
CNC Router Tool Touch Off Probe Mechanical Check & Calibration

1.0 Maintenance Objective & Frequency

The objective of this procedure is to verify the mechanical integrity and calibration accuracy of the CNC router's tool touch off probe. This PM prevents tool crashes, ensures consistent tool length offsets, and maintains the reliability of automatic tool setting operations. Perform this check every 500 operating hours or quarterly, whichever comes first.

2.0 Lockout/Tagout (LOTO) & Safety

- Electrical Isolation: Disconnect main power to the CNC router control cabinet and apply a personal lock and tag.
- Pneumatic Isolation: Close the main air supply valve to the machine and bleed any residual pressure from the pneumatic system.
- Mandatory PPE: Safety glasses with side shields, cut-resistant gloves, and steel-toed boots.

3.0 Required Tools, Parts & Lubricants

- 0-1 inch Digital Micrometer (0.0001 inch resolution)
- Precision ground calibration shim or gauge block (0.5000 inch nominal)
- Isopropyl alcohol (99%) and lint-free wipes
- Small flathead screwdriver (for adjustment screw if applicable)
- Torque wrench (inch-pounds) with appropriate hex bit
- Replacement probe contact tip (if worn or damaged)

4.0 Step-by-Step Maintenance Procedure

1. Perform LOTO as per Section 2.0. Verify zero energy state by attempting to power on the control and checking for any pneumatic pressure on the gauge.
2. Visually inspect the probe body for any physical damage, cracks, or signs of coolant ingress. Check the mounting bracket for tightness and alignment.
3. Clean the probe contact tip and the reference surface on the machine table using isopropyl alcohol and a lint-free wipe. Ensure no debris or chips are present.
4. Manually actuate the probe plunger by pressing the contact tip. Verify smooth, linear motion without binding or sticking. Release and confirm the plunger returns fully to its rest position under spring force.
5. Using the digital micrometer, measure the over-travel distance of the probe plunger from rest to full compression. Record the value. Compare to OEM specification (typically 0.100 to 0.150 inches). If out of spec, inspect for mechanical obstruction or spring fatigue.
6. Place the precision calibration shim (0.5000 inch) on the machine table directly under the probe contact tip. Manually lower the spindle (with power off) until the tool holder just contacts the shim. Use a feeler gauge to verify zero gap.

7. Remove the shim and manually lower the spindle until the probe contact tip is depressed by approximately 0.010 inches (the trigger point). Measure the distance from the spindle nose to the table surface using the micrometer. This is the mechanical offset.
8. Compare the measured mechanical offset to the known calibration value stored in the CNC controller. If the deviation exceeds ± 0.001 inches, adjust the probe position using the mounting bracket slots and re-torque the mounting bolts to 15 in-lbs.
9. Inspect the probe cable for any cuts, kinks, or pinch points. Ensure the cable is routed securely away from moving components and that the connector is fully seated and locked.
10. Remove LOTO and restore power and pneumatic supply to the machine.

5.0 Verification & Return to Service

1. Home the CNC router and perform a manual tool touch off cycle using a known reference tool. Verify that the measured tool length is within ± 0.001 inches of the expected value.
2. Run a test program that performs a tool change and touch off for three different tools. Confirm that all tool length offsets are automatically set correctly and that no alarms occur.
3. Inspect the first test cut for any signs of incorrect tool length (e.g., tool crashing into material or cutting too shallow). If the cut is acceptable, the PM is complete.
4. Sign off on the PM work order in ServiceGrid, documenting the measured mechanical offset, any adjustments made, and the final verification results.

Regulatory Disclaimer: This document is a generic maintenance template provided for educational and informational purposes only. It does not constitute professional engineering or reliability advice. The end-user assumes all liability for validating all step sequences, torque specs, and LOTO protocols against specific machinery OEM manuals before deployment to a live production floor.