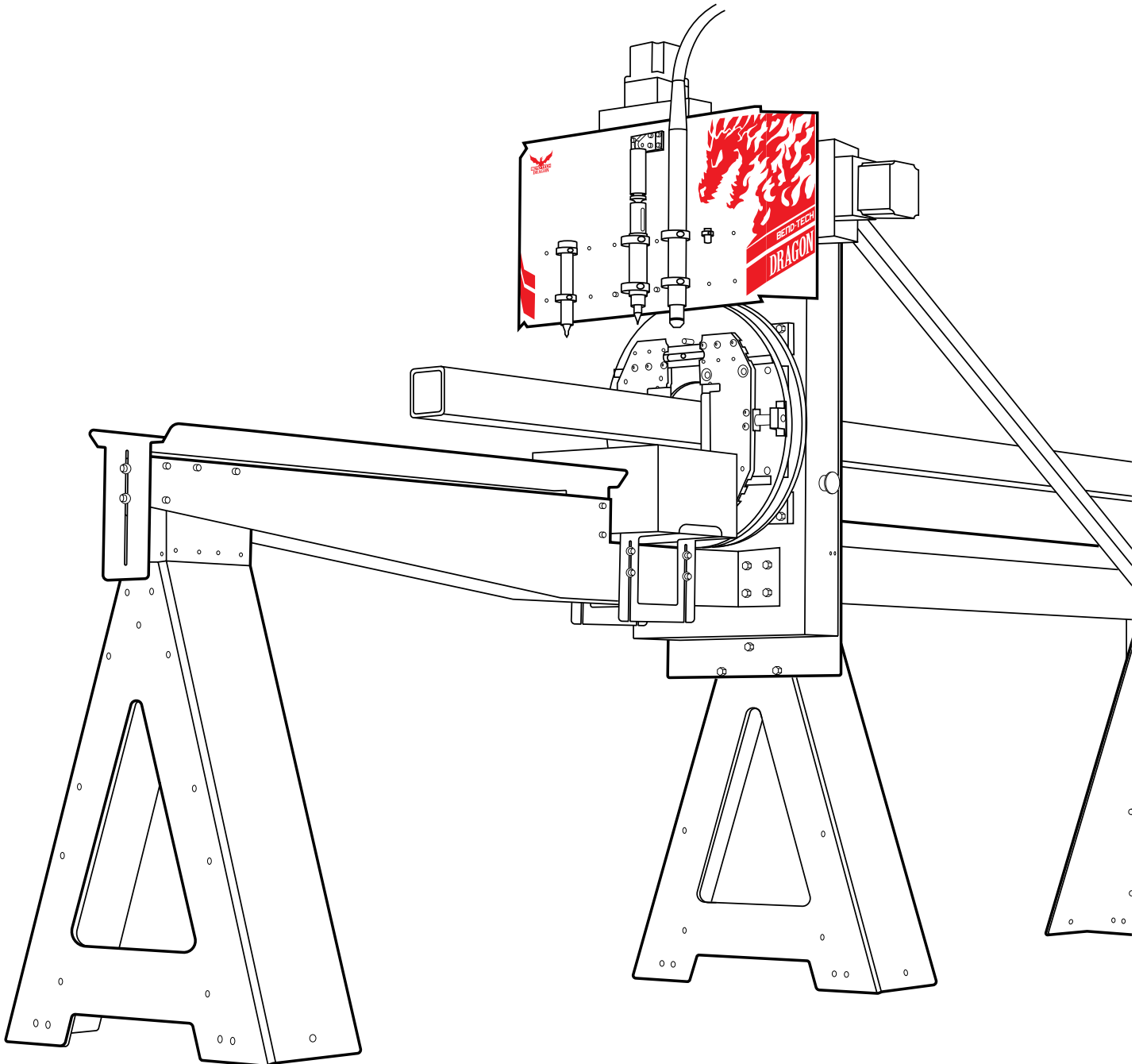


Part 1 of 1

BEND-TECH DRAGON A400

Operator's Manual



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Dragon A400

Operator's Manual
Revision 2

English
Original Instructions

August 2020

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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 the date the Dragon machine is installed at 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. are excluded from this warranty. 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, improper maintenance or unauthorized modification of the machine. The warranty does not cover damage due to natural disasters, fire, flood or other external factors.

Software

Dragon software is covered by a 2-year maintenance plan from the purchase date of the Dragon A400 machine. After the 2-year maintenance plan is expired, the Customer can purchase a maintenance plan. A maintenance plan 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 Service

Any questions or concerns regarding this manual can be directed to Bend-Tech, LLC representatives via the Dragon website, www.bend-tech.com. Click Contact in the menu bar for communication options and send your comments to the Dragon Customer Service department.

Online Resources

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

Customer Satisfaction Commitment

Congratulations on your purchase of the world's best CNC plasma tube and pipe cutting machine, the Dragon A400. Bend-Tech LLC places great pride in customer satisfaction and it is our promise to offer you the best support available for your Dragon A400. We recognize that our support is a key factor in your success.

Contact Us

You can contact Bend-Tech LLC customer service at 651-257-8715. Our support hours are Monday-Friday, 8:30-5:00 CST. E-mail Bend-Tech LLC sales at: support@bend-tech.com. Our mailing address is: Bend-Tech LLC, 729 Prospect Ave., Osceola, WI 54020, U.S.A..

Warnings

This manual contains important statements that are called out from the regular text with an associated signal word: ‘Danger,’ ‘Warning,’ ‘Caution,’ or ‘Note.’ Each of these signal words is accompanied by its own icon. These signal words and icons indicate the severity of the condition and the warning. The machine operator should familiarize themselves with these warnings and read the statements before operating the machine.

Definitions & Examples

Danger

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

Example

! Danger !



Exceeding the material weight limit of the Dragon A400 can result in serious injury to the operator and/or bystanders.

Warning

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

Example

! Warning !



Due to the extreme temperatures that result from the plasma cutting process, parts cooled in water in the parts catcher can still be extremely hot. Always use caution when handling newly-cut parts.

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.

Example

! Caution !



Exceeding the material weight limit can affect performance and possibly damage the Dragon A400.

Note

A Note gives clarification or focuses on information that is critical or unique to an operation.

Example



Water Cooling system greatly reduces smoke and vapor emitted by the machine. Bend-Tech recommends use of the Water Cooling system whenever possible.

Glossary

A400

Indicates machine with 400-lb weight limit.

Axis

A fixed reference line used by the Dragon A400.

Bend-Tech 7X

Machine design software - CAD.

BOB

Breakout Board.

Material Support Lifter

The Material Support Lifter supports material to reduce sag.

Chuck

Located on the Trolley, the Chuck holds the material so it can be moved forward, backward and rotated.

Control Box

Connects Dragon Software Suite to the Dragon A400.

Coolant Tray

Cools cut parts as they are produced.

Drive Belt

The X Motor uses the Drive Belt to power the Trolley along the Rail. The Drive Belt is mounted stationary along the length of the machine.

Drive Belt Pulley

Located on the X Motor, it works in conjunction with the Drive Belt to power the Trolley along the Rail.

E-Stop

Emergency stop.

ESS

Ethernet Smooth Stepper (Control Board).

Ethernet

System for connecting multiple computers via a Local Area Network.

Front Gate

The Gate supports the material at the front of the machine. It consists of two sets of self-centering roller jaws.

Gate Lead Screw

Controls operation and adjustment of the Gate.

Interface

Any particular screen display generated by Bend-Tech software.

Mach3

Machine driver software.

Parts Catcher

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

Rail

The Rail is the main structure of the Dragon A400. The Trolley rides on the Rail.

Tail

The Tail is located at the opposite end of the Head of the machine. The Tail arrives pre-assembled. The X Axis homing sensor, Drive Belt Adjustment Block and E-Stop are located at the Tail of the machine.

Toolhead

Operates the Marker, Engraver and Torch.

Trolley

The Trolley rides on the Rail, and carries the Chuck forward and backward along the length of the Rail Support Beam.

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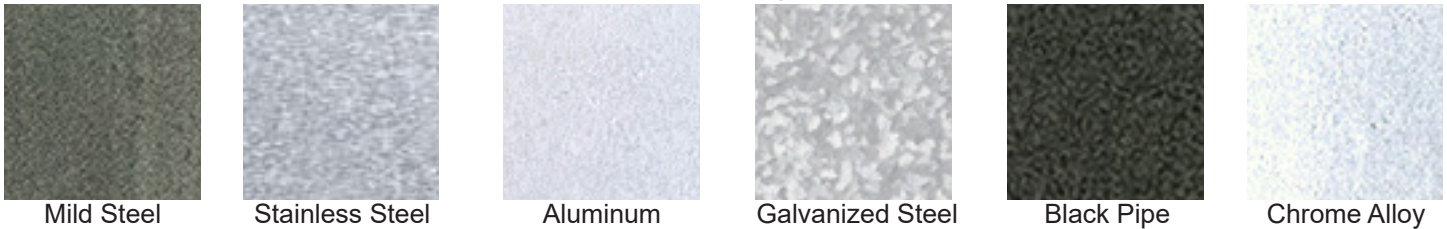
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Bend-Tech Dragon A400 Capabilities

The Bend-Tech Dragon A400 uses CAM and CNC to make correct parts every time, saving time and money by eliminating errors and manual labor. The Dragon A400 quickly and easily plasma cuts holes and end cuts, and marks clear bending instructions such as bend location, rotation, and degrees on the tube. This results in parts with accurate fit and reduced labor cost, which results in higher quality work and jobs that get done on time. For shops that fabricate with tube and pipe, the Dragon A400 is the essential tool for success.

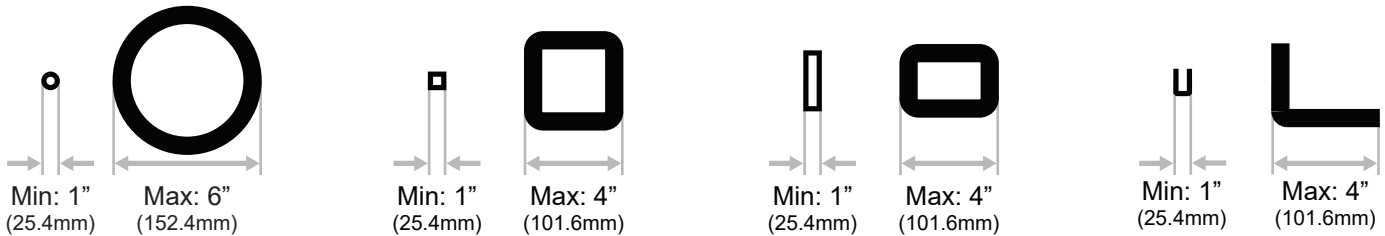
Dragon A400 Capabilities

Material Type



Any type of electrically conductive metal.

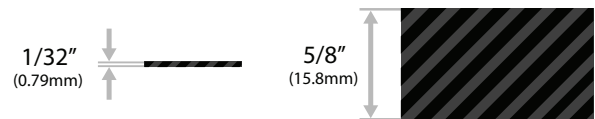
Material Size



Material Weight



Material Thickness



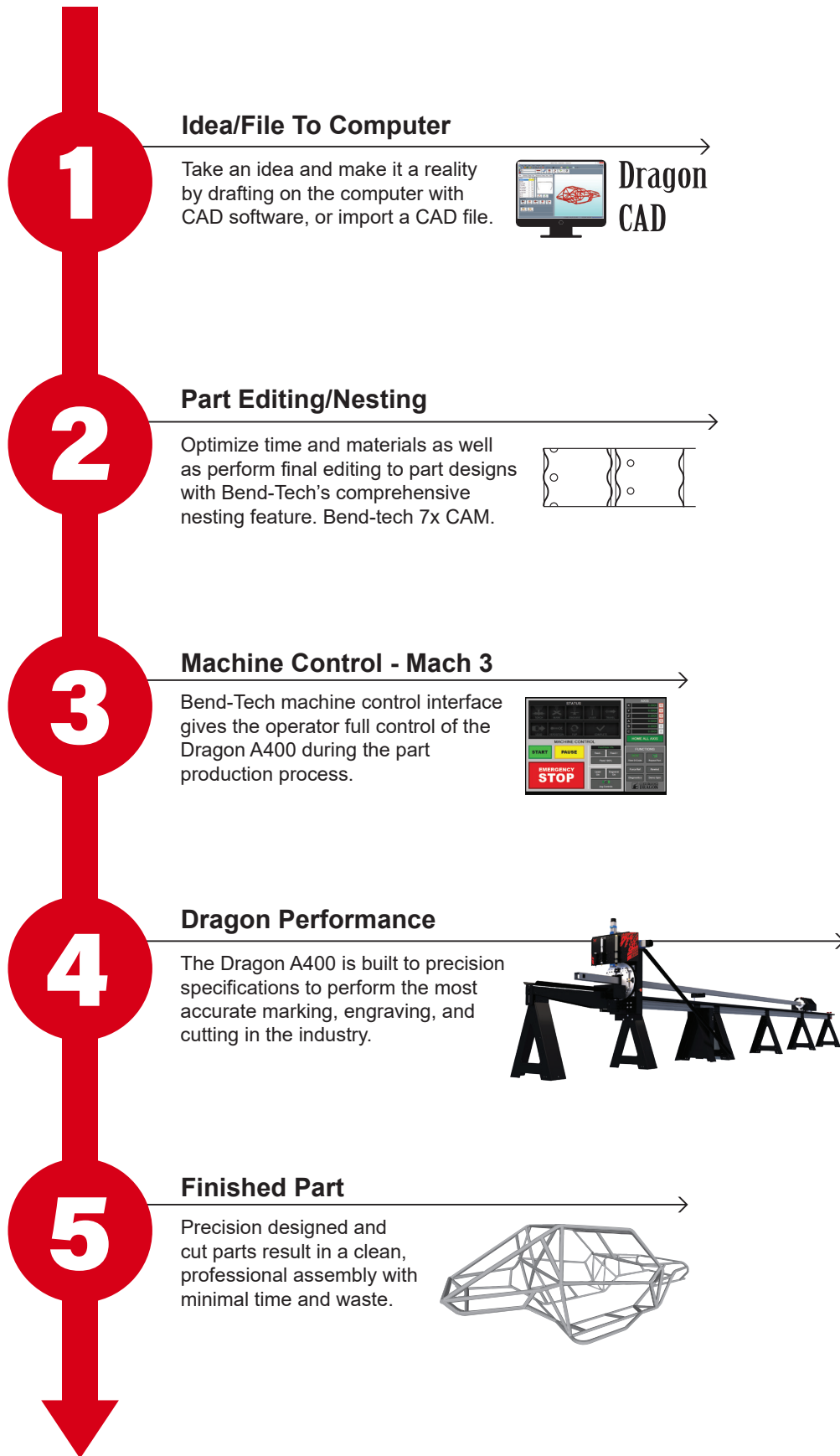
Material Length

The Dragon A400 handles full 24 ft. (7.31m) length material. The chuck has a pass through ability for round material with a 2" or less OD to accommodate longer than standard pieces.

Driven by Bend-Tech Software

Bend-Tech Software has been in use by over 27,000 fabricators. For more than 20 years, Bend-Tech Software has led the industry, providing the best tube design software on the market. Every Dragon comes standard with powerful Bend-Tech Software.

Bend-Tech Dragon A400 Fabrication Process



01

Safety

1.1 General Safety Notes

Read all warnings, cautions and instructions before operating the machine.

Each company has different processes. Always act in accordance with Environmental Health & Safety (EHS) standards set in place regarding the facility in which the Dragon A400 is being operated.

Follow basic safety precautions to reduce the risk of injury or mechanical damage. CNC metal working machines such as the Dragon A400 introduce hazards such as moving parts, rotating work, belts, pulleys, high voltage electricity, sparks, heat, noise and compressed air. It is the responsibility of the Operator to take appropriate safety measures regarding the potential hazards of this machine, and not the responsibility of Bend-Tech LLC.

Maintaining cleanliness of the machine is important during normal use as well as prior to and after servicing the machine. Cleaning procedures may require Personal Protective Equipment (PPE) equipment beyond the scope of daily operation procedures of the machine.

Read the Start-Up and Training manual in its entirety to ensure safe and efficient operation of the Dragon A400 machine.

This manual is a reference guide for operation of the Dragon A400 and is not a comprehensive source of operation or training information. A complete training course and support can be requested from Bend-Tech LLC, www.bend-tech.com.

! Caution !



The Dragon A400 should only be operated by authorized and trained personnel. Operator should always act in accordance with the Dragon A400 Start-Up and Training Manual, safety procedures and machine instructions for safe operation of this machine. Failure to follow these guidelines may pose a hazard to personnel and the machine.

1.2 Safety Procedures

1.2.1 Personal Protective Equipment (PPE)

Metalworking and metalworking operations can be dangerous. Using the proper PPE is important in avoiding injuries that can result from sparks, heat, noise, smoke and vapor, dropped objects and ultraviolet light. Consult local safety codes before operating the machine. Before any personnel work on or near the machine it is important to read this manual and fully understand the safe operation of the machine. Contact Bend-Tech LLC with any questions or concerns regarding the safe operation of the Dragon A400.

1.3 Recommended PPE for Operating the Dragon A400

1.3.1 Ultraviolet Eye Protection

Safety glasses with the proper shade based on amperage of the Torch are required for operation of the machine. It is important the Operator and anyone observing the machine wear welder's glasses or a welder's mask, or the machine be surrounded by a welding curtain. Refer to Occupational Safety and Health Administration OSHA standards to determine proper safety glass shading and/or welding curtain for the cutting torch amperage being used.

! Danger !



The cutting torch emits ultraviolet light. Looking directly at the plasma stream can damage human retinas.

1.3.2 Footwear

The Dragon A400 is a metal working machine and metal materials can be extremely heavy. A piece of dropped material could cause injury to the Operator or observers. Also, the torch emits sparks and possibly hot torch slag. It is highly recommended that the Operator wear safety shoes or boots while operating the Dragon A400.

1.3.3 Heat-Resistant Gloves

Parts produced by the Dragon A400 will be extremely hot and could cause severe burns if not handled properly. It is recommended that the Operator wear heat-resistant gloves when handling parts produced by the Dragon A400.

! Warning !



Due to the extreme temperatures that result from the plasma cutting process, parts cooled in water in the parts catcher can still be extremely hot. Always use caution when handling newly-cut parts.

1.3.4 General Eye Protection

The Dragon A400 will emit sparks, plasma dust and torch slag during operation. Anyone operating or observing the machine should wear the appropriate eye protection.

1.3.5 Hearing Protection

While the Dragon A400 is relatively quiet, it is recommended that the Operator wear hearing protection as specified per the facility safety requirements.

1.3.6 Breather Mask or Ventilation System

Plasma dust and debris is toxic, and inhalation can cause respiratory difficulties or other complications. It is recommended that the Operator and any observers wear a breathing mask, or that the shop be equipped with an effective ventilation system for safe operation of the Dragon A400.



The Dragon A400 Coolant System greatly reduces smoke and vapor emitted by the machine. Bend-Tech recommends use of the Coolant System whenever possible. The Coolant System is especially effective when working with aluminum or stainless steel.

1.4 Operational Safety

1.4.1 Guards

Do not operate the machine without safety guards in place.

1.4.2 Machine Walkthrough

Perform an inspection walkthrough of the machine before each startup, making sure all electrical cords and cables that function as part of moving assemblies are secure and fastened. Ensure all tools are fastened securely. Ensure all E-stop switches are disengaged.

1.4.3 Machine Operational Movement

While a program is running, the Trolley and Toolhead can move rapidly at any time through its short/long travel feed rate procedures. Operator and bystanders should stay clear of the Trolley and Toolhead during machine operation.

! Warning !



The Trolley and Toolhead are pinch points. Stay clear during machine operation.

1.4.4 Parts Securing

Assure that any material loaded into the machine is securely fastened in the Chuck and is snug in the Gate.

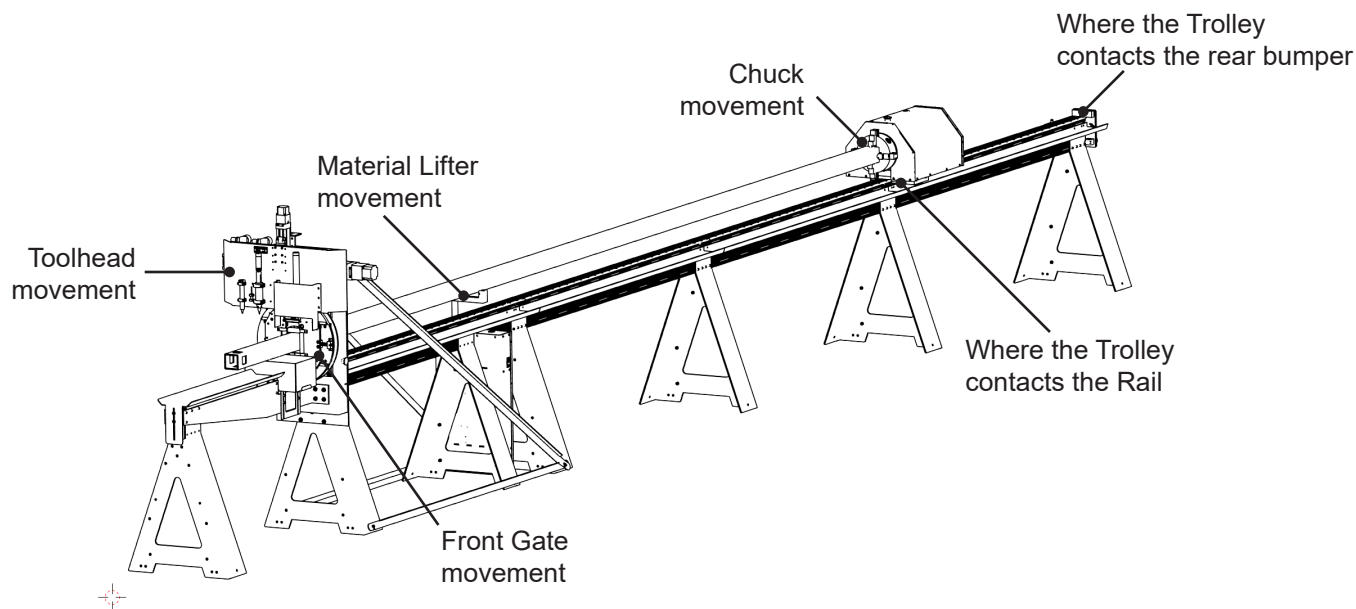
! Warning !



Improperly secured parts may cause injury.

1.5 Pinch Points

Use caution in the area of pinch points. There are many pinch point locations identified on the Dragon A400 including the Gate assembly, Toolhead, Trolley and Material Support Lift. It is advised to use caution in these areas and stay clear of them during machine operation.



1.6 Recommended Safety Guidelines

- Keep unauthorized personnel away from the Dragon A400 work area.
- Keep the work area clean and free of debris.
- Stay clear of the machine and any moving parts during machine operation.
- Stay clear of the tool head during operation.
- Never operate the machine while under the influence of alcohol or drugs.
- Wear appropriate PPE at all times while operating the machine.
- Keep flammables away from machine during operation.
- Risk of electric shock - avoid touching exposed wires while machine is powered.
- Always power off machine and disconnect from main power source before servicing electrical components.
- Do not exceed the machine's capacities.
- Do not wear loose-fitting clothing or jewelry while operating machine.
- Be aware of sharp edges on cut material.

1.7 Modifications To The Machine

1.7.1 Unauthorized Modifications

Performing unauthorized modifications to the Dragon A400 is not recommended. Bend-Tech, LLC is not responsible for damage resulting from modifications to the Dragon A400.

1.7.2 Factory Parts Kits and Updates

Some parts kits and update packages are manufactured and sold by Bend-Tech LLC. Customers may choose to install these kits and updates themselves. However, the Customer should have a thorough understanding of the machine and the service actions being performed. If a Customer has any doubts regarding their ability to install parts kits or update packages contact Bend-Tech, LLC for assistance.

! Caution !

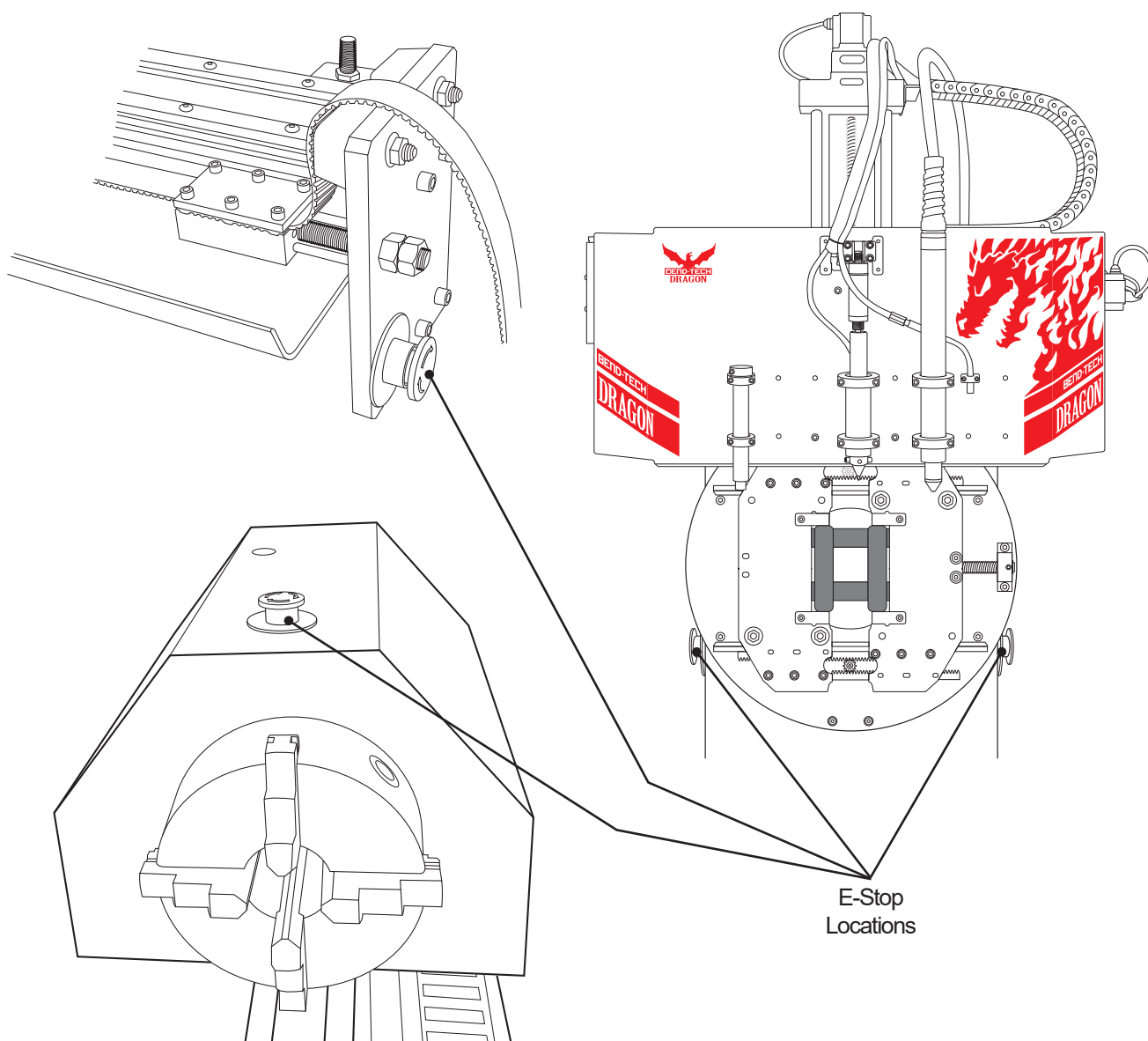


Bend-Tech, LLC does not recommend unauthorized modifications to the Dragon A400. Contact Bend-Tech service representatives with any questions regarding operation or capabilities of the machine.

1.8 Emergency Stops (E-Stops)

1.8.1 E-Stop Overview

There are four external emergency stop (E-stop) buttons located on the Dragon A400 machine. There is one E-stop on the Tail of the machine, one on the Trolley cover, and one on each side of the Gate. These four emergency stops completely shut power off to all motors and outputs. To re-enable the machine after pressing an E-stop, the E-stop must be disengaged and power to the motors must be initialized by pressing the green light on the Control Box. If the green light doesn't initialize, this is an indicator that the E-stop is still engaged. The green light indicates the motors have power.



1.8.2 Control Screen E-Stop

There is an additional emergency stop located on the machine control screen. This E-Stop doesn't cut power to any motors or outputs, but will temporarily disable any software that is being used. This will discontinue any project that is being run, without losing power to the motor.

1.9 Electrical Servicing

1.9.1 Power Down Before Servicing

Completely power off the Control Box before handling any electrical components. Electrical components include all motor connections, motor cables, sensors, sensor cables, emergency stops, laser cable, and Torch cable.

! Danger !



Do not touch 120VAC components inside Control Box without first disconnecting the machine from its power source.

! Warning !



Never disconnect a Motor Cable with power applied.

1.10 Material Weight

1.10.1 Weight Limit

Material weight limit for the Dragon A400 should not exceed 400 lbs. This is the maximum weight of material the Gate can support while still operating safely. This is also the maximum weight of material the Drive Belt and Stepper Motor can handle and maintain safe operation.

! Danger !



Exceeding the material weight limit of the Dragon A400 can result in serious injury to the Operator and/or bystanders.

! Caution !



Exceeding the material weight limit can affect performance and possibly damage the Dragon A400.

1.11 Material Length

1.11.1 Material Lift Support

In some cases, material longer than 7 ft. can sag and place excessive stress on the Gate, introducing the danger of material contacting the Torch head or damaging the Engraver. Material longer than 7 ft. or thinner material may need to be supported by the Material Lift Support in order to avoid contacting the Torch head or damaging the Engraver.



Material shorter than 7 ft. may sag. However, if the material is shorter than 7 ft. it will not be able to be supported by the Material Lift Support. In some cases the Operator can manually support the material.

1.12 Plasma Torch

1.12.1 Torch Overview

The Torch and plasma cutting device is a high-voltage system that requires extreme caution when operating. It is recommended that the Operator read the manual and become familiar with the hazards of working with the machine before operating it in conjunction with the Dragon A400.

1.12.2 Ultraviolet Light

The Torch emits extreme ultraviolet light which can damage human retinas. Never look directly at the cutting process without the appropriate eye protection.

! Warning !



Always wear shade 10 glasses when Torch is cutting.

1.12.3 Heat

The Torch will introduce extreme heat into the material during the cutting process. The Operator should take caution handling freshly-cut parts. Always wear heat resistant gloves when handling parts after cutting.

! Danger !



The plasma arc of the Torch can cause severe injury or even death. Never approach the Torch while it is activated and operating.

1.12.4 Gloves

Always wear insulated gloves when handling Torch consumables. Consumables get extremely hot during Torch operation. Touching Torch consumables can result in electric shock if the Torch is not disabled before handling.

1.12.5 Fumes

Some metals, including stainless steel, can emit toxic fumes when cut. Bend-Tech recommends using a ventilation system with the Dragon A400 or ensure the facility has adequate ventilation to ensure air quality meets standards and regulations

! Danger !



Servicing the unit with power connected can result in electric shock which can lead to severe injury or death. Disconnect power before servicing the Torch unit.

! Danger !



The plasma arc of the Torch can cause severe injury or even death. Never approach the Torch while it is activated and operating.

! Danger !



Do not use combustible fuel gases or oxidizing gases in the plasma cutting process. Use of these types of gases can result in explosive conditions during cutting operations.

1.13 Other Safety Information

The Dragon A400 may have subassemblies supplied with independent warnings. It is the Operator's responsibility to familiarize themselves with all possible hazards of the machine.

1.14 More Information

Bend-Tech, LLC is continuously updating information regarding the Dragon A400. Users can see updated and supplemental information online at www.bend-tech.com or talk to a technical representative directly by calling 651-257-8715.

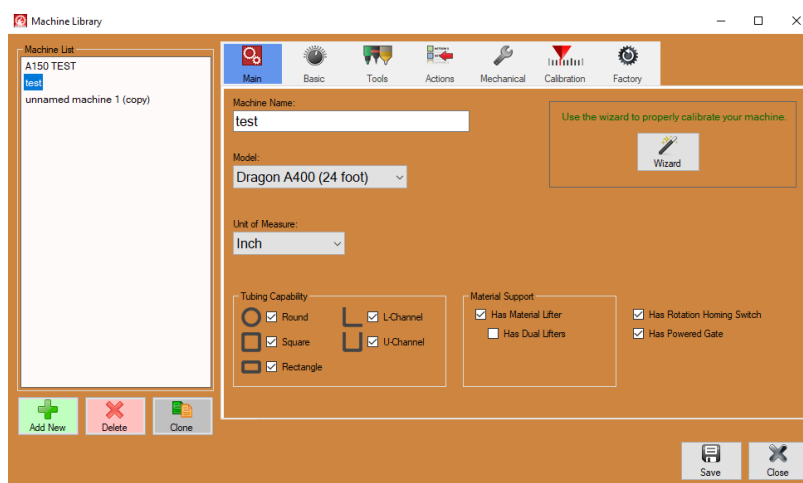
Machine Library

2.1 Using the Machine Library

The Machine Library contains all the basic settings and operational information regarding the Dragon A400. The Operator should familiarize themselves with the functions and settings available in the Machine Library. Using the Machine Library properly will help the Operator optimize the machine's operational capabilities.

2.2 Main

The Main interface contains basic machine information for the Dragon A400. It contains a Machine List window that will display all the Dragon A400 machines connected to the given computer. Most shops will likely only have two machines in the Machine List, the "Factory Calibrated Machine" and a "Dragon" machine that was created at the Bend-Tech manufacturing facility when the machine was originally calibrated.





The Factory Calibrated Machine cannot be deleted from the Machine List.

2.2.1 Machine List

In the Machine List box, there will be a "Factory Calibrated Machine" as well as a clone of the Factory Calibrated Machine named "Dragon" for shop use. The Factory Calibrated Machine cannot be altered or deleted, and serves as a backup. The "Dragon" machine is created at the Bend-Tech manufacturing facility when the machine is factory calibrated. If the Dragon machine becomes corrupt or misprogrammed in some way, the Operator can create another clone of the Factory Calibrated Machine.

2.2.2 Machine List Actions

Under the Machine List box in the lower left of the Main interface, the Operator can click the green Add New icon to enter a new machine. The Operator can click the red Delete icon to delete a machine.

2.2.3 Cloning a Machine

To clone the Factory Calibrated Machine, click on Factory Calibrated Machine in the Machine List to highlight it, then click the Clone icon located under the Machine List in the lower left of the Main interface.

2.2.4 Machine Name

The Machine being used will be displayed in the Machine Name text box. The Operator should ensure the model and unit of measure is accurate, as well as Tubing Capability, Material Support and Powered Gate information.

2.2.5 Model

Ensure the correct Dragon model is chosen from the Model dropdown menu.

2.2.6 Unit of Measure

Ensure the unit of measure is correct for the given shop.

2.2.7 Tubing Capability

When a machine is chosen from the Machine List, the Operator will need to check the different types of tubing that will be used by the machine. If the machine has a Powered Gate the Operator can check L-Channel and U-Channel. If a certain capability isn't available, contact sales@bend-tech.com for upgrade package options.

2.2.8 Material Support

Depending on the length and configuration of the Dragon machine, it may or may not be equipped with a Material Lift Support. Check the appropriate box(es) regarding how the given Dragon A400 machine is configured.

2.2.9 Powered Gate

If the machine has a Powered Gate, ensure the box indicating Has Powered Gate is checked. Leave unchecked if the machine does not have a Powered Gate.

2.2.10 Rotation Homing Switch

If enabled, the machine has a switch installed for Chuck Rotation (Y Axis). Machines with this switch are capable of homing the Y Axis, which is necessary to process square or rectangular materials.

2.2.11 Wizard

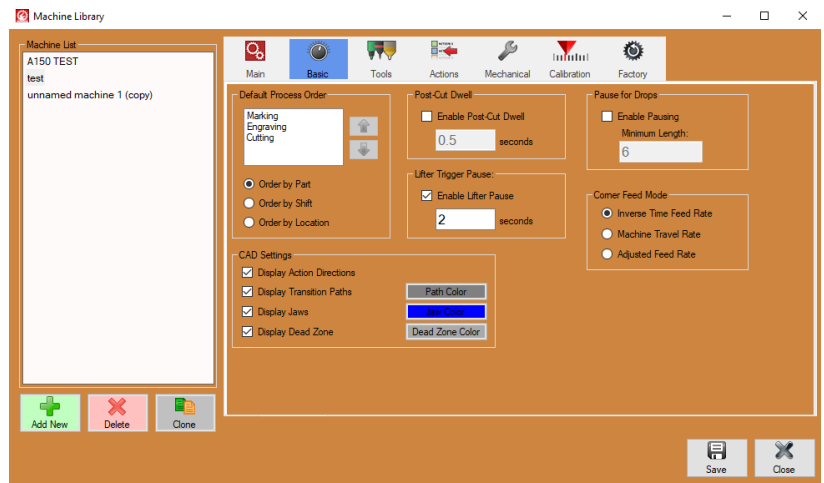
In the Main tab interface there is also an icon for the Wizard, which is used to calibrate the machine. The Dragon A400 is calibrated at the Bend-Tech manufacturing facility. Calibrating the machine should not be necessary unless a part on the machine has been replaced because of service.

2.3 Basic

In the Basic interface the Operator can configure cutting process settings as well as certain CAD settings.

2.3.1 Default Process Order

Just under the menu bar on the left, in the box labeled Default Process Order, the Operator can select the sequence of actions for the Toolhead.



To change the order of actions in regard to the Toolhead, click to highlight the action (Marking, Engraving or Cutting) and click the up or down arrow to the right of the box to change the sequence. Bend-Tech has found the default order (Marking, Engraving, Cutting) results in the best performance of the Toolhead. However, some projects may require altering this order.

The Operator can also select the sequence of actions when the machine processes material. The Operator can select Order by Part, Order by Shift or Order by Location.

Process	Definition
Order By Part	The machine will produce each part in a 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 the Nest Project.

2.3.2 CAD Settings

Near the center of the interface, in the CAD Settings box, the Operator can choose how parts are displayed. These settings can be used to customize how Nest Projects are displayed in CAM. 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 in CAD.
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 process.
Display Dead Zone	The software will display the material Dead Zone.

2.3.3. 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 Torch or material to cool after each cut.

2.3.4 Lifter Trigger Pause

Enables the machine to pause the specified amount of time after the Material Lifter is engaged or disengaged. Bend-Tech recommends using this feature to prevent the machine from colliding with the Material Lifter.

2.3.5 Pause for Drops

If enabled, the machine will pause after cutting a part that exceeds the minimum length specified by the Operator.

2.3.6 Corner Feed Mode

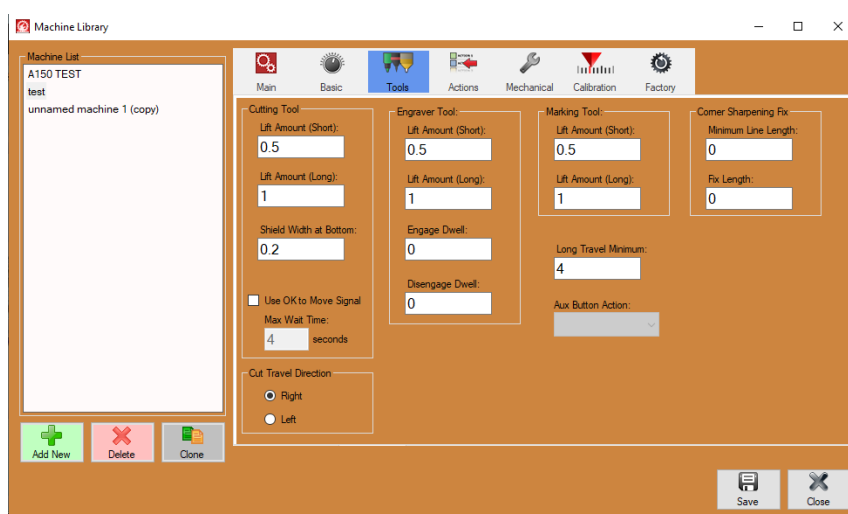
Corner Feed Mode contains advanced settings. Bend-Tech does not advise changing these settings unless first contacting a Bend-Tech Technical Representative. Default selection is Inverse Time Feed Rate.

2.4 Tools

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

2.4.1 Lift Amount

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. The Operator can define Short vs. Long distance by inputting a different value in the text box under Long Travel Minimum near the center of the interface.



Default lift amounts have been determined by Bend-Tech technicians as ideal for most efficient production when using the Dragon A400 machine.

2.4.2 Long Travel Minimum

The Long Travel Minimum setting defines List 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 Lift Amount (Long) distance.

2.4.3 OK to Move Signal

If enabled, the machine will wait for the Torch to confirm it is ignited before moving along the cutting path. The machine will wait the Max Wait Time before stopping and aborting the current program.

2.4.4 Shield Width at Bottom

Depending on the Torch being used, and the consumables installed on that Torch, the Shield Width could vary enough where it creates a danger of Torch collision. The default value is set to 0.2, which is typical of most Torch Shield Caps.

2.4.5 Cut Travel Direction

The Hypertherm units supplied with the Dragon A400 use a clockwise swirl ring. With a clockwise swirl ring the Torch will cut cleaner on the right side than the left. It is up to the Operator to determine the desired type and quality of cut based on desired results and choose Cut Travel Direction accordingly.

2.4.6 Engraver Dwell

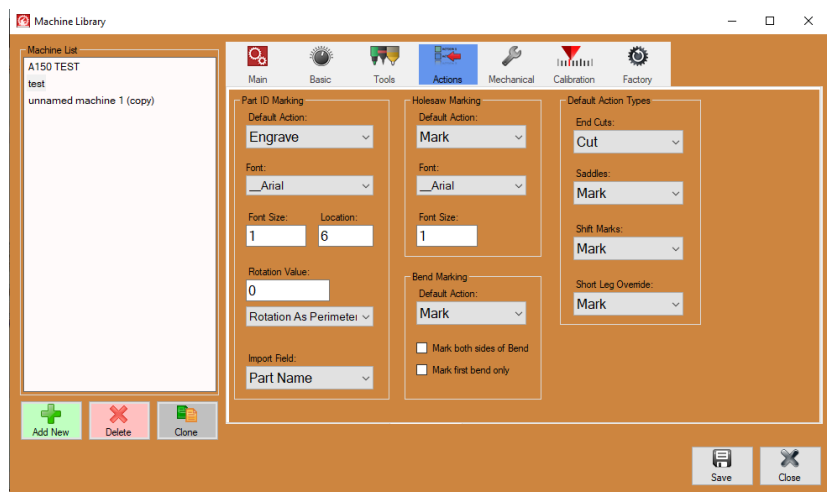
If the Operator is engraving parts, setting a dwell time for the Engraver engage and disengage can help optimize operation of the tool. Setting a dwell time can ensure the Engraver moves into position and gets into position and up to speed properly before engraving, and completes engraving before retracting.

2.4.7 Corner Sharpening Fix

This setting is no longer used. Leave this setting at 0.

2.5 Actions

The Actions interface is where the Operator can go to program how the machine will perform an action. For example, under Default Action Types on the right-hand side of the interface, under Saddles, if the Operator chooses Engrave, the machine will Engrave every Saddle programmed into a CAD or Nest Project.



2.5.1 Part ID Marking

An Operator may choose to add a Part ID to a part that is being processed by the machine. In the Part ID box, in the dropdown menu under Default Action, the Operator can choose the type of Part ID Marking desired for the project, or the Operator can select None if no marking is desired.

2.5.2 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. The Operator can choose Rotation As Perimeter Distance to place the Part ID according to measured distance around the material, or Rotation As Angle to place the Part ID measuring by degrees around the material.

2.5.3 Import Field

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 Die Name of the die used to create the part as the Part ID.

2.5.4 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 A400 machine. Under Holesaw Marking, the Operator can program the machine to Mark or Engrave holesaw marks or choose None if no marking is desired.

2.5.5 Bend Marking

Under Bend Marking, the Operator can program the machine to Mark or Engrave bend marks, or choose None if no marking is desired. The Operator can also 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.

2.5.6 Default Action Types

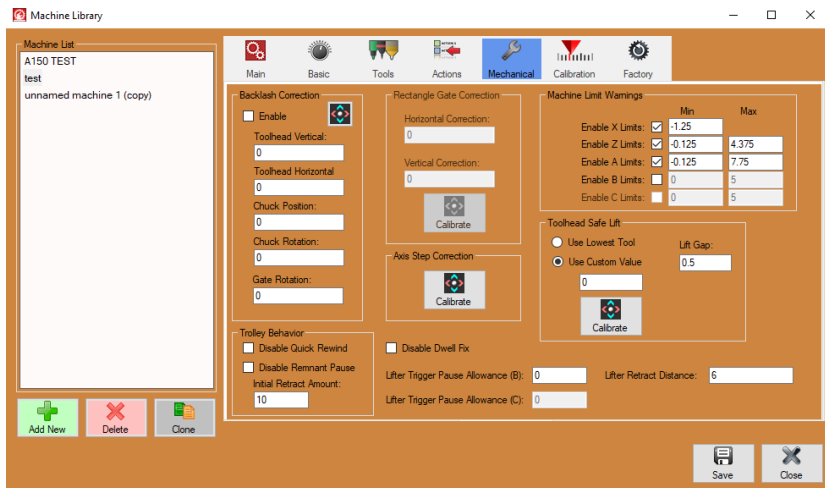
Under Default Action Types the Operator can choose Default Action Types for four basic machine operations.

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.

Shift Marks	Shift Marks are used when the Operator is required to reposition the material in the Chuck, or when flipping the material. The Operator can choose Mark or Engrave.
Short Leg Override	If the software determines a cut is programmed such that the material will be too short to be placed in the bender, the software will mark the cut so the Operator can perform the action with a torch or holesaw after bending the piece.

2.6 Mechanical

In the Mechanical interface the Operator can calibrate and/or test a number of different operating components of the machine. While many of these should not be altered without first consulting with a Bend-Tech Technical Representative, there are some values the Operator will need to be familiar with.



2.6.1 Backlash Correction

Backlash Correction is calibrated at the Bend-Tech manufacturing facility. The Backlash Correction values should not be altered without first consulting with a Bend-Tech Technical Representative. If the Operator is seeing inaccurate cuts, or if parts are too long, it may be necessary to perform a Backlash test. To initiate this, click the multicolored, square icon at the top of the Backlash Correction box. Follow the on-screen prompts. If the Operator deems a Backlash test necessary contact Bend-Tech Customer Support before proceeding.

2.6.2 Rectangle Gate Correction

The Rectangle Gate Correction feature no longer applies to the Dragon A150 or the Dragon A400. The features in this box will be grayed out.

2.6.3 Axis Step Correction

The Axis Step Correction feature is a tool that allows the Operator to coordinate positioning of the machine's various components, comparing where the component is at on the machine vs. the value the computer displays. Consult a Bend-Tech Technical Representative before performing the Axis Step Correction procedure.

2.6.4 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. While an Operator can change the default values, or disable Machine Limit Warnings, Bend-Tech does not recommend this as damage to the machine could result.

2.6.5 Trolley Behavior

In the lower left of the interface, under Trolley Behavior, the Operator can choose to 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.

! Warning !



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

2.6.6 Disable Remnant Pause

If checked, the machine will not pause to unload the material remnant.

2.6.7 Initial Retract Amount

In the text box under Initial Retract Amount, the machine will have a default value of 10 in. which means after the machine has completed a project, the Trolley will retract 10 in. Bend-Tech recommends changing this value to 2 in. especially if the machine is equipped with a Cooling System.



Failure to change the Initial Retract Amount to 2 in. on a machine equipped with the Cooling System will result in a water spill.

2.6.8 Lifter Trigger Pause Allowance

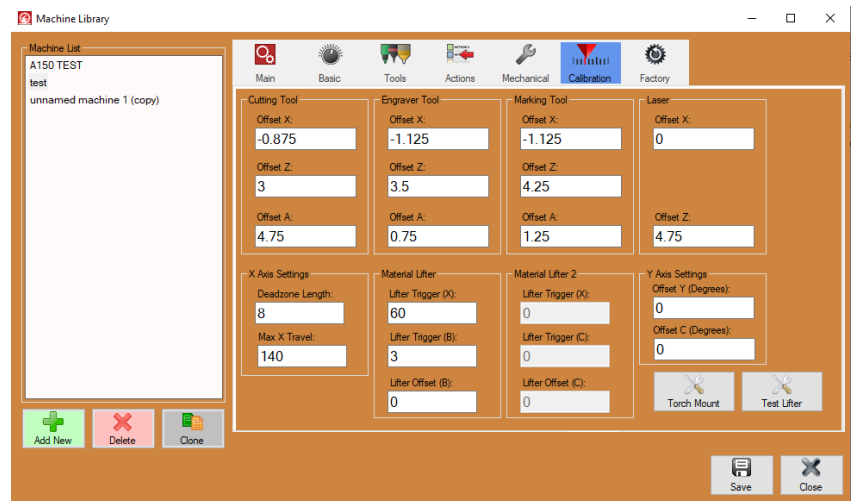
The Lifter Trigger Pause Allowance helps determine how efficiently the Material Lift Support retracts and moves away from the Rail. Bend-Tech has determined that .0625 in. is the ideal value for this setting.

2.6.9 Lifter Retract Distance

The Lifter Retract Distance determines when the Lifter retracts in relation to Trolley position.

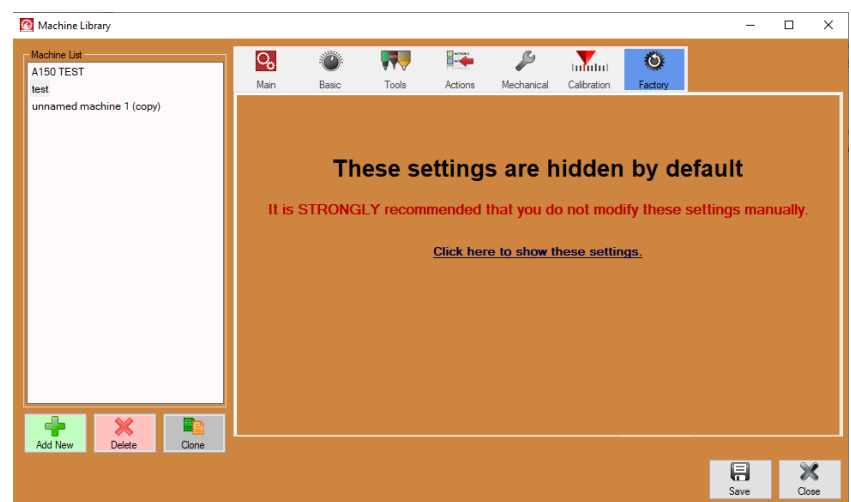
2.7 Calibration

The Dragon A400 is calibrated at the Bend-Tech manufacturing facility. Bend-Tech does not recommend altering factory calibrations. Customers who need assistance with a technical issue regarding machine calibration should contact Bend-Tech directly.



2.8 Factory Settings

The Dragon A400 is calibrated at the Bend-Tech manufacturing facility. Bend-Tech does not recommend altering Factory Settings. Customers who need assistance with a technical issue regarding machine calibration should contact Bend-Tech directly.



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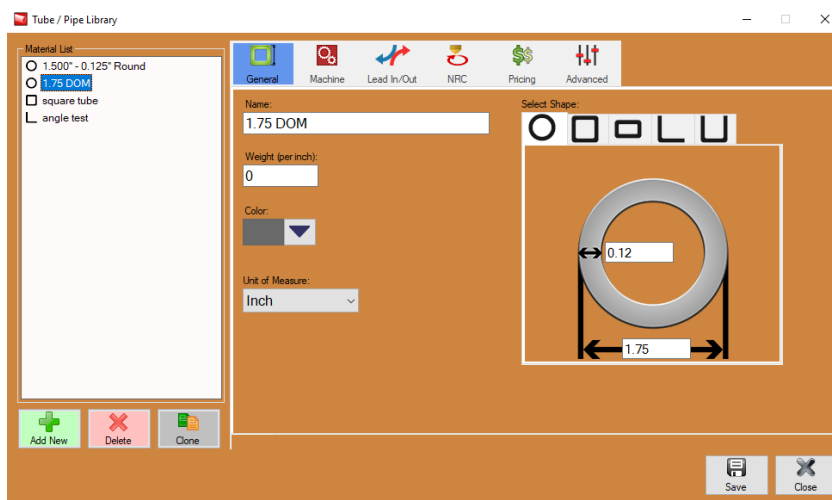
Tube Library

3.1 Using the Tube Library

The Tube/Pipe Library contains information regarding material and material processing with the Dragon A400. The Operator should familiarize themselves with the functions and settings available in the Tube/Pipe Library. Using the Tube/Pipe Library properly will help the Operator optimize the machine's precision operational capabilities. This section will provide the Operator with an overview of some of the basic settings in the Tube/Pipe Library that are critical to proper operation of the Dragon A400.

3.2 General

When the Operator opens the Tube Library from the Dragon A400 home interface, it will open in the General interface. The values on the interface will be grayed out until a material is selected in the Material List. The program will come loaded with 1.75 in. DOM tubing as a default material in the Material List window on the left hand side of the screen. The General interface contains basic settings for material dimensions.





It is important the Operator familiarize themselves with how to determine proper dimensions of given materials. Entering accurate material dimensions in the Tube/Pipe Library is critical to accurate operation of the machine.

3.2.1 Select Shape

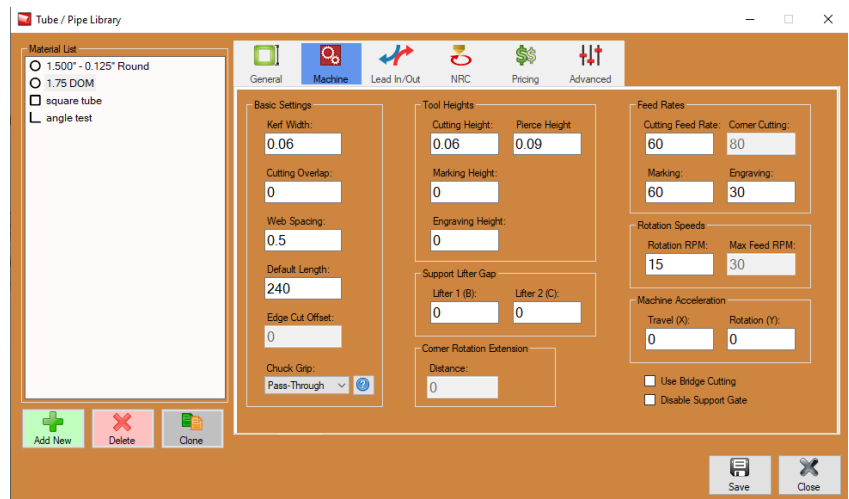
The Operator will be required to select the shape of the material being processed in the machine. Once the shape is selected, a representation of the shape will appear in the interface with blank text boxes. The Operator will be required to enter the dimensions of the material in the text boxes. Typically the values can be gathered from the material order form or by using 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 dropdown menu before entering the material dimensions.

3.2.2 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 the Operator can choose any name that suits the material. Weight of the material per inch is an optional measurement that can be used to calculate job cost in the Pricing feature.

3.3 Machine

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



3.3.1 Kerf Width

Kerf Width setting is located under Basic Settings. Kerf Width 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 A400 Startup and Training Guide, a typical Kerf Width will be 0.05-0.06. The default Kerf Width value is 0.06, which is typical for most cuts on the Dragon A400. The Operator can make a test cut and measure the width of the cut with a feeler gauge to determine a more accurate Kerf Width value.

Kerf width will vary depending on the cutting process. Amperage, Torch height (see section 3.3.3), cutting speed and gas settings will also affect kerf width.

3.3.2 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.

3.3.3 Web Spacing

Web Spacing is the distance the machine leaves between parts as it cuts a Nest Project. The default value is 0.5 but can be adjusted by the Operator to increase or reduce the amount of material left uncut between parts.

3.3.4 Default Length

The Operator can set a Default Length value if the lengths of the material being cut in the machine are consistent. If the Operator is cutting material that is typically a different length, the Default Length value is not important and can be left at the default value.

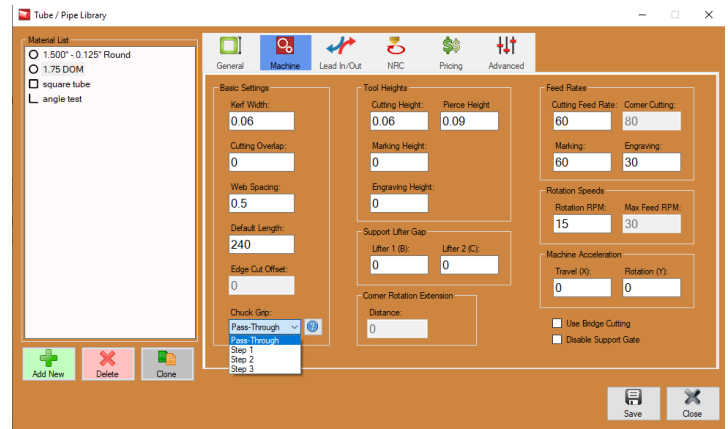
3.3.5 Edge Cut Offset

When cutting angle and channel material the edges of the material are typically thinner than at the radius. Edge Cut Offset combines with 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.

3.3.6 Chuck Grip

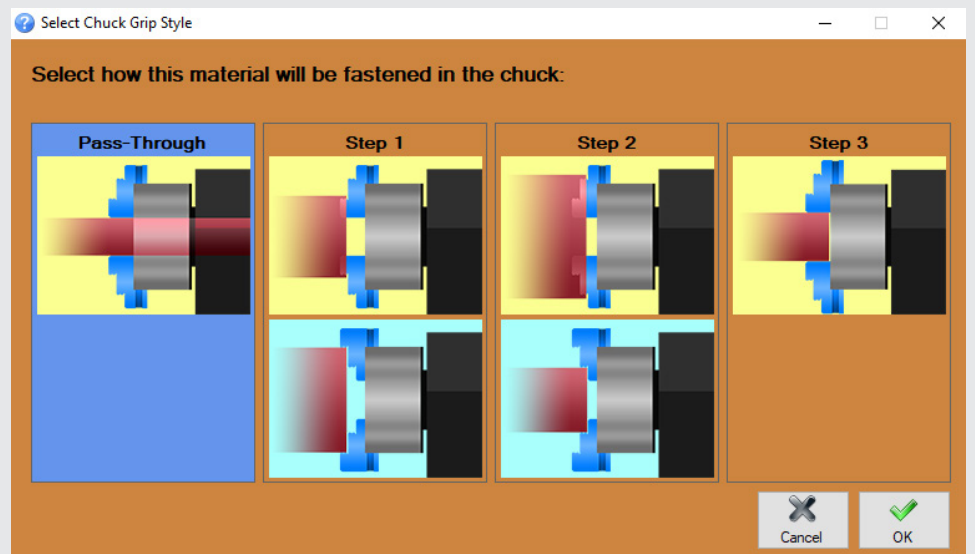
Depending on the size and type of material being cut, under Basic Settings, the Operator may be required to change the Chuck Grip setting. Click the question mark icon to view the different Chuck Grip illustrations. Choose the proper Chuck Grip from the drop down menu.

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



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 A400 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 in the smallest part of the Chuck.

3.3.7 Chuck Grip Laser Settings

Whenever Chuck Grip is changed for a given material it will affect Laser position on the material and how the machine perceives stock length.



If the Laser 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.



Changing the Chuck grip may require changing the Chuck teeth on the machine.

3.3.8 Chuck Dimensions

1. The Operator can view Chuck dimensions in the Dragon software. Chuck dimensions can serve as a reference when operating the Dragon A400 machine.
2. In Machine Library, with a machine chosen from the Machine List, Click Factory from the menu at the top of the interface.
3. A warning will appear. Click on “Click here to show these settings.”
4. In the Chuck Settings box, click the question mark icon. An interface showing Chuck dimensions will appear.

! Caution !



Do not alter Chuck Settings in the Factory interface.

3.3.9 Tool Heights

The software contains default values for Cutting Height and Pierce Height. Cutting Height will determine Kerf Width. 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.



Kerf width will also be dependent on consumables. See the Bend-Tech Plasma Cutting Guide for more information.



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

3.3.10 Marking Height and Engraving Height

The Operator may need to change Marking Height or Engraving Height if either are not contacting the material. In most cases these will be set to zero.

3.3.11 Support Lifter Gap

The Support Lifter Gap will have a 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. Setting the Support Lifter Gap value to 0.1 holds the material level with no sag. For best performance and consistent cutting, Bend-Tech recommends leaving the Support Lifter Gap value at 0.1.

3.3.12 Corner Rotation Extension

Adjusting this value essentially 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. Adjusting this value also helps avoid Torch collision on sharp radius material.

3.3.13 Use Bridge Cutting

By checking the box in the bottom right hand corner of the interface, the Operator can choose Use Bridge Cutting. When the program uses Bridge Cutting, it determines where it 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.

3.3.14 Disable Support Gate

In the bottom right hand corner, the Operator can click Disable Support Gate to disable the Material Support Lifter. 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 Lifter.

3.3.15 Feed Rates

Feed Rates determine how fast (inches per minute) 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 Cooling System will all affect Cutting Feed Rate and Corner Cutting.

3.3.16 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 the default values for these settings.

3.3.17 Machine Acceleration

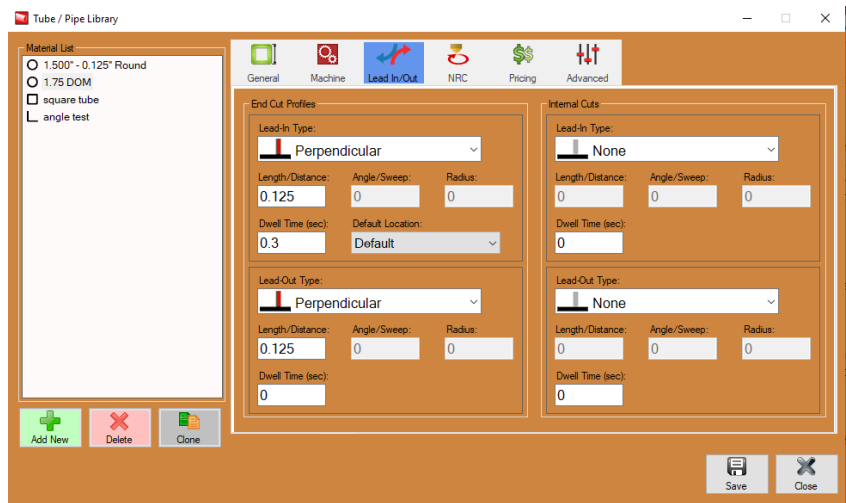
Machine Acceleration settings determine how quickly the axis reaches operating speed. Machine Acceleration Travel (X) sets the rate the Trolley travels forward and backward on the Rail. Machine Acceleration Rotation (Y) sets the rate the Chuck rotates the material. Bend-Tech sets both of these values with a default of 0. The Operator can 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.



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.

3.4 Lead In/Out End Cut Profiles

Lead In/Out End Cut Profiles settings are critical to achieving precise cuts with a consistent edge profile with the Dragon A400. These settings will change depending on the type of material, consumables and if the machine is equipped with a Cooling 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.



3.4.1 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 an Angle From Edge on material with an inconsistent edge such as angle or channel material.

3.4.2 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 goals of the Operator.

3.4.3 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.

3.4.4 Angle/Sweep

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

3.4.5 Radius

The Radius value sets the angle at which the Torch will enter the cut. A good starting point here is .125.

3.4.6 Lead-Out Type

When setting Lead-Out type Bend-Tech has found Perpendicular to be the desired setting. Perpendicular cuts the arc while the Torch is at 90-degrees to the material which leaves a 90-degree edge on the cut.

3.4.7 Length/Distance

Bend-Tech has found a Length/Distance setting of 0.125 for Lead Out is a good basis for cutting. 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.

3.4.8 Angle/Sweep

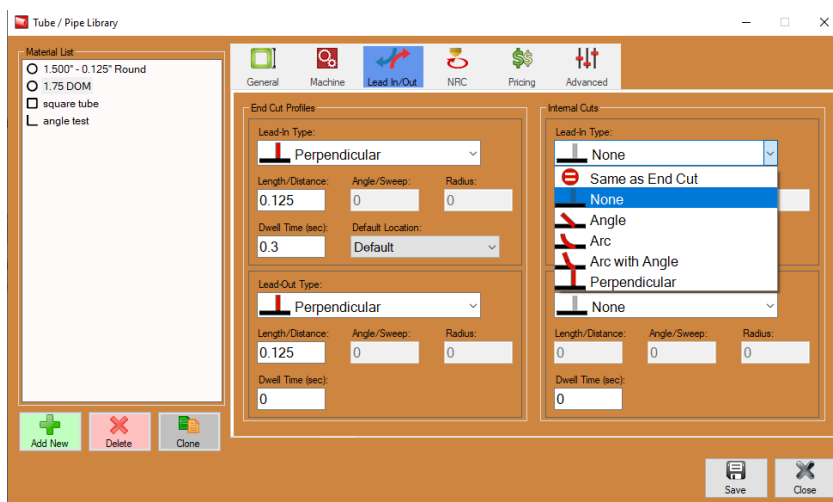
With the recommended Perpendicular Lead-Out, the Angle/Sweep will be grayed out.

3.4.9 Radius

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

3.5 Lead-In/Out Internal Cuts

Lead In/Out End Cut Profiles settings are critical to achieving accurate cuts such as holes and shapes with the Dragon A400. These settings will change depending on the type of material, consumables and if the machine is equipped with a Cooling 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.

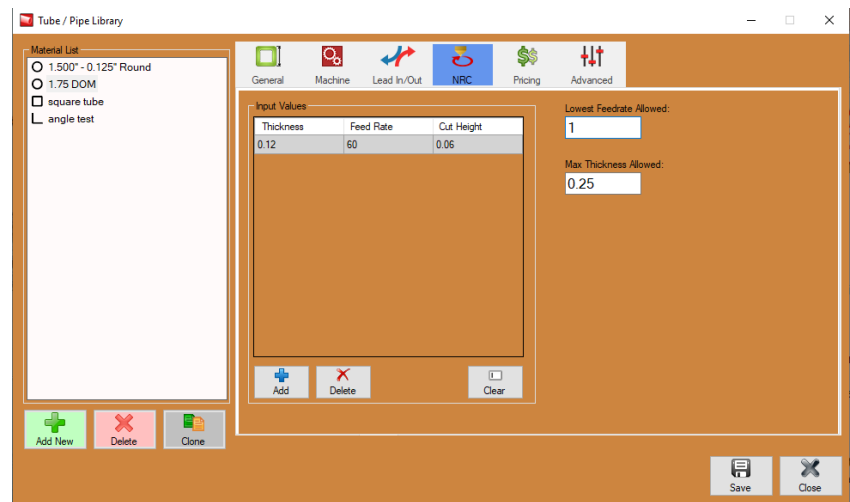


For Internal Cuts Bend-Tech recommends using the same settings as External Cut Profiles.

On Internal Cuts it is acceptable to set the Length/Distance of the Lead-In longer than the End Cut Profile. 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 middle of the hole.

3.6 NRC

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. This results in a round hole on the vertical axis.



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.

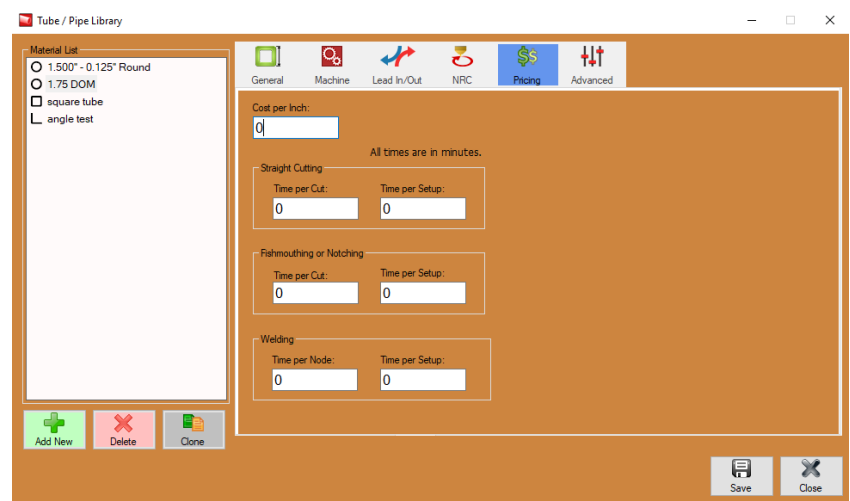
NRC cutting requires the Operator to generate holes in edit flat. If the holes are not generated in edit flat the software will normalize the holes. Next, click Actions>Create >NRC button, then click the hole in the edit flat display to apply a NRC to it. It will also be necessary to add NRC settings in the NRC interface. If NRC settings are not entered the Torch may collide with the material.

3.7 Pricing

The Pricing interface is designed to help the Operator calculate the cost of producing a cut, part or project. It can also calculate the process per inch of material.

3.7.1 Cost per Inch

The Operator can enter the cost of the material per inch. This is the basis the software uses to calculate cost of material used in a project.



3.7.2 Time per Cut

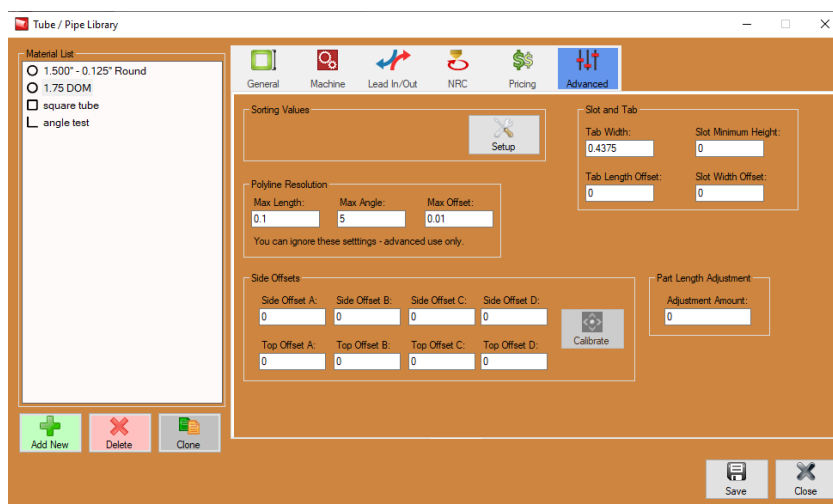
The Operator can enter Time per for Straight Cutting and Fishmouting or Notching. This is the time per cut, not per part. The software will recognize cuts and calculate total time for each part based on the cuts programmed in the software. The Operator can also enter how long it takes to weld each node, or intersection.

3.7.3 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.

3.8 Advanced

The Advanced interface contains Side Offsets calibration. When processing square, rectangle, angle or channel material it is critical that the Operator perform Side Offsets calibration. To begin this process, click the Calibrate icon in the Side Offsets box near the center of the interface. Side Offsets Calibration is covered in Chapter 8 of the Dragon A400 Startup and Training Manual.



The Advanced interface also contains Slot and Tab settings. Slot and Tab is covered in section 13 of this manual.

04

Die Library

4.1 Using the Die Library

The Die Library allows the User to enter dies and calibrate them for use in producing parts. A calibrated die allows the User to apply exact bend angles to reproduce part designs in Bend-Tech design software. The Die Library helps the User produce parts that are more accurate, and produce them within a shorter amount of time. The User can save calibrated dies in the Die Library for ongoing use.

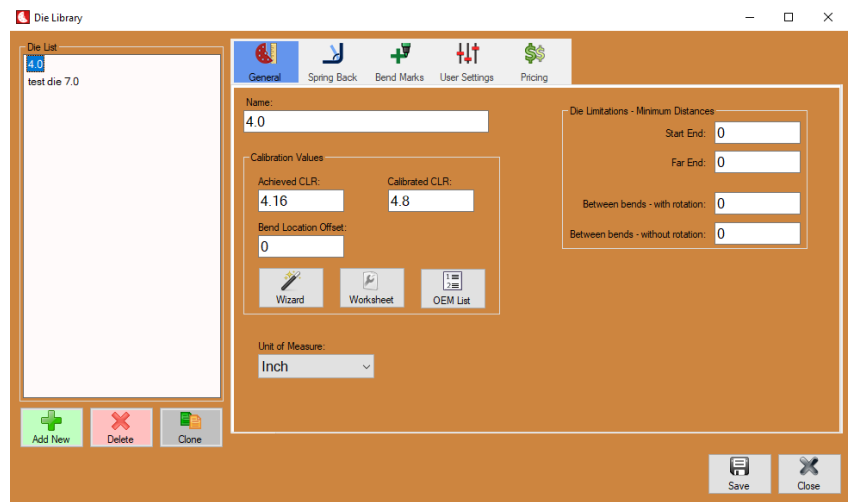
4.2 Before Beginning

Before using the Die Library the User will need to know:

- What type and/or model of bender is being used?
- The CLR of the tube or pipe being used.
- What die is being used?

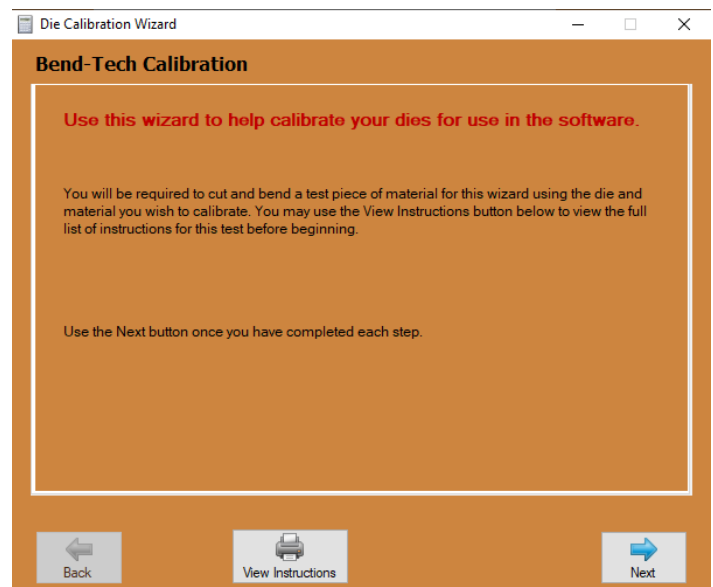
4.3 Die List

On the Dragon Task Menu, under Library, Click Die Library to open the Die Library interface. The User can also use the Tools dropdown tab at the top of the screen to access the Die Library. To begin calibrating a die, click Add New in the lower left corner of the interface under the Die List. Type in a name for the die. Most Users enter the size of the die as its name, but the name can be anything the User wishes. Under the Die List, the User can also delete a die by first highlighting a die in the Die List and then clicking the Delete icon. The User can also clone a die. Cloning a die allows the User to alter the calibration of a die to suit specific applications while keeping the original calibration for general use.



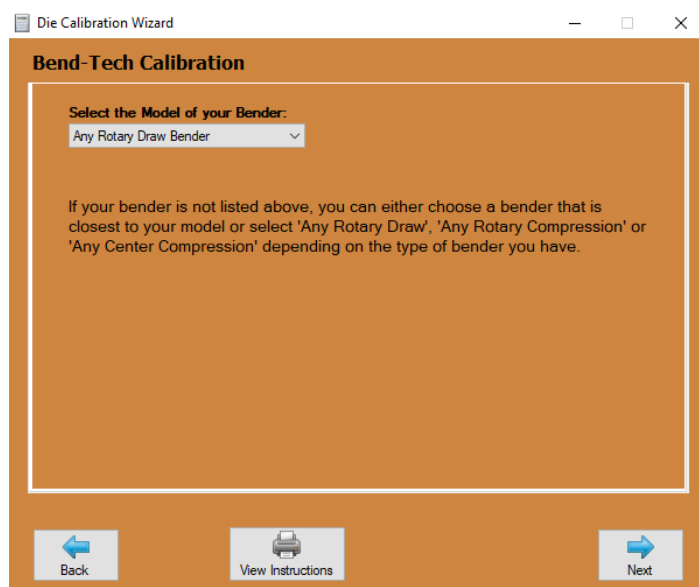
4.4 Wizard

After entering a name for the die being calibrated, click the Wizard icon in the Calibration Values box near the center of the interface. This will begin the die calibration process. Click Next.



4.4.1 Choose Bender Brand and Model

The Die Calibration Wizard will ask for the brand and model of the bender being used. This is helpful, but not critical, as the User can continue to calibrate by using the type of bender. If the brand and model are not known, click the type of bender from the first three choices in the dropdown menu (Any Rotary Draw Bender, Any Rotary Compression Bender, Any Center Compression Bender).

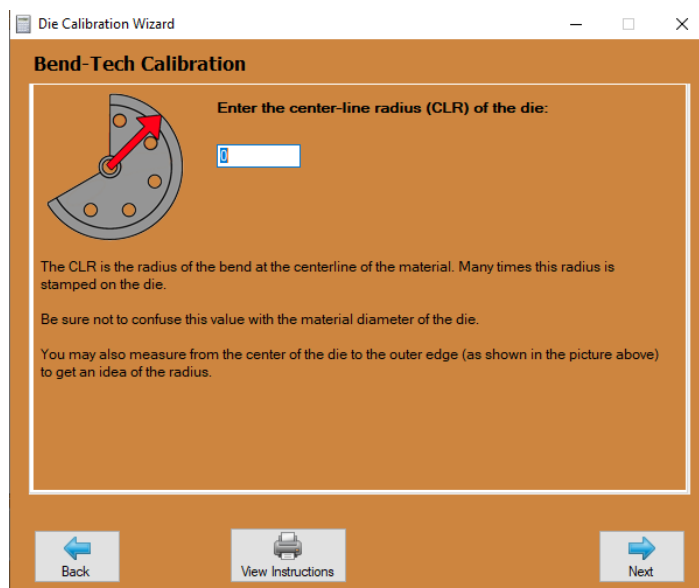


4.4.2 Die Centerline Radius

Enter the Centerline Radius of the die being used. This is typically stamped on the die somewhere. If the Centerline Radius is not known, the User can measure from the center of the die to the outer edge of the die.

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.



In addition to the centerline radius, the die may also have the material diameter stamped on it. Be sure to enter the proper number as the centerline radius.



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

4.4.3 Material Diameter

Enter the outside diameter of the material being used for the die calibration. If using pipe for this calibration be sure to enter the O.D. and not the pipe size (I.D.).

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.

4.4.4 Measure the Material

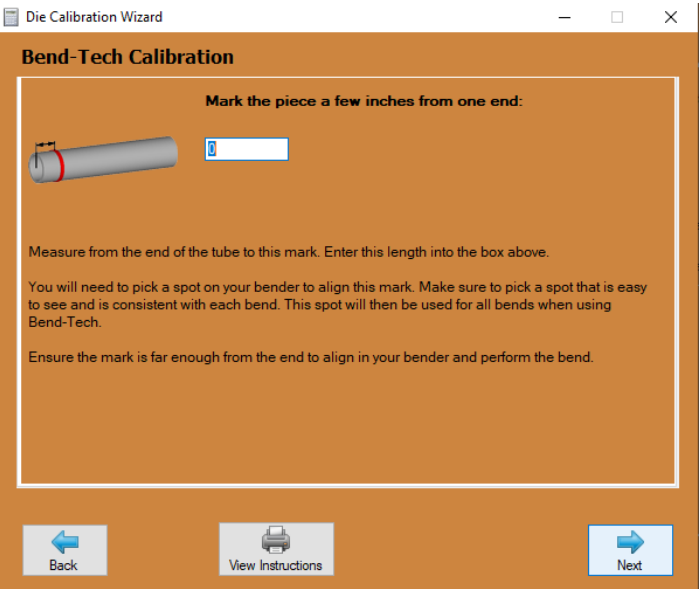
Cut a piece of the material being used for the die calibration process. Ensure the piece is long enough to create a 90-degree bend. Bend-Tech recommends cutting a length of material five times the die CLR. For example, if our die CLR is 7, we would cut a piece of material 35 in. long.

Example: $7 \times 5 = 35$

Enter the total length of the piece of material after it is cut.

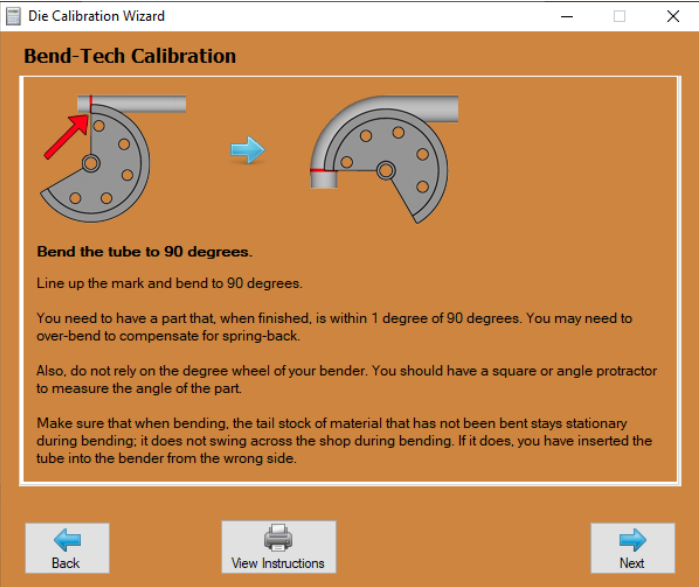
4.4.5 Mark the Material

Measure a spot near the end of the tube and place a mark. This is where the material will be positioned in the die. Ensure the mark is far enough from the end of the tube that it can be placed and aligned in the bender. This may require trial fitting the material in the bender first before marking the tube.



4.4.6 Bend to 90-degrees

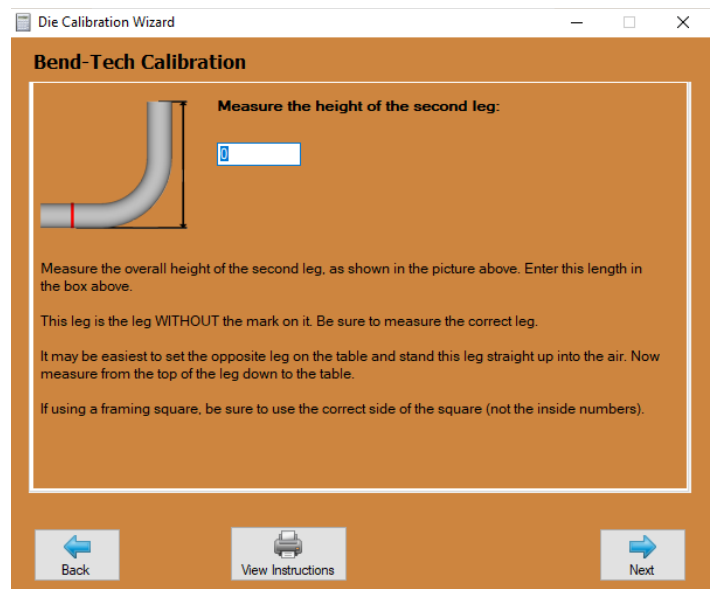
Line up the mark on the tube with the starting point of the die. Proceed to bend the part to 90-degrees. For calibration purposes the bend has to be within one degree of 90-degrees. Use a square or angle protractor to measure the bend angle. Do not rely on the markings on the bender for angle measurement.



The part may need to be bent past 90-degrees to accomodate for spring back.

4.4.7 Measure Height of Legs

Set the part on a table or the floor with the marked end upright. Use a square to ensure the piece is vertical. Measure from the surface of the floor or table to the marked end of the piece of material. Enter the value in the text box. Click Next. Measure the other leg of the part using the same method. Enter the value. Click Next.

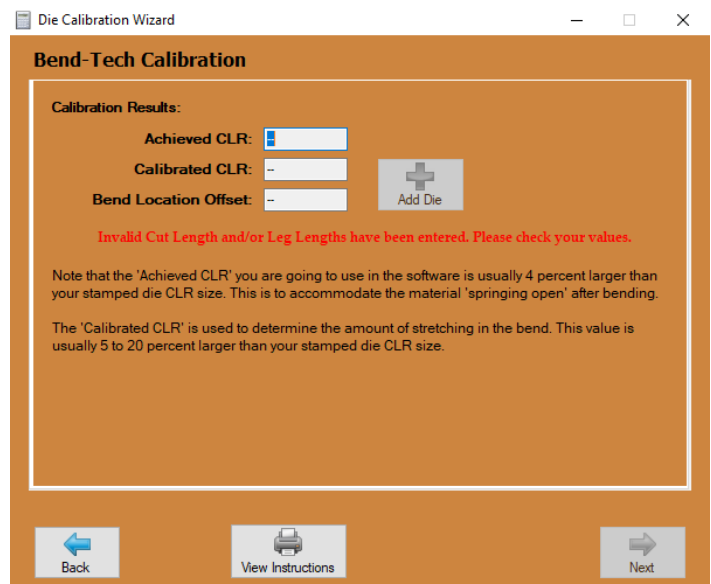


4.4.8 Calibration Results

The Wizard will show the Achieved CLR, Calibrated CLR and Bend Location Offset on the Calibration Results interface.

4.4.9 Achieved CLR

Achieved CLR, or Achieved Center Line Radius, is the centerline radius of the die that compensates for spring back. This number will always be slightly higher than the actual center line of the die.



4.4.10 Calculating Achieved CLR

For any given die, the Achieved CLR will be 4-percent greater than the CLR stamped on the die. For example, if the User has a die with a 7 in. CLR, the Achieved CLR for that die will be 7.28.

$$\text{Example: } 7.0 \times 1.04 = 7.28$$

4.4.11 Calibrated CLR

When a piece of material, such as tubing, is bent, the bending process will stretch one side of the tubing. Calibrated CLR is used to determine the amount of stretching, or growth. The Calibrated CLR value varies, but is typically 5-20-percent greater than the CLR stamped on the die.

4.4.12 Bend Location Offset

When the material is lined up with the edge of the die, the bend will not necessarily start at that point. The Wizard takes the values entered and calculates where the bend actually starts in the die and marks the material appropriately.

4.4.13 Calibrated Die

With a die calibrated in the Wizard, the software will automatically calculate spring back, stretch, and bend location offset. When a part is designed in Dragon CAM, the software will calculate and adjust based on calibrated die values to ensure the finished part is produced accurate to the design.

Click Add Die to add the calibrated die to the Die List. Enter a name for the die and click OK. A message will appear saying the die has been added to the Die List. Click OK.

4.4.14 Worksheet

Once a User becomes 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 in the Calibration Values box near the center of the Die Library interface. 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.

4.4.15 OEM List

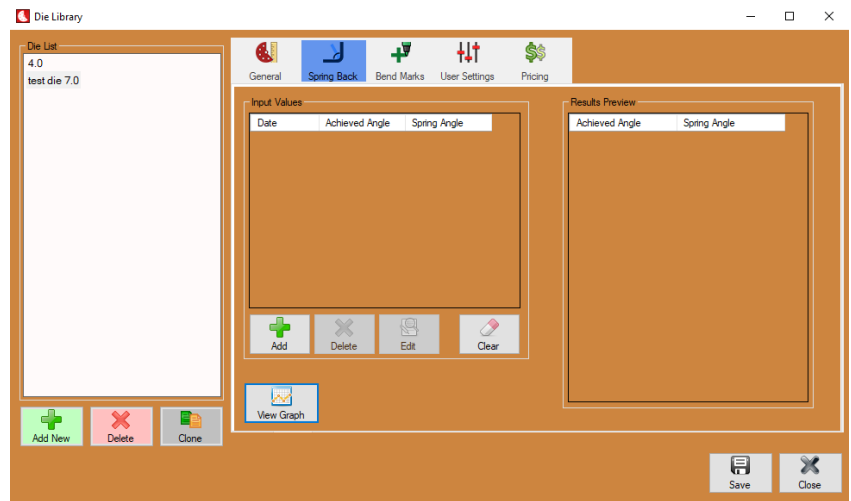
The User can proceed without calibrating a die by choosing the correct bender, then clicking OEM List under Calibration Values near the center of the Die Library interface. This method will input default measurements and calculations into the design based on information provided by the die manufacturer.



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

4.5 Spring Back

In the Die Library the User can track Spring Back when using a particular die. This feature allows the User to calculate more accurate bends based on the history of the die and its bending qualities. For example, if the User bends a piece of material to 90-degrees and, with spring back, the bend is 92-degrees, the User can enter those values 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.



4.5.1 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 near the center of the interface.

4.5.2 Achieved Angle

Enter the Achieved Angle of the bend. This is the angle that the User has calculated in the software.

4.5.3 Spring Angle

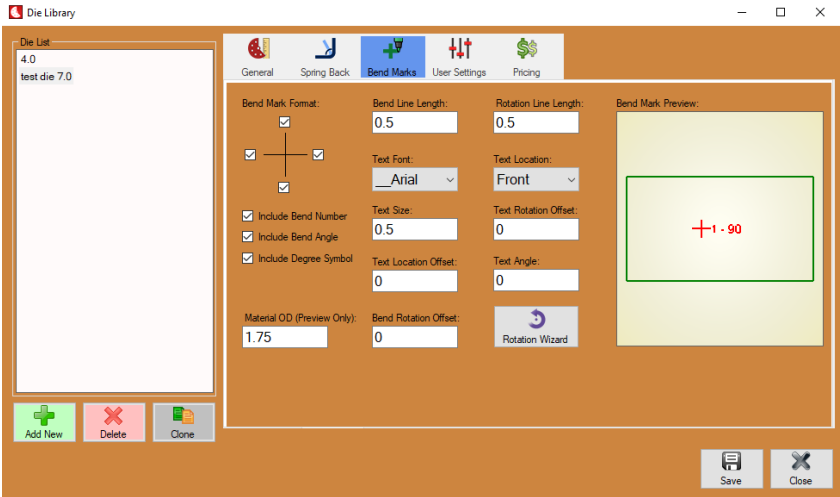
Enter the actual angle of the bend as the tubing comes out of the bender. This will be different than the Achieved Angle.

4.5.4 View Graph

As bends are entered into the Spring Back feature the software takes the information and creates a chart the Operator can refer to when performing bends with a particular die. The Operator can click View Graph to see a graph of the results.

4.6 Bend Marks

When a project is being cut in the Dragon A400 machine, the Operator can choose to 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, the Operator can choose the length of the Bend Line Length, Rotation Line Length, Font, Text Rotation Offset, Text Location, Text Location Offset, Text Size and Text Angle. The Operator can also choose to include the bend number in the project, bend angle and to have a degree symbol placed with the bend angle.

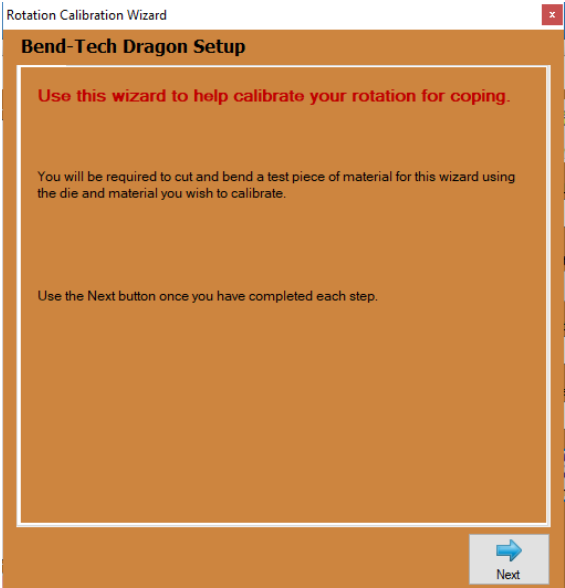


4.6.1 Rotation Wizard

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

4.6.2 Open Rotation Wizard

In Bend-Tech 7X, open Dragon CAM. Under Library, click Die Library, choose a die from the Die List. In the menu at the top of the Die Library interface click Bend Marks. Near the center of the interface click the Rotation Wizard icon. A new interface will appear that will walk the User through the Rotation Wizard. Click Next.



The Rotation Calibration Wizard will require the User to cut a piece of material to use in the calibration process.

4.6.3 Rotation Calibration Wizard

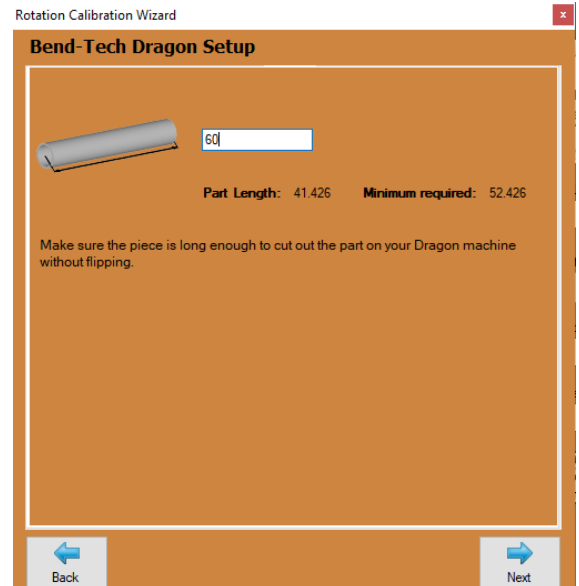
In the Rotation Calibration Wizard interface, the die will already be selected. Select the machine, select the material. Click Next. Select the model of bender, click Next.

4.6.4 Enter Material Values

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.

4.6.5 Minimum Part 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.



4.6.6 Send to Machine

The software will automatically program the Dragon A400 to perform the required operations to carry out the Rotation Calibration Wizard. Click Send to Machine. Press Start on the Machine Control interface. Load the material into the machine, tighten in the Chuck and ensure the Gate jaws are snug to the material. Click Start in the Machine Control interface. The Dragon A400 will cut and mark the material appropriately.

4.6.7 Bend the Material

The next interface will ask the User to bend the material to 90-degrees. During the cutting and marking procedure in 2.6.5, the machine placed a crosshair on the material. Line the marks of this crosshair up with the start of the die. Bend to 90-degrees. Click Next.



The User may need to bend the material past 90-degrees to account for spring back.

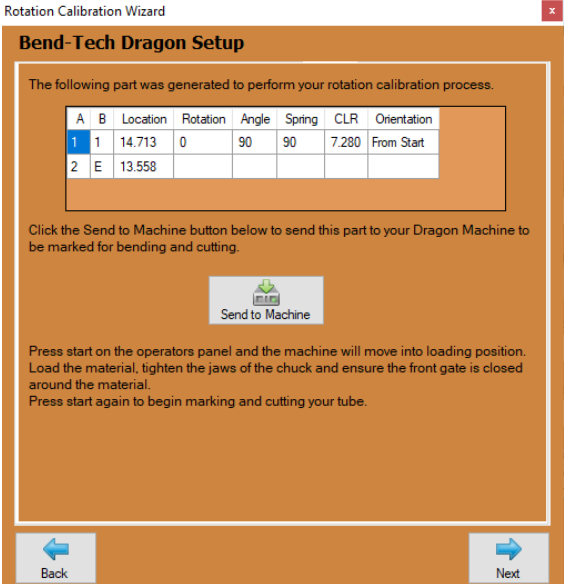
4.6.8 Measure Degree of Rotation

The next interface will ask the User to place the bent piece of material 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. Enter that value in the text box. Click Next. 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 the User entered and the actual part. Click Next.

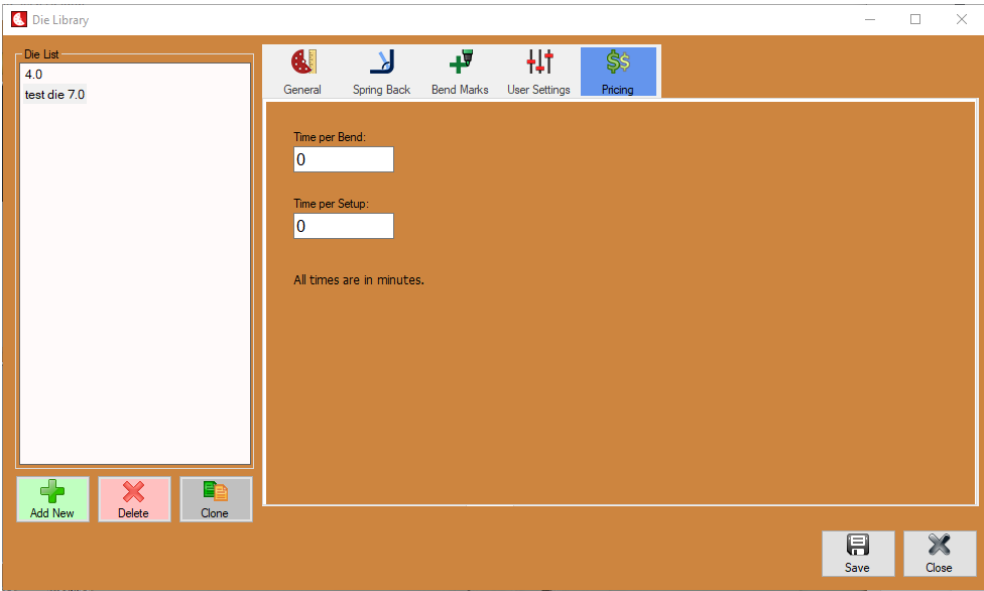
4.6.9 Calibration Complete

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. When 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.



4.7 Pricing



Using the Pricing tab the Operator can calculate the cost of each bend performed in a given project. The Pricing interface allows the Operator to 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.

05 Settings

The Bend-Tech Dragon CAM interface contains a Settings interface where the Operator can choose default settings for the software and machine. Choosing defaults can help the Operator streamline operations for the machine and software. Also, the Operator can create custom settings for a particular machine to suit a specific user. Knowing how to use the Settings interface is critical to efficient operation of Bend-Tech software and the Dragon A400 machine.

5.1 General

In the General interface, the Operator can set default values, auto save specifications as well as a number of other values that help automate processes regarding the Dragon machine and its operational software.

5.1.1 Default Items

When creating bent or straight parts in the design interface, the Operator can set defaults for such things as bending die, material and machine. Setting defaults can speed up the process so the Operator does not have to choose a die or material every time. This is especially helpful at shops that fabricate using the same general material for many different jobs.



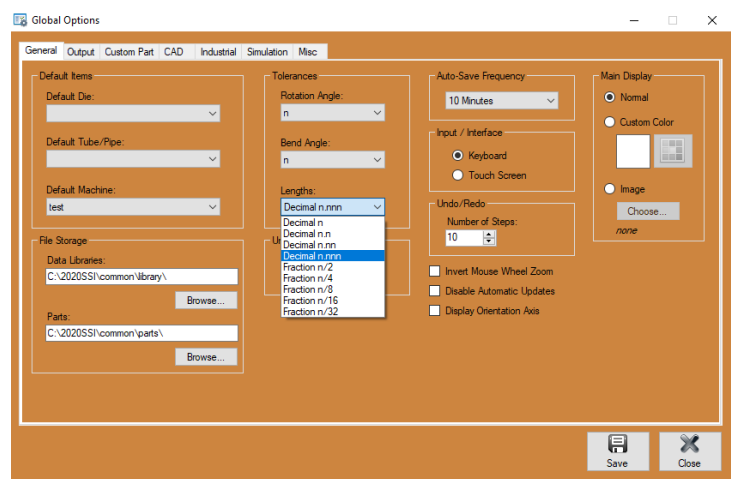
5.1.2 File Storage

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:\202SS1\common\ folder on the computer. Bend-Tech highly recommends leaving the File Storage settings at their default location. This helps Bend-Tech Service Techs resolve any issues that may arise.

In some cases, a customer may have an internal server at their business location. If the customer begins using 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 Operator should leave the libraries in the common folder.

5.1.3 Tolerances

Bend-Tech uses decimals for all of its value inputs. While some shops may use fractions, the Operator will be required to convert fractions to decimal for value inputs. In Tolerances Bend-Tech recommends using decimals, and setting to the third decimal point. However it is at the Operator's discretion and may need to be coordinated with the designer.



5.1.4 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.

5.1.5 Auto Save Frequency

The Operator can choose the frequency the software auto saves an open project. 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. If the Operator is working on a project that has not been saved with a part number or project name, then closes out of the software, the software will not remember that part.

5.1.6 Input/Interface

With all Dragon A400 computers Keyboard should be checked for this value.

5.1.7 Undo/Redo

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

5.1.8 Main Display

The Operator can choose a specific background color or image for the Main Display in the Bend-Tech software part interface. It's important to note this is not for the software as whole, it will only apply to the part display interface.

5.1.9 Invert Mouse Wheel Zoom

This will change the mouse wheel settings to zoom as the Operator scrolls either up or down. It is at the Operator's discretion to choose a preference regarding Mouse Wheel Zoom.

5.1.10 Disable Automatic Updates

In some cases the Operator may choose 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 the Operator search for updates on a regular basis by either using a wifi hotspot or connecting the computer to an internet hub.

5.1.11 Display Orientation Axis

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

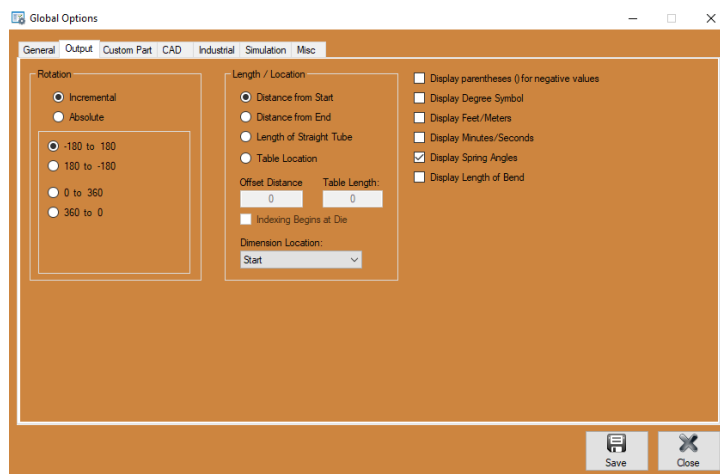
5.2 Output

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

5.2.1 Rotation

The Operator can choose to have the software display 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.



5.2.2 Length/Location

The Length / Location settings are in relation to bending, and 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 dropdown menu to choose where bend markings will be placed on the material in relation to the Start, End or Center of the bend.

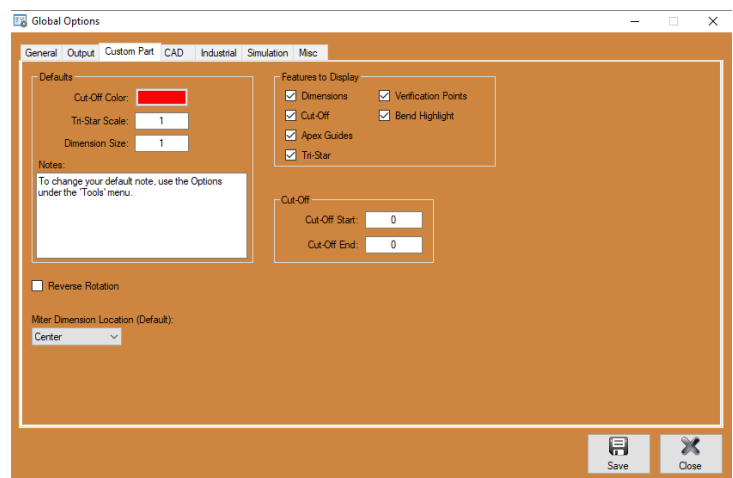
On the right hand side of the Output interface, the Operator can choose to display a number of different preferences and/or values related to bending. These preferences are the choice of the Operator.

5.3 Custom Part

In the Custom Part interface the Operator can choose settings regarding bending dimensions and bend cut-off.

5.3.1 Defaults

In the Custom Part interface the Operator can set values in the Defaults box for Cut-Off Color, Tri-Star Scale and Dimension Size. When a bend is too close to the end of a part, the Operator will be required to designate a cut-off length. 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. The Operator can choose to highlight that piece a certain color by clicking the color box and choosing the desired color.



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

5.3.2 Features to Display

The Operator may want to display only certain features of a part or project in the design interface. In Features to Display, the Operator can check or uncheck the features needed in a certain project. The software defaults to display all features.

5.3.3 Cut-Off

If a bend is too close to the end of the material, the Operator can set a default length on either side of a bend as a cut-off length. 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 set by the Operator 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.

5.3.4 Reverse Rotation

The Dragon A400 will always cut clockwise on the initial cut. Choosing Reverse Rotation will begin the job by turning counterclockwise.

5.3.5 Miter Dimension Location

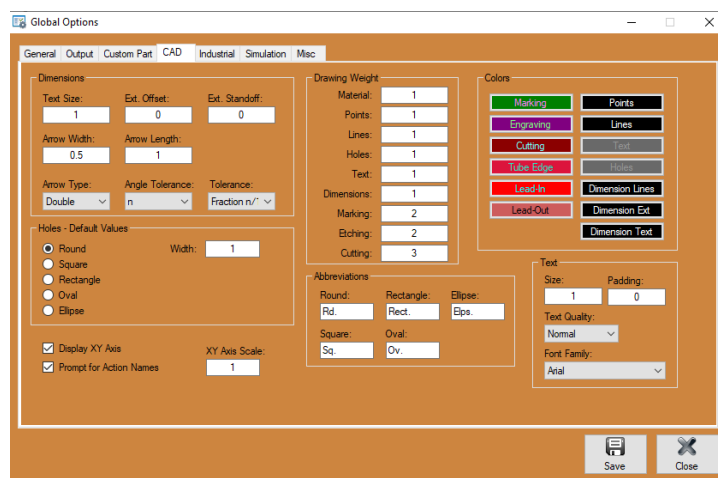
The Operator can designate how a miter cut will be dimensioned. Bend-Tech typically uses the centerline of the material, so the default setting is Center, but the Operator can choose from Inside, Outside or Center (Tube).

5.4 CAD

The CAD interface contains user settings for the various CAD visuals in Bend-Tech software. Many are defaults that are Operator preference.

5.4.1 Dimensions

In the Dimensions box, the Operator can choose how some of 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.



5.4.2 Holes - Default Values

When a hole is designed, the software will use the default hole values. The Operator can use these defaults in the Holes - Default Values box.

5.4.3 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.

5.4.4 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.

5.4.5 Abbreviations

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

5.4.6 Text

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

5.4.7 Display XY Axis

By checking or unchecking Display XY Axis, the Operator can choose to have the software display the XY axis or hide the XY Axis in the CAD interface.

5.4.8 Prompt for Action Names

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

5.5 Industrial

In the Industrial interface, the Operator can choose settings regarding how the software imports and exports CAD files.

5.5.1 Rotational Indicator

When placing a Rotational Indicator on a piece of material, the Operator can choose how that indicator will appear by choosing settings in the Rotational Indicator box.

5.5.2 Type

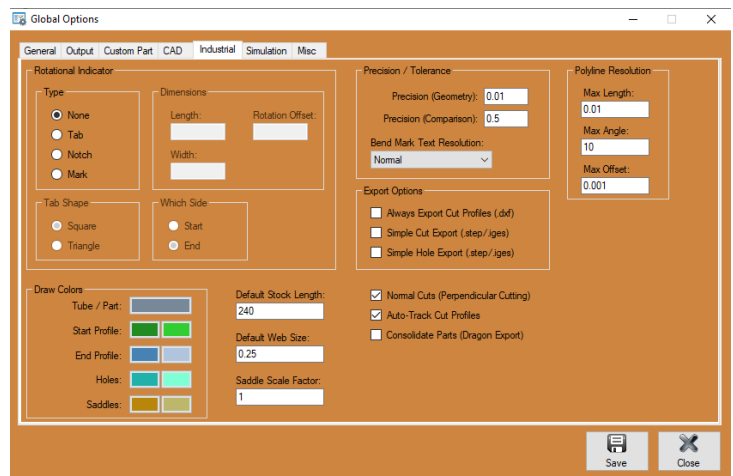
Under Type of Rotational Indicator, the Operator can choose None, Tab, Notch or Mark. If None is chosen, the rest of the settings in the Rotational Indicator box will be grayed out.

5.5.3 Dimensions

In the Dimensions box the Rotational Indicator Length, Rotation Offset and Distance from End can be set by the Operator.

5.5.4 Tab Shape

If Tab or Notch is chosen in Type of Rotational Indicator, the Operator can choose the Tab Shape as either Square or Triangle.



5.5.5 Which Side

Under Which Side, the placement of the Rotational Indicator can be set to be placed at the Start or End of the material.

5.5.6 Precision / Tolerance

In the Precision / Tolerance box 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.

5.5.7 Precision (Geometry)

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

5.5.8 Precision (Comparison)

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

5.5.9 Bend Mark Text Resolution

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

5.5.10 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 in the Dragon A400 machine. Typically, the higher the resolution the more precise the cut.

5.5.11 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.

5.5.12 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.

5.5.13 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.

5.5.14 Export Options

When exporting a file to a CAD program, the Operator can choose if certain cut profiles are exported in the design. The Operator can 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).

5.5.15 Draw Colors

When displaying part designs the Operator can choose the colors of elements displayed. 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.

5.5.16 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.

5.5.17 Default Web Size

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

5.5.18 Saddle Scale Factor

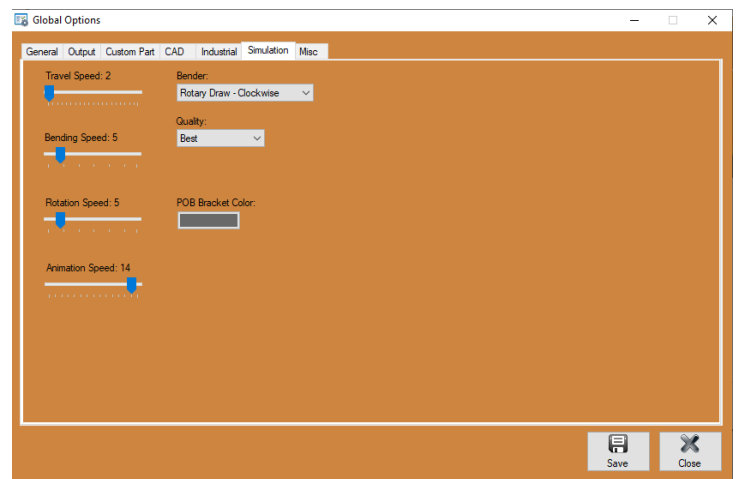
Saddle Scale Factor is typically set to 1.

5.6 Simulation

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

5.6.1 Speed Settings

The bending simulator speed can be set using the slide bars in the interface. The Operator can set Travel Speed, Bending Speed, Rotation Speed and Animation Speed.



5.6.2 Bender

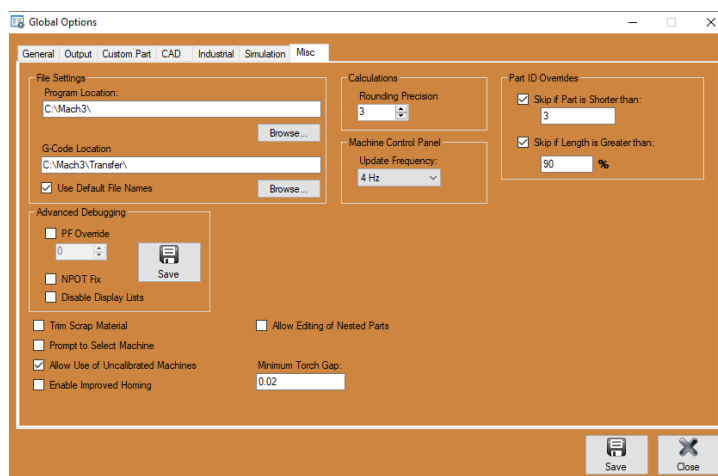
The type of bender can be chosen as well as whether the bender moves clockwise, counterclockwise or vertically.

5.6.3 Quality

The quality of the simulation display can be set using the Quality dropdown.

5.7 Misc

The Misc, or Miscellaneous tab, contains settings that could be considered administrative settings. Some of these settings should be left alone, others can be edited.



5.7.1 File Settings

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

! Warning !



Altering File Settings could affect operation of the Dragon A400 machine.

5.7.2 Calculations

In the Calculations box, the Operator can set the rounding precision of the software. Bend-Tech recommends setting this in coordination with the decimal settings in the General tab under Tolerances. Bend-Tech also recommends this precision be 3 or greater.

5.7.3 Part ID Overrides

Part ID Overrides can be set 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.

5.7.4 Advanced Debugging

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

5.7.5 Allow Editing of Nested Parts

Once a part is Nested it cannot be edited unless the Operator chooses to Allow Editing of Nested Parts. If this box is not checked it will not allow the editing of nested parts.

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 also appear in the Nesting project.

5.7.6 Allow Use of Uncalibrated Machines

Checking this box will allow the Operator to use the software while connected to an uncalibrated machine. This feature is useful for a User such as a designer who may not be connected to a machine, but needs to simulate certain operations.

5.7.7 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 the Operator has set up multiple machines in the software and calibrated them for specific uses. For example, a machine may be calibrated to cut steel tube while another may be set up to cut aluminum. Depending on the job, the Operator can choose a machine that has the correct settings already in place for the job.

5.7.8 Trim Scrap Material

A Nest Part project may have excessive material between parts. The Operator can check Trim Scrap Material and the software will calculate the excessive material and move the parts accordingly to eliminate waste.

06

Importing

6.1 Importing Files Overview

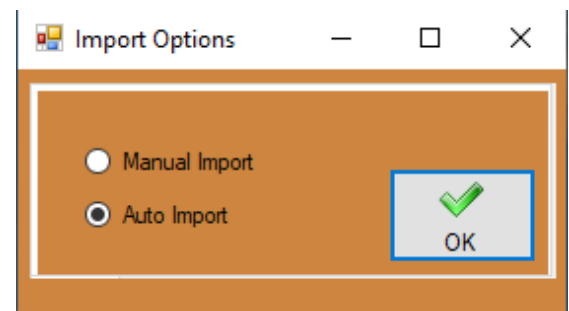
The Dragon A400 operational software has a variety of different options for importing design files created in other programs. Bend-Tech's import tools allow the Operator to open design files created in other programs and prepare them for production in the Dragon A400 machine. The software offers Auto Import which converts information into files that are ready for final preparation for the Dragon A400. The software also offers Manual Import features. Manual Import files typically require editing using Bend-Tech import tools.

It is possible to import a variety of different CAD files into Bend-Tech software including STEP, IGES and DXF. There are many different formats and idiosyncrasies to these types of files, and Bend-Tech cannot account for all of the scenarios an Operator may see. The software is designed to work with as many formats as possible, but Bend-Tech cannot guarantee 100-percent compatibility.

6.1.1 Opening Files in Dragon CAM

When the Operator chooses to open a STEP file, an Import Options popup will appear prompting the Operator to select Manual Import or Auto Import. Bend-Tech recommends selecting Auto Import whenever possible. Upon successful import, the file will open in Dragon CAM.

Once imported, the Interface will display a list of all the parts in the file. The Operator can modify the name of each part as well as the quantity of each part. This is based on preference and/or specific needs of the Operator and project. This information will carry forward when the Operator performs the Nest Part process.



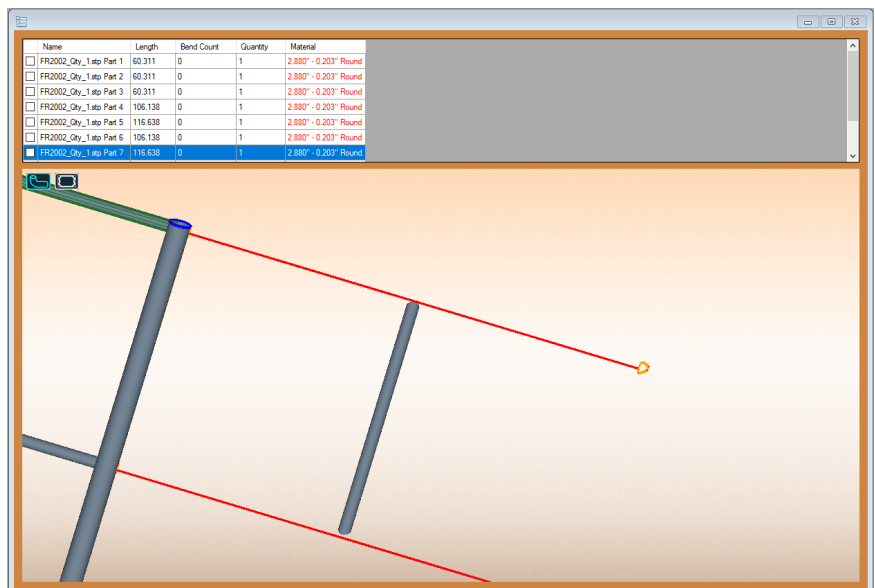
With the file open in Dragon CAM, the Operator can view the part in the 3D interface including cut features and other design features. The Operator can also choose to view the part in Edit Flat. Parts can be edited in Dragon CAM as well, a feature that allows the Operator to further define elements of the project that may not have imported accurately.

The software will automatically attempt to match the material specified in the imported files to material in the Bend-Tech Dragon Material Library. If it cannot match the material to one that's already been created in the Material Library, the software will create a Temporary Material. Before the project can be run on the machine the Operator will be required to enter material dimensions to convert the Temporary Material to a permanent entry in the Material Library.

With an imported file and material created in the Material Library, the Operator can perform the Nest Part procedure to prepare the project for processing with the Dragon A400. In Nest Part the imported file can be viewed in Edit Flat where further editing can take place if necessary.

6.2 Undefined Import Elements

There are numerous different elements to STEP files. The Operator may import a STEP file that contains elements that Bend-Tech software does not recognize. This may be in the form of a material, or of an incomplete material, or a design that is formatted in a way that Bend-Tech does not recognize properly. A poor import will show up as red lines, or a series of edges. The Operator will be required to define the part manually, or import an undefined part separately and recreate it using Bend-Tech software.



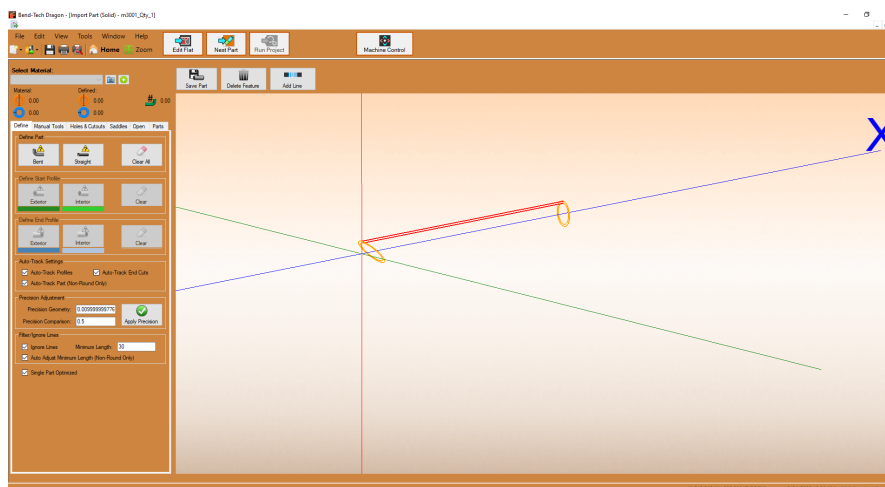
6.3 Tekla Import Utilities

Bend-Tech Tekla importer covers a variety of different software imports to create files that can be viewed and edited in Bend-Tech Dragon software. Tekla importer defaults to the Auto Import feature, it does not give the Operator a choice of Manual Import. When importing with the Tekla import, Bend-Tech software creates an .enc file and displays a parts list and the part or assembly in the 3D interface.

In the parts listing the Operator can change the file name and the number of parts depending on the project.

6.4 Manual Import

Manual Import can be used for STEP or IGES file imports. If an Auto Import file or series of files fails, the Operator can choose Manual Import to pull the files into Bend-Tech software. Manual Import will translate the file, find any edges within the file, and display it in simple line information according to those edges.



6.4.1 Manual Import Part Display

When Manual Import is performed, Bend-Tech will display the part in a Manual Import interface. This interface contains tools the Operator can use to define all the elements of a part and make it a complete part.

6.4.2 Select Material

If the Manual Import finds a material that matches the material specified within the imported project, it will automatically populate the correct material. If the software cannot find a matching material, the Operator will be required to click the green plus sign button to the right of the Select Material window. This will prompt the Operator to enter a new material into the library.

The software will display the Material, as well as the Material as it is defined.



When importing files, the software requires a full material profile. Elements of a design that don't use a full profile, such as a longitudinal slit cut, will not be recognized by the importing feature.

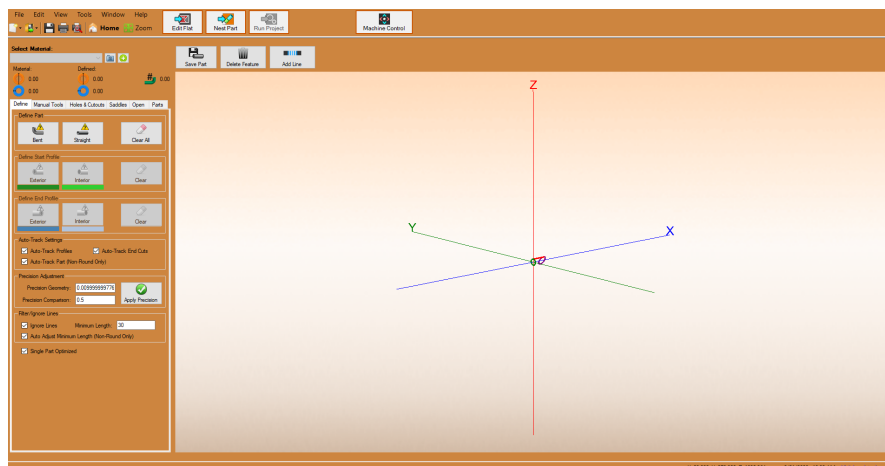
6.4.3 Bend Count Display

Below Select Material, the software will display a bend count. It will appear as a number symbol along with a green bent part icon. The number next to it is the number of bends that have been recognized in the imported file.

6.4.4 Precision Adjustment

In the Precision Adjustment box, the Operator can change the values for Precision Geometry and Precision Comparison. The Operator can click Apply Precision, and it will define the elements of a part to a greater degree. The effectiveness of this tool depends on how well the Bend-Tech importer was able to define the part during the import process. The Operator should use caution when using Precision Adjustment as it can affect design elements in a way that compromises the overall part.

6.5 Defining A Part



Once a part is imported, under the Define tab, in the Define Part box, choose either Bent or Straight depending on the part that has been imported. After selecting the type of part, the software will display a prompt next to the mouse cursor to “Select a line which defines the outside profile of the tube.” Click on the line that indicates the outside profile of the tube. The software will display a rendering of the tube and attempt to track any cut information.

Once the outside profile of the tube is defined, the Operator can move on to Define Start Profile and Define End Profile. Under each of these, click Exterior to define the outside of a cut profile, and Interior to define an interior of a cut profile.



With Manual Import, the software may choose to define elements incorrectly. If this is the case, the Operator can click Clear, or in the case of Define Part, Clear All, and start over.

6.5.1 Add a Line

If there are missing elements, or if Precision Adjustment damages an element, the Operator can click Add Line at the top of the interface and add a line to a design element. Using the mouse, click to create a start point for the line, then click an end point to form a line.

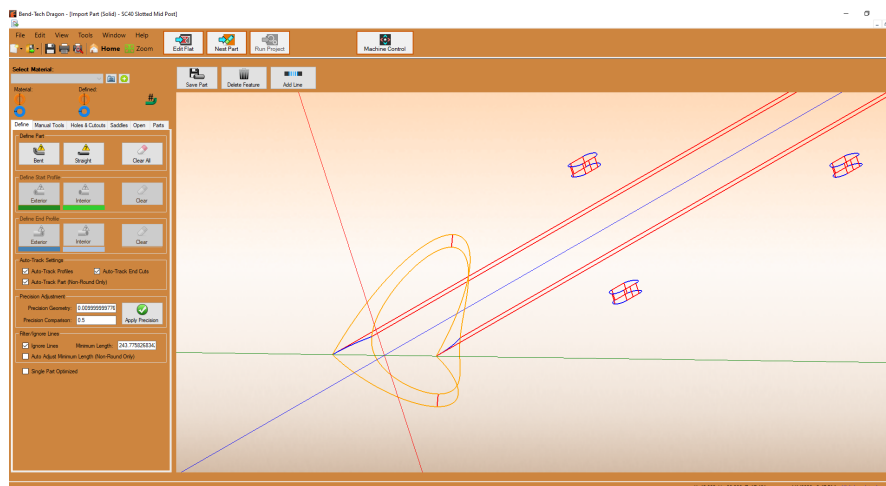
6.5.2 Holes & Cutouts

If there are holes or cutouts that need to be defined, click the Holes & Cutouts tab. In the Define Holes/Cutouts box, click Exterior, then use the mouse to click the exterior edge of the cut to define the Exterior. Click Interior, then click the interior edge of the cut to define the Interior. If any lines are created incorrectly, the Operator can click Clear All and start over.

6.5.3 Nest Part

Once all the dimensions of the material are defined, the Operator can begin the Nest Part process. With the project nested, the Operator can inspect the elements of the project in the Nest Part interface to ensure all the aspects of the design transferred correctly.

6.5.4 Deleting Line Segments



In Manual Import, the feature may place line segments that connect inner and outer line elements. When inner and outer segments are connected it can cause issues with the software recognizing proper boundaries of the material. The Operator will be required to delete line segments that connect inner and outer line elements. At the top of the interface, click the Delete Feature icon. Using the Delete Feature, the Operator can use the mouse cursor to click on line segments and delete them.

6.6 Manually Importing Square or Rectangular Material

In order to import square or rectangle material, Bend-Tech requires a radius at the corners of the material. With square or rectangle material, each side of the radius on the outside of the material will feature a line that needs to be defined. Square and rectangle material will import with many more edge elements than round and typically requires more time to define.

6.7 Defining a Bent Part

When using Manual Import for bent parts, the software will import the bent part and display it as lines. It will also display profile circles to represent the inside diameter and outside diameter of the material. To define a bent part, with the part imported and displayed in the importing interface, under the Define tab in the Define Part window, click the Bent icon. Locate one of the profile circles indicating inside diameter and outside diameter of the part. Ensure it is a complete circle. Click on the circle. The part should be defined as a complete part.

6.8 Save Part

Once a part is defined within the import interface, the Operator can click the Save Part icon at the top of the interface. A Name Part popup will appear. Choose a name for the part and click OK to save the part.

Once a part is saved, the new part will appear in the Parts List under the Parts tab. The Parts tab will be used to transfer parts from Manual Define to the Nesting project. The Parts tab will be used to transfer parts from Manual Define to the Nesting project.

6.9 Manual Tools

When performing Manual Import the software may not recognize all elements of a piece of material, or may not recognize all elements correctly. The Operator can use Manual Tools to define elements of material and create the correct geometry. This is a time intensive process, but often allows the Operator to get the desired results.

6.9.1 Remove Sections

Under the Manual Tools tab, in the Modify Sections box, the Operator can click Remove Sections to break a part or assembly down to its basic import elements that may include circles and line sections. Remove Sections is helpful if the Operator has attempted to define a part, but is unable to define it correctly. Remove Sections allows the Operator to remove sections of parts or entire parts by removing all the sections one at a time.



When using Manual Tools it is best to retain at least one element, such as a bent section, that has been imported correctly, and base the rest of the edits off that correct segment.

6.9.2 Two Points

Under the Manual Tools tab, in the Define Straight Section box, click the Two Points icon. When using the Two Points feature, the software will display a red point at the center of an element. The Operator can click on a red point and connect it with another red point to define a straight section of material.

6.9.3 Line

In some cases, an imported element may not be represented as a solid, and will simply have a line showing its length. Under the Manual Tools tab, in the Define Straight Section box, click the Line icon. Using the Line feature, the Operator can click the imported Line to create a solid element.

6.9.4 Define Bend

Bends are a critical part of any design, and creating them accurately is important to importing the design. When using Manual Import, the software may not recreate the bends as designed. In this case, the Operator can manually define the bends to match the original design using the Define Bend tool.

6.9.5 Defining Bends using Two Circles

Under the Manual Tools tab, in the Define Bend box, the Operator can choose the Two Circles feature to connect circles that define a bend profile. The cursor will prompt the Operator to click the first circle in the bend, then it will prompt to click the second circle. The software will then connect the two circles with the appropriate bend.

6.9.6 Defining Bends using Points

If a bend has been imported and there are missing circles, or there are no circles, the Operator can choose the Center, Start, End feature, or the Start, Mid, End feature, to connect points and create a bend segment. While both features essentially operate the same, which feature the Operator chooses depends on the given import and the elements it contains.

6.9.7 Defining Bends using Arc

The Import may display a bend by displaying an arc line. With an arc line, the Operator can choose Arc and use the cursor to create the bend segment.

6.9.8 Defining Bends using Circle -->Arc

The Import may display a circle on one end of the bend and no circle on the other end of the bend. If there is an arc present, the Operator can use the Circle -- > Arc feature. Click the circle, then use the arc as a guide to place the missing circle. This will define the bend.

6.9.9 Modify Sections

Modify Sections allows the Operator to redefine elements of the imported design. Using these features, elements can be extended, removed or adjusted.

6.8.10 Extend Straight

The Extend Straight tool can be used to extend a piece of material that may have partially imported, leaving a missing section. Click on the Extend Straight icon, then click on the end of the element, and click the location where the element should extend to, or click the element where it should connect.

6.9.11 Remove Section

The Remove Section tool can be used to remove a section of material that does not belong, or that needs to be temporarily removed in order to reconfigure the import so it is accurate. Remove Section is a helpful tool when using Manual Tools such as those found in Define Straight Section and Define bend.

6.9.12 Adjust Radius

If an imported part displays an incorrect bend radius, the Operator can use the Adjust Radius tool to edit the radius. When the Adjust Radius icon is clicked, an Adjust Bend popup will appear. The Adjust Bend popup will display the initial CLR as reference, and it will display a New CLR text box where the Operator can adjust the bend. The Operator can also choose to adjust all matching bends in the design. Click OK to apply the changes to the import.

6.10 Define Saddles

In the Saddles tab, the Operator can use line elements from the imported information to create a Saddle definition. Locate a circle in a position where two pieces of material intersect and, under the Saddles tab, in the Define Saddles box, click the Exterior or Interior icon, then click on the corresponding circle in the import.

The Operator can use Auto Saddles to define saddles faster. Under the Parts tab, click the Auto Saddles icon and the software will define all saddles it finds within the design. If there are missing saddles, the Operator can go to the Saddles tab and define them manually.



Bend-Tech recommends using Auto Saddles before attempting to manually define saddles.

6.11 Open

Under the Open tab, in the Define Open Features box, the Operator can click Auto-Track or Manual Definition to define non-typical features of an import such as specialized design cuts, specialized material shapes or other custom features.

6.12 Importing NC1 Files

It is possible to import NC1 files into Bend-Tech CAM. However, significant loss of information and part details is typically an issue when importing these files. Some NC1 importing issues include minimal data points regarding cut profiles as well as difficulty synchronizing materials.

Under Create New in the Bend-Tech Dragon main interface, click the Import icon. Locate the NC1 file for import and click Open.

An Import Options pop-up will appear. The Operator will have the choice of opening the part in Designer or to import it to Nesting. Bend-Tech recommends opening the part in Designer to ensure all the elements of the import are correct. Click OK.

6.12.1 NC1 Layout Viewer

When opened in Designer, the part will open in the NC1 Layout Viewer Interface. This interface will display all the part information Bend-Tech software was able to gather on import.



NC1 files will always be formatted in metric measurements.

6.12.2 Select Material

The import feature will attempt to match a material in the Material Library with the material contained in the NC1 file. If it cannot find an exact match, it will choose the closest material. The Operator should consult the Select Material dropdown to ensure the material is appropriate for the imported design.



If the Operator chooses to import the NC1 file to Nesting and the software cannot find a matching material the import will fail.

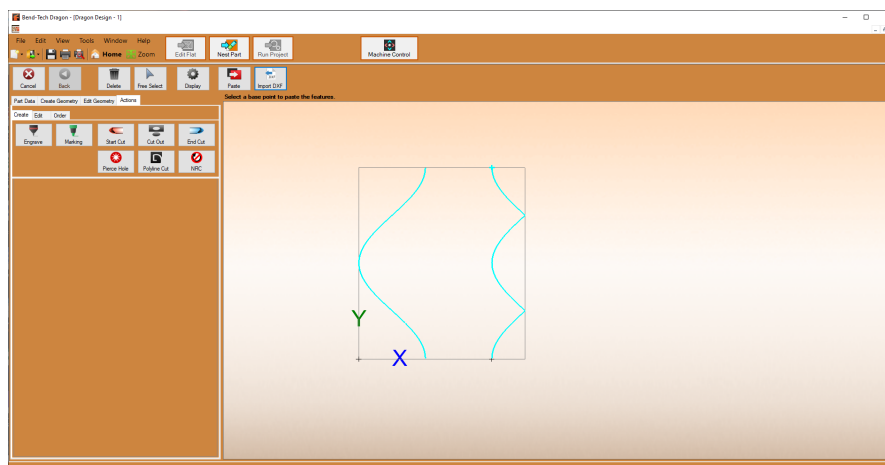


The Operator should always ensure the proper material is selected. There are no checks in the NC1 import to ensure a material is suitable for the import.



The Operator should always check NC1 file imports in Edit Flat to ensure the OD matches the cutting geometry.

6.13 Importing DXF Files



It is possible to import DXF files into the Edit Flat feature in Dragon CAM. DXF files can be applied to a part as cutting information.

6.13.1 Importing a DXF File

With a part open in the Straight Part design interface, click Edit Flat. In Edit Flat, click the Import DXF icon at the top of the interface. An Import DXF File popup will appear. Locate the DXF file for import, click on the file, and click Open.

When the Operator clicks Open to import the DXF file, an Import/Export DXF popup will appear. It will prompt the Operator to choose the DXF Import/Export method. Choose Standard.

A Set DXF Base Point interface will appear. Click OK and the DXF information will appear in the Edit Flat part display. If the information looks correct, drag the DXF information into the required location on the part.

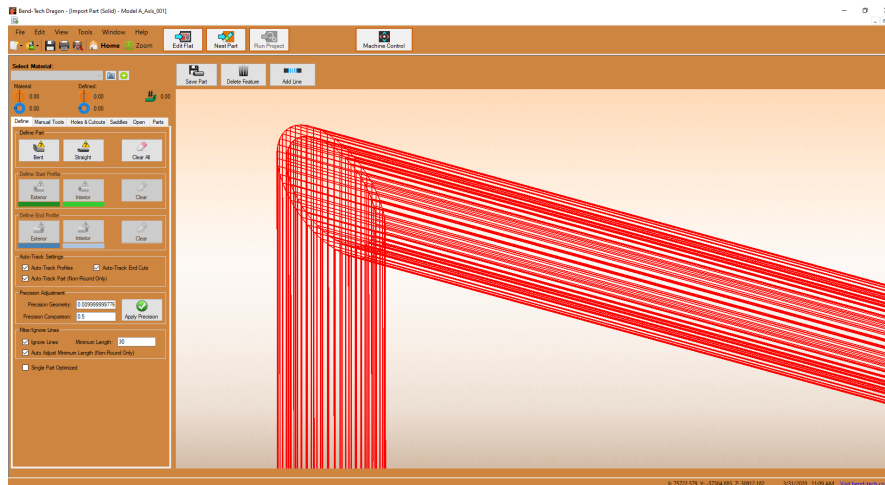


The Operator should be familiar with Edit Flat in order to properly place the DXF files in Edit Flat.

6.13.2 DXF Actions

Once the DXF information is placed on the part, click the Actions tab and assign the appropriate action to the information.

6.14 Faceted Model in CAD



An Operator may encounter a situation where a part appears in the import interface, but is not recognized as a proper part by the import software. In this case, the part is typically displayed as a series of lines rather than a single line with a shaded representation of the material. The Faceted Model tool will allow the Operator to convert the series of lines representing a part into a defined part.

6.14.1 Opening a File in Tekla Import

In Dragon CAD, click CAD Import. In the Import CAD File popup click Faced Model. An Import Tekla Model popup will appear. Locate the desired file, click on it and click Open. The file will open in Tekla Import - HR1 (mixed facet and clean) interface.

6.14.2 Creating Tube

Locate the part or parts that are defined by lines. Under the Define tab, in the Define box, click the Create Tube By Dragging icon. The Create Tube By Dragging feature will allow the Operator to drag a line across each element to create a section of tube. Perform this action for all sections of tube.

6.14.3 Join with Bend

Once the straight sections of tube are defined, the Operator will be required to join the tubing with bends to complete the part. Under the Define tab, in the Define box, click the Join With Bend icon. Using this feature, the Operator can click one element of the tube, then click the next element in the design and it will create the appropriate bend to join the two sections. For a part with multiple bends, click the sections in series to continue creating bends until the part is complete.

Temporary Material

7.1 Entering Temporary Material in the Material Library

If an imported project contains material that is not already entered in the machine's Material List, the software will automatically enter it as a Temporary Material. This will allow the Operator to edit the project, but before the Nest Part process can be performed the material will need to be updated in the Material List.

7.1.1 Incomplete Material Error

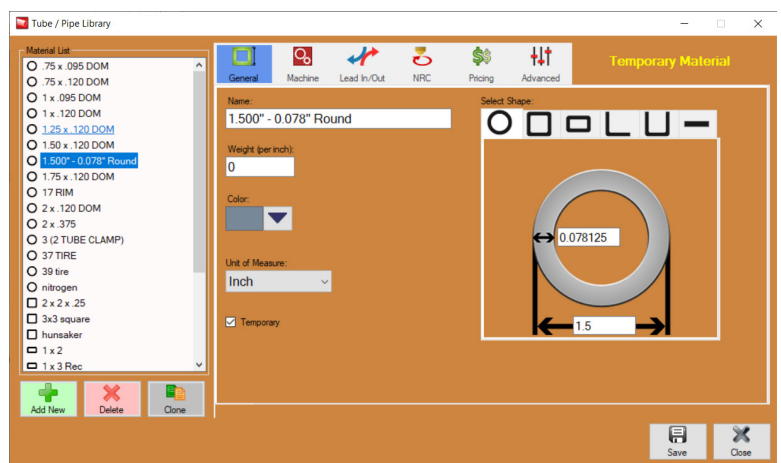
If the Operator attempts to perform the Nest Part process by clicking Nest Part, an Incomplete Material Error popup warning will appear. Click OK.

7.1.2 Material List

In the Tools dropdown, click Tube / Pipe Library. Find the Temporary Material in the Material List. Click on it to highlight it and bring up its information.

7.1.3 General

In the General interface, ensure the measurements for thickness and outside diameter are accurate. If the material is not round, ensure the radius is correct. Use a radius gauge to determine accurate radius of the material. If these measurements aren't correct, the Operator will be required to confirm the design file is correct, and that the appropriate material was used for the design file.



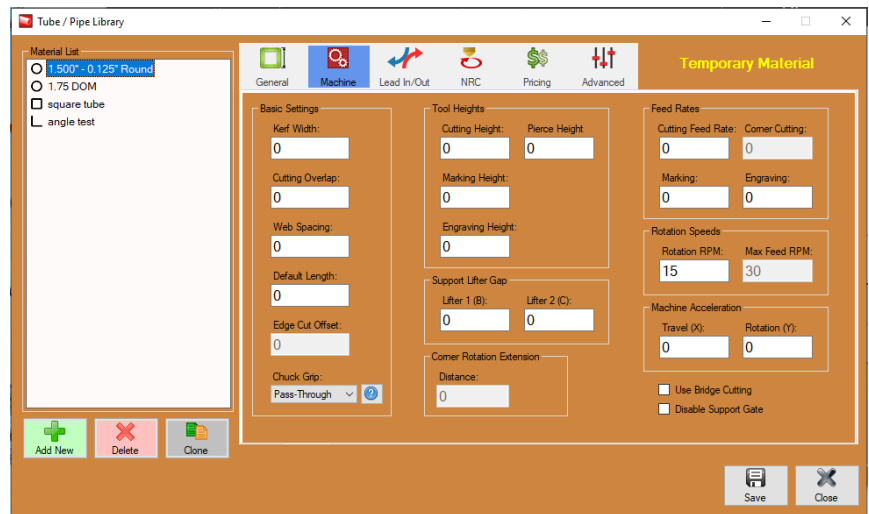
7.1.4 Machine

In the Machine interface the Operator will be required to verify and/or edit settings that are critical to the operation of the machine.

7.2 Machine Settings

7.2.1 Kerf Width

In the Basic Settings box, set the Kerf Width to 0.06. This is a default setting Bend-Tech uses that works well for most materials. Depending on the material and cutting requirements, the Operator may want to measure Kerf Width to enter a more accurate setting.



7.2.2 Web Spacing

When cutting parts in a Nest Project, Web Spacing is the amount of material the Operator sets the machine to leave between parts. Bend-Tech recommends .25 as a good starting point for Web Spacing.

7.2.3 Default Length

The Default Length setting is the length of material the Operator will load into the machine.

7.2.4 Chuck Grip

The Chuck Grip setting is dependent on the size and type of the material. Click the question mark icon to see the different styles of Chuck Grip. Choose the correct Chuck Grip from the drop down menu.

7.2.5 Feed Rates

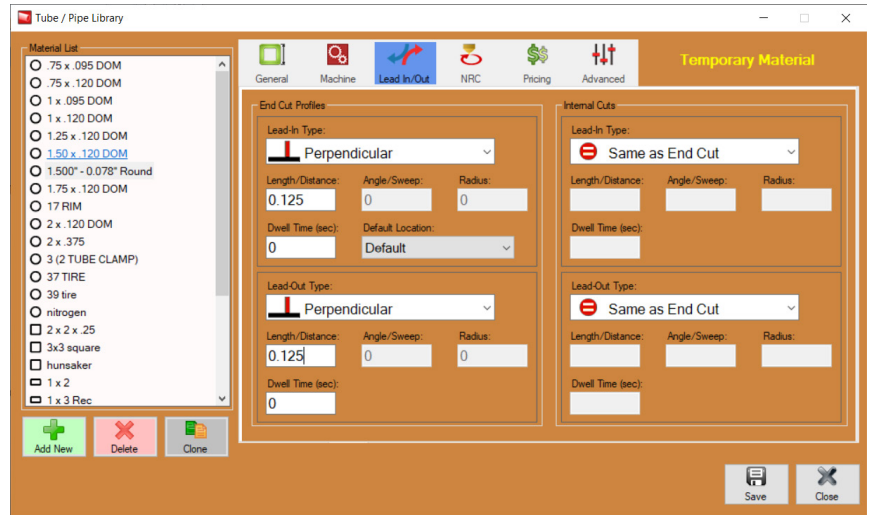
Typical Feed Rate setting for Cutting Feed Rate, Marking and Engraving is 60.

7.2.6 Corner Feed Rate

Since the Torch will essentially spend more time arcing on the corner of the material, Corner Feed Rate should be set slightly higher. Bend-Tech recommends 100 as a good starting point for Corner Feed Rate.

7.3 Lead In/Out

Lead In/Out settings can differ greatly depending on the type of material. For a material such as Round, Square or Rectangle, Lead In/Out settings are not as critical as with Angle or Channel. Angle and Channel material typically have different material thickness from the edge of the material to the radius, which makes Lead In/Out critical to maintaining proper Torch arc and achieving a clean cut.



7.3.1 Round, Square and Rectangle

In the End Cut Profiles, box, Lead-In Type and Lead-Out Type for Round, Square and Rectangle material is typically set to Perpendicular.

7.3.2 Angle and Channel

When setting Lead-In Type for Angle material, Bend-Tech recommends using the Angle From Edge setting for Lead-In. When setting Lead-Out it is recommended to use Path From Edge. Set Angle/Sweep to 45.

7.3.3 Length/Distance

In the Length/Distance text box, Bend-Tech recommends a default setting of 0.125 for both Lead-In and Lead-Out, with the exception of Angle material or smaller holes.

When setting Length/Distance for Angle or Channel, match this setting to the Edge Cut Offset under the Machine Tab.

In the Internal Cuts box, set Lead-In Type and Lead-Out Type to Same As End Cut.

7.4 Advanced

When entering any new material other than Round, the Operator will be required to perform Side Offsets calibration. Click the Advanced icon at the top of the interface. In the Side Offsets box, click the Calibrate icon.

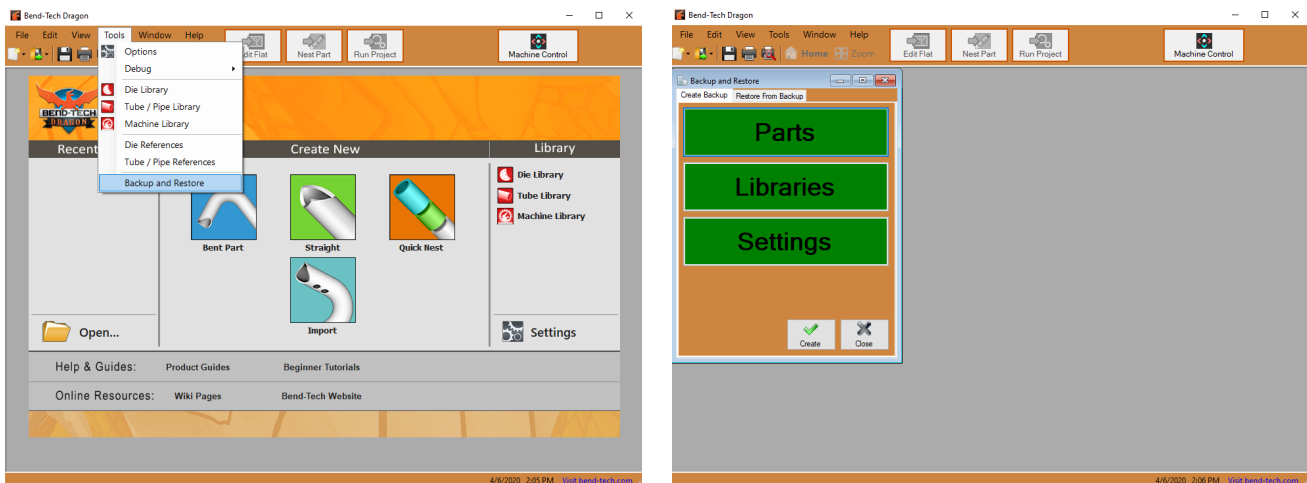
7.5 Save Updated Material

When all settings are entered appropriately, click Save at the bottom of the interface. The Temporary Material has now been updated in the Material List. The Temp Material text will disappear.

Backup and Restore

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

8.1 How to Backup Files



1. 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. In the Backup and Restore popup, under the Create Backup tab, the Operator can choose to Backup Parts, Libraries, and Settings in the software.

3. Select the elements to Backup.

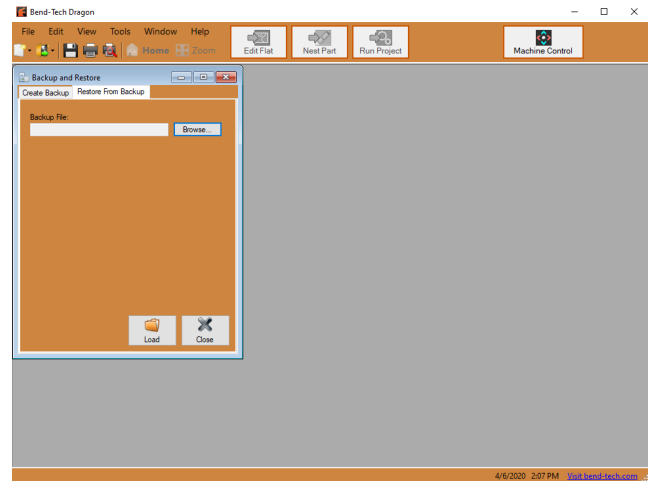
Green = Selected

Orange = Not Selected

4. 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.

8.2 Restore from Backup

1. To Restore from the Backup files, in the Tools dropdown menu, click Backup and Restore.
2. In the Backup and Restore popup, click the Restore From Backup tab. 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. A Backup and Restore popup will appear showing all of the files in the Backup file.
4. To transfer files, click None or All, then click Overwrite or Merge. Overwrite will populate the software with the files that are in the Backup file and Overwrite all files currently in the software. Merge will Overwrite matching files and add new ones.
5. If the Operator chooses Overwrite, a Merge Warning popup will appear for each matching file. Choose Ignore or Overwrite options depending on preference.



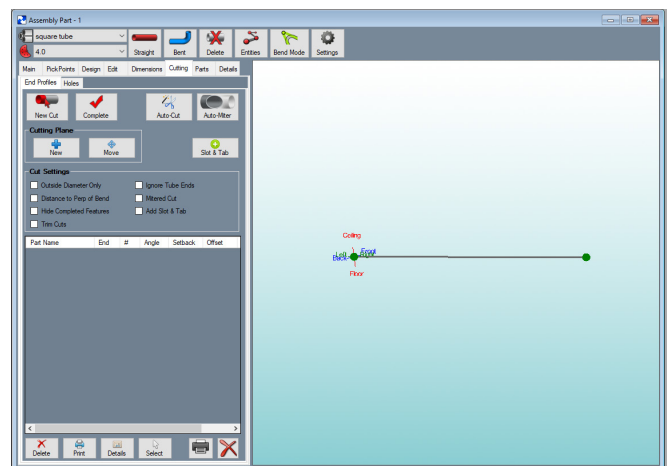
Creating Notches

Notching a tube allows the Operator 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 allows the Operator to cut pieces of an assembly that can be moved to a different location and easily bent at the jobsite.

9.1 Creating A Notch In Dragon CAD

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

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



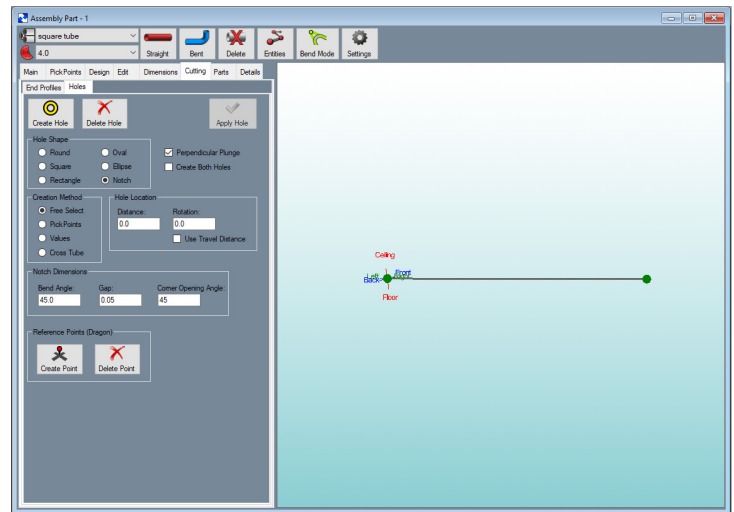
The Notch feature is only available when working with square material. If the User has selected material that is not square, the Notch feature will not appear in the Cutting interface.

Notch Creation Method	
Free Select	Not recommend.
Pick Points	Holes are created in the pick point locations the Operator plots in Dragon CAD.
Values	hole is placed based on the value (measurement) selected by the Operator.
Cross Tube	This requires an intersecting tube in the design.

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

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.

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.

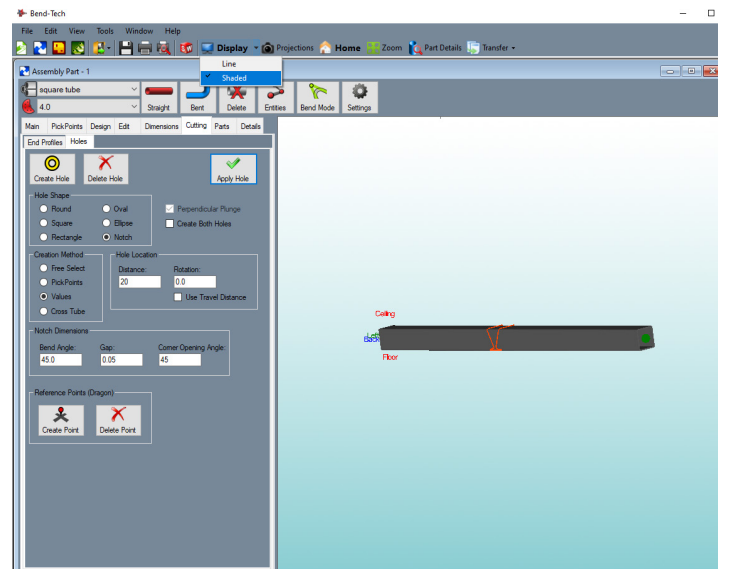


After selecting a location for the Notch, the software will ask the User to “Select the rotational direction point.” Select a pick point in the direction the part will fold when it is bent, or select the pick point where the cut will be placed to set the Rotational Direction Point to default settings.

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.

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

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



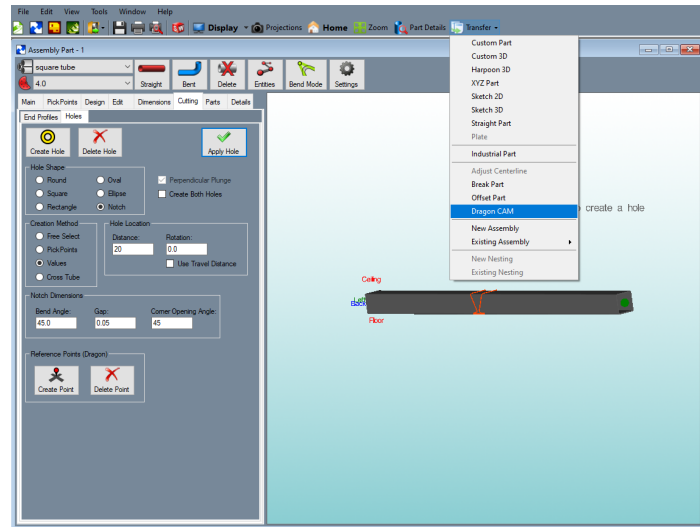
9.2 Transferring the Notch To Dragon CAM

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.

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



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.

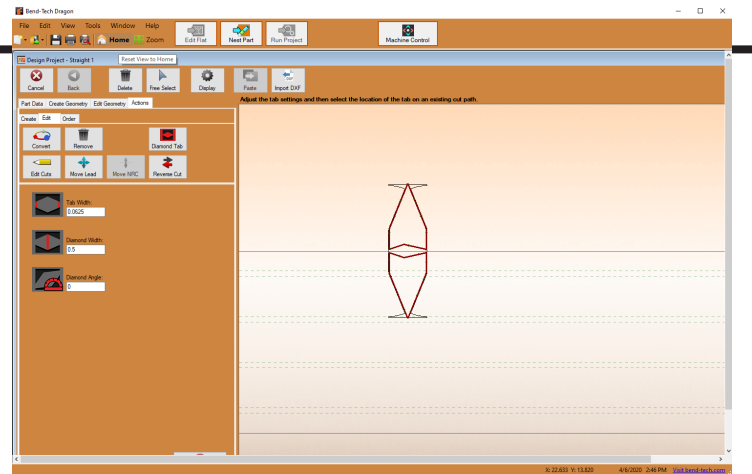
9.2.1 Adjusting Cutting Path Using Kerf Width

Ensure the Notch cut 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, click the Actions tab, click the Edit 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.

9.3 Adding A Diamond Tab

Cutting a notch removes material on three of four sides of the tube. 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.

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



Click the Actions tab, Click the Edit tab, then click the Diamond Tab icon in the upper right of the Edit tab box.

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.

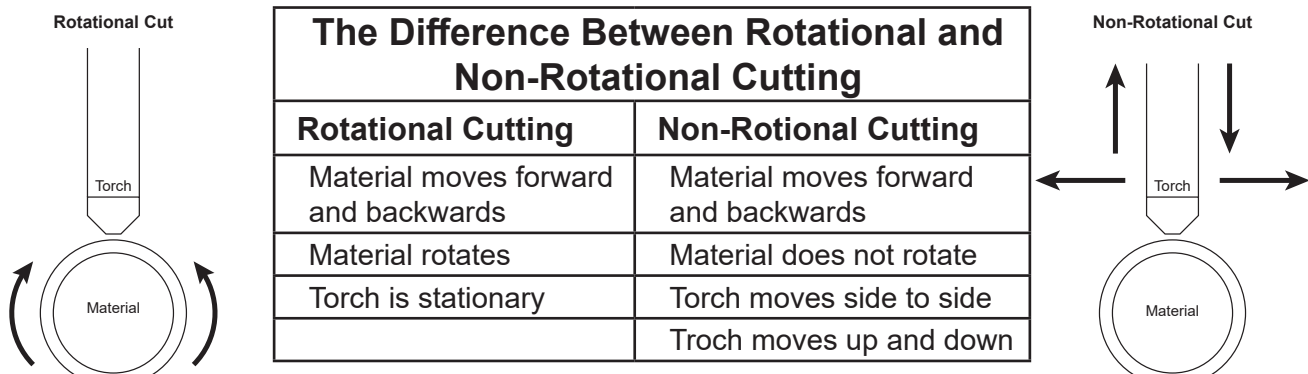
With Diamond Tab chosen, the User can change the dimensions of the Diamond Tab including Tab Width, Diamond Width and Diamond Angle, to suit the project needs.

10

Non-Rotational Cuts

10.1 Non-Rotational Cut (NRC)

A rotational cut will create a hole that is round on the inside diameter of the material and, typically, oblong on the outside diameter of the material. In some cases, the Operator may want to create a hole that is round on both the inside and outside diameter. This can be achieved by programming the machine to perform a Non-Rotational Cut (NRC).



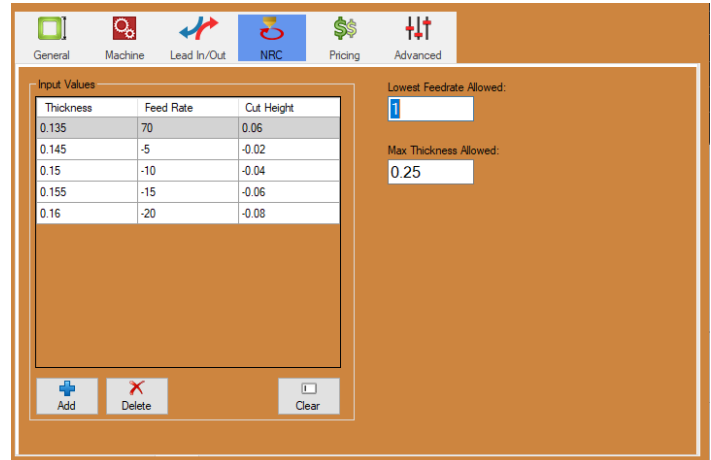
To program an NRC, the Operator will be required to generate holes in the Edit Flat designer. If holes are created outside of Edit Flat the software will normalize the holes, which automatically defaults the cutting process to a rotational cut. Once a hole is created in Edit Flat, click actions>create >NRC, then click a hole to program it as a NRC. The Operator will also be required to program the NRC using the Input Values grid in the Tube / Pipe library, under the NRC tab.

10.2 Setting Up Non-Rotational Cutting

When performing a Non-Rotational Cut (NRC), the Torch moves side-to-side on the Z Axis, and up and down on the A Axis. The material moves forward and back on the X Axis. Since the material does not rotate, to maintain cut quality, the machine will need to adjust for Material Thickness, Feed Rate and Cut Height.

In the Tube Library, with the appropriate material selected, click the NRC icon at the top of the interface.

In the NRC interface, to perform an accurate NRC cut, the Operator will be required to enter the necessary values in the Input Values chart.



Torch Setting	
Thickness	Thickness of the material the Torch is cutting as it moves along the Z axis.
Feed Rate	Feed Rate decreases as the thickness of the material increases.
Cut Height	As the Torch moves along the Z axis it will be required to change height to maintain cutting distance with the material. The Cut Height will decrease as it moves from the center of the material to the outside of the material.

10.3 Using NRC Input Values

When using the NRC Input Values table, the first entry should have cut values with the Torch centered on the material, and where it will be cutting actual material thickness.

Thickness

Thickness values will progressively increase as the Torch moves away from the centerline of the material.

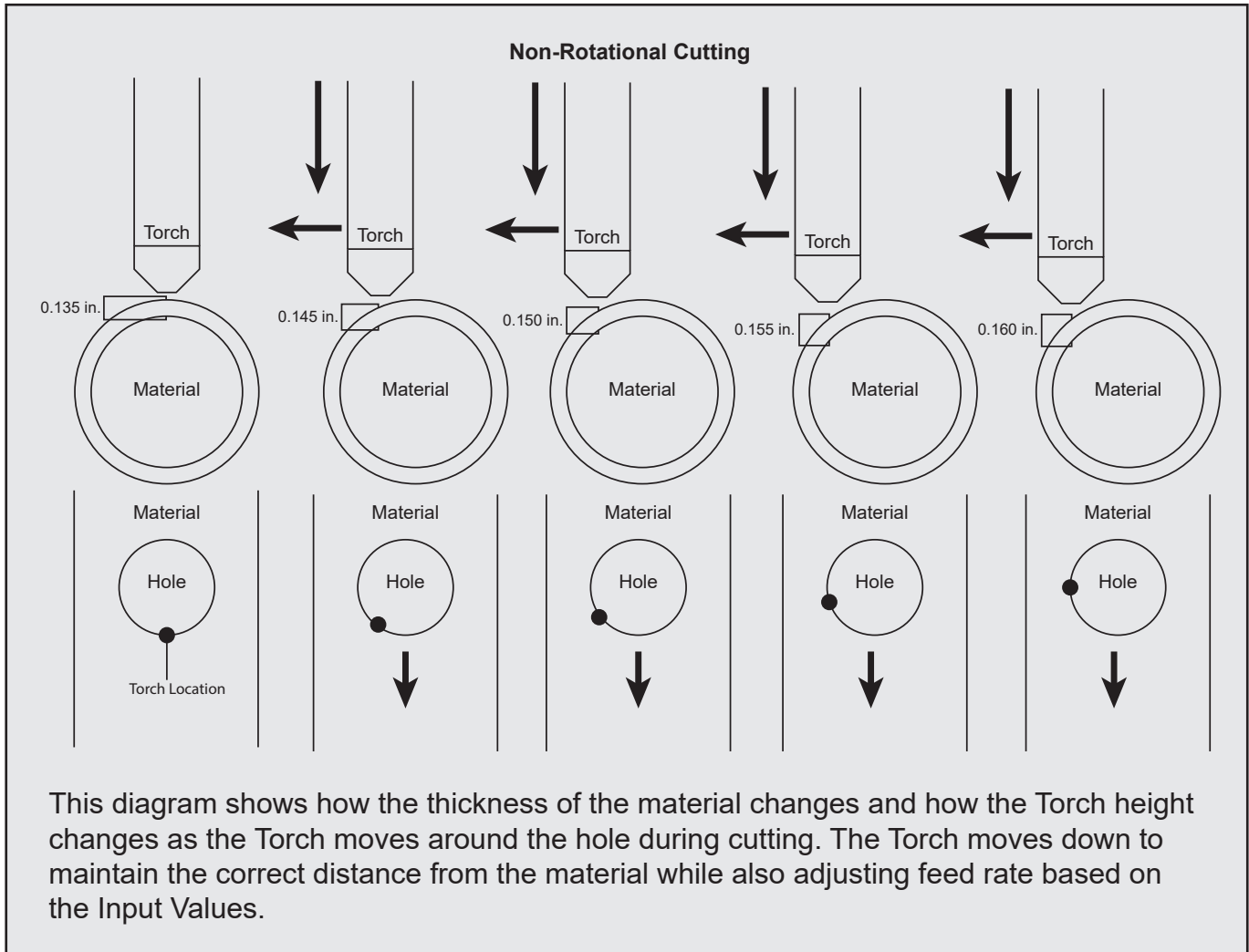
Feed Rate

As the Torch moves away from the centerline of the material, Feed Rate will need to be set progressively slower to maintain cut quality.

Cut Height

As the Torch moves away from the centerline of the material, Torch Height values will need to progressively decrease to maintain Cut Height.

As the Torch moves back toward centerline, the machine will reverse the values in the Input Values chart to adjust for Thickness, raise the Cut Height and increase Feed Rate.



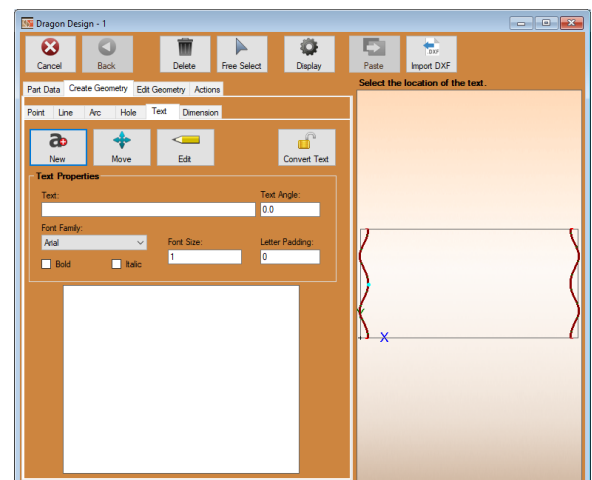
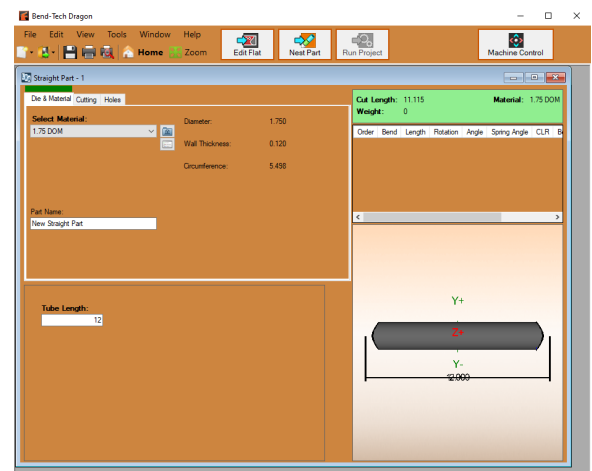
11

Placing Text on a Part

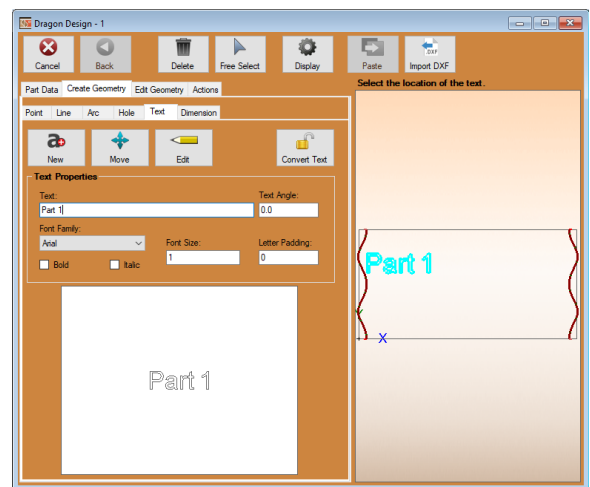
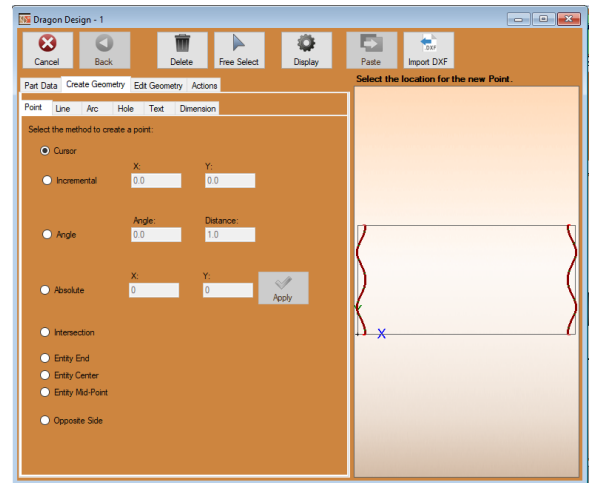
11.1 Placing Text on a Part

It is not uncommon for designers to want to place text on a part, or cut text out of a part. Using the Dragon A400 and its operational software, text can be easily marked, engraved or cut into a part.

1. With a part opened in the Dragon CAM design interface, click Edit Flat.
2. With the part open in Edit Flat, click the Create Geometry tab.



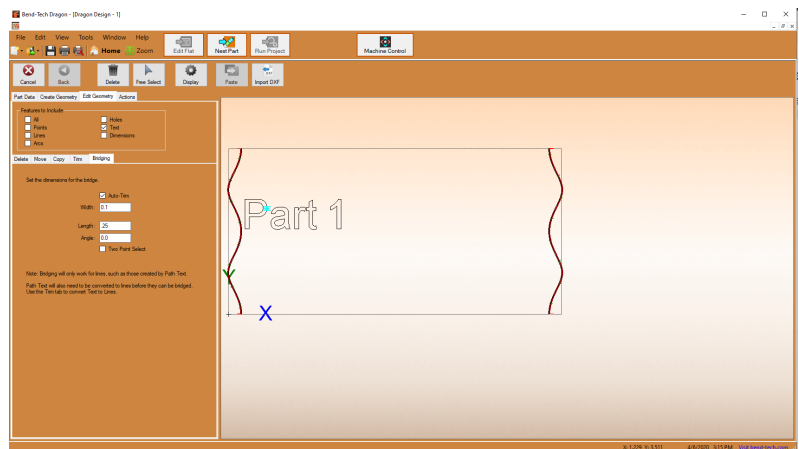
3. If the text needs to appear at a specific point on the material, click the Point subtab. Under the Point subtab, the Operator can choose a point using the Cursor. Place an Absolute point by entering specific measurements according to the X and Y axis, then click Apply. If the text does not need to appear at a specific point on the material the Operator can skip this step. The text can be placed using Free Select at a later step.
4. To begin creating text, click the Text subtab.
5. Click the New icon. In Text Properties, in the Text box, type the text that will appear on the part.
6. Choose the desired Font Family, Font Size and Letter Padding. Letter Padding will space the letters out, or move them closer together.
7. Click to place the text onto the material. If a specific point was chosen in Point, place the text on that point. The Operator can also choose Free Select to place text.
8. Click Convert Text, then click on the text that was created on the part. Convert Text turns the text into lines and arcs the cutting software recognizes. This is required in order to apply Actions.



11.2 Placing Bridge Cuts

When cutting out text, the Operator will be required to place bridge cuts on letters that have pieces which may drop out.

1. Click the Edit Geometry tab, click the Bridging subtab.
2. In the Bridging subtab, the Operator will be required to set dimensions for the bridge such as Width, Length and Angle. Choose the desired settings to achieve the appearance desired.



3. With 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.

For example, in the case of a letter A, an ideal place for a bridge might be at the center of the horizontal crossbar in the letter. This will keep the triangular piece from falling out of the inside of the letter.

4. Click Actions, 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.



It is recommended the Operator use Polyline Cut for actions such as letters. A Cut Out will have a lead-in, which is not necessary and could affect the quality of the cut.

5. Click Nest Part.

The part is now ready to be cut in the Dragon A400.

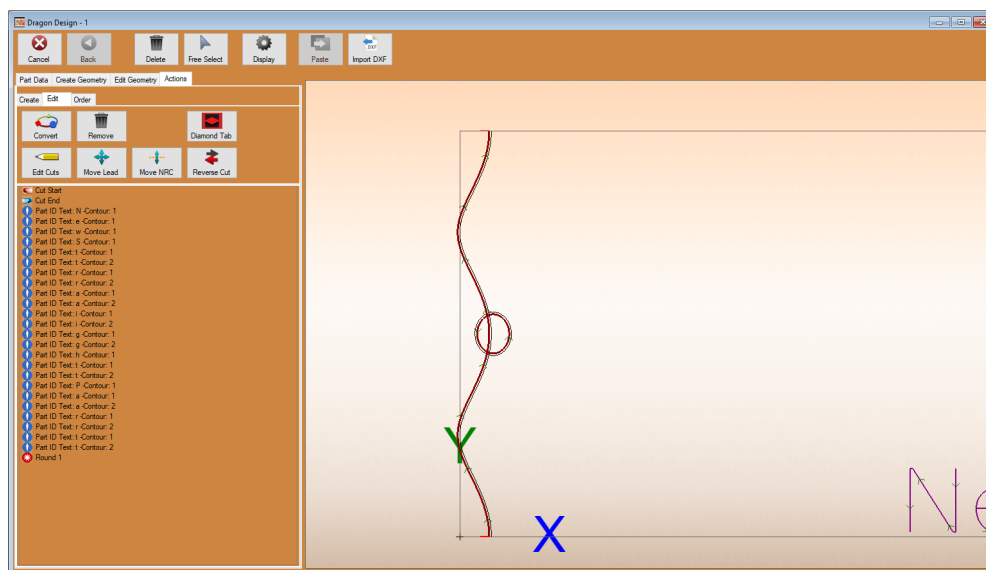
12

Reassigning an End Cut

12.1 Reassigning An End Cut

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. Upon opening the project in Edit Flat, the Operator may see that cutting actions are out of sequence, or two cutting actions are overlapping and contradicting each other. If this is the case, the Operator can reassign cut actions in the Edit Flat feature.

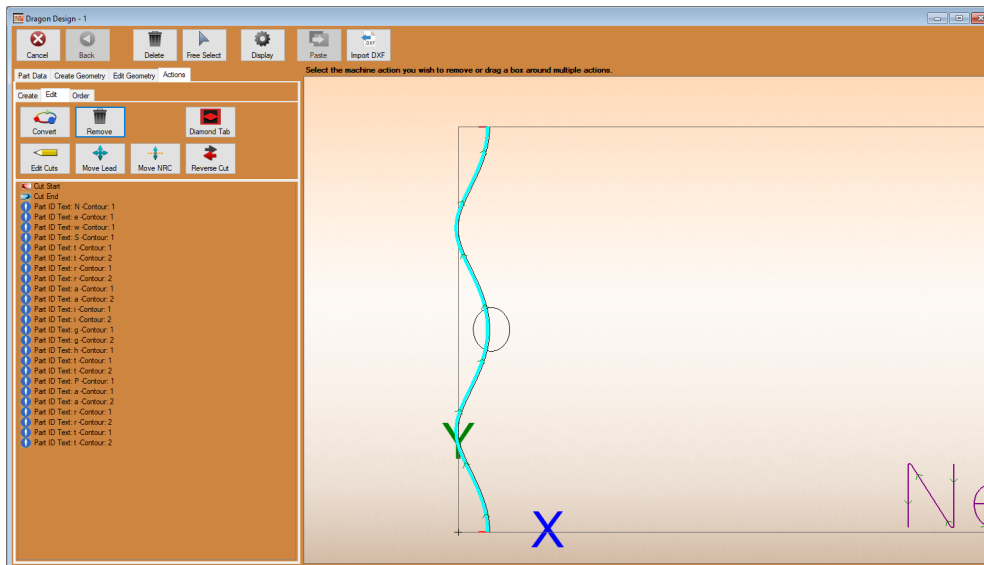
1. With the part open in the Dragon CAM design window, click Edit Flat



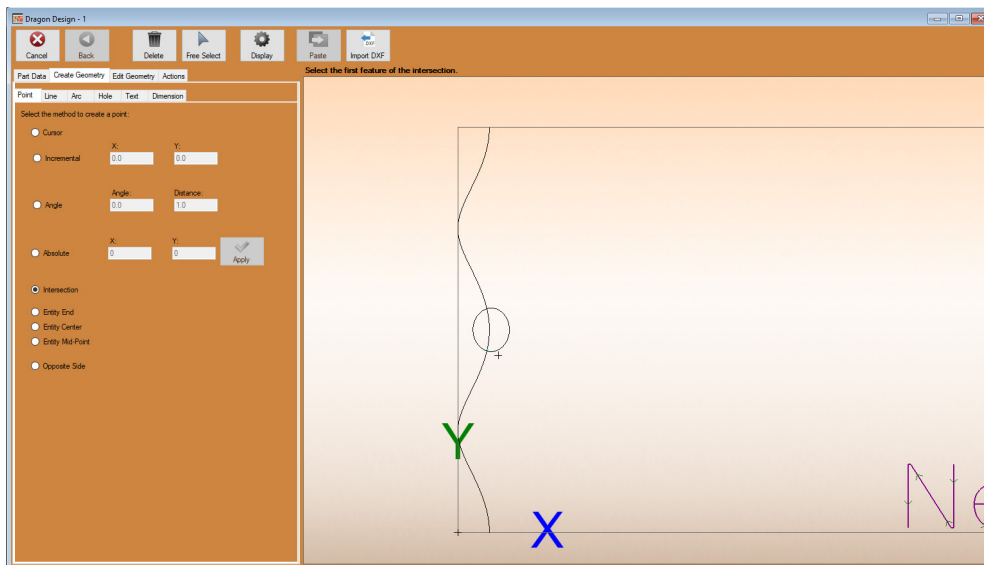
2. Click the Actions tab, then click the Edit tab.

12 Reassigning an End Cut

3. Click the Remove icon, then click each action in the part display interface that should be removed. When actions are removed the part will be displayed as simple lines, the cutting indicators will disappear.



4. To reapply geometry, click the Create Geometry tab.
5. In the case of intersecting cuts, in the Point tab, choose Intersection. Click each cut intersection.

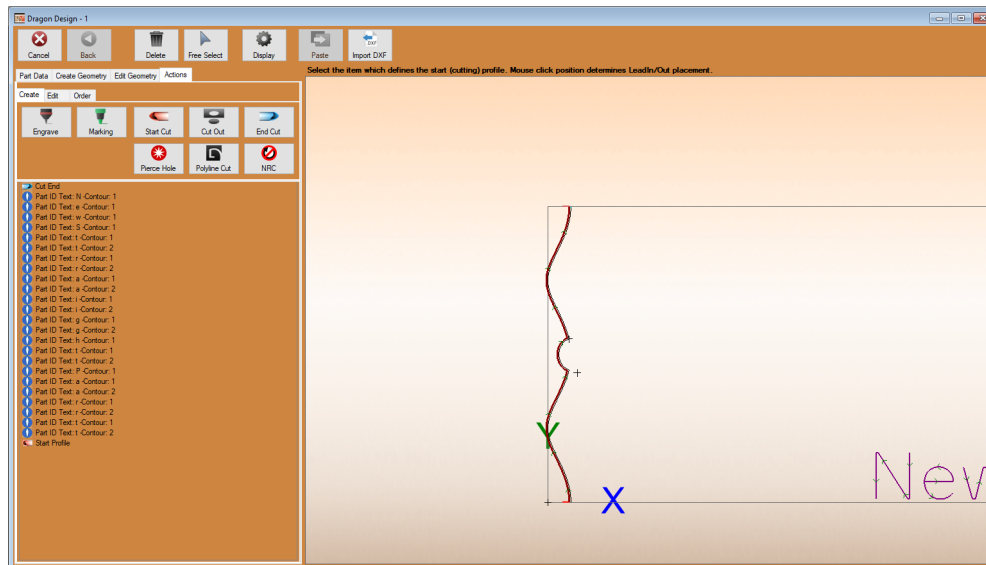


6. Once each intersection is chosen, the Operator can click the Delete icon and delete cut lines from the design. Delete unnecessary geometry. Be sure to leave enough geometry so the original design can be rebuilt.
7. In the Create Geometry tab, click the Line tab. Choose Two Points.

8. With Two Points chosen, the Operator can create new geometry by clicking a point, then clicking a second point. The software will connect those two points.

Using this method, connect points two at a time to create the desired geometry using the Intersections chosen along with the remaining geometry as a guide.

9. Click the Actions tab, click the Create tab. Click Start Cut, then click on the start of the cut on the new geometry. If the geometry is done properly, the software will populate a new cutting action.



13

Creating Slot and Tab

13.1 Slot and Tab

A unique feature of the Dragon A400 machine 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 final assemblies together. Ensuring Slot and Tab is done properly is key to creating professional assemblies with the Dragon A400. Slot and Tab can only be done in Dragon CAD.

13.1.1 Creating Slot and Tab

With an assembly designed in Dragon CAD, select the Cutting tab, then click New Cut. The software will prompt the User to select the feature to cut in the 3D interface. Click on that part.

1. The program will 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. Click on the part that will determine the cutting profile.

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.

2. On the left hand side of the interface, in the Cut Settings box, click Add Slot & Tab. 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.

3. At the top of the interface click Display. Click the Parts tab at the top of the box next to the 3D parts display. Next to the Part Name, the User can check and uncheck the parts to view them displayed individually. When this is done the part can be viewed with the Slot & Tab cuts visible.

When the User clicks Add Slot & Tab in the Cut Settings box, 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.

Whenever the location of the Slot & Tab is changed the User will be required to choose New Cut, select the feature to cut, select the tube that will determine the cutting profile, then click complete. The Slot & Tab will appear in the re-plotted position.

13.1.2 Changing Slot & Tab Dimensions

1. 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.
2. In the Dragon CAD interface, in the Tools dropdown menu, click Tube / Pipe Library. In the Material List choose the material that is being used.

At the top of the interface click the Advanced tab. In the Advanced interface, on the right hand side, in the Slot and Tab box, there are four Slot and Tab values.

3. 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. The User can leave this value as-is. However, Bend-Tech has found 0.2 to be a better value for Tab Width.

In the Slot Minimum Height text box enter the Tab width plus the Kerf Width. If the Tab width is .2 and Kerf Width is .06, the Slot Minimum Height would be .26.

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 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 to be a good starting value for Slot Width Offset.

13.1.3 Transferring the Slot & Tab Assembly To Dragon CAM

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.

1. At the top of the interface, click the Transfer drop down menu. Click Dragon CAM.
2. 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.

3. 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 placed on the material using the Marker tool.

14

Using Pick Points

14.1 Using Pick Points

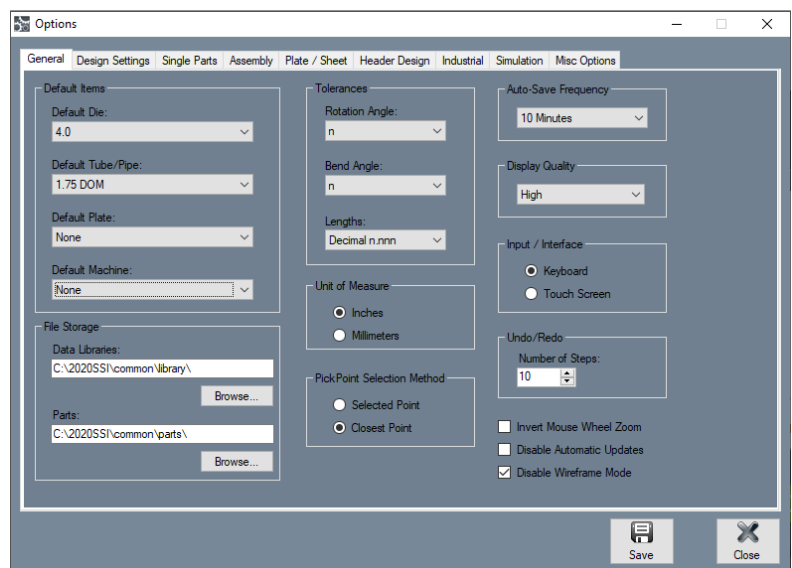
When working in Bend-Tech CAD software, the pick point is the main tool for designing parts and assemblies. The Dragon A400 Operator should have at least a basic knowledge of how to work with pick points. Pick points can be a useful tool in not only creating parts, but helping the Operator understand how the parts in an assembly interface, and the best way to use the Dragon machine to create those parts.

14.1.1 Settings

Before beginning using the design features and pick points in CAD, Bend-Tech recommends choosing some default settings. Recommended defaults may help make the design process smoother by eliminating the need to choose them every time the interface is used.

14.1.2 General

In the CAD home interface, in the bottom right-hand corner, click Settings. Under the General tab it is recommended the Operator enter default settings for the Bend-Tech CAD Program



14.1.3 Default Die

Enter a calibrated die that is most commonly used in the shop.

14.1.4 Default Tube/Pipe

Many shops do large portions of work using a specific size of material. Choose the Default Tube/Pipe most commonly used in the shop from the dropdown menu.

14.1.5 Default Machine

If the shop only works with one machine, choose that machine in the Default Machine dropdown.

14.1.6 Design Settings

Design settings are bending-related settings which affect how lengths, rotations and angles are calculated when designing. When these are set the software will alert the Operator if a bend is placed in the wrong position. It also tells the software how to display bending-related information.

14.1.7 Length/Location

Length/Location allows the designer to choose how bends are measured from one another, and will affect LRA data.

14.1.8 Changing Default Settings inside an Assembly

When an assembly is open the software will not allow the Operator to set defaults. However, the Operator can set defaults within a specific design. With a design open, at the top of the design interface, click the Settings icon.



14.1.9 Tube / Pipe Library

Before beginning a design, ensure the material that will be used in the design is entered in the Tube / Pipe Library.

14.1.10 Dragon CAD

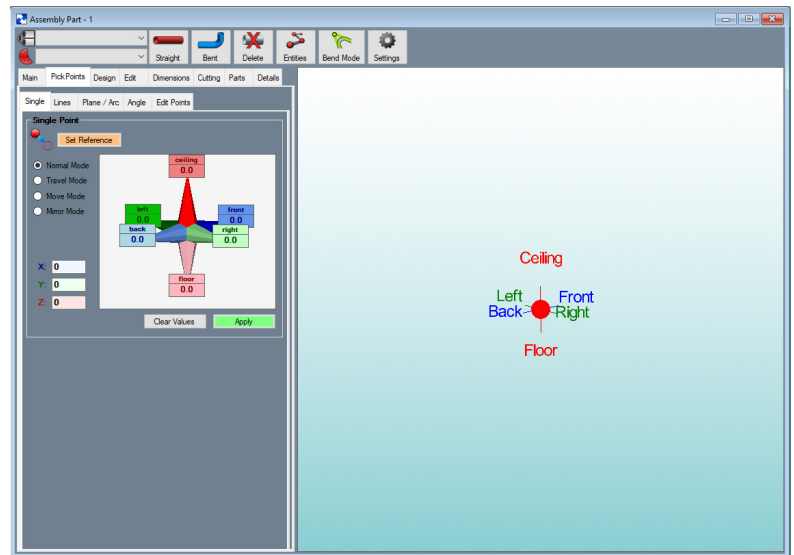
Dragon CAD is a complete design software that can be used to design anything from straight parts to complex assemblies such as vehicle chassis and hand rails.

14.1.11 Beginning a Project

To begin a project in Dragon CAD, in the Bend-Tech Launcher interface, click Dragon CAD. In Dragon CAD, under Create New, choose Assembly. This tutorial will use Assembly, but it crosses over to many other aspects of Dragon CAD.

14.1.12 Assembly Interface

With the Assembly interface open, locate the Pick Points, Dimensions and Cutting tabs. Those three tabs will be the main features used when creating basic designs using pick points.



14.1.13 Projections

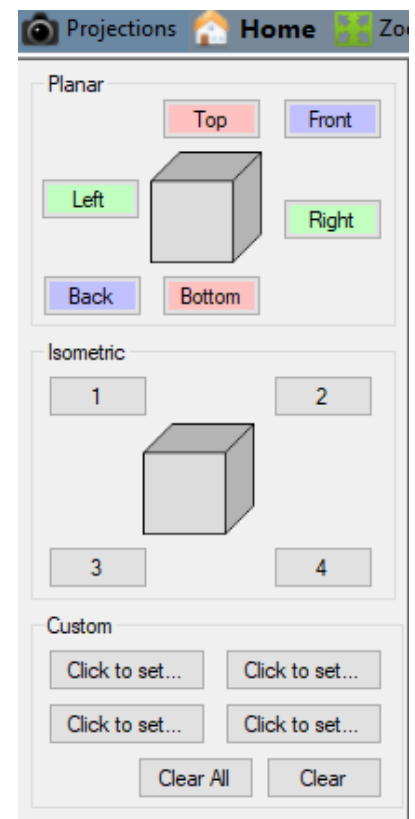
The view of the project can be changed in the Projections feature. At the top of the interface, click the Projections dropdown menu. Projections offers the Operator a number of display options that can be used to reconfigure a project view.

14.1.14 Planar

In Planar, Back offers a view as if the Operator were standing directly to the rear of the design project. Each of the other choices switches the view to that respective position.

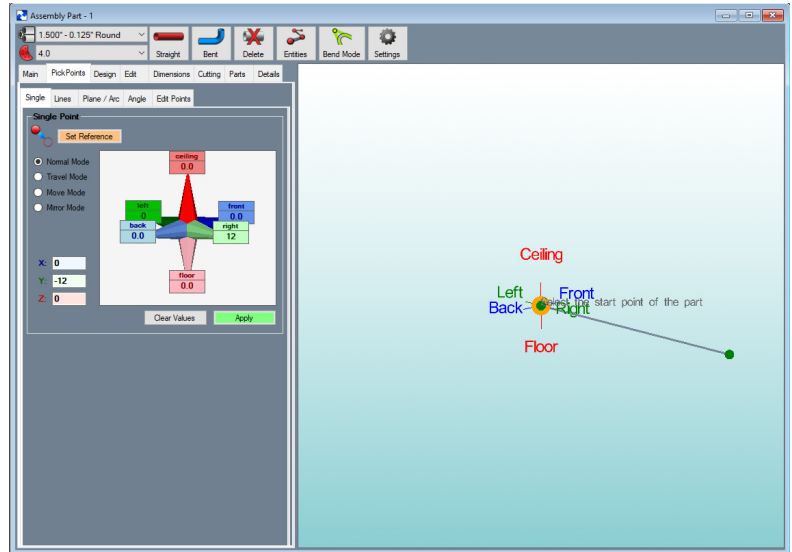
14.1.15 Isometric

Isometric options switches the view to an angle that varies from different sides of the project. Each position, 1 through 4, rotates the project view 90-degrees.



14.1.16 Creating a Pick Point

When a design is started, the software will default the first Set Reference pick point to the center of the Tri Star. The Tri-Star will display Front, Back, Left, Right, Ceiling and Floor. Imagine these points as if the Operator were standing in a shop or garage. If a pick point is needed 12-inches to the right of the center point, or the center of the Tri Star, enter a 12 into the green text box under “right.” The software will create a purple point. Click the green Apply button below the Tri Star display to set that Pick Point.



14.1.17 Using Set Reference

While the software will always default to the center of the Tri Star as its reference, the Operator can set any Pick Point created as a reference. This allows the Operator to place parts at other points when creating an assembly. To set a reference point, click Set Reference. A message will be displayed next to the mouse cursor that reads “Set reference point.” Click on a Pick Point to set that point as the reference point. The next measurement entered in the Tri Star will be based on that reference point.

The Operator can also click Set Reference and leave the measurement originally entered in the Tri Star, click the pick point that was just created, and the software will create another pick point the same distance from the new pick point.

The Operator can choose Clear All Values, place a reference point and enter a new measurement to create a new pick point set to a new distance from the reference.

14.1.18 Delete

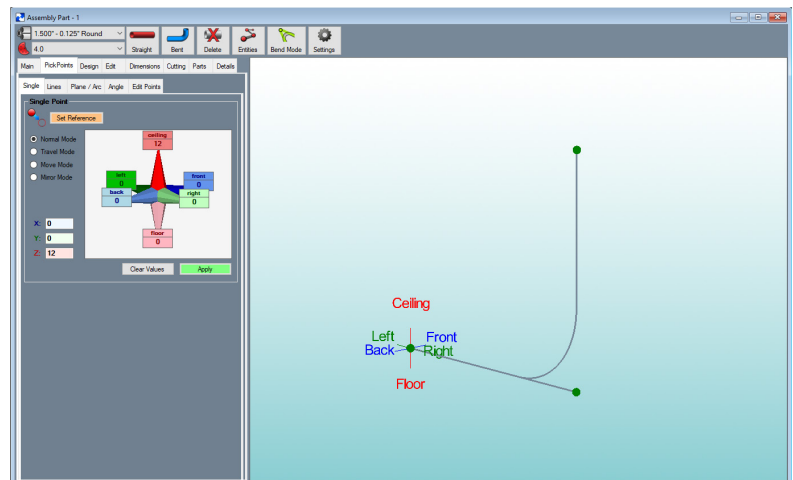
To Delete a pick point, click the Delete icon at the top of the interface, then click on the pick point to delete it.

14.1.19 Connecting Pick Points

When the Operator connects two pick points, it essentially creates a section of tube. Connecting pick points creates a visual representation of the assembly. To connect pick points, click the Straight icon at the top of the interface. Click the first pick point, then click the second pick point. This will connect the pick points.

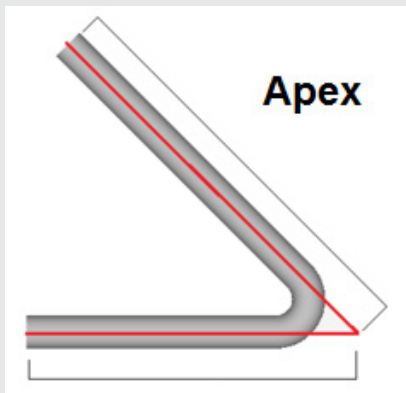
14.1.20 Connecting Pick Points to Form a Bend

Creating pick points to form a bend requires placing three pick points. The bent part will require a pick point at each end of the material as well as a pick point at the apex of the bend.

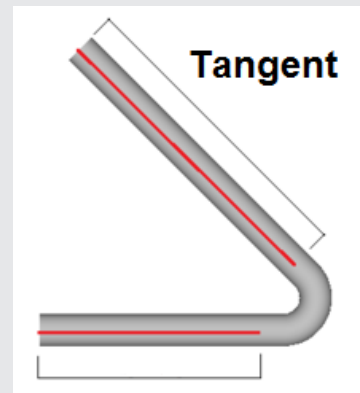


14.1.21 Apex vs Tangent

Apex measures the outside intersection of the bend's two sides. Apex is essentially the measurement of where the material would intersect if there were not a bend.



Tangent measures the material minus the bend, or the straight runs of the material. Use Tangent when the straight lengths of the part are known.

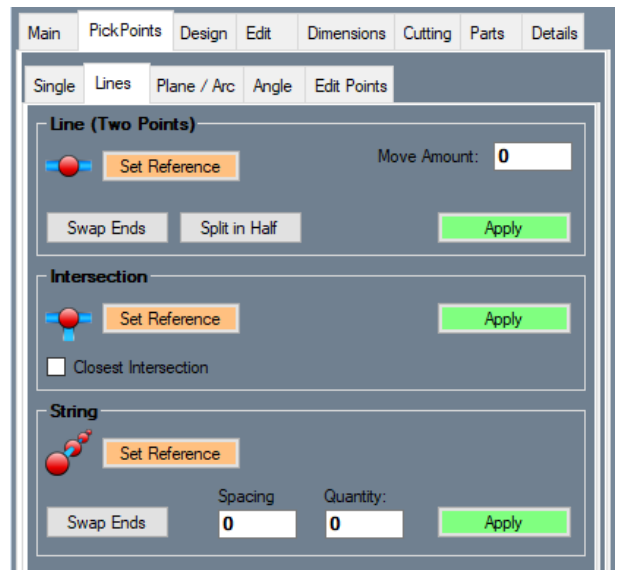


14.1.22 Lines

In the Pick Points tab, in the Lines subtab, the Operator can create pick points by plotting them along the lines of a design that has already been created.

14.1.23 Setting Reference Points in Line

In the Line (Two Points) box, click Set Reference. A message will appear next to the mouse cursor that reads “Select reference point or line.” If the Operator selects the line, the software will default the reference point to the zero position of that line. If the Operator chooses a pick point when performing Set Reference, the software will use that pick point as the reference, and the Operator will create a line when a second pick point is clicked.



In the Move Amount text box, the Operator can enter a specified distance where a pick point should be placed according to the reference point.

If the Operator places a pick point at one end of the material, the Swap Ends feature can be used to place a pick point in the same position on the other half of the material.

With a pick point placed at each end of the material, the Split in Half feature will place a pick point halfway between the two points.

14.1.24 Intersection

If there are intersecting lines in a design, the Operator can create a pick point at the intersection as a way to make all the parts even, or to create a new design element based on the intersection point. In the Lines subtab, in the Intersection box, click Set Preference, then click the intersecting lines. The software will automatically place a pick point where the lines intersect. Click Apply to create the pick point.

14.1.25 String

With the String feature, the Operator can Set Reference, then set Spacing and Quantity for a series of pick points. Click Apply and the software will place the pick points on the line. If the Spacing or Quantity value is changed, the software will automatically update the design. This feature is helpful when creating pickets for handrails.

14.1.26 Using The Tri Star With Line

In the Lines subtab, the software will only place pick points on lines that have already been created. The Operator can use the Single subtab to create new pick points. When the Single subtab is open the Operator can use the Tri Star to create new pick points in space, and then create new lines.

14.1.27 Breaking Up Parts Within a Design

When there is a pick point at a mid-section of a line, the Operator may want to break that line into two separate parts. Or the Operator may want to delete a section of that part. This is especially true when using the Intersection feature. Under the Edit tab, in the Misc subtab, in the Break or Join Tubes box, click Break Point. The cursor will prompt the Operator to “Select the point to break.” Click the pick point where the break should occur. The software will automatically break that part into two separate parts. The new part will show up in the Parts tab.

14.1.28 Deleting Parts

With the part broken up, the Operator can click the Delete icon at the top of the design interface. The cursor will prompt the Operator to “Select the feature to delete.” The Operator can click a line segment or pick point to delete that feature.



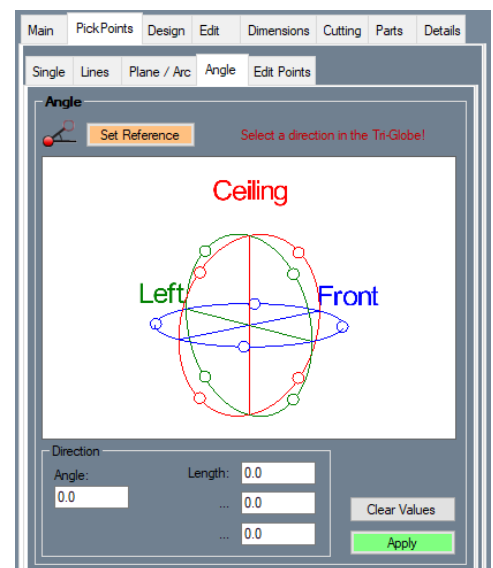
A project can be completed without using the Break Point feature. However, this will result in excessive scrap material, and excessive material in the Nest Part.

14.1.29 Angle Tool

Under the Pick Points tab, in the Angle subtab, the Operator can place pick points using angles and distance inputs. The angle interface will display a circle with four quadrants. Click Set Reference to set a reference pick point. Choose a quadrant on the Angle display. In the Direction box, enter an Angle the new pick point will be placed in reference to the Set Reference pick point. Enter a length for the length of the part. The software will not create a pick point until a length and angle have been entered.

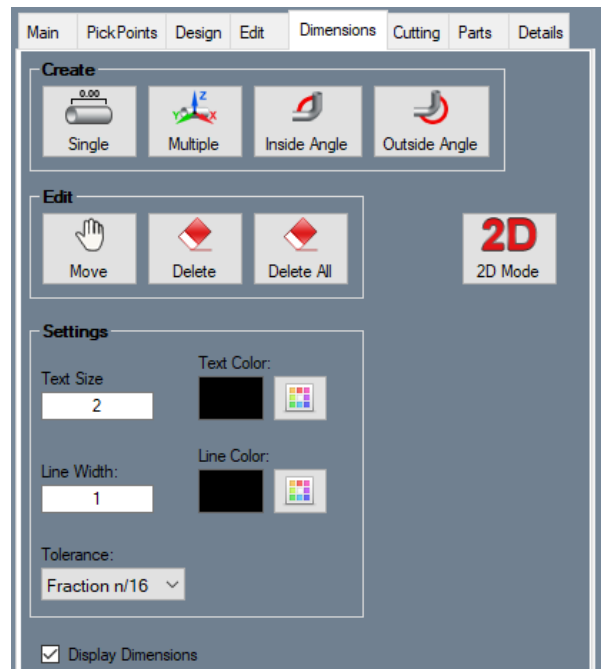
Click a different quadrant to move the pick point to a different direction in relation to the reference point.

In the Projections drop down, change the view if a 3D view is required.



14.1.31 Dimensions

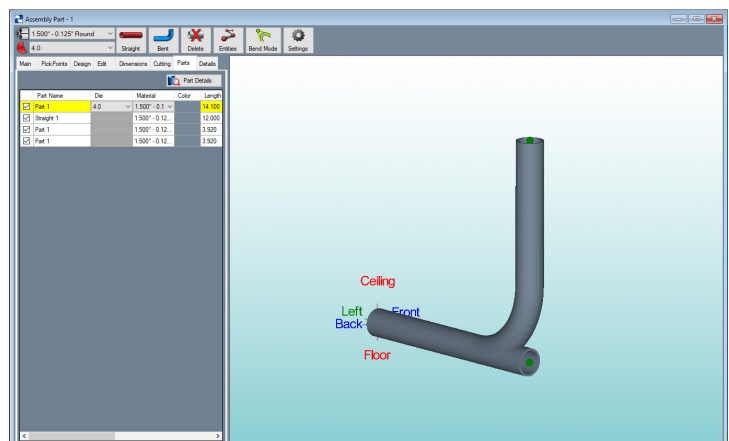
In the Dimensions tab, the Operator can determine a number of different measurements within a project either using pick points or manually clicking to apply a measuring point.



Measurement	Function
Single	Place two points to measure a part or section of a part.
Multiple	Place multiple points to measure multiple parts or lengths within an assembly.
Inside Angle	Place more than two points on a bend to measure the inside angle.
Outside Angle	Place more than two points on a bend to measure the outside angle.
Edit	Function
Move	Move a measurement to different location on an assembly. Helpful for comparing part lengths.
Delete	Delete a specific measurement
Delete All	Delete all measurements within the assembly.

14.1.31 Parts

Under the Parts tab, the Operator can view complete information for a specific part. The Operator can also color code parts within the interface and select which parts are sent to Dragon CAM.



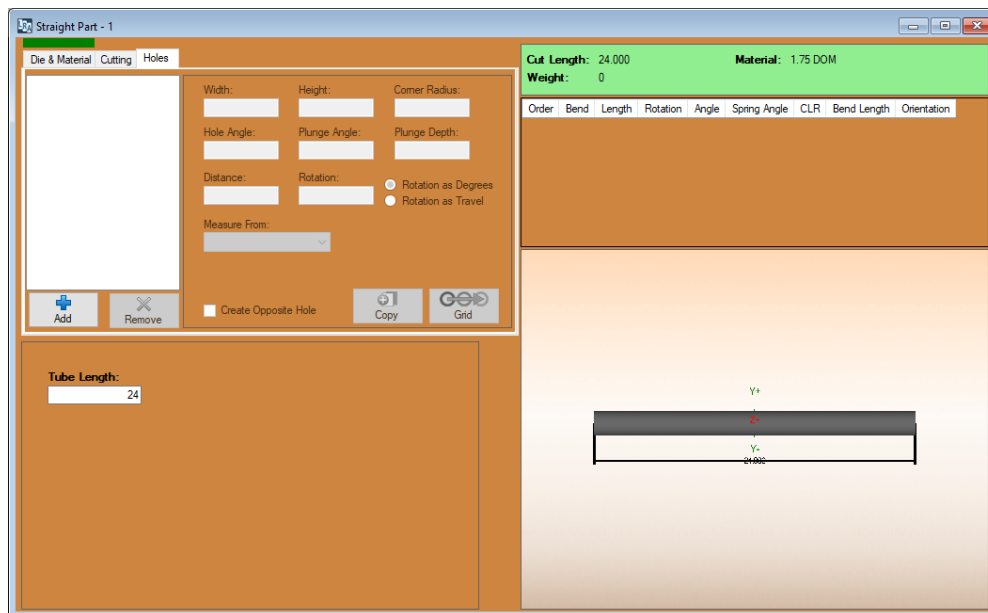
15

Creating a Series of Holes

15.1 Creating a Series Of Holes

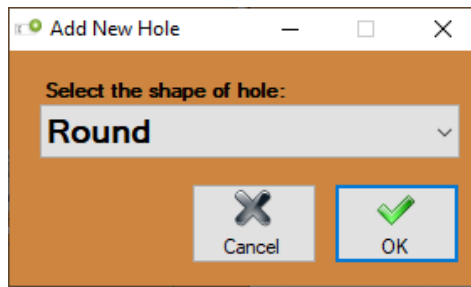
In Dragon CAM the Operator has the option to create a series of holes, or a line of holes, easily using the Grid feature. This is a helpful feature when creating such things as hand rails where the Designer may want to create multiple holes at a fixed size and distance. This is also helpful when the project requires the Designer to countersink certain features of the design.

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



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

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



- In the Measure From dropdown, choose the measuring point where the holes should begin.
- In the Distance text box, enter the distance the holes should begin from the Measure From point chosen in the previous step.
- In the Width text box, enter the desired Width, or diameter of the hole.

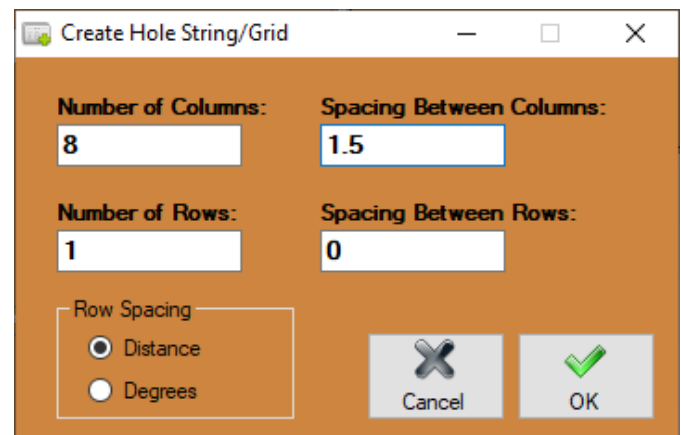
The Operator may want to place holes on a different rotation than a cope or miter cut. If this is the case, enter the Rotation value in the Rotation text box. Rotation can be entered as Degrees or linear Travel.

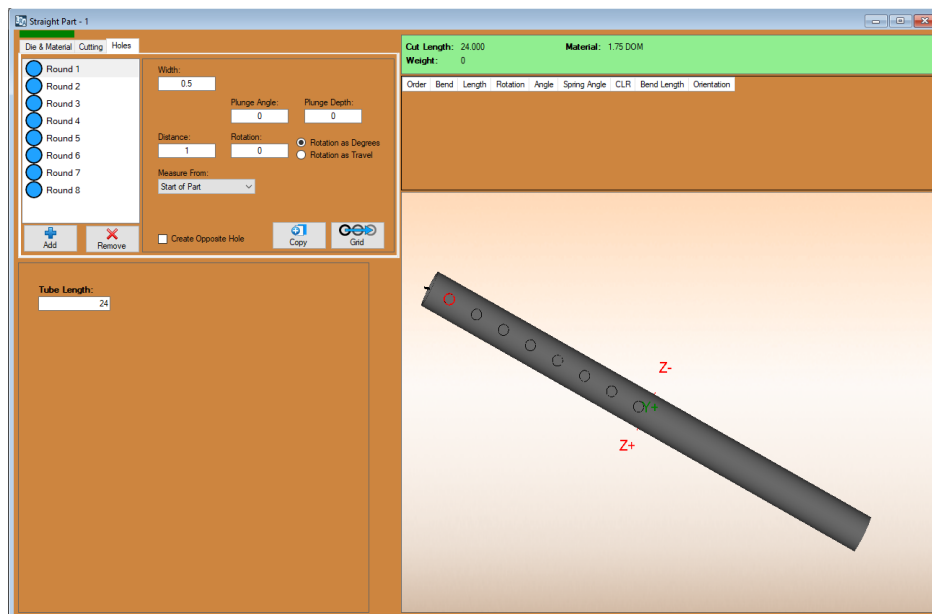
If cutting square or rectangle, enter the corner radius of the material.

If creating plunge holes, enter Plunge Angle and Plunge Depth in the text boxes.

If the Operator knows the project will need pass-through holes, or two sets of holes 180-degrees apart on the material, click Create Opposite Hole.

- Click the Grid icon. A Create Hole String/ Grid popup will appear. Two different sets of data can be entered in the popup. 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 the Operator can 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.





If a mistake is made entering a Grid, the Operator will be required to highlight each hole, click Remove and re-enter the correct values.

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Using the Flip Feature

16.1 Using the Flip Feature

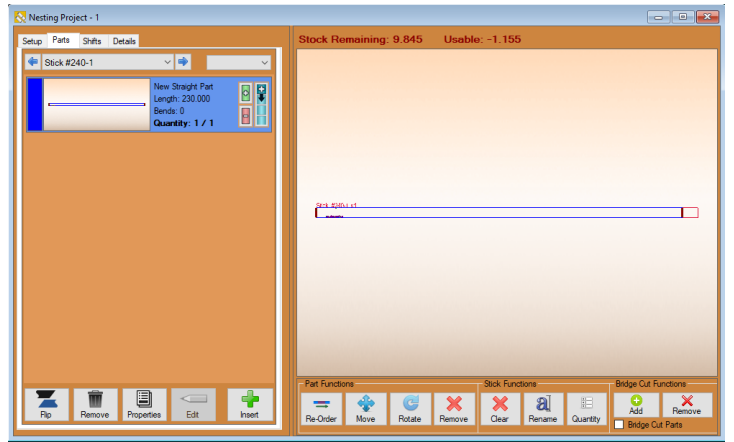
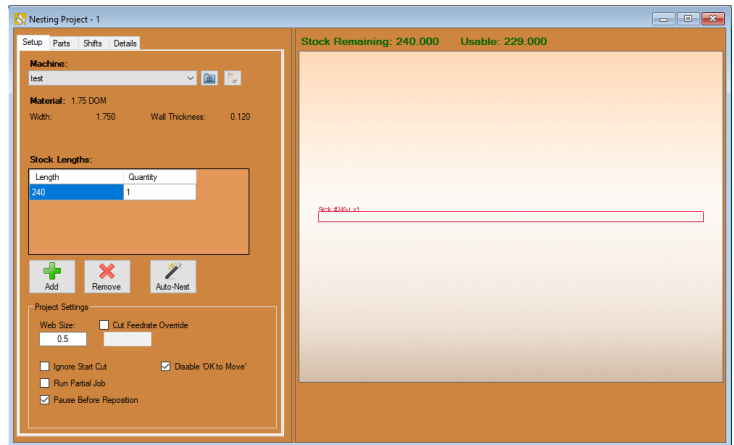
When any sized stick of material is loaded into the Dragon A400 machine, that piece of material will have 13-inches of “drop,” or material the machine will not be able to process since it lies between the toolhead and the Chuck. However, with the Flip Feature, the Operator can use that 13-inches of material by programming the material for repositioning in Nest Project.




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

16.1.1 Apply the Flip Feature

With a part on the Nest Project interface that is longer than will fit on the material without using the drop, click the Setup tab. At the bottom of the Setup interface, check the Pause Before Reposition box. While in the Nest Project interface, under the Parts tab, double click the part to add it to the material.

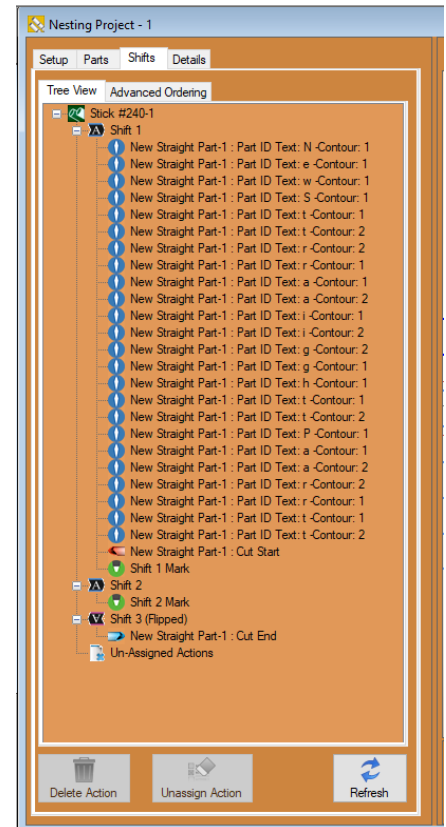




The software will recognize the part is too long to fit on the material and will not allow the Operator to add the part to the stick using the green or blue “+” icon.

The software will place the part on the material in the Nest interface. The software will automatically apply a “Shift 1” mark to the part. The Operator can program the machine to either Mark or Engrave the Shift 1 Mark.

When the machine works into the position on the job where the Shift Mark is located, it will pause while the Operator repositions the material. This will require the Operator remove the material, flip it, Chuck it back into the machine and line the Shift mark up with the laser. Once this is complete, the job can be restarted.



16.1.2 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.

16.1.3 Chuck Settings

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

16.1.4 Start Cut

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.

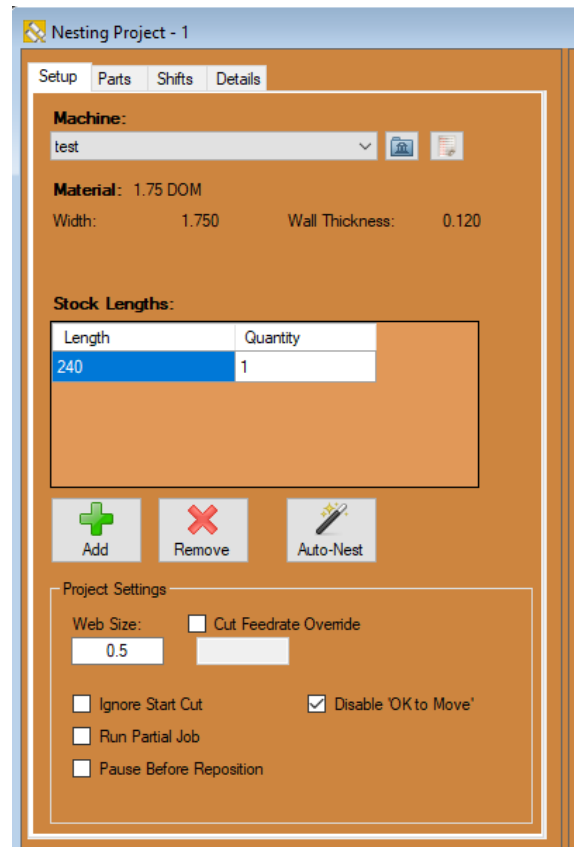
If the material will be cut into two separate parts, ensure the smaller part is cut first, leaving a longer part in the machine.

Dry Running a Project

17.1 Dry Running a Project

Dry running a job on the Dragon A400 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 materials and scrap.

1. With the project open as a Nesting Project, under the Setup tab, locate the Project Settings box.
2. 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.
3. Ensure the Hypertherm unit is turned off.
4. At the top of the interface, click the Run Project icon. The Machine Control interface will open.
5. If the machine is not Homed, click Home All Axis.
6. Once the machine is Homed, click Start.
7. The Machine will perform all operations in the Nest Project.



When the program is complete, if there are more stock lengths 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.

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