



# QB2

**QB2**

**QB2-V2**

**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 earmuffs 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.

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# Introduction

## Some key things with the QB2

### 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 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, click the E-stop button in Commander then the unlock button.

### Tramming your spindle

It is important to ensure your spindle and endmills are perfectly perpendicular to your bed, therefore it is highly recommended to tram your spindle. This process cannot be completed before shipping due to vibrations, bumps etc. during the shipping process.

### Surfacing your bed

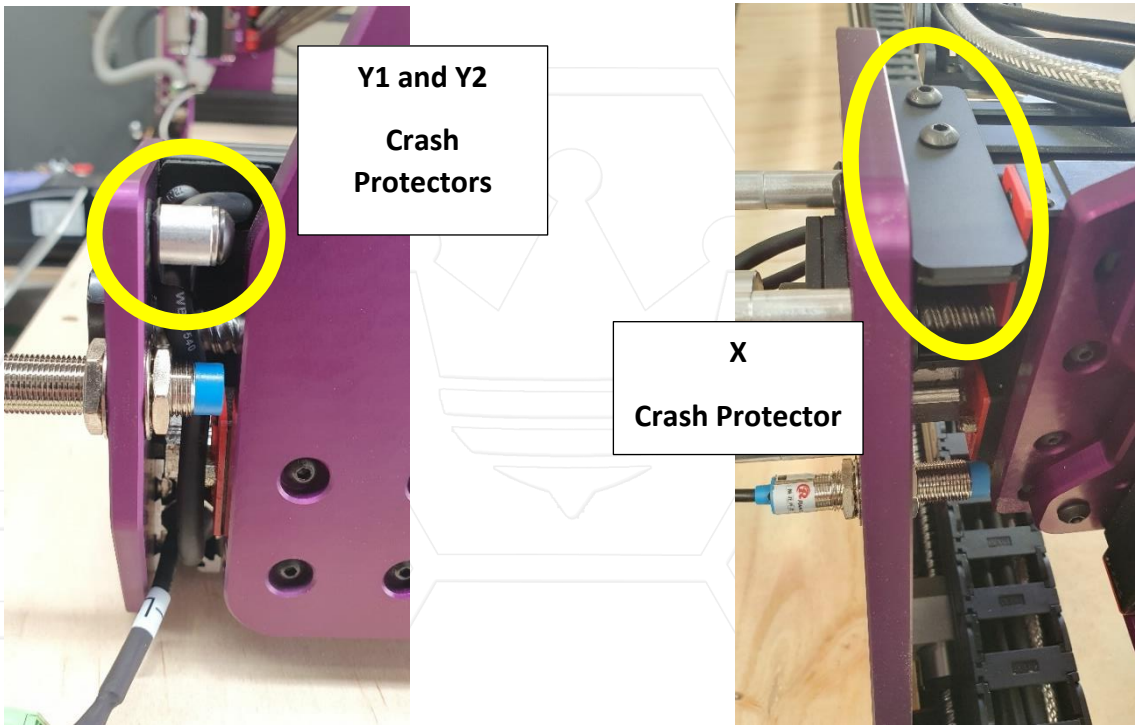
We do our best to ensure that your machine is perfectly square and aligned during the build process. Bed surfacing cannot be completed before shipping due to vibrations, bumps etc. during the shipping process. During transportation and movement of your machine certain parts may change position meaning that surfacing needs to occur once the machine is in its final resting location to ensure that you have a sturdy and well supported base to start using your machine.

## Limit Switches

**This section only applies to the QB2-V2**

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.

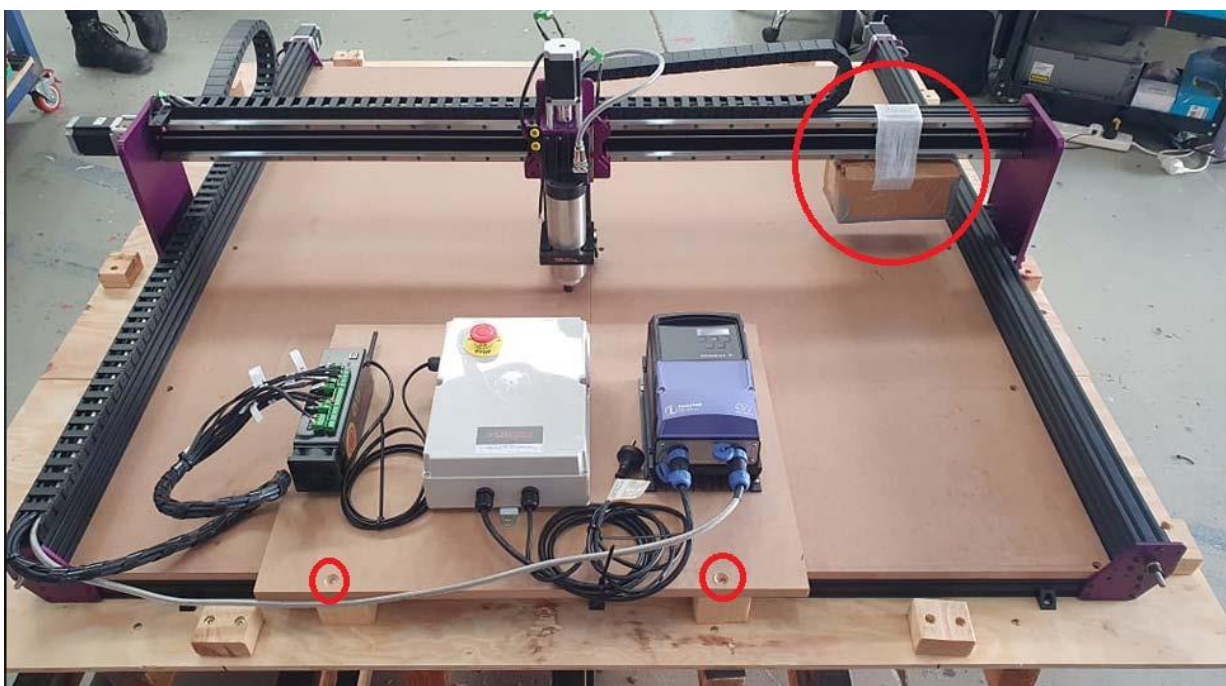


# Unboxing your Machine and Setup

1. **Welcome to your new QB2!** To remove the plywood crate, you will only need to remove the screws which are painted purple, then the whole lid will slide up and off the pallet. At this point you can also carefully remove the small parts accessories box that is attached to the gantry. This will contain your endmills, laser goggles, Dust shoe and other accessories you may have purchased with your machine.



2. 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.



3. Now that we have everything free 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.*

4. 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 where you like as long as the cables will reach of course. It is not recommended to power up just yet, but we will shortly!

**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 firm and secure. Try giving each wire a slight tug in each screw terminal to make sure they are 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. Once powered on, your Nighthawk controller fan will come on and so will the display on your VFD.

We highly recommend visiting the user manual for the Nighthawk controller found here, or in the "Help" section of our Commander program:

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

## Connecting to Your Nighthawk

There are multiple options that you can use to connect to your Nighthawk – 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.

### WiFi (Best Option)

The best possible way to run your QB2 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 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.

**For more information about Nighthawk connections, refer to your Nighthawk manual which is available in the “Help” section in our Commander software.**

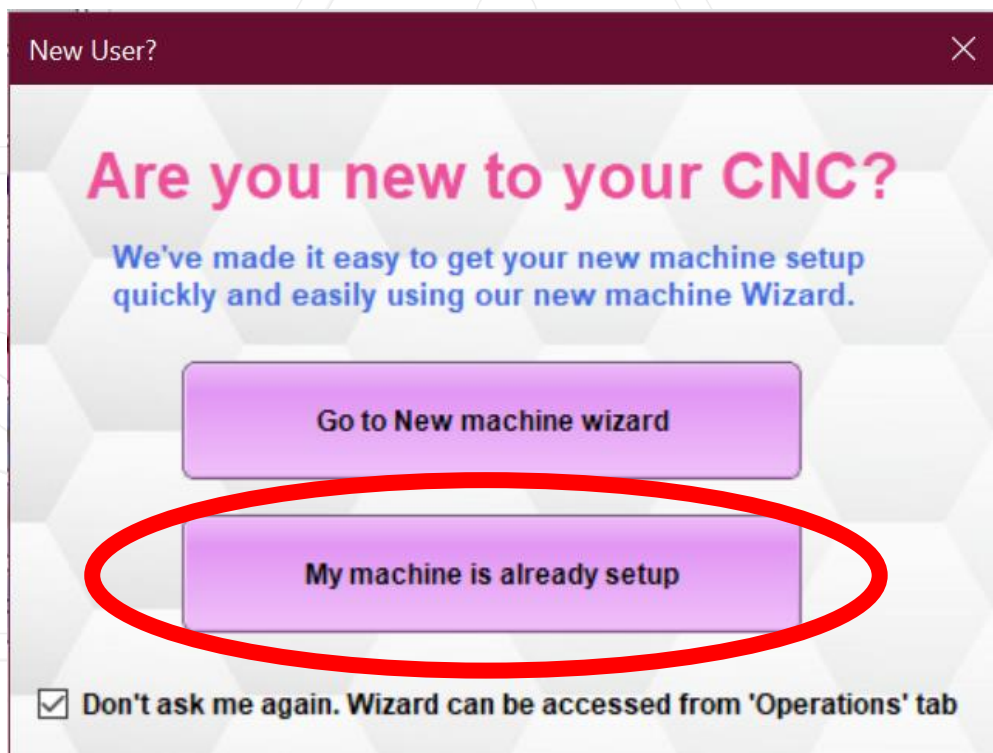
**Check out this video to learn how to set up each of these connections through our Commander software**

<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.



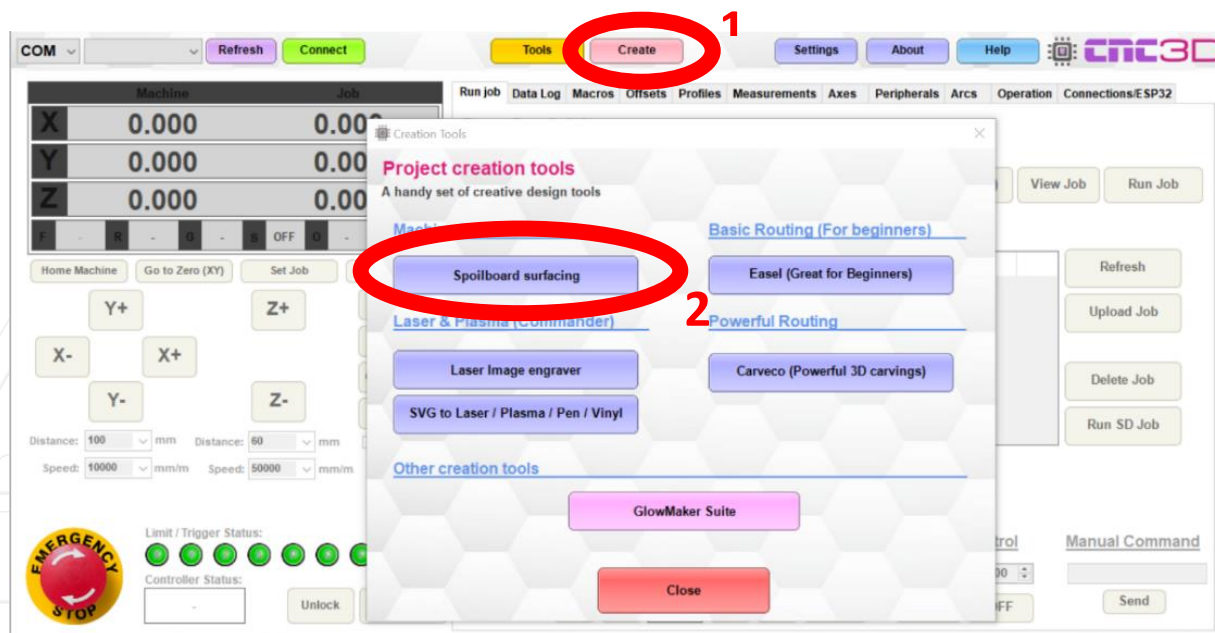
Selecting “New Machine Wizard” will cause Commander to overwrite some of the critical settings like maximum travels and axis directions and can cause your machine to crash.

## Surfacing your spoil board

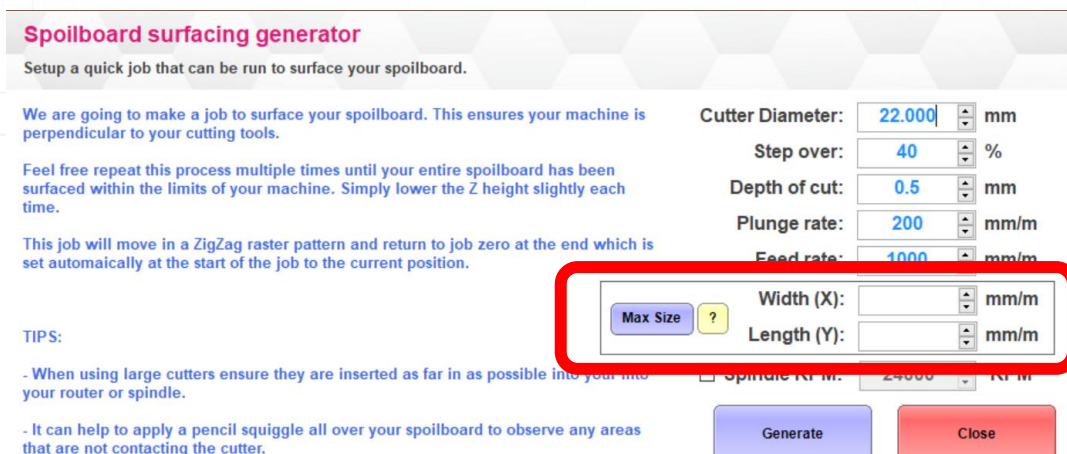
It is highly recommended to surface the top of your spoil board. Surfacing the entire working area means that your tool will always be perpendicular to your cutting tool.

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 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.



## QB2-V2 ONLY

**QB2-V1 users, skip to page 15.**

Using the jogging buttons in Commander, move the spindle 50mm in the X+ and Y+ directions so that it is sitting above the machine bed.

Lie a piece of scrap paper on the bed directly under the cutter and lower the tool down using the Z- button until it is just touching the paper. When you can no longer move the paper around under the tool, then the tool is at its maximum downward travel.

**Note: Reduce your downward travel distance as you get closer to the surface to ensure the machine does not crash into the spoil board.**

	Machine	Job
X	0.000	0.000
Y	0.000	0.000
Z	0.000	0.000

Feed: 0 mm/m Speed: 0 Buffer: 0%

Home Machine Go to Zero (XY) Set Job Zero Job

Y+ Z+ My Buttons

X- X+ Lower's Z

Y- Z- Probing

Coolant Flood

Coolant Mist

Distance: 100 mm Distance: 100 mm

Speed: 100 mm/m Speed: 10 mm/m

Distance



Click the “Set Job” button and you will need to change the Z number to 0.  
**DO NOT** change the X or Y number.

Set Job Zero Job

My Buttons

Probing

Coolant Flood

Coolant Mist

Keys / Pad

Status: A P D F M

Set Job

Manually set Job coordinates without moving

X: [ ]

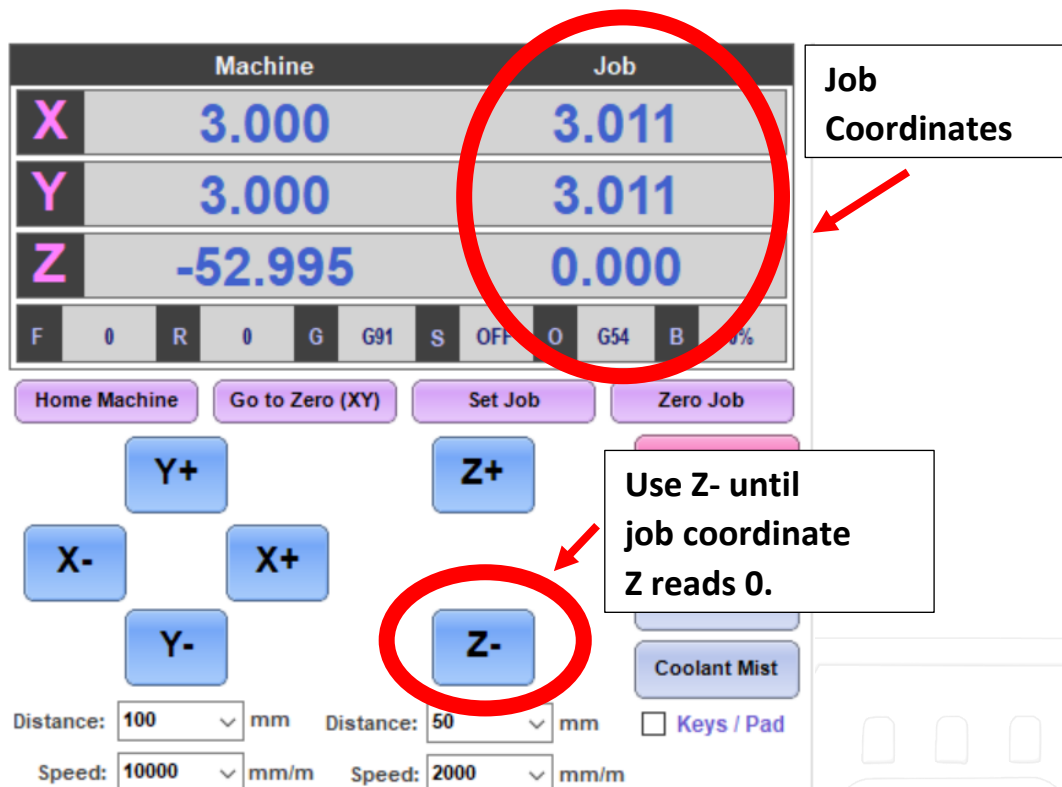
Y: [ ]

Z: 1.200

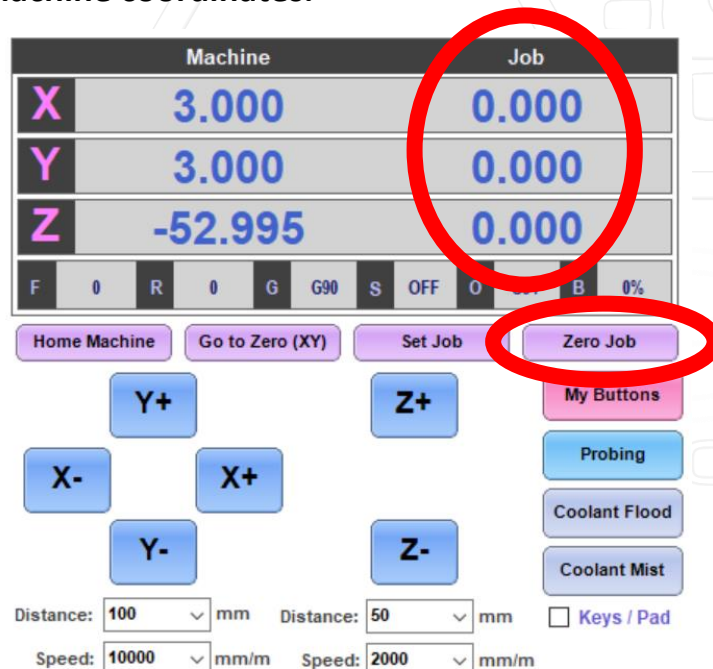
Change to 0

Set Job coordinates Cancel

Home your machine. When your machine has finished homing, use the Z- button to move your Z axis down until the Z number in “Job Coordinates” is 0.



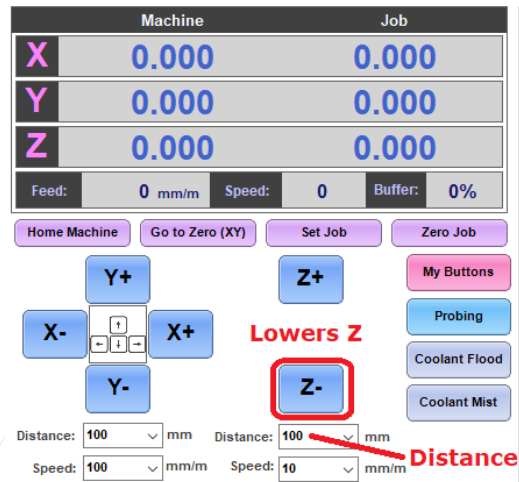
When your Job Z number reads 0, click ‘Zero Job’ and now all Job coordinates will be set to 0. You can ignore the Machine coordinates.



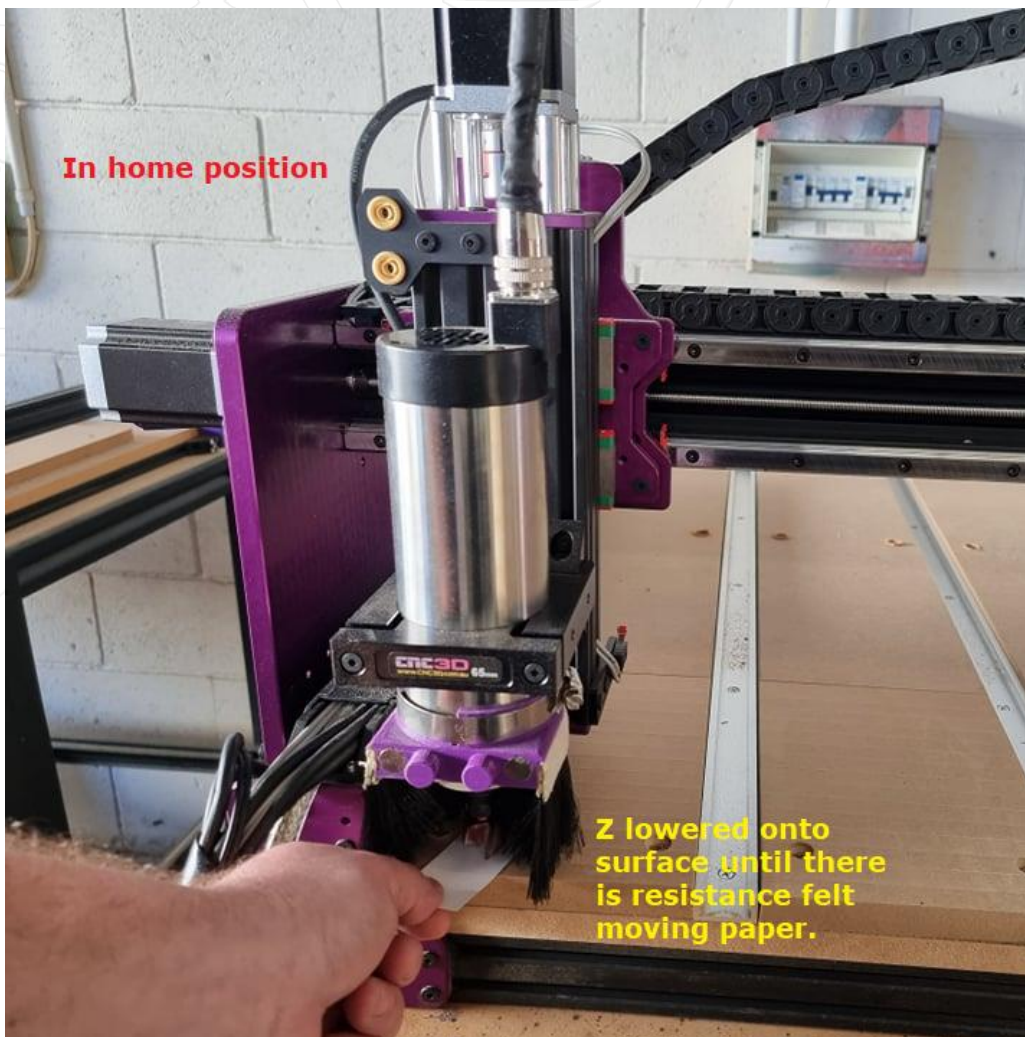
You can now skip ahead to page 16.

## QB2-V1

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.

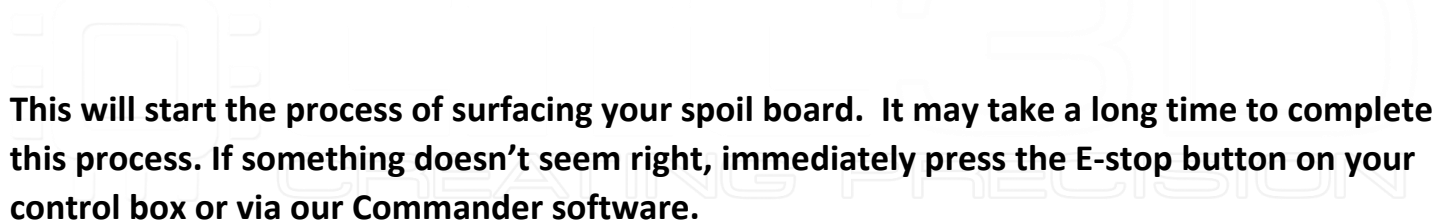


Once you feel resistance when moving the paper around you can remove the paper and discard it.



**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.**

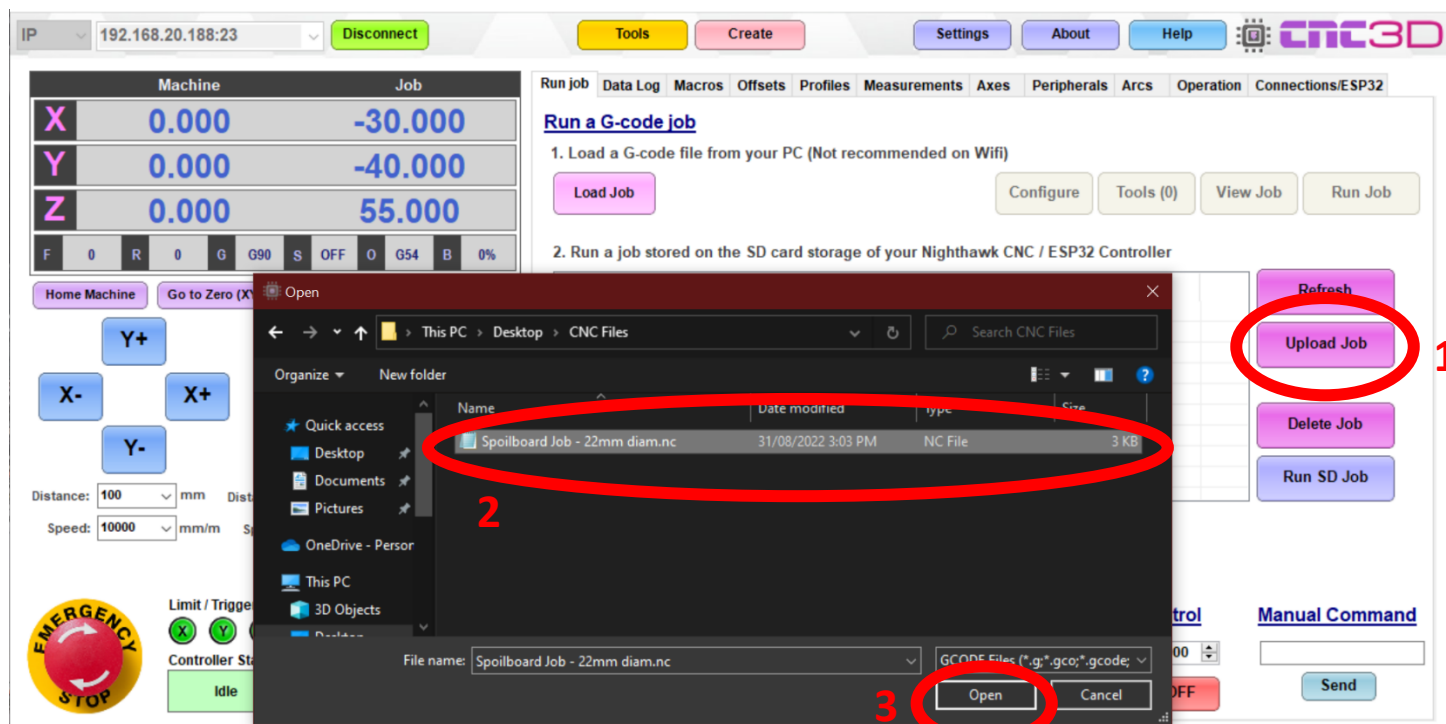
**Back in our Commander software, Click the “Zero job” button. Then click on Load Job and select the file you saved out of the surfacing wizard. Once loaded, hit the green run button on your VFD and wait until the spindle is up to speed. Once at speed, turn on your vacuum extraction (if attached) and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



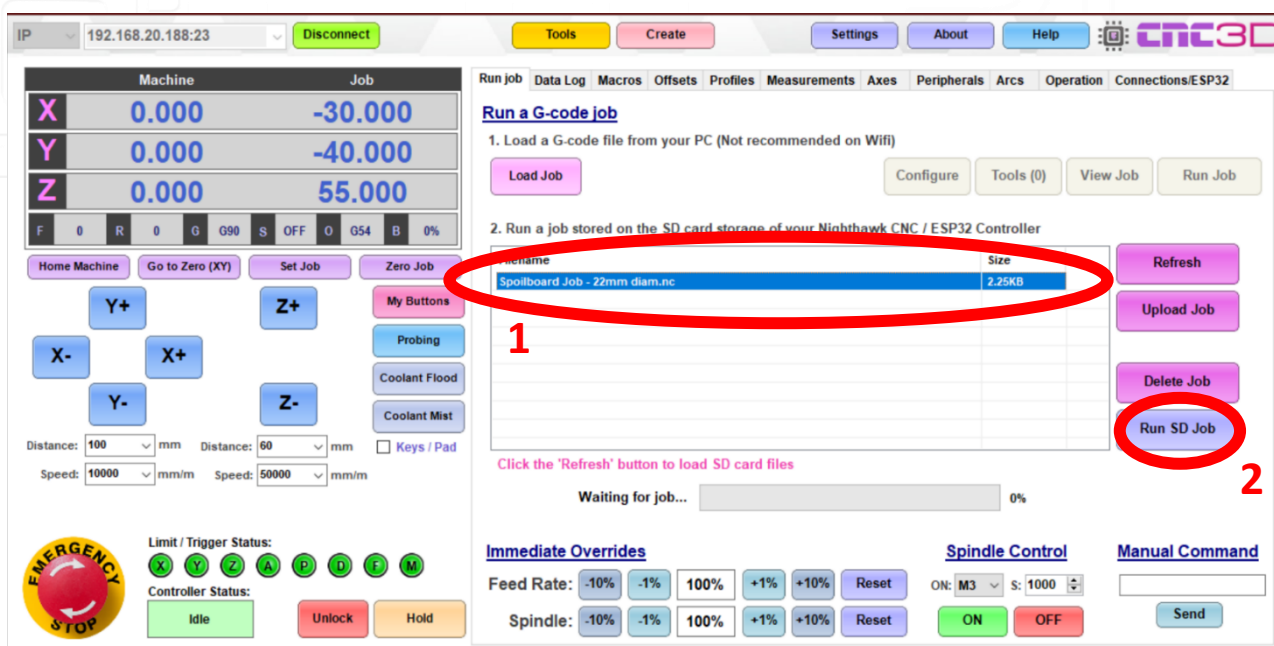
**Note: Using the E-stop on your Nighthawk controller or via our Commander software will only stop your machine moving but will not stop your spindle. If you want to stop both the spindle and machine quickly, we recommend using the mechanical E-stop on your control box.**

## If you are connected to your Nighthawk via WiFi (Direct or Existing Network)

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 one, 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. Click OK to close.



You're now ready to run the job! Attach your vacuum hose to the dust shoe (if fitted) 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 job. If something doesn't seem right, immediately hit the E-stop button on your power box or via our Commander software.

When the job completes, press the red button on the VFD to turn off the spindle.

**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, press the mechanical E-stop on your control box.

You may need to turn the Nighthawk off and back on after using the E-stop button in Commander or on top of the controller. The E-stop causes the controller to reset as it's the fastest way to stop machine motion.

### SOME GREAT NEWS!

The process you have just followed here is how every job will be run. You will be running all future jobs like this. 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

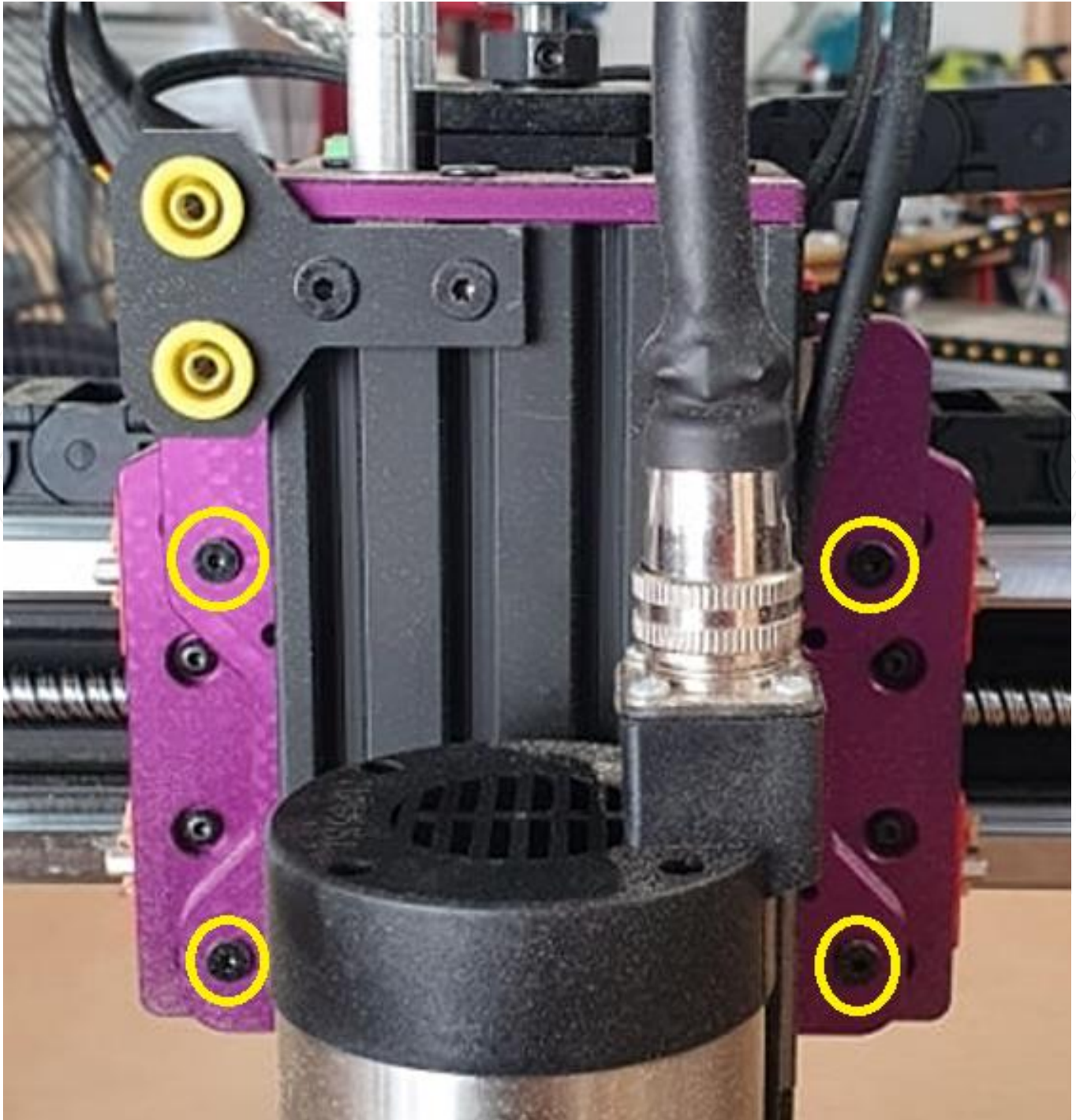
You may notice after surfacing you have some ridges in your spoil board. This is due to the spindle needing some minor adjustments to be truly “flat” with your spoil board.



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 use the new Spoil board surfacing wizard in Commander's Creation Tool section to 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, CNC3D innovates and improves 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 and all your bolts are identical then you need to follow the below guide for “NO shoulder bolt”. This bolt could be either in the top hole or the bottom hole.

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

To do this, we first need to loosen off *\*slightly\** the shoulder bolt highlighted below in **BLUE**. Once these are loose, loosen all of the bolts highlighted in **YELLOW** below.



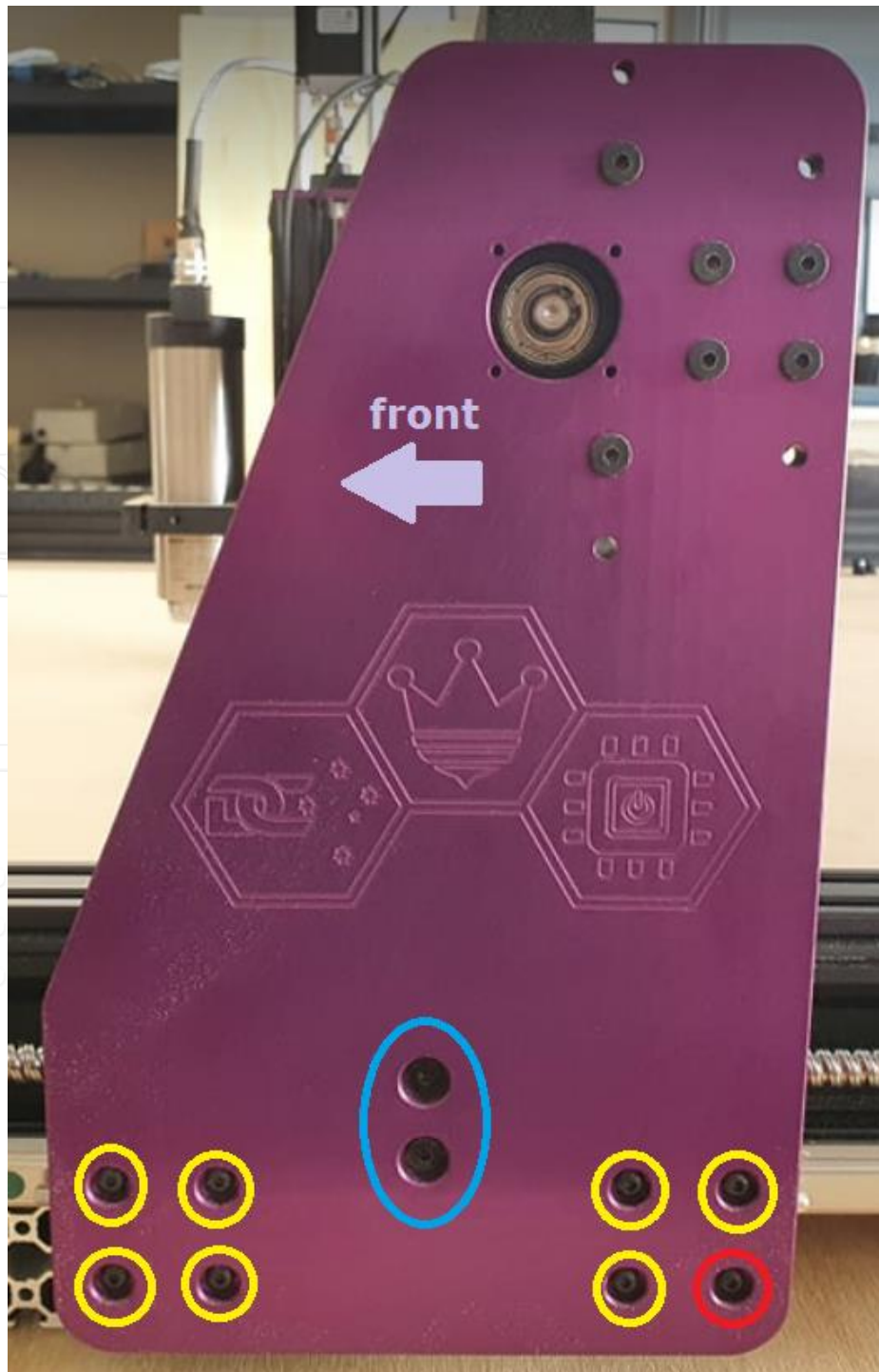
Repeat this process on the other side of the machine in the exact same pattern as the first side. This will allow us to “twist” the gantry front to back. Make slight adjustments at a time to both sides and re-secure the **BLUE** bolt first, then the **YELLOW** bolts. Check if it is trammed correctly 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 we need to look at adjusting the gantry angle.

To do this, we 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 tramping a quick YouTube search for “spindle tramping” 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

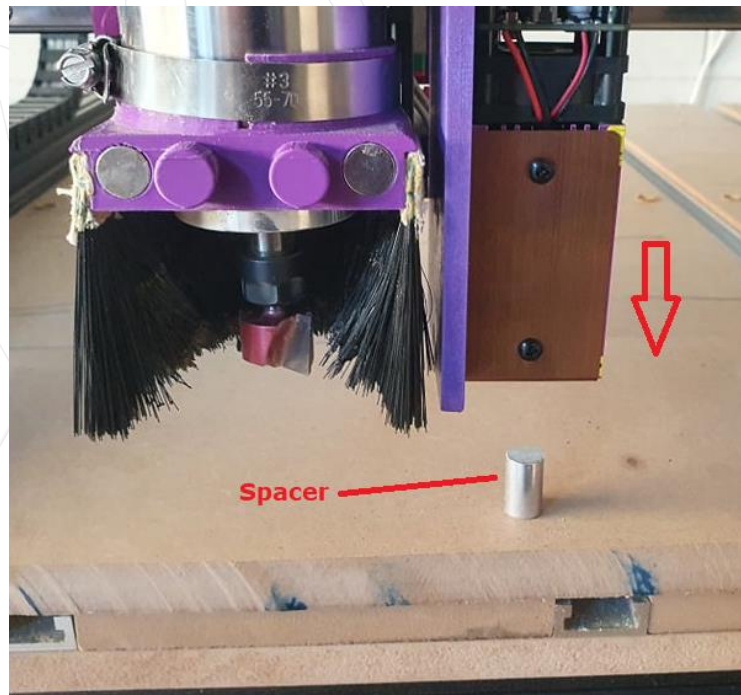
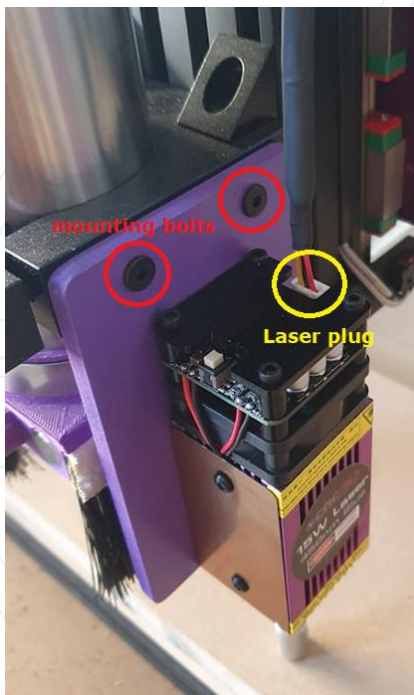
## LASER SAFETY WARNING!



**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 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.

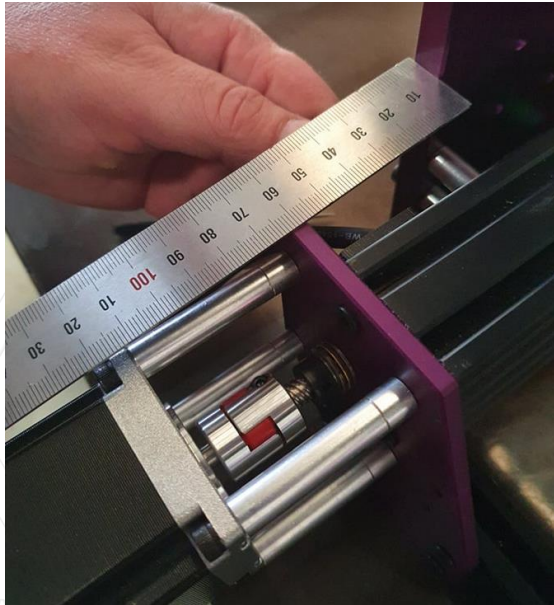
It is important to ensure your machine frame stays square. Use a tape measure or ruler to make sure both sides of the machine are equal distance from the front. To do this, measure from the gantry side plate to the front plate. Repeat the same process on the other side of the machine and record the results. 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.

### QB2-V1

3-axis QB2 machines received after April 2022 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.

## QB2-V2

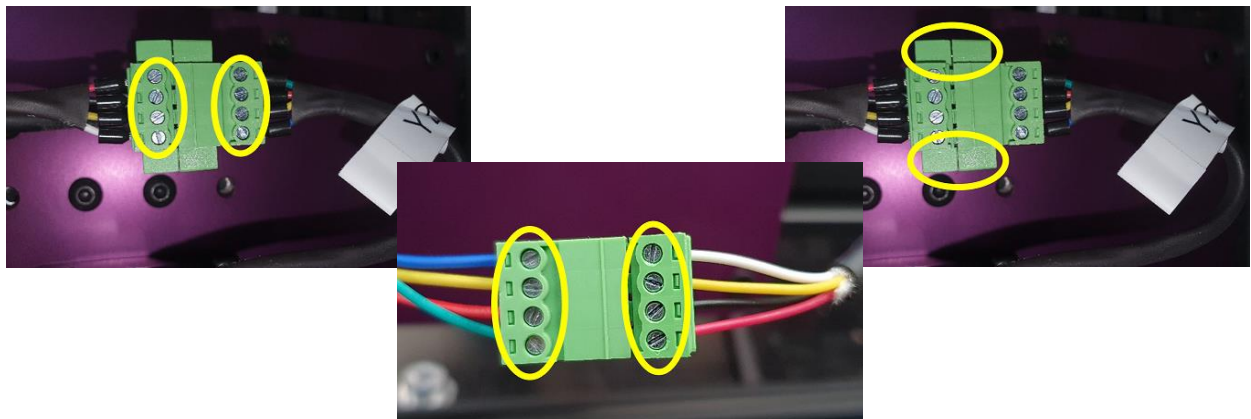
Standard 3-axis QB2-V2 machines are set up for dual axis homing from the factory, though it is recommended to occasionally check your gantry squareness after homing and making some slight adjustments to the position of your limit switches if needed. Ideally, a squareness of less than 1mm is recommended.



### 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 make sure they will not pull out of the connector. **Your machine may have either of the connector types in these photos, QB2-V2 will have the screw-together type.**



## 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 you will need to keep the linear rails and ball screws rust free and lubricated.

The recommended method is to use a grease gun and inject the grease into the nipples provided on your linear bearing. You can also apply a line of grease to the ballscrew, and it will be picked up into the bearing mechanism as the machine moves along.

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>

We use a general purpose NLGI 2 Lithium-based grease to lubricate the machines before they are shipped. **When selecting a grease, ensure it is compatible with Lithium-based greases!**

As a **temporary** 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 running smoothly until you can source a proper grease and grease gun.

When using the grease gun 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 photos below show where the grease nipples are located and how you can lubricate them.



## 5. Checking and cleaning Limit Switches

### QB2

Over time dust and other debris can infiltrate the mechanical limit switches on your machine causing them to not trigger reliably. It is good practice to occasionally clean out the black plastic housing with low-pressure compressed air, paying particular attention to the Z-limit switch as it is very close to the cutting action and is exposed to more of the resulting debris.

**Do not use high-pressure compressed air as you could damage the internal mechanism inside the switch.**

### QB2-V2

The QB2-V2 has ip66 rated inductive limit switches on all axes. These switches are sealed against dust and moisture ingress and are therefore impervious to the dust created by cutting timbers and plastics. However due to how they sense metals they may be interfered with by any metal swarf that falls on them so be sure to clean them off after cutting any metals. Compressed air does the job very well, however, make sure that metal shavings do not fall into any electrical connections on the machine.

**Please power off the machine before using compressed air after cutting any metals in case metal shavings find their way into any exposed electrical contacts.**

## 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](mailto: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>