



METAL STORM

Metal Storm CNC User & 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 and ear 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 timber shavings and dust.

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

NEVER unplug or plug in any connectors while the machine is powered up. Always ensure machine is powered off before making or breaking any electrical connections.

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Some key things with the Metal Storm...

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.

Tramming your spindle

It is important to ensure your spindle and endmills are perfectly perpendicular to your bed, it is highly recommended to tram your spindle for best results. 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. If you have opted for an alloy bed our team do **NOT** surface the bed for you. For convenience we have included a quick job stored on your controllers SD card that is tailored to your machine to make bed surfacing easy. 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 with its feet adjusted to ensure that you have a sturdy and well supported base to start using your machine.

Unwrapping your Machine and Setup

Your Metal storm comes on a pallet that is wrapped in black plastic. Most of your machine is fully assembled but for safe shipping certain parts need to be disassembled and then reassembled by the user upon arrival.

The tools you will need are listed below:

5mm Allen Key
4mm Allen Key
Phillips Head Screwdriver
19mm Spanner
17mm Spanner
Digital or Bubble Level

Step 1: **Unwrap your machine!**

DO NOT use a knife! You may accidentally cut into electrical cables or damage certain parts! We do not need anything returned to us, the straps are intended to hold the machine down for shipping and are factored into the shipping costs.

Step 1: **Welcome to your new Metal Storm CNC Machine!**

Locate your accessories box. This box will contain your starter endmill kit, ER20 collet set, the Nighthawk controller, USB Cable, VFD manual and any other items you may have added on to your order.
This box should be secured under the gantry for transport.

Step 2: **Attach the Nighthawk Controller to the machine**

The Nighthawk controller will be in the accessories box wrapped in foam, it will already be attached to a piece of aluminium checkplate with 2 bolts attached loosely.

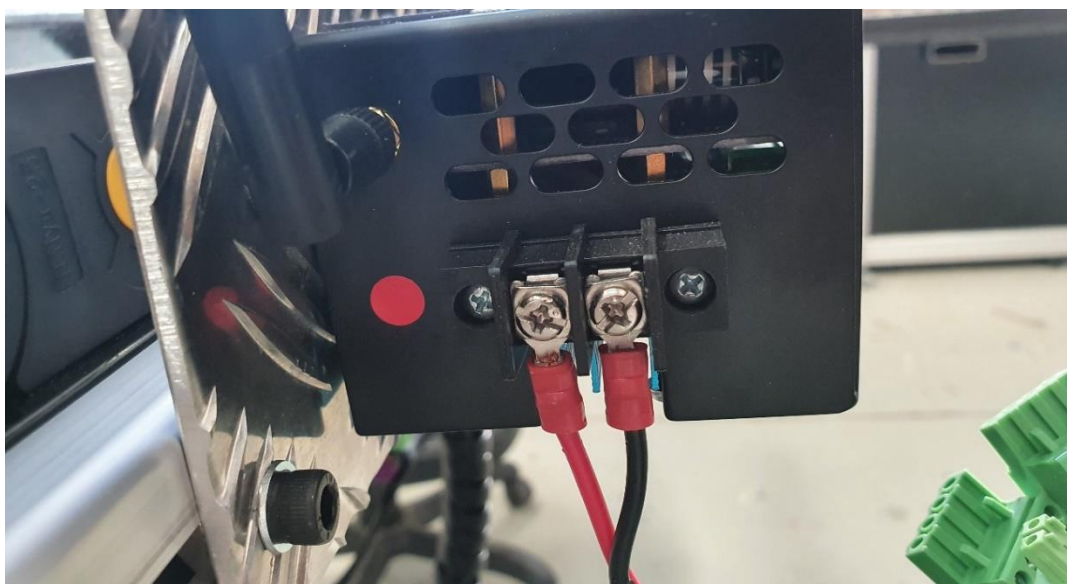
The controller is designed to attach to the machine on the left-hand side of the drag chain using 2x M6 bolts and T-nuts that are loosely attached to the checkplate (see photo below). **Your bolts may be silver instead of black.**



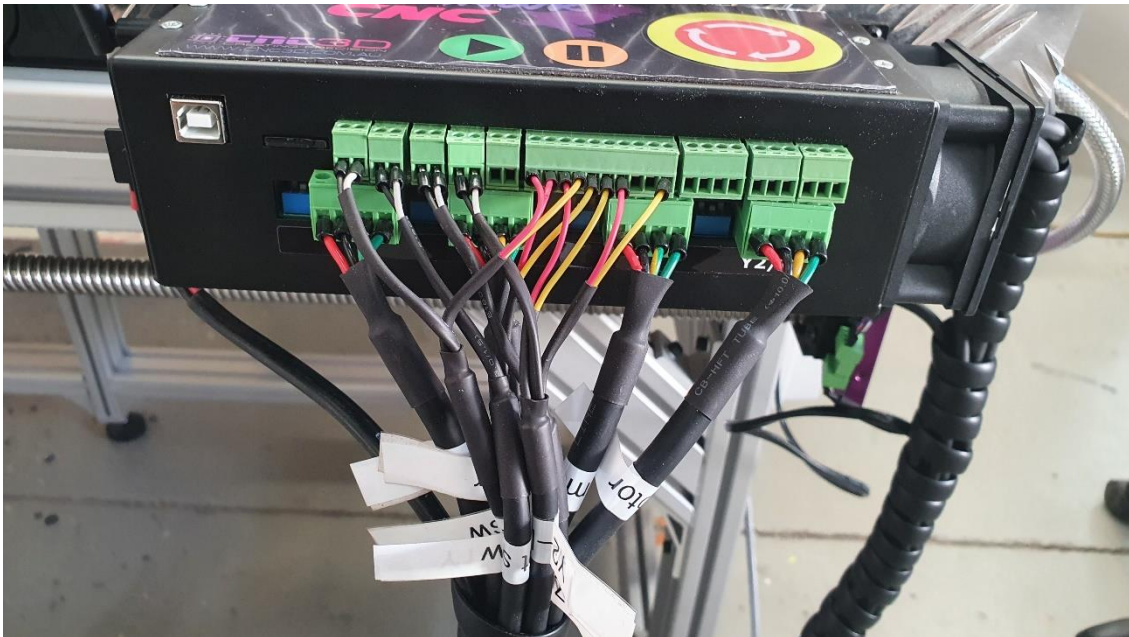
Step 3: Plug in and wire up the Nighthawk Controller

The cables that run from the Nighthawk Controller are bundled together in a black plastic wrap on the machine bed for transport. These cables run to all the motors and limit switches as well as provide power to the Nighthawk. These need to be removed from the Nighthawk to protect them during shipping.

Firstly, locate the wire with the **Red** and Black spade terminals crimped onto the ends, these are the DC power connections for the Nighthawk. Slide the fork terminals onto the power connector on the Nighthawk with the **red wire** on the terminal closest to the **red dot** on the case and tighten both using a Phillips head screwdriver, see photo below for a reference.



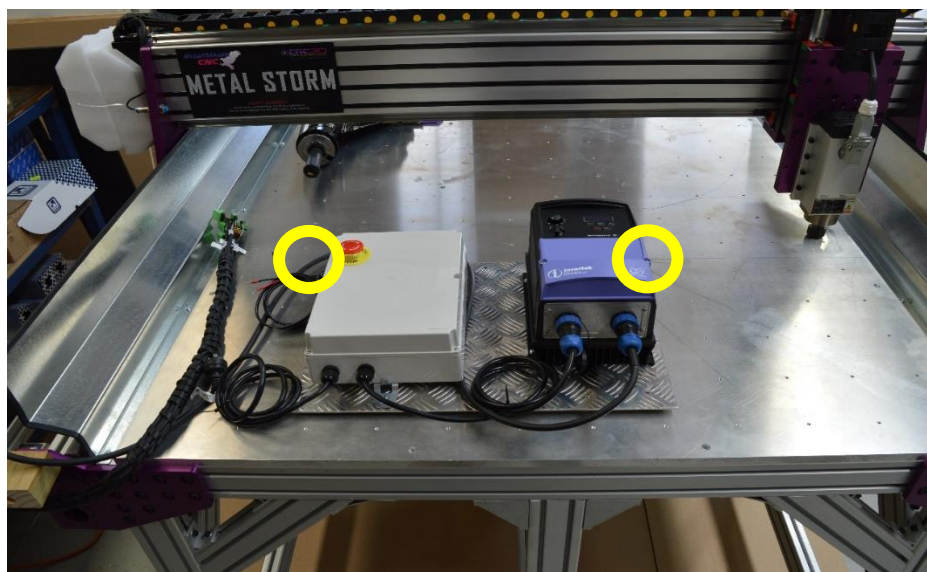
Next you can plug in the rest of the green connectors following the labels on the cables to each of the plugs on the Nighthawk. **Take care as the cables are stiff and putting too much pressure on the green connectors in the Nighthawk can deform them resulting in intermittent signals.**



Step 4: **Remove and mount power supply and VFD**

The white box contains the power supply for the machine as well as the VFD which runs the spindle. These are secured to a piece of aluminium checkplate which has been bolted to the machine bed for transport. This can now be removed and mounted to the machine frame.

Remove the M6 bolts holding the checkplate in position on the bed. These bolts are in the two top corners of the plate.



Next, find the bag of M6 bolts in your accessories box. You will need to slide a washer onto each bolt, then insert the bolt through the checkplate. On the back side you will need to slide a black rubber grommet onto each bolt, then another washer and lightly thread on the M6 t-nuts. You can then align the checkplate and tighten the bolts to securely mount the electronics to the front of the machine frame. **You may need to apply some force to the bolts to allow the T-nuts to rotate into position in the frame.**



Congratulations! Your wiring is now complete!



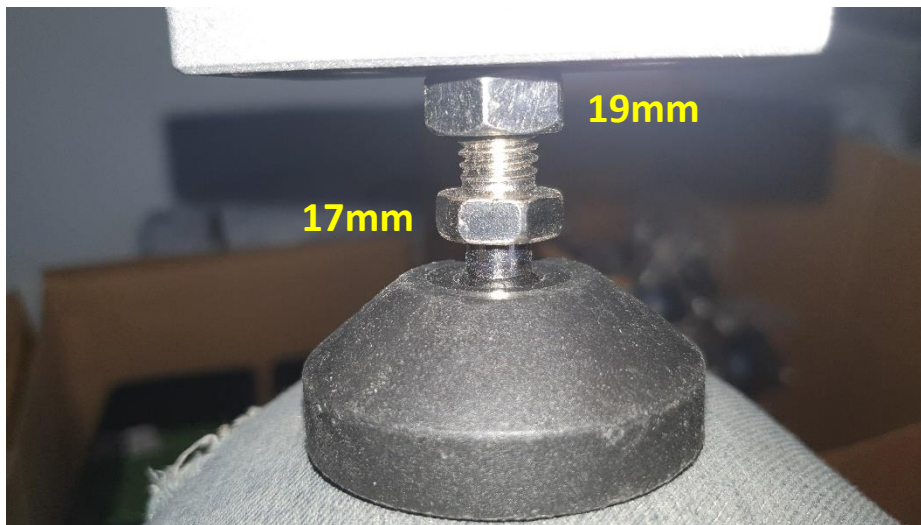
**Follow through the next section for setting up
BEFORE powering on the machine!**

Adjusting the Legs of Your Metal Storm

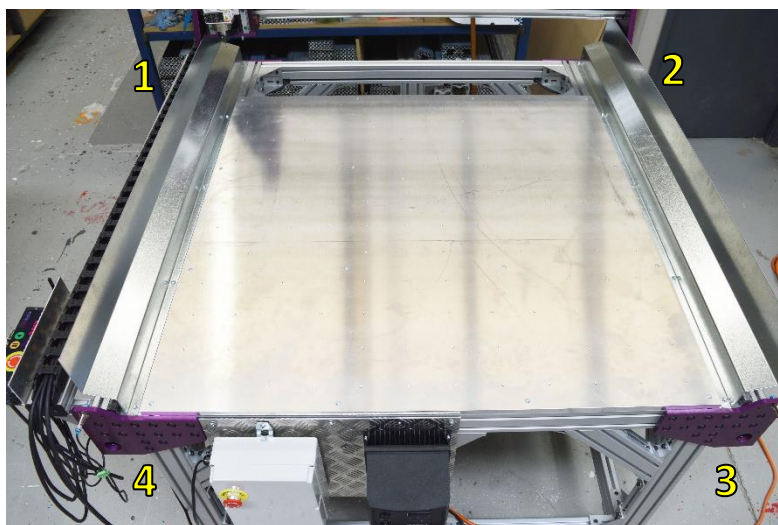
The feet of your machine are adjustable to allow for variations in the surface it is standing on. You will need to get these to the correct position for your floor as we may have needed to drastically move the feet to align them properly on the shipping pallet.

Using a bubble or digital level, check the alignment of the machine frame and you will need to raise or lower each foot in turn to adjust the machine so that it is sitting level in space.

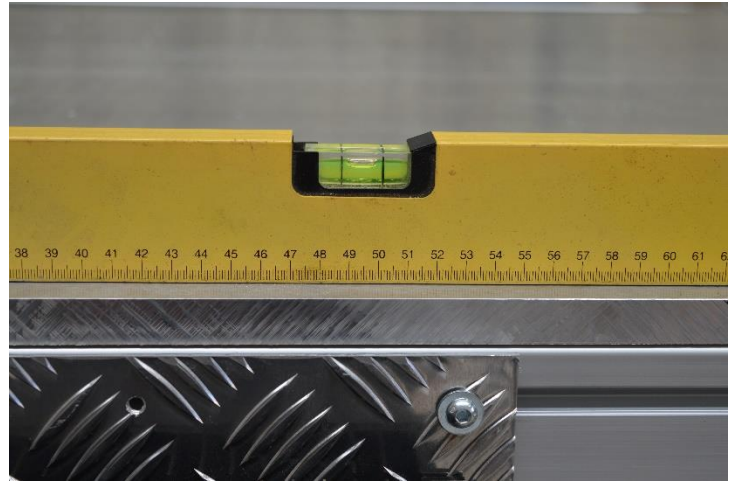
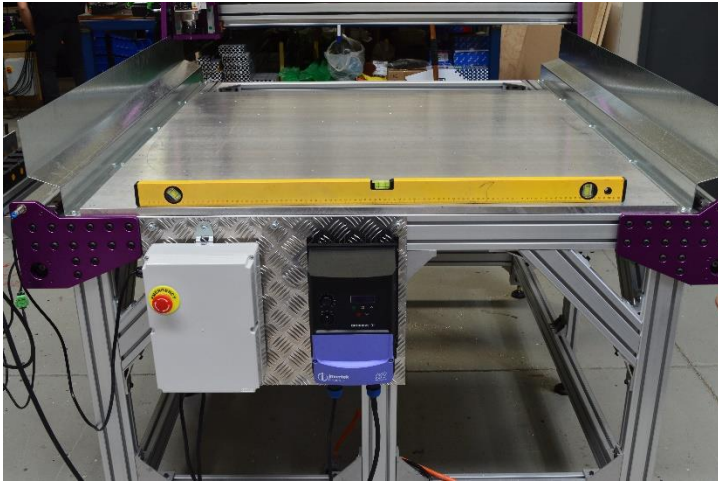
There are 2 nuts on each foot, the top one (closest to the extrusion) is a locking nut which you will need to loosen to adjust the foot height. The bottom one is attached to the foot and will adjust the foot's height as you turn it.



Starting at one corner of the machine, adjust the foot so it is firmly planted on the ground, then move to the next corner. Adjust all 4 corners first, then the legs in between.



Note: There is a leg under the bed of the machine so make sure to adjust it as well!



Ensure your machine is level in both the X (Left to Right) and Y (Front to Back) directions before moving to the next step.

Once the corners are done and the machine is level, have another look around the machine and make sure all feet (including the middle one under the bed) are firmly planted on the ground and the machine is steady. It should not rock or move around easily on the floor.

Using your 19mm spanner you can now lock the feet into position using the uppermost nut on the foot's thread and turning it counter clockwise up into the bottom of the leg.

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 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>
- ❖ Download and install the CH340 USB Driver for the Nighthawk Controller. It can be found here:
<https://www.cnc3d.com.au/nhc>

Let's plug it in!

Take the single power plug lead and plug it directly into a 15A wall socket. 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 by directly accessing the Nighthawk controllers web interface.

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

Surfacing Your Machine Bed

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 as well as ensuring any material on the bed is lying flat.

We have already created a surfacing operation unique to your machine in our factory however surfacing cannot be done until the machine is in its final position as any movement during shipping may nudge something out of place.

Please read through all the following steps before doing them to familiarise yourself with the process and so you know what to expect.

This will take you through the process of surfacing your machine's spoil board.

This process will take approximately 4 hours so make sure you have the time to complete the operation as it will need to be done in one sitting.

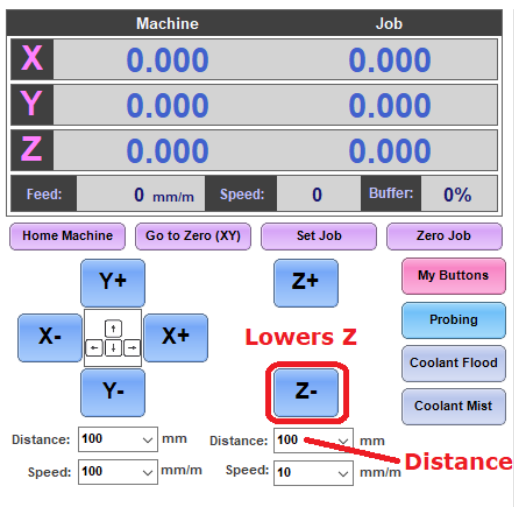
- Step 1:** Power on your machine, connect to it through Commander and Home your machine to clear the alarm.
- Step 2:** Loosen off the collet nut and attach your ER20-8mm collet. You can then insert your 8mm 1F Upcut endmill and push it in as far as you can before any of the cutting flute is inside the collet. You can then tighten it onto the spindle using a 21mm and 30mm spanner. Tighten it firmly but you do not need to overtighten – Tightening collets too hard can bend them and cause runout and inaccurate cuts.



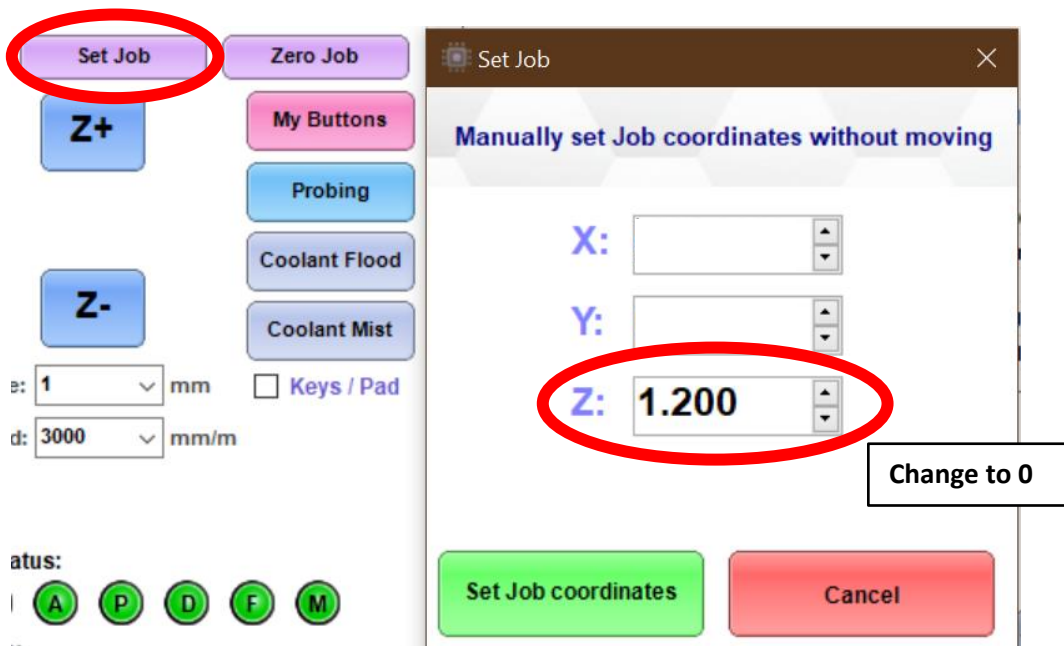
Step 3: Using the jogging buttons in Commander, move the spindle 50mm in the X+ and Y+ directions so that it is sitting above the machine bed.

Step 4: 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 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.



Step 5: Click the “Set Job” button and you will need to change the Z number to 0. **DO NOT** change the X or Y number.



Step 6: Home the machine. The surfacing job on your Nighthawk is programmed to run from the Home position. When the homing cycle is complete your “Job” Numbers should be X:0 Y:0 and Z can be ignored at this point.

	Machine	Job
X	1.000	0.000
Y	1.000	0.000

Step 7: In the “Run Job” tab you will find a job called “BedFacing-0.5mm.nc”. This is the job which will face your bed.

DO NOT RUN AT THIS POINT

The job will start at the far-right side, push 0.5mm into the bed and then cut from right to left. It will then retract, move back to the right side, and cut the next line.

**This next step will turn on the spindle and start the job.
Before starting the next step make sure you have your required PPE!**

If something doesn't seem right or the machine moves in an unexpected way, press the Emergency Stop button on the white box on the front of the machine to stop machine movement and the spindle.

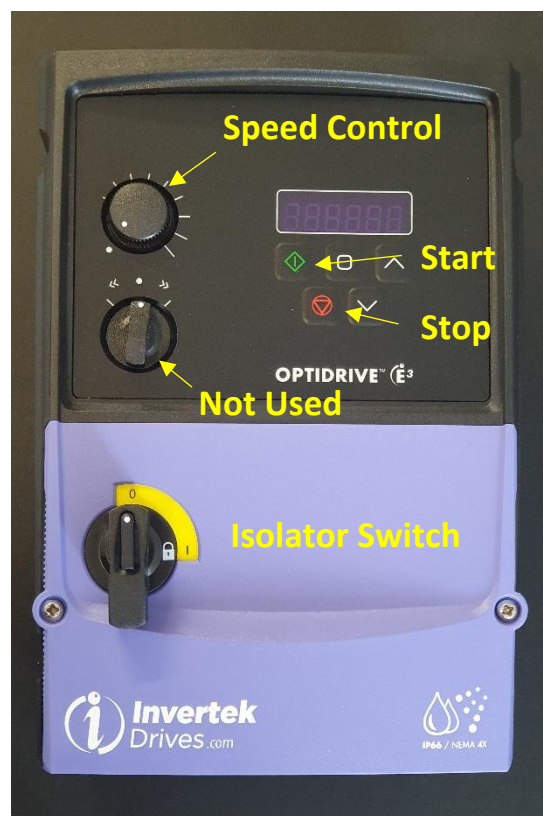
There are 2 different VFD setups on factory-built Metal Storm CNC machines. This is due to supplier shortages during manufacture however both versions are identical internally, the only difference is the interface.

Non-Switched: Spindle speed is controlled by the up and down arrow buttons while the spindle is running.

Switched: Spindle speed is controlled by the potentiometer on the front of the VFD while the spindle is running. You also will need to turn the isolator switch to the on position to provide power. **The FOR/REV switch is disabled so you cannot accidentally reverse the spindle direction or change the speed while spindle is running.**



Non-Switched



Switched

- Step 8:** Press the Green button on the VFD to activate the spindle.
Use the speed controls specific to your VFD to adjust the RPM of the spindle until it is sitting as close as possible to 16000, slightly higher is preferable to slightly lower.
- Step 9:** Click “Run SD Job” and the machine will start cutting!
This will start the process of surfacing your spoil board. **It will take roughly 4 hours to complete this job.**

If something doesn't seem right 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, press the mechanical E-stop on the white power 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.

Running Jobs

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 (Not recommended) or Bluetooth

Move your machine into the position you want the job to start from. This would generally be in a corner of the stock with the tip of the tool touching the top of stock, but this position will depend on how your job was set up in the CAM program used to create it.

In the Commander control software, Click the “Zero job” button. Then click on Load Job and select the file you want to run. Once loaded, press the green run button on your VFD and get the spindle up to the correct speed for the job. Once at speed, turn on your vacuum extraction (if attached) and click the ‘Run Job’ button. See sequence here:

The screenshot shows the CNC3D Commander software interface. On the left, the 'Machine' section displays coordinates (X: 0.000, Y: 0.000, Z: 0.000) and feed/speed settings. The 'Zero Job' button is highlighted with a red box and labeled '1.'. Below it are directional buttons (X+, X-, Y+, Y-, Z+, Z-) and a 'My Buttons' section with 'Probing', 'Coolant Flood', and 'Coolant Mist'. At the bottom left is an 'EMERGENCY STOP' button. The main area on the right is titled 'Run a G-code job' and contains a list of steps: 1. Load a G-code file from your PC (Not recommended on Bluetooth or Wifi), 2. Run a job stored on the SD card storage of your Nighthawk CNC / ESP32 Controller, 3. Turn on spindle, 4. Turn on vacuum, and 5. Run Job. The 'Load Job' button is highlighted with a red box and labeled '2.'. The 'Run Job' button is highlighted with a red box and labeled '5.'. The 'Spindle Control' section at the bottom right shows the spindle speed set to 100% and the 'ON' button highlighted with a green box. The 'Manual Command' section at the bottom right shows the 'Send' button highlighted with a blue box.

This will immediately start the job. If something doesn't seem right, immediately press the E-stop button on your control box or via our Commander software.

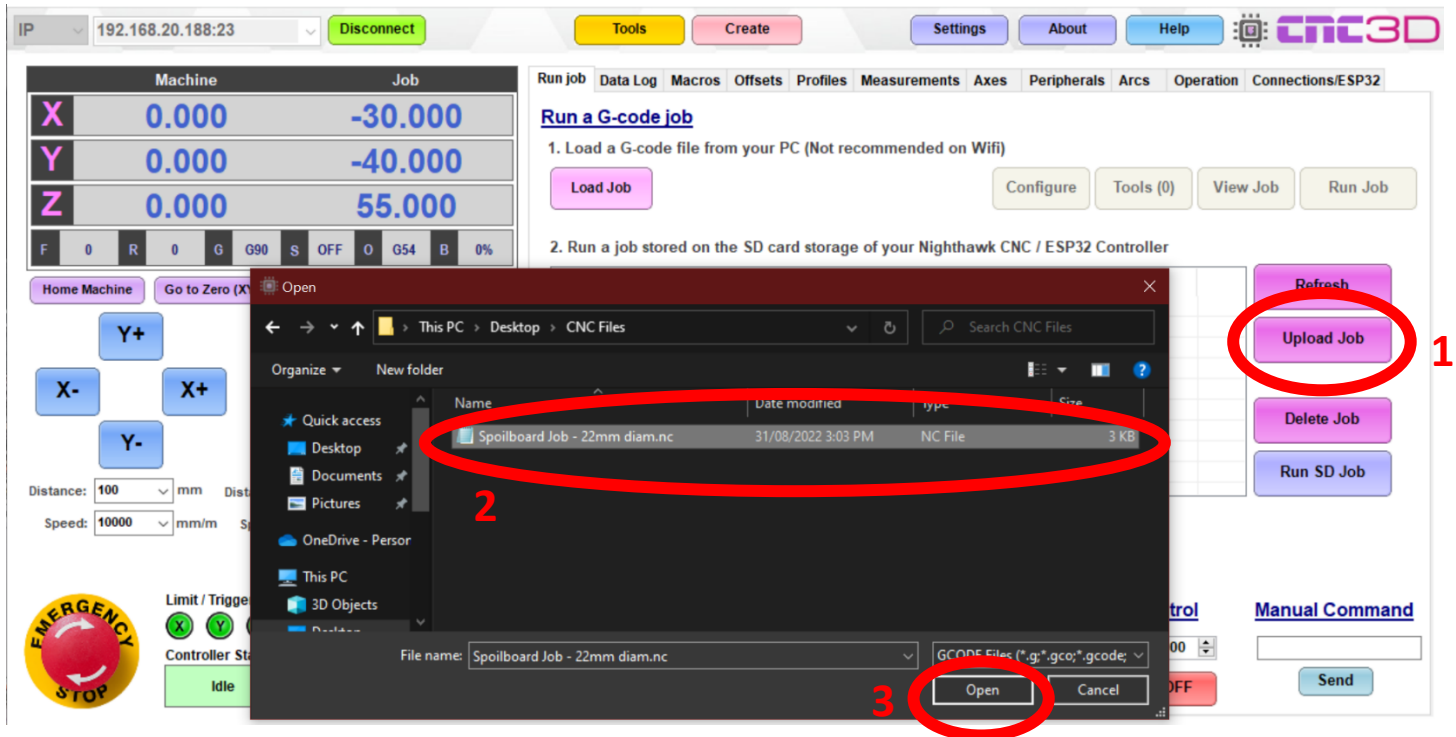
When the job completes, press the red button on the VFD to turn off the spindle.

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.

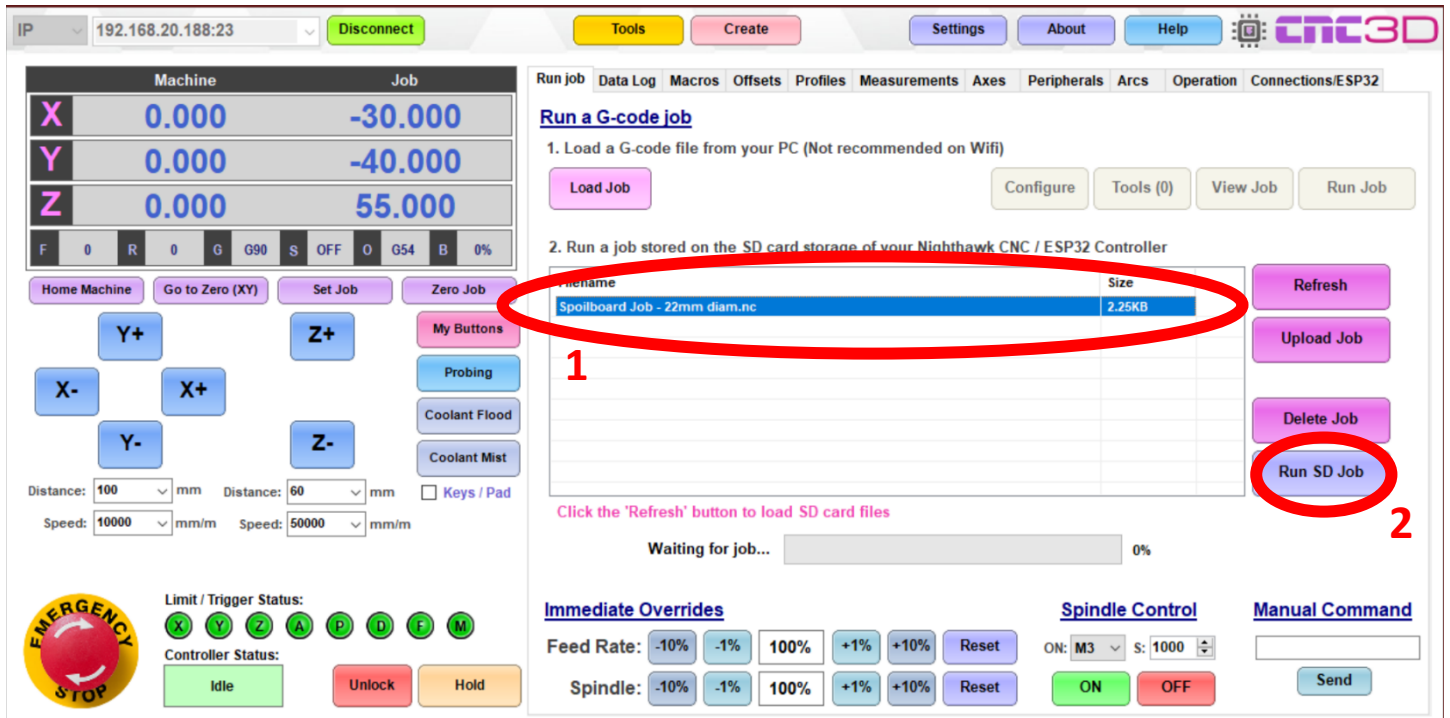
If you are connected to your Nighthawk via WiFi (Direct or Existing Network)

Move your machine into the position you want the job to start from. This would generally be in a corner of the stock with the tip of the tool touching the top of stock, but this position will depend on how your job was set up in the CAM program used to create it.

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 want to run and select the correct 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 which you can click OK on to close.



You're now ready to run the job! Attach your vacuum hose to the dust shoe (if fitted), press the green run button on your VFD and get the spindle up to the correct speed for the job. Once at speed, turn on your vacuum extraction (if attached) and click the 'Run Job' button. See sequence on the next page.



This will immediately start the job. If something doesn't seem right, immediately press the E-stop button on your control 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.

Metal Storm 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.

CNC3D Commander will remind you every 3 months to perform periodic maintenance!

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

Visit all the nuts and bolts on your machine. You will need a set of Allen keys from 2.5mm up to 8mm 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 or you run the risk of stripping the bolt heads.

2. Check to make sure your gantry is square.

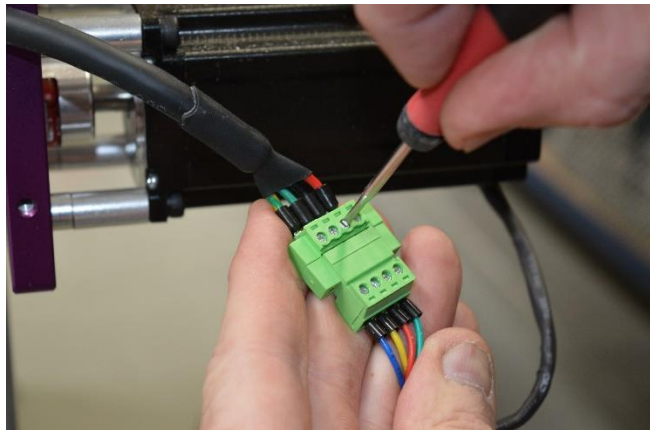
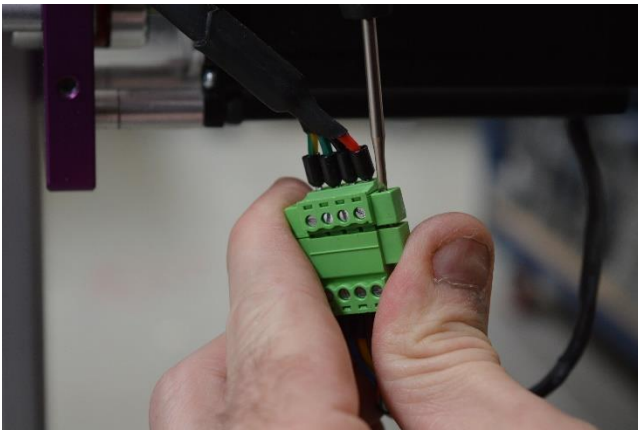
It is important to ensure your machine frame stays square. Use a tape measure or ruler to make sure both sides of the machine are equal distance from the front. To do this, measure from the gantry side plate to the front plate. Repeat the same process on the other side of the machine and record the results.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

Even though your Metal Storm machine has been set up for 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 as 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 ballscrews rust free and lubricated.

The recommended method is to use a grease gun and inject the grease into the nipples provided on your linear bearings. 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.

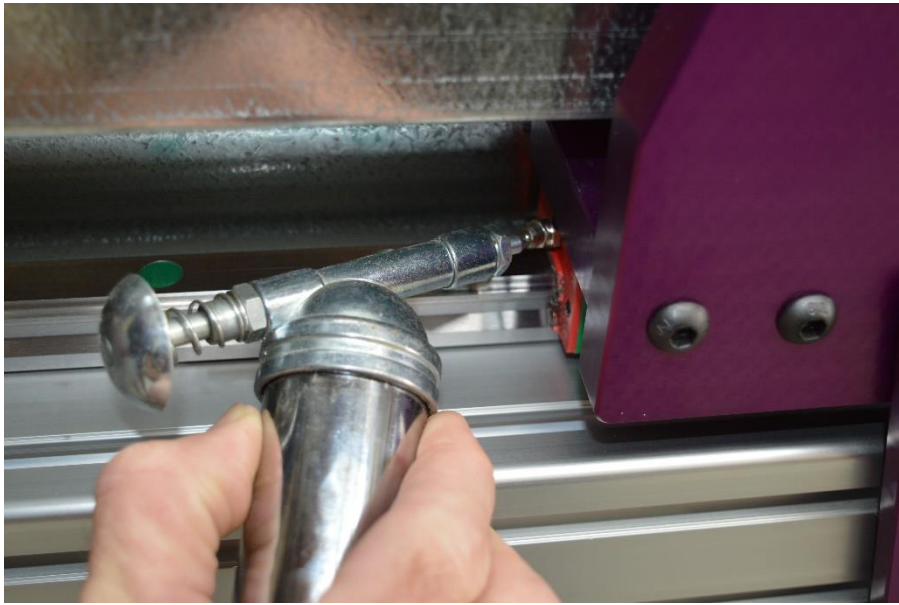
A Kingchrome mini grease gun works well. They can be special ordered from most hardware stores or directly from Kingchrome. See this video on how to lubricate using a Kingchrome mini grease gun:

<https://www.youtube.com/watch?v=ccsnIOzvoWI&t>

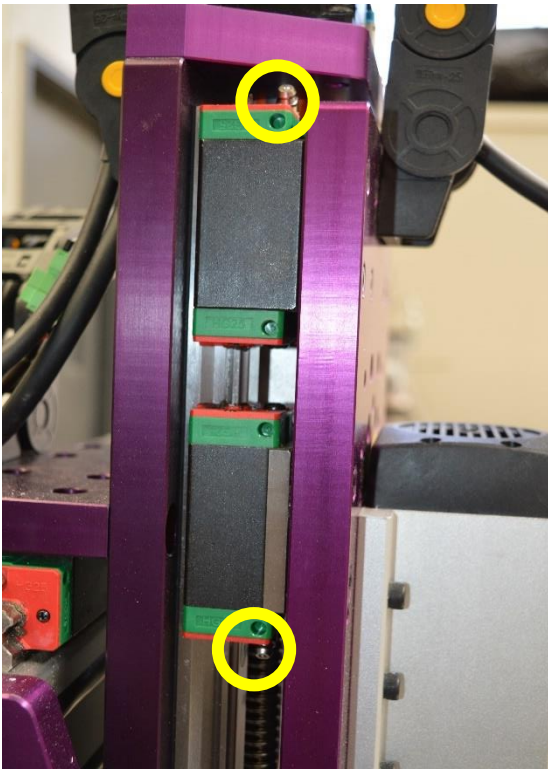
We use a general purpose NLGI 2 Lithium-based grease to lubricate the machines before they are shipped. **When selecting a grease, ensure it is compatible with Lithium-based greases!**

As a **temporary** solution, you can apply a fine coating of lithium grease aerosol on the rails and ballscrews and run the machine back and forth a few times to spread the lubricant on the rails/ballscrews. This will coat the surface and keep them running smoothly for a short time until you can source a more suitable grease and grease gun.

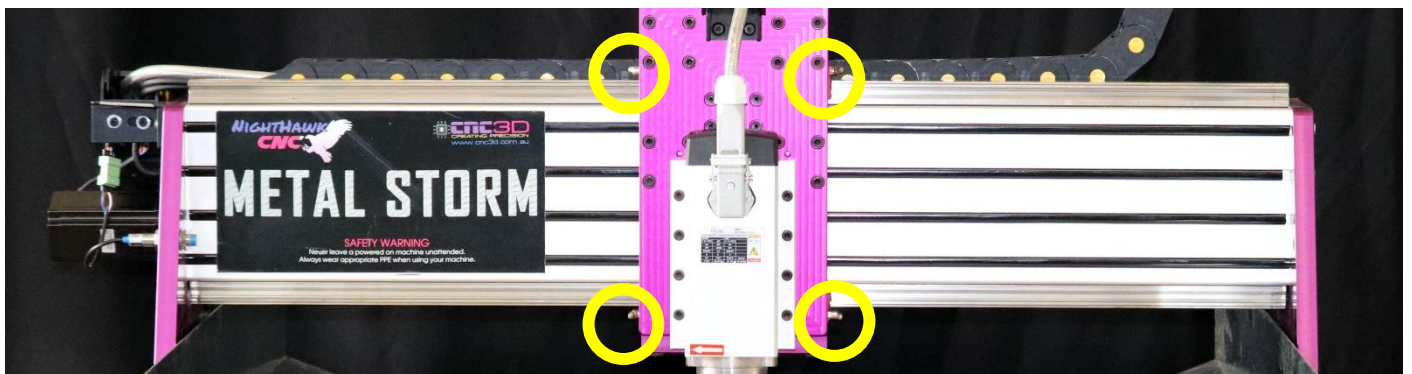
When filling the bearing with the grease gun ensure that no more than 1 or 2 pumps is used, or you run the risk of blowing out the seals on the bearing blocks. This should be performed no more than once per month with daily use of your machine.



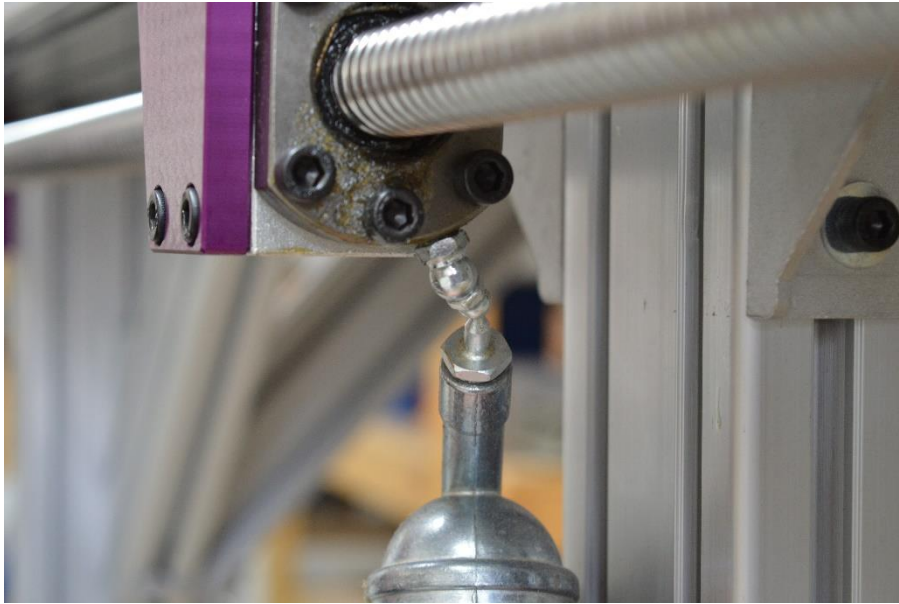
The photos below show where the grease nipples are located on each linear bearing block and how you can lubricate them.



There is a grease nipple on each bearing block. There are 4 on the X axis, 4 on the Z axis and 2 on each side of the Y axis.



There are also grease nipples on the ballnuts to allow a mini grease gun to push grease into the bearing.



5. Lubricating your radial bearings

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

Your Metal Storm CNC Machine uses angular contact bearings on all ballscrews. These bearings (also known as spindle bearings) are designed for use in industrial high-speed applications due to their ability to handle loads in both axial and radial directions.

The one downside of these bearings is that they do not have seals over the races, so you must keep them lubricated. The bearing closest to the motor is sealed in the block, however the opposite end is not so you will need to periodically lubricate them with the same grease you have been using on the rails and ballscrews.



Remember to use your grease gun to lubricate these bearings. Aerosol Lithium is not recommended as a long-term solution!

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>