

Denford

Mirac

**DENFORD**

COMPUTERISED MACHINES AND SYSTEMS

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## Operating Guide for the Mirac Series of CNC Lathes

- Installation
  - Specific  
Features
  - Routine  
Maintenance
- 

This manual applies only to the machine having the serial number shown below.

Please note that this number will be required should Denford Limited be contacted regarding this machine.

Machine Serial Number : \_\_\_\_\_

Year of Manufacture : \_\_\_\_\_



Manufactured by  
Denford Limited,  
Birds Royd, Brighouse, West Yorkshire, HD6 1NB, England.  
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## INTRODUCTION.

This guide will describe how to transport, site and setup your Denford Mirac CNC lathe.

Any operational features, specific to the Mirac range, are also covered in this guide. General operating functions are explained in the separate "Generic CNC Turning Manual" delivered with your machine.

A Routine Maintenance section is also included. Please note, the Electrical Diagrams for your machine are held in a folder fixed inside the electrical control box.

**IF YOU HAVE ANY DOUBTS AND/OR QUESTIONS REGARDING THE SPECIFICATION, SERVICING OR FEATURES OF YOUR MACHINE, PLEASE CONTACT CUSTOMER SERVICES AT DENFORD.**



## WARNING.

The Warranty on this machine will be invalidated if any modifications, additional ancillary equipment is fitted, or any adjustments made to the controlling devices without prior notification from Denford Limited.

Do not carry out any portable appliance testing (PAT) on any of the supplied equipment.

# EC DECLARATION OF CONFORMITY.

The responsible person :	_____
Business Name :	Denford Limited.
Address :	Birds Royd, Brighouse, West Yorkshire, HD6 1NB, England.
Declares that the machinery described :	
Manufacturer :	Denford Limited.
Model Name :	Mirac
Serial Number :	_____
conforms to the following directives :	EC Machinery directive 89/392/EEC as amended by directive 91/368 EEC and directive 93/ 44/EEC, CE marking directive 93/68/EEC and low voltage directive 73/23/EEC
and the following standards :	BS EN 60204 - 1 : 1993  _____
and complies with the relevant health and safety requirements.	
Signature :	_____
Position within company :	_____
Signed at :	Denford Limited, Birds Royd, Brighouse, West Yorkshire, HD6 1NB, England.

# UNPACKING & LIFTING THE MACHINE.

Cut the top of the delivery box open and remove the styrofoam packaging carefully.

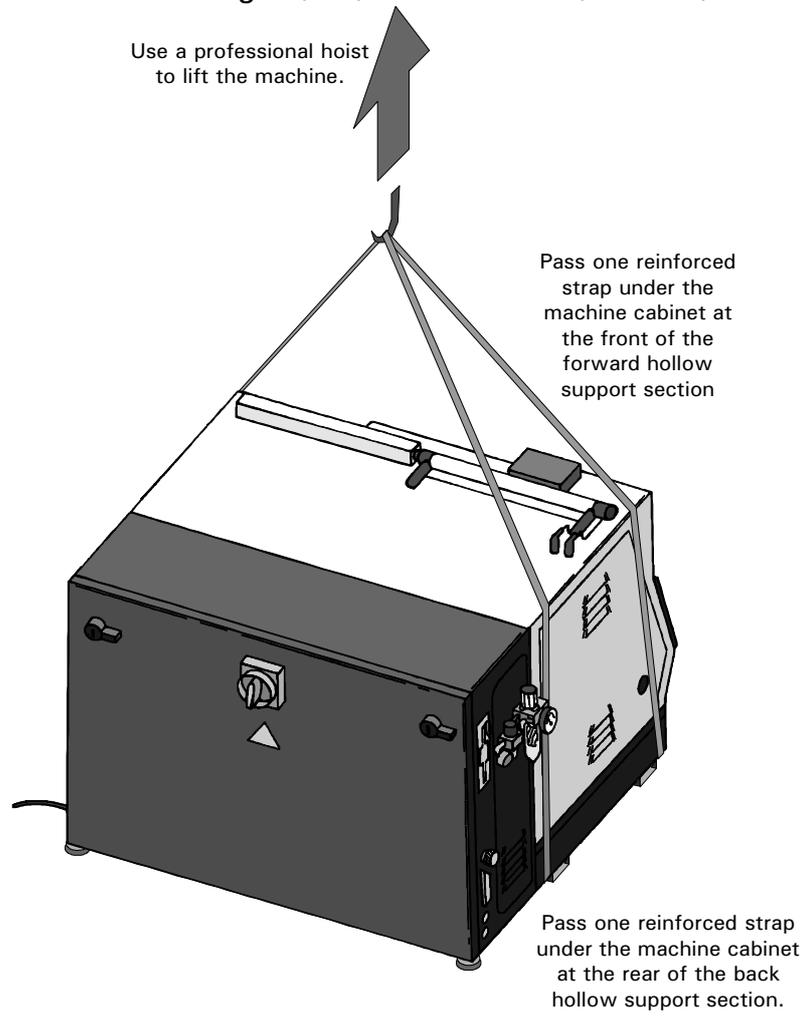
To obtain better access to the machine and the power supply box, remove all the sides from the delivery box, leaving the machine standing on its wooden delivery pallet.

Lift the power supply control box from the packaging. If possible, lift the power supply box using a porters trolley.

Lift the machine from the packaging. Denford recommends using a professional hoist and two equal length slings, arranged as shown in the diagram below. Pass sling number one under the machine cabinet at the front of the forward hollow support section and sling number two under the machine cabinet at the rear of the back hollow support section.

NOTE - The Mirac is back heavy - Ensure that the machine is secure and balanced before lifting. Always use sensible lifting precautions in accordance with Health and Safety Regulations in your establishment.

Mirac Weight (net) = 320 Kilos (705 lbs)



# LEVELLING & POSITIONING THE MACHINE.

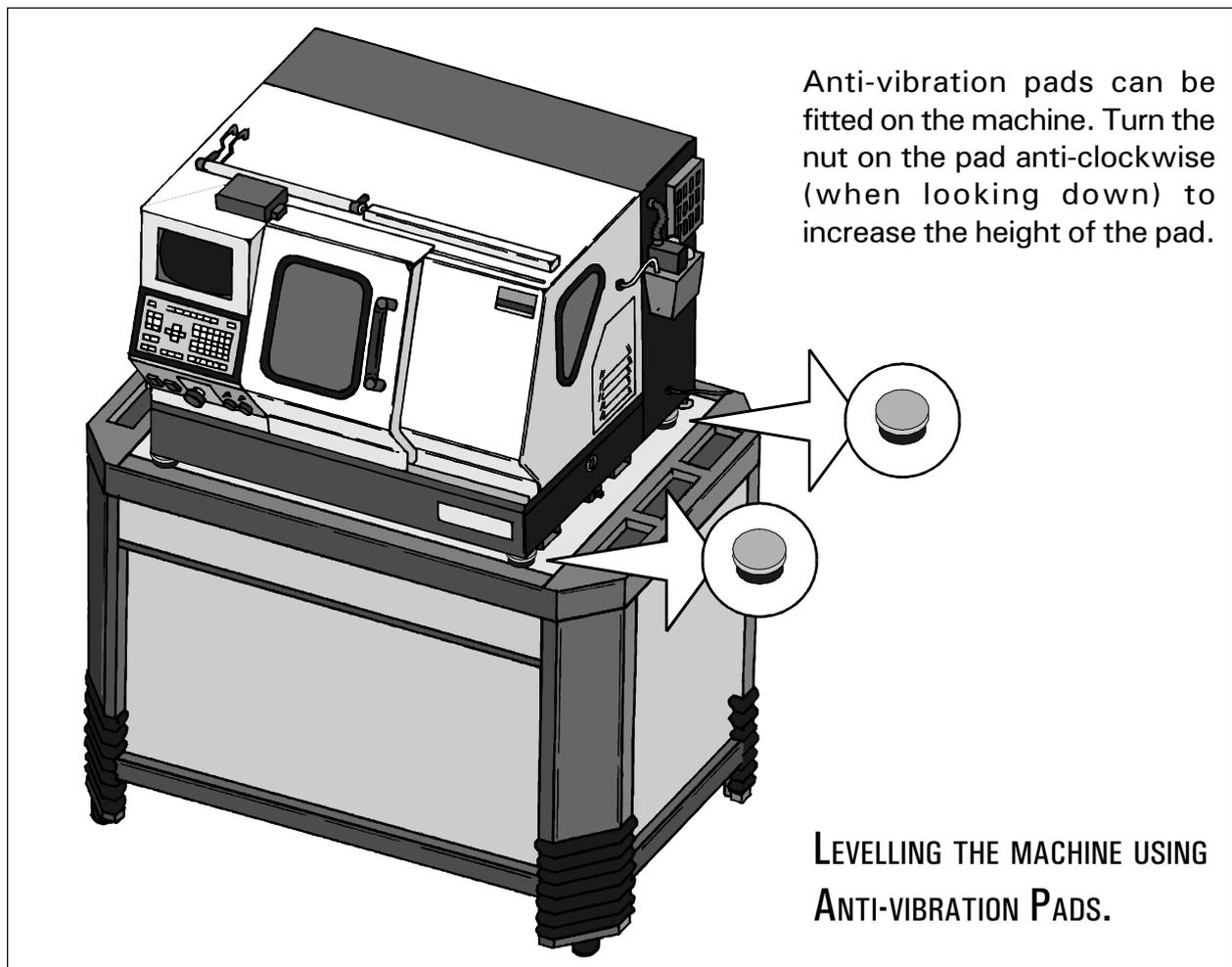
Remember when positioning the machine in the room, sufficient space should be provided for effective maintenance to be carried out.

The Mirac is a bench mounted machine, so 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.

The machine should rest level on the two hollow sections which run beneath the machine cabinet. The lathe itself has been levelled to the machine cabinet prior to dispatch, so it is only necessary to level the machine to the table on which it is to be situated.

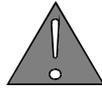
If the machine is not stable resting on these two hollow sections, insert four anti-vibration pads under the sections at each corner of the machine - as illustrated in the diagram below. Adjust the pads until the machine is stable and level. The pads will also help to reduce the amount of noise and vibration generated when the machine is operating.

Note - the pads are **ONLY** used to *help* stabilise the machine, the main weight of the machine should still be taken by the hollow sections (ie, these sections should **ALWAYS** be in direct contact with the table surface).



# ELECTRICAL CONTROL BOX SEAL.

The Electrical Diagrams for your machine are held in a folder fixed inside the electrical control box.



*Warning! Do not connect cables between any electrical hardware with the mains power switched on, since this could damage the hardware.*

*The electrical control box is inspected then sealed with a yellow seal; if this seal is broken on delivery, inform the suppliers immediately. The seal should only be broken for the initial mains power connection.*

# CONNECTING THE MAINS SUPPLY.

The mains power supply is fed to the electrical control box, fitted on the back of the machine cabinet, which in turn is connected to the lathe.

This electrical control box is delivered with the mains supply cable connected directly into the isolator with approximately 3 metres of cable. The cable should then be fitted with a standard 13 amp. plug suitable for the mains power supply.

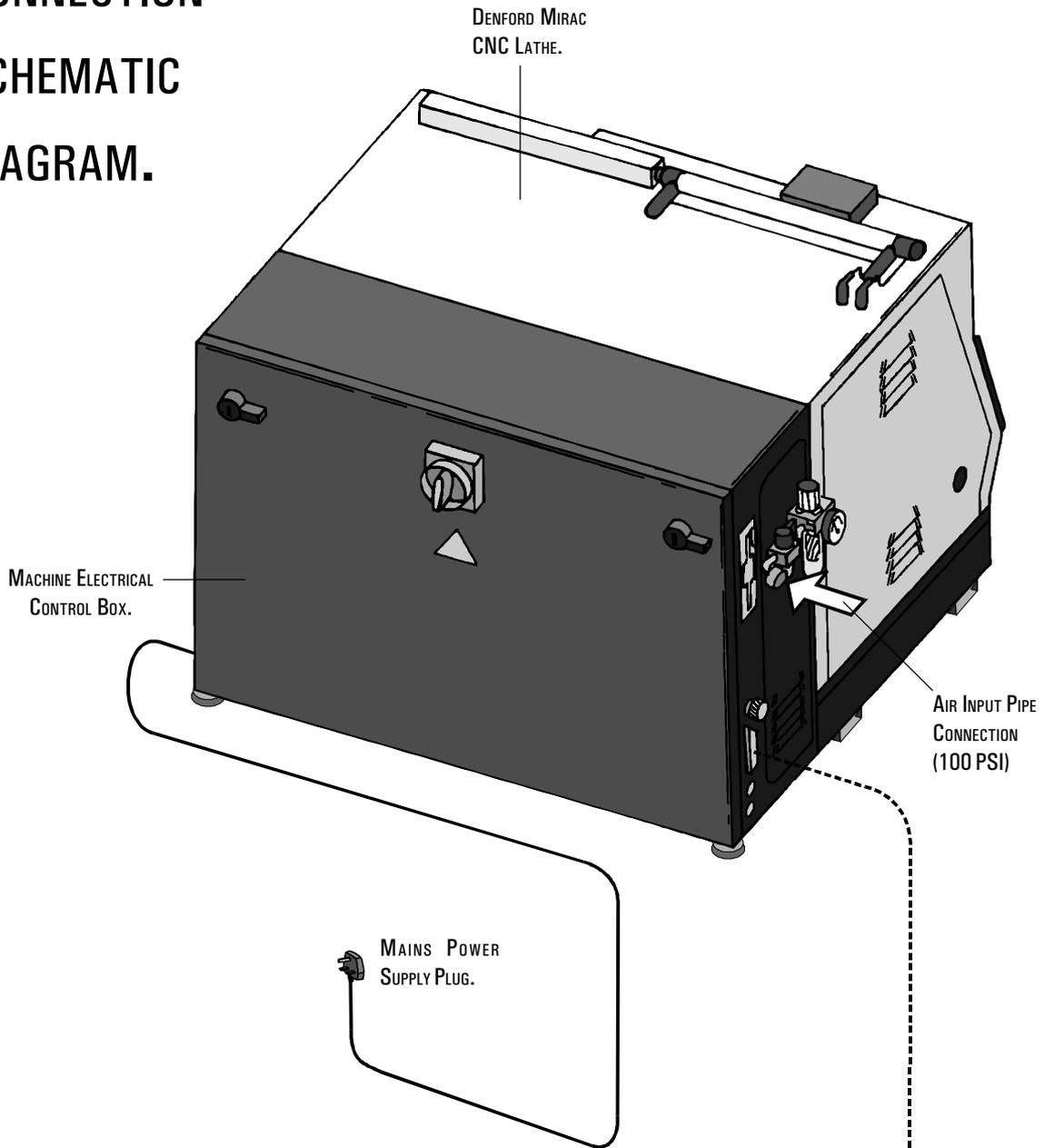
The supply is 220/240volt Single Phase 50Hz.

Cable required:- 2 Core + Earth, 1.5mm per core.

Current Taken 10 Amps.

All electrical connections should only be made by suitably qualified electrical engineers.

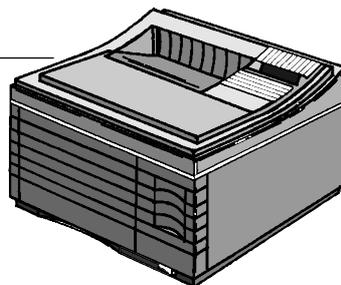
# COMPONENT CONNECTION SCHEMATIC DIAGRAM.



ANCILLARY EQUIPMENT, SUCH AS THIS SERIAL PRINTER, CONNECTS TO THE PORT LABELLED "RS 232".

THIS SIDE OF THE ELECTRICAL CONTROL BOX CONTAINS THE FOLLOWING FITTINGS:

- 3.5" FLOPPY DISK DRIVE.
- AUXILIARY I/O SOCKET.
- RS 232 PORT.
- EXTERNAL MONITOR SOCKET.
- KEYBOARD SOCKET.



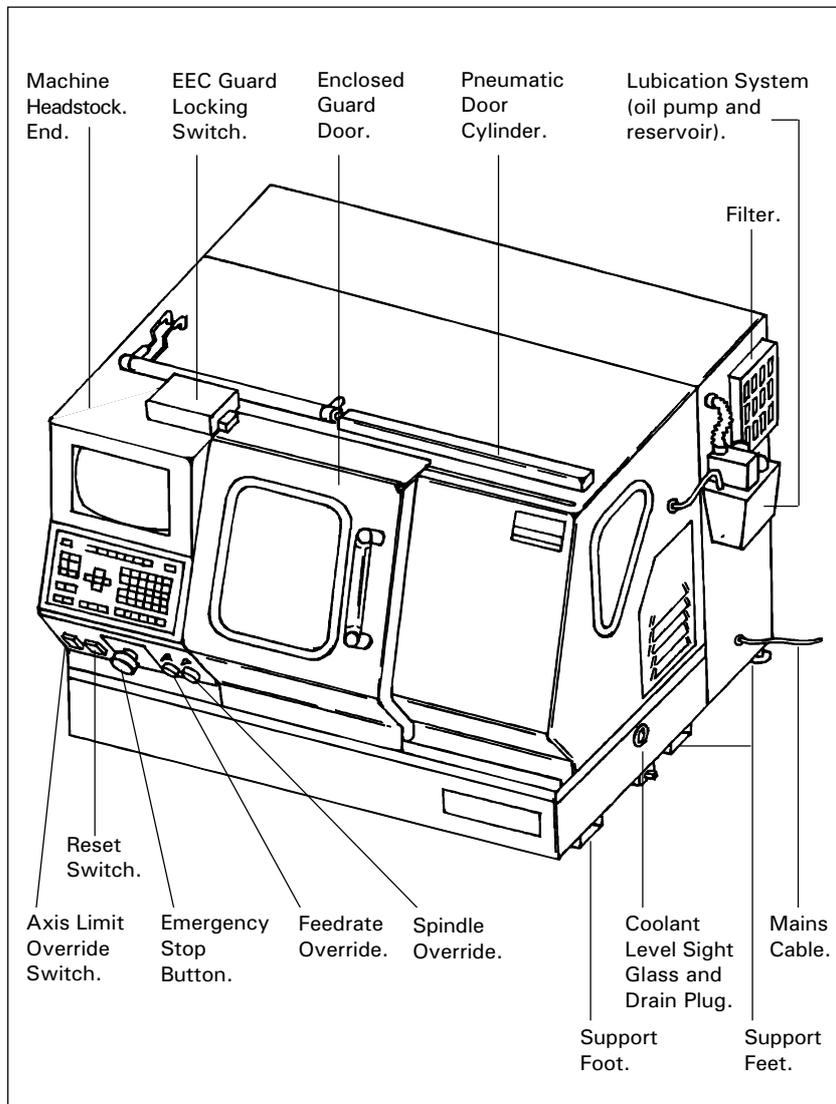
# REMOVAL OF PROTECTIVE COATINGS.

Once the machine has been sited and connected electrically, the protective coatings must be removed to prepare the machine for running.

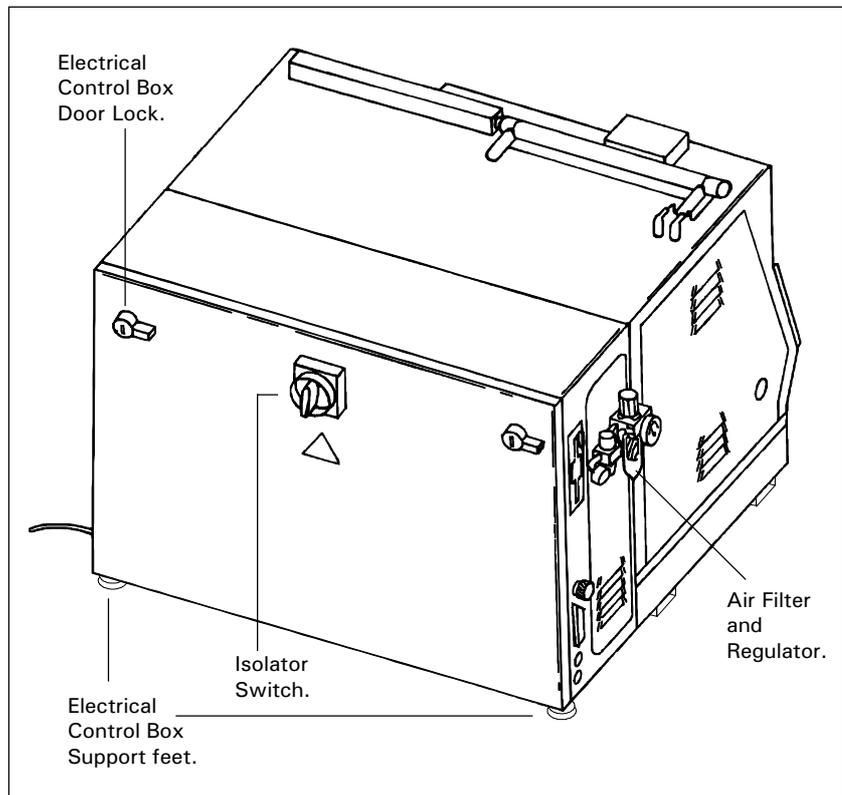
The protective coatings applied to the slideways and bright surfaces can be removed using a kerosene based solvent. The coatings must be removed from the slideways before any attempt to move them is made. Once these protective coatings have been removed, all untreated surfaces should be coated with a light covering of machine oil (eg BP: CS 68).

The protective plastic sheeting on the guard windows should be removed and the perspex cleaned with an anti-static cleaner.

# MIRAC - GENERAL LAYOUT - FRONT VIEW.



# MIRAC - GENERAL LAYOUT - BACK VIEW.



# AIR PIPE CONNECTION.

The pneumatic chuck and pneumatic machine door, when fitted, require an air compressor fitted with a SCHRADER quick release connector.

The connection fitted onto the machine air filter regulator is SCHRADER part number SC 8051-11 1/8 BSP MALE (or Denford part number BI 01451S).

The female connector required on the 1/4" pipe leading to the air compressor is SCHRADER part number 9793C-12 1/4" BSP FEMALE (or Denford part number BI 01128S).

# PNEUMATIC DOOR OPERATION.

## PNEUMATIC MACHINE DOOR (WHEN FITTED).

The opening and closing of the machine guard door is controlled using the following M codes:

To open guard, program code M38.

To close guard, program code M39.

The system defaults to guard close (M39). Pressing the Emergency Stop button has no effect on the operation of the guard. When the pneumatic power is off or disconnected, the guard can be operated manually (unless an EEC locking switch is fitted).

Note - on machines fitted with an EEC guard locking switch, the EEC guard locking switch will not allow the door to be opened if the power is not switched on.

# AUTO TOOLPOST OPERATION.

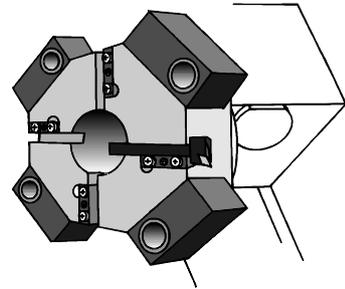
## AUTOMATIC TOOLPOST (WHEN FITTED).

The automatic indexing turret is driven by an electric motor, controlled using M codes (see the separate "Generic CNC Turning Manual" - section 11.6 for M codes listing and section 3.3 for tool changing).

## TOOL MOUNTING PROCEDURE FOR AUTO TOOLPOST.

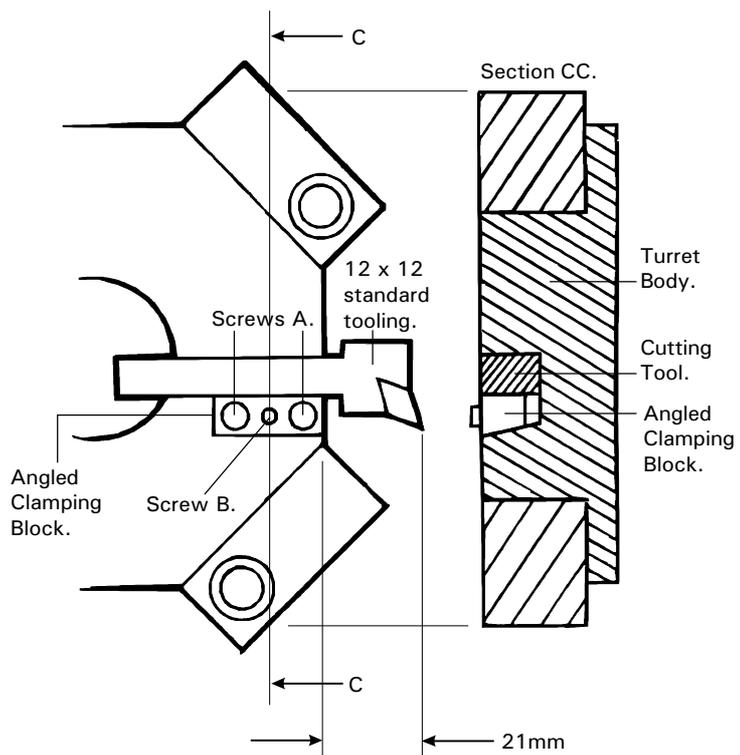
(Screw thread M6 R.H.).

- 1) Before mounting the tool, ensure that screw "B" is tightened down fully.
- 2) Tighten the angled clamping block on the turret head using screws "A", but only tighten these screws 3 or 4 turns, at this stage.
- 3) Place cutting tool between the angled clamping block and the turret with approximately 21mm protruding from the side of the turret.
- 4) Ensure that the tool and the clamping block are square with the turret head before evenly tightening screws "A".



## TOOL REMOVAL PROCEDURE FOR AUTO TOOLPOST.

- 1) Sufficiently loosen screws "A".
- 2) Unscrew "B" to eject the angled clamping block.
- 3) Remove the cutting tool.



# GENERAL SAFETY PRECAUTIONS.

## General Safety Precautions :

- Wear clothing suitable for operating the machine and follow the safe working procedures in place at your establishment.
- 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.
- Ensure that the correct cable for the power source is used.
- If power fails turn off the yellow isolator (found on the electrical control box) immediately.
- Ensure the power is switched off before starting any maintenance work on the machine or opening/working on the electrical control box.
- Check the state of the slideway lubrication daily, to prevent the axes from becoming jammed.
- Further operational safety precautions are outlined in the separate "Generic CNC Turning Manual".

Note - Training courses are available on request.

# SAFETY FEATURES.

The following safety features apply to Mirac machines:

## **KEY OPERATED EMERGENCY STOP BUTTON.**

The red emergency stop button is fitted on the lefthand lower front panel of the machine. When depressed it has the effect of stopping all axis and spindle movement. To reset, push the button in and turn clockwise (a key may be required). The axes will then require homing individually. Further information can be found in the separate "Generic CNC Turning Manual" - section 7.9.

## **AXIS LIMIT SWITCHES.**

Limit switches are fitted to both axes to prevent overtravel.

An axis limit switch override button is fitted on the lefthand front lower panel of the machine. It should be used when the toolpost has overtravelled and activated the limit switch. To reset, depress the button and simultaneously press the appropriate axis key to move the toolpost away from the limit switch and back onto its regular section of slideway, then home each axis individually.

# SWITCHING THE MACHINE ON/ OFF.

## SWITCHING THE MACHINE 'ON'.

The machine controlling software is loaded directly off one floppy (3.5 inch) disk.

To load the machine controlling software insert the disk into the floppy (3.5 inch) disk drive, located on the side of the machine electrical control box (see the diagram below).

Power up the machine by turning the yellow rotary isolator switch on the electrical control box door to the 'on' position.

The machine controlling software and all necessary drivers will automatically load.

## SWITCHING THE MACHINE 'OFF'.

Exit the machine controlling software using the *Quit* command.

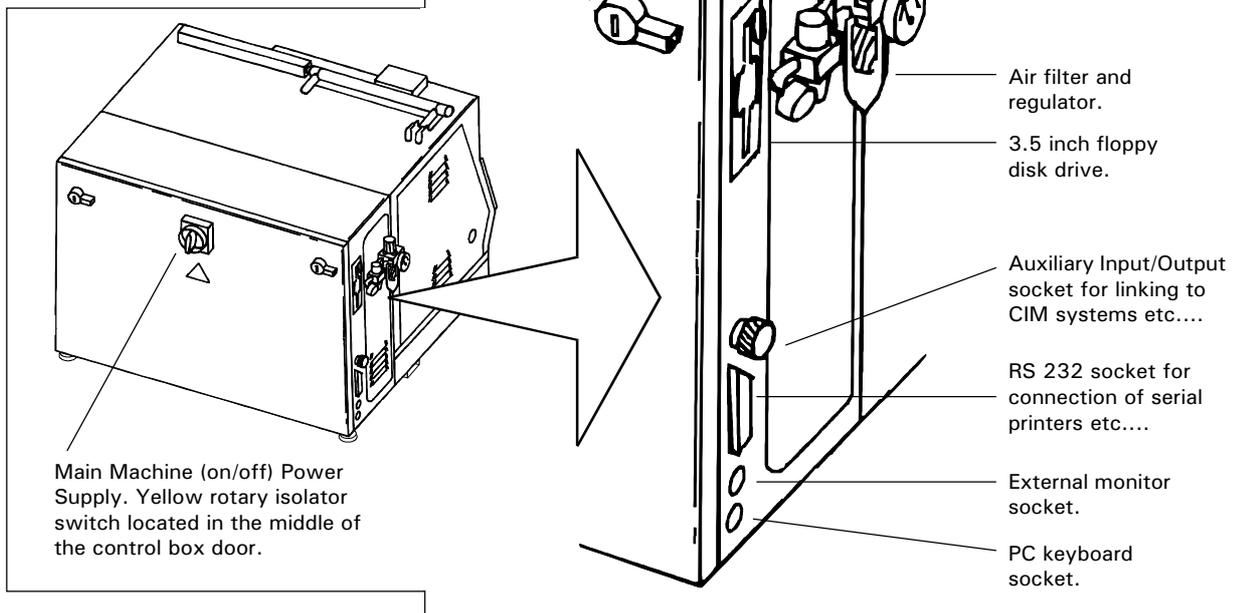
Select the *Main Menu* by pressing the [F10] key on the Desktop Tutor.

Press the [PAGE DOWN] key to highlight '*Quit*', then press the [EOB] key to close the software.

Power down the machine by turning the yellow rotary isolator switch on the electrical control box door to the 'off' position.

The machine must not be turned off if a turning program is running, or the machine is cutting work....

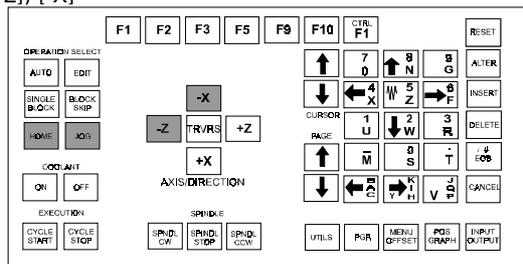
# ELECTRICAL CONTROL BOX LAYOUT.



# MACHINE START-UP - AUTOMATIC SEARCH FOR DATUM POINT.

## Keys Helpbox.

The following keys are used in this section:  
[HOME], [JOG]  
[ Z ], [ X ]



Tutor keypad.

On loading up the DENFORD FANUC TURNING software, the start-up screen will be displayed.

It is necessary to home the machine whenever it is switched on, to find the machine datum point - this is used as a zero reference for describing other co-ordinates on the machine.

To set the machine datum point automatically, the machine axes must be 'homed'.

Press the [HOME] key, then press the [X] key. On a Mirac the toolpost will move to the extreme top of the machine (when looking directly from the front). The limits of movement for the X axis have now been set.

Press the [HOME] key, then press the [Z] key. The toolpost will now move to the extreme righthand of the machine. The limits of movement for the Z axis have now been set.

When the machine datum point is set, X and Z are shown on the display screen as 'zero'.



# MAINTENANCE SCHEDULE.

<i>Daily</i>	<ul style="list-style-type: none"> <li>- Clean and remove swarf.</li> <li>- Check/top-up slide lubrication oil level in reservoir.</li> </ul>
<i>Weekly</i>	<ul style="list-style-type: none"> <li>- Clean machine thoroughly.</li> <li>- Check exposed screws and nuts for tightness.</li> <li>- Check/top-up Cutting Coolant level.</li> </ul>
<i>Bi-annually</i>	<ul style="list-style-type: none"> <li>- Pneumatic Chuck / Door models - Check condition of filter and drain any build-up of water in the filter bottle.</li> <li>- Check condition of electrical connections.</li> <li>- Check all cables for kinks and breaks.</li> <li>- Clean sensors and microswitches.</li> <li>- Remove chuck jaws, clean chuck.</li> </ul>
<i>Annually</i>	<ul style="list-style-type: none"> <li>- Check slides for wear.</li> <li>- Grease axis bearings.</li> <li>- Change Air Filters.</li> </ul>

# LUBRICATION CHART.

Lubrication Point	Lubricating System	Frequency	Recommended Oil/Grease	Quantity
Slide ways and Ballscrews	Auto pump unit	As required	BP : CS 68 Shell : Vitrea 68 Castrol : Perfecto NN	0.5 litre
Headstock	Grease Seal	On Maintenance of Headstock	Kluber Isoflex NBU 15	4 cc/Bearing
Axis Bearings	Grease Seal	Once a year	BP : LS 3 Shell : Alvania No. 3	2 cc/Bearing
Coolant	Electric pump	As required	Cincinnati Millacron Simcool C60	13 litres

# SLIDE LUBRICATION SYSTEM.

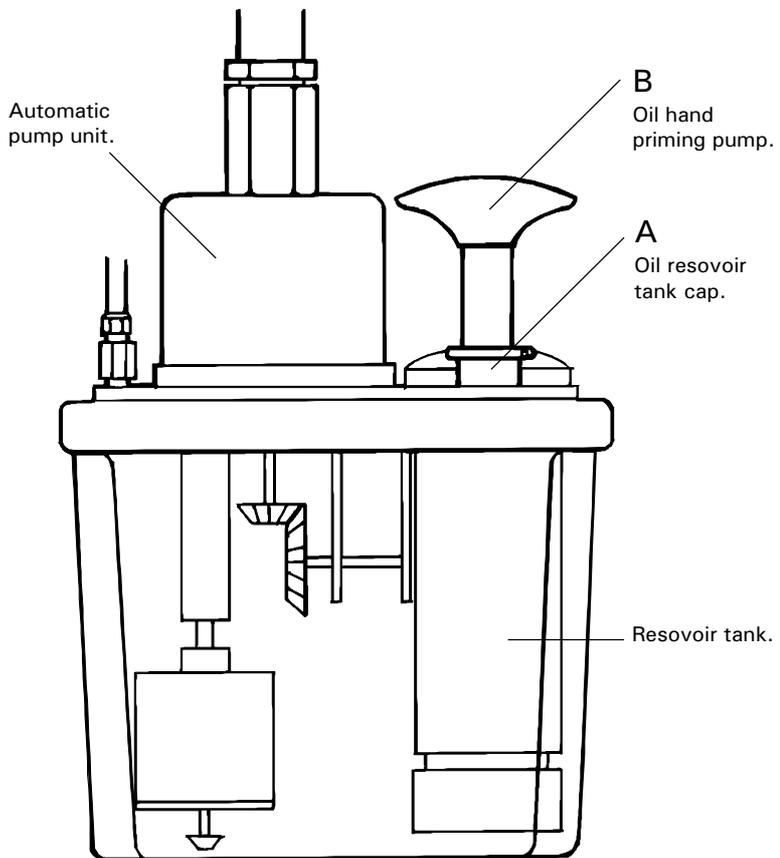
## SLIDE LUBRICATION SYSTEM (SEE DIAGRAM BELOW).

The slide lubrication system is fitted to the righthand side of the machine (when viewed from the front). It comprises of an oil reservoir tank and an automatic pump unit. Oil is automatically pumped to the required areas of the machine.

The slide lubrication system is located on the righthand side of the machine cabinet, when viewed from the front.

The oil level can be topped-up by adding the required grade of lubrication oil into the reservoir through cap A.

The hand priming pump, B, should only be used if there is no oil in the reservoir, ie, the pump has run dry or the oil is being renewed.



FRONT ELEVATION OF SLIDE LUBRICATION SYSTEM.

# AIR FILTERS.

The air filters on the lefthand side panel of the machine (when viewed from the front) should be changed either annually, or when "black" in colour.

When ordering new filters quote reference:

Air Inlet Filter - 120mm Ref: RS 507-876

# COOLANT FILLING AND DRAINING.

## CUTTING COOLANT SYSTEM (SEE DIAGRAM BELOW).

The coolant tank is positioned in the base of the machine.

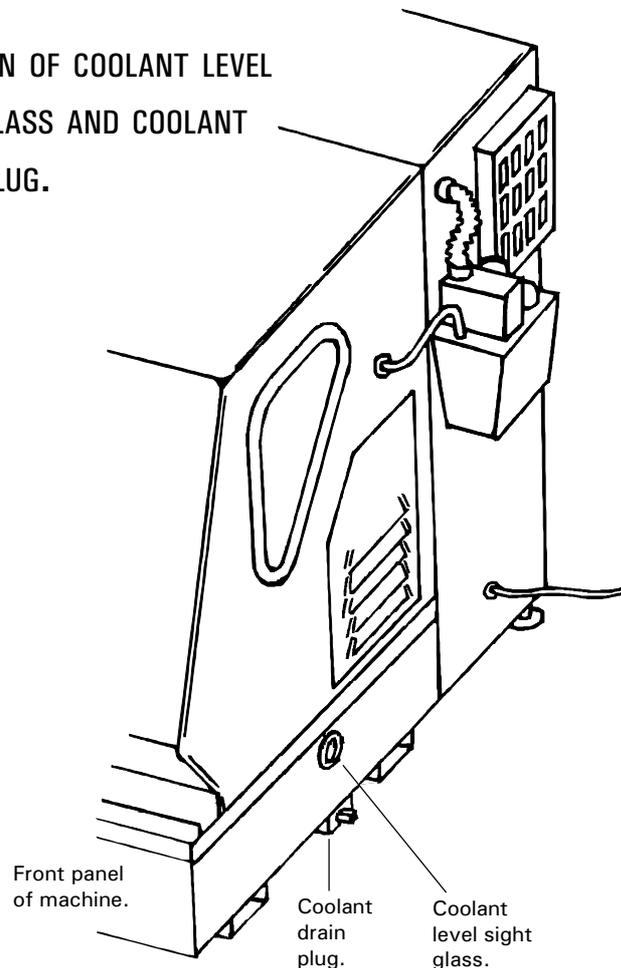
Coolant Tank Capacity: 13 litres.

Recommended Coolant Type: Cinnccinati Millacron Simcool C60.

### LOCATION OF COOLANT LEVEL

SIGHT GLASS AND COOLANT

DRAIN PLUG.



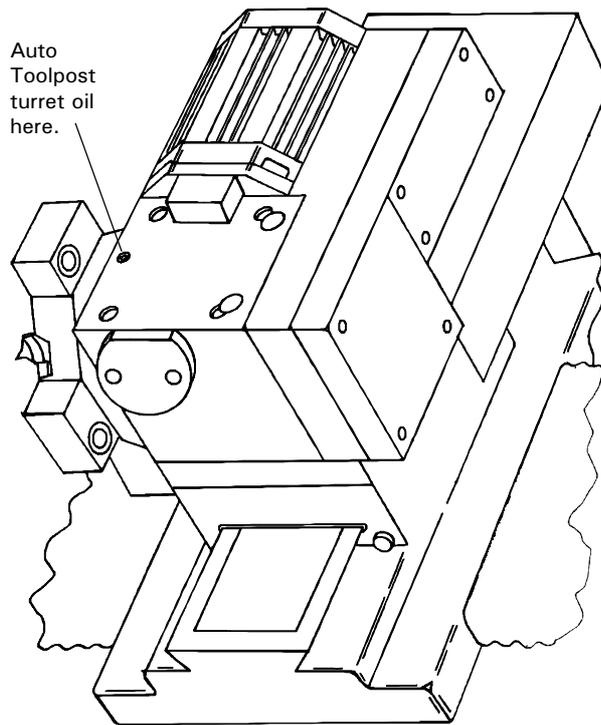
## FILLING.

- 1) Mix coolant as prescribed by the manufacturer.
- 2) Pour coolant in through front of machine.
- 3) Watch the coolant level using the sight glass on the righthand side of the machine (when viewed from the front)
- 4) Stop filling when the level of the coolant reaches the middle of the sight glass.

## DRAINING.

- 1) The drain tap is found on the righthand side of the machine, just below the coolant level sight glass (when viewed from the front).
- 2) The tap is fitted with a tailpiece adapter which accepts a 6mm I.D. tube.
- 3) To drain the coolant, fix the tube to the tailpiece adapter and open the tap.

# AUTO TOOLPOST LUBRICATION.



## AUTO TOOLPOST LUBRICATION POINT.

The turret mechanism of the auto toolpost should be oiled at weekly intervals, using a pump-action oil can. The lubrication point for the turret is shown in the diagram above.

The specification of oil used on the turret should be the same as the slide lubrication system.

# AIR FILTER ISOLATOR AND REGULATOR.

## AIR FILTER ISOLATOR AND REGULATOR (SEE DIAGRAM BELOW).

The automatic toolpost and pneumatic machine door are supplied with compressed air, passing through an air filter regulator which is situated on the back panel of the machine cabinet.

## AIR SUPPLY ISOLATOR.

Turn anticlockwise to allow air to flow (as shown in the diagram below).

Turn clockwise to cut air supply and drain air pressure from the system.

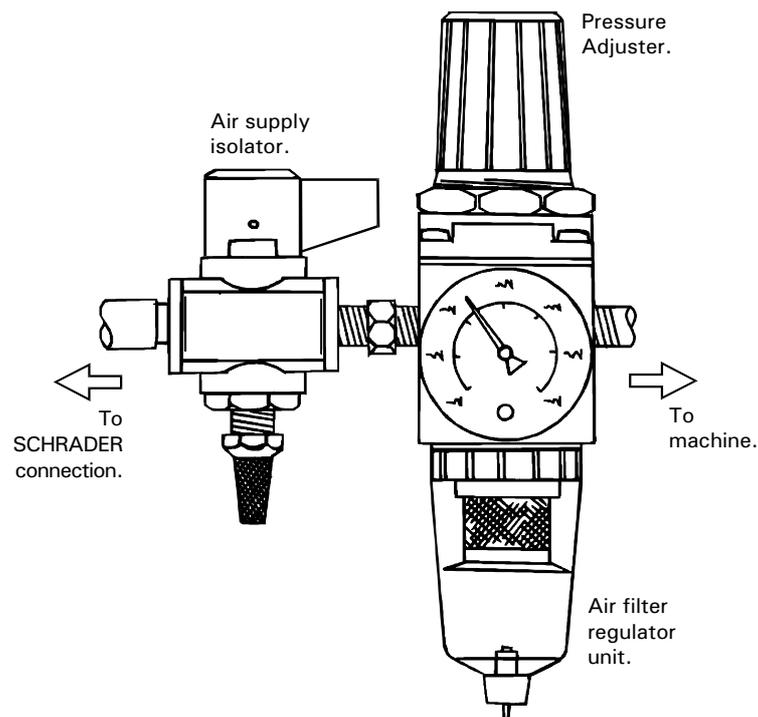
## AIR FILTER REGULATOR.

Normal operating pressure (as supplied, preset on the machine) is 100 PSI (6.6 Bar).

Maximum pressure for the air regulator is 150 PSI (9.9 Bar).

Always check the main supply pressure before adjusting pressure at the regulator. To adjust the pressure, pull up the rotary control to unlock it from its current position. Turn the control clockwise to increase pressure, or anticlockwise to decrease pressure. Push the rotary control down to relock it in its new position.

Regularly drain any water collected in the filter bottle using the cap in the base of the bottle. The interval at which this operation is required will depend on the type and condition of the air compressor being used.



# MIRAC

## SPECIFICATION.

### MECHANICAL.

Swing over Bed .....	250mm (10")
Maximum Turning Diameter .....	160mm (6.25")
Maximum Turned Length .....	180mm (7")
Spindle Bore No. 3 MT .....	21mm (0.8125")
Spindle Nose A2 Type .....	42mm (1.625")
Spindle Speeds .....	0-5000 RPM
Feedrates .....	0-1200 RPM
X Axis Travel .....	85mm (3.375")
Z Axis Travel .....	200mm (8")
Bed hardened, ground and of slant design	
High precision and Anti backlash ballscrews fitted to both axes	
Coolant Capacity .....	18 litres
Machine Resolution .....	0.01mm (0.0004")
Optional Automatic Toolpost:	
External Tool size.....	12mm x 12mm (0.5" x 0.5")
Internal Tool size .....	25mm (1")
Machine Length .....	1100mm (43.6875")
Machine Width .....	1050mm (41.3125")
Machine Height .....	620mm (24.5")
Machine Weight (net) .....	320 Kilos (705 lbs)

### ELECTRICAL.

Mains Supply  
50/60 Hz - Single phase - 240 Volts

Spindle Motor:  
0.75 Kw / 1 H.P. AC

Axes Motor:  
Stepper Motors - 200 steps/rev

# DENFORD CONTACTS, PRODUCTS AND SERVICES.

If you require specific help regarding the specification, operation or maintenance of this machine, contact Denford on the phone/fax number below. Please have the machine serial number and year of manufacture (printed on the front of this guide) to hand, when you call.

Telephone: + 44 (0)1484 712264.

Fax: (01484) 722160.

Denford Limited,

Birds Royd, Brighouse, West Yorkshire, HD6 1NB, England.

Email: [service@denford.co.uk](mailto:service@denford.co.uk)

### *Stuck for projects and ideas?*

Denford LatheCAM Designer is an easy to use CAD package specifically designed for use with Denford CNC lathes.

Components can be designed directly on-screen, or imported from other popular drawing packages. The G-code programs are then automatically generated by LatheCAM's post processor.

What simpler way is there of creating your own library of CNC files? !!

### *Need further training?*

The Denford PTDC (Professional Training and Development Centre) is a purpose built centre specialising in project guidance, CNC machine training and software development skills for Denford customers. Training packages can be tailored to suit your needs, with the help of our experienced Education Support team. The centre can cater for training sessions from the very basics of CNC machine operation, upto the complexities of G-code programming, then further into 'new' Technology areas such as video conferencing.

Denford Limited is committed to the development of its training guides and manuals. If you have found certain sections in this setup guide useful, or feel that particular sections could be further developed, or new sections added in future, we would welcome your suggestions and comments.