



## NIGHTHAWK CNC3D CNC Controller User Manual

[Home](#) » [NIGHTHAWK](#) » NIGHTHAWK CNC3D CNC Controller User Manual 

# NIGHTHAWK<sup>®</sup>



Nighthawk CNC Controller  
User Manual

## Contents

- [1 Nighthawk controller Specifications](#)
- [2 Safety precautions](#)
- [3 Hardware setup](#)
- [4 Setting your micro-stepping and current](#)
- [5 Connecting your stepper motors](#)
- [6 Connecting your other wires](#)
- [7 Getting connected](#)
- [8 Standalone Nighthawk card](#)
- [9 Need help?](#)
- [10 Documents / Resources](#)
- [11 Related Posts](#)

## Nighthawk controller Specifications

<b>Input voltage:</b>	14V – 40V(max) DC	<b>Power Usage:</b>	320w (max)
<b>Mounting:</b>	Bench / wall	<b>SD Support:</b>	Class 4-10 (Up to 32gb)
<b>Onboard Drivers:</b>	4 x 4.5A (max)	<b>SD Format:</b>	FAT32 required
<b>Total Axes:</b>	4	<b>Wifi frequency:</b>	2.4ghz
<b>Enclosure:</b>	Folded steel	<b>Operating frequency:</b>	240mhz
<b>Enclosure finish:</b>	Powder coated	<b>Antenna:</b>	4.5db gain



## 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.

## Hardware setup

Getting to know the hardware settings and configuration of your Nighthawk CNC Controller.

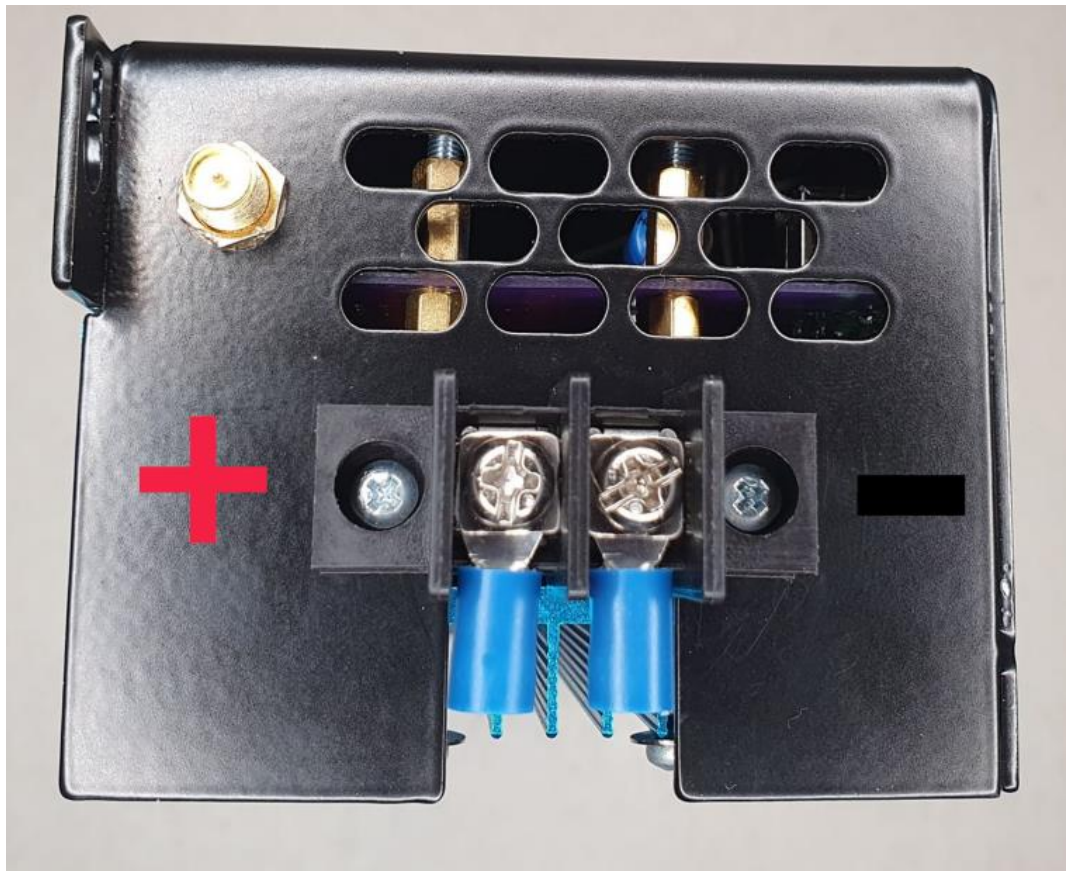
Did you get your Nighthawk controller with a CNC3D QueenBee, SharpCNC or Nighthawk CNC machine?

Every Nighthawk controller provided with our fully assembled machines are tuned by our team for the best

performance and longevity. You will not need to change any hardware settings on your controller and you can skip this section and move on to the Connection setup section of these instructions.

### 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 your micro-stepping and current

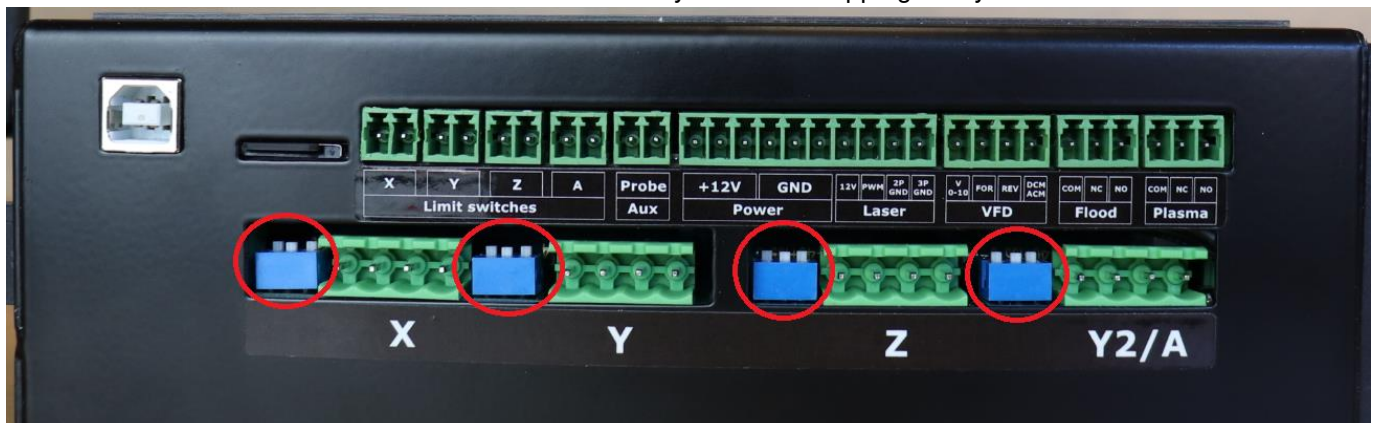
The drivers included with your controller have physical settings that can be adjusted to suit your needs these include micro-stepping and current output settings.

#### **\*\*PLEASE NOTE\*\***

Always ensure the unit is powered OFF and the USB cable is disconnected before performing any microstepping changes.

### Settings 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

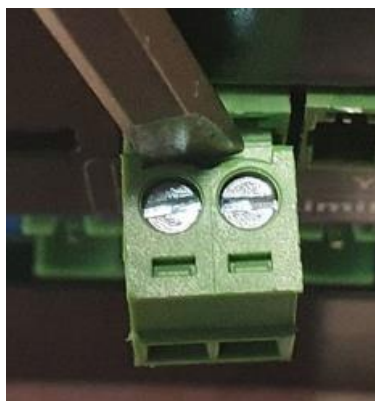
#### Setting the current for each driver

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 generally the current has already been set for you. 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.

**Tip:** Try using a flat head screw driver to lever the plugs out gently:

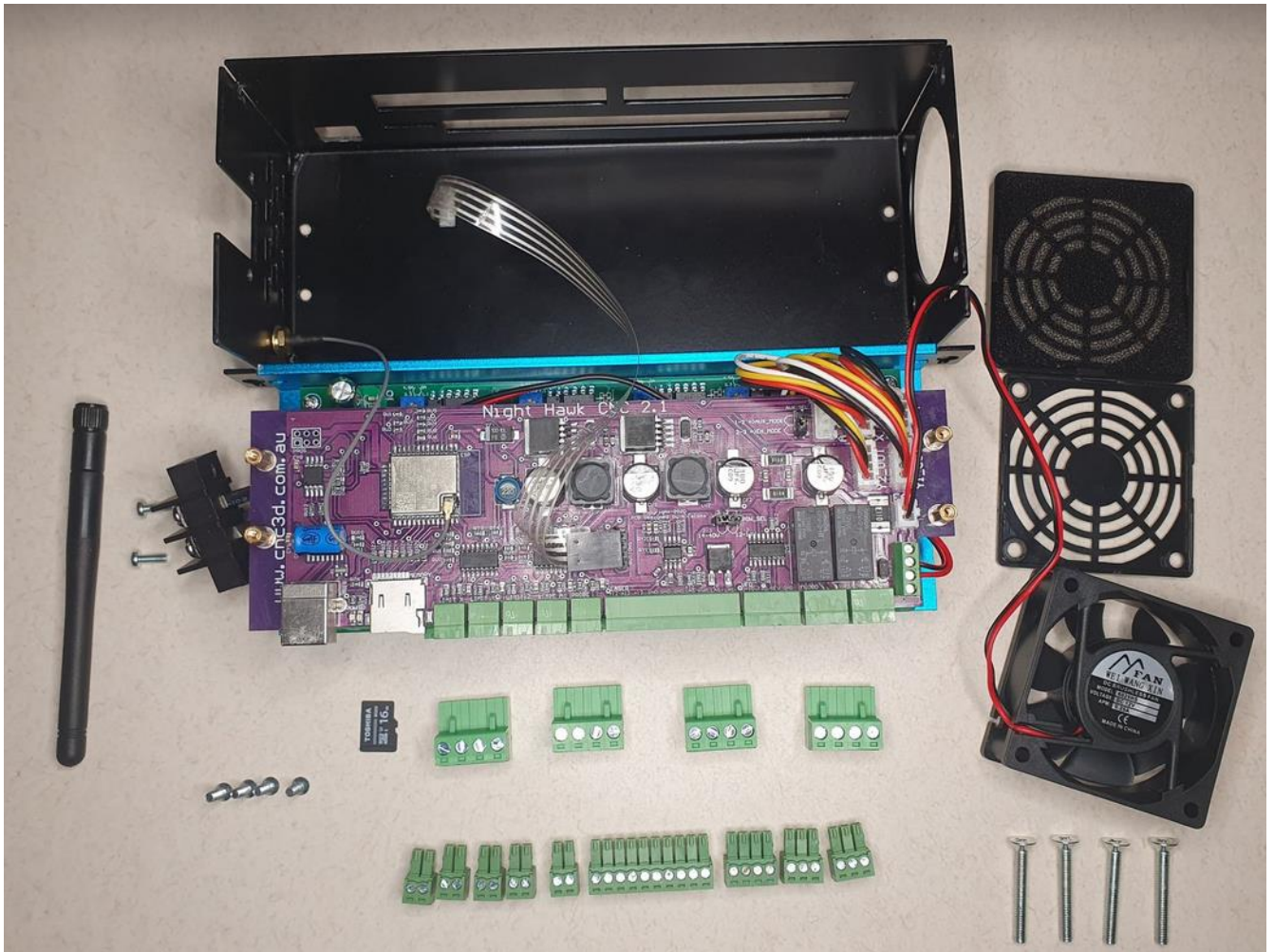


- Remove the antenna (if attached) by unscrewing it from the gripped black plastic part of the antenna.
- Using a Phillips head screw driver, carefully unscrew the black power connector from the controller housing. Take note of the orientation of the RED power cable to ensure it goes back in the same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



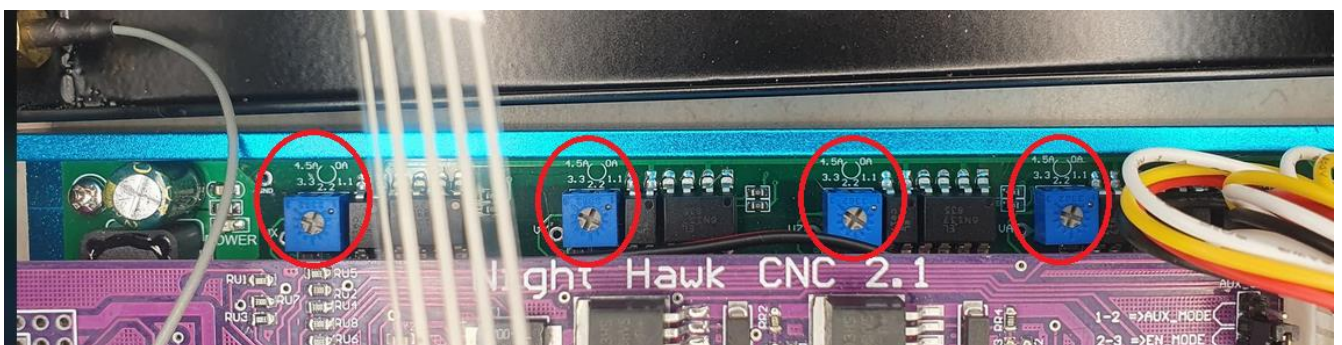
the orientation of the fan. The Nighthawk is designed to have cool air blowing into the enclosure.

- 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 both hands to hold 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:



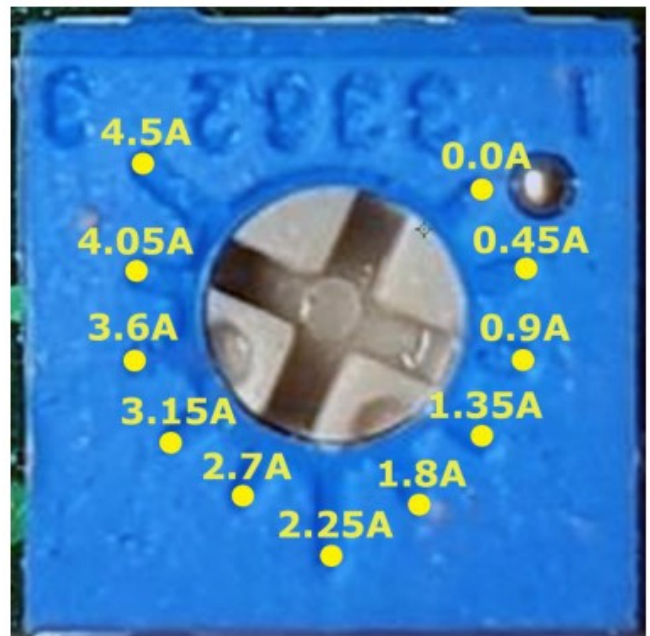
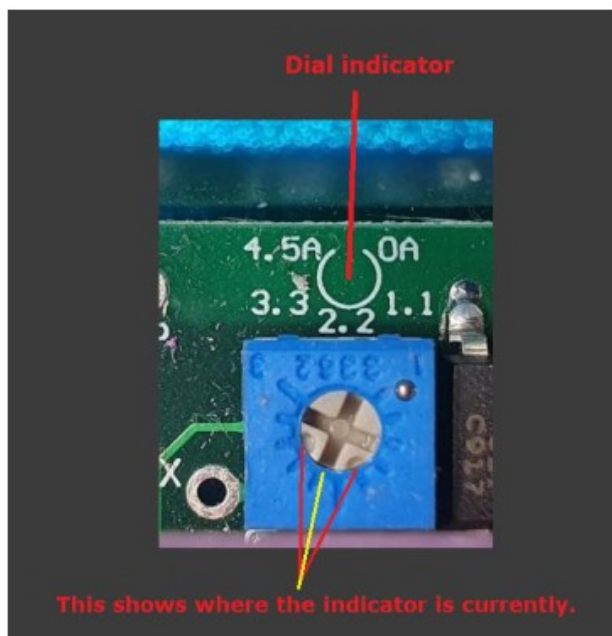
## 2. Set the current for each stepper.

There are 4 blue screw trim pots and setting guides at the rear of the controller on the lower green driver board, they are used for setting the current, see photo of what they look like:



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 screw driver. 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:

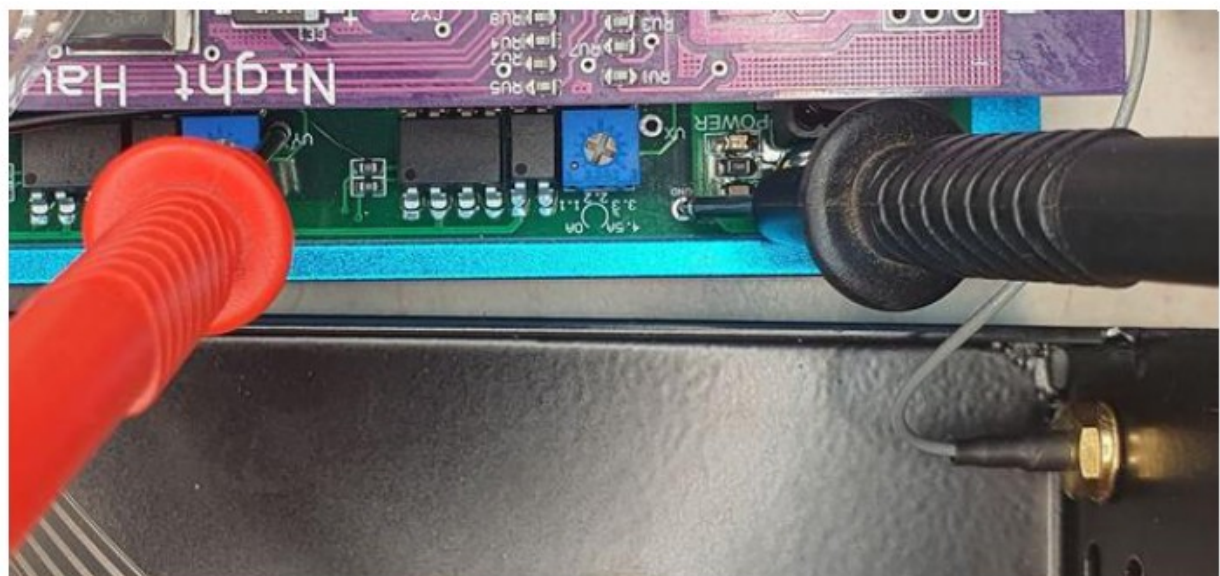




It is important to note that this is a very rough method of setting your motor current and the following finetuning method will be a better option.

### 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. Generally Just to the left of each of the blue dials there is a small solder-tinned hole, generally 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 of the blue dials labelled "GND". Using a multimeter set to voltage mode we can position the multimeter 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.



Once your multimeter 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:

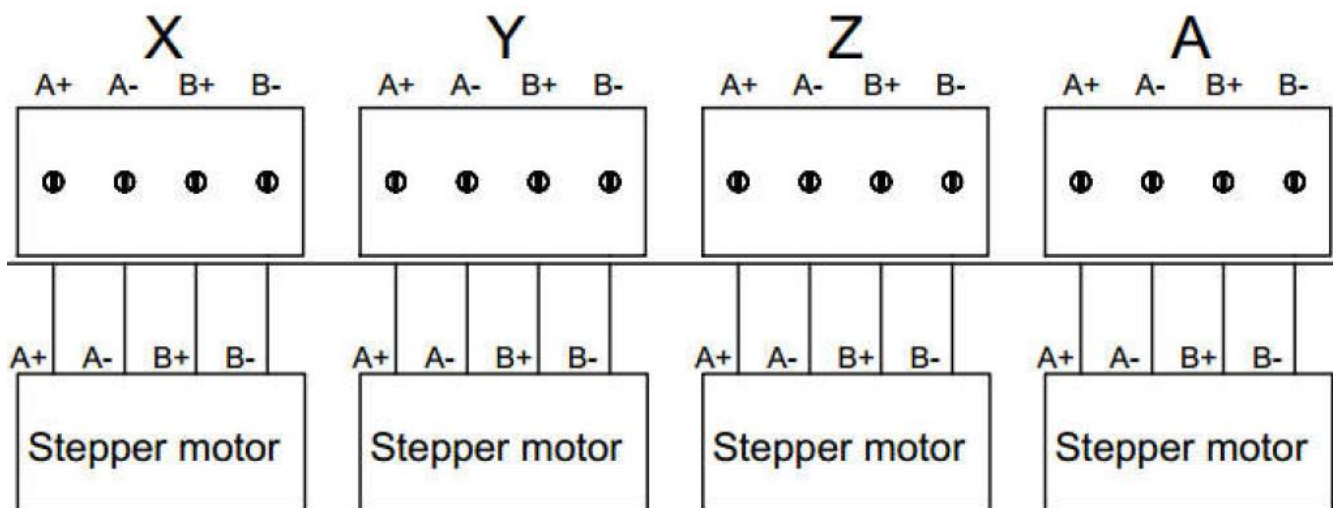


## Connecting your stepper motors

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 and the USB cable is disconnected before connecting or disconnecting any motors from your controller. 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.



## 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 screw driver to secure wires to the connectors. It is recommended to use solder-tinned wires or bootlace crimped wires for a safe and secure fit.

### \*\* Laser Warning \*\*

Care must be taken when attaching or working with any lasers. After connecting them to the controller, 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.



### Limit switches

**X:** The X axis limit switch. Generally does not matter which orientation is connected.

**Y:** The Y axis limit switch. Generally does not matter which orientation is connected.

**Z:** The Z axis limit switch. Generally does not matter which orientation is connected.

**A:** The A axis limit switch. Generally does not matter which orientation is connected.

### Aux

**Probe:** A probe connection. If issues occur when probing try swapping wire orientation.

### Power

**3 x 12+:** General 12V rail. Can be used for powering inductive PNP limit switches.

**3 x GND:** General ground rail. Can be used for powering inductive PNP limit switches. Please note: Take care to ensure these pins are never shorted. The internal resetting fuse should protect the controller but it is still not recommended to short these outputs.

### Laser

**12V:** This pin is used for powering a 12V diode laser, it applies to both 2 pin and 3 pin lasers.

**PWM:** This is an intensity signal, applies to 3 wire lasers only.

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

**3P Ground:** 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 a 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 manufactures and brands, CNC3D do not provide support for setting this up.

#### **Flood**

**COM:** This is a common pin between NC and NO pins.

**NC:** This is a Normally closed contact with the COM pin.

**NO:** This is a common pin between NC and NO pins.

**Please note:** These are relay outputs only. They are not powered. This relay is triggered when an M8 command is received by the controller and return to normal when an M9 is received.

#### **Plasma**

**COM:** This is a common pin between NC and NO pins.

**NC:** This is a Normally closed contact with the COM pin.

**NO:** This is a common pin between NC and NO pins.

**Please note:** These are relay outputs only. They are not powered. This relay is triggered when an M3, M4 or M5 command is received.

This completes the hardware setup of your Nighthawk controller.

## **Getting connected**

### **Now that our hardware is setup, let's take control!**

The first step is to connect power to your Nighthawk controller.

#### **1. Using our CNC3D Commander software (Windows PC)**

The first step is to download and install our CNC3D Commander software and the CH340 USB driver.

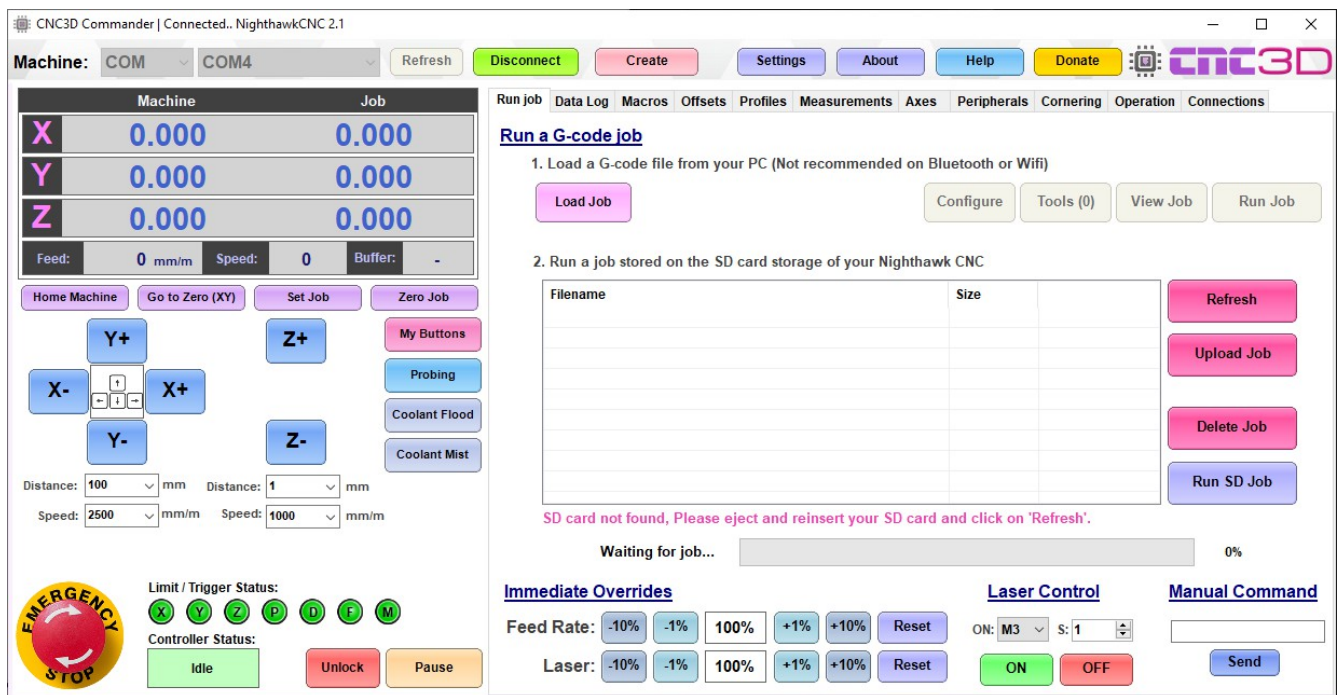
They can be downloaded from: <https://www.cnc3d.com.au/nhc>

Follow through the normal program installation process.

Occasionally Windows will not install the drivers automatically. It may be required to unzip the ch340.zip file from the link above and manually install the driver as per the instructions in that zip file.

Connect your Nighthawk controller to your PC via USB

Once this is complete launch the CNC3D Commander software from the icon on your desktop, once loaded it should already show a COMPORT in the list then click the "Connect" button:



Once connected it is recommended to view some of the videos shown on the instructions link:

<https://www.cnc3d.com.au/nhc>

## 2. Accessing via Web-Portal (Any device with wifi and a web browser)

By default, every Nighthawk controller has direct access point mode enabled. This means you can connect to your controller via a mobile device (like a tablet or phone) or via your PC's wifi connection and access the web interface using your browser.

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

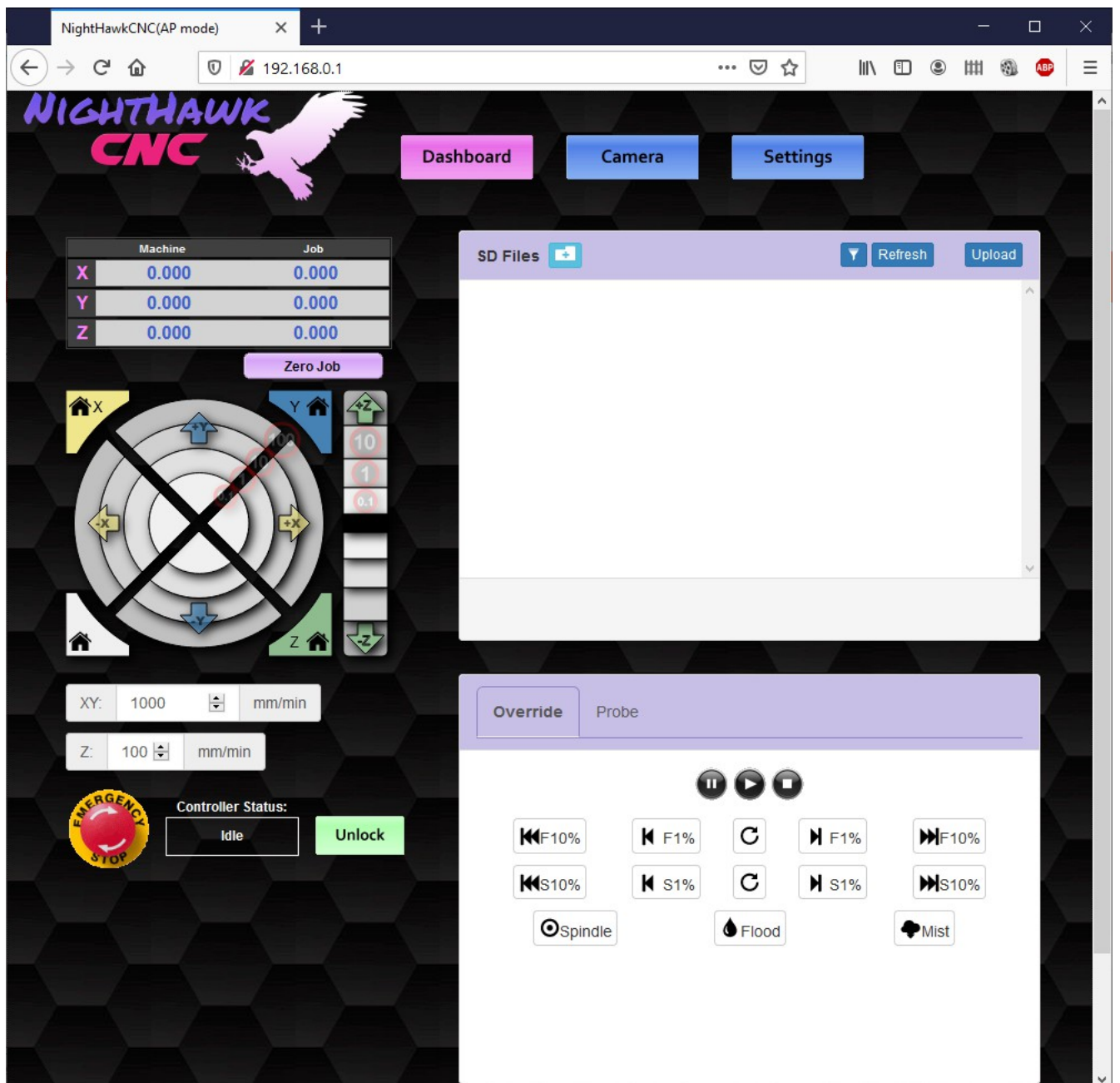
The default network details are:

**Network:** NighthawkCNC

**Password:** 12345678

**Default IP:** 192.168.0.1

Assuming you are using a browser on a PC, the interface should look like 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.

## Network settings



NightHawkCNC(AP mode)

192.168.0.1

NIGHTHAWK  
CNC

DashboardCameraSettings

Network


Controller Config

Label	Value
Station SSID	<div>my_wifi</div> Set
Station Password	<div>*****</div> Set
Station IP Mode	<div>DHCP</div> Set
Station Static IP	<div>192.168.0.1</div> Set
Station Static Gateway	<div>192.168.0.100</div> Set
Station Static Mask	<div>255.255.255.0</div> Set
AP SSID	<div>NightHawkCNC</div> Set
AP Password	<div>*****</div> Set
AP Static IP	<div>192.168.0.1</div> Set
AP Channel	<div>1</div> Set
Hostname	<div>NightHawkCNC</div> Set
HTTP Enable	<div>ON</div> Set
HTTP Port	<div>80</div> Set
Telnet Enable	<div>ON</div> Set

## CNC Settings

NightHawkCNC(AP mode)
+

192.168.0.1



Dashboard
Camera
Settings

● Network ○ Controller Config

Label	Value	Help
\$0	3 Set	Step pulse, microseconds
\$1	250 Set	Step idle delay, milliseconds
\$2	0 Set	Step port invert, mask
\$3	0 Set	Direction port invert, mask
\$4	0 Set	Step enable invert, boolean
\$5	1 Set	Limit pins invert, boolean
\$6	1 Set	Probe pin invert, boolean
\$10	3 Set	Status report, mask
\$11	0.010 Set	Junction deviation, mm
\$12	0.002 Set	Arc tolerance, mm
\$13	0 Set	Report inches, boolean
\$20	0 Set	Soft limits, boolean
\$21	0 Set	Hard limits, boolean
\$22	0 Set	Homing cycle, boolean

**Standalone Nighthawk card**

**Typical machine retrofit to external drivers**







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CNC3D CNC Controller, CNC3D, CNC Controller, Controller