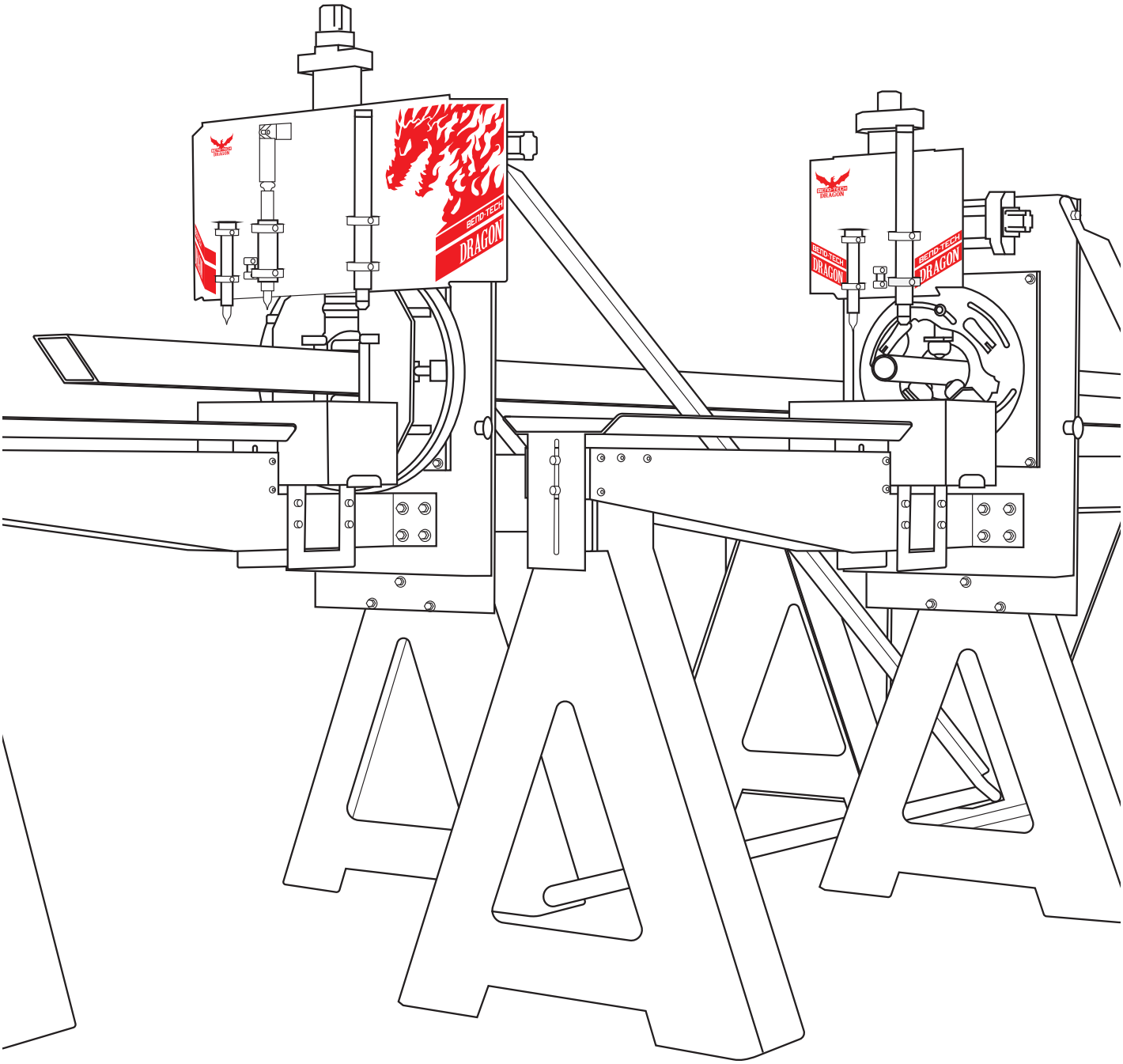
Part 1 of 1

Dragon CAM v1.0

BEND-TECH

DRAGON MACHINES

Dragon Troubleshooting Guide



Revision 002 | English

Dragon Machines

Dragon Troubleshooting Guide

Revision 002

English
Original Instructions

October 2021

Bend-Tech LLC
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Osceola, WI 54020 USA

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

Contents

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

Repair or Replacement Only

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

Limits

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

Software

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

Customer Satisfaction Commitment

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

Contact Us

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

Phone: 651-257-8715

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

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

Customer Service

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

Website, Socials, and Online Resources

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

Alerts

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

Definitions & Examples

Danger

! Danger !

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

Warning

! Warning !

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

Caution

! Caution !

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

Important Alerts

Important

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

Notes and Tips

Note or Tip

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

Glossary

Axis
A fixed reference line.

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

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

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

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

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

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

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

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

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

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

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

Mach3
The driving software behind Machine Control. Required for the machine to operate.

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

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

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

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

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

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

Task Menu

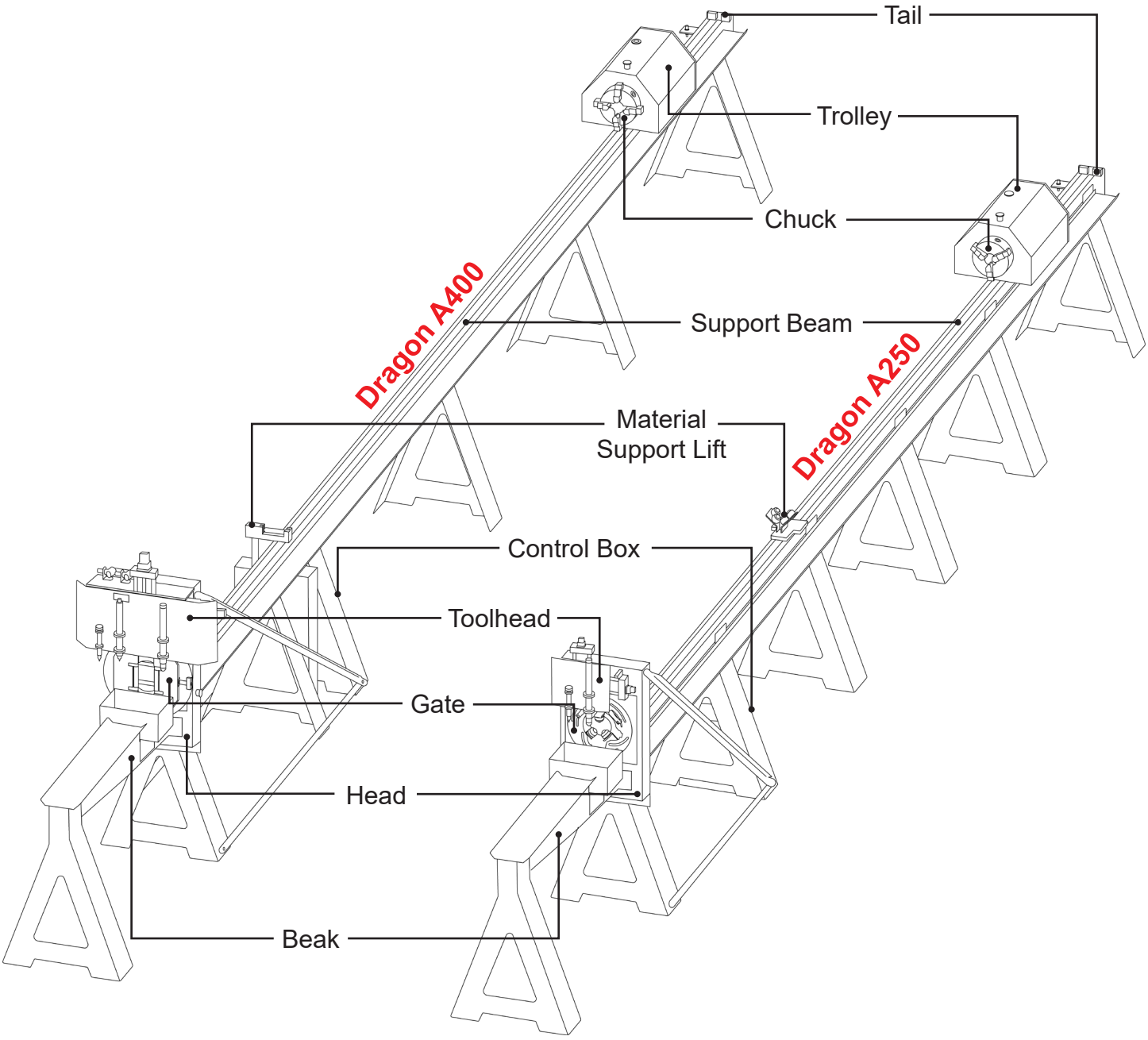
The first menu that opens upon starting the Dragon Software or the Bend-Tech software. From this menu various tasks can be started, such as part designing, importing, library access, etc.

Toolhead

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

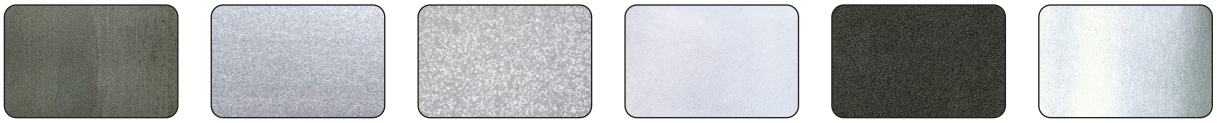
Trolley

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



Machine Capabilities

Material Types

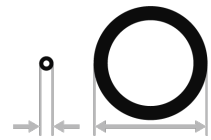


Steel | Stainless Steel | Galvanized Steel | Aluminum | Black Pipe | Chrome Alloy

Dragon A250

Material Size

Round



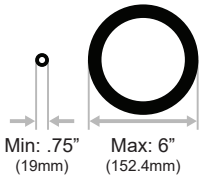
Material Thickness

Max Material Weight

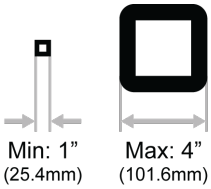
Dragon A400

Material Size

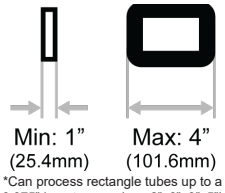
Round



Square

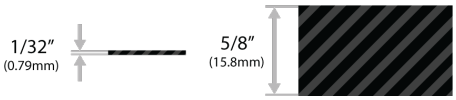


Rectangle



*Can process rectangle tubes up to a 6.375” hypotenuse. (e.g. 2”x6”, 3”x5”)

Material Thickness

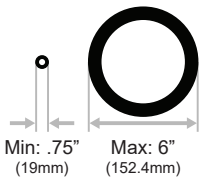


Max Material Weight

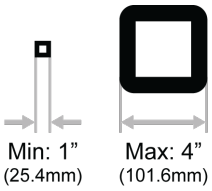
Dragon A400 with Powered Gate

Material Size

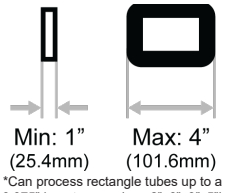
Round



Square

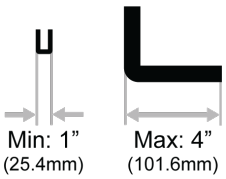


Rectangle

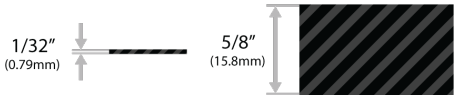


*Can process rectangle tubes up to a 6.375” hypotenuse. (e.g. 2”x6”, 3”x5”)

Angle/Channel



Material Thickness



Max Material Weight

01 Troubleshooting

1.1 How to Send a Support Session

Properly setting up a Support Session with a Bend-Tech Service Technician can be key to keeping the Dragon up and running.

1. Open the Part Design or Nesting Project

If there is a problem with a specific part design or nesting project, open the project before sending a Support Session, then keep the project open after submitting.

2. Open the Support Session

On the Bend-Tech Dragon Home interface, click the Help tab, then click Support Request.

3. Fill in the requested information

Fill in your Name, E-mail, Phone Number, and if you know a Service Technician or have had help with this issue before fill in that Service Technician's name.

4. Provide Details about the Problem

Give a detailed description of the issue in the Description of Problem text box. The more information given the better our Service Technicians can help.

5. Attach the Files

If there is a file associated with the issue, click the folder icon on the right-hand side and upload the design file.

6. Submit the Session

Click Submit.

02 Gate Troubleshooting

2.1 Dragon Gate Troubleshooting

2.1.1 Eccentric bearing on the Gate is sticking

Bearings are Dirty

Clean the bearings with compressed air, brake cleaner, or glass cleaner.

2.1.2 Gate is Binding

Bearings or Bearing Rotation Plate/Gate Ring Gear are Dirty

Clean the Gate using glass cleaner, brake cleaner, or compressed air.

Eccentric Bearing needs Adjustment

Remove the Gate and adjust the eccentric bearing on the Bearing Rotation Plate/Gate Ring Gear. See Section 2.2 for the full procedure.

C-Axis Backlash needs Adjustment

Check the C-Axis for backlash. If play is observed, see Section 2.3.

2.1.3 Gate is Loose

Eccentric Bearing needs Adjustment

Remove the Gate and adjust the eccentric bearing on the Bearing Rotation Plate/Gate Ring Gear. See Section 2.2 for the full procedure.

2.1.4 Gate is not Operating Smoothly

Gate is Dirty

Clean the Gate with compressed air, glass cleaner, or brake cleaner. If the Gate is extremely dirty use a rag or toothbrush to help clean it.

Eccentric Bearing needs Adjustment

Remove the Gate and adjust eccentric bearing on the Bearing Rotation Plate/Gate Ring Gear. See Section 2.2 for the full procedure.

2.1.5 Play in the Gate

Eccentric Bearing needs Adjustment

Remove the Gate and adjust eccentric bearing on the Bearing Rotation Plate/Gate Ring Gear. See Section 2.2 for the full procedure.

2.1.6 Gate Jaws are not Operating Smoothly

Lead Screws are Dirty

Clean Gate Lead Screws, with brake cleaner, glass cleaner, or compressed air. Re-lubricate.

Gate Jaw Rack & Pinion are Dirty

Clean Gate Jaw Rack with brake cleaner, glass cleaner, or compressed air.

Important

On older machines it is possible for the Gate Lead Screw retaining clips to fall off. Customers with older machines who are having this issue should contact Bend-Tech regarding updating the Gate Lead Screws.

2.2 Adjusting the Gate Eccentric Bearing

Tools Needed

- 3⁄16 in. Allen wrench
- 7⁄16 in. wrench
- 3⁄32 in. Allen wrench
- 9⁄16 in. Socket & Ratchet with Extension
- 17mm Socket & Ratchet
- 3⁄4 in. Thin wrench (provided)

2.2.1 Before Beginning

Power on the Dragon machine, and move the Toolhead up for easy access to the Gate.

Though the procedure for adjusting the Gate Eccentric Bearing is the same for both the Powered Gate and Non-Powered Gate, there are a few additional steps when uninstalling and installing the Powered Gate. For Non-Powered Gates, skip to 2.2.4.

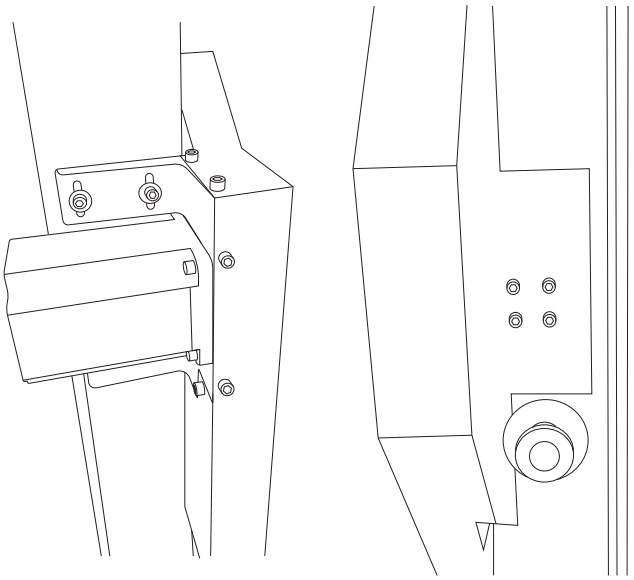
Note

The Parts Catcher, Beak Assembly, and/or Coolant Trays may need to be removed before uninstalling the Gate from the Dragon

2.2.2 Remove Safety Guards (Powered Gate Only)

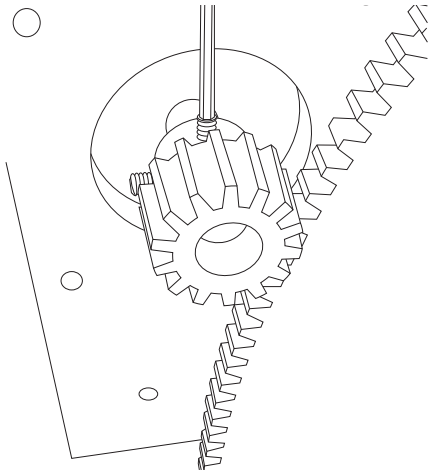
The safety guards are only installed on machines with Powered Gates. Locate the Gate Ring Gear Safety Guards on the right and left sides of the Powered Gate.

To remove the left safety guard, place a 7⁄16 in. wrench on the nut and remove the screws securing the covers using a 3⁄16 in. Allen wrench.



2.2.3 Remove the Drive Gear (Powered Gate Only)

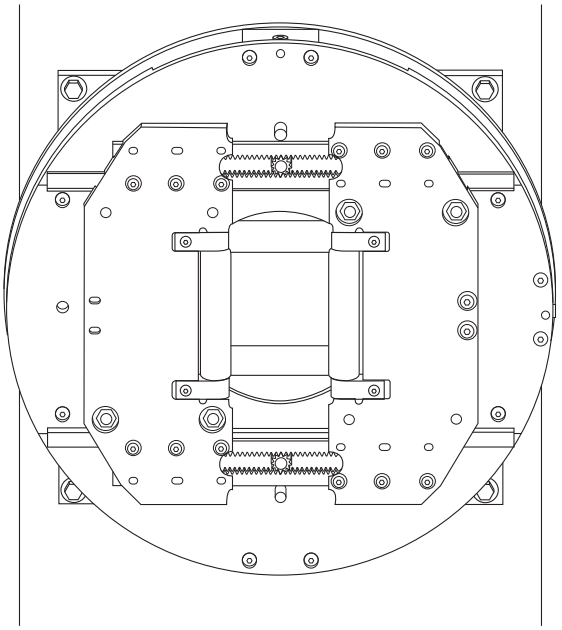
Turn the position of the C-Axis Drive Gear so that the set screws are visible. Remove each set screw with a 3⁄32 in. Allen wrench and pull the gear off.



2.2.4 Remove the Gate

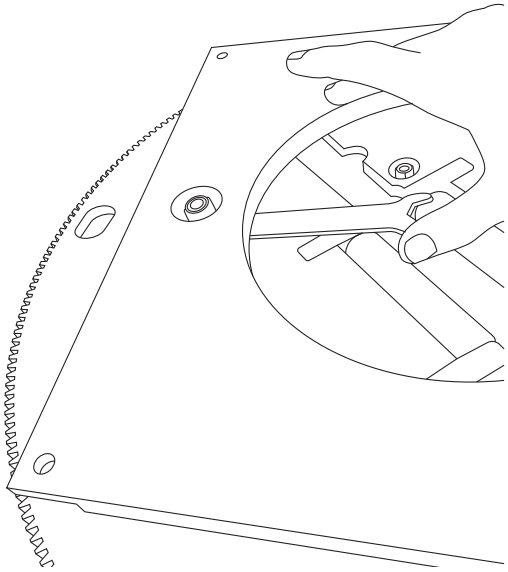
Four bolts secure the Gate Assembly to the Dragon. On a Powered Gate machine. There are four access holes in the Gate Ring Gear which allows access to the Gate Mount Bolts. Turn the Gate Ring Gear to access the Gate Mount Bolts.

Locate the four Gate Mount Bolts and loosen them using a 9⁄16 in. socket, ratchet and extension. While enlisting a helper, remove the Gate from the front of the machine. Place it on the work surface face down.



2.2.5 Adjust the Eccentric Bearing

There are two concentric bearings, which are not adjustable and one eccentric bearing that is. When the eccentric gear is properly adjusted, there should be no play between the gate mount plate and the gate ring. Use a ratchet and 17mm socket to loosen the eccentric bearing enough that it can be rotated for adjustment.



Place the supplied ¾ in. thin wrench on the eccentric bearing adjustment hex located between the Gate Mount Plate and the Gate Bearing Rotation Plate or Gate Ring Gear. Turn the adjustment hex until the Gate Ring Gear bearing surface is fully seated in the eccentric bearing v-groove.

When properly adjusted, the Gate Ring Gear should spin freely with no side play. Tighten the v-groove eccentric bearing nut securely, ensuring the bearing stays in adjustment.

2.2.6 Re-install the Gate

Re-install the Gate. Use assistance in placing the gate. Ensure the eccentric bearing is to the bottom of the Gate. Tighten the four bolts with a 9⁄16 in. socket and ratchet.

Important

Re-install the Parts Catcher, Beak, and/or Coolant Trays if they were removed to access the Gate.

2.2.8 Position Drive Gear (Powered Gate Only)

Push the C-Axis Drive Gear onto the C-Axis motor shaft. Ensure it fully meshes at the center of the Gate Ring Gear. The drive gear must be centered on the Gate Ring Gear.

Install each set screw and tighten securely with a 3⁄32 in. Allen Wrench.

2.2.9 Re-attach the Safety Guards (Powered Gate Only)

Re-install the Safety Guards.

2.3 Adjusting the C-Axis Backlash

Adjusting the C-Axis Backlash is only necessary on Dragon A400 machines equipped with a Powered Gate.

1. Remove the Safety Guard

Use a 3⁄16 in. Allen wrench to remove the screws securing the right safety guard to the C-Axis Motor Mount. Set the screws and guard aside.

2. Loosen the C-Axis Motor Mount

Use a 3⁄16 in. Allen wrench to loosen the screws that secure the C-Axis Motor Mount in place.

3. Mesh the Drive Gear to the Gate Ring Gear

Adjust the C-Axis Motor Mount up or down to mesh the Drive Gear with the Gate Ring Gear. Set the mesh to the tightest position between the gears.

4. Re-tighten the C-Axis Motor Mount Bolts

Re-tighten the C-Axis Motor Mount bolts with a 3⁄16 in. Allen wrench. Ensure the Gate rotates smoothly and without binding.

5. Re-center the Drive Gear

Check to ensure the C-Axis Drive Gear is centered against the Gate Ring Gear. If the drive gear's position needs to be adjusted use a 3⁄32 in. Allen wrench to loosen the set screws. Then reposition the drive gear so that it is centered, and re-tighten the set screws.

6. Re-install the Safety Guard

Re-install the right Safety Guard, tightening the screws with a 3⁄16 in Allen wrench.

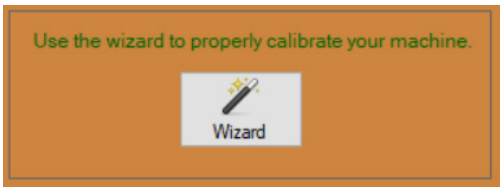
2.4 Calibrating Coordinated Rotation

Before a Dragon A400 machine that has been retrofitted with a Powered Gate can process angle or channel material, the Chuck and Powered Gate must be calibrated. This is to ensure the coordinated rotation feature is working properly.

Note or Tip

The Dragon machines are calibrated at the Bend-Tech manufacturing facility. Calibration of the machine is not necessary unless a component has been replaced under maintenance, or a Dragon A400 has been retrofitted with a Powered Gate.

3.4.1 Open the Wizard



From the Bend-Tech Task Menu, open Machine Library, and choose the machine from the Machine List. Click the Wizard icon in the top right of the Main interface. This will open the Dragon Calibration Wizard.

3.4.2 Dragon Calibration Wizard

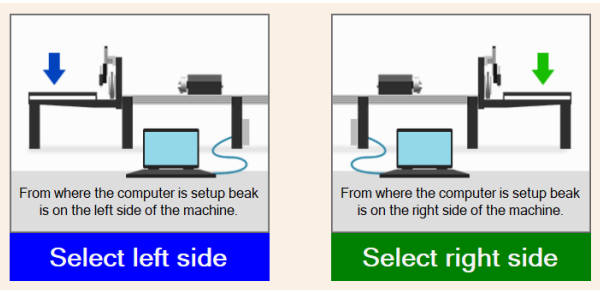
The Dragon Calibration Wizard will display options to calibrate individual aspects of the machine.

Click on ADJUST CHUCK ZERO. This will begin the calibration process for the Chuck and the Powered Gate.

2.4.3 Begin Calibration

Starting ADJUST CHUCK ZERO will prompt the user to ensure the Dragon A400 is powered on. It will then prompt the user to start Mach3, click START MACH.

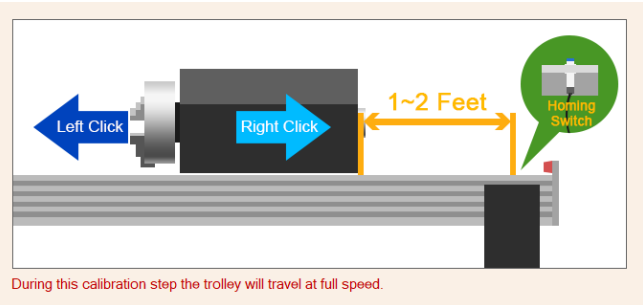
2.4.4 Computer Setup



Determine a left side and a right side of the machine based on where the computer is placed. Choose which side the computer is placed.

Click NEXT.

2.4.5 Ready the Trolley



Ready the Trolley by using the mouse to jog the Trolley within 1-2 feet of the end of the Rail.

Once this is complete click NEXT.

! Caution !

Avoid moving the Trolley past the Homing Switch on the Rail. Damage to the Trolley, Homing Switch, or Rail could occur.

Tip

It is not necessary to jog the Trolley within 1-2 feet of the end of the Support Beam. However, jogging the Trolley to the end of the Support Beam speeds up the process.

2.4.6 Begin Homing Process

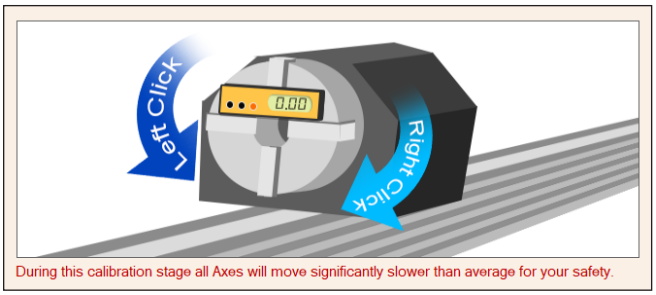
Click the image on the screen to begin the homing process. A message will appear informing the user that the machine is homing. Once the message disappears, click NEXT.

2.4.7 Toolhead Level

This step is no longer necessary because the machine is leveled during the installation process at the Bend-Tech.

Click NEXT to skip this step.

2.4.8 Chuck



Calibrating the Chuck requires placing a small level or angle finder on the Chuck Teeth. Once the level or angle finder is placed, jog the Chuck into a level configuration using the left and right mouse buttons. With the Chuck head calibrated to level it is now synchronized with the tool head. This is critical when performing cutting procedures.

Once this is done, click NEXT.

Important

When leveling the Chuck ensure the key is in the 2 o'clock position.

2.4.9 Powered Gate

Calibrating the Powered Gate requires the user to place a level on the Gate. As indicated on the screen, the best place to do this is by placing the level on the Gate as shown in the image on the screen. Use the right and left mouse buttons to jog the Powered Gate into a level position.

Click NEXT. Click DONE. Close out of the calibration feature. The machine is now ready to process angle or channel material.

Laser Light & Engraver Troubleshooting

3.1 Laser Light Troubleshooting

Important

The Laser Light is a consumable. If the Laser Light quits working it may have reached the end of its service life. Contact Bend-Tech to order a new Laser Light.

3.1.1 Laser Light does not Align with the End of the Material

Material length Set Wrong

Check the material length, verify length is correct in software project settings.

Chuck Grip Setting are Wrong

Verify the Chuck grip setting is correct in Dragon CAM > Tube Library > Machine > Chuck Grip. Click the question mark to see examples of Chuck Grip settings.

Machine Not Homed or Calibrated Correctly

From the Bend-Tech Dragon home interface click Machine Control, then click HOME ALL AXIS to home the Dragon. If it is determined the machine needs to be calibrated, a full calibration can be performed by clicking into Machine Library, and in the Main interface click the WIZARD icon.

3.1.2 Laser Light Failure

Laser Light Burned Out

Replace the Laser Light. Contact Bend-Tech for options available.

Laser Light Cable or Plug Issues

Inspect cables, inspect plugs, replace if damaged. Contact Bend-Tech for options available.

3.2 Engraver Troubleshooting

The Engraver is mounted in the center of the Toolhead on the Dragon A400. When the Engraver is engaged, an air cylinder is pressurized and the tool is pushed down to meet the material. The pressurized cylinder allows the engraver to ride over contours in the material without damaging the tool.

3.2.1 Engraver is Marking too Heavy or too Light

Engraving Height Set Incorrectly

In Tube Library > Machine interface > Tool Heights change the Engraving Height value in the text box. Bend-Tech recommends changing the value by small increments. If this does not fix the issue, perform the Engraver calibration process.

Air Pressure is Incorrect

Set the air pressure for the Engraver Actuator Cylinder to 7-8 psi

3.2.2 Engraver is not Turning On

No Air Supply

Check the air lines to the Engraver and the main air supply to machine. Ensure valve on the Engraver is open. Ensure the bleed valve is open.

3.3 Setting Engraver Air Pressure

The Engraver is driven by pressurized air. It uses two separate regulators located just behind the Toolhead. The right side regulator controls the Engraver and is pre-set at the Bend-Tech manufacturing facility to 70-80 PSI. The left side regulator controls the Engraver air cylinder and is pre-set at the Bend-Tech manufacturing facility to 7-8 PSI.

3.3.1 Engraver Bleeder Valve

The Engraver Actuator Cylinder and air regulator also use an air bleeder screw. The bleeder screw is located on an air line extension just off the Engraver Air Regulator. Ensure the bleeder valve is open.

Engraver Air Pressure Settings	
Engraver	70-80 PSI
Engraver Actuator Cylinder	7-8 PSI

04 Torch & Cutting Troubleshooting

4.1 Cutting and Torch Troubleshooting

4.1.1 Copes are Not the Same Rotation

Material is not Properly Secured in the Chuck

Ensure material is tight in the Chuck. If using spacers for the material, ensure the measurements are correct.

Settings in the Nesting Projects are not Correct

Check the part in Edit Flat.

Y-Axis Backlash Needs Adjusting

Remove the Trolley Cover and observe backlash on Y-Axis Motor. If incorrect adjust on machine. See Section 6.8 for full procedure. Perform a Backlash Test in Machine Library > Mechanical Settings.

Y-Axis Motor or Y-Axis Drive Gear Loose

Remove the Trolley Cover and perform visual and physical check of Y-Axis Motor and Y-Axis Motor Drive Gear.

Y-Axis Motor Skipping Steps

Check Ethernet connectivity. Check to ensure Breakout Board is seated in Motor Drivers properly. Ensure consistent power to machine.

4.1.2 Poor Cut Quality or Accuracy

Torch Consumables are Worn Out

Inspect Torch consumables, measure the pit depth of electrode.

Incorrect Torch Height Settings

Check settings in the software and torch height on machine.

Incorrect Cutting Speed

Ensure cutting speed is correct in regard to amperage and material thickness.

Incorrect Cutting Amperage

Ensure consumables match the amperage settings on the machine. Set cut speed appropriately.

Improper Machine Alignment

Check Support Beam alignment. True Support Beam if out of spec. See Section 4.3 for a full procedure.

4.1.3 Round Holes are Cutting as Ovals

Incorrect Cutting Speed

Adjust material feed rate.

Material is Loose in the Chuck

Ensure material is secure in Chuck.

Gate is too Tight or too Loose

Ensure material moves freely in the Gate with no play.

Too much Backlash

Perform a Backlash Test in Machine Library > Mechanical Settings. Remove the Trolley Cover and perform a visual inspection of backlash. Ensure all motors are tight.

4.1.4 Machine Cuts and then Returns to Previous Action

Order of Actions is Incorrect

Change order of actions: Machine Library > Basic > Default Process Order.

4.1.5 Off Center Holes on Rectangular or Square Material

Gate Out of Position

Check homing sensors, check X-Axis backlash, re-home, load material with Gate in home position and perform side offsets calibration.

X-Axis Backlash Needs Correcting

In the Machine Control interface click Home All Axis.

Machine is Not Properly Homed

In the Machine Control interface click Home All Axis.

4.1.5 Jagged Cuts

Material Feed Rate too High

Ensure consumables match the amperage settings on the machine. Set cut speed appropriately.

Loose Set Screws on the X-Axis or Y-Axis

Remove Trolley Cover and perform inspection of X-Axis and Y-Axis Drive Gears and Motors.

Gate is too Tight

Ensure material moves freely in the Gate with no play.

4.1.6 Torch Not Firing

Plasma Unit is Not Powered On

Check the plasma unit's power switch; check power cable; check cable to Control Box.

4.1.7 Torch is set too High

Check Torch height with feeler gauge; perform Torch Mount procedure.

Inadequate Air Supply

Check air supply, check air pressure.

Consumables Need Replacing

Remove and inspect Torch consumables. Refer to the plasma unit's consumables guide.

4.1.8 Torch is Colliding with the Material

Material Selected in the Software does not match the Material Loaded into the Machine

Check to ensure material chosen in software matches material loaded in the machine.

Torch Improperly Set

Perform Torch Mount procedure.

4.2 Grounding the Torch

It is critical the Plasma Torch is grounded properly. Improper grounding can lead to numerous cutting issues. Early Dragon A400 Machines used a pair of brushes contacting the Chuck Spindle to ground the Torch. To achieve a more consistent grounding convert to a grounding tab mounted on the pillow block bearing.

Tools Needed

- ⅛ in. Allen Wrench
- Ratchet
- 12 in. extension
- 5⁄16 in. socket
- ¾ in. socket
- ½ in. wrench
- Grinder

1. Remove the Trolley Cover

Using a ⅛ in. Allen wrench, remove the Allen head screws securing the Trolley Cover to the Trolley Base. Unscrew the red E-stop button. Reach inside the Trolley Cover and hold the E-Stop button while unscrewing the chrome retaining collar. Remove the chrome retaining collar and yellow E-stop label. Remove the E-Stop button and lay it out of the way on the Trolley. Remove the Trolley Cover.

2. Remove the Pillow Block Mount Bolt

Use a ¾ in. socket to remove the rear pillow block mount bolt nearest the Y-Axis Motor.

3. Grind the spot Clean of Paint

Use a grinder to clean any paint off the flat washer surface of the pillow block bearing.

4. Fabricate a Grounding Tab

Use ⅛ in. or 3⁄16 in. steel to fabricate a grounding tab. The Customer can also request a grounding tab from Bend-Tech.

5. Remove the Grounding Cable from the Carbon Brush Mount

Use a 5⁄16 in. socket and extension to remove the grounding cable from the carbon brush mount. Place a ½ in. wrench on the nut to assist in the removal.

6. Attach the Grounding Tab to the Prepared Space on the Pillow Block

Place a small amount of grease on the ground surface of the pillow block bearing. Place the grounding tab on the ½ in. pillow block mount bolt, then place the washer. Insert the ½ in. bolt and thread it into the mounting hole. Ensure the grounding tab is positioned so it will not interfere with the Trolley Cover.

7. Secure the Grounding Cable to the Grounding Tab

Use the bolt and nut that secured the grounding cable to the carbon brush mounting system to mount the grounding cable to the grounding tab.

8. Remove the Old Brush Grounding Components

Remove the old brush grounding components from the Trolley assembly.

4.3 Support Beam and Rail Alignment

4.3.1 Checking the Straightness and Level of the Support Beam

Ensuring the Support Beam is straight and level is critical to accurate operation of the Dragon. During long term operation the machine can come out of alignment, or it can be accidentally bumped out of alignment by shop personnel. This is especially true if the machine has not been mounted to the floor of the shop.

Tools Needed

- 9⁄16 in. wrench
- Torpedo level
- String or laser

1. Position the Trolley

Jog the Trolley to the front of the machine.

2. Check Machine Straightness

Use a taut string or a laser to determine if the Support Beam is straight. The operator can also stand at the Tail or the machine and sight down the Support Beam. Any fluctuations in the Support Beam are often visible when it is viewed in this manner. However, for best results, always use a string or laser.

Note

Newer machines come with a string specific to the machine that is used for checking machine straightness. Older machines do not.

3. Check Machine Level

To determine if the Support Beam is level lengthwise, place a Torpedo level on each joint of the Support Beam. Place a Torpedo Level across the Rails to determine of the Support Beam is level side-to-side.

4.3.2 Truing the Dragon Support Beam

If the Support Beam is not true, use the swivel levelers to align the machine.

1. Loosen the Floor Brackets

If the Floor Brackets are in place, use a 9⁄16 in. wrench to loosen the floor brackets on the machine legs. Loosen the concrete anchor bolts holding the machine to the floor.

2. Adjust the Swivel Levelers

To adjust the Swivel Levelers, ensure the jam nut is loose and backed off to the base of the Swivel Leveler. Place a 9⁄16 in. wrench on the hex adjustment at the base of the Swivel Leveler. When viewing from above, turn clockwise to raise the leg, turn counterclockwise to lower the leg.

3. Check if the Machine is Level

Use a bubble level to level the machine. Also, ensure the machine remains straight by sighting along the length of the Support Beam or using the string provided with the machine.

4. Tighten the Swivel Levelers and Floor Brackets

Once the Rail Beam is true, tighten the Swivel Levelers. Tighten the Floor Brackets.

5. Ensure the Machine is Straight and Level

After the Swivel Levers and Floor Brackets have been tightened, re-check the Support Beam to ensure it has remained true.

Tip

Bend-Tech recommends mounting the Dragon to the floor of the shop whenever possible. Mounting the machine to the floor will help ensure the machine remains true.

4.3.3 Rail Splices

Improperly spaced Rail Splices can affect Trolley movement and possibly affect cut quality. Ensure that each Rail Splice intersects with the next as seamlessly as possible. Ensure that all of the Rail splices are fastened properly to the Rail.

05 Material Support Lift Troubleshooting

5.1 Material Support Lift Troubleshooting

The Material Support Lift on the Dragon A400 is a pneumatic actuator driven system. Ensure that the air pressure is sufficient for activating the Material Support Lift.

5.1.1 Material Support Lift is Colliding with the Rail

Material Support Lift has fallen out of Adjustment

Calibrate the Material Support Lift.

Material Support Lift is not Calibrated Correctly

Calibrate the Material Support Lift.

5.1.2 Material Support Lift is Not Homing

Material Support Lift has fallen out of Adjustment

Calibrate the Material Support Lift.

5.1.3 Material Support Lift is Pausing at the Wrong Time

Material Support Lift is not Calibrated Correctly

Calibrate the Material Support Lift.

5.1.4 Material Support Lift is too High

Material Support Lift Can is out of Adjustment

Contact Bend-Tech Support.

5.1.5 Material Support Lift is Bottoming Out

Material Support Lift Can is out of Adjustment

Contact Bend-Tech Support.

5.2 Material Support Lift Settings In Bend-Tech 7x

The Material Support Lift should be calibrated before machine use. Before beginning, ensure Material Lifter is checked in the Material Support box on the Machine Library Main interface. The Material Support Lift settings Lifter Trigger (X), Lifter Trigger (B) and Lifter Offset (B) are determined during the machine calibration process. Once the Material Support Lift is calibrated, these settings should not need to be adjusted.

5.2.1 Change the Support Lifter Gap

In the Tube Library, in the Machine interface, change the material support lift height by entering the desired value in the Support Lifter Gap text box. The Support Lifter Gap is typically set to zero. However, in the case of some larger materials, such as large square or rectangle material, the lifter may need to be set to compensate for material size. If the Material Support Lift is binding and/or skipping steps when processing large material, it may be necessary to change the Support Lifter Gap. Contact a Bend-Tech Service Tech before changing these settings.

5.2.2 Adjusting Lifter Trigger Pause

The Lifter Trigger Pause should be enabled whenever the Material Support Lifter is in use. The Lifter Trigger Pause should be set to a parameter longer than the retraction time or the Material Support Lifter may hit the Rail.

5.2.3 Material Support Lift Support Retraction Settings

Function	Setting
Material Support Lift Retraction	2 seconds
Lifter Trigger Pause	2 seconds (can be more if needed to prevent Material Support Lift from hitting the rail.)

5.2.5 Disabling the Material Support Lift

To disable the Material Support Lift when processing thicker material, or when there are no concerns about material sagging. Go to the Tube Library, click the Machine tab, and select “Disable Support Gate” in the bottom left of the interface.

5.3 Material Support Lift Retraction Adjustment

Material Support Lift Retraction is pre-set at the Bend-Tech manufacturing facility. The retraction value is typically set to roughly two seconds. If it is determined the retraction time needs to be adjusted the operator will be required to open the Material Support Lift enclosure and adjust the needle valves in the air cylinder.

1. Open the Lifter Case

Open the Material Support Lift enclosure.

2. Locate the Air Cylinder

Locate the Material Support Lift air cylinder.

3. Adjust the Needle Valves

There are two needle valves on the air cylinder. When facing the inside of the enclosure, the needle valve on the left adjusts the retraction speed of the Material Support Lift. The needle valve on the right controls the actuation speed of the Material Support Lift.

Adjust the needle valves as needed. Screwing the needle valve in will slow the actuation, screwing the needle out will speed up the actuation.

Bend-Tech recommends adjusting the needle valves incrementally, turning a half turn at a time in order to avoid damaging the Material Support Lift.

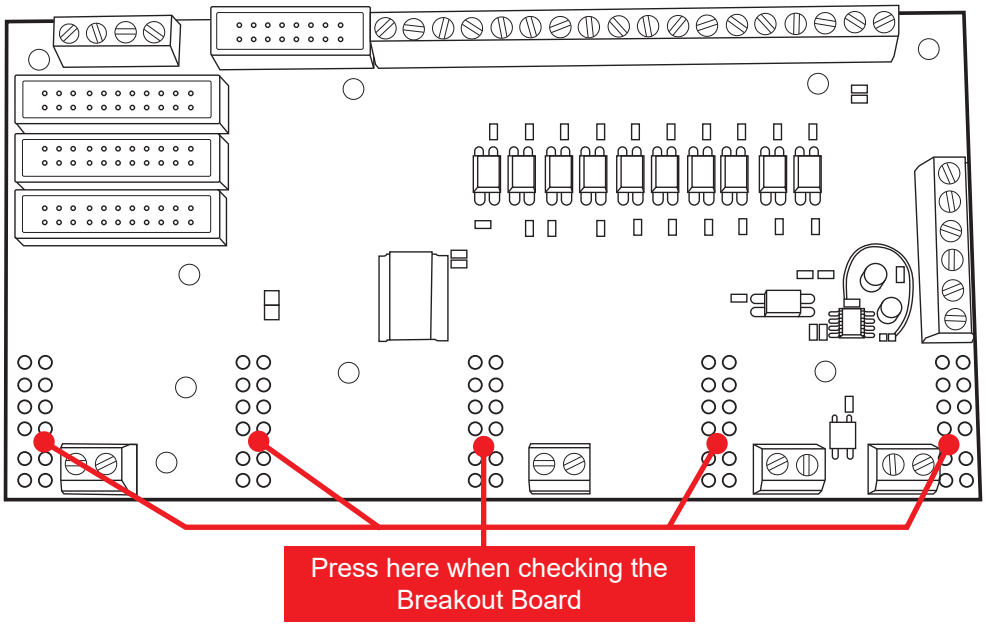
06 Trolley & Chuck Troubleshooting

6.1 X-Axis Motor Troubleshooting

6.1.1 X-Axis Will Not Jog

Breakout Board has come unseated from the Motor Drivers

With the Dragon powered off and disconnected from power, open the Control Box using a flathead screw driver. Press down on the red Breakout Board firmly to ensure the Breakout Board is seated properly on the motor drivers.



Bad Motor Cable

Check the motor cable. Inspect the cable connections and ensure the connections are tight. Swap with another cable to check if the X-Axis motor cable is functioning properly.

Poor Ethernet Connection

Check Ethernet cable, ensure it is connected properly and routed away from other electrical cables and devices.

6.1.2 Trolley is Binding while Jogging at Full Speed

Rails are not Aligned Properly

Use a tape measure to check Rail spacing at different locations on the machine. Check the spacing where Trolley binds. Ensure Rail spacing is consistent along the length of the rail.

Rail spacing is set at the Bend-Tech manufacturing facility. If the Rails are out of alignment, contact a Bend-Tech service representative to discuss the alignment process: support@bend-tech.com.

Trolley Eccentric Bearings need Adjustment

Move Trolley along the Rail by hand and observe any locations where the Trolley might be binding. The Trolley should travel smoothly along the length of the Rail without binding or rocking side to side. If Trolley movement is inconsistent it may be necessary to adjust the Trolley Eccentric Bearing. See section 6.2 for a full procedure on adjusting the Trolley eccentric bearings.

6.1.3 X-Axis Motor is Skipping Steps

Set Screws between the X-Axis Motor and the Gearbox are Loose

Jog the Trolley and observe if the motor sound changes as it moves along the Rail. Motor RPM will fluctuate if the set screws have come loose. If set screws are loose remove the X-Axis motor and gearbox. Remove set screws, apply Loctite Blue 242 and reassemble.

6.2 Adjusting Trolley Eccentric Bearings

The Trolley Eccentric Bearings will need to be adjusted if the Trolley rocks from side to side, or binds anywhere along the length of the rail. If the Trolley rocks from side to sides the eccentric bearings are too loose. If the Trolley binds the eccentric bearings are too tight.

Tools needed

- ¾ in. wrench
- ¾ in. thin wrench

1. Locate the Eccentric Bearings

Locate the two eccentric bearings on the Trolley. The eccentric bearings are located on the right side (the side opposite of the Cable Track) of the Trolley. The bearings on the left side of the Trolley are fixed. Place the thin wrench supplied with the Dragon on the adjustment flat of the eccentric bearing, located between the bearing and underside of the Trolley.

Important

In older belt driven Dragon machines, the eccentric bearings are located on the left side (the side with the Cable Track) of the Trolley.

2. Loosen the Front Eccentric Bearing

Use a ¾ in. wrench to loosen the front eccentric bearing mount nut on the top side of the Trolley Base Plate. Loosen the bearing mount nut just enough to allow adjustment of the bearing using the flat wrench. Adjust the bearing so the Trolley rides smoothly along the Rail with minimal effort and no rocking.

Note

Eccentric Bearings are off center bearings. It is best to adjust the eccentric bearings when they are in the closest position to the rail. Once the bearing is loose, rotate it and adjust it to the tightest position.

3. Loosen the Rear Eccentric Bearing

Use a ¾ in. wrench to loosen the rear eccentric bearing mount nut on the top side of the Trolley. Loosen the bearing mount nut just enough to allow adjustment of the bearing using the flat wrench. Adjust the bearing so the Trolley rides smoothly along the Rail with minimal effort and no rocking.

4. Re-tighten the Bearing Mount Nuts

The bearings may need to be adjusted multiple times in order to achieve optimal Trolley operation.

Once the eccentric bearings are adjusted so the Trolley rides smoothly along the Rail with no rocking or binding, tighten the eccentric bearing mount nuts, then tighten another quarter turn.

6.3 X-Axis Backlash Adjustment

The X-Axis backlash will need adjustment if there is front to back play in the trolley when pushed or rocked by hand. To access the X-Axis backlash adjustment bolt, remove the Trolley Cover.

1. Loosen the Locking Nut

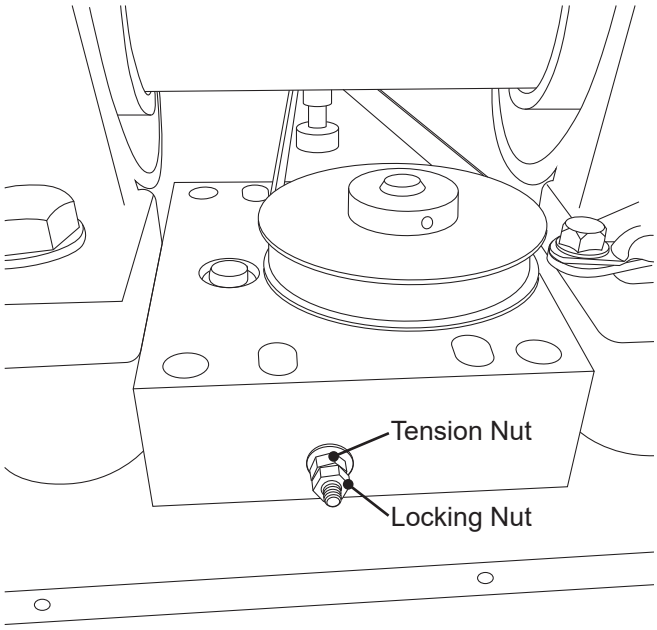
Use a 7⁄16 in. wrench to loosen the locking nut on the X-Axis backlash adjustment bolt.

2. Adjust the Tension Nut

Tighten the tension nut by hand until all play in the Trolley has been removed. Use a 7⁄16 in. wrench to tighten the tension nut a ¼ turn past the correct tension.

3. Re-tighten the Locking Nut

Hold the tension nut in place with a 7⁄16 in. wrench. Take a second 7⁄16 in. wrench and tightening the locking nut against the tension nut to lock it in place.



6.4 Chuck Troubleshooting

6.4.1 Chuck is Skipping Steps

Breakout Board has come unseated from the Motor Drivers

With the Dragon powered off and disconnected from power, open the Control Box using a flathead screw driver. Press down on the red Breakout Board firmly to ensure the Breakout Board is seated properly on the motor drivers.

Y-Axis Motor is Loose

Remove the Trolley Cover and perform an inspection of the Y-Axis Motor. Check to ensure the Y-Axis Motor is secure.

6.4.2 Chuck is not level when in the Load Position

Y-Axis Gear is loose

Remove Chuck Housing and inspect Y-Axis gear and Y-Axis Motor drive gear. If either one is loose, re-tighten.

Y-Axis Motor is skipping steps

Ensure the Breakout Board is firmly seated in the Motor Drivers.

Ensure cables are in working order and not damaged.

Y-Axis is not homed

In the Bend-Tech Dragon home interface, click Machine Control. In the top right hand corner click the home icon next to the Y-Axis, or click Home All Axis.

6.5 Removing and Cleaning Chuck Jaws

Chuck jaws can be removed without removing the Chuck from the shaft.

1. Open the Chuck Jaws

Use the Chuck Key to open the Chuck Jaws as far as possible. When the Chuck Jaws stop moving, lift them out of the Chuck.

2. Clean the Chuck Jaws

Clean the Chuck Jaws with brake cleaner and a rag.

3. Re-install the Chuck Jaws

Chuck jaws should be re-installed in the same position on the Chuck from which they were removed. The Chuck and Chuck Jaws are numbered. Match the Chuck Jaws to their corresponding positions on the Chuck.

Install the Chuck Jaws on the same rotation of the Chuck Key. This will ensure they are all the same distance from the center of the Chuck.

6.6 Removing The Chuck

The Chuck is secured to the Chuck Shaft with three M10 x 1.5mm button head cap screws. Older machines may be equipped with regular cap screws. Button head cap screws require a 6mm Allen wrench, regular cap head screws require a 5⁄16 in. Allen wrench. Remove the cap screws to remove the Chuck from the Chuck shaft.

When installing the Chuck, tighten the screws then give each one another quarter turn.

6.7 Cleaning The Chuck

Over time, the inner mechanism of the Chuck can become dirty, causing it to operate poorly. Cleaning the inner mechanism can help the Chuck work smoothly again.

1. Remove the Chuck

Remove the Chuck from the Chuck Shaft. Refer to section 6.6.

2. Remove the Chuck Jaws

Remove the Chuck jaws, noting the location of each jaw so it can be reinstalled in its original location.

3. Clean the Chuck

Clean the Chuck with brake cleaner, spraying the inner mechanism as much as possible. If the operator has access to a parts washer it is recommended the Chuck be cleaned in this manner to more effectively flush dirt and slag from inside the Chuck.

4. Lubricate the Chuck

With the Chuck clean, lightly lubricate the inside with a quality spray lubricant.

5. Re-install the Chuck Jaws

Re-install the Chuck jaws, ensuring they are installed in the same location and on the same rotation of the Chuck key.

6. Re-install the Chuck

Re-install the Chuck. Tighten the Chuck mounting screws then give each screw another quarter turn.

6.8 Y-Axis Backlash Adjustment

The Y-Axis should have no backlash. The Y-Axis Drive gear should rotate freely on the axis, while the machine is powered off. If there is any rotational play in the chuck, an adjustment is needed.

1. Loosen the Y-Axis Motor

Locate the six bolts under the trolley base plate. Use a 3⁄16 in. wrench to loosen the bolts.

2. Reposition the Y-Axis Motor

Reposition the Y-Axis Motor so that the Y-Axis Drive Gear meshes against the Nylon gear without any backlash. Adjust it to the tightest point in order to avoid binding when the Y-Axis rotates.

3. Tighten the Bolt Securing the Y-Axis Motor

Then tighten each one. The chuck should have no side to side, or up and down play. The gear should rotate smoothly, without binding.

If this does not resolve the issue, contact technical support.

07 Control Box Troubleshooting

7.1 Control Box Troubleshooting

Important

Do not attempt to service or modify the Control Box without first contacting a Bend-Tech service representative.

7.1.1 Motor is not Responding

Motor Driver has Failed

Replace the Motor Driver. See section 7.2.

7.1.2 Machine is not Powering On

Control Box Power Switch has Failed

Replace the Control Box Power Switch. See section 7.3.

7.1.3 Smooth-stepper is not Connecting to the Computer

Critical Failure in the Circuit Board or Circuit Board Component

Replace the Smooth-stepper Board. See section 7.4.

7.1.4 Axis is not Responding or is Responding Incorrectly

Breakout Board has come unseated from the Motor Drivers

Re-seat the Breakout Board. See section 7.6.

7.1.5 No Power to the Control Box

Blown fuse at the Power Switch

Replace the fuse. See section 7.5.

Blown fuse inside the Control Box

Replace the fuse. See section 7.5.

7.1.6 Unknown Failure within the Control Box

Wear, Power Spike, or Contamination

Contact Bend-Tech support for a replacement Control Box.

7.1.7 Control Box is Outdated

Control Box components have become obsolete or the machine has been updated

Contact Bend-Tech support for a replacement Control Box.

7.2 Replace the Motor Driver

1. Power off the machine

Power off the machine and disconnect from power.

2. Open the Control Box

Using a large, flat blade screwdriver, open the Control Box by turning the latch counterclockwise.

3. Disconnect the Breakout Board

Locate the red Breakout Board in the upper left corner of the Control Box. The Breakout Board will have a ribbon cable leading to it. Gently pry the Breakout Board out of its location and set aside. Leave the ribbon cable attached.

4. Remove the Faulty Motor Driver

Locate the Motor Driver that needs to be replaced. From left to right, the Motor Drivers are: X, Y, Z, A, B.

Unplug the Motor Driver.

Using a 11⁄32 in. nut driver or small socket and extension, remove the top nut securing the Motor Driver. Loosen, but do not remove, the bottom nut. Lift the Motor Driver slightly upward and tilt the top out to remove.

5. Copy the Dip Switch Settings

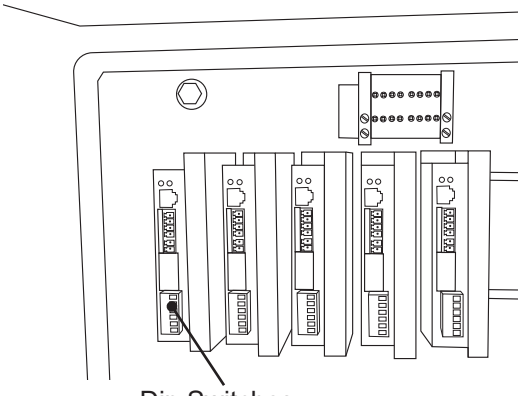
Copy the dip switch settings on the old Motor Driver to the new Motor Driver.

6. Install the New Motor Driver

Installation is the reverse of removal. During the installation process, use the bottom mounting pin with the nut still threaded onto it to seat the new Motor Driver.

7. Re-install the Breakout Board

Re-install the Breakout Board and close the Control Box.



7.3 Replacing the Control Box Power Switch

The Control Box Power Switch snaps into the power receptacle assembly.

1. Power off the Machine

Power off the machine and disconnect from power.

2. Open the Control Box

Using a large, flat blade screwdriver, open the Control Box by turning the latch counterclockwise.

3. Disconnect the Power Switch

Remove the two wires that connect to the Control Box Power Switch, noting the location of the wires so they can be re-attached to the new switch in the same location.

4. Remove the Old Power Switch

Using a small, flat blade screwdriver, pry the old switch out of its location.

5. Snap the New Switch into Position

Snap the new switch into its location.

6. Attached the wires to the New Switch

Swap the wires onto the new switch, ensuring the wires are attached in the same locations.

7. Close the Control Box

Close the Control Box.

7.4 Replacing the Smooth-stepper

1. Open the Control Box

Using a large, flat blade screwdriver, open the Control Box by turning the latch counterclockwise.

2. Disconnect the Ribbon Cables

The smooth-stepper is located on the Control Box door. It will have three ribbon cables, an Ethernet connection, and a power connection.

Disconnect the ribbon cables. Note the location of the ribbon cables so they can be re-installed in the same location. Unplug the Ethernet cable. Unplug the power connection.

3. Remove the Smooth-stepper

Use a 7⁄32 in. nut driver or small socket to remove the nuts that secure the smooth-stepper to the Control Box door.

Once the nuts are removed, remove the smooth-stepper.

4. Install the new Smooth-stepper

Installation is the reverse of removal.

7.5 Replacing Control Box Fuses

Replacing the Main Power Fuse

The Main Power Fuse is a 10A, 120VAC fuse. Ensure any replacement fuses are 10A, 120VAC.

The Main Power Fuse is located in a slot just below the Main Power Cord. To access the Main Power Fuse, remove the Main Power Cord from its socket and slide out the Main Power Fuse holder.

Replacing the Power Button Fuse

The power button fuse inside the Control Box is a 2A, 120VAC fuse. Ensure any replacement fuses are 2A, 120VAC.

The power button fuse is located in a fuse holder in the bottom right hand side of the Control Box. Twist the fuse holder to access the fuse. Remove the old fuse and insert the new fuse.

7.6 Re-seating the Breakout Board

The Breakout Board smooth-stepper facilitates communication between the computer and the motor drivers. Over time, it is possible for the Breakout Board to come unseated from the motor drivers.

1. Open the Control Box

Using a large, flat blade screwdriver, open the Control Box by turning the latch counterclockwise.

2. Locate the Breakout Board

Locate the Breakout Board in the upper left-hand corner of the Control Box.

3. Re-seat the Breakout Board

Firmly push on the Breakout Board to seat it in the motor drivers

7.7 Replacing the Control Box

1. Breakout Board

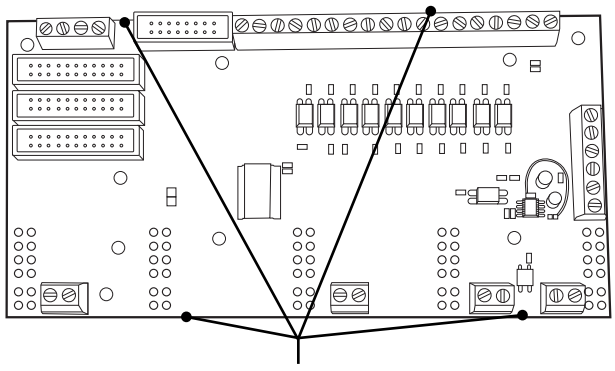
Locate the Control Box mounted on the rear of the third Rail Support Leg. Using a large, flat blade screwdriver, turn the black Control Box Door Latch located on the right hand side of the Control Box counterclockwise to open the Control Box. Locate the red Breakout Board in the upper left hand side of the Control Box. The Breakout Board will have a flat flex cable leading to it. Carefully pull the Breakout Board off the Motor Drivers. This will give access to the left hand Control Box Mounting Bolt. The Breakout Board should remain connected to the Control Box via its flat flex cable.

2.Control Box Mounting Bolts

Control Box Mounting Bolt heads are located inside the Control Box, in the upper right and left hand corners of the Control Box. Use a ratchet with a 9⁄16 in. socket and extension to reach the bolt heads inside the Control Box. Place a 9⁄16 in. wrench on the nut located on the Mounting Bolt

Tools Needed

- 9⁄16 in. wrench
- 9⁄16 in. socket
- Ratchet and extension
- Large flat blade screwdriver

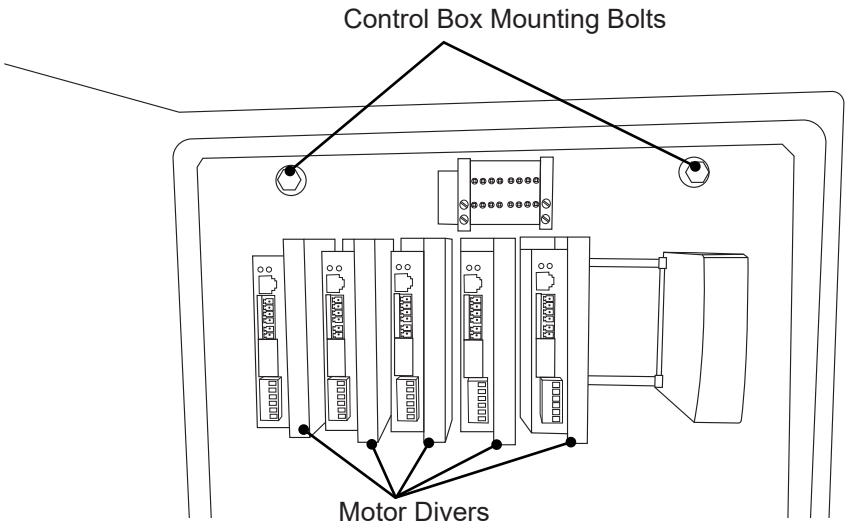


Hold the Breakout Board on the sides and gently pull it off the motor drivers.

on the backside of the Control Box. Turn the ratchet counterclockwise to remove the Mounting Bolt. Repeat this process for the right side Mounting Bolt. Once the mounting bolts are removed, position the old Control box out of the way so the new Control Box can be mounted.

3. Mount New Control Box

Before mounting the new Control Box, the Installer will need to remove the red Breakout Board located in the upper left hand corner of the new Control Box. Carefully pull the Breakout Board out of its mount on the motor drivers. It should remain connected to the door of the Control Box via its flat flex cable. Using the Mounting Bolts and nuts from the old Control Box, position the new Control Box so the Mounting Bolts can be fed through the mounting holes in the Control Box and the Rail Support Leg. Once in position with a Mounting Bolt fed through both parts, thread a nut onto the Mounting Bolt and tighten finger tight. Place the 9⁄16 in. wrench on the nut and use the ratchet, extension and 9⁄16 in. socket placed on the bolt head inside the Control Box to tighten the Mounting Bolts securely.



Note

The Powered Gate Control Box will have a separate Powered Gate Driver Box attached to it. This control box contains the motor driver for the Powered Gate. The Powered Gate Driver Box is placed on top of the main Control Box once it is mounted to the third Rail Support Leg.

4. Reinstall the Break Out Board

After mounting the Control Box, reinstall the Breakout Board. Position the Breakout Board over the motor drivers and, applying even pressure, carefully press the Breakout Board into its sockets on the motor drivers. Ensure the Breakout Board is fully seated on the motor drivers. Take care not to alter any of the white dip switch settings as these are preset at the Bend-Tech manufacturing facility for optimum performance.

5. Place the Powered Gate Driver Box

On Dragon A400 machines equipped with a Powered Gate, the Powered Gate Driver Box should be placed on top of the main Control Box. The Powered Gate Driver Box is secured with Velcro which is pre-installed on the Control Boxes.

6. Control Box Connections

Transfer all cable, wiring and compressed air connections from the old Control Box to the new Control Box. Bend-Tech recommends starting at either the top or bottom of the old Control Box and transfer each connection individually. Using this method will avoid mis-connections.

08 Sensors Troubleshooting

8.1 Sensor Overview

The Dragon uses rugged, long-lasting proximity sensors to determine critical machine positions. Issues related to the machine positioning are rarely sensor-related. Typically an issue is the result of a sensor falling out of adjustment or a loose cable. It can be assumed there is an issue with a sensor if the machine cannot find home, or if a machine Axis experiences a collision.

8.2 Checking a Sensor

The operator can check a sensor by placing a piece of metal, such as the blade of a screwdriver, in front of the sensor.

In the Machine Library, on the Main interface, click the Wizard icon and choose PERFORM FULL CALIBRATION.

Follow the prompts on the screen, the program will walk through the process of checking sensor operation. The calibration can be closed after this is complete if a full machine calibration does not need to be completed.

8.3 Inspecting Sensor Cables

1. Disconnect the Sensor Cable

Disconnect the cable from the sensor.

2. Inspect the Cables

Perform a visual inspection, ensure all contacts are in position and intact.

3. Test Cables

If the cable passes inspection and the sensor is still malfunctioning, swap cables with a sensor that is known to be functioning correctly. After swapping the cable, if the problem follows the cable it can be concluded that there is a problem with the cable.

4. Contact Bend-Tech Support

Contact Bend-Tech Support for replacement cables.

8.4 Setting a Proximity Sensor

1. Disconnect the Sensor Cable.

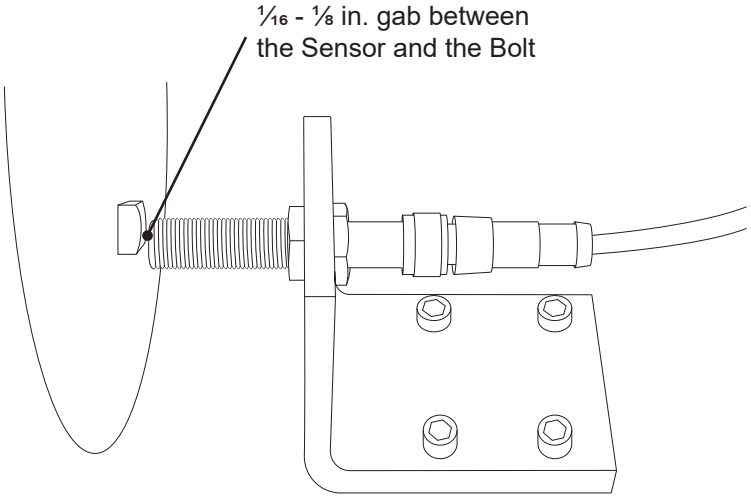
Disconnect the sensor cable.

2. Position the Sensor Bolt

Position the sensor bolt directly in front of the sensor. This will require jogging the machine. To move the axis by hand, power OFF the machine.

3. Check the Gap between the Sensor and Bolt Head

Use a feeler gauge to check the gap between the face of the sensor and the bolt head - the gap should be between 1⁄16 - 1⁄8 in. A yellow-orange light will illuminate when within proximity.



4. Adjust the Gap

If the gap is not within spec, loosen the nuts on the sensor and adjust accordingly.

5. Tighten the Mounting Nuts

When the sensor gap is correct, tighten the mounting nuts. Re-check to ensure the gap remained in spec during the tightening procedure.

8.5 A-Axis and Z-Axis sensors

A-Axis and Z-Axis (Toolhead) negative sensors can be changed easily. However, the positive sensors require removal of the Toolhead to change. The positive sensors can be disconnected and the machine run safely without them until down time is scheduled for sensor replacement.

09

Connections

9.1 Troubleshooting ESS Connections

The majority of connection issues are the result of improper cable routing, improper cable connection, or the computer's CPU running other programs simultaneously.

- Ensure the Ethernet cable is connected properly and routed clear of other cables.
- Ensure the computer is connected directly to the Control Box via the Ethernet cable.
- Check the computer Task Manager and ensure it is not running other programs while trying to connect.

When the machine loses connectivity while running it is typically because of electrical interference with the Ethernet Cable or the computer is prioritizing memory to a different process or program.

It is possible a cable can become damaged by hot slag or that it can become jostled by the machine's actions and lose connection.

9.1.1 ESS Failure to Connect

Control Box Not Powered Up, Fuse Blown, or E-Stop Triggered

Check E-Stops, check fuses, check ribbon connection to Breakout Board, power up Control Box.

ESS Signature Error or Damaged Cable

Check cables and replace if damaged.

Electrical Interference

Check cable routing. Ensure the Ethernet cable is routed clear of any other cables, especially the Torch lead.

High CPU Usage

Ensure no other programs are running on the computer.

To check CPU usage, right click the Task Bar > Task Manager > More Details. Scroll through to ensure no processes are using an inordinate amount of computer memory.

Computer Utilizing Power Saving Feature

Ensure all sleep timers are turned off.

Ethernet Cable Connection Incorrect

Ensure the computer is connected directly to the Control Box. Ensure the Ethernet Cable is connected to its own Ethernet plug in the computer with no adapters.

9.2 Connection Lost While Machine is Running

Ethernet Cable Routed Incorrectly or Electrical Interference

Re-route Ethernet cable away from other electrical cables.

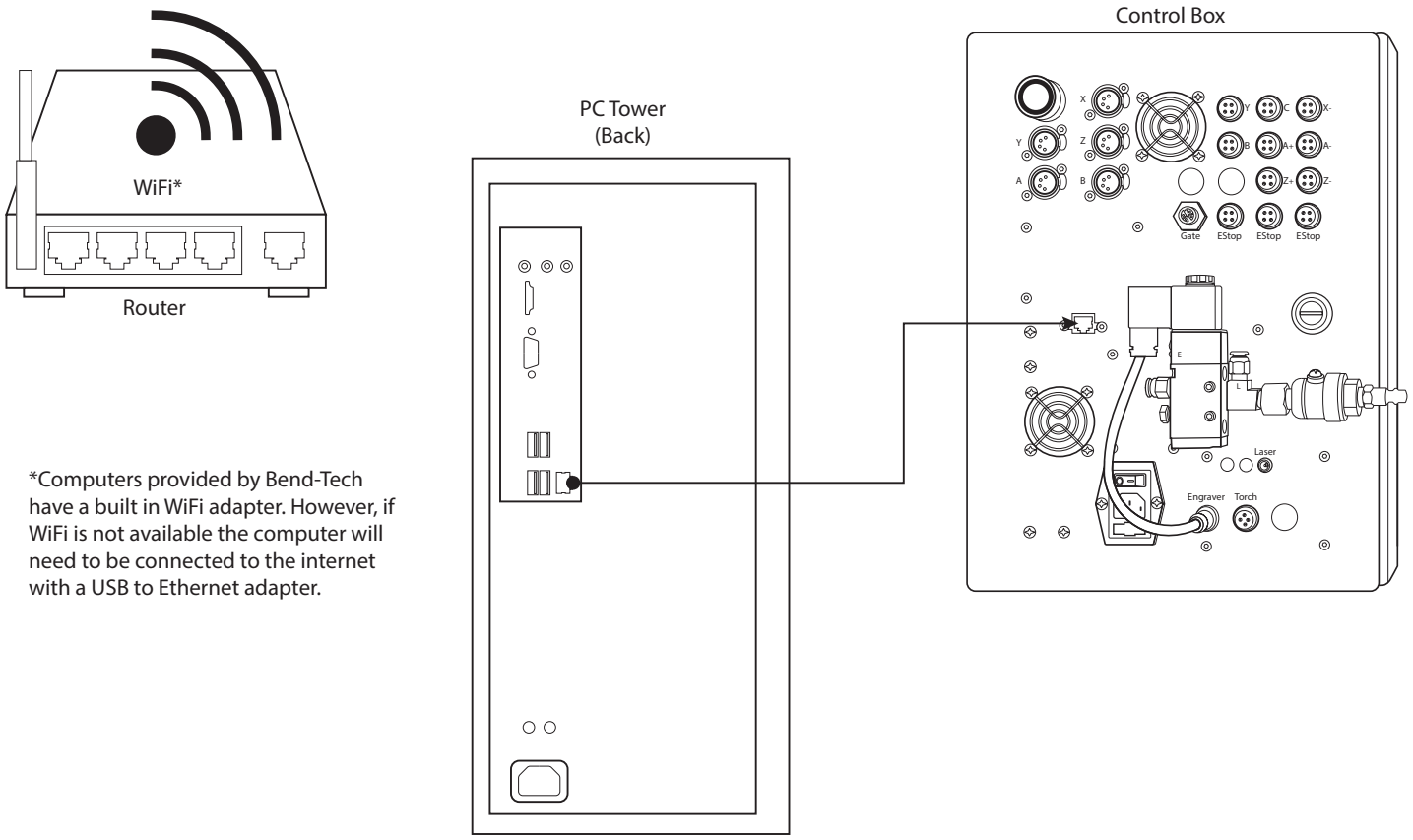
Computer Running Out of RAM

Ensure Bend-Tech is the only program running. Close out of all other programs. Check CPU usage.

To check CPU usage, right click the Task Bar > Task Manager > More Details. Scroll through to ensure no processes are using an inordinate amount of computer memory.

9.3 Ethernet Connections

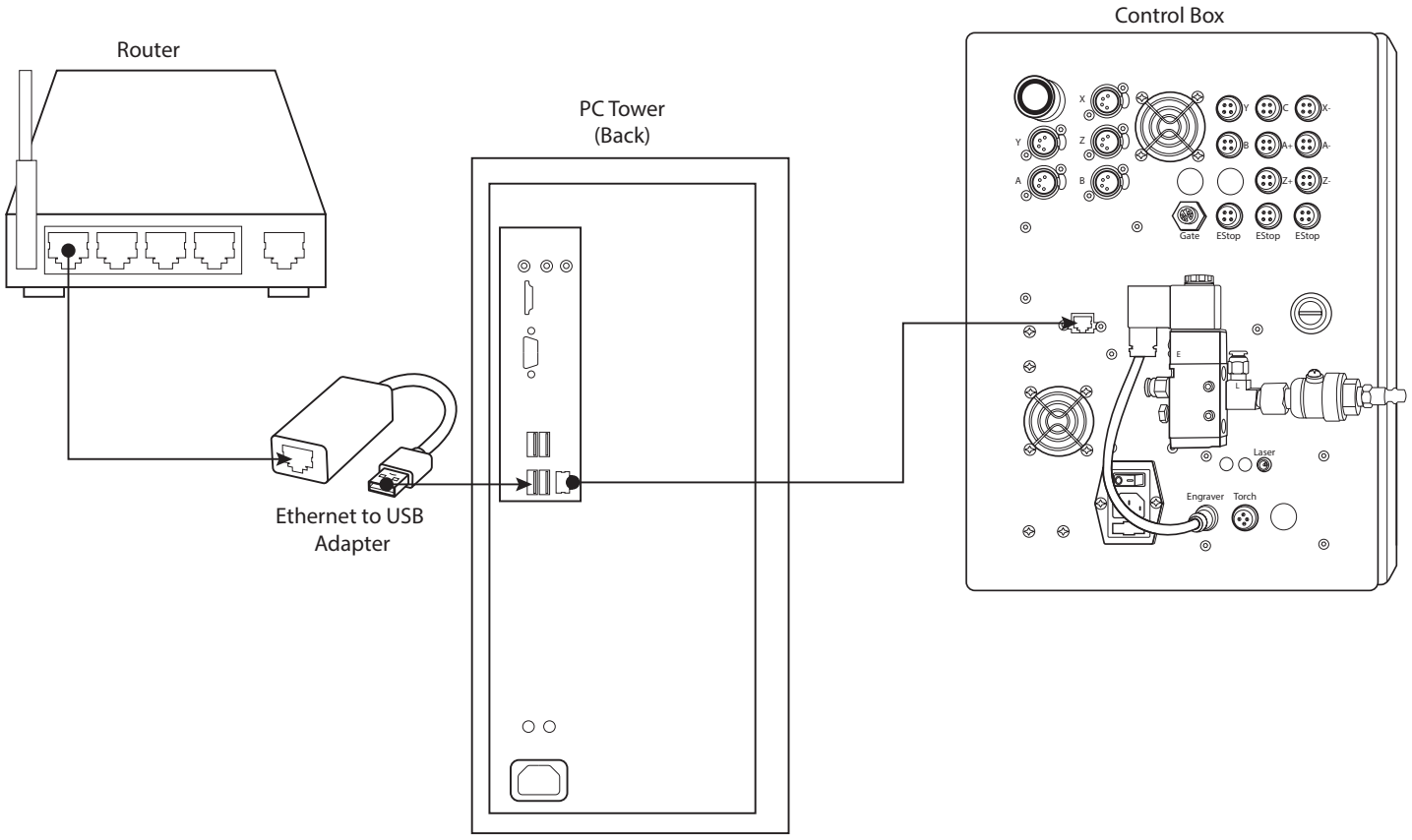
Ensure there is a direct connection between the Ethernet port on the Control Box and the Computer.



*Computers provided by Bend-Tech have a built in WiFi adapter. However, if WiFi is not available the computer will need to be connected to the internet with a USB to Ethernet adapter.

Note

It is OK to use a USB to ethernet adapter and connect an ethernet cable from the USB port to the router to gain internet access for computers without Wifi capabilities. This will leave the other ethernet port open for use with the Dragon machine.



Important

Do Not connect the Control Box to a USB port via an adapter. **Do Not** Connect the Computer to the Control Box via a Router.

10 Troubleshooting Mach3

10.1 Diagnostics in Mach3

10.1.1 Mach3 License Data

The Mach3 license data is located in the upper left corner of the Mach3 interface. This license data is used by Bend-Tech Support to help troubleshoot the Dragon machine from the Bend-Tech Service Center.

10.1.2 Coordinating Dragon Designations With Mach3

In some cases it may be necessary to coordinate the Dragon Machine Control homing system with Mach3 software user interface.

Mach3 uses ++ and - machine limit labeling system in its user interface. These are prefaced by a numbered order preceded by the letter M.

Per Dragon programming, the “- -” designations in Mach3 are considered home.

Note

When homing the Dragon, when the green Home symbol lights up it should briefly light up the corresponding M Home designation in Mach3.

10.1.3 Dragon Axis vs. Mach3 Definition

Dragon A400 Axis	Mach3 Designation	Dragon + Limit	Dragon - Limit (Home)
X	M1	M1 ++	M1 --
Y	M2	M2 ++	M2 --
Z	M3	M3 ++	M3 --
A	M4	M4 ++	M4 --
B	M5	M5 ++	M5 --
C	M6	M6 ++	M6 --

10.1.4 Testing Homing Sensors in Mach3

In Mach3, in the Diagnostics interface, if an Axis is triggered it will light up its corresponding box and limit designation. To determine if a sensor is functioning, place a metal tool such as the blade of a screwdriver in front of the sensor. If that sensor is functioning it will light up its designation in Mach3. This offers a quick and easy way to troubleshoot a sensor or cable. Also, in the case of a malfunction, check Mach3. If a designation is lit up when it should not be it is an indication of a problem with an Axis sensor, cable, or box.

10.1.5 Jogging With Mach3

There are some situations where the machine may need to be jogged but will not be able to. The Bend-Tech 7x software may already be performing an operation and preventing it. For example, if the machine is going through its calibration process it will not be possible to jog the machine. With Mach3 open, press the ‘Tab’ key on the keyboard to open a jog control interface. Press ‘Tab’ again to close the jog control feature.

10.2 Mach3 Troubleshooting

11.2.1 Limits 3, 4, and 5 triggered in Mach3 and Emergency Mode Activated

E-Stop was Activated

Check E-Stops to ensure all circuits are closed.

Power Loss

Ensure machine has power. (Power supply is active, switch is on, green button is lit.)

Fuse Blown

Check fuses.

11.2.2 “Emergency” Box is Flashing Red and Machine is Unable to Home

E-Stop Triggered

Check E-Stop switches.

10.3 Reviewing G-Code in Mach3

While Bend-Tech 7x displays G-Code in the Nesting feature, it may be necessary to review G-Code in Mach 3 to determine where a project may have stopped due to Torch failure, or why there was an error in the order of operations. In the Program Run tab, Mach3 will display the same G-Code as Bend-Tech 7x. Determine the line number where the project failed and then compare it to Bend-Tech 7x.

10.4 Prioritizing Mach3 on the Computer

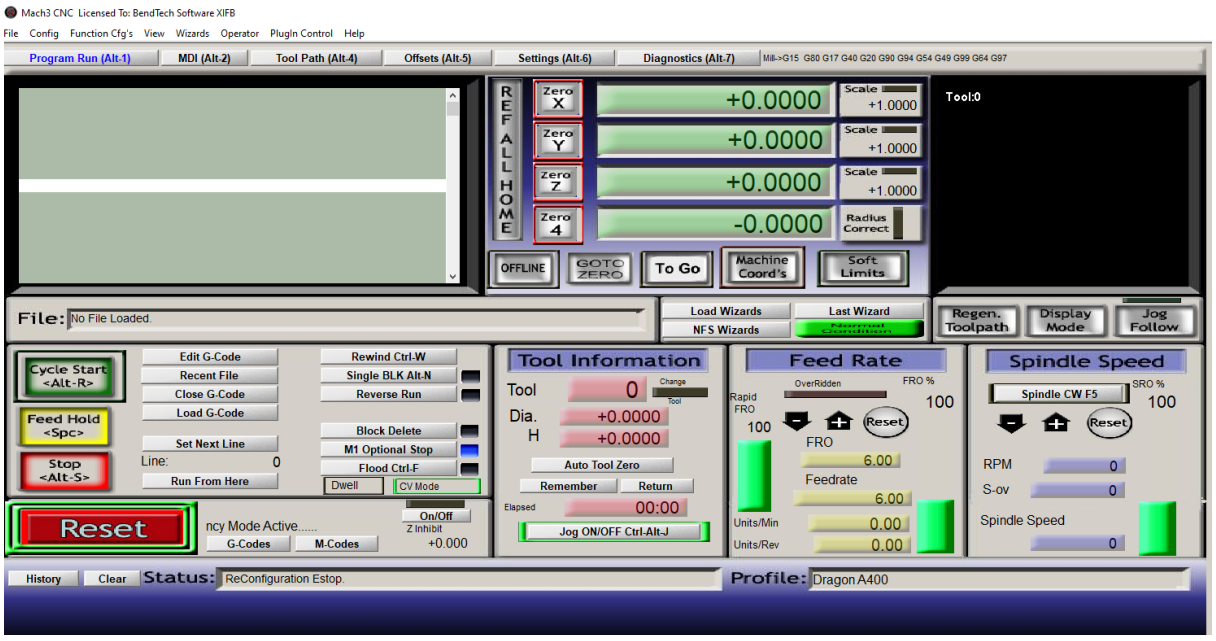
All new Dragon machines are shipped with a new computer that is optimized for use with the machine. However, customers with older machines will need to supply a computer. It is important to optimize the computer for use in running the machine. This will result in the most efficient use of both machine and software for the user. Prioritizing Mach3 is critical to optimizing Dragon performance. Follow these steps to prioritize Mach3 in the computer’s operating system.

1. On the desktop right click on Mach3 Loader. Select properties at the bottom
2. In the Shortcut tab next to Target: Copy/Paste the following:

“C:\Windows\System32\cmd.exe /c start “Mach3” /AboveNormal “C:\Mach3\Mach3.exe”

3. Click APPLY. Click OKAY.

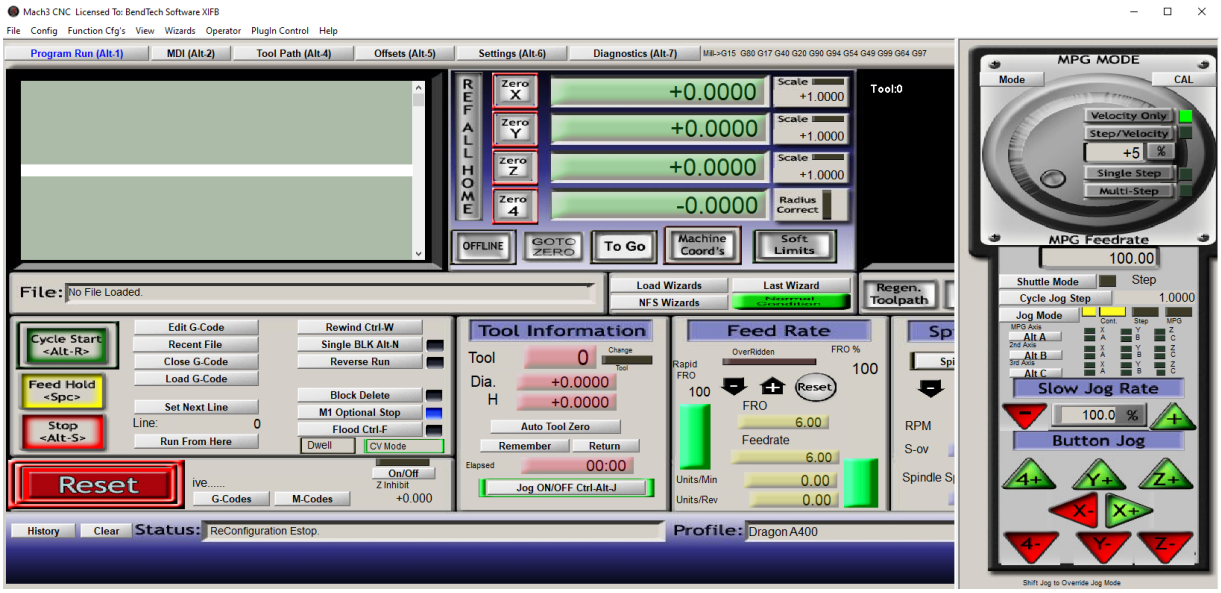
10.5 Opening Mach3



When powering up the Dragon machine and its operational software, it is critical to follow the correct order of operations. If Mach3 was minimized on the computer screen and the machine was shut down without closing out of Mach3, then when the machine is re-started, a number of connectivity-associated error messages and problems could occur. This is explained in more detail in section 10.12.

Dragon Power Up Order of Operations	
Turn on black switch on the Control Box	The switch is connected to the ESS board which is necessary for connectivity.
Power on Green Button	24V to each of the motor drivers. Motor drivers are not connected to the ESS board.
Open Dragon CAM > select machine > Machine Control	Mach3 will open When opening Machine Control the machine will always show “Machine Disabled - Press Here To Enable Machine.”

10.6 Jogging in Mach3



Access jog controls within any Mach3 interface by pressing the ‘Tab’ button on the keyboard. The X, Y, Z, and A-Axes can be accessed within Mach3. Press the Tab key again to close out of the jog control interface.

Note

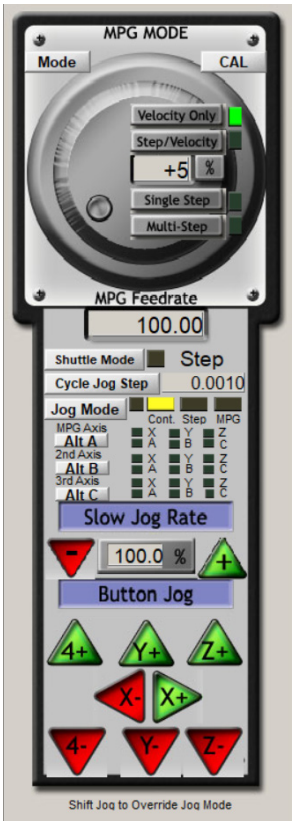
The “A” axis is labeled “4” in the Mach3 jog controls interface.

10.6.1 Jogging During Calibration

If the Dragon is performing its calibration process, the Machine Control interface will not be accessible. In order to jog the machine during the calibration process, Mach3 will need to be used. In any Mach3 interface press the ‘Tab’ button and it will open a jog controls interface. This will override the Dragon software and allow the operator to jog the machine.

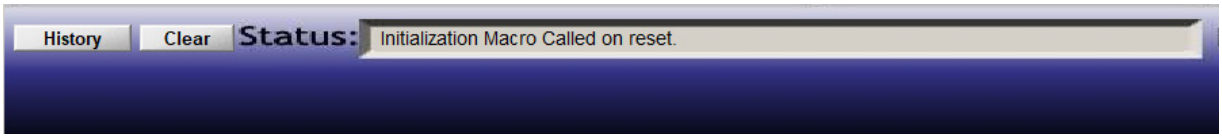
10.6.2 Jogging Between Projects

When a job is created and Run Project is clicked, Dragon software will run the project to its completion. Once the project is complete, Dragon software will not allow the machine to be jogged. This is because the software expects the user to create a new nesting project. The machine is waiting to receive information on the new material length before it will move. However, if the machine needs to be jogged, go into Mach3 and press the ‘Tab’ key on the keyboard. Use the Mach3 jogging interface to jog the machine.

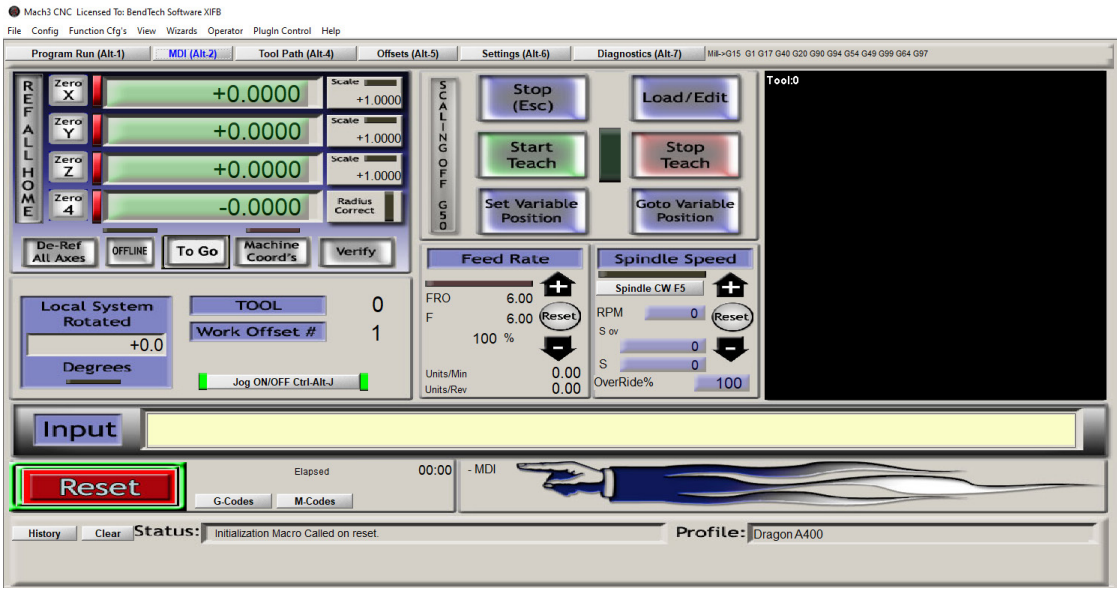


10.7 Determining Machine Status in Mach3

In the Program Run tab in Mach3 there is a Status message at the bottom of the interface. Status will display why something may or may not have happened, such as ‘Torch failed to initialize’ or ‘E-stop deactivated the machine’.



10.8 MDI (Alt-2) Tab



10.8.1 Input Text Box

Enter an M code into the input box to tell the machine to perform an operation. For example, if there is a problem with the Torch, enter the M code to fire the Torch to determine if it is a problem with the plasma unit, the machine, or software.

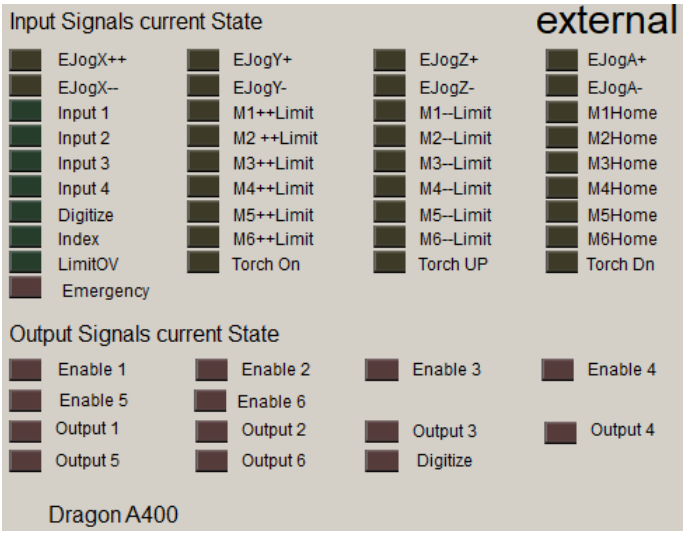
10.9 Diagnostics (Alt-7)

10.9.1 External Signals

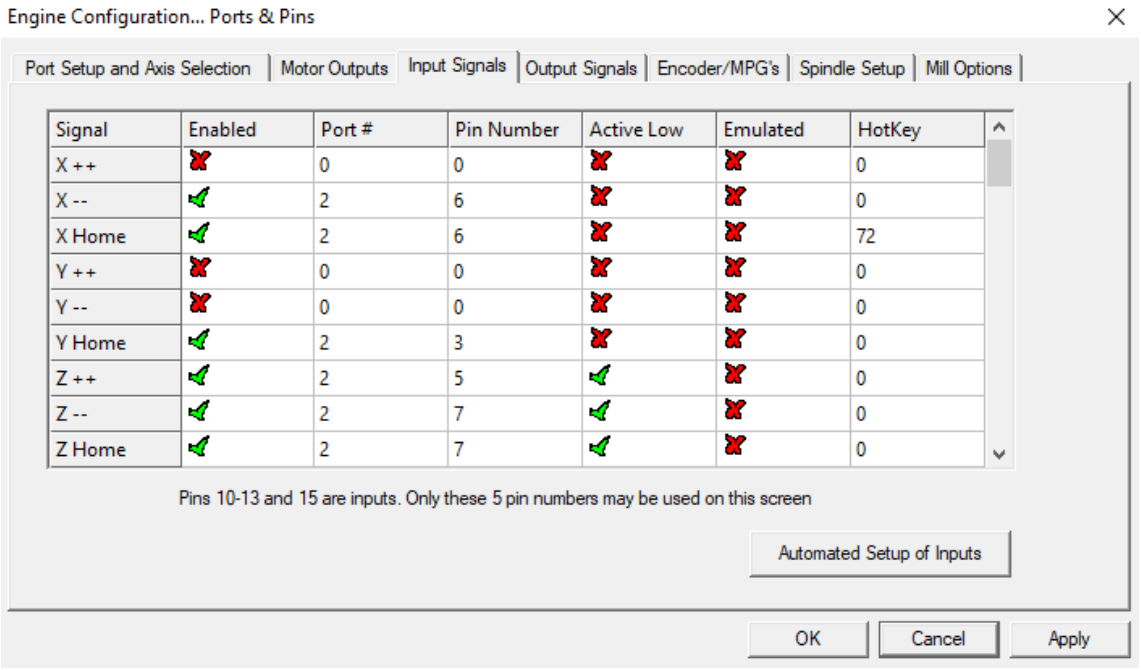
In the Diagnostics interface, Mach3 will display if a limit switch has been triggered by lighting up an input indicator yellow. Indicators for the Torch and Engraver will light up red when active.

A Limit Switch or E-Stop will cause the machine to disable. Checking the input signals in Mach3 can indicate what is disabling the machine. For example, if the machine is disabled and one of the external input signals is lit, that input signal can indicate a possible malfunction.

If the machine is in Emergency Mode, the Emergency Light will be red in Mach3. This will happen when the machine receives the wrong input and/or output signal(s).



10.10 Ports and Pins



In the Config drop down menu, the operator can click Ports and Pins, then click the Input Signals tab to view input signals for all Axes as well as E-Stops.

Bend-Tech uses three different configurations of Mach3. Each version uses its own combination of Port and Pin numbers. In the case that a machine is fitted with a new Control Box, the Control Box should match the Mach3 configuration for that machine. This depends on the age of the machine and when it was produced by Bend-Tech. Bend-Tech does not recommend reconfiguring any Pin numbers without first consulting a Bend-Tech Service Tech.

Enabled vs. Disabled

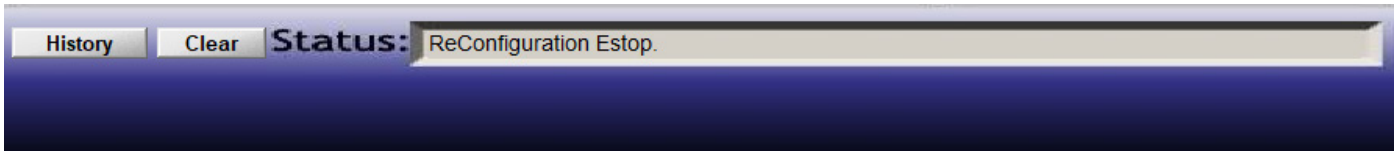
Next to each Signal is a red X or green check mark indicating if a specific limit switch is enabled.

Red X = disabled
Green Check Mark = enabled

Some Axes only have one sensor. In these cases only the location equipped with a limit switch will show up as a green check mark.

In some cases the limit switch will need to be disabled in order to keep a machine running, or to diagnose a problem. To do this, click on the red X or green check mark to either enable or disable a given limit switch. Click OK. Click APPLY.

10.11 Limit Switch is Triggered in Mach3



If there is an unknown problem with the machine, go to Mach3 > Program Run and check the Status text box. The Status text box will display if a limit switch or E-stop is triggered. Then go into Diagnostics and determine which limit switch is lit up and/or check E-stop switches on the machine.

If it is determined a limit switch or E-stop has been triggered, Home the machine.

If the limit switch keeps triggering after Homing the machine, click the Config drop down menu, click Ports and Pins, click the Input Signals tab and disable that limit switch until the cause of the problem is determined (bad limit switch, limit switch out of adjustment, bad cable, etc.). Click APPLY, Click OK.

Try to enable the machine and Home the machine with the limit switch disabled. If successful, contact Bend-Tech to replace the bad component as soon as possible.

10.12 Leaving Mach3 Open

If the Mach3 interface is left open when the Bend-Tech Dragon software and the Dragon machine are shut down, then upon booting up the computer, a message window will pop up saying the Ethernet Smooth-stepper has failed to communicate for an extended period of time.

When this occurs, click OK.

If the Main Power Switch is turned on and the green button is pressed on the Control Box, the machine will boot up normally. When Machine Control is opened, the control interface will display Machine Disabled as it normally does. But, when the button to enable the machine is pressed, the machine will not enable. A message will appear that reads, “Unable to bring the machine out of an emergency state.”

Clicking into Mach3, will show a blinking red Emergency light in Diagnostics and reseting the machine through Mach3 will not work in this Emergency state.

At this point, Mach3 is not connected to the machine. The solution is to close out of the Dragon software and the Mach3 software. Then turn off the main power switch on the Dragon machine, and restart in the proper order.

10.13 Diagnosing an E-Stop in Mach3

If the machine is non-responsive because it has been disabled, click the Program Run tab in Mach3 and check the Status text box. If an E-Stop has been triggered, the Status will read Limit Switch Triggered. At this point, check all E-Stop buttons to ensure none are triggered. If an E-Stop is triggered, pull the switch back out, and press the Green Button on the Control Box. Click Reset in Mach3 and the machine will be enabled.

Important

If the machine is disabled, always check the Control Box first to ensure the Main Power Switch is on and the green button is lit.

10.14 Calculating Run Time in Mach3

1. Create a Nesting Project

Load or create a nested project. Ensure, Disable 'OK to Move' is checked.

2. Turn off the Plasma unit

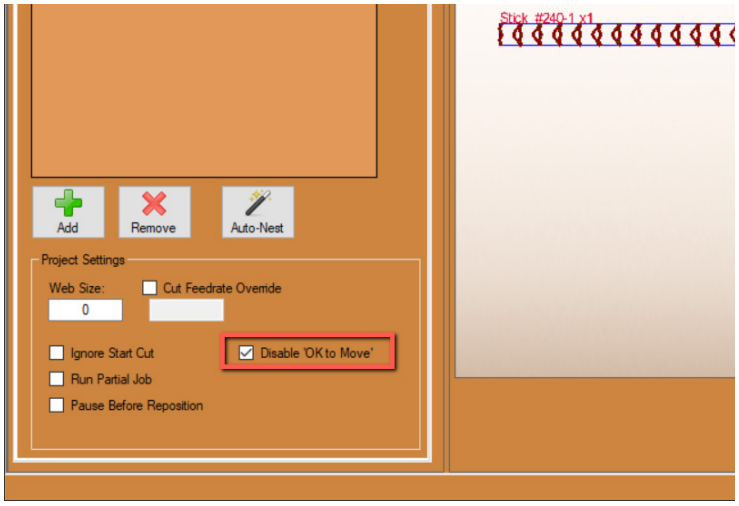
Ensure the plasma unit is powered OFF. If the torch is left on, it will still try to ignite.

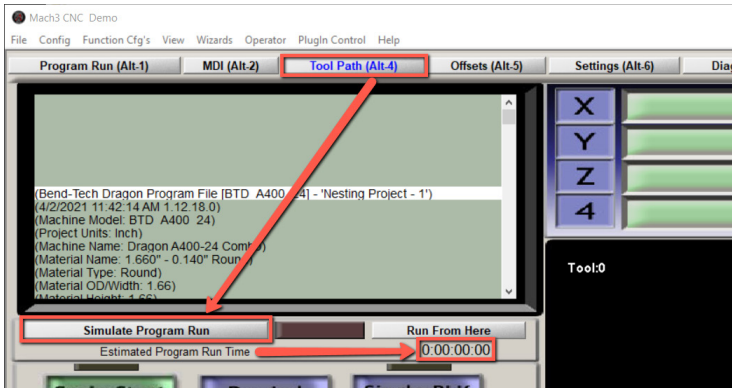
3. Run Project

Press run project and wait for the project to load the G-Code into Mach3.

4. Simulate Program

In Mach3, navigate to the Tool Path tab and click Simulate Program Run. A time will appear next to Estimated Program Run Time.





10.15 Restarting a Job in Mach3 after Torch Failure

In the Program Run tab, Mach3 displays the G-Code for any given job being run by Dragon software. In the case of a Torch failure to initialize, it is possible to locate the position in the G-Code where the job was halted because of Torch failure and re-start the project from that position.

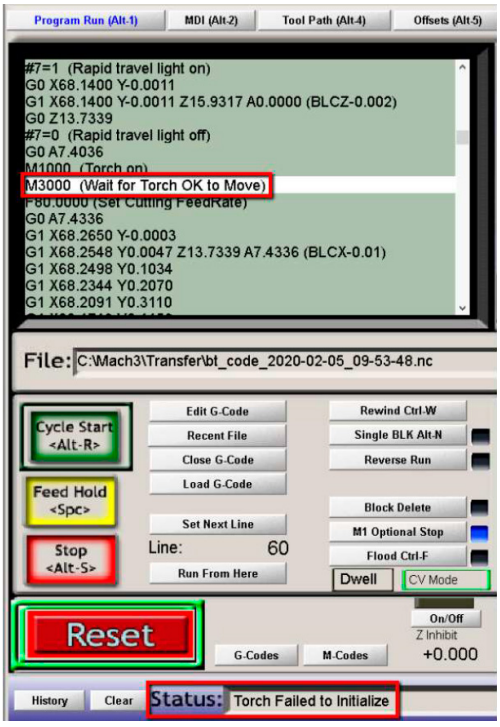
Important

Restarting a job in Mach3 after Torch failure to initialize will only work if the Torch failed to initialize because of a problem with the Torch, such as consumables or air supply. If there is an issue with the machine, material, or job settings, restarting a job in Mach3 will not work.

Newer machines have this macro installed. This allows the operator to use Machine Controls to start from the previous G-Code line. For older machines, the following instructions will walk through the process of Restarting a Job after Torch Failure. The Macro can also be obtained from Bend-Tech.

10.15.1 Editing the Macro

If the Torch fails to initialize the G-Code will default to the beginning of the job in Mach3. Before restarting a job in Mach3, the Torch Initialization Macro code will need to be edited.



Click the folder icon in the menu bar at the bottom of the computer screen. In the Quick Access menu on the left-hand side, click on the OS (C:) icon.

Click the Mach3 folder and open the Macros folder. Click Dragon A400 or Dragon A250. Scroll down to the macro file titled M3000 and double click on it. Open the file with Notepad.

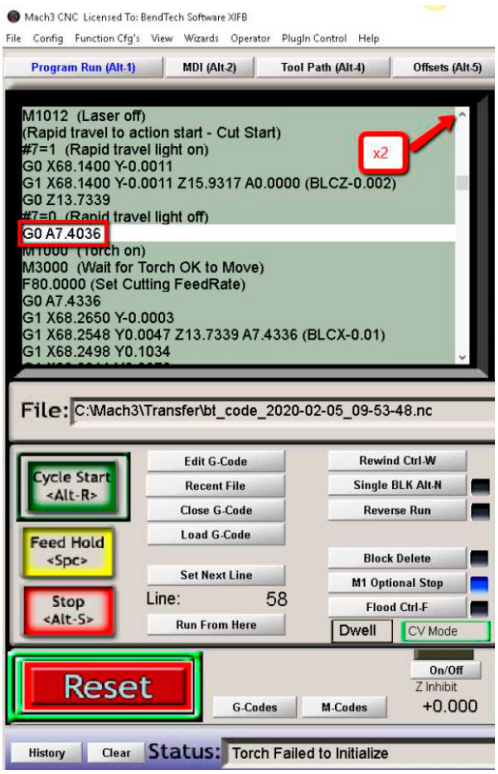
In the Notepad document, change Code(“M30”) to Code(“M02”). Click the X in the upper right hand corner to close out of the window. Click SAVE. If Mach3 is open, close out of the software and re-open it to initiate the change.

10.15.2 Restarting the Job

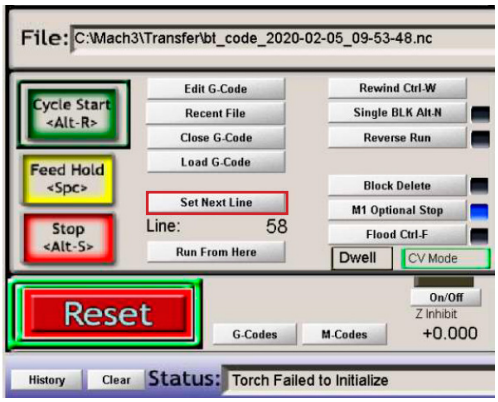
Once the Torch issue is resolved, restart the job from where it left off.

In the G-code, the job will show that it has stopped at the M3000 code. The Status message at the bottom of the Program Run interface will read “Torch Failed to Initialize.”

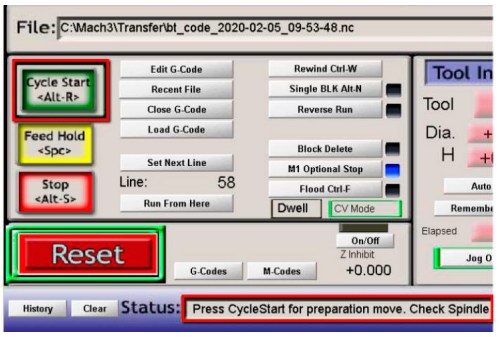
In the G-code display, click the up arrow on the right-hand side of the display twice to move the command line back two steps in the code. This is the command to lower the Torch to the cutting position.



Click “Set Next Line.” The Status message will now read “Press CycleStart for preparation move.”



Click the green CYCLE START icon. A Preparation Positioning window will appear. Click OK. The job will proceed from the Torch initialization position.



10.16 Diagnosing Sensor, Cable, and Control Box Problems

If an Axis on the Dragon is not homing properly, it is possible for the operator to diagnose the problem using Mach3. Mach3 can be used to determine if there is a cable, sensor, or Control Box issue.

10.16.1 Diagnosing a Sensor Issue

Diagnose a sensor issue using Mach3 to monitor the Input Signals in the Diagnostics interface. If an Axis is not homing properly, swap cables to determine if it is a sensor, cable, or control box issue. For example if the A-Axis (Horizontal Axis on the Toolhead) is not homing properly, follow the troubleshooting process to determine the issue.

Observe which limits are being triggered in Mach3 (for the A-Axis this will be the M4-Limit and M4Home).

10.16.2 Checking the Control Box

To eliminate the Control Box as the issue, move the A+ sensor cable to the A- port on the Control Box, and move the A- sensor to the A+ port on the control box.

Swapping the cables at the Control Box should change the Input Signals to Mach3.

If the M4--Limit and M4Home remain triggered the signal has not followed the cables. This indicates there is a problem with the Control Box.

If M4++Limit is activated it indicates the input has changed along with the cable configuration. In this case the Control Box is communicating properly with Mach3 and there is a problem with a cable or sensor.

10.16.3 Checking Sensors

Important

Sensor cables can be swapped without powering down the Dragon. However, motor cables should not be swapped until the machine is powered off.

Swap the A- and A+ sensor cables back to their designated input ports on the Control Box.

Swap the A- cable to the A+ sensor on the Toolhead.

Swap the A+ cable to the A- sensor on the Toolhead.

With the cables in this configuration, if the machine is run through its homing process it will light up the M4++Limit (instead of the M4-Limit/M4Home) since the machine is now sending a signal from the A- sensor to the A+ port in the Control Box.

If the M4--Limit/M4Home is activated in Mach3, it indicates there is a problem with the cable.

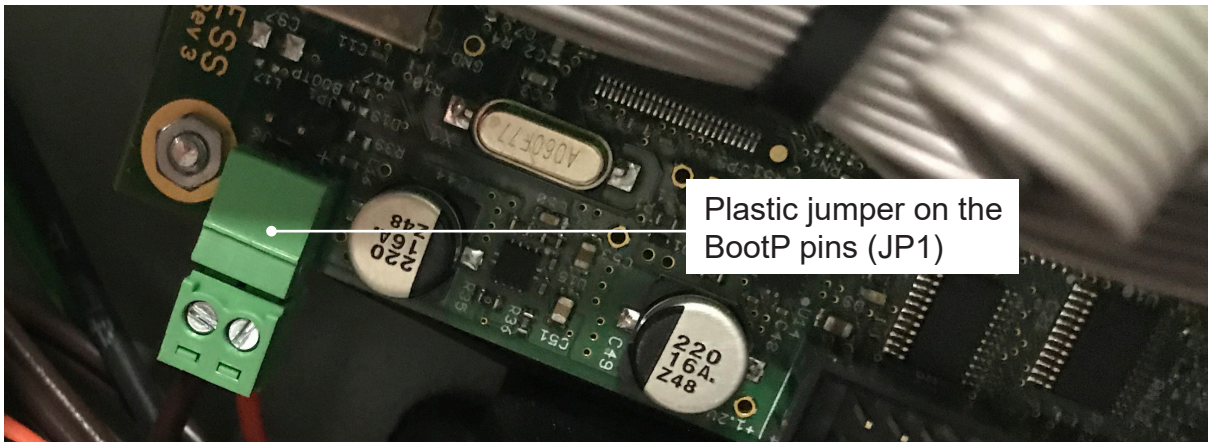
If the M4++ Limit is activated in Mach3, it indicates there is a problem with the sensor.

10.16.4 Reading ESS LED Status Codes

The port where the Ethernet cable connects to the Ethernet Smooth Stepper board inside the Control Box has colored status lights. Knowing the meaning of these status lights can help diagnose connection problems between Mach3 and the Dragon.

ESS Board Status Lights			
Light	**Status**	**Definition**	**Solution**
Red Left	On	Machine is in emergency state (machine disabled)	Check E-stops
Red Right	Not Used	N/A	N/A
Green Left	Rapid flashing	ESS/PC communication	N/A

ESS Board Status Lights			
Light	**Status**	**Definition**	**Solution**
Green Right	Two quick blinks	Waiting for communication with Mach3	N/A
	One second on, one second off	BootP mode	Remove the small plastic jumper from the BootP pins (JP1) and power cycle the ESS. See the image below.
	One long flash, two short flashes	The ESS board has lost its IP address	Run Configurator to generate IP address and power cycle the ESS board.
	Constant on	ESS mode - ESS has established communication with the computer. This is normal operating mode.	N/A



10.16.5 Ethernet Jack LED Lights

There are two lights at the port where the Ethernet cable connects to the ESS board. Knowing the meaning and behavior of each color of the status lights can help the operator diagnose connection problems between Mach3 and the Dragon.

Ethernet Jack LED		
Amber Link Light	On	Cable is connected to a device (the computer).
	Off	No connection - bad cable or Ethernet disabled on computer.
Green Data Light	Flashing	Ethernet connected.

10.17 Running Warp 9 Utility

If the ESS board is waiting for communications and Amber Link Light is on, the Ethernet port on the computer needs to be configured for use. Typically the software will display a wakeup error message that reads: “The ESS did not respond to the wakeup message. If this is a new profile, you will need to enter an IP address. Is your ESS powered and connected?”

Select YES to try connecting again, click NO to enter a new IP address, or click CANCEL to stop trying to connect to the ESS.

If the Warp 9 scu tool needs to be run, on the Dragon computer go to C:\2020SSI\Bend-Tech 7X\mach.

Click on warp9_scu_tool.

The computer will ask if changes are allowed to be made to the computer. Click YES.

Click Start PC Configuration.

Note

This process does not always work as expected. If problems persist, contact Bend-Tech Support.

10.18 Mach3 Lost Communications while Operating

Problem	Cause
Mach3 Lost Communications	Bad Ethernet cable.
	Bad connection at either end of the Ethernet cable.
	Ethernet cable routed too close to the Torch lead or other electrical cables.
	Torch ground is loose at the Trolley or alligator clamp.

In some situations the Smooth-Stepper will lose communication with the computer. A message window will appear that says, “The Smooth-Stepper has failed to communicate properly for an extended amount of time.” The message will ask to exit Mach3 then cycle power on the Smooth-Stepper.”

It will also read, “If you unplugged the USB cable while Mach was still running, then that is

likely the cause."

Note

This message will also appear if the Dragon machine was powered down and the Bend-Tech Dragon software was closed out, but Mach3 was left open. When the Dragon machine is powered up the computer will display this message.

10.19 Other Mach3 Errors

10.19.1 Invalid Bootloader Signature

When Mach3 displays this error it means it has not been able to communicate with the ESS correctly. In the case of an Invalid Bootloader Signature message, close Mach3, cycle power to the ESS off, then back on. Restart Mach3.

10.19.2 CryptoMemory Error

On rare occasions Mach3 will display an error that reads, "The CryptoMemory did not provide a valid authorization." This error indicates the ESS board is not functioning properly. Check power at the green connector on the ESS board. It should show 5VDC with no ripple. Check for ripple by changing the meter to AC volts. If power is good it is likely a bad ESS board.

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