location of the Slot & Tab around the circumference of the cope. The software automatically places the tab at the bottom of the cope. Changing the value to 90 will move the tab to one of the high sides of the cope. Entering 180 will move the tab to the low side on the opposite side of the cope, and so on.

4.2.2 Changing Slot & Tab Dimensions

The user can change the dimensions of the Slot & Tab assembly to create a closer fit or to increase or reduce the overall size of the Slot & Tab.

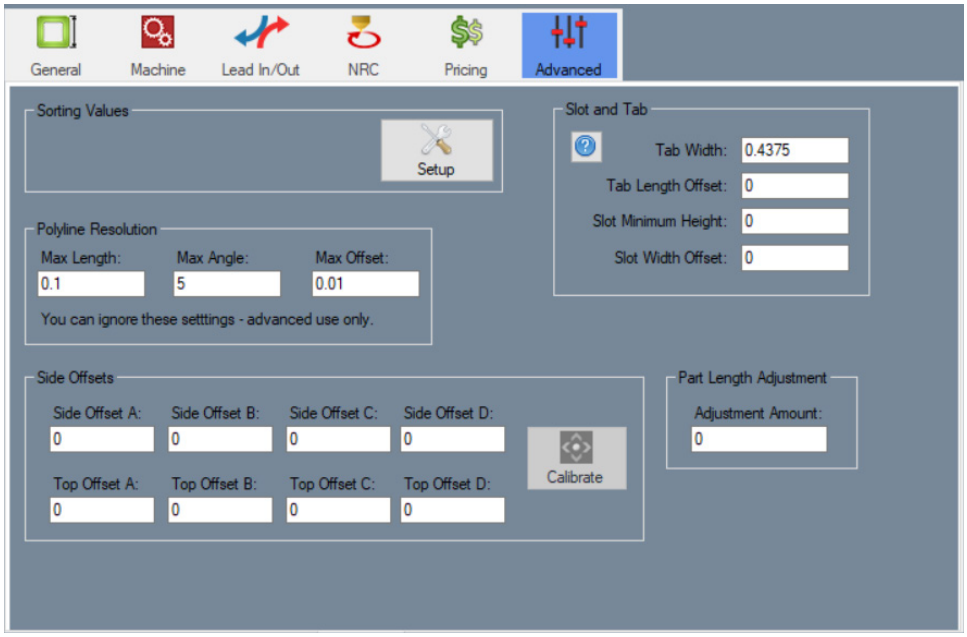
1. Open the Tube / Pipe Library

In the Dragon CAD interface, in the Tools drop down menu, click Tube / Pipe Library. In the Material List choose the material that is being used.

2. Open the Advance Tab

At the top of the screen click the Advanced tab. In the Advanced interface, under the Slot and Tab section, there are four Slot and Tab values.

3. Adjust the Slot & Tab Settings



The TAB WIDTH is the width of the tab that will extend into the slot in the adjoining tube. The default value will be 0.25 inches. The user can leave this value as-is. However, Bend-Tech has found 0.2 inches to be a better value for TAB WIDTH.

Add the Tab Width value to the Kerf Width value and enter the value into the SLOT MINIMUM HEIGHT. If the Tab Width is .2 inches and Kerf Width is .06 inches, the Slot Minimum Height would be .26 inches.

The TAB LENGTH OFFSET value is the overall length of the tab, or how far it extends into the slot. The default value for Tab Length Offset is .25 inches and Bend-Tech has found this to be a good starting point for most applications.

The SLOT WIDTH OFFSET is the amount the slot width will be cut oversize in relation to the Tab. Bend-Tech has found .08 inches to be a good starting value for Slot Width Offset.

4.2.3 Transfer the Slot & Tab Assembly to Dragon CAM

1. Verify that all Parts are Ready for Transfer

On the left hand side of the interface, under the Parts tab, ensure all the parts ready to be processed in the Dragon are checked.

2. Transfer to Dragon CAM

At the top of the interface, click the Transfer drop down menu. Click Dragon CAM.

3. Open Dragon CAM

In the menu bar at the bottom of the computer screen click the Dragon icon. This will open Dragon CAM. Dragon CAM will display a Part Transfer interface showing the parts that were transferred from Dragon CAD.

4. Open the Part Designer

Click the Designer icon at the bottom of the interface. A “Select Machine” interface will open, ensure the desired Dragon machine is selected. Click OK. The parts will appear as a Design Project. The software will create multiple Design Project windows depending on how many parts are being created.

The part with the Slot will display a saddle mark that will be drawn on the material using the Marker tool.

4.3 Adding a Notch

Notches can only be cut on the Dragon A400 machine. Notching a tube is used to fold a square or rectangle tube to a specific, squared-off angle. This process involves programming the Dragon A400 to make a cut in the material that removes parts of three sides of the tube, leaving one side intact as the outside corner of the bend. Notching is helpful when pieces of an assembly are cut and assembled at different locations.

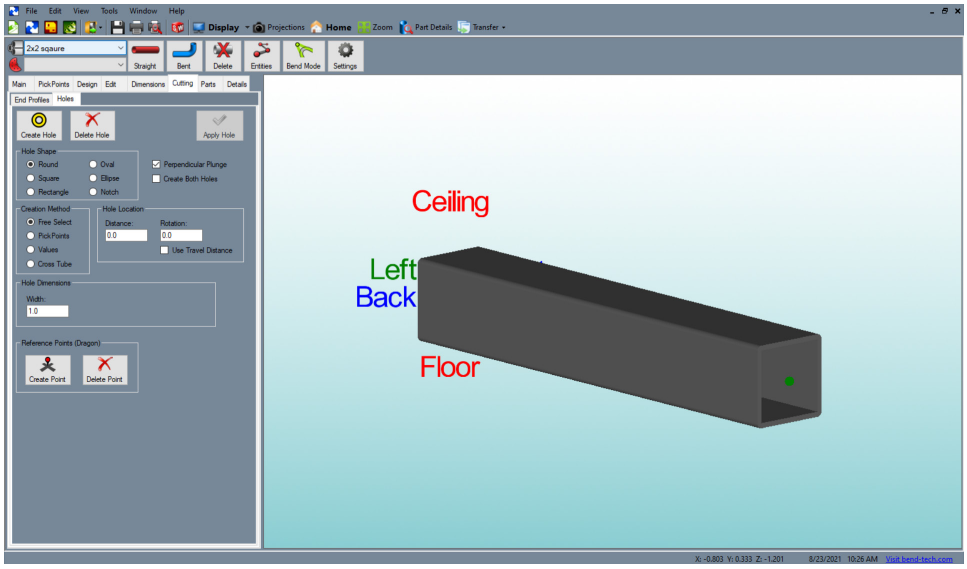
4.3.1 Creating a Notch in Dragon CAD

1. Navigate to the Cutting Tab

With material displayed in Dragon CAD Assembly, click the Cutting tab.

2. Open the Holes Tab

To create a Notch in the Cutting interface, click the Holes tab.



3. Select Notch

In the Hole Shape box select NOTCH. Default notch dimensions will appear in the Notch Dimensions box.

4. Select Create Hole

Select Create Hole. When the cursor is moved over the part display, the software will display a message that reads, “Select the part to create a hole.” Click the part that will receive the notch.

5. Select the Hole Center Point

The software will then display a message that reads “Select the center point of the hole.” Bend-Tech recommends plotting cuts using pick points. Select the pick point that marks the location of the notch.

6. Select the Rotational Direction Point

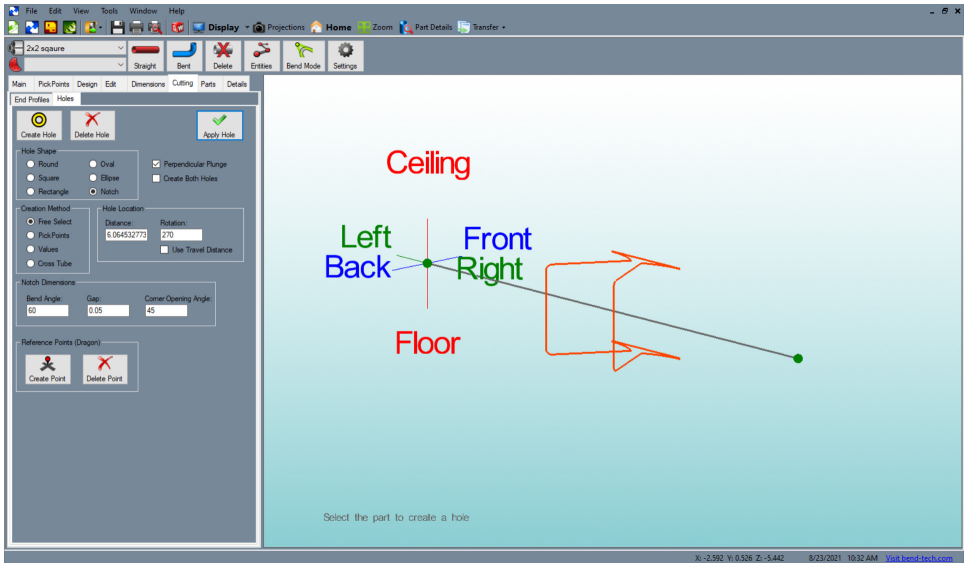
After selecting a location for the Notch, the software will ask the user to “Select the rotational direction point.” Select a pick point in the direction the part will fold when it is bent, or select the pick point where the cut will be placed to set the Rotational Direction Point to default settings.

7. Select the Opening Angle

Next the software will ask the user to select the opening angle of the hole. Click the pick point, then verify the values in the Notch Dimensions box are still correct. Clicking the pick point may change some of the dimensions.

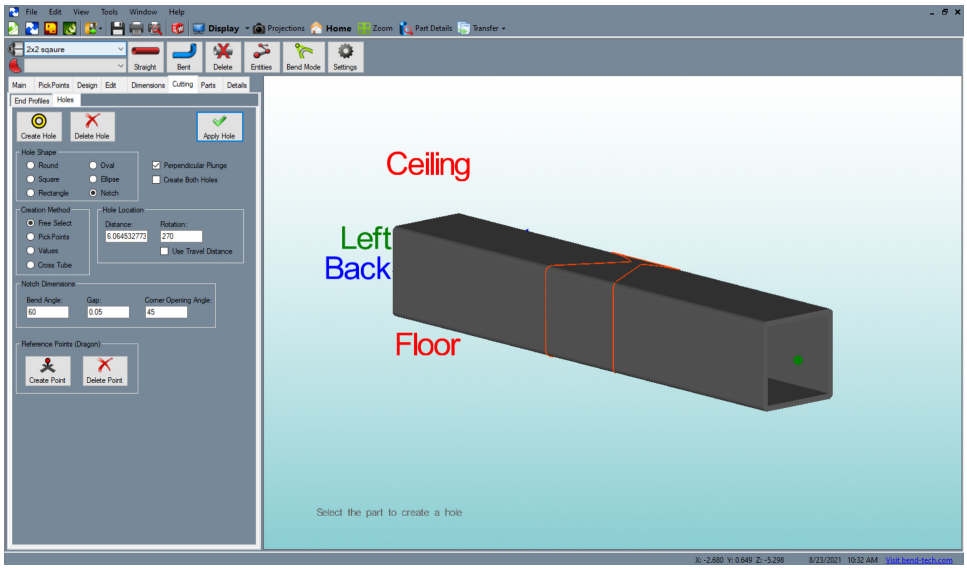
8. Click Apply Hole

At the top of the Holes interface click APPLY HOLE. The Notch will appear in the 3D part interface.

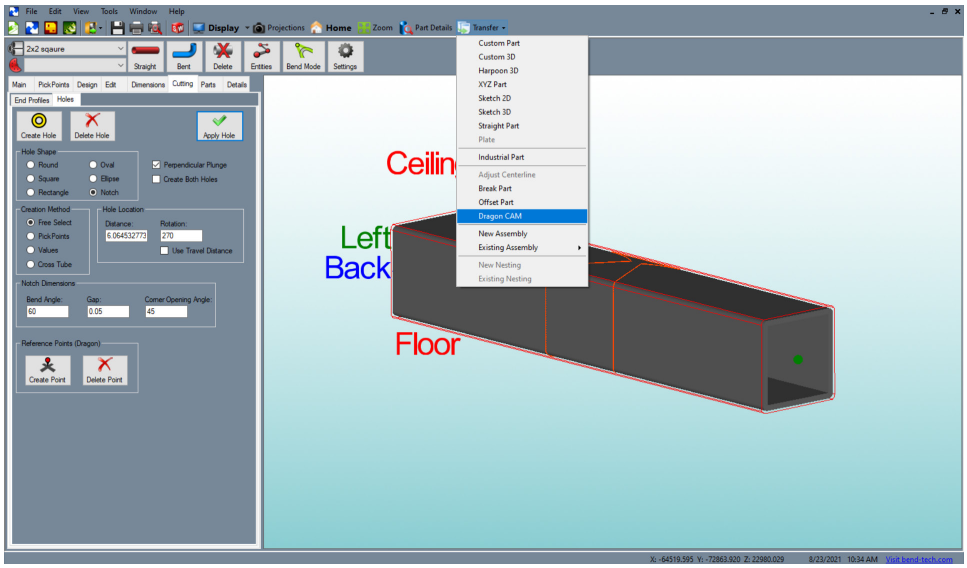


9. Change Display

In the menu at the top of the interface, click Display and select Shaded to see the Notch applied to the material.



4.3.2 Transfer the Notch to Dragon CAM



1. Select the Parts to Transfer

On the left hand side of the interface, under the Parts tab, ensure all the parts ready to be processed in the Dragon A400 are checked.

2. Transfer to CAM

At the top of the interface, click the Transfer drop down menu. Click Dragon CAM.

3. Open Dragon CAM

In the menu bar at the bottom of the computer screen click the Dragon icon. This will open Dragon CAM. Dragon CAM will display a Part Transfer interface showing the parts that were transferred from Dragon CAD.

4. Open the Part Designer

Click the DESIGNER icon at the bottom of the interface. A Select Machine interface will open, ensure the desired Dragon machine is selected. Click OK.

The parts will appear as a Design Project. The software will create multiple Design Project windows depending on how many parts are being created.

5. Ensure the Notch Converted Correctly

Ensure the Notch appears correctly in the interface. Due to the close proximity of the cuts at the corners of the Notch, the software will sometimes choose a different cutting path. If this happens, navigate to the Edit Tab located under the Actions Tab, then click the Edit Cuts icon. Click on the cut in the part display to select the cut, then reduce the KERF OFFSET ADJUST. Click Apply Settings. Typically, reducing the Kerf Offset Adjust will alter the cut path enough to correct the cut. Alter the setting .01 at a time until the cut appears properly on the material display.

4.3.3 Adding a Diamond Tab

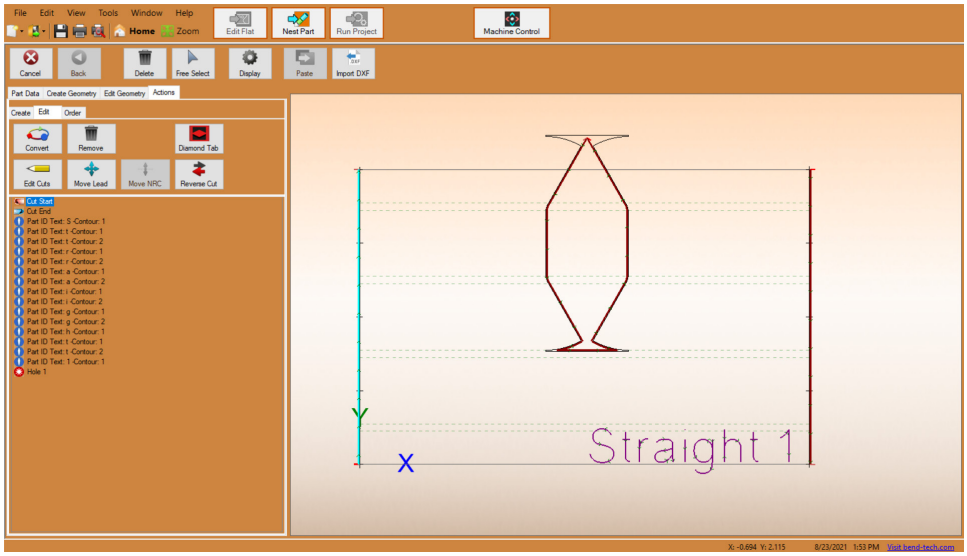
Cutting a notch removes material on three of four sides of the material. If the operator requires the material to retain its structural integrity, the user can add a Diamond Tab to the Notch. The Diamond Tab helps the material keep its rigidity and can be easily broken away when it comes time to bend the material.

1. Transfer the Notched Part to Dragon CAM

Transfer the part to Dragon CAM. Open the part by clicking the Designer tab. This will open the part in Edit Flat.

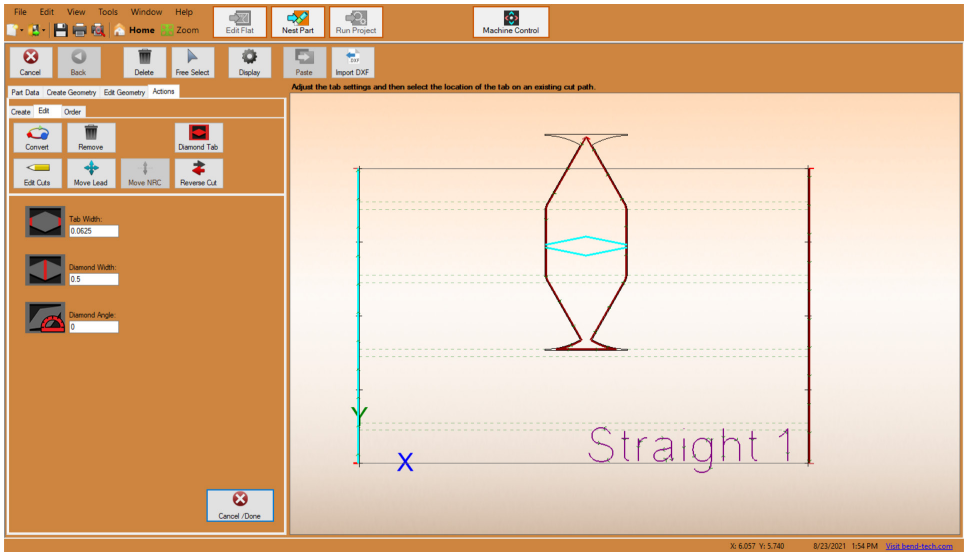
2. Navigate to the Edit Tab under Actions

Navigate to the Actions tab. Click the Edit tab, then click the Diamond Tab icon.



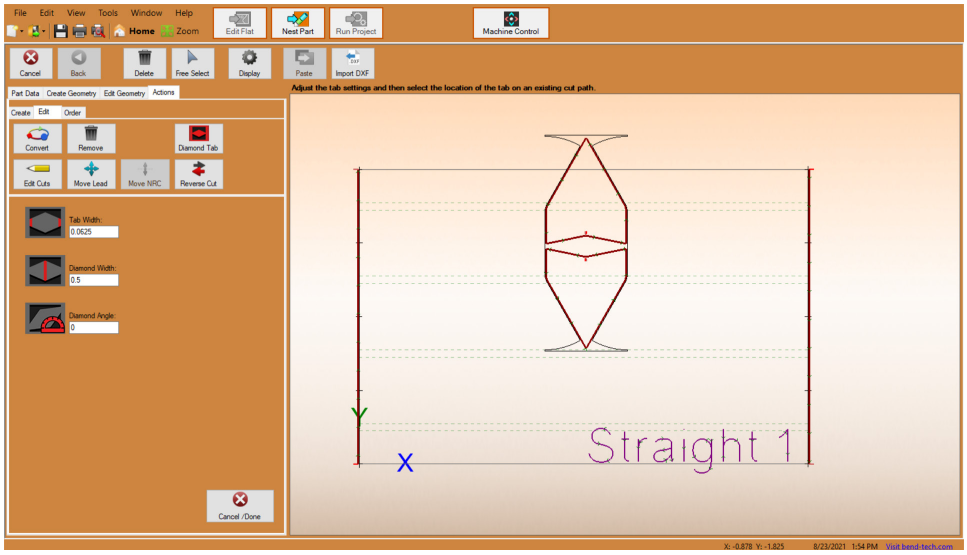
3. Add a Diamond Tab

Mouse over the part in the Edit Flat display. A Diamond Tab shape will appear. Move the mouse cursor to move the Diamond Tab into the desired position. Once in position, left click the mouse to place the Diamond Tab on the part. The Diamond Tab will split the cut into two separate cuts.



4. Adjust Dimensions of the Diamond Tab

With Diamond Tab chosen, the User can change the dimensions of the Diamond Tab, including Tab Width, Diamond Width, and Diamond Angle, to suit the project needs.



05 Miscellaneous Tutorials

5.1 Dry Running a Project

Dry running a job on the Dragon ensures the machine will perform all operations as programmed. This is helpful when initiating a new job, or when performing new operations. Ensuring the program will run as intended saves material and time.

1. Open a Nested Project

With the project open as a Nesting Project, locate the Project Settings under the Setup Tab.

2. Disable Ok to Move

In the Project Settings box, ensure the box next to Disable ‘OK to Move’ is checked. This will allow the machine to operate without the Torch achieving arc.

Ensure the Plasma Unit is turned off.

3. Run Project

At the top of the interface, click the RUN PROJECT icon. The Machine Control interface will open.

4. Home the Machine

If the machine is not Homed, click HOME ALL AXIS.

5. Click Start

Once the machine is Homed, click START. The Dragon will perform all operations in the Nest Project.

When the program is complete, if there are more pieces to cut in the Nesting Project, the Machine Control interface will show a green Complete light in the Status box. If the Nesting Project is complete and there are no more parts programmed to cut, the green Complete light will not appear. The machine is done with the program. If the Complete box is lit, click Run and the machine will continue running the Nesting Project.

If the Complete box is lit, click START to set up the next stock length, and then press START again to initiate the second stock length.The machine will continue running the Nesting Project.

5.2 Using the Flip Feature

When any length of material is loaded into the Dragon machine, that piece of material will have approximately 13-inches of drop or deadzone, material the machine will not be able to process since it lies between the Toolhead and the Chuck. However, the Flip Feature can be used to make use of the deadzone material. It requires programming the Nesting Project to include a material flip, where the material is removed from the machine, flipped end-for-end, and then re-chucked.

Important

To perform the Flip the part must extend more than halfway into the dead zone area when nested on the material.

1. Open or Start a Nesting Project

Load a part into the Nesting Project. The part will need to extend into the deadzone more then halfway.

2. Activate Pause Before Reposition

Navigate to the Setup Tab. At the bottom of the Setup interface, check the “Pause Before Reposition” box.

3. Add the Part to the Material

Next, navigate to the Parts Tab. Double click on the part to add it to the material.

Note

The software will recognize the part is too long to fit on the material and will not allow the operator to add the part to the stick using the green or blue "+" icon.

4. Mark or Engrave Shift 1

When the part is added to the stick, the software will automatically apply a "Shift 1" mark to the part. Program the machine to either Mark or Engrave the "Shift 1" mark.

5. Cutting the Part

When the machine reaches the "Shift 1" actions, it will pause while the operator repositions the material. This requires removing the material, flipping it, and chucking it back into the machine. Line the shift mark up with the Laser Light. Once this is complete, the job can be restarted.

5.2.1 Important Features

Material Cut To Length

If the material is already cut to the required length and end cuts are not necessary, the operator will be required to remove end cuts in Edit Flat. If material is pre-cut to the specified length and end cuts are not removed the software will display an "Export Failed" popup window.

Chuck Settings

When performing a Flip, "Pass Through" cannot be chosen as an option in Chuck Settings.

Start Cuts

If there are cuts with extreme angles, or cuts that will make the material difficult to fit into the Chuck, those should be programmed to take place after the Flip. Nest the end with the cut so it is placed in the Chuck at the start of the procedure.

If the material will be cut into two separate parts, ensure the smaller part is cut first, leaving a longer part in the machine.

06 Calibration

6.1 Calibration Overview

The Dragon is delivered to the customer from the Bend-Tech manufacturing facility fully calibrated. While the machine is delivered pre-calibrated, it is possible for the machine to lose calibration over time, or lose calibration due to servicing such as changing a tool or part. The purpose of this guide is to assist the Customer in understanding the calibration process of the Dragon.

6.1.1 Calibration Points

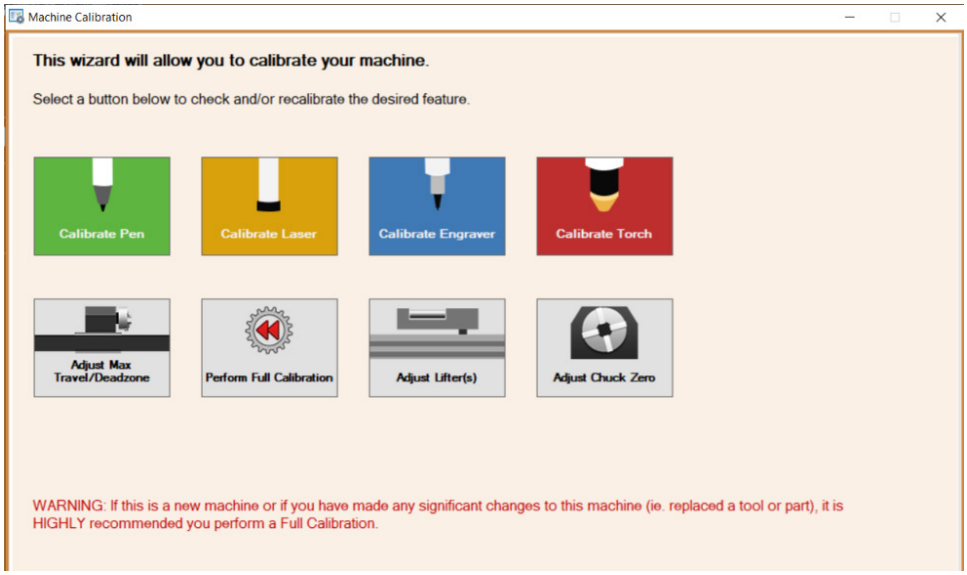
The Dragon uses calibration points as references in its operation procedures. There are seven different calibration points in regard to Dragon A400 operation and five calibration points for the Dragon A250:

- Adjust Max Travel / Deadzone
- Adjust Chuck Zero
- Adjust Lifter (Dragon A400)
- Marker
- Engraver (Dragon A400)
- Torch
- Laser Light
- Powered Gate (Dragon A400)

Each of these can be calibrated individually or a full calibration can be performed to calibrate the entire machine.

6.2 Dragon Calibration Wizard

Open the Machine Library. Select ‘Dragon’ or the specific machine that needs to be calibrated. Click the Wizard icon. The Dragon Calibration Wizard will display options to calibrate individual values in the machine, or the operator can choose ‘Perform Full Calibration’.



Each calibration option is similar to each other. They all come with detailed on-screen instructions. Since a new machine is pre-caibrated at the Bend-Tech Factory, a full calibration is not needed, however, both the Torch and the Marker/Pen will need to be calibrated after the machine is assembled.

6.3 Torch Calibration

1. Power on the Dragon

Ensure the Dragon is powered on as instructed by the wizard.

2. Start Mach3

When prompted, click START MACH to start Mach3.

3. Computer Setup

Determine a left side and a right side of the machine based on where the computer is placed. Use the images provided as a reference.

Select which side of the machine the computer is placed on. Click NEXT.

4. Jog the Trolley

Jog the Trolley so that is is near the Tail of the machine. This will save time when homing in the next step. Click NEXT after the Trolley is in position.

! Caution !

Avoid moving the Trolley past the homing switch on the Rail. Damage to the Trolley, homing switch and Rail could occur.

5. Home the Dragon

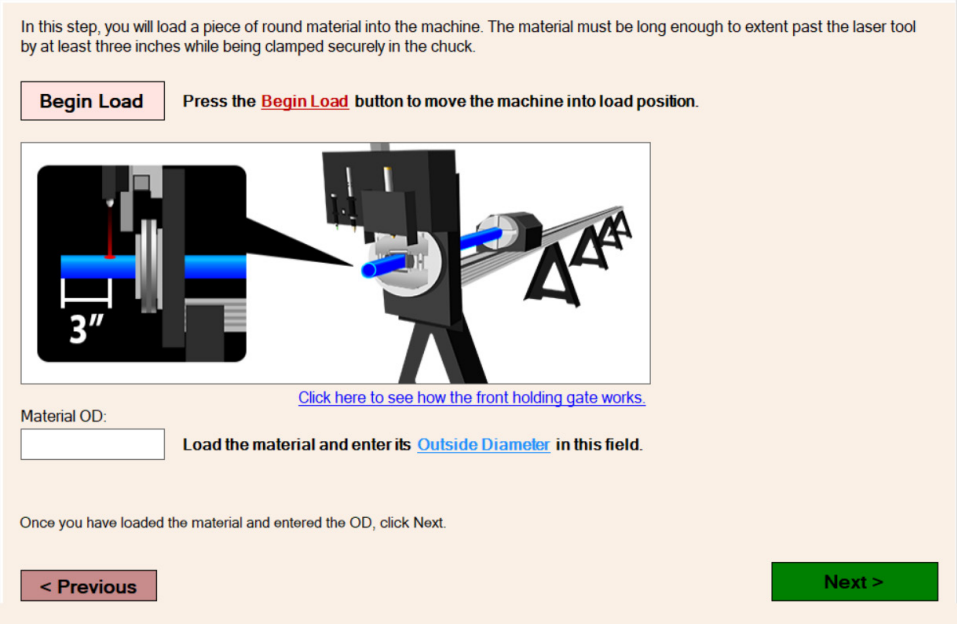
Click the image to begin the homing process. While the Dragon is homing, a warning will appear on the screen stating that the “Machine is currently homing, please wait.” Once the warning disappears, click NEXT.

6. Select the Calibration Material

Select ROUND or SQUARE for the calibration material. Ensure that the stock length is long enough to secure in the Chuck and extend past the Laser Light. Click NEXT.

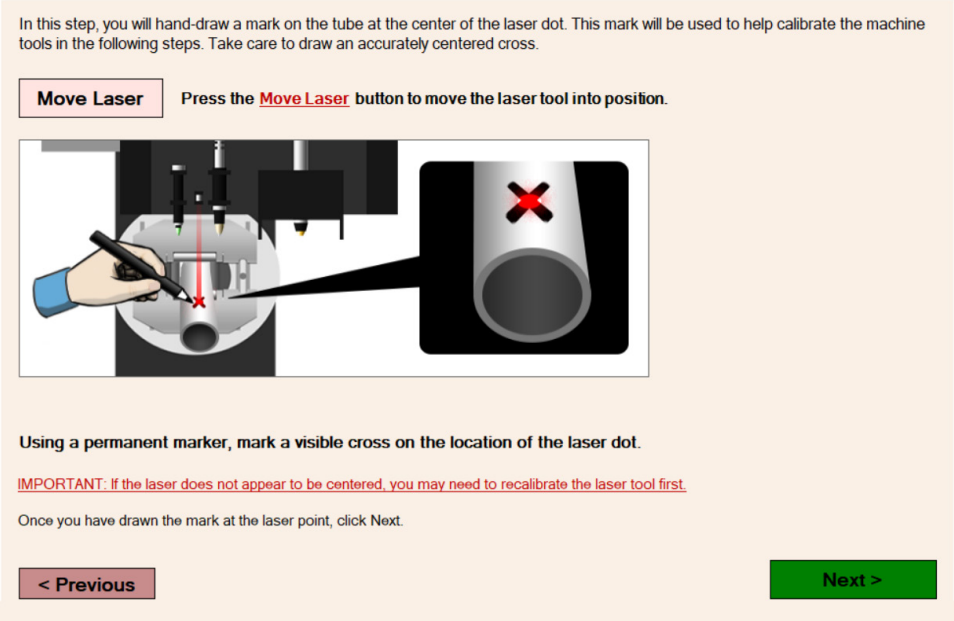
7. Load the Material

Click BEGIN LOAD. This will move the Dragon into Load Position. Enter the outside diameter (OD) of the calibration material into the text box. After loading the material, click NEXT.



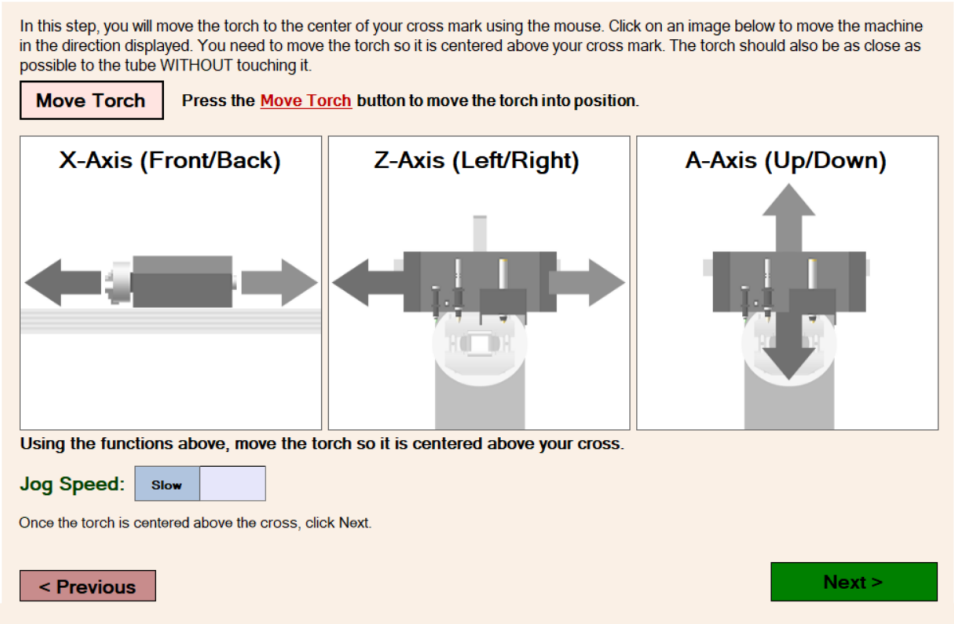
8. Mark the Laser Light Location

Click MOVE LASER to move the Laser Light into position. Next, mark the Laser Light location with a marker. Click NEXT, after marking the Laser Light position.



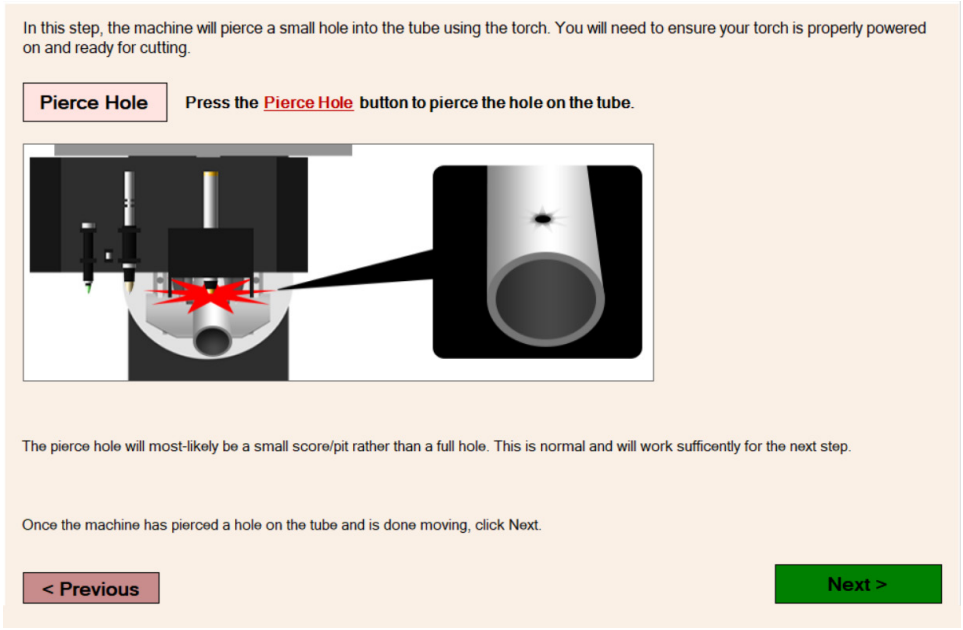
9. Position the Torch

Click MOVE TORCH. Use the positional buttons to position the Torch centered over the mark made in the previous step. Click NEXT.



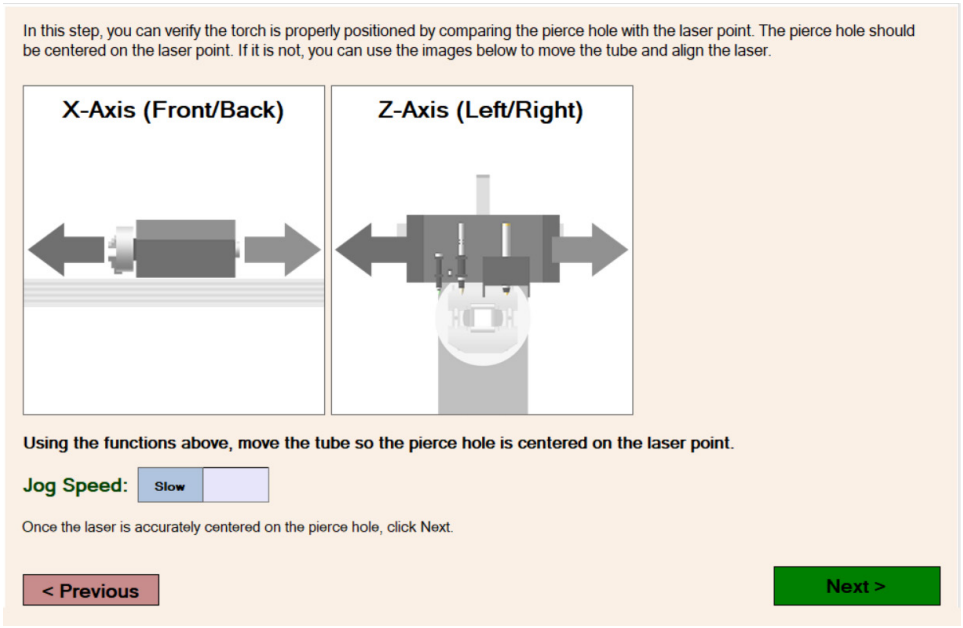
10. Pierce a Hole

Click PIERCE HOLE. A warning will appear, click OK. The Dragon will pierce a hole. Click NEXT after the Dragon is finished moving.



11. Verify Positions

Verify the pierce hole is centered over the Laser Light. Use the positional buttons to adjust the position as needed. Click NEXT.



12. Calibration Complete

Click DONE or close out of the Calibration Wizard to complete the Torch Calibration.

6.4 Marker/Pen Calibration

1. Power on the Dragon
Ensure the Dragon is powered on as instructed by the wizard.

2. Start Mach3
When prompted, click START MACH to start Mach3.

3. Computer Setup
Determine a left side and a right side of the machine based on where the computer is placed. Use the images provided as a reference.

Select which side of the machine the computer is placed on. Click NEXT.

4. Jog the Trolley
Jog the Trolley so that is is near the Tail of the machine. This will save time when homing in the next step. Click NEXT after the Trolley is in position.

! Caution !

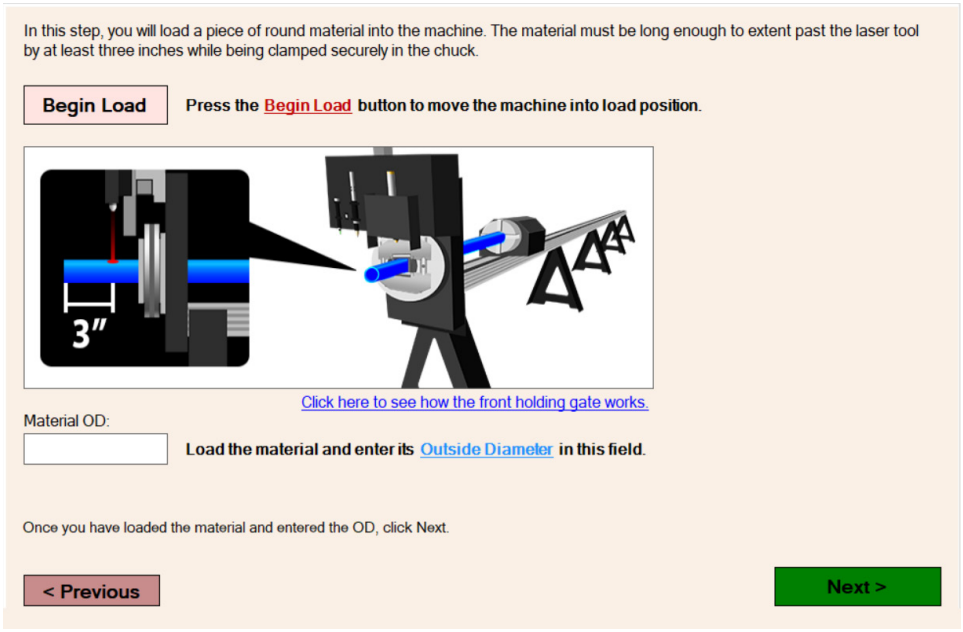
Avoid moving the Trolley past the homing switch on the Rail. Damage to the Trolley, homing switch and Rail could occur.

5. Home the Dragon
Click the image to begin the homing process. While the Dragon is homing, a warning will appear on the screen stating that the “Machine is currently homing, please wait.” Once the warning disappears, click NEXT.

6. Select the Calibration Material
Select ROUND or SQUARE for the calibration material. Ensure that the stock length is long enough to secure in the Chuck and extend past the Laser Light. Click NEXT.

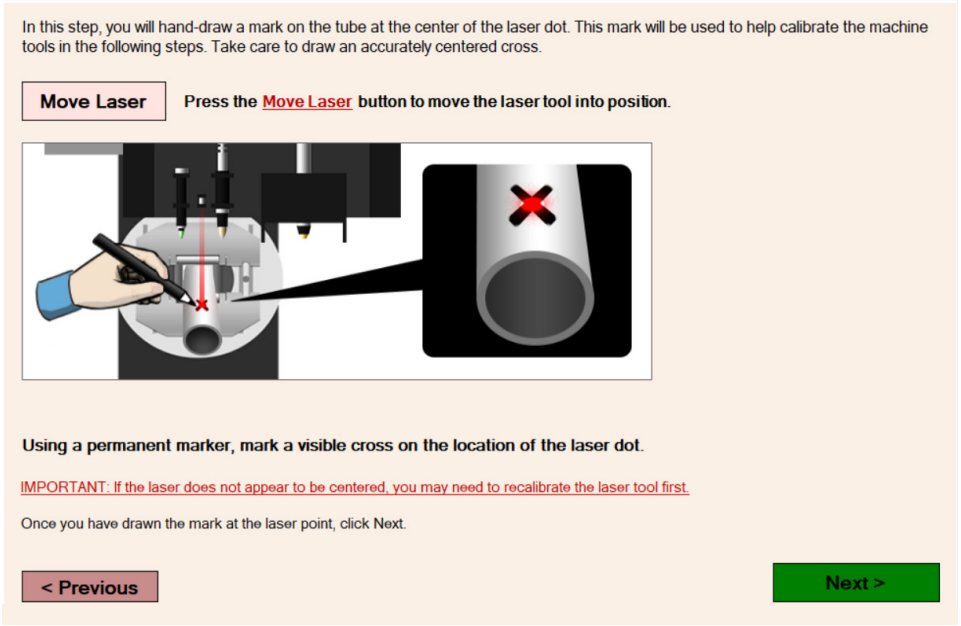
7. Load the Material

Click BEGIN LOAD. This will move the Dragon in to Load Position. Enter the outside diameter (OD) of the calibration material into the text box. After loading the material, click NEXT.



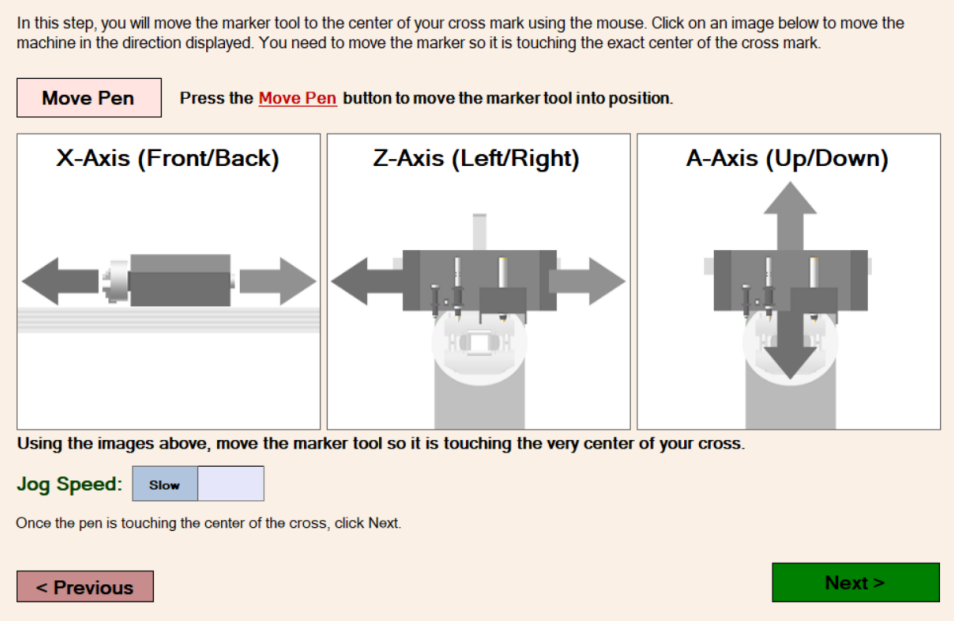
8. Mark the Laser Light Location

Click MOVE LASER to move the Laser Light into position. Next, mark the Laser Light location with a marker. Click NEXT, after marking the Laser Light position.



9. Position the Marker

Click MOVE PEN. Use the positional buttons to position the Marker centered over the mark made in the previous step. Click NEXT.



10. Calibration Complete

Click DONE or close out of the Calibration Wizard to complete the Marker/Pen Calibration.

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