TC820LTY-Ssi - Absolute Encoder Adjustment (Machine Zero Reset)

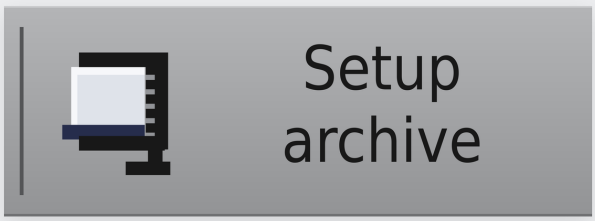
Written By: Ryan Levrini



INTRODUCTION

This procedure re-establishes the absolute encoder reference, and therefore machine zero, on a TC820LTY-Ssi. It covers five servo axes: Q, X, Y, Z1 and Z2.

Step 1 — Before You Start: Take a Full Machine Archive



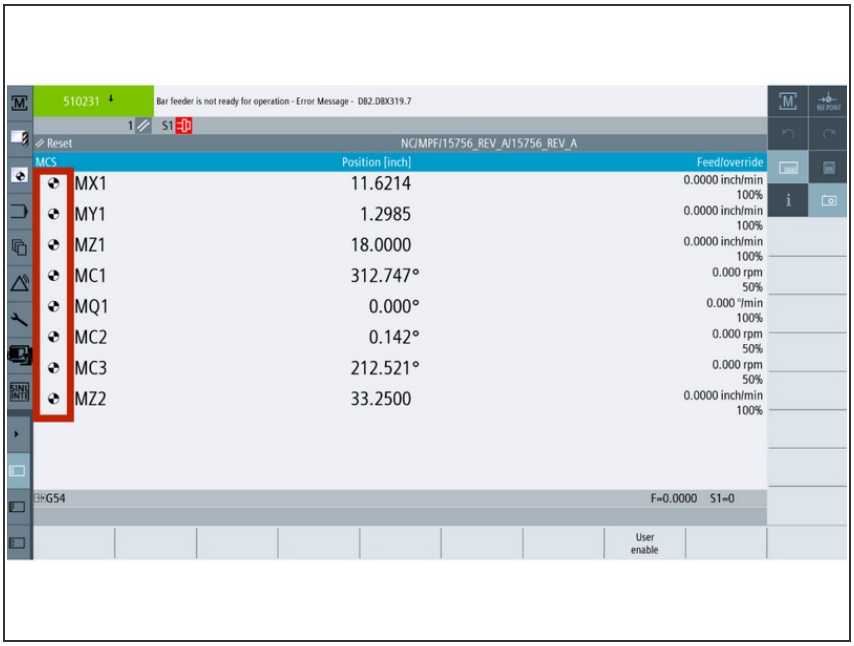
- This procedure overwrites machine zero on X, Y, Z1 and Z2. The archive is the only way back to the machine's current state.
- Create a complete machine archive before touching anything.
  - Archive Current System

Step 2 — Get the Z Axis Reference Blocks



- The Z1 and Z2 references use gage blocks.
  - 6.000 in rectangular gage block, Grade AS-2, for Z1.
  - 12.000 in rectangular gage block, Grade AS-2, for Z2.
- Call TRAK Service to obtain them. They are a Shars catalog item if the shop needs its own set.

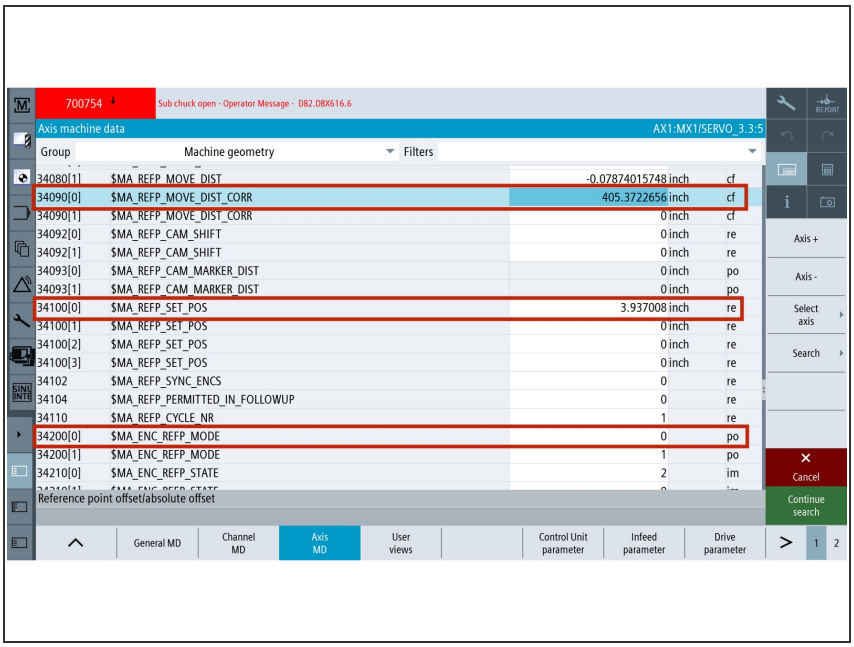
Step 3 — Recognize the Reference Marker Icon



- Press **[JOG]** and **[REF POINT]** on the MCP.
- On the **[Machine]** screen, look for the reference icon beside each axis name: MQ1, MX1, MY1, MZ1 and MZ2.
- The black and white circle means the axis has a reference. No icon means it does not.
- All servo axes must show the icon before the machine is operational.
  - ⓘ MC1 and MC3 are the main and sub spindles. They reference themselves the first time they rotate.
  - ⓘ MC2 is the driven tool spindle. It references itself the first time it rotates.

ⓘ The icon means only that MD34210 = 2, that the control has marked the reference valid. It does not prove the reference is correct.

Step 4 — Understanding the Machine Data That Carry the Reference

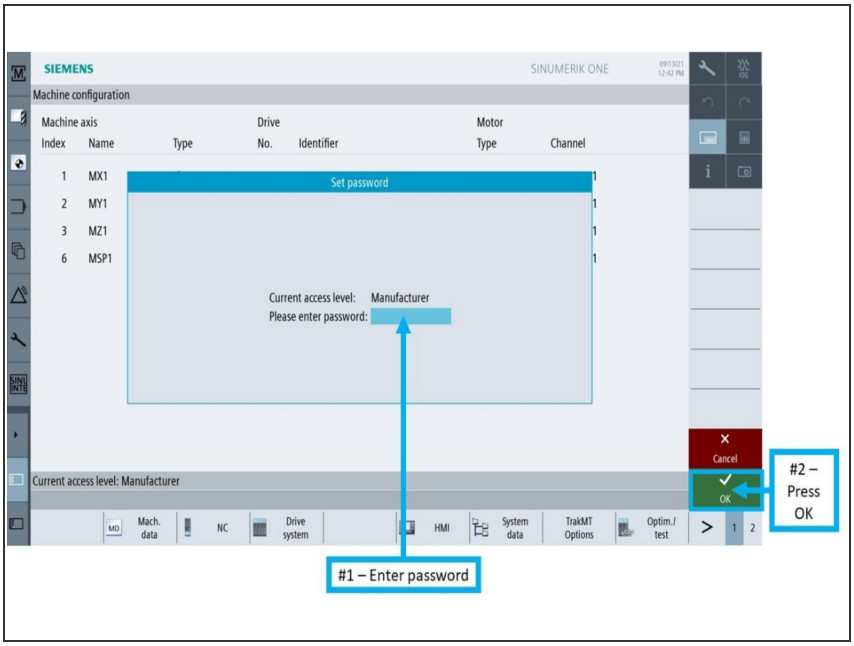


- **MD34090** $MA_REFP_MOVE_DIST_CORR. The calibration itself, the offset between machine zero and the encoder zero. The control writes it, not you.
- **MD34100** $MA_REFP_SET_POS. The coordinate you tell the control the axis is standing at. This is your input.
- **MD34210** $MA_ENC_REFP_STATE. Records whether this axis is referenced. Siemens calls it the adjustment status of the absolute encoder. It holds one of these values:
  - **0**. Not calibrated. The encoder has no reference to the physical position.
  - **1**. Calibration enabled. The control will accept MD34100. This is the state you set.
  - **2**. Calibrated. Written by the control, not by you.

ⓘ With MD34210 = 1, the control transfers MD34100 as the absolute value and computes MD34090 from it. That is the whole mechanism this guide runs on.

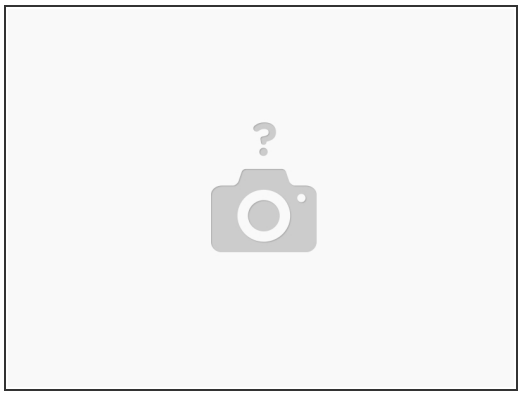
ⓘ Because MD34090 is computed from MD34100, a wrong MD34100 produces a wrong machine zero with no alarm and no icon difference.

Step 5 — Set Manufacturer Password



- Set Manufacture Password.

Step 6 — Removing an Existing Reference

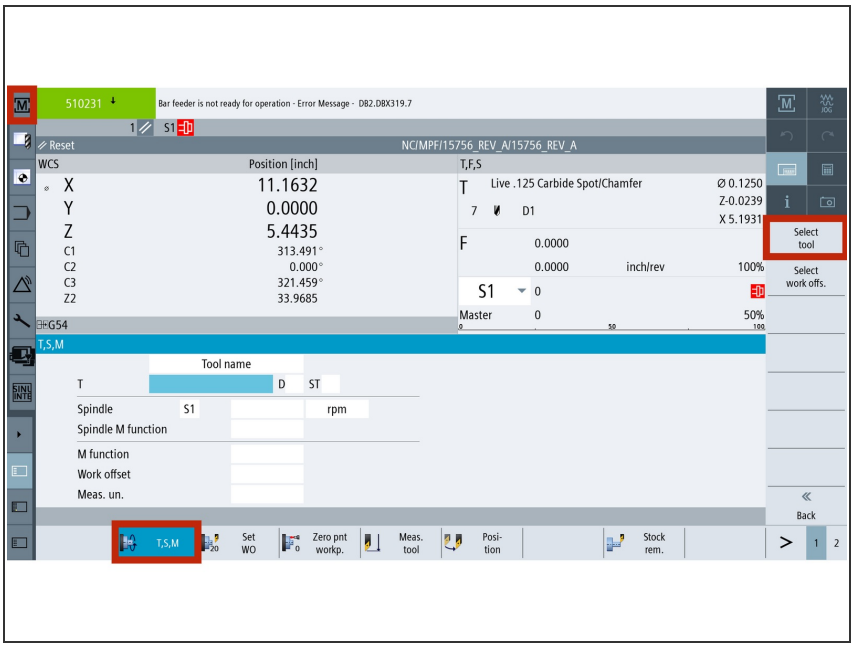


ⓘ You only need this step on an axis that is already referenced and has to be re-referenced. If the axis shows no reference icon, skip this step and carry on with that axis.

- Move the axis to its reference position before you clear the reference.
  - This puts the axis about where it needs to be so the soft limits do not get in the way once the old reference is cleared.
- Go to **[Setup]** → **[Mach. Data]** → **[Axis MD]** → **[Select Axis]** and select the axis you are working on. Confirm the top right banner names it before you enter anything.
- Press **[Search]**, enter 34210, press **[OK]**, and set MD34210[0] = 0.
- Power cycle the machine.
- The old reference is now gone. That axis will now accept a new one.

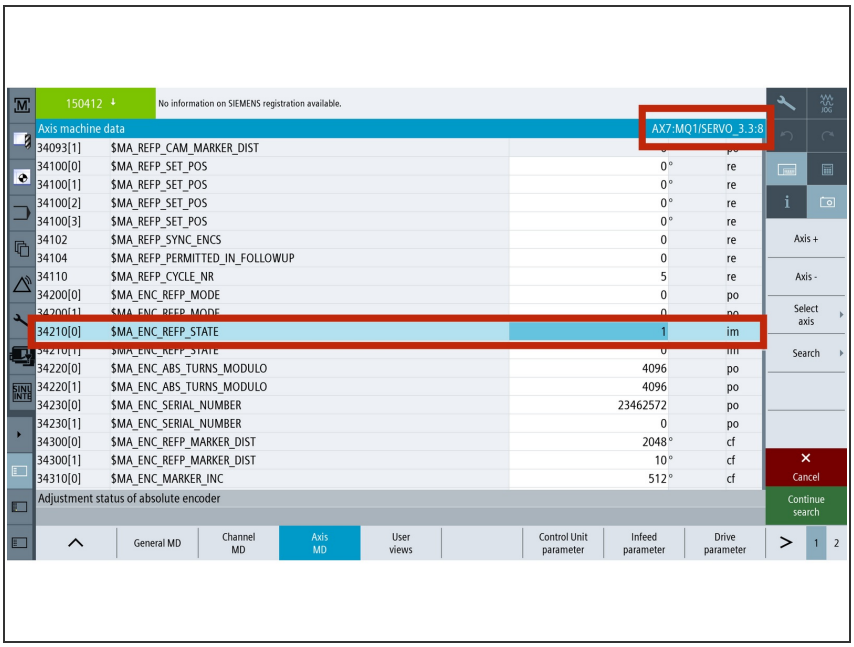
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Step 7 — Q Axis: Index the Turret to Station 1



- The Q axis is the rotational position of the turret.
- Go to **[Machine]** → **[TSM]** → **[Select Tool]**. Select Tool 1 and press **[Cycle Start]**.
- Confirm the turret has fully indexed and locked.

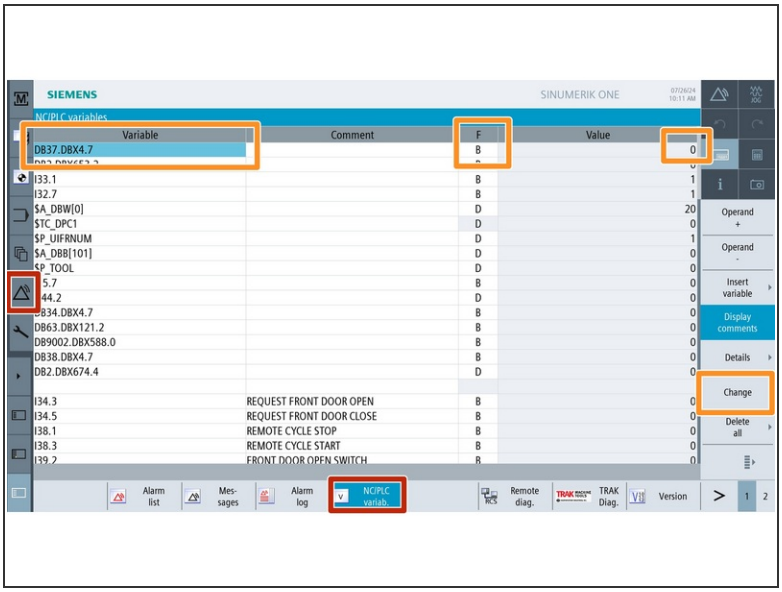
Step 8 — Q Axis: Enable Calibration

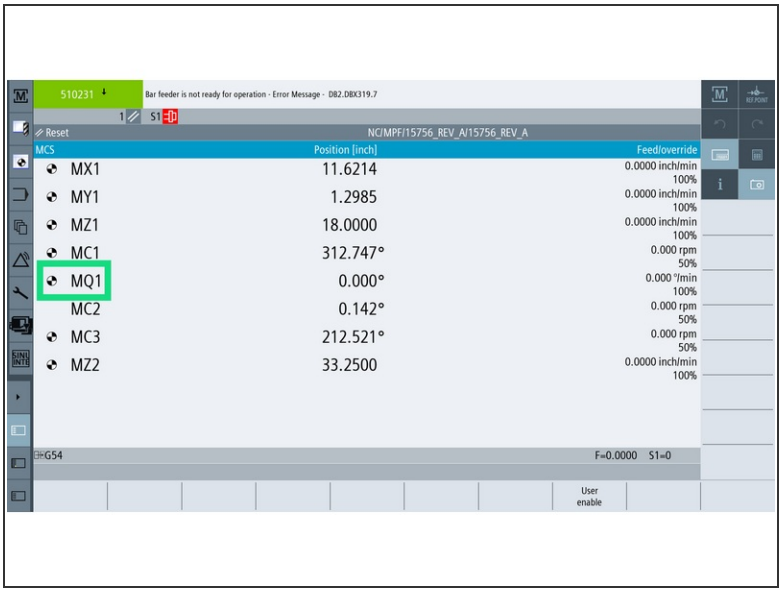


ⓘ Before you start, MD34210[0] must read 0 on MQ1. 0 means the axis has no reference and will accept a new one. If it reads 2, it still holds its old reference and will not take a new one. Go back to Step 6, remove it, and return here.

- Go to **[Setup]** → **[Mach. Data]** → **[Axis MD]** → **[Select Axis]** → **[MQ1/SERVO]** → **[OK]**.
- Confirm the top right banner reads MQ1 before entering anything.
- Press **[Search]**, enter 34210, press **[OK]**.
- Set MD34210[0] = 1.

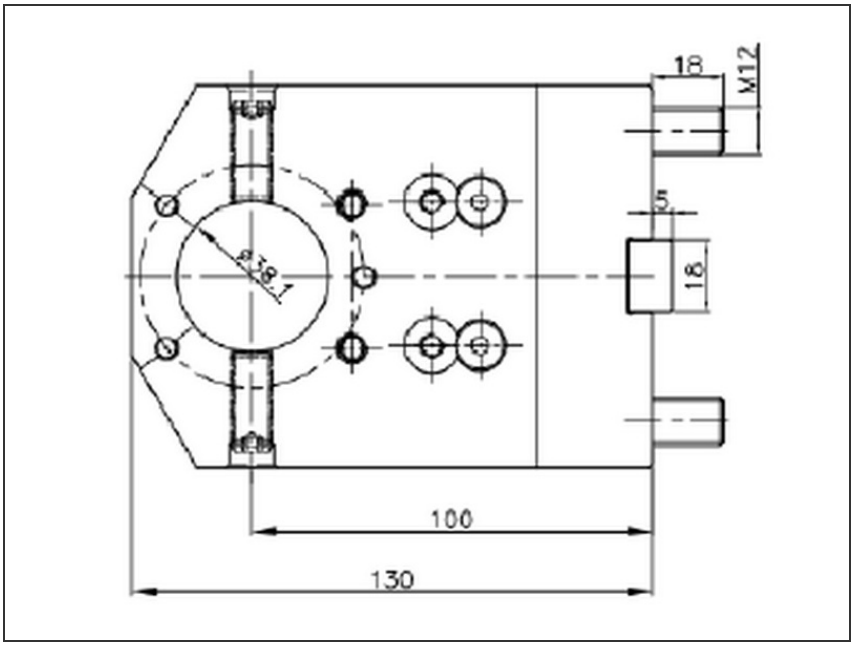
Step 9 — Q Axis: Trigger the Reference Bit





- Go to **[Diagnostics]** → **[NC/PLC Variable]**.
- In an empty Variable row, enter **DB37.DBX4.7**
- Set the Format to **[B]**.
- On the MCP, press **[JOG]** and **[REF POINT]**.
- Press **[Change]**, enter 1 under Value, press **[Input]** → **[OK]**. The bit returns to 0 on its own.
- Confirm the Q axis now shows the reference icon.

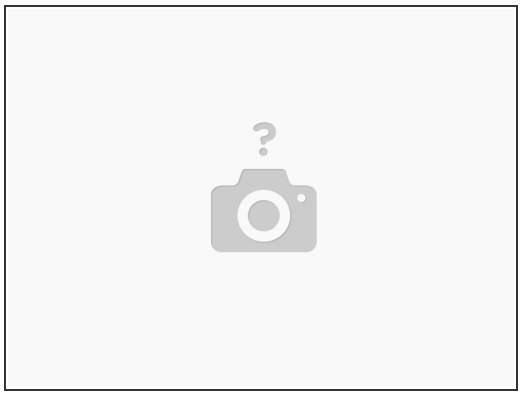
Step 10 — X and Y Axes: Mount the Reference Toolholder



- Mount TRAK Part 35723, HOLDER-BORING BAR-1.5"-BMT65, in turret **Position 1**.
- Any BMT65 boring bar holder with a 100 mm center height also works.
- The center height is in the holder designation. 35723 reads B65 BTH 18-38.1 CH100 L120. CH100 is the center height in millimeters.

⚠ Do not substitute a holder with a different center height. MD34100[0] for X is 100 mm because the holder is. If you do not have a 100 mm holder, stop and call TRAK Service.

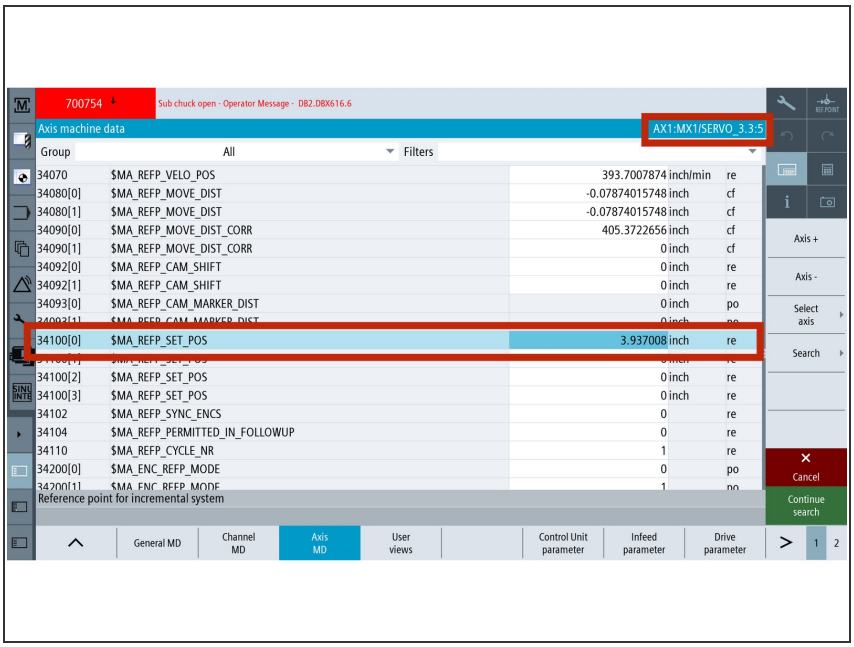
Step 11 — X and Y Axes: Align the Tool Center to the Spindle Center



- ⓘ X and Y are referenced from one alignment. Do this once and it serves both axes.
- Insert the centering indicator into the chuck.
- Go to **[Machine]** and press **[Act. values MCS]** to display machine coordinates.
- Bring the centering indicator into contact with the bore of the toolholder.
- Jog X and Y until the tool center and the spindle center are coincident.
- Sweep to confirm. Deviation should be under **0.001 in**.
- ⓘ Do not move X or Y again until both references are set.

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Step 12 — X and Y Axes: Confirm MD34100[0]

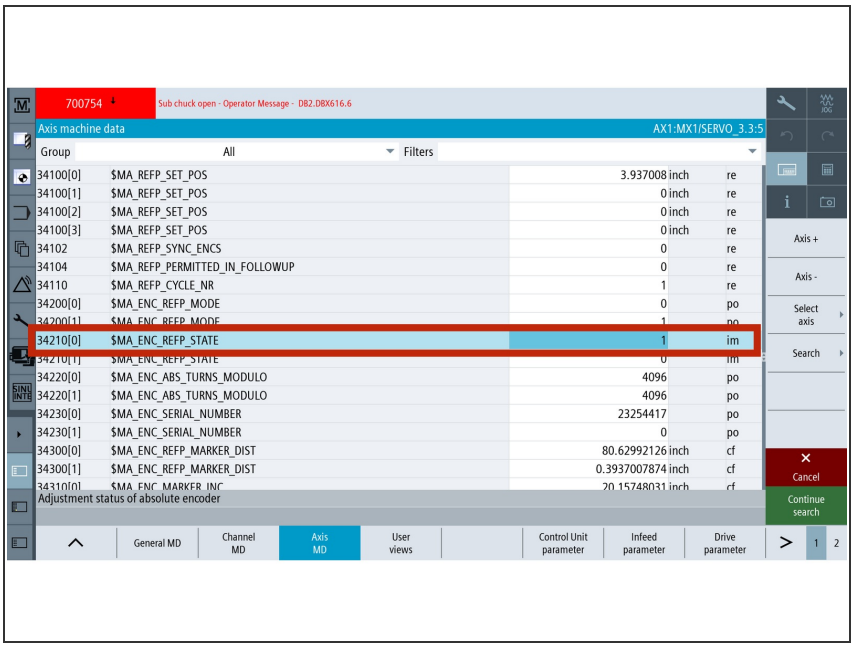


- Go to **[Setup]** → **[Mach. Data]** → **[Axis MD]** → **[Select Axis]** → **[MX1/SERVO]** → **[OK]**.
- Confirm the top right banner reads MX1. Press **[Search]**, enter 34100, press **[OK]**.
  - On MX1, confirm MD34100[0] = 3.937008, which is exactly 100.000 mm, the center height of holder 35723.
- Select **[MY1/SERVO]** and confirm the banner reads MY1. Press **[Search]**, enter 34100, press **[OK]**.
  - On MY1, confirm MD34100[0] = 0.

ⓘ With the bore on the spindle centerline, X is 100 mm (3.937008 in) and Y is 0. X is 100 mm because X zero is the turret face on center and the holder puts the bore 100 mm out from that face. Y is 0 because Y zero is the centerline itself.

ⓘ If either value does not match, correct it before referencing. Whatever sits in MD34100[0] becomes the machine coordinate when you set the reference.

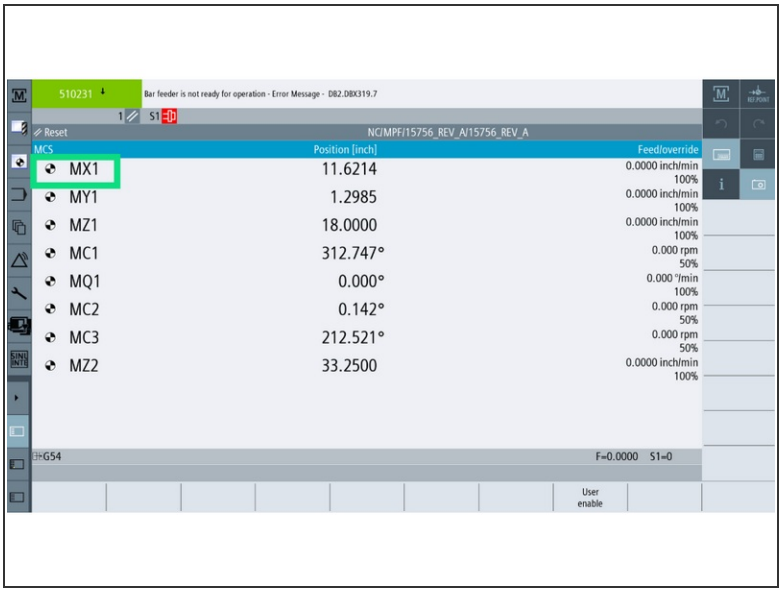
Step 13 — X and Y Axes: Set the Reference

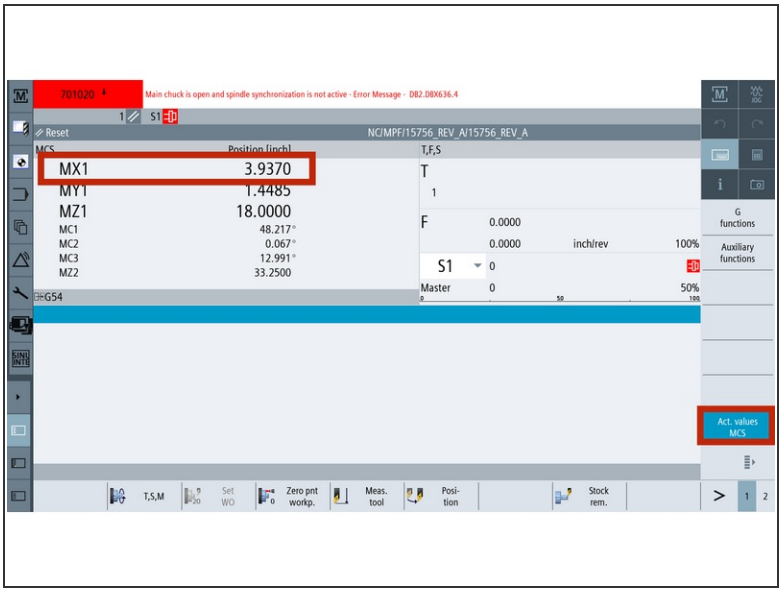


ⓘ Before you start, MD34210[0] must read 0 on both MX1 and MY1. 0 means the axis has no reference and will accept a new one. If either axis reads 2, it still holds its old reference and will not take a new one. Go back to Step 6, remove it, and return here.

- Go to **[Setup]** → **[Mach. Data]** → **[Axis MD]** → **[Select Axis]** → **[MX1/SERVO]** → **[OK]**.
- Confirm the banner reads MX1. Press **[Search]**, enter 34210, press **[OK]**. Set MD34210[0] = 1.
- Select **[MY1/SERVO]**. Confirm the banner reads MY1. Press **[Search]**, enter 34210, press **[OK]**. Set MD34210[0] = 1.
- On the MCP, turn on **[JOG]** and **[REF. POINT]**.
- Press the **[X]** axis button, then press **[+]**.
- Press the **[Y]** axis button, then press **[+]**.
- Confirm MD34210[0] now reads 2 on both MX1 and MY1.

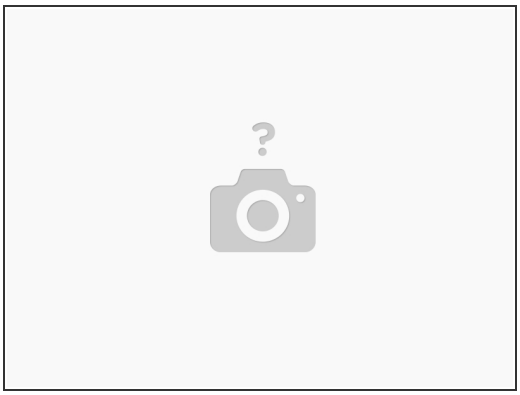
Step 14 — X and Y Axes: Verify





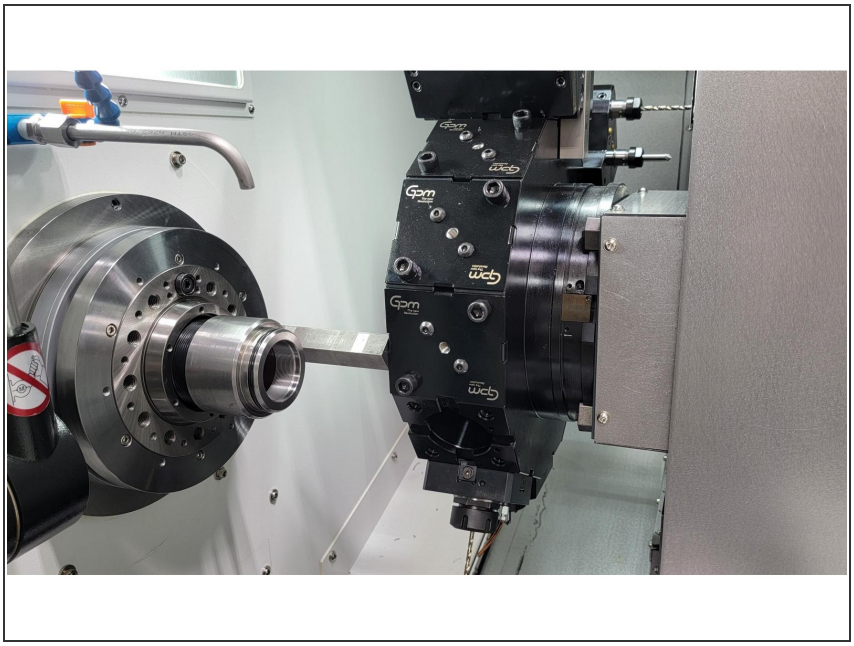
- Confirm X and Y both show the reference icon.
- Go to **[Machine]** and press **[Act. values MCS]**.
- With the tool center still on the spindle center, confirm X reads 3.9370 and Y reads 0.0000.
- If either reading is wrong, the reference is wrong. Do not continue. Re-check MD34100[0].

Step 15 — Z1 Axis: Measure the Turret Width



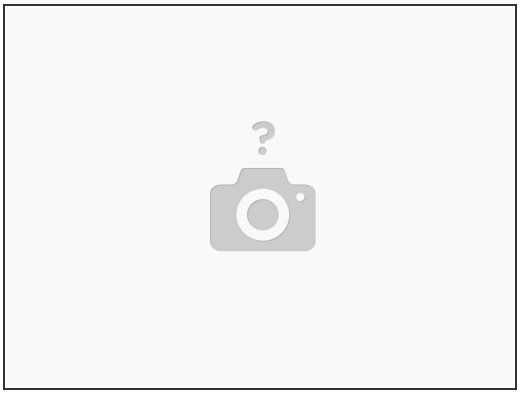
- Measure the turret, front face to back face. This is W.
- Measure square to both faces, at or beside turret Position 1.
- Measure this turret. Do not use W from another machine or a drawing. Every turret gets its own measurement.
- Write W down.
- W goes straight into machine zero. Nothing downstream catches an error in it after this step.

Step 16 — Z1 Axis: Touch Off the Block



- Place the 6.000 in gage block against the main spindle face.
- Jog the turret forward until the turret front face makes light contact with the block.
- No visible gap, but do not compress or deflect the block.
- Leave the axis where it is. Do not move Z until the reference is set.
- The turret front face is now 6.000 in from the main spindle face.

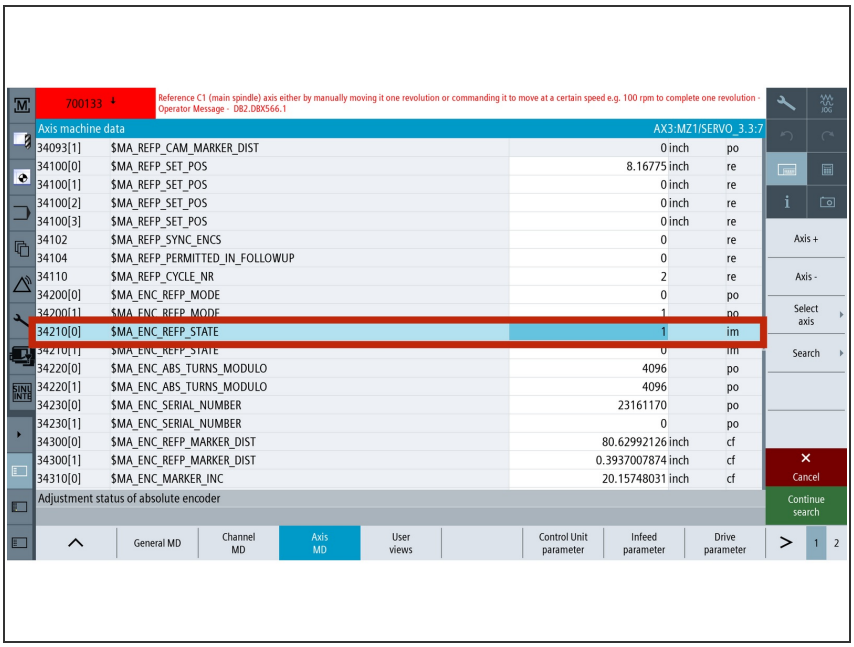
Step 17 — Z1 Axis: Calculate and Enter MD34100[0]



- Calculate 6.000 + W/2. The 6.000 is the block. The W/2 carries the datum from the turret front face back to the turret centerline.
- Go to **[Setup]** → **[Mach. Data]** → **[Axis MD]** → **[Select Axis]** → **[MZ1/SERVO]** → **[OK]**.
- Confirm the top right banner reads MZ1.
- Press **[Search]**, enter 34100, press **[OK]**.
- Enter the calculated value in MD34100[0].

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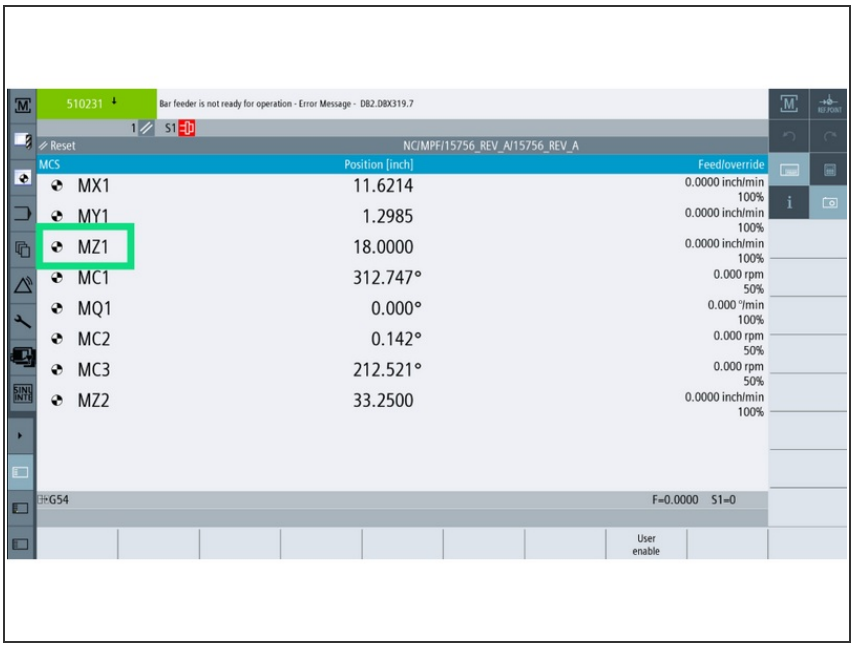
Step 18 — Z1 Axis: Set the Reference



ⓘ Before you start, MD34210[0] must read 0 on MZ1. 0 means the axis has no reference and will accept a new one. If it reads 2, it still holds its old reference and will not take a new one. Go back to Step 6, remove it, and return here.

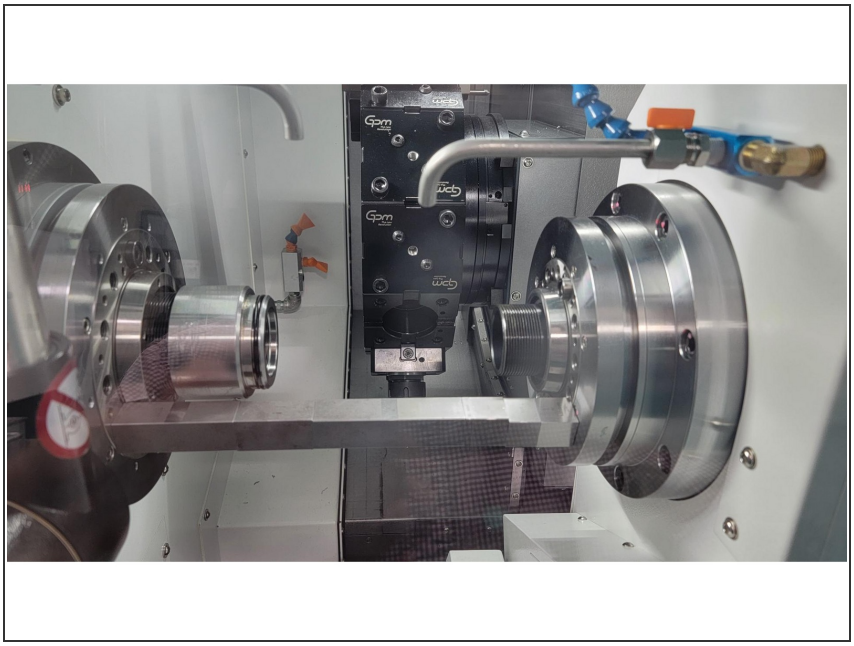
- Still on **[MZ1/SERVO]**, press **[Search]**, enter 34210, press **[OK]**.
- Set MD34210[0] = 1.
- On the MCP, turn on **[JOG]** and **[REF. POINT]**.
- Press the **[Z]** axis button, then press **[+]**.
- MD34210[0] flips to 2 on its own.

Step 19 — Z1 Axis: Verify



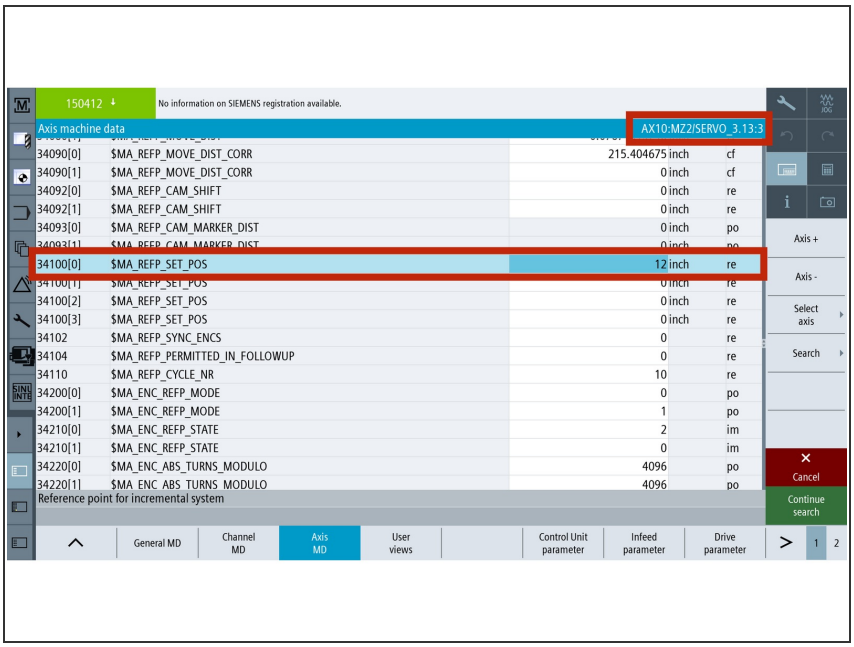
- Confirm MZ1 now shows the reference icon.
- Go to **[Machine]** and press **[Act. values MCS]**.
- With the turret front face still in contact with the block, confirm MZ1 reads the value you calculated and entered.
- If it does not, the reference is wrong. Do not continue. Re-check the value you entered in MD34100[0].

Step 20 — Z2 Axis: Touch Off the Block



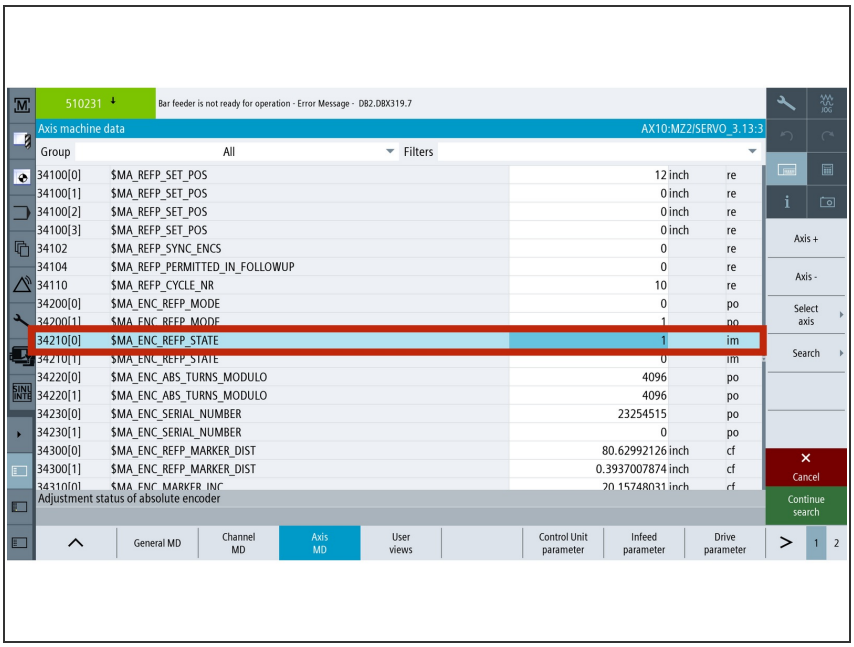
- Retract the turret fully clear of the working area.
- Place the 12.000 in gage block between the main spindle and sub spindle faces.
- Jog the sub spindle forward until it makes light contact with the block.
- No visible gap, but do not compress or deflect the block.
- Leave the axis where it is. Do not move Z2 until the reference is set.
- The sub spindle face is now 12.000 in from the main spindle face. There is no W/2 on this axis: the sub spindle face is the datum itself.

Step 21 — Z2 Axis: Enter MD34100[0]



- Go to **[Setup]** → **[Mach. Data]** → **[Axis MD]** → **[Select Axis]** → **[MZ2/SERVO]** → **[OK]**.
- Confirm the top right banner reads MZ2.
- Press **[Search]**, enter 34100, press **[OK]**.
- Enter 12.000 in MD34100[0].

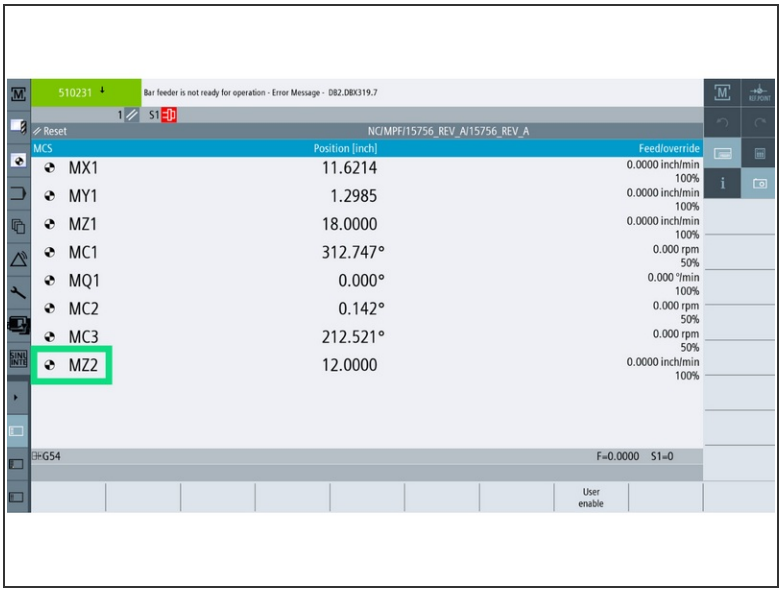
Step 22 — Z2 Axis: Set the Reference

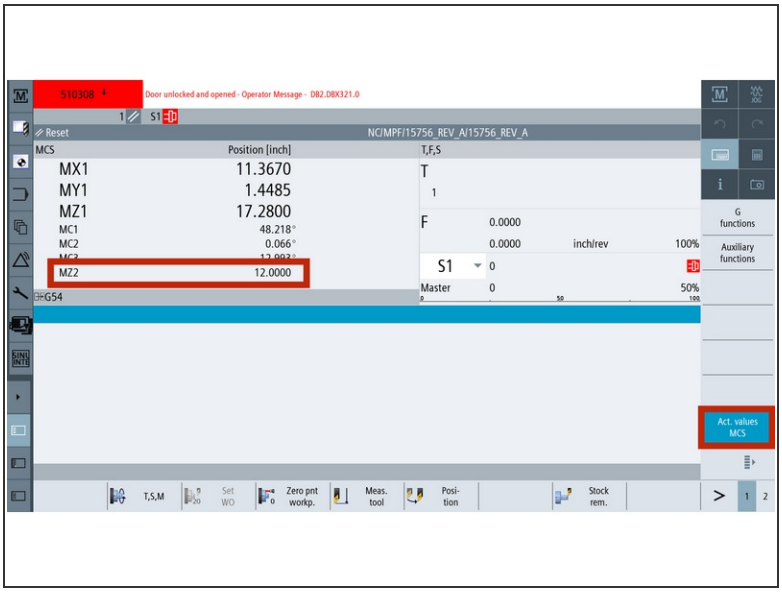


ⓘ Before you start, MD34210[0] must read 0 on MZ2. 0 means the axis has no reference and will accept a new one. If it reads 2, it still holds its old reference and will not take a new one. Go back to Step 6, remove it, and return here.

- Still on **[MZ2/SERVO]**, press **[Search]**, enter 34210, press **[OK]**.
- Set MD34210[0] = 1.
- On the MCP, turn on **[JOG]** and **[REF. POINT]**.
- Press the **[Z2]** axis button, then press **[+]**.
- MD34210[0] flips to 2 on its own.

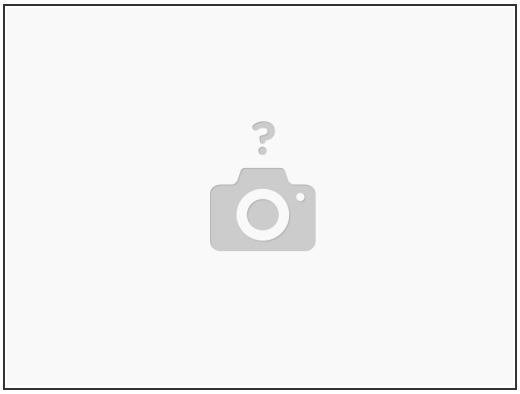
Step 23 — Z2 Axis: Verify





- Confirm MZ2 now shows the reference icon.
- Go to **[Machine]** and press **[Act. values MCS]**.
- With the sub spindle still in contact with the block, confirm MZ2 reads 12.000.
- If it does not, the reference is wrong. Do not continue. Re-check MD34100[0].

Step 24 — Re-establish Dependent Calibrations



⚠ If machine zero has moved, anything calibrated against machine position is now wrong.

- Recalibrate the tool setter. Probe calibration is machine position based.
  - Calibrate Tool Setters

Step 25 — Take a Closing Archive



- Create a complete machine archive now that the references are set.
  - Archive Current System
- Send new archive to TRAK Tech Support or upload to Config Folder
  - TC820LTY-Ssi Config Folder