TACTILE FOOT

AN OPERATION SUPPLEMENT MANUAL FOR

CINCINNATI CNC LASER SYSTEMS

CINCINNATI®

CINCINNATI INCORPORATED
CINCINNATI, OHIO 45211

EM-563 (N-07-17)

MANUAL GUIDE

To get the maximum benefit of your new CINCINNATI INCORPORATED machine, read this manual thoroughly and refer to it often for guidance and information.

SIGNAL ICONS

This manual contains important icons that are associated with a signal word like “Danger,” or “Warning,” or “Note”. The icon and/or signal word indicate the severity of the condition or situation. Be sure to read these statements and take special care to follow the instructions.

SIGNAL WORD	DESCRIPTION	ICON
DANGER	Means that there is a condition or situation that will cause death or severe injury if you do not follow the instructions given.	
WARNING	Means that there is a condition or situation that will cause moderate injury if you do not follow the instructions given.	
CAUTION	Means that minor injury or machine damage could occur if you do not follow the instructions given. You may also have to start a procedure over if you do not follow the instructions in a caution statement.	
IMPORTANT	Means that the text gives additional information that must be followed for safety of other significant reason.	
NOTE	Means that the text gives additional information, clarification, or helpful hints.	

TACTILE FOOT

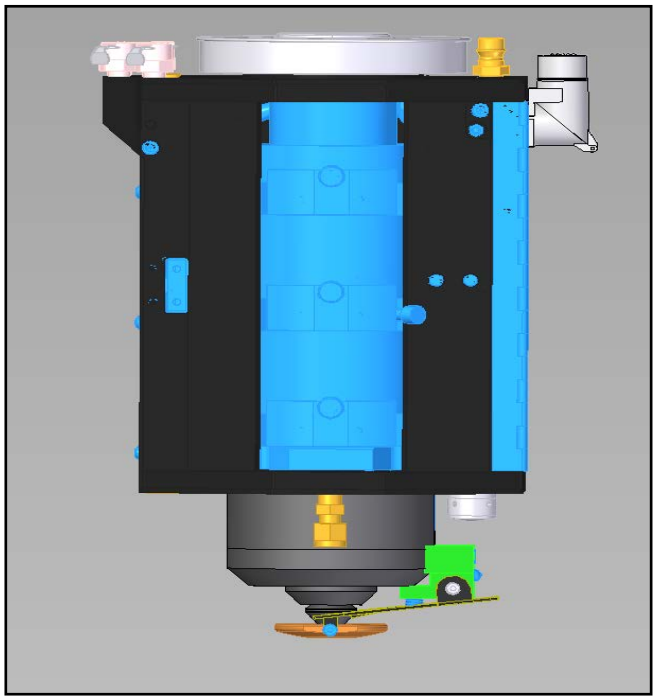
The Tactile Foot option allows the Laser System to cut materials such as wood, plastic, fabric and light gauge metals with the autofocus cutting head. This option uses the CINCINNATI INCORPORATED Height Sensing System (HSS).

The CINCINNATI INCORPORATED Height Sensing System is a capacitive sensor. A capacitive sensor has two electrodes with an AC signal across them. One electrode (the workpiece) is at neutral and the other electrode (the nozzle tip) has a charge. The sensor measures the charge and converts it into a voltage. If the distance between the electrodes changes, the voltage changes to accurately indicate the nozzle tip height above the workpiece surface. The Z-axis CNC responds to the voltage and moves the nozzle tip up or down to maintain the target standoff.

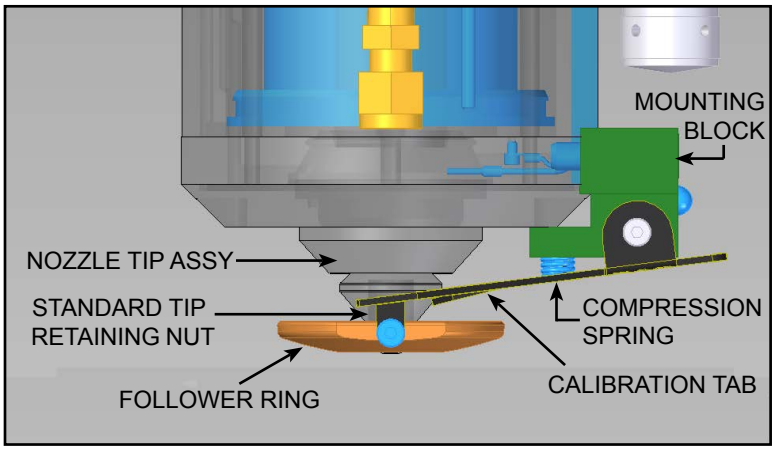
When cutting with the tactile foot, the follower ring is the neutral electrode of the sensor. The sensor measures the capacitance between the follower ring and the standard nut. The Standard Nozzle Retainer Nut is used because the device does not function with the High capacity Tip Nut. Since the follower ring rides on the workpiece surface, if the elevation of the workpiece surface changes, the follower ring moves up or down, changing the capacitance. The sensor measures the capacitance change and the CNC compensates the Z-axis position to maintain the target nozzle tip standoff. In addition, the follower ring applies a downward force to help keep the material flat on the pallet and prevent the flutter that sometimes occurs when cutting thin materials.

HARDWARE

AUTOFOCUS HEAD



NOTE: COVER NOT SHOWN FOR CLARITY



TACTILE FOOT (CLOSE-UP)

FIGURE 1: Autofocus Head with Tactile Foot

TACTILE FOOT

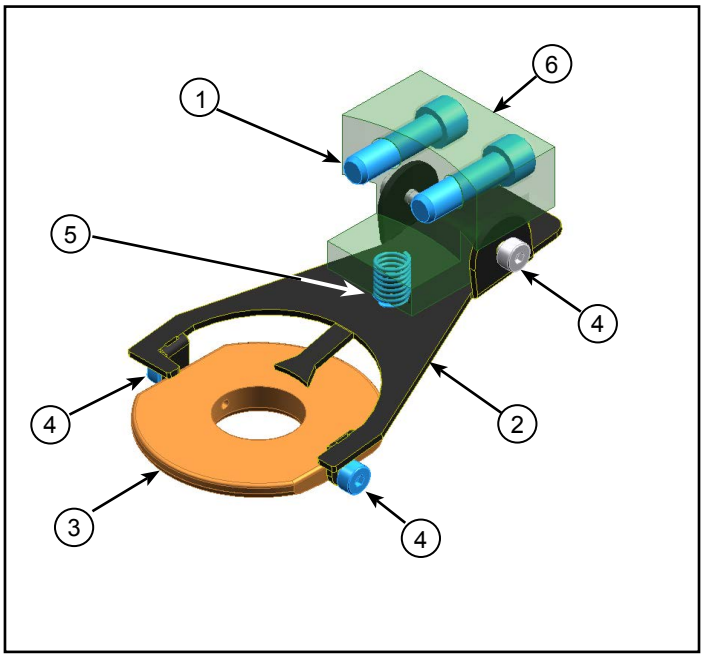


FIGURE 2-1: Tactile Foot

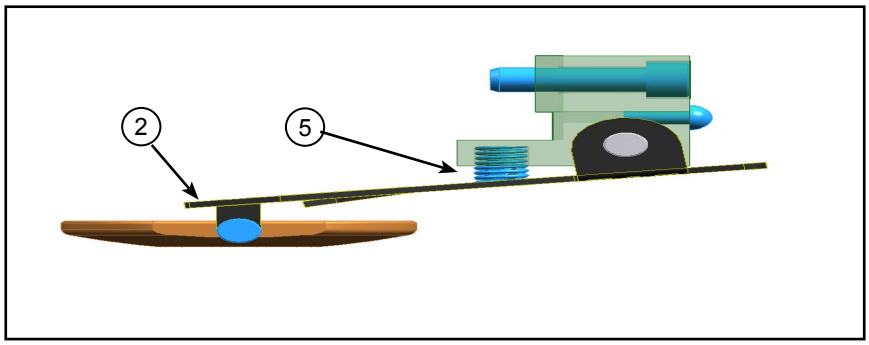


FIGURE 2-2: Tactile Foot

ITEM	DESCRIPTION	PART NUMBER
1	MOUNTING SCREWS	214733
2	FOLLOWER ARM	924228
3	FOLLOWER RING	924272
4	4X40-1/8-INCH SHOULDER BOLTS	924330
5	COMPRESSION SPRING	924331
6	MOUNTING BLOCK	926679

MECHANICAL SET UP

TACTILE FOOT MOUNTING

The tactile foot is removable for storage and cleaning. To install,

1. Remove the two set screws from either of the two mounting locations on the cutting head.
2. Attach the mounting block of the tactile foot to the two mounting holes on the cutting head using .25-20 cap screws. Make sure that the follower ring is centered on the nozzle tip.
3. Push the follower ring up until the calibration tab hits the tip retaining nut and hold for 1 second, then release. The message “Nozzle Tip Touch” should appear on the CNC window. If no message appears, refer to the TROUBLESHOOTING section. After installing or removing the tactile foot assembly, always perform a Standoff Calibration.

FIGURE 3: Mounting Location

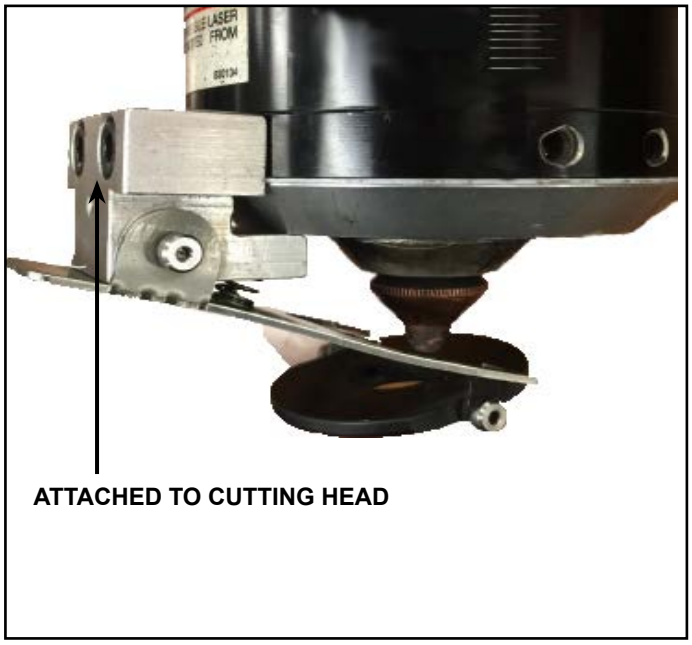


FIGURE 4: Tactile Foot Mounted

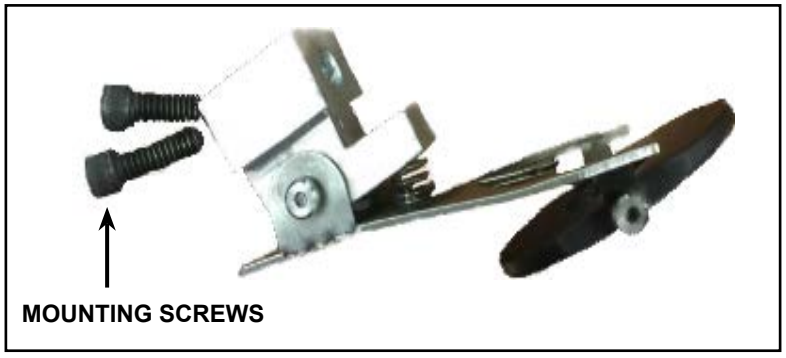


FIGURE 5: Mounting Screws

TIP TOUCH POSITION

This procedure ensures that the “Nozzle Tip Touch” message occurs when the nozzle tip either touches the material surface or is just slightly above it (0.001 to 0.002-inch). Located on the follower arm is a calibration tab

that extends from the follower arm body out towards the center of the follower ring (between the forks.) The tab is bent down slightly. This tab creates an electrical short between the machine ground and nozzle tip when the follower ring moves toward the nozzle tip and the calibration tab contacts the tip retaining nut. The angle of the bend determines when the short occurs with respect to the position of the follower ring and nozzle tip. When the angle of the bend is correct, the short occurs when the workpiece side of the follower ring and the nozzle tip are in the same plane.

It is sometimes necessary to adjust the angle of the bend for a different nozzle tip length. To adjust the angle of the bend, remove the cutting head from the laser center. Turn the cutting head upside down and rest it on the flange. With a straight edge, push the follower ring down while keeping it perpendicular to the beam path (parallel to the workpiece surface). Adjust the bend angle so the calibration tab touches the tip retainer nut when the straight edge either contacts the nozzle tip or is slightly above it. *See Figure 6.*

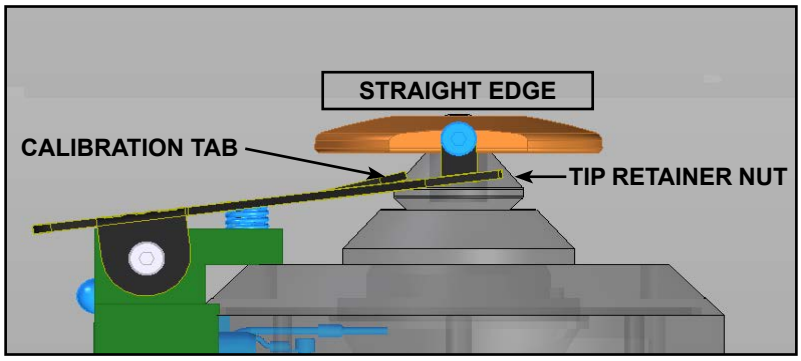
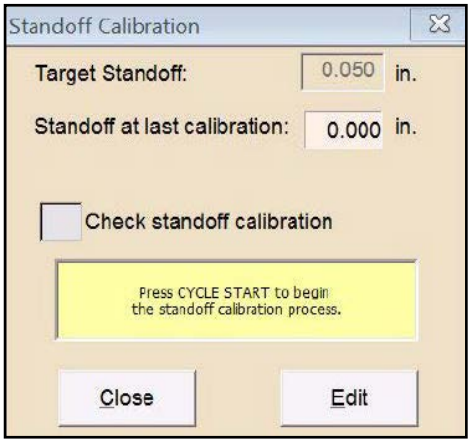


FIGURE 6: Tip Touch Position

STANDOFF CALIBRATION

Before performing Standoff Calibration, verify that the tactile foot is installed as specified in the Tactile Foot Mounting section. Jog the cutting head so the tactile foot is above the workpiece.

4. Open the "Standoff Calibration" window by pressing the standoff calibration icon located on the CNC tool bar. Make sure that the check standoff check box is not checked". To calibrate for a different standoff position, edit the target standoff value in the calibration window. The text field inside the calibration window will be the color yellow and read "Press CYCLE START" to begin the standoff calibration process. *See Figure 7.*



Previous Standoff Calibration Window

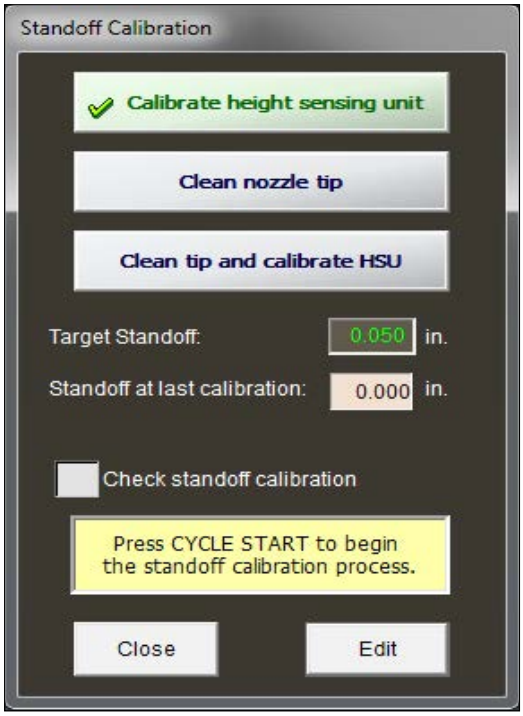


FIGURE 7: Standoff Calibration Window

5. Press the CYCLE START pushbutton.

6. The Z-axis retracts to the home position, pauses for 1 second, then moves in the Z-down direction. The yellow text field inside the calibration window reads, “Moving to calibration position”. The Z-axis continues in the down direction until a tip touch occurs. With the tactile foot installed, the calibration tab needs to act as the ground to cause the tip touch signal. When the tip is at the material surface through the “follower ring “, the calibration tab is in contact with the tip retaining nut. At that point, the Z-axis stops and then moves up to 0.260-inch above the workpiece surface. The control automatically collects the calibration data, and then the Z-axis moves to the target standoff position and records the measured standoff in the “ standoff at last calibration” box. The head moves to target standoff using the calibration table just created and the standoff at last calibration is the actual measured height above the material as determined by the z-axis encoder. The head will finish the calibration routine with the head fully retreated in the home position. To stop the calibration routine, press the CYCLE STOP pushbutton. To restart, press CYCLE START.

7. If standoff accuracy is acceptable, the text field inside the calibration window changes color from yellow to green and reads, “Nozzle is in calibration position”, or “Standoff calibration complete” (depending on the software version).

8. If the actual standoff does not meet the accuracy specification, the software displays a warning message. If this occurs, select “Cancel” to close the message box and press CYCLE START to repeat the calibration. If the warning message repeats, refer to the TROUBLESHOOTING section.

9. To check the nozzle tip standoff, follow the same procedure except select the option button “Check standoff” in step 2.

PROGRAMMING

When using the tactile foot, the CNC program uses the same G and M codes as the non-contact cutting head. See the programming manual (EM-423) for details.

- G84 moves the cutting head (Z-axis) to the pierce/cut position and starts the cutting process.
- G89 P filename.lib specifies target standoffs (pierce and cut) with a material library file.
- M42 returns the cutting head to the Z-home position.
- M47 moves the cutting head to the partial Z-up position.
- M130 disables the Z-axis anti-dive function.
- M131 cancels M130, to restore Z-axis anti-dive.

Before using the tactile foot, the programmer should consider the stability of the parts as the tactile foot rides on the material surface. Hooking the follower ring on a part can disconnect the cutting head and stop the process. Leaving small tabs to connect parts to the sheet can help keep parts from tipping and “hooking” on the follower ring. The programmer should also consider how part location can affect the stability of parts supported by the pallet grids.

CLEANING

When cutting nonferrous material, debris can build up on the nozzle tip assembly and tactile foot follower ring. It is very important to keep the nozzle tip assembly and tactile foot assembly clean and as free of debris as possible.

Remove the tactile foot and clean it daily. Always keep the calibration tab and retainer nut free of any material that would prevent an electrical short from occurring between them.

Cincinnati Incorporated recommends “LPS Presolve” or an equivalent citrus-based cleaner for capacitance-sensing surfaces.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	RECOMMENDED ACTION
Calibration out of specification.	Incorrect tip touch position.	Follow tip touch setting procedure.
Z-axis hard over-travel during calibration.	Tip touch electrical short not occurring.	Check to see that electrical short occurs when calibration tab touches nozzle tip retainer nut.
Electrical Sensor Fault message. Message will not clear.	• HSS Interface cable is disconnected. • Tactile foot was removed from cutting head.	• Reconnect HSS interface cable. • Disconnect the sensor interface cable, wait 10 seconds and then reconnect.
Intermittent Nozzle tip touch when cutting.	The work piece might be pushing up on the follower ring and causing an actual tip touch.	Consider programming methods to improve part stability.
No nozzle tip touch message when expected.	• No electrical short. • Broken SMA connection. • Wiring problem from HSS to CNC.	• Remove debris between nozzle tip retainer nut and calibration tab. • Replace SMA cable. • Check Signals

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