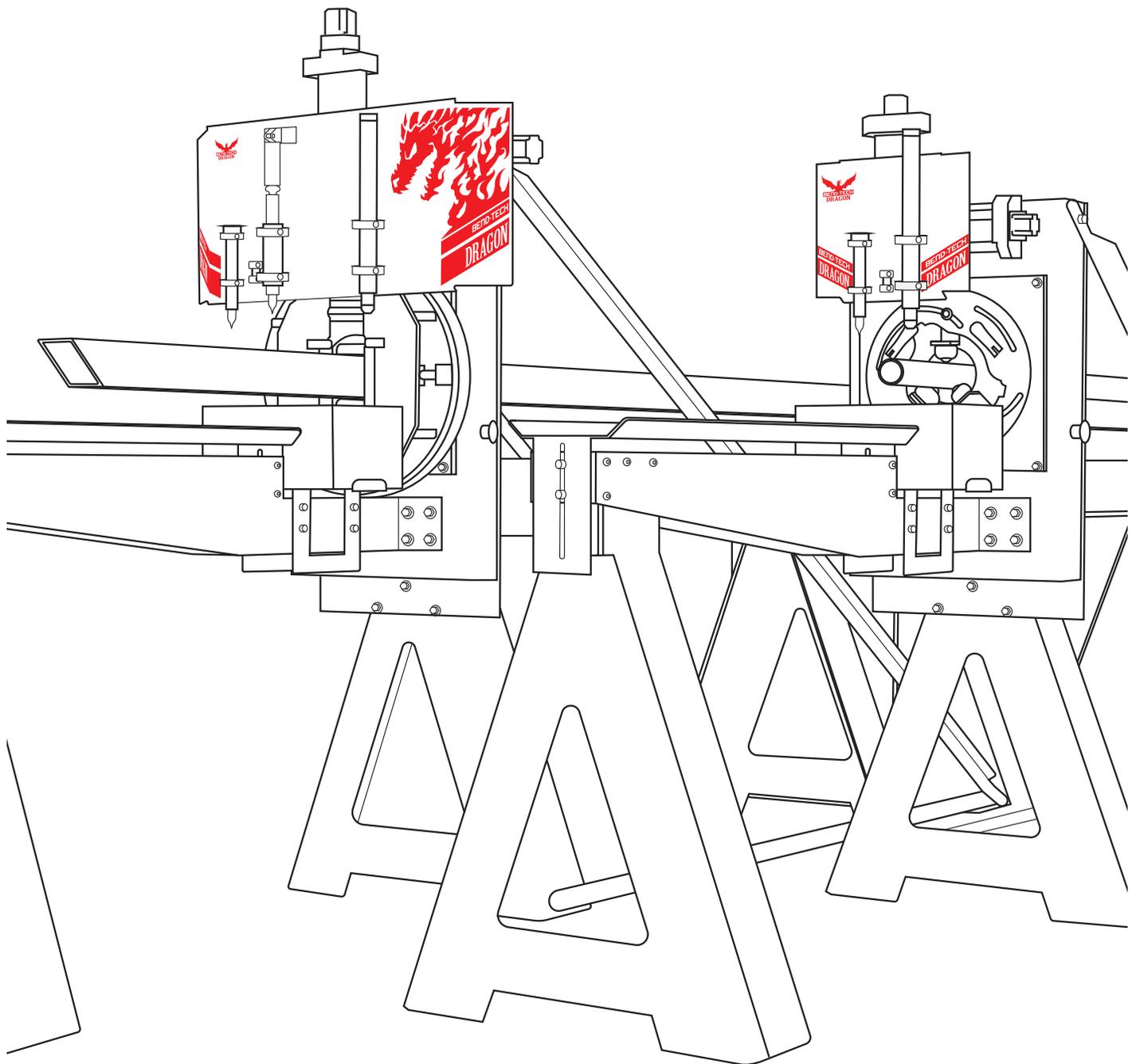


BEND-TECH **DRAGON MACHINES**

Dragon CAM Operator's Manual **Part 1: Libraries, Settings, Backup & Restore**



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Dragon Machines

Operator's Manual
Revision 004

English
Original Instructions

October 2021

Bend-Tech LLC
729 Prospect Ave.
Osceola, WI 54020 USA

(651) 257-8715
www.bend-tech.com
support@bend-tech.com

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Limited Warranty

Covering Bend-Tech Dragon

Bend-Tech LLC provides a limited warranty on all new Dragon machines that are manufactured directly or under license by Bend-Tech LLC, and sold by Bend-Tech LLC or its approved distributors.

Warranty Coverage

Each Bend-Tech Dragon machine is warranted by the manufacturer against defects in material workmanship for 12-months. The warranty period commences upon delivery of the Dragon machine to the customer's facility.

Repair or Replacement Only

The Manufacturer's sole liability, and the Customer's exclusive remedy under this warranty shall be limited to repairing or replacing the defective part. Repair or replacement of parts is at the sole discretion of the manufacturer. The Customer is responsible for warranty parts installation. Bend-Tech does not provide warranty service labor.

Limits

This warranty does not cover components subject to wear due to normal use of the machine such as belts, lights, tooling etc. This warranty is void if Bend-Tech LLC has determined any failure is the result of mishandling, abuse, misuse, improper installation, improper storage, improper maintenance or unauthorized modification of the machine. The warranty does not cover damage due to natural disasters, fire, flood or other external factors. The warranty may become void or limited in the event that hardware changes or adaptations are made to the machine.

Software

The standard 2-year software maintenance plan is included with the purchase of a Dragon. Before the 2-year maintenance plan has expired, the customer may purchase an extended maintenance plan. The maintenance plan and extended maintenance plans will ensure the customer always has the newest version of Dragon Software. The maintenance plan is critical to keeping Dragon software updated with the newest capabilities possible, and is critical to the servicing of the machine. Bend-Tech LLC will contact the Customer regarding updates to the maintenance plan within 1-month of expiration. Contact Bend-Tech Support to ensure software is up to date: support@bend-tech.com.

Customer Satisfaction Commitment

Congratulations on your purchase of the world's best CNC plasma tube and pipe cutting machine, the Bend-Tech Dragon. Bend-Tech LLC places great pride in customer satisfaction and it is our promise to offer you the best support available for your Dragon. We recognize that our support is a key factor in your success.

Contact Us

Bend-Tech's hours of operation are Monday - Friday, 8:00 am - 5:00 pm EST. The Bend-Tech support team and sales team are always available during our hours of operation.

Phone: 651-257-8715

Email: Sales team: sales@bend-tech.com
Support team: support@bend-tech.com

Address: Bend-Tech, 729 Prospect Ave., Osceola, WI 54020, U.S.A..

Customer Service

Comments, questions, or concerns regarding the Dragon Machine, this manual, or the Bend-Tech Software can be directed to Bend-Tech sales and service representatives at the above contact information. Check out the following links for more information regarding Dragon Machines and Bend-Tech Software.

Website, Socials, and Online Resources

- <http://www.bend-tech.com>
- <https://www.facebook.com/2020ssi>
- https://www.instagram.com/bend_tech
- <https://www.youtube.com/bendtech2020>
- <http://www.bend-tech.com/wiki7>

Alerts

Bend-Tech manuals use specific callouts to highlight important information. Each style of callout pertains to specific types of information being given. The machine operator should familiarize themselves with the following definitions and examples of each type.

Definitions & Examples

Danger

! Danger !



Danger indicates a serious condition that could cause severe injury or death to the operator or bystanders if the instructions are not followed.

Warning

! Warning !



A Warning indicates there is a possibility for minor injury if the instructions are not followed correctly.

Caution

! Caution !



Caution warns the operator that minor injury or machine damage could occur if instructions are not followed. It could also mean that not following directions could affect the overall procedure being performed.

Important Alerts

Important

Important notes give clarification or focuses on information that is critical or unique to an operation.

Notes and Tips

Note or Tip

Notes and tips give additional helpful information for operating the Dragon machine or Dragon software. They are meant for supplemental information and not information that is critical for operating procedures.

Glossary

Axis

A fixed reference line.

Beak

The front assembly that includes the Parts Catcher and Parts Bin/Bucket. The Material Coolant System replaces most of the Beak when installed.

CAD

Computer Aided Design. Modeling or design software for creating parts, components, or whole assemblies. Used for manufacturing or similar industries. Can be 2D or 3D design.

CAM

Computer Aided Manufacturing or Machining. Using the computer to assist in operating machines by converting CAD models into G-Code that the machine recognizes.

Chuck

Secures and rotates the material. Part of the Trolley. Also referred to as the Y-Axis.

Control Box

Contains the motor drivers and other electrical components that allows the Dragon CAM software to control the Dragon machines.

Deadzone

The space between the Chuck and the Laser Light position when the Chuck is all the way forward.

Emergency Stop

Abbreviated E-STOP. A button which shuts down machine operations. Four are located on the machine and one is part of Machine Control.

Gate

The adjustable mechanism that holds the material in place at the Head of the Machine.

Head

The machine assembly that makes up the front end of the machine.

Limit Switch

The switch that operates as an automatic control to prevent a mechanism or process from going beyond a prescribed limit.

Load Position

The position the machine enters after clicking START on machine control the first time after starting a cutting project. This allows the operator to more easily load the designated material into the machine.

Mach3

The driving software behind Machine Control. Required for the machine to operate.

Machine Control

The computer interface that controls the machine operations. Used by the operator when running projects.

Material Coolant System

The system that transports coolant through the material during cutting operations.

Material Support Lift

The mechanism that supports the material during cutting. Sometimes referred to as the Lifter.

Parts Catcher

The Parts Catcher is placed at the front of the machine to catch parts as they are cut.

Support Beam

Forms the backbone of the machine. Comprised of Aluminum Beams and Steel Rails.

Tail

The machine assembly that makes up the far end of the machine.

Glossary

Task Menu

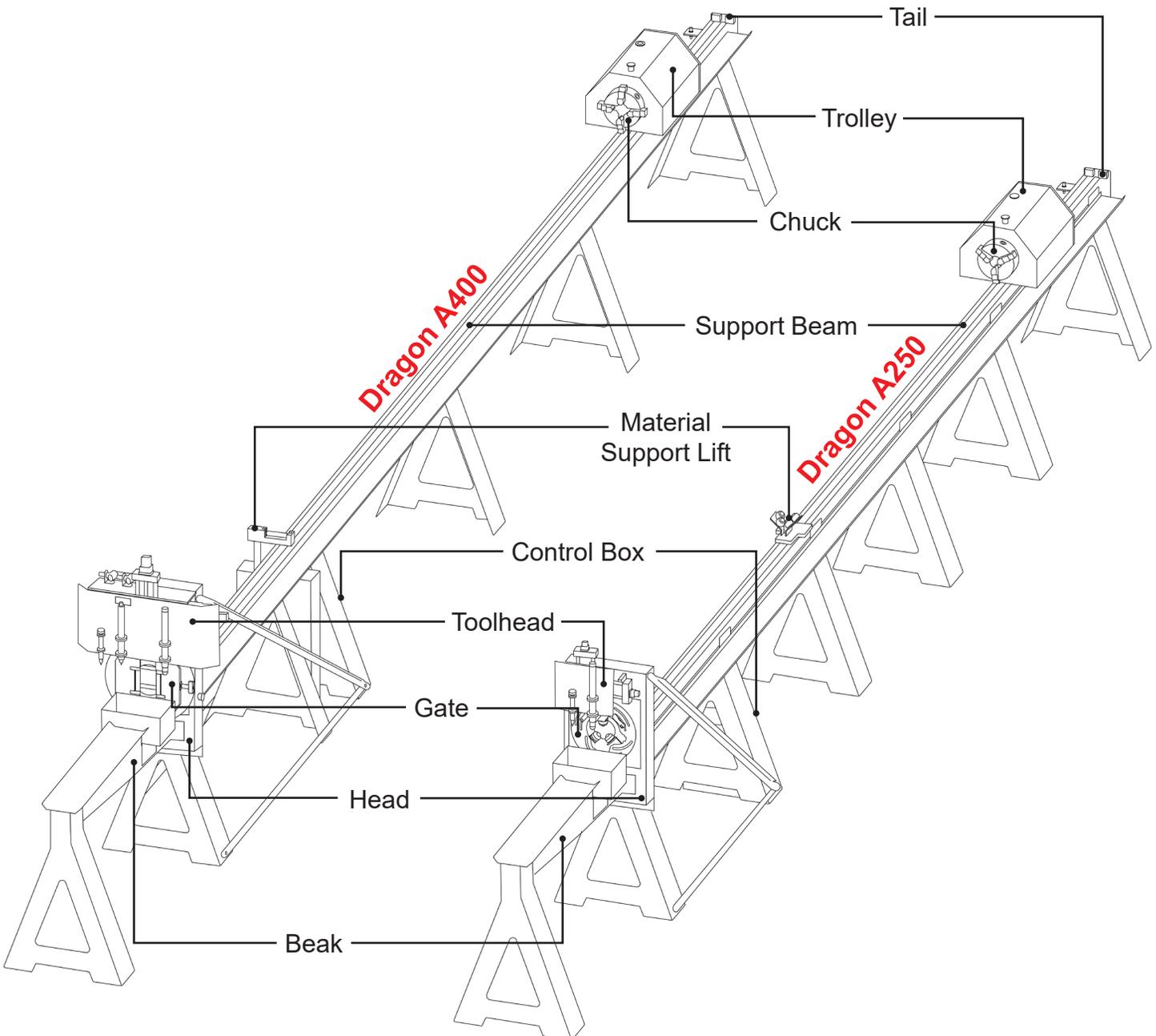
The first menu that opens upon starting the Dragon Software or the Bend-Tech software. From this menu various tasks can be started, such as part designing, importing, library access, etc.

Toolhead

The machine component that the tools are attached too. Maneuvers the tools into position with the A and Z axes.

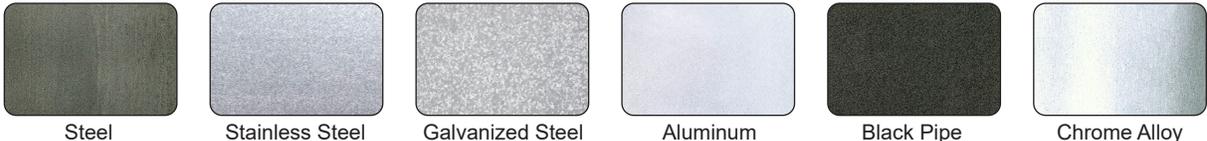
Trolley

The machine component that includes the Chuck. Travels along the Support Beam on the X-Axis.



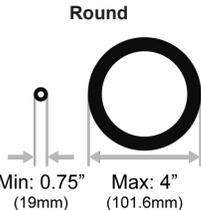
Machine Capabilities

Material Types

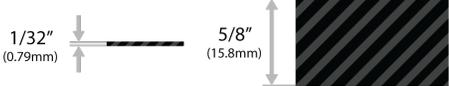


Dragon A250

Material Size



Material Thickness

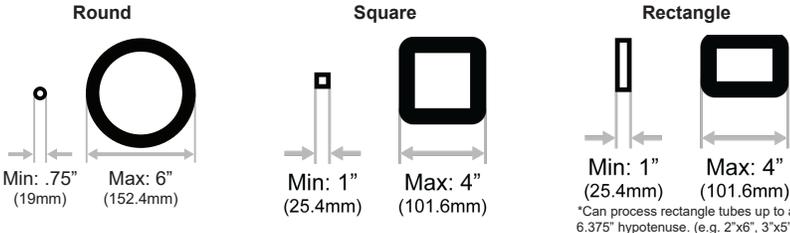


Max Material Weight



Dragon A400

Material Size



Material Thickness

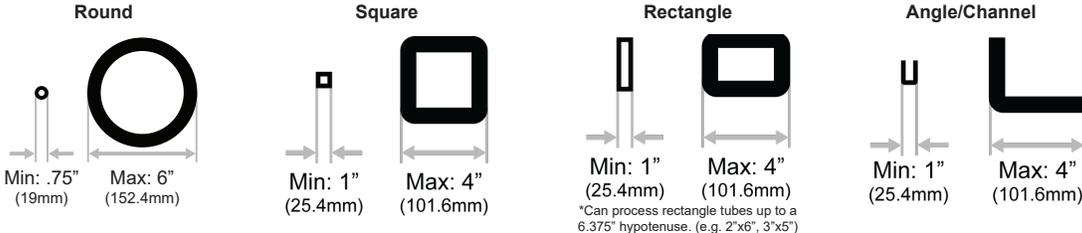


Max Material Weight



Dragon A400 with Powered Gate

Material Size



Material Thickness



Max Material Weight



Machine Capabilities

Machine Library

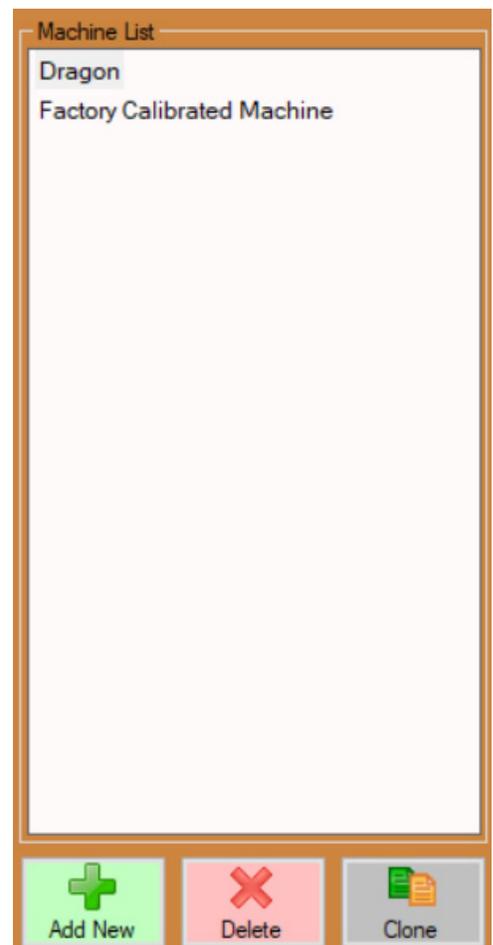
1.1 Machine List

The Machine List contains all machines that have been added to the software. New machine packages will have two machines listed. The first is the 'Factory Calibrated Machine'. This machine is a backup that can be cloned in the event the machine settings of another machine are corrupted. The 'Factory Calibrated Machine' cannot be deleted or altered. The second machine listed is the default 'Dragon' which is created during the initial calibration at the Bend-Tech facility.

1.1.1 Machine List Actions

From the Machine List dragon machines can be added, deleted, or cloned. Click ADD NEW to add a new machine record. To delete a machine, select the machine and click the DELETE button.

Use the CLONE button to clone a previous machine. To do this, select the machine to clone first and then click the CLONE button. Remember to rename the new machine to differentiate it from the cloned machine.



1.2 Main Tab

The Main workspace of the Machine Library includes basic information regarding the selected Dragon Machine. This includes the name and model of the machine, unit of measure used with the machine, material capabilities, material support lift options, and miscellaneous options. The Machine Calibration Wizard is also accessed from the Main tab.

The screenshot displays the Machine Library Main workspace with the following elements:

- Machine Name:** A text input field containing "Dragon".
- Model:** A dropdown menu showing "Dragon A400 (24 foot)".
- Unit of Measure:** A dropdown menu showing "Inch".
- Tubing Capability:** A section with two columns of options, each with a checkbox and a corresponding icon:
 - Round (checked)
 - Square (checked)
 - Rectangle (checked)
 - L-Channel (checked)
 - U-Channel (checked)
 - Flat/Bar (unchecked)
- Optional Features:** A section with two options, each with a checkbox:
 - Has Material Lifter (checked)
 - Has Powered Gate (unchecked)
- Wizard:** A button with a wizard icon and the text "Wizard", located in a box with the instruction "Use the wizard to properly calibrate your machine."

1.2.1 Machine Name

The name of the selected machine will appear in the MACHINE NAME text box. When adding a new machine or cloning a machine, edit the name to differentiate machines apart.

1.2.2 Model Options

Verify the correct Dragon model is chosen from the MODEL drop down menu.

1.2.3 Unit of Measure

Verify the UNIT OF MEASURE is correct for the given shop.

1.2.4 Tubing Capability Options

TUBING CAPABILITY lists the types of tube profiles that the Dragon machine can handle. Machine capabilities differ depending on the Dragon model. If a certain material capability is not available, contact sales@bend-tech.com for upgrade options.

Dragon Model	Tube Capabilities
Dragon A400 Non-Powered Gate	Round, Square, Rectangle profile material
Dragon A400 Powered Gate	Round, Square, Rectangle, Angle, and Channel profile material
Dragon A250	Round profile material only

Important

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

1.2.5 Optional Features

The Dragon A400 has several optional features available that the Dragon A250 does not have.

The Dragon A400 is typically equipped with a pneumatic Material Support Lift, so the HAS MATERIAL LIFT option should be checked. If the machine is not equipped with a Material Support Lift or the Material Support Lift needs to be disabled, ensure that this box is unchecked. Though this option can be disabled per machine, many operators choose to disable it per material as needed.

If the Dragon A400 is equipped with a Powered Gate, ensure the HAS POWERED GATE option is checked. If the Dragon A400 is a Non-Powered Gate model, leave this option unchecked.

1.2.6 Machine Calibration Wizard

In the Main workspace there is also an icon for the Machine Calibration Wizard, which is used to calibrate the machine. The Dragon is calibrated at the Bend-Tech manufacturing facility. Calibrating the machine should not be necessary unless a part on the machine has been replaced because of service.

1.3 Basic Tab

The Basic workspace includes settings relating to the machine process order, timings, and corner feed modes; in addition to CAD settings for nested projects.

1.3.1 Default Process Order

The Default Process Order settings are used to set the order of actions (marking, engraving, cutting) that the Dragon follows. To change the order of action, click to highlight the action and click the up or down arrow to the right of the box. Bend-Tech recommends the default order, marking→engraving→cutting, for the best performance.

The order in which the machine processes are completed is set by choosing the Order by Part, Order by Shift, or Order by Location options. Refer to the table on the next page for descriptions about each of these process order options.

Important

Though it is listed in the process order, the Dragon A250 does not come equipped with an engraver. The Dragon A250 will mark anything set to engrave.

Process	Definition
Order By Part	The machine will produce each part in Nest Project in sequence, performing all actions on a part before moving on to the next part.
Order by Shift	The machine will perform all actions according to Shift (all marking, all engraving, all cutting) before starting the next Shift.
Order by Location	The machine will perform each specific action starting at one end of the material and moving along the entire length of the material. The operator can view the Process Order in Nest Project.

1.3.2 Post-Cut Dwell

Enables the machine to pause for a specified amount of time after each cut. It is useful when time is needed to allow the material to cool after each cut. When Post-Cut Dwell is enabled, the torch will continue blowing air, which cools the consumables.

1.3.3 Lifter Trigger Pause

Enables the machine to pause the specified amount of time after the Material Support Lift is engaged or disengaged. Bend-Tech recommends using this feature to prevent the material support lift arm from colliding with the machine rail.

1.3.4 Pause for Drops

If enabled, the machine will pause after cutting a part that exceeds the minimum length specified. When a pause happens, use START on Machine Control to start the project after a pause.

1.3.5 Corner Feed Mode

Corner Feed Mode contains advanced settings. Bend-Tech does not advise changing these settings unless first contacting Bend-Tech Support. Default selection is INVERSE TIME FEED RATE. These options are not available for the Dragon A250.

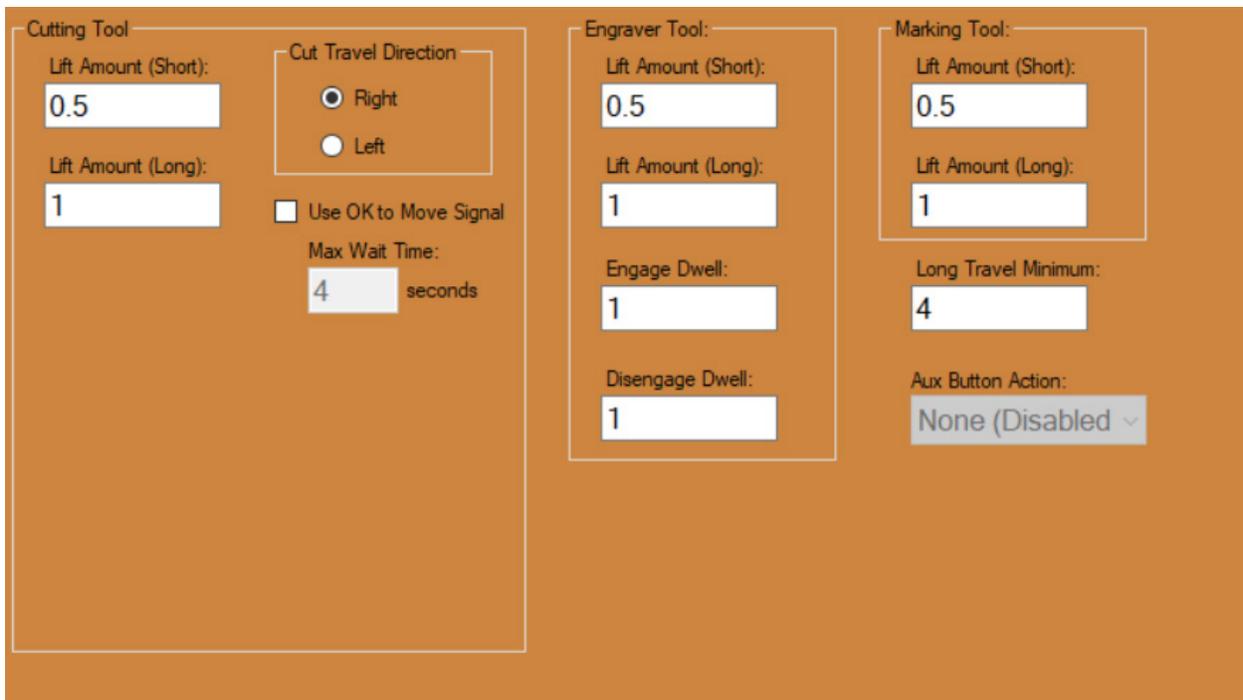
1.3.6 CAD Settings

The CAD Settings can be used to customize how Nest Projects are displayed, the information will be shown in the Shifts tab of the Nesting Project as well as in the part illustration window.

CAD Setting	Definition
Display Action Directions	The software will display arrows indicating the direction of a given process.
Display Transition Paths	The software will display the path of the machine as it moves from action to action.
Display Jaws	The software will show the jaws of the Chuck in relation to the material and processes.
Display Dead Zone	The software will display the material Dead Zone.

1.4 Tools Tab

The Tools workspace contains information regarding tool settings such as Tool Lift Amount. While these are rarely adjusted, understanding the function of these settings is important.



1.4.1 Lift Amounts

Lift Amounts are categorized as either Long or Short. LIFT AMOUNT (Short) is the height the tool lifts off the material before it travels to another action a short distance away. LIFT AMOUNT (Long) is the height the tool lifts off the material to travel a long distance away.

1.4.2 Cutting Tool

The Cutting Tool options include the USE OK TO MOVE SIGNAL and LIFT AMOUNTS. If enabled, this setting will tell the machine to wait for the torch to establish an arc before moving along the cutting path. The machine will wait the MAX WAIT TIME before stopping and aborting the current program.

1.4.3 Cut Travel Direction

Cut Travel Direction defines the direction the torch will travel on a cutting path. The type of swirl ring that the plasma torch has can affect cut quality. For torches with counter clockwise swirl rings, select RIGHT for the Cut Travel Direction for cleaner cuts. For torches with a clockwise swirl ring, choose LEFT for the Cut Travel Direction instead.

1.4.4 Engraver Tool

The Engraver Tool settings includes dwell times and LIFT AMOUNTS. When engraving parts, setting a dwell time for the Engraver ENGAGE and DISENGAGE can help optimize operation of the tool. Setting a dwell time can ensure the Engraver moves into position and up to speed properly before engraving, and completes engraving before retracting.

1.4.5 Marking Tool

The Marking Tool options only include LIFT AMOUNT settings.

1.4.6 Long Travel Minimum

The Long Travel Minimum setting defines Lift Amount (Short) vs. Lift Amount (Long). The distance entered in LONG TRAVEL MINIMUM will set the minimum distance the machine will travel before lifting a tool to the Lift Amount (Long) distance.

1.4.7 Aux Button Action

This is a Dragon A150 only option. Dragon A150's have an extra button on their Control Panel that can be associated with a specific action. The possible actions available to assign to this button are: Home All Axes, Repeat Part, Home X, Home Y, Home Z, Home A, Toggle Laser, and Toggle Engraver. This option is not used on Dragon A250 or Dragon A400 machines.

1.5 Actions Tab

The Actions workspace settings pertain to how the Dragon machine will perform specific actions. For example if Engrave is selected for Saddles under the Default Action Types, then the machine will engrave every saddle that is part of the nested project.

The screenshot displays the Actions workspace settings interface, which is organized into four main sections:

- Part ID Marking:** Includes a Default Action dropdown set to "Engrave", a Font dropdown set to "__Arial", Font Size input set to "1", Location input set to "6", a Rotation Value input set to "0", a Rotation As Perimeter dropdown, and an Import Field dropdown set to "Part Name".
- Holesaw Marking:** Includes a Default Action dropdown set to "Mark", a Font dropdown set to "__Arial", and a Font Size input set to "1".
- Bend Marking:** Includes a Default Action dropdown set to "Mark", and two checkboxes: "Mark both sides of Bend" (unchecked) and "Mark first bend only" (unchecked).
- Default Action Types:** Includes End Cuts dropdown set to "Cut", Saddles dropdown set to "Mark", Shift Marks dropdown set to "Mark", and Short Leg Override dropdown set to "Mark".

1.5.1 Part ID Marking

A Part ID can be added to a part during the cutting process. Under Default Actions box, choose the type of Part ID Marking desired for the project, or select None if no marking is desired. Choose the default Font and Font Size. Font size is measured in inches or millimeters depending on machine settings.

1.5.2 Location and Rotation Value

The Location value defines where the part will be marked from the start of the material. The Rotation Value determines where the Part ID Marking occurs on the material circumference. Choose "Rotation as Perimeter Distance" to place the Part ID according to the measured distance around the material, or "Rotation as Angle" to place the Part ID According to the degrees around the material.

1.5.3 Import Field

The Import Field determines what field in the design will be used as the Part ID. For example, choosing "Die Name" from the drop down menu will tell the software to apply the name of the die used during part creation as the Part ID.

1.5.4 Holesaw Marking

In some cases, such as when a bend is required near the end of a tube, a project may require cutting that will take place away from the Dragon machine. Under Holesaw Marking, program the machine to Mark or Engrave holesaw marks or choose None if no marking is desired.

1.5.5 Bend Marking

Under Bend Marking, program the machine to Mark or Engrave bend marks, or choose “None” if no marking is desired. Choose “Mark Both Sides of Bend” to place a bend mark on either side of the bend, or “Mark First Bend only” to place a mark only at the first bend on each part.

1.5.6 Default Action Types

Under Default Action Types, choose the default action for the basic machine operations.

Default Action Type	Preferred Action
End Cuts	This typically is not changed from the Cut option.
Saddles	The operator will typically choose to Mark or Engrave saddles depending on machine model.
Shift Marks	Shift Marks are used when the operator is required to reposition the material in the Chuck, or when flipping the material. Choose Mark or Engrave depending on machine.
Short Leg Override	If the software determines that the material will be too short to bend after cutting, the cuts will be marked instead. The operator can then complete the actions manually after bending.

1.6 Mechanical Tab

The Mechanical workspace is used to calibrate and/or test a number of different operating components of the machine. Many of these should not be altered without first consulting with Bend-Tech Support.

The screenshot shows the Mechanical Tab settings interface with the following sections and controls:

- Backlash Correction:**
 - Enable
 - Toolhead Vertical:
 - Toolhead Horizontal:
 - Chuck Position:
 - Chuck Rotation:
 - Gate Rotation:
- Axis Step Correction:**
 - Calibrate button
- Machine Limit Warnings:**

	Min	Max
Enable X Limits: <input checked="" type="checkbox"/>	<input type="text" value="-1.25"/>	
Enable Z Limits: <input checked="" type="checkbox"/>	<input type="text" value="-0.125"/>	<input type="text" value="18.45"/>
Enable A Limits: <input checked="" type="checkbox"/>	<input type="text" value="-0.125"/>	<input type="text" value="7.75"/>
Enable B Limits: <input checked="" type="checkbox"/>	<input type="text" value="0"/>	<input type="text" value="7.1"/>
Enable C Limits: <input type="checkbox"/>	<input type="text" value="0"/>	<input type="text" value="7.1"/>
- Trolley Behavior:**
 - Disable Quick Rewind
 - Disable Remnant Pause
 - Initial Retract Amount:
- Lifter Behavior:**
 - Trigger Pause Allowance:
 - Retract Distance:
- Toolhead Behavior:**
 - Use Lowest Tool
 - Use Custom Value
 - Lift Gap:
 -
 - Calibrate button
 - Use Legacy Dwell

1.6.1 Backlash Correction

Backlash Correction is calibrated at the Bend-Tech manufacturing facility. The Backlash Correction values should not be altered without first consulting with Bend-Tech Support. If inaccurate cuts are seen or if parts are too long, it may be necessary to perform a backlash test.

If a Backlash test is deemed necessary contact Bend-Tech Support before proceeding. To initiate this test, click the multicolored, square icon at the top of the Backlash Correction box. Follow the on-screen prompts.

1.6.2 Axis Step Correction

The Axis Step Correction feature is a tool that coordinates positioning of the machine's various components, comparing where the component is at on the machine vs. the value the computer displays. Contact Bend-Tech Support before performing the Axis Step Correction procedure.

1.6.4 Trolley Behavior Settings

Trolley Behavior settings include Disable Quick Rewind and Disable Remnant Pause. If Disable Quick Rewind is checked, the machine will not use the Quick Rewind function, which unwinds the Chuck while moving into load position. If Disable Remnant Pause is checked, the machine will not pause to allow for unloading the material remnant.

In some cases, the operator may want the machine to pause after completing a cut to retrieve the cut part. However, for longer cut material, it may be more efficient to choose Disable Remnant Pause and simply retrieve the cut parts after the machine moves to its next load position.

! Warning !



The machine should never be set to Disable Remnant Pause without also checking Disable Quick Rewind.

1.6.5 Lifter Behavior

The Lifter Behavior section only affects Dragon A400 machines. The LIFTER TRIGGER PAUSE ALLOWANCE helps determine how efficiently the Material Lift Support retracts and moves away from the rail. Bend-Tech has determined that .0625" is the ideal value for this setting.

The LIFTER RETRACT DISTANCE determines where the Material Support Lift retracts in relation to trolley position.

1.6.3 Machine Limit Warnings

Machine Limit Warnings are set in Mach3 software and are calibrated to protect the machine from overrunning a safe limit on one of its Axes. Bend-Tech does not recommend changing the default or disabling the machine limit warnings, as it could damage the machine.

1.6.6 Toolhead Behavior

The Use Legacy Dwell option forces the machine to use the normal dwell g-code. A typical dwell time is about 0.3s, and Mach3 rounds down to the nearest integer.

The other settings affect how high the Toolhead moves when rotating non-round material between sides. USE CUSTOM VALUE should always be set by the Calibrate button.

The LIFT GAP value will increase the distance indicated by either selected setting.

1.7 Calibration Tab

The Calibration workspace contains settings relating to Tool Offsets, Deadzone, X-Axis Max Travel, and Y-Axis Offset. These values are calculated from a full machine calibration, which is done at the Bend-Tech manufacturing facility and should not be adjusted without contacting Bend-Tech Support first.

Cutting Tool Offset X: <input type="text" value="0.625"/> Offset Z: <input type="text" value="15.64"/> Offset A: <input type="text" value="6"/>	Engraver Tool Offset X: <input type="text" value="0.56"/> Offset Z: <input type="text" value="7.16"/> Offset A: <input type="text" value="7"/>	Marking Tool Offset X: <input type="text" value="0.25"/> Offset Z: <input type="text" value="2.87"/> Offset A: <input type="text" value="6"/>	Laser Offset X: <input type="text" value="0"/> Offset Z: <input type="text" value="4.5"/>
X Axis Settings Deadzone Length: <input type="text" value="13.25"/> Max X Travel: <input type="text" value="290"/>	Y Axis Settings Offset Y (Degrees): <input type="text" value="0"/>	Material Lifter Lifter Trigger (X): <input type="text" value="123.5"/> Lifter Trigger (B): <input type="text" value="3.6"/> Lifter Offset (B): <input type="text" value="0"/>	<div style="text-align: center;">  Torch Mount </div> <div style="text-align: center; margin-top: 20px;">  Test Lifter </div>

Two wizards are located on this tab. The Torch Mount Wizard walks through the procedure for installing the plasma torch on the Dragon machine. This will need to be done during initial startup and anytime the torch is reinstalled after maintenance or replacement. The Test Lifter Wizard is a Dragon A400 only feature that walks through a short procedure for testing if the Material Support Lift's 'Pause' location is accurate.

1.8 Factory Settings Workspace

The Dragon is calibrated at the Bend-Tech manufacturing facility. Bend-Tech does not recommend altering Factory Settings. These settings are hidden by default.

Customers who need assistance with a technical issue regarding machine calibration should contact Bend-Tech directly.

Material Library

2.1 Using the Tube Library

The Tube / Pipe Library stores the material database created by the operator. This includes all material specific information, such as material type and dimensions, processing settings, lead in and lead out styles, material pricing information, and other advanced settings. Being familiar with the various settings will help to optimize the machine's capabilities for more accurate cutting, marking, and engraving.

2.1.1 Material List

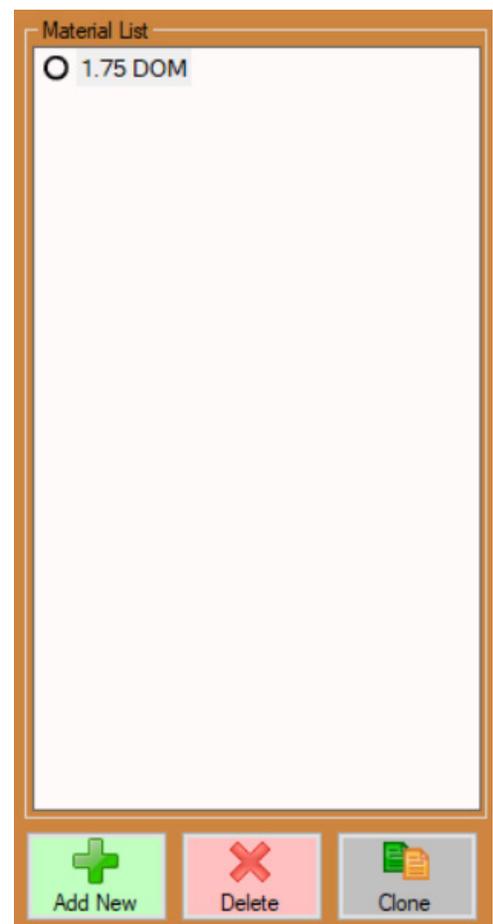
The Material List is the list of materials that have been added to the library. The program will come loaded with 1.75 in. DOM tubing as the default material in the Material List.

2.1.2 Material List Actions

To add a new material to the Machine Library, click the green ADD NEW button located below the material list. To delete a material, select the material and click the red DELETE button.

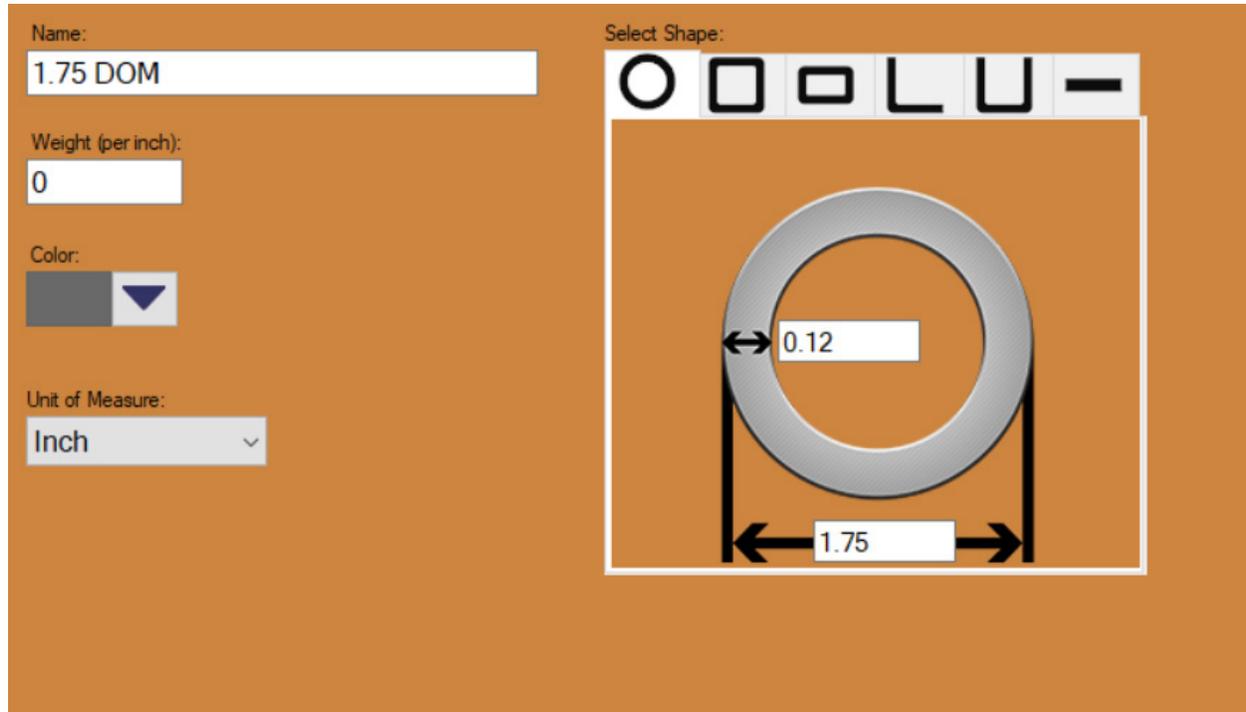
2.1.3 Cloning a Material

To clone a material, select the material to clone from the Material List. Then click the CLONE icon located under the Material List. Adjust the material settings as needed for the newly cloned material.



2.2 General Tab

When opened from the Dragon Task Menu, the Tube / Pipe Library will open to the General workspace. The values on the interface will be grayed out until a material is selected in the Material List. The General workspace contains basic settings for material dimensions.



2.2.1 Select Shape

Select the shape of the material being added to the library. Once the shape is selected, a representation of the shape will appear in the interface with blank text boxes. Enter the dimensions of the material in the text boxes. Typically the values are listed on the material order form or if the dimensions are unknown use a calipers to measure the dimensions. Calculating dimensions for square, rectangle, angle and channel material will require a radius gauge. Choose Unit of Measure in the drop down menu before entering the material dimensions.

Dragon Model	Tube Capabilities
Dragon A400 Non-Powered Gate	Round, Square, Rectangle profile material
Dragon A400 Powered Gate	Round, Square, Rectangle, Angle, and Channel profile material
Dragon A250	Round profile material only

2.2.2 Name, Weight, Unit of Measure

Choose a name for the material and enter it in the text box under NAME. Most operators enter the type of material, such as 1.75 DOM, but any descriptive name will work. Weight of the material per inch is an optional measurement that can be used to calculate job cost on the Pricing tab. Unit of Measure should be kept consistent to what the shop and machine are set up to use.

2.3 Machine Tab

The Machine workspace contains many of the basic machine settings used when processing material. While some of these may not change depending on the material and job being run, it is important to understand the settings and ensure the machine is properly set up to process a given material.

The screenshot displays the Machine workspace settings interface, organized into several panels:

- Basic Settings:**
 - Kerf Width: 0.06
 - Cutting Overlap: 0
 - Web Spacing: 0.5
 - Default Length: 240
 - Edge Cut Offset: 0
 - Chuck Grip: Pass-Through (dropdown menu with a help icon)
- Tool Heights:**
 - Cutting Height: 0.06
 - Pierce Height: 0.09
 - Marking Height: 0
 - Engraving Height: 0
- Support Lifter Gap:**
 - Lifter 1 (B): 0
 - Lifter 2 (C): 0
- Corner Rotation Extension:**
 - Distance: 0
- Feed Rates:**
 - Cutting Feed Rate: 60
 - Corner Cutting: 80
 - Marking: 60
 - Engraving: 30
- Rotation Speeds:**
 - Rotation RPM: 15
 - Max Feed RPM: 30
- Machine Acceleration:**
 - Travel (X): 0
 - Rotation (Y): 0
 - Use Bridge Cutting
 - Disable Support Gate

2.3.1 Basic Settings

Kerf Width

Kerf Width, located under Basic Settings, is the amount of metal removed by the plasma cutting process. The KERF WIDTH setting helps determine how much material will be eliminated in the cutting process, as well as how far the Toolhead and Trolley will move in relation to cuts performed. If the Torch is adjusted per the Dragon Startup Manual, a typical Kerf Width will be 0.05-0.06. The default KERF WIDTH value is 0.06, which is typical for most plasma torches. Make a test cut and measure the width of the cut with a feeler gauge to determine a more accurate Kerf Width value.

Note

Kerf width will vary depending on the cutting process. Amperage, torch height, cutting speed, consumables, and gas settings will also affect kerf width.

Cutting Overlap

The CUTTING OVERLAP value determines how much the Torch repeats a tool path or stops short of completing a tool path. A positive value is the distance the Torch travels past the tool path completion point. A negative value is the distance the Torch stops short of completing the tool path. This is typically set to 0.

Web Spacing

WEB SPACING is the space between parts the machine leaves when it cuts a Nested Project. The default value is 0.5 but can be adjusted to increase or reduce the amount of material left uncut between parts.

Default Length

The DEFAULT LENGTH value is the length of the material being cut, usually a standard length like 24 feet or 21 feet.

Edge Cut Offset

This is only used for Dragon A400 machines equipped with a powered gate. When cutting angle and channel material, the edges of the material are typically thinner than at the radius. EDGE CUT OFFSET combines with the Lead In & Out to achieve arc and a consistent cut. When cutting angle and channel, the EDGE CUT OFFSET is typically set to .060, or kerf width.

Chuck Grip

Depending on the size and type of material being cut, CHUCK GRIP settings may need to be changed. Click the question mark icon to view the different Chuck Grip illustrations. Choose the proper CHUCK GRIP from the drop down menu.

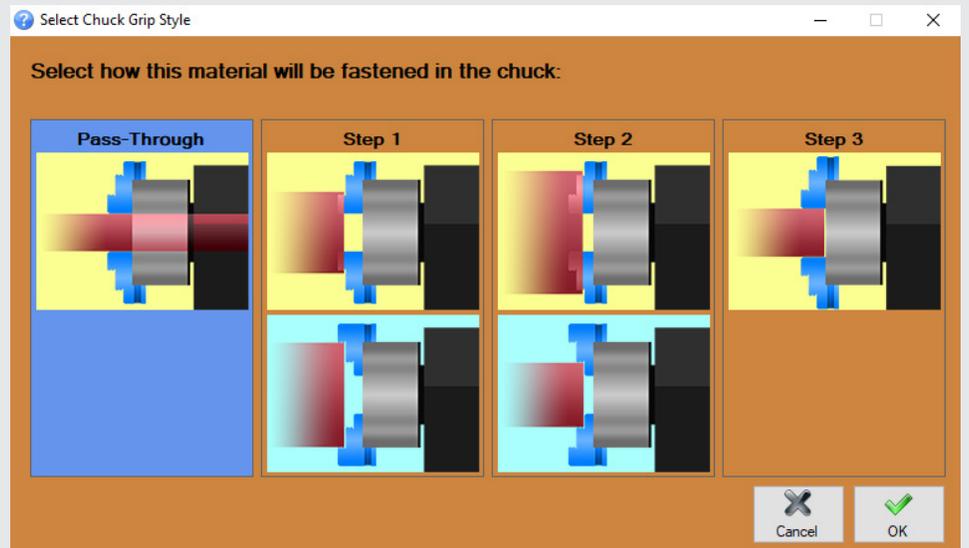
Choosing the proper Chuck Grip allows the machine to calculate how much material is available for cutting.

Tip

Whenever Chuck Grip is changed for a given material it will affect the Laser Light position on the material and how the machine perceives stock length. If the Laser Light is not lining up with the material properly, it is likely due to Chuck Grip Style. Ensure the Chuck Grip Style matches how the material is loaded into the Chuck.

Chuck Grip Style

Clicking the (?) symbol next to the Chuck Grip drop down menu will open an interface showing the differences between each type of Chuck Grip.



Pass-Through

The Pass-Through grip is intended for smaller tubing (2 in. diameter or smaller) that will fit through the Chuck Shaft.

Step 1

Select Step 1 if the material will be gripped by the outer teeth (the teeth farthest from the Chuck mounting surface) on the Chuck.

Step 2

Select Step 2 if the material will be gripped by the middle teeth on the Chuck. Step 2 will be used to grip the largest material the Dragon is able to process.

Step 3

Select Step 3 if the material will be gripped by the innermost teeth on the Chuck. Step 3 is typically used when material is slightly too large to fit through the Chuck Shaft but can still be gripped by the innermost chuck teeth.

Important

Changing the Chuck Grip may require changing the Chuck Teeth on the machine.

Important

If the Chuck dimensions are needed, they can be found under the Factory Settings tab for the selected Machine in the Machine Library. Do not adjust Factory Settings without contacting Bend-Tech Support.

2.3.2 Tool Heights

CUTTING HEIGHT will determine Kerf Width and the default is set to 0.06. If the Torch is closer to the material, the Kerf Width will be narrower. If the Torch is farther away from the material, the Kerf Width will be greater. PIERCE HEIGHT will determine the size of the hole on lead-in. Pierce Height is set to 0.09 by default. MARKING and ENGRAVING HEIGHT defaults are set to 0. If the Marker or Engraver do not connect with the material properly the tool heights may need to be adjusted.

Note

Kerf width will also be dependent on consumables. See the Plasma Unit's Operator's Manual for more information.

Important

If the Pierce Height is set too high the Torch may not arc on the material.

2.3.3 Support Lifter Gap

The SUPPORT LIFTER GAP only pertains to Dragon A400 machines. Bend-Tech recommends leaving the SUPPORT LIFTER GAP value at the default value of 0.1. The default value will place the Material Support Lift at the same height as the bottom of the Chuck and Gate Rollers.

2.3.4 Corner Rotation Extension

The CORNER ROTATION EXTENSION option only pertains to the Dragon A400. When cutting square, rectangle, angle, or channel material, the machine can be programmed to extend past the edge of the material a set distance. Adjusting this value creates a larger corner radius, initiating rotation of the material before the radius begins. This prevents the Torch from cutting into the opposite wall of the material before the material begins to rotate.

2.3.5 Feed Rates

Feed Rates determine how fast or slow the machine will perform a process such as cutting, corner cutting, marking or engraving. Bend-Tech sets default feed rate values that may work well for most materials. However, thicker or thinner materials, corner radius, torch settings, torch consumables, type of material, and material cooling system use will all affect Cutting Feed Rate and Corner Cutting.

2.3.6 Rotation Speeds

Rotation Speeds are settings for the Chuck (Y-Axis). ROTATION RPM is the rotation speed for the Chuck when not performing cutting actions. MAX FEED RPM is the maximum rotation speed of the Chuck when it is performing cutting actions. Bend-Tech recommends keeping the default values for these settings.

2.3.7 Machine Acceleration

Machine Acceleration settings determine how quickly the axis reaches operating speed. MACHINE ACCELERATION TRAVEL (X-Axis) sets the rate the Trolley travels forward and backward on the Rail. MACHINE ACCELERATION ROTATION (Y-Axis) sets the rate the Chuck rotates the material. Bend-Tech sets both of these values with a default of 0. Change these values to increase the operating speed of the machine. The machine can move at faster speeds with smaller material, but should be set at slower speeds when processing larger material.

Important

If Machine Acceleration is set too fast, the machine may skip steps when processing larger material. This will result in imprecise cutting, marking, and engraving.

2.3.8 Use Bridge Cutting

Bridge Cutting is used when the machine can move between cuts without stopping the Torch arc and re-piercing. This extends the life of Torch consumables. Bridge Cutting is for round material only. To enable Bridge Cutting check the USE BRIGE CUTTING option.

2.3.9 Disable Support Gate

To disable the Material Support Lift, click DISABLE SUPPORT GATE. This may be helpful when processing more rigid material or when the material might be marginally longer than the minimum length required for use of the Material Support Lift. This option is only used for Dragon A400 machines.

2.4 Lead In / Out Tab

Lead In / Out End Cut Profiles settings are critical to achieving accurate cuts with a consistent edge profile with the Dragon. These settings will change depending on the type of material, consumables, and if the machine is equipped with a Material Coolant System. It is up to the operator to determine the best settings for the project being cut. Bend-Tech sets a limited number of defaults when performing original calibration of the machine.

Section	Lead-In Type	Length/Distance	Angle/Sweep	Radius	Dwell Time (sec)	Default Location
End Cut Profiles - Lead-In	Perpendicular	0.125	0	0	0.3	Default
End Cut Profiles - Lead-Out	Perpendicular	0.125	0	0	0	-
Internal Cuts - Lead-In	None	0	0	0	0	-
Internal Cuts - Lead-Out	None	0	0	0	0	-

2.4.1 Lead-In Type

“Perpendicular Lead-In” is typically the best starting point when piercing on a consistent surface such as the flat surface of a tube. Bend-Tech recommends “Angle From Edge” on material with an inconsistent edge such as angle or channel material.

2.4.2 Length/Distance

Bend-Tech sets the default Length/Distance to 0.125 when calibrating the machine. This value is a good starting point for most material, however the Length/Distance can vary depending on the material or nesting features.

2.4.3 Dwell Time

Dwell Time is the length of time the Torch will remain in position prior to initiating movement, or after a cutting action has finished. Typical start settings for Dwell Time range from 0.3-0.4. Bend-Tech recommends keeping Dwell Time as short as possible. Extended Dwell Time can affect cut quality as the Torch attempts to maintain arc on the material. For thin material, set Dwell Time to 0.

2.4.4 Angle / Sweep

When setting Lead-In Type to Angle, Arc, or Arc With Angle, an Angle/Sweep value can be entered. Angle/Sweep is the angle of the initial cut as the Torch moves into cutting position on the material. A good starting point is 45 degrees.

With the recommended Perpendicular Lead-Out, the Angle/Sweep will be grayed out.

2.4.5 Radius

The Radius value sets the curve at which the Torch will enter the cut when using “Arc” or “Arc with Angle”. A good starting point here is .125.

With the recommended Perpendicular Lead-Out, the Radius will be grayed out.

2.4.6 Lead-Out Type

When setting Lead-Out type, Bend-Tech has found Perpendicular to be the desired setting.

2.4.7 Length / Distance

Bend-Tech has found a Length/Distance setting of 0.125 for Lead Out is a good basis for cutting. Some plasma unit manufacturers, like Hypertherm, recommends zero lead-out on cuts, especially with thinner material under ½ in., so it is advised to keep the Lead Out Length/Distance as short as possible.

2.4.8 Lead-In / Out Internal Cuts

Lead In / Out Internal Cut Profiles settings are critical to achieving accurate cuts such as holes and shapes with the Dragon. These settings will change depending on the type of material, consumables used, and if the machine is equipped with a Material Coolant System. Choose the best settings for the project being cut. Bend-Tech sets a limited number of defaults when performing the original calibration of the machine.

For Internal Cuts, Bend-Tech recommends using the same settings as External Cut Profiles.

Tip

Setting a longer distance on Lead-In for internal cuts keeps any slag puddle away from the cut. It also allows the arc to stabilize before getting to the contour of the hole/shape. When making internal cuts such as holes, Bend-Tech recommends starting the cut at the center of the hole.

2.5 NRC Tab

With a rotational cut, the machine rotates the material to create a round hole. This results in a hole that is round on the inside diameter of the material but can be oblong at the outside diameter of the material. A Non-Rotational Cut (NRC) moves the Toolhead instead of the material to make the cut. The material still moves in the X-Axis direction. This results in a round hole on the vertical axis.

The screenshot shows the NRC interface with the following components:

Thickness	Feed Rate	Cut Height
0.135	65	0.06
0.145	-5	-0.02
0.15	-10	-0.04
0.155	-15	-0.06
0.16	-20	-0.08

Below the table are three buttons: **Add** (with a plus sign), **Delete** (with a red X), and **Clear** (with a trash icon).

To the right of the table, there are two input fields:

- Lowest Feedrate Allowed:** 1
- Max Thickness Allowed:** 0.25

With rotational cutting the machine is cutting a consistent thickness as the material rotates. With NRC the machine is essentially cutting thicker material as the Toolhead moves from side to side on the material.

NRC requires entering specific values for material thickness, feed rate and cut height to ensure the Torch achieves a consistent cut and does not collide with the material.

NRC cutting requires the operator to generate holes in Edit Flat. If the holes are not generated in Edit Flat, the software will normalize the holes. To add a NRC hole in Edit Flat, click **Actions**→**Create**→**NRC** button, then click the hole in the Edit Flat display to apply a NRC to it. It will also be necessary to add NRC settings in the NRC interface. If NRC settings are not entered, the Torch may collide with the material.

See Part 2 of the Dragon Operator's Manual for more information.

2.6 Pricing Tab

The Pricing Tab is designed to help calculate the cost of producing a cut, part, or project.

Cost per Inch:

All times are in minutes.

Straight Cutting

Time per Cut: Time per Setup:

Fishmouthing or Notching

Time per Cut: Time per Setup:

Welding

Time per Node: Time per Setup:

2.6.1 Cost per Inch

Enter the cost of the material per inch. This is the basis the software uses to calculate cost of material used in a project.

2.6.2 Time per Cut

Time per for Straight Cutting and Notching is the time per cut, not per part. The software will recognize cuts and calculate total time for each part based on the cuts programmed in the software. The time it takes to weld each node or intersection can also be included into the calculations.

2.6.3 Time per Setup

The Time per Setup value is how long it takes to set up one piece of material to be cut in the machine. The software then calculates total time based on how many pieces of material it will take to produce the entire job. This time is for one piece of material and is the same whether the job requires one stick, 10 sticks, or 100 sticks.

2.7 Advanced Tab

The Advanced interface contains Side Offsets calibration, Polyline Resolution, Slot and Tab settings, and Part Length Adjustment.

The screenshot displays the Advanced Tab interface with the following sections and controls:

- Sorting Values:** A 'Setup' button with a wrench and screwdriver icon.
- Slot and Tab:**
 - Tab Width: 0.4375
 - Tab Length Offset: 0
 - Slot Minimum Height: 0
 - Slot Width Offset: 0
- Polyline Resolution:**
 - Max Length: 0.1
 - Max Angle: 5
 - Max Offset: 0.01
 - Note: You can ignore these settings - advanced use only.
- Side Offsets:**
 - Side Offset A: 0
 - Side Offset B: 0
 - Side Offset C: 0
 - Side Offset D: 0
 - Top Offset A: 0
 - Top Offset B: 0
 - Top Offset C: 0
 - Top Offset D: 0
 - Calibrate button with a crosshair icon.
- Part Length Adjustment:**
 - Adjustment Amount: 0

2.7.1 Sorting Values

The Sorting Values setting is not longer supported and can be ignored.

2.7.2 Polyline Resolution

MAX LENGTH is the maximum length of each segment in a polyline. Any length longer than this value will be ignored, and any shorter segments are combined with adjacent segments to create a single segment. In most cases this can be left at the default value of 0.1.

The MAX ANGLE is the maximum angle between two segments in a polyline. This value can be left at the default value of 5.

The MAX OFFSET is the maximum boundary offset for a polyline. If the combination of two segments breach the boundary defined by this value, the features will not be combined. Most of the time this can remain the default value of 0.01.

2.7.3 Side Offsets

When processing square, rectangle, angle, or channel material it is critical to perform Side Offsets calibration. To begin this process, click the Calibrate icon in the SIDE OFFSETS button. Side Offsets Calibration is covered in the Dragon A400 Startup Manual.

2.7.4 Slot and Tab

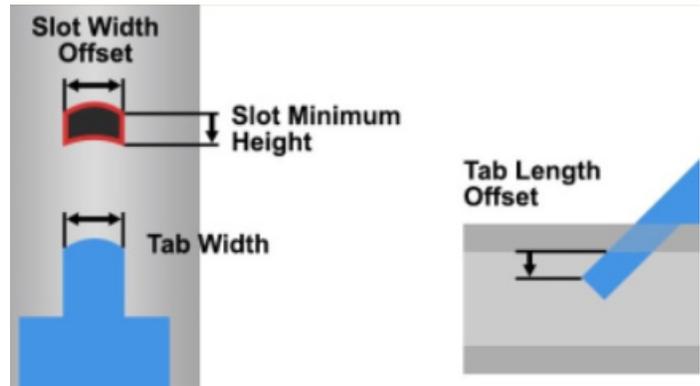
The Slot and Tab settings adjust the dimension limitations and offsets for slot and tab geometry. Slot and Tab is covered in more detail in Part 3 of the Dragon Operator's Manual.

The TAB WIDTH adjust the width of the tab.

The TAB LENGTH OFFSET is the amount (positive or negative) added to the length of the tab. By default, the tab will extend flush with the inside wall of the adjoining tube. Use these settings to increase or decrease that length.

The SLOT MINIMUM HEIGHT adjusts the minimum height of the slot.

The SLOT WIDTH OFFSET adjusts the width of the slot.



2.7.5 Part Length Adjustment

The PART LENGTH ADJUSTMENT setting will adjust both end cuts from the center of the part by half the entered value.

03

Die Library

3.1 Using the Die Library

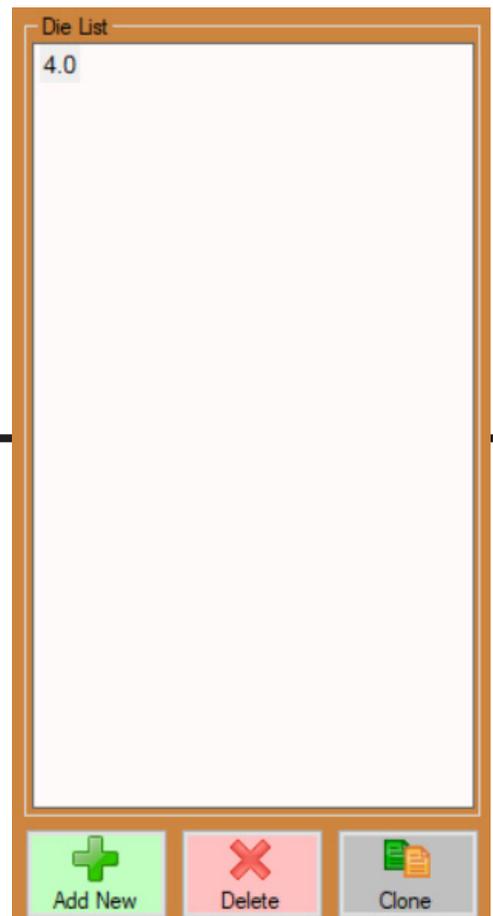
Dies are added and calibrated in the Die Library. A calibrated die is used to apply exact bend angles when reproducing part designs in the Bend-Tech design software. The Die Library helps to produce parts that are more accurate, and produce them within a shorter amount of time. Calibrated dies are saved in the Die Library for ongoing use.

3.2 Die List

Select Die Library from the task menu to open the die list. The Die Library can also be accessed by clicking the tools drop down at the top of the screen.

To begin calibrating a die, click ADD NEW in the lower left corner of the interface under the Die List.

To delete a die, first highlight the die in the Die List and then click the DELETE icon. Cloning a die can be used to alter the calibration of a die to suit specific applications while keeping the original calibration for general use.



3.3 General Tab

The General workspace contains the basic information for the selected die. These settings include the Die Name, Calibration Values, Calibration Wizards, Die Limitations, and Unit of Measure.

The screenshot shows the General Tab settings for a die. The background is a solid orange color. At the top left, there is a text input field labeled "Name:" containing the value "4.0". Below this is a section titled "Calibration Values" which contains four input fields: "Achieved CLR:" with the value "4.16", "Calibrated CLR:" with the value "4.8", and "Bend Location Offset:" with the value "0". Below these fields are three buttons: "Wizard" (with a pencil icon), "Worksheet" (with a document icon), and "OEM List" (with a list icon). At the bottom left, there is a dropdown menu labeled "Unit of Measure:" with "Inch" selected. On the right side, there is a section titled "Die Limitations - Minimum Distances" which contains four input fields: "Start End:" with the value "0", "Far End:" with the value "0", "Between bends - with rotation:" with the value "0", and "Between bends - without rotation:" with the value "0".

3.3.1 Die Name

The NAME field will display the name for the selected die. This should be unique and description.

3.3.2 Achieved CLR

ACHIEVED CLR, or Achieved Center Line Radius, is the center line radius of the die that compensates for spring back. This number will always be slightly higher than the actual center line of the die. On average, the ACHIEVED CLR will be 4-percent higher than the Calibrated CLR.

3.3.5 Calibrated CLR

CALIBRATED CLR is used to determine the amount of stretch or growth that occurs during the bending process. The CALIBRATED CLR value varies, but is typically 5 to 20 percent greater than the CLR stamped on the die.

3.3.6 Bend Location Offset

The BEND LOCATION OFFSET value is the distance from the true/exact start of the bend to the location on the die/bender that aligns with the bend marks.

3.3.7 Die Calibration Wizard

The Die Calibration Wizard is used to add new dies to the Die List. The wizard will walk through the entire process of calibrating and adding dies.

3.3.8 Worksheet

Once familiar with the die calibration process, it may be quicker to calibrate a die using the Worksheet rather than the Wizard. To do this, click the WORKSHEET icon. The Worksheet allows the user to enter all the values needed to calibrate the die without going through the process of clicking through the Wizard.

3.3.9 OEM List

The user can proceed without calibrating a die by choosing the correct bender and then clicking the OEM List button. This method will input default measurements and calculations into the design based on information provided by the die manufacturer.

Important

Bend-Tech highly recommends calibrating any dies used when designing parts. Using uncalibrated dies can result in imprecise part fit and assembly.

3.3.10 Unit of Measure

Ensure the UNIT OF MEASURE is selected appropriately for the selected die.

3.3.11 Die Limitations - Minimum Distances

There are four Die Limitation settings. The START END value adjusts the amount of material needed at the start of the part in order to bend the first bend. The FAR END value adjusts the minimum amount of material needed at the end of the part in order to be able to bend the last bend.

The BETWEEN BENDS WITH ROTATION value sets the minimum distance between 2 bends when there is rotation in the bends. The BETWEEN BENDS WITHOUT ROTATION value sets the minimum distance between two bends on the same plane with no rotation of the bends.

3.4 Spring Back Tab

Spring Back information can be tracked in the Die Library when using a particular die. This is used to calculate more accurate bends based on the history of the die and its bending qualities. For example, if the material is bent to 90-degrees and with spring back the bend is 92-degrees, those values can be entered into the Spring Back library. As more bends are entered it will create a chart showing all the Spring Back values for a particular die.

The screenshot displays the Spring Back interface with two main sections: 'Input Values' and 'Results Preview'.

Input Values Table:

Date	Achieved Angle	Spring Angle
2/14/2020	39.1	47
2/14/2020	45	53.1
2/14/2020	85	94.1
2/14/2020	86.3	96
2/14/2020	87.3	97.5
2/14/2020	90	99.2
2/14/2020	93.1	97
2/14/2020	112	123.9

Below the table are four buttons: Add (green plus), Delete (grey X), Edit (grey document), and Clear (grey eraser). A 'View Graph' button with a chart icon is located at the bottom left.

Results Preview Table:

Achieved Angle	Spring Angle
1	7.608
2	8.642
3	9.676
4	10.71
5	11.744
6	12.778
7	13.812
8	14.846
9	15.88
10	16.914
11	17.947
12	18.981
13	20.015
14	21.049

3.4.1 Using Spring Back

In the Die Library, select the die being used from the die list. Click Spring Back in the menu bar at the top of the interface. To enter a Spring Back value for a bend, click the ADD icon below the Input Values box.

3.4.2 Achieved Angle

Enter the Achieved Angle of the bend. This is the expected angle after being bent, i.e. 90°.

3.4.3 Spring Angle

Enter the angle of bend needed to achieve the Achieved Angle, i.e. 92°. This will be different than the Achieved Angle.

3.4.4 View Graph

As bends are entered into the Spring Back table the software takes the information and creates a chart. This can be referred to when performing bends with a particular die. The user can click View Graph to see a graph of the results.

3.5 Bend Marks Tab

When a project is being cut on the Dragon machine, the operator can place bend marks that are part of the overall project. The Dragon will perform these marks as part of its processes. In the Bend Marks interface, set the Bend Line Length, Rotation Line Length, Font, Text Rotation Offset, Text Location, Text Location Offset, Text Size, and Text Angle. A bend number, bend angle, and a degree symbol can be added to the project.

The screenshot shows the Bend Marks configuration interface. It is divided into several sections:

- Bend Mark Format:** Contains three checkboxes for selecting the shape of the plus sign (top, left, right, bottom).
- Include Bend Number, Include Bend Angle, Include Degree Symbol:** Three checkboxes, all of which are checked.
- Material OD (Preview Only):** A text input field containing the value 1.75.
- Bend Line Length:** A text input field containing 0.25.
- Text Font:** A dropdown menu showing "_Arial".
- Text Size:** A text input field containing 1.
- Text Location Offset:** A text input field containing 0.
- Bend Rotation Offset:** A text input field containing 271.
- Rotation Line Length:** A text input field containing 0.25.
- Text Location:** A dropdown menu showing "Front".
- Text Rotation Offset:** A text input field containing 0.
- Text Angle:** A text input field containing 0.
- Rotation Wizard:** A button with a circular arrow icon.
- Bend Mark Preview:** A large rectangular area showing a green-bordered box containing the red text "+1 - 90".

3.5.1 Bend Mark Format

The Bend Mark Format check boxes adjust the shape of the plus sign that forms the Bend Mark. There are also options for including the Bend Number, Bend Angle, and Degree Symbol.

3.5.2 Material OD (Preview Only)

The MATERIAL OD value adjusts the outside diameter of material seen in the preview window. This has no effect on the bend marks themselves, it is only used as a reference.

3.5.3 Bend Line Length

The BEND LINE LENGTH value adjusts the length of the line that represents the bend's location. This line is the vertical line that is marked on the tube.

3.5.4 Rotation Line Length

The ROTATION LINE LENGTH value adjusts the length of the line that represents the bend's rotation. This line is the horizontal line that is marked on the tube.

3.5.5 Text Font

The TEXT FONT option is used to select the font style that is used for the bend mark text, such as the bend number and bend angle. Bend-Tech recommends __Arial or __Times New Roman for readability. These two fonts are single polyline fonts, meaning that they are drawn as a single line instead of as an outline.

3.5.6 Text Location

The TEXT LOCATION options adjust the location of the text in relation to the bend mark. Three options are available: None, Front, and Back.

3.5.7 Text Size

The TEXT SIZE value adjust the size of the text that is marked for each bend mark. This value is either in inches or millimeters depending on the software settings.

3.5.8 Text Rotation Offset

The TEXT ROTATION OFFSET setting is optional. It adjusts the amount to rotate the text in relation to the bend mark. This setting is useful to offset the text from the bend mark in order to make it more visible.

3.5.9 Text Location Offset

The TEXT LOCATION OFFSET value is an optional setting that adjusts the amount to offset the location of the text in relation to the bend mark. This setting is useful to offset the text from the bend mark in order to make it more visible.

3.5.10 Text Angle

The TEXT ANGLE value adjusts the angle of the text portion of the bend mark (90 - 360 degrees). For example, an angle of zero will mark the text parallel to the tube (as see in the screenshot), while an angle of 90 will mark the text wrapping around the tube.

3.5.11 Bend Rotation Offset

The BEND ROTATION OFFSET value determines where the marks are located on the tube in relation to the rotation of the tube. The rotation is measured from the center of the bend. Use the Rotation Wizard for help in determining this value.

3.5.12 Rotation Wizard

The Rotation Wizard calibrates the BEND ROTATION OFFSET. The Rotation Wizard will calibrate the machine to place bend marks that compensate for the bender configuration.

3.5.13 Bend Mark Preview

The Bend Mark Preview displays a preview of the bend mark options.

3.6 Pricing Tab

The Pricing Tab can be used to calculate the cost of each bend performed in a project. Enter the TIME PER BEND, which is the time it takes to make the actual bend. It also allows the TIME PER SETUP which is the time to set up the die before bending material. This is a one-time calculation and is the same if making one bend or unlimited bends.



Time per Bend:

Time per Setup:

All times are in minutes.

04 Settings

4.1 General Tab

Default values are set in the General workspace, including the auto save options as well as a number of other values that help automate processes regarding the Dragon machine and its operational software.

The screenshot displays the 'Settings' application, specifically the 'General Tab'. The interface is organized into several panels:

- Default Items:** Contains three dropdown menus for 'Default Die', 'Default Tube/Pipe', and 'Default Machine' (set to 'test').
- File Storage:** Contains two text boxes for 'Data Libraries' (C:\2020SSI\common\library\) and 'Parts' (C:\2020SSI\common\parts\), each with a 'Browse...' button.
- Tolerances:** Contains three dropdown menus for 'Rotation Angle' (n), 'Bend Angle' (n), and 'Lengths' (Decimal n.nnn).
- Unit of Measure:** Contains two radio buttons for 'Inches' (selected) and 'Millimeters'.
- Auto-Save Frequency:** Contains a dropdown menu set to '10 Minutes'.
- Input / Interface:** Contains two radio buttons for 'Keyboard' (selected) and 'Touch Screen'.
- Undo/Redo:** Contains a 'Number of Steps' spinner box set to '10'.
- Main Display:** Contains three radio buttons for 'Normal' (selected), 'Custom Color', and 'Image'. Below 'Image' is a 'Choose...' button and the text 'none'. There are also two small icons representing different display styles.
- Checkboxes:** Located at the bottom right, including 'Invert Mouse Wheel Zoom', 'Disable Automatic Updates', and 'Display Orientation Axis'.

4.1.1 Default Items

When creating bent or straight parts in the design interface, defaults can be set for bending die, material, and machine. Setting defaults can speed up the process. This is helpful at shops that fabricate using the same general material for many different jobs.

4.1.2 File Storage

File Storage defines the location where library information and part designs are stored on the machine's computer. The default setting is set to the same location as other Bend-Tech information. This information is pointed to the C:\202SSI\common\ folder on the computer. Bend-Tech recommends leaving the File Storage settings to the default location. This helps Bend-Tech Service Techs resolve any issues that may arise.

If the customer uses an internal server and sharing libraries, it can create issues between the Bend-Tech Service Techs and the customer's computer. It can also create problems with the computer's ability to download and install automatic software updates. It is OK to have the computer connected to an internal server and retrieve files from it, but the libraries must be left in the common folder.

4.1.3 Tolerances

Bend-Tech uses decimals for all of its value inputs. Some shops may use fractions; all input values will need to be converted from fractions to decimal values. In Tolerances, Bend-Tech recommends using decimals set to the third decimal point. However, it is at the operators discretion and may need to be coordinated with the designer.

4.1.4 Unit of Measure

Choose between inches (standard) or millimeters (metric). This setting will depend on what is being used at the shop, or measurements used by the designer or industry of operation.

4.1.5 Auto Save Frequency

Auto Save works on projects that are active in the interface. It will work to recover files in case of some sort of system failure. This is a recovery feature, not a file saving feature. The frequency with which the software auto saves projects can be set from the drop down menu.

Important

Auto Save is only a system failure recovery feature. If a project being worked on has not been saved with a part number or project name, and the user closes out of the software, the software will not save that part.

4.1.6 Input/Interface

With all Dragon computers, KEYBOARD should be checked for the input / interface value.

4.1.7 Undo / Redo

Use the Undo / Redo setting to change the number of steps the computer will retain as it executes a job program. If the operator wants to step back while creating a project, or move forward in the job creation process after editing, the software will allow them to click “Undo” or “Redo” for as many steps as set in Undo / Redo.

4.1.8 Main Display

The Main Display settings are used to set a background color or image for the part interface. It's important to note this is not for the software as whole, it will only apply to the part display interface.

4.1.9 Invert Mouse Wheel Zoom

The Invert Mouse Wheel Zoom changes which direction the scroll wheel zooms when scrolled up or down.

4.1.10 Disable Automatic Updates

In some cases it may be necessary to Disable Automatic Updates. This may be chosen if the computer is offline to save resources that may be used to search for online updates. If this setting is chosen it is highly recommended to search for updates on a regular basis by either using a wifi hotspot or connecting the computer to an internet hub.

4.1.11 Display Orientation Axis

If DISPLAY ORIENTATION AXIS is checked, the part interface will display an Orientation Axis to help determine part orientation while it is being rotated during the design and editing process.

4.2 Output Tab

The Output workspace contains settings for bend rotation and how bend marks are placed on the material.

The screenshot shows the Output workspace settings panel with the following configurations:

- Rotation:**
 - Incremental
 - Absolute
 - 180 to 180
 - 180 to -180
 - 0 to 360
 - 360 to 0
- Length / Location:**
 - Distance from Start
 - Distance from End
 - Length of Straight Tube
 - Table Location
 - Offset Distance:
 - Table Length:
 - Indexing Begins at Die
 - Dimension Location:
- Display Options:**
 - Display parentheses () for negative values
 - Display Degree Symbol
 - Display Feet/Meters
 - Display Minutes/Seconds
 - Display Spring Angles
 - Display Length of Bend

4.2.1 Rotation

The software display can be set to either Incremental or Absolute information regarding bending. Incremental will display each bend in relation to the bend previous. For example, if a part has two 90-degree bends, Incremental will list each bend as 90-degrees of rotation. Absolute will list the first bend as 90-degrees of rotation and the second bend as 180-degrees of rotation.

Choosing the 180-degree or 360-degree configuration has to be coordinated with the designer or with a particular shop's working standards. If there are none, Bend-Tech recommends using the default setting -180 to 180.

4.2.2 Length / Location

The Length / Location settings relate to how bend locations are measured and placed on a piece of material. A bend can be placed measuring the Distance from Start, Distance from End, or in relation to the Length of Straight Tube between each bend. When using Table Location, the bends will be placed according to a table of bending values. Use the drop down menu to choose where bend markings will be placed on the material in relation to the Start, End, or Center of the bend.

On the right hand side of the Output workspace, a number of different display options and/or values related to bending can be chosen. These options are based on preference.

4.3 Custom Part Tab

The Custom Part workspace is used to set the bending dimensions and bend cut-off options.

The screenshot shows the Custom Part workspace settings interface. It is organized into several sections:

- Defaults:** Includes a color selection box for Cut-Off Color (set to red), a text input for Tri-Star Scale (set to 1), and a text input for Dimension Size (set to 1). Below these is a Notes section with a text area containing the instruction: "To change your default note, use the Options under the 'Tools' menu."
- Features to Display:** A list of checkboxes for various features: Dimensions, Cut-Off, Apex Guides, Tri-Star, Verification Points, and Bend Highlight. All are currently checked.
- Cut-Off:** Two text input fields for Cut-Off Start and Cut-Off End, both set to 0.
- Reverse Rotation:** An unchecked checkbox.
- Miter Dimension Location (Default):** A dropdown menu currently set to "Center".

4.3.1 Defaults

In the Defaults box, values for Cut-Off Color, Tri-Star Scale, and Dimension Size can be set. When a bend is too close to the end of a part, a cut off length is required. Once the material is bent, this piece is cut off by hand. Cut-Off Color is the color the software will designate to the piece that will be cut off the material. To do this, click the color box and choose the desired color.

Bend-Tech recommends leaving Tri-Star Scale and Dimension Size at the default settings.

4.3.2 Features to Display

To display only certain features of a part or project in the design interface, check or uncheck the features needed in a certain project. The software defaults to display all features.

4.3.3 Cut-Off

If a bend is too close to the end of the material, default lengths can be set for Start and End Cut-Offs. This allows the material to be processed in the bender, but requires the operator to hand cut the programmed cut-off length of the material. The software will use the default cut-off values to mark the material.

If a cut-off is required, the Dragon machine will mark all end cuts that need to be performed after bending.

4.3.4 Reverse Rotation

The Dragon will always cut clockwise on the initial cut. Choose Reverse Rotation to change this to counterclockwise.

4.3.5 Miter Dimension Location

Bend-Tech typically uses the center line of the material, so the default setting is Center. Inside, Outside, or Center (Tube) are available to choose in the settings.

4.4 CAD Tab

The CAD Tab contains user settings for the various CAD visuals in the Bend-Tech software.

The screenshot shows the CAD Tab settings window with the following sections and controls:

- Dimensions:** Text Size (1), Ext. Offset (0), Ext. Standoff (0), Arrow Width (0.5), Arrow Length (1), Arrow Type (Double), Angle Tolerance (n), Tolerance (Fraction n/1).
- Holes - Default Values:** Round (selected), Square, Rectangle, Oval, Ellipse, Width (1), Display XY Axis (checked), Prompt for Action Names (checked), XY Axis Scale (1).
- Abbreviations:** Round (Rd.), Rectangle (Rect.), Ellipse (Elps.), Square (Sq.), Oval (Ov.).
- Drawing Weight:** Material (1), Points (1), Lines (1), Holes (1), Text (1), Dimensions (1), Marking (2), Etching (2), Cutting (3).
- Colors:** Marking (green), Engraving (purple), Cutting (red), Tube Edge (pink), Lead-In (red), Lead-Out (red), Points (black), Lines (black), Text (grey), Holes (grey), Dimension Lines (black), Dimension Ext (black), Dimension Text (black).
- Text:** Size (1), Padding (0), Text Quality (Normal), Font Family (Arial).

4.4.1 Dimensions

The Dimensions section is used to set how the part information is displayed such as Text Size, Extension Offset, Extension Standoff, Arrow Width, Arrow Length, Arrow Type, Angle Tolerance and Tolerance. Set these to the value that best suits the work being done in the Bend-Tech Dragon software.

4.4.2 Holes - Default Values

When a hole is designed, the software will use the default hole values, which is set from the Holes - Default Values box.

4.4.3 Drawing Weight

The Drawing Weight settings determine how heavy the lines are displayed in the CAD design interface in regard to each action. A small number designates a light line, a larger number displays a heavier line.

4.4.4 Colors

In the Colors box, the color can be changed for a particular action by clicking on the box and choosing a new color from the color palette.

4.4.5 Abbreviations

When a part is displayed in the CAD interface the operator can choose the abbreviations the software will use for different terms.

4.4.6 Text

In the Text section the operator can choose the Size, Padding, Text Quality and Font Family of the text used in the CAD design interface.

4.4.7 Display XY Axis

Checking or unchecking Displaying XY Axis will have the software display the XY axis or hide the XY Axis in the CAD interface.

4.4.8 Prompt for Action Names

When Prompt for Action Names is checked the CAD software will display a prompt to give the part a name. If Prompt for Action Names is not checked the software will assign each part a default name.

4.5 Industrial Tab

Settings regarding how the software imports and exports CAD files are located in the Industrial workspace.

4.5.1 Rotational Indicator

The Rotational Indicator settings are used to choose how that indicator will appear.

4.5.2 Type

The Rotational Indicator types are None, Tab, Notch, or Mark. If None is chosen, the rest of the settings in the Rotational Indicator box will be grayed out.

4.5.3 Dimensions

The Rotational Indicator Dimensions are Length, Rotation Offset, and Distance from End.

4.5.4 Tab Shape

If Tab or Notch is chosen for the Rotational Indicator Type, Tab Shape can be set as either Square or Triangle.

4.5.5 Which Side

The Which Side setting for the Rotational Indicator determines if the indicator is placed at the Start or End of the material.

4.5.6 Precision / Tolerance

In the Precision / Tolerance section the operator can set defaults in regard to how the program sees values that are placed on the material. These tolerances can be altered to resolve issues when there are conflicting Polyline Resolution values.

4.5.7 Precision (Geometry)

This setting determines how far away one feature can be from another before it is defined as a separate feature.

4.5.8 Precision (Comparison)

This setting determines how close two features need to be before they are defined as identical.

4.5.9 Bend Mark Text Resolution

This setting determines the quality of bend mark resolution in the Edit Flat display.

4.5.10 Polyline Resolution

A line in Bend-Tech design software is essentially a connection of dots, or a Polyline. Polyline Resolution settings determine how the software translates the design and programs it to be cut on the Dragon machine. Typically, the higher the resolution the more precise the cut.

4.5.11 Max Length

This is the maximum length of a line segment before it will be converted to one large line. The larger this value the less precise the cut.

4.5.12 Max Angle

This is the maximum acute inside angle the software will recognize before it takes two lines and makes it into one, cutting off the angle. The more acute the angle the less precise the cut.

4.5.13 Max Offset

Max Offset determines the precision of the contours in a cut. The larger the number, the less precise the contour of a cut.

4.5.14 Export Options

When exporting a file to a CAD program, the operator can choose if certain cut profiles are exported in the design. Check "Always Export Cut Profiles", "Simple Cut Export" and/or "Simple Hole Export" to include this information in any exported .dxf, .step or .iges file(s).

4.5.15 Draw Colors

The colors of the displayed design element are changed under the Draw Colors settings. Tube and Pipe default to the color Gray. Each element has two colors set as default, the first color is the inner contour of the element, the second color is the outer contour of the element.

4.5.16 Default Stock Length

Set Default Stock Length to the desired value. The machine will use this when setting up Nest Projects and positioning the Trolley during a job.

4.5.17 Default Web Size

This is the default web spacing placed between cuts when creating a Nest Project. This can be reduced to save material or increased if necessary.

4.5.18 Saddle Scale Factor

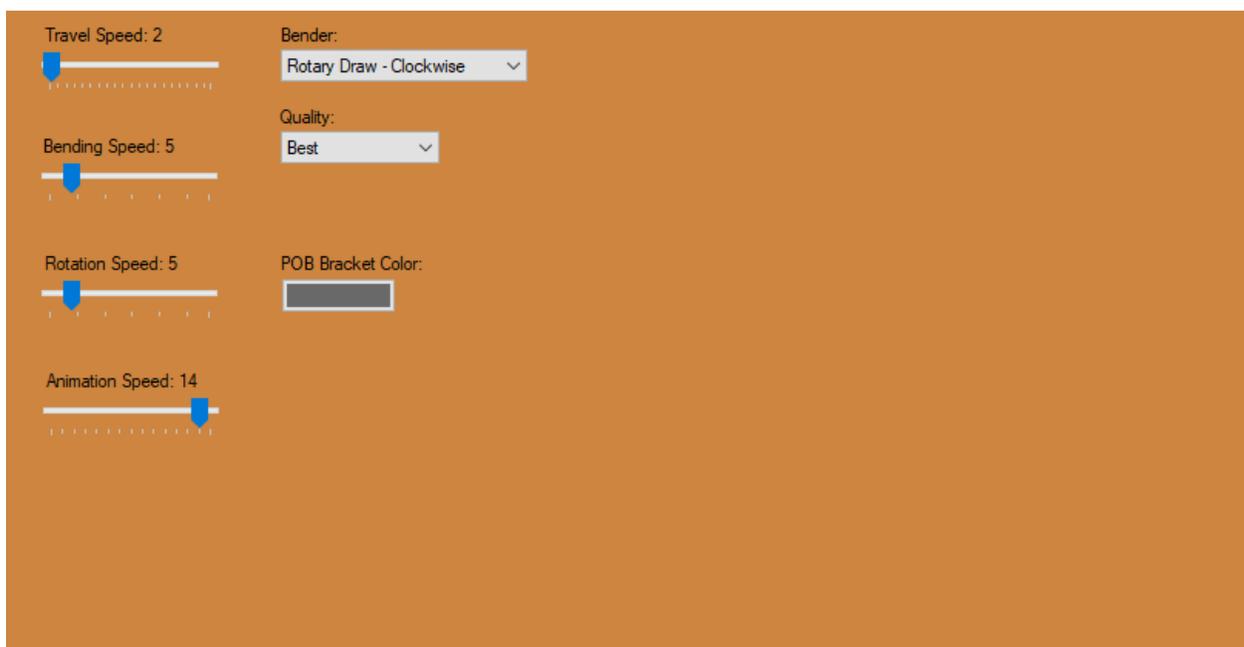
Saddle Scale Factor is typically set to 1.

4.6 Simulation Tab

The Simulation interface contains settings for the bending simulation feature. The bending simulation feature is used to visualize how the material will be moved through the bending process. Using the bending simulator can help to avoid potential bending issues such as the material being fed into the floor or ceiling.

Important

This is just a simulation, and will not work for all given benders, dies, material, or designs. Do not always trust the simulation. Rely on LRA data.



4.6.1 Speed Settings

The bending simulator speed is set using the slide bars in the interface. The options include Travel Speed, Bending Speed, Rotation Speed, and Animation Speed.

4.6.2 Bender

Set the type of bender from the Bender drop down menu. Options include: Rotary Draw - Clockwise, Rotary Draw - Counter CW, Rotary Draw - Vertical, Center Compression, Rotary Compression - Clockwise, Rotary Compression - Counter CW, and Rotary Compression - Vertical.

4.6.3 Quality

The quality of the simulation display is set using the Quality drop down.

4.7 Misc Tab

The Misc, or Miscellaneous workspace, contains the administrative settings. Some of these settings should be left alone, others can be edited.

The screenshot shows the following settings in the Misc Tab:

- File Settings:**
 - Program Location: C:\Mach3\
 - G-Code Location: C:\Mach3\Transfer\
 - Use Default File Names
- Calculations:**
 - Rounding Precision: 3
- Machine Control Panel:**
 - Update Frequency: 4 Hz
- Part ID Overrides:**
 - Skip if Part is Shorter than: 3
 - Skip if Length is Greater than: 90 %
- Advanced Debugging:**
 - PF Override: 0
 - NPOT Fix
 - Disable Display Lists
 - Trim Scrap Material
 - Allow Editing of Nested Parts
 - Prompt to Select Machine
 - Allow Use of Uncalibrated Machines
 - Enable Improved Homing
 - Minimum Torch Gap: 0.02

4.7.1 File Settings

File Settings point the Bend-Tech software to Mach3 file locations. These settings should not be altered.

! Warning !



Altering File Settings could affect operation of the Dragon machine.

4.7.2 Calculations

Rounding precision of the software is set in the Calculation box. Bend-Tech recommends setting this in coordination with the decimal settings in the General tab under Tolerances. Bend-Tech recommends rounding precision of 3 or greater.

4.7.3 Part ID Overrides

Part ID Overrides are used so the machine does not mark parts that are under a certain length, and does not place markings on a part that are longer than a specified percentage of the material length.

4.7.4 Advanced Debugging

Bend-Tech does not recommend altering settings in Advanced Debugging unless instructed to by a Bend-Tech Service Tech.

4.7.5 Allow Editing of Nested Parts

Once a part is Nested it cannot be edited unless the “Allow Editing of Nested Parts” box is checked.

If this box is checked, the software will allow the Nested part to be brought back into Edit Flat. After the part is edited, it can be transferred back to the Nesting project. It will be transferred back as a new part. The original part will still appear in the Nesting project.

4.7.6 Allow Use of Uncalibrated Machines

Checking the box “Allow use of Uncalibrated Machines”, allows the software to be used while connected to an uncalibrated machine or when the software is not connected to a machine at all. This feature is useful for a designer who may not be connected to a machine, but needs to simulate certain operations.

4.7.7 Prompt to Select Machine

If “Prompt to Select Machine” is chosen, the software will prompt the user to select a machine when performing the Nest Part procedure. This feature is helpful when there are multiple machines set up and calibrated for specific uses in the software.

For example, a machine may be calibrated to cut steel tube while another may be set up to cut aluminum.

4.7.8 Trim Scrap Material

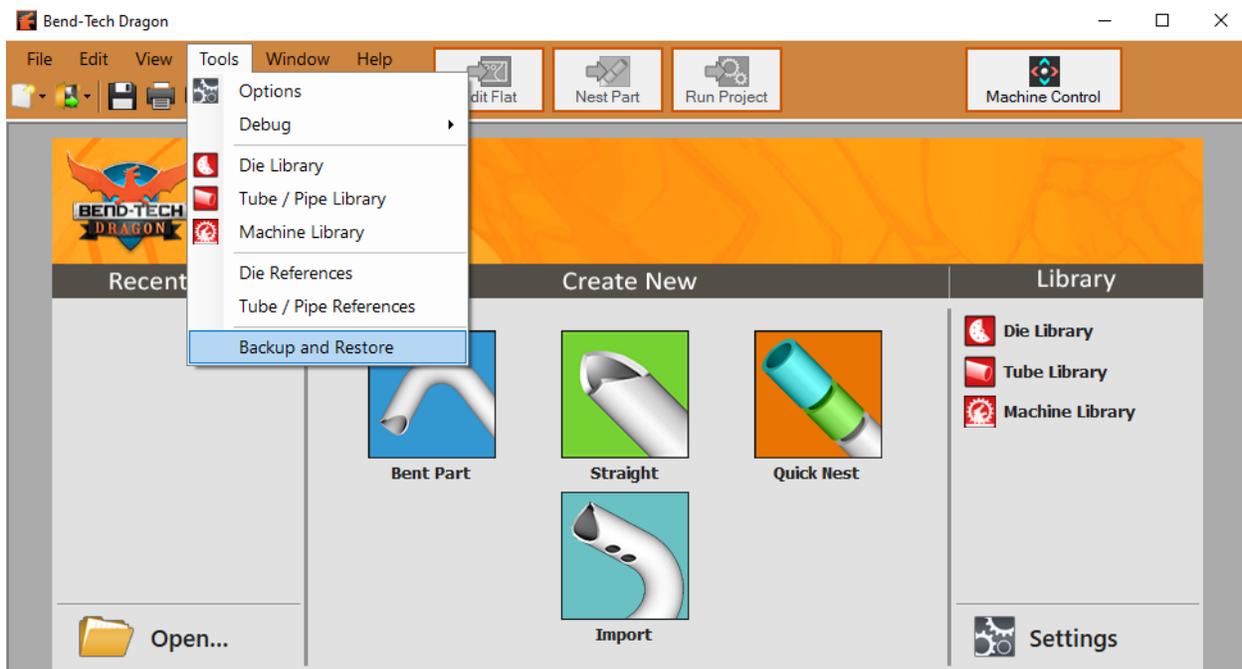
A Nest Part project may have excessive material between parts. If Trim Scrap Material is selected, the software will calculate the excessive material and move the parts accordingly to eliminate waste.

05

Backup and Restore

5.1 Backup and Restore

The Operator and Designer are often working on different computers. If the Material Library or other aspect of the Bend-Tech Dragon software needs to be updated between computers, the software can be updated from one computer to the next using the Backup and Restore function. This feature can also be used if there is a new computer introduced to the shop.



5.1 How to Backup Files

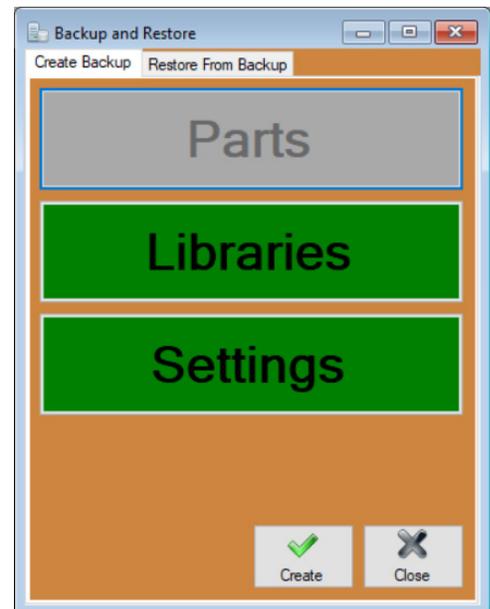
1. Open Backup & Restore

At the top of the Bend-Tech interface, click the TOOLS dropdown. At the bottom of the dropdown menu, click Backup and Restore. A Backup and Restore window will pop up.

2. Select the Options to Backup

In the Backup and Restore popup, under the CREATE BACKUP tab, there are three options to choose from: Backup Parts, Libraries, and Settings.

Select the elements to Backup.
 Green = Selected
 Gray = Not Selected



3. Name and Save the Backup File

A “Save Bend-Tech Backup File” popup will appear. Choose a name for the Backup file. Choose a location for the Backup file from the menu on the left hand side. This can be a desktop or an external USB drive or similar location. Click SAVE.

5.2 Restore from Backup

1. Open Backup & Restore

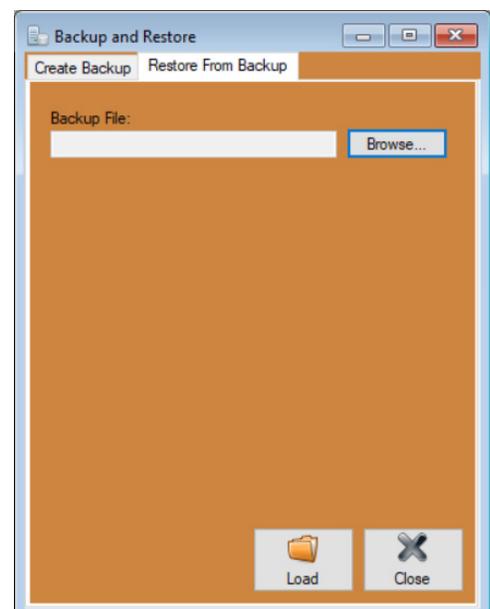
To Restore from the Backup files, in the Tools dropdown menu, click Backup and Restore.

2. Select Restore

In the Backup and Restore popup, click the Restore From Backup tab.

3. Open the Backup Save File

Click the Browse button. An Open Bend-Tech Backup File popup will appear. Locate the Backup file. It will feature the name that was chosen for it in the Backup Files process and will appear as a .bbk file. Click on the file, click Open.

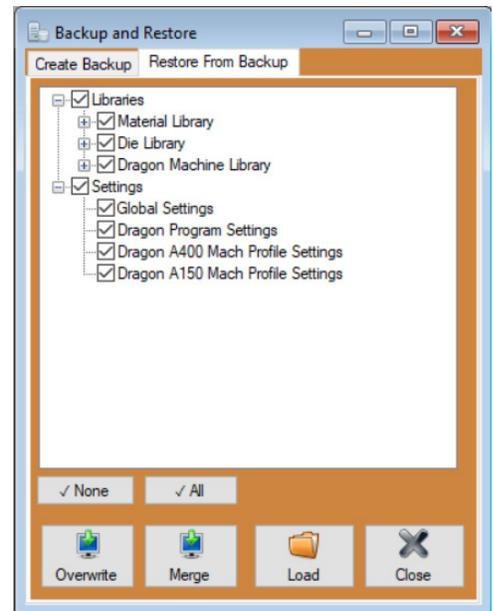


3. Transfer the Files that need to be Restored

A list of available files to backup and restore will appear in the window.

To transfer files, click None or All, then click Overwrite or Merge. The OVERWRITE option will populate the software with the files that are in the backup file, and will overwrite all files currently in the software. MERGE will overwrite matching files, and add in any new ones the backup file has.

If OVERWRITE is chosen, a Merge Warning will appear for each matching file. Choose Ignore, or select the appropriate overwrite options depending on preference.



Bend-Tech LLC

729 Prospect Ave. Osceola, WI 54020
1-651-257-8715

sales@bend-tech.com
www.bend-tech.com