



**Digital Torch Height Control Basics
(DTHC)**

Digital torch height control also known as dthc, is by far the most confusing part of operating a cnc plasma table.

This document will attempt to shed some light on how it works, when to not use it and what to look for when it does not work.

In theory dthc will keep the torch the same distance from the material regardless of table being uneven or material warping. In reality, that is just a result of many variables being just right!

To start with, why is height important? The plasma manufacturer has defined an optimal height for materials at certain amperage. These heights are very important for cut quality, both dross and edge angle. Also plasma has a narrow energy "spot". Raise the torch to far and it will not cut material, lower it to low and consumables will wear, or physical damage to machine and torch can occur.

How does it work? First lets look at how the system cuts without dthc.

After a gcode program is created in sheetcam and loaded in to control program:

- 1.we home all axis**
- 2.jog machine to desired 0,0 point**
- 3.lower torch close to material (within 1")**
- 4.zero X Y and Z axis**
- 5.click run**

At this point machine will raise to rapid clearance set in sheetcam job section (we use .75")

-move to first pierce point

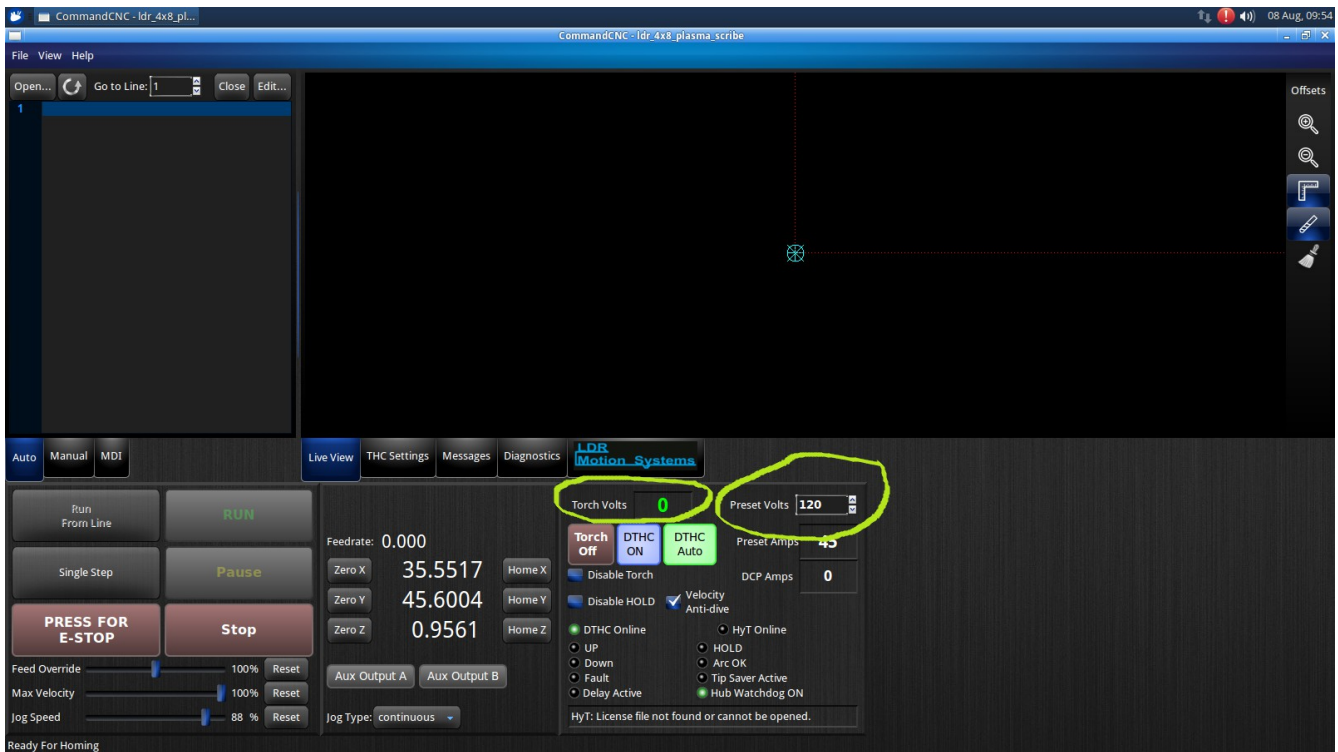
-drop torch to safety plunge distance set in sheetcam job section (we use 0.5")

- continue down at a reduced feedrate till torch contacts metal**
- continue down pushing torch up till probe switch located behind the torch (known as probe switch) is actuated.**
- set z axis height to top of material**
- lift torch to pierce height defined in sheetcam tool above material**
- turn torch on**
- wait the amount of time defined in sheetcam tool (called pierce delay)**
- lower torch to cut height define in sheetcam tool (called cut height)**
- begin to move in the x and y direction to cut part. Z will not move**
- when cut is complete torch will turn off**
- torch will raise to rapid clearance set in sheetcam job section (we use .75")**

As can be seen this is simple and would work well if table remained perfectly flat and material did not warp.

Now when using Dthc, all steps are the same right up to moving in the x and y direction. At this point:

- 1. Dthc will turn on, and compare the actual voltage of the arc to the preset volts defined in sheetcam tool (called preset volts) these are both displayed on the cut screen while cutting**



The higher the torch is from the material the higher the voltage SO:

**Preset higher than actual = torch raises
preset lower than actual = torch lowers**

It is a simple servo loop, similar to cruise control in a car.

Now what is not simple is the fact that many many variables can affect the actual volts. Hypertherm numbers listed in the plasma cutter manual are starting points. They are not exact for every system.

Some of the things that affect actual volts are:

Consumable life left

air pressure

air quality

cut speed

work clamp connection

material quality

electrical power level (main volts)

To overcome these differences in each facility, we need to define what each users preset volts should be. This is a key point **THE VOLTAGE NUMBER IS NOT RELEVANT!** the important thing is cut height, so we need to find what the voltage is at the proper cut height.

This is very easy.

1. Draw a straight line in cad

2. import in to sheetcam

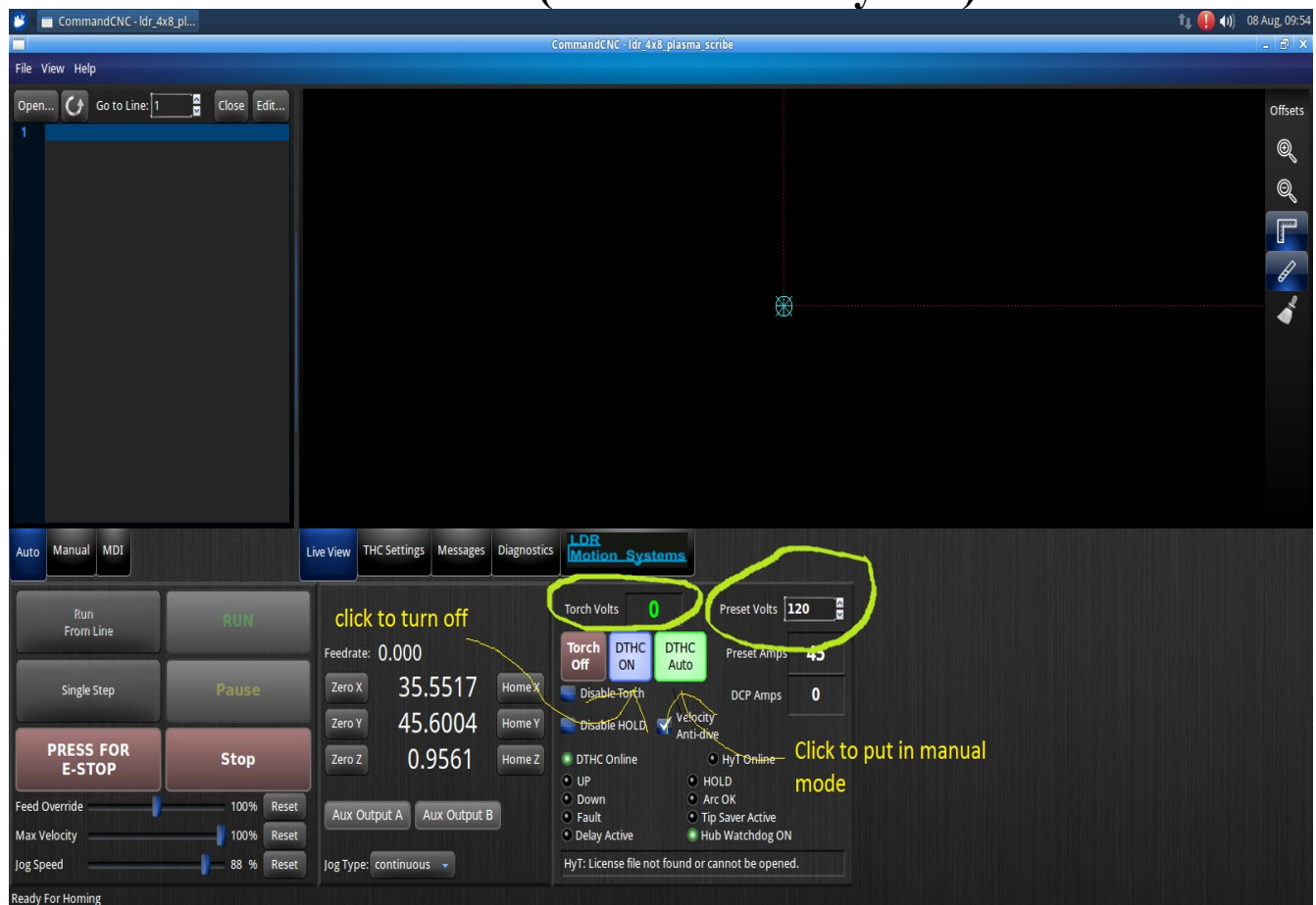
3. define an operation with proper tool = thickness, material type, amperage

4. generate gcode

5. load gcode in control program

6. click dthc auto button (puts dthc in manual mode)

7. click dthc on/off button (make sure it says off)



8. Run program like normal.

9. watch the torch volts indicator on the screen, using the number closest to after it started to move that would be your ideal voltage for that material, and amperage setting.

10. in sheetcam change that tool's preset volts to the new define number.

What we did was simply cut at a known height (the one listed in the plasma manual) and monitored visually the voltage that the hypertherm was cutting at.

Not everyone will need to perform these test cuts, however I do recommend it.

Dthc components on screen explained

The screenshot shows the CommandCNC software interface with several handwritten annotations in yellow. The interface includes a menu bar (File, View, Help), a toolbar with 'Open...', 'Go to Line: 1', 'Close', and 'Edit...', and a main workspace. Below the workspace is a control panel with buttons for 'Auto', 'Manual', 'MDI', 'Run From Line', 'RUN', 'Pause', 'Single Step', 'PRESS FOR E-STOP', 'Stop', 'Feed Override', 'Max Velocity', and 'Jog Speed'. A 'Diagnostics' window is open, showing 'LDR Motion Systems' with various status indicators and a 'HyT: License file not found or cannot be opened.' message.

Actual torch volts (points to the 'Torch Volts' display showing 0)

preset volts from gcode file (points to the 'Preset Volts' display showing 120)

Leave checked will lock torch head when cutting speed slows down (points to the 'Velocity Anti-dive' checkbox, which is checked)

will illuminate when arc is transferred if not machine will not move (points to the 'Arc OK' indicator)

Not Used (points to the 'Preset Amps' and 'DCP Amps' displays)

Normal Ignore (points to the 'UP', 'DOWN', 'FAULT', and 'DELAY ACTIVE' indicators)

HyT: License file not found or cannot be opened. (points to the license error message)

DTHC settings screen

The screenshot shows the DTHC settings screen in the CommandCNC software. The interface is divided into several sections: DTHC Responsiveness, Other DTHC Settings, Auto-Set, and General Settings. The DTHC Responsiveness section includes sliders for DTHC Sensitivity (set to 4), DTHC Tracking (set to 0), and Slowest Velocity (set to 10). The Other DTHC Settings section includes a Tip Saver ON checkbox and a DCP Settings section with Upper Volts Fault Limit (200) and Lower Volts Fault Limit (50). The Auto-Set section includes Upper Auto-Set Tolerance (8) and Lower Auto-Set Tolerance (8). The General Settings section includes a Stop on Fault checkbox. The bottom of the screen shows a control panel with buttons for Run, Pause, Stop, and E-Stop, along with various status indicators and a Jog Type dropdown.

Changes PID tuning of dthc. Alter with caution (circled around DTHC Sensitivity)

How close we want to track voltage. 1 recommended (circled around Voltage Tracking Tolerance)

Leave checked (pointing to Use Hardware Enable Pin)

not used (pointing to Arc OK Current)

Do Not Change (pointing to DCP Settings)

More detailed information on settings can be found in the manufacturers manual located in the manuals folder named: [CommandCNC-DTHCIV-REV4FullManual.pdf](#)