CNCdrive
motion controls

I2rA AND UCCNC

I2rA CNC ROUTER USERS MANUAL

STONEYCNC

Date: 25/04/2014

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I2r

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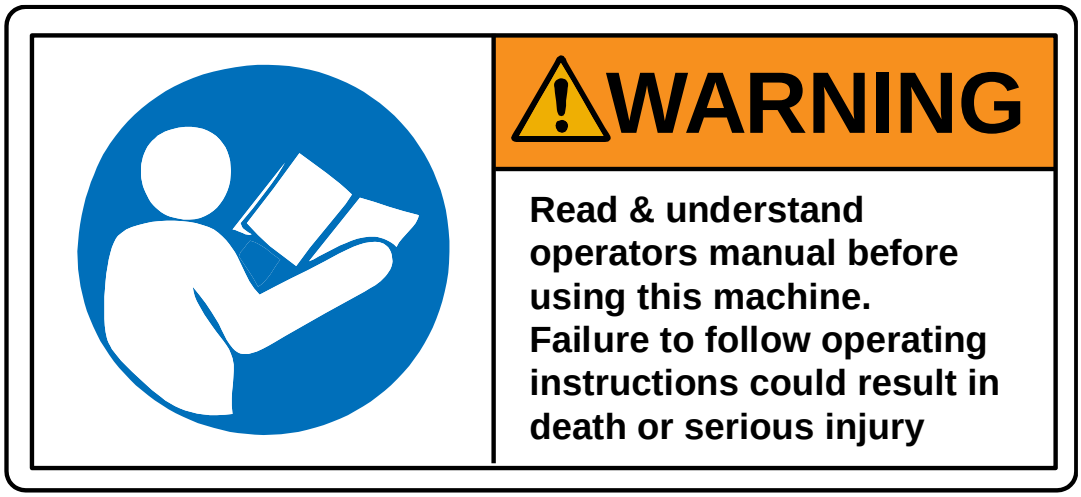


Before using/turning on the machine, the device should be carefully checked to make sure all connections are secure and the device is technically sound.

Ensure You understand the safety considerations of a machine provided in the open configuration without a safety enclsoure

Do NOT Interfere with the machine when under CNC control

NEVER LEAVE THE MACHINE WORKING UNATTENDED

TABLE OF CONTENTS

1 INTRODUCTION

Thank you for purchasing your i2r CNC router system. Firstly, please inspect the machine and all components after deliver has been received. Please check and ensure all aspects of the machine and associated extra items are in good condition and there is no evidence of damage or wear to any components due to the shipping process.

Please ensure you read the operational manuals for this i2r CNC router machine prior to attempting to use the system. All persons that use, or come into contact with the i2r router system must be familiar with the instruction manual prior to using the system.

This manual serves to provide the information needed to safely operate and maintain the i2r CNC router system. This manual has been designed to be used as an instruction tool as well as a reference tool for everyday work. Step by step instructions are provided where possible to help all levels of user understand the machine.

NOTE: Important aspects of machine use and best practice are highlighted and should be adopted where possible to maximise the machine tool life and performance. It is VERY IMPORTANT that all personnel read and understand the safety chapter BEFORE operating the machine. All Warning and Caution notices must be noted before interacting with the machine.

If there are any further questions or if anything is not clear, please contact us at info@stoneycnc.co.uk

2 MACHINE OVERVIEW

2.1 COMPONENT IDENTIFICATION

Component	Function
I2R controller	The I2R controller is the white control box that has the electronics necessary to move and manipulate the machine position and spindle speed
I2R CNC router main machine	This is the main machine XYZ carcass itself. This consist of 3 ballscrew driven axes on a steel frame
I2R main cutting spindle	The Cutting spindle rotates and drives the cutting tool in the materials the CNC router is asked to cut and process
I2R Stand	The I2R stand is a steel stand that the machine can sit on (This is optional extra)

3 SAFETY

The I2R CNC router is an electrical appliance and precision machine. Protect yourself and your investment. Read and understand the entire owner's manual before attempting assembly or operation. Read and understand the warnings posted on the machine and in this manual. On I2R CNC router Basic models, before attaching a router, read and become thoroughly familiar with all the router manufacturer's operating and safety instructions. Failure to comply with all the warnings may cause serious personal injury or costly damage to your I2R CNC router.

This I2R CNC router CNC machine is designed and intended for use by properly trained and experienced personnel only. If you are not familiar with the proper and safe operation of a CNC machine, do not use the I2R CNC router until proper training and knowledge have been obtained.

Your I2R CNC router machine is intended for cutting wood, acrylics, wood-fiber composites, certain plastics and non-ferrous metals. Do not use this machine for other than its intended use. If used for other purposes, I2r disclaims any real or implied warranty and holds itself harmless from any injury that may result from that use.

3.1 MEANING OF THE RELATED SYMBOLS

DANGER	Symbols and texts, that are marked with the addition "DANGER", warn against a specific threatening/dangerous hazard (serious injury, long term damage, death) **Unconditional attention must be given to these references!**
WARNING	Symbols and texts, that are marked with the addition "WARNING, "warn against a possibly threatening danger (serious injury, long term damage, death) **Unconditional attention must be given to these references!**
CAUTION	Symbols and texts, that are marked with the addition "CAUTION, "warn against a possibly threatening danger (possible injuries, risk of damages) **Unconditional attention must be given to these references!**
	Where the manual refers with this symbol (shown left) it contains very important references. Compliance is unconditional in order to avoid damage to people and property. **Unconditional attention must be given to these references!**

Danger through electric shock.

Danger through mechanical movements – danger of crushing and pinching

Danger through uncontrolled movement / crashing and heavy loads.

Danger through flying particles ejected by the machine system. Carry unconditionally visibility protection – ALWAY WEAR EYE PROTECTION –

READ THE MANUAL – and have the manual to hand at all times near the machining area.

DANGER spindle cutting edge

LOOSE CLOTHING – never wear loose clothing of jewellery near machine.

.

WARNING – ear protection must be worn

WARNING – face mast must be worn

3.2 Workshop Environment

1. Ensure that the floor can bear the weight of the machine and work pieces mounted on it.

2. Keep the floor around the machine clean and free of scrap material, oil and grease.
3. Do not lean lumber or other heavy materials against the gantry, guide rails or table.

4. Support the weight of the dust hose attached to the dust shoe accessory to prevent the weight of the hose from dislodging the dust shoe. Ensure that there is sufficient slack in the dust collection hose to allow the spindle to cover the entire work area.
5. Locate the I2R CNC router away from overhead pipes and plumbing fixtures to prevent condensation from dripping on to the spoil boards and control system components.

6. Locate the I2R CNC router away from sinks, faucets or other water supplies or storage to prevent splash-out that can damage the spoil boards and control system components.
7. Provide adequate room between the I2R CNC router and other machines in the shop to reduce the chance of accidental jarring when transporting lumber or other heavy materials through the shop and while materials are being worked on other machines.

8. Ensure adequate space between machines to allow for the possibility that the work piece will extend over the end of the I2R CNC router table.
9. Store cutting tools in a dry location and prevent contact to preserve the cutting edges.

3.3 Health and Safety

10. Always wear approved personal health and safety equipment as indicated for the materials and type of operations that will be performed. These should include a dust mask, hearing protection, safety clothing, and safety glasses/face shield. Do not rely on prescription or over-the-counter eyeglasses; they are *not* safety glasses. Wear ear protectors (plugs or muffs) even during short periods of operation.

11. Before operating this machine; remove any hand, wrist, and neck jewellery and roll sleeves up past the elbows. Be sure to not wear loose clothing which may become caught in the machine and confine long hair.
    a. Non-slip footwear or anti-skid floor strips are recommended.

12. Use a dust mask or other safeguards to avoid inhaling dust generated from wood products. Install dust collection equipment consistent with shop ventilation practices and budget. Remove dust and debris from the floor frequently to prevent slipping. Drilling, sawing, sanding or machining wood products generates wood dust and other substances known to cause cancer. Wood products also emit chemicals and must be dealt with accordingly.

13. In addition to other health hazards, dust from wood and other materials is flammable. Do not operate welding, wood burning, smelting, soldering or other high-heat tools on the AutoRoute™ table or vicinity.
14. Do not operate this machine while tired or under the influence of drugs, alcohol or any medication.

3.4 ELECTRICAL

15. Make certain the switch is in the OFF position before connecting the machine to the power supply.

16. Make certain the machine is properly grounded and the circuit is protected with a fuse or circuit breaker in accordance with local codes. Install a separate circuit if necessary to limit power loss when multiple machines in your shop are operating simultaneously. If necessary, place a cover on the outlet to prevent accidental disconnection.
17. Make all machine adjustments or maintenance with the machine unplugged from the power source.
18. Follow effective lockout procedures to reduce the risk from high voltage wires and components, and prevent intentional bypassing of safety controls and accidental operation.
19. Don't use in a damp or wet location, or expose to rain, fog or snow.
20. Keep the electrical cord away from sharp edges, heat or moving parts, and do not store materials on top of it. Position the cord so it will not become a tripping hazard.
21. While the use of an extension cord is discouraged, it is recognized that the wiring layout of the shop may not allow the placement of the I2R CNC router directly next to

an outlet. If it is necessary to use an extension cord, make sure the extension cord is in good condition, heavy enough to carry the current requirements, and installed to prevent a tripping hazard. An undersized cord will cause a reduction in voltage resulting in loss of power and overheating which may result in fire or electrical shock.

22. On I2R CNC router Basic models do not plug a router directly into a wall outlet. Connect it to the provided receptacle on the router table so that all machine movement can be regulated by the single controller.

3.5 Other Safeguards

23. Remove and store adjusting keys and wrenches before turning on the power. If necessary for visibility, apply safety markings to adjusting wrenches and keys.
24. Install safety guards consistent with general shop safety practices. Keep safety guards in place at all times when the machine is in use. If removed for maintenance purposes, use extreme caution and replace the guards immediately after completion of maintenance.

25. Check damaged parts immediately. Before further use of the machine, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function.

26. Keep visitors a safe distance from the work area. Keep children away.
27. Control liquids in your shop to limit the possibility of spillage that can damage the I2R which can cause damage or personal injury from electric shock or fire. Be careful with storage and use of cleaning fluids, finishes and solvents. Never use the table to apply or dry finishes.

3.6 Maintenance

28. Establish a weekly and monthly maintenance checklist and follow it diligently.
29. Routine maintenance should include periodic checks for alignment of moving parts, looseness or binding of moving parts, worn or bare wires, breakage of parts, skewed mounting and any other conditions that may affect its operation or cause injury. Analyse breakage or damage to determine the cause and take appropriate remedial action.
30. Do not operate the I2R CNC router if a component of the control system is damaged. It should be properly repaired or replaced before use.
31. Follow instructions for lubricating and changing accessories.
32. Store maintenance tools and supplies nearby, consistent with shop maintenance practices and resources.

3.7 Operational Practice

33. Never leave the machine running unattended. Always be in close reach of the emergency stop button.
34. Turn the power off and do not leave the machine until it comes to a complete stop.

35. Avoid pinch points and entanglement hazards. Keep hands and clothing away from the ball screws, thrust bearings, gantry, guide rails and rotating cutting tool while in operation.

36. Use the right tool at the correct speed and feed rate. Do not force a tool or attachment to do a job for which it was not designed. The right tool will do the job better and more safely.
37. Do not touch a cutting tool immediately after use. It will be hot and may cause skin burns. Exercise caution when handling the collet and spindle nut if the cutting tool is hot. Keep a heavy glove or oven mitt on hand for the purpose.

38. Do not lay a hot cutting tool on its side. Create a rack for cooling off hot cutting tools.
39. Use recommended accessories; improper accessories may be hazardous.
40. Do not use dull, gummy, or damaged cutting tools. Keep bits and other cutting tools clean and sharp for best and safest performance.
41. Turn off the machine before cleaning. Use a vacuum, brush or compressed air to remove chips or debris. Do not use hands.
42. Do not climb or stand on the machine. Serious personal injury and costly damage could occur if the machine tips over or the gantry is dislodged.
43. Remove loose items and unnecessary work pieces from the table before starting the machine.
44. Plan tool paths to make multiple passes rather than to take off a large amount of material at one time. This will reduce mechanical stress and heat on cutting tools.
45. Always secure a work piece to the spoil board using clamps, vacuum, or double-sided tape. If the work piece is mounted in a jig ensure that the fixture is securely held to the table. Never hold a work piece down by hand while operating.
46. Inspect the material of your work piece to detect any defects that may result in ejection of large pieces of scrap.
47. Make sure the work piece is free from nails, hardware, or other foreign objects.
48. After installing a cutting tool, make sure the collet is securely tightened. An unsecured cutting tool may fly loose from the collet and cause injury. Be sure that the adjusting wrenches have been removed and are secured before turning on the power.

3.8 EMERGENCY SWITCH PADLOCK

To avoid accidental or unintended use by young children or others not qualified to use the tool, the use of a padlock is required.

WARNING: FOR YOUR OWN SAFETY READ INSTRUCTION MANUAL BEFORE OPERATING TOOL:

To lock out an Emergency switch:

1. Open the padlock.
2. Insert through hole in the emergency switch (need depress this button).
3. Close the padlock.
4. Place the KEY in a safe place out of the reach of children.

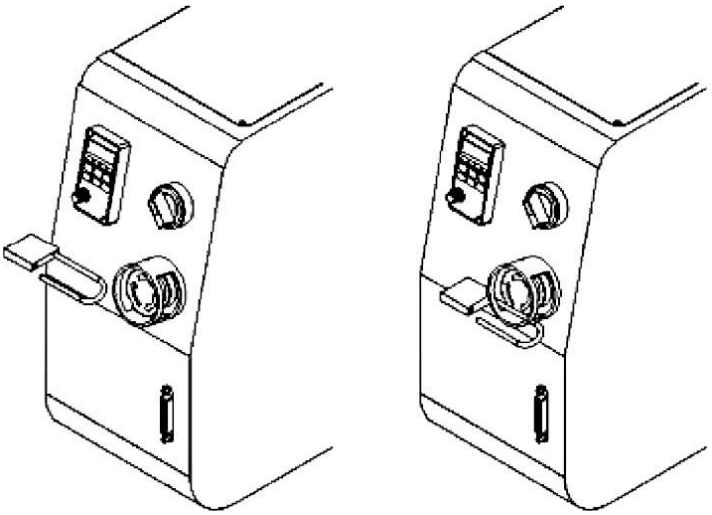


Figure 1: Padlock in estop

See Figure 1 for illustration

3.9 GROUNDING INSTRUCTIONS:

This tool should be connected to a grounded metal permanent wiring system, or to a system having an equipment-grounding conductor.

The I2R CNC router control system assumes the ground pin on the AC controller box connection is connected to a grounded conductor.

3.10 STORAGE

In the case where the machines are stored and not used for extended periods of time (greater than 3 days) the machine must be placed in an atmosphere free from moisture and from excessive changes in temperature. The slides must be kept clean and sprayed periodically with silicone spray. The ballscrews (more details in section 13) must be lubricated with a grease gun using the greasing nipple.

4 SPECIFIC SAFETY AROUND MACHINE GUARDING

Table top, and indeed any CNC router platform can be supplied in an open configuration. Or an enclosed guarded CNC system

- See below in Figure 2 where the machine is supplied in an open configuration

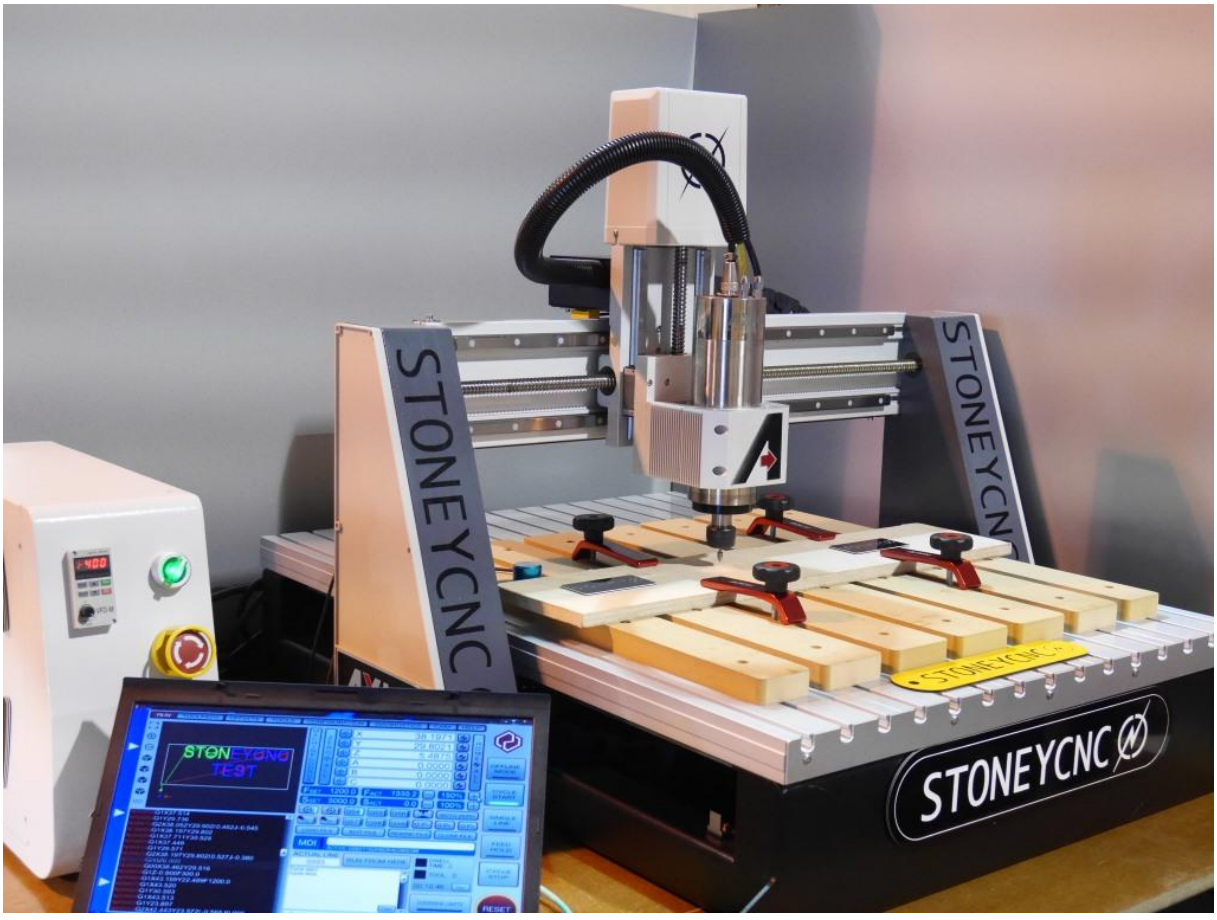


Figure 2: The I2R system in its open configuration

- Please see below in Figure 3 where the machine is fitted with a full safety enclosure.

- The enclosure has shatterproof lexan protection and the doors have provision for mounting a safety switch to the enclosure.
- Figure 4 shows safety switches fitted to the enclosure.

For a fully compliant system the CNC router system needs to be fitted with the safety enclosure and the safety switches. The safety switches lock the user out of the machine tool when the machine is active and controllable by the software.

In the case where an enclosure and safety switches are not supplied, the user of the machine system must carry out their own risk assessments and address the safety aspects of the open machine tool. Recommended aspects to consider to reduce the risk of the open machine tool are as follows

- Where is the machine located?
- Can the room / section of the room have limited access via keys / swipe cards / external interlocks?
- Who has access to the area of the machine?
- What level of skill does the person(s) who are using the machine have?
- Who else other than trained person(s) has access to the machine area?
- Does the power to the machine system power outlet have a lockable outlet?

The main issue / consideration surrounding a fully enclosed machine tool – is usually cost. While the enclosure does help eliminate dust and noise, the main function is to provide full protection from the machine tool. We can supply the machine with an integrated interlock system. This allows you to fit the interlock to your own installed guard / protection system.

Figure 3: Machine supplied in a full safety enclosure

Figure 4: Safety switches fitted to the enclosure

5 LIABILITY AND GUARANTEE

All statements in these operating instructions serve the certain and undisturbed business of the CNC Router.

The operating instructions are an important component of the machine, its safe use, and the long term reliability of the CNC router system. These instructions must be read and studied carefully by ANY operator of the machine system before use.

Improper handling of the machine can lead to serious injury to the operator(s) and severe damage to the machine. The machine manufacturer and provider are not liable (except in the case of due negligence) for damage and injury due to improper handling and use of the CNC router machine.

We the manufacturers and appointed agents reserve the right to make variations to the frame and components in the event of future developments.

6 WARRANTY

The machine system is guaranteed with a 12 month warranty from the date of delivery on site at the customer location.

The warranty covers all hardware aspects of the machine use within the 12 month warranty period ***provided the machine operation and use meets the following requirements:***

- The machine is used by *trained operators only*. The use of the machine by untrained persons will **immediately void** the warranty as well as putting the machine and the untrained operator in serious risk of injury or damage.
- The machine is used within the application scope recommended/discussed. This will have been discussed with the customer during the enquiry. Machining of hard materials e.g. stainless steel or other hard metals will put the machine under excessive stress and load, and will void the warranty. Section 7 outlines the scope of work that can be carried out on the CNC routers.
- The machine is maintained in the same state and configuration as when the machine was delivered / installed. Modifications effecting the safe operation of the machine will void the warranty.
- The environment where the machine is kept does not expose the machine to excessive moisture or thermal changes.
- The AC electrical supply to the machine is reliable and free from excessive noise – if necessary a dedicated MCB/RCD switch may be required.
- The AC electrical system has a reliable and professionally installed earth connection.
- StoneyCNC must be notified in the case where a mist coolant system is to be run on the machine. Special precautions are needed and the machine configuration will be different if mist coolant is to be used

- The machine is kept clean, free from build-up of materials on moving parts especially the linear slides, and generally in good condition. Excessive build-up of material around the spindle and the linear slide mechanisms of the CNC router frame can cause excessive loads in the drive system and damage to the machine drives.
- The maintenance of the ball screws is carried out periodically to ensure free unrestricted movement (see section 13)
- The linear slides are periodically cleaned, inspected and lubricated (see section 13)
- The cables to the machine, the power and communications are managed and protected. Damaged cables can cause short circuits and can damage the machine's sensitive electronics. Machine damage due to cable damage voids the warranty terms.

- Damage or failure of the machine, or part of the machine is reported to StoneyCNC immediately upon discovery of a problem.

6.1 WARRANTY REGARDING THE CONTROL PC

In the case ***where StoneyCNC provide a PC for the CNC router operation*** the Guarantee on the control PC will be in-line with the CNC router system.

In the case ***where the customers control PC is used*** StoneyCNC can take no responsibility for loss of functionality caused by subsequent failure of the customer's PC. In the case were StoneyCNC installs the machine on site, StoneyCNC will test the control PC to ensure it is suitable for controlling the CNC router system.

We can provide remote login and reconfiguration if the control PC goes down or has an issue. We recommend you purchase a fresh new control PC prior to the machine arrival and use this as the dedicated machine for the CNC system. A moderate spec Windows PC is sufficient for controlling the machine. Any extra/additional CAD packages you wish to run may require you to wish to upgrade to a higher spec windows system.

A Laptop is fit for purpose and often the preferred unit to control the system – you as a machine operator need to consider how to manage the use of the control PC as it is important not to let the swarf and chips generated during the cutting process interfere with the PC's – for example - the keyboard etc.

7 RECOMMENDED USE

7.1 TYPICAL APPLICATION MATERIALS

The I2R CNC router systems are suitable for milling, boring, engraving the following materials:

- Wood.
- Plastics.
- Aluminium and other NE metals (under certain very specific conditions)
- Fibre composites e.g. GFK or CFK (with specific attention to the dust generated from cutting)

The above list of materials is appropriate if the following conditions are met

- Appropriate tooling is used for the job requirement
- The tools have been installed correctly in the collet mounting system in the provided spindle. Never use a tool outside of its operating parameters.
- The spindle speed and feed rate are appropriate for the job
- In the case where you are machining aluminium some extra care is required to maintain good chip development. If necessary a cold airline will improve chip generation.
- Coolant may be required in some cases where aluminium is the main application. In the case where coolant is used the operator must pay close attention to manage the coolant run off.
- In all cases – especially where composites are machined – provision of adequate extraction systems to eliminated hazardous swarf, dust and particulates must be implemented.

7.2 SPECIAL NOTE ON APPLICATION MATERIALS

If the CNC router system is used on materials outside of the scope of recommended use then the warranty does not cover and issues caused by this incorrect machine usage.

8 MACHINE INSTALLATION

8.1 MACHINE INSTALLATION BY STONEYCNC DELIVERY VEHICLE

In the case where a Machine is delivered by StoneyCNC directly to the customer then the following aspects must be taken into account

- Prior to delivery StoneyCNC must be notified of any narrow or difficult access areas to the position where the machine will be finally installed
- If any access points / hallways / gates etc are narrower / smaller / lower than normal and the machine has to go in at difficult / awkward angles then StoneyCNC should be notified of such issues prior to delivery.
- It is important that sufficient man power / forklift is provided to allow easy movement of the machine into place
- If manually lifted then 4 able bodied persons. 1 on each corner of the machine and the machine should be lifted without any cardboard underneath it.

Figure 5: I2R with box cover removed and ready for lifting

8.2 MACHINE INSTALLATION BY FREIGHT

In the case where a machine is not delivered by StoneyCNC but is delivered by a third party then EXTRA care is needed to ensure the machine is handles correctly.

The machines are crated in cardboard covering and then in timber crates or on heavy duty timber pallets.

Please mange the machines with extreme caution and only use forklifts to move the crated machines on their pallets. Figure 6 shows what a crated I2R i2rA-2.4 looks like.

Figure 6 Scope of crated machine delivery

8.3 MACHINE ASSEMBLY ONCE DELIVERED

Once you have verified the machine and their contents are 100% okay and damage free after transport then you can begin the setup process.

NOTE: in the case where StoneyCNC will visit and install machine some (or all) of these tasks will be carried out by one of our installation engineers.

8.3.1 SETTING UP THE STAND

The steel stand is an optional extra with the machine. So if you have purchased this part then please proceed through the assembly steps.

Packaging contents for the I2r Precision Stand

2-Stand upright (front & back)
2-Cross braces
1-Lower shelf plate
1-Stand hardware package

Hardware package contains:

4-Swivel casters
4-Leveling Feet
4-hex nuts
16-Hex bolts (M8x25)
16-Lock washers (M8)
16-Flat washer (M8)
16-Hex bolts (M6x12)
16-Lock washer (M6)
16-Flat washer (M6)
1-Controller hook
2-Machine screws (M4x6)
4-Small rubber pads

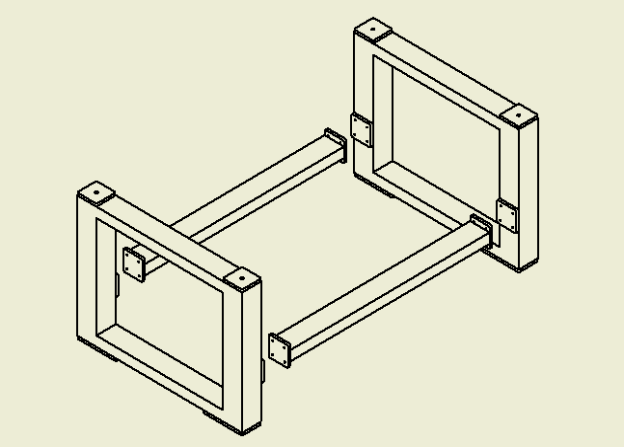


Figure 7: I2R steel stand assembly overview

Remove all contents from shipping boxes. Do not discard carton or packing material until assembly is complete. Accessories commonly ship inside machine or stand packaging and can be easily over looked.

Tools required for assembly:

#2 Philips-Screwdriver

10mm, 13mm and 17mm sockets and socket wrench

24mm open-end wrench

2mm and 3mm Allen key

Spirit Level

Assembling Stand (all models):

Assembly for stand fitting all Basic and Pro model machines is the same. The only difference is the length of the cross braces.

Figure 8: Castors and feet

- Thread a loose hex-nut onto each of the levelling feet.
- Turn the square stand uprights upside down. Do this on top of the cardboard packaging to prevent scratching.
    a. Install the levelling feet and swivel casters using M6 hex bolt, M6 lock washer, and M6 flat washer for each caster. Tighten all the caster hardware securely. The levelling feet can be adjusted later.
    b. Rotate uprights so the cross-brace mounting plates are facing each other. Separate the uprights far enough that the braces can fit between them.
    c. Align the cross-braces between the uprights and bolt the mounting flanges to the plates using (4) M8 hex bolt, (4) lock washers and (4) flat washers for each side.

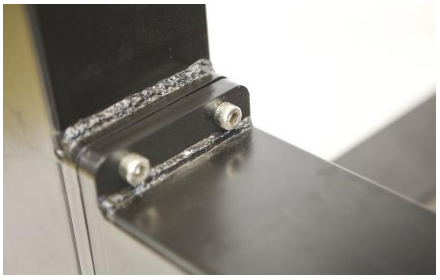


Figure 9: Bolted connections for stand

As seen in the diagram above (Figure 7), the braces should be rotated correctly for the tool-box and shelf to sit at the correct height. Braces should be mounted so that the top and bottom are the larger flat surfaces

- With assistance, the stand can now be flipped over onto the casters and levelling feet.
- Flip the shelf upside down and stick of the rubber pads on each corner of the shelf flange.
    a. Install shelf between the braces on the stand, all the way forward.
    b. The small rubber pads should now be between the flange and the top surface of the brace. This will help prevent unwanted movement and scratching.

Figure 10: Toolbox

- If the optional tool-box has been purchased, the shelf can be slide to the far back of the stand (AR6 and AR8 models only, AR4 models, will no longer have room for the shelf).
    a. Turn the tool-box upside down. Install (1) of each hanger on either side of the toolbox using the installed rivnuts and (2) 3mm cap-screw each.
    b. Insert the tool-box into the stand, from the top. The hangers will with snugly between the braces on either side of the tool-box.
    c. The front can be slid forward to rest within the opening on the stand upright.
- Install the hook on the front right-hand side of the stand using the included hardware.

Figure 11: Hangers for toolbox

Figure 12: Hanger for USB pendant P2S (optional)

8.3.2 SETTING UP THE MACHINE ONTO THE STAND

Packaging contents for I2r Precision CNC machines:

1-Router table assembly

1-Electrical control box

1-Controller cable

1-Tool touch-off puck

1-Stepper Motor

1-Top stepper motor cover

2-Collet wrenches (Pro Model Only)

1-1/4” ER-20 Collet (Pro Model Only)

1-1/2” ER-20 Collet (Pro Model Only)

4-Rubber bushings

4-Hex Bolts (M17x45)

4-Washers (M17)

1-2mm Allen Key

Figure 13: Machine setup summary

Installing the router table on the Stand:

The CNC router table assembly is heavy. Please use a secure means and use caution when lifting onto the stand. At least 3-4 able bodies persons are needed to lift the machine onto the stand.

To avoid damage, be careful to never lift the router by the gantry. Always lift the router under the T-slot table or under the steel frame.

1- If using a forklift, keep forks under the steel frame to avoid damaging the wiring and mechanics of the machine.
    a. Place a scrap piece of lumber beneath the router assembly and carefully slide forks beneath the steel base.

    Make sure the forks extend through to the other side of the machine for safe lifting. See Figure 14 **for more detailed info. It's IMPERATIVE you lift only from the steel frame.**

Figure 14: Ensure forks extent the entire way across the machine

2- Position router over the stand and align holes on router mounting flanges and stand uprights. Being careful to make sure the stand is properly oriented with the machine front.
3- Place rubber bushing over the holes in the stand. Lower the machine to sit on the bushings.
    a. Attach the machine to the stand using M10 Hex bolt, washer at each corner.
    b. Insert the bolt/washer through the machine mounting flange and the rubber bushing.
    c. Thread the bolt loosely into the stand mounting holes. **Do not tighten until all bolts have been threaded.**
    d. Remove fork lift and tighten bolts evenly.
4- Place level on the router table, then level the assembled machine by adjusting the levelling feet. Be sure to level the machine in all directions.

Figure 15: Rubber feet

Figure 16: Castors and feet

8.3.3 FINISHING MACHINE ASSEMBLY:

With the machine mounted on the stand, or safely on a secure work surface if a stand was not acquired, now it's time to begin finishing the setup.

1- Locate and install the stepper motor to the top of the Z-axis motor seat, on the gantry tower.
    a. Use the existing 4 cap-screws found on the motor seat to secure the stepper motor
    b. Tighten the two set screws in coupling that attaches stepper motor shaft to the ball-screw.
    c. Install plastic cover over stepper motor mount and tighten the two screws.

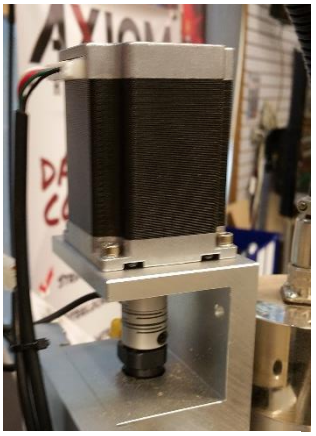


Figure 17: Z axis motor installation

8.3.4 Final Mechanical Setup Preparation

Once you have unpackaged your I2R CNC router and located it on a bench you have chosen or the I2R bench as per the above steps, it is time to connect the machine and control system together in preparation for first steps.

1) Locate it on a stable bench (as per the above steps)
2) Put the controller near the machine on the same bench (or under machine on I2R stand)
3) Locate and turn on laptop / PC to control machine next to the controller (see Figure 18)

Figure 18: Locate control PC near to machine and control box

First connection steps

The following steps should be carried out to ensure safe setup and operation of the machine. At all times inspect all connectors and anything you are handling for damage or any sign of mishandling.

Figure 19: Cable summary out of control box

1) There will be 3 cables coming out of the control box (control box is identified in Figure 19).

- 2 cables will connect to the machine as shown in Figure 20
- Carefully seat these cables (there is only one correct way to seat connectors)
- Carefully tighten the connectors and careful not to cross thread the locking part of the connectors.

Figure 20: Connections to the back of the machine

2) Check the Green switch (shown in Figure 21) on the front of the controller box

- Switch should be clicked anticlockwise for OFF!
- NOTE Figure 21 shows switch in the OFF position.
- Switch OFF before plugging into mains supply

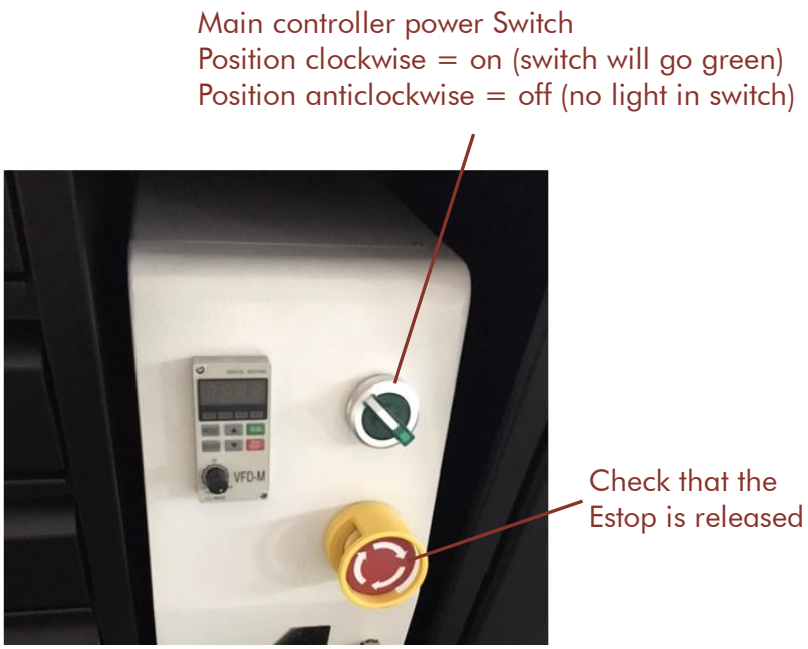


Figure 21: Green power switch and estop on the controller

3) Plug in the 3 pin plug powering the control box into the AC wall socket outlet.

- Ensure the connection has RCD and standard domestic electrical protection installed
- Inspect the plug for any sign of damage
- Do not plug into a live socket
- Turn on AC power at the plug

4) Turn on the mains controller switch

- Figure 22 shows the green switch in the ON position
- The switch should light up green (you might hear a small clunk from motors engaging)
- You should see the Ethernet connector on the front of the white control box blink green.
- Connect the Ethernet port to the control PC (connection sequence not important)
- You are now ready to setup the UCCNC controller and run your I2R CNC router!

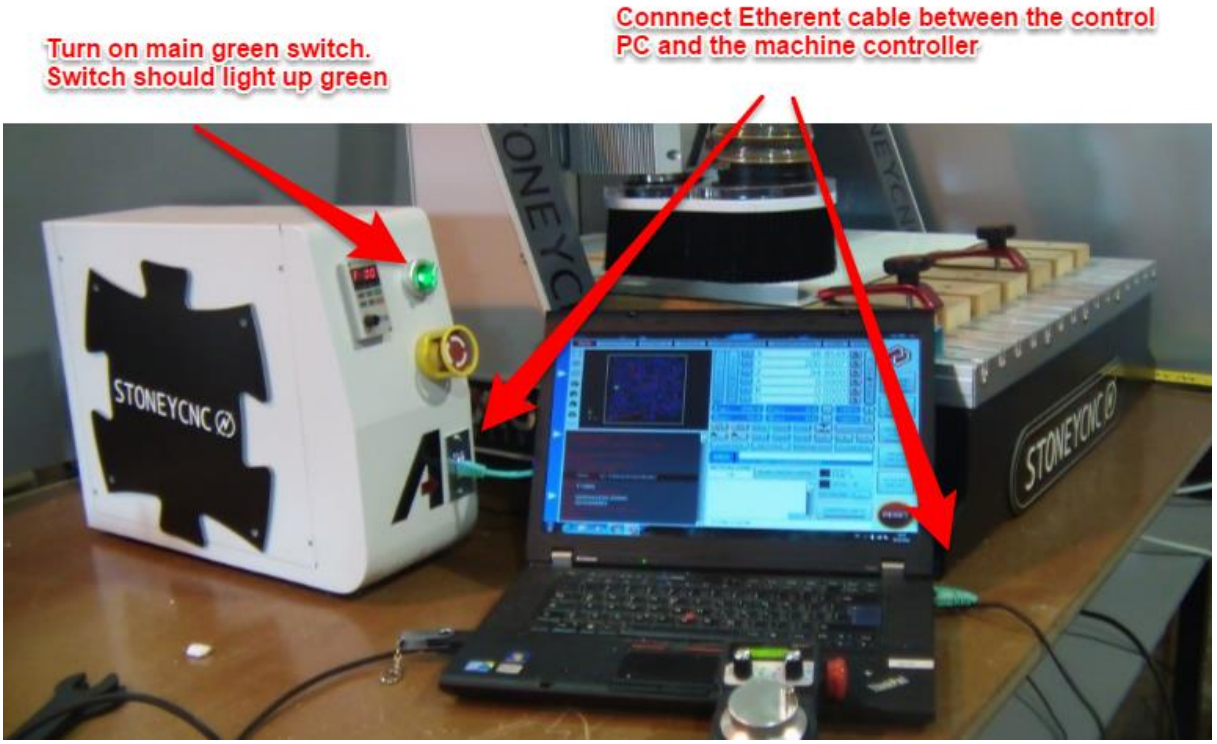


Figure 22: Turn on mains green power switch and plug in Ethernet connector into PC and controller

9 I2R SETUP AND CONFIGURATION

This section of the manual is intended to show you how to configure your I2R CNC ROUTER machine to be controlled by UCCNC software. The UCCNC software is a full Gcode based machine controller and is therefore compatible with Gcode based CAM packages. We support the UCCNC in conjunction with Vectric products. Cut2D and VcarvePro are the two most popular CAM packages we support. The combination of Cut2D/VcarvePro and the UCCNC is a very user friendly and powerful machine control package, whilst remaining easy to use.

Visit www.Vectric.com where you can download Vectric CAM packages and run them in demo mode where you can test them out.

Please read this manual completely before using your I2R CNC ROUTER system with the UCCNC software.

To minimise the risk of injury and/or to prevent property damage, please only operate the machine and the associated control unit when you are sure that you have understood these instructions completely!

Should questions arise, please contact us.

Email: ***info@stoneycnc.co.uk***

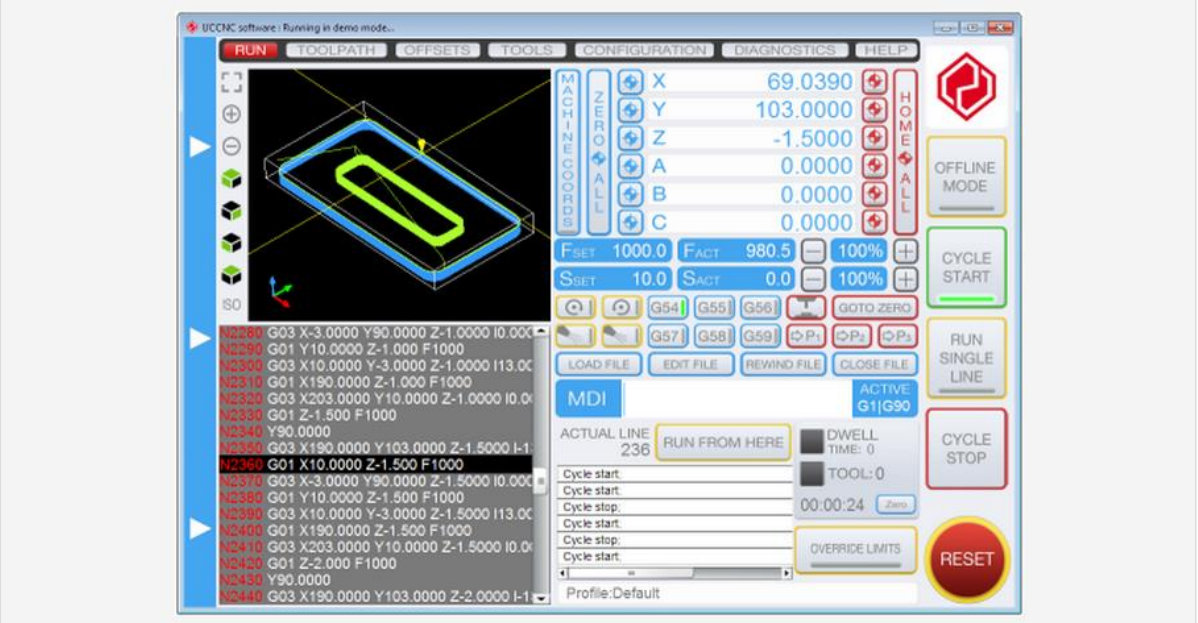


Figure 23: UCCNC controller main GUI

9.1 INITIAL MACHINE SETUP FOR UCCNC OPERATION

Items required for UCCNC operation

You need to make sure you have the following items for using your I2R machine with UCCNC.

- I2R AR series CNC router
- UCCNC compatible controller
- Control PC with Ethernet port
- Control PC connected to the machine
- Machine controller on and powered up.

Figure 24: I2R AR series router sitting next to controller and PC

9.1.1 UCCNC SETUP PRECHECKS

This section assumes you have done the following

1) Securely located your machine on your workbench or I2R supplied table
2) You have successfully connected your controller to your I2R machine
3) You have turned on the controller
4) You have a windows based laptop running beside the machine
5) You have connected the machine to the control computer using CAT5 Ethernet cable

You should have a set of files on a USB stick with all the installation steps. If not please contact us and we will send you an installer package.

9.1.2 UCCNC INSTALLATION

The installer files are all on your USB key or the link sent to you via email.

- Do not rush the installation.
- For the I2R Ethernet controller, no USB drivers are needed.
- See Figure **25** for the link you will receive via email to install the software
- $$$$$$$NOTE$$$$$$$ Please download the main installation drop box link in full before you start – see Figure **26**
- Please download and unzip the folder before you start

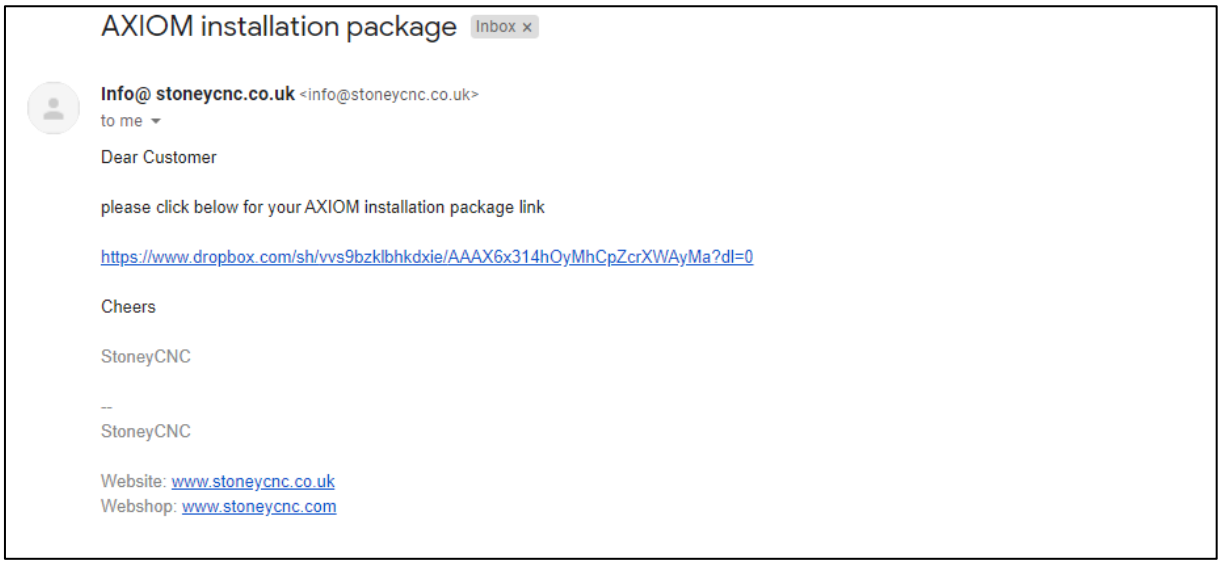


Figure 25: AXOIM installation link

Figure 26 Click on download when you open the link – this will open small sub menu

Figure 27 Clock direct download to download the folder

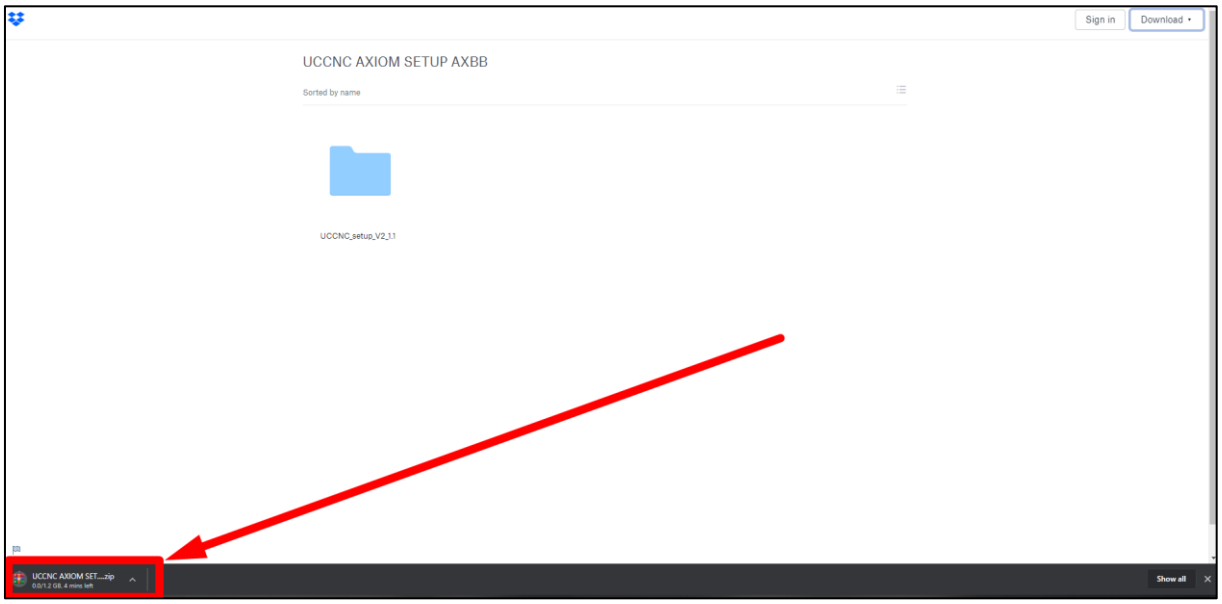


Figure 28 the installer will download to your computer

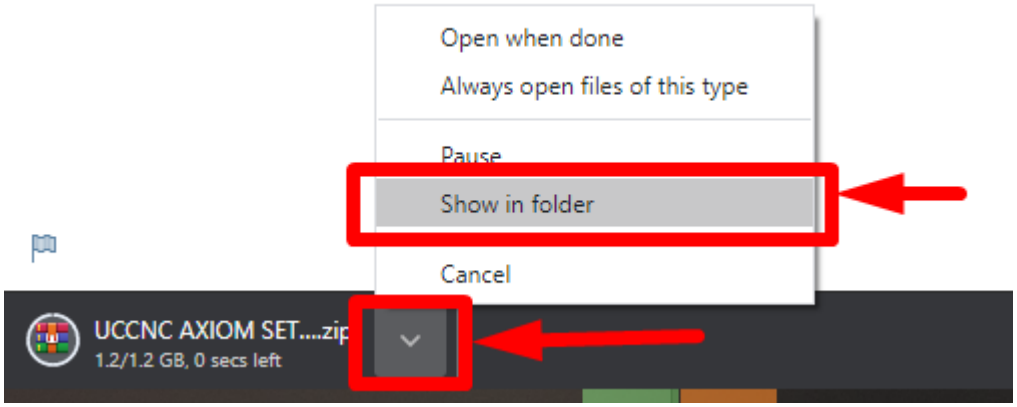


Figure 29: Navigate to the folder where it was downloaded

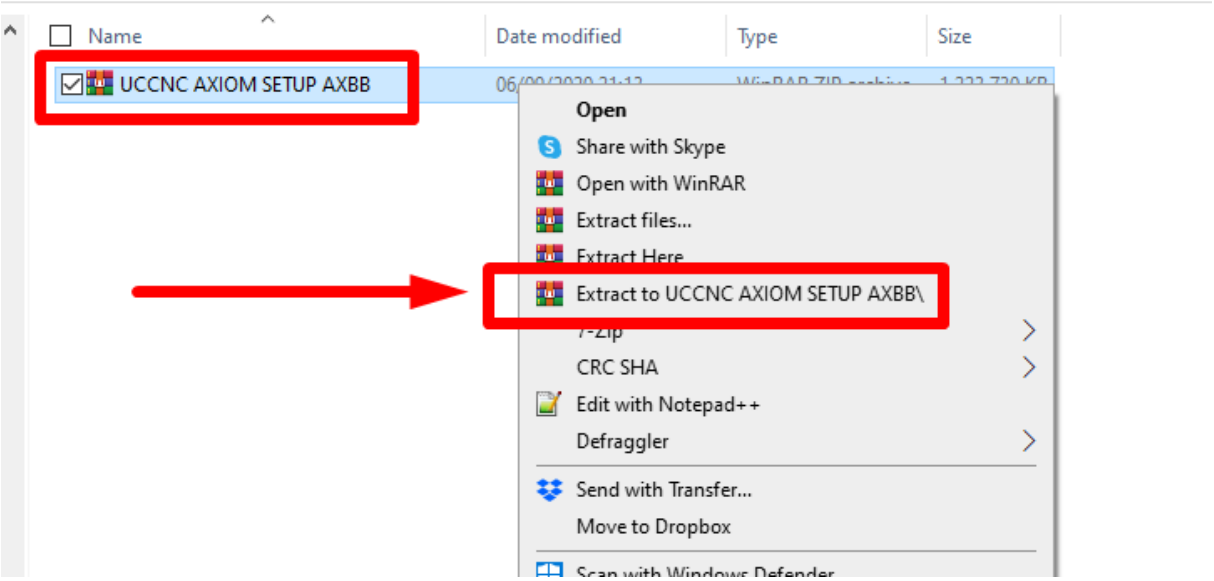


Figure 30 Unzip file when its downloaded – right click and unzip the file

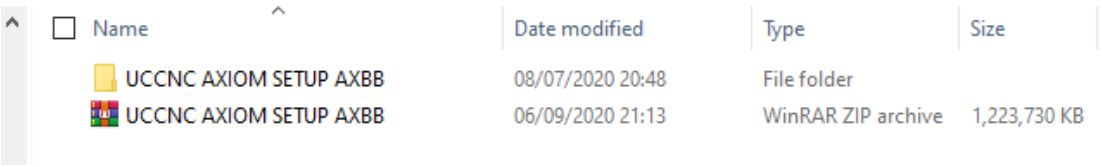


Figure 31: You will now have access to the installation folder

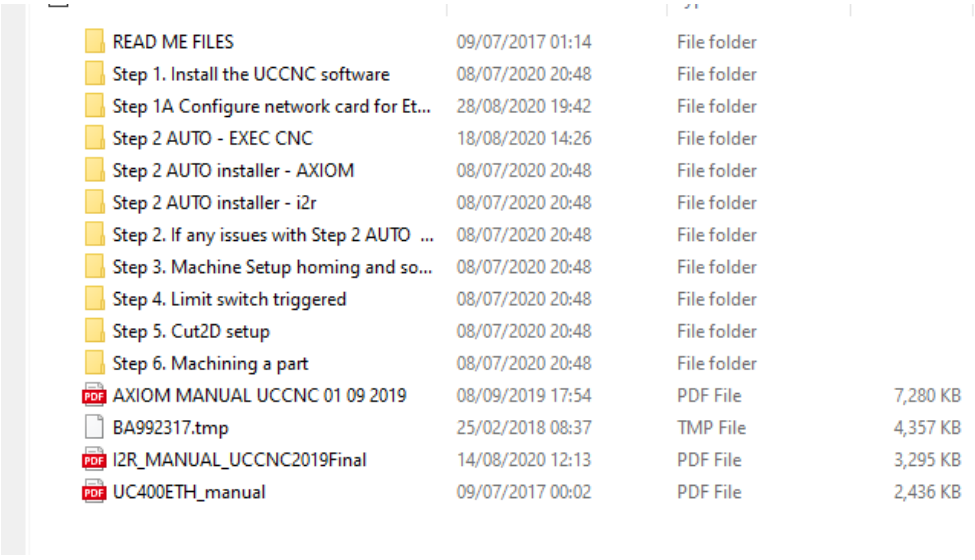


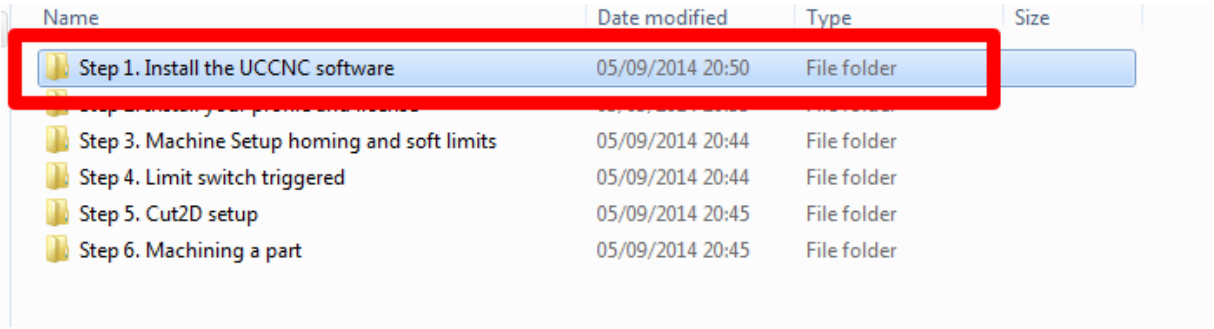
Figure 32: You can now begin the installation

9.1.3 INSTALL THE UCCNC STEP 1

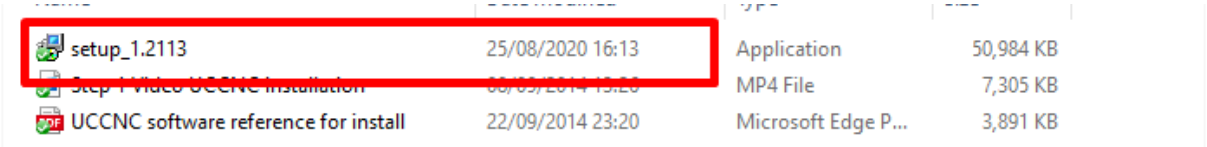
You can now begin the software installation process.

Open up STEP 1 from the installation folder and double click the installer. Please refer to the ***UCCNC software reference for install*** PDF when installing. Depending on the PC certain steps during the installation (like USB drivers) can take some time. If you are installation and I2R CNC router you can ignore the USB driver installation steps

1. *Enter the installation folder*



2. *Run the installer (note the version in this manual may differ from the version in your installer*



Please watch the installation video (should be included in your USB/Email link in the same folder as the installer for your UCCNC)

The latest version of the installer is always available on the CNC Drive website

9.1.4 IP ADDRESS CONFIG – STEP 1A

Your UCCNC module in the I2R controller is an ethernet controller. Ethernet control is the most robust control for CNC applications. The controller requires IP address to be set on the local PC connected to the machine.

Please refer to step 1A for network config of your network controller.

Figure 33 shows the IPV4 network IP address that needs to be set. Please refer to the UC400ETH manual for this setup in step by step details.

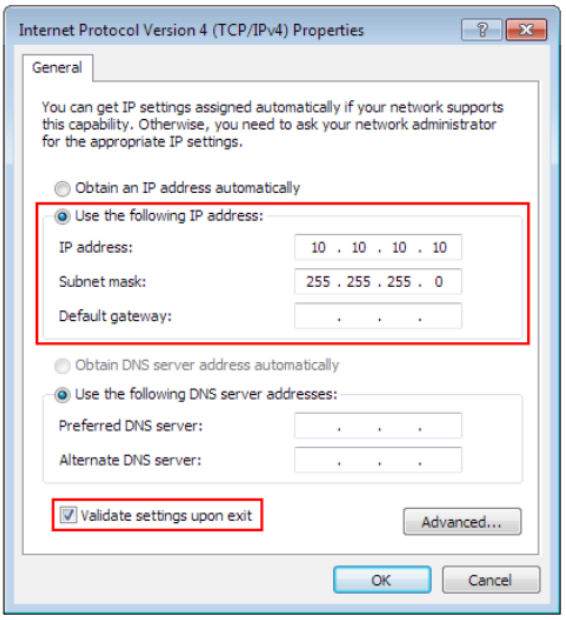


Figure 33: Network settings that need to be set prior to running the machine

Once configured you can run the utility scanner to check the module is connecting to the machine okay.

- The UCCNC utility checker is in the Cdrive/UCCNC/Util main folder.
- Open the utility checker and hit scan
- You should see your module number pop up on the screen
- This is your main controller licence number
- You should have been sent a licence file with your machine. The licence file is a text file you will be sent to unlock your controller and software connection.

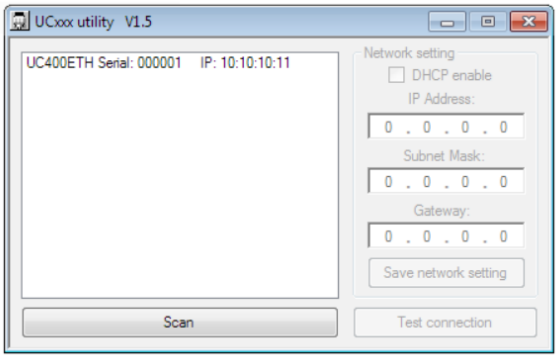


Figure 34: Utility scanner showing that the module is connecting okay with the computer

9.1.5 STEP 2 AUTO INSTALLER

NOTE: please download the full installation pack to the desktop before you start or this installer won't run. The profile for your machine can be installed using the Auto installer, The Auto installer looks like this below – see Figure 35 shows this installation step location.

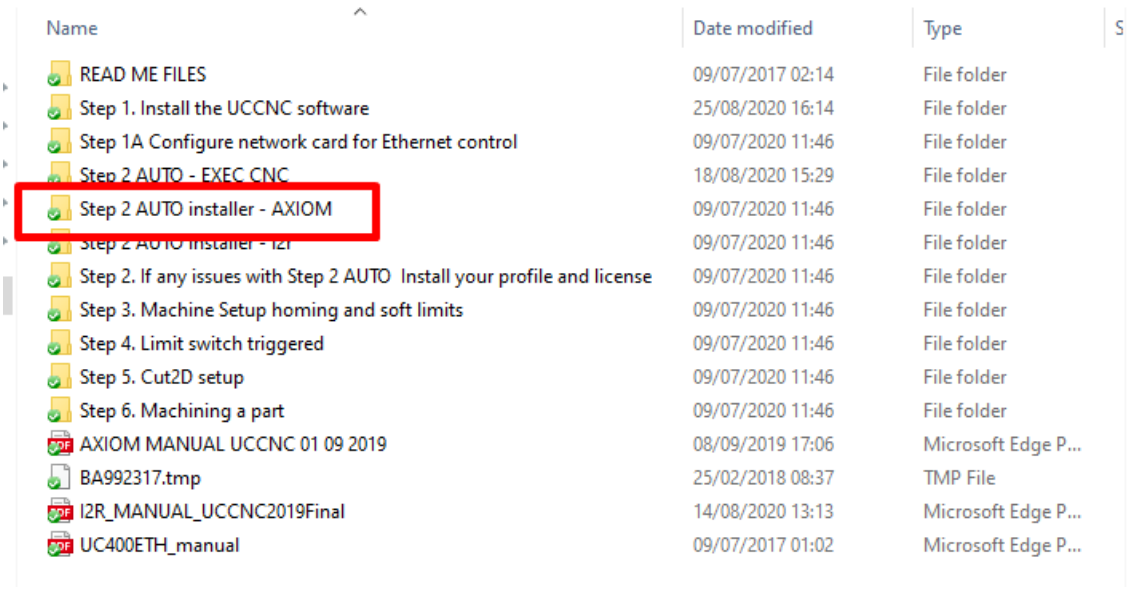


Figure 35 Step 2 auto

Load the screen set installer as shown in Figure 36

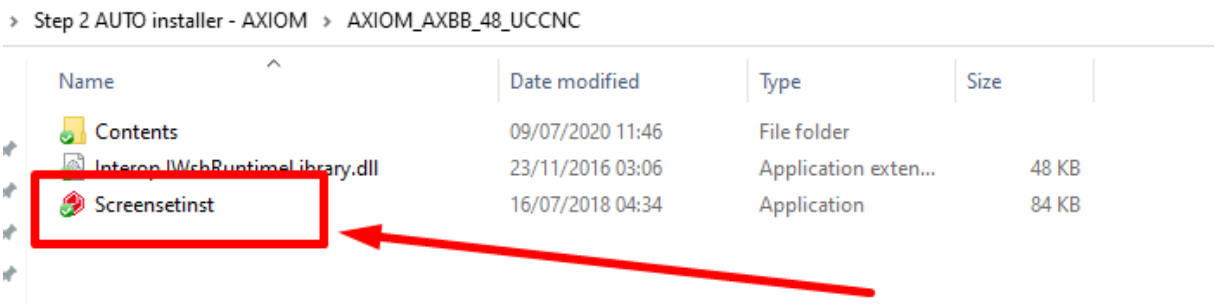


Figure 36 Load the screen set installer

Load your profile depending what machine you have – see Figure 37

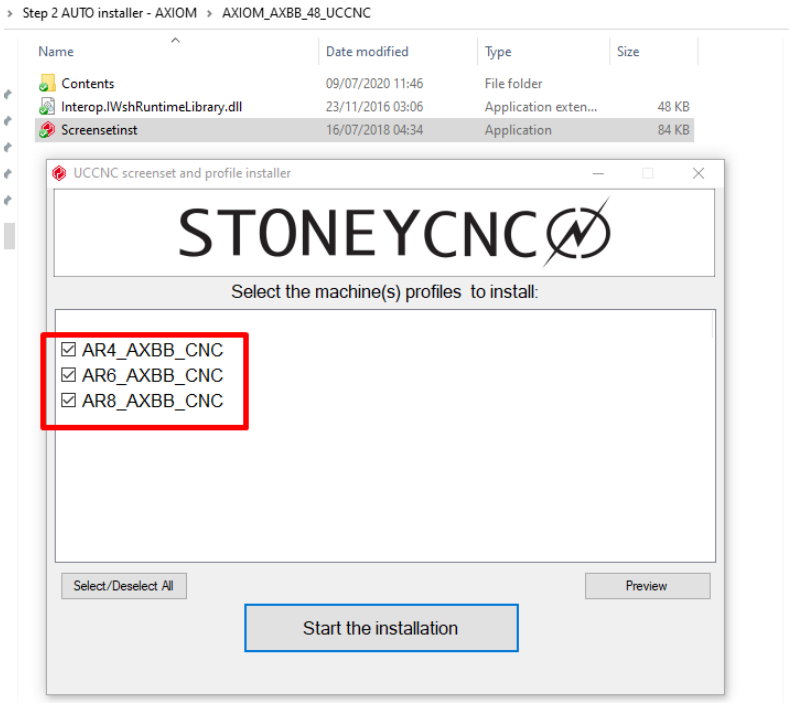


Figure 37: Profile load screen

The installer will now ask you for your licence – see Figure 38 – click yes and chose your licence file which you should have downloaded from the email you were sent.

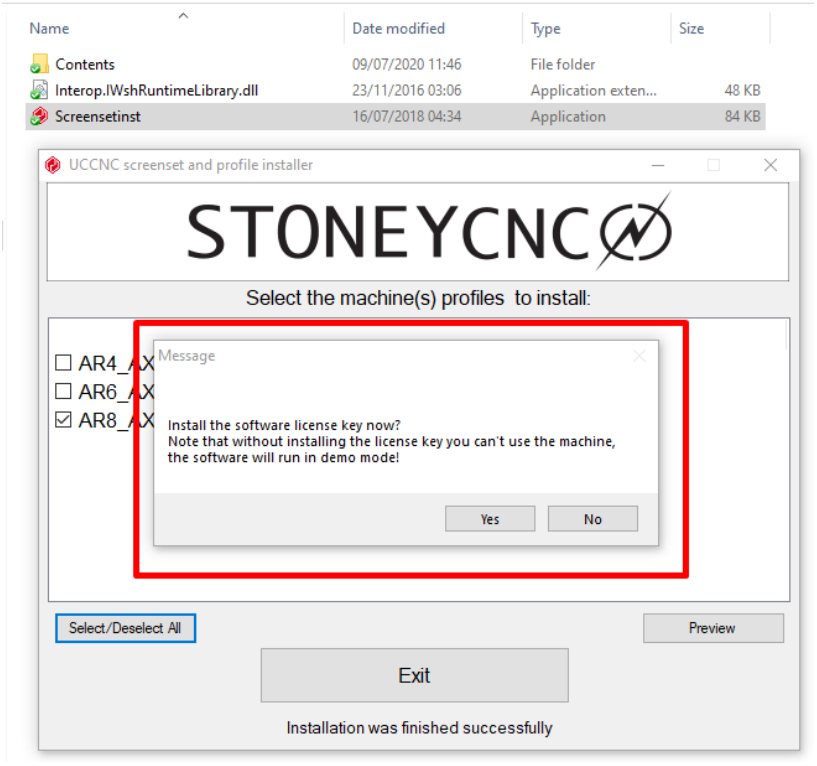


Figure 38 install your license

The final screen before you close looks like Figure 39. You should now have a shortcut on your desktop that is your machine profile.

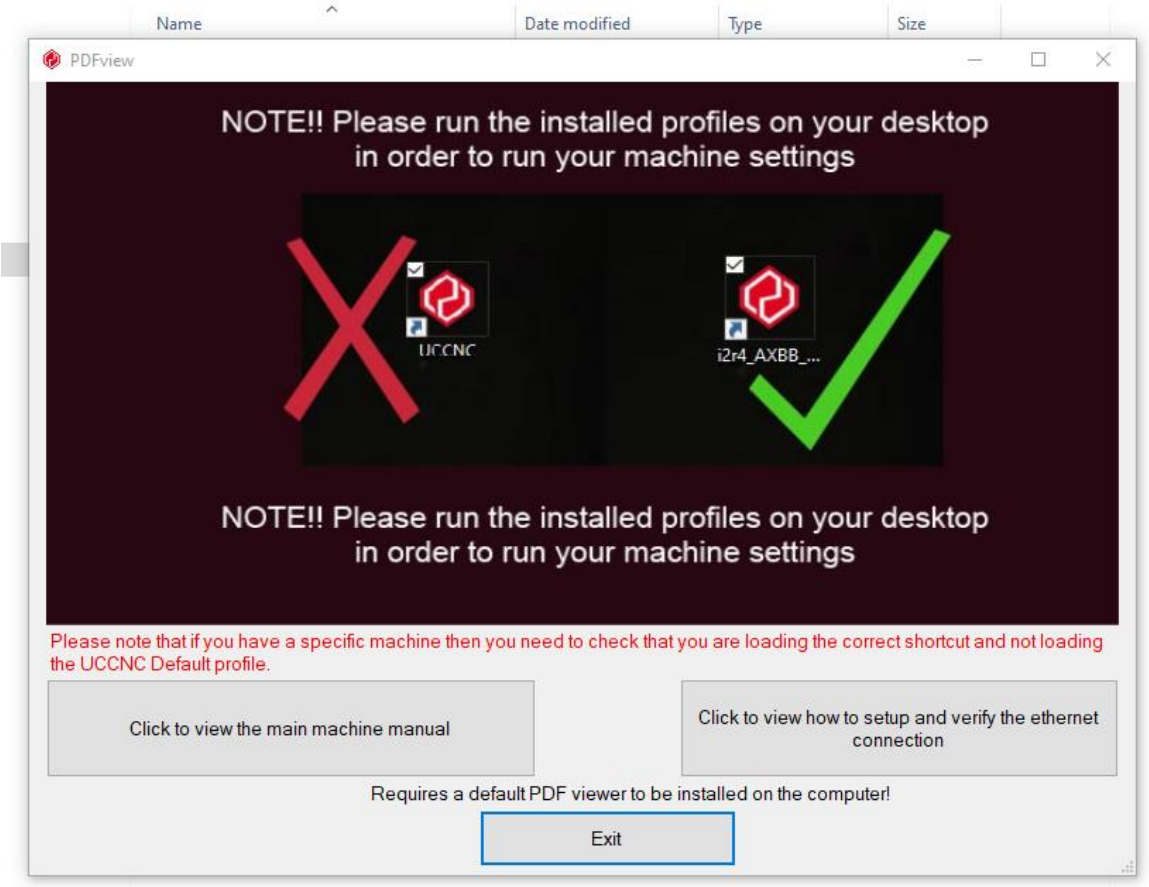
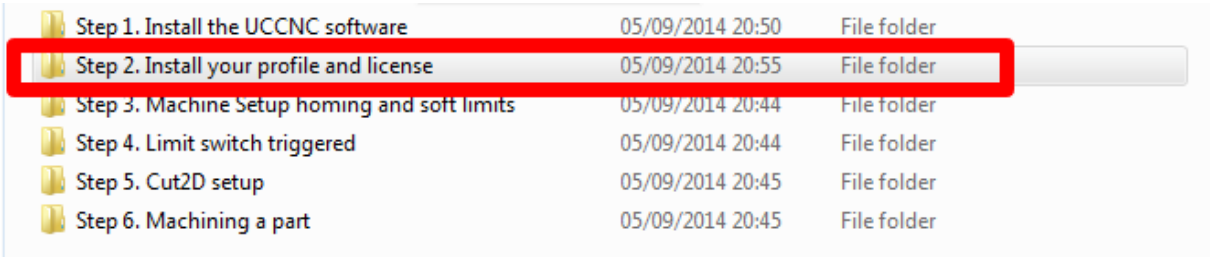


Figure 39 Final Screen for profile installation

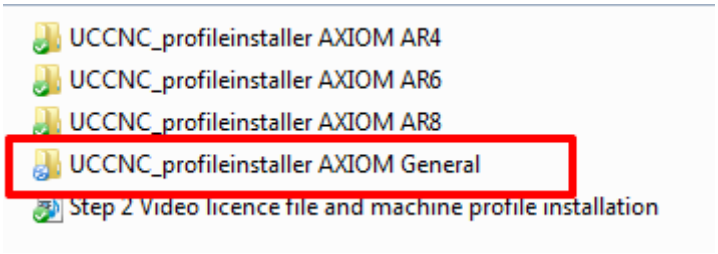
9.1.6 STEP 2 UCCNC LICENSE AND PROFILE MANUAL INSTALLER

In the case where STEP 2 AUTO does not work – this is rare, they you can use the manual method.,

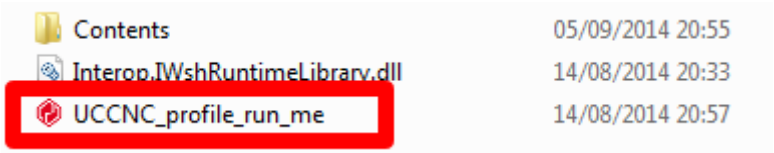
1. *Double click on Step 2. To open the profile and licens installer)*



2. *Click on the profile you wish to install for your machine.*



3. *Click the UCCNC_profile installer.*



4. There should now be a desktop shortcut for your I2R machine. All of the settings are now loaded and your machine is ready for full operation.
    - NOTE!!!! When UCCNC installs for the first time there is a default shortcut always loaded to the desktop.
    - VERY IMPORTANT you ether delete the generic shortcut or understand that it won't be the correct profile.

The "I2R_CNC HF" profile from the "I2R General" folder has the general settings for the machine without the softlimits specific to each machine. Soft limits are useful when you start to use all of the machining area and are good practice – but to start off with we recommend that you don't use softlimits. To keep is simple while you start off us the "I2R_CNC_HF " profile shortcut.

Please watch the video for **Step 2.** The video should also be in the "Step 2." folder that you received with your machine

CLICK HERE for the YouTube link to the video showing this step

9.2 STEP 3 MACHINE OPERATION

9.2.1 STEP3_A MACHINE OPERATION WITH UCCNC

- Make sure your I2R machine is powered on
- Make sure your UC400ETH connection on front of control box is connected to the PC
- Make sure the emergency stop button on the front of the machine is released
- Make sure the green button on front of I2R controller is clockwise and green
- Make sure you have carried out all "setup operations from Step 1. Step 2. And Step 3 ***Exactly.***

- Double click on the icon on your desktop that the profile installer created in Step 2. This should be “I2R_CNC_HF” on the desktop (as shown in Figure 40)

Figure 40: The UCCNC shortcut you should now have on the dekstop

- The software should open and go straight to splash screen shown in Figure 41

Figure 41: UCCNC splash screen

- Note if you have installed the license file correctly you should not see any window pop up regarding the license when you open the program. Before you try to open the finally installed and validated UCCNC – make sure there are no currently open UCCNC windows. When you have checked that there are no currently open UCCNC windows then attempt to open the UCCNC to test the installation has been successful.

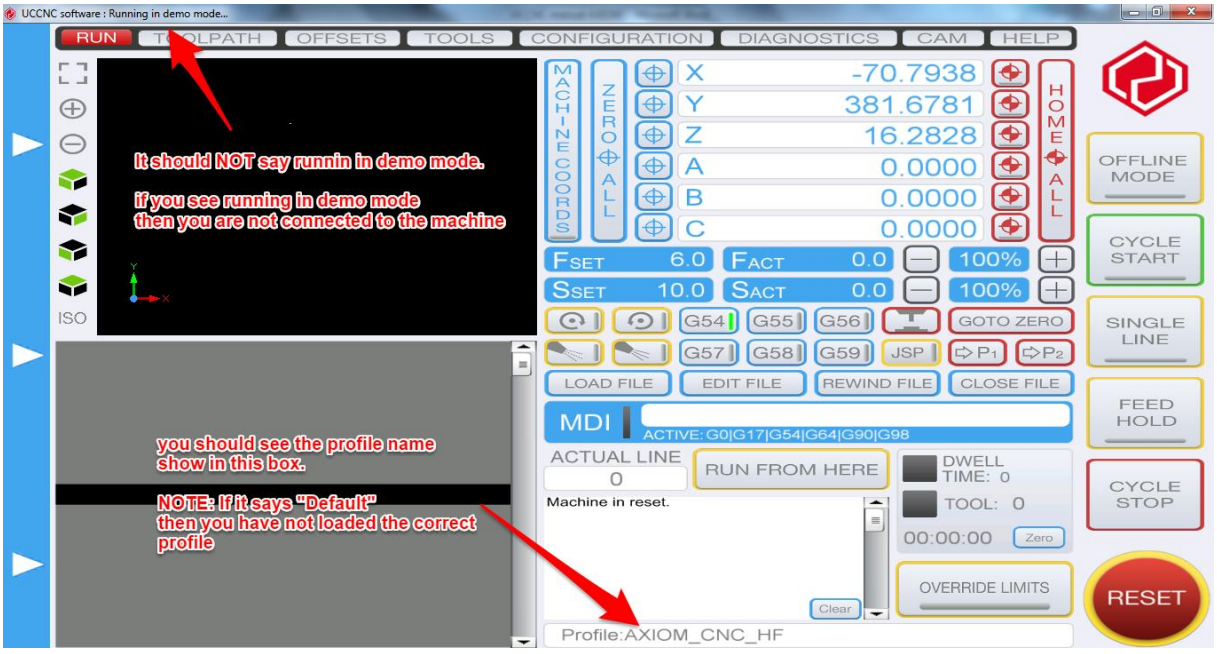


Figure 42: UCCNC main screen summary

- Figure 42 shows the main screen once you open the UCCNC controller.

- NOTE – top left hand side. You should NOT see the text “Running in Demo mode” is should just say UCCNC software after the icon.
- NOTE – In the profile summary box (next to red reset button) you should see the text “I2R_CNC_HF” showing you have loaded the correct profile.

- Hit the rest button (it should be flashing yellow and red and is shown in Figure 43). Once clicked it should remain solid red in colour. You should now be able to control the machine with your UCCNC software

NOTE – Whenever you are not directly interacting / controlling the machine you must click the reset button so the **button flashes red and yellow**. This is a safety procedure to make sure you don’t accidentally turn on the spindle system.
Now two very specific steps have to occur to turn on the spindle! Always click reset when you are not directly controlling the machine

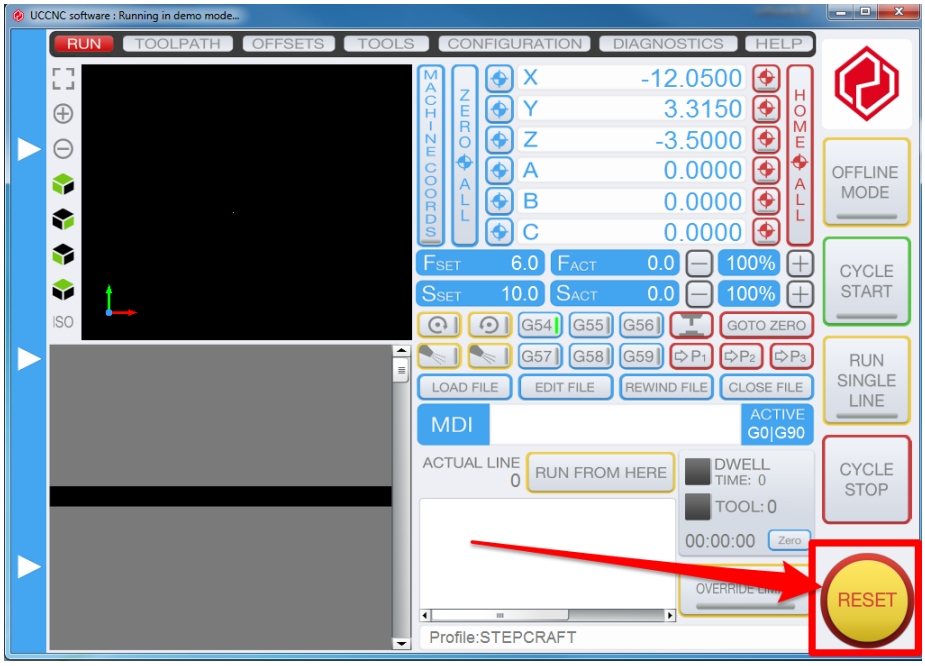
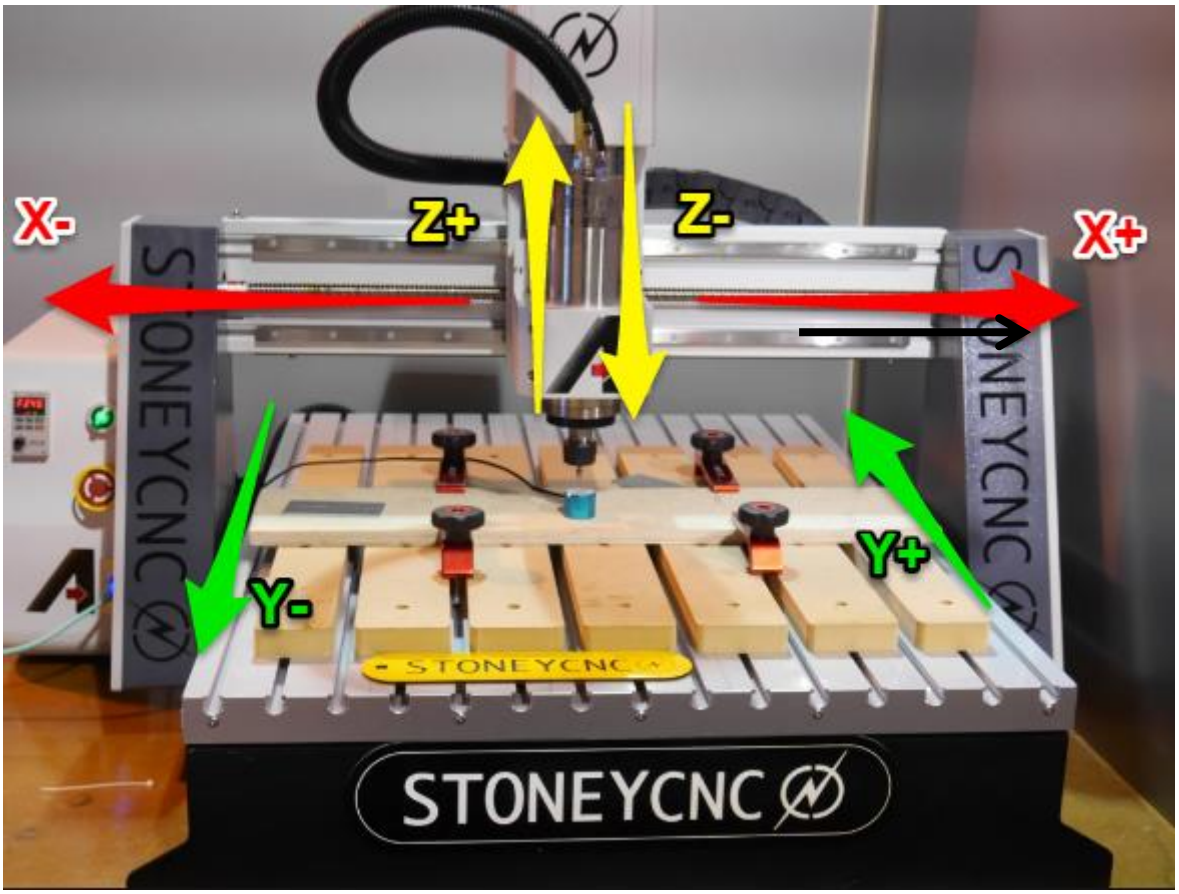


Figure 43: Reset button on UCCNC front panel

The UCCNC lets you jog the machine with the Keyboard in **Rapid** and **Slow** jog modes. The directions of movement are assigned as follows

- Right arrow key – jog X right / positive
- Left arrow key – jog X left / negative
- Up arrow key – Jog Y up / positive
- Down arrow key – Jog Y down / negative
- Page up – Z axis up / positive
- Page down – Z axis down / negative

- Holding the "**Shift**" key while pressing the directions of movement keys will move the machine in rapid mode.
- Releasing the **"Shift**" key will result in the slow jog motion



Z positive move

Z negative move

Hold for Rapid Move

Y positive move

X positive move

X negative move

Y negative move

9.2.2 STEP3_B MACHINE HOMING AN SOFT LIMITS

As discussed in Step 2. You are given the choice of configuring the machine with the soft limits enabled or with the general machine configuration.

Soft limits are software defined limits that can be enabled to prevent your machine from moving outside of its zone of movement (and crashing). In order for the soft limits to work you have to make sure you have loaded the correct profile for your machine (AR4, AR6, AR8) as the values are related to the geometry of the machines.

In order for this to work ***you must reference the machine each time the machine gets turned on*** to tell the software where the edges of the machine movement are each time. The machine will move each axis until is hits that axis limit switch. It will then move away until the switch releases. This is how the software knows where the machine is relative to the limits switches.

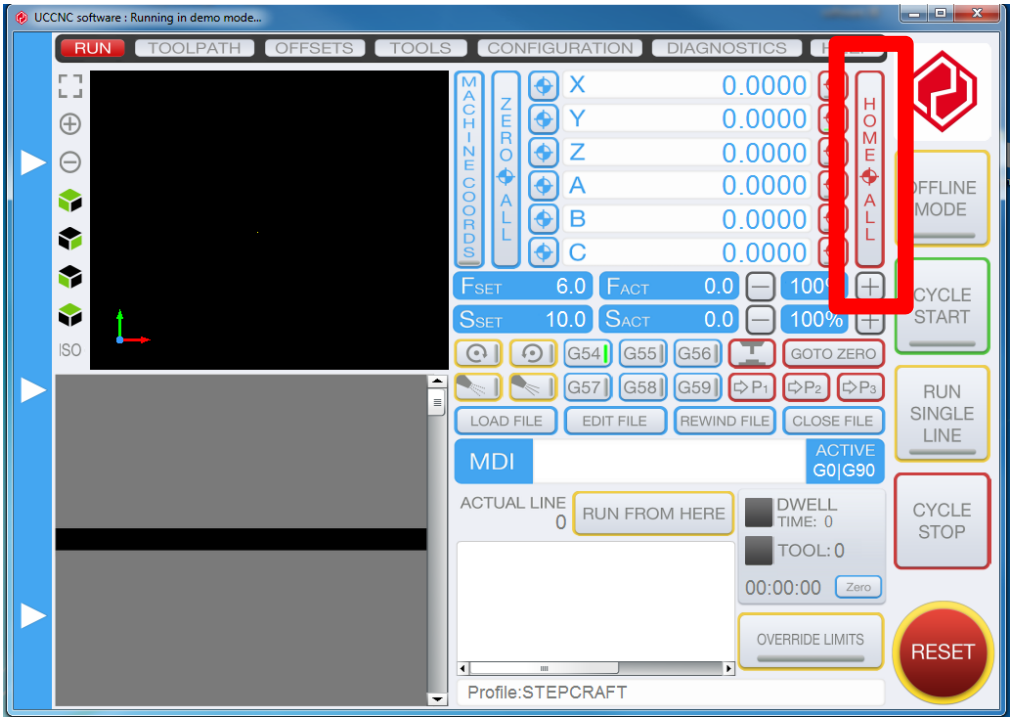
This is not 100% required for use of the machine. We recommend you continue to Step 4. At this stage and come back to Step3_B later when you are proficient with the machine and its operation.

Crashing the machine will not do damage provided you press the emergency stop button shortly after. The stepper motors will simply “buzz” and the machine will not move.

Step 5. Shows you in detail how to setup the machine and to check to make sure you are within the machine limits. Sometimes it is better to check and double check by actually using the machine (shown in Step 5.), rather than relying on the soft limits.

For the full explanation of how the homing and soft limit functions work See the video **Step 3B** in the folder for Step3. or click here for the direct YouTube link.

The video will show a STEPCRAFT machine for the illustration – the process is identical for the I2R



9.3 SOFT LIMITS EXPLAINED

The soft limits are designed to restrict the machines motion to the machines working envelope.

Figure 44 shows the machine layout.

- Note there are two co-ordinate systems
- 1) The machine co-ordinate system (marked green) where all the background machine co-ordinates and soft limits are stored and located
- 2) The workpiece co-ordinate system where you spend most of your time. This is the system that allows you to setup and zero our work in the machine bed..
- NOTE – if you setup a workpiece that is outside of the machine software limits – you should get an error telling you the job cannot be run.

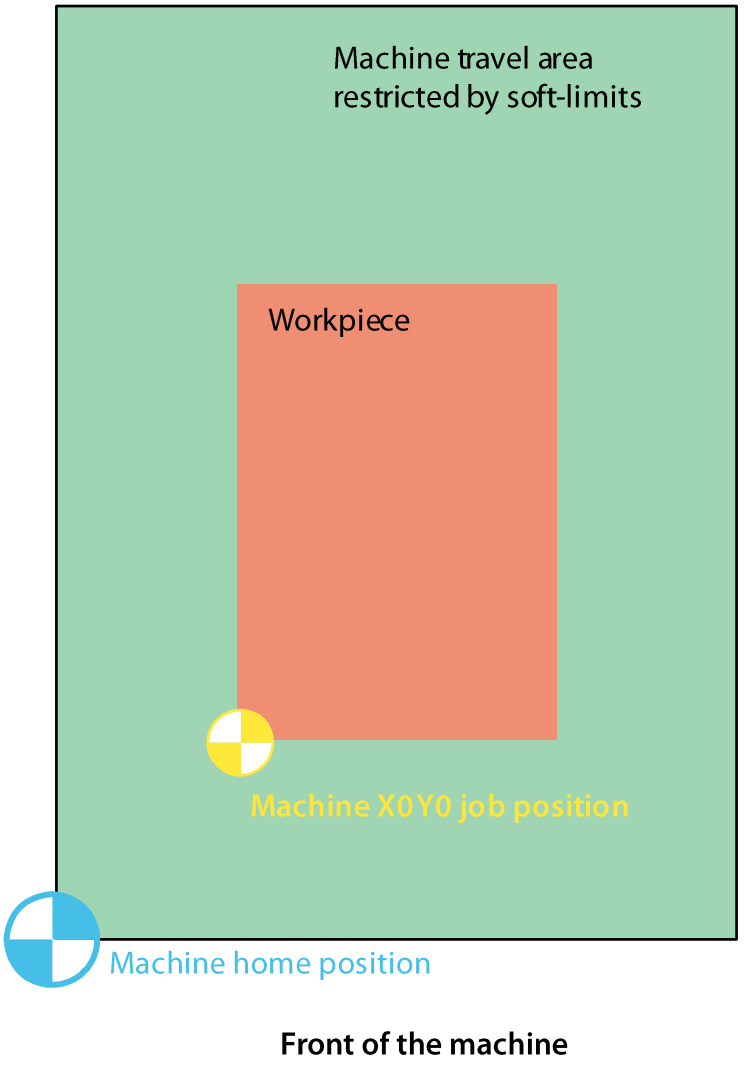


Figure 44: Machine layout illustrated

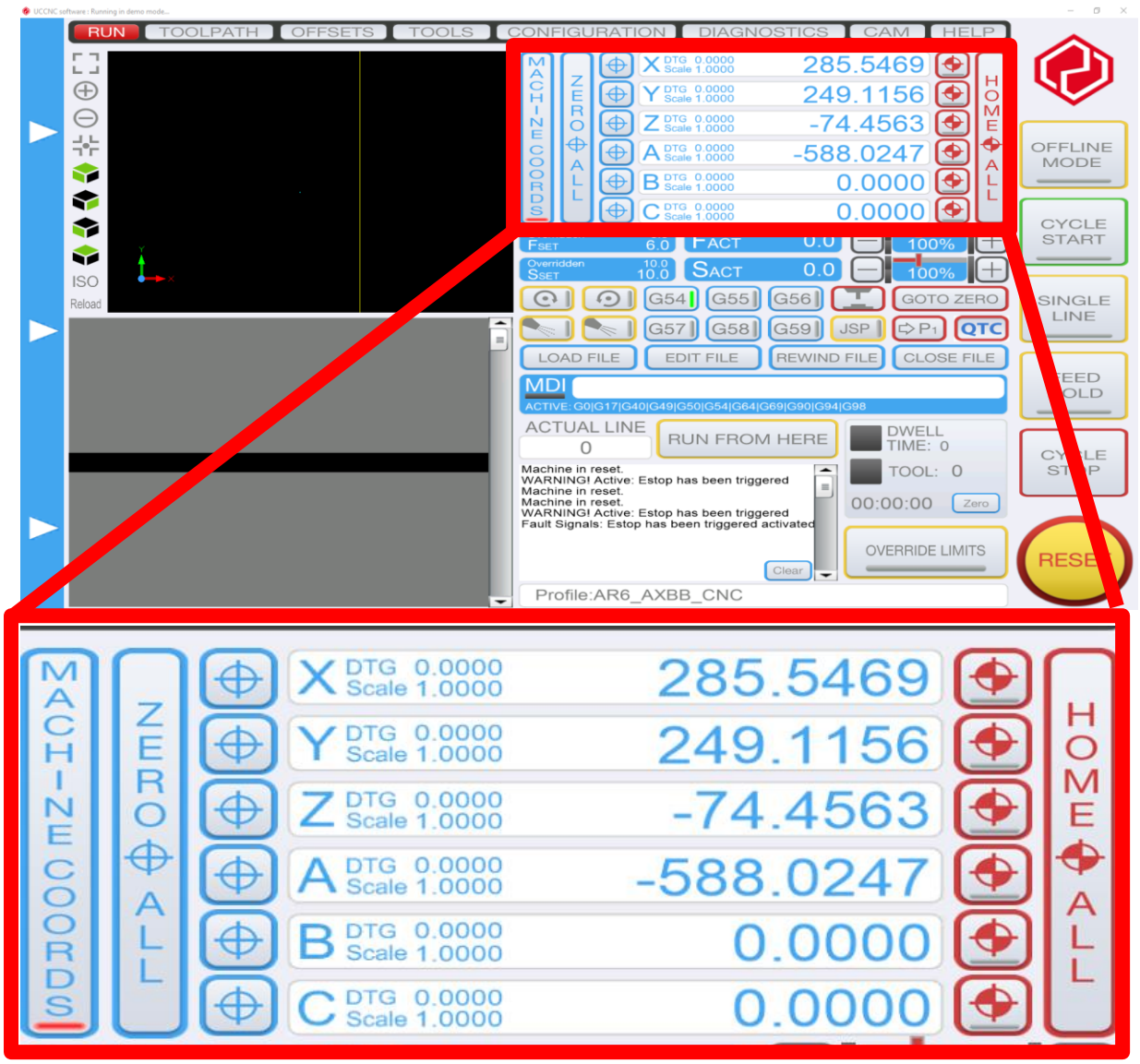


Figure 45 Note when the machine co-ords button is red you are in machine coordinates

- Figure 45 shows the machine co-ordinate button
- When in machine co-ordinates you are in the machine reference system
- On an I2R CNC after the home all routing the machine co-ordinates should read 0,0,0
- NOTE be sure to go back to the workpiece co-ordinates when you are finished checking the machine co-ordinates.

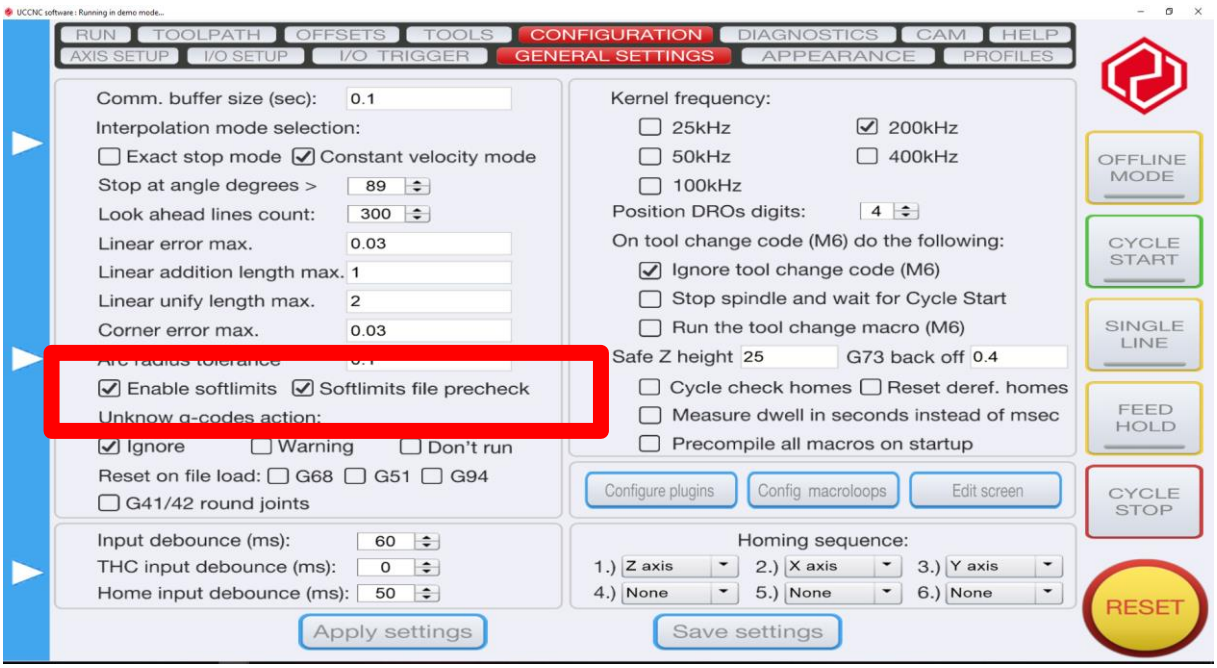
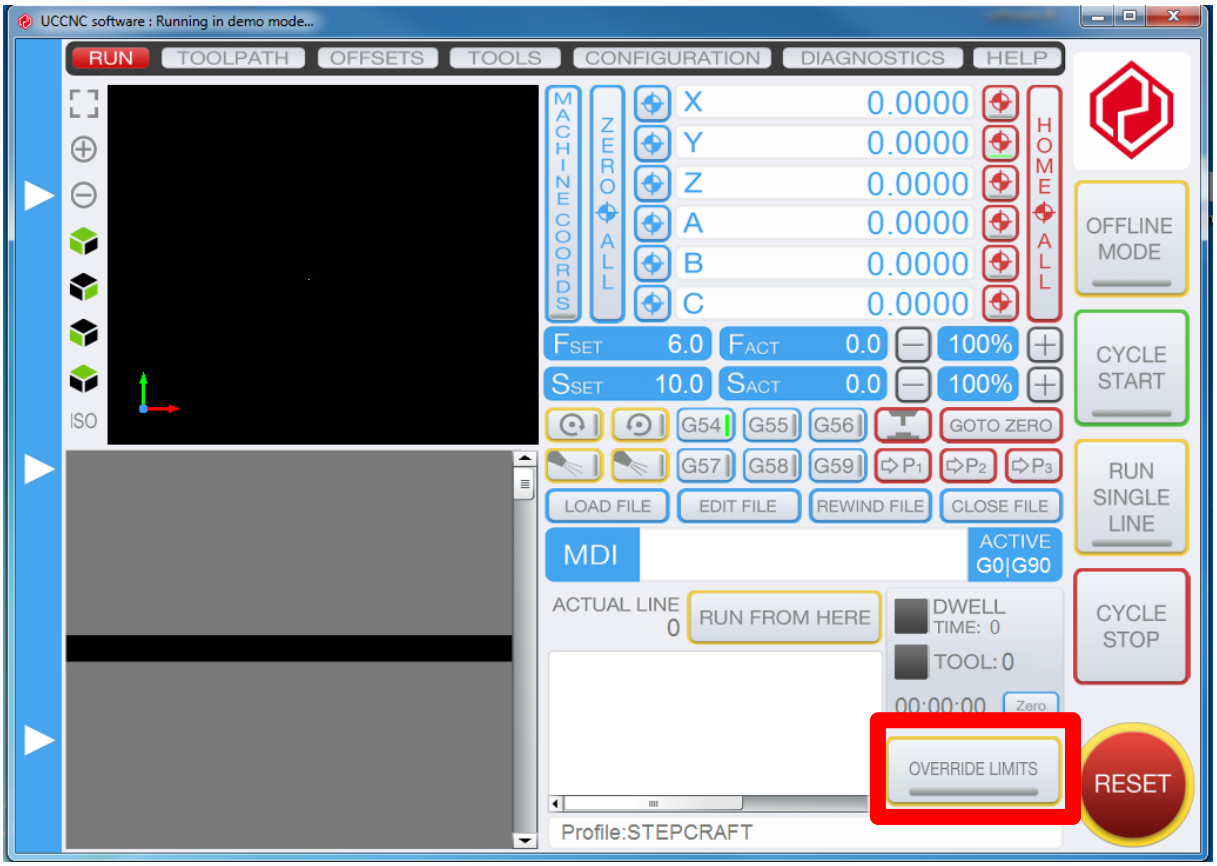


Figure 46: turning soft limits on and off

- Figure 46 for the area in the UCCNC where you can turn these on and off
- NOTE we don't recommend turning them off… However if you have a limit switch failure or other reason for homing failure – they can be turned off to keep machine going so as not to stop production
- We recommend you call us before turning the soft limits off.

9.4 STEP 4. LIMIT SWITCH TRIGGERED

Occasionally it is possible to jog the machine to the end of the machine travel such that a limit switch will be triggered. The software will now prevent you from controlling the machine. You will not be able to reset the software when the limit is triggered. When this happens you must press the “OVERRIDE LIMITS” button in order to reset the machine. Once the “OVERRIDE LIMITS” button is pressed you can then click the reset button and regain control of the machine. Make sure you jog/move the machine AWAY from the limit switch. You will hear the switch release if you listen carefully. You are now back in the zone of operation for the machine and can continue.



This is explained in more detail in the step by step video **Step 4** that is in your installation folder (Step 4.). Here is a link to the YouTube video also.

The video shows a STEPCRAFT machine in this illustration – the process is identical for the I2R

9.5 SPINDLE SYSTEMS

DANGER Before you change the tool in the spindle (Kress of HF spindle systems), and before you handle any of the spindle components in any way you must de-activate the spindle system to avoid accidental spindle start-up during handling.

The first stage in disabling the spindle system is to hit the reset button in Mach3/UCCNC. This will de-activate the charge pump signal and will disengage a safety relay in the machine control electronics preventing unexpected start-up of the machine spindle.

Figure 47: Reser to disable spindle relay

9.5.1 *SETTING SPINDLE RPM – FORMER MANUAL CONTROL (MACHINES AFTER 2019 PLEASE SEE AUTO SPINDLE CONTROL NEXT SECTION)*

The Pro Model machines are equipped with a Delta VFD-m invertor for spindle RPM control. This can be found on the front of the white control box.

To adjust the RPM, simply turn the dial. Clockwise (right) to increase RPM and Counter-clockwise (left) to decrease RPM.

This can be adjusted at <u>any time</u>. Included during a machine operation. Allowing RPM to be dialled in dynamically as needed.

Delta VFD - RPM Values	
Frequency	RPM
250	15,000
267	16,000
283	17,000
300	18,000
317	19,000
333	20,000
350	21,000
367	22,000
383	23,000
400	24,000
Frequency equals desired RPM/60	

The display shows the RPM in 60Hz frequency. This means that while the RPM is 0-24,000, the display will show 0-400. Each 100-displayed is equal to 6000RPM.

The buttons on the VFD, are intended to be used for programming only and should not be used to set the spindle speeds.

9.5.2 SETTING SPINDLE RPM – AUTO MODE IN UCCNC

All machines in the V5 config, post Jan 2020 have automated spindle speed control. The UCCNC software controls the spindle speed directly.

NOTE when you first load the UCCCNC the spindle speed is set by default to 0, So in this case the spindle will not turn as this is essentially Zero RPM . See Figure 48

Click in the MDI – type in S24000, and the S set will then change to 24000. See Figure 49

To turn on the spindle see Figure 50

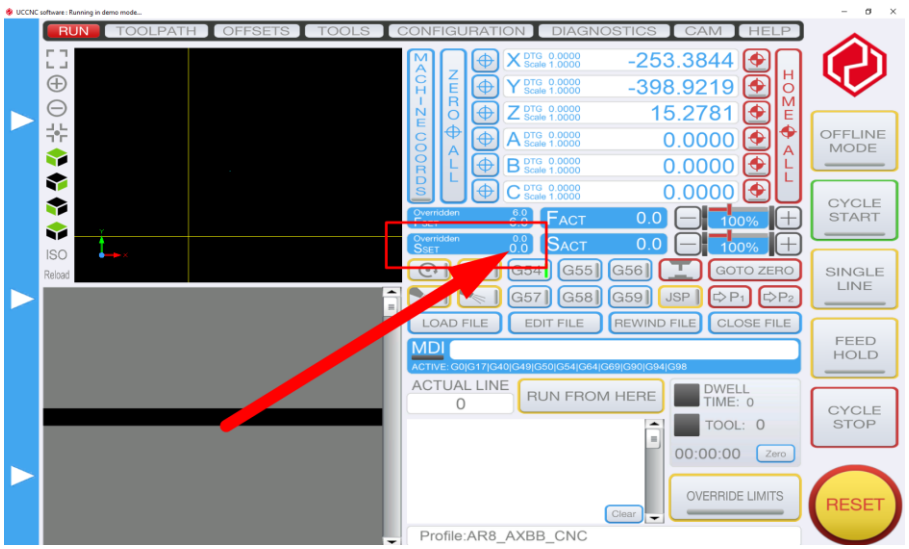


Figure 48: UCCNC spindle summary on boot up

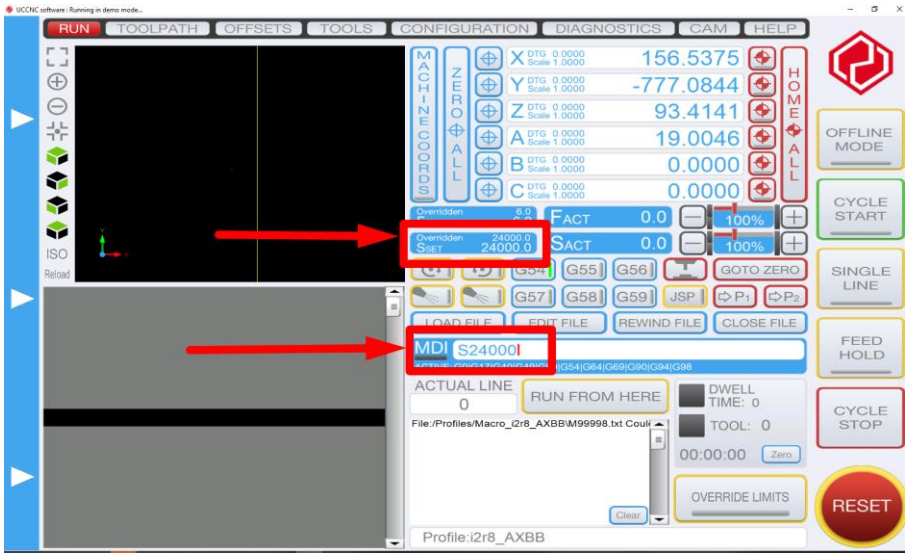


Figure 49 Click in MDI - Type S240000- press enter.

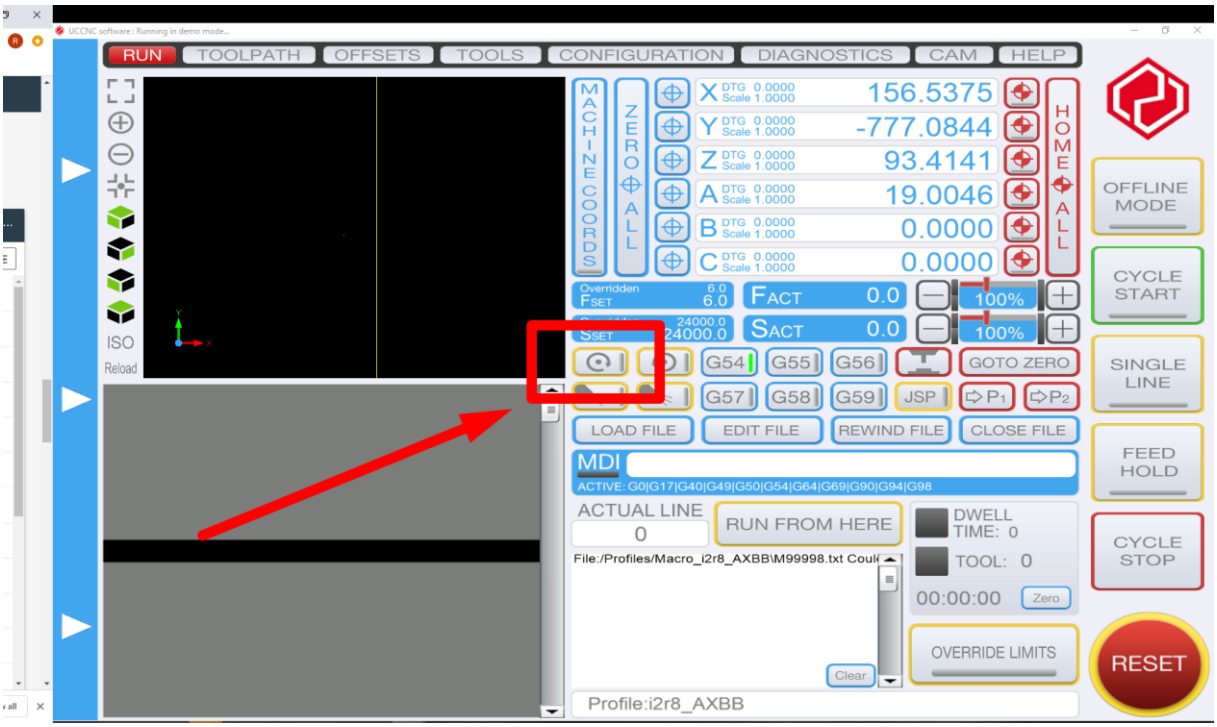


Figure 50 Turn on spindle

9.6 THE Z TOUCH OFF SENSOR

9.6.1 USING THE TOUCH OFF SENSOR FOR THE Z AXIS

The touch off sensor is an automated way to set the Z zero of the Z axis. The sensor is shown in Figure 51 and plugs into the back of the left hand gantry upstand on your I2R machine.

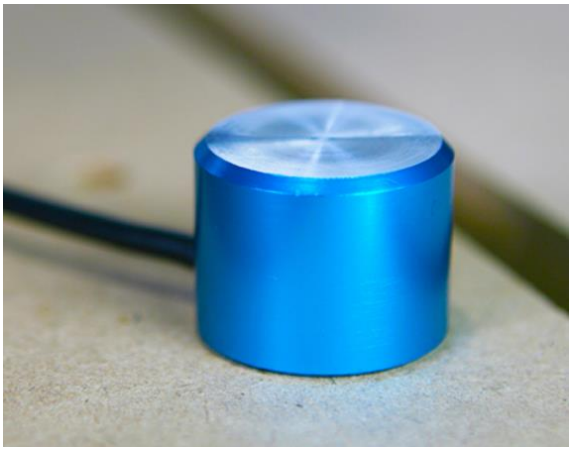


Figure 51: The conductive touch off sensor

- Plug the sensor into the back of the gantry
- Go to the Diagnostics page of the UCCNC
- Touch the sensor off the spindle with top aluminium part
- Check the probe light lights up

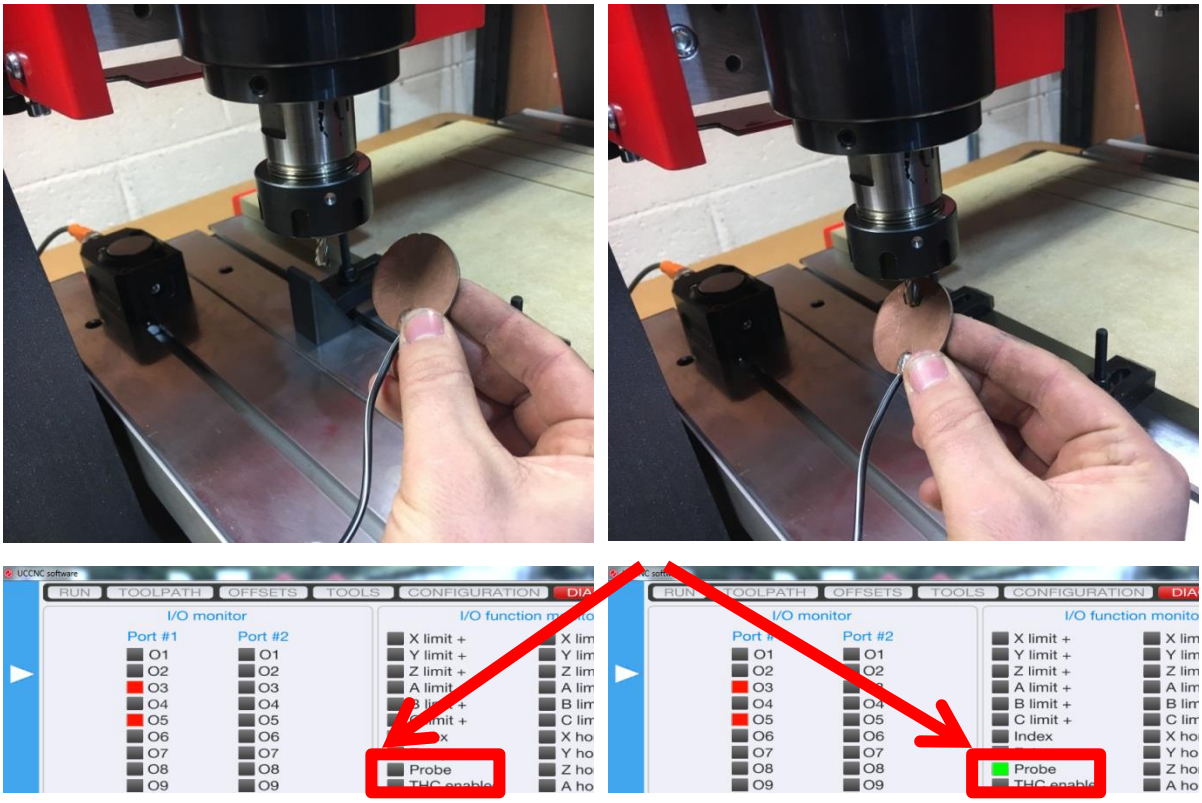


Figure 52: Check the probe is working

To use your touch off sensor you can use the button on the UCCNC screen as shown in Figure 53. Press the button and the Z will drop to the sensor and set the Z heigh to the surface the sensor is sitting on

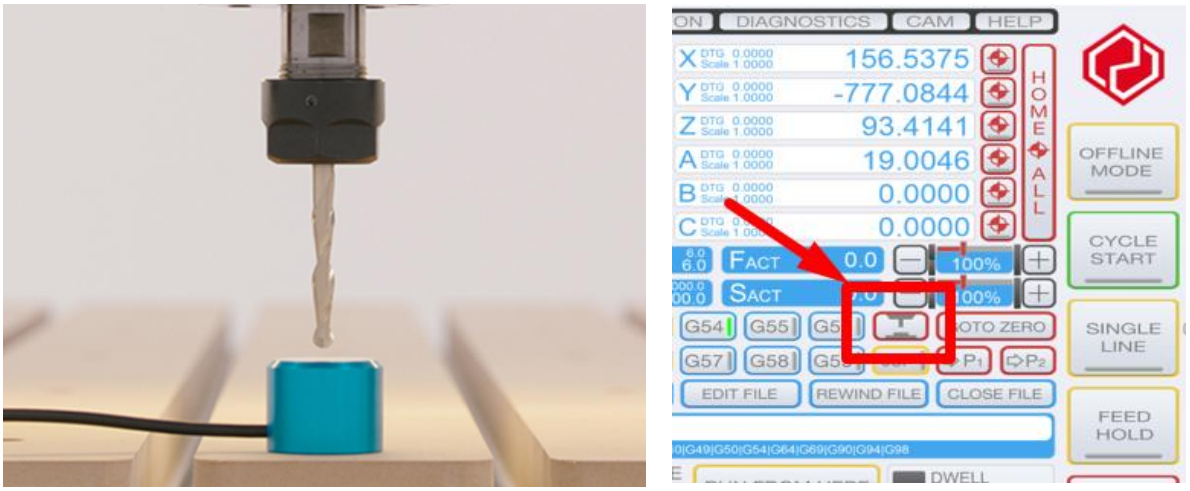


Figure 53: touch off system

1. Press the touch off button on the UCCNC front screen
2. The Z axis drops towards the sensor
3. When the Z axis touches the sensor the Z axis should stop and set the Z axis value
4. The Z axis should then retract and stay above the work

9.6.2 CALIBRATING THE TOUCH OFF SENSOR

When using the automated Z touch off sensor system this system can be calibrated and tweaked by you the user. As normal use the touch off puck or sensor to set your Z zero position as outline in Section 9.6.

Please note in Figure 54 the Z axis is not correct when tested on the actual work.

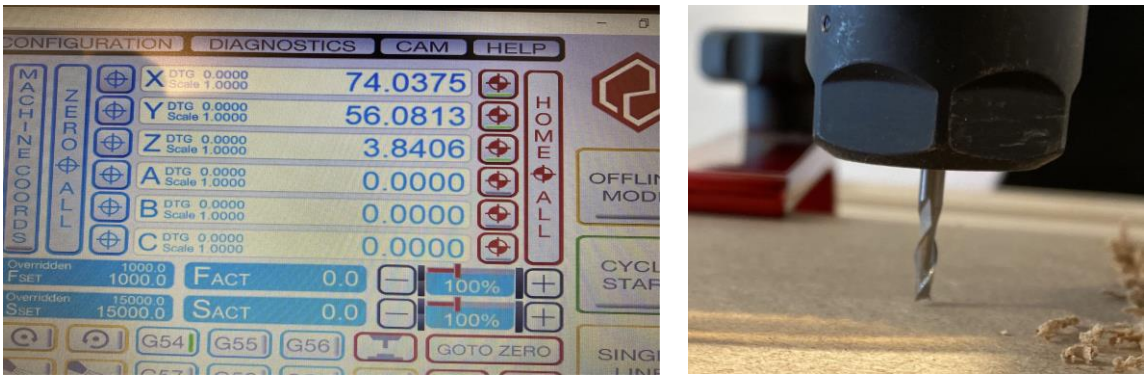


Figure 54 Incorrect Z value when checked

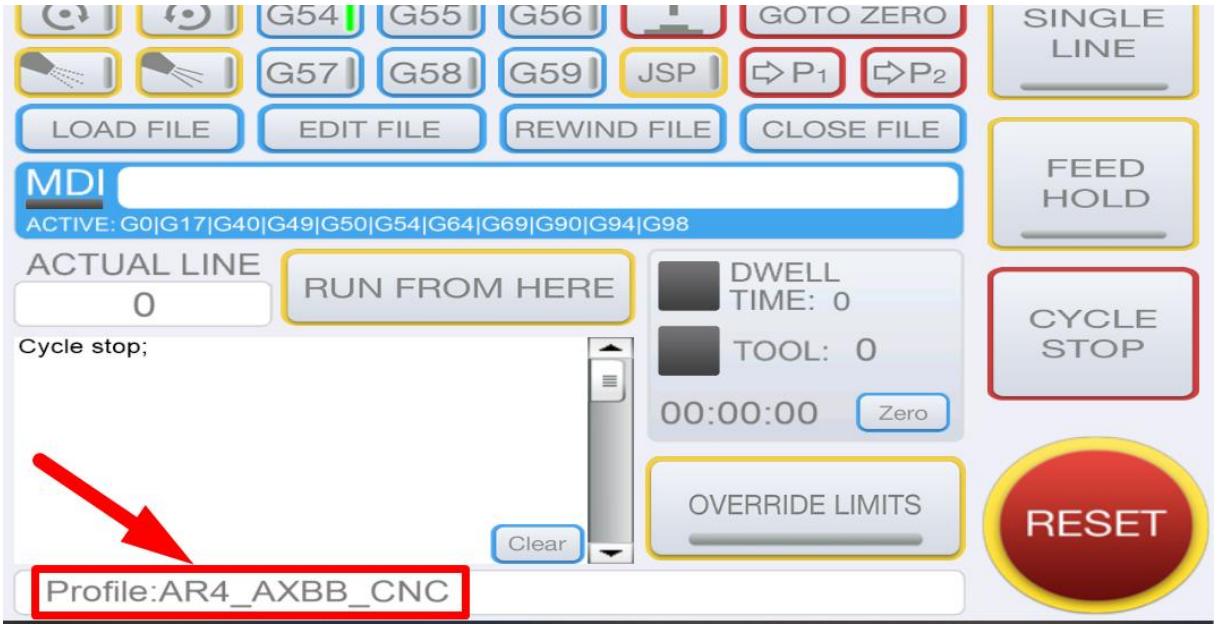


Figure 55: Check your profile

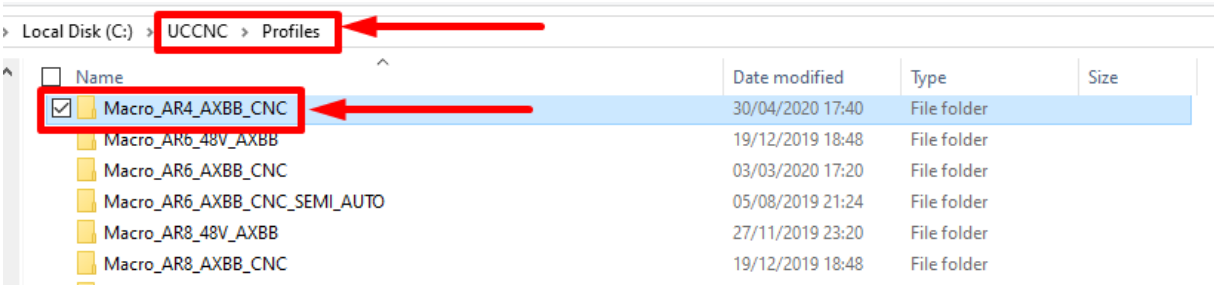


Figure 56: Navigate to the location on the C:drive with your profile macro folder as shown

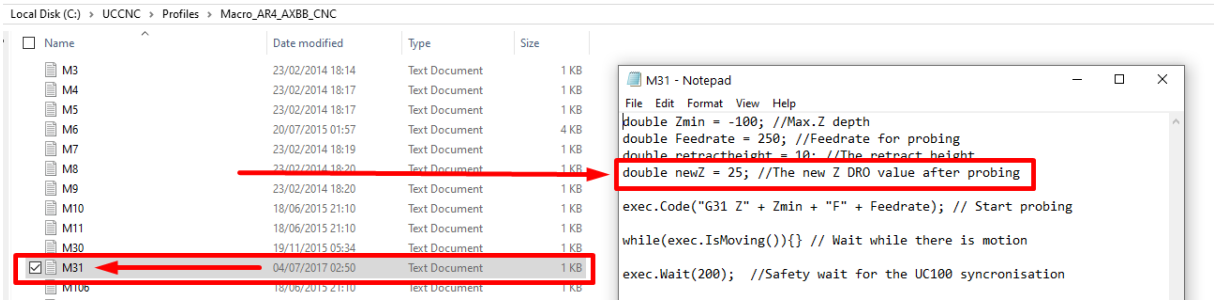


Figure 57: Locate the M31 Macro and change the Z axis value

1. Touch off as normal – as shown in Figure 53
2. Check the Z axis level when touching the work – as shown in Figure 54
3. As shown the Z axis is incorrect by 3.8406mm.
4. Refer to Figure 57 where the Z axis value set on touch is 25mm.
5. To calibrate this machine - add 25mm to 3.8406mm = 28.8406mm
6. Simply modify the M31 macro so that the Z value is now 28.8406. This will calibrate the sensor correctly.

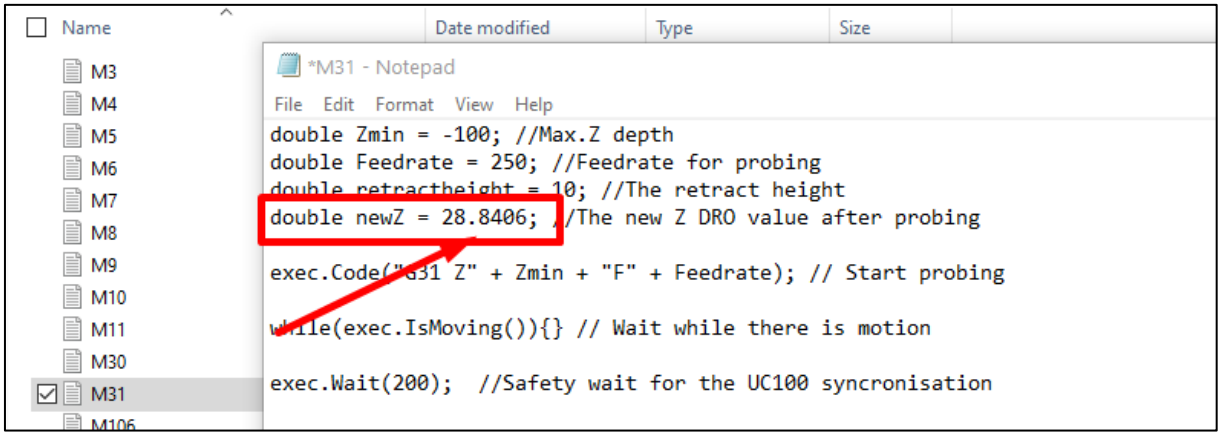


Figure 58: The M31 macro has the new calibrated value

9.7 THE MTC SYSTEM

NOTE – THIS IS FOR ADVANCED USERS ONLY. PLEASE understand simple 3 axis control first before you attempt to use this feature. when you run the semi auto system for the first time – ALWAYS slow down the feed rate before attempting to run the machine in auto mode.

Figure 59: Running the automated setup for the first time always slow down the feed rate

- The MTC auto sensor uses a fixed sensor on the machine table to setup auto
- The sensor location needs to be set in the software macro.
- Please load the semi auto profile as shown in Figure 61
- The tool change location on the machine can be set as shown in Figure 62
- The sensor location can be set as shown in Figure 63. This will set the machine co-ordinate location where the machine will plunge towards the sensor

Figure 60: The MTC Auto sensor system

Figure 61: Launch the auto installer to install the correct profile

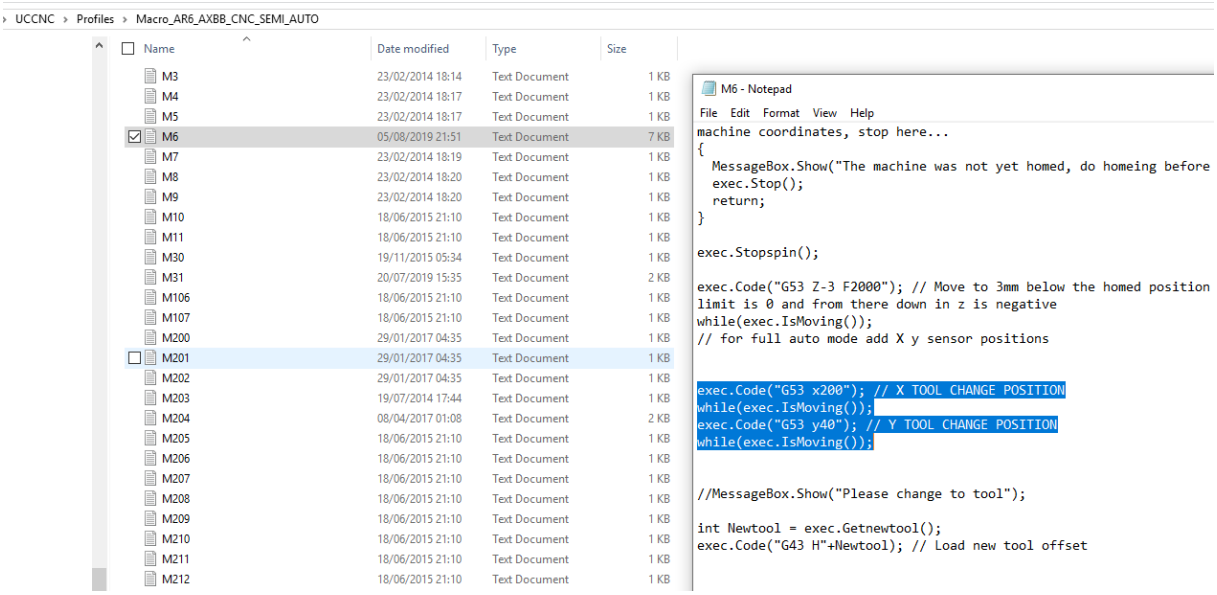


Figure 62: The tool change location can be set here in the macro folder for this profile

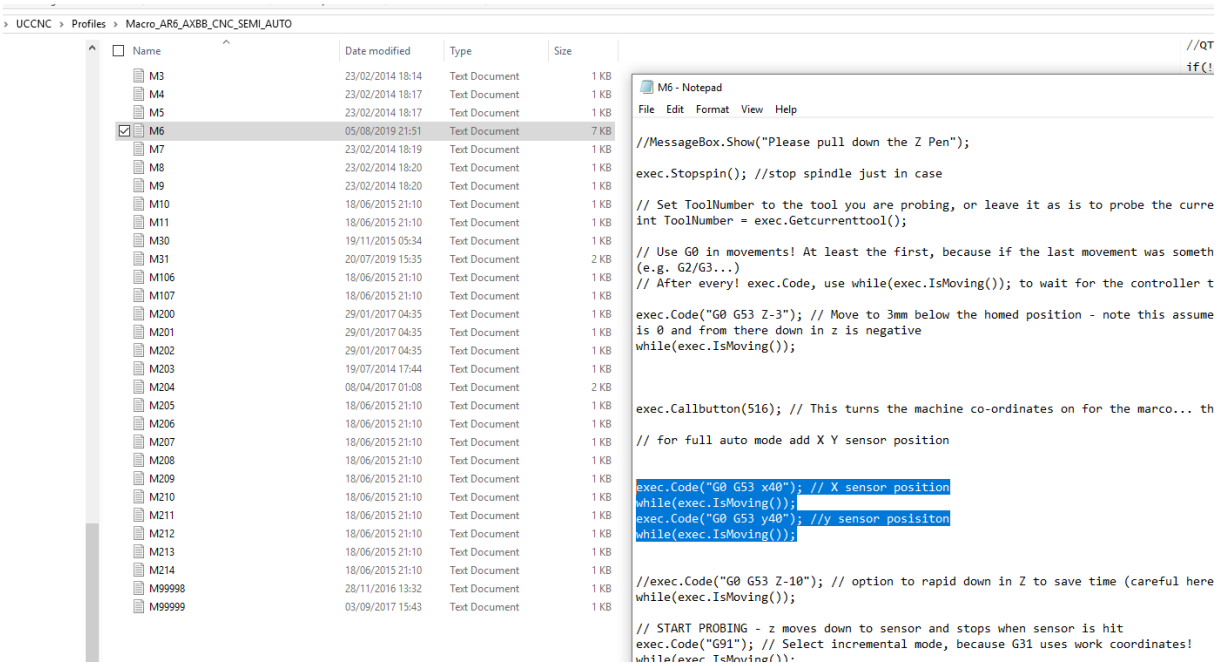


Figure 63: The sensor location can be set here

Figure 60, Figure 62 and Figure 63 show how to locate the tool sensor and the tool change position.

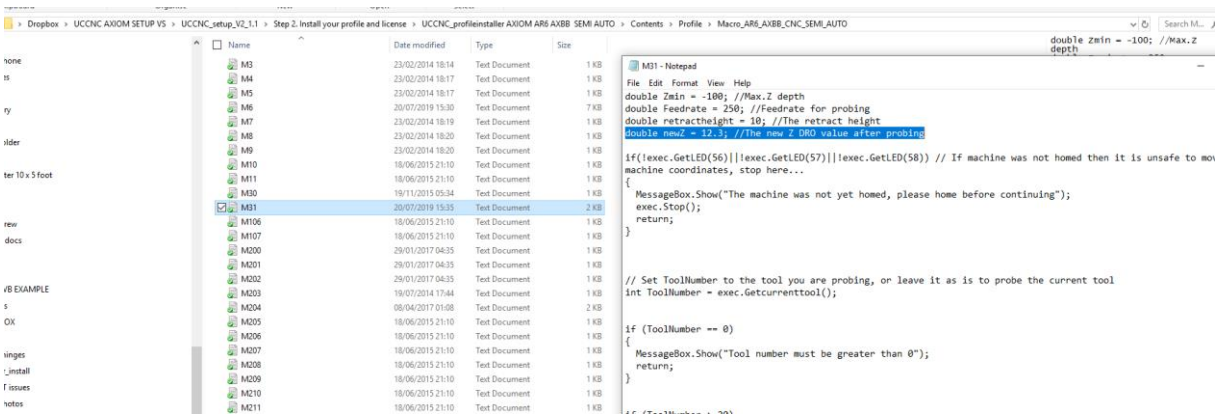
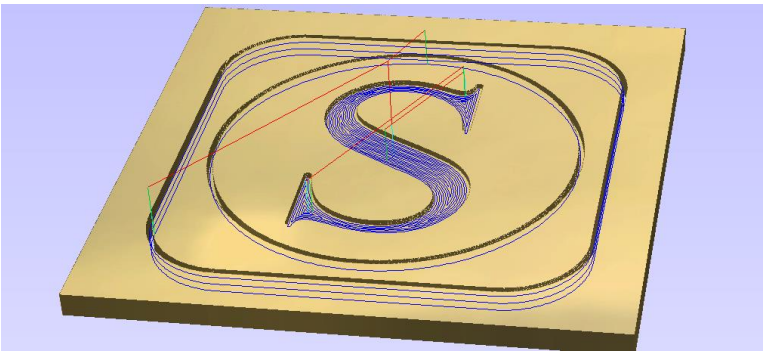


Figure 64: The workpiece tool height can be set here

9.8 STEP 5. CUT2D/VCARVE/ASPIRE SETUP

9.8.1 INTRODUCTION AND OVERVIEW

Cut2D is a very popular CAM package and is very easy to use. Cut2D is very similar to VcarvePro. However VcarvePro has a lot more functionality (which is why it is more expensive). The best way to learn how to use Cut2D is to open up the software and try to use it. There is a video to help you in your installation folder (Step 5) giving you a step by step run through the process. The video goes through each step in the process for creating your first tool path. The video shows you how to make the part shown below. You can see the live preview that gives you an idea of what the part will look like. You can also see the machine tool path overlaid also. Cut2D gives you a preview so you can check what your part will look like and check for mistakes.

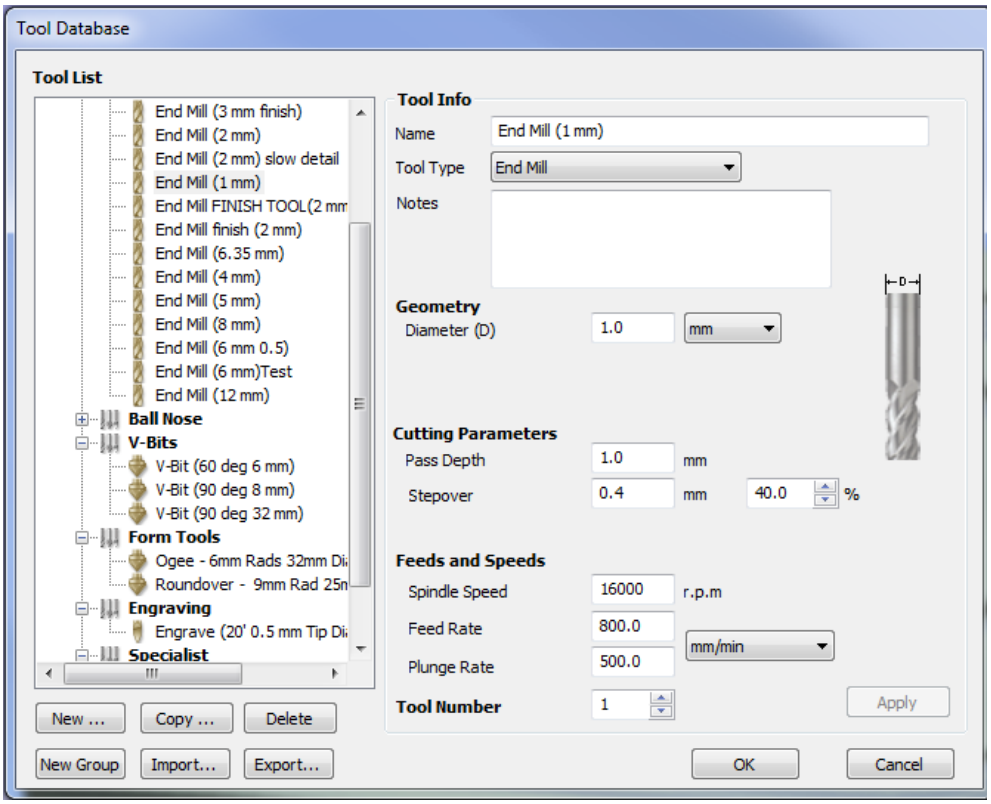


9.8.2 TOOL SETUP

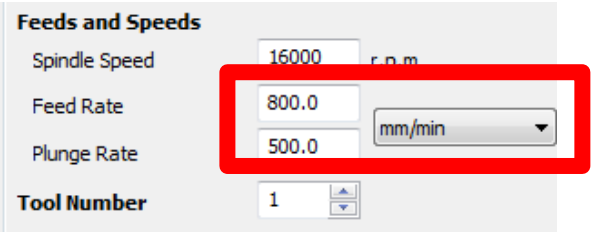
See below for the tool window that opens when you select the tool to use in cut2D/VcarvePro. Both Cut2D and VcarvePro allow you to build up a tool database. So you can setup a tool for each materials/cutter combination. You can save tools for various jobs. As you learn you will find some settings work better than others. When you find the sweet spot you can save the settings in the tool library. To help you with your settings they are explained as follows

- **Name** – this is not important for the settings – but its good practice to name the tool to be descriptive of what is in the settings.
- **Tool Type** – this is important as it tells Vcarve what sort of tool you are using. This will effect the calculations and the live demo so always choose the same tool as you are using
- **Notes** – this field is useful for documenting specific outcomes or requirements needed when running with specific tools and settings. For example “make sure to clamp work piece well when running with these settings”
- **Diameter –** The diameter of the tool tells Cut2D how to approach tool radius compensation. If for examples you set the tool diameter to 4mm, Cut2D will then make the toolpath run 2mm outside the path you specify (if compensating for tool radius on the outside) to account for the tool geometry.
- **Pass Depth** – is the maximum depth that tool can go at once. If your cut depth is set at 5mm for example. And you are using a 1mm cutter. A good strategy would be to machine the 5mm in 1mm passes. Cut2D will then program the machine to cut down 1mm at a time down to the 5mm cut depth.
- **Stepover** – this setting is related to the pocketing function where you need to machine out a pocket and not just an outline/profile toolpath. The stepover controls how much overlap there is as the cutter pocket out the work.

- **Spindle speed** – Your spindle speed will be set on the dial on the front of the machine. If you look at the front of the controller you will see a small screen. This is the VFD screen and you can adjust the spindle speed. 0 = 0RPM. 400HZ - 24000RPM
- **Feed Rate** – this parameter is the speed of the machine when machining the work in the X and Y directions. The machine can rapid move at up to 5000mm/min. Typically machining speeds are at 700-2000mm/min. Stick to 1500 with a pass depth of 0.5mm or 1mm when you get started. You can build confidence and speed as you get used to using the machine. If you machine too fast the machine will stall and you will loose position. So tread carefully here.
- **Pluge rate** – is the same as the feed rate except it related to the Z direction. Typically milling cutters (like slot drills etc) prefer to mill in X and Y and are not as efficient in the Z / plunge direction. Keep this setting at 500mm/min or so as you get started.



NOTE: It is VERY important that you set your Feeds to be in ***mm/min***

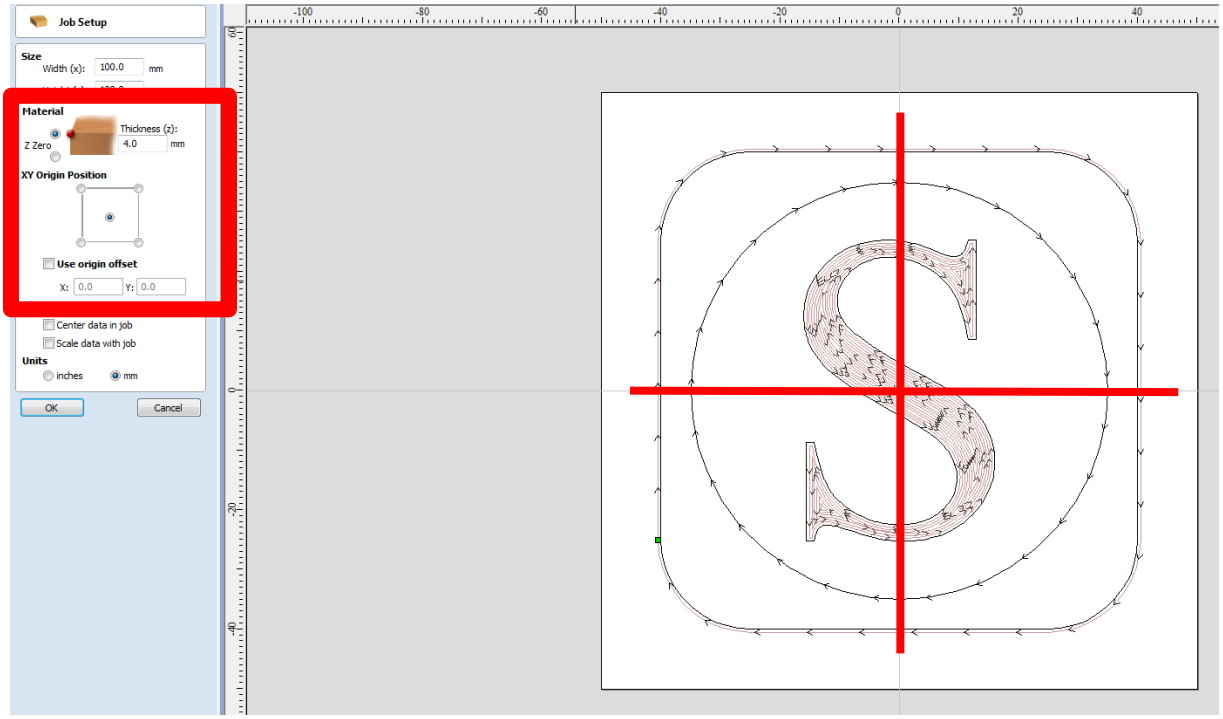


The toolpath generated from the demo video, and the video itself are in your installation folder. Please watch this and try to replicate the toolpath step by step using the video. Pay special attention to the parameters and relate this to their explanations. The Video is in your folder for Step 5.

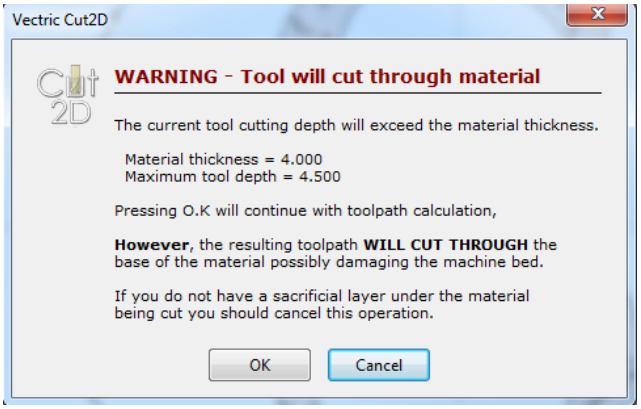
The video is on Youtube HERE .

Zeroing The job setup is important. You can see the faint cross hairs on the workpiece drawing. The cross hairs appear in the centre of the work. This is because the X,Y origin is setup in the centre in the job setup in the left hand side. You can setup the job origin to be the bottom left for example. It is very important that your are consistent with the setup here in Cut2D and also with the machine.

If you zero in the middle in Cut2D like here – you need to zero the machine in the middle of the work.



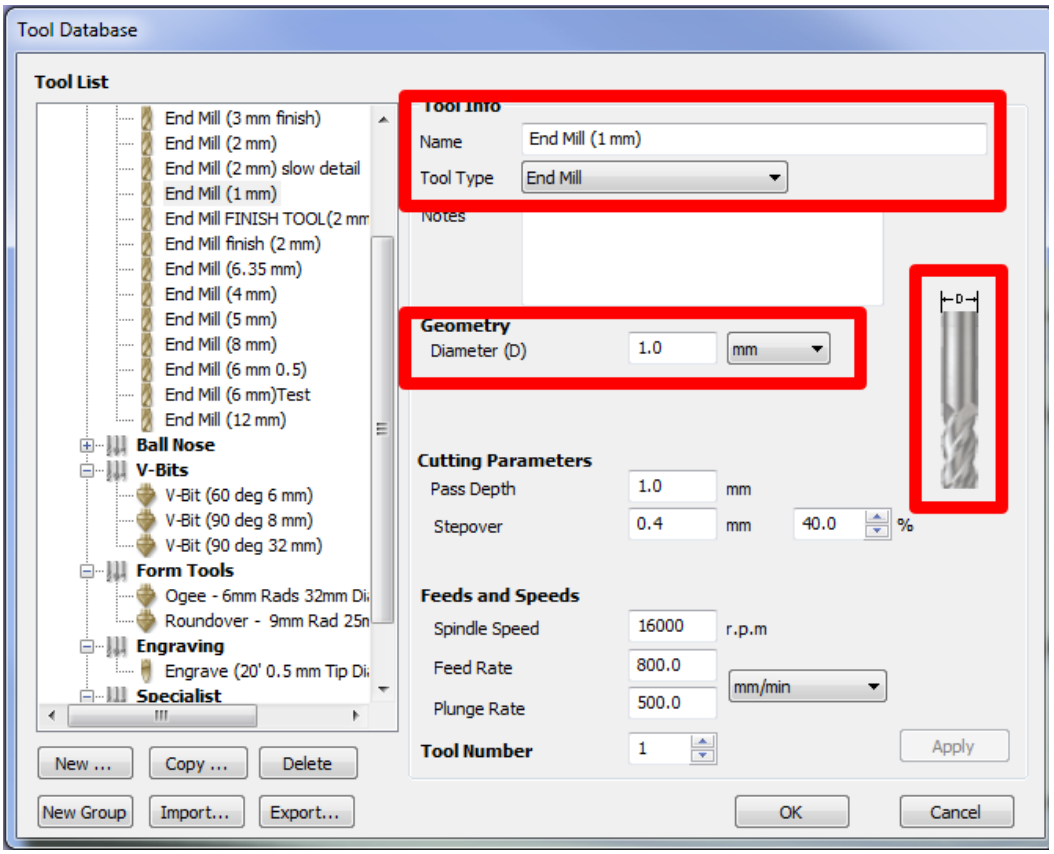
As we have set the thickness of the work to be 4mm (as per our plywood), and we set the cut depth of the final outline cut to be 4.5mm, Cut2D will give a warning. You can still proceed, its simply telling you that you are going to machine deeper than your materials thickness.



If you have a sacrificial layer under your part to be machined (which you should) then cutting through deeper than the material thickness will ensure you cut all the way through around the entire perimeter and leave minimal finishing

9.8.3 TOOL RADIUS COMPENSATION

In order for Vcarve/Cut2D to carry out effective tool radius compensation (accounting for the fact that the tool has a diameter) *Make sure that when you select your tool*



- You select the correct tool type – in this case an end mill. You will see an image of a tool sample on the right hand side in the above figure.
- Make sure you enter in the correct tool diameter. The tool diameter is the diameter of the "hole" or the width of the "channel" the tool will make in the work piece. One way to measure this (if not written on tool) is to slowly plunge the tool into a sample work piece – say MDF or plywood (jog only in Z and make sure the spindle is on). The circular hole the milling cutter makes in the work piece (ply or MDF) is the cutter diameter. You can now measure this with a ruler of calliper. NOTE it is best to specify the cutter diameter from the supplied cutter specifications.
- Take some notes for specific jobs. You might find the optimal settings for Perspex for example. It is a good idea to save a new tool with these settings so you always have this tool in your tool library for the next time.

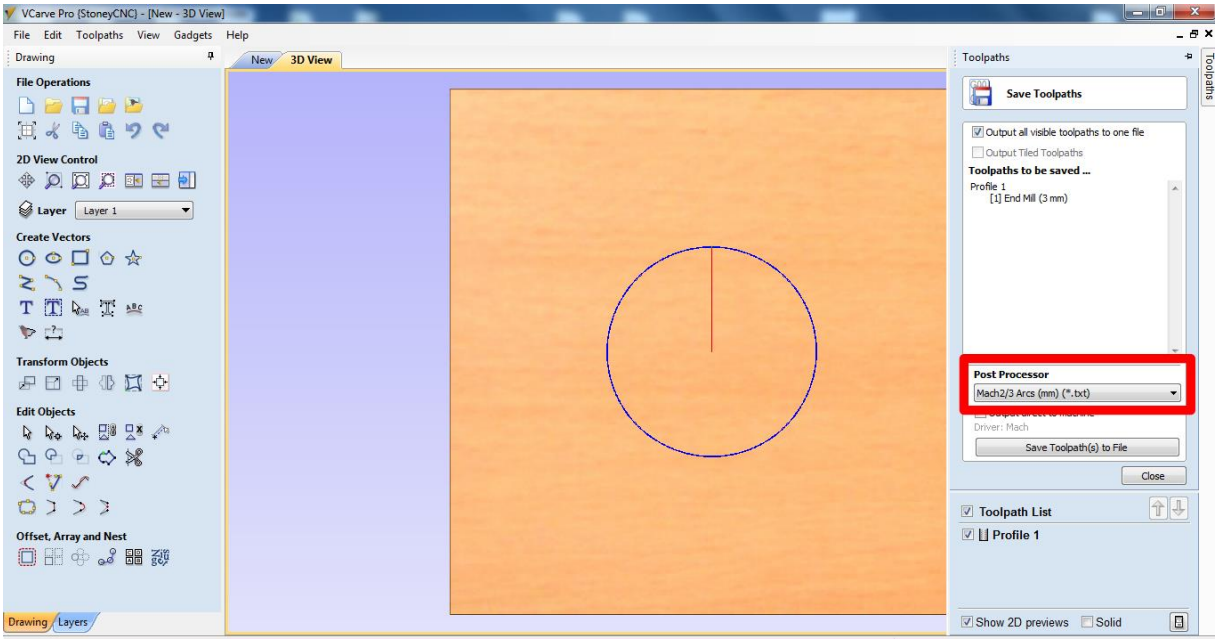
9.8.4 VECTRIC SOFTWARE INSTALLATION

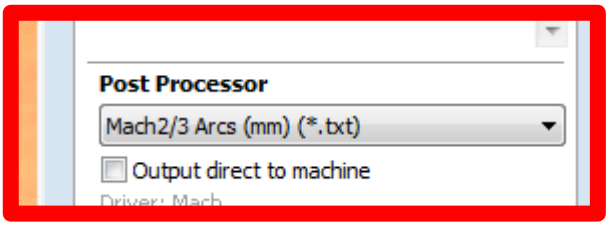
When we provide you with the software – the license number and user name specific to your machine should be on a sticker on the rear of the software case provided. If you purchased VcarvePro or cut2D from us and you do not have a case with a licence number – please let us know.

If you purchase from Vectric directly then Vectric will supply you with your software license key.

9.9 POST PROCESSOR

As shown in the Step 5, part of the process requires you to export the toolpath from Cut2D/VcarvePro to a text file in order to import it into the machine. In order to do this you must choose a post processor specific to your machine. In the case where you are using the I2R machine with either Mach3 or UCCNC you must select the "**Mach2/3 Arcs (mm)(*.txt)**" post processor. The drop down menu in Vcarve/Cut2D has many post processor options. Make sure choose the "**Mach2/3 Arcs (mm)(*.txt)**" in order to generate the toolpath to be compatible with the I2R machine.





9.10 STEP 6 PART MACHINING

MACHINING OVERVIEW

The final stage is to machine your part and make some chips. This is best viewed in the demonstration videos as there are a number of steps that you must carry out.

https://www.youtube.com/watch?v=Sd7ex6q1NFc

https://www.youtube.com/watch?v=bsJM7VH_apU

To machine your part you must carry out the following steps

9.10.1 LOAD YOUR GCODE FILE

The Gcode file is generated from Cut2D/Vcarve and from there loaded into the UCCNC software

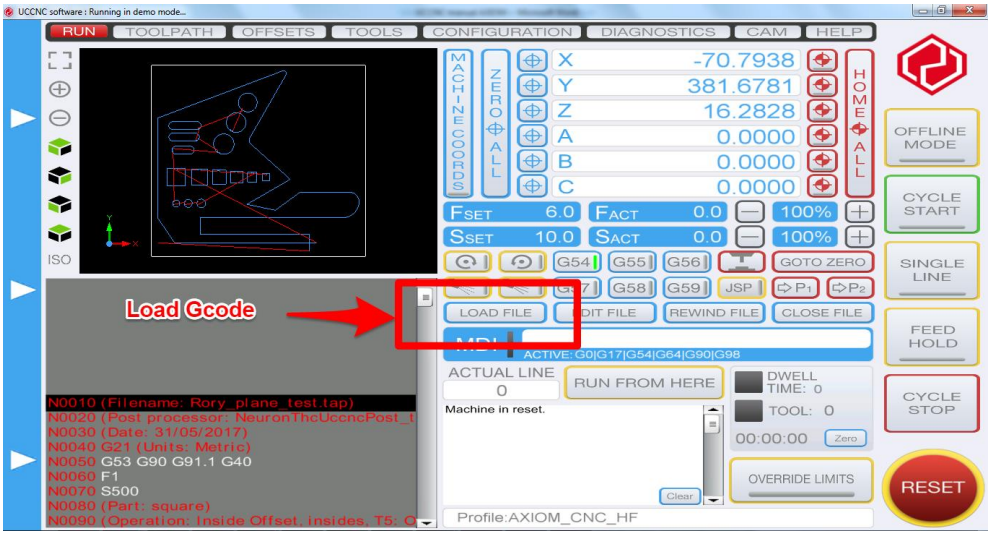


Figure 65: Load Gcode into UCCNC

9.10.2 CLAMP YOUR WORK PIECE TO THE MACHINE TABLE

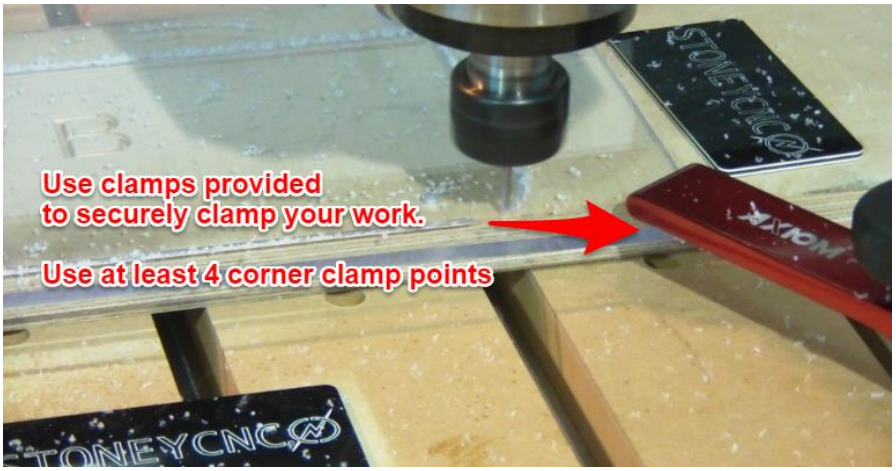


Figure 66: Clamping methods

9.10.3 LOAD YOUR TOOL

Before loading any tool or touching the spindle refer to Figure 43 and press the rest button BEFORE attempting to change the tool
DO NOT TOUCH the spindle unless the reset button is flashing red and yellow on UCCNC front panel

The Kress and HF spindle both use collets to load the cutters into the spindles. The Kress uses a Kress specific collet and the HF spindle uses an ER20 collet system. You must disable the spindle system before you handle the collet mounting system by pressing the reset button on the UCCNC front panel (refer to Figure 50)

The procedure for mounting the collets is important

Kress collet

HF ER20 Collets

In both cases the method for using the collets is the same.

- Choose the correct collet for your tool. Always stick to the cutter spec. If using a 3.175mm collet (1/8th inch) then use a 1/8th inch collet. Using the correct collet for your cutter will make safe tool mounting easier and safer.
- Make sure the collet and collet nut are clean and debris free

- Insert the collet into the collet nut until the collet seats. You should hear a “click”. NOTE: if you mount a collet incorrectly into the spindle it will damage the collet.
- Mount the collet nut (now with seated collet) into the spindle head fixture and loosely tighten by hand only – just so the collet is on the threads of the spindle.
- Insert the tool you wish to use (NOTE: you should have pre- selected your collet size for your tool choice)
- Mount the tool so that you have enough tool stick out to carry out your machining operation.
- You must now lock the spindle head in order to tighten the collet nut
    - On the Kress there is a locking button on the base of the kress spindle itself
    - On the HF spindle you must use the spanner to lock the head
- The collet nut can now be used to tighten the collet into the spindle head securing the cutter. The Kress needs a 17mm open spanner and the HF spindle needs a special ER20 collet spanner. (NOTE: be careful as you do this as you can slip and damage the cutter or cut/injure yourself. You will be exerting a tightening force with the locking spanner around and near a sharp cutter. So be careful!)
- Check the cutter is seated in the spindle and collet correctly by eye after you have installed the cutter and tightened the collet.
- Carry out steps in reverse to remove the cutter.
- Never use undersized tools for collets. Always use the correct collet for the correct tool
- Never us a tool beyond its recommended RPM.
- Always expect the unexpected.
- Take extra care when loading a tool and ensure the tool is mounted correctly prior to running a tool path and turning on the spindle.

9.10.4 SETUP AND RUN YOUR PROGRAM

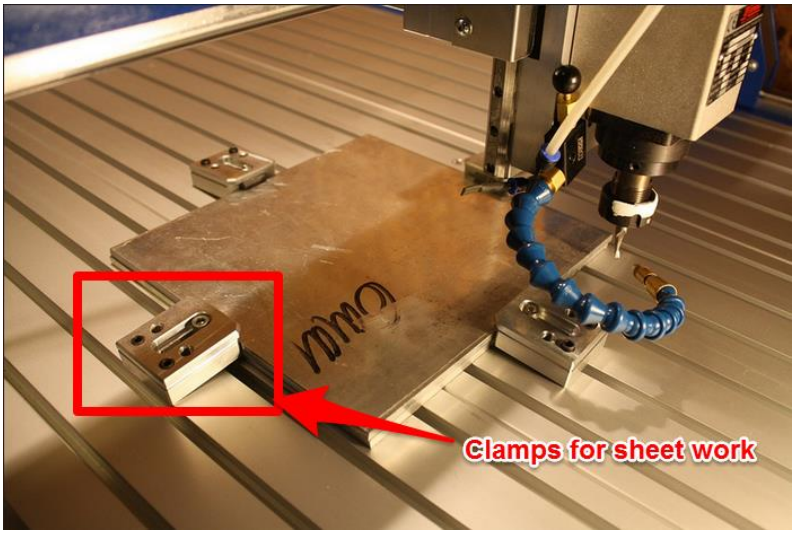
1. Make sure your machine is on and running in all directions
2. Move the machine an set the machine zero point for the X, Y and Z axes
    - See here for a full video of the process
    - http://stoneycnc.co.uk/i2r-ar-sf-software/
3. Verify the working area is sufficient for machining
4. Turn on the spindle
5. Hit cycle start and hopefully see your creation emerge from the dust

9.11 SPECIAL NOTES ON CLAMPING

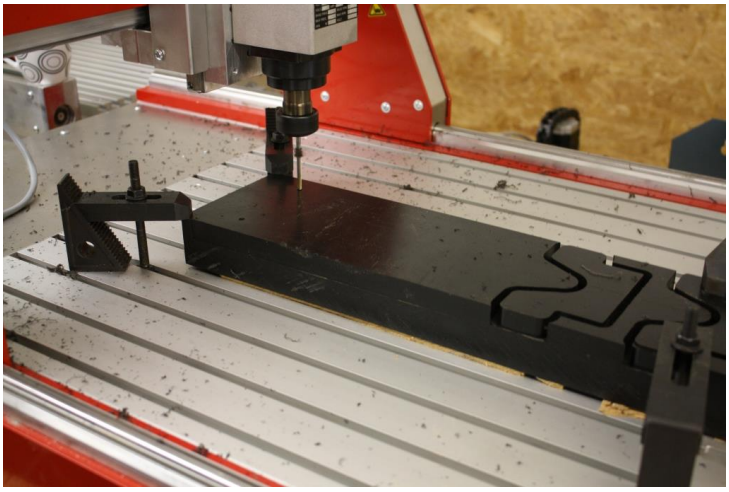
WARNING: Very important the work piece is clamped securely.

9.11.1 SHEET CLAMPING USING SUPPLIED CLAMPS WITH THE MACHINE

The T-slot bed provides a number of methods for clamping. The image below shows the typical method for clamping sheet work in small sizes to the T-slot table. The clamps can be used to clamp a variety of thicknesses up to 18mm MDF. There are other options available- please contact us for more information. It is very important the work is securely clamped as if the work hops during use and becomes loose – it is extremely dangerous.



9.11.2 CLAMP SETS FOR LARGER WORK PIECES



Another method of clamping is shown here in the image on the left using triangular brackets and fixing cantilever arms. These can work very effectively for larger pieces like the acetal part shown here in the image on the left. The advantage of this configuration is larger work pieces can be clamped securely. However you have to be careful as the larger the clamps you use, the more you run the risk of crashing into the clamps during use. Always double check before you run your toolpath that the machine will not move itself to crash into the clamps.

9.11.3 SACRIFICIAL LAYERS

It's a good idea to always use a sacrificial layer under the work piece you are machining. This is especially important when you are milling all the way through the material. 3-4-6mm MDF often works well. It saves you blemishing the T-slot Aluminium table. Often if you use a thick layer you can use a drill and screws to fix your work. Crude but functional.

9.11.4 VACUUM TABLES

We also provide a range of vacuum tables. The tables come in both MDF and Aluminium configurations. The Aluminium configurations are much better at keeping materials stuck to the work. MDF tables can also work well. Pump specification is very important when considering a vacuum table clamping solution.

9.11.5 SPRAY ADHESIVE

Spray adhesive, especially 3M photo mount spray is a very useful additional method of clamping. For example a piece of MDF can be clamped to a sacrificial layer of MDF with just the spray adhesive. You have to play with trial and error to find the optimal machining conditions as the spray adhesive is not as strong as the other clamping methods – but can still be VERY effective. For example, when machining letters out of MDF or plywood the addition of spray adhesive as well as the clamps can help prevent the cutout shapes from "hopping" on the bed. For larger pieces this is especially helpful. The reason for this is that is makes sure that the work piece sits flush to the top surface on all areas. Sometimes when clamping larger sheets – the middle of the sheet can rise slightly when clamped at the

edges. The spray adhesive does a great job of keeping everything flat and true. Light sanding afterwards gets rid of the adhesive. Trial and error is the best method to approach.

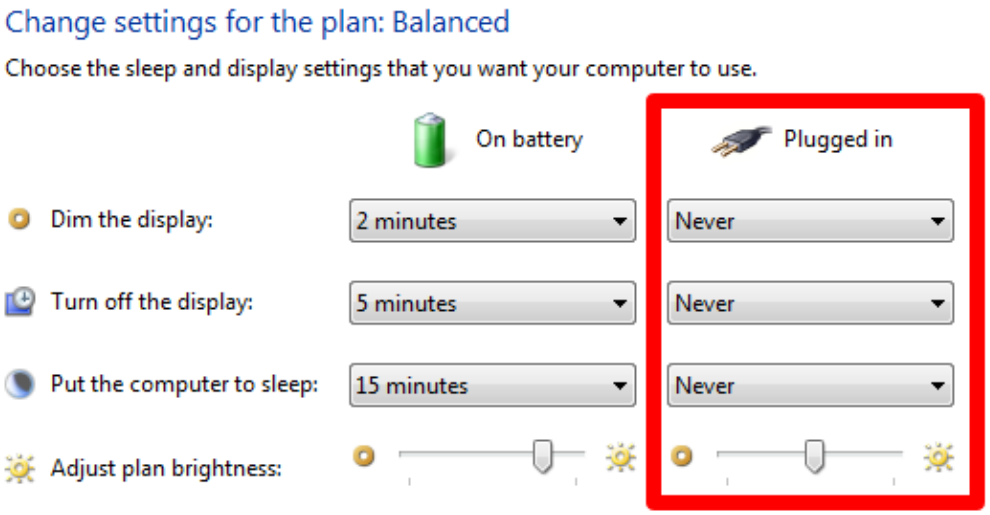
9.11.6 CLAMPING CONSIDERATIONS

It's very important that whatever clamping approach you use that you proceed with caution. This is especially important when your experiment with new methods. Work coming loose when you are machining is extremely difficult.

10 POWER MANAGEMENT OF LAPTOP/PC

It is very important that you disable all screen savers and any temporary shutdown present on your window system. Automatic restarts, updates, screen savers, power save modes etc etc. These can all cause the USB/Ethernet communication to be lost between your machine and control PC. This usually results in lost work.

As the figure show – disable the **Display Dim**, **Turn off Display** and **Sleep functions** when the laptop is plugged in.



11 TECHNICAL SPECIFICATIONS

AutoRoute:		4 Basic	4 Pro	6 Pro	8 Pro
X Axis Travel	24" (610mm)	•	•	•	•
Y Axis Travel	24" (610mm)	•	•		
	36" (915mm)			•	
	48" (1220mm)				•
Z Axis Travel	6" (153mm)	•	•	•	•
Table Work Area	39.17" x 28.39" (995mm x 721mm)	•	•		
	51.18"x 28.39" (1300mm x 721mm)			•	
	62.99" x 28.39" (1600mm x 721mm)				•
Collet	ER-20		•	•	•
Collet Chuck	1/2" Included		•	•	•
High Speed Spindle	3 HP 2.2kW/7.5A Electro Spindle		•	•	•
Spindle Speed	0~24000 RPM		•	•	•
Rapid Feed Rate	3500mm/min)	•	•	•	•
Precision Linear Guide Rails	X/Y/Z Axis	•	•	•	•
Precision Ball Screw	X/Y/Z Axis	•	•	•	•
Power Requirements		•			
	220V, 50~60 Hz, 10A Single Phase		•	•	•
Working Table	High Rigidity Interlocking Aluminum	•	•	•	•
	Integrated MDF Spoil Board	•	•	•	•
Gantry Bridge	High Rigidity Aluminum Extrusion	•	•	•	•
Gantry Support	Gravity Cast Aluminum Alloy	•	•	•	•
Gantry Clearance	6.5" (165mm)	•	•	•	•
Machine Base	Welded Structural Steel Frame	•	•	•	•
Machine Footprint	35" x 30" (890mm x 770mm)	•	•		
	47" x 30" (1197mm x 770mm)			•	
	58.85" x 30" (1495mm x 770mm)				•
Required Floor Space	39.17" x 37.36" (995mm x 949mm)	•	•		
	51.18" x 37.36" (1300mm x 949mm)			•	
	62.99" x 37.36" (1600mm x 949mm)				•
Max. Machine Height	30.27" (769mm)	•	•	•	•
Machine Weight	132lbs (60kg)	•			
	154lbs (70kg)		•		
	198lbs (90kg)			•	
	242lbs (110kg)				•
Tool Touch Off Puck	Standard Accessory	•	•	•	•
Integrated Liquid Cooling System	Standard Accessory	N/A	•	•	•
Controller	UCCNC controller as standard	•	•	•	•

12 ELECTRICAL CONNECTIONS

WARNING All Electrical connections must be performed by a qualified electrical and follow any local codes and ordinances. Failure to comply may result in serious injury.

Electrical connections that are improperly installed or are outside operational specifications may cause machine damage and void any warranties that are in place.

Figure 67: Standard UK plug

The **Pro Model** CNC machines are rated for 220V +/-10% having an operational range of 200-240V. The machines come pre-wired with a **UK** plug for use on a circuit with a grounded outlet as pictured. It is recommended that these machines be connected to a dedicated 10-amp circuit.

If the machine must be reconnected for use with a different type of electric circuit, the connection must be done by qualified person(s), and must comply with all local codes and ordinances.

12.1 Grounding Instructions:

I2r CNC machines must be grounded. This grounding provides a path of least resistance for electrical current, which during a malfunction will reduce the risk of electrical shock.

All I2r machines are equipped with an electrical cord with grounding conductor and plug. The plug must be used with a matching outlet that is properly installed and grounded in accordance with local codes and ordinances.

These plugs must not be modified, if a matching outlet is need, one must be installed by a qualified electrician.

Improper installation may result in electrical shock.

If grounding instructions are not completely understood or if in doubt as to whether the machine is properly grounded, a qualified electrician should be consulted.

12.2 Extension Leads:

The use of extension cords should be discouraged. It is recommended to place the machines as near to the power source as possible.

If an extension cord is necessary, make sure any cord used is in good conditions. Worn or damaged cords should be replaced immediately.

When using an extension cord, be sure to use one that is heavy enough to carry the required current and use only 3-wire extension cords that feature the correct 3-prong grounding plugs and 3-pole receptacles.

An undersized cord will cause a drop-in line voltage resulting in loss of power, overheating and runs the risk of fire.

It is recommended that if an extension cord must be used, it be a 10-12 gauge grounded-three wire cord of no more than 8-10 feet.

13 MAINTENANCE

13.1 GENERAL MAINTENANCE

Best practice with machine tools is to keep the machines clean and free from dirt and debris.

To ensure proper machine operation, it is recommended that the prismatic guides and rolled ball-screws on all axis are kept clean regularly wiped down with a light machine oil lubricant (such as 3-IN-ONE oil). Figure 68 shows the X axis rails and ballscrew. The Z and Y axes have the same components.

The ballscrews also have grease nipples on them. Every 1000 hours or every year these can be packed with standard grease for optimal operation – See Figure 69 for the recommended grease specification.

Figure 68: Weekly (best case daily) cleaning and application of light oil externally to screws and rails with cloth and light oil.

Figure 69: Recommended grease for the ballscrews when greasing bia the grease nipple

13.2 Routine Checks: (Performed Daily with machine use)

1. Wipe the ball-screws and prismatic guides clean and dust free.
2. Apply light machine oil to ball-screws and prismatic guides using a clean cloth.
    a. Move the machine through travel limits to properly disperse lubricant.
3. Check cutting tool edges for chips and/or dullness.
4. Generally, inspect the machine for any damage.
5. Ensure that slots in the collets are free of sawdust and debris.
6. Check coolant levels in reservoir.
7. Verify that the dust extractor is free of blockages.
8. Check that all electrical connectors are fitted correctly and are not loose.

13.3 Cooling System Flush/Refill:

On I2R CNC routers with the liquid cooled spindle, every 4-6 months the electro spindle cooling system should be flushed and refilled to guarantee that the coolant is fresh and able to perform optimally.

The cooling system consists of a clear reservoir/pump assembly.

To flush this system it is recommended that users acquire:

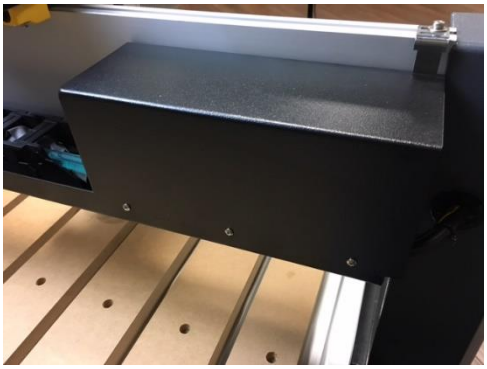


Figure 70: Cooling system is under cover on back of bridge

1. A small (12 inch) section of 5mm tubing.
2. Empty container used to catch old fluid.
3. Container of distilled water (Flush).
4. Fresh Propylene Glycol (RV/Marine Grade) coolant.

First, locate the cooling system which can be found on the rear side of the gantry. Uncover the cooling system by removing the 3-screws which hold the black cover in place.

Once the cover is removed, notice the cooling pump/reservoir, as seen in Figure 74:

The output from the pump is going directly into the radiator. From there the fluid travels up the wire chain to the spindle then back to the pump through the return tube.

To flush the system, removing all the old coolant and preparing for the new fluids:

Figure 71 Cooling pump

1. Remove the return tube from the brass fitting, leaving a small section of tube and all the fittings still attached to the pump.
2. Attach a short section of tubing to that same fitting.

3. Insert that tube into a container of distilled water (Flush).
4. Insert the tube returning from the spindle into an empty container.

Make sure the spindle RPM is turned to Zero (F0.00). Then from the main coordinate screen, manually cycle the spindle/pump on by pressing the ON/OFF button on the controller.

This will cause the pump to draw up the distilled water (Flush), and push out the old fluids and water through the other line.

Once the coolant has been flushed from the system. Press the ON/OFF button again to stop pump.

Next, replace the distilled water (Flush) with the new coolant, by:

1. Remove the tube going into the container of distilled water (Flush).
2. Insert this tube into the fresh coolant (RV/Marine Grade).
3. Cycle the pump again by pressing the ON/OFF button on the controller.

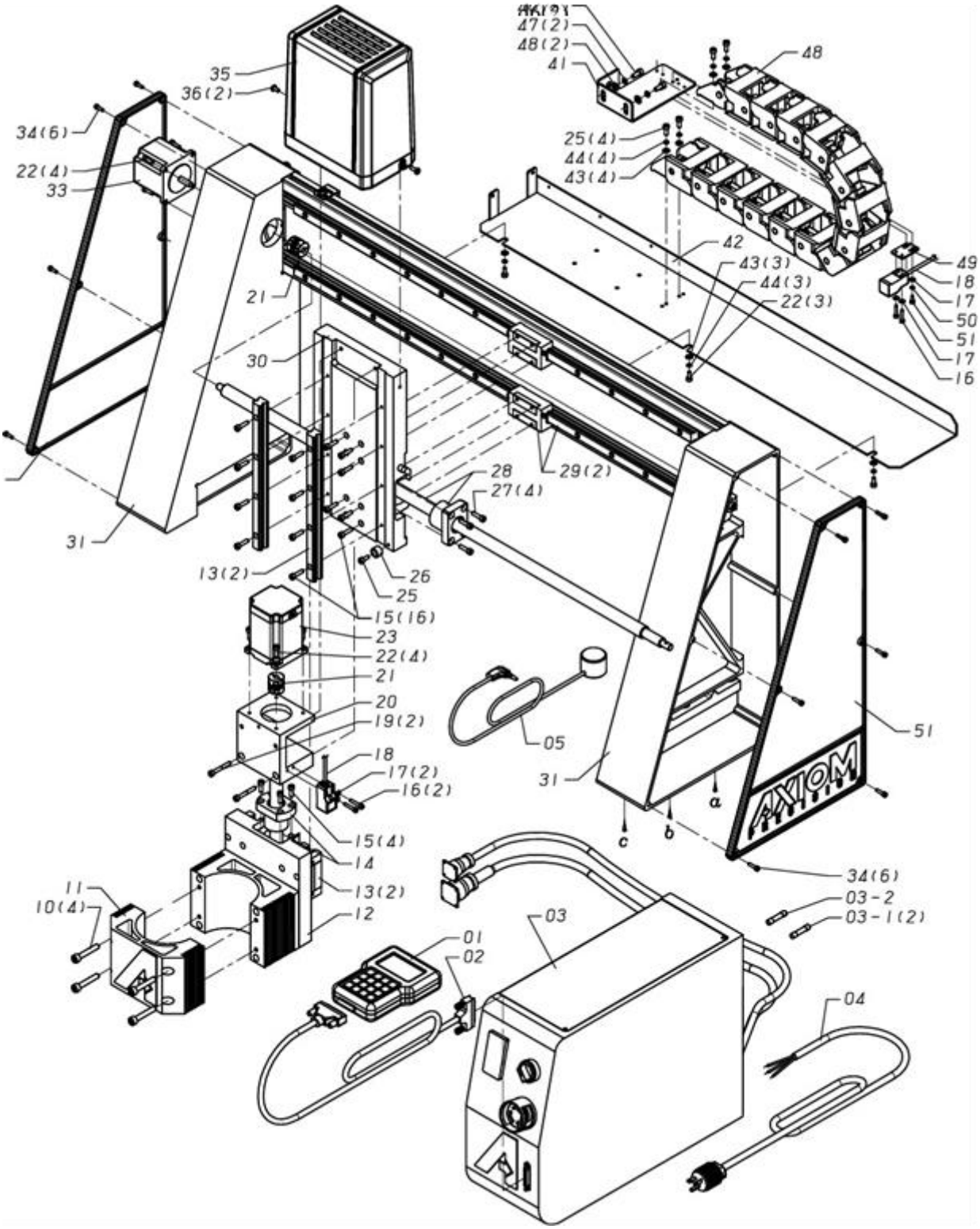
Once all the distilled water (Flush) has been removed from the system, replaced by the proper coolant, stop the pump by pressing the ON/OFF button on the controller a final time.

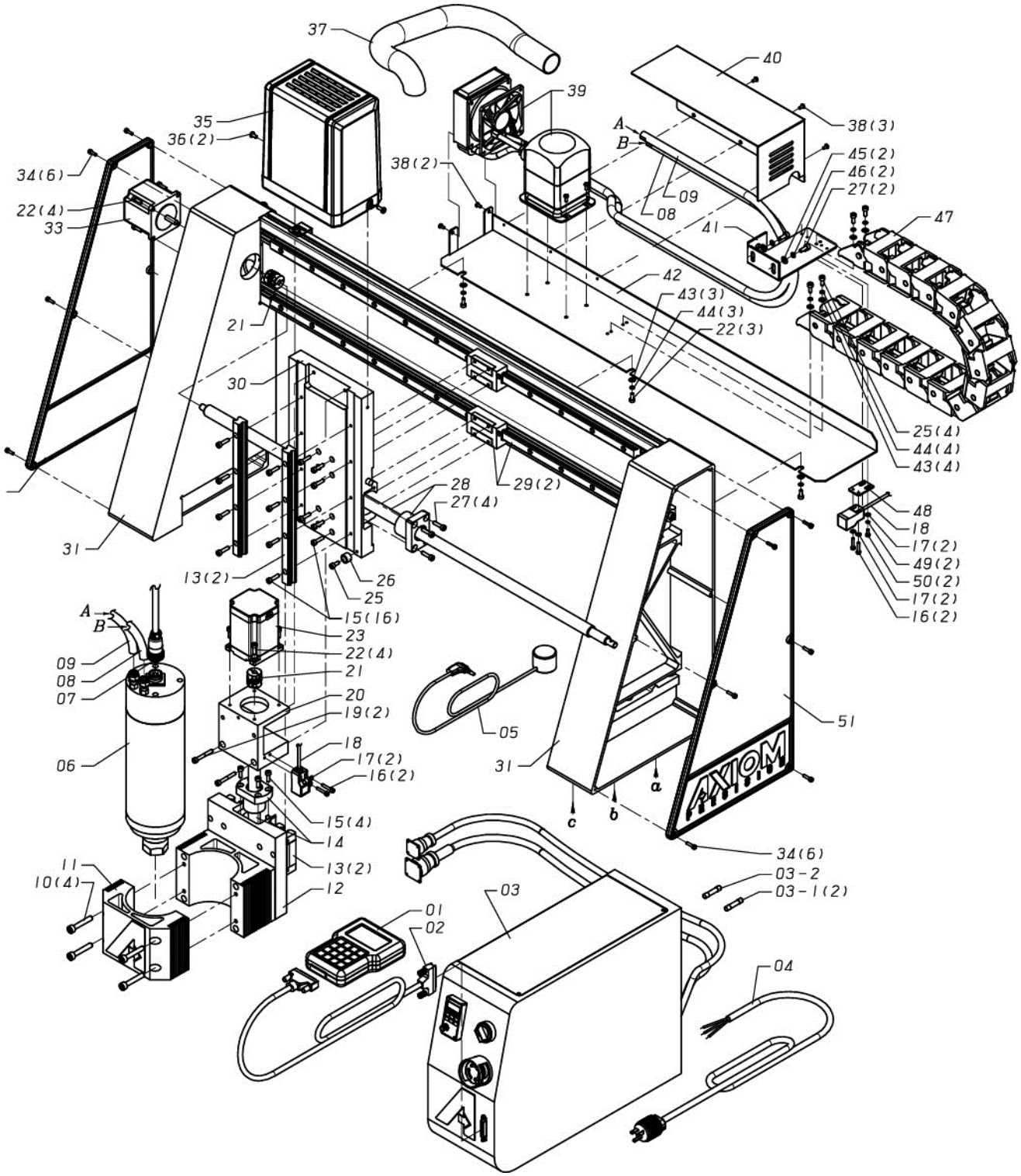
Remove the temporary section of tube used for flushing and reconnect the spindle tubing to the brass fittings at the pump.

If needed, the reservoir cap can be removed and the tank can be filled to approximately ¾ full, using the remaining coolant.

Entire system holds between 14 and 20oz of fluid. It should not take much to flush and refill the system

14 DOCUMENTATION

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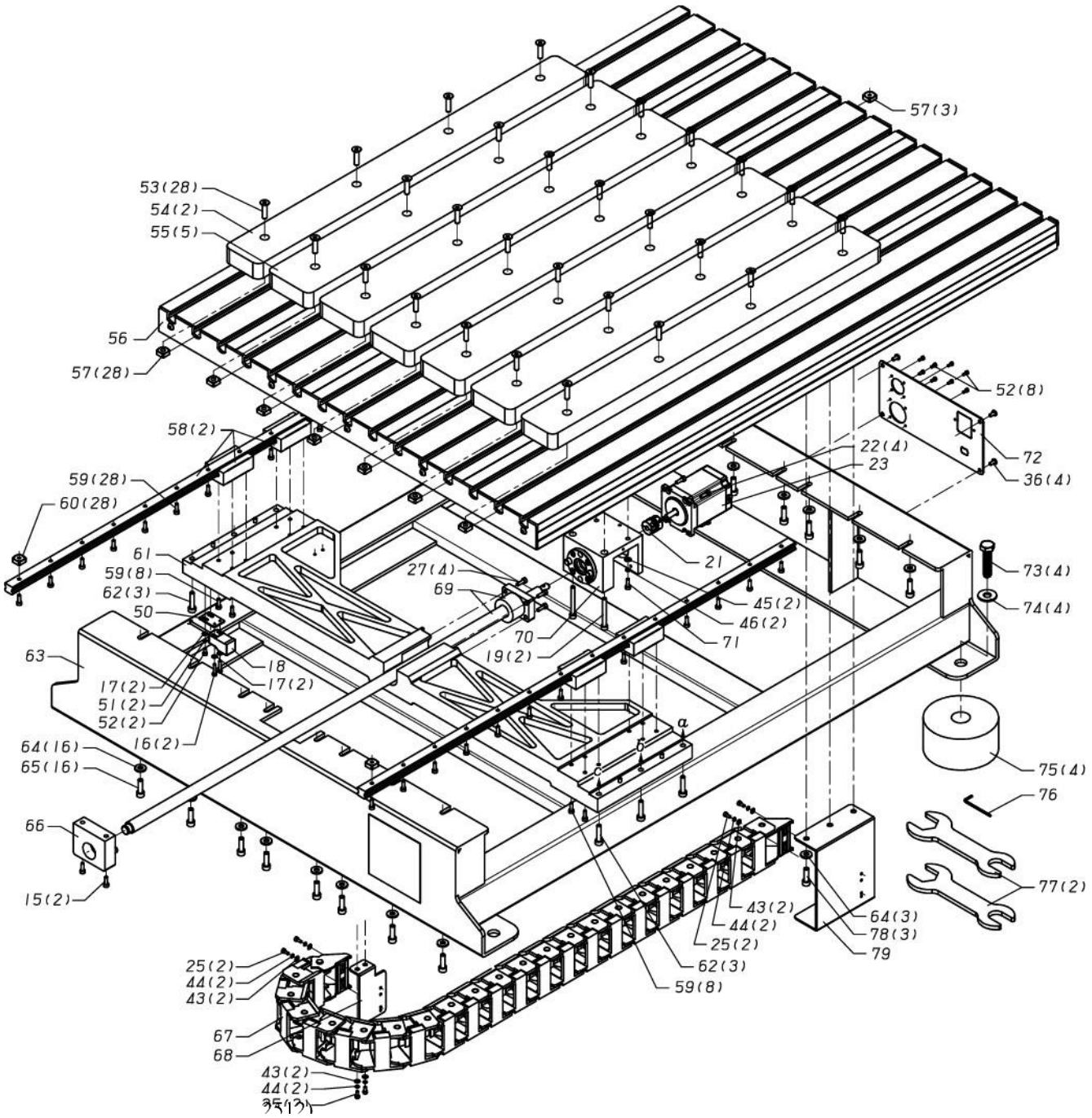
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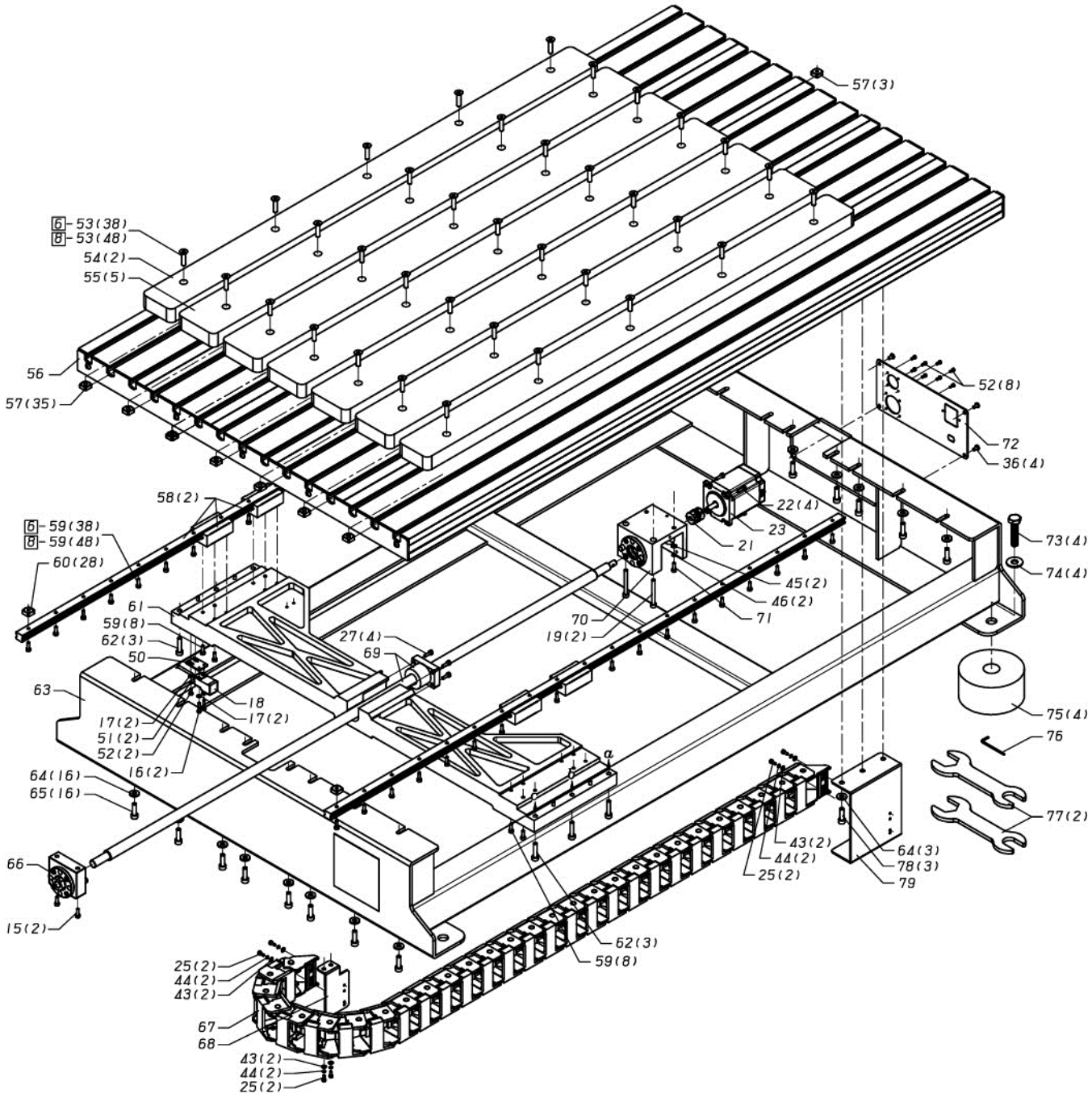
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	Parts No.	Description.	Size.	Qty.	Remark.
1	RichAuto-A11E	HANDHELD CNC CONTROLLER		1	
2	AX01C00050	HANDHELD CNC CONTROLLER CABLE	VW-I /30V/80C	1	
3	AXO1BOO1O	ELECTRIC CABINET ASSY.		1	AR4/6/8 PRO
3	AX01B0020	ELECTRIC CABINET ASSY.		1	AR4/6/8 BASIC
3.1	FU-10A	FUSE	10A	3	
3.2	FU-5A	FUSE	5A	1	
4	AX01C00040	POWER CORD	15AWGx3Cx2100L PLUG: LK7620P	1	
5	AX0100530	MILLING FROM ZERO GAUGE		1	
6	GDZ.23-1C@80/2.2	ELECTRO SPINDLE		1	
7	AX01C00030	MOTOR CABLE	FTI .17AWGx4C	1	
8	CW TUBE-IO	COOLING TUBE (IN)	5MMx8MMx1350L	1	
9	CW TUBE-IO	COOLING TUBE (OUT)	5MMx8MMx1350L	1	
10	HS-SCW-M6x35	HEX SOC HD SCR	M6xP1.0x35L	4	
11	AX0100421	FRONT MOTOR HOLDER		1	
12	AXO1AOO1O	REAR MOTOR HOLDER ASSY.		1	
13	BGXSI 5BN-1-220-NZO-20-20	Z AXIS LINEAR GUIDE		2	
14	AX0100110	Z AXIS BALL SCREW		1	
15	HS-SCW-M4x16	HEX SOC HD SCR	M4xPO.7x16L	20	
16	HS-SCW-M3x16	HEX SOC HD SCR	M3xPO.5x16L	6	
17	W-M3	FLAT WASHER	3.2x7x0.5T	10	
18	DA-1805NO	SENSOR	DA-1805NO	3	
19	HS-SCW-M5x45	HEX SOC HD SCR	M5xPO.8x45L	4	
20	AX01A0020	Z AXIS MOTOR SEAT		1	
21	SFC20C-8X6.35	COUPLING	SCT-20C	3	
22	HS-SCW-M4x12	HEX SOC HD SCR	M4xPO.7x12L	15	
23	TK268D-02A5	STEPPER MOTOR	TK268D-02A5	2	
25	HS-SCW-M4x10	HEX SOC HD SCR	M4xPO.7x10L	7	
26	AX0100750	RUBBER PAD	12x8	1	
27	HS-SCW-M5x12	HEX SOC HD SCR	M5xPO.8x12L	10	
28	AX0100070	X AXIS BALL SCREW	L=795	1	
29	BGXS15BN-1-700-NZO-20-20	X AXIS LINEAR GUIDE		2	
30	AX0100061	X AXIS SLIDE SEAT		1	
31	AX01A0030	X AXIS MOVING GANTRY		1	
32	AX01A0040	LEFT SIDE COVER		1	
33	TK266D-02A5	STEPPER MOTOR	TK266D-02A5	1	
34	HS-SCW-M3x10	HEX SOC HD SCR	M3xPO.5x10L	12	
35	AX0100140	TOP HOUSING		1	
36	THP-SCW-M4x10	TRUSS HD PHILLIPS SCR	M4xPO.7x10L	6	
37	CRS-25P	FLEX TUBE	40x500L	1	
38	RHP.SCW.M3x6	ROUND HD PHILLIPS SCR	M3xPO.5x6L	5	
39	AX01A0050	LIQUID COOLING SYSTEM		1	
40	AX0100470	COOLING SYSTEM COVER		1	
41	AX0100251	X AXIS DRAG CHAIN SEAT UPPER		1	
42	AX0100183	X AXIS DRAG CHAIN SEAT LOWER		1	
43	W-M4	FLAT WASHER	4.2x10x0.8T	13	
44	SW-M4	SPRING WASHER	M4	13	
45	W-M5	FLAT WASHER	5.2x12x1.0T	4	
46	SW-M5	SPRING WASHER	M5	4	
47	A0450.21 KR52	X AXIS DRAG CHAIN	A0450.21 KR52-658MM	1	
48	AX0100220	SENSOR FIXED PLATE		2	
49	SW-M3	SPRING WASHER		4	

	Parts No.	Description.	Size.	Qty.	Remark.
51	AX01A0060	RIGHT SIDE COVER		1	
53	FH-SCW-M6x25	HEX SOC FLAT HD CAP SCR	M6xP1.0x25L	28	AR4
53	FH-SCW-M6x25	HEX SOC FLAT HD CAP SCR	M6xP1.0x25L	35	AR6/8
54	AX0100540	WOOD PLATE (2 SIDE)	630x65x25.4	2	AR4
54	AX0100550	WOOD PLATE (2 SIDE)	935x65x25.4	2	AR6/8
54	AX0100590	WOOD PLATE (2 SIDE)	1235x65x25.4	2	AR8
55	AX0100562	WOOD PLATE (MIDDLE)	630x80x25.4	5	AR4
55	AX0100572	WOOD PLATE (MIDDLE)	935x80x25.4	5	AR6
55	AX0100582	WOOD PLATE (MIDDLE)	1235x80x25.4	5	AR8
56	AX01A0070A	TABLE ASSY.	989x145.3x40	1	AR4
56	AX01A0070B	TABLE ASSY.	1294x145.3x40	1	AR6
56	AX01A0070C	TABLE ASSY.	1594x145.3x40	1	AR8
57	4040M6	SQUARE NUT	M6xP1.0	31	AR4
57	4040M6	SQUARE NUT	M6xP1.0	38	AR6/8
58	BGXS15BN-2-820-NZO-20-20	Y AXIS LINEAR GUIDE	RAIL SIZE: 15x13x820L	2	AR4
58	BGXS15BN-2-1120-NZO-20-20	Y AXIS LINEAR GUIDE	RAIL SIZE: 5x13x1120L	2	AR6
58	BGXS15BN-2-1420-NZO-20-20	Y AXIS LINEAR GUIDE	RAIL SIZE: 5x13x1420L	2	AR8
59	HS-SCW-M4x20	HEX SOC HD SCR	M4xPO.7x20L	44	AR4
59	HS-SCW-M4x20	HEX SOC HD SCR	M4xPO.7x20L	54	AR6
59	HS-SCW-M4x20	HEX SOC HD SCR	M4xPO.7x20L	64	AR8
60	4040M4	SQUARE NUT	M4xPO.7	28	AR4
60	4040M4	SQUARE NUT	M4xPO.7	38	AR6
60	4040M4	SQUARE NUT	M4xPO.7	48	AR8
61	AX0100021	Y AXIS SLIDE SEAT		1	
62	HS-SCW-M6x30	HEX SOC HD SCR	M6xP1.Ox30L	6	
63	AX0100031	BASE		1	AR4
63	AX0100351	BASE		1	AR6
63	AX0100381	BASE		1	AR8
64	W-M6	FLAT WASHER	6.5x15x2T	19	
65	HS-SCW-M6x20	HEX SOC HD SCR	M6xP1.0x20L	16	
66	AX01A0080A	Y AXIS BEARING SEAT		1	AR4
66	AX01A0080B	Y AXIS BEARING SEAT		1	AR6/8
67	A0450.21 KR52-987	Y AXIS DRAG CHAIN	L=987	1	AR4
67	A0450.21 KR52-1269	Y AXIS DRAG CHAIN	L=1269	1	AR6
67	A0450.21 KR52-1551	Y AXIS DRAG CHAIN	L=1551	1	AR8
68	AX0100241	Y AXIS DRAG CHAIN (FIXED PLATE A)		1	
69	AX0100201	Y AXIS BALL SCREW		1	AR4
69	AX0100372	Y AXIS BALL SCREW		1	AR6
69	AX0100392	Y AXIS BALL SCREW		1	AR8
70	AX01A0090	Y AXIS MOTOR SEAT		1	
71	HS-SCW-M5x20	HEX SOC HD SCR	M5xPO.8x20L	2	
72	AX0100281	BASE REAR PLATE		1	
73	HH-SCW-M1Ox45	HEX HD SCR	M1OxP1.5x45L	4	
74	W-M10	WASHER	10.2x25x2T	4	
75	AX01C00044	TABLE FOOT		4	
76	HW-2x60	HEX WRENCH	2x60L	1	
77	AX0100671	OPEN WRENCH	30x21	2	
78	HS-SCW-M6x16	HEX SOC HD SCR	M6xP1.Ox16L	3	
79	AX0100331	Y AXIS DRAG CHAIN (FIXED PLATE B)		1	
160	AXO1COOOO1	CARTON		1	
161	AX01C00041	OPERATION MANUAL		1