APPENDIX C: SYSTEM CALIBRATION

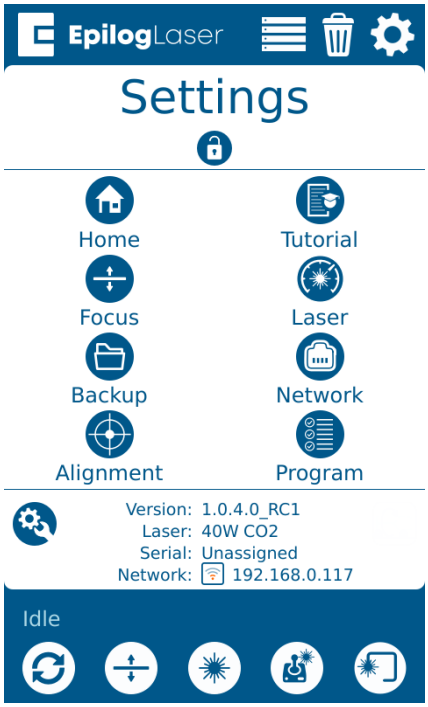
Camera Calibration

Note: Camera calibration on the Fusion Pro & Fusion Edge is only necessary if recommended by Epilog's Technical Support.

Note: Before beginning, reboot your machine if you have recently run any jobs.

Note: For the Fusion Pro you will use the calibration mat that came with your machine for this process. For the Fusion Edge you will use a 24" x 12" piece of anodized aluminum.

1. Click the **Settings** button to enter the Settings menu.

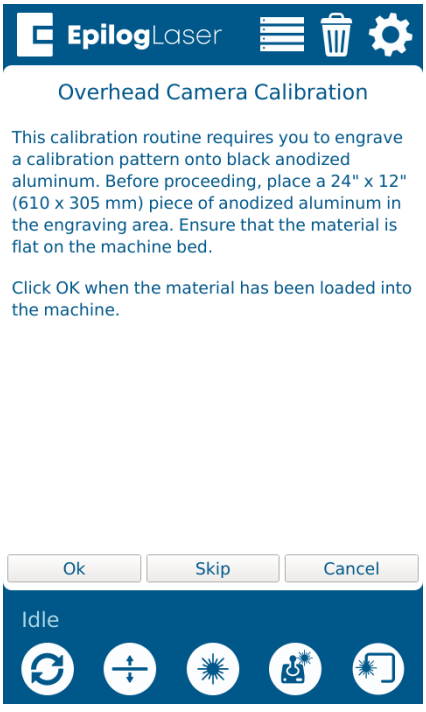


2. Long Press the **"Settings"** text for 5 seconds to enter the Advanced Settings Menu.

3. Click on **"Calibrate Cameras"** to enter the Camera Calibration menu.

4. While the machine is Idle, follow the prompt, and begin the calibration routine by selecting **"Ok"**.

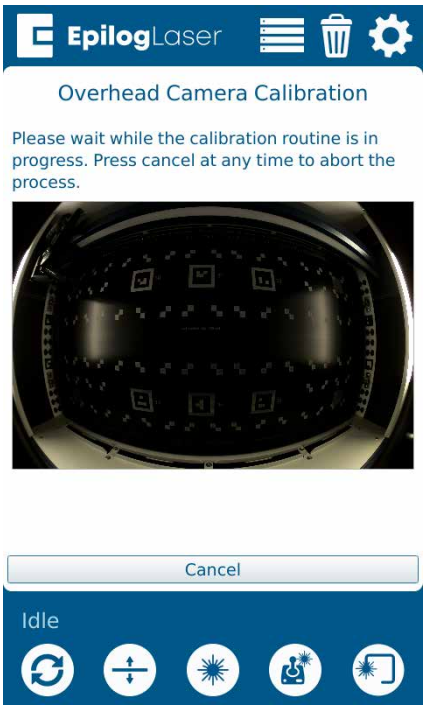
- If your machine is a Fusion Pro, you will place your calibration mat on the table at this time.
- If your machine is a Fusion Edge, you will place a piece of anodized aluminum on the table at this time.



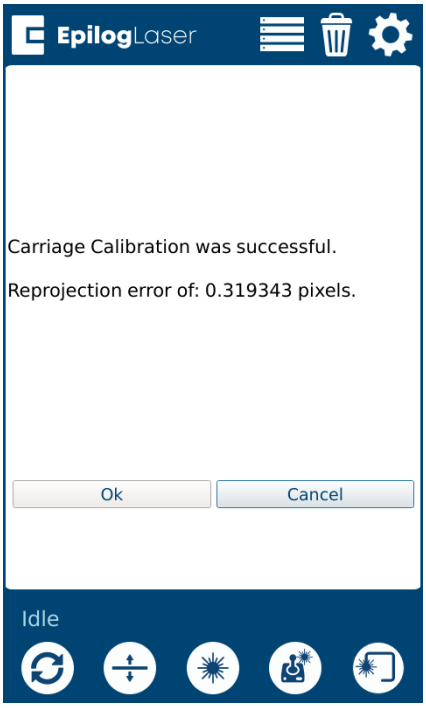
5. Follow the prompt and close the top door of the engraver.

- If you are calibrating on a Fusion Edge, once **"OK"** is pressed the laser will start engraving the calibration pattern. The engraver will automatically focus to the 0.635mm thickness of the anodized aluminum, the engrave a calibration pattern.
- If you are calibrating on a Fusion Pro, the camera will begin taking pictures of the calibration mat.

6. Allow the job to run until completion.
7. Once the job has finished engraving (Fusion Edge only), the camera at the laser head will take pictures of the engraving to calibrate itself. This process takes several minutes.



8. Once the calibration has successfully finished, a dialog will appear. The “Reprojection error” will be listed and is used to determine the quality of the calibration. The lower the value, the better. If the reprojection error is above 2.0, the user will see an error “Calibration unsuccessful. Error too high”. A value of 0.6 or lower is desired.



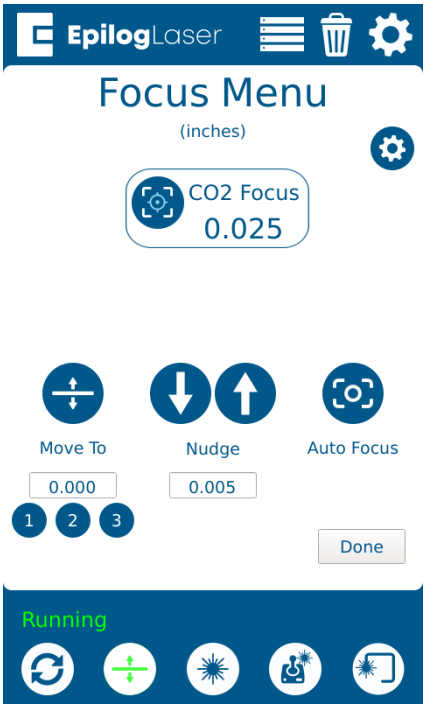
Calibrating the Auto Focus

Calibrating CO2 Focus

Note: These steps will walk you through calibrating the auto focus of a Fusion Pro or Fusion Edge with a CO2 laser only. For information on calibrating a Fiber or Dual Source Fusion Pro, **see “Calibrating Dual Source Focus” on page 271.**

1. Run a test job with a piece of anodized aluminum. Set up a small solid square as your artwork and run the job with high speed and low power settings.

2. Once the job is running, press the Focus Menu button on the touch screen, and slightly raise and lower the table with the joystick while keeping an eye on the spark coming from the laser hitting the anodized aluminum.



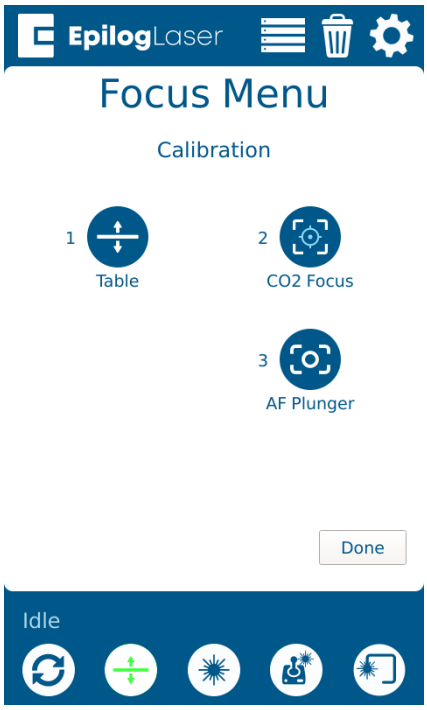
3. While raising the table up and down, find the height where the spark appears the brightest. If it’s difficult to tell, turn off any overhead lights in the room.

4. Once you've found the brightest spark, let go of the joystick and press the Go/Stop button to stop the job. Then press the "Reset" button to return the laser head back to its home position.

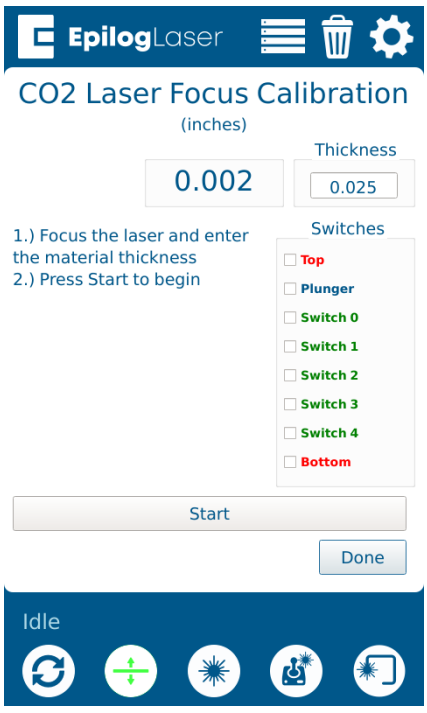
5. Remove the material from the engraving bed.

6. Press the Settings button, and then long press the "Settings" text until the Advanced Settings menu appears.

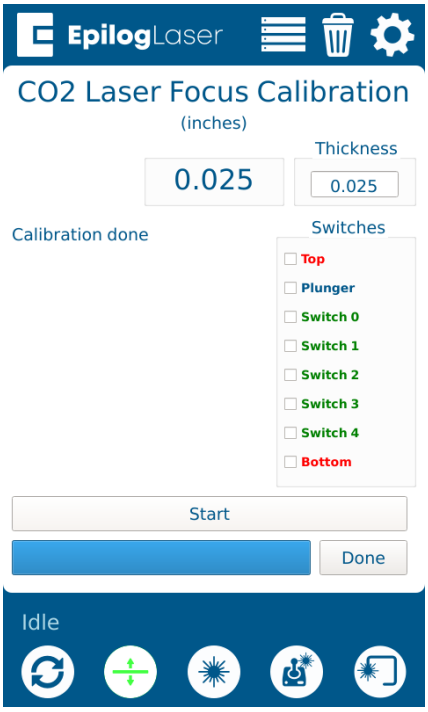
7. Select "Focus Commands" from the menu. Then select "CO2 Focus".



8. Select "Calibrate CO2 Focus". Ensure the material thickness used during calibration is entered in the Thickness text box (The default of 0.025" corresponds to the supplied anodized aluminum). Press "Start".



9. Once the calibration is complete, press "Done."



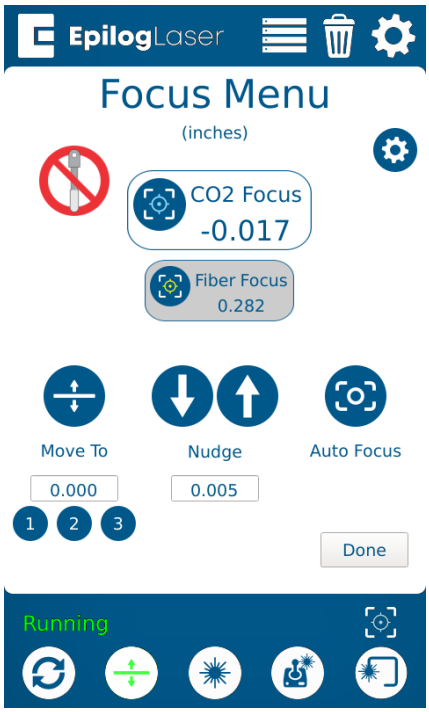
10. The CO2 auto focus should now be calibrated properly, and you will now need to calibrate the Auto Focus Plunger. See **"Calibrating the Auto Focus Plunger" on page 275.**

Calibrating Dual Source Focus

Note: These steps will walk you through calibrating the auto focus of a Fusion Pro with a fiber or Dual Source laser only. If you only have a fiber laser, follow steps 1-8, and then follow the steps to **"Calibrating the Auto Focus Plunger" on page 275.**

1. Run a test job with a piece of anodized aluminum. Set up a small solid square as your artwork and run the job as a **Fiber** process with high speed and low power settings. With a lower power setting it will be easier to find the correct focus.

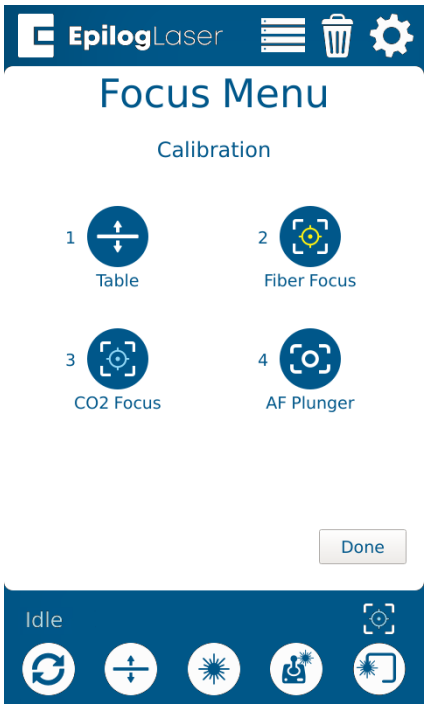
2. Once the job is running, press the Focus Menu button on the touch screen, and slightly raise and lower the table with the joystick while keeping an eye on the spark coming from the laser hitting the anodized aluminum.



3. While raising the table up and down, find the height where the spark appears the brightest. If it's difficult to tell, turn off any overhead lights in the room.

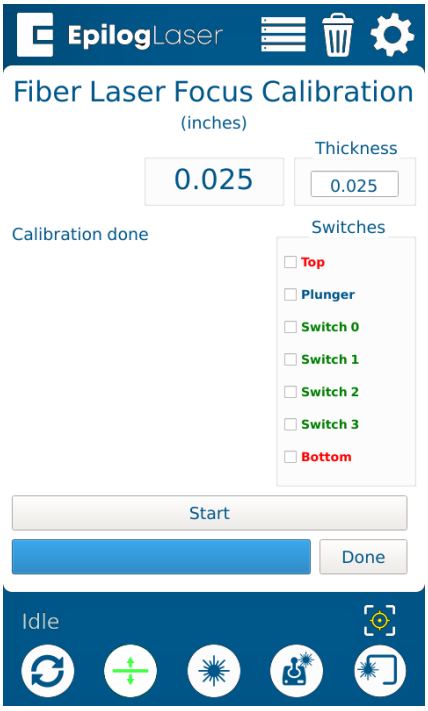
4. Once you've found the brightest spark, let go of the joystick and press the reset button to stop the job.
5. Remove the material from the engraving bed.
6. Press the Settings button, and then long-press the "Settings" text until the Advanced Settings menu appears.

7. Select "Focus Commands" from the menu.

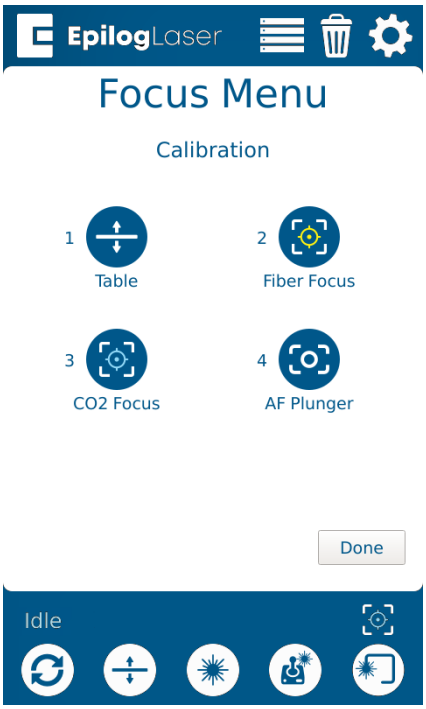


8. Select "Fiber Focus".

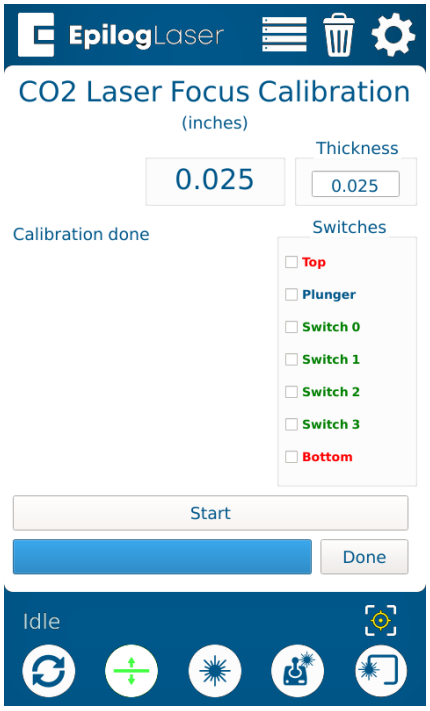
Ensure the material thickness used during calibration is entered in the Thickness text box (The default of 0.025" corresponds to the supplied anodized aluminum). Press "Start" to calibrate, and then press "Done" when completed.



9. Back at the Focus Commands menu, select “CO2 Focus”. This will reset the CO2 focus height, allowing proper CO2 focus adjustment in the following steps.

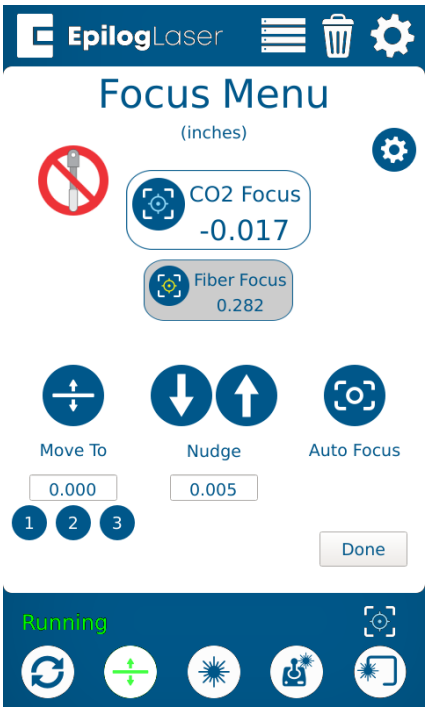


10. Press “Start” to calibrate, and then press “Done” when completed.



11. Now run another test job on the anodized aluminum, using the same square artwork, but this time make the process a **CO2** job in the Dashboard. Use low power and high speed settings.

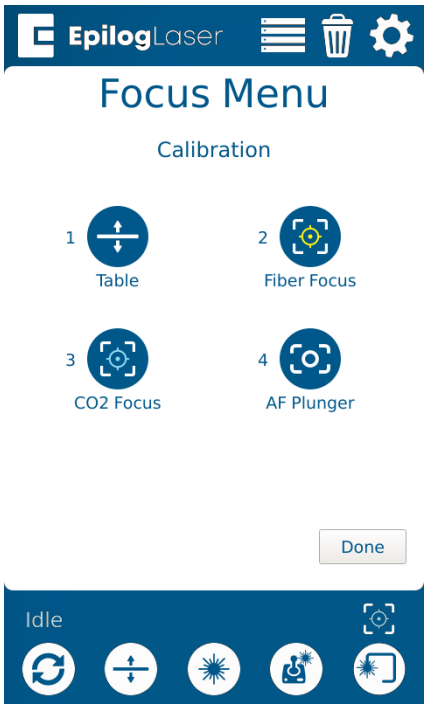
12. Once the job is running, press the Focus Menu button on the touch screen, and slightly raise and lower the table with the joystick while keeping an eye on the spark coming from the laser hitting the anodized aluminum.



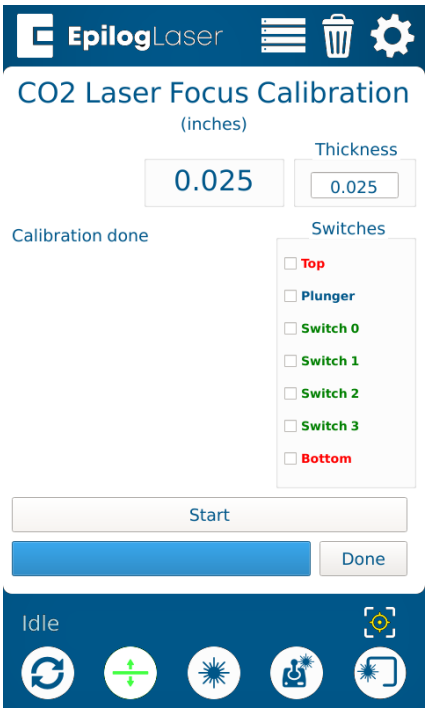
13. While raising the table up and down, find the height where the spark appears the brightest. If it’s difficult to tell, turn off any overhead lights in the room.

14. Once you’ve found the brightest spark, let go of the joystick and press the reset button to stop the job.

15. Return to the Focus Commands menu, select “CO2 Focus”.



16. Press “Start” to calibrate, and then press “Done” when completed.



17. Both the Fiber and CO2 lasers should now be calibrated. After completing these steps, you will need to calibrate the Auto Focus Plunger. See **“Calibrating the Auto Focus Plunger” on page 275.**

Calibrating the Auto Focus Plunger

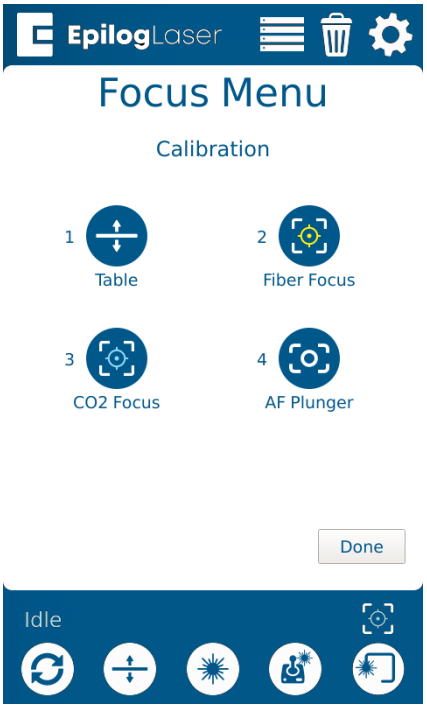
1. Before beginning, engrave a job to ensure that the material is in focus on the table. We recommend using a piece of anodized aluminum, but any flat material should work.

Note: The Task Plate must be in the machine, you can **NOT** calibrate the Auto Focus Plunger using the Slat Table or the Vector Cutting Grid.

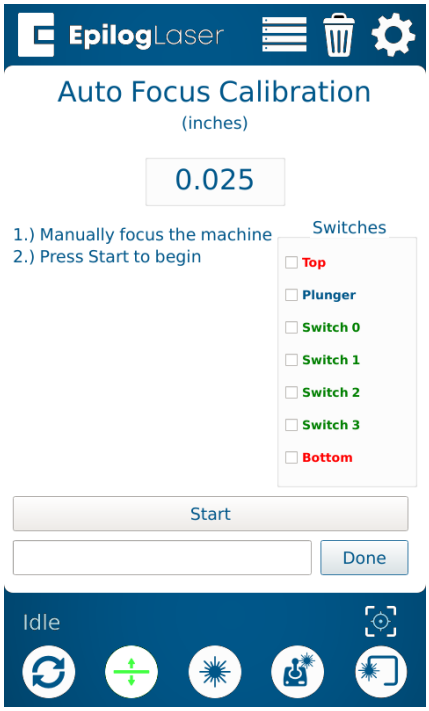
2. Leave the material on the table once it is in focus. Turn on the red dot pointer and jog the laser head til the red dot is centered on the material.

3. Press the Settings button, and then long-press the “Settings” text until the Advanced Settings menu appears.

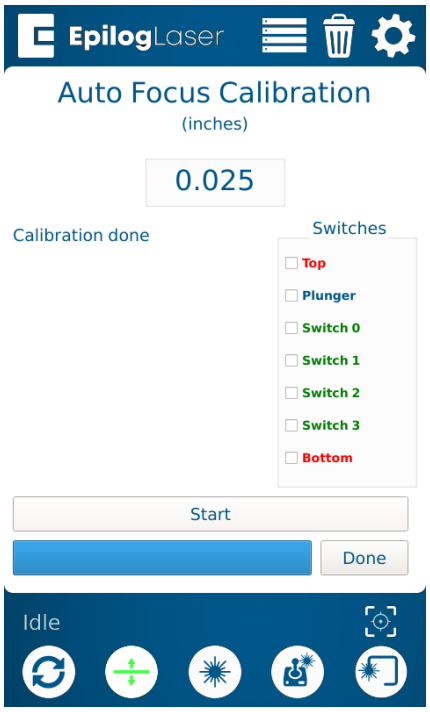
4. Select “Focus Commands” from the menu.



5. Select “AF Plunger” and then press “Start”. The plunger will automatically move down to the table surface and calibrate the focus plunger.



6. Once the calibration is complete, press "Done".



7. The Auto Focus Plunger calibration should now be complete.

Machine Settings:

- **Acceleration Match Offset [cnts]**
  - Number of encoder counts to delay firing laser when accelerating. Used for raster quality adjustments
- **Deceleration Match Offset [cnts]**
  - Number of encoder counts to delay firing laser when decelerating. Used for raster quality adjustments
- **Bed Margins [in]**
  - The margins around the bed, in inches that the carriage can travel to.
  - Format is as follows: TOP,LEFT,BOTTOM,RIGHT
- **Bed Size [in]**
  - The size of the bed in the machine in inches
  - Format is as follows: WIDTH,HEIGHT
  - Requires "Home Axis" to take effect
- **Disable Table Homing**
  - Setting to disable homing the table when the machine boots. For optimal operation, leave this at a value of 0
  - A value of 1 will disable table homing
  - Will take effect after reboot
- **Rotary Encoder [cnts/in]**
  - The number of encoder counts per inch of travel for the rotary device
  - Requires "Home Axis" to take effect
- **X Axis Encoder [cnts/in]**
  - The number of encoder counter per inch of travel for the X Axis
  - Requires "Home Axis" to take effect
  - Must recalibrate cameras if this changes
- **Y Axis Encoder [cnts/in]**
  - The number of encoder counter per inch of travel for the Y Axis
  - Requires "Home Axis" to take effect
  - Must recalibrate cameras if this changes
- **Home Offset [in]**
  - The offset of the table origin, relative to the X and Y limit switches
  - Requires "Park Axis" to take effect
  - Must recalibrate cameras if this changes

- **Joystick Center X**
  - The center X position of the joystick, in joystick units
- **Joystick Center Y**
  - The center Y position of the joystick, in joystick units
- **Joystick Deadzone [%/100]**
  - The percentage of dead zone around the center of the joystick
- **Joystick Limit X**
  - The MIN and MAX limits for the X axis of the joystick, in joystick units
  - Format is as follows: MIN,MAX
- **Joystick Limit Y**
  - The MIN and MAX limits for the Y axis of the joystick, in joystick units
  - Format is as follows: MIN,MAX
- **Laser Match [cnts]**
  - Adjustment to synchronize left to right and right to left raster lines. Units are in number of encoder counts
- **Laser Match Offset [cnts]**
  - Offset of the raster data in X. Used to align raster and vector if needed. Units are in number of encoder counts
- **Velocity Match Offset [cnts]**
  - Offset of the raster data proportional to velocity. Units are in number of encoder counts
- **Park Position [in]**
  - The position in inches to park the laser head when the machine is idle
  - Requires “Park Axis” to take effect
- **Plunger Offset [cnts]**
  - The number of table encoder counts from the laser zero focus position, to the auto focus plunger
- **Rotary Offset [in]**
  - The offset of the rotary origin, relative to the X and Y limit switches
- **Rotary Table Height [in]**
  - The distance in inches to clear the rotary device
- **Scale [mm/in]**
  - A scale factor to adjust the scale of the X and Y axis
  - Format is as follows: X,Y
  - Requires “Home Axis” to take effect
  - Must recalibrate cameras if this changes
- **Table Switch Locations [cnts]**
  - A list of the locations in which the table switches were located
- **Table Current [A]**
  - The current in Amps to run the table drive
- **Table Resolution [cnts/in]**
  - The number of encoder counts per inch of travel for the table
  - Must “Home Table” if this value is changed
- **CO2 Tickle Duration [us]**
  - The duration of the laser tickle pulse in microseconds
- **CO2 Tickle Frequency [Hz]**
  - The frequency of the laser tickle pulse in hertz
- **CO2 Tickle Holdoff [us]**
  - The duration in which the laser tickle is stalled after a laser pulse in microseconds
- **CO2 Pulse Stretch [us]**
  - The amount to stretch all laser pulses in microseconds
- **Table Focus Offset [cnts]**
  - The distance in table encoder counts from the top crash switch, to the laser focus position
- **RHS Y Skew [cnts]**
  - The number of encoder counts to skew the right hand side of the Y axis after homing
  - Requires “Home Axis” to take effect
- **Air Assist Delay [s]**
  - The number of seconds to delay turning ON and turning OFF the air assist before and after a job finished
  - Format is as follows: ON,OFF