4

Touch Sensor and Plasma Torch Height Control Configuration for Mach4 Ver.3 (BETA)

Posted: *October 09, 2023* | **Categories:** Plasma Setup C82, PTS, THC

Touch Sensor and Plasma Torch Height Control Configuration for Mach4

Overview:

There are two ways of commanding the plasma cutting sequence. You could command all the actions using gcode commands (M62/M63 as torch on/off, G31 for probing, and G4 for piercing delays) or you could set all the operating parameters and just command the plasma using the M2003/M2005 macros. These instructions will configure the system to use it both ways.

M2003 Macro performs the following actions:

- Probes or moves down the Z axis to the "Z Min. height" position that is set in the DRO for this value and the feed that is set in "Probing FR".
- Set the current position to be the new Z = Zero considering the Z Offset if a Floating Head is used.
- Moves the Z up at max velocity to the piercing position or DRO = Pierce Height.
- Turn on the Torch.
- Wait for Pierce time or DRO = Pierce Delay.
- Moves the Z up at max velocity to the cut position or DRO = Cut Height.
- Activate THC.

M2005 Macro performs the following actions:

- Turns the torch off.
- Deactivates the THC.
- Moves the Z axis at max speed to the position where it would be safe to move at max velocity to the next cutting position. This is DRO =Z Top.
- The screen holds the new DRO values and also has the code that will enable the probe while the system is probing.

Used software: Mach4 4.2.0.5207.

https://www.machsupport.com/ftp/Mach4/DevlopmentVersions/Mach4Hobby_Installer-4.2.0.5207.exe

ESS Plugin Mach4: ESS v298.

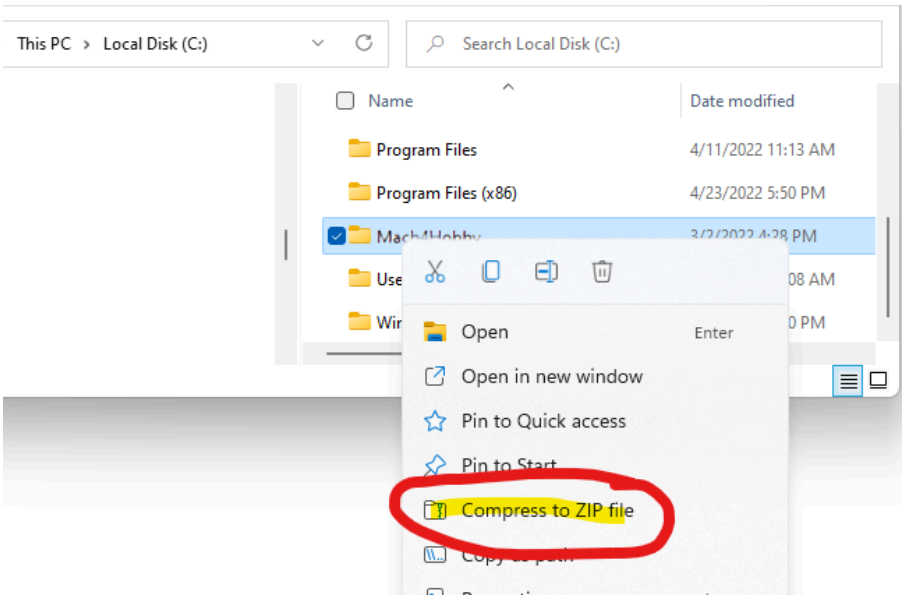
https://warp9td.com/files/Plugins/ESS/Mach4/ESS_Mach4_v298.zip

Hardware Used:
THC-1 or THC-2, PTS-1

STEP 1: BACKUP

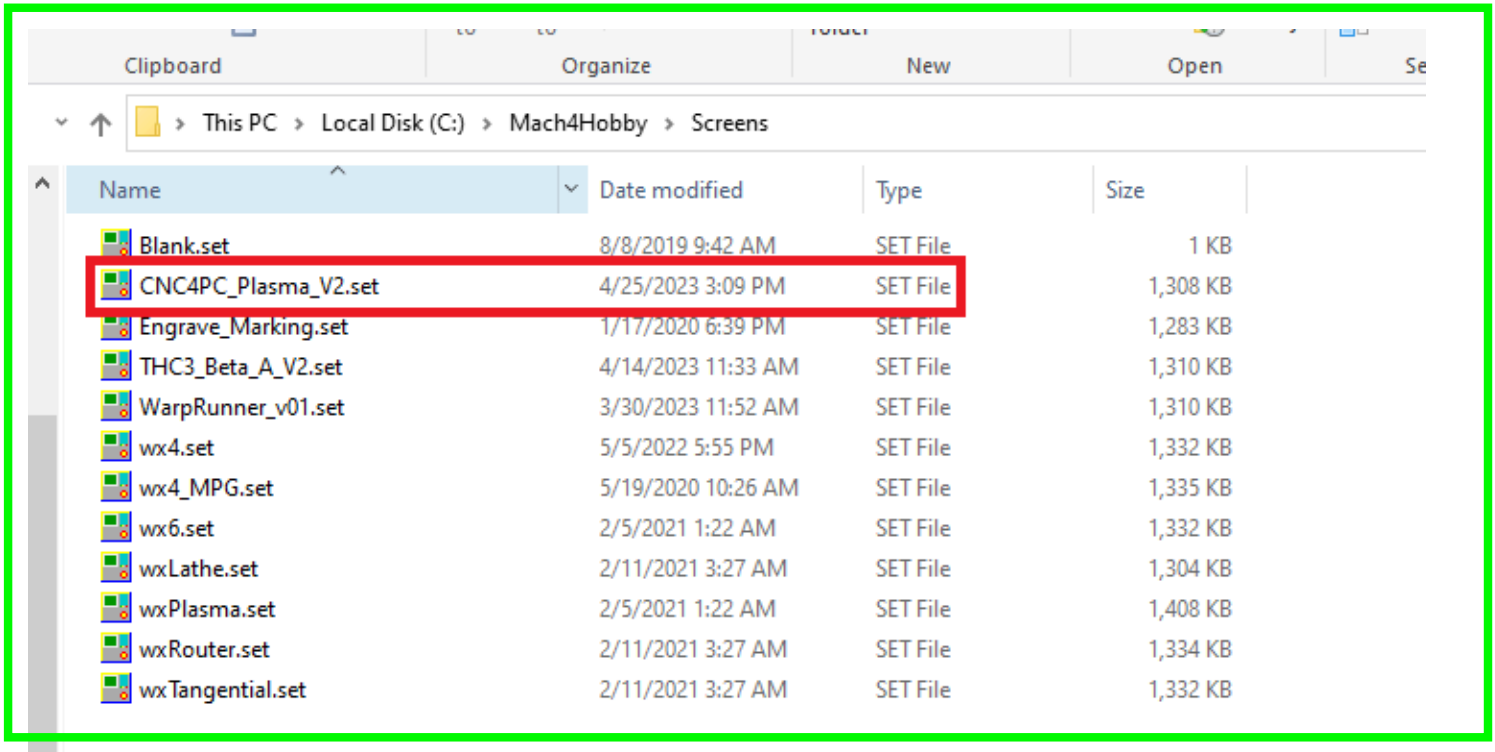
Start by making a backup of the existing installation:

Make a backup of the configuration and file installation, we recommend creating a backup of the current installation by right-clicking in the current installation folder and zipping it.

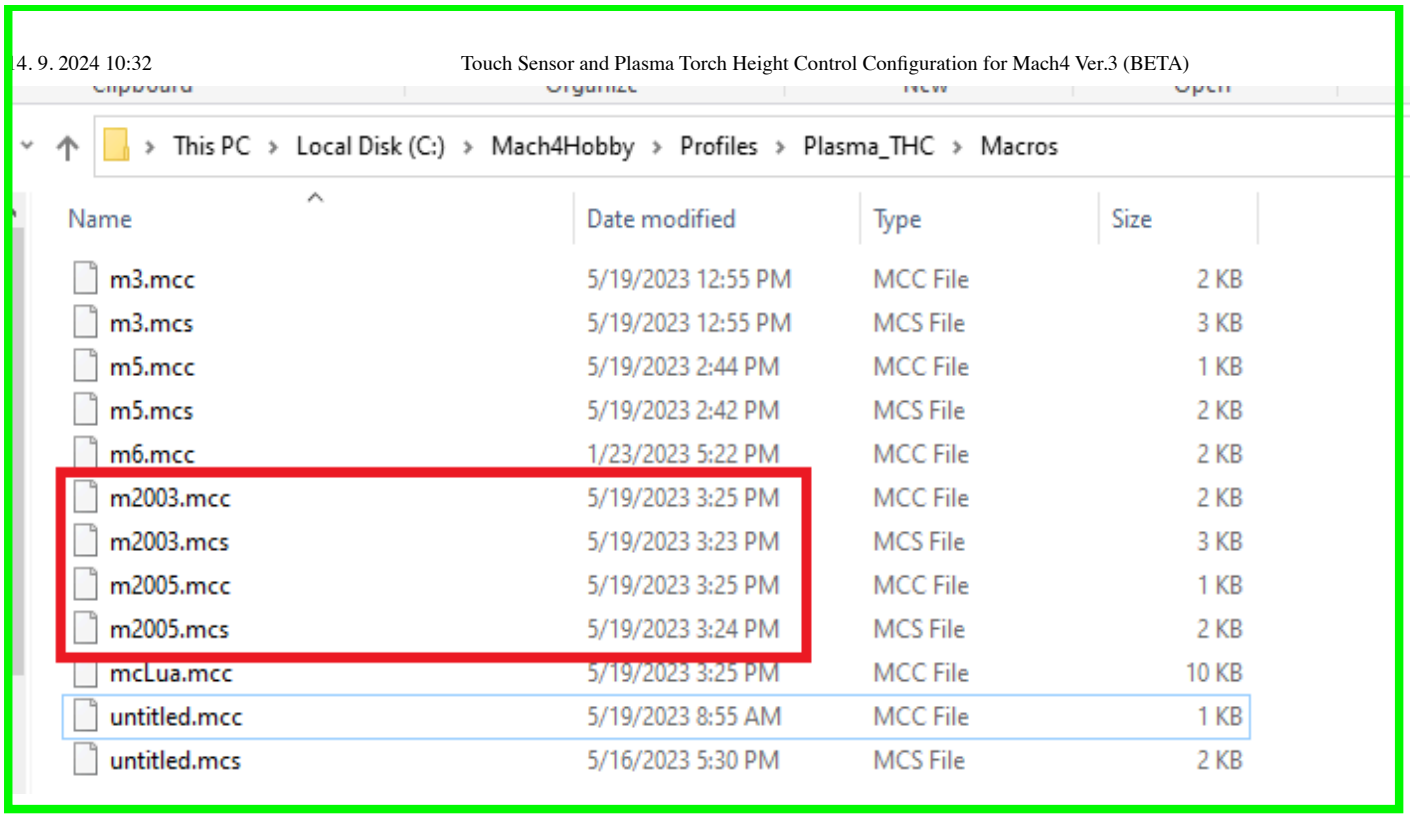


STEP 2: INSTALL THE FILES

Download and install the new screen and macro files: Download the compressed file containing the macros and screen that work with the macros:https://www.cnc4pc.com/pub/media/productattachments/files/M4_CNC4PC_Plasma_V2.zipYou will need to install the screen found in the download folder and place the macro in the macros directory for the profile folder.

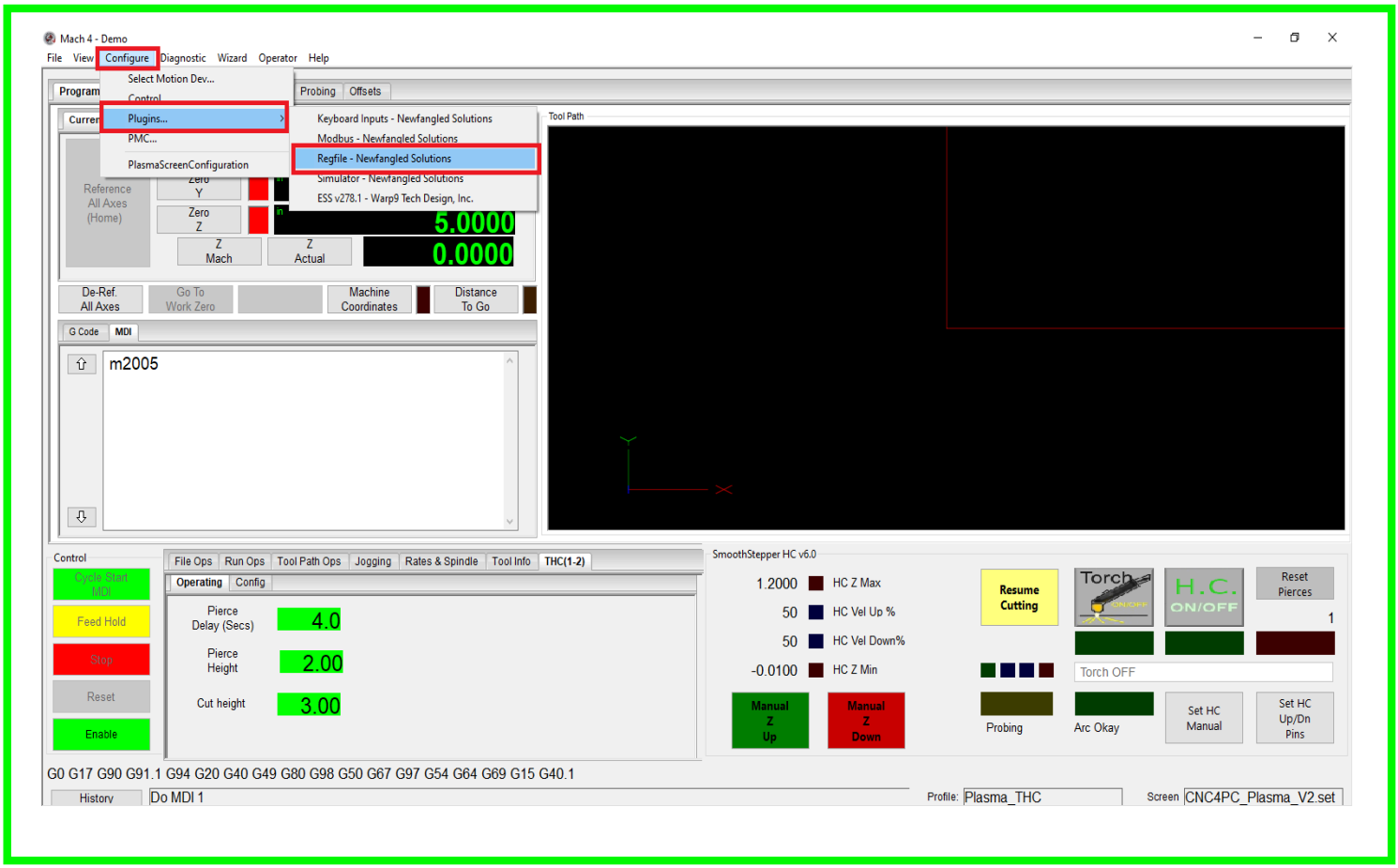


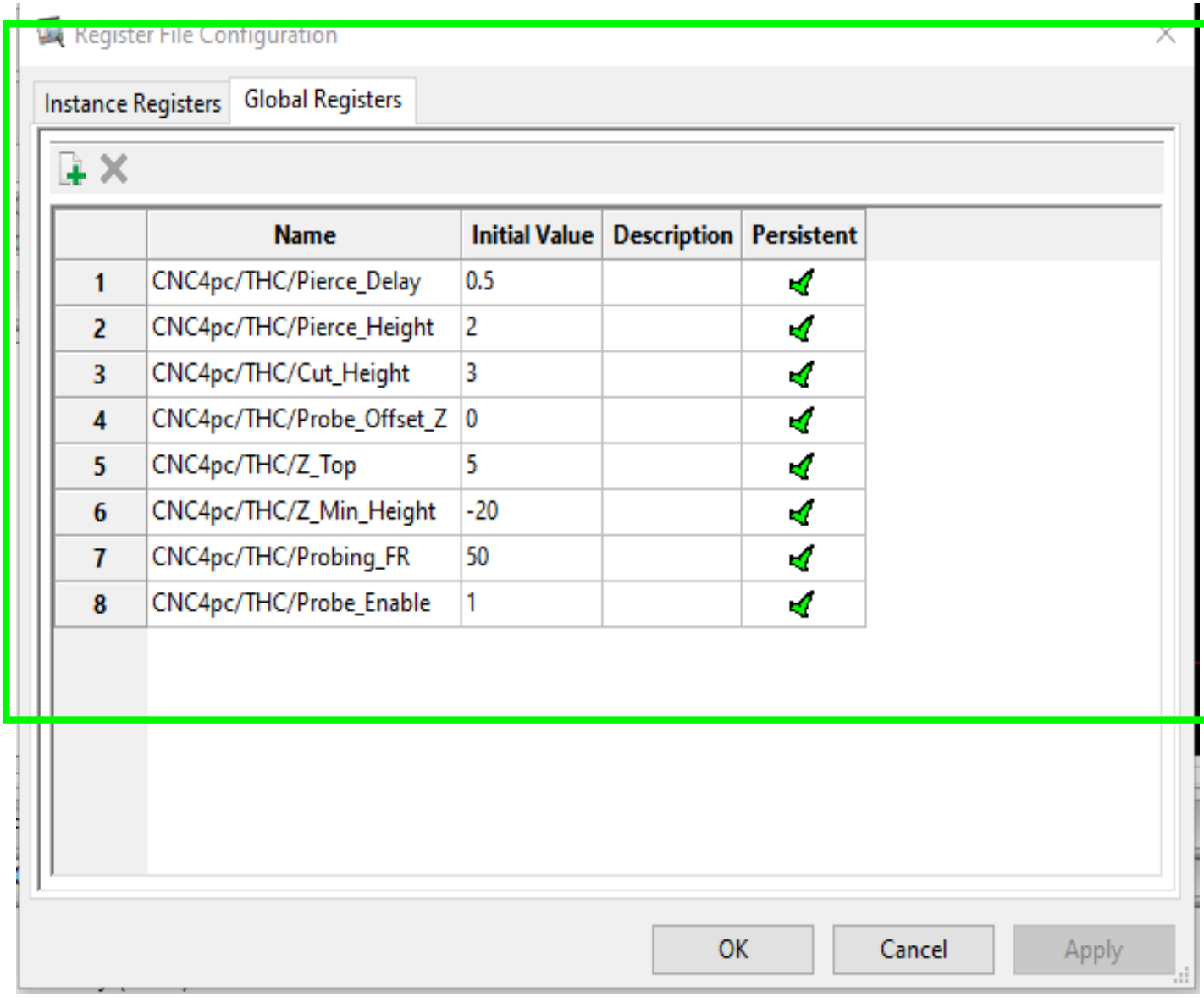
Make a backup of the original M2003 and M2005 macros by zipping them into the same folder, just so you may have access to the original macros if you need to revert the installation later:



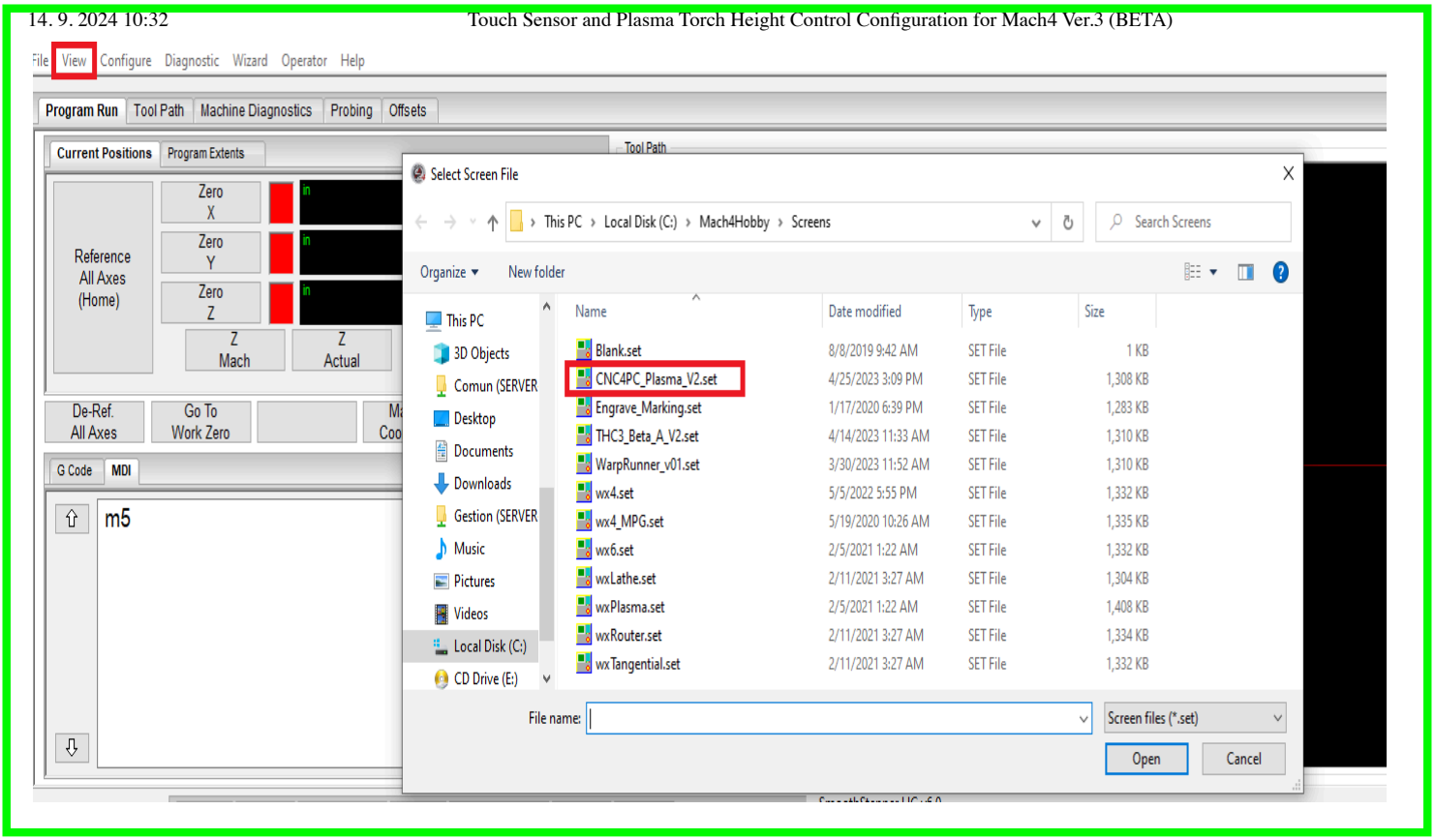
STEP 3: CONFIGURE THE NEW SCREEN

Configure/Plugin/Regfile:



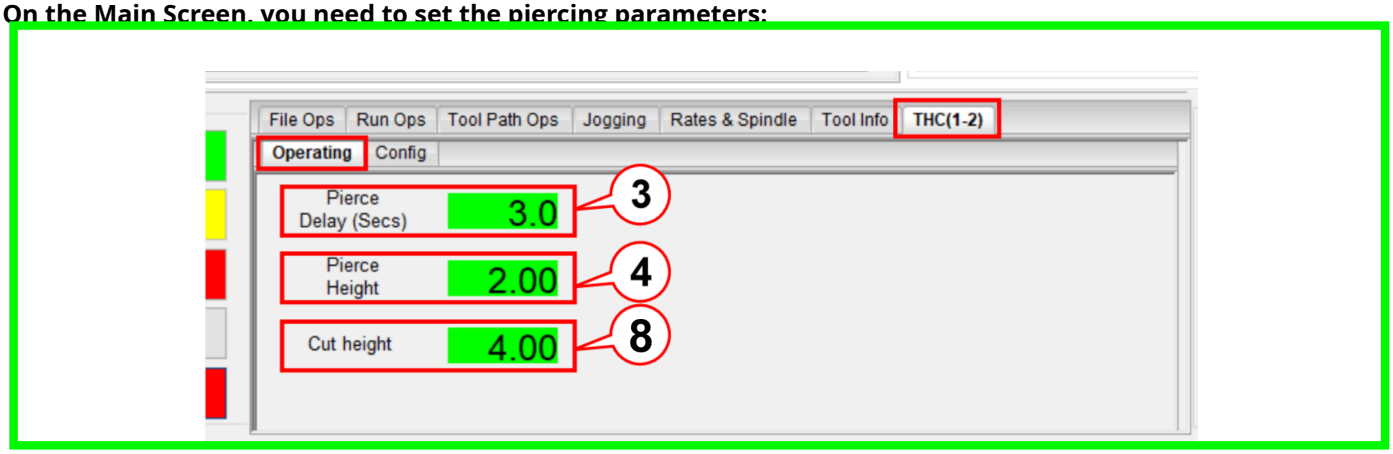


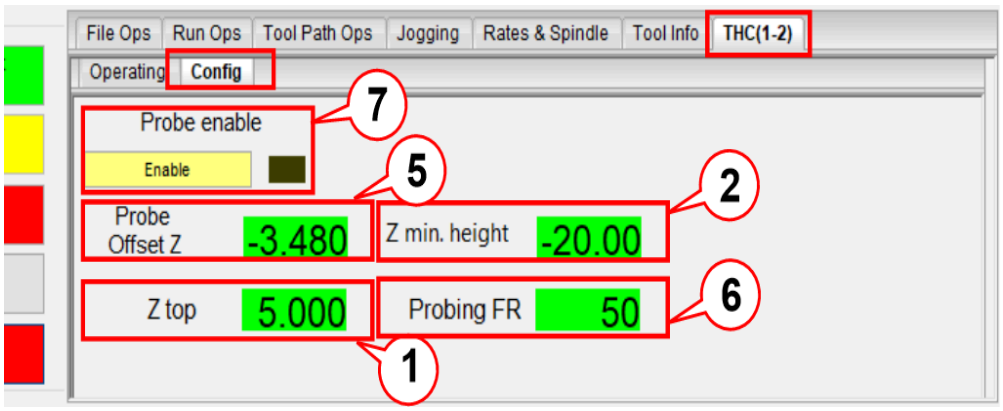
View/Load Screen:



Apply Changes, Save Settings, and Restart MACH4 for all the changes to take effect.

On the Main Screen, you need to set the piercing parameters:





1. **Set Z_Top which is the safe position from which you can do a rapid motion to the new cutting position.**
2. **Set how low you want the Z-axis to go while probing or touching the plate.**
3. **Set the THC delay or Piercing Time.**

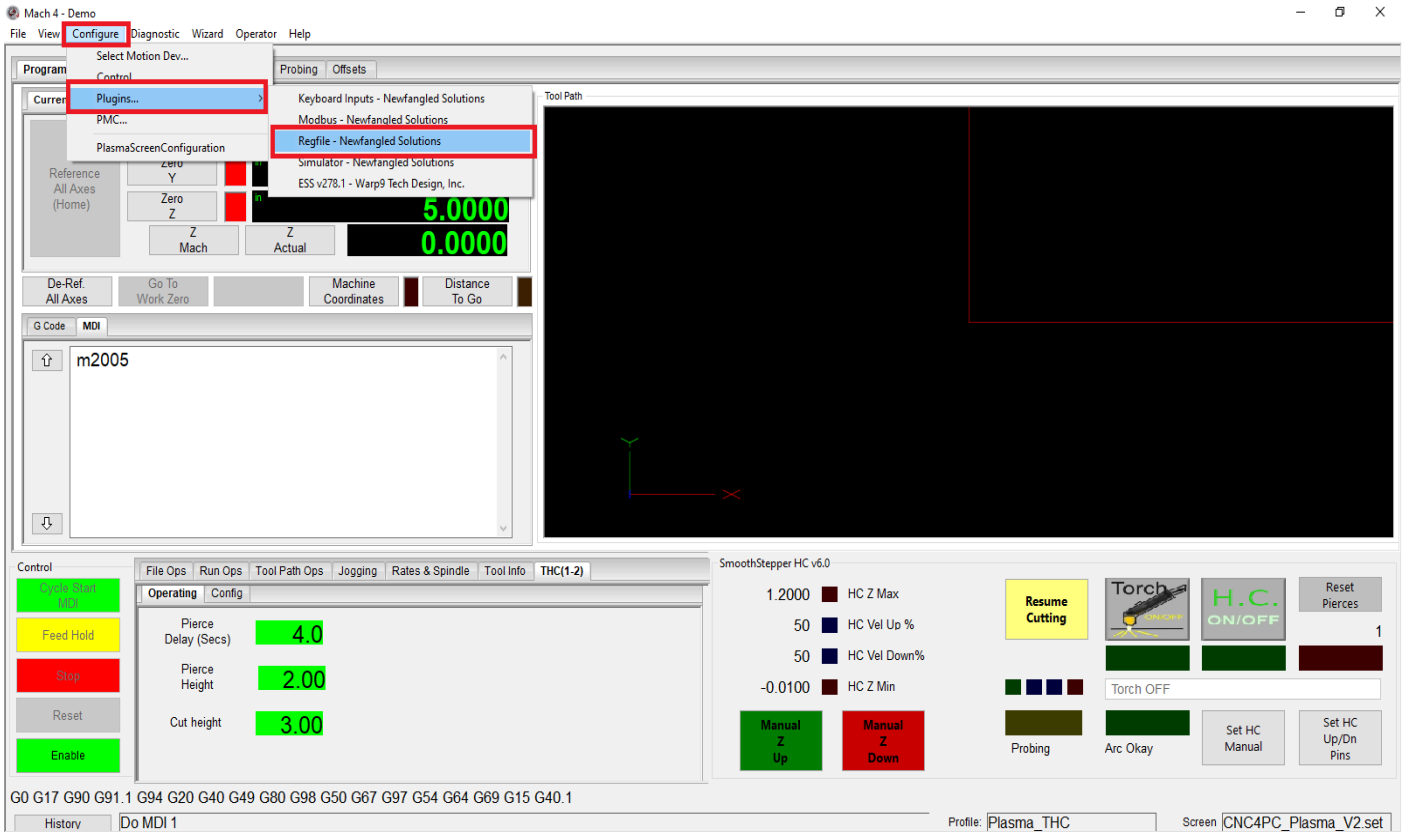
4. **Set the height at which you want to start cutting or do the initial pierce.**
5. **Set the OFF SET_Z.**
6. **Set the Probing FR.**
7. **Set the Probe enable.**
8. **Cut height**

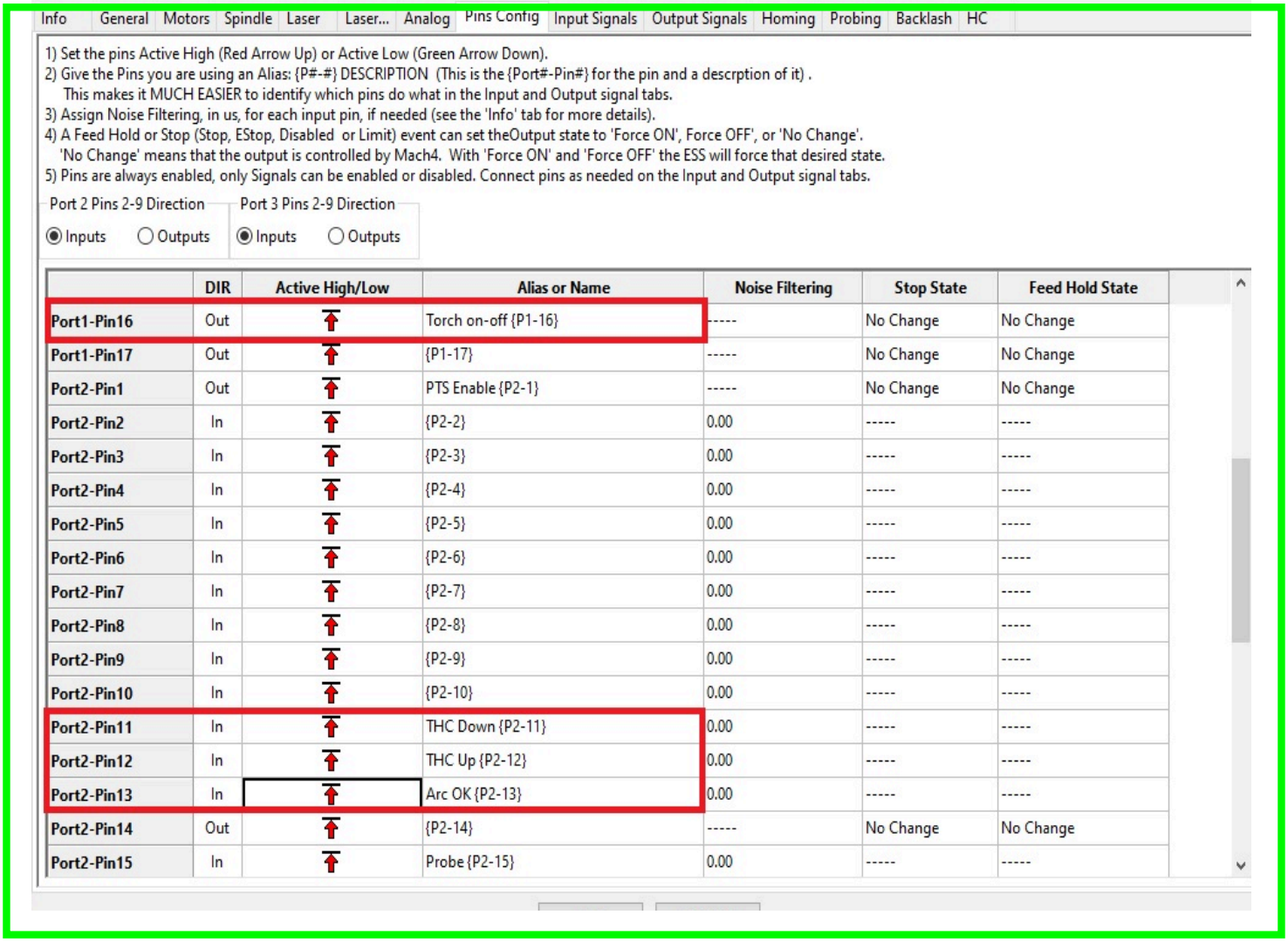
STEP 4:VERIFY WIRING:

https://www.cnc4pc.com/blog/post/connection-c25xp-with-thc-1-and-pts-1

STEP 5: CONFIGURE THC AND PROBING

Probe pin configuration. This is the pin used to sense the probing action. This pin will go high when the probe touches the plate. If using a floating head where the z-axis will need to travel to the switch position, you need to set the Z offset.



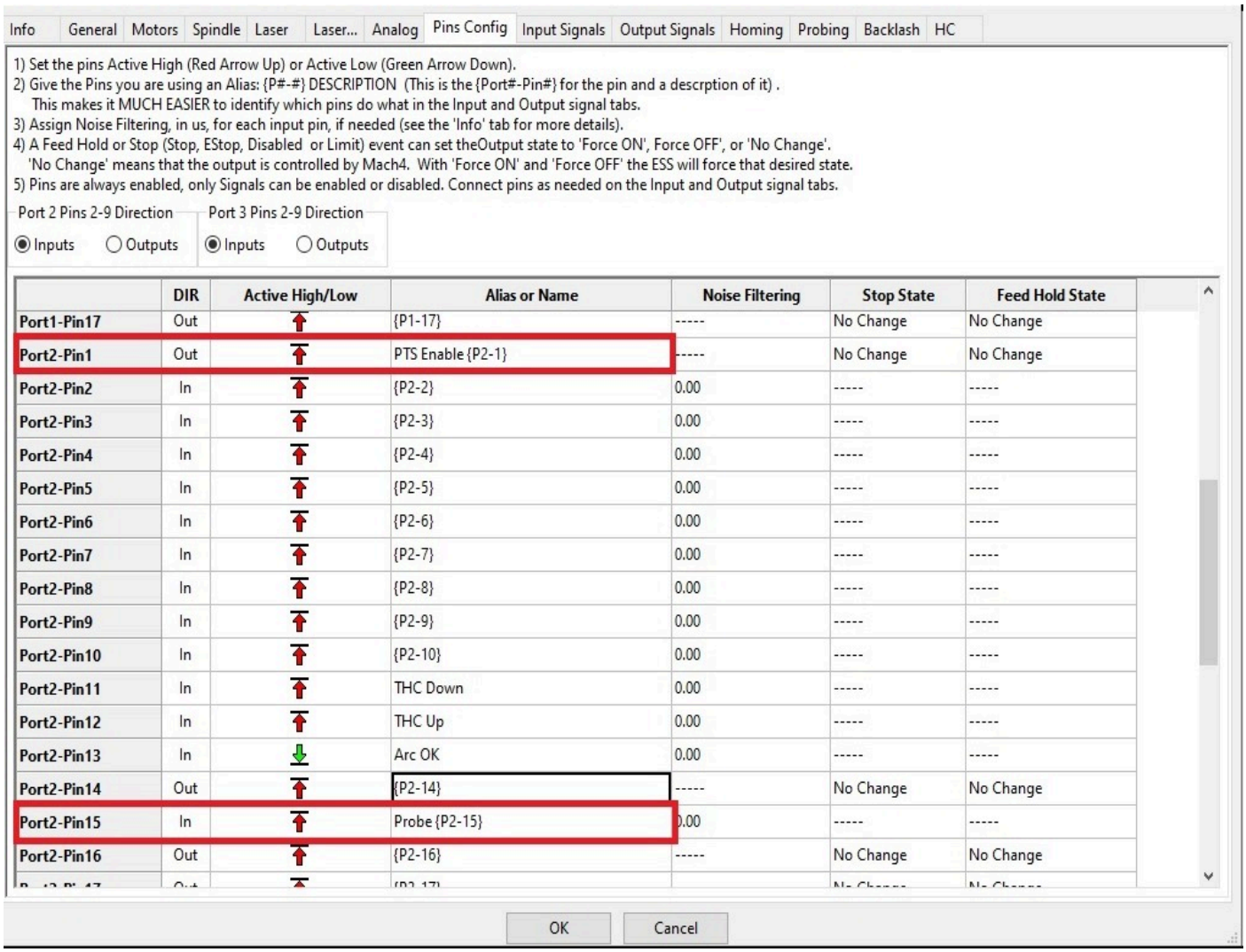


Info | General | Motors | Spindle | Laser | Laser... | Analog | Pins Config | Input Signals | Output Signals | Homing | Probing | Backlash | HC

1) Set the pins Active High (Red Arrow Up) or Active Low (Green Arrow Down).
2) Give the Pins you are using an Alias: {P#-#} DESCRIPTION (This is the {Port#-Pin#} for the pin and a descrption of it) .
This makes it MUCH EASIER to identify which pins do what in the Input and Output signal tabs.
3) Assign Noise Filtering, in us, for each input pin, if needed (see the 'Info' tab for more details).
4) A Feed Hold or Stop (Stop, EStop, Disabled or Limit) event can set theOutput state to 'Force ON', Force OFF', or 'No Change'.
'No Change' means that the output is controlled by Mach4. With 'Force ON' and 'Force OFF' the ESS will force that desired state.
5) Pins are always enabled, only Signals can be enabled or disabled. Connect pins as needed on the Input and Output signal tabs.

Port 2 Pins 2-9 Direction: (•) Inputs ( ) Outputs
Port 3 Pins 2-9 Direction: (•) Inputs ( ) Outputs

	DIR	Active High/Low	Alias or Name	Noise Filtering	Stop State	Feed Hold State
Port1-Pin16	Out	↑	Torch on-off {P1-16}	-----	No Change	No Change
Port1-Pin17	Out	↑	{P1-17}	-----	No Change	No Change
Port2-Pin1	Out	↑	PTS Enable {P2-1}	-----	No Change	No Change
Port2-Pin2	In	↑	{P2-2}	0.00	-----	-----
Port2-Pin3	In	↑	{P2-3}	0.00	-----	-----
Port2-Pin4	In	↑	{P2-4}	0.00	-----	-----
Port2-Pin5	In	↑	{P2-5}	0.00	-----	-----
Port2-Pin6	In	↑	{P2-6}	0.00	-----	-----
Port2-Pin7	In	↑	{P2-7}	0.00	-----	-----
Port2-Pin8	In	↑	{P2-8}	0.00	-----	-----
Port2-Pin9	In	↑	{P2-9}	0.00	-----	-----
Port2-Pin10	In	↑	{P2-10}	0.00	-----	-----
Port2-Pin11	In	↑	THC Down {P2-11}	0.00	-----	-----
Port2-Pin12	In	↑	THC Up {P2-12}	0.00	-----	-----
Port2-Pin13	In	↑	Arc OK {P2-13}	0.00	-----	-----
Port2-Pin14	Out	↑	{P2-14}	-----	No Change	No Change
Port2-Pin15	In	↑	Probe {P2-15}	0.00	-----	-----



Info | General | Motors | Spindle | Laser | Laser... | Analog | Pins Config | Input Signals | Output Signals | Homing | Probing | Backlash | HC

1) Set the pins Active High (Red Arrow Up) or Active Low (Green Arrow Down).
2) Give the Pins you are using an Alias: {P#-#} DESCRIPTION (This is the {Port#-Pin#} for the pin and a descrption of it) .
This makes it MUCH EASIER to identify which pins do what in the Input and Output signal tabs.
3) Assign Noise Filtering, in us, for each input pin, if needed (see the 'Info' tab for more details).
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'No Change' means that the output is controlled by Mach4. With 'Force ON' and 'Force OFF' the ESS will force that desired state.
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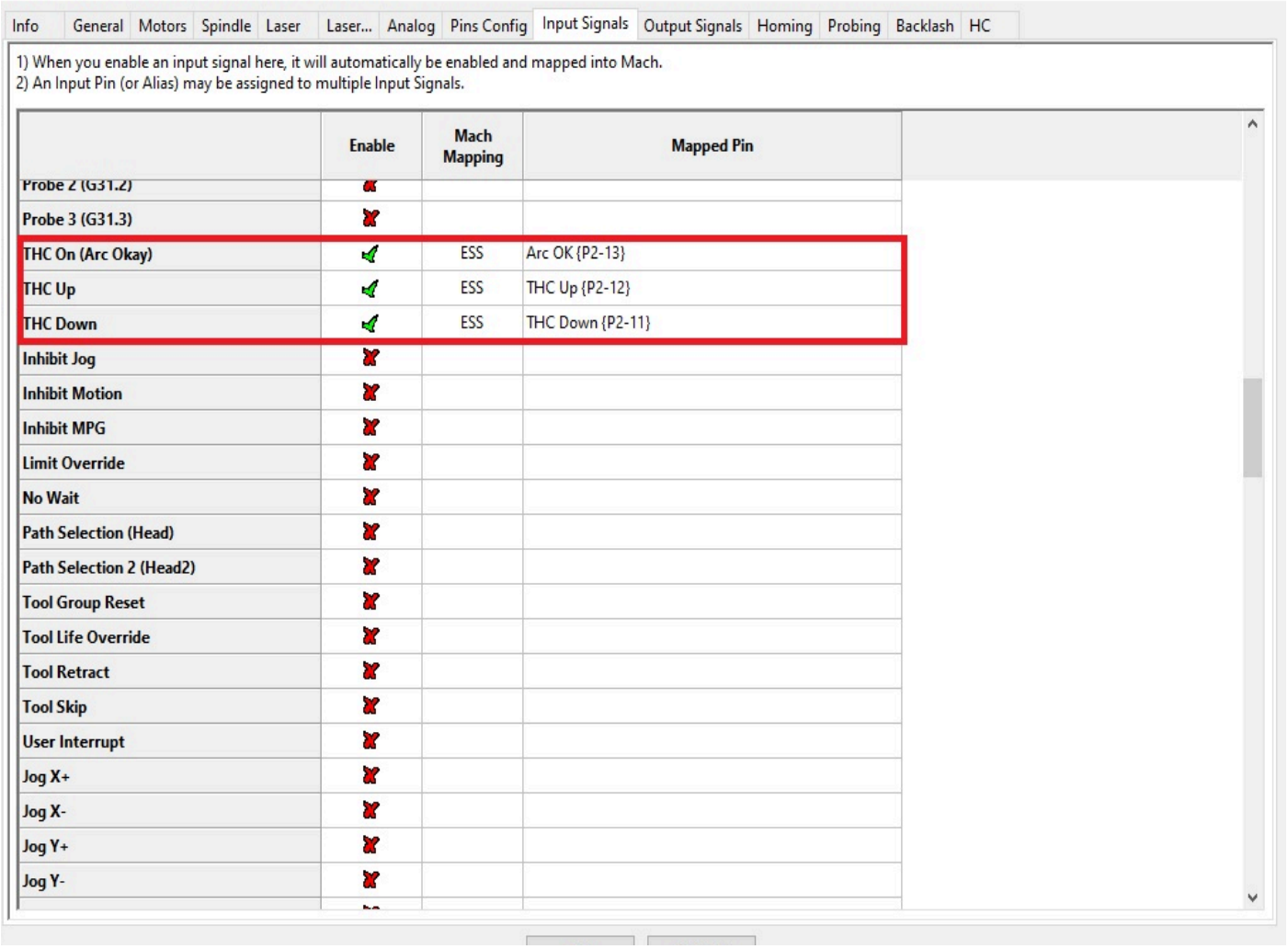
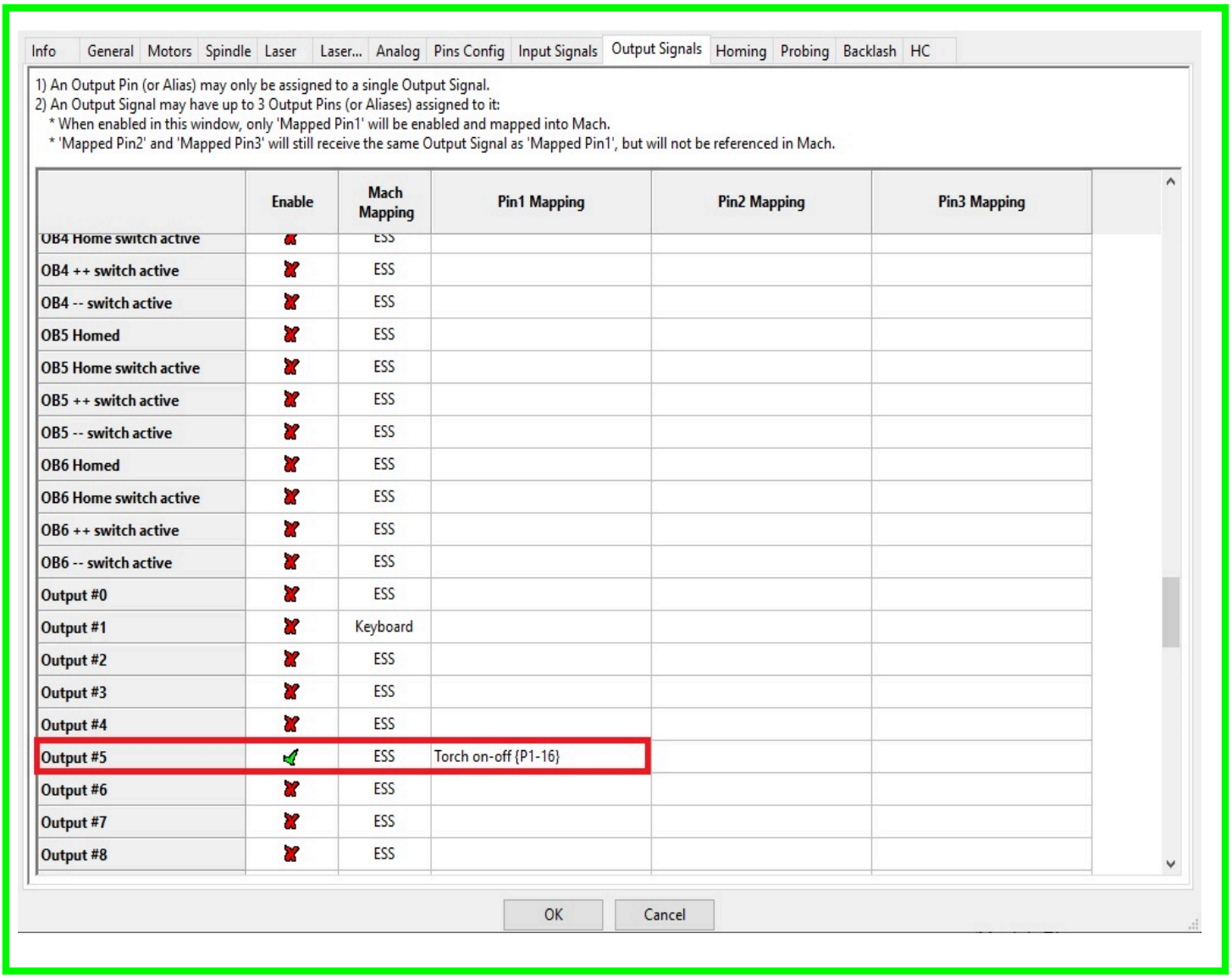
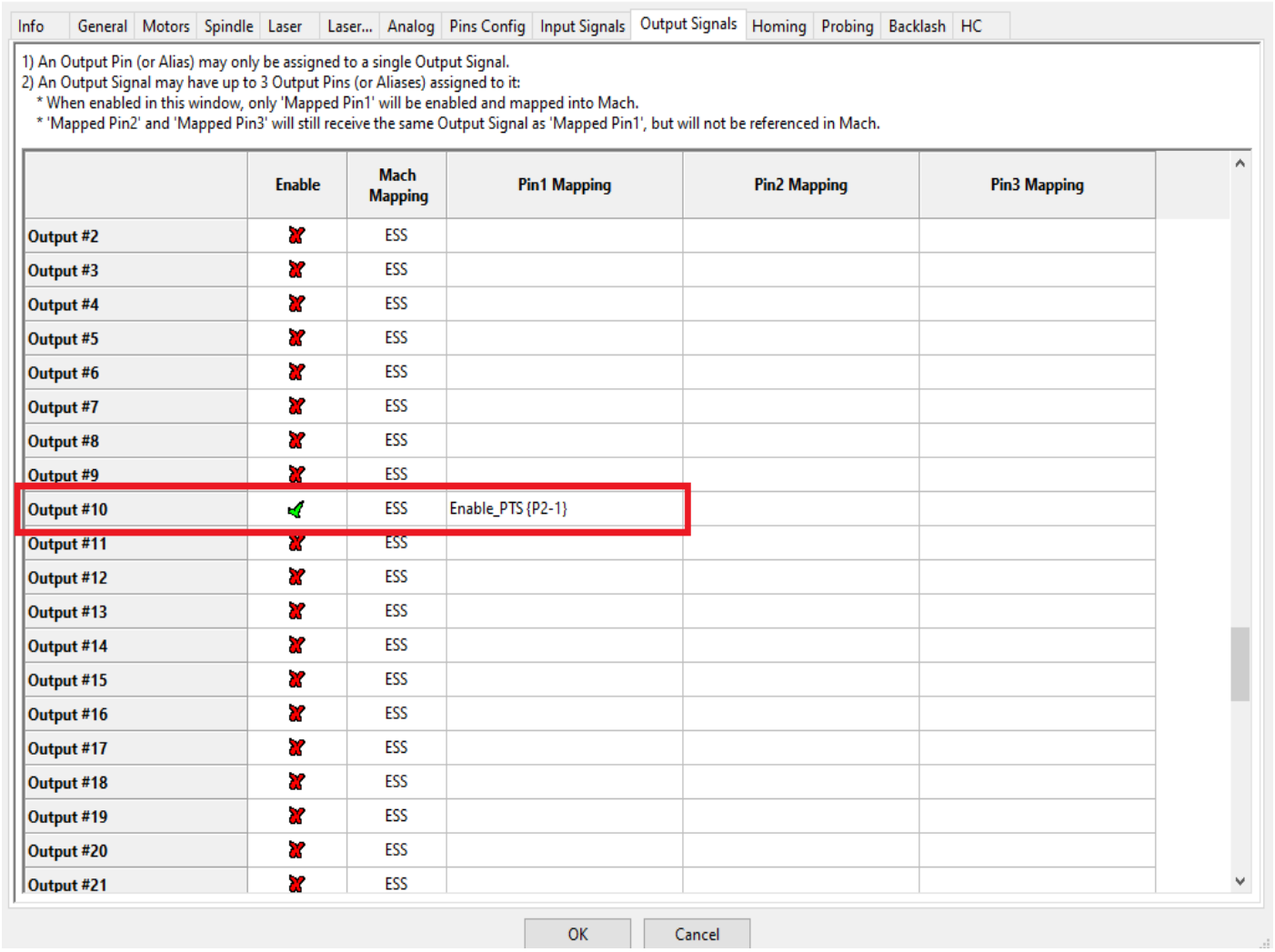
Port 2 Pins 2-9 Direction: (•) Inputs ( ) Outputs
Port 3 Pins 2-9 Direction: (•) Inputs ( ) Outputs

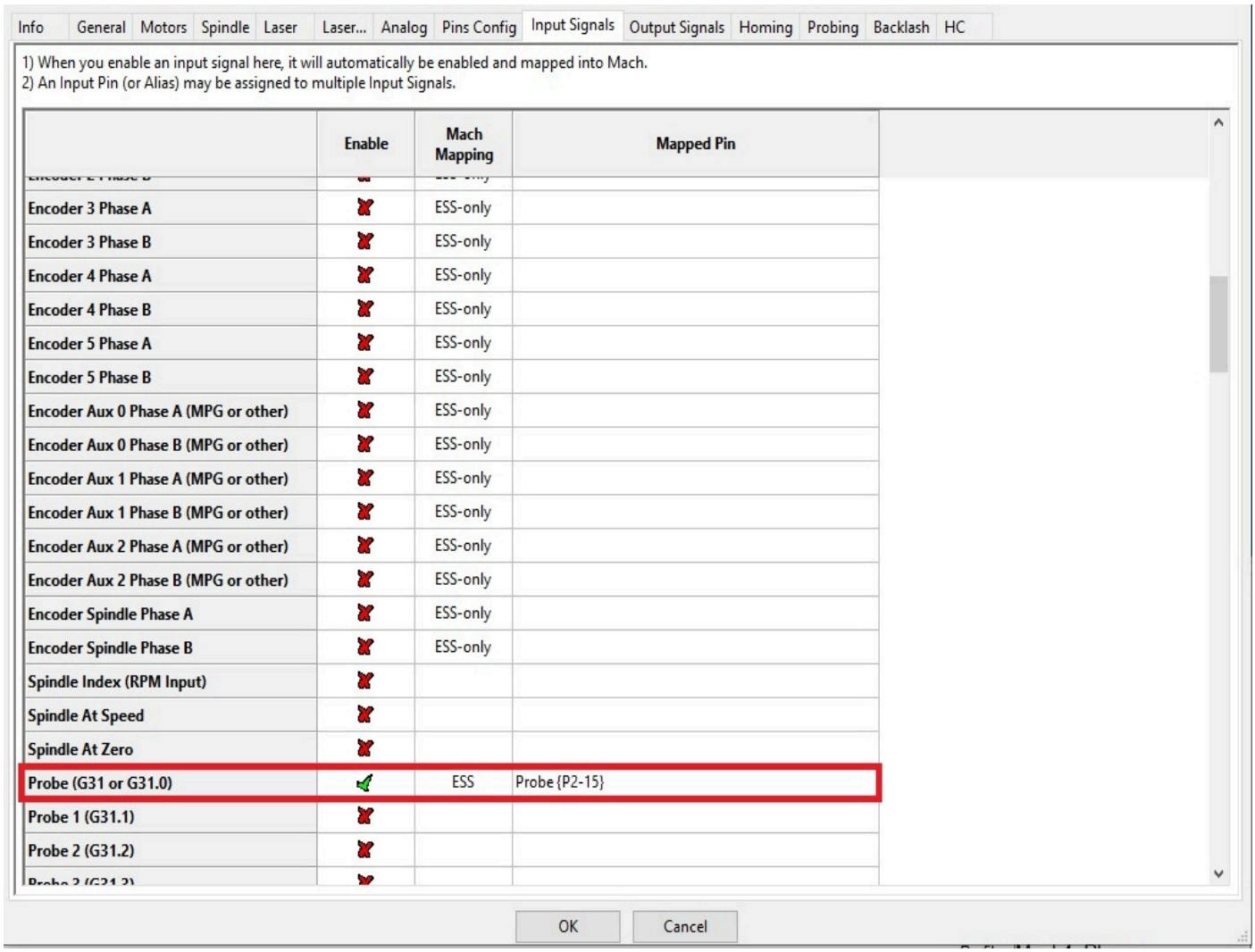
	DIR	Active High/Low	Alias or Name	Noise Filtering	Stop State	Feed Hold State
Port1-Pin17	Out	↑	{P1-17}	-----	No Change	No Change
Port2-Pin1	Out	↑	PTS Enable {P2-1}	-----	No Change	No Change
Port2-Pin2	In	↑	{P2-2}	0.00	-----	-----
Port2-Pin3	In	↑	{P2-3}	0.00	-----	-----
Port2-Pin4	In	↑	{P2-4}	0.00	-----	-----
Port2-Pin5	In	↑	{P2-5}	0.00	-----	-----
Port2-Pin6	In	↑	{P2-6}	0.00	-----	-----
Port2-Pin7	In	↑	{P2-7}	0.00	-----	-----
Port2-Pin8	In	↑	{P2-8}	0.00	-----	-----
Port2-Pin9	In	↑	{P2-9}	0.00	-----	-----
Port2-Pin10	In	↑	{P2-10}	0.00	-----	-----
Port2-Pin11	In	↑	THC Down	0.00	-----	-----
Port2-Pin12	In	↑	THC Up	0.00	-----	-----
Port2-Pin13	In	↓	Arc OK	0.00	-----	-----
Port2-Pin14	Out	↑	{P2-14}	-----	No Change	No Change
Port2-Pin15	In	↑	Probe {P2-15}	0.00	-----	-----
Port2-Pin16	Out	↑	{P2-16}	-----	No Change	No Change

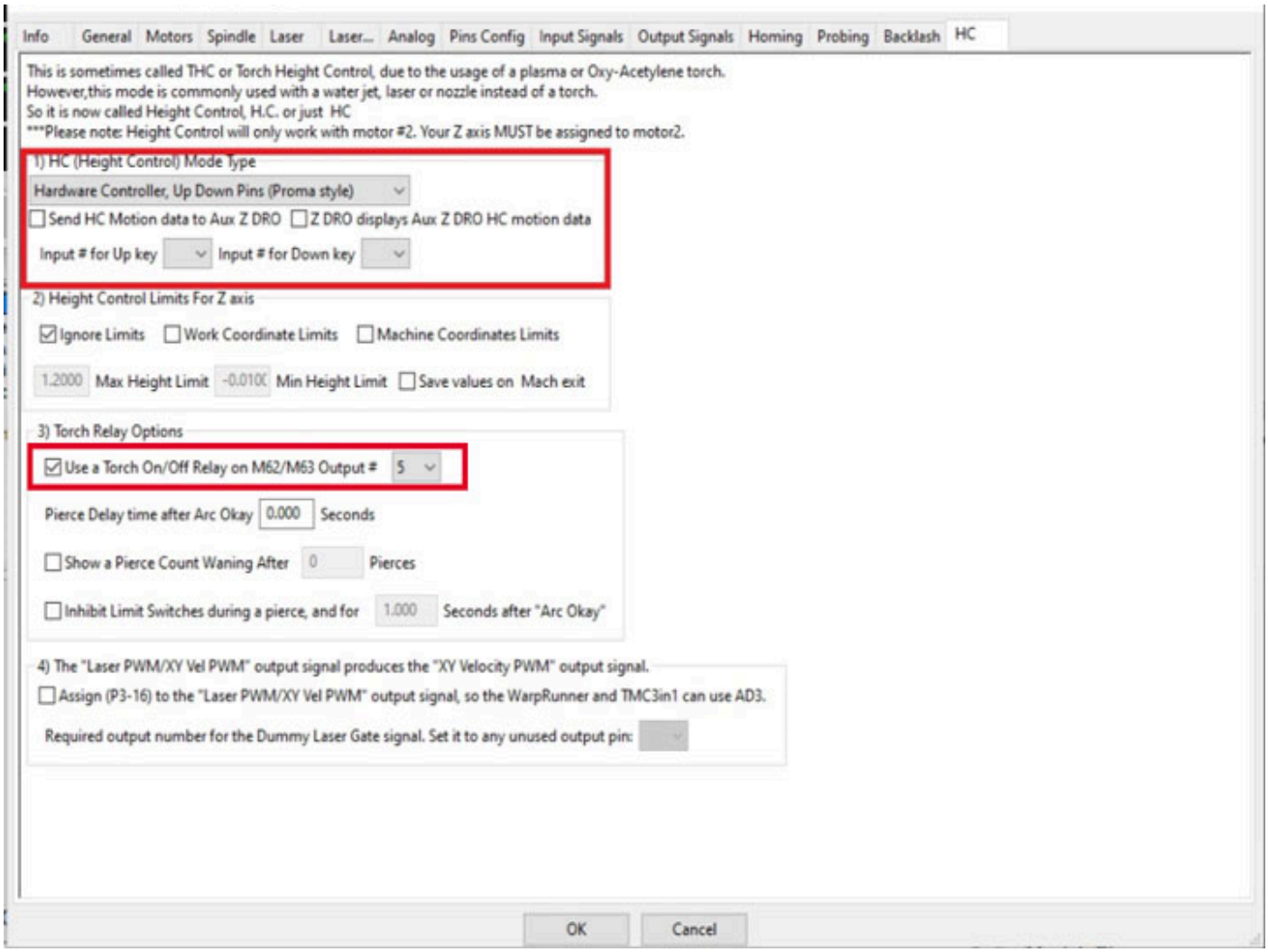
OK Cancel


Info
General
Motors
Spindle
Laser
Laser...
Analog
Pins Config
Input Signals
Output Signals
Homing
Probing
Backlash
HC
1) When you enable an input signal here, it will automatically be enabled and mapped into Mach.
2) An Input Pin (or Alias) may be assigned to multiple Input Signals.
Enable
Mach Mapping
Mapped Pin
Probe 2 (G31.2)
Probe 3 (G31.3)
THC On (Arc Okay)
ESS
Arc OK {P2-13}
THC Up
ESS
THC Up {P2-12}
THC Down
ESS
THC Down {P2-11}
Inhibit Jog
Inhibit Motion
Inhibit MPG
Limit Override
No Wait
Path Selection (Head)
Path Selection 2 (Head2)
Tool Group Reset
Tool Life Override
Tool Retract
Tool Skip
User Interrupt
Jog X+
Jog X-
Jog Y+
Jog Y-


Info
General
Motors
Spindle
Laser
Laser...
Analog
Pins Config
Input Signals
Output Signals
Homing
Probing
Backlash
HC
1) An Output Pin (or Alias) may only be assigned to a single Output Signal.
2) An Output Signal may have up to 3 Output Pins (or Aliases) assigned to it:
* When enabled in this window, only 'Mapped Pin1' will be enabled and mapped into Mach.
* 'Mapped Pin2' and 'Mapped Pin3' will still receive the same Output Signal as 'Mapped Pin1', but will not be referenced in Mach.
Enable
Mach Mapping
Pin1 Mapping
Pin2 Mapping
Pin3 Mapping
OB4 Home switch active
OB4 ++ switch active
OB4 -- switch active
OB5 Homed
OB5 Home switch active
OB5 ++ switch active
OB5 -- switch active
OB6 Homed
OB6 Home switch active
OB6 ++ switch active
OB6 -- switch active
Output #0
Output #1
Output #2
Output #3
Output #4
Output #5
Output #6
Output #7
Output #8
ESS
Keyboard
Torch on-off {P1-16}
OK
Cancel


Info
General
Motors
Spindle
Laser
Laser...
Analog
Pins Config
Input Signals
Output Signals
Homing
Probing
Backlash
HC
1) An Output Pin (or Alias) may only be assigned to a single Output Signal.
2) An Output Signal may have up to 3 Output Pins (or Aliases) assigned to it:
* When enabled in this window, only 'Mapped Pin1' will be enabled and mapped into Mach.
* 'Mapped Pin2' and 'Mapped Pin3' will still receive the same Output Signal as 'Mapped Pin1', but will not be referenced in Mach.
Enable
Mach Mapping
Pin1 Mapping
Pin2 Mapping
Pin3 Mapping
Output #2 ESS
Output #3 ESS
Output #4 ESS
Output #5 ESS
Output #6 ESS
Output #7 ESS
Output #8 ESS
Output #9 ESS
Output #10 ESS Enable_PTS {P2-1}
Output #11 ESS
Output #12 ESS
Output #13 ESS
Output #14 ESS
Output #15 ESS
Output #16 ESS
Output #17 ESS
Output #18 ESS
Output #19 ESS
Output #20 ESS
Output #21 ESS
OK
Cancel


Info
General
Motors
Spindle
Laser
Laser...
Analog
Pins Config
Input Signals
Output Signals
Homing
Probing
Backlash
HC
1) When you enable an input signal here, it will automatically be enabled and mapped into Mach.
2) An Input Pin (or Alias) may be assigned to multiple Input Signals.
Enable
Mach Mapping
Mapped Pin
Encoder 3 Phase A
Encoder 3 Phase B
Encoder 4 Phase A
Encoder 4 Phase B
Encoder 5 Phase A
Encoder 5 Phase B
Encoder Aux 0 Phase A (MPG or other)
Encoder Aux 0 Phase B (MPG or other)
Encoder Aux 1 Phase A (MPG or other)
Encoder Aux 1 Phase B (MPG or other)
Encoder Aux 2 Phase A (MPG or other)
Encoder Aux 2 Phase B (MPG or other)
Encoder Spindle Phase A
Encoder Spindle Phase B
Spindle Index (RPM Input)
Spindle At Speed
Spindle At Zero
Probe (G31 or G31.0)
ESS
Probe {P2-15}
Probe 1 (G31.1)
Probe 2 (G31.2)
ESS-only
OK
Cancel



STEP 6: TESTING.

Testing and Troubleshooting Considerations:

- **Test wiring and Configuration using TEST MODE on the THC:**

Test Probing with a PTS-1 or Floating head:

1. **Note that all the position values are considering that work Z zero is the plate position and we recommend setting this before executing the gcode.**
2. **For the initial testing, make sure the plasma machine is off and you can observe the plasma relay activating and deactivating accordingly.**
3. **Do the initial testing using the G31 Z-40 F20 command in the MDI screen, and you should be able to see the torch start probing.**
4. **You can observe the probe enable LED on the screen LED and the Enable LED on the PTS-1 unit itself when it starts probing and the touch LEDs on the screen and PTS-1 unit.**

Test that the Touch Relays Starts/Stop the Plasma

M62 should start the plasma and M63 should stop it. Observe action on the screen LEDs, Output pins of the breakout board, relay, and plasma cutter.

Test THC action:

- **Press the knob three times to enter test mode in the THC and observe the ARC OK signal activate.**
- **Turn the knob up or down to move the axis and observe the Torch UP and Torch Down LEDs activate when moving in each direction. The Z-Axis should also move to adjust the position.**
- **To exit test mode, press the knob once.**

- **Test the complete sequence which includes probing, piercing cutting with THC.**

Configure the THC parameters according to the manual:

Run this G code that does not use macros:

```
N0050 F20        (Set the Probing Speed 20mm/sec)
N0060 G31 Z-10   (Start probing axion on the Z-axis to a depth of up to 10mm)
N0070 G92 Z -3   (Set work zero for the z axis using an offset of the switch)
N0080 G00 Z 2    (move the Z-Axis 2mm up. initial pierce )
N0090 M62 P5     (Start the Torch)
N0100 G04 P2     (Set a Pause of 2 seconds to allow the pierce time.)
N0110 G00 Z 3    (move the Z-Axis 3mm up. Cut height)
N0120 G01 X5     (Cut a 5mm square.)
N0130 Y5
N0140 X0
N0150 Y0
N0160 M63 P5     (Turn off the Plasma)
N0170 G0 Z5      (move the Z-Axis 5mm up. Z_top)
```

Feel free to adjust it to your units or other preferences.

Test using the macros

Macros:

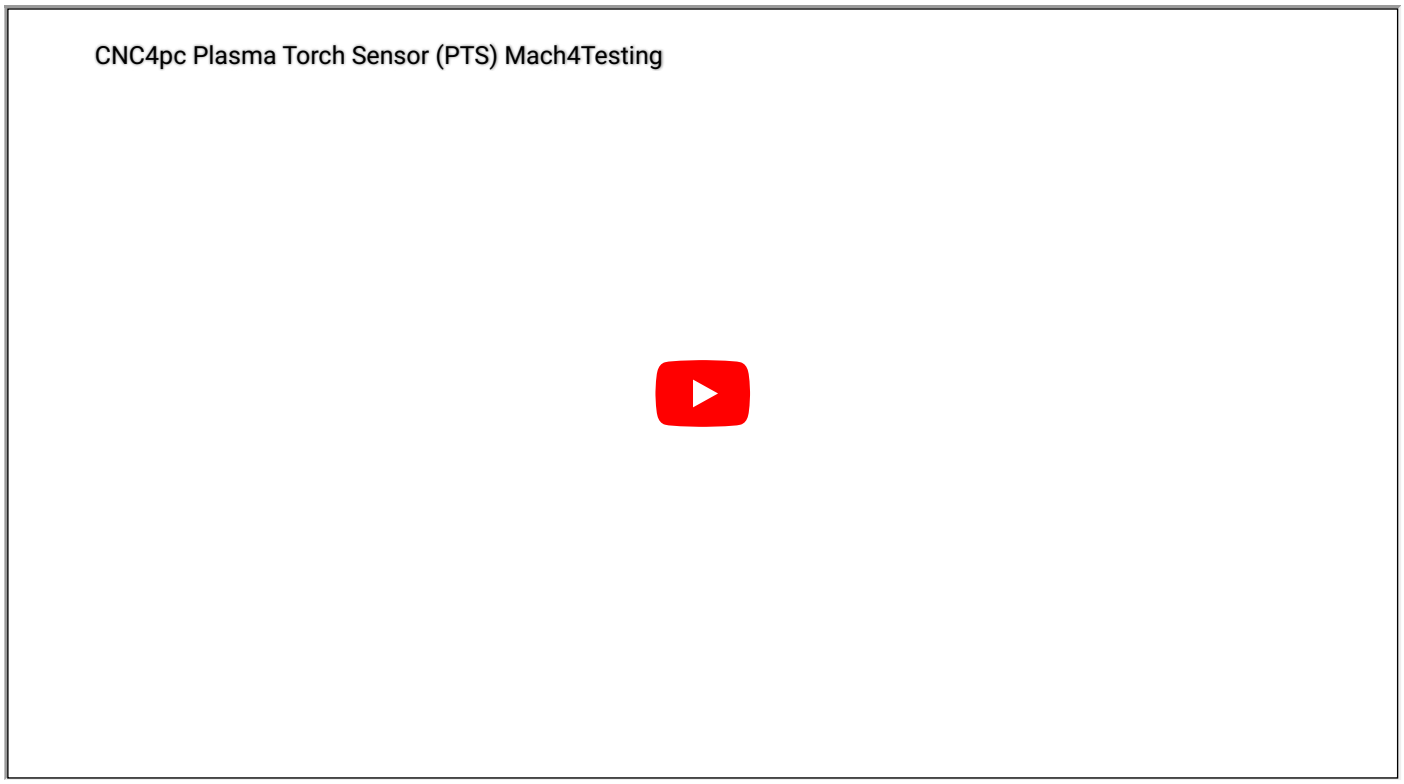
Keep in mind the macro will now execute the following actions when M2003 (Start Cutting) and M2005 (End Cutting):

1. **If using a PTS-1 (Plasma Touch Sensor), the first section is to Enable the Probing action. You should see the ENABLE LED on the PTS-1 and also on the breakout board on the LED for the pin that you wired and configured for activating the probe. In these instructions, we are using Pin 1 on Port 2 (Output10).**
2. **The Z-axis lowers until the nozzle or sensor that you connected to the nozzle touches the plate and closes the circuit and activates the probe input. You would momentarily see action for this on the TOUCH LED on the PTS-1 unit or the switch if using a Floating Head, on the LED for the input pin you assigned on the Breakout Board, and on the Probe LED on the Mach4 screen.**
3. **As soon as probing is completed, the Probe ENABLE is disabled and the z-axis moves to the Pierce position or the Pierce Height that you configured.**
4. **The plasma starts by activating the plasma relay and stays cutting for the duration of time that you configured or set as Pierce Time in Seconds.**
5. **After pierce time the z-axis moves to the cut position that I set in the cut height**
6. **The Plasma stays on and continues to execute g-code and THC if implemented until an M2005 is reached or e-stop is pressed.**

Configure the operation parameters in this screen:

G code with macro:

```
N0090 M2003        (Probes, pierces, moves to cutting position, and start the torch)
N0100 G01 X5       (Cut a 5mm square.)
N0110 Y5
N0120 X0
N0130 Y0
N0150 M2005        (Turn off the Plasma and move the z axis to Z_Top)
```



CHANGELOGS

June 14, 2023: Mach4 4.2.0.5036 and *ESS Plugin Mach4: ESS v284*

- ***Upgrade to Mach4 and ESS Plugin.***

April 26, 2023: *Mach4 4.2.0.4612. and ESS Plugin Mach4: ESS v278.1*

← Previous Next →

Related Products

C25XP - Smooth Stepper Integrated Board

From **$136.00**
To **$1,342.80**

PTS-1 Plasma Touch Sensor

$78.00

THC-1 Plasma Torch Height Control

$176.00

C82 - Dual Port Multifunction Board

From **$168.00**
To **$1,693.00**

Mach4 License File

$190.00

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