C3D THC

CNC PLASMA TORCH HEIGHT CONTROLLER

USER GUIDE

CNC3D
CREATING PRECISION

Safety Precautions

- **Please read this entire manual before using your C3DTHC, Nighthawk controller or CNC3D Commander software.**
- **Please ensure any relevant PPE equipment is worn or used when operating any machine. This includes eye protection for plasma cutters.**
- **All CNC machinery can be dangerous and must be operated with diligence and safety in mind.**

By using this controller and/or any associated software, you acknowledge and agree that you are taking full responsibility for any damage to property, machinery, person or persons that could potentially occur as a result of using this product. CNC3D PTY LTD will not be held liable or responsible in any way for the misuse or use of this product.

All 110V/240V wiring MUST be done by a licensed electrician. Failure to do so can cause fire or electric shock!

DO NOT ATTEMPT ANY MAINS WIRING WITHOUT HOLDING AN ELECTRICAL LICENSE

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C3DTHC Specifications

Power Input Voltage*	12-24Vdc (max)
Control Input Voltage^	12Vdc (max)
Power Usage	<20W
Connectivity	USB
Enclosure	Folded Steel
Mounting	Bench/Wall
Enclosure Finish	Powder Coating

*** WARNING: The C3D THC does not come with a DC Power supply. CNC3D PTY LTD only recommend using certified power supplies for operating your controller. The use of an uncertified power supply will be deemed improper use and will void your warranty. If you are unsure if the power supply you plan on using is certified or have not yet selected a power supply, please confirm with a local licensed electrician.**

^ The voltage coming from the plasma cutter's voltage divider must be below 12v.

Plasma Cutter Requirements

We have designed the C3DTHC to be as universal as possible, however there are some restrictions as to which plasma cutters can be used.

It is your responsibility to ensure the plasma cutter you intend to use meets these requirements before attempting to install the C3DTHC.

CNC3D will not be held responsible for any damage resulting from using unsuitable hardware or improper installation.

CNC Control Port

If your plasma cutter does not have this connection, it is unlikely that your plasma cutter will work with a THC.

There are a number of vital connections that need to be made between the C3DTHC and your plasma cutter so that the controller can automatically adjust the torch height as well as allow certain safety mechanisms to work.

Plasma cutters which have been designed for use with a CNC machine will have a “CNC Control Port” which is a plug port somewhere on the plasma generator to plug in a THC.

Voltage Divider

The C3D THC is designed for use ONLY with plasma cutters that have a voltage divider installed for ALL CNC connections.

A voltage divider is a device that converts the high voltage in a plasma cutter’s electrical arc down to a very low voltage that the controller’s circuitry can interact with. Most plasma sources with an inbuilt CNC Control Port will have an integrated voltage divider circuit.

The C3DTHC will allow use with either a 20:1 or a 50:1 voltage divider.

Voltage input to the C3DTHC from your plasma source cannot exceed 12v.

It is your responsibility to confirm that your plasma cutter has a voltage divider installed for ALL CNC connections. Please refer to your plasma cutter’s user manual or contact the manufacturer to confirm the voltage divider ratio for your hardware.

CNC3D cannot advise you if your model has a voltage divider or what ratio/output voltage it might be!

What is the C3DTHC?

What is it?

The C3DTHC is what's commonly known as a Torch Height Controller (THC).

A THC is a device which allows a CNC plasma cutter with a controllable Z axis to automatically adjust the position of the torch while cutting to maintain the perfect cut height even if the material isn't flat or if the heat of cutting causes it to warp.

How does it work?

A THC works by reading the voltage of the electrical arc between the torch and the material being cut. This voltage will increase or decrease depending on the length of the arc, i.e. the distance between the torch and the material.

The shorter the distance from the nozzle to the stock, the lower the voltage of the arc.

If the THC detects that the voltage is *higher* than intended ie: the torch is too high, it will command the machine's Z motor to move the torch down towards the material and shorten the arc's length and lower the voltage.

If the THC detects that the voltage is *lower* than intended ie: the torch is too low, it will command the machine's Z motor to move the torch up away from the material and increase the arc's length to raise the voltage.

This is all done autonomously in the THC without any input from the machine operator allowing tiny, high-speed adjustments to keep the torch at the best cutting height faster than any human could.

C3DTHC Pinout

Connection	Type (pin count)	Label on PCB	Function
Terminal Block	OUT (16)	JB	LCD screen connection
Header Pins	IN/OUT (5)	JP1	Control button membrane switch connections
IDC Connector	IN/OUT (12)	P1	Allows ribbon cable connection from C3DTHC to a CNC controller
GREEN PLUGGABLE	IN/OUT (10)	J3	Various I/O functions between C3DTHC and CNC controller
GREEN PLUGGABLE	INPUT (4)	J7	Signals from plasma cutter
GREEN PLUGGABLE	INPUT (3)	J6	Z min limit switch
GREEN PLUGGABLE	INPUT (3)	J5	Z max limit switch
GREEN PLUGGABLE	OUTPUT (5)	J2	Z motor control outputs
GREEN PLUGGABLE	INPUT (2)	J4	Power Input (24v max)
USB	IN/OUT (1)	J1	USB connection

C3DTHC Connections

Step

Y: Step signal for Y axis — Input from CNC controller. Often labelled STP- or PUL-
X: Step signal for X axis — Input from CNC controller. Often labelled STP- or PUL-
Z: Step signal for Z axis — Input from CNC controller. Often labelled STP- or PUL-

Dir

Z: Direction signal for Z axis — Input from CNC controller. Often labelled DIR-

Torch

ENBL: Torch enable signal — Input from CNC controller. Usually a PWM signal such as laser or spindle
COM: Common positive — Input from CNC controller. Often labelled STP+ or PUL+

Overrides

HOLD: Pause command — Allows the unit to send a hold/pause command to the CNC controller
RESM: Resume command — Allows the unit to send a resume command to the CNC controller
HALT: Abort command — Allows the unit to send an abort/E-stop command to the CNC controller
GND: Common ground — Input from the CNC controller. Common ground (-) shared across controls

Torch

TV+ : Torch voltage (+) — Positive torch voltage input from plasma source – 12v max
TV- : Torch voltage (-) — Negative torch voltage input from plasma source
ON- : Arc OK (-) — Negative Arc OK signal input from plasma source
ON+ : Arc OK (+) — Positive Arc OK signal input from plasma source – 12v max

Z- Limit

+12v: — Positive 12v output for a Z min limit switch
Signal: — Signal or trigger wire from Z min limit switch
GND: — Ground connection for Z min limit switch (proximity type only)

Z+ Limit

+12v: — Positive 12v output for a Z max limit switch
Signal: — Signal or trigger wire from Z max limit switch
GND: — Ground connection for Z max limit switch (proximity type only)

Z Output

DIR+:	Positive direction signal for Z stepper motor driver
PUL+:	Positive step signal for Z stepper motor driver
Down:	Down signal for CNC controllers that need Up/Down signals
Up:	Up signal for CNC controllers that need Up/Down signals
GND:	Common ground for Z stepper motor driver

Power

+24v:	DC Power – positve input. 24Vdc maximum
-24v:	DC Power – negative input. 24Vdc maximum

USB

	A USB connector to allow software control and firmware updates

Controller Wiring

Did you get your C3DTHC together with a Nighthawk controller, attaching your C3DTHC to an already set up Nighthawk, or using a 3rd party controller?

As of March 2025, we have 2 versions of our Nighthawk CNC Controller available.

The newer version (v2.2) of the Nighthawk has a ribbon cable connector to easily connect the C3DTHC and Nighthawk together without a whole lot of messy wires.

Users with the older (v2.1) Nighthawk or a 3rd party controller will not have the ribbon cable connector and will need to use the green connectors on the front of the C3DTHC to facilitate the installation and setup.

Please note: This is only recommended for advanced users with some skill in wiring and soldering. If you aren't confident in your soldering / wiring skills, consider purchasing the Nighthawk v2.2 instead!

The Nighthawk version number will be printed along the top edge of the PCB to easily identify which one you have. If you have a Full-Stack Nighthawk Controller you will need to open the case to check which version you have. Refer to the Nighthawk Controller user manual for information on how to open the case.

Nighthawk CNC Controller v2.2

Nighthawk CNC Controller v2.1

If you are retrofitting your C3DTHC to an existing Nighthawk v2.1, skip ahead to page 14

If you are using a 3rd party CNC controller skip ahead to page 16

Nighthawk V2.2

If you received your C3DTHC and Nighthawk controller together and they are already joined by a ribbon cable you will not need to wire anything to link the controllers together. Skip ahead to page 17.

If you are adding a C3DTHC to an existing Nighthawk V2.2 controller you can choose how you would like to wire the controllers together.

Option 1: You can use the wiring outlined in the V2.1 steps below on page 14 ***or***

Option 2: You can use a 12-wire ribbon cable to connect the two controllers together in a single cable.

If you choose to go with option 2 you will need a 12-wire ribbon cable and 2x 12-pin IDC connectors to attach the cable to the control boards. *These can be purchased from CNC3D*

If you are connecting your Nighthawk and C3DTHC board using the ribbon cable method, you will need to open the cases of both to access both control boards.

Refer to the Nighthawk user manual for information on opening the case.

To open the C3DTHC case and install the ribbon cable you will need the following:

- Small Philips Head Screwdriver
- 12-Wire Ribbon Cable
- 2x 12-Pin IDC connector

To make it easier, you can purchase a ribbon cable with the connectors pre-assembled from CNC3D

Before attempting to open the case on your C3DTHC you must ensure it is powered off and unplugged!

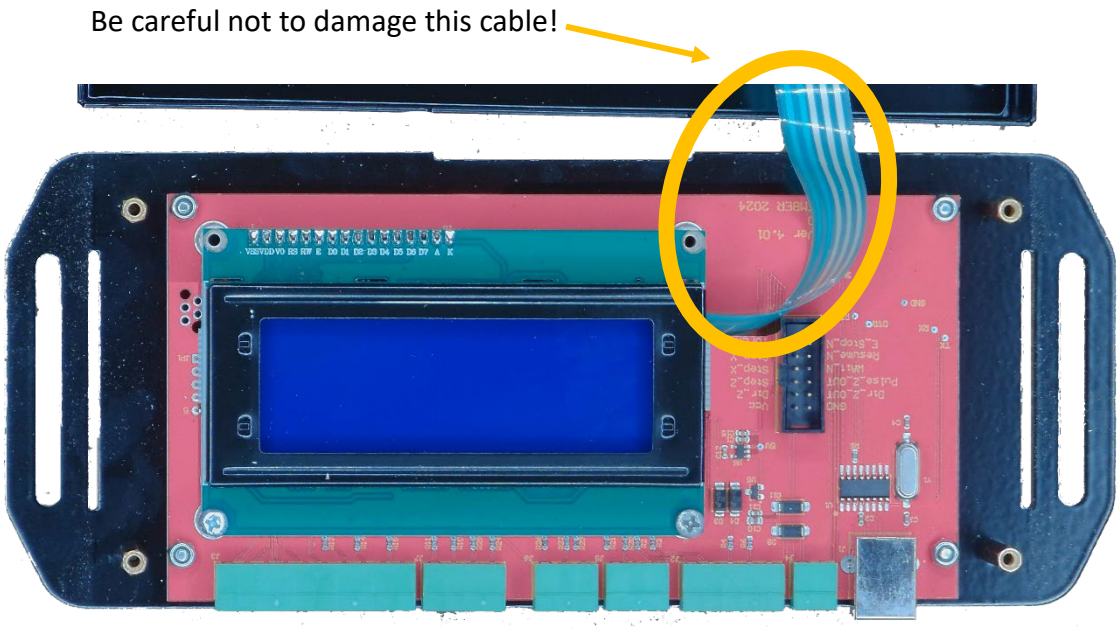
Step 1

Remove all green plugs and USB cable from the front, then unscrew and remove the screws at each corner on the top of the case.

Step 2

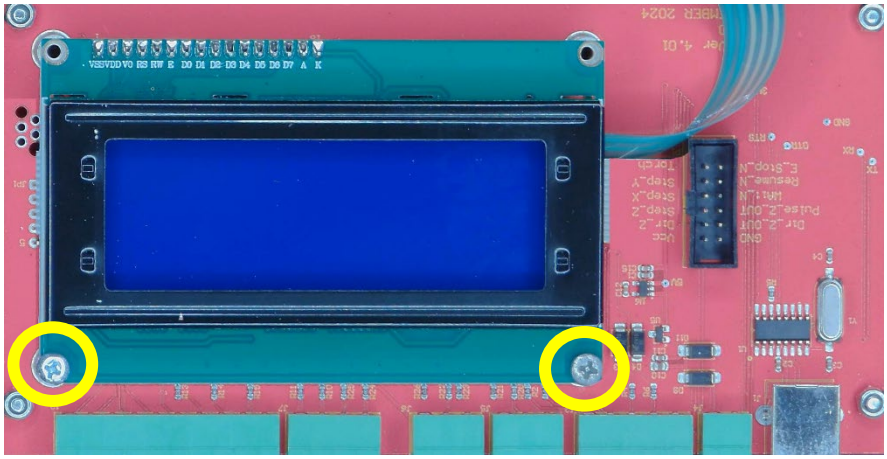
Gently lift the back of the case upwards then tilt the front of the case forwards away from the green connectors.

Pay close attention to the thin ribbon cable that runs through the case and under the screen that connects the buttons on the front to the control board.



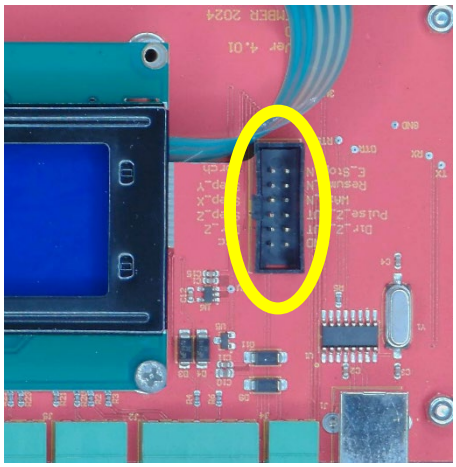
Step 3

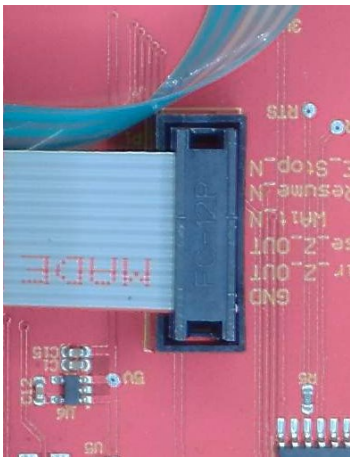
Unscrew and remove the screws holding the screen in place, you can then gently lift the screen and backing circuit board directly up off the main control board.



Step 4

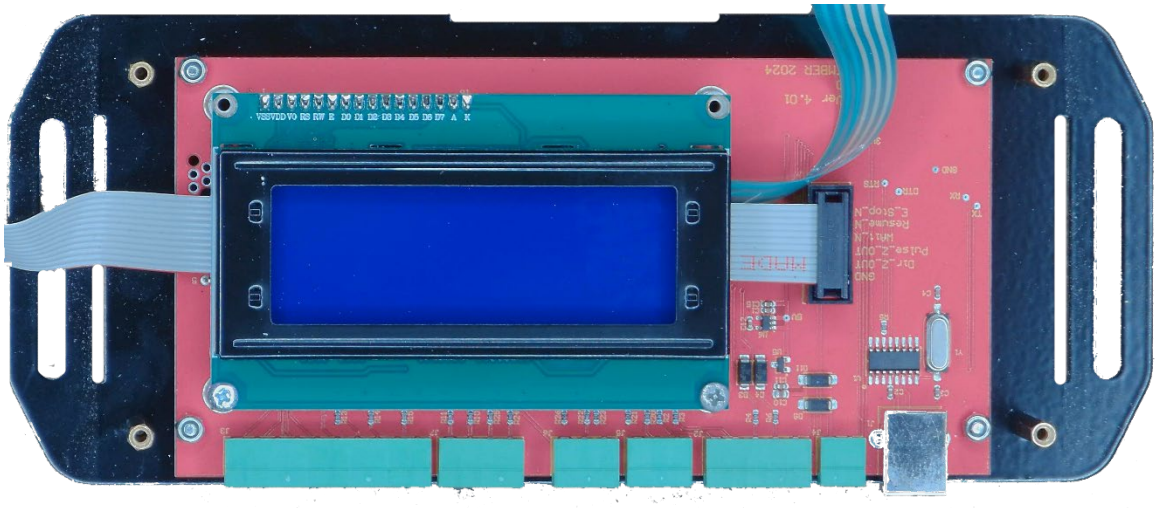
The IDC connector on the ribbon cable will only go into its plug on the board in one direction. When positioning the cable, make sure the IDC is oriented correctly and the **red** GND conductor is closest to the USB plug on the front of the C3DTHC.





Step 5

Plug the IDC connector with the wire installed into its plug on the control board, then route the ribbon cable under the screen and out to the left side where there will be a notch cut out of the steel case to allow the cable to pass through.



Step 6

Reverse steps 1-3 to close the C3DTHC case. Pay close attention to the pins on the bottom of the LCD screen to make sure they all fit into their matching location on the control board.

If the ribbon cable for the control buttons has accidentally been removed, make sure to reattach it before inserting the LCD screen. You will see a black plug on the end of the ribbon with one side having visible silver pins. The side with the visible silver pins needs to face UP towards the back of the screen when installed, or the control buttons will not respond properly.

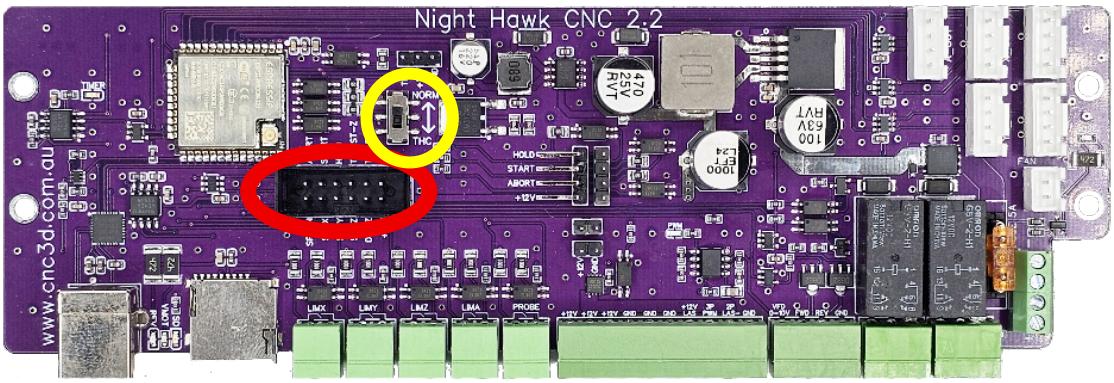
The C3DTHC wiring is now complete. The following steps relate to the Nighthawk.

Step 7

With the Nighthawk case open you will find another IDC connector socket (circled in red in the image below).

Insert the IDC connector. It will only go in one way so if force is required it's likely you have the plug in backwards; pull it out and try the other direction.

The **red** conductor will need to be positioned to the far-right side, labelled GND.

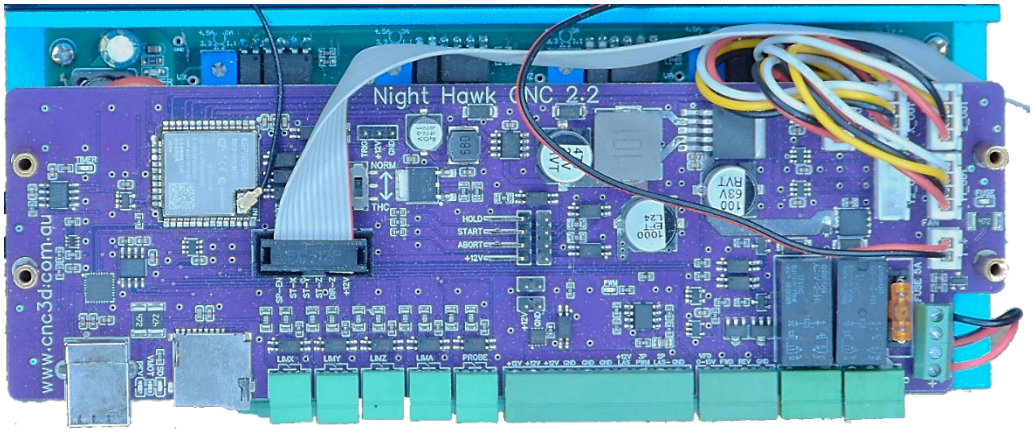


Step 8

There is a small switch just above and right of the IDC connector labelled NORM and THC (Circled in yellow above). This switch will need to be in the THC position to tell the Nighthawk to send the Z motor commands to the THC, otherwise it will continue to bypass the IDC connector entirely.

Step 9

Reverse the steps in the Nighthawk user manual to close the case. The ribbon cable can be routed out of the right side of the case through the slot beside the fan.



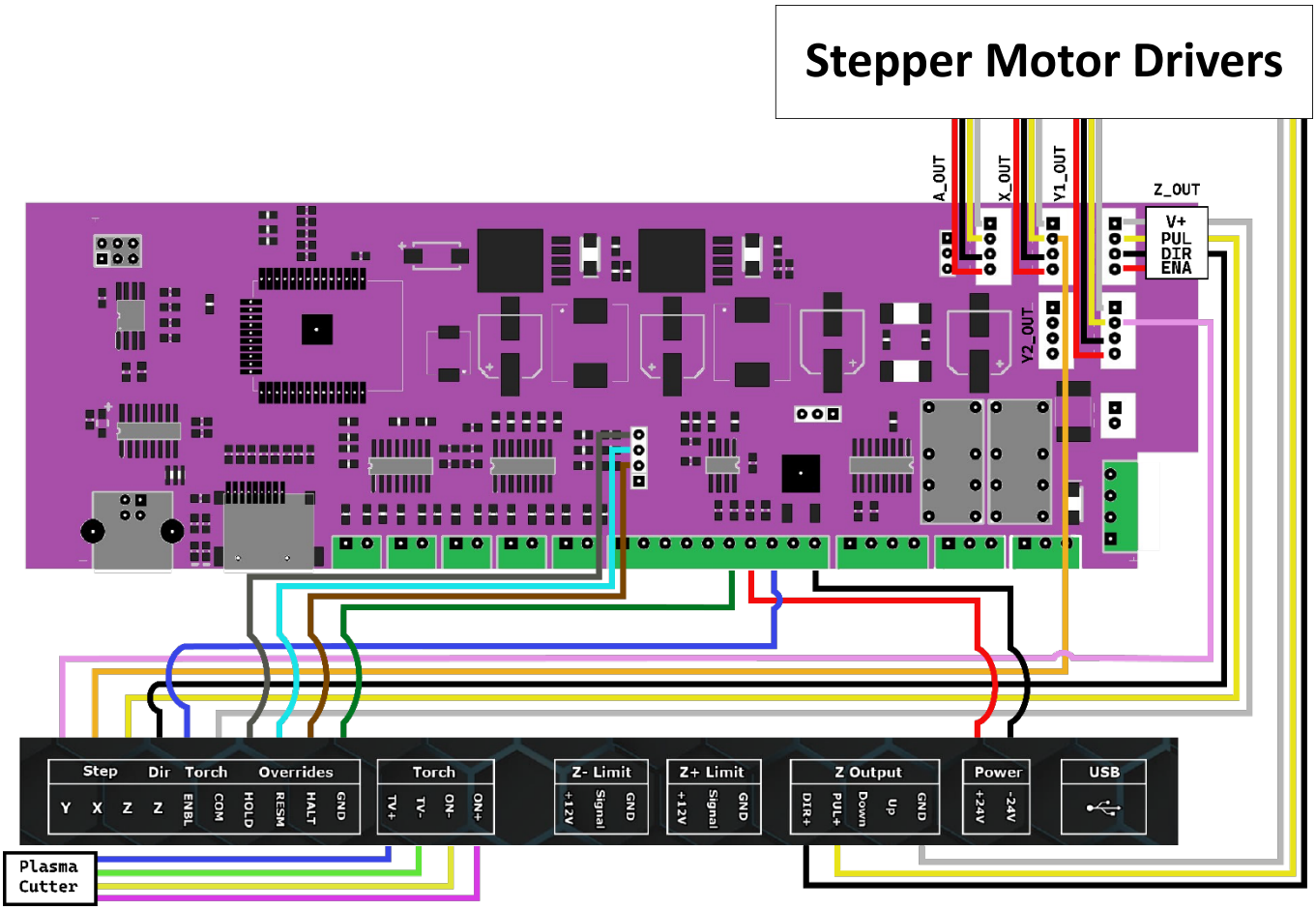
Nighthawk V2.1

For users with the v2.1 Nighthawk you will need to wire the C3DTHC to your Nighthawk using the green connectors on the front of your Nighthawk as well as some internal connections. This will require a bit of soldering to make the connections needed including splicing connections to send signals in 2 directions.

This is only recommended for advanced users with some skill in wiring and soldering. If you aren't confident in your soldering / wiring skills, consider purchasing the Nighthawk v2.2 instead!

Please read the following few pages on wiring setup *thoroughly* and make sure you understand everything BEFORE starting on any wiring.

This ensures you know what is involved before you start cutting and joining any wires.



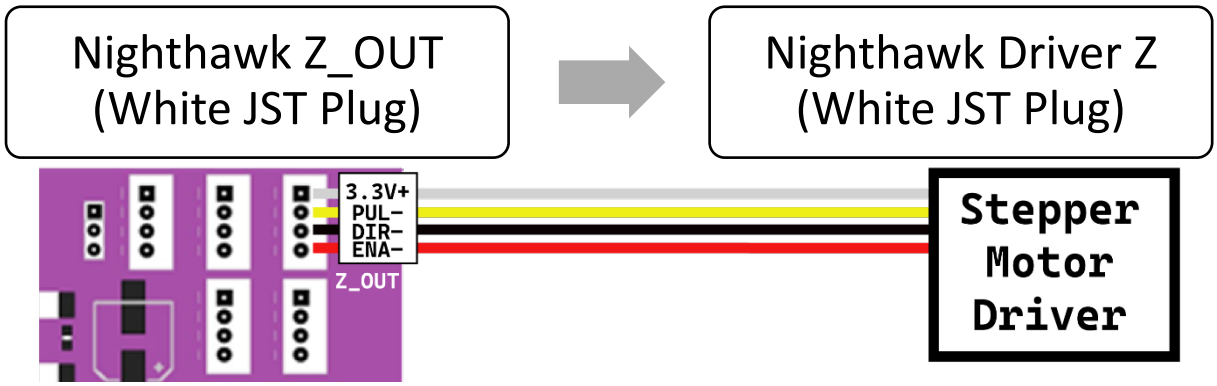
Wiring Nighthawk v2.1 to C3DTHC

The above wiring diagram only shows the wiring to the C3DTHC, it does not show the wiring to the machine's limit switches, Nighthawk power input, Nighthawk motor outputs etc. as they will not be changed.

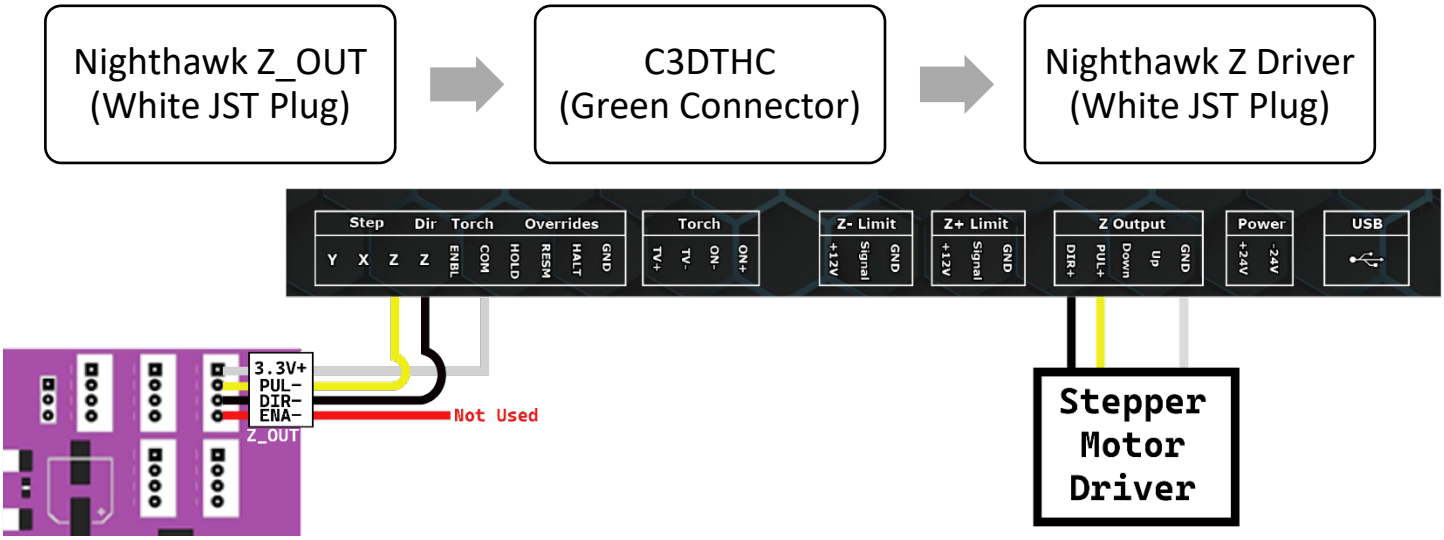
Wiring Motor Control

When retrofitting the C3DTHC to your Nighthawk you will need to reconfigure the Z axis motor control pathway to allow the THC to take control when it needs to.

The current control pathway is as follows:



To allow the THC to take control of the Z axis you will need to reconfigure the pathway to:



The THC will also need to be wired to sense the Y and X motor Step signals, but it does not need to override them. You will need to solder a breakout wire from the X and Y PUL signal wires from the Nighthawk and connect them to their respective pins on the front of the THC. These are the **ORANGE** and **PINK** wires in the diagram on page 14.

Wiring Torch Ignition Signal

The C3DTHC needs to know when the plasma torch has been commanded to turn on, so it knows to start processing data.

You will need to use the PWM output from the Nighthawk and wire it to the ENBL port on the C3DTHC. You will also need to wire the COM port on the C3DTHC to one of the GND pins on the Nighthawk.

These are the **DARK GREEN** and **BLUE** wires in the image on page 14.

Wiring Override Controls

The C3DTHC can interact with the Nighthawk's built-in E-Stop/Pause/Resume control pins which are used by the buttons on the top of the Nighthawk case.

With the Nighthawk v2.1 there is only 1 set of headers to trigger those pins, and you will need to disconnect the buttons on the top of the Nighthawk so the C3DTHC can take over instead. When you open the Nighthawk controller this header will be occupied by a black plug on the end of a ribbon cable which goes to the buttons on the top of the case. You will need to unplug this by pulling the black connector left while keeping it as flat as you can, and it will slide off.

The Override Controls are the **DARK GREY**, **CYAN**, and **BROWN** wires in the image on page 14.

Wiring Power Input

The C3DTHC can draw its power from the Nighthawk without requiring an external power supply.

You can use the LASER 12v output on the Nighthawk to send power to the +24v pin on the C3DTHC and the 3P GND output on the Nighthawk to the -24v pin on the C3DTHC.

Please ensure that these wires are correct before powering on your Nighthawk! Reversing these wires could cause irreparable damage to the Nighthawk or the C3DTHC!

These are the **RED** and **BLACK** wires in the wiring diagram on page 14.

3rd Party/Generic Controllers

For 3rd party or generic controllers that are not a Nighthawk, follow the steps above for wiring the C3DTHC to a Nighthawk v2.1.

The layout and wiring will likely be the same or close to your controller, however the pictures will not represent your control board's layout, and you will need to be able to interpret the wiring layout and apply it to your specific hardware.

This is only recommended for advanced users with some skill in wiring and soldering. If you aren't confident in your soldering / wiring skills, consider purchasing the Nighthawk v2.2 instead!

Wiring Plasma Cutter Feedback

Voltage input to the C3DTHC from your plasma source cannot exceed 12v.

This applies to the TV+, TV-, ON-, and ON+ pins connecting the unit to your plasma source.

The C3DTHC needs to constantly read the torch voltage while running so it knows how to adjust the Z-height. It also needs to know the status of the torch and if the arc is lit or not.

Using the “Torch” pins you can connect your C3DTHC to your plasma cutter using its CNC Control Port.

C3DTHC PIN	FUNCTION
TV+	Arc Voltage +
TV-	Arc Voltage -
ON-	Arc OK -
ON+	Arc OK +

These functions may be labelled differently on your plasma cutter. We have tried to make the labels as generic as we can.

Wiring Limit Switches

Having a Z- Limit and/or a Z+ Limit switch allows the system to automatically stop a job if it senses that the Z axis of your CNC machine has reached the end of its travel in the direction that the switch is set up to reach. This is not a requirement, however having them adds a level of safety to the unit's autonomous operation.

Z- Limit refers to the LOWEST point the Z axis can travel to.
Z+ Limit refers to the HIGHEST point the Z axis can travel to.

The C3DTHC can be used with either of the following switches:

Mechanical Type Switches

Must be wired as NO (normally open)

Can be wired to the C3DTHC with COM leg connected to +12v and NO leg connected to Signal.

Proximity Type Switches

These switches can come in either PNP or NPN type. **Only PNP type switches will work with this unit!**
These switches can come in either NO, NC, or combined. **Only NO / Combined type switches will work!**

Refer to the table below for wiring these switches. If using a combined-type switch, you will have a wire labelled NC and a wire labelled NO. The NC wire will not be used in this configuration.

LABEL ON SWITCH	PIN ON C3DTHC
+DC	+12V
NO	Signal
-DC	GND

Calibration

Any THC device needs to be calibrated before being used as each individual plasma cutter will have its own voltages which the C3DTHC needs to be told how to interpret.

If you have replaced your plasma cutter hardware or are getting inconsistent cut results you may need to run through the calibration process again.

Your CNC and plasma cutter will both need to be operating correctly before you are able to calibrate your C3DTHC.
If your CNC or plasma cutter is not currently running please come back to this section after setting up your machine.

Cut Height Calibration

To calibrate the cut height on your C3DTHC you will need to ignite the plasma torch while in open air as well as while cutting so have some scrap material on your machine that you can use for this purpose and have any necessary PPE and safety systems in place ready for operation.

Pro Tip: Use a scrap piece of the material you intend to cut the most to get the most accurate results

You will need to be able to control the machine AND see the screen on the unit at the same time

Step 1

Power on your C3DTHC and machine, connect to your machine and move it to a position where the plasma torch is high above the work area where it will not burn or cut any material. This can be at the machine home position or simply raise the Z axis 50-100mm above any material.

Using the buttons on the C3DTHC case press the back arrow (↰) to open the main menu then use the up and down arrows to navigate to the 'Read Torch Volts' option and press OK to open the menu.

Select Read Torch Volts

Step 2

While watching the screen on the C3DTHC, turn on the plasma torch and take note of the number labelled 'Voltage'. This number will fluctuate as the torch is lit, try to catch what you consider the average/middle number it shows. This will be the *Torch Maximum* voltage. Write this number down as you will need to enter it manually later.

Record the number shown on your screen here.
It will be different depending on your setup.

Step 3

Using a piece of scrap, position the plasma torch at the correct cutting height above the material and get prepared to cut a straight line 100-200mm long.

Pro Tip: You should cut this line at the same cutting height and speed you would normally use for the material you're using for this test.

Step 4

Ignite the torch, then cut the line while watching the screen on the unit. At about halfway through the line, record the number shown on the screen. This is the *Target voltage*. Write this number down as you will need to enter it manually.

This number should be smaller than the one recorded in Step 2.

Step 5

Press the back arrow button and navigate to the 'Set Maximum Volt' option, click OK to open the menu. You will need to use the up and down arrow buttons to set the number to the *Torch Maximum* voltage recorded in Step 2. When the number has been set, press the OK button to save.

Step 6

Repeat the process again for the 'Set Target Volt' menu however this will be the number that was recorded in Step 4.

This concludes the cutting calibration.

If you have replaced your plasma cutter or are getting inconsistent cut results you may need to run through the calibration process again.

You may need to revisit this calibration if you are changing the current of your plasma source eg: changing between cutting 2mm steel or 8mm steel.

Small variations in current shouldn't require recalibration.

You may also need to replace your consumables eg: nozzle or electrode.

Ignition Delay

This delay begins when the arc start signal is sent from the controller and prevents voltage readings or adjustments until the set time has passed. Its purpose is to allow time for the plasma cutter to react to the ignition signal and ignite the plasma arc, as this period can vary between plasma sources.

Voltage readings cannot be done in this period as the readings will either be non-existent or wildly inaccurate.

Select Ignition Del [ms]

This setting is in milliseconds (ms); 1 second = 1000ms. For example, if your plasma cutter takes 0.8 seconds to ignite the arc after you send the ON signal, use the arrows to adjust the number in this menu to 800, then press OK to save.

Pro Tip: If in doubt, set this number slightly higher rather than lower as the wait time being longer by a few milliseconds will likely not be an issue.

Having this set correctly will prevent inaccurate readings and will make the C3DTHC operation more reliable.

General Operation

The C3DTHC must be in the correct mode before starting a job or running a cut. If the system is not ready to start it will not enable any of its automatic height control features and simply allow passthrough of the Z axis movement and torch control from the controller.

The system will be in the ready mode by default once powered on so it will be ready to run straight away, otherwise use the arrow buttons to navigate to the Run Torch menu and press OK to set the C3DTHC into ready mode.

Run Torch: If you see this screen, the C3DTHC is ready to run

If you need to disable the C3DTHC for any reason and prevent it from adjusting the torch height, simply press the back button to return to the main menu. The system will only move the torch when in Run Torch mode, if it is any other menu or state it will simply allow passthrough of Z commands from the controller.

If Z Limit Switches are Installed

While the system is controlling the Z axis during normal operation the limit switches are actively monitored. If either limit switch is triggered the system will issue an E-Stop signal to the CNC controller to stop the job and prevent the machine from crashing. It will also flash an error message on the screen explaining the reason it stopped.

Pressing the OK button will close the error message and return the system into the ready state.

Operating Modes

Arc Start Modes

Arc Start Modes control how your C3DTHC reacts when your plasma torch is commanded to ignite.

None

The C3DTHC will not monitor or respond to whether the arc has successfully started. It will simply execute the programmed job as-is without verifying arc ignition. In this mode settings like *Arc Start Delay* and similar parameters are ignored.

This mode is ideal for plasma cutters that do not send arc ignition feedback to the C3DTHC or controllers that are only looking for Up/Down signals and manage their own arc.

Alarm

The C3DTHC will send an Alarm/E-Stop signal to your CNC controller if it does not detect a valid arc. The *Arc Start Delay* value determines the time the system will wait before assuming the arc has failed to ignite due to the absence of an "*Arc OK*" signal from the plasma cutter.

This mode is recommended for plasma cutters that provide an "*Arc OK*" signal *and* the C3DTHC is connected to the Alarm/E-Stop pins on your CNC controller.

Dynamic

Once the Enable command has been sent the C3DTHC will look for the *"Arc OK"* signal. If that signal is not detected within the *Ignition delay* period it will issue a Feed Hold/Pause command to your CNC controller to pause the job and gradually lower the torch towards the bed while searching for the "*Arc OK*" signal. If the signal is not detected within the *Arc Start Delay* period OR *Maximum Steps* are reached, the system will trigger an Alarm/E-Stop signal to the controller. Fine-tuning the *Ignition Delay, Arc Start Delay,* and *Maximum Steps* settings are crucial for optimal performance in this mode.

This mode is recommended for plasma cutters that provide an "*Arc OK*" signal *and* when the C3DTHC is connected to both the Pause/Feed Hold and Alarm/E-Stop pins on your CNC controller.

Detailed information about the signals and delay settings are outlined in the Sub Menus section below.

Hole Detection Modes

Hole Detection Modes control how your C3DTHC reacts when the system detects that the torch has travelled over a hole or edge of the stock.

None

The C3DTHC won't respond when the torch passes over a hole and may plunge the torch down into it while hunting the target voltage.

This setting is not recommended for most users as it can cause collisions but might be useful for heavily warped stock or troubleshooting.

Alarm

The C3DTHC will try to find a stable arc if the torch passes over a hole or void. If it can't restore a good arc within the *Detection Delay* time it will send an Alarm signal back to the CNC controller to stop the job.

This setting is recommended for most setups due to its high level of safety and responsiveness.

Dynamic

The C3DTHC will wait the *Detection Delay* time when it detects a hole. If the torch is still over the hole after this time it will move to its original arc height plus the *Max Steps Up* value to prevent collisions while continuing the job. This is the smartest mode and has the best chance of the job continuing adequately after detecting a hole..

This setting is suitable for most applications as it offers the best balance of safety and performance.

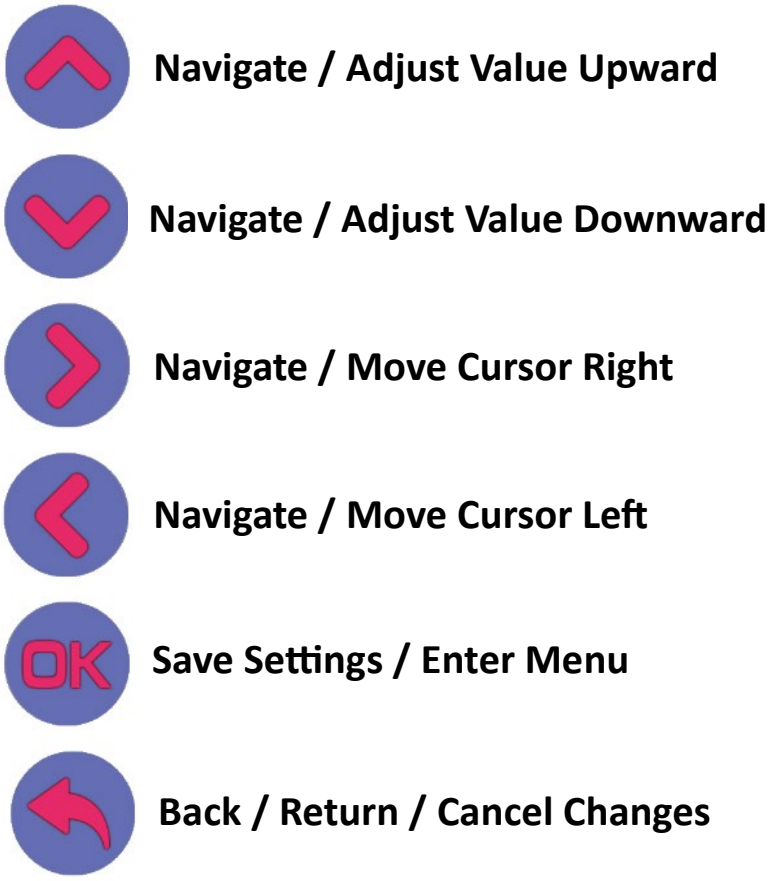
Please note: "Dynamic" mode may not work with all plasma cutters as some models will protect themselves by lowering the torch current when the torch is in open air e.g. over a hole or edge of the stock. This changes the voltage seen by the system and can confuse it. If you find that Dynamic Mode is not working for your setup consider using the "Alarm" mode instead.

Detailed information about the signals and delay settings are outlined in the Sub Menus section below.

C3DTHC Button Layout

These are the buttons on the top of the C3DTHC case to allow you to make changes and adjustments without needing to connect the controller to a computer.

Please Note: They respond to physical pressure and are not touch sensitive, so make sure to press firmly to activate the button.



Main Menu

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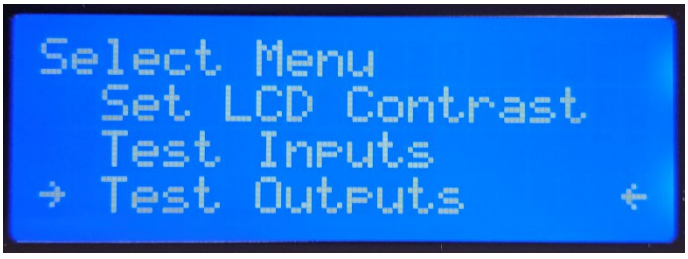


Sub Menus

Run Torch

This is the screen you will see when the C3DTHC is ready to run. The C3DTHC will be on this screen by default as it powers on, so you do not need to touch anything before running.

This screen tells you the status of the torch as well as what the C3DTHC is doing while cutting.

Pressing the back (↩) button will bring you into the main menu. The system will not operate if you are in any menu other than Run Torch.

Enable: Reports the signal status from the controller commanding torch on/off.

Torch: Reports feedback from the plasma cutter. Typically, this is the "*Arc OK*" value.

Set Target Voltage

Target voltage of the cut. This is the voltage the system will aim for when adjusting the torch height. Use this setting to change the height of the torch from the surface of the material whilst being cut.

Setting is in millivolts (mV); 1 volt = 1000mV.

Higher number = Higher Torch Height

Refer to page 5 for more information on cutting voltage.
Refer to page 19 for more information on setting this value.

Set Maximum Volt

Sets the Open Circuit voltage of the plasma cutter. This is the highest voltage the plasma source will send out on the CNC control port. Usually, this voltage is only reached if arc ignition occurs too far away from the stock material or the torch travels over a hole or edge. This value is used by some *Arc Start* and *Hole Detection* modes.

Setting is in millivolts (mV); 1 volt = 1000mV.

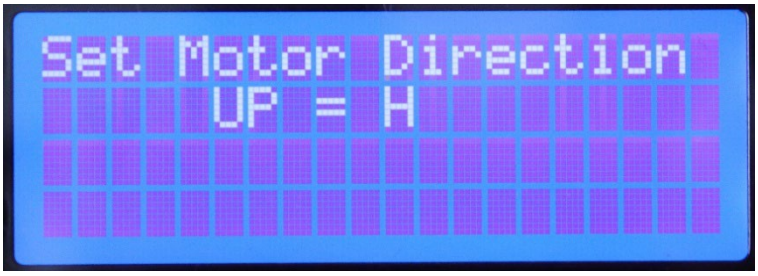
Refer to page 19 for more information on setting this value.

Read Torch Volts

Diagnostic information displaying the current arc voltage.

Refer to page 19 for more information.

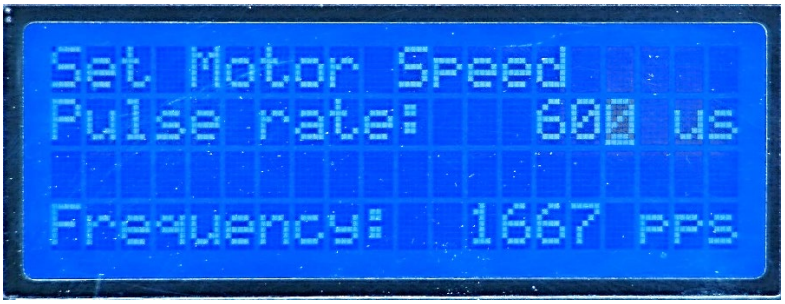
Set Motor Direction



Set the motor direction to ensure it is moving in the right direction. Where UP can either be “H” or “L” (High or Low) signal. DOWN value will always be the opposite value.

While on this screen you can use the Up and Down arrow buttons to check motor movement direction.

Set Motor Speed



Set the speed of the motor's movements for best performance. The pulse rate may be specific to your driver so check your manual. Setting a higher Pulse Rate (µs) will increase the responsiveness / speed of the motor however setting this too high is the same as driving a motor too fast and may cause the motor to stall. The Frequency number is just to show you how many pulses per second (pps) your selected Pulse Rate translates to.

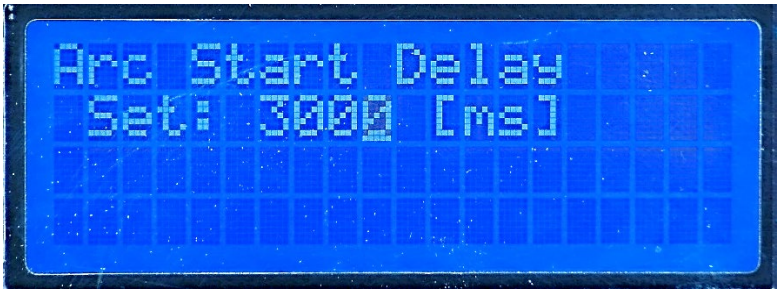
Setting is in microseconds (µs); 1 second = 1,000,000µs

Arc Start Mode

Set the Arc Start Mode.

Refer to page 23 for details on the different Arc Start Modes

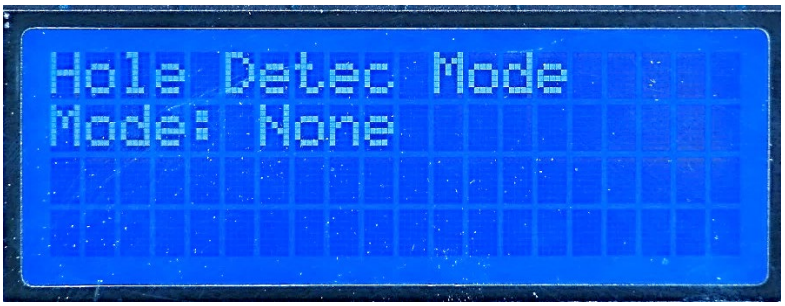
Arc Start Delay



The delay before the C3DTHC takes over control and performs the required action when an arc is not correctly ignited. This only applies if the above *Arc Start Mode* is set to Alarm or Dynamic.

Setting is in microseconds (ms); 1 second = 1000ms.

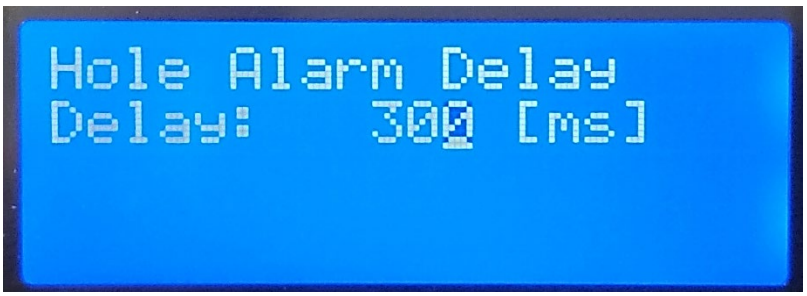
Hole Detect Mode



Set the Hole Detection Mode.

Refer to page 24 for details on the different Hole Detection Modes

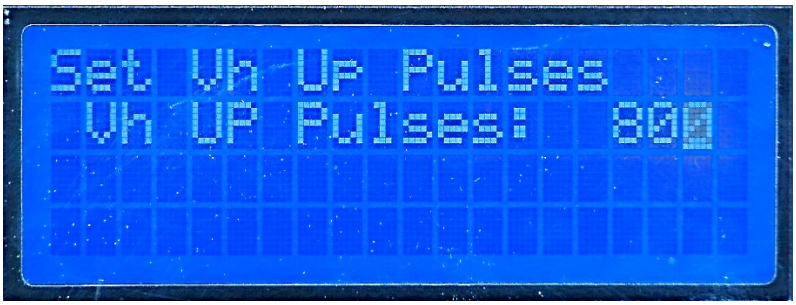
Hole Alarm Delay



The delay before the C3DTHC acts when it detects the torch is travelling over a hole or void. This only applies if the above *Hole Detection Mode* is set to Alarm or Dynamic.

Setting is in microseconds (ms); 1 second = 1000ms.

Set Vh Up Pulses



Applies when Hole Detection mode is set to Dynamic. This is how many pulses upwards the torch will move when the C3DTHC detects high voltage (Vh), indicating the torch has travelled over a hole.

Refer to page 24 for more information on Dynamic mode.

Set Max Steps

This setting defines the maximum number of steps the C3DTHC can move in a specific direction. You can set different limits for both upward and downward movement as needed. This prevents the Z motor from over traveling and ensuring it does not run indefinitely or collide with the machine.

Pro Tip: Move the cursor all the way to the right before moving down to adjust Max Step DN

Set Ignition Delay

The time it takes for your plasma cutter to ignite after the Enable command is sent.

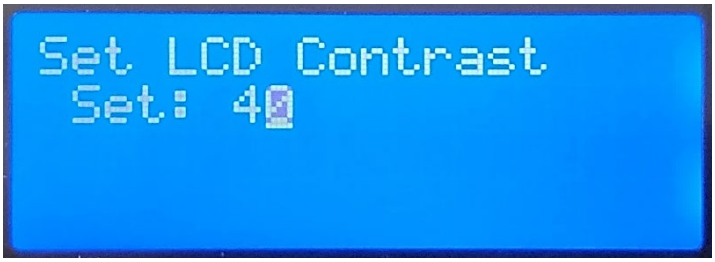
Refer to page 19 for more information.

This setting is in milliseconds (ms); 1 second = 1000ms.

Set LCD Backlight

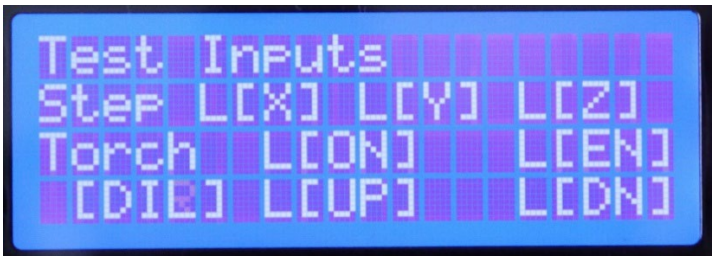
Sets the brightness of the LCD Backlight

Set LCD Contrast



Sets the contrast of the LCD display.

Test Inputs



Diagnostics and testing of inputs. Returns information such as Step signal state for XYZ and torch signals are either High or Low signal. You can also trigger your limit switches and check if their state changes from L to H.

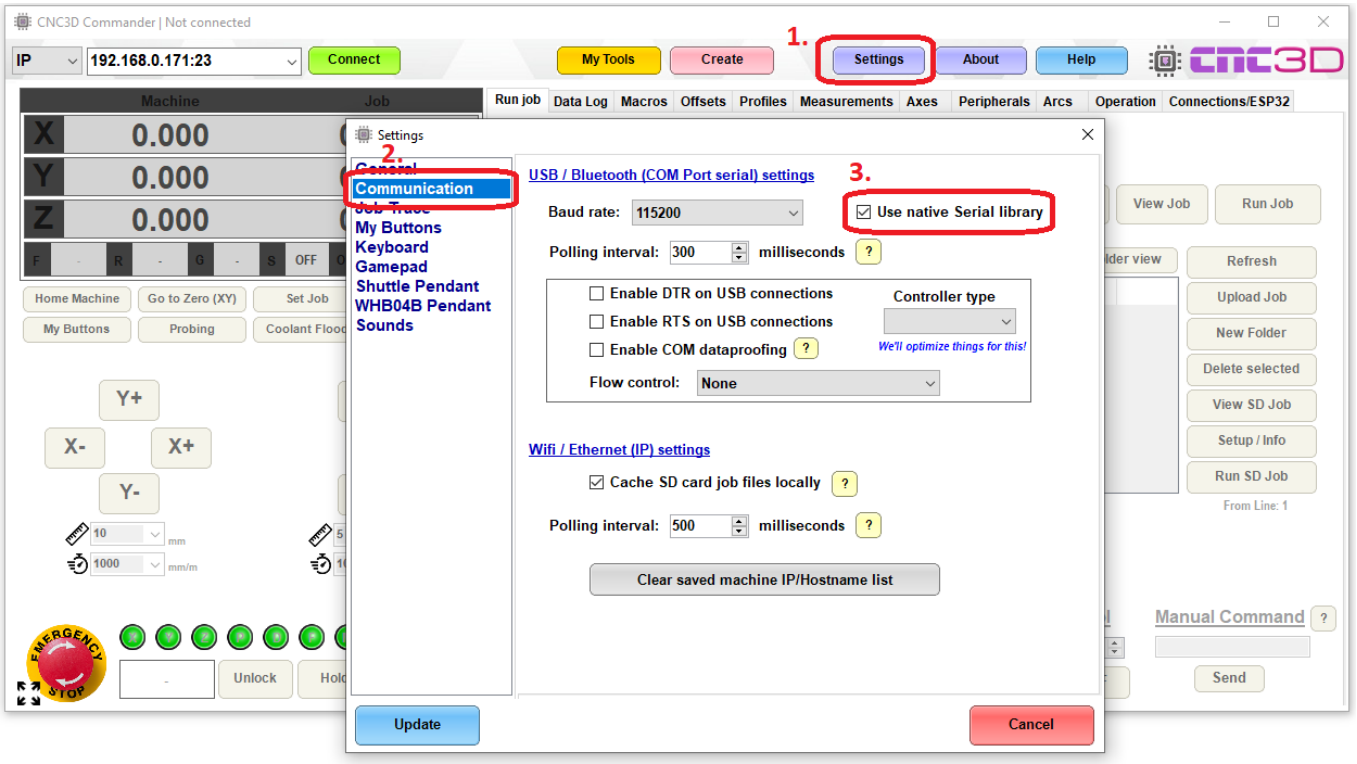
Test Outputs

Diagnostics and testing of outputs. Returns information such as whether the Z step signals are being sent or not, along with the Pause, Resume, and Abort signals that are commonly used by the Dynamic modes of *Arc Start* and *Hole Detection*.

C3DTHC Control via Commander

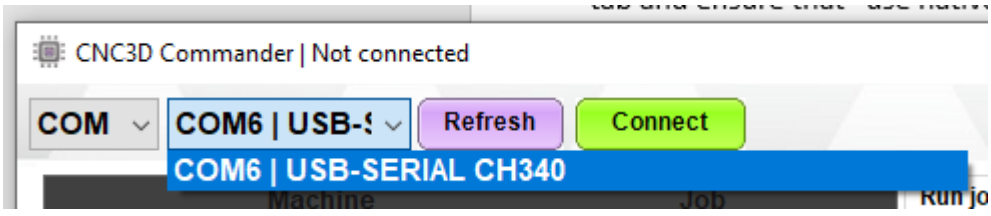
You can set up and configure your C3DTHC from our Commander software directly via USB.

To ensure Commander is ready for this, make sure to go Into Settings and click on the Communications tab and ensure that “use native serial port” is ticked.



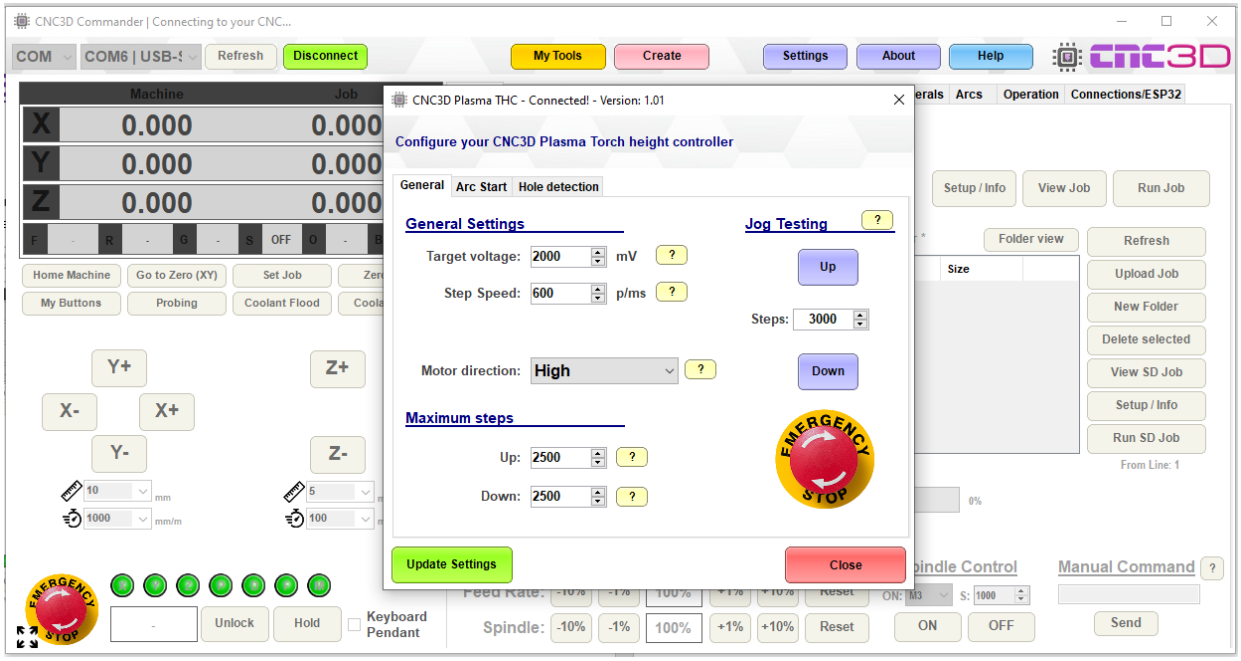
Once this is done, Click on Update in the settings window to return to the main Commander window.

Connect your USB cable to your C3D THC and the other end to your PC and then change the connection type in Commander to ***COM*** and then click on ***Refresh***. You should then be able to search for the right COM port. It should have “***CH340***” in the title somewhere, select this one. Please note the Nighthawk also uses a CH340 chip and will also show a port for this with CH340 in it if connected. If your Nighthawk is connected via USB we recommend unplugging it to remove any confusion and hitting ***Refresh*** again if you need to.



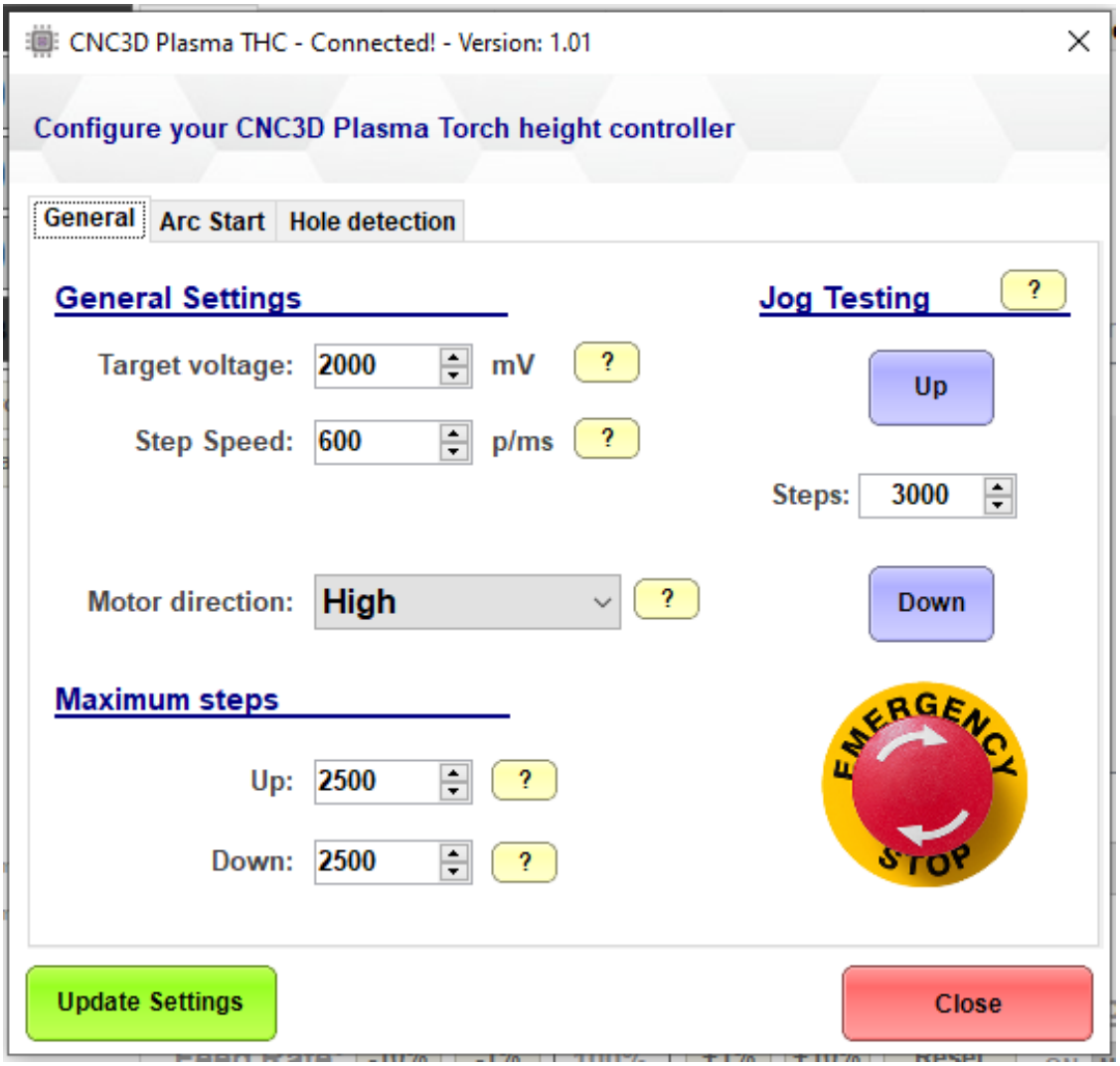
Once you have the right COM port selected, click the “***Connect***” button and the following window should appear.

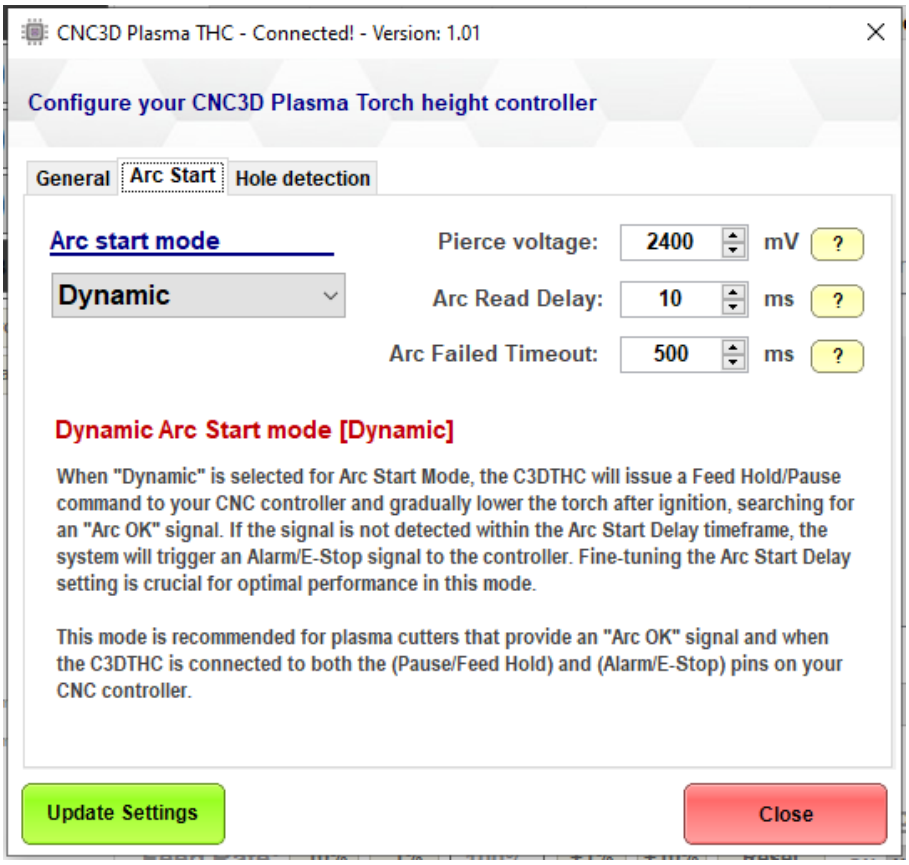
Please note: Initial connection could take a few seconds! If connection fails, try again.

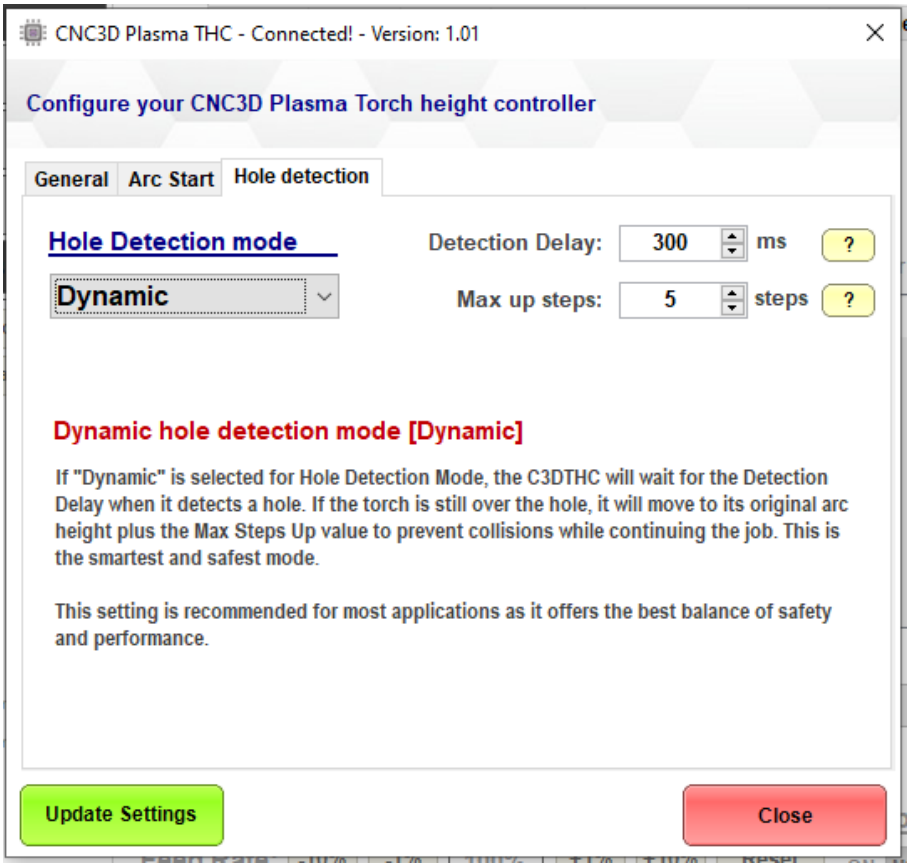


This is where you can easily set your settings and learn more about this by clicking on the "**?**" buttons throughout.

Let's take a closer look at the tabs:







After changing any settings, always press the “Update Settings” button and wait for a confirmation that the settings have been updated successfully.

Additional Resources

Below is a list of other resources we recommend for further information on your machine use, specific guides/manuals for parts or general tips and tricks for your machine or software usage.

Nighthawk Information
User Manual / USB Driver
cnc3d.com.au/nhc

CNC3D Commander
Download / Information / Guides
cnc3d.com.au/commander

CNC3D TV
"How-To" Videos / Video Guides
cnc3d.com.au/cnc3dtv
youtube.com/@cnc3d

Post Processors
For Common CAD/CAM Software
cnc3d.com.au/postp

Facebook User Group
Show Off and Chat!
facebook.com/groups/cnc3dplayground

Support FAQ
Common Questions and Answers
cnc3d.com.au/forum/support-faqs

Need help?

Reach out to our friendly Support team.

Phone: +617 5522 0619 (9am-5pm AEST)

Email: solutions@cnc3d.com.au

Website: https://www.cnc3d.com.au/nhc OR via our Chat.

Facebook: https://www.facebook.com/cnc3dau

FB Community: https://www.facebook.com/groups/cnc3dplayground

We are always looking for feedback! If you have any suggestions regarding how we can re-word our manuals or support pages to make them easier to understand please let us know using the links above!