

# Denford Novamill

**DENFORD**

COMPUTERISED MACHINES AND SYSTEMS

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## Operating Guide for the Novamill Series of CNC Milling Machines

- 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,  
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# CONTENTS.

| Section   | Page |
|---|------|
| Introduction. ....                                    | 2    |
| Warning.....  | 2    |
| EC Declaration of Conformity. ....                    | 3    |
| Unpacking & Lifting the Machine. ....                 | 4    |
| Levelling & Positioning the Machine. ....             | 5    |
| Connecting the PC. ....                               | 6    |
| Electrical Diagrams and Control Box Seal. ....        | 6    |
| Connecting the Mains Supply. ....                     | 7    |
| Component Connection Schematic Diagram. ....          | 8    |
| Removal of Protective Coatings. ....                  | 10   |
| Novamill - General Layout. ....                       | 10   |
| General Safety Precautions. ....                      | 11   |
| Install and Run the Machine Control Software. ....    | 12   |
| Automatic Search for Datum Point.....                 | 13   |
| Maintenance Schedule.....                             | 14   |
| Lubrication Chart. ....                               | 14   |
| Maintenance - Lubrication Points on the Novamill. ... | 15   |
| Novamill Specification. ....                          | 17   |
| Denford Contacts, Products and Services. ....         | 18   |

## INTRODUCTION.

This guide will describe how to transport, site and setup your Denford Novamill CNC Milling Machine.

Any operational features, specific to the Novamill range, are also covered in this guide. General operating functions are explained in the separate "Generic CNC Milling 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 : Novamill

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.

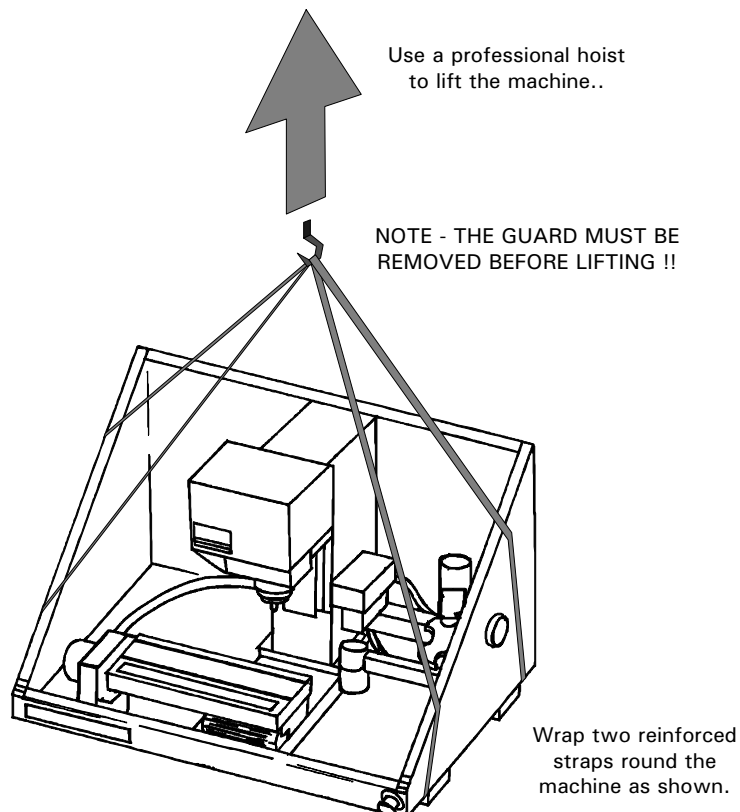
Lift the power supply control box from the packaging. If possible, lift the power supply box using a porters trolley.

Lift the machine from the packaging. Denford does NOT recommend direct lifting of the machine !! Always use sensible lifting precautions in accordance with Health and Safety Regulations in your establishment.

Denford recommends using two 5 metre long slings and a professional hoist, arranged as shown in the diagram below.

Before fitting the slings, remove the guard. Do not lift the machine with the guard still in place - the pressure of the slings may cause the guard to crack. The guard is held in position using two nuts and bolts. Some machines will also have a side mounted safety interlock switch (this should be set "open" on delivery of the machine to allow the guard to be removed, but must be set "closed" when the machine operates). Ensure that the machine is both secure and balanced before lifting.

To transport the machine over longer distances, use a suitably sized trolley. Remember to refit the guard when the machine has been sited.



# LEVELLING & POSITIONING THE MACHINE.

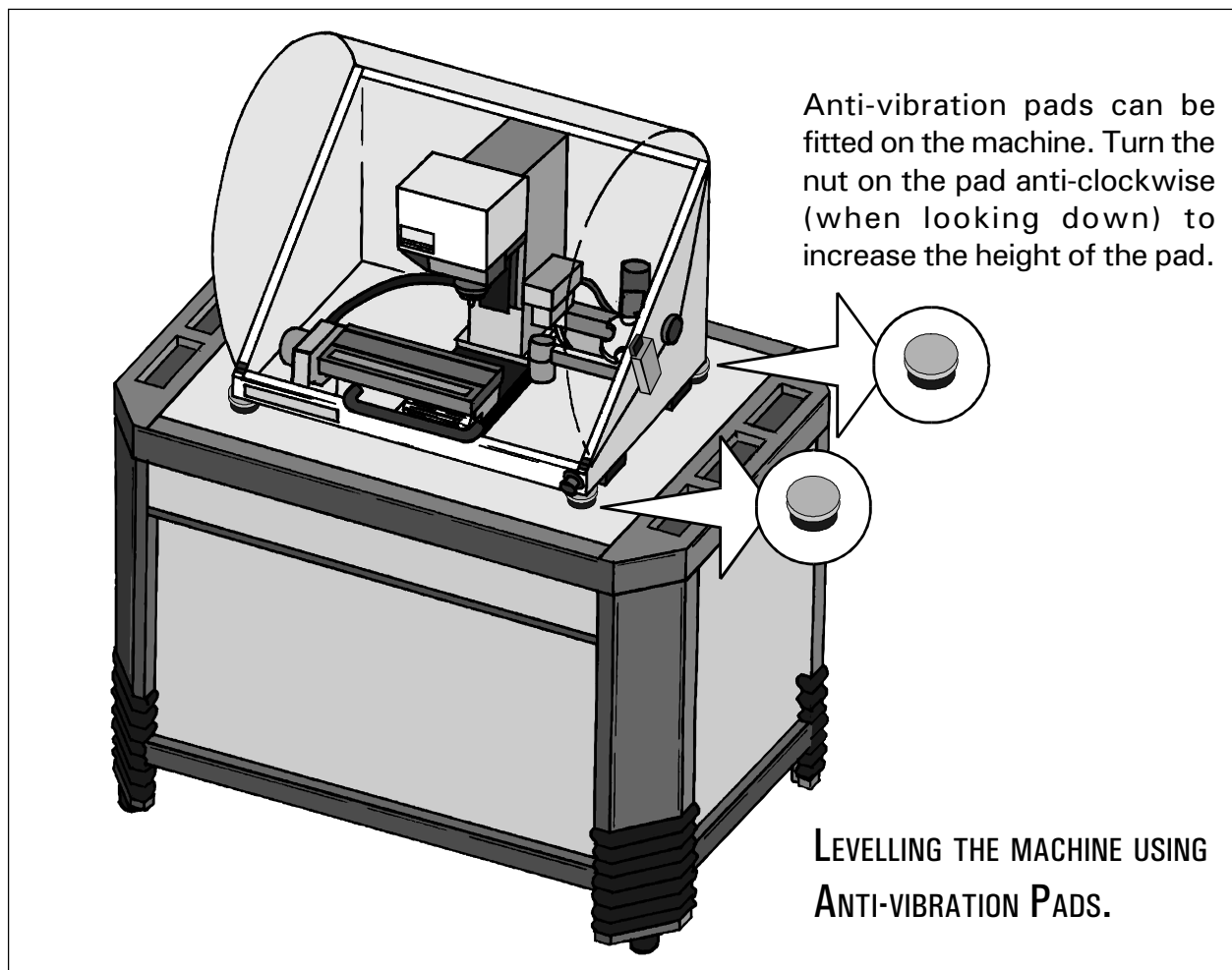
Remember when positioning the machine in the room, space will be required for the electrical control box. Sufficient room should also be provided for effective maintenance to be carried out.

The Novatmill 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).



# CONNECTING THE PC.



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

Ideally, the pc (personal computer) should be placed next to the machine and its electrical control box, with access to a mains power supply.

Connect the elements of the pc together as described in the pc manufacturers operating manual.

The pc and the machines electrical control box are physically linked by the RS232 cable (supplied). This cable is fitted with 25 pin connectors at both ends.

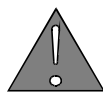
One end connects to the 25 pin port on the electrical control box labelled "RS 232".

The opposite end of this cable connects to the 25 pin port of the pc labelled "COM2". If this port cannot be identified on the back panel of the pc, please refer to the pc manufacturers operating manual.

*Note. On some personal computers, this port may have a 9 pin connection. If this is the case, a 25 pin to 9 pin adapter, available from most good computer/electrical retailers must be fitted to allow the cable to be connected to the pc.*

A schematic diagram illustrating these component connections is shown on page 8.

# ELECTRICAL DIAGRAMS AND CONTROL BOX SEAL.

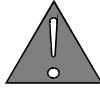


*Warning! Do not connect cables between any electrical hardware with the mains power switched on, since this could damage the hardware.*

*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 large flexible machine power cable, leading from the side of the electrical control box is connected to the fixing bracket on the side of the milling machine. Check that the connector is inserted into the bracket with the main cable from it leading towards the back of the machine (see the diagram on page 9).



*Warning! Do not insert the connector into the bracket the wrong way round; this could damage the connector pins. Check that the letters and numbers on the two halves of the connector and bracket match before closing the junction.*

Ensure the two roller clips holding the male connector against the female bracket are fully closed. There should be no free movement at the junction.

The mains power supply is fed to the electrical control box, which in turn, is connected to the milling machine.

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.

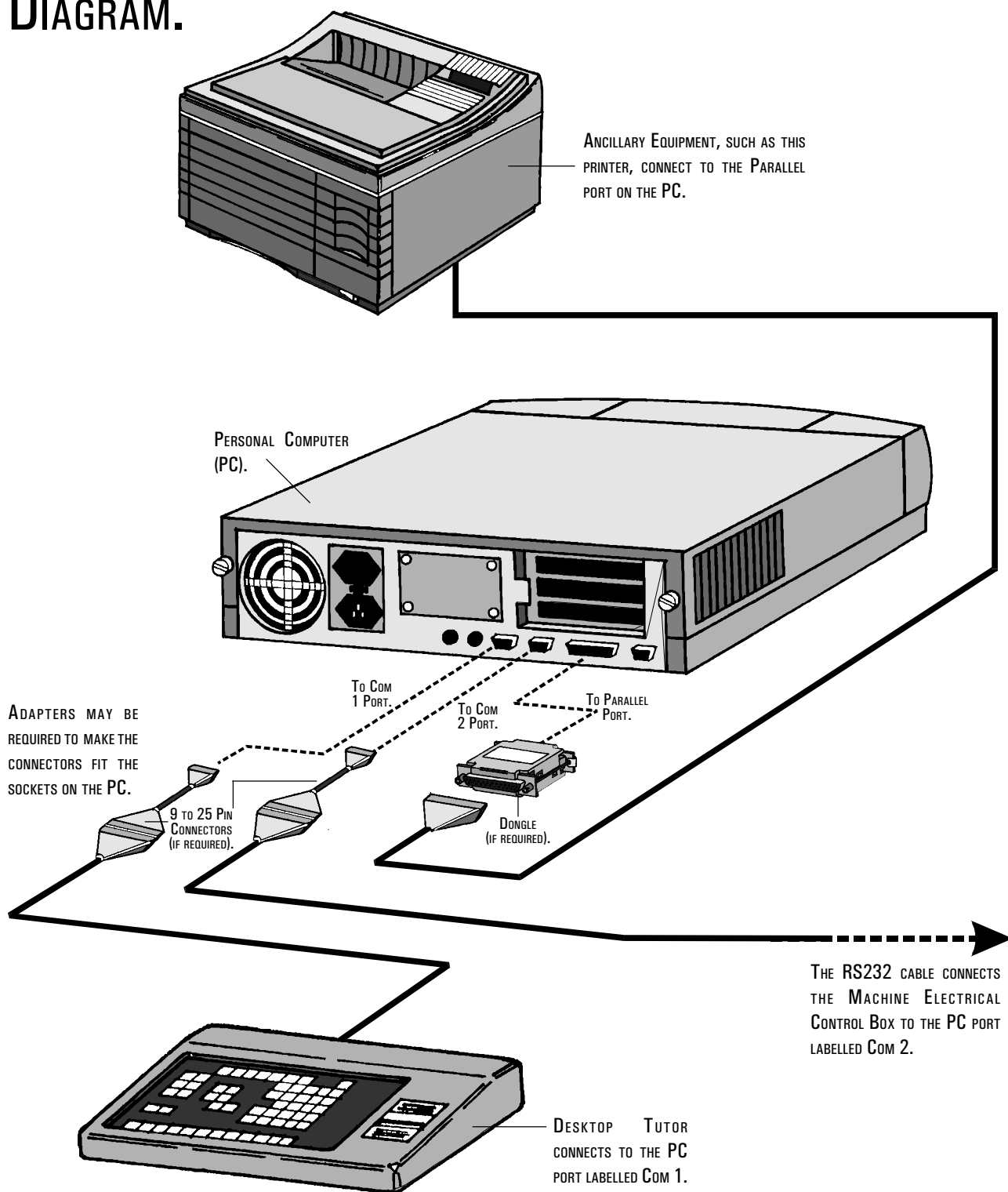
Cable required:- 2 Core + Earth, 1.5mm per core.

Current Taken 11 Amps.

All electrical connections should only be made by a suitably qualified electrical engineer.

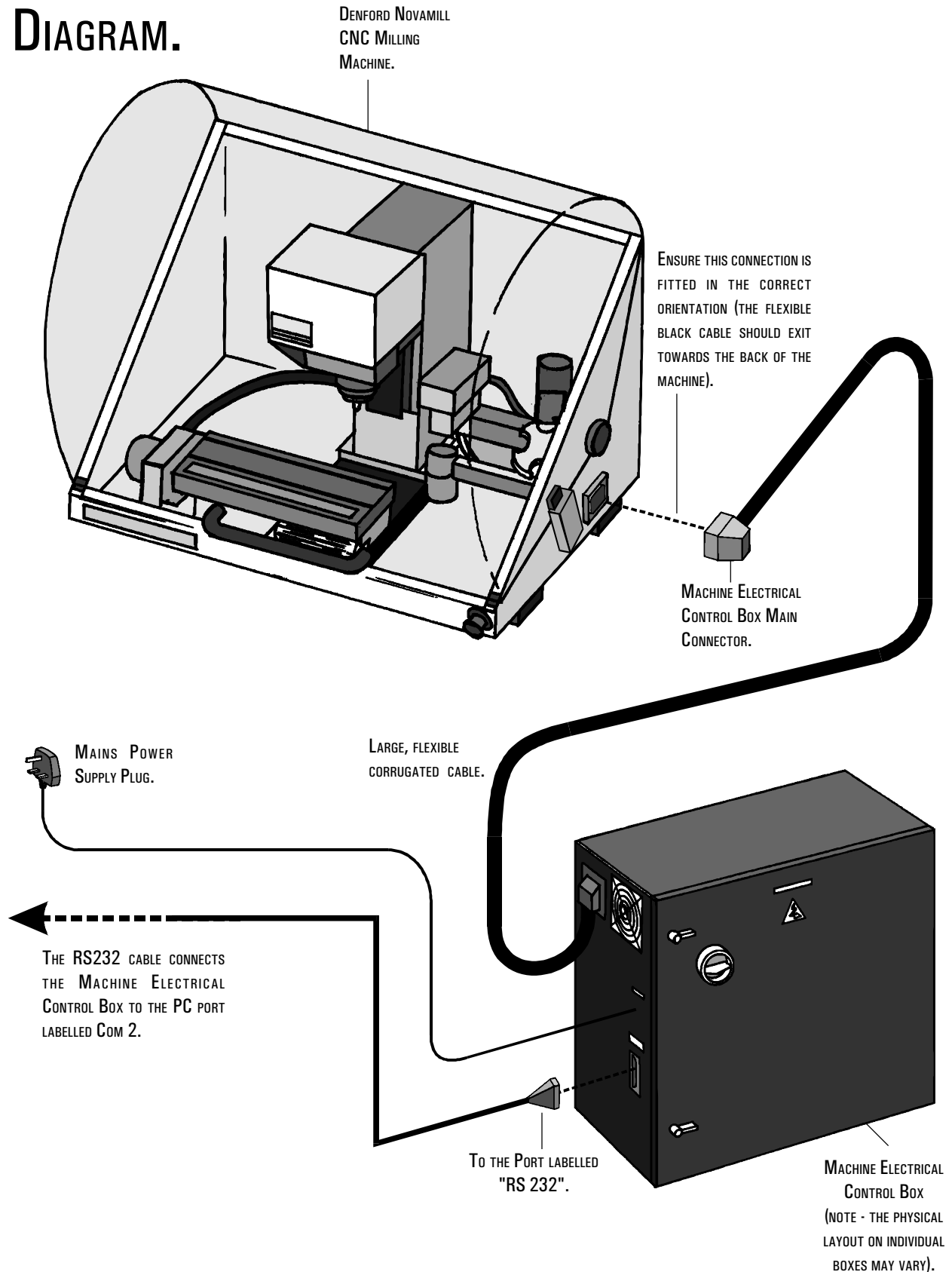
A schematic diagram illustrating these component connections is shown on page 8 and 9.

# COMPONENT CONNECTION SCHEMATIC DIAGRAM.





# COMPONENT CONNECTION SCHEMATIC DIAGRAM.



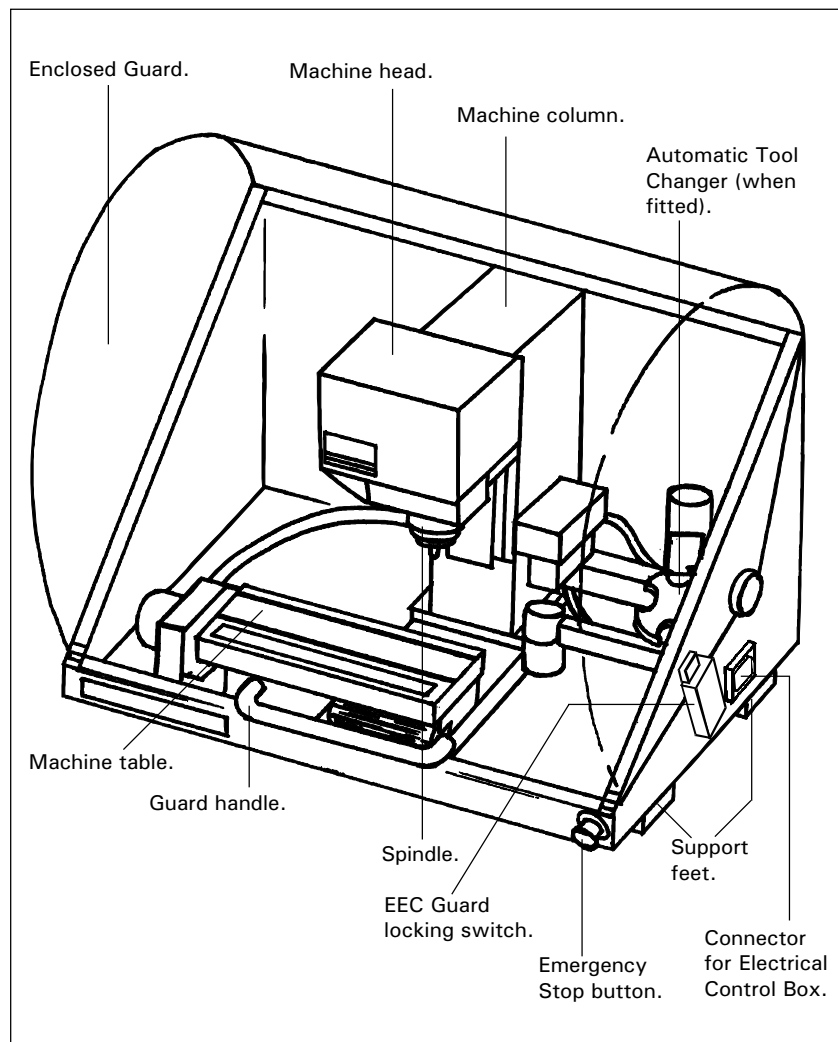
# REMOVAL OF PROTECTIVE COATINGS.

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.

# NOVAMILL - GENERAL LAYOUT.



# 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.
- Always secure the work on the table or in a fixture or vice.
- 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 Milling Manual".

# INSTALLING & RUNNING THE MACHINE CONTROL SOFTWARE.



To install the machine control software onto your pc hard disk, switch on your pc and run/type the following:

**A:\Install.exe**

....where **A:** is the label for the floppy (3.5 inch) disk drive.

Press the [ENTER] / [RETURN] key on the pc qwerty keyboard to confirm this command.

The install routine will ask you for a drive destination (the label assigned to your pc hard disk - the default is set as **C:**) and a directory destination (the name of the area/folder you would like the software to be stored - the default is set as **\NOVAMILL**).

The machine control software is an MS-DOS application.



Each time you wish to run the machine control software from your pc hard disk, exit,if necessary, to the 'DOS' prompt and type the following:

**C:**

....where **C:** is the label for the drive where the software is installed, then press the [ENTER] / [RETURN] key on the pc qwerty keyboard. Next, type:

**CD\NOVAMILL**

....where **NOVAMILL** is the directory where the software is stored and press the [ENTER] / [RETURN] key on the pc qwerty keyboard. Then type:

**FANUCMD**

Press the [ENTER] / [RETURN] key on the pc qwerty keyboard and the software will start.

Alternatively, the software can be run directly off one floppy (3.5 inch) disk.



To load the machine controlling software from a floppy (3.5 inch) disk, switch on your pc and exit, if necessary, to the 'DOS' prompt.

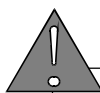
Type the following line at the 'DOS' prompt:

**A:\FANUCMD**

....where **A:** is the label for the floppy (3.5 inch) disk drive.

Press the [ENTER] / [RETURN] key on the pc qwerty keyboard to confirm this command.

The machine control software will now start.



Note - The default configuration in the software is for the desk-top tutor to connect to COM 1 and the CNC machine to COM 2.

# MACHINE START-UP

## - AUTOMATIC

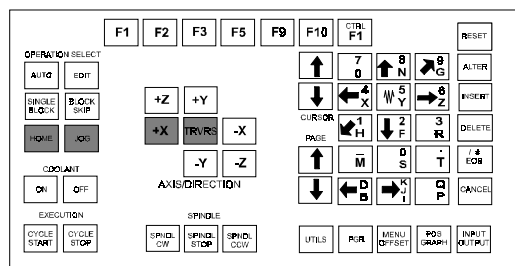
## SEARCH FOR DATUM POINT .

Keys Helpbox.

The following keys are used in this section:

[HOME], [TRVRS]

[JOG], [+ X]



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



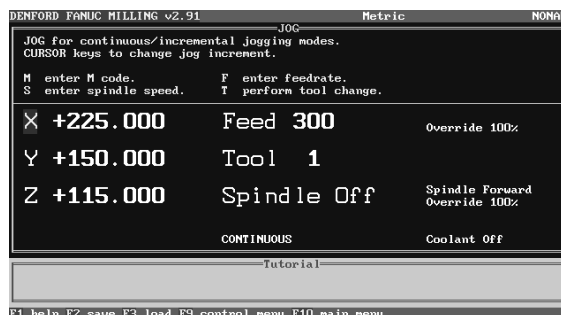
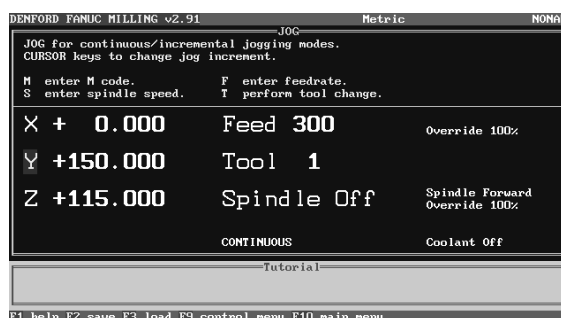
It is necessary to home the machine whenever it is switched on, to find the machine datum point - this is used as a zero reference for describing other co-ordinates on the machine.

To set the machine datum point automatically, first press the [HOME] key.



Next press the [TRVRS.] key. On a Novamill the table will move to the extreme righthand front corner of the machine (when looking directly from the front). The screen display shows the 'working area' of the machine in the Y and Z axes. X is shown as 'zero' due to the way this machine datum point is set. This does not mean that there is a 'working length' of 'zero' in the X axis !!

To display the 'working area' in the X axis, the table must be driven to the extreme lefthand front corner of the machine. This can be achieved by pressing the [JOG] key, then the [+ X] key to move the table until its X limit is reached. On completion, the screen co-ordinates shown relate to the maximum limits of travel for each axis on the Novamill.



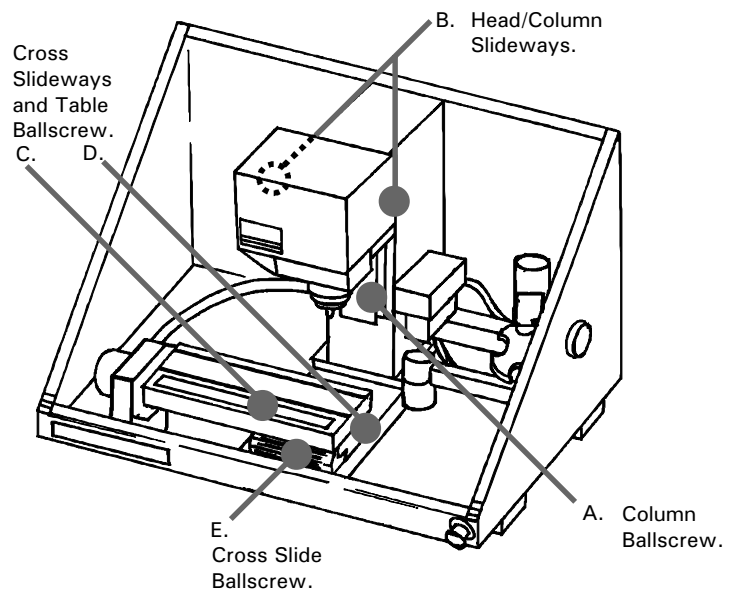
# MAINTENANCE SCHEDULE.

|                    |   |
|--------------------|---|
| <i>Daily</i>       | <ul style="list-style-type: none"> <li>- Clean and remove swarf.</li> <li>- Check that the slides are lubricated.</li> </ul>  |
| <i>Weekly</i>      | <ul style="list-style-type: none"> <li>- Clean machine.</li> <li>- Oil the slides and ballscrews.</li> <li>- Oil the enclosed guard pivot points.</li> <li>- Check exposed screws and nuts for tightness.</li> </ul>            |
| <i>Bi-annually</i> | <ul style="list-style-type: none"> <li>- Check condition of electrical connections.</li> <li>- Check and clean collet.</li> <li>- Check all cables for kinks and breaks.</li> <li>- Clean sensors and microswitches.</li> </ul> |
| <i>Annually</i>    | <ul style="list-style-type: none"> <li>- Check slides for wear.</li> </ul>  |

# LUBRICATION CHART.

| Lubrication Point         | Lubricating System  | Frequency             | Recommended Oil/Grease                                   | Quantity     |
|---------------------------|---------------------|-----------------------|--|--------------|
| Slide ways and Ballscrews | Pump-action oil can | As required           | BP : CS 68<br>Shell : Vitrea 68<br>Castrol : Perfecto NN |              |
| Headstock                 | Grease Seal         | On change of bearings | Kluber Isoflex NBU 15                                    | 4 cc/Bearing |
| Axis Bearings             | Grease Seal         | Once a year           | BP : LS 3<br>Shell : Alvania No. 3                       | 2 cc/Bearing |
| Coolant                   |                     |                       | Cincinnati Millacron<br>Simcool C 60<br>Dilution 2.5%    |              |

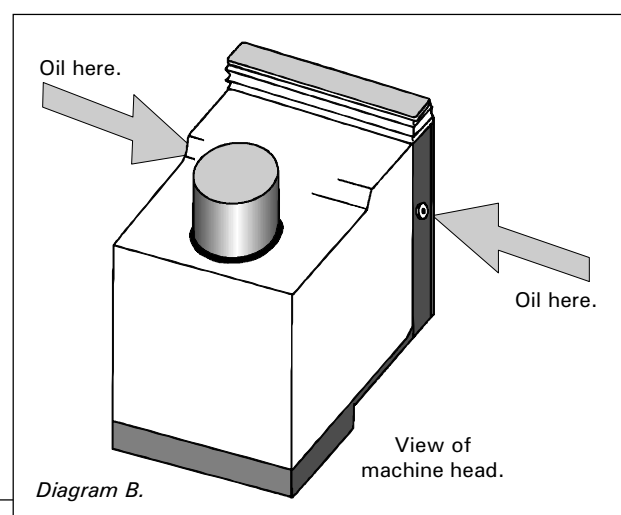
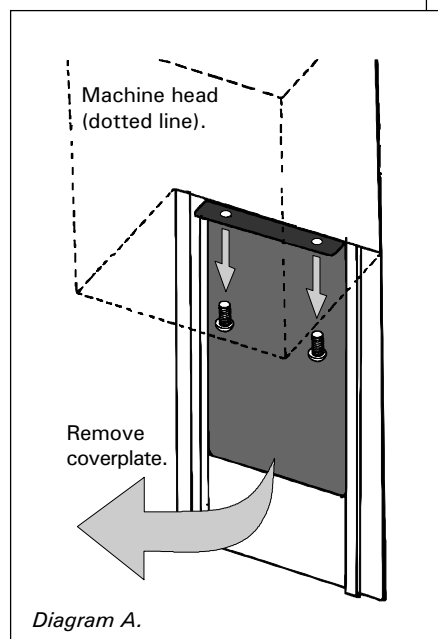
# LUBRICATION POINTS ON THE NOVAMILL.



**LUBRICATION POINTS ON THE NOVAMILL.**

## COLUMN BALLSCREW.

The column ballscrew is lubricated by removing the two screws which hold the cover plate to the underside of the head and with a pump action oilgun pump oil onto the ballscrew. Replace the cover after running the head up and down the column to distribute the oil - see diagram A.



## HEAD / COLUMN SLIDEWAYS.

Oil can be pumped directly on to the column slides, oiling points are situated on both sides of the head slideways - see above diagram B.

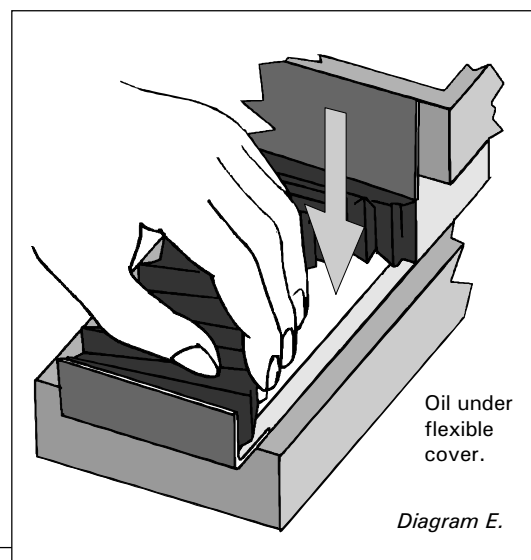
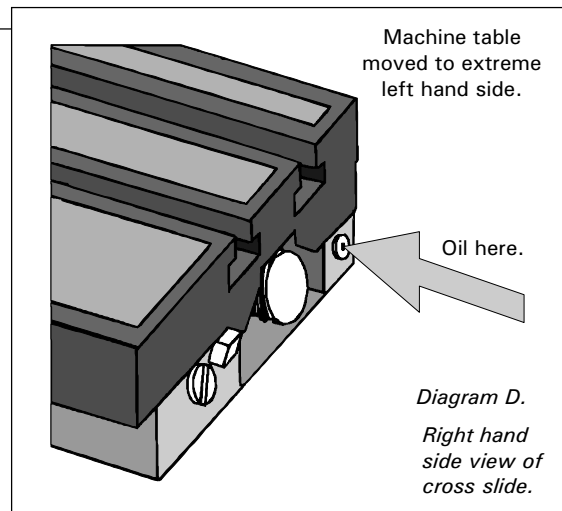
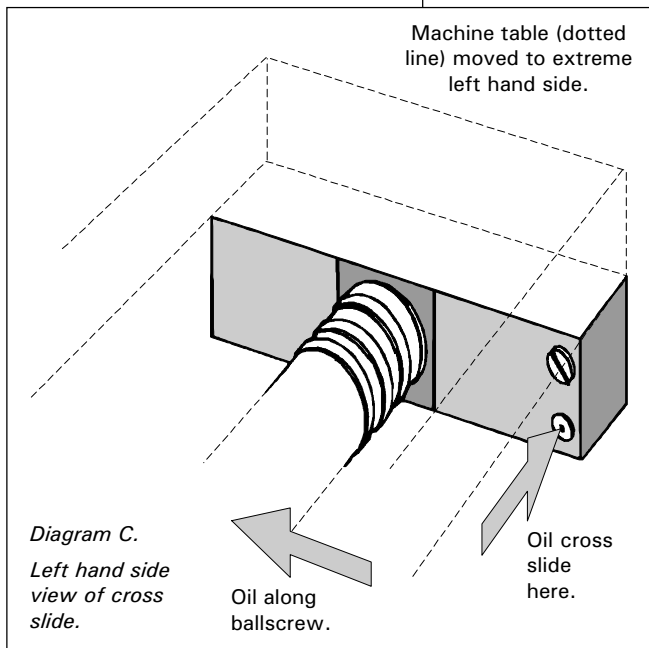
# LUBRICATION POINTS ON THE NOVAMILL.

## CROSS SLIDEWAYS AND TABLE BALLSCREW.

The cross slideways can be lubricated by pumping oil into the oiling points on both sides of the cross slide - see below diagrams C and D.

Easy access to the table ballscrew is obtained by moving the machine table to the far left. Oil can then be pumped directly along the ballscrew - the ballscrew will be located under the machine table - see below left diagram C.

*Note - Always run the slides to distribute the oil along the slideways.*



## CROSSLIDE BALLSCREW.

Lift the slide base covers and pump oil on to the crossslide ballscrew which is revealed when the machine table is moved (back) towards the column - see above diagram E.



# NOVAMILL

## SPECIFICATION.

### MECHANICAL.

|  |                              |
|--|------------------------------|
| Working Table Surface .....                  | 360mm x 130mm (14" x 5.125") |
| Longitudinal Travel (X) .....                | 225mm (9")                   |
| Cross Travel (Y) .....                       | 150mm (6")                   |
| Head Travel (Z) .....                        | 115mm (4.5")                 |
| Machineable Area .....                       | 225mm x 115mm (9" x 4.5")    |
| Spindle to Table .....                       | 180mm (7.0625")              |
| Spindle to Column .....                      | 110mm (4.75")                |
| Spindle Taper ( + Quick Change Holder) ..... | ISO30                        |
| Spindle Taper for ATC .....                  | BT30                         |
| 2 Tee Slots .....                            | 10mm width 50mm centres      |
| Z Axis Ballscrew .....                       | 16mm dia. x 5mm Pitch        |
| X Axis Ballscrew .....                       | 16mm dia. x 5mm Pitch        |
| Y Axis Ballscrew .....                       | 16mm dia. x 5mm Pitch        |
| Max. Machine Length .....                    | 900mm (35.5")                |
| Max. Machine Width .....                     | 890mm (35")                  |
| Max. Machine Height .....                    | 660mm (26")                  |
| Control Box Length .....                     | 620mm (24.4")                |
| Control Box Width .....                      | 320mm (12.5")                |
| Control Box Height .....                     | 640mm (25.2")                |
| Machine Weight (net) .....                   | 170 Kilos (375 lbs)          |
| Control Box Weight (net) .....               | 34 Kilos (75 lbs)            |
| System Resolution .....                      | 0.01mm (0.0004")             |

### ELECTRICAL.

Mains Supply  
50/60 Hz - 1 phase 220/240 Volts 8 Amp

Spindle Motor:  
Vari Speed 0.5 HP 180 VDC 0.37 Kw

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: [education@denford.co.uk](mailto:education@denford.co.uk)

## *Stuck for projects and ideas?*

Denford produces a range of project based courseware material, especially designed for use with our range of CNC Milling Machines and software products. Denford Courseware is developed to encourage the use of CNC machines and software within Keystages 3 and 4 of the Design and Technology National Curriculum.

Products available include:

- Milling Courseware Introductory (a brief introduction to the milling machine and Denfords "MillCAM Designer" software).
- Keystage 3 Projects for Milling.
- Milling Courseware Intermediate (exploring how the machine works, basic G-code program writing and the use of CNC machines in Industry).
- Keystage 4 Projects for Milling.

## *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.