**BEND·TECH**

# DRAGON A400

## Maintenance & Troubleshooting
### Part 2: Mach3 & Bend-Tech Dragon Software
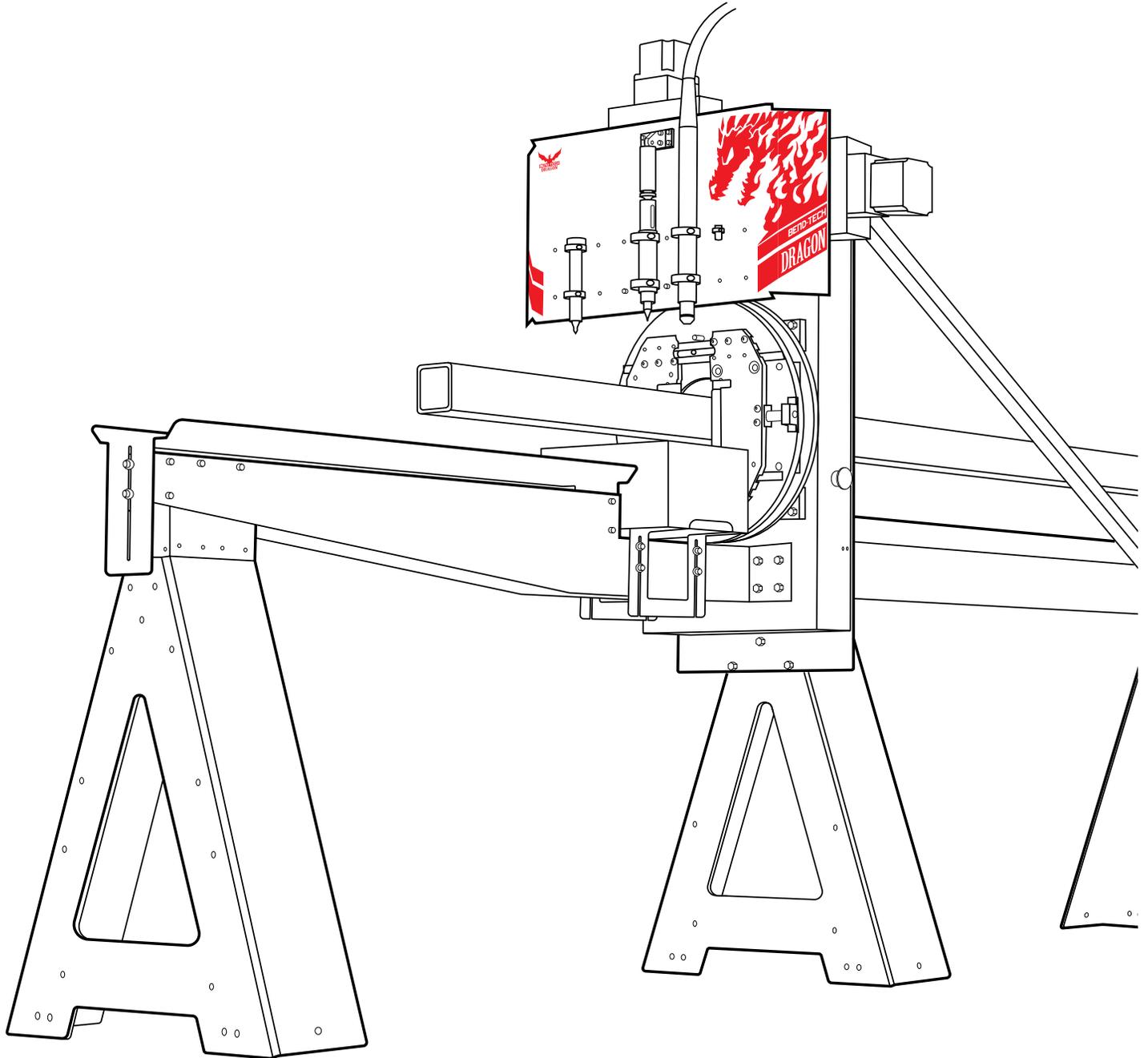
# Dragon A400

## Maintenance & Troubleshooting
Version 2


English
Original Instructions


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# Diagnostics in Mach3

### Mach 3 License Data

The Operator can find Mach3 license data in the upper left corner of the Mach3 interface. This license data is used by Bend-Tech Support to help troubleshoot the Dragon A400 from the Bend-Tech Service Center.

### Coordinating Dragon A400 Designations With Mach3

In some cases it may be necessary to coordinate the Dragon A400 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 A400 programming, the "- -" designations in Mach3 are considered home.

> *When homing the Dragon A400, when the green Home symbol lights up it should briefly light up the corresponding M Home designation in Mach 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 - |

## Testing Homing Sensors in Mach3

In Mach 3, in the Diagnostics interface, if an Axis is triggered it will light up its corresponding box and limit designation. The Operator can determine if a sensor is functioning by placing 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, the Operator can check Mach3. If a designation is lit up when it should not be it is an indication of a problem with an Axis sensor or cable.

## Jogging With Mach3

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

# Mach3 Troubleshooting

| Symptom | Cause | Corrective Action |
|---|---|---|
| Limits 3, 4, and 5 triggered in Mach3 and emergency mode was activated | E-Stop 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. |
| "Emergency" box flashing red, machine unable to Home | E-stop triggered. | Check E-stop switches. |

# Reviewing G-Code in Mach3

While Bend-Tech 7x displays G-code in the Nesting feature, it may be necessary for the Operator to review G-code in Mach 3 to determine where a project may have stopped due to Torch failure or similar, 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. The Operator can determine the line number where the project failed and compare to Bend-Tech 7x.

# Prioritizing Mach3 On The Computer

All new Dragon A400 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 A400 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.

# Opening Mach3
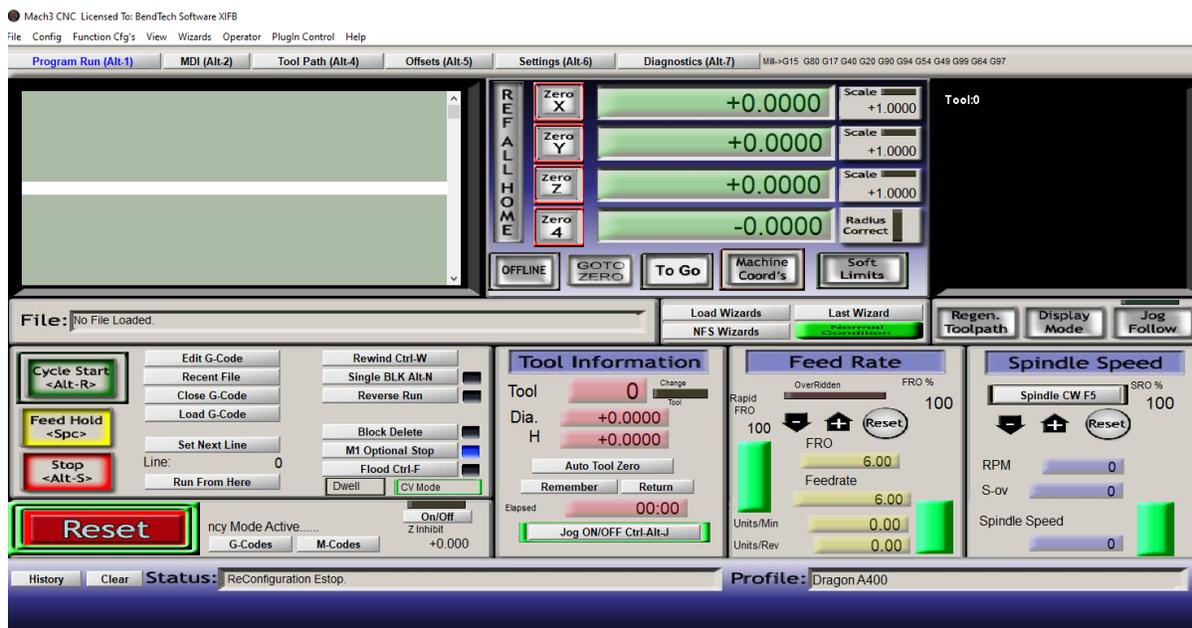


When powering up the Dragon A400 and its operational software, it is critical to follow the correct order of operations. The Operator may encounter a situation where Mach3 was minimized on the computer screen and the machine was shut down without closing out of Mach3. If the machine is re-started with Mach3 still open, a number of connectivity-associated error messages and problems will occur.

| Dragon A400 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<br>When opening Machine Control the machine will always show "Machine Disabled - Press Here To Enable Machine." |

# Jogging In Mach3
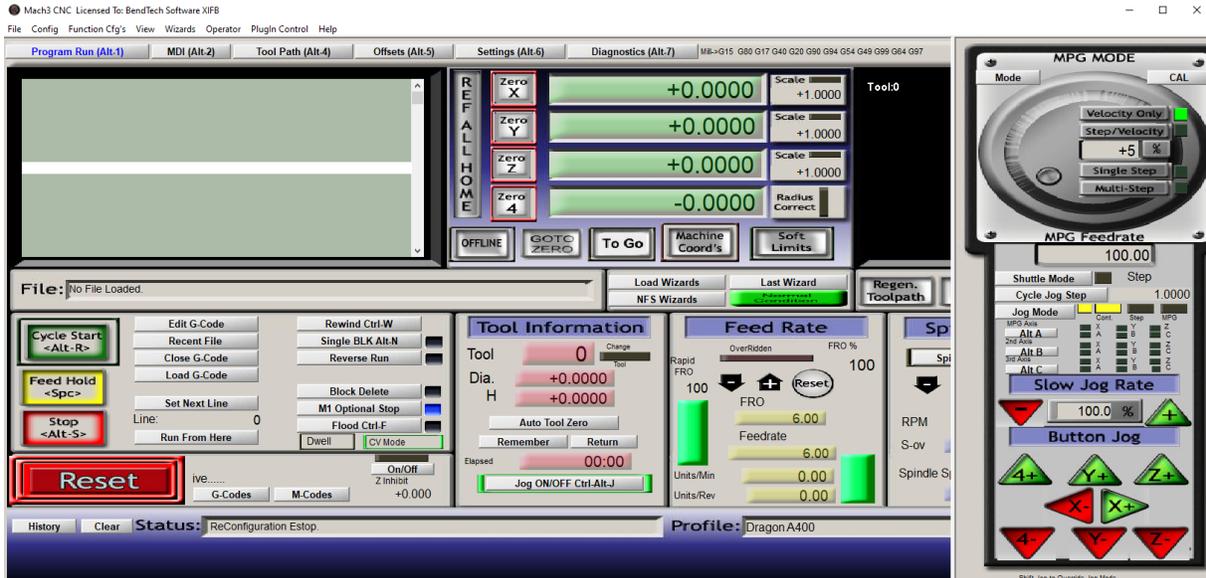


The Operator can access jog controls within any Mach3 interface by pressing the Tab button on the keyboard. The Operator can jog the X, Y, Z and A Axes within Mach3. Press the Tab key again to close out of the jog control interface.

*The "A" axis is labeled "4" in the Mach3 jog controls interface.*

## Jogging During Calibration

If the Dragon A400 is performing its calibration process, the Operator will not be able to access the Machine Control interface. If the Operator needs to jog the machine during the calibration process this can be done within Mach3. 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.

## Jogging Between Projects

When a job is created and the Operator clicks Run Project, 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 is expecting the Operator to create a new Nesting Project and press Run Project again. The machine is waiting to receive information on the new material length before it will move. The software does not anticipate the Operator requiring ability to jog the machine for any reason.

However, if the Operator needs to jog the machine, it can be accomplished by going into Mach3 and clicking Reset, then clicking Reset a second time.

The first time the Operator clicks Reset the Status window will display a message reading "External E-Stop Requested."

The second time the Operator clicks Reset the Status window will display a message reading "Initialization Macro Called on Reset."

At this point the Operator can go back into the Dragon Machine Controls and jog the machine without losing Home.

If the Operator Resets the machine and jogs it, then chooses to click Run Project the machine will default to machine positions that coincide with the material setup length originally entered in the Nesting Project.
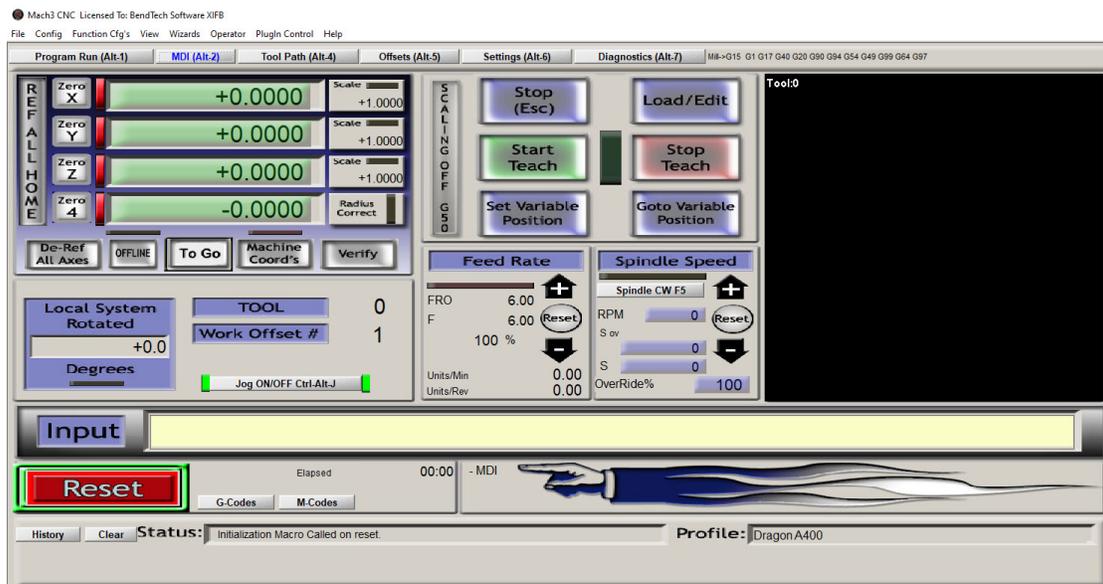
# Determining Machine Status in Mach3



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.

# MDI (Alt-2) Tab

## Input Text Box



In the Input text box the Operator can enter an M code to tell the machine to perform an operation. For example, if there is a problem with the Torch, the Operator can enter the M code to fire the Torch to determine if it is a problem with the plasma unit, the machine or software.

# Diagnostics (Alt-7)

## External Signals

In the Diagnostics interface Mach3 will display if a limit switch has been triggered by lighting up an input indicator yellow. It will also indicate if outputs such as the Torch or Engraver are active by lighting those up red.

A limit switch or e-stop can cause the machine to disable. Checking the input signals in Mach3 can tell the Operator 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.
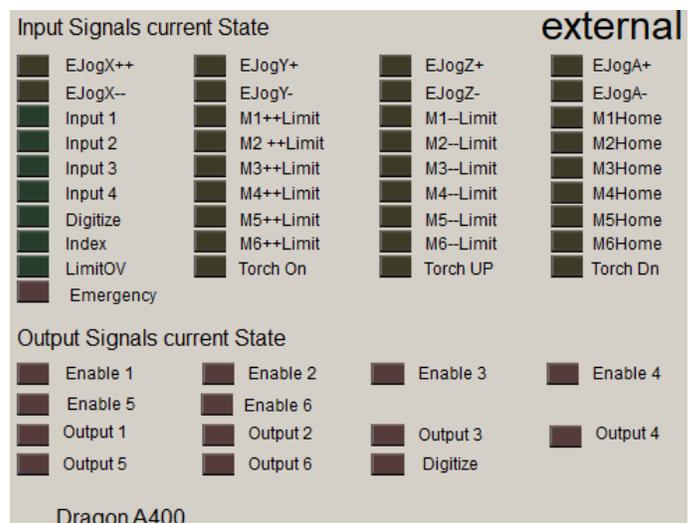
If the machine is in Emergency mode, the Emergency light will be red in Mach3. This will happen when the machine receives the wrong input and/or output signal(s).

# Ports and Pins
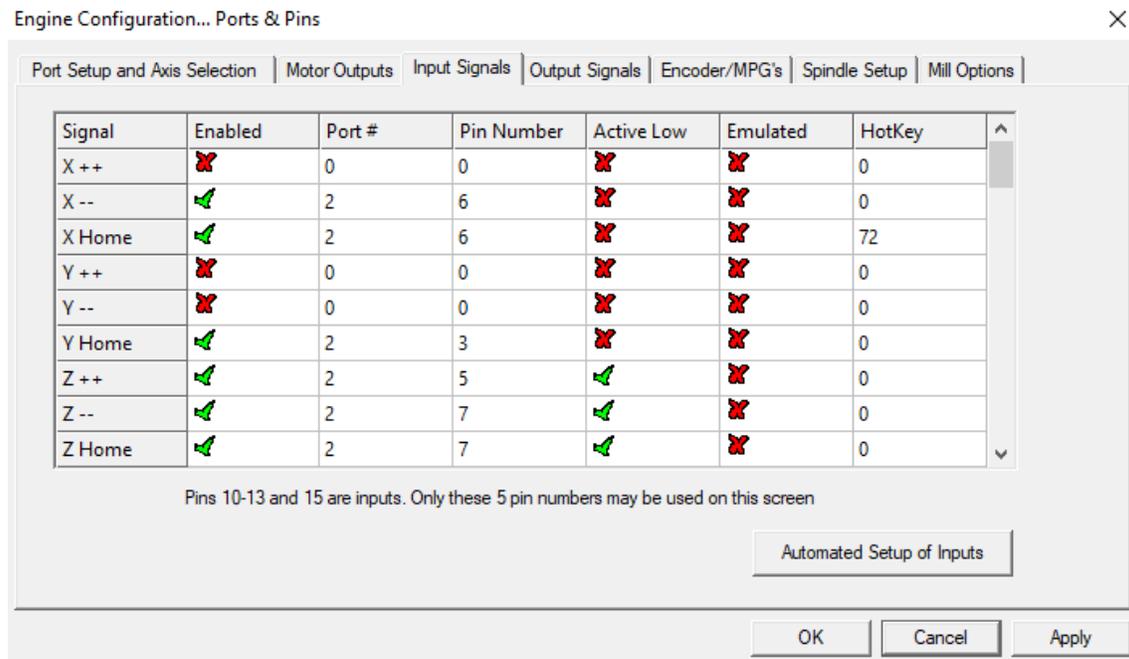


In the Config dropdown menu, the Operator can click Ports and Pins, then click the Input Signals tab to view input signals for all Axes as well as E-stop.

Bend-Tech uses three different versions 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 the Operator reconfigure 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 Operator may need to disable a limit switch signal in order to keep a machine running or diagnose a problem. To do this, the Operator can click on the red X or green check mark to either enable or disable a given limit switch. Click OK. Click Apply.

# Limit Switch Is Triggered In Mach3

| History | Clear | **Status:** | ReConfiguration Estop. |
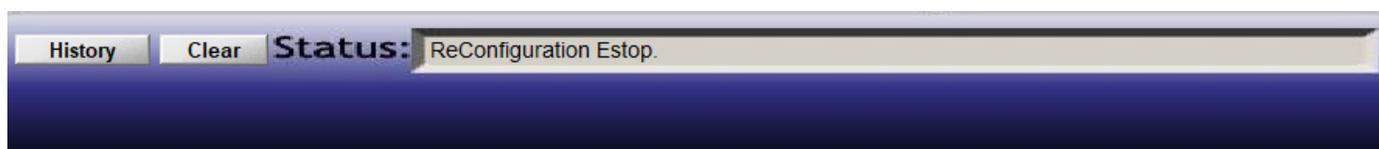
If there is an unknown problem with the machine, the Operator can go to Mach3 > Program Run and check the Status text box. The Status text box will display if a limit switch or E-stop is triggered. Operator can then go into Diagnostics and determine which limit switch is lit up and/ or check E-stop switches on the machine.

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

If the limit switch keeps triggering after Homing the machine, the Operator can click the Config dropdown 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.

The Operator can then try to enable the machine and Home the machine with the limit switch disabled. If successful, the machine can continue being used.

# Leaving Mach3 Open

A common issue regarding Mach 3 occurs when the Operator minimizes the Mach3 interface on the computer and at the end of the day shuts down Bend-Tech Dragon software and the Dragon machine while leaving Mach3 running.

Upon booting up the computer, a message window will pop up saying the Ethernet Smoothstepper has failed to communicate for an extended period of time. Click OK.

If the Operator turns on the Main Power Switch and green button on the Control Box, the machine will boot up normally. When the Operator clicks Machine Control, the control interface will display Machine Disabled as it normally does, but when the Operator clicks the button the machine will not enable. A message will appear that reads "Unable to bring the machine out of an emergency state."

If the Operator clicks into Mach3, it will show a blinking red Emergency light in Diagnostics.

The Operator will not be able to Reset the machine through Mach3 in Emergency state.

At this point the Operator has determined that Mach3 is not connected to the machine. The solution is to close out of all software and turn the Main Power Switch off on the Dragon machine, then restart in the proper order.

# Diagnosing an E-Stop in Mach3

If the machine is non-responsive because it has been disabled, the Operator can 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 the Operator should check all E-stop buttons to ensure none are triggered. If an E-stop is triggered, pull the switch back out, click Reset in Mach3 and the machine will be enabled.

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

# Calculating Run Time In Mach3

The Operator can calculate how much time it will take to run a given job within Mach3.

With a job G-code loaded and ready to run, Click the Tool Path tab in Mach 3. Under the G-code display click the Simulate Program Run tab. A time will appear next to Estimated Program Run Time.

# 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 for the Operator 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.

*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.*

## Editing the Macro

If the Torch fails to initialize the G-code will default to the beginning of the job in Mach3. Before the Operator can perform the process for 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, click the Macros folder, Click Dragon A400. 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 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.

## Restarting the Job

Once the Torch issue is resolved, the Operator can begin the process of restarting 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."
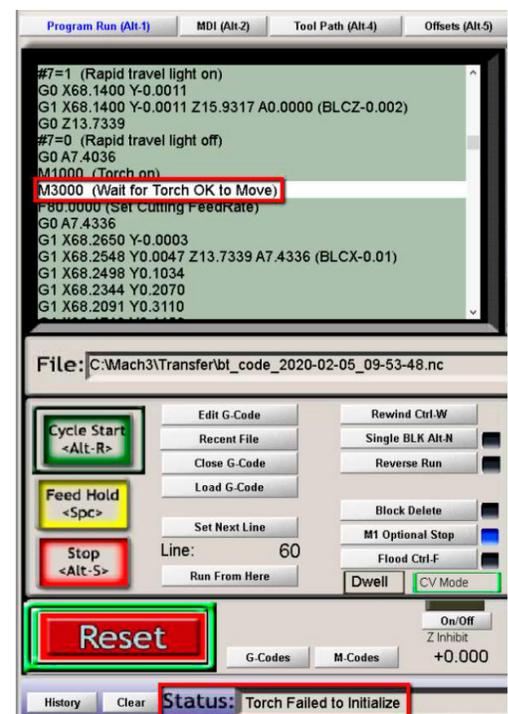
In the G-code display, click the up arrow on the right-hand side of the display twice to move the command line back two steps in the code. This is the command to lower the Torch to the cutting position.
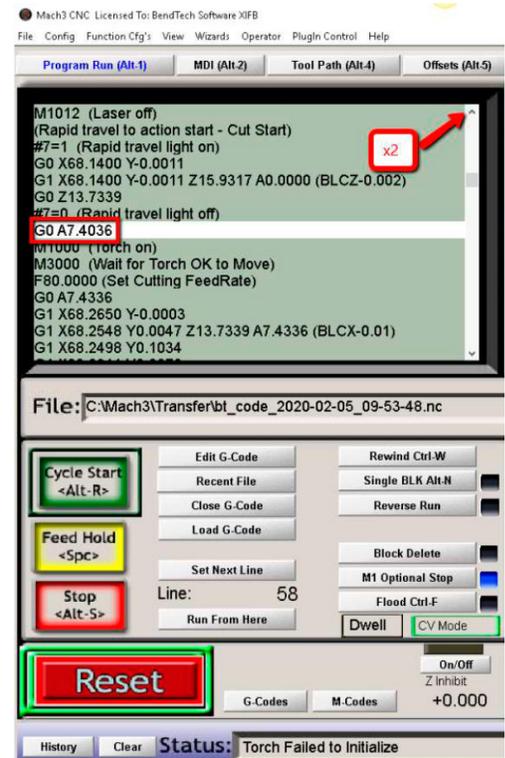
Click "Set Next Line." The Status message will now read "Press CycleStart for preparation move."
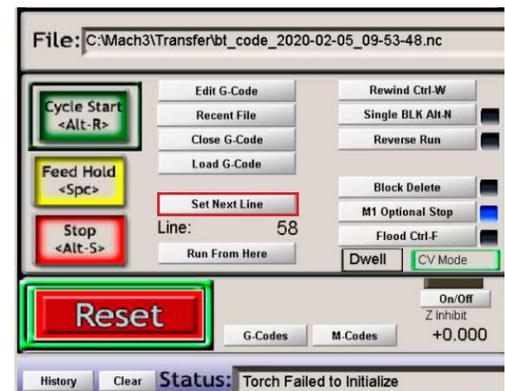


Click the green Cycle Start icon. A Preparation Positioning window will appear. Click OK. The job will proceed from the Torch initialization position.
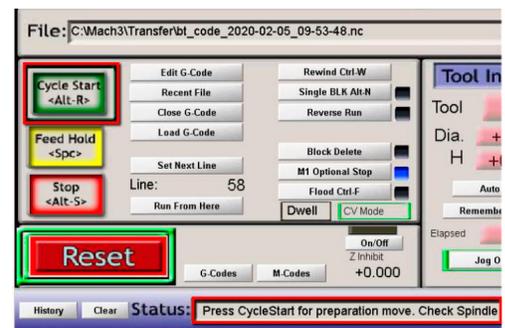
# Using Mach3 To Diagnose Sensor, Cable and Control Box Problems

If an Axis on the Dragon A400 is not homing properly, it is possible for the Operator to diagnose the problem using Mach3. Within Mach3 the Operator can determine if there is a cable, sensor, or Control Box issue.

## Diagnosing a Sensor Issue

The Operator can diagnose a sensor issue using Mach3 to monitor the Input Signals in the Diagnostics interface. If an Axis is not homing properly the Operator can 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, the Operator can use the following troubleshooting process to determin the issue.

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

## Checking the Control Box

To eliminate the Control Box as the issue, the Operator can 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.

*The Operator can swap sensor cables without powering down the Dragon A400. However, motor cables should not be swapped without powering down the machine.*

## Checking Sensors

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 indicates there is a problem with the sensor.

## 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 the behavior of these status lights can help the Operator diagnose connection problems between Mach3 and the DragonA400.

| 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 |



Plastic jumper on the BootP pins (JP1)
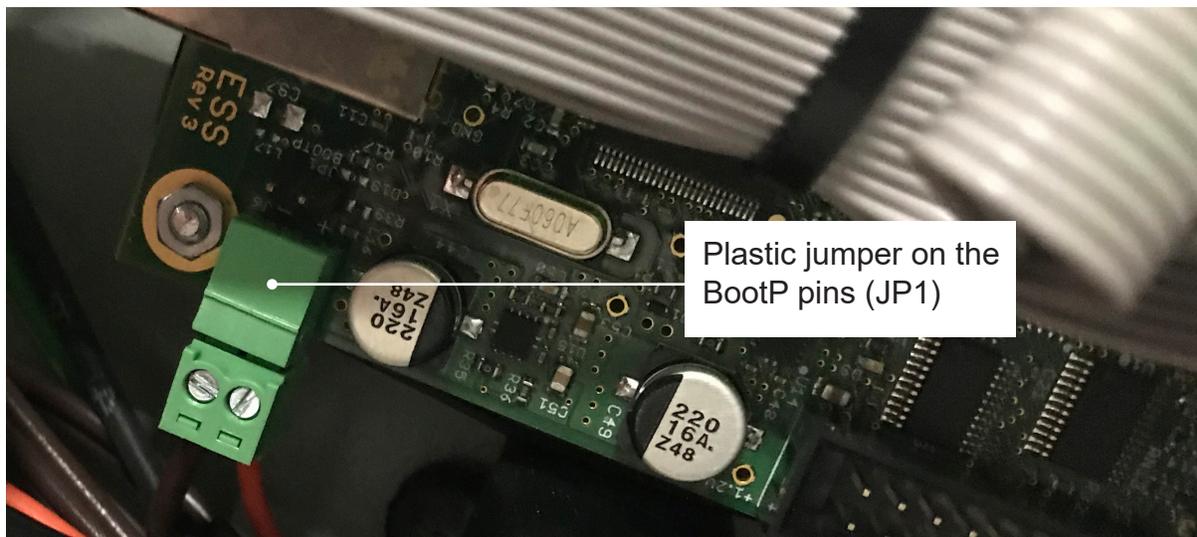
## Ethernet Jack LED Lights

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 DragonA400.

| 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. |

# 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?"

At this point the Operator can choose to click 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 Operator is required to run the Warp 9 scu tool, on the Dragon A400 computer go to C:\2020SSI\Bend-Tech 7X\mach

Click on warp9_scu_tool

The computer will ask the Operator to allow changes to be made to the computer. Click Yes.

Click Start PC Configuration.

# Mach3 Lost Communications While Operating

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

It will also read, "If you unplugged the USB cable while Mach was still running, then that is likely the cause."

| 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. |

*This message will also appear if the Dragon machine was powered down and 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.*

# Other Mach3 Errors

## 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.

## 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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