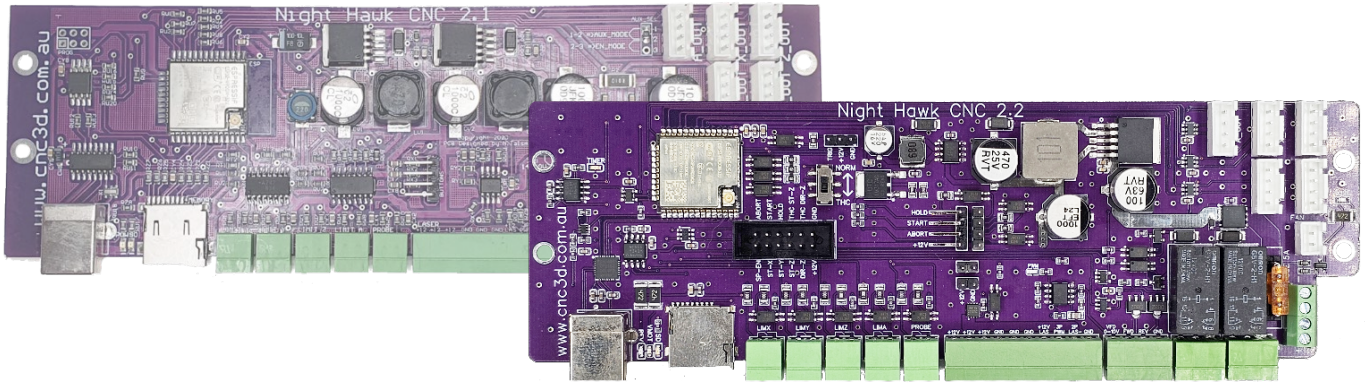
Nighthawk CNC Controller

User Manual



Safety precautions

- **Please read this entire manual before using your new Nighthawk controller or CNC3D Commander software.**
- **Please ensure any relevant PPE equipment is worn or used when operating any CNC machine. This includes safety glasses for using any lasers.**
- **CNC machines 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 AN ELECTRICAL LICENSE

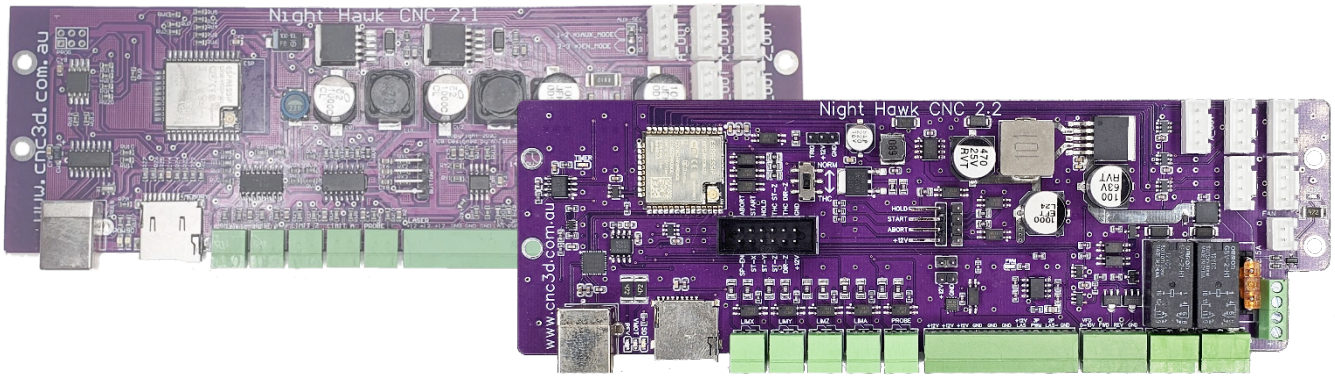
Nighthawk Controller Form Factors

There are two available form factors of the Nighthawk Controller:
***Full Stack* and *Stand-Alone Control Card*.**

Knowing which form factor Nighthawk you have will aid you when reading through this manual, as well as if you need to contact our support team for assistance.

Full-Stack Nighthawk

Includes steel case, stepper drivers, cooling fan, control buttons



Stand-Alone Nighthawk Card*

Control Card and Antenna only. No fan, no case, no included drivers

**From November 2024 we have released a revised version of the Nighthawk control card. See Key Information on page 8 for explanation and more information*

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Nighthawk Controller Specifications

Input Voltage*	
Full-Stack	14-40V DC (36v Recommended)
Stand-Alone	14-50V DC (24v-48v Recommended)
Power Consumption	
Full-Stack	~320W (Max)
Stand-Alone	<5W
Onboard Drivers	4 x 4.2A (max) (Full-Stack Only)
Total Simultaneous Axes^	4
VFD Support	0-10v Analogue + FWD/REV
SD Support	MicroSD Class 10 (Up to 32Gb)
SD Format	FAT32 Required
Communications	WiFi, Bluetooth, USB
WiFi Frequency	2.4GHz
Operating Frequency	240MHz
Antenna	4.5db Gain
Enclosure	Folded Steel
Mounting	Bench/Wall
Enclosure Finish	Powder Coating

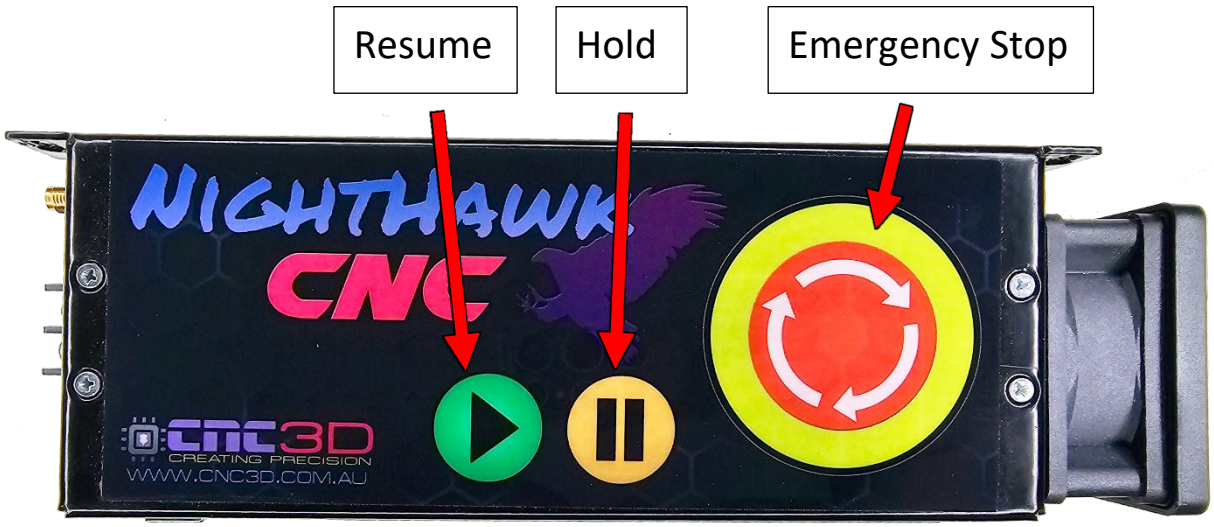
*** WARNING: The Nighthawk does not come with a DC Power supply. CNC3D PTY LTD only recommend using certified power supplies for operating your Nighthawk. The use of an uncertified power supply will be deemed as improper use and void your warranty. If you are unsure if the power supply you plan on using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

^ Total available axes will depend on your configuration. Full-Stack controllers can support XYZA *or* XYYZ configurations with no additional hardware. With an additional external driver it can support XYYZA configuration. Stand-alone cards can support XYYZA *or* XYZA *or* XYYZ with external drivers

Important

Some key things to note

Full-Stack Controller Buttons



These are physical buttons on the top of the Full-Stack Nighthawk controller which allow you to control machine movement **even when no computer or mobile device is connected**.

The Resume and Hold buttons function as play and pause, allowing you to temporarily pause a job without losing position, and then resume it from the last line. **This will not allow you to move the machine while in a hold state.**

The Emergency Stop (or E-Stop) button is what's known as a "soft E-stop", where pressing it will immediately stop the machine movement and cause an alarm but will not cut electrical power.

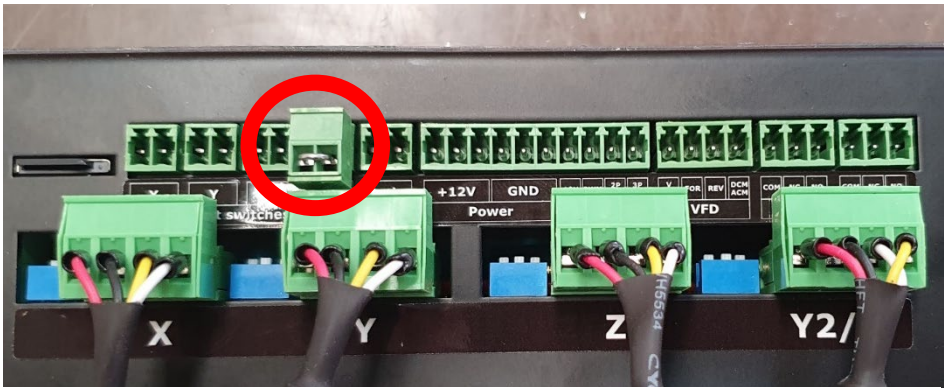
Pressing the E-Stop will also turn off the PWM signal which stops any laser or plasma torch. It will also open both plasma and flood relays. In the case of a manually controlled spindle where the operator needs to turn the spindle on and off with a button on the VFD, it will **not turn off the spindle or router**.

Y2/A Limit Bridging Connector

From May 2023 **all** Nighthawks are shipped with a wire bridging across the Y2/A limit switch connector. This bridge stops the Nighthawk from thinking that the A limit switch is being pressed and preventing the machine from homing normally.

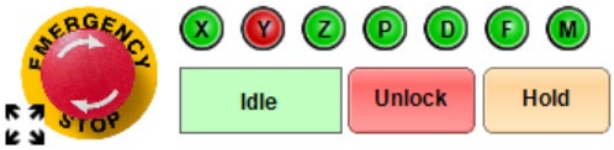
If you do not have this green plug with a wire across it check to see if it has fallen out in the packaging before contacting CNC3D for assistance.

If you ARE NOT using the Y2/A limit switch, for example in a dual-homing setup with a limit switch on both Y axes you will need to keep this plug always inserted into the "A" limit connector on the front of the Nighthawk.

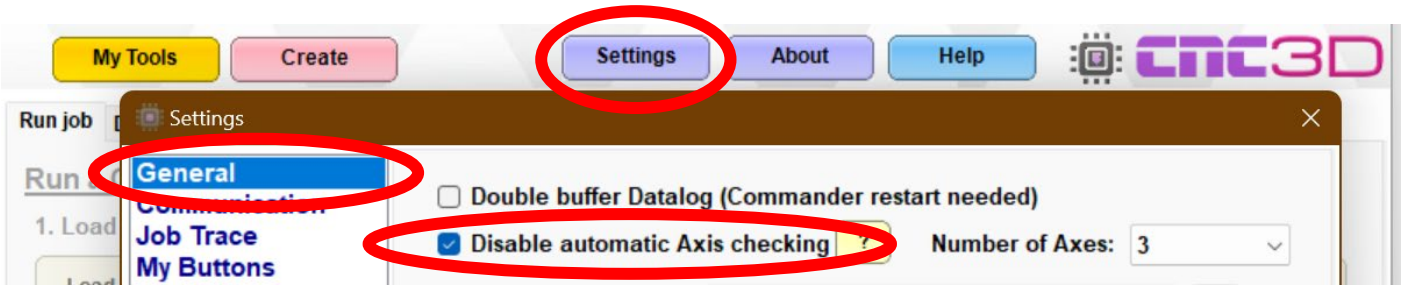


'Y2/A' limit connector with bridging wire installed and location circled in red

If you find your Y-Limit flashing red in Commander (see example below), there are no broken wires to your Y limit switch, and all other switches react as expected then the likely cause is the Y2/A limit bridging connector is not correctly installed in the Nighthawk.



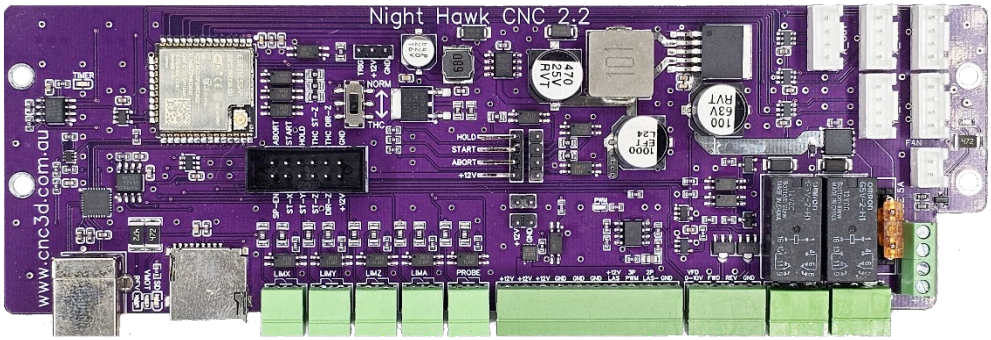
You can confirm this by unticking the 'Disable Axis Checking' button found under General in the Settings box. This will allow Commander to show the A-Limit bubble. If the A-Limit is flashing it will need the bridging connector or a limit switch inserted to correct it.



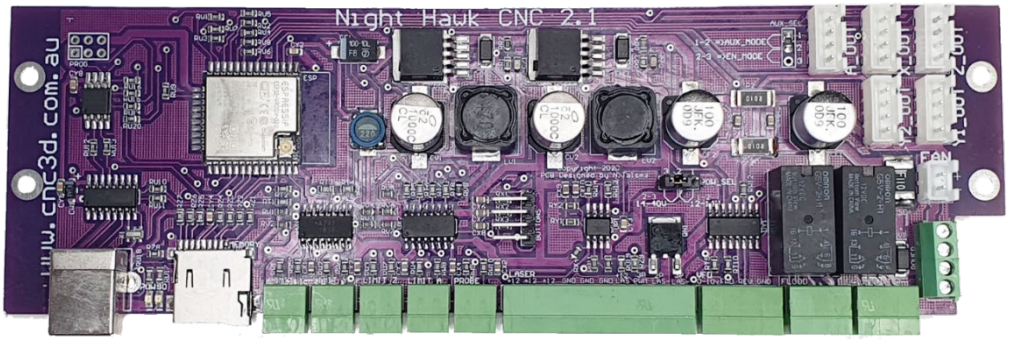
Nighthawk Controller Changes

From March 2025 there have been some changes to the control card used in Nighthawk Controllers. These changes apply to both the control card only and the full-stack controllers. These changes add some functionality to the board and simplify some of the circuitry to make production easier. Importantly, most users will see no difference in functionality between the newer boards and the older ones, even for users with multiple Nighthawk controllers.

From 22-07-2025 ALL Nighthawk controllers sent out will be V2.2.
If you received your controller after this date, it will be V2.2.



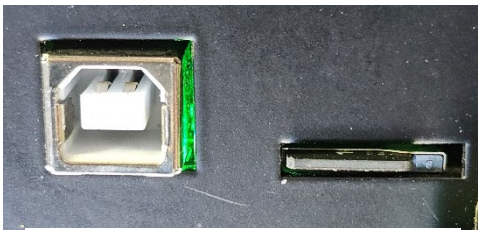
Nighthawk Control Card V2.2



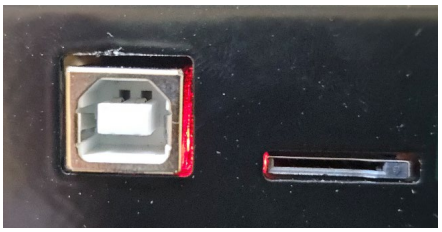
Nighthawk Control Card V2.1

These cards are easily identified by the version number printed onto the circuit board along the top edge.

If you have a full-stack Nighthawk you will not be able to see the PCB, however when powered on you should be able to see a small light coming from inside the steel case next to the USB connector. The colour of that light will tell you which Nighthawk card you have.



Green Light – V2.2 (new)



Red Light – V2.1 (old)

Please note: This manual is used for **both** versions of the Nighthawk controller. Differences will be labelled with **Orange text and the version number,** for example**:**

V2.2 – This is the newer version
V2.1 – This is the older version

Hardware setup

This section relates to our Full-Stack controller.
For stand-alone cards please skip to page 17

Did you get your Nighthawk controller with a CNC3D CNC machine or are you retrofitting your Nighthawk CNC Controller to an existing machine?

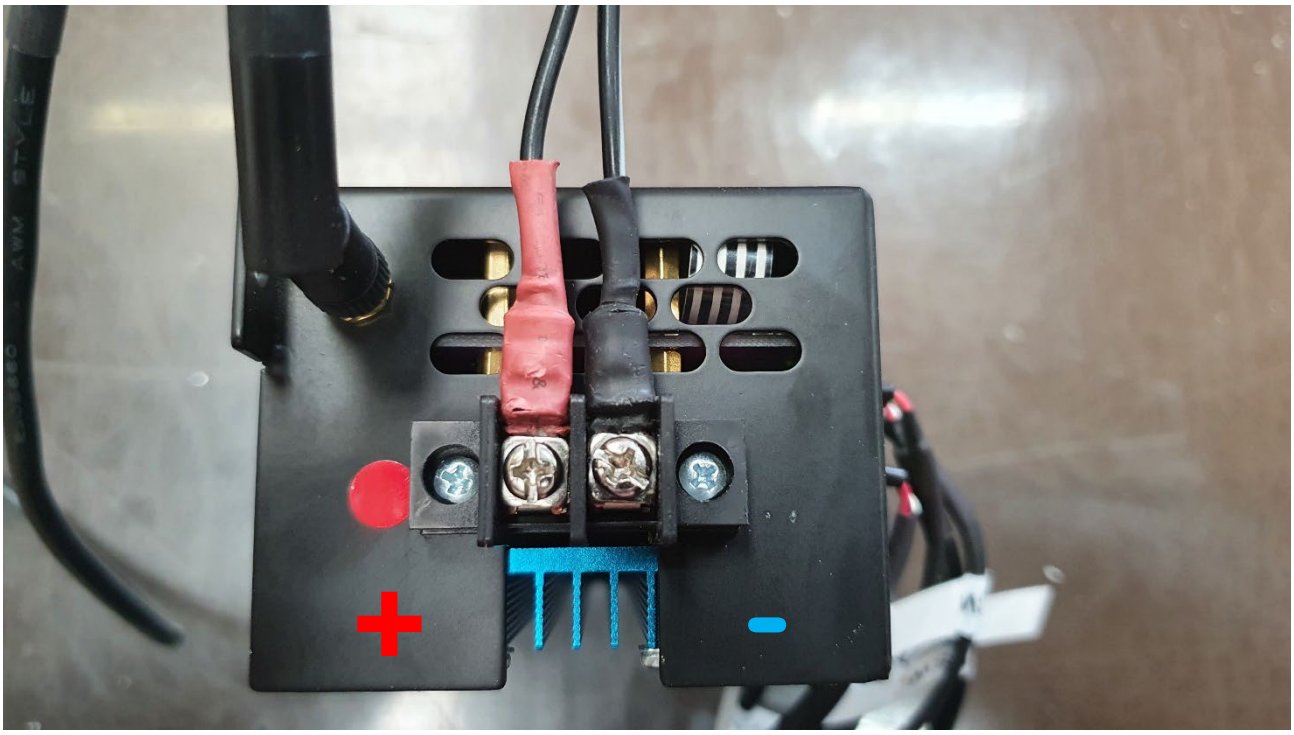
Every Nighthawk controller provided with our fully assembled machines is tuned by our team for the best performance and longevity.

If you are setting up a new FULLY ASSEMBLED machine such as a QueenBee, QB2 or Metal Storm you will not need to change any hardware settings on your controller, *you can skip this section and move on to the Connection setup section of these instructions on page 35.*

V2.2 + V2.1

Power input orientation

The positive terminal is located closest to the Antenna plug. Please ensure to use a 14V minimum power supply with a total wattage rating greater than 300w.



Setting Motor Micro-stepping and Current

The drivers included with your controller have physical settings that can be adjusted to suit your needs these include micro-stepping and current output settings.

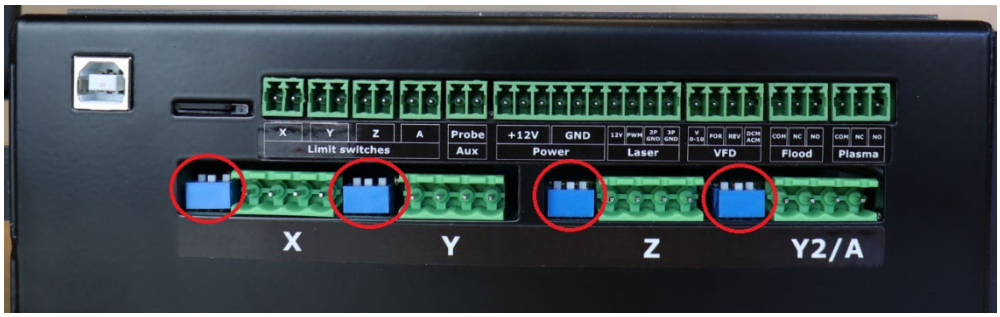
Note: Always ensure the unit is powered OFF and the USB cable is disconnected before performing any micro-stepping changes.

V2.2 + V2.1

Setting Micro-stepping

Each drive has the option of ***1 / [1, 2, 4, 8, 16]*** micro-stepping settings. For most CNC routing applications, a **1/8** ratio is a good balance of torque, accuracy, and maximum speed.

The front of your Nighthawk controller shows 4 **blue** tactile switch blocks. These blocks are used to set your micro-stepping. They can be seen here:



A small pick or screwdriver can be used to set the micro-stepping from the front of the unit, or the controller cover can be removed to make setting the values easier, see below for removing cover.

Each of these switch blocks has 3 small switches for setting your micro-stepping.

The default on your controller will be 1/8.

Please note the ON position and switch number:

Micro-stepping settings chart

Set the switches for each drive in the order as per the table below to choose your micro-stepping options.

SW1	SW2	SW3	Pulse/rev	Microstep
OFF	OFF	OFF	Standby	Standby
OFF	OFF	ON	200	1
OFF	ON	OFF	400	2 (A)
OFF	ON	ON	400	2 (B)
ON	OFF	OFF	800	4
ON	OFF	ON	1600	8
ON	ON	OFF	3200	16
ON	ON	ON	Standby	Standby

Setting the current for each driver

Each driver can have its current set to match the motors you are using on your machine. As noted above, if you have purchased your machine from CNC3D and it came with a Nighthawk controller then the current has already been set for you and you will not need to do this step.

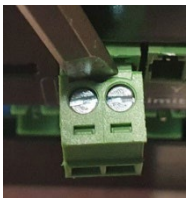
As a general rule you should always set the current of your motors slightly lower than the value as per your motor's datasheet.

There are 2 methods for setting your motors current, the first is a "quick" method and should be used with caution to ensure you do not overdrive your motors.

1. Remove the controller cover

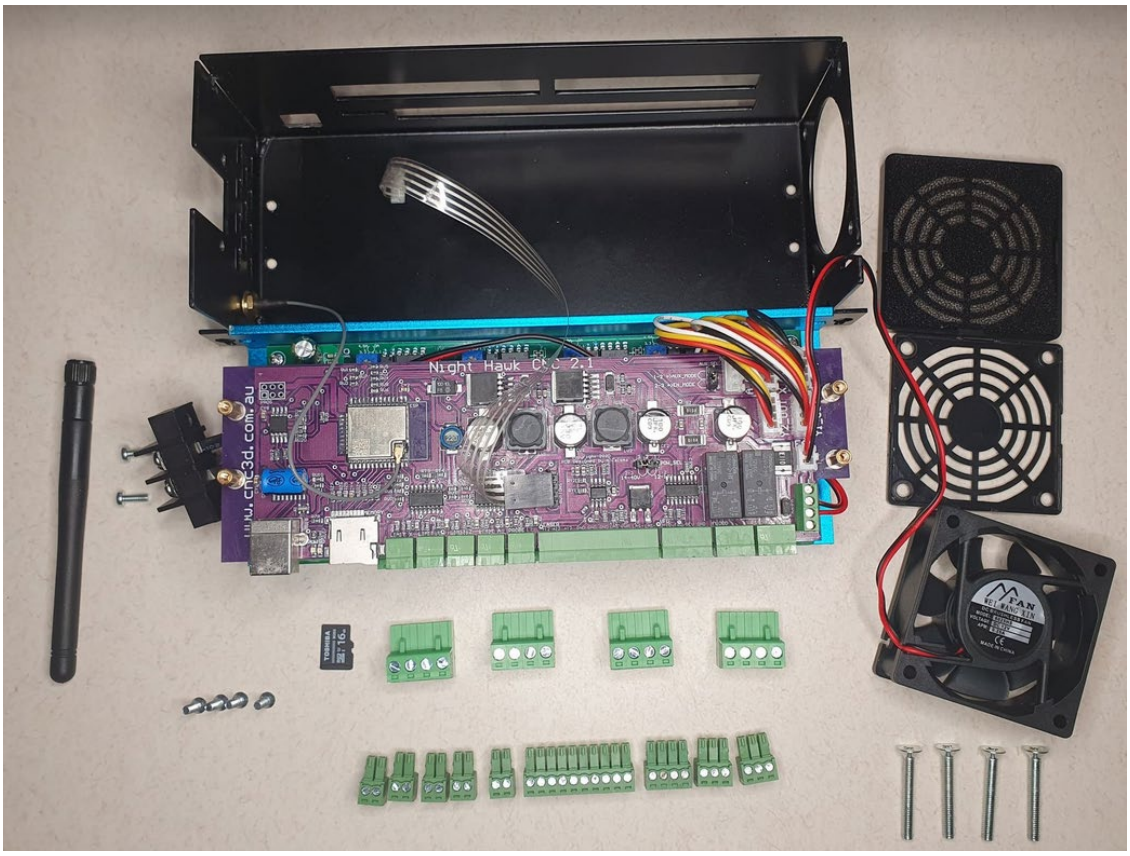
Ensure all plugs or leads on the front of the controller are unplugged and the SD Card is removed

Tip: Try using a flat head screwdriver to lever the plugs out gently:



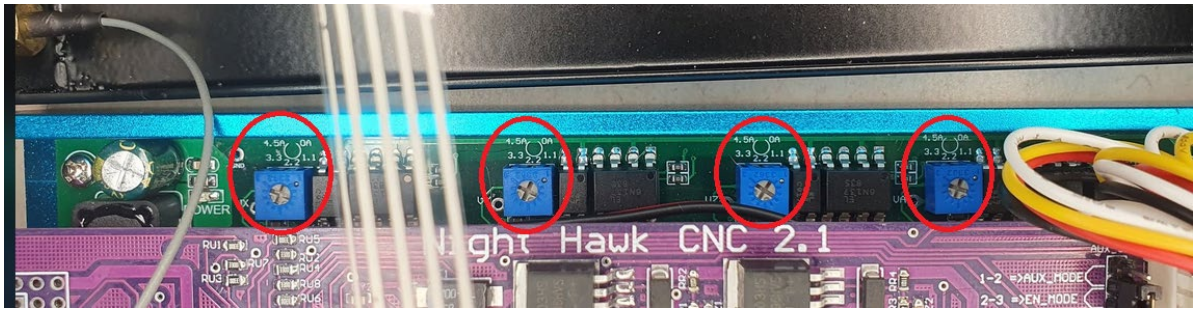
- Remove the plastic antenna (if attached) by unscrewing it from the gripped black plastic part of the antenna. The brass thread can stay attached to the case.
- Using a Phillips head screwdriver, carefully unscrew the black power connector from the controller housing. Take note of the orientation of the RED power cable to ensure it goes back in the same orientation.

- Carefully lever the fan cover off the side of controller to expose the bolts attaching the fan. Loosen these bolts and carefully remove the fan. Take care to ensure no stress is put on the fan cable in the cable slot. Remember the orientation of the fan. The Nighthawk is designed to have cool air blowing into the enclosure.
- Now remove the remaining 4 bolts on top of the enclosure. Once removed, carefully lever the front of the housing upward. It should lift away quite easily by using one hand to hold blue the heatsink at the bottom while removing the top cover. Now that the front cover is loose, flip it towards the back of the enclosure taking care not to unplug or damage any wires. Everything should look like this:

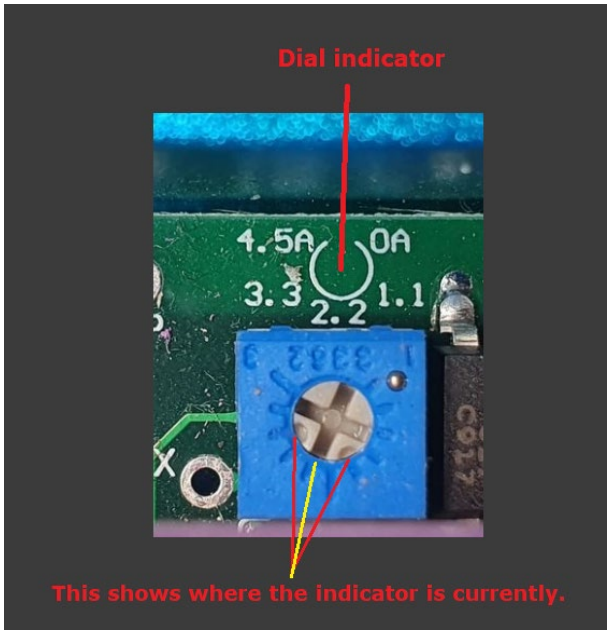


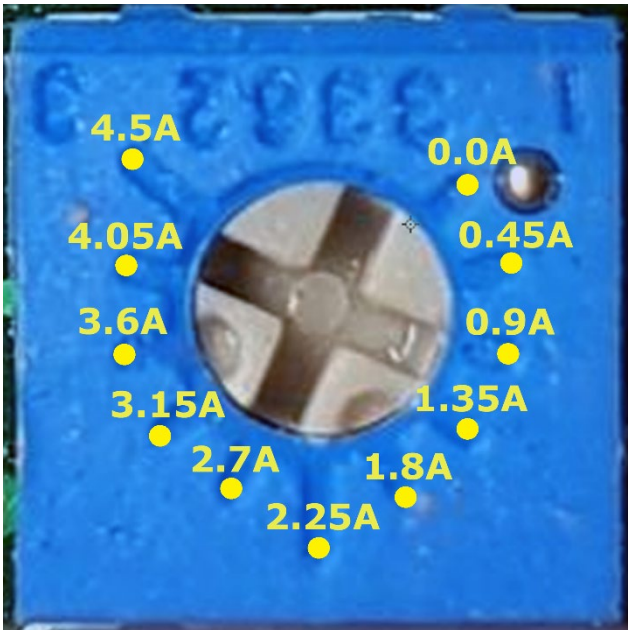
2. Set the current for each stepper.

There are 4 blue screw trim pots and setting guides at the rear of the controller on the lower green driver board that are used for setting the current. See photo below:



Each dial has a guide above it to indicate roughly what the current setting is. The quick method for setting your current is by visually adjusting the dial using a small Phillips head screwdriver. See diagram below of where the indicator is, there are 2 notches either side of it. See also below the approximate value of each chevron on the dial:





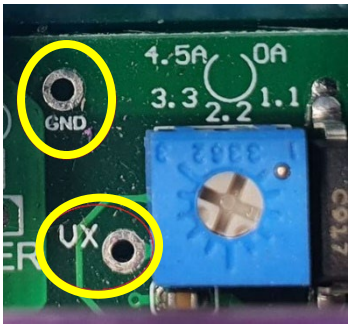
It is important to note that this is a very rough method of setting your motor current and the following finetuning method will be a better option.

Fine tuning your motor current

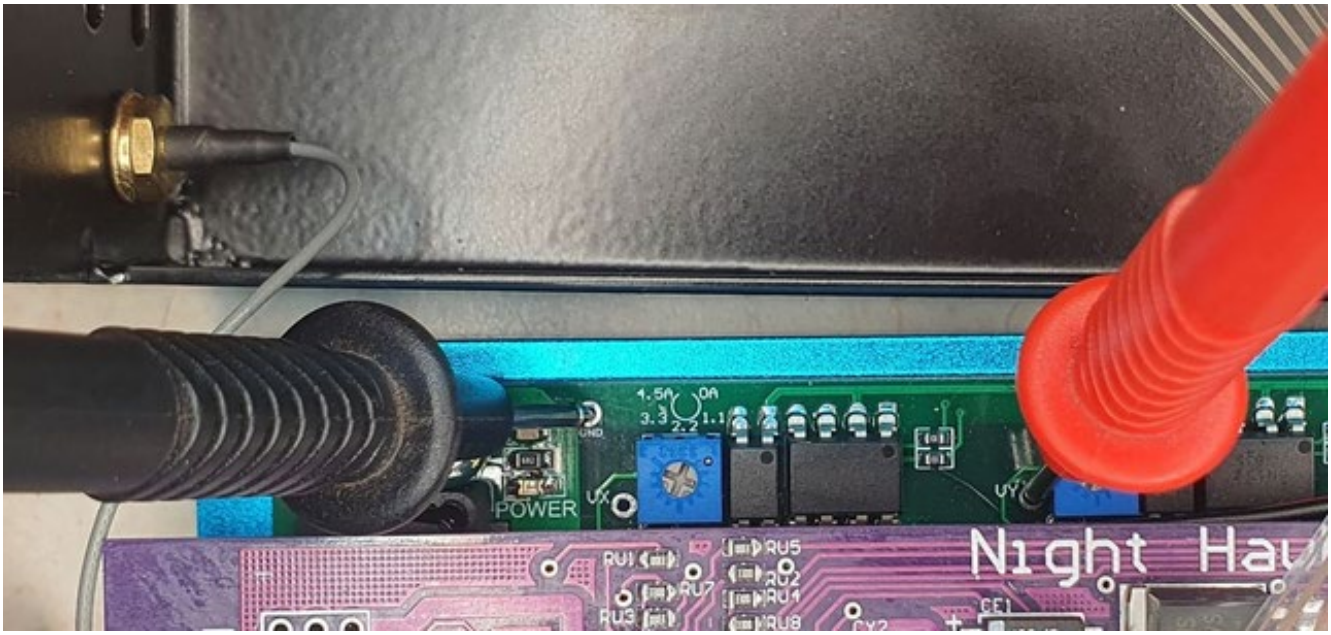
Firstly, you must connect power to the power input terminal on the side of the controller. Please be careful with the orientation of the connections.

Just to the left of each of the blue dials there is a small solder-tinned hole, these are labelled as **V(axis) i.e: VX**. These holes are used for precisely setting your motor current. There is also another hole on the far left of all the blue dials labelled "**GND**".

Using a multimeter set to voltage mode we can position the black probe on the GND hole on the board and position the red probe on the hole closest to the driver you wish to set.



Close-up image showing the location of the axis-specific voltage test point (**VX**) and the common ground location (**GND**)



Testing the voltage on VY using a multimeter with the black probe on GND and the red probe on VY

Once your multimer probes are in position and a voltage is showing, use a small screw driver to carefully turn the blue dial being set, rotate clockwise to increase current and counter-clockwise to decrease the current. While turning, check the voltage change on your multimeter for the expected value.

The equations used for setting your current are:

$$\text{Current} = \text{Voltage} / 0.62$$

Which is equivalent to:

$$\text{Voltage} = \text{Current} \times 0.62$$

Current is represented in amps (A) and 1000mA = 1A

Based on these equations if we are trying to set our current to **3A** exactly we must have a reading of **1.86V**. As advised above, it is recommended to go slightly lower than the rated current. In this case we would set the voltage reading to **1.84V**.

Once you have set the current for each axis, you can power off the controller and reassemble the enclosure in the same order it came apart from, keeping on mind to ensure the power connector and fan go back in the same orientation. When fitting the enclosure back onto the electronics, take note to ensure the antenna cable, fan cable and ribbon cable are not pinched anywhere by the case. Also remember to re-attach the antenna. Once everything is fitted, use your fingers to push the fan cable back inside the enclosure. It should look like this:

V2.2 + V2.1

Connecting your stepper motors

The drivers on your Nighthawk support the connection for 4-wire stepper motors. Generally, these motors have 2 pairs of motor poles. Connecting them to your controller should be relatively straight forward.

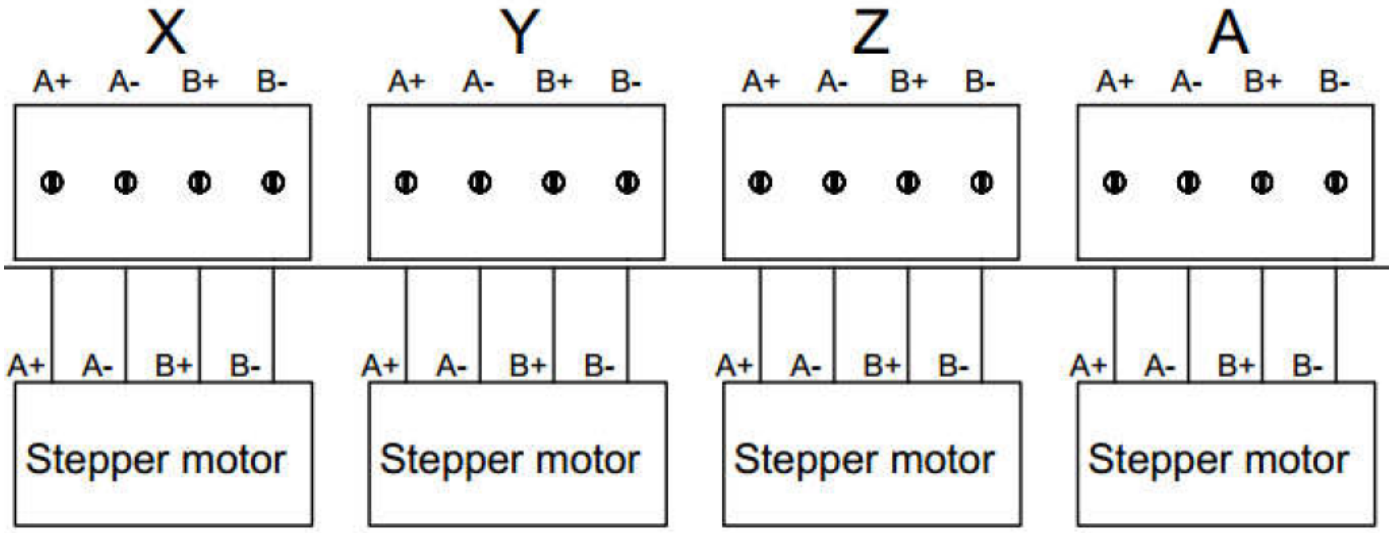
*****PLEASE NOTE*****

Always ensure the unit is powered OFF before connecting or disconnecting any motors from your controller. Failing to power off the controller can cause irreparable damage to the stepper motor drivers and void your warranty!

Use a small flat head screwdriver to attach your motor wires to the green plugs.

The motor connections are shown here, check your motors datasheet for the wiring colours of your motors to match them to the controller.

If your machine is set up to use separate motors for each Y axis, such as one of our QueenBee, QB2, YouCarve, Metal Storm or SharpCNC machines (XYYZ) then your Y2 motor will go into the A plug.

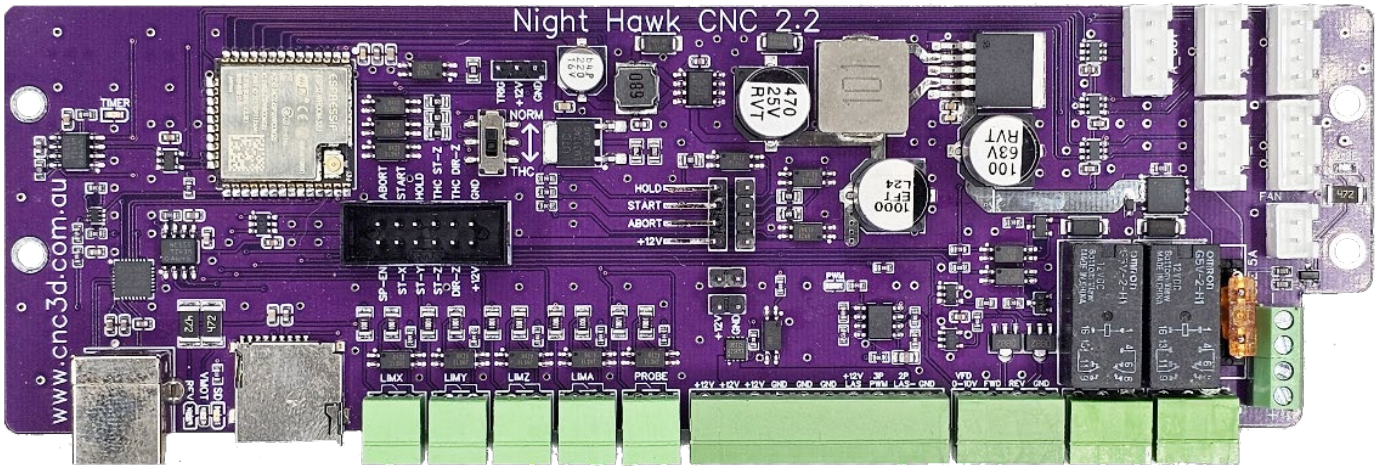


You can now skip ahead to page 30 for connecting Limit Switches

Standalone Nighthawk Control Card

V2.2

This section is for users with a Nighthawk V2.2. For users with a V2.1 card, please skip ahead to page 21



With the stand-alone card, you will need to use external stepper drivers to run your motors, this allows for high-power motors, closed-loop control as well as higher motor voltages than the Nighthawk card can manage on its own.

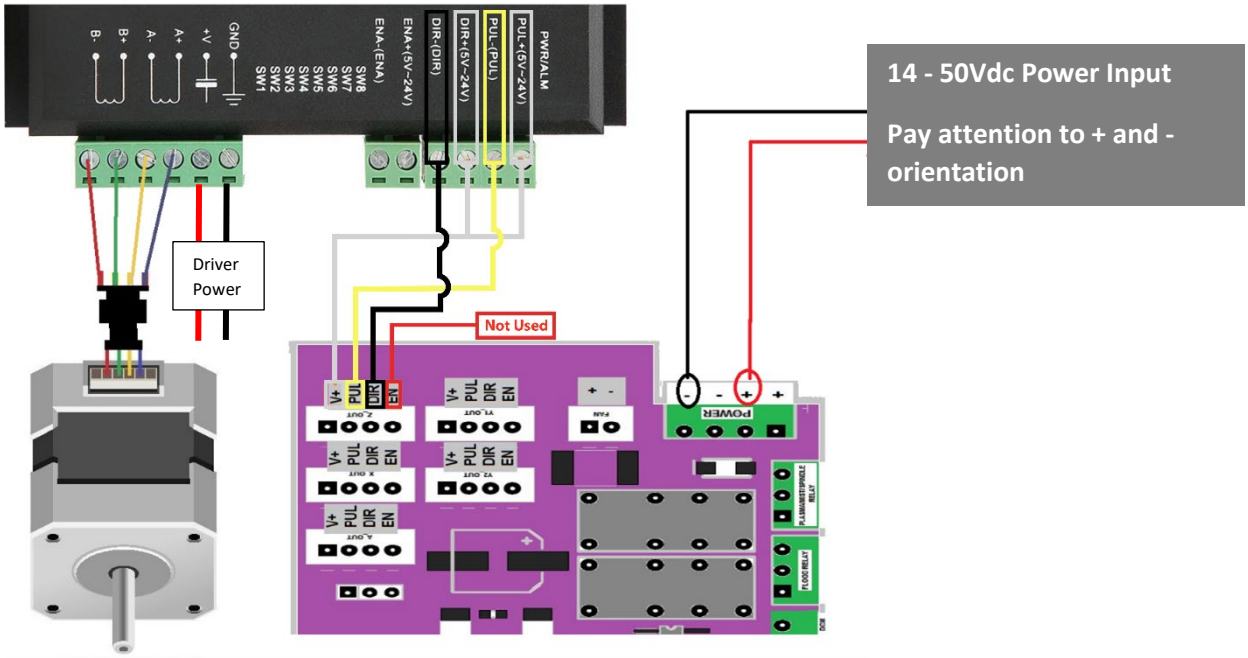
PLEASE NOTE: The maximum input voltage for the Stand-Alone Nighthawk Control Card is 50VDC.

Any higher will risk causing irreparable damage to the card and void your warranty.

Typical machine retrofit to external drivers

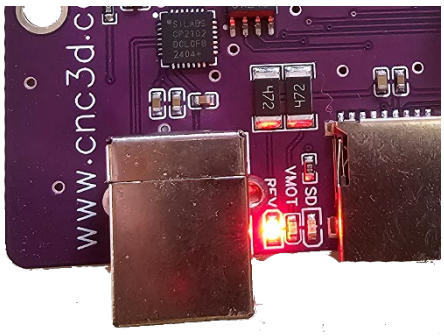
Please Note: The wiring colours used in this diagram are indicative only. While all care has been taken to match the diagrams to the real-world hardware, wiring colours may differ between suppliers. Please ensure you use the labels on the control card, drivers and motors and do not rely on the colours of the wires.

See page 24 for more detail on wiring stepper motors and drivers

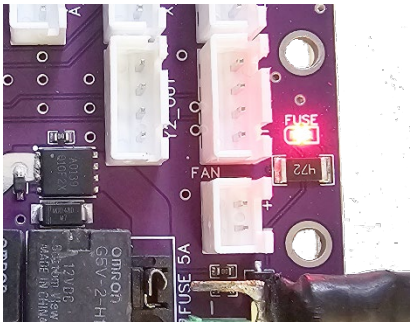


If you see the "REV" LED near the USB connector illuminate, you have your power wired incorrectly. Immediately turn the power supply off and reverse the connections! Refer to page 19 for more information on the REV warning.

If you see the "FUSE" LED near the power input block illuminate, the fuse has blown. Immediately power off! Refer to page 19 for more information on the fuse.



REV LED near the USB connector



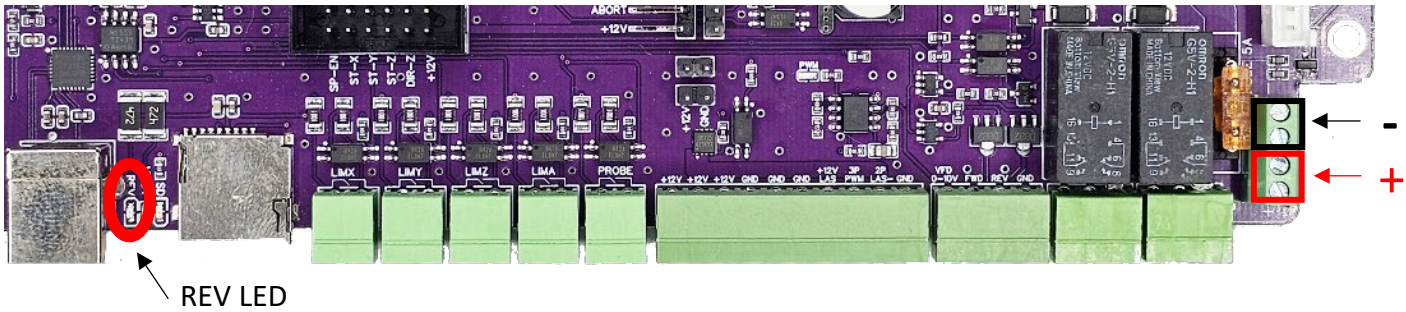
FUSE LED near the power connector

Reverse Polarity Protection

This is a situation where the positive and negative wires coming from the power supply are connected to the Nighthawk inverse to what they should be ie: positive 24v is connected to the GND input.

When this happens, the Nighthawk will not allow itself to power up and there will be a red LED light on the board near the USB connector with the label **REV.** To correct this, turn off the power supply and ensure the positive is connected to the + terminal and the negative is connected to -.

Pro Tip: When the board is orientated like the photo, the bottom 2 terminals are + and the top 2 are -



Overcurrent Protection

Overcurrent protection is provided in the form of a 5A micro blade fuse located just near the power input on the Nighthawk board. If there is a short circuit and the board is put into an overcurrent situation, the fuse will blow and remove power from the board.

If power is supplied to the Nighthawk with a blown fuse, or if the fuse is not inserted correctly you will see a red LED light under the **FUSE** label.

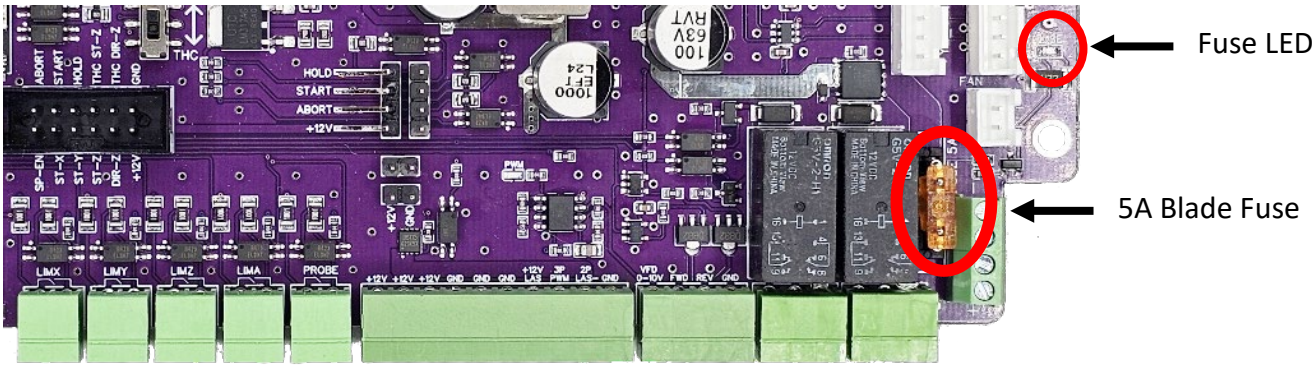
If you ever see the **FUSE** LED light up, power off your Nighthawk and look for any signs of short circuits through your machine wiring, such as charring or blackening on any connectors or any metal swarf or chips lying across any electrical connections.

Once the machine is clear of any swarf and all electronic connections are clean and repaired (if needed) you will need to replace the fuse before you can continue to use your Nighthawk.

Never attempt to insert anything other than a 5A blade fuse into the fuse holder.

Using anything other than a blade fuse rated at 5A has a risk of causing overheating resulting in damage or fire in the case of an overcurrent.

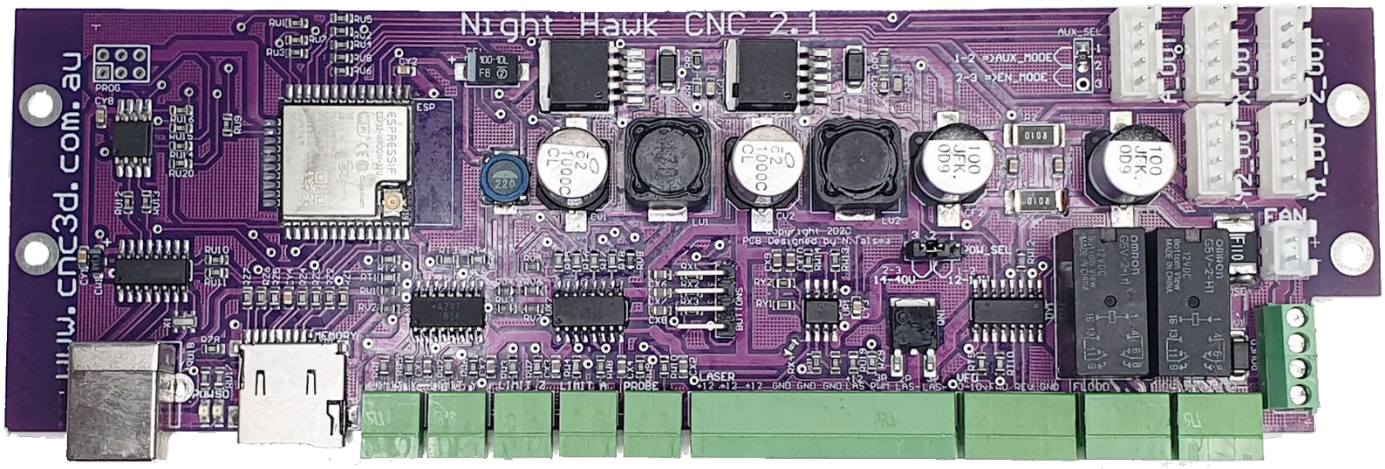
Using anything other than a blade fuse rated at 5A will void your warranty.



Nighthawk Control Card Connections/Pins

Connections	Type (Pin Count)	Label on PCB	Function
Green Plug	INPUT (2)	Limit X	X Limit Switch
Green Plug	INPUT (2)	Limit Y	Y Limit Switch
Green Plug	INPUT (2)	Limit Z	Z Limit Switch
Green Plug	INPUT (2)	Limit A	Y2/A Limit Switch
Green Plug	INPUT (2)	PROBE	Probe Input
Green Plug	OUTPUT (10)	LASER and 12V POWER OUT	Laser Port and Proximity switch 12V supply Max 12.5V @2A
Green Plug	OUTPUT (4)	VFD	VFD(VSD) Speed Control
Green Plug	DRY CONTACTS (3)	FLOOD	Flood Relay (Dry Contacts) Max 30VDC @ 2A
Green Plug	DRY CONTACTS (3)	PLASMA/MIST	Spindle Interlock/Plasma/Mist Relay (dry contacts) Max 30VDC @ 2A
TB BLOCK	POWER (4)	POWER	POWER INPUT (14v to 50v) Limited protection is provided by a 5A blade fuse
White JST	OUTPUT (2)	FAN	Fan (12VDC)
White JST	OUTPUT (4)	Y1_OUT	Y1 driver control
White JST	OUTPUT (4)	Z_OUT	Z driver control
White JST	OUTPUT (4)	Y2_OUT	Y2 driver control (cloned from Y1_OUT)
White JST	OUTPUT (4)	X_OUT	X driver control
White JST	OUTPUT (4)	A_OUT	A driver control
Header Pins	OUT/IN (4)	CONTROL	Hold, Start, Abort control pins with +12v supply
Black IDC	OUT/IN (12)	THC	Torch Height Controller connectivity
Switch SMD	DPDT	NORM ◄► THC	Enable/Disable Z driver interrupt for THC control
Fuse	POWER FUSE	FUSE 5A	5A Fuse for board protection in overcurrent

V2.1



With the stand-alone card, you will need to use external stepper drivers to run your motors, this allows for high-power motors, closed-loop control as well as higher motor voltages than the Nighthawk card can manage on its own.

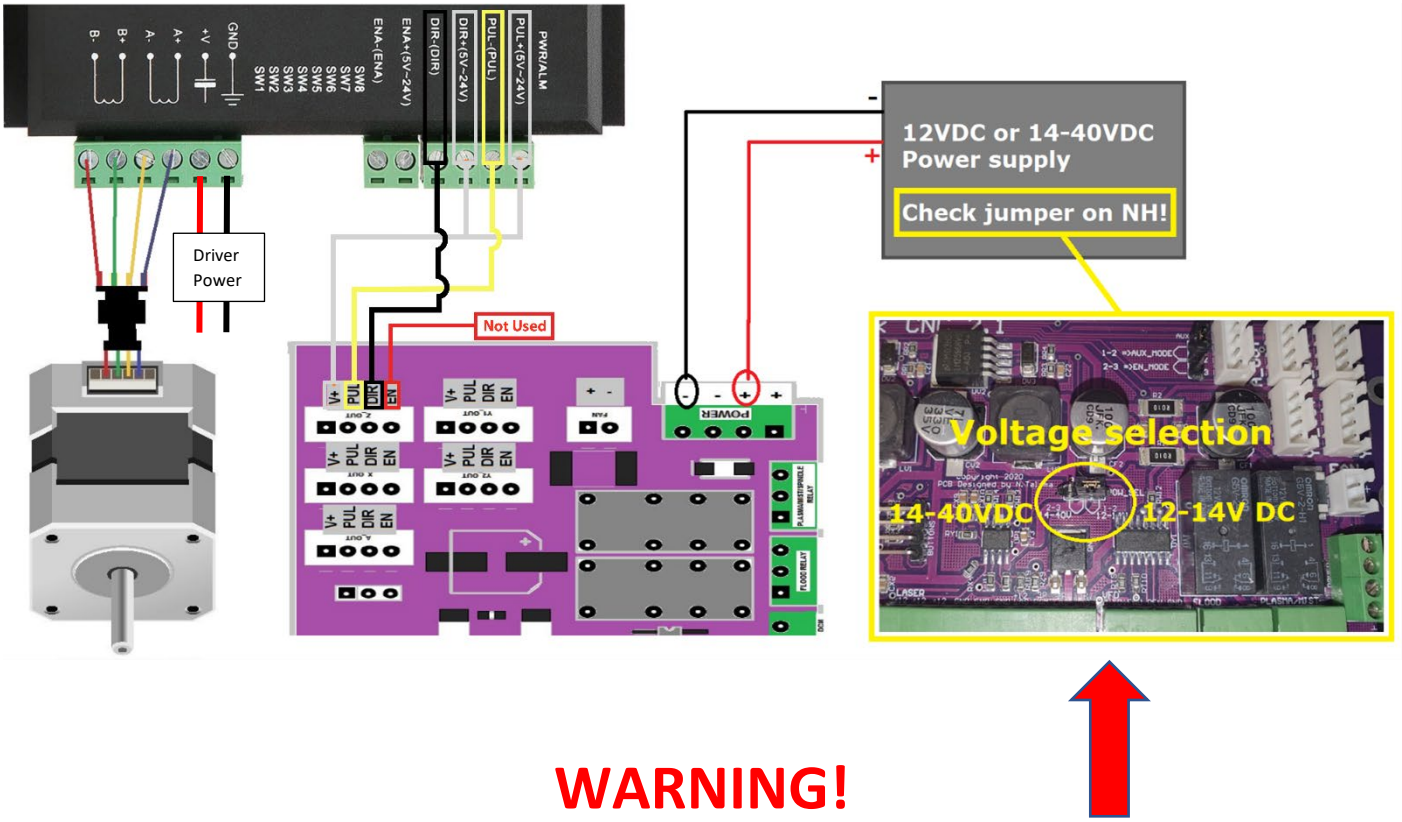
PLEASE NOTE: The maximum input voltage for the Stand-Alone Nighthawk Control Card is 50VDC.

Any higher will risk causing irreparable damage to the card and void your warranty.

Typical machine retrofit to external drivers

Please Note: The wiring colours used in this diagram are indicative only. While all care has been taken to match the diagrams to the real-world hardware some wiring colours may differ between suppliers. Please ensure you use the labels on the control card, drivers and motors, and do not rely on the colours of the wires.

See page 24 for more detail on wiring stepper motors and drivers



WARNING!

Failure to select voltage correctly may cause irreparable damage to the controller and your machine, please ensure you select this voltage correctly!

Nighthawk Cards will be set at the factory for 14-40VDC, if you are using a 12V power supply you will need to switch this jumper.

Nighthawk Control Card Connections/Pins

Connections	Type (Pin Count)	Label on PCB	Function
Green Plug	INPUT (2)	Limit X	X Limit Switch
Green Plug	INPUT (2)	Limit Y	Y Limit Switch
Green Plug	INPUT (2)	Limit Z	Z Limit Switch
Green Plug	INPUT (2)	Limit A	Y2/A Limit Switch
Green Plug	INPUT (2)	PROBE	Probe Input
Green Plug	OUTPUT (10)	LASER and 12V POWER OUT	Laser Port and Proximity switch 12V supply Max 12.5V @2A
Green Plug	OUTPUT (4)	VFD	VFD(VSD) Speed Control
Green Plug	DRY CONTACTS (3)	FLOOD	Flood Relay (Dry Contacts) Max 30VDC @ 2A
Green Plug	DRY CONTACTS (3)	PLASMA/MIST	Spindle Interlock/Plasma/Mist Relay (dry contacts) Max 30VDC @ 2A
TB BLOCK	POWER (4)	POWER	POWER INPUT (12-14v or 14v to 40v) (POW_SEL 1-2) Min 12VDC Max 14VDC Dependent on POW_SEL JUMPER (POW_SEL 2-3) Min 14VDC Max 40VDC Limited Protection is provided by a self-resetting fuse.
White JST	OUTPUT (2)	FAN	Fan (12VDC)
White JST	OUTPUT (4)	Y1_OUT	Y1 driver control
White JST	OUTPUT (4)	Z_OUT	Z driver control
White JST	OUTPUT (4)	Y2_OUT	Y2 driver control (cloned from Y1_OUT)
White JST	OUTPUT (4)	X_OUT	X driver control
White JST	OUTPUT (4)	A_OUT	A driver control
AUX_SEL	Jumper (3)	AUX_SEL	A_OUT MODE SELECTOR
POW_SEL	Jumper (3)	POW_SEL	Enables/Disable Onboard 12V regulator
90º Header Pins	OUT/IN (4)	CONTROL	Hold, Start, Abort control pins with +12v supply

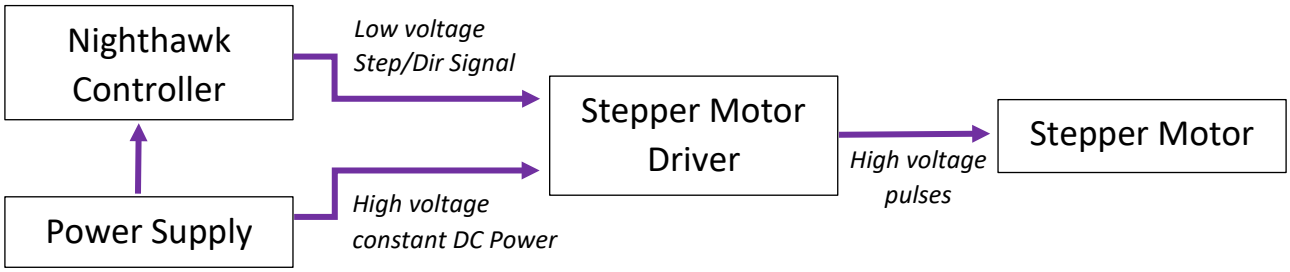
V2.2 + V2.1

Wiring Stepper Motors and Drivers

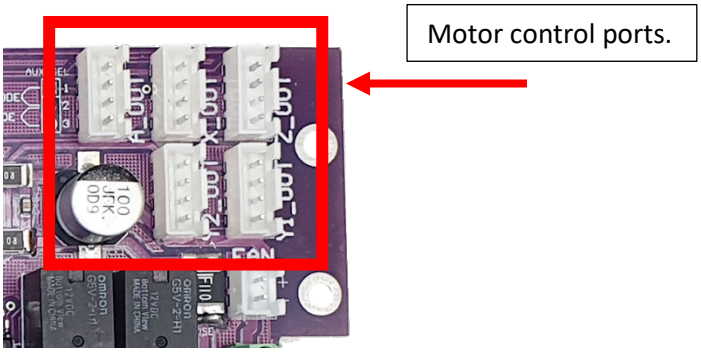
This step is only for users with a Stand-Alone control card. For those with a Full-Stack Nighthawk controller, this has been done for you with the built-in stepper drivers.

For a stepper motor to work it needs to receive high voltage pulses which cause it to turn. A stepper motor driver converts low voltage control signals to the high voltage pulses.

The order in which the electrical signals travel is:



You will have received 5x 4-pin white JST plugs with short tails with your Nighthawk control card. These will need to be soldered to a length of 4-core cable with enough length to reach your stepper motor drivers. The white plug will be inserted into the corresponding white motor control port on the Nighthawk card.



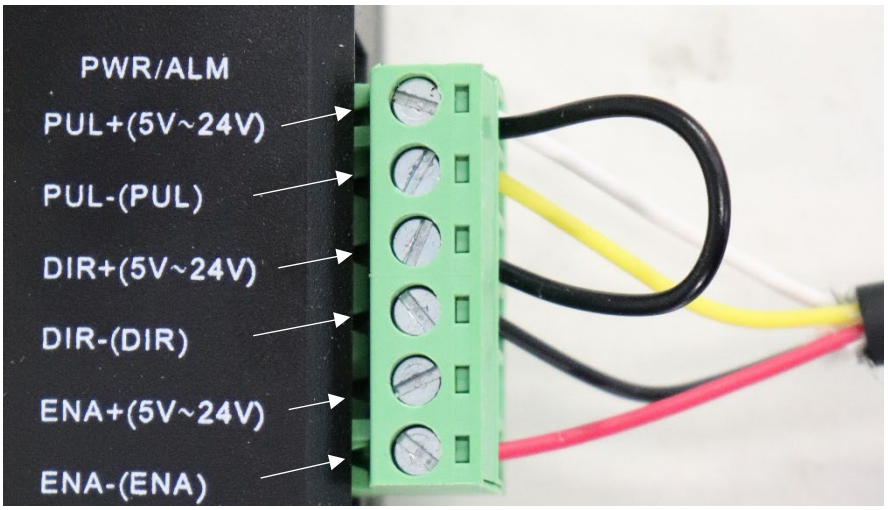
At the other end of the 4-Core cable coming from the Nighthawk you will need to strip between 30-40mm of the outer sheath and the wire braid to allow the individual wires to easily reach their intended terminals.

You will also need a short length of wire to link the PUL+ and DIR+ terminals, a piece of offcut of the 4-core cable works well for this purpose. *See photo on next page.*

This 4-core wire coming from the Nighthawk will be used for the low voltage inputs on the stepper motor driver and will go to the PUL+, PUL-, DIR+, DIR- and ENA- terminals. Refer to the picture below for reference. If using the cable from CNC3D the colours should match, only if you matched the colours when soldering on the JST plug in the step above.

Pro Tip: The ENA+ and ENA- terminals are not used with a Nighthawk, however you can wire the red wire to ENA- to stop it from hanging loose.

Stepper Motor Driver
(TB6600, DM542, DM556 etc.)



From Nighthawk motor control port

At this point you can also wire in the cable from the stepper motor and the DC power. Pay close attention to the orientation of the power cable as wiring it backwards can damage the driver's circuitry!

When wiring the stepper motor cable you will need to know which wires go to which terminal. The easiest way to test this is by using a multimeter on continuity or resistance mode, and testing the wires going to the stepper motor, not into the stepper motor driver.

The images below show how to test the coils in a stepper motor to find the pairs.

These photos are an example only and your wire colours may be different.

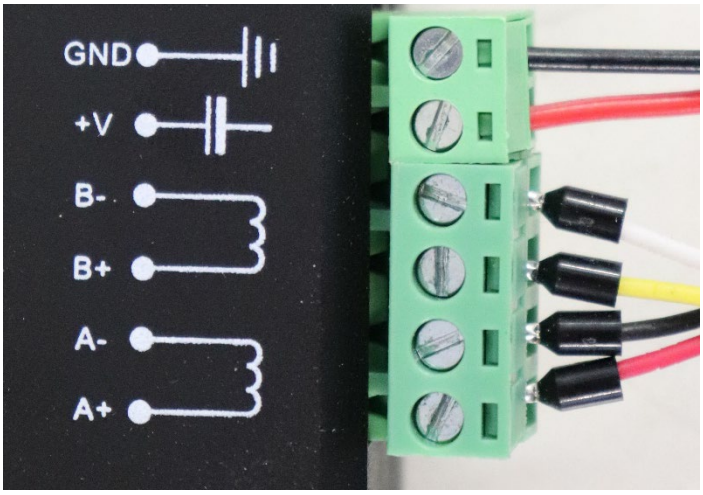
Green & Blue wire have no continuity so are not a pair

Green & Red wire have low resistance, so they are a pair

There are 2 coils (phases) in a stepper motor. If your multimeter is reading zero or very low resistance between a pair of wires, that is one coil (A) and the other pair would be the second coil (B).

There is no way to tell which would be the positive or negative (A+/A-) before powering it up, however you will not cause any damage by wiring them backwards. Wiring it backwards would cause the motor's coils to be out of phase with each other, resulting in the motor either running backwards or simply not turning at all.

Stepper Motor Driver
(TB6600, DM542, DM556)



DC Power In

Stepper Motor Out

The last step in setting up the driver is to check the DIP switch positions. On the stepper driver case you will see a table which tells you how to orient the switches to get the right output and some small switches along the side. There will also be a marking on the switch telling you which way is ON.

Please Note: These switches must not be adjusted while the driver is powered on.

You will need to know the current rating of your stepper motor, and the pulse/rev you want to set it at.

Pulse/rev is functionally the same as microstepping but is related to how many pulses the motor needs to rotate a full 360 degrees, whereas microstepping is how many times a single step of 1.8 degrees is divided up. The higher the pulse/rev or microstep setting, the higher the accuracy but the lower the torque.

For most users, 1600 pulse/rev is perfect and equates to 1/8th microstepping.

The following table below is from a DM556 stepper driver and is an example only. You will need to refer to your stepper driver as the switch position may vary across different drivers.

Current Table

Peak	SW1	SW2	SW3
1.4A	on	on	on
2.1A	off	on	on
2.7A	on	off	on
3.2A	off	off	on
3.8A	on	on	off
4.3A	off	on	off
4.9A	on	off	off
5.6A	off	off	off

SW4:off=Half Current on=Full Current

Pulse/rev Table

Pulse/rev	SW5	SW6	SW7	SW8
400	off	on	on	on
800	on	off	on	on
1600	off	off	on	on
3200	on	on	off	on
6400	off	on	off	on
12800	on	off	off	on
25600	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
5000	off	off	on	off
8000	on	on	off	off
10000	off	on	off	off
20000	on	off	off	off
25000	off	off	off	off

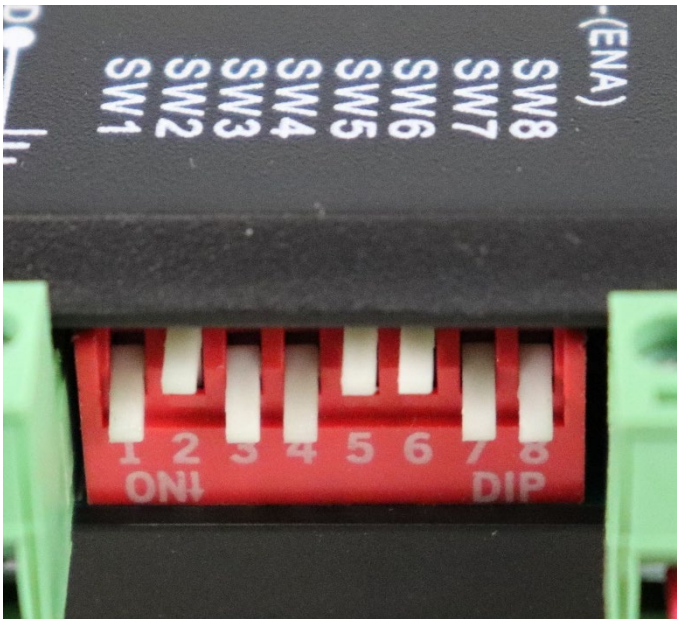
The first table, labelled “Current Table” tells you how to set your current. In this example I have a stepper motor rated for 3A. This table doesn’t have a 3A setting but the best practice is to go slightly lower so I will set my driver to 2.7A instead.

For this to work, Switches 1 and 3 need to be on, and switch 2 is off.

Switch 4 is how much of the available current gets sent to the motor during idle, known as holding current. Having this set to Full Current (switch in the On position) will send the full operating current to the motor even when it’s not moving. This can cause the motor to get hot so keeping it in the Off position is best for screw-driven machines. Belt driven machines can benefit from having full holding current as their natural resistance to movement is lower.

We already talked about pulse/rev and I want 1600, so looking at the second table, I need Switches 5 and 6 off, Switches 7 and 8 on.

Switch 1 – On	**Switch 5 – Off**
Switch 2 – Off	**Switch 6 – Off**
Switch 3 – On	**Switch 7 – On**
Switch 4 – Off	**Switch 8 – On**

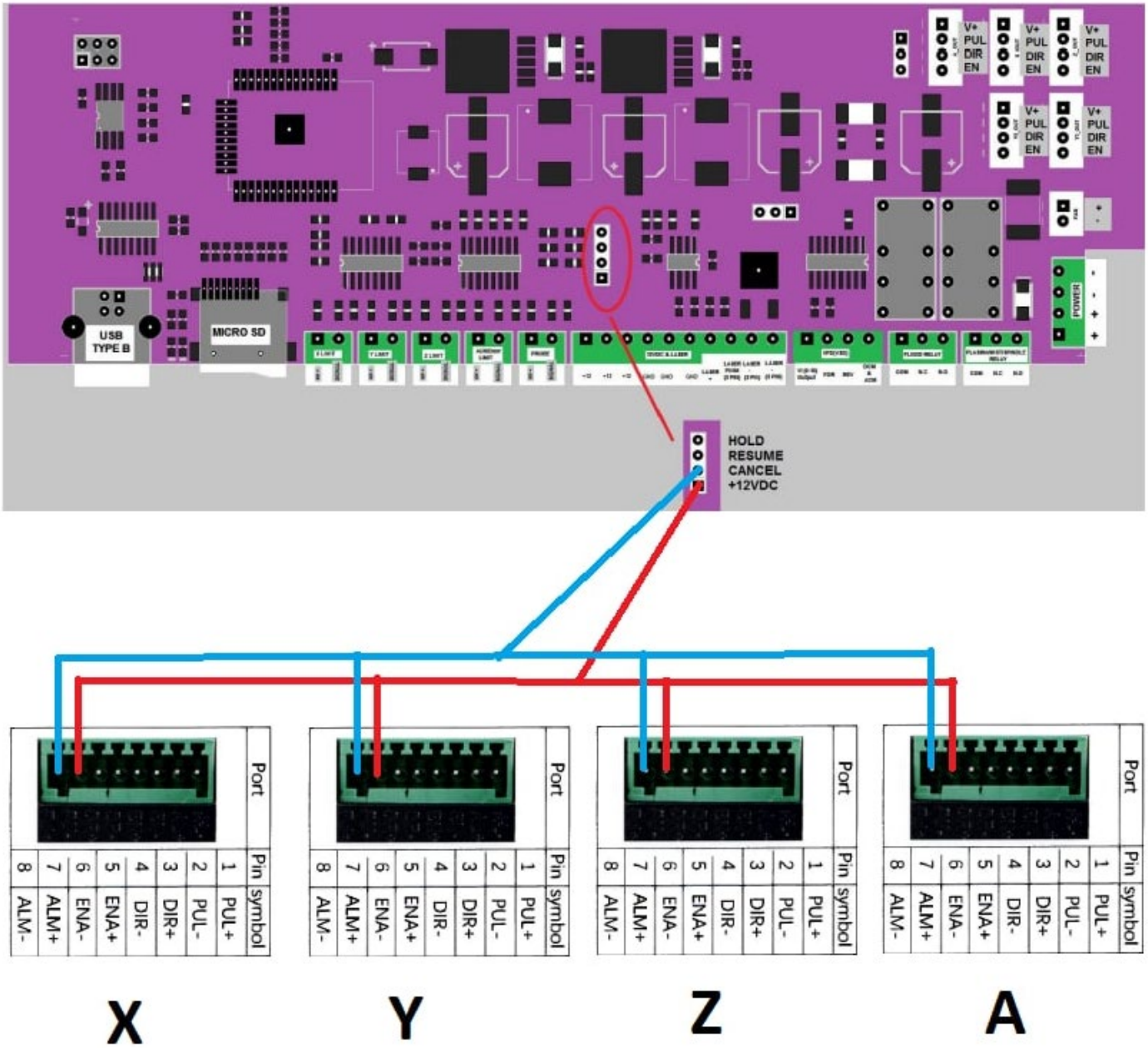


V2.2 + V2.1

Wiring of closed loop Stepper drivers

The standalone Nighthawk card supports using Closed-loop stepper drivers. The only difference between closed loop and open loop stepper drivers from a wiring perspective is the **ALARM+** and **ALARM-** signal wires. These are typically triggered by your closed loop stepper driver if it was unable to do the required number of steps requested. The purpose is to stop the job as it has clearly gone off course.

Basic overview of how to wire 4 closed loop stepper driver ALARM signals to the Nighthawks E-stop pin.



Please note: Your external closed loop stepper drivers may be slightly different than the ones shown here. Make sure to confirm that then wiring for ALARM+ and ALARM- Ensure you follow the polarity of the Nighthawk.

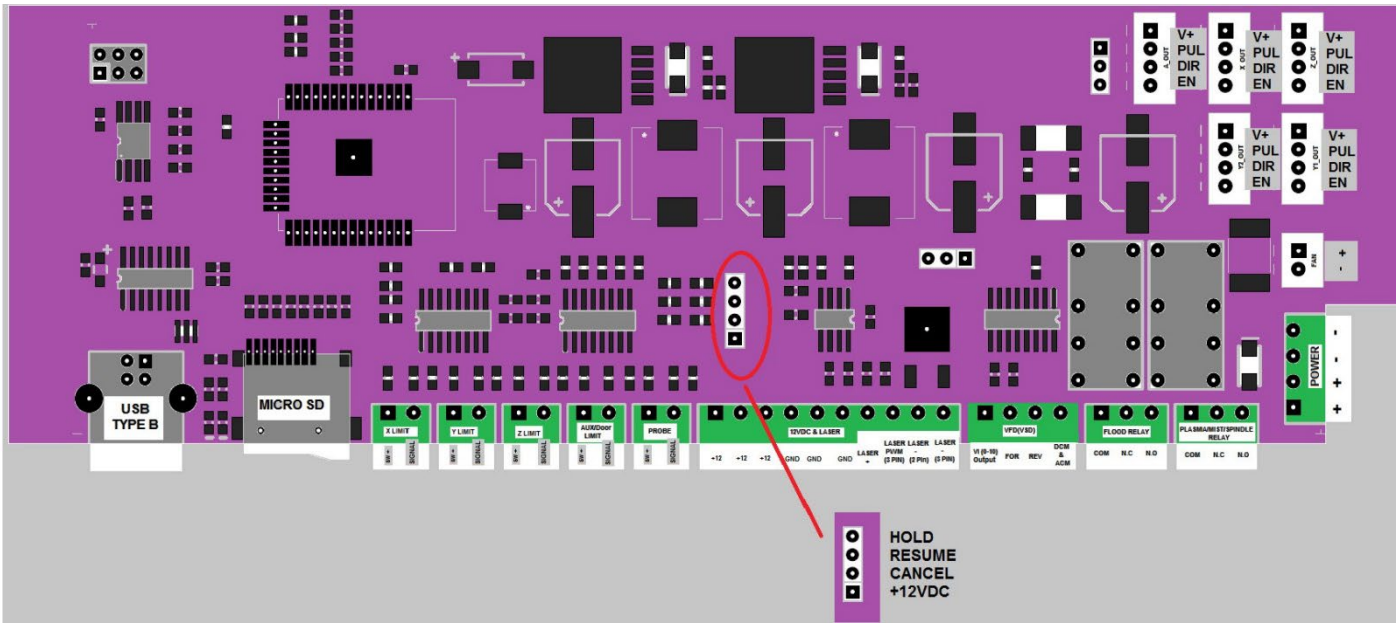
V2.2 + V2.1

Wiring of External Control Buttons

If you have a Full-Stack Nighthawk Controller, these pins will be in use by the membrane buttons on the front of the steel enclosure. If you decide to use these pins for an external E-Stop switch instead you will need to disconnect the control buttons on the enclosure.

The Nighthawk control card has pins to allow wiring of external E-stop, pause and resume buttons. These pins are highlighted below.

The pins are <u>active high</u> and can connect to +12VDC to activate.



V2.2

There are 2 sets of control pins, one bent at 90° to the PCB and one vertical immediately behind them

HOLD: Will send pause command when triggered
START: Will send resume command when triggered
ABORT: Will send E-Stop command when triggered

V2.1

These pins are bent at 90° to the PCB

HOLD: Will send pause command when triggered
RESUME: Will send resume command when triggered
CANCEL: Will send E-Stop command when triggered

V2.2 + V2.1

Wiring of VFD to the Nighthawk for Control

Due to the large number of VFD models and manufacturers, no colour code is given for connection from the Nighthawk to the VFD. Instead, generic terms are being used in this manual. Always refer to your user manual.

VFD (INPUTS)	Nighthawk (Outputs)
VI (0 to 10V) input	VFD, Connector 7 PIN 1 (0-10v)
Forward input	VFD, Connector 7 PIN 2 (FOR)
Reverse input	VFD, Connector 7 PIN 3 (REV)
DCM Common Terminal of Digital Ground	VFD, Connector 7 PIN 4 (ACM/DCM)
ACM Common Terminal of Analog Ground	VFD, Connector 7 PIN 4 (ACM/DCM)

The Nighthawk uses a single common ground for both ACM and DCM as such you may need to jumper DCM and ACM on the VFD.

CNC3D cannot provide support for wiring your VFD.

We test every Nighthawk card on a test bench which includes a VFD control test, and it will not be shipped unless it passes. If your VFD is not responding to your Nighthawk card after setting Commander up to run it, it is a wiring or VFD settings problem and you should refer to your VFD user manual.

We have created a “Cheat Sheet Guide” with ways to connect common VFDs. This is the extent of support we can offer for VFD wiring and settings. Click the link below or type it into an internet browser to view the document. This document is not an exhaustive list of available VFDs and care should be taken when changing your VFD settings. Refer to your VFD user manual or manufacturer with any questions about VFD settings.

https://libraries.sharpsoft.com.au/nighthawk/nh-vfd-guide.pdf

CNC3D cannot provide support for your VFD.

V2.2 + V2.1

Proximity Limit Switch Wiring

The Nighthawk is designed to work with PNP proximity switches and are the only supported type. NPN proximity switches will not work.

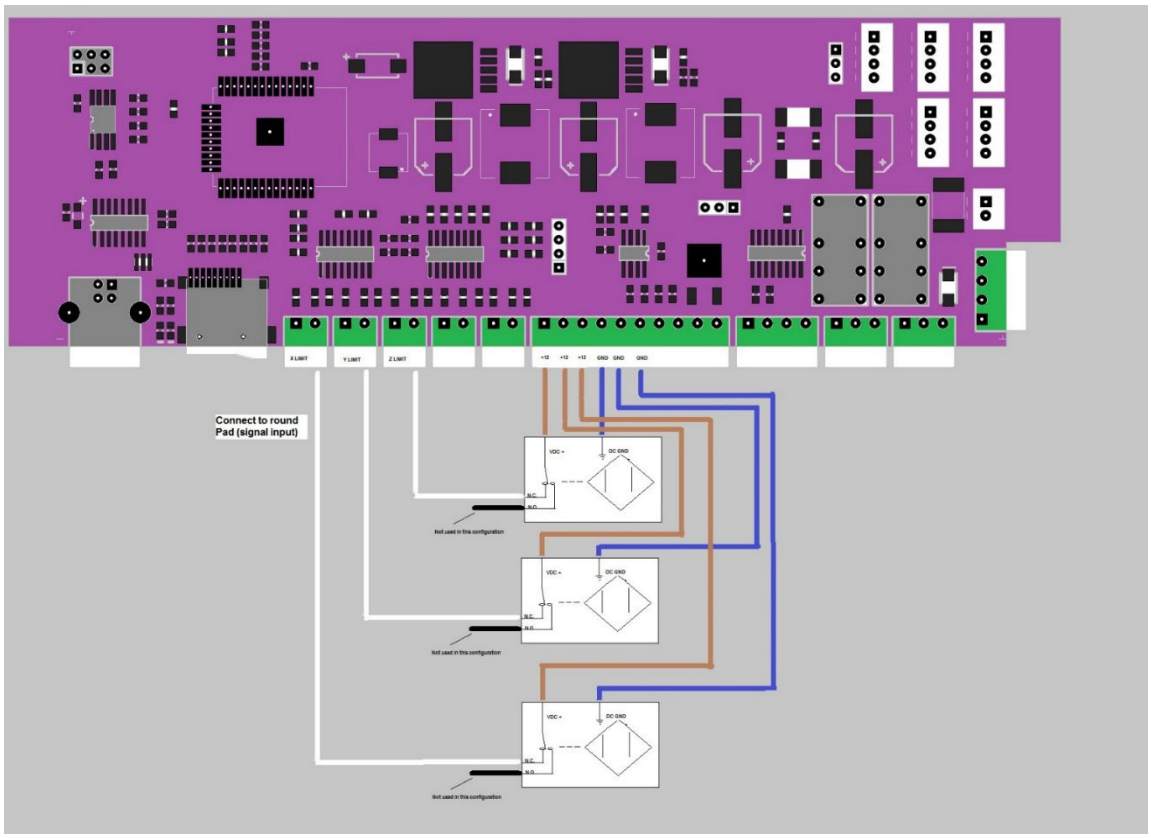
Normally Closed (NC) switches are the recommended type as any break in the circuit will cause the limit to trigger on that axis, resulting in safer operation.

Please Note: All signals for the limit and probe inputs are interpreted in reverse. This is due to components on the Nighthawk board protecting it from short circuits. Importantly, this does not affect the switch's operation or orientation, just how the signal is read by the Nighthawk.

For example, if using a NC (Normally Closed) switch, you will need to select NO (Normally Open) under the Limit Switch type option in the Peripherals tab of Commander.

Having the opposite type selected in the software will not change how your physical switch operates, or the protection offered by using NC switches vs NO type switches.

Brown:	+12v (10-pin plug)
Blue:	GND (10-pin plug)
White:	Limit Switch Input (right side of plug)
Black:	Not used in this configuration



V2.2 + V2.1

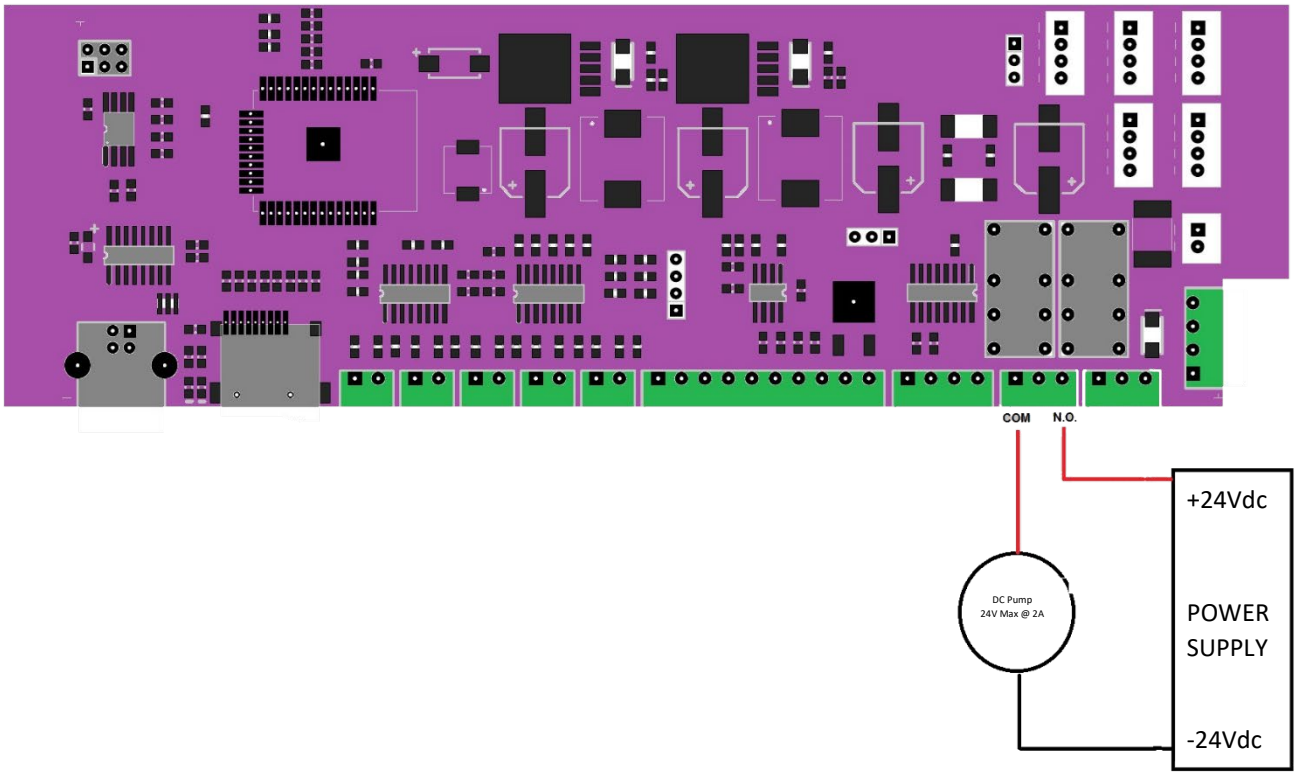
Relay Setups

There are 2 relays on the Nighthawk Control Card which control the FLOOD and PLASMA ports. They are both dry contact relays and rated at 24VDC max @ 2A

Pro Tip: **The PLASMA relay will respond to M3/M4 and M5 commands**
The FLOOD relay will respond to M8 and M9 commands

These relays are not designed or rated for mains voltage or high current applications. If looking to control a 110/230V appliance such as an extractor or pump you will need an external mains voltage contactor. See next page for an example setup.

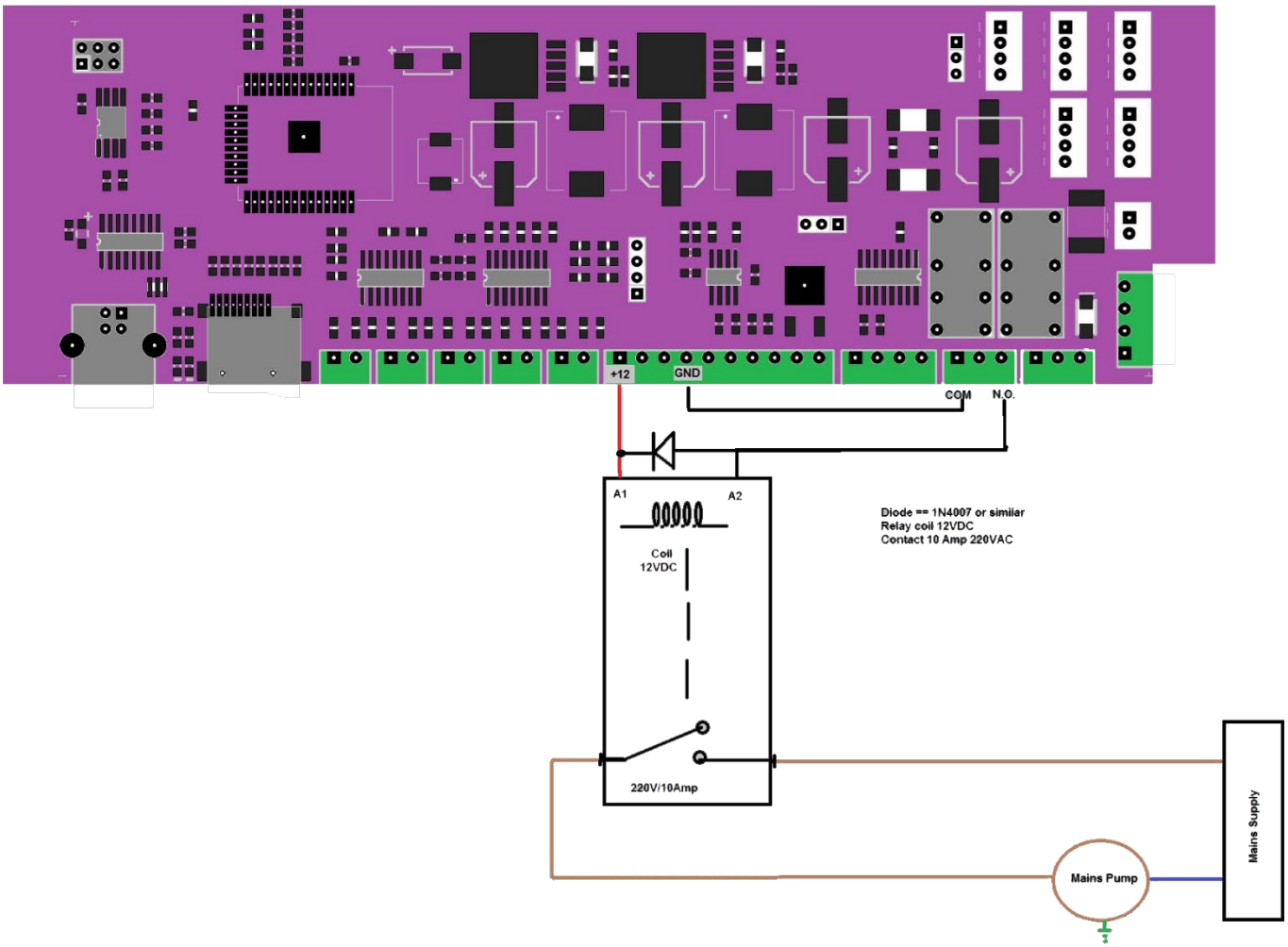
Flood Relay (24VDC – Normally Open) *



** This is an example only. CNC3D cannot provide support for any external relay wiring that you have added. We test every Nighthawk card on a test bench which includes a relay control test, and it will not be shipped unless it passes. If your relay is not responding to your on/off commands, it is a wiring or GCODE problem and you should revisit your wiring or GCODE commands.*

Using Flood Relay for Mains Voltage Applications*

The onboard relays are not designed or rated for mains voltage or high current applications. If looking to control a 110/230V appliance such as an extractor or pump you will need an external mains voltage contactor.



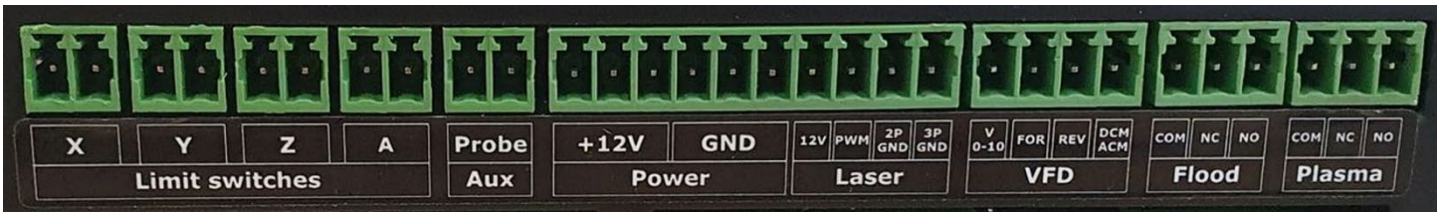
Do not attempt any mains wiring without holding a valid electrical license

** This is an example only. CNC3D cannot provide support for any external relay wiring that you have added. We test every Nighthawk card on a test bench which includes a relay control test, and it will not be shipped unless it passes. If your relay is not responding to your on/off commands, it is a wiring or GCODE problem and you should revisit your wiring or GCODE commands.*

V2.2 + V2.1

Connecting your other wires

The front of your controller has a label indicating the wiring for your limit switches, probe, laser and VFD connections. Use a small flat head screwdriver to secure wires to the connectors. It is recommended to use bare wire ends or bootlace crimps for a safe and secure fit.



Limit switches

X: The X axis limit switch. Mechanical - No polarity needed, either wire can go to either hole.
Proximity – Trigger wire goes to the right side hole.

Y: The Y axis limit switch. Mechanical - No polarity needed, either wire can go to either hole.
Proximity – Trigger wire goes to the right side hole.

Z: The Z axis limit switch. Mechanical - No polarity needed, either wire can go to either hole.
Proximity – Trigger wire goes to the right side hole.

A: The A/Y2 axis limit switch. Mechanical - No polarity needed, either wire can go to either hole.
Proximity – Trigger wire goes to the right side hole.

Pro Tip: If you do not have a limit switch connected for A/Y2, we recommend bridging the A/Y2 limit together to stop it from being triggered in software. Refer to page 7 for more information.

Aux

Probe: A probe connection. Conductive - No polarity needed, either wire can go to either hole.
Mechanical/3D Indexing – Trigger wire goes to the right side hole.

Pro Tip: If issues occur when probing with a conductive probe, try swapping wire orientation.

Please Note: All signals for the limit and probe inputs are interpreted in reverse.
Importantly, this does not affect the switch's operation. Please see page 31 for more information.

Power

3 x +12V: General 12V rail. Maximum of 1A total – shared with laser 12V, *to be used for inductive limit switches only!*

3 x GND: General common ground rail. Maximum of 1A total – shared with laser 12V, *to be used for inductive limit switches only!*

*Please note: Take care to ensure the 12v and GND pins are **never** shorted. The internal fuse should protect the controller in case of a short but damage is still possible if these pins are shorted.*

Laser

Care must be taken when working with any lasers. Ensure that the laser is pointed away from any people or animals and that you are wearing appropriate laser PPE before powering on your controller.

12V: This pin is used for powering a 12V diode laser, it applies to both 2 pin and 3 pin lasers. Maximum laser power of 15W.

PWM: This is a digital signal 0-5V, applies to 3 wire lasers only.

2P GND: This pin is used for the negative wire of a 2 pin laser.

3P GND: This pin is used for the negative wire of a 3 pin laser.

VFD

V0-10: This pin is used for setting the speed on most common VFDs, It is an analogue 0-10V varying output.

FOR: This is the signal wire to tell the VFD to spin forward.

REV: This is the signal wire to tell the VFD to spin in reverse.

ACM DCM: This pin is generally connected to the ACM and DCM ports on the VFD for control.

Please note: You will need to refer to your VFD manual for instructions on setting these connections up. If unsure, reach out to a licensed electrician for assistance. Due to the large number of variations with VFD manufacturers and models, ***CNC3D cannot provide support for setting this up.***

Flood

COM: This is a common between NC and NO pins – maximum 2A @24v

NC: This is a Normally Closed contact with the COM pin – maximum 2A @24v

NO: This is a Normally Open contact with the COM pin – maximum 2A @24v

Please note: These are dry relay contacts only. They are not powered. This relay is switched when an M8 command is received by the controller and returns to normal when an M9 is received.

Plasma

COM: This is a common between NC and NO pins – maximum 2A @24v

NC: This is a Normally Closed contact with the COM pin – maximum 2A @24v

NO: This is a Normally Open contact with the COM pin – maximum 2A @24v

Please note: These are dry relay contacts only. They are not powered. This relay is switched when an M3 or M4 command is received by the controller and returns to normal when an M5 is received.

This completes the hardware setup of your Nighthawk Controller.

Getting connected

Now that your hardware is set up, let's get control!

The first step is to connect power to your Nighthawk controller and download our Commander control software by clicking the link below or typing it into your internet browser.

https://www.cnc3d.com.au/commander

To use your Nighthawk CNC Controller, you will need to have a way of communicating with it from a PC so you can give it GCODE files as well as commands like movement and of course, running your jobs!

There are multiple options that you can use to connect to your Nighthawk CNC Controller – USB, WiFi, and Bluetooth.

USB (Not Recommended)

Your first instinct may be to use USB however this is the **least reliable way** to control and run your machine and it is heavily discouraged! While it's running the spindle will create lots of Electromagnetic Interference (EMI) and electrical noise which can cause the USB connection to drop out resulting in random job stoppages or irregular machine behaviour. We only recommend using the included USB cable for setting up wireless communications, then unplugging the cable and storing it in a drawer.

WiFi (Best Option)

The best possible way to run your Nighthawk controller is via WiFi and connecting the machine to an existing WiFi network such as a house or factory network.

The next preferable option is WiFi – Direct Access Point Mode which allows you to connect directly to the Nighthawk instead of connecting the Nighthawk to an existing network. This will be the best option if there is no network in the area where your Nighthawk is located or if you are using a mesh network/WiFi range extenders as the Nighthawk cannot connect to these networks. This works the same as connecting to a network, but the drawback is that the computer running the machine will not have access to the internet while running the machine.

Bluetooth (Backup Option)

The third option is connecting to the Nighthawk via Bluetooth from a compatible PC or Laptop (not a smartphone!)
Bluetooth works the same as USB without the physical cable so it will eliminate the risk of EMI and unpredictable machine behaviour.

WiFi (Connect to Existing Network)

Connecting your Nighthawk to an existing wireless network is the best and most reliable way to communicate with and control your Nighthawk controller. Keep in mind that your Nighthawk DOES NOT need internet access, it only needs access to the network so that computers and devices on the same network can communicate with it.

Click the link below or type it into a web browser for a video on how to set up a wireless connection

https://www.youtube.com/watch?v=k07Qwe4IduU

Note: There are some network configurations that the Nighthawk will not work with or will have limited connectivity.

- Modern WiFi routers are often capable of putting out signals in both the 5.8GHz and 2.4GHz frequency bands. **The Nighthawk is only capable of interacting with and connecting to the 2.4GHz band.** If you are unsure which frequency band your network is you will need to contact your router's manufacturer for help as our support team usually cannot help with this.

- Some modern WiFi routers ship with "Smart Connect" enabled by default. This setting disables separate 2.4GHz and 5.8GHz networks and lets the router decide which is best for each device. This setting can cause problems with Nighthawks and other ESP32 devices. Refer to your router's user manual to disable this setting and enable the 2.4GHz radio band.

- Some mobile devices such as phones and 4G/5G mobile routers will sometimes cause problems with a Nighthawk by changing their gateway IP. These issues are often easily overcome by running through the setup wizard again.

- Mesh networks are common in large properties where a single router isn't powerful enough to provide wireless signals to the entire property. We have solutions in place for these networks, but every network is different, and we cannot guarantee complete reliability with these networks.

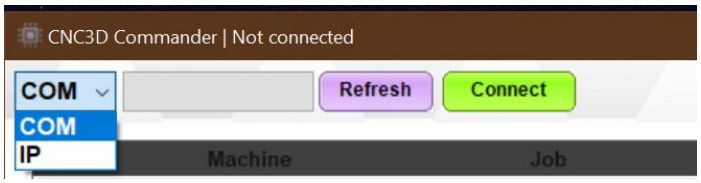
- WiFi range extenders are common in large properties where a single router isn't powerful enough to provide wireless signals to the entire property. We have solutions in place for these networks, but every network is different, and we cannot guarantee complete reliability with these networks.

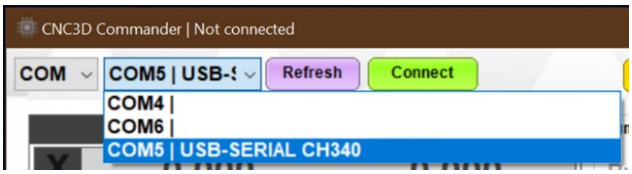
To get started with this process you will need to have a Windows PC located near the machine so you can connect to it with a USB cable.

Plug in your USB cable, turn on your PC, turn on the Nighthawk and open CNC3D Commander.

Note: If your Nighthawk is not installed automatically or detected by your PC, refer to the USB setup section of this guide.

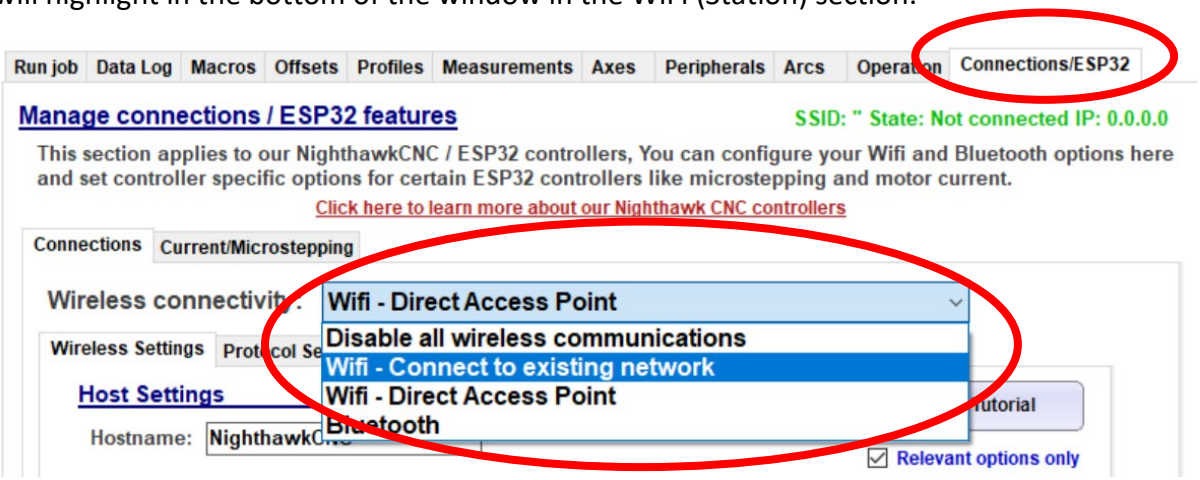
Select COM in the first drop-down menu. In the second drop-down menu select the correct COM port, it should be the one that has CP210x or CH340 in the description, depending on Nighthawk version.





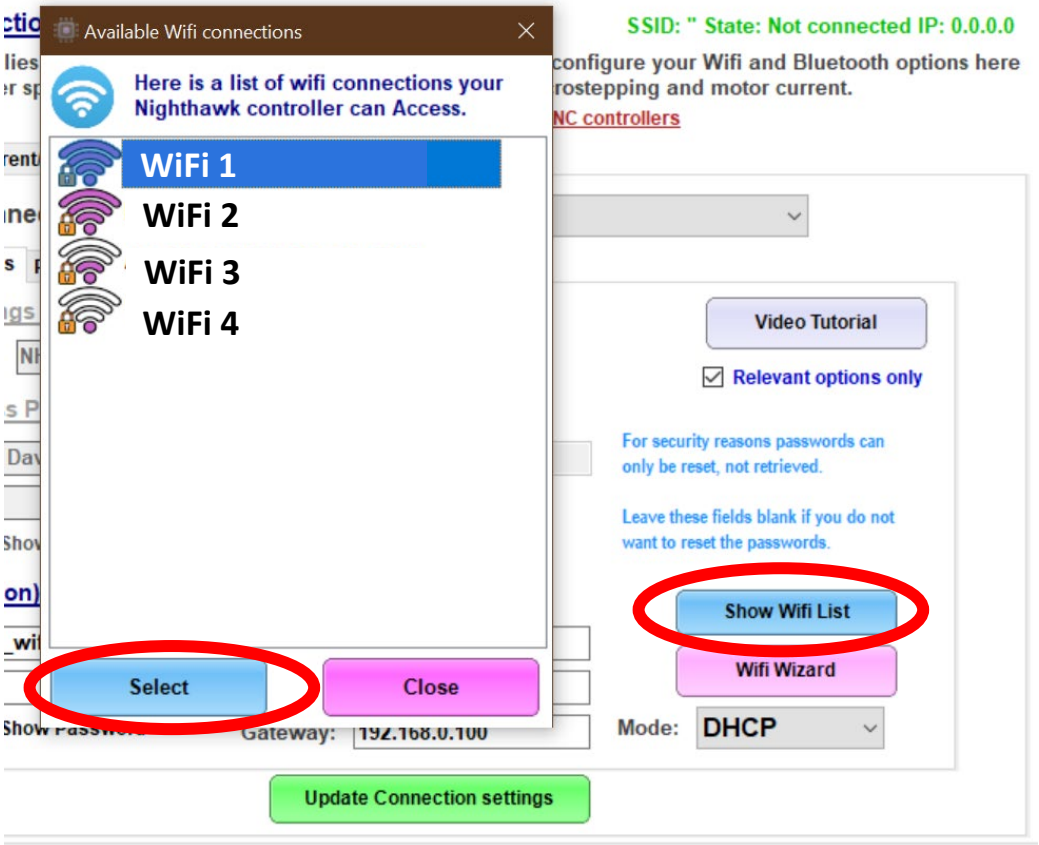
Once connected, you will need to clear the Alarm by clicking the E-stop button and then "Unlock" so the Alarm box changes to green, then click on the Connections/ESP32 tab to access the wireless settings.

In the drop-down box you will need to select WiFi – Connect to Existing Network and the relevant options will highlight in the bottom of the window in the WiFi (Station) section.



With the correct options highlighted, click on the "Show WiFi List" button to bring up the list of available WiFi networks that your Nighthawk can see.

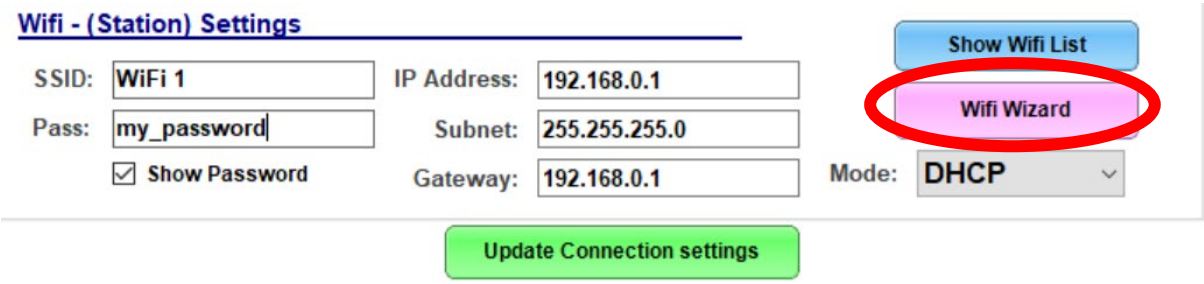
Pro Tip: Your network will usually be the one with the best signal, but not always!



Note: You may need to refresh the list by closing the window and clicking the WiFi list button again

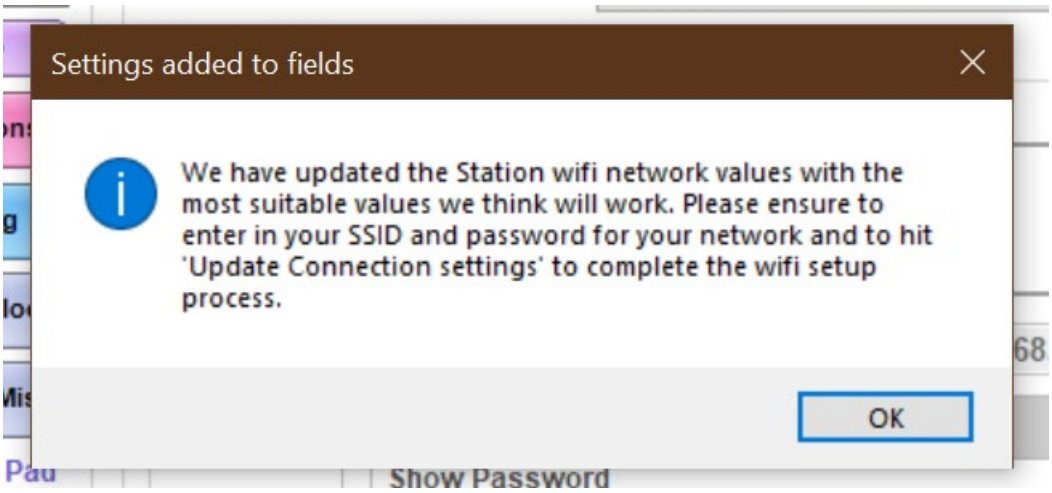
Highlight your network name, then click Select. This will put the network name you selected into the SSID box; you will then need to enter in your WiFi password. For now, you can leave the other boxes with numbers in them alone, and do not update settings just yet.

The next step is to click the WiFi Wizard button. This will automatically grab some details about your network from your computer and put them into the IP Address, Subnet and Gateway boxes. To do this your computer MUST be connected to the same network that you are setting up on your Nighthawk controller.



If your computer is connected to your WiFi network, you can click “Yes” on the popup box. The next box allows you to set the Nighthawk controller’s IP Address. For most users the default of 155 is perfect. If you do not need to assign a particular number here, you can leave it at 155.

Click OK to update the numbers and look for the popup to confirm it has been completed and click “OK”.

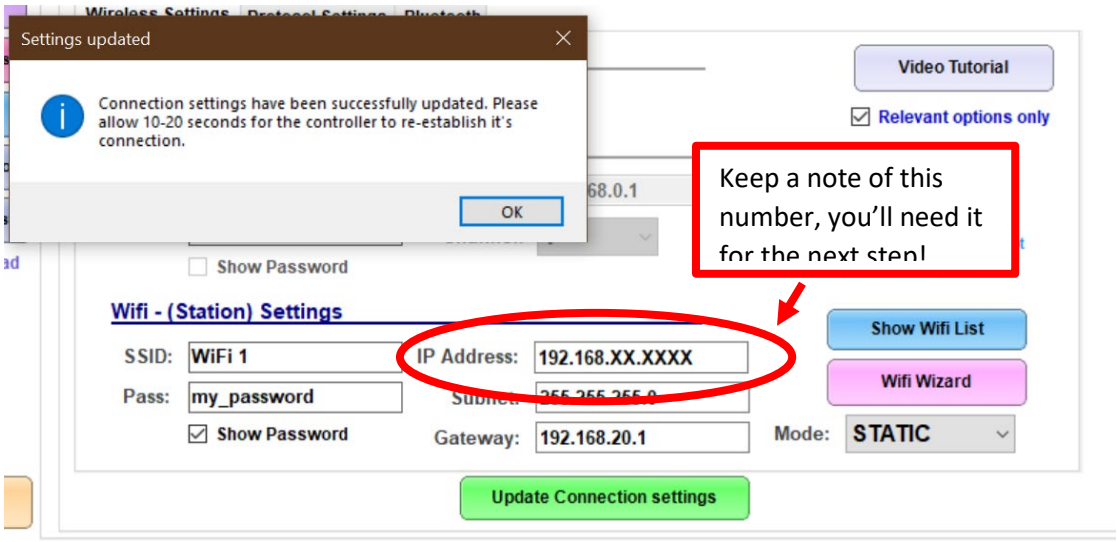


If you did not get a popup box telling you the settings have been updated, check to see if your machine is in an Alarm state in the bottom left corner of the Commander window next to the E-Stop. If you are in Alarm state you will need to clear it by clicking the E-stop button, then “Unlock” and re-do the process to update your settings.

You will see the numbers in IP Address, Subnet and Gateway may have changed to best suit your network, and the Mode box will read STATIC.

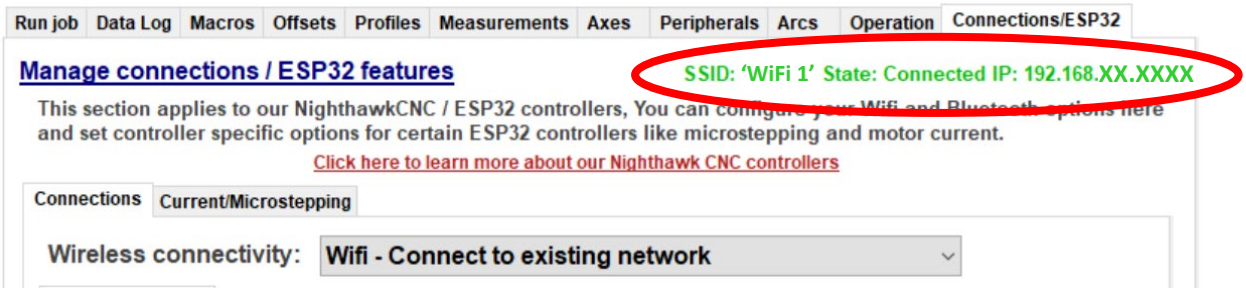
Pro Tip: Keep a note of the number in the IP Address box. All 4 number sets and . are vital!

You can now click “Update Connection Settings” and look for the popup box confirming the settings have been updated.

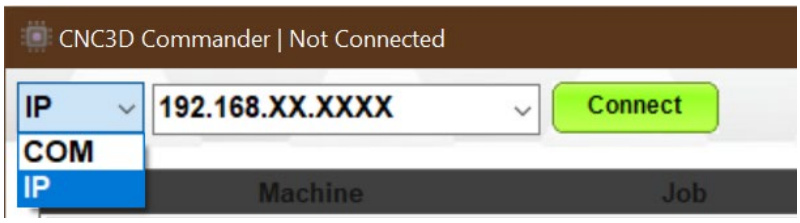


You should now click “Disconnect”, turn off your Nighthawk controller, wait 10-20 seconds, and then turn it back on.

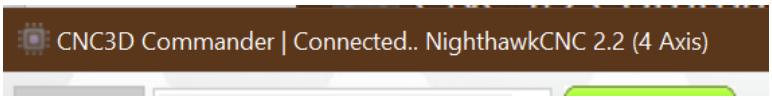
After powering the controller back on, you can click “Connect” to re-establish a connection via the USB cable after selecting the correct COM port and switch over to the Connections/ESP32 tab. If your connection was successful, you will see green text at the top right of the tab.



You can now click “Disconnect” at the top left of Commander, change that first drop-down box to IP, and then type in the IP Address that was specified in the previous step and click “Connect”.



If everything was successful, Commander will light up and you will have full control of your machine. You will also see “Connected.. NighthawkCNC 2.X” in the coloured bar above the “Disconnect” button. You can ignore the description in the brackets eg: 4 Axis.



You can now unplug the USB cable from both the PC and the Nighthawk and continue to control your machine via your WiFi connection.

WiFi (Direct Access Point)

This connection method is only recommended if the one above does not work. We recommend trying the WiFi (Connect to Existing Network) option first.

If you do not have access to an existing wireless network, or your existing network setup is incompatible with your controller, you can connect directly to your Nighthawk using its own built-in WiFi signal.

Click the link below or type it into a web browser for a video on how to set up a wireless connection

https://www.youtube.com/watch?v=k07Qwe4IduU

Please Note: The PC used to run the Nighthawk will not have internet access while connected to your machine if using the Direct Access Point method.

If you're using Easel or another web-based design suite to create your jobs, you will need to ensure you have downloaded your GCODE file or job file **BEFORE** connecting to your controller as you will not be able to do so while connected to your Nighthawk.

To get started with this process you will need to have a Windows PC located near the machine so you can connect to it with a USB cable.

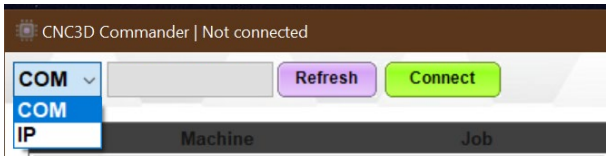
USB is not necessary to set up direct access when you first receive your Nighthawk from the factory, however it is easier to use the cable for setting up the machine. You will need the USB cable if you are reverting to Direct Access mode after setting up any other wireless connections if you can no longer access your Nighthawk via the existing connection.

If you are not using the USB cable, skip ahead to page 54 for connecting to the NighthawkCNC WiFi.

Plug in your USB cable, turn on your PC, turn on the Nighthawk and open CNC3D Commander.

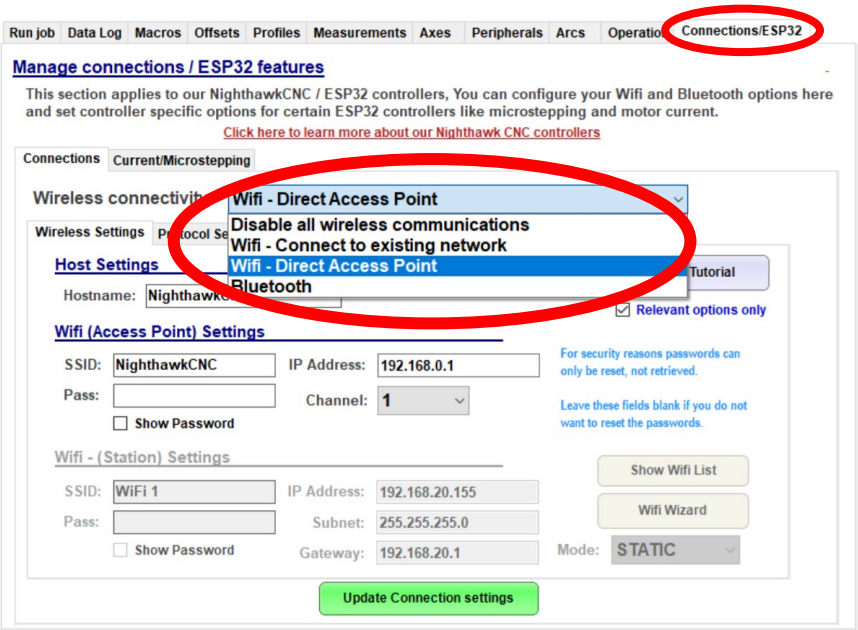
Note: If your Nighthawk is not installed automatically or detected by your PC, refer to the USB setup section of this guide.

Select COM in the first drop-down menu. In the second drop-down menu select the correct COM port, it should be the one that has CH340 in the description.



Once connected, you will need to clear the Alarm by clicking the E-stop button and then "Unlock" so the Alarm box changes to green, then click on the Connections/ESP32 tab to access the wireless settings.

In the first drop-down box you will need to select WiFi – Direct Access Point and the relevant options will highlight in the middle of the window in the WiFi (Access Point) section.



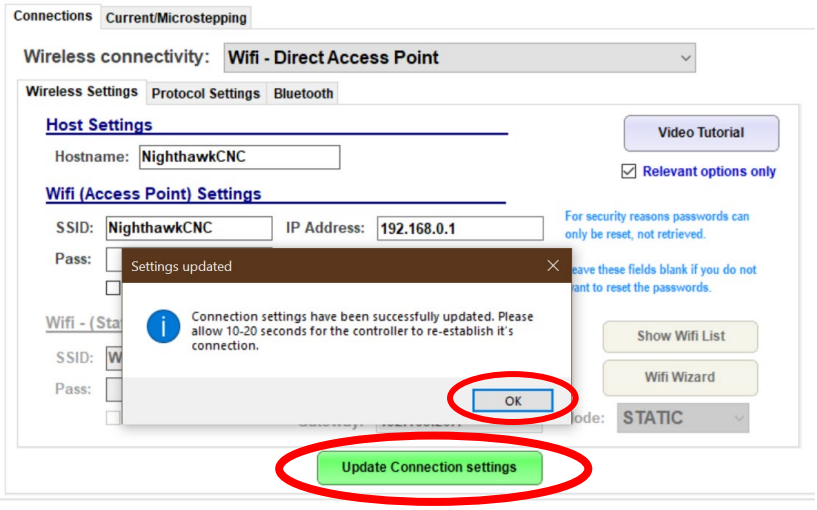
The SSID, IP Address and Channel boxes should match the ones in the image above, these are the defaults and will work just fine. The Hostname box should be the same as the SSID, which is **NighthawkCNC** by default.

The Pass box is blank, though the default password has already been set on the controller. You do not need to put anything in the Pass box unless you want to change the default password.

If you do want to change the password from the default you can enter your desired password into the box.

If all your settings are correct, you can now click “Update Connection Settings” and look for the popup box confirming the settings have been updated and click “OK”.

If you did not get a popup box telling you the settings have been updated, check to see if your machine is in an Alarm state in the bottom left corner of the Commander window next to the E-Stop. If you are in Alarm state you will need to clear it by clicking the E-stop button, then “Unlock” and re-do the process to update your settings.

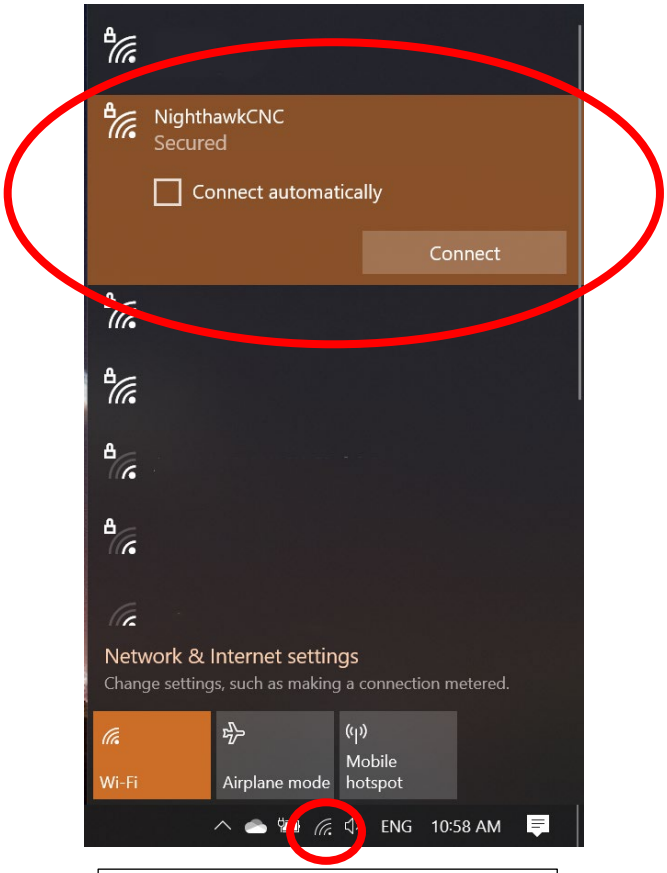


You should now click “Disconnect”, turn off your Nighthawk controller, wait 10-20 seconds, and then turn it back on.

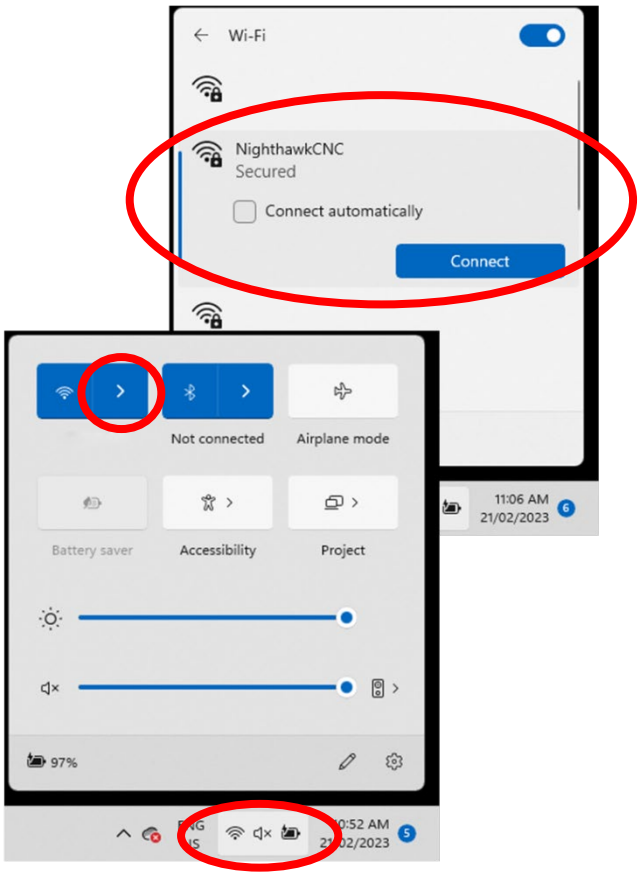
After powering your Nighthawk back on, you will need to connect your PC to the Nighthawk's wireless signal. You will need to do this from your PC's WiFi selection settings, not in our Commander software.

Please Note: PCs will vary due to the different versions of Windows operating system that are available. Because of this yours might look a little different to the pictures below. If you are unsure on how to navigate the next step on your particular PC you may need to get help from your PC retailer's technical support as this is specific to your computer and is not a part of CNC3D Commander software.

Look for the WiFi signal in the bottom-right corner of your computer screen. Open the menu to see the available wireless networks and look for the NighthawkCNC network.



Windows 10



Windows 11

After selecting the NighthawkCNC network in the list, click 'Connect' and enter the password.

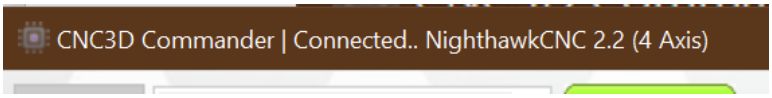
If you did not specify a password in the previous step, your default password will be 12345678 with no spaces between the numbers or any other characters.

Your PC may take a minute or so to connect to the Nighthawk as it is verifying the connection. Once your PC is connected you will see "No Internet, secured" or "Connected Without Internet" written below the "NighthawkCNC" WiFi name.

You can now switch back to our Commander software.

In the top-left corner of Commander you will need to change the first drop-down box to “IP” and the second box will need to read **192.168.0.1** you do not need to enter the :23. Click ‘Connect’ and Commander will add the :23 to the end of the IP address and connect to your Nighthawk.

If everything was successful, Commander will light up and you will have full control of your machine. You will also see “Connected.. NighthawkCNC 2.X” in the coloured bar above the “Disconnect” button. You can ignore the description in the brackets eg: 4 Axis.



You can now unplug the USB cable from both the PC and the Nighthawk and continue to control your machine via your WiFi connection.

Note: When the connection to your Nighthawk drops by either turning off the machine, moving your PC out of range or by using the Emergency Stop button, you may need to go through the steps above to reconnect to your NighthawkCNC WiFi Network before attempting to connect to your Nighthawk in Commander.

Bluetooth

This connection method is only recommended if neither of the WiFi options work for you. We recommend trying the WiFi (Connect to Existing Network) option first.

Click the link below or type it into a web browser for a video on how to set up a wireless connection

https://www.youtube.com/watch?v=k07Qwe4IduU

Bluetooth connections work the same as a USB connection without the drawbacks of having a physical wire plugged into the Nighthawk, so it is impervious to EMI interruption.

Bluetooth and USB connections work by sending every line of code to the Nighthawk one-by-one so if anything interrupts that connection you run the risk of your machine stopping mid-job or uncontrolled machine movement. This can be something as simple as your computer going to sleep or a laptop losing power so if you are certain you must use a Bluetooth connection to control your machine make sure you have disabled all power saving options in your PC and are plugged into power if using a laptop.

Contact your PC retailer's technical support if you need assistance with disabling these features.

Please Note: Bluetooth will only work with a Windows laptop or desktop computer with Bluetooth capabilities, it is not intended for use with a smartphone or tablet.

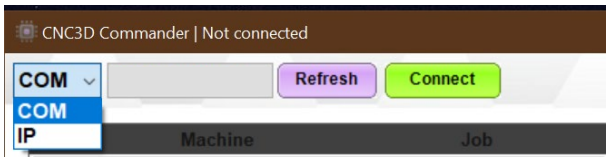
Most modern laptop computers will have a Bluetooth adapter built into the computer, however if not you can use a plug-in Bluetooth adapter which are readily available from most electronics retailers.

To get started with this process you will need to have a Windows PC located near the machine so you can connect to it with a USB cable.

Plug in your USB cable, turn on your PC, turn on the Nighthawk and open CNC3D Commander.

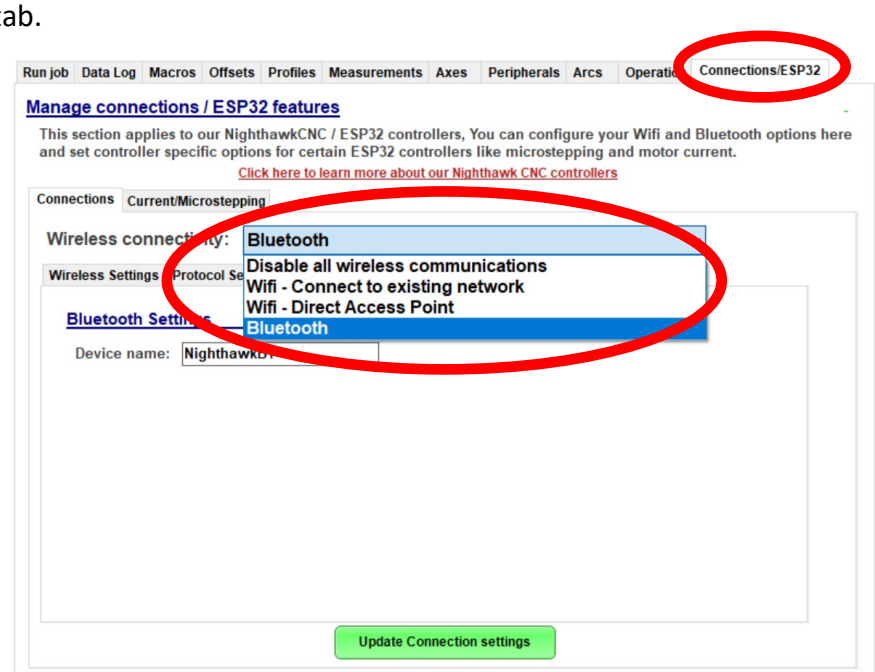
Note: If your Nighthawk is not installed automatically or detected by your PC, refer to the USB setup section of this guide.

Select COM in the first drop-down menu. In the second drop-down menu select the correct COM port, it should be the one that has CH340 in the description.



Once connected, you will need to clear the Alarm by clicking the E-stop button and then "Unlock" so the Alarm box changes to green, then click on the Connections/ESP32 tab to access the wireless settings.

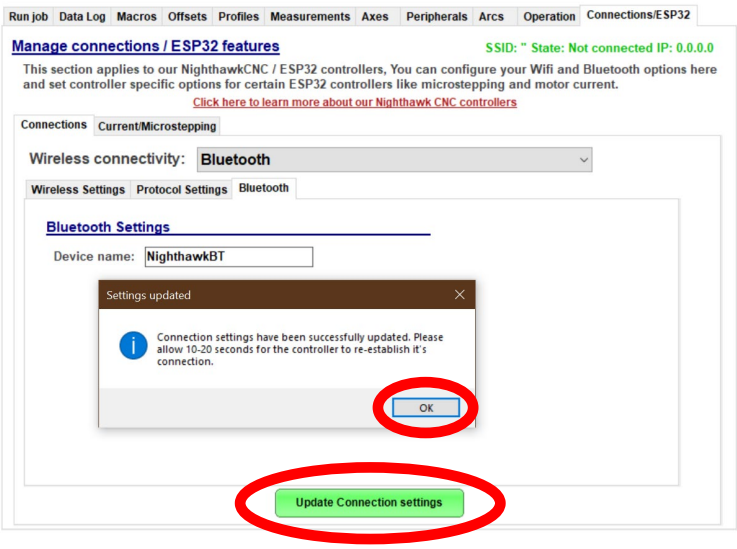
In the first drop-down box you will need to select Bluetooth and Commander will switch over to the Bluetooth settings tab.



From here you can set the Device Name, however leaving it as the default **NighthawkBT** is perfectly fine.

This will be all the settings you need to change in Commander so you can now click “Update Connection Settings” and look for the popup box confirming the settings have been updated and click “OK”.

If you did not get a popup box telling you the settings have been updated, check to see if your machine is in an Alarm state in the bottom left corner of the Commander window next to the E-Stop. If you are in Alarm state you will need to clear it by clicking the E-stop button, then “Unlock” and re-do the process above to update your settings.



You should now click “Disconnect”, turn off your Nighthawk controller, wait 10-20 seconds, and then turn it back on.

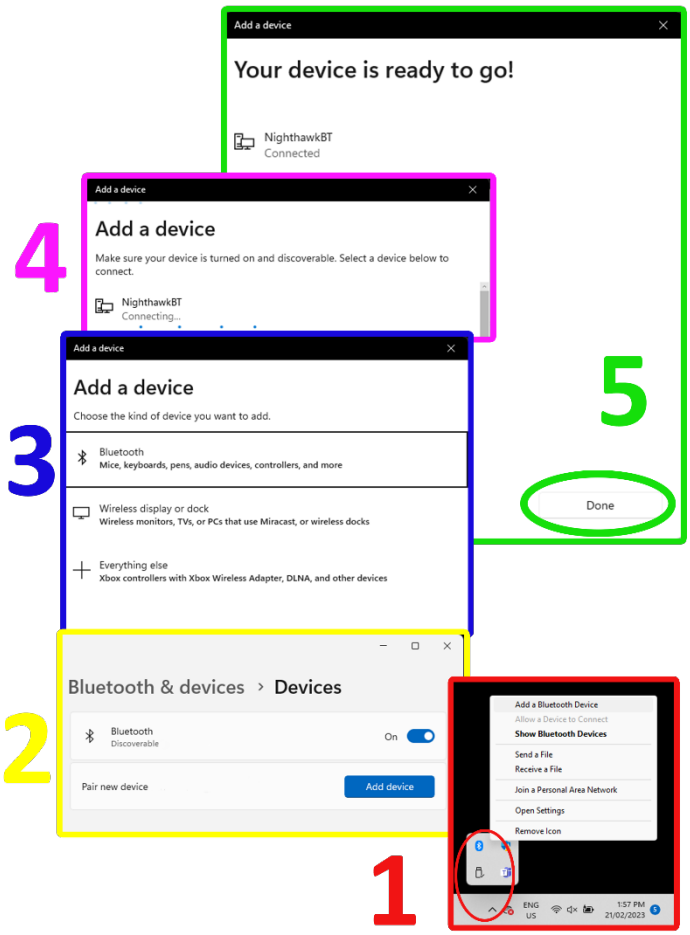
After powering your Nighthawk back on, you will need to connect your PC to the Nighthawk's Bluetooth signal. You will need to do this from your PC's Bluetooth selection settings, not in our Commander software.

Please Note: PCs will vary due to the different versions of Windows operating system that are available. Because of this yours might look a little different to the pictures below. If you are unsure on how to navigate the next step on your particular PC you may need to get help from your PC retailer's technical support as this is specific to your computer and is not a part of CNC3D Commander software.

Look for the Bluetooth symbol in the bottom-right corner of your computer screen. You may need to click the ^ to see it. Open the menu and select 'Add a Bluetooth Device' and another window will open. Click 'Add Bluetooth or Other Device' then 'Bluetooth'.

It will then search for available Bluetooth devices and should find the **NighthawkBT** device. If you changed the device name in the previous step then you should see that name show up now. Click on it and it will attempt to connect. Once it shows as 'Paired' you have successfully connected, and it will show up in your 'Other Devices' section of the window.

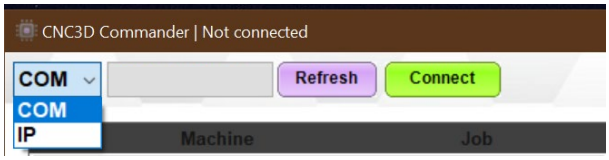
Windows 10

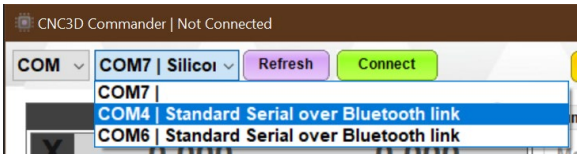


Windows 11

It may be necessary for you to wait a minute or two while your computer installs the device after the first time connecting. After the installation is complete you can switch back over to Commander.

Select COM in the first drop-down menu. In the second drop-down menu you should now see the option for ‘Standard Serial over Bluetooth link’. There will be two different COM numbers associated with both links.



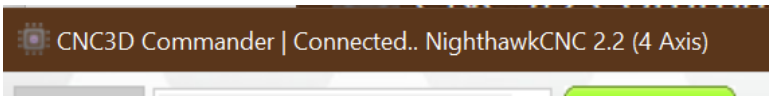


Unfortunately, it is not currently possible for Commander to tell you which the correct COM port is to select as your computer doesn’t differentiate between them. One of them will work and the other will not, though often it’s the higher number that is the correct one.

Choose one of the available Bluetooth link COM ports and click ‘Connect’. If Commander stops responding for a few seconds then it is likely the wrong one and you can click ‘Disconnect’.

Select the other Bluetooth link and click ‘Connect’.

If everything was successful, Commander will light up and you will have full control of your machine. You will also see “Connected.. NighthawkCNC 2.X” in the coloured bar above the “Disconnect” button. You can ignore the description in the brackets eg: 4 Axis.



You can now unplug the USB cable from both the PC and the Nighthawk and continue to control your machine via your Bluetooth connection.

Note: If the connection to your Nighthawk drops by either turning off the machine, moving your PC out of range or by using the Emergency Stop button, you may need to go through the steps above to reconnect to your NighthawkBT Bluetooth connection before attempting to connect to your Nighthawk in Commander.

USB

This connection method is only recommended if NONE of the wireless options work for you. We recommend trying the WiFi (Connect to Existing Network) option first.

USB is the absolute last resort when choosing how to run your machine. We recommend USB for initial setup **ONLY** and **NEVER** for running jobs. Spindles, routers, or plasma torches will create lots of Electromagnetic Interference (EMI) and electrical noise which can cause the USB connection to drop out resulting in random job stoppages or uncontrolled machine behaviour. This is also a slow connection which will cause problems when running laser jobs especially when in laser mode.

If you have no other choice but to use USB, for example in a secure area where wireless devices are not permitted, then you must use a high-quality USB cable that has magnetic ferrules attached to it, as well as disabling certain features of your PC.

USB connections work by sending every line of code to the Nighthawk one-by-one so if anything interrupts that connection you run the risk of your machine stopping mid-job or uncontrolled machine movement. This can be something as simple as your computer going to sleep, a laptop losing power or even just turning on the cutting tool. So, if you are certain you must use a USB connection to run your machine make sure you have disabled all power saving options in your PC and are plugged into power if using a laptop.

Contact your PC retailer's technical support if you need assistance with disabling these features as they are specific to your PC and not part of our Commander software.

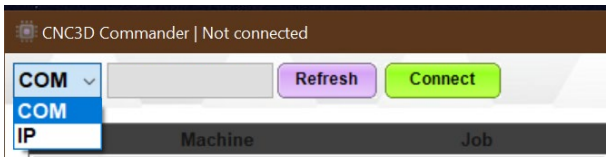
To get started with this process you will need to have a Windows PC located near the machine so you can connect to it with a USB cable.

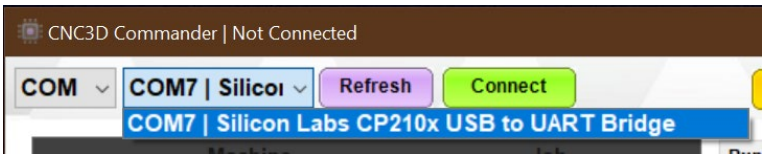
Plug in your USB cable, turn on your PC, turn on the Nighthawk and open CNC3D Commander.

V2.2

For V2.1 users, skip ahead to page 52

Select COM in the first drop-down menu. In the second drop-down menu select the correct COM port, it should be the one that has CP210x in the description, then click 'Connect'.





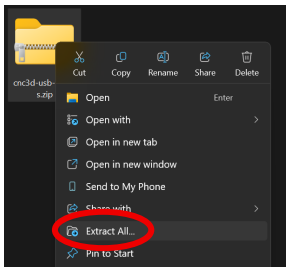
If you can select the CP210x COM port and connect successfully, congratulations, you're done!

If you do not have any COM ports, or no COM ports with the CP210x description then it's likely that you do not have the correct driver installed. You will need to download the driver by clicking the link below or typing it into a browser window from your computer.

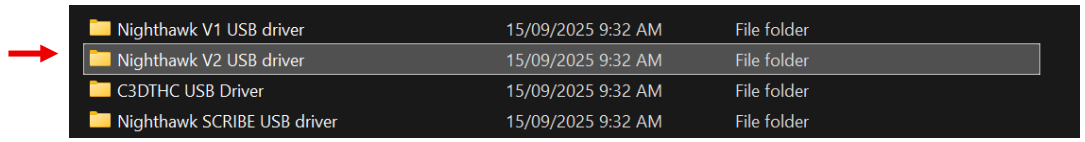
https://libraries.sharpsoft.com.au/drivers/cnc3d-usb-drivers.zip

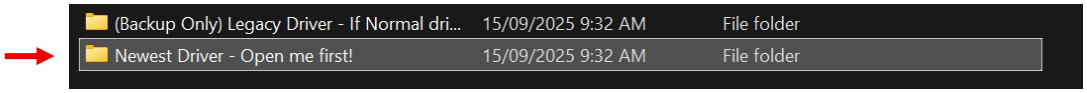
You will also need to turn off your Nighthawk and unplug the USB cable from your computer.

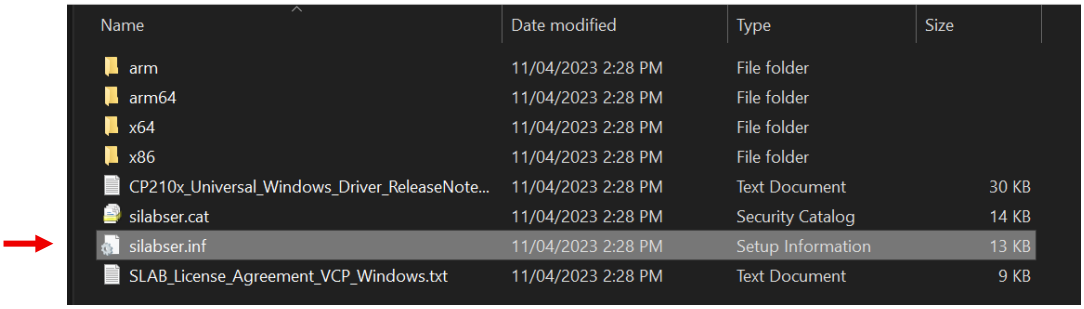
When the download is complete, navigate to your downloads folder and look for the **cnc3d-usb-drivers.zip** file. You will need to 'unzip' this folder before you can use the contents. It's as easy as right-clicking on the file and selecting the 'Extract All' option. The next window will ask you to specify a location for the files to be saved. Take a note of the location and click 'Extract'. When the extraction process finishes it should open the location of the extracted files.



Open the 'CNC3D USB driver collection' folder, then open the folder called 'Nighthawk V2 USB driver', then look for the folder named 'Newest Driver'. In this folder look for the file called **silabser.inf**.







Right-click on the **silabser.inf** file and select 'install'

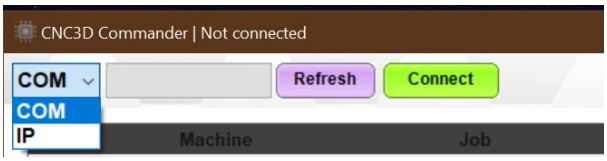
*Note: For Windows 11 users, after right-clicking on the **silabser.inf** file you may need to click 'Show more options' before the 'install' option is visible.*

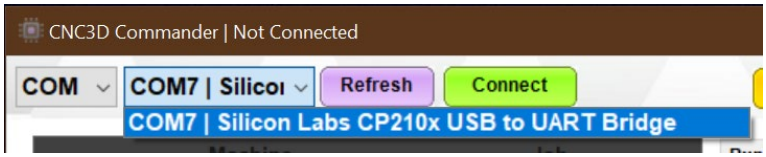
If you get a security popup asking if you would like to allow this program to run or make changes to your device, make sure you click 'Yes' or the program will not run.

When the driver is installed, and the message box pops up saying "Installation Completed" you can click on 'Ok' to close it.

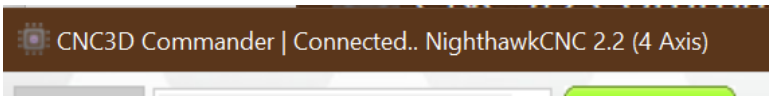
Now that your CP210x driver is installed, you can turn on your Nighthawk, plug the USB cable back into your computer and switch back to our Commander software.

Select COM in the first drop-down menu. In the second drop-down menu select the correct COM port, you should now see one that is labelled CP210x. Click ‘Connect’.



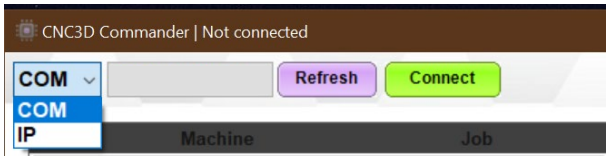


If everything was successful, Commander will light up and you will have full control of your machine. You will also see “Connected.. NighthawkCNC 2.X” in the coloured bar above the “Disconnect” button. You can ignore the description in the brackets eg: 4 Axis.



V2.1

Select COM in the first drop-down menu. In the second drop-down menu select the correct COM port, it should be the one that has CH340 in the description.

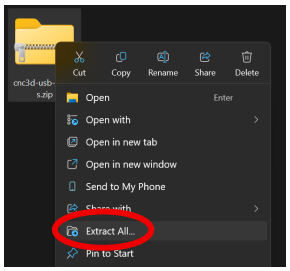


If you do not have any COM ports, or no COM ports with the CH340 description then it's likely that you do not have the correct CH340 driver installed. You will need to download the driver by clicking the link below or typing it into a browser window from your computer.

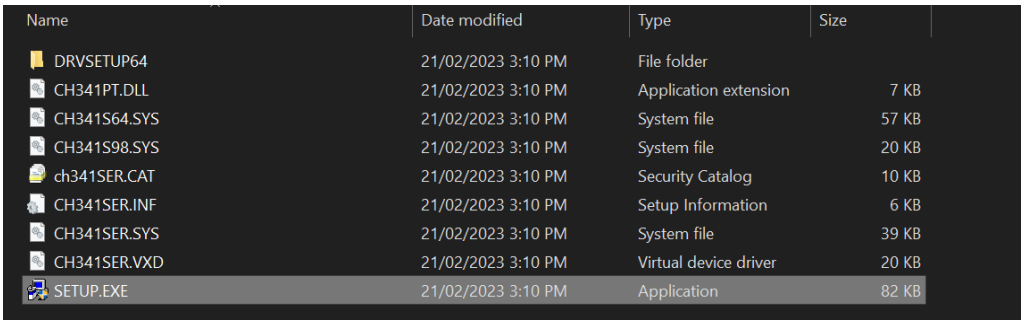
https://libraries.sharpsoft.com.au/drivers/cnc3d-usb-drivers.zip

You will also need to turn off your Nighthawk and unplug the USB cable from your computer.

When the download is complete, navigate to your downloads folder and look for the **cnc3d-usb-drivers.zip** file. You will need to 'unzip' this folder before you can use the contents. It's as easy as right-clicking on the file and selecting the 'Extract All' option. The next window will ask you to specify a location for the files to be saved. Take a note of the location and click 'Extract'. When the extraction process finishes it should open the location of the extracted files.



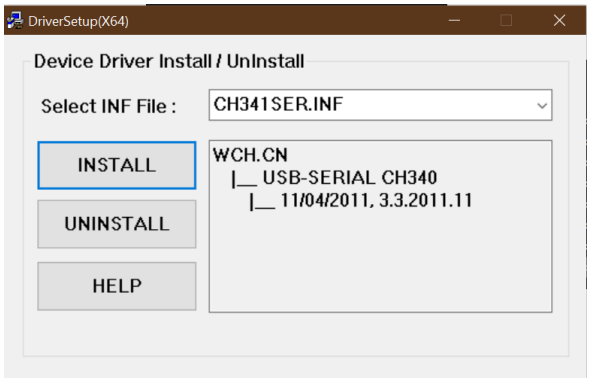
Open the 'CNC3D USB driver collection' folder, then open the folder called 'Nighthawk V1 USB driver', then look for the 'Setup.exe' file and open it.

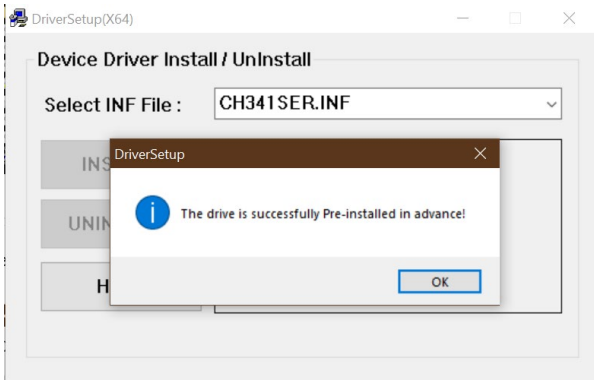


Name	Date modified	Type	Size
DRVSETUP64	21/02/2023 3:10 PM	File folder	
CH341PT.DLL	21/02/2023 3:10 PM	Application extension	7 KB
CH341S64.SYS	21/02/2023 3:10 PM	System file	57 KB
CH341S98.SYS	21/02/2023 3:10 PM	System file	20 KB
ch341SER.CAT	21/02/2023 3:10 PM	Security Catalog	10 KB
CH341SER.INF	21/02/2023 3:10 PM	Setup Information	6 KB
CH341SER.SYS	21/02/2023 3:10 PM	System file	39 KB
CH341SER.VXD	21/02/2023 3:10 PM	Virtual device driver	20 KB
SETUP.EXE	21/02/2023 3:10 PM	Application	82 KB

If you get a security popup asking if you would like to allow this program to run or make changes to your device, make sure you click 'Yes' or the program will not run.

When the program opens it will already have some information pre-loaded. All you need to do it click ‘Install’. If successful you will get a message which reads “The drive is successfully pre-installed in advance”.



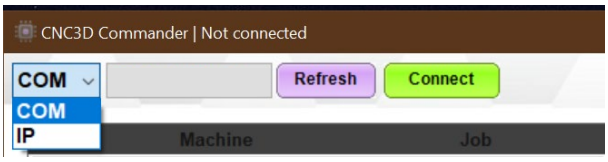


If you get a message box saying “Drive Install Failure” you simply need to click ‘Uninstall’ to uninstall any older drivers that are interfering with the installation, then click ‘Install’ once it has finished uninstalling.

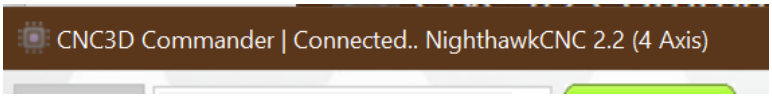
When the driver is installed you can close the installation program.

Now that your CH340 driver is installed, you can turn on your Nighthawk, plug the USB cable back into your computer and switch back to our Commander software.

Select COM in the first drop-down menu. In the second drop-down menu select the correct COM port, you should now see one that is labelled CH340. Click ‘Connect’.



If everything was successful, Commander will light up and you will have full control of your machine. You will also see “Connected.. NighthawkCNC 2.X” in the coloured bar above the “Disconnect” button. You can ignore the description in the brackets eg: 4 Axis.



Accessing via Web-Portal (Any device with WiFi and a web browser)

If you have your Nighthawk controller connected to an existing network or in direct access point mode, you can use any device with a WiFi connection and a web browser to control your machine. For example a smartphone or tablet.

If your Nighthawk is connected to an existing network you can access it using the assigned IP address from the connection steps listed above, but only if the device you're using is connected to the same WiFi network.

Note: Only one device can be connected to your Nighthawk through a browser at a time so if you can't connect from your mobile device, check to see if another device on your network is already connected.

If your Nighthawk is in direct access mode (which is the factory default), you can connect to the NighthawkCNC WiFi from your smart device using the details set up in the steps above. You will need the WiFi name and IP address. The defaults are listed below for easy reference but if you have changed them from the defaults you will need to use those instead.

Pro tip for Mac users: We recommend using Chrome browser instead of Safari to get the most from your Nighthawk Controller.

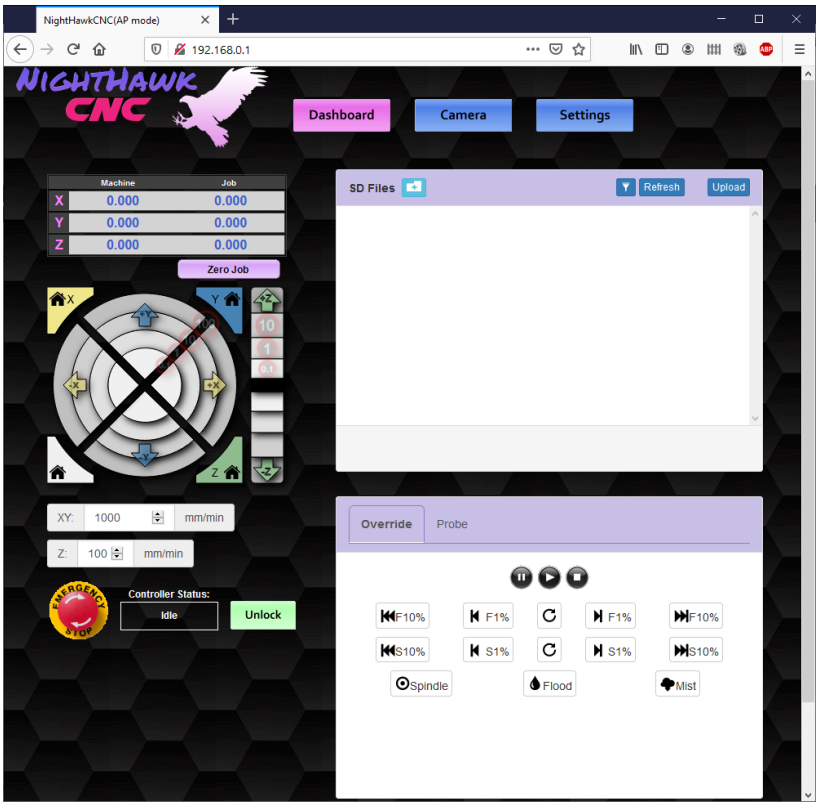
The default network details are:

Network: NighthawkCNC

Password: 12345678

Default IP: 192.168.0.1

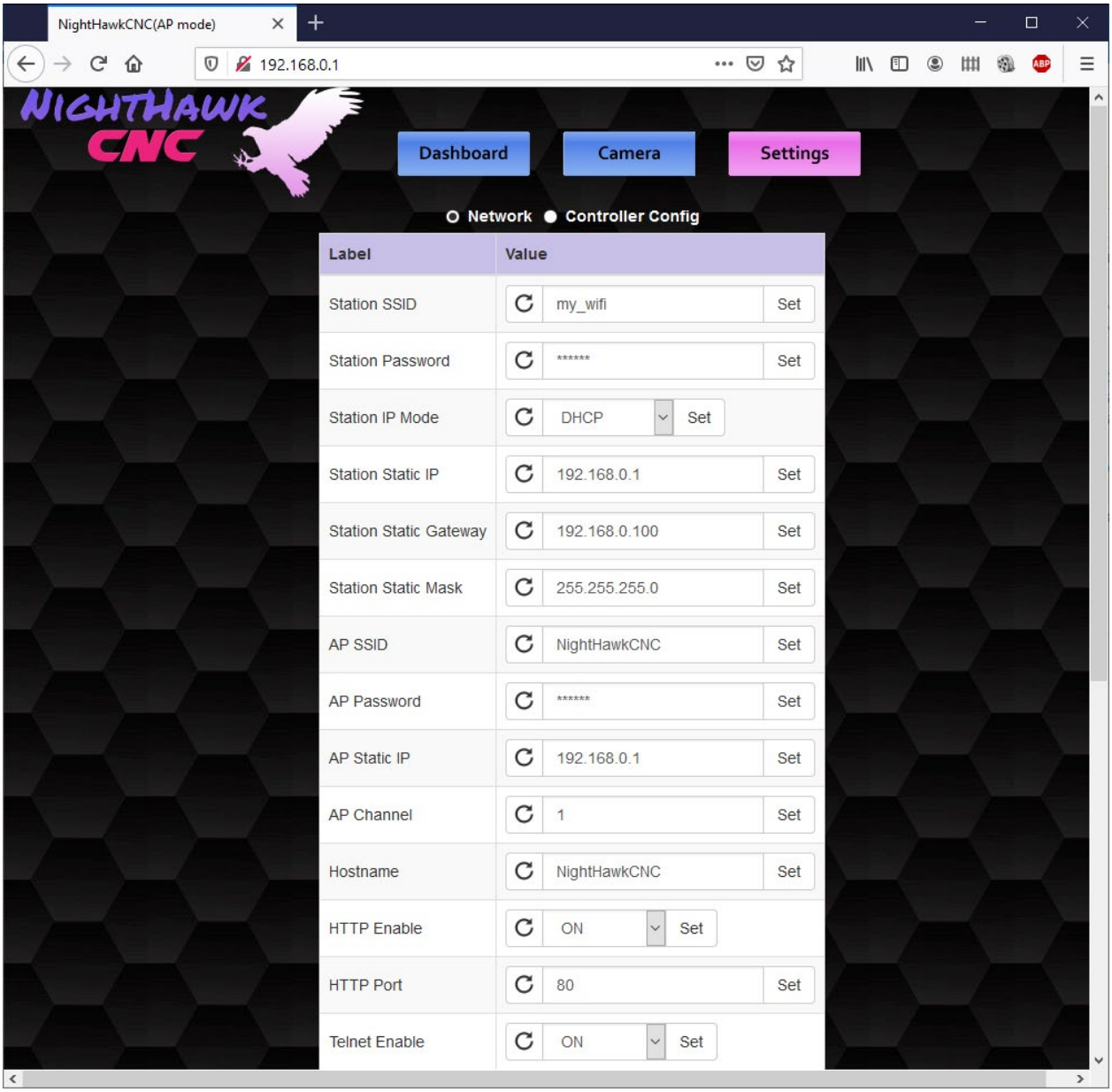
Assuming you are using a browser on a PC, the interface should look similar to this:



To start configuring your controller Click on the “Settings” button at the top right. This will expose the network configuration options and general CNC settings. It is possible from the Web portal to configure any settings you would like to change including your connection type.

Note: If you have already set up your Nighthawk through our Commander software, do not change any of these settings.

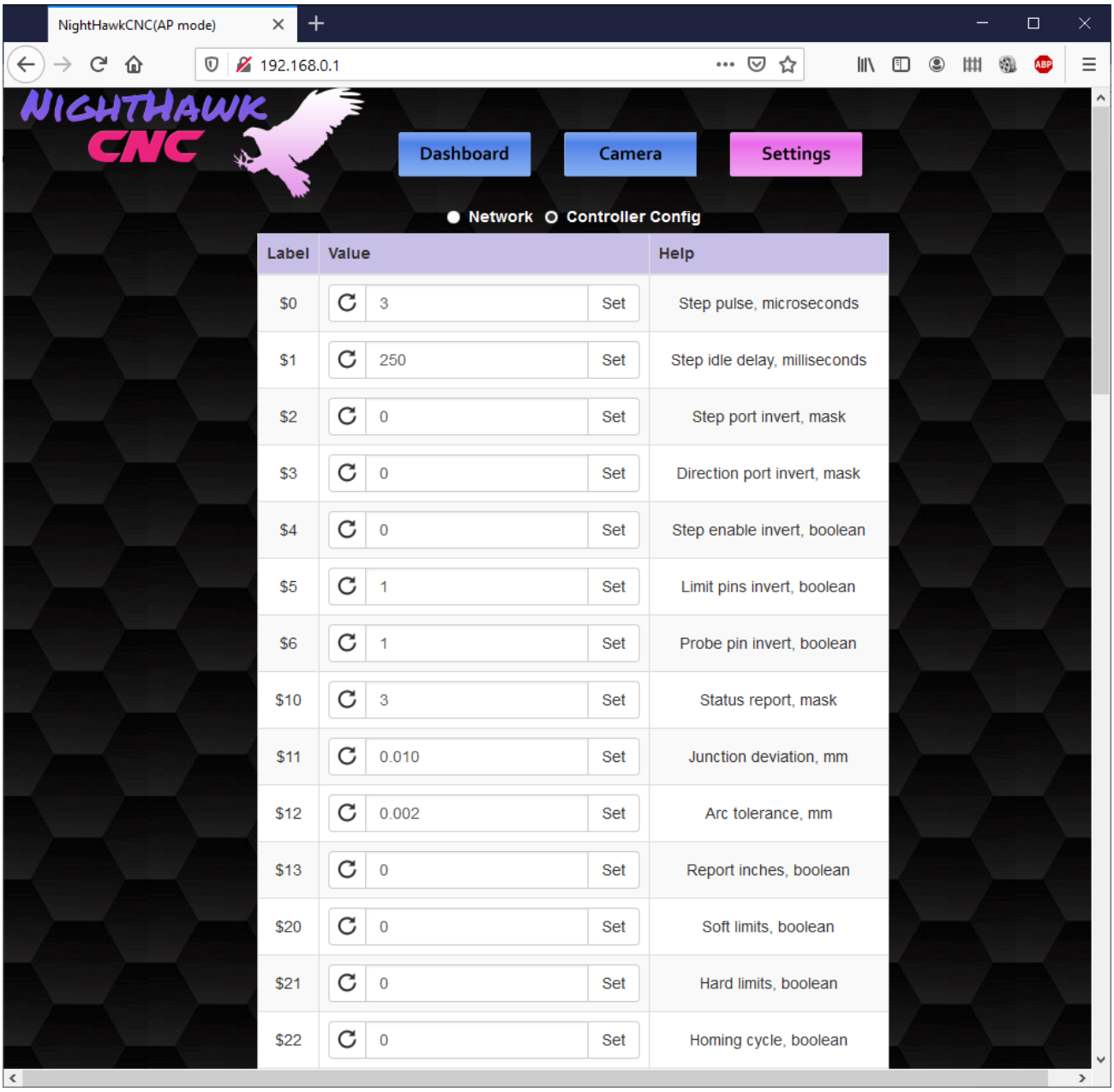
Network settings



CNC Settings

Do not change these setting unless you are certain that you must! Setting these to the wrong values can cause your machine to behave unexpectedly or crash!

If you have a pre-assembled CNC3D machine such as a QueenBee, QB2, Metal Storm or YouCarve, these will already be set for you.



Profile Setup

This step is for users who are replacing an existing controller such as an XPRO, Black Box, or another generic GRBL controller with a Nighthawk.
If you are setting up a pre-built machine such as a QB2, Metal Storm or QueenBee you do not need to do this step as it's already been done for you in the factory.

For users who do not have access to their old controller or if you are starting from scratch with your Nighthawk, skip ahead to page 58.

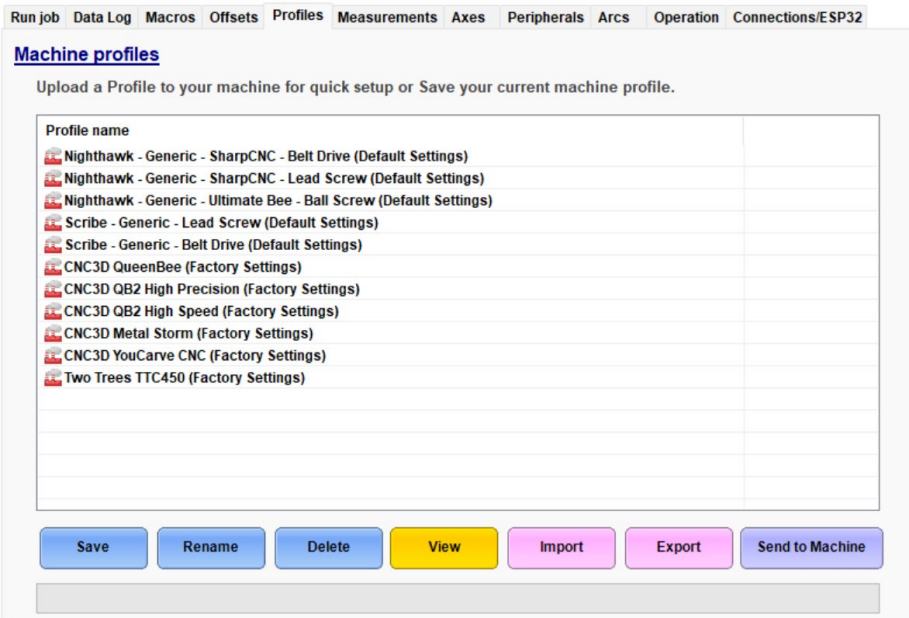
To make this process as easy as possible, CNC3D Commander can save and load custom machine profiles.

Your old controller will need to be powered up and then connected via USB to your computer.

Note: If you are unable to connect your existing controller due to electrical failure etc. you will not be able to transfer your current machine profile to your Nighthawk. Skip ahead to page 59 for a new install.

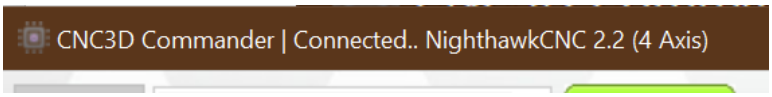
You can then open CNC3D Commander, select the correct COM port for your controller and click "Connect". Once connected, navigate to the 'Profiles' tab.

s



On this tab you can save and load profiles onto your controller.
Click 'Save' to grab all the relevant machine settings from the currently connected controller and you will be prompted to give the saved profile a name. When saved you will see your new saved profile show up on the list.

You can now disconnect your old controller and switch over to your Nighthawk. Don't forget to click 'Disconnect' and 'Connect' when you have selected the correct COM port or IP address. You can confirm that you are connected to your Nighthawk by checking the coloured bar above the 'Disconnect' button. Eg:



IMPORTANT

This next step will completely override any pre-set settings on your Nighthawk, including maximum travel distances, axis movement directions, maximum speeds etc. and replace them with the ones from your old controller.

If you have already installed your Nighthawk on your machine and done initial setup DO NOT PROCEED.

Only proceed if you have *not yet installed* your Nighthawk on your machine *and* you are replacing an existing controller!

Once you have successfully connected to your Nighthawk, click over to the 'Profiles' tab and select the correct profile from the list. If you just created a profile you should see it with the name you provided.

When your profile is highlighted click 'Send to machine' to send the settings in that profile to your Nighthawk. Don't forget to read the boxes to double-check and click on 'Yes' to continue or 'No' to cancel.

When the profile has been sent you will get a popup box to confirm. You will then need to power cycle your Nighthawk and disconnect Commander before reconnecting.

Now that your profile has been changed you will need to confirm that everything is moving and operating as expected before running the machine.

To revert to defaults, follow the steps on this page again and select one of the 'Nighthawk-Generic' profiles which correspond to your drive system.

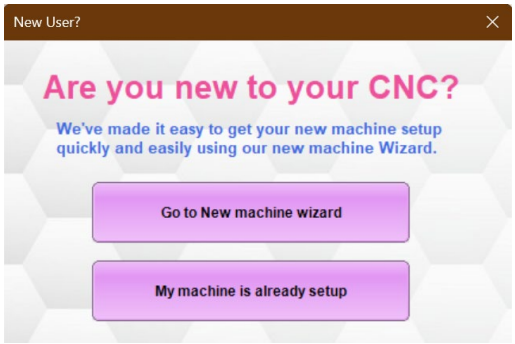
We recommend running through the initial setup wizard even if you have loaded an existing profile. The next page has the information on how to run through or restart the wizard. You can skip the first step which is for loading a profile as you have just completed it.

This step is for users who do not have access to their old controller, or if you are starting from scratch with your Nighthawk.

If you are setting up a new pre-built machine such as a QB2, Metal Storm or QueenBee your machine has already been set to the correct settings at the factory, you do not need to follow the initial setup wizard.

When you first connect to your Nighthawk you will be prompted to run through the New Machine Wizard. This will help guide you through the setup and tuning process of your Nighthawk controller.

Please Note: Before you run through the initial setup wizard you should make sure your Nighthawk controller is installed on your machine and your machine is free and clear of any obstructions. The wizard will need to move your machine to its maximum travel on all axes so it can set up and tune each one.



If you have already dismissed or closed the New Machine Wizard you can reset it by opening Settings and clicking 'Reset Machine Wizard'. The next time you connect to your controller you will be prompted to run through the wizard again.

The wizard has 2 options: 'Go to New machine wizard' and 'My machine is already set up'. Click the first option and it will start guiding you through setup. If you select the second option the wizard will close and will not progress to the next step.

Your Nighthawk will have preloaded default settings which work fine for most machines which use leadscrews for their drive systems. If your machine is leadscrew driven you can skip the first step of loading a profile and dive straight into setting up your machine.

If your machine is driven by belts, ball screws, rack-and-pinion or any combination, the 'Nighthawk-Generic' profiles are preset for the drive type listed. Eg: 'Nighthawk – Generic - Ultimate Bee - Ball Screw' is for an Ultimate Bee, or a machine using ball screws.

If you are not sure or your drive system isn't listed, you can select any of the Generic profiles. The wizard will run through each step regardless of profile choice and you will be able to set up your machine's specifics.

Please Note: Only select a profile from the list in the first step if you have determined that you need to. If you select a profile when you don't need to it will make the rest of the initial setup more difficult.

You can now follow through the rest of the New Machine Wizard. It will guide you through all aspects of setup including maximum travels, steps per mm, homing etc.

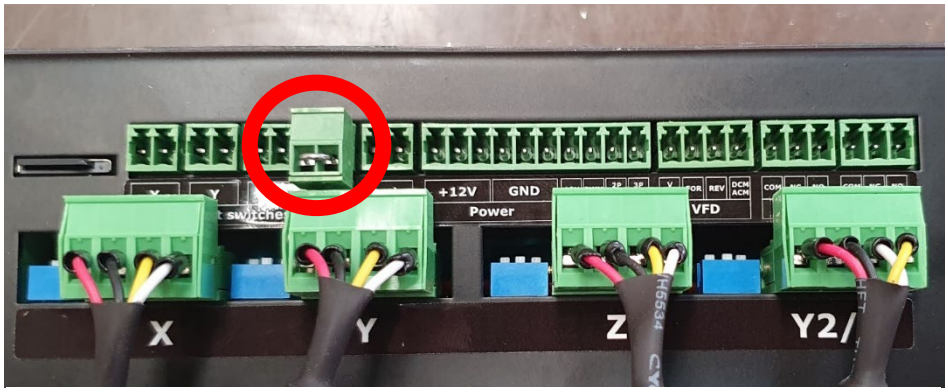
Troubleshooting

Click the link below or type it into your web browser for the most up-to-date information on our Frequently Asked Questions page

https://www.cnc3d.com.au/group/support-faqs/discussion

Y or A Limit switch flashing red

- If only one limit is flashing, check the wiring for any loose or broken connections along the corresponding circuit.
- Check above on page 7 for information regarding the Y2/A bridging connector
- If Y *and* A are flashing and you DO NOT have a second limit switch on Y2, check the front of the Nighthawk for a jumper across the A limit switch connection. If there is no jumper, bridge it out with a piece of wire in the green connector. *See below for an example.*
- If only A is flashing and you DO NOT have a second limit switch on Y2, check the front of the Nighthawk for a jumper across the A limit switch. If there is no jumper, bridge it out with a piece of wire in the green connector. *See below for an example*. If you have ONLY A flashing, your machine will likely run just fine without needing to bridge the connector.
- If Y *and* A are flashing and you *do* have a second limit switch on Y2, check your wiring for any loose or broken connections on the Y2/A limit switch circuit.



'A' limit switch location circled in red with a bridging wire installed

All limit switches flashing red / switches run opposite to how they should

- Toggle Limit Switch Type on Peripherals tab between NO or NC – See page 31 for more information
- Check wiring is correct, and trigger wire is on the RIGHT side of the connector
- For proximity switches check switch transistor type is PNP, or you have correctly wired a converter to change an NPN transistor switch to PNP

Nighthawk not being recognised by PC when using USB

- Must be on a Windows computer or Laptop (not Mac or Linux unless using a Windows emulator)
- Try using another USB port on the computer
- Make sure there is no USB hub or splitter in the cable
- Check Nighthawk is receiving power. Fan should be spinning or red light visible on the card
- Check above on page 48 for installing the USB driver for your computer

WiFi connection timing out when attempting to connect

- Check you have selected IP and are entering the correct IP address into the “Connect” box
- Make sure your computer and Nighthawk are both on the same WiFi network
- Check your network password and SSID (Network name) are correct and do not contain any special characters
- Re-do the WiFi connection using the WiFi Setup Wizard in Commander (Check page 36 above)
- Watch the video here: **https://www.youtube.com/watch?v=k07Qwe4IduU**

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

cnc3d.com.au/nhc

User Manual / USB Driver

CNC3D Commander

cnc3d.com.au/commander

Download / Information / Guides

CNC3D TV

cnc3d.com.au/cnc3dtv

youtube.com/@cnc3d

"How-To" Videos / Video Guides

Post Processors

cnc3d.com.au/postp

For Common CAD/CAM Software

Tool Libraries

cnc3d.com.au/tool-libraries

Tool Lists for Common CAD/CAM Software

Facebook User Group

facebook.com/groups/cnc3dplayground

Show Off and Chat!

Support FAQ

cnc3d.com.au/forum/support-faqs

Common Questions and Answers

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

Our 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!