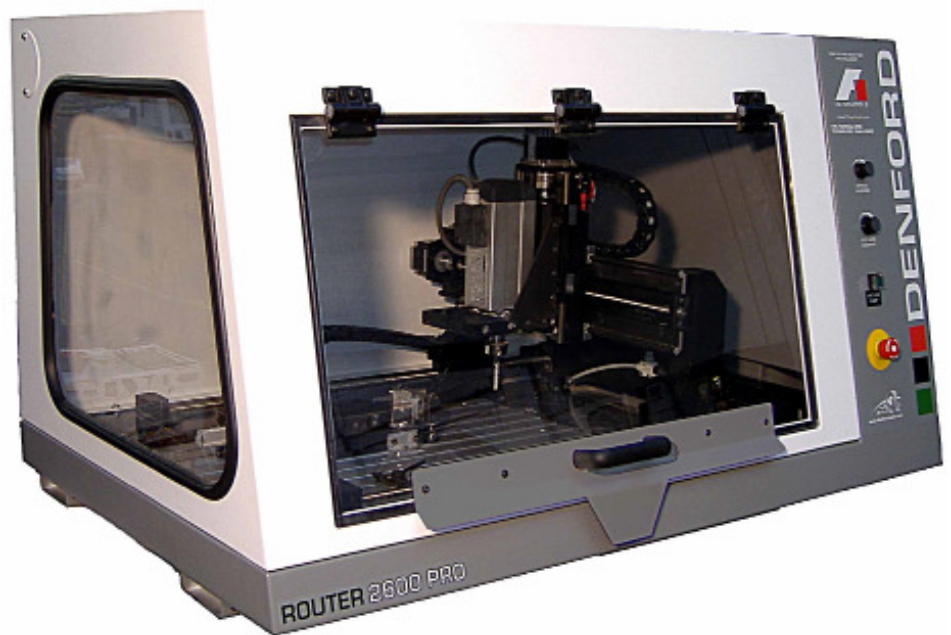


Router 2600 Pro  
CNC Machine  
User's Manual







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# 1: Warning Notices

## Warranty Disclaimer.

The Warranty on your Router will be invalidated if any modifications are made to the machine or any additional ancillary equipment fitted, or any adjustments are made to the controlling devices without prior notification from Denford Limited. Please refer to the information held in your separate Warranty pack, for specific details.

## Maintenance Disclaimer.

Always obtain permission from the person responsible for machinery in your establishment, before accessing the electrical control panel or Router machine casings to carry out any maintenance work. All work must be carried out by personnel suitably qualified for each maintenance task, to avoid damage to the machine systems and injury to the maintenance personnel. Denford Limited cannot accept responsibility for any damage, injury and/or loss that may occur through incorrect maintenance of your router.

## Use of Machine.

Your Router is designed for machining hard and soft woods, certain ceramics, plastics and non-ferrous metals. In each case, the appropriate tooling, speeds and feeds should be used as recommended by the material supplier. Information should also be sought from suppliers regarding the safety specification of the materials to be cut. Facility is provided for connecting a vacuum system for dust extraction. Always use the machine coupled to such a system.

Your Router is **not** intended for use with any ferrous metals.

Do **not** remove the router head and attempt to use it independently of the machine.

Do **not** machine any toxic, radio-active or volatile materials.

***Use of the machine for any purpose other than those for which it is designed may result in injury, and may also invalidate the warranty.***

The machine should only be used under constant supervision, to help guard against, and respond to, any unforeseen hazard such as fire or explosion. First aid and firefighting equipment (CO<sub>2</sub> Extinguisher) should be located nearby in a clearly signed and prominent position.

# 1: Warning Notices

## Sound Level Disclaimer.

The Noise Level test published in this manual is for the machine and any essential equipment such as dust extraction equipment, and complies with the relevant standards. It cannot make provision for noise resulting from the cutting process, since this is a variable, depending on such factors as material, cutting data and tooling.

Any ancillary equipment supplied by Denford will also comply with the relevant standards. However, when used jointly with the machine in a machining environment, the combined sound levels emitted may require that Personal Protection Equipment, such as ear defenders, be used. Other factors, such as high ambient noise levels and nearby machinery and equipment can also increase the sound levels.

It may be possible to reduce the sound levels by changing the machining process and/or repositioning the machine and/or its ancillary equipment.

If, under these circumstances, it is felt that the sound level is still unacceptably high, then independent advice should be sought and complied with.

If you have any doubts and/or questions regarding the use, specification, servicing, or features of your machine, please contact Denford Customer Services.

Denford Limited reserves the right to change the specification and/or operating features regarding this CNC machine without notice or documentation.

## Portable Appliance Testing.

***This machine has an Inverter drive fitted with Internal EMC filters.  
The Insulation Resistance test should not be carried out with the filter in circuit.***

***If the test is carried out with the filter in circuit then the appliance will fail the Insulation Resistance Test and damage can be caused to the machine.***

### In-Service Testing

This is the testing carried out as a routine to determine whether the equipment is in a satisfactory condition.

In-Service testing will involve the following:

- Preliminary inspection
- Earth continuity tests (for Class 1 equipment)
- Insulation testing (for Class 1 equipment)

# 1: Warning Notices

## Portable Appliance Testing (continued).

Electrical testing should be performed by a person who is competent in the safe use of the test equipment and who knows how to interpret the test results obtained. This person must be capable of inspecting the equipment and, where necessary, dismantling it to check the cable connections.

If equipment is permanently connected to the fixed installation, e.g. by a flex outlet or other accessory, the accessory will need to be detached from its box or enclosure so that the connections can be inspected. Such work should only be carried out by a competent person.

### **Preliminary inspection**

Formal visual inspections should only be carried out by persons competent to do so.

- Cables located so as to avoid damage
- Means of disconnection/isolation readily accessible
- Equipment positioned to avoid strain on cord
- Equipment is being operated with the covers in place
- Indiscriminate use of multi-way adaptors and trailing sockets is avoided
- Identify signs of overheating
- Identify signs of damage to insulation
- Check the correct size fuse is fitted (13A)
- Check the flexible cable connections and anchorage .

***Before carrying out the following tests ensure the machine is disconnected from any external equipment or supplies.***

***Ensure USB and RS232 connections are removed prior to testing.***

### **Earth continuity Test (Class 1 equipment)**

The test should be carried out at 25A for a period of 5 – 10 Seconds

The reading should be less than  $0.1 + R$  (where R is the resistance of the lead)



# 1: Warning Notices

Portable Appliance Testing (continued).

## Insulation Resistance Test (Class 1 equipment)

***A qualified electrical engineer should make the following modifications before carrying out the Insulation Test.***

- Remove the cover from the electrical panel.
- Locate the Spindle drive and remove the EMC and VAR screws.



The insulation resistance test can now be carried out

The applied test voltage connected between Live/Neutral and Earth should be 500VDC  
The insulation Resistance should be greater than 1M Ohms

The EMC and VAR screws must be refitted prior to operating the machine again.



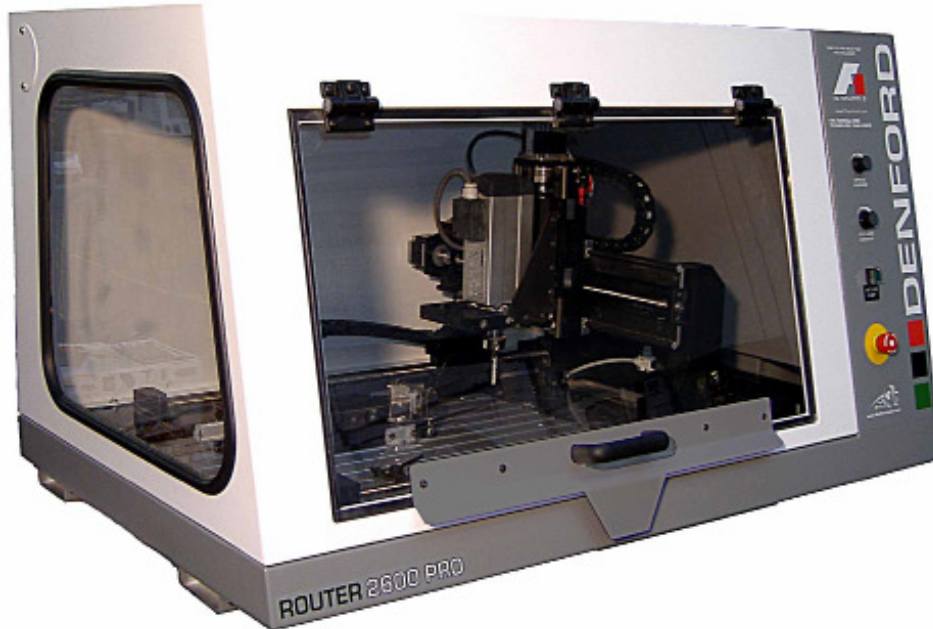
# 1: About this Manual

Using this manual	<p>This manual provides information describing how to transport, site, setup and operate the basic functions of your Denford Router CNC machine, including any operational features of hardware specific to the Denford Router series.</p> <p>This manual does not provide any information regarding the software packages used. Please refer to the help section within the appropriate software.</p> <p>Please note that the Electrical Diagrams for your Router are not included in this manual - they are delivered separately in the standard equipment box supplied with your CNC machine.</p> <p>If you have any doubts and/or questions regarding the specification, servicing, or features of your Router, please contact Denford Customer Services. Denford Limited reserves the right to change the specification and/or operating features regarding this CNC machine without notice or documentation.</p>
Disclaimer	<p>Please note that due to the nature of hardware and software developments, the specifications and features of this product can change without notice. The information contained in this manual is correct at the date of printing only - August 2010. No liability can be accepted by Denford Limited for loss, damage or injury caused by any errors in, or omissions from, the information supplied in this manual.</p>
Screenshots	<p>Please note that any screenshots are used for explanation purposes only. Any numbers, wording, window or button positions may be different for the configuration of the CNC machine control software being used to control your Router.</p>
Language	<p>This manual is written using European English.</p>
Contact	<p>Any comments regarding this manual should be marked for the attention of our technical authoring team and referred to the following e-mail address: <a href="mailto:customerservices@denford.co.uk">customerservices@denford.co.uk</a></p>



# 1: Introducing your Router 2600 Pro

Congratulations on your purchase of a Router 2600 Pro CNC machine. In this manual you will learn how to setup and use your Machine correctly and safely.



Your Router is a full three axes CNC router with a large work area, allowing machining of materials approaching 600 x 400mm in size. Suitable for all levels of education and training, it is manufactured to meet industrial standards. Together with rapid traverse rates of up to 5000 mm/min your Router is the ideal partner for intensive 3D applications, such as the F1 in Schools Formula One Technology Challenge ([www.f1inschools.co.uk](http://www.f1inschools.co.uk)) and the 4x4 in Schools Technology Challenge. Your Router 2600 Pro is designed with you in mind - making the processes involved both safe and easy to use.

## Main Features:

- Designed specifically for Education and Training.
- Manufactured to industrial standards.
- Programming via International Standards Organisation format, incorporating controls such as FANUC.
- CE approved for safety.
- Capable of cutting common resistant and prototyping materials, including Wood, MDF, Wax, Plastics and Acrylics and non-ferrous metals.
- Links to various CAD/CAM software packages.
- Totally enclosed high visibility interlocked guard.
- Feedrate and Spindle Speed override controls.
- Dust extraction ready.

# 1: Before Beginning to Setup

Before beginning to set up your Router 2600 Pro, please check your separate order documentation, making sure that all items have been delivered to your establishment. Any missing or damaged items should be reported to Denford Customer Services as soon as possible.

The following equipment is supplied as standard with your Router CNC machine :

- Router 2600 Pro CNC machine. Note that the precise specification of your CNC machine will depend on any options selected at the time of ordering (see below).
- 1 x Set of Workholding Clamps
- 6/7mm Collet and 12/13mm Collet
- 1 x Allen (hex) keys pack.
- 2 x Special Double Ended Spanners for tool changing.
- External USB Cable
- 1/4" Dia. Ball Nose Cutter
- 1 x Router 2600 Pro warranty pack (UK Machines only)
- 1 x CD-ROM containing Denford VR CNC Machine Control Software and manuals, and Machine user's manual.
- 1 x VR CNC Machine Control Software Security Key (dongle) or Flash screen software (supplied on removeable media).

The following optional equipment may also be supplied with, or ordered for, your machine:

- Additional Software: CAD/CAM, Offline CNC Machine Control.
- CNC Machine Control software security keys (dongles) or licence disks.
- Machine work bench and PC workstation.
- Vacuum for dust collection.
- Additional work holding systems.
- Various tooling packages.
- On-screen representation of industrial control systems (FANUC 21i) and optional link to industrial keypad.
- Courseware, project books and project material packages.
- Video conferencing system.



# 2: Safety Features Overview and Precautions

## Safety Features Overview.

The following safety features are standard on your Machine:-

- Emergency stop button.
- Manually operated, totally enclosed guard door with interlock switch.
- Option on control software to check CNC programs using toolpath graphics, prior to machining.
- Automatic tool retraction and spindle stop for tool changing.

## Safety Precautions.

Safety is very important when working with all forms of machinery but particularly when working with CNC equipment, due to the hazardous voltages, speeds and forces that exist in the hardware. Follow the rules below at all times, when using your machine.

General Safety Precautions :

- Wear clothing suitable for machine operation and follow the safe working procedures in place at your establishment. When emptying the dust extraction system base unit or cleaning down the machine, wear suitable respiratory protective equipment that is CE marked. Other personal protective equipment, such as eye protection, overalls and gloves should also be considered.
- Do not place any objects so that they interfere with the guards or the operation of the machine.
- Never try to clean the machine if any part of it is rotating or in motion.
- Always secure the work on the table or in a fixture or vice.
- Ensure that the correct cable for the power source is used.
- Ensure the mains power is switched off (and preferably unplugged) before starting any maintenance work on the machine. Depending on ancillary equipment supplied with machine there may be more than one power supply to the machine. When isolating machine always ensure that **all** power sources have been disconnected. Post a notice informing others not to use the machine since it is undergoing maintenance.
- Hazardous voltages can still exist immediately after switching the machine off. Always wait at least 5 minutes before accessing the CNC machine electronics.
- If power fails turn off the mains power switch immediately and unplug the machine from the mains power socket.
- Correct maintenance is an essential part of the safe use of this machine (see the Maintenance section for further details).
- Observe caution when handling machine tooling, particularly with regard to hot and/or sharp cutters. Consider wearing protective gloves.
- When an emergency stop is required, press the circular red emergency stop button, located on the right side of the CNC machine front panel.
- If laser scanner fitted do not stare into laser beam. Refer to Scanner instruction manual for all aspects of safe use of laser.
- Visually check door and window for signs of cracks or chips. Any damage should be reported immediately to Denford and a suitable replacement obtained without delay.
- Regularly check door gas springs and/or hinges for correct operation and inform Denford of any deterioration.

## 2: Safety Features - Emergency Stop Button



The emergency stop button is located on the right front panel of the CNC machine. To activate an emergency stop, press the button fully in until it clicks.

A circular, red emergency stop button is located on the right front panel of your Router, as shown above. When pressed, it has the effect of stopping all axes and spindle movements immediately. The guard interlock switch will also close. When the safety guard door is in its closed position, this will prevent access to the working area of the CNC machine.

To activate an emergency stop, press the button in until it clicks. The emergency stop button will continue to cut all power to the machine drives and continue to keep the interlock switch closed, until the release sequence is performed.

To release a closed emergency stop button, push in and turn the button clockwise until it springs back out.

After releasing an emergency stop, you may need to reset any CNC control software messages and home the CNC machines axes.

Check the emergency stop button is released before attempting to power up the Router


# 2: Safety Features - Interlock Guard Switch

**Note** [Close] [Maximize] [Minimize]

A closed safety guard door cannot be opened when:

- The machine is switched off (ie, not in use). To release the interlock guard switch, supply power to the machine.
- The emergency stop button is fully pressed in. To release the lock, push in and turn the emergency stop button counter-clockwise until it springs back out to its ready position.
- Machining is taking place. The interlock guard switch will release when the machining operations have been completed and the machine controlling software is operating in Jog Mode.

**Warning** [Close] [Maximize] [Minimize]

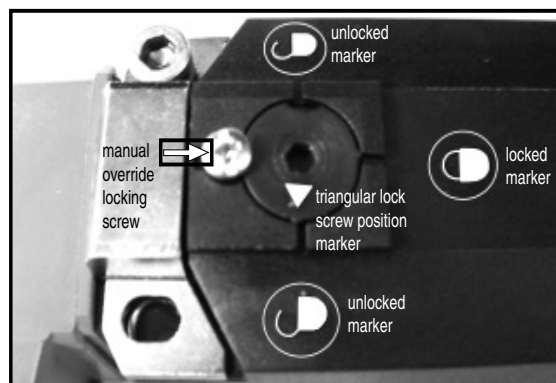
 Danger of serious injury! Do not let unauthorised personnel use the machine when the guard lock feature is disabled. Ensure the guard lock feature is switched back on as soon as possible. Under no circumstances must the safety switch actuator be removed (or a spare or replacement actuator, or other device be used) to defeat the safety interlocking system.

An interlock guard switch is fitted to the front machine door. The switch unit itself is attached behind the lower machine panel, accessible from beneath the front of the machine. The lock must be manually released to enter the working area when the 24 volt circuit has failed and the door is clamped electrically. An override facility is provided on the interlock guard switch, allowing temporary removal of the guard lock feature. For manual interlock release, the power supply must be switched off.



Left: The interlock guard switch unit (circled) is located behind the lower front machine panel.

- 1) Working beneath the front edge of the machine, locate the interlock guard switch unit.
- 2) Using a small flat or crosshead screwdriver, loosen the manual override locking screw until the circular black plastic lock screw can be turned (refer to photograph below).
- 3) Using a 3mm allen key, turn the circular black plastic lock screw one quarter turn to switch off the guard lock feature. If in doubt refer to the lock/unlock symbols embossed on the casing surface.
- 4) If necessary, tighten the manual override locking screw slightly. If you need to leave the machine, post a warning note informing users that the safety guard door lock is not operating.



Left: Looking directly at the face of the interlock guard switch unit.



## 2: Dust Extraction & General Dust Precautions

***If cutting known hazardous materials, the machine must be used with a suitable dust extraction system fitted and enabled.***

Your Router is designed to run with a dust extraction system, used to remove any potentially harmful airborne dust particles from within the working area of the machine.

Denford can supply dust extraction systems for your machine, or you may wish to connect your own system.

Connect the pipe from your dust extraction system through hole in the left hand cabinet wall to the hole on the left hand side of the spindle motor adaptor plate.

***It is a legal requirement to have the dust extraction system independently tested every 14 months to ensure that dust is kept***

### General Dust Safety Precautions.

Obtain "material safety data sheets" from your material suppliers and enforce the recommended precautions. Be aware that certain hardwood and other material dust particles, such as oak and MDF, could contain known carcinogens. Please consult your materials supplier for further details.

Dust particles that remain inside the working area of the Router after a part has been machined, should be removed using a vacuum.

***Never used a compressed airline for this purpose.***

When emptying the dust extraction system base unit or cleaning down the machine, wear suitable respiratory protective equipment that is CE marked. Other personal protective equipment, such as eye protection, overalls and gloves should also be considered.

Dust particles on the floor can cause slipping. This should be monitored by the operator and removed before becoming a hazard.


Launder overalls regularly, provide good washing facilities with hot and cold water, soap and towels and encourage a high standard of personal hygiene.

***Failure to fit and enable a suitable dust extraction system when machining known hazardous materials, and failure to adhere to the material safety data sheets, could lead to the following health problems which are among the potential effects associated with exposure to certain dust particles:***

- Skin disorders.
- Obstruction to the nose.
- Rhinitis.
- Asthma.
- Nasal cancer.

# 3: Unpacking and Lifting your CNC Machine

Warning



Caution.  
Always use sensible lifting precautions in accordance with Health and Safety Regulations in your establishment.

If your CNC machine has been supplied inside a delivery box, cut the top of the box open and remove any packaging carefully. To obtain better access to the machine, remove all the sides from the delivery box. Your Router 2600 Pro weighs 160 kg. for bench mounting: with floor standing unit it weighs 275 kg.

With the bench mounting unit a suitable method of transportation must be used as the unit is not fitted with wheels: for example secure machine on a pallet and transport using a pallet truck.

If lifting by crane, suitable certified slings must be used as shown in following the illustration.



Denford do **not** advise manual lifting of this machine, however if no other suitable alternatives are available, the machine only could be lifted by at least 4 people, one at each corner. Account should be taken of the non-uniform distribution of the weight of the machine. It is generally heavier at the right hand end than the left hand end. The use of suitably rated lifting bars through the hollow sections under the machine may assist in lifting the machine.

Always use sensible lifting precautions in accordance with Health and Safety Regulations in your establishment. Particularly in the case of manual lifting be aware of the danger of trapping.

Ensure that your CNC machine is both secure and balanced before lifting. Do not tip the machine whilst lifting.

All lifting equipment must be certified as being suitable for the loads involved.





# 3: Choosing a Site for your CNC Machine

Site your machine in a well ventilated room. If the Router is supplied for bench mounting it should be sited on a bench of sturdy construction to take the weight of the machine and of a height which enables comfortable operating and programming to take place.

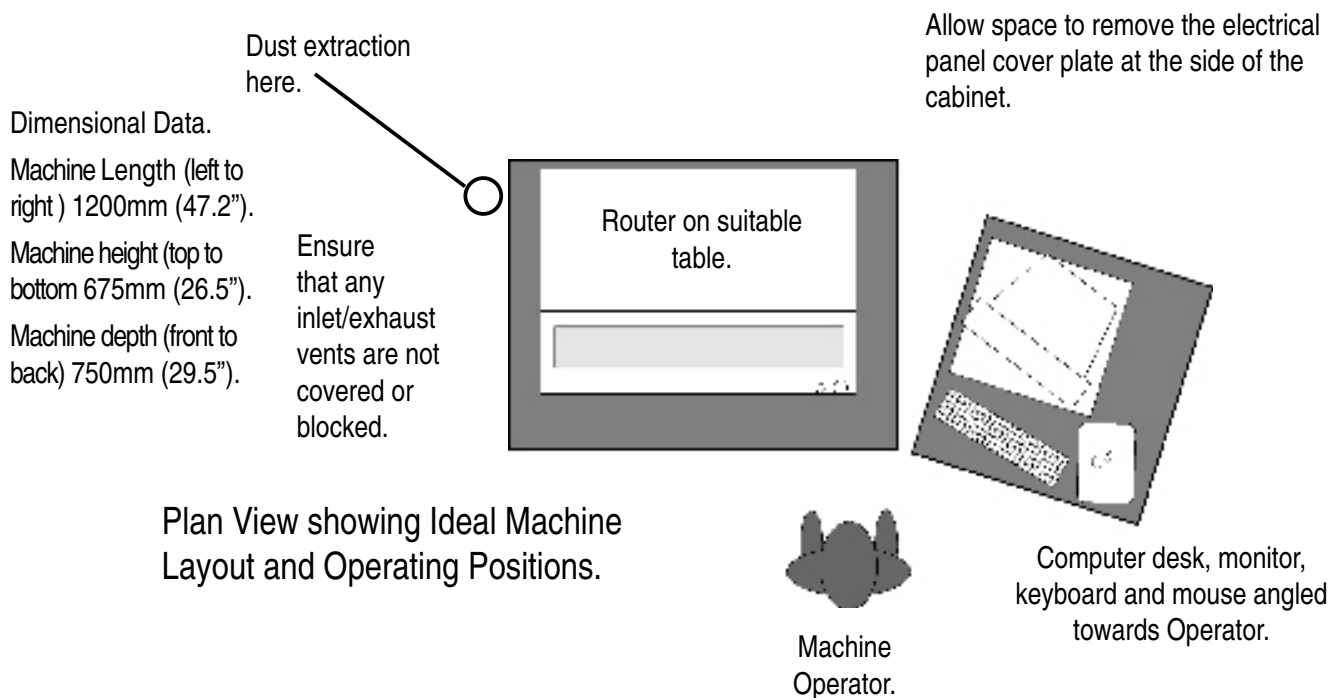
If the Router is supplied with a Universal Machine Bench, the adjustable corner feet should be wound down to contact the floor to help minimise noise and vibration.

Ideally, the user will operate the machine when standing at its front, with a clear view of both the machine working area (through the transparent guard window) and the personal computer being used as the controller unit (which should be angled towards the user), as shown in the diagram below.

Sufficient room should also be provided for effective maintenance to be carried out around the machine itself. In particular, leave enough space for removal of the large plate covering the electronics at the right hand side of the cabinet. Positioning the PC on a movable workstation may allow easier access to the various vents, connectors and switches on the machine cabinet, when required.

Position any vacuum pumps used with the dust extraction at the rear, or under, the machine table. The use of a centralised extraction system or, where possible locating the extraction unit in a separate room, will help in noise reduction. If non-hazardous materials are being cut, and the extraction unit is not employed, then noise level will be significantly reduced, particularly if the cover on the side of the machine is secured in the closed position. Again, if a vacuum pump is being used in conjunction with a vacuum work holding feature, remote location would assist in noise reduction.

Do not place the machine in a position which allows any of the cabinet vents to be covered. Ensure all cables, pipes and flexes are routed to avoid the possibility of users tripping over them.




# 3: Removing Protective Coatings and Packaging

Once your Router has been sited and connected electrically, the protective coatings and transit packaging must be removed to prepare the machine for running:

- 1) The protective plastic sheeting on the guard door and window must be removed prior to cleaning them with an antistatic cleaner.
- 2) Tie-wraps may be used in the working area of the machine, to prevent movement of components during transit. Additional items from your order may also be supplied packaged inside the working area.
- 3) To gain entry to the working area of the machine, power must be supplied to the machine, in order to release the switch unit that locks the safety guard door. Note that the switch unit will also remain locked when the emergency stop button is fully pressed in.

Warning - Aerosol based or flammable products must not be used to clean your CNC machine. To avoid the potential risk of ignition / explosion, ensure that any trapped solvent vapours can exit fully from any enclosed areas on the CNC machine. Wait at least 1 hour before attempting to operate the CNC machine.

**Warning** - □ X

 Potential risk of ignition / explosion!

Do not use any aerosol based or flammable products to clean your CNC machine.

Carefully read and follow any instructions or notices included with cleaning products.




# 4: Switching the Router On

Follow these instructions to switch on your Router:

**Note**


The safety guard cannot be opened until the Router is powered up to release the interlock guard switch.

**Warning**



Do not connect cables between any electrical hardware with the mains power switched on, since this could seriously damage components inside your CNC machine.

**Warning**



Never attempt to access the electronic hardware systems of the machine with the mains power switched ON.

Note that hazardous voltages can still exist immediately after switching off the power.

If the machine has previously been switched on, wait at least 5 minutes before attempting to open the electrical panel cover plate.

Many electronic components are sensitive to electrostatic damage - ensure components and/or personnel are suitably earthed to minimise this risk.

- 1) Check the Denford machine link cable is fitted securely between the USB port socket on the machine controller PC and the USB socket, located on the right-hand panel of the router cabinet.
- 2) Check that all access panels are in position and securely fastened.
- 3) Check that all inlet/exhaust vents are clear from obstructions.
- 4) Check the flexible hose from your separate dust collection vacuum system is securely fitted to the connection hole, located at the top of the left side viewing window.
- 5) Check that the guard door is fully closed.
- 6) Plug the router mains supply cable into an available power socket. Switch the power socket on.
- 7) The on/off power switch is located on the right-hand panel of the Router cabinet. To switch machine on depress the left-hand side of switch. The switch will illuminate when power is being supplied to the machine.

If the Router does not begin its power-up routine, switch off the mains power and check all connections and fuses.

- 8) Switch on the machine controller PC and start the CNC machine control software.

Establish a communication link between your machine controller and PC.

When the 'found new hardware' box appears install the driver for the USB connection (VR CNC milling cd must be in the CD Drive) - for help please contact technical support 01484 728000.

When you start the motor for the very first time or if the motor has not been used for over a month, carry out a brief running in routine with the following times:

- 5 minutes at 50% of the max. speed
- 3 minutes at 80% of the max. speed
- 2 minutes at 100% of the max. speed

With every daily start, ALWAYS PREHEAT THE SPINDLE MOTOR following the indicated times:


- 2 minutes at 50% of the max. speed
- 2 minutes at 80% of the max. speed
- 1 minute at 100% of the max. speed

This routine allows the bearings and all rotating parts to reach the ideal working temperature. It shall then reach the maximum speed shown on the motor plate. If the spindle motor is loaded cold, there is a reduction in the preload of the bearings, and they will wear prematurely as a result.



# 4: Switching the Router Off

**Warning** [ - ] [ □ ] [ X ]



Never attempt to access the electronic hardware systems of the machine with the mains power switched ON.

Note that hazardous voltages can still exist immediately after switching off the power.


If the machine has previously been switched on, wait at least 5 minutes before attempting to open the electrical panel cover plate.

Many electronic components are sensitive to electrostatic damage - ensure components and/or personnel are suitably earthed to minimise this risk.

Follow these instructions to switch off your Denford Router off:

- 1) Wait for the Router to fully complete any machining or processing of any operational instructions.
- 2) Open the safety guard door and remove any finished parts from the working area.
- 3) Close the safety guard door.
- 4) Close down the communication link between the CNC control software and the Router, then exit the CNC control software, as described in your separate CNC Control Software User's Manual.
- 5) Shut down and switch off the machine controller personal computer.
- 6) Power down the Router by depressing the right-hand side of the red on/off mains power switch. The on/off switch is mounted on the right-hand cabinet panel, Note that cutting the machine power will trigger the closing of the interlock guard switch. This will lock a closed safety guard door in position, preventing access to the machine working area. The interlock guard switch will automatically reopen when power is next supplied to your Router.
- 7) Switch off the mains power socket.

**Warning** [ - ] [ □ ] [ X ]



Depending on ancillary equipment supplied with machine there may be more than one power supply to the machine.

When isolating machine always ensure that **all** power sources have been disconnected.

# 4: Homing the Machine Axes (Home Mode)

## Note

The sequence of events required to home the router will depend on the type of CNC machine control software being used - please refer to your separate CNC Machine Control Software User's Manual for specific details.

Immediately after establishing a communication link between the CNC control software and the Router, all three axes of the CNC machine must be homed. The process is commonly referred to as homing the machine, or datuming each of the three machine axes.

When a communication link is first established between the router and the CNC machine control software, or when the CNC machine "loses" position, the software will not know the true position of the machine head in relation to the three machine axes.

Homing the CNC machine defines:

- The machine datum, by physically driving the machine head to a fixed zero reference point.
- The constraints of three dimensional co-ordinate grid system used for plotting any programmed movements, effectively the working envelope of the CNC machine.

## Note

The CNC machine control software Jog and Auto Modes will not become available until the machine has been configured by homing all three machine axes.

After homing the machine, the zero position of the three dimensional co-ordinate grid system is referred to as the machine datum. You can find the position of the machine datum by switching the co-ordinate display in your CNC control software to read Machine Co-ordinates. The position of the machine datum is achieved when the X, Y and Z panels of the co-ordinate display all read zero.

## Note

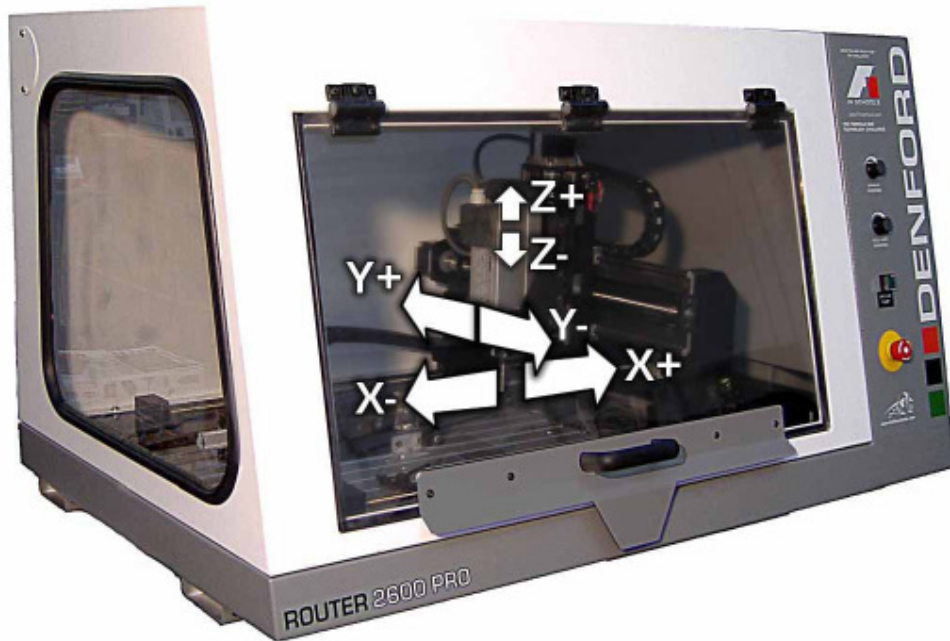
The machine datum position is set by Denford and can never be moved, since it defines the physical movement capability of the CNC machine.

In addition to homing the CNC machine after it has first been switched on, we also recommend homing the CNC machine after loading or configuring any offsets.



## 4: Manual Control - Axis Definitions (Jog)

Jog mode is used for manually controlling the CNC machine, moving the three machine axes, changing tools, operating optional equipment and configuring any offsets.



### Axis Definitions.

**X Axis** - The X axis slides run at 90 degrees to the Y and Z axes, horizontally left and right, when viewed from the front of the machine.

Minus (-) X movements run towards the left end of the machine and positive (+) X movements run towards the right end of the machine.

Jog Keys to move axis - arrow keys left and right

**Y Axis** - The Y axis slides run at 90 degrees to the X and Z axes, horizontally forwards and backwards, when viewed from the front of the machine.

Minus (-) Y movements run towards the front of the machine and positive (+) Y movements run towards the back of the machine.

Jog Keys to move axis - arrow keys up and down

**Z Axis** - The Z axis slides runs at 90 degrees to the X and Y axes, vertically up and down, when viewed from the front of the machine.

Minus (-) Z movements run down, towards the floor of the machine and positive (+) Z movements run up, away from the floor of the machine.

Jog Keys to move axis -Page up and Page down

# 4: Machine Operators Panels

**Note**

Feedrate override changes will only be registered when an actual spindle speed or feedrate is being applied by the CNC control software.

## Spindle Speed and Feedrate Override Controls.

The spindle speed and feedrate of the Router 2600 Pro can be manually overridden during a machining operation, using the potentiometer controls fitted to the operators panel.

The spindle speed can be overridden between 50% and 120%. The feedrate can be overridden between 0% and 150%.

To increase the spindle speed or feedrate, rotate the appropriate control clockwise.

To decrease the spindle speed or feedrate, rotate the appropriate control counterclockwise.

The degree of adjustment applied to each value is displayed in the CNC control software.

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**Warning**

Depending on ancillary equipment supplied with machine there may be more than one power supply to the machine. When isolating machine always ensure that **all** power sources have been disconnected.

## Mains Power Switch.

To supply power to the CNC machine, depress left-hand side of the switch immediately above the power inlet socket. To cut power to the CNC machine, depress right-hand side of switch.

Do not cut the mains power when machining or processing of any operational instructions is taking place. Note that cutting the machine power will trigger the closing of the interlock guard switch. This will lock a closed safety guard door in position, preventing access to the machine working area. The interlock guard switch will automatically reopen when power is next supplied to your Router.

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**Note**

Activating an emergency stop will also trigger the interlock guard switch. This will prevent a closed safety guard door from being opened.

## Emergency Stop Button.

The emergency stop button is a circular red push button. Pressing the emergency stop button has the effect of stopping all axes and spindle movements immediately. To activate an emergency stop, press the button in fully until it clicks. The emergency stop button will remain closed (continuing to cut all power to the machine drives) until the release sequence is performed. To release a closed emergency stop button, push and turn the button clockwise until it springs back out, then wait 10 seconds for the machine systems to reset, unlocking the safety guard door.



# 5: Performing a Tool Change

**Warning** [ - ] [ □ ] [ X ]



Never open the safety guard door and enter the working area when the spindle or machine axes are moving.

**Note** [ - ] [ □ ] [ X ]

When two or more tools are used in the same CNC file:

Your new tool **MUST** be refitted to router motor and machine head in exactly the same position used when originally configuring its Z tool offset value.

**Performing a Manually Requested Tool Change.**  
Before beginning a manual tool change operation, we recommend you home the Y and Z machine axes and drive the X axis to roughly the mid point on its axis. When the axes are in this position, the maximum amount of free space will be available in the working area, allowing easier access to the tooling.

## Performing an Automatically Requested Tool Change during the running of a CNC program.

On reading a tool change operation line in your CNC program, all three machine axes will move to their home positions, via an intermediate point, if programmed.

At this point, the software will pause the CNC program and a message window will be displayed, prompting you to manually change tools.

Always wait for the spindle and machine axes to stop moving, before attempting to open the safety guard door.

Replace the current tool number with the tool number specified in the software message window (the tool profiles allocated to each tool number may be listed at the beginning of your CNC program).

Close the safety guard door and clear the software message window to resume your machining.





# 5: Performing a Tool Change

## Standard Tool Change System.

The tool change system, supplied as standard with your Router 2600 Pro, comprises four elements:

- i) The spindle motor with attached threaded shaft, configured to allow fitment of the cutting tool and collet assembly.
- ii) The collet and nut assembly - a tapered, tubular, split metal collet held inside the locking nut, which threads directly onto the router motor threaded shaft. Different sized collets and collet adaptors are available to allow use of cutting tools with varying shank sizes.
- iii) The cutting tool. (See recommendations below).
- iv) Special Tooling - 2 off double ended spanners are supplied with the machine.

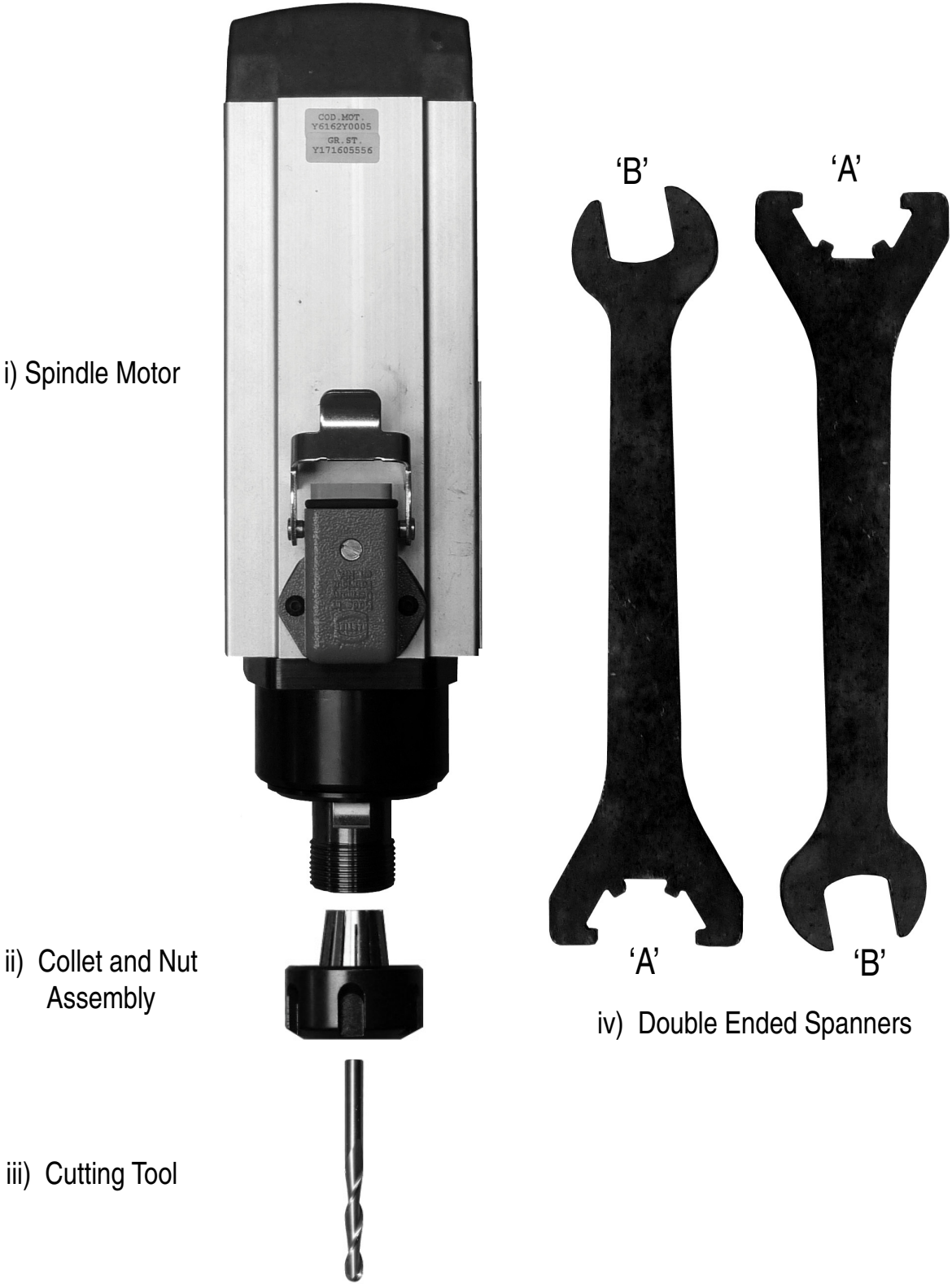
Bear in mind the following recommendations when choosing tools:

- a) Only use fully sharpened tools, and make sure that they are securely locked in the spindle.
- b) Never use bent or damaged tools, chipped tools, or tools that are not perfectly balanced.
- c) Always make sure that the mating surfaces of tools are perfectly clean and dent free before fitting the tool in the tool holder.
- d) Never use tools at speeds in excess of that punched on them or specified by their manufacturer.
- e) Always ensure that the following essential requisites are met before using any tool at high speed:
  - The tool must be of compact, short, and lightweight design.
  - The tool must be a precision instrument, and any inserts must be held in to a high degree of security.
  - The tool must be balanced and must mate symmetrically with the tool holder.
  - The cutting surfaces of the tool must be located near its centre of rotation.

In general, the recommended balance rating for tools run at speeds over 6000 RPM is G2.5 (ISO 1940 standard).



# 5: Performing a Tool Change



# 5: Setting Tools in the Spindle Motor



Tools required:

- 2 x Double Ended Spanners (supplied).

## Removing a Tool.

Position end 'A' of the first spanner around the locking nut on the end of the router motor shaft. Position end 'B' of the second spanner around the locating fixture on the router motor spindle.

To loosen the locking nut, when directly viewing the end of the router motor shaft, turn the spanner around the locking nut in an counter-clockwise direction. Turn the spanner around the router motor shaft in a clockwise direction.

Remove the nut and collet assembly, then remove the cutting tool.

## Refitting a Tool.

Select the correct nut and collet assembly, according to the shank size of your new cutting tool.

Hand thread the locking nut back onto the router motor shaft, then insert the cutting tool into the nut and collet assembly. Position end 'A' of the first spanner around the locking nut on the end of the router motor shaft. Position end 'B' of the second spanner around the locating fixture on the router motor spindle.

To tighten the locking nut, when directly viewing the end of the router motor shaft, turn the spanner around the locking nut in a clockwise direction. Turn the spanner around the router motor shaft in an counter-clockwise direction.

Check that the cutting tool is secure before putting the machine back in to operation.



## 6: Automatic Tool Change Option

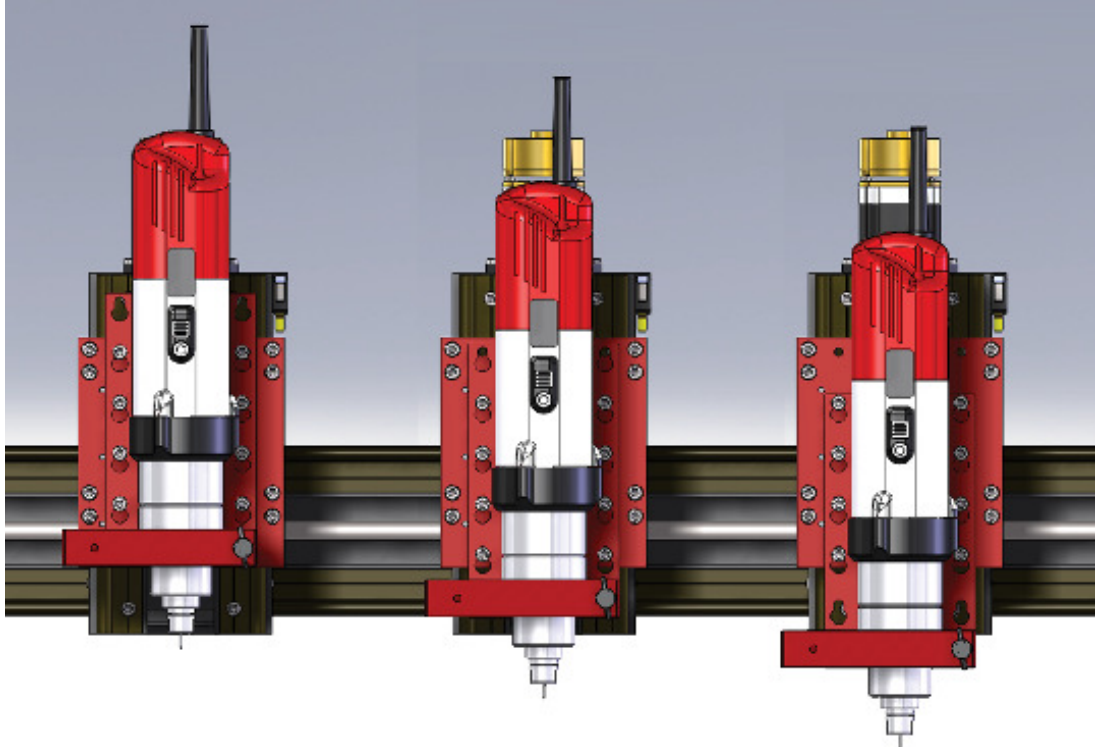
The auto toolchange system requires a maintained pressure above 8 Bar (116PSI) to operate correctly. A 10 Bar compressor should be used and be set to run when the air drops to 8 Bar.

The machine is fitted with a pressure switch that will prevent the machine tool changing if the pressure falls too low.

The Toolchange system when fitted is recognised automatically by the machine electronics so there are no parameters that have to be set. You will however be prompted to confirm the position of the toolchanger when manually changing tools and when running the machine in automatic mode for the first time.

The toolchange motor can be fitted in 3 different positions on the Z axis back plate to allow the machine Z travel to be available closer to the bed or higher up for tall components.

The default position is the mid position.



# 6: Automatic Tool Change Option

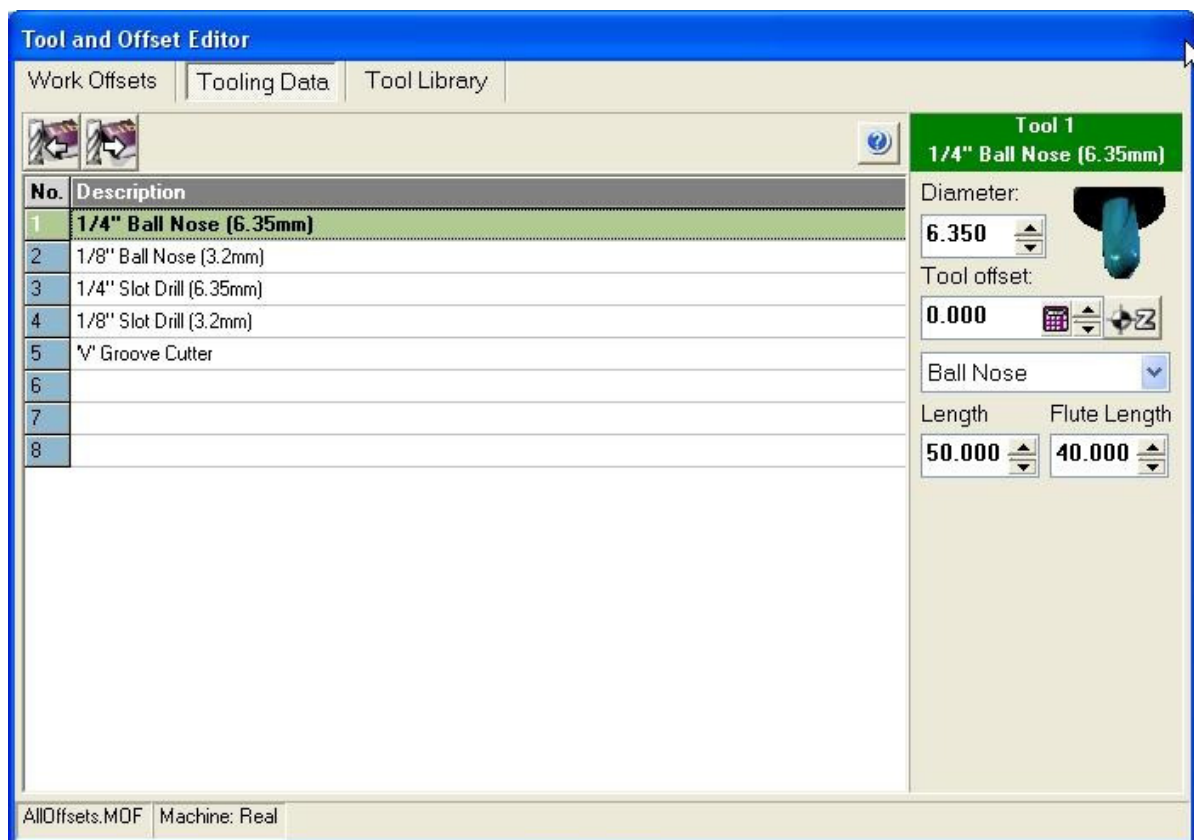
Loading the tools into the tool rack for the first time.

In the VR Milling software add the tooling to the “Tool and Offset Editor” then fit the tooling into the tool holders.

Take care to assemble the collet to the collet nut prior to fitting into the tool holder.

Ensure the correct collet size is used to match the tool shank.

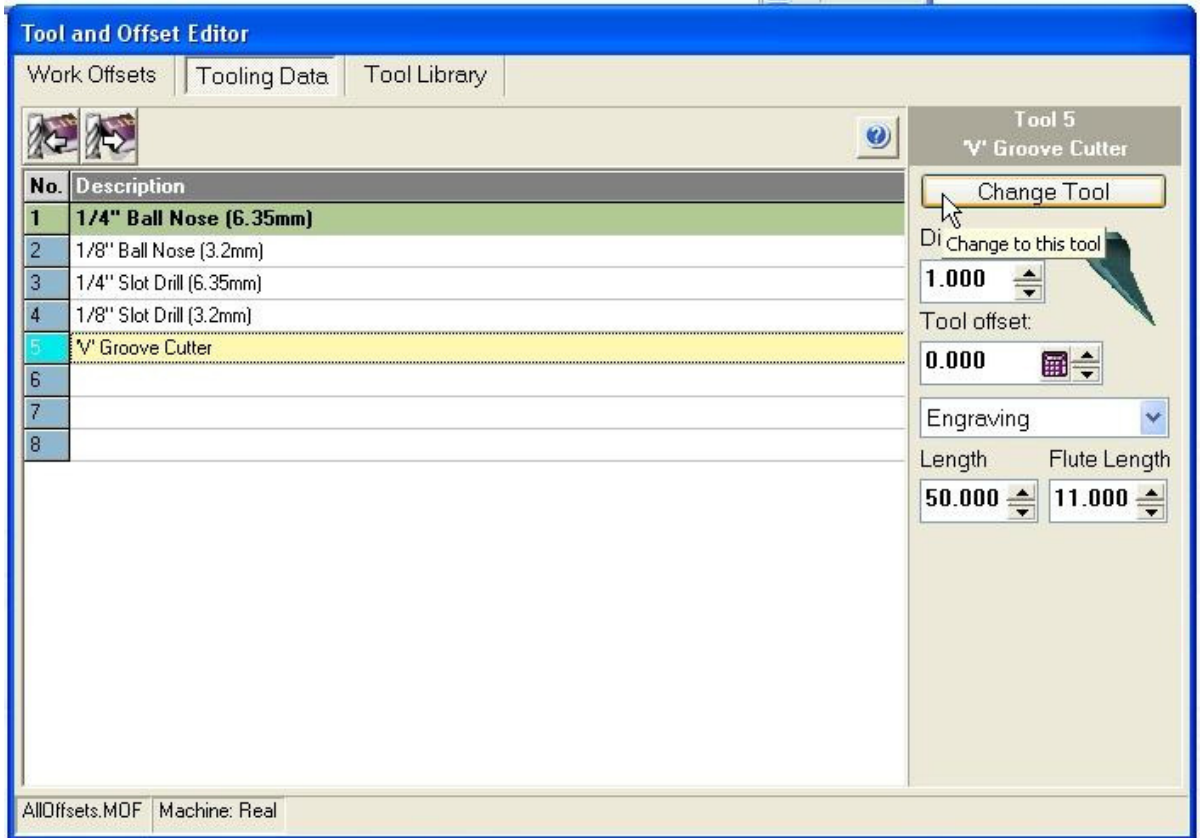
In this case the library is loaded with the recommended router tooling (all with 1/4” shanks).



# 6: Automatic Tool Change Option

Ensure the Tool Rack is empty and there is not a tool in the spindle before starting to load the tooling to the machine. If there is a tool in the spindle open the guard and press the tool release button on the front of the machine to remove it.

Select one of the 5 tools in the “Tool and Offset Editor” that is not already selected, say tool 5, highlight it then select the “Change Tool” option.

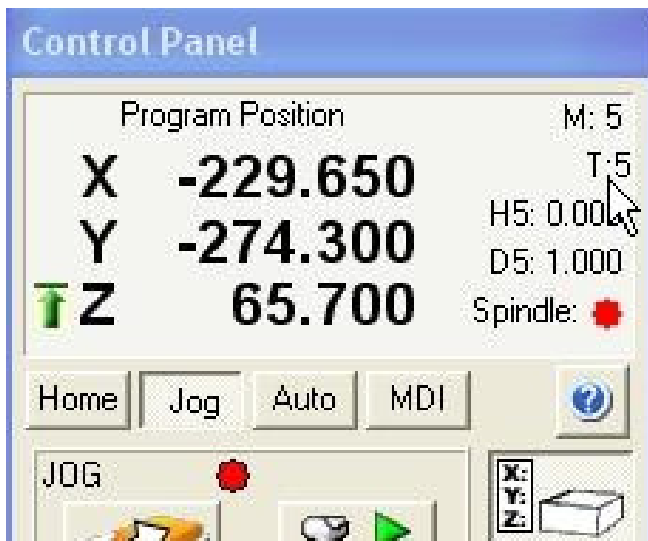


The machine will then move through the tool change procedure and try to pick up tool number 5 (which is not present in the tool rack). On completion of the tool change procedure the tool head will move to the final tool change position.

Open the guard and manually press the tool release button. Now offer up tool 5 to the spindle and then release the button.



# 6: Automatic Tool Change Option



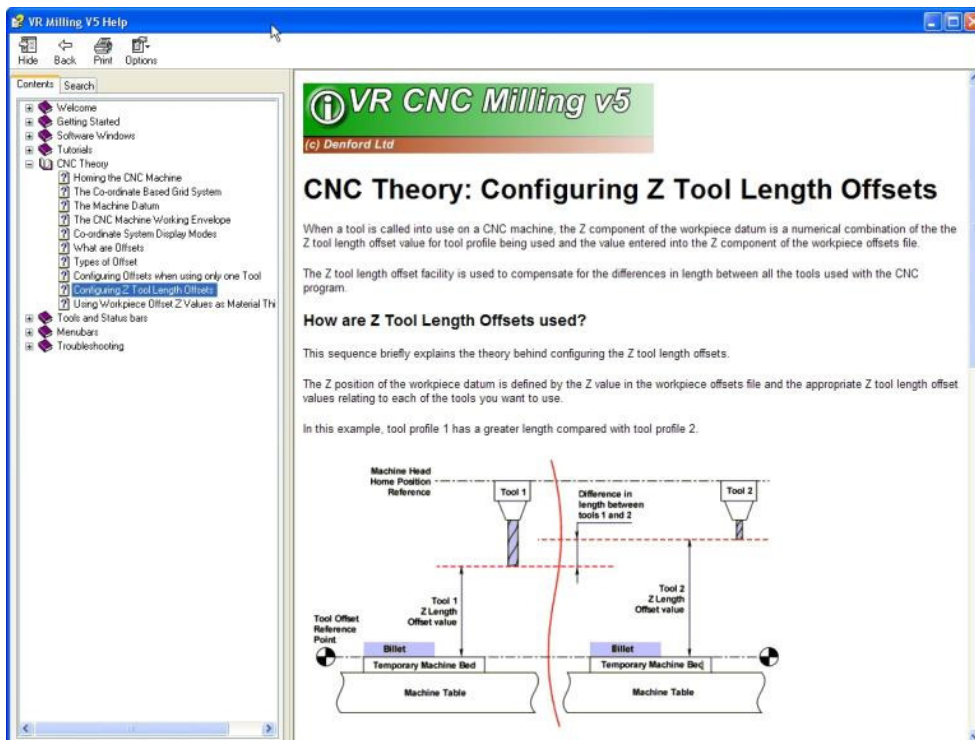
T5 is now active as shown in the Control Panel.

Now fit the other tools in the correct pockets of the tool rack.

Select tool 1 in the "Tool and Offset Editor" then select the "Change Tool" option.

The current tool will be placed in the rack and tool 1 will be picked up.

Once the tools are fitted in the tool rack you will need to set the tool length offsets. To do this refer to the help section of the VR Milling Software.



# 6: Automatic Tool Change Option

## Tool Rack Alignment.

The tool rack is aligned at the factory.

If for any reason you need to realign the rack use the following procedure:

Fit one of the toolholders in the spindle then jog the machine to the back left corner of the bed until the axes reaches their limit. (Machine position X-600, Y0)

Lower the Z axis to Z-70 and align pocket 1 of the tool rack around the toolholder.

Lift the Z axis clear then travel to Y-120 and again lower the head to Z-70. Align pocket 5 of the tool rack here and then secure the rack in position. Recheck pocket 1 is still in position.

***Note - the whole of the 600 x 400 working area is still available when the ATC rack is in place. Therefore great care must be taken when writing part programmes, or when jogging the machine axes, to avoid collision with the tool rack and tooling.***





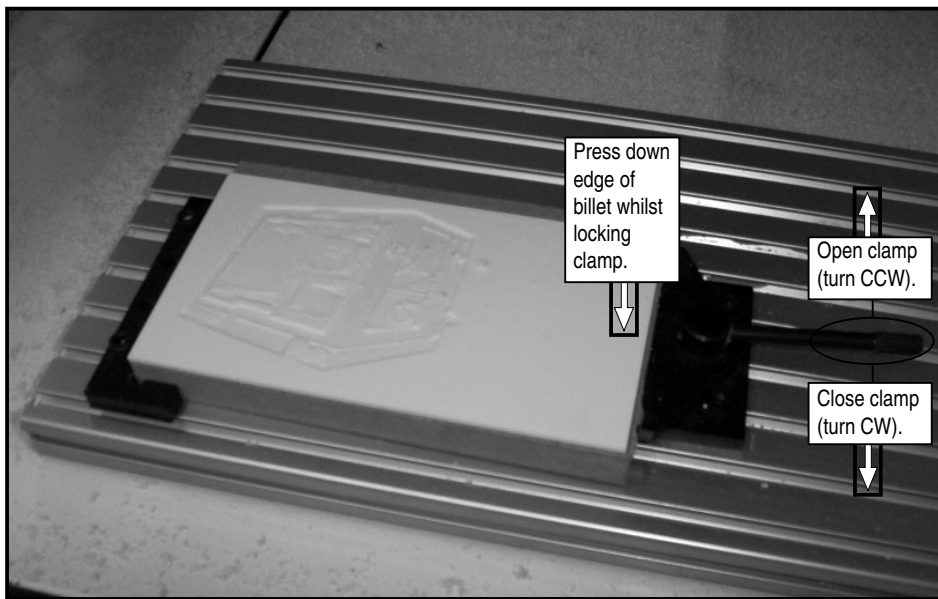
# 7: Using the Work Clamp

## Setting the Position of the Work Clamp.

Place the billet onto the machine table, so it is located correctly against the inside edges of the datum plate. Set the work clamp in the open (unlocked) position. If you have fitted the work clamp to the right end of the machine table, you must push the handle back.

Slide the work clamp assembly along the machine table until the two flats on the clamp plate are just touching the billet. Fully tighten the two hex bolts to firmly fix the work clamp base plate in position on the machine table. At this stage, it should still be possible to remove the billet.

To close (lock) the work clamp, pull the handle forwards. Press the end of the billet down against the machine table, whilst locking the work clamp - this will prevent the end of the billet from lifting. The handle should only need to be turned about one quarter of a revolution before locking the billet firmly in position. If the billet can still be moved, you must loosen the two hex bolts and reposition the work clamp base plate so it is closer to the billet.



Now that the work clamp position has been set, the billet can be continually withdrawn from the machine table, then replaced, always to the same position.

This is an advantage for jobs involving the repeat milling of pieces of work, such as a small production run or a college class/group project.



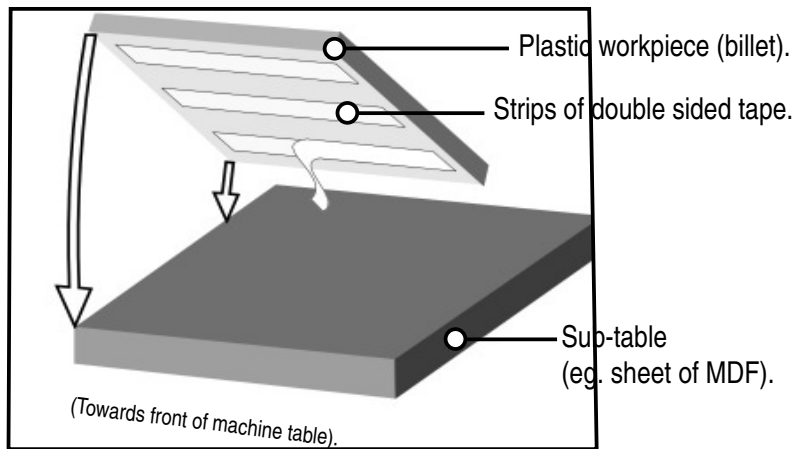
# 7: Using the Work Clamp

The work clamp, when used in combination with the datum plate, is a quick and versatile method of securing most pieces of work to the machine table.

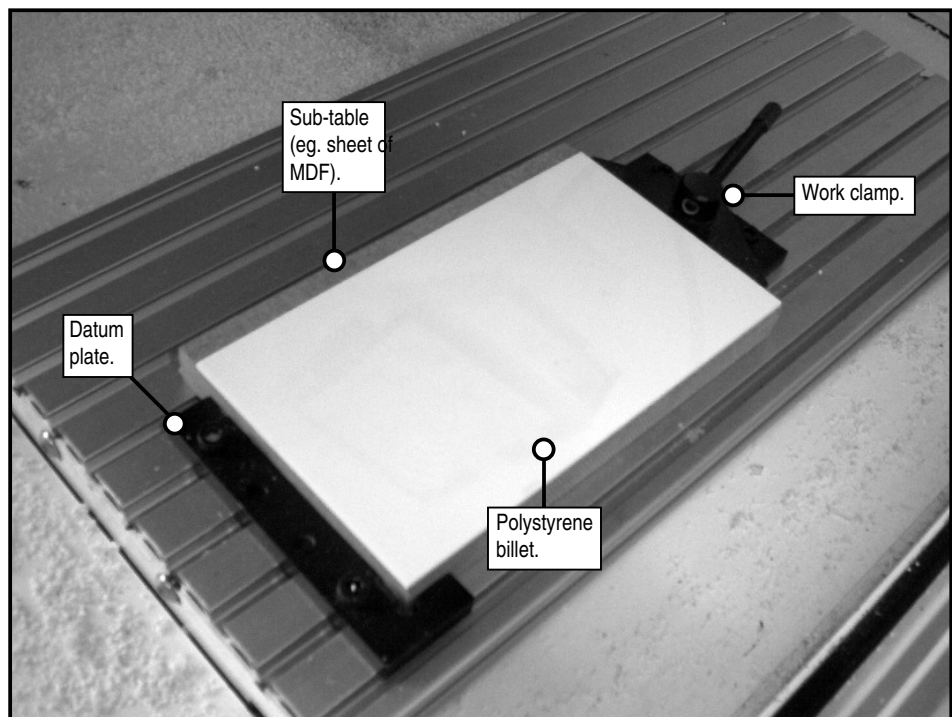
In the example shown below, a polystyrene billet is taped onto a sheet of MDF (medium density fibreboard), with its front and left-hand edges aligned with the front and left-hand edges of the MDF - this front, left upper corner will be configured as the workpiece datum for the machine offsets. The MDF is used as a sub-table - a safety measure to prevent damage occurring to the machine table itself, should a problem occur when milling.

**Tape Tip** [ - ] [ X ]

Use plastic type double sided tape, which can be removed from your billet without tearing. If your billet material comes supplied with a protective film, affix the tape to this film, then simply tear off the film once machining has been completed. Avoid using tissue type double sided tape, which is a strip of tissue with a thin coating of glue each side - this type is very difficult to remove from your billet once it has been machined.



The polystyrene/MDF block can then be added or removed from the machine table without having to reconfigure the machine offsets.



continued...



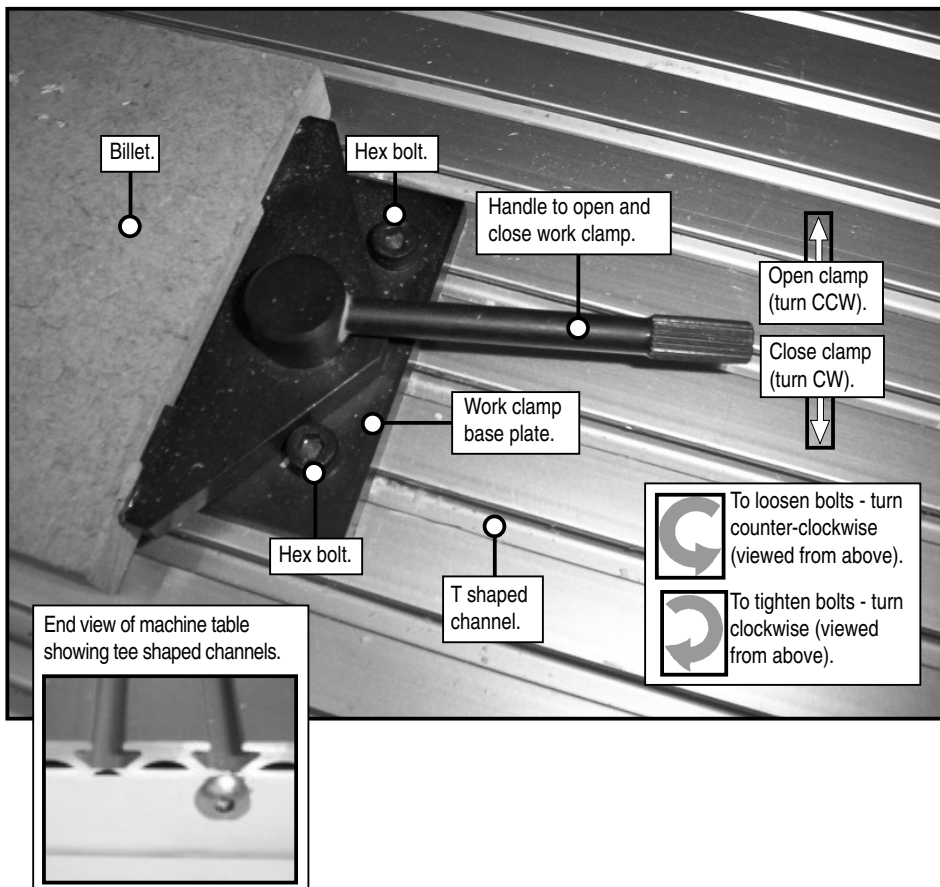
# 7: Fitting and Removing the Work Clamp

## Removing the Work Clamp.

Using a 4mm allen (hex) key, loosen the two hex bolts clamping the work clamp to the machine table. Do not completely remove the bolts at this stage, since this will make removal of the individual tee nuts more difficult. Slide the entire work clamp assembly to a free end of the machine table, release the tee nuts from their respective channels and withdraw the work clamp assembly.

## Fitting the Work Clamp.

Fit, align and clamp the datum plate. Loosely assemble the two hex bolts and tee nuts through the two holes in the work clamp base plate. Move the work clamp assembly to a free end of the machine table, then carefully align each tee nut with the respective channels in the machine table and slide the clamp onto the table. Before fully tightening the hex bolts, adjust the position of the clamp against your chosen billet, as described on the next two pages.



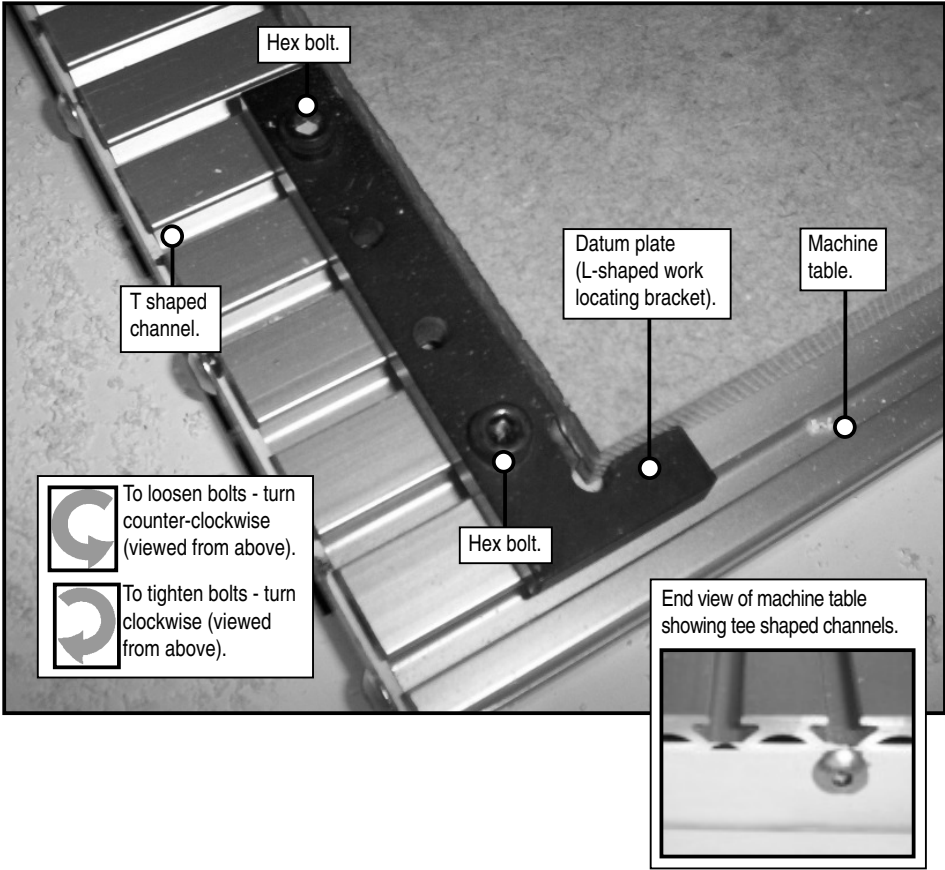
# 7: Fitting and Removing the Datum Plate

## Removing the Datum Plate.

Using a 4mm allen (hex) key, loosen the two hex bolts clamping the datum plate to the machine table. Do not completely remove the bolts at this stage, since this will make removal of the individual tee nuts more difficult. Slide the entire datum plate assembly to a free end of the machine table, release the tee nuts from their respective channels and withdraw the datum plate assembly.

## Fitting the Datum Plate.

Loosely assemble the two hex bolts and tee nuts on the datum plate. Four holes are provided on the plate for the tee nut assemblies - we recommend using the two outermost holes, as shown in the photograph below. Move the datum plate assembly to a free end of the machine table, then carefully align each tee nut with the respective channels in the machine table. Slide the assembly to the approximate position required. Using a 4mm allen (hex) key, tighten each of the hex bolts, by turning each bolt in a clockwise direction until they just begin to grip the datum plate to the table surface. It must still be possible to move the datum plate, since final adjustments will be required to align the plate exactly “square” with respect to the edges of the machine table - exactly parallel to the direction of the X and Y machine axes. After adjusting the position of the datum plate, fully tighten the two hex bolts.



## 8: Large Format Vacuum Bed Option

The large format vacuum bed requires a dedicated 16A 240V supply that should be protected by a Fuse or an MCB (Motor Circuit Breaker) C Type.

The pump is fitted in a standalone housing and is connected into the rear of the machine.

The vacuum pump has an interlock to prevent it being turned off while the machine is in Automatic Mode. This is to prevent the work becoming unclamped during a program by inadvertently pressing the button during a cycle. Ensure the machine is in Jog mode when starting or stopping the pump.

The system works by drawing air in through the surface of the vacuum bed and requires some airflow to function correctly (so a complete seal should not be applied).

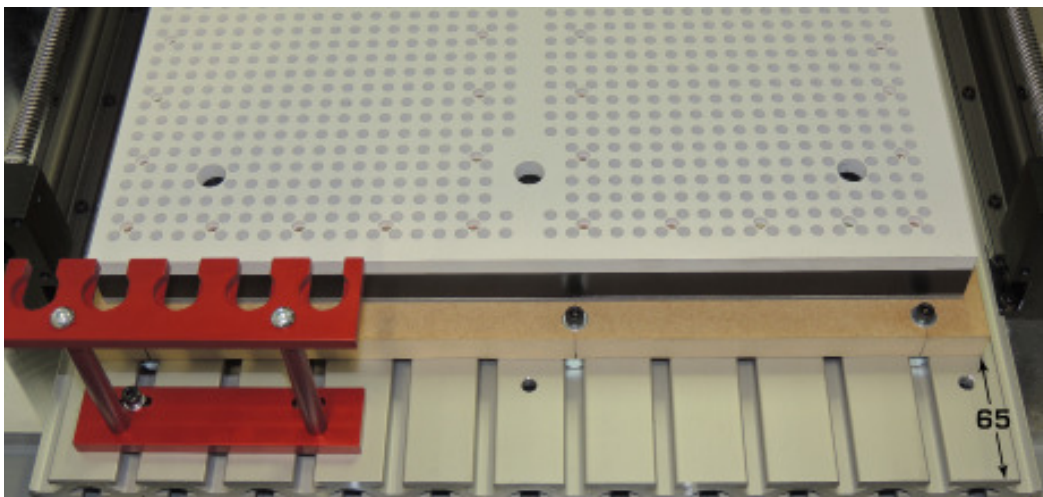
A sacrifice board of MDF (from 6mm to 25mm thick) should be placed over the top of the bed covering the entire surface. The airflow will be created sucking through the MDF.

The workpiece is placed on top of the sacrifice board and is held down by the suction through the sheet.

The vacuum bed is designed primarily for holding down large sheet material allowing them to be cut through without damaging the bed below. As the clamping force is created by the suction over the surface of the material, small parts will break free.

Tall components or porous materials would have to be held by conventional methods.

The Vacuum Bed is positioned in the X Axis with the edge of the MDF mounting board 65mm from the edge of the aluminium T slotted bed whether or not the Auto Tool Change Option is fitted. See illustration below.



# 8: Large Format Vacuum Bed Option

## Fitting and removing the Vacuum Bed

The vacuum bed will normally be supplied fitted to the machine. Simply connect the flying lead from the back of the machine to a 16A 240V supply and plug the vacuum pump into the socket at the back of the machine.

Connect the air pipe to the spigot on the pump and into the fitting at the rear of the machine.

If other ancillary equipment is supplied with the machine such as a 4th Axis Rotary Fixture, this may be fitted to the bed in place of the Vacuum Bed. In this case the Vacuum Bed should be fitted to the machine when required and positioned as shown on page 37.

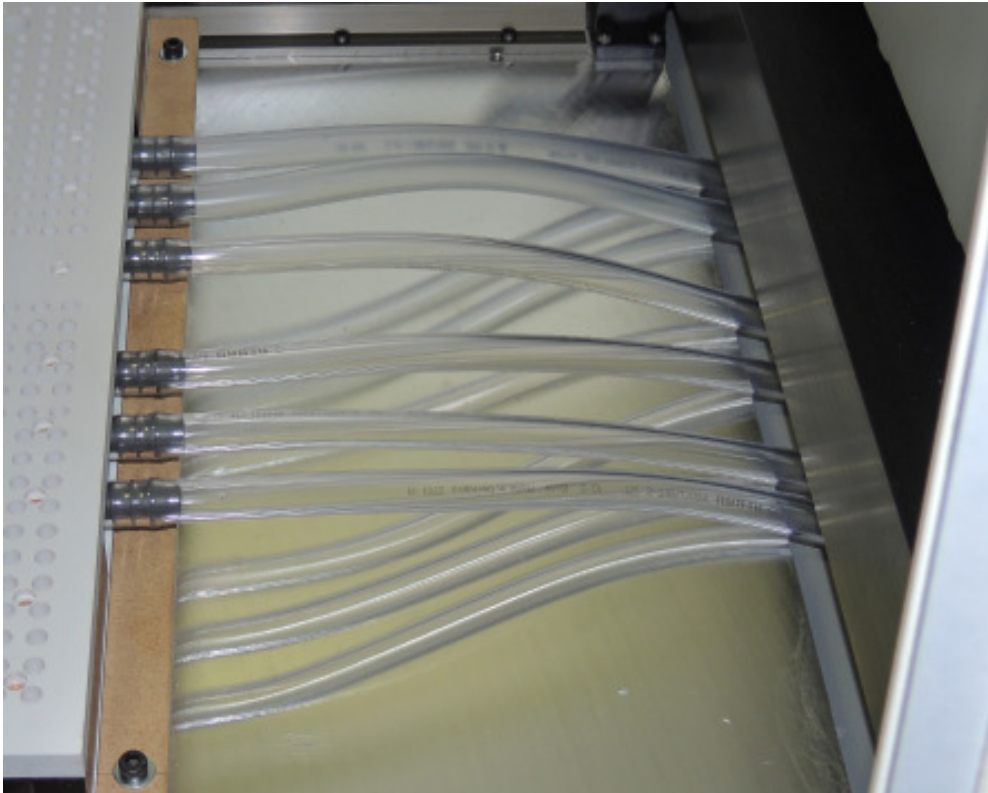


With the machine also connected to the mains supply press the “Vacuum Pump” button on the front of the machine and the vacuum pump will start to run.



## 8: Large Format Vacuum Bed Option

To remove the vacuum bed, first pull the hoses off the fittings to the vacuum bed.




With the machine in the home position, remove the screws fastening down the board to which the vacuum bed is mounted and remove the whole assembly. The mounting board is to accommodate the difference between the hole centres in the vacuum bed and the pitching of the T slots in the machine table, without the need to drill holes into the table.

Unplug the Vacuum pump to prevent it being run without the bed attached.


The vacuum pump has an interlock to prevent it being turned off while the machine is in Automatic Mode. This is to prevent the work becoming unclamped during a program by inadvertently pressing the button during a cycle.

# 9: Planning Procedure for Maintenance Work

Warning 

Caution.

Wear safety glasses and a suitable respiratory mask when cleaning the machine.


Warning 

Never open the safety guard door and enter the working area when the spindle or machine axes are moving.

Warning 

Caution.

If the cutting tool has been recently used, it may still be HOT.

Warning 

Depending on ancillary equipment supplied with machine there may be more than one power supply to the machine.

When isolating machine always ensure that **all** power sources have been disconnected.

When carrying out any maintenance, pay special attention to the following items, ensuring safe and correct working procedures in accordance with Health and Safety Regulations in your establishment:

- Before starting any maintenance work, define the task and obtain the information relevant to carry out the maintenance. Also, define the time period needed to complete the task, to obtain the correct tools and order any spare parts, if required.
- During the maintenance work period, display a suitable notice stating that the machine is under maintenance and should not be used until the notice is removed.
- Safety must be a priority when carrying out any maintenance work. Covers and safety guards that are removed during the maintenance work must be replaced after the task is completed.
- All work must be carried out by suitably qualified personnel.
- Never attempt to access the electronic hardware systems of the machine with the mains power switched ON.
- Hazardous voltages can still exist immediately after switching off the power. If the machine has previously been switched on, wait at least 5 minutes before attempting to open the electrical panel access plate.
- When replacing electrical components, ensure the new parts are of suitable replacement specification.
- All work completed on the machine, whether progressive, or preventative, should be logged to ensure a complete service record is available for future referral. We recommend the maintenance logs at the end of the maintenance section are used to log any maintenance tasks undertaken.
- When maintenance work has been completed, check that the replaced or serviced parts work correctly, before allowing general operation of the machine.





# 9: Maintenance Schedule

## Every Day (and, if necessary between components)

- Clear dust from working area of machine and ensure that the surfaces of the spindle, tool housing and tool are clean - **do not use compressed air.**

Extra care must be exercised when changing from machining MDF, hardwood, foam etc. to machining metal, to avoid any risk of fire or explosion from ignition of dust particles by hot metal chips. Also after machining metal, thoroughly clean areas around leadscrews and guide rails to minimise risk of contamination from chips.

## Every Week

- Clean the machine thoroughly.
- Clean dust from router motor - see p32.
- Lubricate the slideways and leadscrews - see p33
- Check all exposed screws and nuts for tightness.
- Visually check door and window for signs of cracks or chips.  
**Any damage should be reported immediately to Denford and a suitable replacement obtained without delay.**  
**Door Part Number MRP/0402**  
**Window Part Number MRC/0403**

## Every Two Months

- Check the condition of any electrical connections.
- Check and thoroughly clean all components of the tooling system.
- Check all cables for kinks and breaks.
- Check door hinges for correct tension and adjust if necessary.  
**If, after fully hand tightening the centre screw of all hinges with an appropriate tool, the door falls when released from a position 15 degrees forward of vertical, new hinges should be obtained and fitted without delay.**  
**Denford part Number BI01229**

## Every Three Months

- Clean microswitches - see p32
- Check security of Spindle motor mounting bolts.



# 9: Maintenance of the Spindle Motor

Maintenance of the Fimec spindle motor is limited to:-

- i. Regularly (at least once a day if tools are changed frequently) checking that the surfaces of the spindle, tool housing and tool are clean.
- ii. Occasionally cleaning the grill of the cooling fan with a soft brush or vacuum (never use compressed air) and removing any objects blocking the air ways.
- iii. Occasionally checking the security of the fixing of the motor to the machine.
- iv. The bearings are lubricated for life and do not require greasing.

For any maintenance beyond the above, the motor should be returned to Denford or an authorised Fimec agent.

# 9: Cleaning the Microswitches

The X,Y Z axis all have microswitches

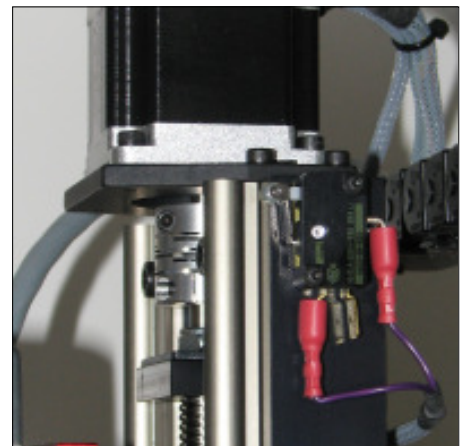
Using a soft bristled brush, carefully clean dust and debris away from the microswitch, to an area where it can be removed using a vacuum cleaner.



X Axis Switch located behind rear column



Y Axis Switch located top rear corner of crossbeam



Z Axis Switch located top front corner of head slide

# 9: Lubrication of the slideways and leadscrews

## Use of Swansil Lubricant on Denford Routing Machines

1. Clean down machine with brush and vacuum - do not use compressed air.
2. Position the Machine in mid-travel.
3. Open the guard.
4. Isolate machine from power supply.
5. Spray each lead screw and guide rail with a 2-3 second burst.
6. Leave 2-3 minutes for silicone to dry before operating the machine.

Item 1 to carried out daily or between components.

Items 2 – 6 to be carried out weekly.

***Always adhere to general instructions and warnings on Swansil can.***

For full health and safety information visit <http://www.swantek.com/html/msds/136.htm>

Do not spray into confined areas.

Any excessive over spray to be dried off with a dry, clean, lint-free cloth before operating the machine.

# 9: Maintenance Log

Date of maintenance work.	Name of personnel carrying out the maintenance.	Details of maintenance work completed.



# 9: Maintenance Log

Date of maintenance work.	Name of personnel carrying out the maintenance.	Details of maintenance work completed.



# 10: Technical Support

Denford Limited provides unlimited telephone and e-mail Technical Support on this CNC machine to registered users. On-site visits by our engineers may be chargeable. Please refer to the information held in your separate Warranty pack, for specific details.

Before contacting Denford for support, please read your hardware and software manuals and check the Denford websites for support.

Internet (access technical support and FAQ sections):

[www.denfordata.com/bb](http://www.denfordata.com/bb)

When you request support, please be at your CNC machine, with your hardware and software documentation to hand. To minimise delay, please be prepared to provide the following information:

- CNC Machine Serial Number (from the machine ID panel).
- Registered user's name / company name.
- The CNC machine control software name and version number (from the "Help/About" menu option).
- The wording of any error messages that appear on your computer screen, if applicable.
- A list of the steps that were taken to lead up to the problem.
- A list of any maintenance work that has been carried out on the CNC machine.

Contact Details:

Denford Limited,

Armytage Road, Brighouse, West Yorkshire, HD6 1QF, UK.

Telephone: 01484 728000

Fax: 01484 728100

E-mail: [customerservices@denford.co.uk](mailto:customerservices@denford.co.uk)

Technical Support: Monday to Friday 8.30am - 4.30pm GMT

For international dialling: +44 and remove first 0 in each city code.



# 11: Specification of the Router 2600 Pro

## Safety Features:

- Manual operation, totally enclosed, interlocked, safety guard door.
- Emergency stop button.
- Toolpath graphics to verify part programs prior to machining.

## Mechanical Details:

- Travel X axis 600mm (23.6").
- Travel Y axis 400mm (15.7").
- Travel Z axis 110mm (4.3").

## Dimensions:

- Machine width 1200mm (47.2").
- Machine height 675mm (26.6").
- Machine depth - door closed 750mm (29.5").

## Weights:

- Machine weight 160 KG (350 lb).

## Electrical Details:

- Mains supply required:  
220/240Volts, 50Hz, 8 Amps.
- Spindle motor: 1.0 kW
- Spindle Speeds: 0 - 24,000RPM.
- Axis stepper motors

## Performance:

- Rapid traverse rate up to 5000 mm/min (197 in./min)
- Max Feed traverse rate up to 5000 mm/min (197 in./min)



# 11: EC Declaration of Conformity for Machines prior to 29.12.09

## EC Declaration of Conformity

The responsible person                      Mr P T Harkness  
Business Name                                Denford Limited  
Address                                         Brighouse  
    West Yorkshire  
    United Kingdom

Declares that the machinery described:

1. Make                                         Denford Limited
2. Model                                        Router 2600
3. Serial Number

Conforms to the following                 The Machinery Directive 98/37/EC  
Directives                                     The EMC Directive 89/336/EEC  
    The LVD Directive 73/23/EEC

Also the following standards  
(where applicable)                            .....

And complies with the relevant  
health and safety requirements            .....

Signature of responsible person  
.....

Position                                        Senior Design Engineer  
Signed at                                        Brighouse  
    West Yorkshire  
    United Kingdom





# 11: EC Declaration of Conformity for Machines after 29.12.09



## EC Declaration of Conformity

Mr P T Harkness

The responsible person and person authorised to compile the Technical File

Business Name Denford Limited

Address Armytage Road  
Brighouse  
West Yorkshire  
HD6 1QF  
United Kingdom

Declares that the machinery described:

- 1. Make Denford Limited
- 2. Model Router 2600 Pro
- 3. Serial Number

Fulfils the relevant provisions of the following Directives

Machinery Directive 2006/42/EC  
Low Voltage Directive (LVD) 2006/95/EC  
EMC Directive (2004/108/EC).

Also the following standards (where applicable)

EN 953 1997 + A1 2009: Safety of machinery – Guards. General requirements for the design and construction of fixed and movable guards.  
EN 954-1 1997: Safety of machinery - Control systems - Part 1 General principles for design.  
EN 60204-1 2006: Safety of Machinery - Electrical-equipment of machines Part 1 General requirements.  
EN ISO 12100-1 2003: Safety of machinery. Basic concepts, general principles for design - Part 1 Basic terminology, methodology.  
EN ISO 12100-2 : Safety of machinery. Basic concepts, general principles for design - Part 2: Technical principles.  
EN ISO 13732-1 2006: Ergonomics of the thermal environment. Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces.  
EN ISO 13850 2008: Safety of machinery - Emergency stop -Principles for design.  
BS EN ISO 14121-1 2007: Safety of machinery - Risk assessment Part 1 Principles.  
EN 55011 2007: Limits and methods of radio interference characteristics of industrial, scientific and medical equipment. Conducted Emissions.  
EN 55011 2007: Limits and methods of radio interference characteristics of industrial, scientific and medical equipment. Radiated Emissions.  
EN 61000-4-2: 1995 +A1 +A2 2001: Testing and Measurement Techniques; Electrostatic Discharge immunity test.  
EN 61000-4-3: 2002 +A1 + A2 2005: Electromagnetic Compatibility – Basic Immunity Standard. Radiated radio frequency electromagnetic field immunity test.  
EN 61000-4-4 2004: Testing and measurement techniques. Electrical fast burst/transient immunity test.

Signature of responsible person .....

Position Senior Design Engineer

Signed at Denford Ltd., Armytage Road, Brighouse

Date .....

# 10: Router 2600 Series Noise Level Test Results

## Noise Level test

Test Report No: NL-MRP-02P

Machinery Manufacturer: Denford Limited.

Machinery Type/Model: Router 2600 Pro CNC Routing Machine

Equipment:

Meter Ref. Standard ST-805

Denford Router 2600 Pro

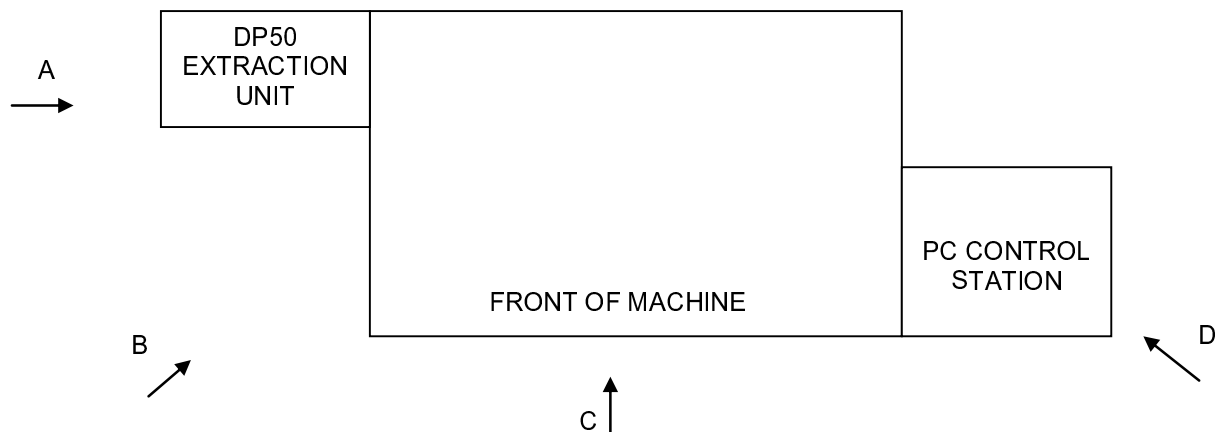
DP50 Extraction Unit

Test Conditions:

Spindle speed: 0 - 24000 RPM.

Axis speed: 0 - 5000 mm/min

Ambient background noise: 50 dB(A).



A, B, C, & D are measurement positions 1 metre from the machine and at height of 1.6 metres above floor level.

Results;

All values are measured in dB(A)

Condition	A	B	C	D
Test Program	71	73	74	75
Test Program with Extraction	73	74	74	75

Test Program

Spindle speed varying between 0 and 24000 RPM

Machine axes in combination 0 to 5000 mm/min.

Extraction unit ran continuously during Test Program with Extraction.

The entire test cycle was run at each of the positions shown and the maximum figures registered at each position were recorded in the above table.

# 12: Glossary

BILLET .....	A small, usually rectangular, bar of wood or metal in an intermediate stage of manufacture.
CAD .....	Computer Aided Design - the use of a wide range of computer based tools that assist engineers, architects and other design professionals in their design of "real world" objects.
CAM.....	Computer Aided Manufacture - software that is capable of creating tool cutter paths in a number of different axes for different CNC systems. Usually taking the design input from CAD system.
CNC.....	Computer Numerical Control - a computerised system of hardware and software, which controls the movement of a machine tool.
DRIVE .....	The controller unit for a disk system.
DRY RUN .....	An operation used to test how a CNC program will function without driving the machine itself.
DWELL .....	A programmed time delay.
EDIT .....	The mode used for altering the content of a CNC program via the Desktop Tutor or qwerty keyboard.
END OF BLOCK SIGNAL ...	The symbol or indicator ( ; ) that defines the end of a block of data. The equivalent of the PC [return] key.
ERROR.....	The deviation of an attained value from a desired value.
G-CODE .....	The programming language understood by the machine controller.
FEEDRATE .....	The rate, in mm/min or in/min at which the cutting tool is advanced into the workpiece. For milling and drilling, the feedrate applies to the reference point on the end of the axis of the tool.
FILE .....	An arrangement of instructions or information, usually referring to work or control settings.
FORMAT .....	The pattern or way that data is organised.
FNC .....	FANUC Miller file, extension ".fnc". Contains G and M codes describing the machine and cutting operations.
G CODE .....	A preparatory code function in a CNC program that determines the control mode.
HARDWARE .....	Equipment such as the machine tool, the controller, or the computer.
HOME .....	Operation to send the axes of the CNC machine to their extreme limits of movement. Defines the co-ordinate based grid system of the CNC machine. Commonly referred to as homing the machine, or sending the machine to its home position.
INCREMENTAL .....	Incremental programming uses co-ordinate movements that are related from the previous programmed position. Signs are used to indicate the direction of movement.
INPUT .....	The transfer of external information (data) into a control system.
INTERFACE .....	The medium through which the control/computer directs the machine tool.



# 12: Glossary

JOG CONTROL.....	Manual movement mode for the machine axes, using very small pre-defined movements, called jog steps. One stepped movement is applied per movement using the machine offset facility. key/button press.
M CODE .....	A miscellaneous code function in a CNC program used to indicate an auxiliary function (ie, coolant on, tool change etc.).
MACHINE DATUM .....	A fixed zero reference point set by the machine manufacturer. The machine datum is used to define the co-ordinate based grid system of the CNC machine. All machining co-ordinates originate from this point. However, this point can be temporarily moved
MACHINE OFFSET.....	The workpiece offset file used with VR and real CNC machines.
MDI .....	Manual Data Input - A method used for manually inserting data into the control system (ie, Desktop Tutor, qwerty keyboard etc.).
MODAL .....	Modal codes entered into the controller by a CNC program are retained until changed by a code from the same modal group or cancelled.
NC .....	Numerical control.
OFFSET .....	Combination of two types of file, the workpiece offset and the tool offset. Used to describe the workpiece datum, a zero reference used on the CNC machine to ensure machining occurs in the correct place on the billet. Offsets are used to shift parts of the three dimensional co-ordinate based grid system, used by the CNC machine.
PART DATUM .....	Used as a zero reference point in a CNC file. All machining co-ordinates originate from this point.
PART PROGRAM.....	A list of coded instructions which describes how the designed part, or component, will be manufactured. The part program is also referred to as the CNC file, program, or G and M code program.
PC .....	Personal computer.
POST PROCESSOR.....	A file or setting that contains instructions for a CAM system, detailing how to create CNC code that can be understood by a particular CNC system (e.g. VR CNC Milling).
PROGRAM .....	A systematic arrangements of instructions or information to suit a piece of equipment.
RAPID TRAVERSE.....	Fast movement of the cutting tool through the 3 machine axes between cutting settings.
REFERENCE POINTS.....	The machine has 3 reference points used in setting the limits of movement for its slides (axes).
REMOVEABLE MEDIA.....	A computerised storage medium that is not permanently attached to the system, e.g. Floppy Disk, Flash Memory Card, USB Memory Key, CD/DVD disc.
ROUTER MOTOR.....	The removable cutting head (motor). Also referred to as the machine head.
RPM.....	Revolutions per minute (rev/min) - a measure of spindle speed.
SLIDES.....	The 3 machine axes - see axis.
SPINDLE SPEED .....	The rate of rotation (velocity) of the machine head / cutting tool, measured in RPM.
SOFTWARE .....	Programs, tool lists, sequence of instructions etc...



# 12: Glossary

- TOOL OFFSET ..... When machining, allowances must be made for the size of tools being used, since they all differ in length. The tool offset is the amount the Z value must be moved (or offset), so that all the different cutting tool tips used line up with each other, so they can all be used by one CNC file. See OFFSET.
- TRAVERSE ..... Movement of the cutting tool through the 3 machine axes between cutting settings.
- TXT ..... Standard Windows text only file, extension ".txt".
- WORK (WORKPIECE) ..... The actual material being machined. The work is sometimes referred to as the billet or stock.
- WORKPIECE DATUM ..... Used as a zero reference point on the real billet. All machining co-ordinates originate from this point, when offset files are used.
- WORKPIECE OFFSET ..... A file containing X, Y and Z values that can shift the entire three dimensional co-ordinate based grid system, used by the CNC machine. See OFFSET.
- WORD ..... A combination of a letter address and digits, used in a CNC program (ie, G42, M04 etc.).
- VIRTUAL REALITY..... A fully interactive, three dimensional, computer based simulation of a real world object or event.
- Z TOOL OFFSET ..... See Tool Offset





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**Language :**

This manual is written using European English.

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