QB2-V2 CNC

User guide

+

Maintenance Guide



Safety precautions

Like any power tool, operating and using a CNC machine can be dangerous. Diligence must be applied when operating any machine. It is recommended to wear appropriate PPE such as eye protection and ear muffs for your own safety.

NEVER leave a powered machine unattended at any time!

In the event of an issue or if something doesn't seem right, it is recommended to immediately disconnect power to the machine and unplug it from the wall power outlet. Contact our customer support team if you have any concerns about your machine.

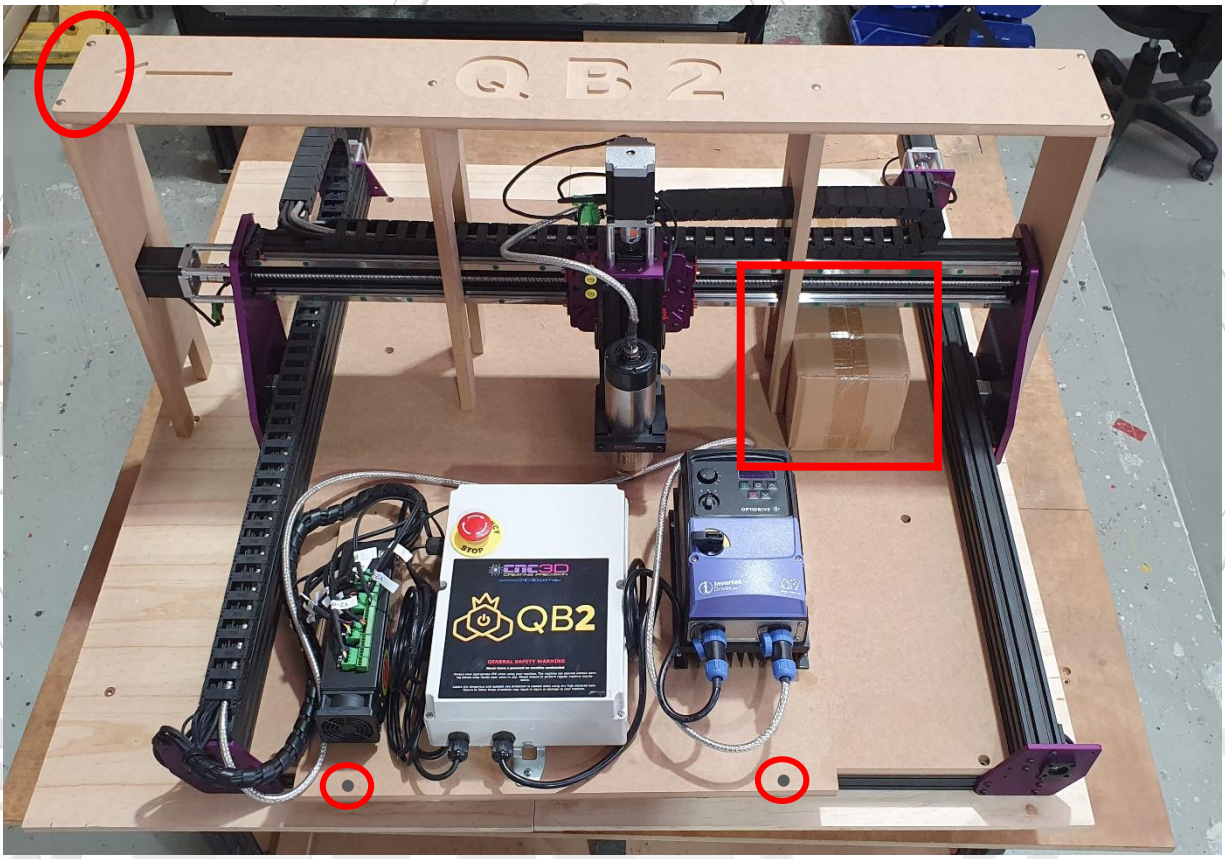
Always ensure your machine is free and clear of any swarf, dust or other obstructions that may impact the motion of your machine. We highly recommend the use of a Dust shoe and vacuum system for keeping your machine clean and clear of swarf and dust.

Always ensure to follow the maintenance guide at the bottom of this manual after initial assembly and setup and also periodically to ensure your machine always performs to its optimal capacity.

Unwrapping your Machine and setup

1. **Unwrap your machine! DO NOT use a knife as you may cut into cables or cause damage to parts of your machine!**

2. **Welcome to your new QB2-V2! In order to remove the gantry protector, you will need to remove the 2 screws that the arrow is pointing to. At this point you can also carefully remove the small parts accessories box that is attached to one of the protective legs. This will contain your endmills, laser goggles, Dust shoe and other accessories you may have purchased with your machine. When the box and screws are removed the whole lid should easily slide straight up off the gantry.**



3. **Once your machine is exposed you can unscrew the electronics board from the front of the pallet and slide it onto the machines spoil board for easy transport to its home location bench or table.**

4. **Now that everything loose it is a good idea to get a friend or 3 to help move your machine on to your table/bench. Be very careful to avoid skewing the machine while transporting it and under no circumstances should you ever grab the ballscrews. Always ensure the ballscrews are protected to avoid bending them. They control your machines movement so keeping them nice and straight and under the right tension is very important.**

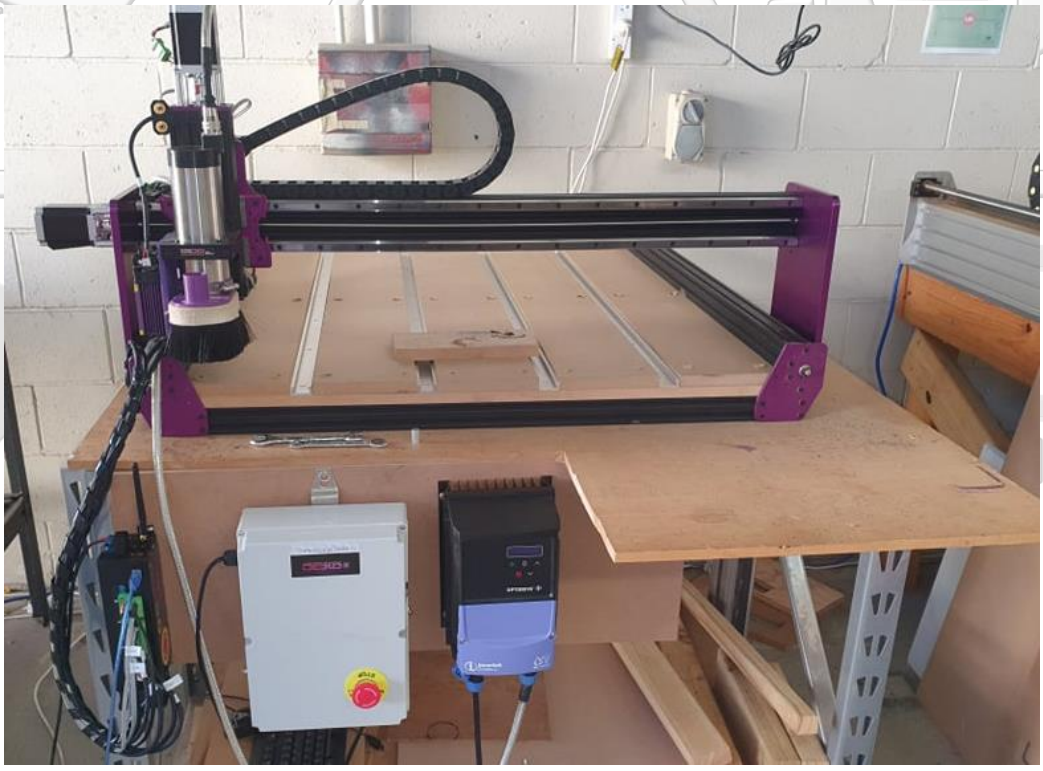
Some users may choose to move the entire pallet and bottom packaging onto the bench and run the machine from there. This is OK to do also. If doing this, keep the machine fastened to the pallet itself.

If you have removed the pallet and crate baseboard from the machine it is recommended to use the 6 angle brackets; 3 on front, 3 on back (that secured your machine to the pallet originally) to secure the machine down to the new bench. Start with the 3 on the rear of the machine and check squareness of your machine. If the machine is square then secure the front down.

5. **Once your machine is in position it is time to find a spot for your electronics. To make it easy, you can mount the existing MDF board that has the electronics fixed to it to the front of your machines table. This will provide easy access to the VFD and E-stop. You can also choose to unmount the electronics from the MDF board and position them wherever is convenient for you. There is 1m of cable between the Nighthawk Controller and the machine so you can mount it wherever you would like.**

Do not power on the machine just yet.

Mounting suggestion using the existing MDF electronics mounting board:



Things to check before powering on!

We're almost there! It's important to do some quick checks to ensure your machine is ready to go. Sometimes in transport, things can wiggle loose. Here are some things to check.

- **Check all nuts and bolts on the machine.**
- **Check the green connectors that connect all the wires. They should be firmly screwed together. Try giving each wire a slight tug in each screw terminal to make sure they are definitely secure!**

  ***PRO TIP**: You can familiarize yourself and follow the maintenance guide at the bottom of these instructions to check that everything is nice and secure after the machine has been moved into its home location.*

- **Download and install our CNC3D Commander software if you have a Windows computer. It can be found here: https://www.cnc3d.com.au/commander**

Let's plug it in!

Take the single power plug lead and plug it directly into a wall socket. It is NOT recommended to run the machine from a power board as it is easy to overload power boards, especially if you are running a vacuum extractor as well. Once powered on, your Nighthawk controller fan will come on and so will the display on your VFD.

You can now either choose to connect to your machine via USB on your PC or wifi via by directly accessing the Nighthawk controllers web interface.

We highly recommend visiting the user manual for the Nighthawk controller found here: https://www.cnc3d.com.au/nhc

PLEASE NOTE

Some key things with the QB2-V2

Machine settings

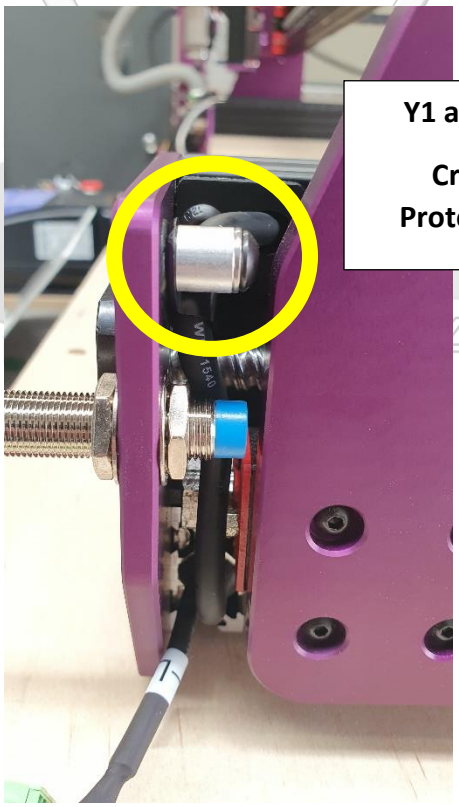
Our trained team preconfigure every aspect of your machine prior to it being sent to you. You do not need to change any settings in your controller and DO NOT load any profiles onto your machine within the Profiles tab of our Commander software.

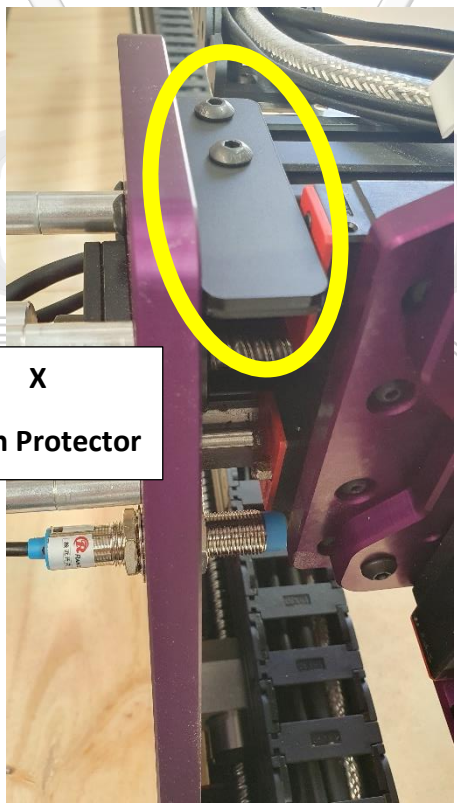
By default, we set soft limits to the maximum travel limits of your X and Y axis. Whenever you first power on your machine you MUST home your machine. If your controller is ever in an Alarm state, you can reset it by clicking the "Unlock" button in Commander. If this fails to clear, hit the E-stop button in Commander then the unlock button.

Limit Switches

The QB2-V2 uses inductive limit switches on all axes. These switches are electronic and require no maintenance. We have also installed crash protectors near the switches on the X and Y axes to protect them in case of a machine crash.

These protectors should not interfere with the limit switches' normal operation and are a critical safety mechanism so please leave them attached.





Connecting to Your Nighthawk

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

USB

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.

WiFi

The best possible way to run your QB2-V2 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 QB2-V2 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

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.

Check out this video to learn how to set up each of these connections through our Commander software

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

Initial setup steps once powered on

Our trained team preconfigure every aspect of your machine prior to it being sent to you. You do not need to change any settings in your controller and DO NOT load any profiles onto your machine within the Profiles tab of our Commander software.

If you get a popup asking if you have a new machine or if your machine is already set up, please select "My Machine is Already Set Up" as we have done it for you in the factory.



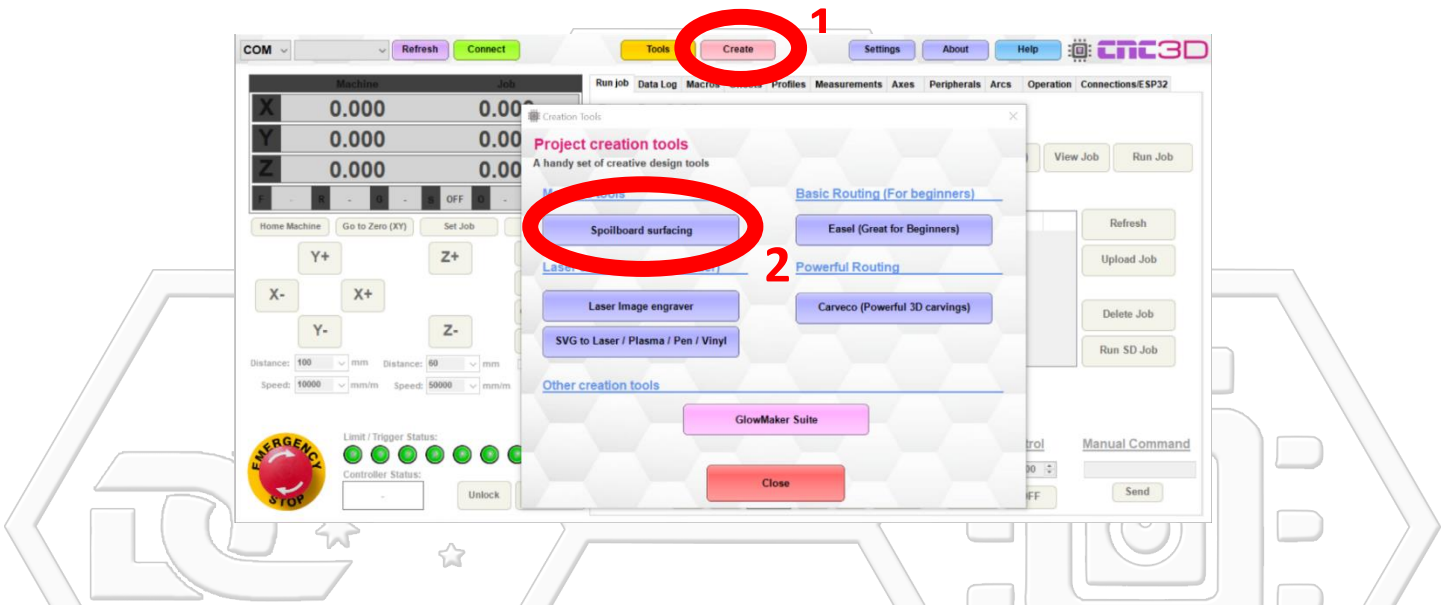
Selecting "New Machine Wizard" will cause Commander to overwrite some of the critical settings like maximum travels and axis directions and can cause your machine to crash.

Surfacing your spoil board

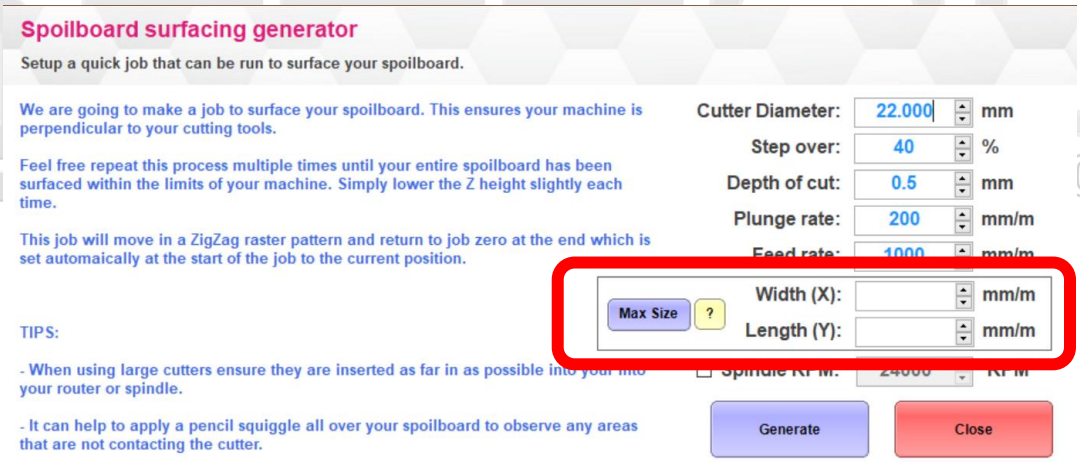
It is highly recommended to surface the top of your spoil board. Surfacing the entire working area means that your tool will always be perpendicular to your cutting tool.

To do this, follow the steps below for making a rectangle the size of your actual working area.

First, connect to your Nighthawk controller and home the machine to clear the alarm. Next step is to open the Create window and select Spoilboard Surfacing.



In the Spoilboard Surfacing Generator window that has opened, there is a highlighted box with a Max Size button. When you click this button, it will insert a number into Width (X) and Length (Y). These numbers are mathematically calculated based on numbers that are saved on your Nighthawk controller and will be unique to your machine. You should not need to make any more adjustments to any of these settings.



When all your numbers have been entered, click Generate and save the file that it creates then close the Spoilboard Surfacing Generator and the Create window.

Running the Job

To do this you will need to home your machine. Once homed, loosen off your collet nut on your spindle and insert a 6mm collet and the 22mm surfacing bit provided with your QB2-V2 CNC (Spindle Option Only). Please ensure the surfacing bit is inserted quite high into the collet but not all the way in. Once in, tighten the collet nut up.

Note: Extreme force is not required to tighten your collet nut. Just make sure it is secure.

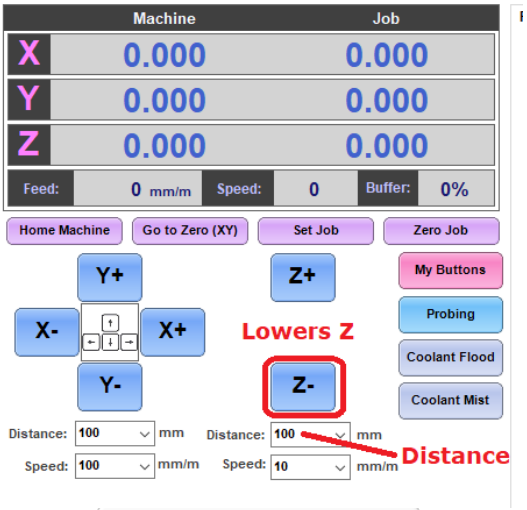
If you ordered one, attach your dust shoe and vacuum hose at this time as well.

Get a marker and squiggle some lines all over your spoil board. This will allow you to tell if the surface has been machined or not. See photo below of areas that were missed on our first pass trying to surface the spoil board.

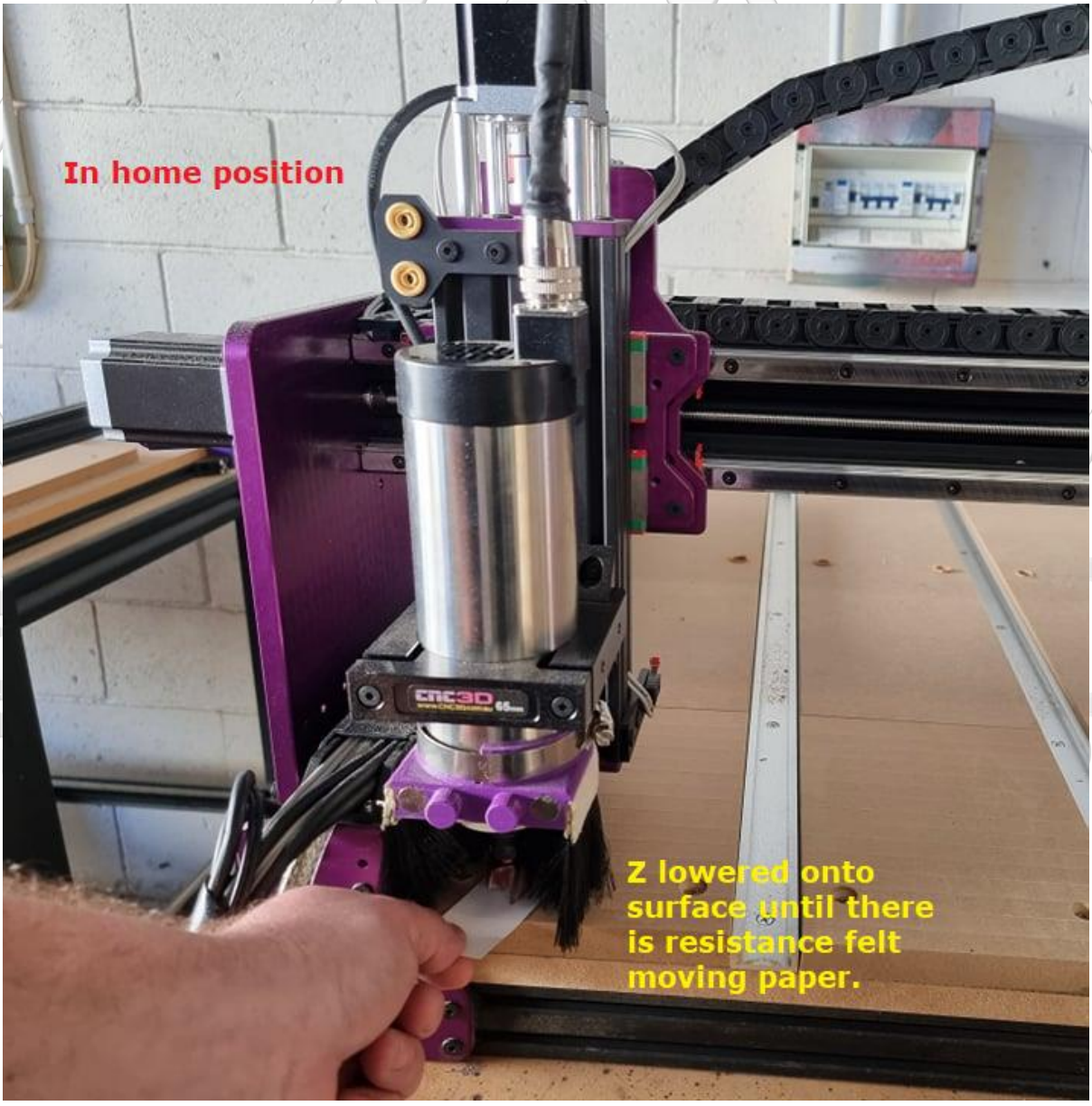


Using the jogging buttons in Commander, put a piece of scrap paper under the surfacing bit and lower the Z down until it is just touching the paper. Ensure to reduce your downward travel distance as you get closer to the surface to ensure the machine does not crash into the spoil board.

CNC3D CREATING PRECISION



Once you feel resistance when moving the paper around you can remove the paper and discard it.

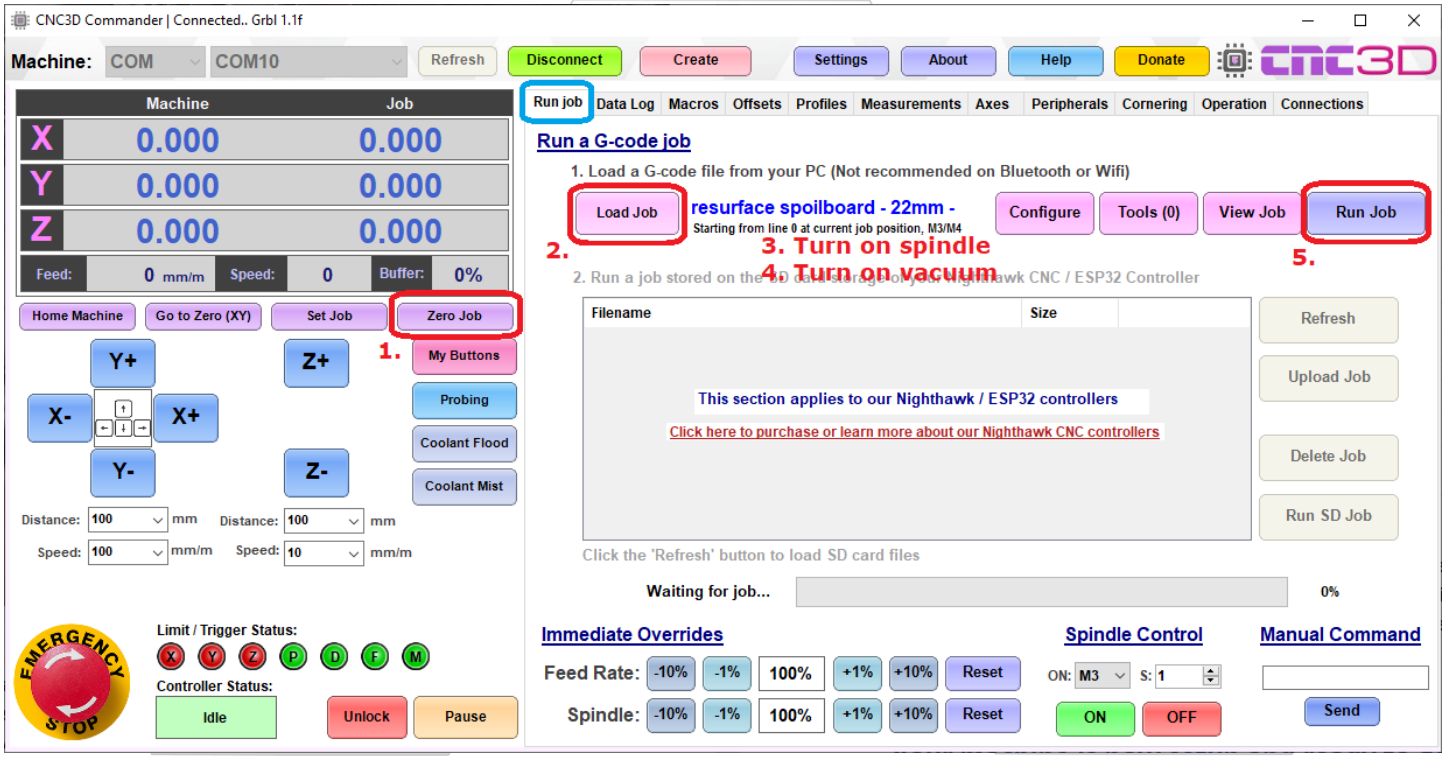


From here it is now time to upload the job and get it started!

There are two different methods depending on how you are connected to your Nighthawk. If you are connected via WiFi then please skip ahead to the next page.

If you are connected to your Nighthawk via USB or Bluetooth

Back in our Commander software, Click the "Zero job" button. Then click on Load Job and select the file you saved out of the surfacing wizard. Once loaded, hit the green run button on your VFD and wait until the spindle is up to speed. Once at speed, turn on your vacuum extraction (if attached) and hit the 'Run Job' button. See sequence here:

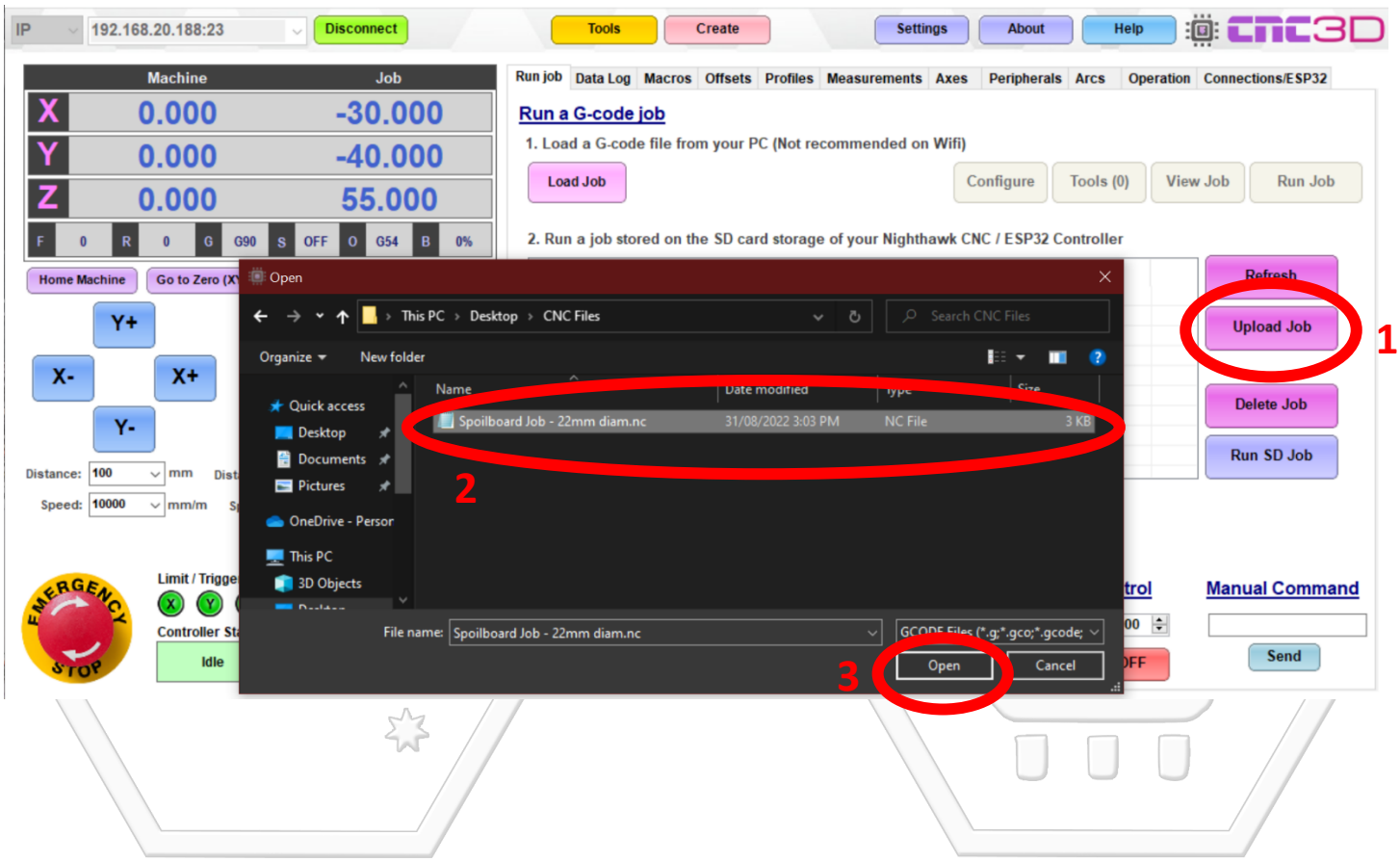


This will start the process of surfacing your spoil board. It may take a long time to complete this process. If something doesn't seem right then immediately hit the E-stop button on your control box or via our Commander software.

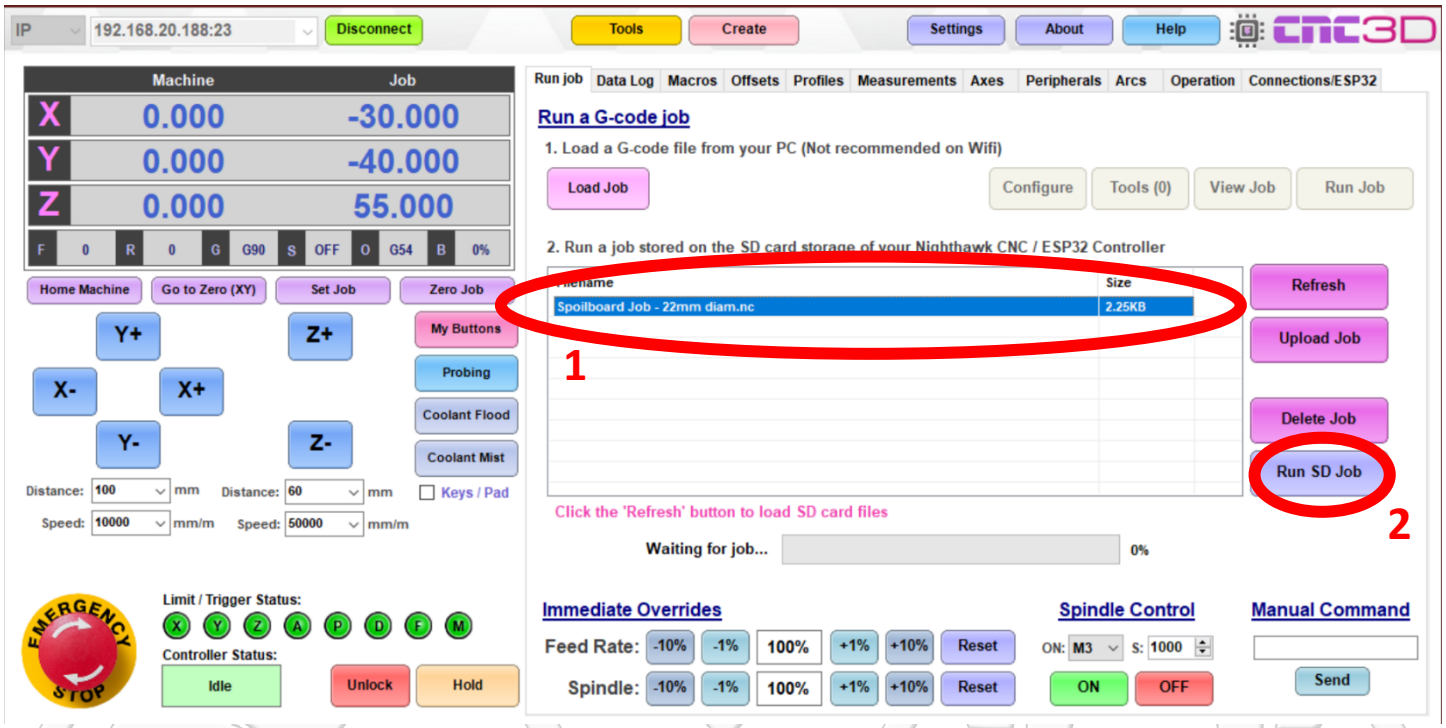
Note: Using the E-stop on your Nighthawk controller or via our Commander software will only stop your machine moving but will not stop your spindle. If you want to stop both the spindle and machine quickly, we recommend using the mechanical E-stop on your control box.

If you are connected to your Nighthawk via WiFi

Back in our Commander software, Click the “Zero job” button. Next, click on the “Upload Job” button, navigate to the location of the job file you just saved and select the correct job file, then click “Open”, this will save the job to the SD card in the Nighthawk Controller. When the upload is successful there will be a popup box to confirm which you can click OK on to close.



You're now ready to run the job! Attach your vacuum hose to the dust shoe turn on the extraction system, then turn on the spindle by pressing the Green button on the VFD. From there, all you need to do is highlight the spoilboard job in the list and click "Run SD Job"



This will start the process of surfacing your spoil board. It may take a long time to complete this process. If something doesn't seem right then immediately hit the E-stop button on your control box or via our Commander software.

Note: Using the E-stop on your Nighthawk controller or via our Commander software will only stop your machine moving but will not stop your spindle. If you want to stop both the spindle and machine quickly, we recommend using the mechanical E-stop on your control box.

Once the job is complete check to see if all the squiggles on the bed have been machined off. If not, repeat the process again 1mm lower than last time until the entire area is surfaced.

SOME GREAT NEWS!

The process we have just followed here is basically how every job will be run if streaming the job. You will be running all future jobs like this. Also keep in mind you can upload jobs to your Nighthawk controller and run them off your SD card. Saving this handy spoil board job will make it easy next time you want to freshen up your surface OR after you replace your spoil board.

Tramming your spindle

You may notice after surfacing you have some ridges in your spoil board. This is due to the spindle needing some minor adjustments to be truly "flat" with your spoil board.



During assembly of your machine our team align your spindle and bracket using engineering squares. This is fine for general tramming but extra tramming steps can be performed to ensure you have smooth bottom results with larger cutting tools. The best way to test your tramming is to create a small rectangle job in Easel or Carbide Create or use the new Spoil board surfacing wizard in Commander's Creation Tool section. If using the Commander spoil board wizard make a 100x100mm rectangle and insert your supplied 22mm surfacing bit and 6mm collet.

Tramming Side to side

Your Z axis plate has 4 bolts that hold it to your X axis plate. These bolts can be loosened off to allow you to tilt the angle of your spindle for tramming. There is a centre locating pin between these plates to make this process easy. It is recommended to loosen off 3 of the bolts quite loosely while keeping one bolt slightly loose to allow some control when tramming. The 4 bolts are located here:



Tramming Front to back

As time goes on, we here at CNC3D like to innovate and improve on our machine designs to make things like tramming your spindle an easier and user-friendly process. One of these improvements is the addition of a "shoulder bolt" on the big Y-axis plates. There will be some machines that have these bolts and some that do not so ensure you are following the correct tramming procedure for your machine.

If your gantry has a shoulder bolt

Shoulder bolts have a washer on the bolt as seen below in BLUE. If you have no washer then you need to follow the below guide for "NO shoulder bolt".

If you need to adjust your tramming front to back, then you need to look at adjusting the gantry angle.
To do this, we first need to very slightly loosen the shoulder bolt highlighted below in BLUE.
Once these are loose, loosen all the bolts highlighted in YELLOW below.



Repeat this process on the other side of the machine in the exact same pattern as the first side. This will allow us to "twist" the gantry front to back. Make slight adjustments at a time to both sides and re-secure the BLUE bolt first, then the YELLOW bolts. Check if it is trammed correctly by cutting into your test piece. Repeat these adjustments until the test piece seems to surface quite flat with no ridges showing up as it skims the surface.

If your gantry has NO shoulder bolt

If you need to adjust your tramming front to back, then you need to look at adjusting the gantry angle.

To do this, first need to loosen off the 2 bolts that secure your ball screw. These are highlighted below in BLUE. Once these are loose, loosen all bearing block bolts highlighted in YELLOW below. With the RED bolt, ever so slightly loosen it. It needs to keep the gantry plate in a fixed position.



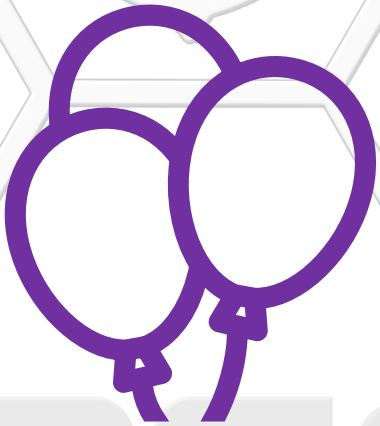
Repeat this process on the other side of the machine in the exact same pattern as the original side. This will allow us to "swing" the gantry front to back. Make slight adjustments at a time to both sides and re-secure the RED bolt first, then the YELLOW, then finally the BLUE bolts. Check if it is trammed correctly by cutting into your test piece. Repeat these adjustments until the test piece seems to surface quite flat with no ridges showing up as it skims the surface.

To look up more advanced methods of spindle tramming a quick YouTube search for "spindle tramming" should return a variety of results.

Repeat the process of surfacing your spoil board again until you are happy with the bottom finish of your spoil board.

Your machine is now correctly set up and ready to go!

It's time to start making things!



Getting started with your laser

LASER SAFETY WARNING!

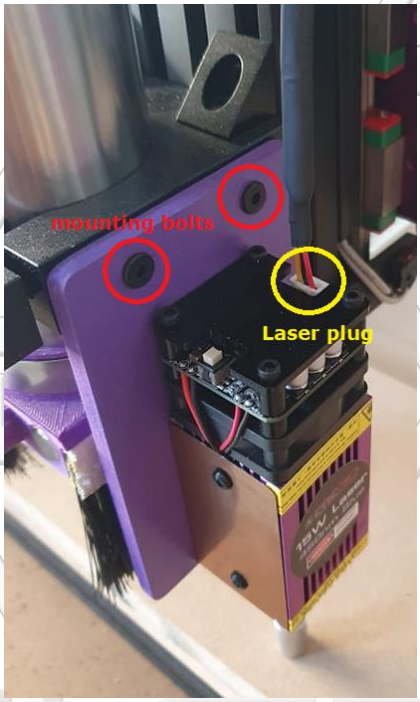


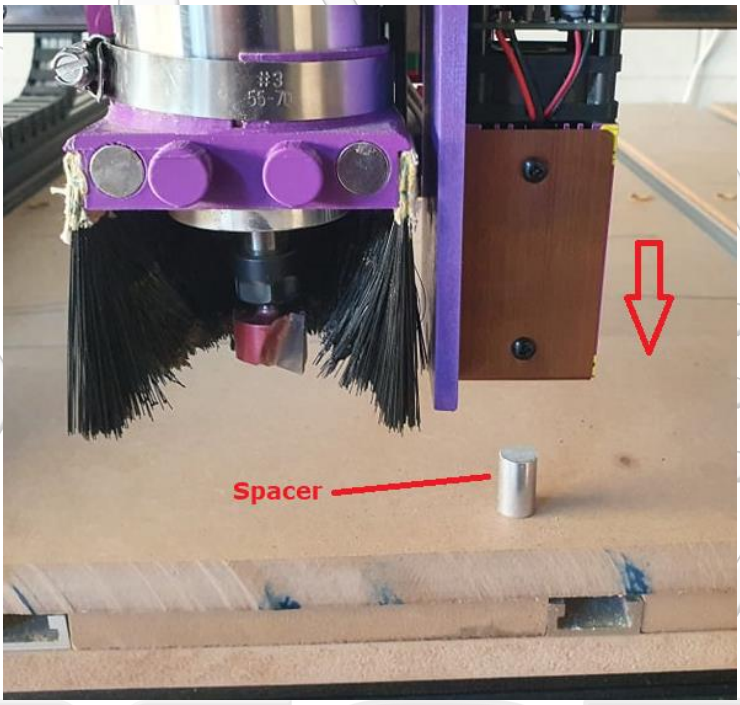
Always ensure you are wearing laser safety goggles and other appropriate PPE when using any high-powered lasers. Please ensure the laser is pointing away from people and sensitive materials.

Remember when plugging in or unplugging any wiring INCLUDING the laser connector, it is vital to ensure the machine is NOT powered up. So called "hot-swapping" can cause irreparable damage to the laser or the Nighthawk Controller!

1. **Raise your spindle high enough so that you can fit the laser to the side of the Right-hand side of your spindle bracket. Use the 2 bolts provided to secure it to the bracket. We always recommend fitting it to the right-hand side so you can still safely home when the laser is attached. POWER OFF YOUR MACHINE then connect to white laser plug to the top of the laser.**

2. **Once firmly attached you can power up the machine and connect to it in Commander remembering that you will need to re-home it before being able to jog any axis. Use the alloy spacer provided with your laser to set the correct focal point of the laser. To do this, position the spacer under the laser head and carefully lower your Z axis until the brass laser head is just clearing the alloy spacer. Take care not to damage the laser by crashing into the spacer!**





We recommend following our video guide here for using your laser:

https://www.youtube.com/watch?v=8Syf86xmeZs&t

Some key laser points!

Always remove your laser when using your spindle and never leave your machine unattended when using it. Also ensure you have adequate extraction to your work area as laser jobs can produce harmful fumes when operating.

QB2-V2 CNC Maintenance guide

It is recommended to visit this guide immediately after positioning your machine and setting it up. It is also recommended to periodically visit this guide to ensure smooth operation and a long service life of your machine or if something isn't quite right such as cuts not coming out right or Z axis depth inconsistent.

1. Check ALL the nuts and bolts on your machine.

Visit all the nuts and bolts on your machine. You will need a 2mm, 2.5mm, 3mm and 4mm allen keys and a small flat blade screwdriver to check every connection. Test each bolt and tighten them if they are loose. This includes the green connectors that join the wires together on your limit switches and stepper motors.

IMPORTANT: When tightening any allen key bolts it is recommended to use a solid allen key end NOT any ball end side of an allen key or you run the risk of stripping the bolt heads.

2. Check to make sure your gantry is square.

It is important to ensure your machine frame stays square. Use a tape measure or ruler to make sure both sides of the machine are equal distance from the front. To do this, measure from the gantry side plate to the front plate. Repeat the same process on the other side of the machine and record the results. If one side is more than 1mm out from the other side, you need to manually turn the lead screw on one side of the machine until it is within 1mm of the other side. You can look at repeating this simple process daily or every 1-2 weeks. The more frequently it is performed, the better your machine will operate.

****PLEASE NOTE: Standard 3-axis QB2-V2 machines have dual axis homing, it is recommended to occasionally check your gantry squareness after homing and making some slight adjustments to the position of your limit switches if your gantry is not completely square. Ideally, a squareness of less than 1mm is recommended.**

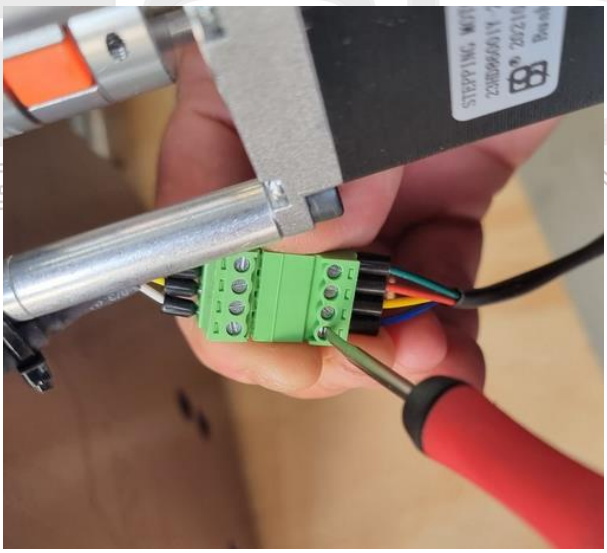


3. Checking connectors

Before doing any maintenance involving wires including checking connections and screw terminals, make sure to POWER OFF the machine. Not doing so risks causing irreparable damage to the Nighthawk Controller!

Check every green connector and its screw terminals with a small flat head screwdriver and ensure they are tight and secure. Give each individual wire a firm tug to ensure they will not pull out of the connector.





4. Lubricating your rails and ball screws

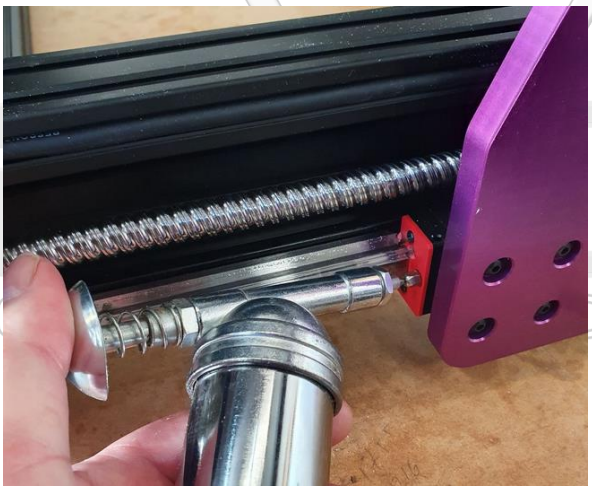
PLEASE NOTE: This process is *NOT* required for new machines; we have already lubricated things perfectly for you in our factory before shipping.

To keep your linear motion system in great condition it is recommended to keep the linear rails and ball screws rust free and lubricated. As a quick and easy solution, you can apply a fine coating of lithium grease aerosol on the rails and ball screws and run the machine back and forward a few times to spread the lubricant on the rails/ball screws. This will coat the surface and keep them in good condition for years to come.

A more advanced and better method is to use a grease gun and use the grease nipples provided on your linear bearings to lubricate them. For your rails a Kingchrome mini grease gun works well. They can be special ordered from most hardware stores or directly from Kingchrome. See this video on how to lubricate using a Kingchrome mini grease gun: https://www.youtube.com/watch?v=ccsnIOzvoWI&t

If choosing to do the grease gun option, ensure that no more than 1 or 2 pumps is used or you run the risk of blowing out the seals on the bearing blocks. This should be performed no more than once per month with daily use of your machine. The recommended lubricant is lithium grease or bar and chain oil.
The photos below show where the grease nipples are located and how you can lubricate them.





You have now completed your machine maintenance!

We recommend visiting this guide periodically. Our Commander software will remind you every 3 months however doing it more frequently will ensure your machine is always in tip top condition.

For more information or if you require support with your machine, please reach out to our friendly support team via email at solutions@cnc3d.com.au, via Facebook or via phone at

+617 5522 0619

You can also join our friendly user group on Facebook and collaborate with thousands of our other users.

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