

TB222 (Rev1) - Laser Mapping Procedure (2.61 and Later Software Versions)

This laser mapping procedure is for CNC10 version 2.61 or above. Please see TB048 for older software versions.

*** remove lash comp and cnc10*.tab (laser table) file, if this is a fresh laser mapping.

If you have laser tables from old laser mapping procedure and wish to redo laser mapping, the old tables must be deleted to use this new laser mapping procedure version 3. Laser tables can be deleted at M Comp table menu or command prompt.

Centroid CNC10

Follow the function key sequence below to get into the Laser menu.

F1 Setup -> F3 Config -> F4 PID -> F7 Laser

Machine: X, Y, Z
Current Position (Inches): [Dashed lines]
Job Name: test.cnc
Tool: T5 H---
Feedrate: 57%
Spindle: 0 A
Part Cnt: 0
Part #: 3

Emergency stop released
Stopped
Press CYCLE START to start job

Laser Measurement
Laser Software: Optodyne v2.18+
Axis: X
Laser Units: INCH
Move increment: 0.5000
Start position: HOME
End position: 0.0000
Number of runs: 1
Dwell time (secs): 3.0
Feedrate: 100.0000

1) Select axis with F1
2) Edit Laser Parameters
3) Press F3 for ballscrew pitch adjustment
4) Press F5 for laser collection
5) Press F2 to load laser data

Next Axis F1 | Load Comp F2 | Set Pitch F3 | Start F5

Laser Measurement Function Keys

F1 - Next Axis - Change axis for laser compensation procedure.

F2 - Load Comp - Load the laser compensation files. Note: CNC10 will accumulate all the laser correction values when it is loaded from this menu.

F5 - Start - Start laser data collection.

Parameters

The highlighted cursor can be moved by pressing the arrow keys on the keyboard. After a specific parameter is highlighted, it can be modified by typing the correct value or by press the space key on the keyboard to go though the choices.

Laser Software: This tells CNC10 what kind of laser data to expect during laser data loading.

Axis: The axis on the machine that you are performing the laser measurement.

Laser Units: The measure unit that is used for this measurement. This parameter can only be changed from the control parameter menu.

Move Increment: The increment of each laser collection point.

Start Position: the starting position of the collection. This position can not be changed; it will always start from the axis home position (Machine home position).

End Position: the ending position of the collection. This position can not be changed from this menu. It is your travel limit from jog screen in the motor parameter menu.

Number of Runs: Number of laser collection you wish to run. It is usually used to see the repeatability of the machine.

Dwell Time (Sec): The amount of time to wait for the laser software to collect data.

Feedrate:

Feedrate of the machine while laser mapping is taking place.

Lash compensation (single value lash comp)

F1 Setup -> F3 Config -> F2 Mach

Single value lash compensation can be inserted here to adjust the laser table. This parameter takes either positive (0.0001) or negative (-0.0001) lash value. The laser table will add or subtract the value that is inserted at lash compensation section for every collection point.

Manual Laser Compensation Table

Laser tables can be hand tuned or insert manual on the control. Follow the step below for Manual laser Compensation table:

F1 Setup -> F3 Config -> F2 Mach -> F5 M Comp

WCS #1 (G54) Current Position (inches)

X -0.9380
Y -0.4780
Z -0.3275

Job Name: test.cnc
Tool: T1 H---
Feedrate: 100% Part Cnt: 0
Spindle: 0 M Part #: 19

Stopped
Jogging...
Stopped
Jogging...
Stopped
Press CYCLE START to start job

X Axis Compensation Table

HOME	Moving From Home			Moving Toward Home		
	Position	Measured Pos.	Correction	Measured Pos.	Correction	Difference
	0.0000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
	-0.5000	-0.50000000	0.00000000	-0.50000000	0.00000000	0.00000000
	-1.0000	-1.00000000	0.00000000	-1.00000000	0.00000000	0.00000000
	-1.5000	-1.50000000	0.00000000	-1.50000000	0.00000000	0.00000000
	-2.0000	-2.00000000	0.00000000	-2.00000000	0.00000000	0.00000000
	-2.5000	-2.50000000	0.00000000	-2.50000000	0.00000000	0.00000000
	-3.0000	-3.00000000	0.00000000	-3.00000000	0.00000000	0.00000000
	-3.5000	-3.50000000	0.00000000	-3.50000000	0.00000000	0.00000000
	-4.0000	-4.00000000	0.00000000	-4.00000000	0.00000000	0.00000000

X Axis Pitch = 2.54000 revs/inch 1 Encoder Count = 0.00004806 inches

Next Axis F1 Delete Table F2 MDI F3 +1 Count F5 -1 Count F6 Graph F8 Save F10

Optodyne Software Setup Screen

The screenshot shows the Optodyne Software Setup Screen with the following fields and options:

- Identification:** Machine (A532), S/N (10756), By (ayu), Date (03/24/08).
- Linear Measurement:** Unit: inch. Start Position (x: 0, y: 0, z: 0), End Position (x: 0, y: -22, z: 0).
- Number of Points:** 45, **Number of Runs:** 1.
- Forward Only:** Forward Only, Positioned by Equal Divisions.
- ATC Board:** ATC Board, ATC Update Continuously.
- Manual/Automatic/On the Fly:** Manual, Automatic, On the Fly.
- Part Prog:** .
- Auto measurement:** Target Window (0.005 inch), Trigger dwell (1 sec), Vel Threshold (0.01), Backlash.
- Laser head Direction/Measurement Axis:** z-Axis (selected), other, x-Axis, y-Axis. Rotate Axis button.
- Preset:** 0.
- Points taken during each run:** [Field]
- Buttons:** New Config File, Save Configuration, Cancel, OK.

Numbered callouts in the image:

- 1: Laser head Direction/Measurement Axis
- 2: Start Position x, y, z
- 3: Number of Points
- 4: Positioned by Equal Divisions
- 5: Verify/Edit
- 6: ATC Board
- 7: Auto measurement

Legend:

- 1. Axis selection
- 2. Start and End Position
- 3. Number of Points
- 4. Positioned by Equal Divisions
- 5. Verify Increment Division
- 6. Auto Temperature Compensation
- 7. Auto Measure Parameters

Laser head Direction: Select the axis for laser data collection.

Linear Measurement: Set the starting and ending position. This section should be the same as what you had on the CNC10 side. If the table is traveling in negative direction, the ending position should be a negative number.

Number of Points: This number depends on your total distance and increment interval.

ATC Board: This is for automatic temperature compensation. Check this box only if you are using the temperature sensors from Optodyne.

Target Window: This distance window tells the laser software where it can collect data around the target distance. Depending on the machine, a typical value is 0.005 inch.

Trigger dwell: The settling time of the machine. This allows the computer to finish the data collection before the machine moves to the next target distance. This is usually 2 seconds less than the control delay time.

Vel Threshold: This is the threshold that the velocity of the retro reflector or laser head must drop under so that a data point can be taken. Typical value: 0.01 in inch mode.

Backlash: This option should be checked if this axis has a software travel limit that does not fall on a multiple of your move increment.

Optodyne Automatic measurement parameter setup

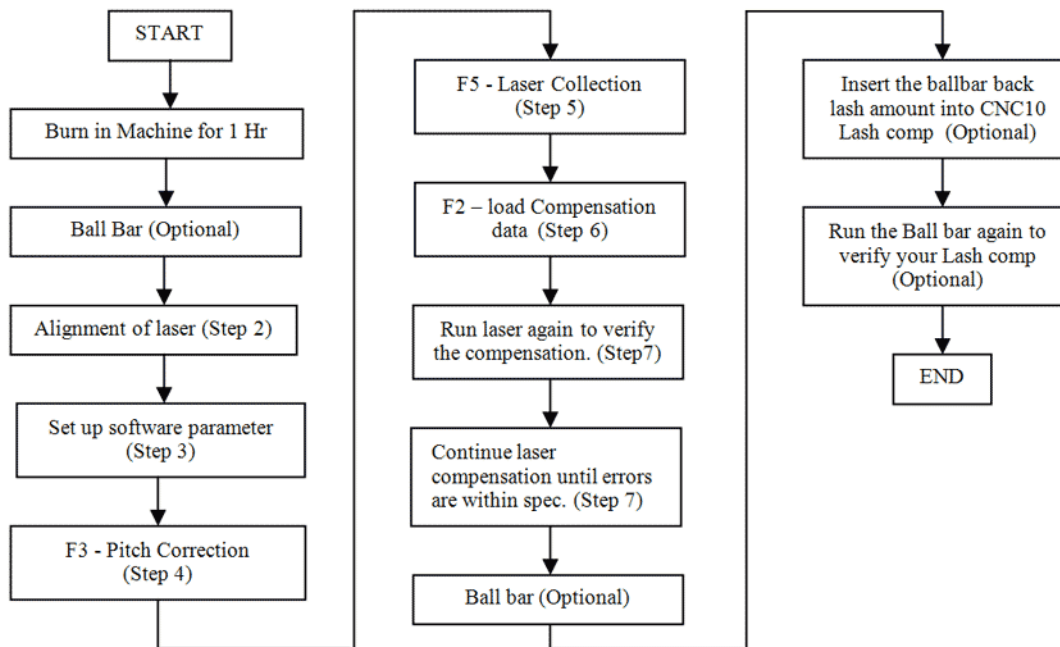
Target Window: 0.005 inch

Trigger dwell: 1 Second.

Vel Threshold: 0.01

Step by Step Instruction with Optodyne Software

Typical Laser Compensation Operation Flow Chart:



1) Set up laser head and retro reflector.

- Mount the laser head (with 90 degree beam bender) at the one end of the travel on the table and make sure the laser beam is parallel to the direction of axis travel.
- Mount the retro reflector on the spindle or any stable part of machine such that it is perpendicular to the laser beam direction. Make sure the returning beam is centered in the receiving aperture and intensity on the LDDM software reads 100%. Note: Set the laser head and retro reflector as close as possible at starting position, this will make alignment easier.

2) Alignment of laser head and reflector.

- When the laser head is at the closest distance with the retro reflector, adjust the reflector or laser head position so the return beam is centered in the receiving aperture and intensity reads at 100%.
- Jog the axis to end of the travel. When the laser head is at furthest travel with the retro reflector, center the return beam in the receiving aperture by adjusting the 2 adjustment knobs on the back of the 90 degree beam bender.
- Continue step 2.a and 2.b until the intensity is at maximum throughout the entire measurement travel.

3) Setup temperature sensor

- Place the ambient temperature sensor somewhere near the laser beam.
- Place the material temperature sensor near the way or on the table.

4) Set up Optodyne software parameter.

- Setup, select axis under laser mapping menu.
- Laser data collection program will always start at home position. So the starting position should always be 0, and end position should be the last position that is in the multiple of the increment distance. i.e. if your software travel limit is - 22.7 and your increment value is set to 0.5, the end position is -22.5. ?Backlash? Box should be checked for this example.
- Number of the points will be calculated by this formula, total distance * 2 + 1. i.e. by using the previous example, the number of the point is $(22.5 * 2 + 1) = 46$. This means you have 46 point of data to collect each direction.
- Check ?Position by equal division? box.
- Press the Verify/Edit to verify the increments. If the table does not display in the increment value you wish, check the

?number of the point? is set correctly.

f. ATC Board means Auto Temperature Compensation.

g. Auto measurement ? This section needs to be set correctly, otherwise laser data collect will not finish. Usually it will miss a point because the backlash is too high and does not move in the target window, increase your target window value. Typical values are showing below,

i. Target Window: 0.005 inch

ii. Trigger dwell: 1 Second.

iii. Vel Threshold: 0.01

h. Check your software travel limit and decide if ?Backlash? should be checked or not.

i. Save the configuration as default. Usually serial # and axis. Eg. 10782x

5) Pitch corrections.

***** remove lash comp and cnc10*.tab (laser table) file, before you perform this step.**

F1 Setup -> F3 Config -> F4 PID -> F7 Laser -> F3 Set Pitch

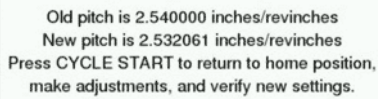
a. On the CNC10 side, press F3 <Set Pitch> for pitch correction.

b. Reset Optodyne LDDM reading to 0 when you are prompted to by CNC10.

c. Press cycle start ? CNC10 will move this table to the last point of collection.

d. Once the table reaches the end of travel, CNC10 will ask for the ?linear distance shown? on the laser LDDM software.

After you insert a value, CNC10 will inform you the old pitch and new pitch. And then you will have to press cycle start to apply the change.



Old pitch is 2.540000 inches/revinches
New pitch is 2.532061 inches/revinches
Press CYCLE START to return to home position,
make adjustments, and verify new settings.

Note: The new pitch will not be updated until the table is moved back to the starting position.

6) Laser Data Collection

F1 Setup -> F3 Config -> F4 PID -> F7 Laser -> F5 Start

a. Press F5 <Start> and follow the on screen direction.

7) Load laser compensation file.

a. After laser data collection CNC10 will jump into load comp file automatically. If you don't see your USB device, you can press F5 <refresh> to refresh the directories.

b. Press F2 <Load Comp>

8) Run the laser again to verify the previous compensation values. If the errors are not within the specification you are asking for, laser correction files can be loaded again on CNC10. CNC10 software will accumulate the compensation values each time a laser correction file is loaded.

Lash compepsation

Document History

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