DENFORD

Total Commitment to Education and Training WorldWide.

Novaturn
CNC Lathe
User's Manual.

$C\epsilon$

approved

Contact Information

Address: Denford Limited,
                  Birds Royd,
                  Brighouse,
                  West Yorkshire,
                  HD6 1NB,
                  UK.
Telephone: General Enquiries +44 (0) 1484 712264
                  Customer Services +44 (0) 1484 722733
                  Sales Enquiries +44 (0) 1484 717282
Fax: +44 (0) 1484 722160
e-mail: for sales enquiries contact, sales@denford.co.uk
                  for machine servicing enquiries contact, service@denford.co.uk
                  for customer services and technical support contact,
                  customerservices@denford.co.uk

Notes

Use this page to make a note of any parts of the software you have changed or configured, for example, common tooling set-ups, machine parameters, changes to installation paths or passwords etc.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Contents

Contents

Warning Notices

⚠ Warranty Disclaimer.

The Warranty on your Novaturn CNC lathe 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. Please refer to the information held in your separate Warranty pack, for specific details.

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

⚠ Maintenance Disclaimer.

Always obtain permission from the person responsible for machinery in your establishment, before opening the electrical control box or Novaturn CNC lathe 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 both the machine systems and the maintenance personnel. Denford Limited **cannot accept responsibility** for any damage and/or loss that may occur through incorrect maintenance of your Novaturn CNC lathe.

⚠ Foreseen Use of Machine.

Your Novaturn CNC lathe is designed for turning wax, plastics, acrylics, copper, aluminium and steel.

In each case, the appropriate tooling, spindle speeds and feedrates should be used as recommended by the material supplier.

Only use water based soluble oil cutting fluids, do not use parafinic or potentially explosive cutting fluid.

Do not attempt to use your Novaturn CNC lathe for manual operations.

If you have any doubts and/or questions regarding the 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 lathe without notice or documentation.

About this Manual

Using this manual

This manual provides information describing how to transport, site, setup, operate and maintain the features of your Denford Novaturn CNC lathe.

This manual does not provide any information regarding the software packages used to control your Denford Novaturn CNC lathe - please refer to your separate CNC machine control software manual.

Please note that the Electrical Diagrams for your Novaturn CNC lathe are held in a folder, fixed inside the electrical control box. Hazard Voltages exist in the electrical control box - only attempt to access these diagrams after isolating the power and leaving the electrical control box untouched for at least 5 minutes.

If you have any doubts and/or questions regarding the 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 lathe without notice or documentation.

Disclaimer

We take great pride in the accuracy of information given in this manual, but due to nature of hardware and software developments, be aware that specifications and features of this product can change without notice. The information contained in this manual is correct at the date of printing only - September, 2001. 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.

Language

This manual is written using European English.

Contact

Any comments regarding this manual should be referred to the following e-mail address: customerservices@denford.co.uk

1: Introducing your Novaturn CNC lathe

Congratulations on your purchase of a Novaturn series CNC lathe. In this manual you will learn how to setup and use the features fitted to your Novaturn.

The Novaturn is a compact two axis CNC training machine. It has been 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.
- Capable of cutting resistant materials such as wax, plastics, acrylics, copper, aluminium and steel.
- Links to various CAD/CAM software packages.
- Totally enclosed high visibility interlocked guard.
- CE approved for safety.
- Programming via International Standards Organisation format.
- Optional 8 station programmable turret available.
- Option of including in Flexible Manufacturing Cells and Computer Integrated Manufacturing systems.

1: What is CNC?

CNC (Computer Numerical Control) is the general term used for a system which controls the functions of a machine using coded instructions, processed by a computer. CNC machines are a very important part of the modern manufacturing process. Indeed, many of the different types of products you use everyday have been made using some sort of CNC machine.

The CNC Manufacturing Process - Example.

The sequence shown below defines the main steps involved in producing a component using a CNC system.

1) A part program is written using G and M codes. This describes the sequence of operations that the machine must perform, in order to manufacture the component.

2) The part program is loaded into the machines computer, called the controller. At this stage, the program can still be edited or simulated using the machine controller.

3) The machine controller processes the part program and sends signals to the machine components. These direct the machine through the required sequence of operations necessary to manufacture the component.

What are the advantages of CNC?

CNC systems are automated and very accurate. Once programmed, a CNC machine will perform repeat tasks until instructed to stop. Each component produced will be exactly the same size and shape, saving money on designing any jigs and fixtures that might have otherwise been required.

Using CNC machines can reduce waste material, since a CNC machine is much less likely to make an error than a human operated machine. CNC machines can also run 24 hours a day, if necessary, with no signs of fatigue.

Companies can estimate the manufacturing costs for CNC production much more accurately, compared to a production line with conventional production machines.

Jargon Buster   `- □ X`

CNC refers to Computer Numerical Control, the automatic system used to control a machine tool.
A Part Program is 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.
A G and M code is a series of letters and numbers that make up the language used by CNC machinery.

1: Before Beginning to Setup...

Before beginning to setup your Novaturn CNC lathe, 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 Novaturn CNC lathe:

- Novaturn CNC lathe (incl. separate electrical control box). Note that the precise specification of your Novaturn will depend on any options selected at the time of ordering (see below).
- 1 x Guard door interlock switch - torx bit.
- 1 x Electrical control box key.
- 1 x 80mm 3 jaw chuck key.
- 1 x Set of internal and external jaws.
- 1 x Quick change (manual) toolpost, standard toolholder and toolpost hex wrench.
- 1 x RS 232 serial link cable (25-25 or 25-9 pin connection)*.
- 1 x Set of metric allen keys (1.5mm, 2mm, 2.5mm, 3mm, 4mm, 5mm, 6mm)
- 1 x Set of fuses (20mm 3.15A, 20mm 6.3A)
- 1 x Novaturn CNC machine warranty pack.
- 1 x Novaturn CNC machine inspection certificate.
- 1 x Novaturn CNC machine manual (this book).
- 1 x CNC Machine Control Software manual.
- 1 x CNC Machine Control Software CD-ROM and/or floppy disks.
- 1 x Mousemat.

The following optional equipment may also be supplied with your Novaturn CNC lathe (please refer to your separate order documentation for confirmation):

- Programmable Turret (Automatic Tool Changer) in place of standard Manual Toolpost.
- Pneumatic Safety Guard Door.
- Pneumatic Chuck.
- Electrical Control Box with Air Connection.
- Various Tooling Packages.
- CAD/CAM Software.
- Additional and/or On-site Training Courses.

2: Safety Features Overview and Precautions

Safety Features Overview.

The following safety features are standard on your Novaturn CNC lathe:

- Emergency stop button.
- Totally enclosed high visibility guard door with interlock switch.
- Toolpath graphics to verify program prior to machining.
- Isolator switch.

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 Novaturn CNC lathe.

General Safety Precautions :

- Wear clothing suitable for machine operation 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 in the chuck (and if necessary, tailstock).
- Ensure that the correct cable for the power source is used.
- Ensure the power is switched off before starting any maintenance work on the machine.
- If power fails turn off the yellow/red isolator (found on the front of the electrical control box) immediately.
- Hazardous voltages can still exist immediately after switching the electrical control box isolator to the OFF position. Always wait at least 5 minutes before entering the electrical control box.
- Lubricate the required machine areas at the intervals specified in this manual, to prevent the axes from seizing (see the Maintenance section for further details).
- Observe caution when adding or removing machine tooling.
- When an emergency stop is required, press the circular red emergency stop button, located on the lower right front panel of the machine.

2: Safety Features - Emergency Stop Button

Location of emergency stop button, mounted on the righthand side of the machine lower front panel.

To active an emergency stop, press the button fully in until it clicks.

A circular, red emergency stop button is mounted on the righthand side of the Novaturn CNC machine lower front panel. When pressed, it has the effect of stopping all axes, toolchanger and spindle movements immediately. The 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 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 counterclockwise until it springs back out.

2: Safety Features - Interlock Guard Switch

Location of interlock guard switch, mounted on the lefthand side panel of the machine casing.
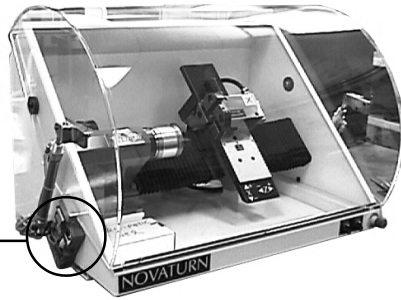
An interlock safety switch is fitted to the guard door, on the lefthand side panel of the machine casing (when viewed from the front). The switch must be manually released to enter the working area when the 24 volt circuit has failed and the door is clamped electrically. Note - For manual interlock release, the power supply must be switched off.

1) Remove security screw A, B or C (whichever is easiest to reach) using the supplied Torx T-20 adapter.

2) Insert a 2.5mm diameter tool (such as a small flat screwdriver) into the hole until it pushes the manual release lever.

3) Whilst holding the tool against this manual release lever, open the guard.

4) Remove the tool from the hole and replace the security screw.

Interlock Trip Lever

A

B

C

1)	2) 2.5mm diameter	3)	4)
T-20			T-20
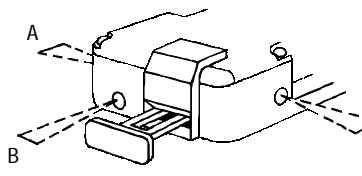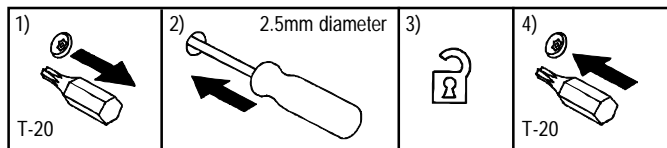
3: Unpacking & Lifting your Novaturn

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

To obtain better access to the Novaturn and the power supply box, remove all the sides from the delivery box, leaving the Novaturn 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 Novaturn from the packaging. The Novaturn can be directly lifted by hand, using the lifting points indicated on the diagram right. A minimum of two persons should be used to lift the machine, positioned one per end. Ideally, use four persons to lift the machine. Always use sensible lifting precautions in accordance with Health and Safety Regulations in your establishment.

Diagram - Lifting Option 1.

Lifting Points (mirrored on opposite end).

When transporting the Novaturn over longer distances, Denford recommends use of either a suitably sized wheeled trolley, or a professional hoist.

When lifting with a professional hoist use two 5 metre x 100 KG slings, arranged as shown in the diagram right. Before fitting the slings, always remove the safety guard - 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. Remember to refit the guard when the machine has been sited.

Ensure that your Novaturn is both secure and balanced before lifting and transporting.

Use a professional hoist to lift the machine.

Wrap two reinforced straps round the machine as shown.

Diagram - Lifting Option 2.

NOTE - THE GUARD MUST BE REMOVED BEFORE LIFTING.
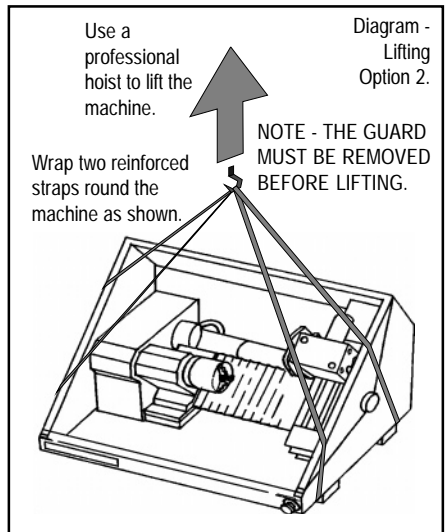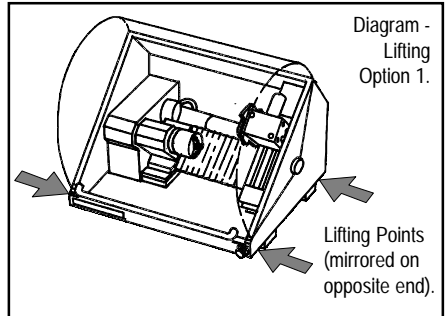
Data Panel   ▬ ☐ X

Lifting Data.
Machine weight: 88 KG (195 lb).
Electrical control box weight: 35 KG (77 lb).
Lift using either two persons, one per end of the machine, or a professional hoist with two 5 metre x 100 KG slings.

3: Deciding on a Site for your Novaturn

Remember when positioning the machine in the room, space will be required for opening of the electrical control box door. We recommend you leave a gap of at least 1000mm. A 300mm clearance must also be left at the rear of your Novaturn. This space will be occupied by the safety guard when in its fully opened position.

Sufficient room should also be provided for effective maintenance to be carried out around the machine itself.

The Novaturn 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.

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

Computer desk, monitor, keyboard and mouse angled towards Operator.

Denford Novaturn CNC Lathe.

Data Panel ▬ ☐ X

Dimensional Data.
Machine width 820mm (32 3/8″).
Machine height 560mm (22″).
Machine depth 690mm (27 1/4″).
Electrical control box width 480mm (19″).
Electrical control box height 640mm (25 1/4″).
Electrical control box depth 230mm (9 1/8″).
Length of cable between machine and electrical control box 1500mm (59″).

Electrical Control Box under table

Electrical Control Box door easy access.

Machine Operator.

Plan View showing Ideal Machine Operating Positions.

3: Levelling your Novaturn

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

3: Connecting your PC to the Novaturn

⚠ Warning.

Do not connect any cables with the mains power switched on, since this could damage the electrical components of your Novaturn and/or your pc.

Your Novaturn CNC lathe is controlled using a standard IBM compatible PC (personal computer). In this role, the PC can be referred to as the machine controller computer. Ideally, the PC you intend to use should be placed next to your Novaturn and its electrical control box, with easy access to a mains power supply.

Your PC must be equipped with hardware that allows it to:

1) run the CNC Machine Control software.

2) be physically connected to the Novaturn electrical control box.

The specification of PC required to control your Novaturn will depend upon the type of CNC machine controlling software being used. Please refer to your separate CNC machine controlling software manual for details regarding the exact PC specification required.

3: Connecting your PC to the Novaturn

To connect your PC to the Novaturn electrical control box:

1) Connect the elements of your PC together as described in your original PC manufacturers operating manual. At this stage, your PC should not be switched on.

2) The PC must be physically connected to the Novaturn electrical control box, using the supplied RS232 cable. This is the long, thin serial link cable fitted with a 25 pin D male connector at one end and a 9 pin D female connector at the opposite end, as shown below right.

3) Connect the 25 pin D male end of the RS 232 cable to the 25 pin D female port mounted on the electrical control box, as shown below left. This port is labelled **RS 232**.
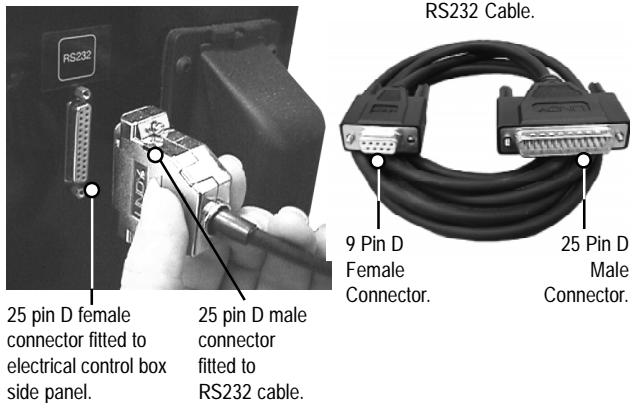
RS232 Cable.

9 Pin D Female Connector.

25 Pin D Male Connector.

25 pin D female connector fitted to electrical control box side panel.

25 pin D male connector fitted to RS232 cable.

Note   — ▢ X

PC Terminology:

The COM ports on your PC may be labelled as Serial ports. Most COM ports have a 9 pin D MALE connector, though some older computers may be fitted with additional PCI COM cards having a 25 pin D MALE connection. In this case, a 9 to 25 pin adaptor cable can be added to the RS 232 cable supplied with your machine. The RS 232 cable supplied with your machine must always be used, since this cable features crossovers on some of the pin connections.

You must also configure the machine control software to recognise which numbered COM port is being used by the RS232 machine lead. Details on this procedure are outlined in your separate CNC machine control software manual.

The Parallel port on your PC may be labelled as the Printer port. The printer port has a 25 pin FEMALE connector.

3: Connecting your PC to the Novaturn

4) Connect the remaining 9 pin D female end of the RS 232 cable to the 9 pin D male **COM** port on your PC, ideally COM 2. Most computers usually have two COM ports situated on the back panel of your PC. If you cannot identify any of the ports on your PC, please refer to your original PC manufacturers operating manual for further guidance. Note that older computers may be fitted with a 25 pin D male COM port, which may require the fitting of an additional 9 to 25 pin adaptor to your RS 232 cable.
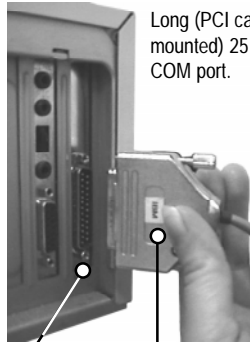
Long (PCI card mounted) 25 pin D COM port.

Short (standard) 9 pin D COM port.

25 pin D male connector fitted to pc (back) panel.

25 pin D female connector fitted to RS232 cable (using a 9 to 25 pin adaptor).

9 pin D female connector fitted to RS232 cable.

9 pin D male connector fitted to pc (back) panel.

5) Do not confuse the 25 pin D female parallel (printer) port on your PC with the 25 or 9 pin male D COM ports. If your CNC machine control software is supplied with a security key, the 25 pin D male connector of this key must be fitted to the 25 pin D female parallel port, as shown right. Security keys are also referred to as dongles.

A schematic diagram illustrating these component connections is shown on page 26 to 27.
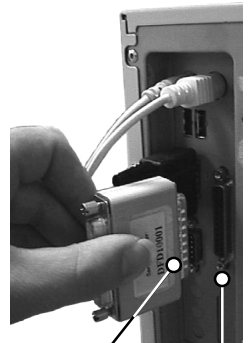
25 pin D male connector on security key (dongle).

25 pin D female connector fitted to pc (back) panel.

3: Compressed Air Connection

Air Connection (when fitted).

An air supply isolator and air filter regulator is fitted to the back panel of the machine cabinet, when your Novaturn is fitted with the following compressed air driven equipment:

- Pneumatic Guard Door.
- Pneumatic Vice.

The air compressor must be fitted with a SCHRADER quick release connector.

The connection fitted onto the machine air filter regulator and isolator is SCHRADER part number SC 8Ø51-11 1/8 BSP MALE (or Denford part number BI Ø1451S).

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 Ø1128S).

AIR SUPPLY
100 PSI-6.6bar

Pressure Adjuster.

Air supply isolator.

To SCHRADER connection on air compressor.

Air filter regulator unit.

Air Supply Isolator and Filter Regulator.

(mounted on the back panel of the machine cabinet).
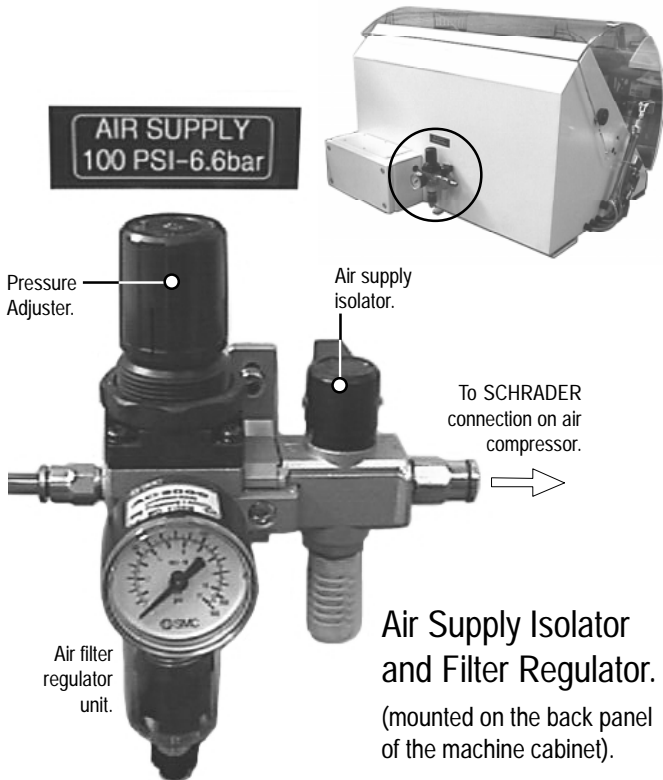
3: Operation of the Air Supply Isolator and Regulator

Air Supply Isolator.

Turn the control anticlockwise (when viewed from above) to allow the air to flow.

Turn the control clockwise (when viewed from above) to cut the air supply and drain the air pressure from the system.

Air Filter Regulator.

The 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 (when viewed from above) to increase pressure, or anticlockwise (when viewed from above) to decrease the pressure. Push the rotary control back 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.

3: Connecting the Pneumatic Control Cable

The optional pneumatic guard door and vice are controlled using solenoids, mounted in the small pneumatic control box attached to the rear of the machine. Signals are fed from the electrical control box, via a pneumatic equipment control cable.

The Pneumatic Equipment Control Cable (when fitted).

The pneumatic equipment control cable must be connected from the main electrical control box to the small pneumatic control box attached to the rear of the machine. The pneumatic equipment control cable is housed in the small, black, flexible hose, approximately 15mm in diameter. The connector housing is fitted with one pin on the top and one pin on the bottom.

One end of the pneumatic equipment control cable is permanently connected to the main electrical control box, whilst the free end is fitted with a male connector plug. The side panel of the small pneumatic control box attached to the rear of the machine is fitted with a fixing bracket that contains the female connector plug.

Back of machine.

The female connector plug is located on the fixing bracket, mounted to the side panel of the small pneumatic control box fitted to the rear of the machine.

The male connecter plug is located on the free end of the pneumatic equipment control cable, fitted to the main electrical control box.
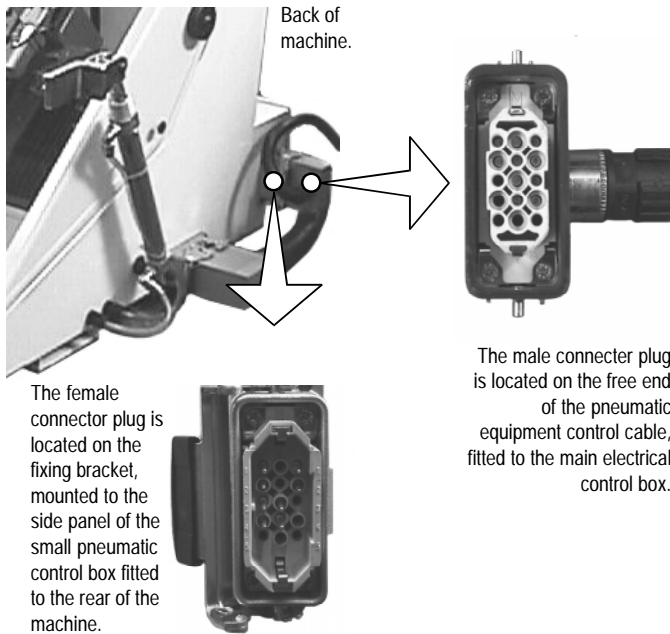
3: Connecting the Pneumatic Control Cable

⚠ Warning.

Do not fit the male and female connector plugs together the wrong way round. This could damage the connector pins. The male and female connector plugs are shaped so they can only be connected in the correct orientation - the cutaway parts of the connector housings and the numbered segments printed on the pin faces must match in order to achieve an electrical connection.

To connect the pneumatic equipment control cable to the Novaturn:

Back of machine.
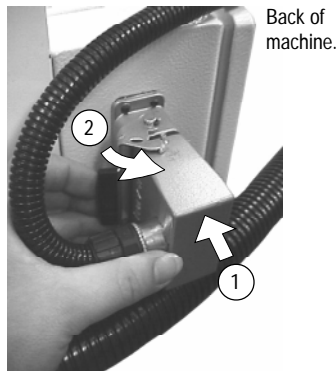
1) Lay the pneumatic equipment control connector plug next to the fixing bracket, mounted on the side panel of the small pneumatic control box. Check that the male and female plugs are arranged in the correct orientation, as outlined above and on the previous page. For correct alignment, the pneumatic equipment control cable will point towards the front of the machine, as shown in the diagram above. Push the connector plug fully onto the fixing bracket.

2) Close the junction by pushing the single fixing bracket roller clips onto the male connector plug housing pins until they 'click'.

A schematic diagram illustrating these component connections is shown on pages 26 to 27.

3: Connecting the Mains Supply Cable

The mains power supply is fed to the electrical control box, which in turn, is connected to the Novaturn. There are two electrical connections that exit the electrical control box:

1) The machine power cable (the largest diameter flexible hose). On machines fitted with pneumatic equipment, do not confuse this with the pneumatic control cable (this is a smaller diameter flexible hose).

2) The mains supply cable (the smallest diameter cable).

The Machine Power Cable.

The machine power cable must be connected from the electrical control box to the machine. The machine power cable is housed in the large, black, flexible hose, approximately 30mm in diameter. The connector housing is fitted with two pins on the top and two pins on the bottom.

One end of the machine power cable is permanently connected to the electrical control box, whilst the free end is fitted with a male connector plug. The righthand side panel of the machine is fitted with a fixing bracket that contains the female connector plug.

Back of machine.

The male connecter plug is located on the free end of the machine power cable, fitted to the electrical control box.

The female connector plug is located on the fixing bracket, mounted on the righthand side panel of the machine.
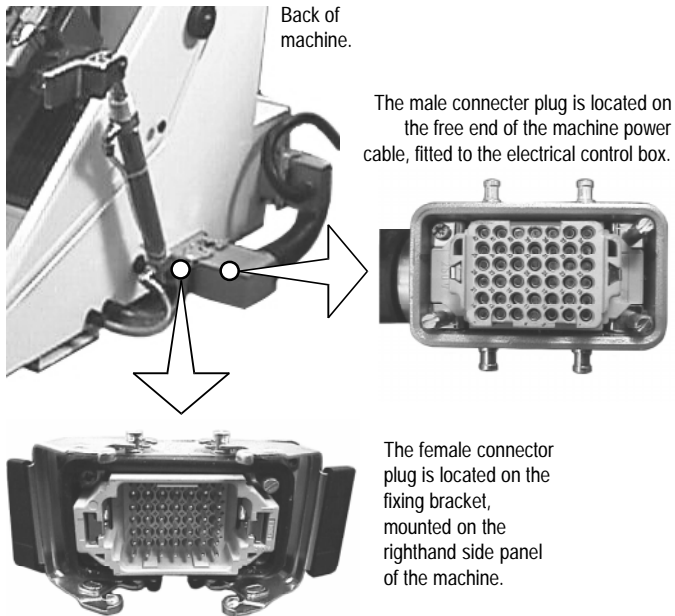
3: Connecting the Mains Supply Cable

⚠️Warning.

Do not fit the male and female connector plugs together the wrong way round. This could damage the connector pins. The male and female connector plugs are shaped so they can only be connected in the correct orientation - the cutaway parts of the connector housings and the numbered segments printed on the pin faces must match in order to achieve an electrical connection.

To connect the machine power cable to the Novaturn:

Back of machine.
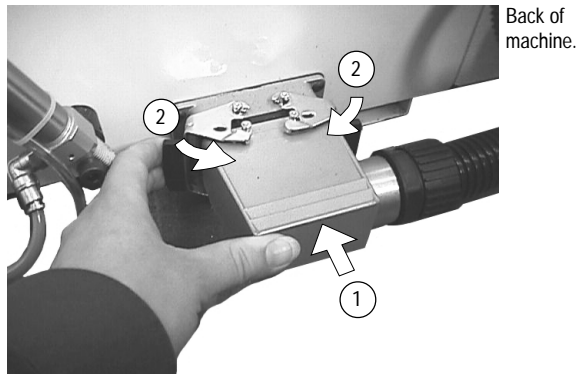
1) Lay the machine power connector plug next to the fixing bracket fitted to the side panel of the machine. Check that the male and female plugs are arranged in the correct orientation, as outlined above and on the previous page. On a standard Novaturn, the machine power cable will exit towards the rear of the machine, as shown in the diagram above. Push the connector plug fully onto the fixing bracket.

2) Close the junction by pushing the two fixing bracket roller clips onto the male connector plug housing pins until they 'click'.

A schematic diagram illustrating these component connections is shown on pages 26 to 27.

3: Electrical Control Box

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.

⚠ Accessing the Electrical Diagrams - Warning.

The Electrical Diagrams for your machine are held in a folder fixed inside the electrical control box. Never attempt to access these diagrams with the mains power switched ON. Note that hazardous voltages can still exist immediately after switching the isolator to the OFF position. Always wait at least 5 minutes before entering the electrical control box.

Note   ▬ ❑ X
Depending on the specification of the machine, some electrical cabinet doors may be fitted with locks.

Isolator Position "0" = Power OFF.
Isolator Position "I" = Power ON.

The electrical diagrams are held in a folder, attached to the inside of the electrical control box door.
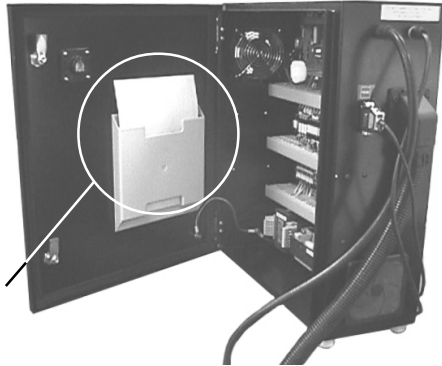
Auxiliary I/O Plug (when fitted).

Your electrical control box may be fitted with an Auxiliary Input/ Output socket, allowing external control of your Novaturn in FMS and CIM systems via a cable connection, as shown below left. To run your Novaturn as a stand alone machine, remove your external system cable and fit the blanking plug which is chained to the socket.

Auxiliary I/O Socket.

Chained Blanking Plug.

3: Mains Supply Details

Data Panel `- ☐ X`

Electrical Connection Data.

Mains supply required: 50/60 Hz, Single Phase, 220/240 Volts, 10 AMP.

Cable required: 3 Core, 1.5mm^2 per core.

Spindle motor: 1.5 HP.

Axis stepper motors: 200 steps/rev.

The Mains Supply.

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

⚠Warning.

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

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

3: Removal of Protective Coatings

Once your Novaturn 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 (e.g. BP: CS 68).

⚠Warning.

Only use kerosene based solvents in accordance with the solvent manufacturers instructions and safety recommendations. Ensure that no naked flames are present.

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

3: Component Connection Schematic Diagram

Ancillary Equipment, such as this printer, connects to the Parallel port on the PC.

Personal Computer (PC).

To COM 1 Port.

To Parallel Port.

9 to 25 Pin D Serial Cable.

To COM 2 Port.

9 to 25 Pin D Serial Cable.

Security Dongle (if required).

Desktop Tutor (when ordered) connects to the PC port labelled COM 1.

Note   ― □ X

PC Terminology:
The COM ports on your PC may be labelled as Serial ports. Most COM ports have a 9 pin D MALE connector, though some older computers may be fitted with 25 pin D MALE connectors.
The Parallel port on your PC may be labelled as the Printer port. The printer port has a 25 pin FEMALE connector.

3: Component Connection Schematic Diagram

Denford Novaturn
CNC Lathe.

Pneumatic
Control
Connector *.

Electrical Control
Box Connector.

Mains Power
Supply Plug.

To the
Port
labelled
RS 232.

Novaturn Electrical
Control Box
(Note - the physical
layout on individual
boxes may vary).

Mains power is supplied from the Electrical
Control Box to the Novaturn using the
largest black flexible corrugated cable.
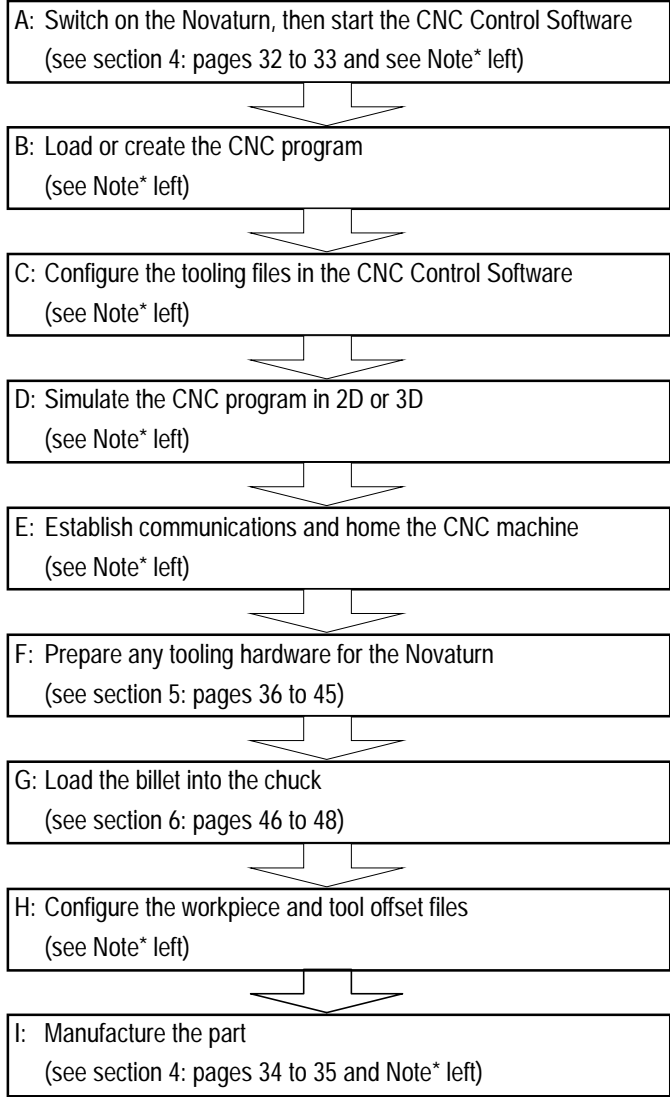
4: Using your Novaturn - Overview

Several steps must be completed before the final manufacture of a part. The flowchart below lists the general steps that should be followed for CNC file creation, simulation and final part manufacture, in the recommended order. However, miscellaneous factors may warrant the user to complete the steps in a different order to that shown.
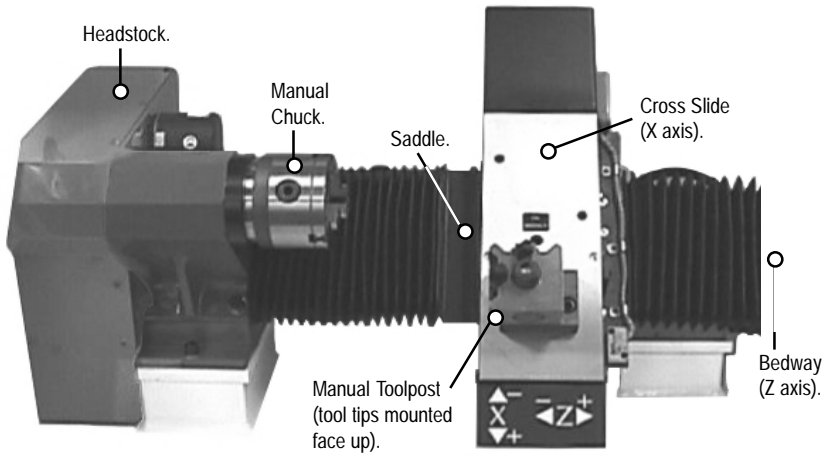
Note *   ▬ ▢ X

For more detailed information regarding these steps please refer to your separate CNC Control Software User's Manual.
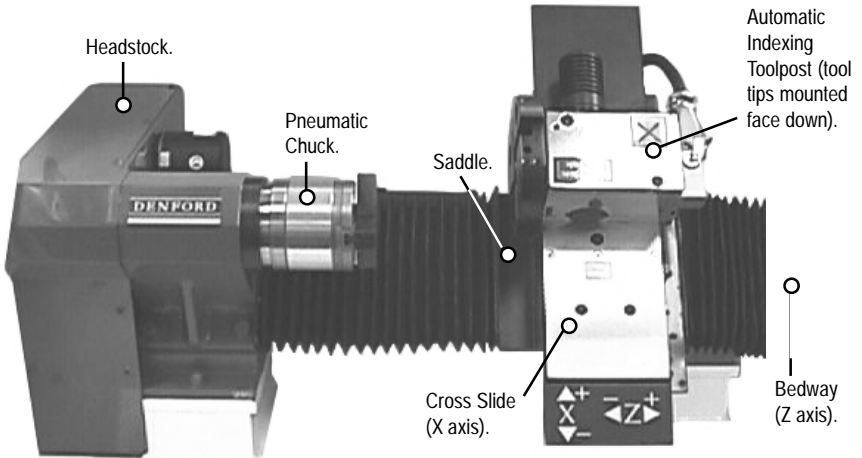
A: Switch on the Novaturn, then start the CNC Control Software
(see section 4: pages 32 to 33 and see Note* left)

B: Load or create the CNC program
(see Note* left)

C: Configure the tooling files in the CNC Control Software
(see Note* left)

D: Simulate the CNC program in 2D or 3D
(see Note* left)

E: Establish communications and home the CNC machine
(see Note* left)

F: Prepare any tooling hardware for the Novaturn
(see section 5: pages 36 to 45)

G: Load the billet into the chuck
(see section 6: pages 46 to 48)

H: Configure the workpiece and tool offset files
(see Note* left)

I: Manufacture the part
(see section 4: pages 34 to 35 and Note* left)

4: Novaturn Variations - Component Layouts

Standard Novaturn with Manual Chuck and Manual Toolpost.

Headstock.

Manual Chuck.

Saddle.

Cross Slide (X axis).

Manual Toolpost (tool tips mounted face up).

Bedway (Z axis).

X−
X+

Z

Novaturn with Pneumatic Chuck and Automatic Indexing Toolpost.

Headstock.

Pneumatic Chuck.

Saddle.

Automatic Indexing Toolpost (tool tips mounted face down).

DENFORD

Cross Slide (X axis).

Bedway (Z axis).

X+
X−

Z

4: Novaturn Variations - Axis Definitions

Axis Definitions for a Standard Novaturn with a Manual Toolpost.

Z Axis.

The centre of the Z axis runs along a line between the spindle and tailstock, or in other words, the centreline of rotation of the spindle, parallel with the longest edges of the bedways.

Minus (-) Z movements of the toolpost are left, towards the headstock area of the machine (ie. towards the chuck face).

Positive (+) Z movements of the toolpost are right, towards the tailstock area of the machine (ie. away from the chuck face).

X Axis.

The X axis runs at 90 degrees to the Z axis, or in other words, perpendicular to the Z axis, parallel with the longest edges of the cross-slide.

Minus (-) X movements of the toolpost are towards the centreline of rotation (ie. down and towards the front of the machine).
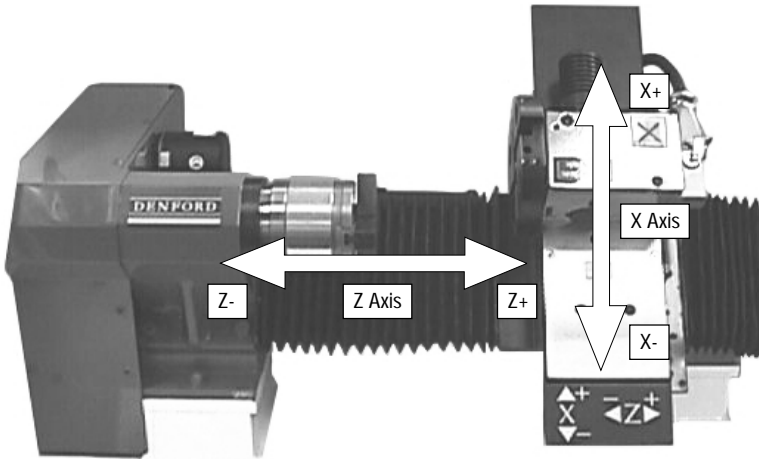
Positive (+) X movements of the toolpost are away from the centreline of rotation (ie. up and towards the rear of the machine).

4: Novaturn Variations - Axis Definitions

Axis Definitions for a Novaturn with an Automatic Indexing Toolpost.

Z Axis.

The centre of the Z axis runs along a line between the spindle and tailstock, or in other words, the centreline of rotation of the spindle, parallel with the longest edges of the bedways.

Minus (-) Z movements of the toolpost are left, towards the headstock area of the machine (ie. towards the chuck face).

Positive (+) Z movements of the toolpost are right, towards the tailstock area of the machine (ie. away from the chuck face).

X Axis.

The X axis runs at 90 degrees to the Z axis, or in other words, perpendicular to the Z axis, parallel with the longest edges of the cross-slide.

Minus (-) X movements of the toolpost are towards the centreline of rotation (ie. up and towards the rear of the machine).

Positive (+) X movements of the toolpost are away from the centreline of rotation (ie. down and towards the front of the machine).

4: Switching the Novaturn On

Follow these instructions to switch on your Novaturn CNC lathe:

1) Check the RS232 machine lead is fitted securely between the serial (COM2) port socket on the machine controller PC and the RS232 socket on the Novaturn electrical control box.

2) When fitted, check the RS232 controller lead is fitted securely between the serial (COM1) port socket on the machine controller PC and the RS232 socket on the DeskTop Tutor controller keypad.

3) Check the large flexible machine power cable is fitted securely into the fixing bracket, mounted on the right-hand side panel of the Novaturn cabinet.

4) When fitted, check the small flexible pneumatic control cable is fitted securely into the fixing bracket, mounted on the right-hand side panel of the pneumatic control box (attached to the rear of the machine).

5) Check the electrical control box door is closed and locked.

6) When fitted, check the air pipe connections for any optional equipment are secure, then switch on the air compressor. Check and adjust the air pressure, if necessary.

7) Plug the mains supply cable from the electrical control box into an available power socket. Switch the power socket on.

8) Rotate the isolator switch on the electrical control box door one quarter turn clockwise, from its off (O) position to its on (I) position (shown below). You should hear the Novaturn begin its power-up routine.

9) Switch on the machine controller PC and start the CNC Control Software. Establish a communication link with the Novaturn (please refer to your separate CNC Control Software User's Manual for details outlining this procedure).
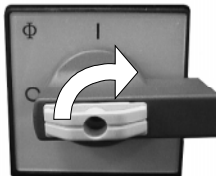
To switch on the Novaturn, turn the isolator switch, mounted on electrical control box door, one quarter turn clockwise, from the off (O) position to the on (I) position. The photo opposite shows the isolator switch in the off position.

If the Novaturn does not power-up, turn the isolator switch to its off (O) position, then check all connections and fuses to see that proper power and communication is established to the CNC machine.

4: Switching the Novaturn Off

Follow these instructions to switch off your Novaturn CNC lathe:

1) Wait for the Novaturn to fully complete any machining or processing of any operational instructions.

2) Open the guard door and remove any finished parts from the working area..

3) To close down the communication link between the Novaturn and your PC, exit the CNC Machine Controlling Software, as described in your separate CNC Control Software User's Manual.

4) To cut power to the machine, rotate the isolator switch on the Novaturn electrical control box door one quarter turn anticlockwise, from its on (I) position to its off (O) position.

   Note that cutting the machine power will trigger the closing of the interlock guard switch, mounted on the side panel of the Novaturn (see page 12). This will lock a closed guard door in position, preventing access to the machine working area. The interlock guard switch will reopen when power is next supplied to the Novaturn.

⚠ Warning.

Hazardous voltages can still exist immediately after switching the isolator to the OFF (O) position. Always wait at least 5 minutes before attempting to enter a Novaturn electrical control box that has just been switched off.

4: Part Manufacture - Checklist & Tool Changing

Checklist.

Before beginning to manufacture your part, check to see that the following tasks have been completed:

- Billet mounted and secure.
- Tools prepared and numbered ready for use (according to your CNC file).
- Safety guard door closed and machine switched on.
- CNC file loaded and checked via simulation.
- Workpiece and Tool Offset files configured or loaded.
- Machine homed (datumed).

Requesting a Tool Change.

The Miscellaneous Function M06 is used to program an automatic tool change operation.

The M06 code activates the machine toolpost and is followed by the code T_ _ _ _, instructing it to move to the stated tool number (the first two numerical digits) using the stated tool length offset file number (the last two numerical digits).

For example,
M06 T0305 ;
This command is read change automatically from the current tool number to tool number 3, using tool length offset file number 5.

Automatic Indexing Toolpost.

When an automatic indexing toolpost is fitted to the Novaturn, the entire sequence will be performed automatically.

Ensure the correct tooling hardware has been fitted and the tool holders have been placed in the correct numbered toolpost stations, according to the tooling specification described at the beginning of your CNC program (see section 5: Preparing Tooling hardware - page 42).

## Quickchange Manual Tooling System.

When a quickchange manual tooling system is fitted to the Novaturn, a message window will be displayed whenever a tool change is required. Wait for all machine movement to stop before opening the safety guard door, then change to the new tool number requested. Close the safety guard door and confirm via any CNC Control Software message windows that machining can be resumed.

Safety First !	▬ ▢ X
⚠	
Never open the safety guard door and enter the working area when the spindle or machine axes are moving.	

Safety First !	▬ ▢ X
⚠	
Caution.	
If the cutting tool has been recently used, it may still be HOT.	

4: Part Manufacture -
Overriding the Spindle Speed and Feedrate

Using Potentiometer Controls to override the Spindle Speed and Feedrate.
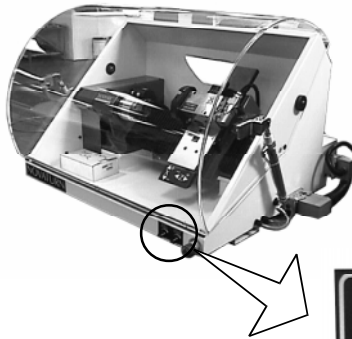
The right side of the front panel, when viewed from the front of the machine, contains the spindle speed and feedrate override potentiometer controls.

<table>
<tr><td>Note</td><td>- □ X</td></tr>
<tr><td colspan="2">Spindle Speed and/or Feedrate override changes will only be registered when an actual spindle speed or feedrate is being applied by the machine controlling software.</td></tr>
</table>

The spindle speed and feedrate of the Novaturn can be manually overridden during a machining operation using the potentiometer controls fitted on the lower front panel of the machine (illustrated above).

On machines not fitted with these controls, the software can be used to override both spindle speed and feedrate (please refer to your separate CNC Control Software User's Manual for details regarding this feature).

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 anticlockwise.

5: Quickchange Manual Tooling System

Introduction.

The quickchange manual tooling system is supplied as standard with the Novaturn CNC lathe, unless an optional automatic indexing toolpost has been fitted.

The system comprises of two elements:

i) The toolpost body, which is mounted to the Novaturn cross slide.

The Quickchange Lathe Toolholder.

The Quickchange Toolpost Body.
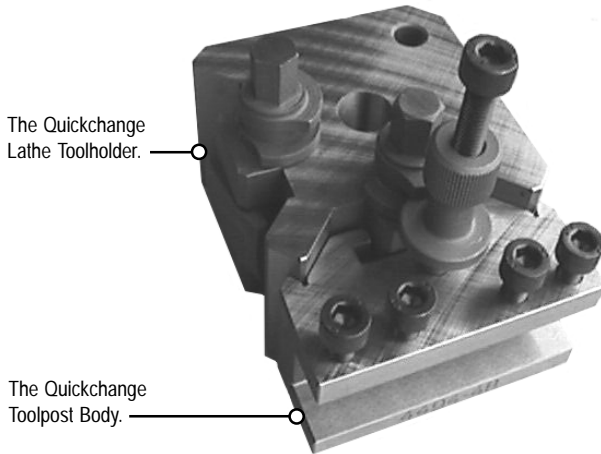
ii) The tool holder, which is fitted to one of the two location slots on the sides of the toolpost body. Tool holders are held in position using a spring loaded slide and bracket assembly, to allow easy manual removal and replacement of tools, when necessary. Height adjustment is achieved using a grooved nut and collar bolt.

5: Quickchange Manual Tooling System

Manual Tooling System Fitting Tools.

The following tools are used to fit and adjust the components of the quickchange manual tooling system.

10mm Spanner.

Toolpost Hex Socket Key.

4mm Allen (Hex) Key.

Fitting a Tool to the Toolholder.

1) Using a 4mm allen (hex) key, unscrew the four lockbolts on the toolholder. When directly viewing the top of the bolt heads, turn counter-clockwise to loosen or clockwise to tighten them.

Diameter turning / external tools must be fitted with the cutting edge facing up.

Four lockbolts.

Slot for cutting tool.
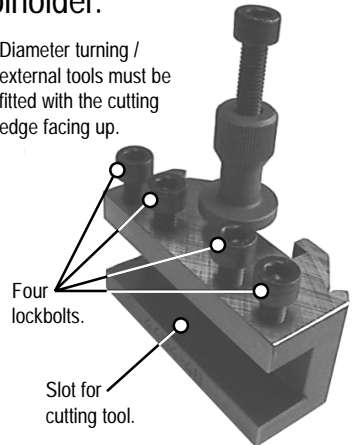
2) Place the cutting tool into the toolholder, in the correct orientation. Diameter turning / external tools must be fitted with the cutting edge facing up.

3) Tighten the lockbolts until they just begin to grip the upper surface of the cutting tool body. Tighten each bolt used by one quarter turn. Continue this procedure until all bolts are fully tightened and the cutting tool is held securely.

5: Quickchange Manual Tooling System

Toolpost Body Angle Adjustment.

To adjust the angle of the toolpost body, use a 10mm spanner to release the locknut. The locknut is located on the central toolpost mounting stud, shown circled right.

When directly viewing the top of the nut, turn counter-clockwise to loosen or clockwise to tighten.

Fitting the Toolholder to the Toolpost Body.

1) Using the supplied toolpost hex socket key, turn the appropriate locknut so the double flanges are pointing towards the centre of the toolpost, as shown left and below.

Double flanged locknuts.
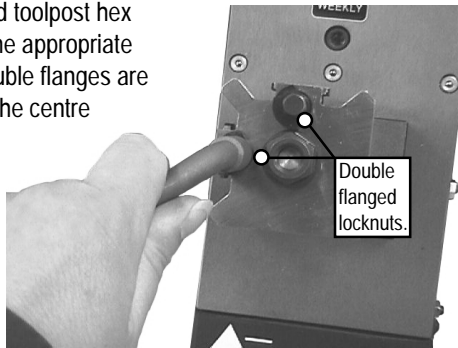
Double flanged locknut closed.

Double flanged locknut open.

5: Quickchange Manual Tooling System

Fitting the Toolholder to the Toolpost Body continued...

2) Aligning the guides on the toolholder with the guides and spring loaded bracket on the toolpost body, slide the toolholder down into the toolpost bracket (shown below left). Lower the toolholder until the single flange on the toolholder height adjustment screw is level with the space between the two flanges on the toolpost locknut (shown below right).
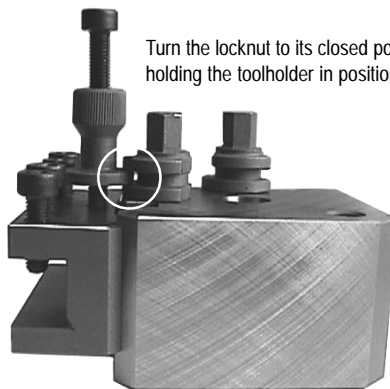
Slide the toolholder onto the toolpost...   ...then align the single flange.

3) Turn the toolpost locknut, so the single flange on the toolholder height adjustment screw is loosely held between the two flanges on the toolpost locknut. At this stage, do not fully tighten the locknut, since this will prevent any toolholder adjustment from being carried out.

Turn the locknut to its closed position, holding the toolholder in position.

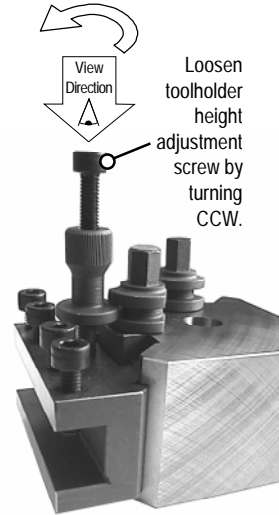# 5: Quickchange Manual Tooling System

Toolholder Height Adjustment.

1) Using a 4mm allen (hex) key, release the lockbolt on the toolholder height adjustment screw (shown right). When directly viewing the top of the bolt head, turn counter-clockwise to loosen. If you intend to raise the height of the toolholder, you must unscrew the bolt further, to allow toolholder movement.

View Direction

Loosen toolholder height adjustment screw by turning CCW.

2) Loosen the double flanged locknut on the toolpost body, if tight. When directly viewing the top of the locknut, turn counter-clockwise to loosen (show below left). Check that the single flange on the toolholder height adjustment screw is still held between the two flanges on the toolpost locknut (shown below right).

Check toolholder height adjustment screw is still held.

Loosen double flanged locknut by turning CCW.
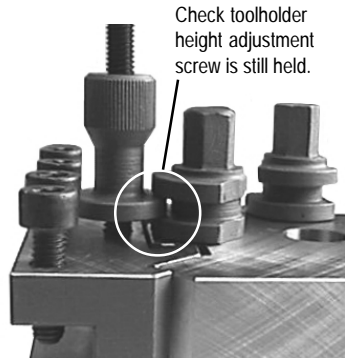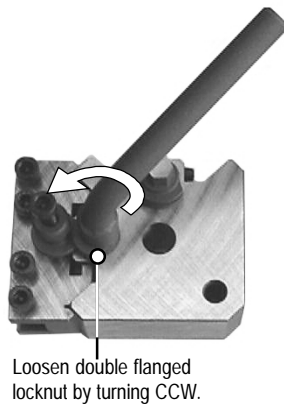
continued...

5: Quickchange Manual Tooling System

Toolholder Height Adjustment continued...

3) Holding the knurled collar, turn the height adjustment screw to raise or lower the toolholder. When directly viewing the top of the screw, turn counter-clockwise to lower or clockwise to raise the toolholder.

View Direction

To raise toolholder, turn knurled collar CW.

View Direction

To lower toolholder, turn knurled collar CCW.
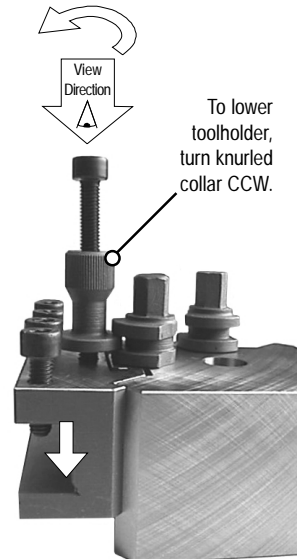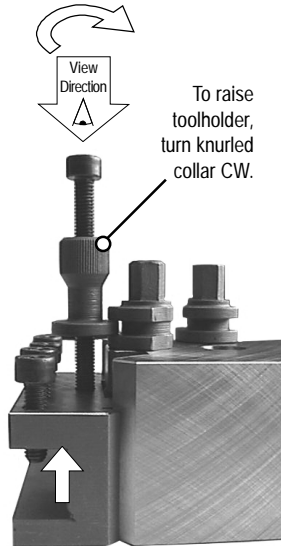
4) Tighten the double flanged locknut on the toolpost body, then screw in and tighten the lockbolt on the toolholder height adjustment screw.
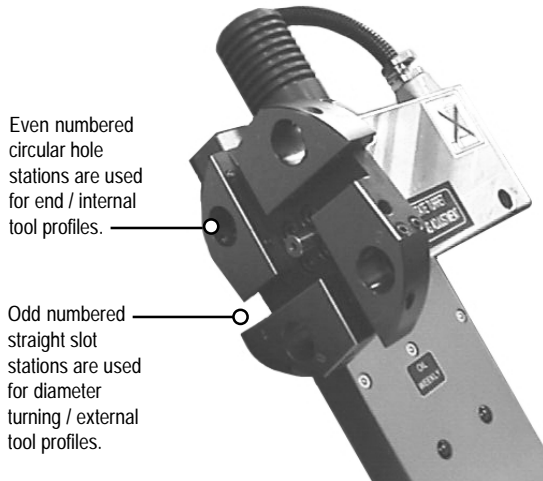
5: Automatic Indexing Tooling System

Introduction.

The optional Automatic Indexing Toolpost is designed to automatically change cutting tools, when required. Each numbered toolpost station, or slot, is designed to contain one tool holder, which in turn contains the cutting tool profile.

On an eight station toolpost, diameter turning / external working tool profiles, such as roughing or threading profiles, must be assigned to the odd numbered stations, 1, 3, 5, 7. End / internal working tool profiles, such as boring bars or drills, must be assigned to the even numbered stations, 2, 4, 6, 8. This will directly affect how tool numbers are assigned to the cutting tool profiles used by your CNC program.

For example, if your CNC program used a roughing profile, finishing profile and drill, odd tool numbers must be assigned to the roughing profile and finishing profile, whilst an even number must be assigned to the drill.

Denford recommends that you establish a standardised numbering system for the most common tool profiles used with your CNC programs.

Even numbered circular hole stations are used for end / internal tool profiles.

Odd numbered straight slot stations are used for diameter turning / external tool profiles.

5: Automatic Indexing Tooling System

Automatic Tooling System Fitting Tools.

The following tools are used to fit and adjust the components on the automatic indexing toolpost.

5mm Spanner.

4mm Allen (Hex) Key.

2.5mm Allen (Hex) Key.

Fitting a Toolholder to the Toolpost.

1) If required, fit the cutting tool profile in an appropriate toolholder.

2) Using a 4mm allen (hex) key, unscrew the two grubscrews on the appropriate numbered toolpost station. When directly viewing the top of the grubscrews, turn counter-clockwise to loosen or clockwise to tighten them.

Safety First !	- □ X

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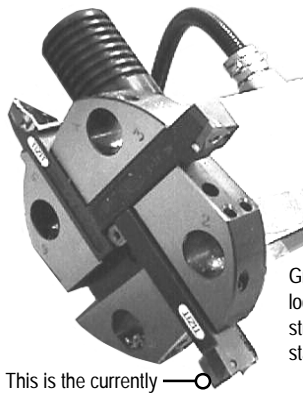
Never open the safety guard door and enter the working area when the spindle or machine axes are moving.

Safety First !	- □ X

⚠

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

Grubscrew locations for straight slot stations.

Grubscrew locations for circular hole stations.

This is the currently active cutting tool.
Diameter turning / external tools must be fitted with the cutting edge facing down.

3) Place the cutting tool / toolholder into the numbered station, in the correct orientation. Diameter turning / external tools must be fitted with the cutting edge facing down.

4) Tighten the grubscrews until they just begin to grip the cutting tool / toolholder. Continue to tighten each grubscrew by one quarter turn. Continue this procedure until both grubscrews are fully tightened and the cutting tool / toolholder is held securely.

5: Automatic Indexing Tooling System

## Height Adjustment of the Automatic Indexing Toolpost.

Any height adjustments made to the toolpost will be applied equally to all tool profiles used in the various numbered toolpost stations.

To adjust the height of the toolpost:

1) Using a 5mm spanner, release the locknut on the lower grubscrew, mounted on the toolpost side facing the front of the machine. Next, release the locknut on the upper grubscrew, mounted on the toolpost side facing the rear of the machine. When directly viewing the face of a locknut, turn the spanner in an anticlockwise direction to unscrew.
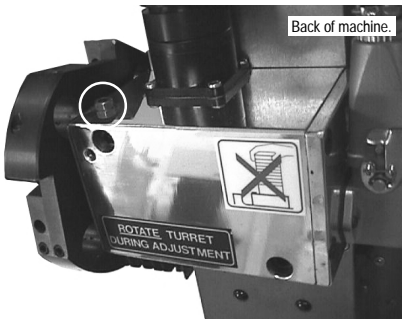
Above: The "upper" locknut/grubscrew (circled), mounted on the toolpost side facing the back of the machine, is used to release the toolpost height adjusting mechanism.
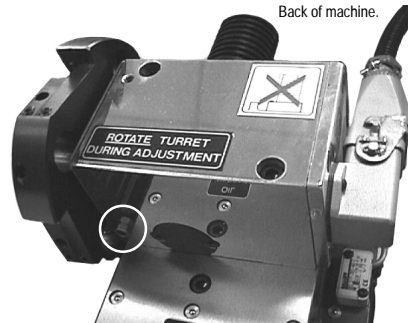
Above: The "lower" locknut/grubscrew (circled), mounted on the toolpost side facing the front of the machine, is used to adjust the height of the toolpost.

2) Using a 2.5mm allen key, unscrew the upper grubscrew, mounted on the toolpost side facing the rear of the machine, by 3 or 4 complete revolutions. When directly viewing the face of a grubscrew, turn the allen key in an anticlockwise direction to unscrew.

3) Using your CNC machine control software, enter a tool change request that will allow the turret to revolve. Ideally, this will be the number of the tool to be adjusted.

5: Automatic Indexing Tooling System

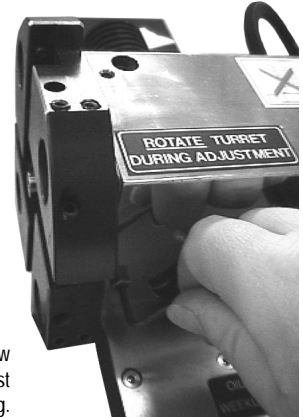4) **Whilst the turret is in motion**, adjust the height of the toolpost by turning the lower grubscrew, mounted on the toolpost side facing the front of the machine. When directly viewing the face of a grubscrew, turn the 2.5mm allen key in an anticlockwise direction to increase the toolpost height, or in a clockwise direction to decrease the toolpost height

Warning - Do not attempt to adjust the height of the toolpost when the turret is stationary. This could result in serious damage to the locking plate inside the toolpost body.

Right: Turn the "lower" grubscrew
to adjust the height of the toolpost
ONLY when the turret is moving.

5) Using a 5mm spanner, retighten the locknut on the lower grubscrew, mounted on the toolpost side facing the front of the machine. When directly viewing the face of a locknut, turn the spanner in an clockwise direction to tighten.

6) Using a 2.5mm allen key, retighten the upper grubscrew, mounted on the toolpost side facing the rear of the machine, until you feel the grubscrew make contact with the inner plate. When directly viewing the face of a grubscrew, turn the allen key in an clockwise direction to tighten.

7) Finally, using a 5mm spanner, retighten the locknut on the upper grubscrew, mounted on the toolpost side facing the rear of the machine. When directly viewing the face of a locknut, turn the spanner in an clockwise direction to tighten.
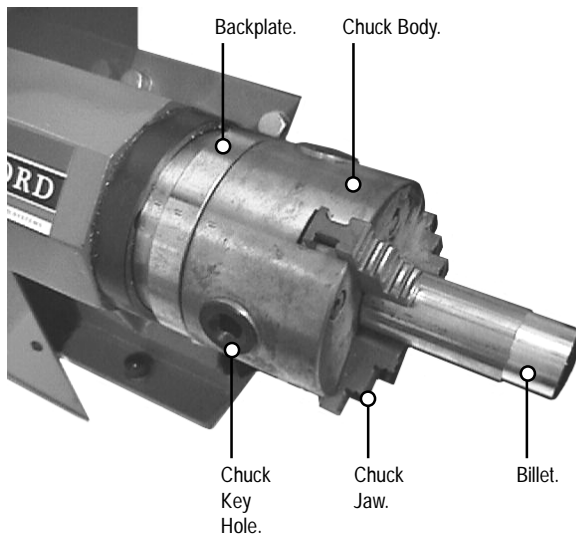
6: Manual Chuck Operation

Introduction.

The manual 3 jaw self-centring chuck is supplied as standard with the Novaturn CNC lathe, unless an optional pneumatic chuck has been fitted.

The system comprises of three basic elements:

i)   The backplate, which is secured against the spindle nose.

ii) The chuck body, which is secured against the backplate.

iii) One set of external chuck jaws (fitted to the chuck shown below) and one set of internal chuck jaws. Three jaws are provided in each set.

Backplate.   Chuck Body.

Chuck   Chuck   Billet.
Key   Jaw.
Hole.

6: Manual Chuck Operation

Fitting the Billet in a Manual 3 Jaw Chuck.

1) The chuck jaws are adjusted using a chuck key - a "T" shaped bar with a square locating peg, shown below. This fits into one of the three square holes equally spaced around the perimeter of the chuck body.

Chuck
Key.

2) Open the chuck jaws by turning the chuck key in a counter-clockwise direction, until there is sufficient space to fit the billet, as shown below.

Turn key CCW to open jaws.

3) Place the billet between the chuck jaws. If possible, try to position the billet so that the largest amount of material is held inside the chuck, or by the chuck jaws.

4) Whilst supporting the billet inside chuck body, close the chuck jaws by turning the chuck key in a clockwise direction.

5) Check the billet is held securely in the chuck jaws. Remove the chuck key from the square locating hole.

6: Pneumatic Chuck Operation

The following Miscellaneous Function codes are used to manually control the optional pneumatic chuck:

M10:   Chuck Open.
M11:   Chuck Close.
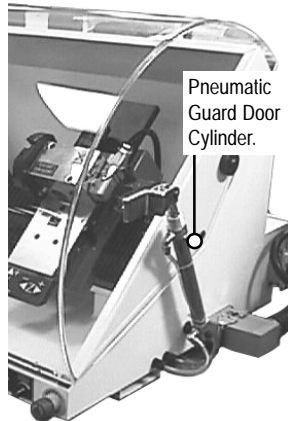
6: Pneumatic Guard Door Operation

The following Miscellaneous Function codes are used to manually control the optional pneumatic guard door:

M38:   Guard Door Open.
M39:   Guard Door Close.

Pneumatic Guard Door Cylinder.

7: Maintenance Schedule and Charts

Maintenance Schedule.

Daily	• Clean and remove any swarf. • Check that all slides are lubricated. • Clean tooling and toolpost.
Weekly	• Clean the machine. • Check all exposed screws and nuts for tightness. • Oil all slides and ballscrews.
Bi-annually	• Check and clean the machine thoroughly. • Check the condition of any electrical connections. • Check all cables for kinks and breaks. • Remove the chuck jaws and clean the chuck. • Clean the slide sensors.
Annually	• Check the slides for wear. • Check and adjust gib strips.

Note	‑ ☐ X
If your CNC machine is used intensively, we recommend that the maintenance tasks listed in the above schedule are performed on a more regular basis.	

Lubrication Chart.

Lubrication Point	Lubricating System	Frequency	Recommended Oil/Grease	Quantity
Slide ways & Ballscrews	Pump-action oil can	As required	BP : CS 68 Shell : Vitrea 68 Castrol : Perfecto NN	As required
Headstock	Grease Seal	On change of bearings	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	Spray Mist System	As required	Cincinnati Millacron Simcool 60 Dilution 2.5%	As required

7: Maintenance Areas on the Novaturn

Quickchange Manual Toolpost Model.

Z Axis Gib Strip Locking Screw behind Saddle.

Location of X Axis Slideways and Ballscrew Lubrication Points on Cross Slide.

Z Axis Gib Strip Adjusting Screw behind Saddle.

Location of X Axis Gib Strip Adjusting Screws on Cross Slide.

Z Axis Slide Sensor behind Saddle.

Location of Z Axis Slideways and Ballscrew Lubrication Points on Saddle.

X Axis Slide Sensor on top of Saddle.
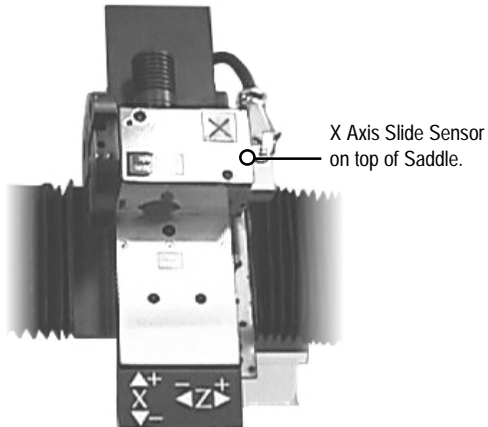
Location of X Axis Gib Strip Adjusting Screws on Cross Slide.

Safety First !   - □ X

⚠
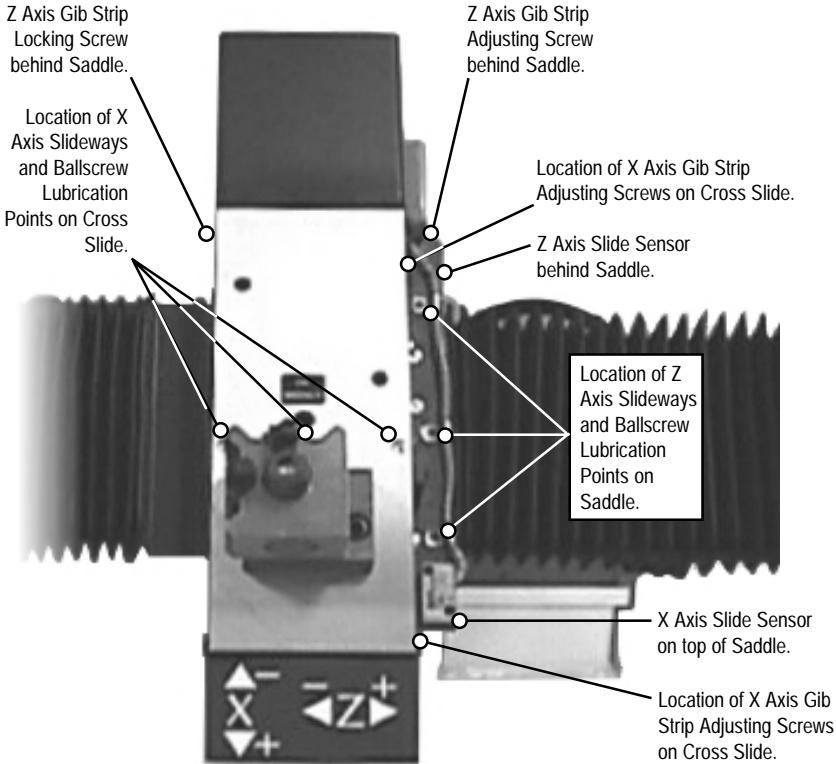
Caution.

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

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

Automatic Indexing Toolpost Model.

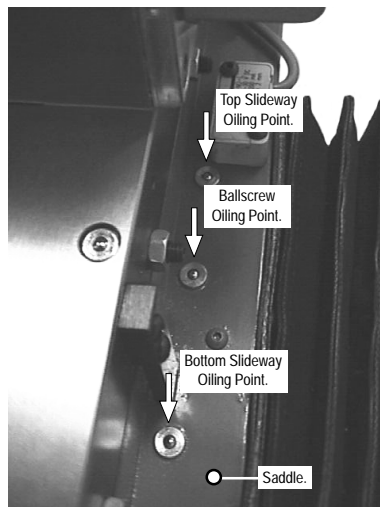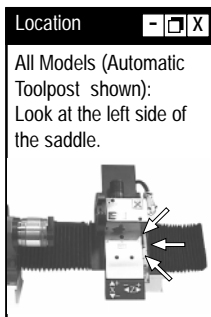X Axis Slide Sensor on top of Saddle.

7: Z Axis Ballscrew and Slideways Lubrication

The bedway ballscrew and slideways run parallel, in the direction of the Z axis, as shown in the diagram below.

Bottom Slideway. Ballscrew. Top Slideway.
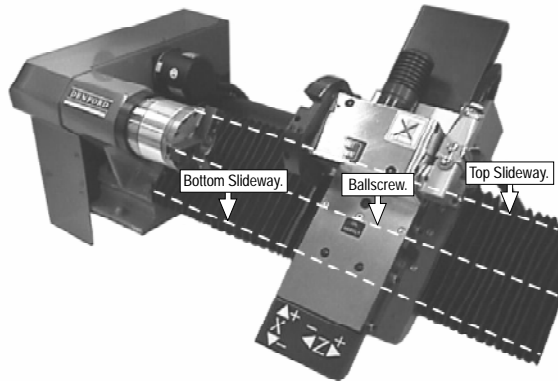
The slideways are located at the top and bottom of the slanted bedway and can be directly viewed by lifting the flexible bedway cover.

The ballscrew lies between the two slideways and can also be directly viewed by lifting the flexible bedway cover.

Location — □ X

All Models (Automatic Toolpost shown): Look at the left side of the saddle.

Top Slideway Oiling Point.

Ballscrew Oiling Point.

Bottom Slideway Oiling Point.

Saddle.

Lubrication is delivered to the ballscrew and slideways using the line of three oil points positioned on the right side of the saddle.

The upper point delivers oil to the top slideway.

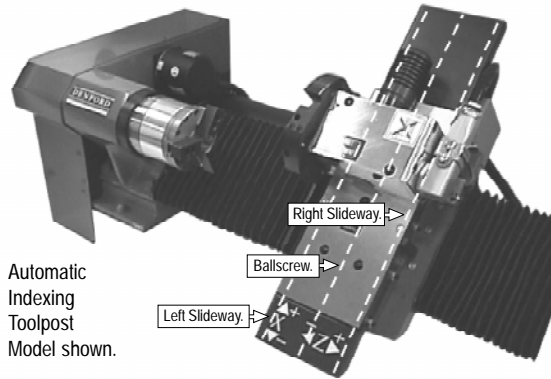The middle point delivers oil to the ballscrew.

The lower point delivers oil to the bottom slideway.

Pump oil into each of the three oiling points. Traverse the saddle assembly right and left along the Z axis, to distribute the oil along the full length of the ballscrew and slideways.
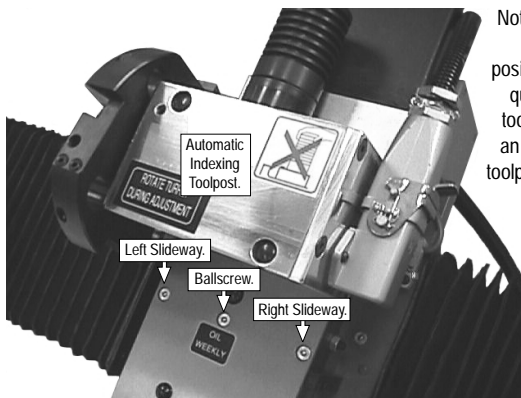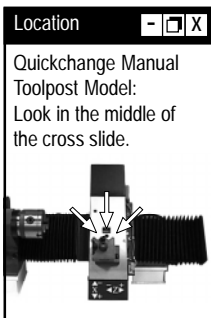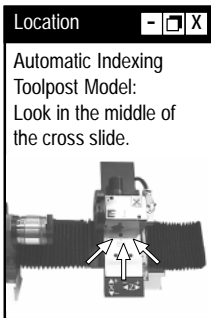
7: X Axis Ballscrew and Slideways Lubrication

The cross slide ballscrew and slideways run parallel, in the direction of the X axis, as shown in the diagram below.

Right Slideway.

Ballscrew.

Automatic
Indexing
Toolpost
Model shown.

Left Slideway.

The slideways are located on the left and right of the cross slide, mounted on the saddle.

The ballscrew lies between the two slideways.

Note: The line of three oiling points are positioned just above a quickchange manual toolpost, or just below an automatic indexing toolpost (as shown left).

Automatic
Indexing
Toolpost.

Left Slideway.

Ballscrew.

Right Slideway.

Lubrication is delivered to the ballscrew and slideways using the line of three oil points positioned horizontally in the middle of the saddle.

The left point delivers oil to the left slideway.

The middle point delivers oil to the ballscrew.

The right point delivers oil to the right slideway.

Pump oil into each of the three oiling points. Traverse the cross slide up and down along the X axis, to distribute the oil along the full length of the ballscrew and slideways.

7: Cleaning & Checking the Z Axis Slide Sensor

The bedway slide sensor defining the Z axis datum is attached behind the top right corner of the saddle, when viewed from the front of the machine.

To check the condition of the sensor, gently pull the flexible bedway cover away from the top slideway. Clean any dust and debris away from the sensor using a soft bristled brush.

Location − □ X

All Models (Automatic Toolpost shown): Look behind the top right side of the saddle.

Slide Sensor.
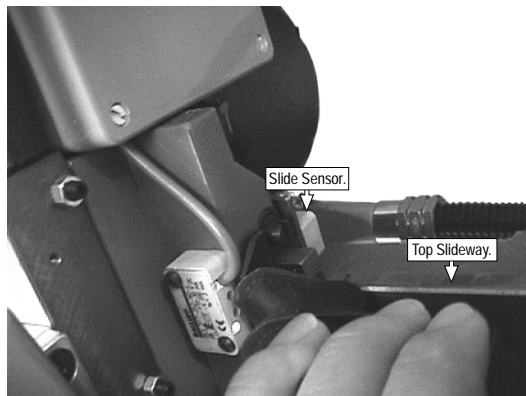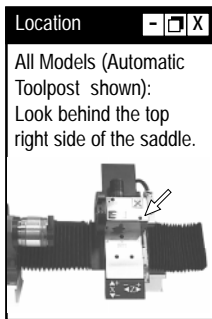
Top Slideway.

The bedway slide sensor trigger is attached to the right end of the top bedway slideway, when viewed from the front of the machine.

To check the condition of the trigger, gently pull the flexible bedway cover away from the top slideway. Clean any dust and debris away from the trigger using a soft bristled brush.

Location − □ X

All Models (Automatic Toolpost shown): Look behind the left side of the top slideway.

Trigger.

Top Slideway.

7: Cleaning & Checking the X Axis Slide Sensor
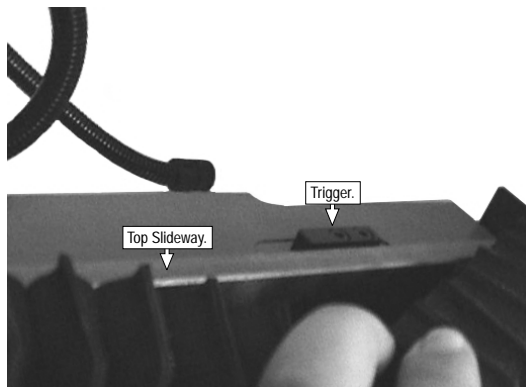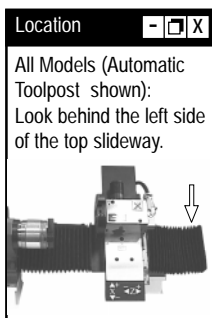
Automatic Indexing Toolpost Models.

The cross slide sensor defining the X axis datum is attached to the top right corner of the saddle, when viewed from the front of the machine.

Check the condition of the sensor, then clean any dust and debris away from the sensor using a soft bristled brush.

Location ▬ ❏ X

Automatic Indexing Toolpost Model: Look on the top right side of the saddle and the middle right side of the cross slide.

Slide Sensor.

Trigger.

The cross slide sensor trigger is attached to the middle of the right side of the cross slide, when viewed from the front of the machine.

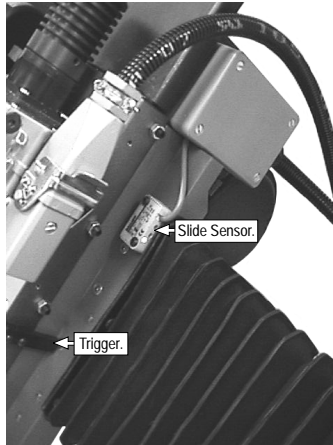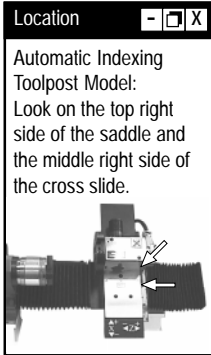Check the condition of the trigger, then clean any dust and debris away from the trigger using a soft bristled brush.

7: Cleaning & Checking the X Axis Slide Sensor

Quickchange Manual Toolpost Models.

The cross slide sensor defining the X axis datum is attached to the bottom right corner of the saddle, when viewed from the front of the machine.

Check the condition of the sensor, then clean any dust and debris away from the sensor using a soft bristled brush.

Location ▬ ▢ **X**

Quickchange Manual Toolpost Model:
Look on the bottom right side of the saddle and the middle right side of the cross slide.

Trigger.

Slide Sensor.

The cross slide sensor trigger is attached to the middle of the right side of the cross slide, when viewed from the front of the machine.

Check the condition of the trigger, then clean any dust and debris away from the trigger using a soft bristled brush.
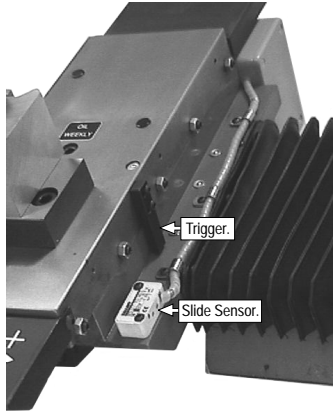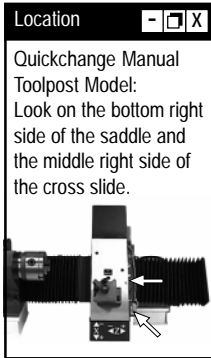
7: Gib Strip Adjustment

A gib strip is an section of metal or plastic, which is fitted to one side of a machine slideway. One gib strip is fitted to each of the two machine slides on your Novaturn. On the Z axis, the gib strip is tapered along its length. The gib strip is driven further along the top Z slideway to decrease the amount of free play in the axis, using a locking and adjusting screw arrangement. On the X axis, the gib strip is equal in section along its length and fitted to the right X slideway.. Free play is decreased in the X axis using five combination locking nuts and adjustment grubscrews.

During the day-to-day use of your Novaturn, wear will occur in each of the gib strips. This wear is normal and if checked regularly will not affect the performance of your machine.

Denford recommends that the gib strips be checked annually. Any slack present in the slides should be rectified, by adjusting the gib strips, as described on the next four pages.

Checking the Condition of the Gib Strips.

As the gib strips wear down, varying degrees of free play will become noticeable in each of the two machine axes.

You can quickly judge the slack available in each slideway, by holding the cross slide or saddle at their extreme ends. Try to move, or wobble them from side to side, across the width of the slideway. Any excessive movement will indicate that the slideway in question requires adjustment.

To accurately assess the condition of each slideway, Denford recommends the use of a dial gauge.

Note that a slight degree of movement will always be present in every slideway. If there is no free movement whatsoever, then the slideways would be too tight to move.

7: Z Axis Gib Strip Adjustment

The Z axis gib strip is adjusted using the two screws, one locking, one adjusting, positioned behind the back of the saddle.

Z Axis Gib Strip Adjustment Method:

1) Using a flat bladed screwdriver, loosen the gib strip locking screw about one half revolution, to release the gib strip. The locking screw is positioned behind the top left side of the saddle. Turn in a counter-clockwise direction to loosen the screw. Easier access to the locking screw can be obtained by gently pulling the flexible bedway cover away from the top slideway.

View Direction

Automatic Indexing Toolpost Model shown.

Location - □ X

All Models (Automatic Toolpost shown):
Look behind the top left side of the saddle.

Back of saddle.

Locking Screw.

Top Slideway.
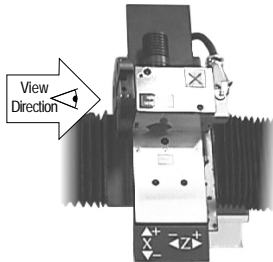
7: Z Axis Gib Strip Adjustment

2) Using a flat bladed screwdriver, adjust any free play in the Z axis by tightening the gib strip adjustment screw one half revolution. The adjusting screw is positioned behind the top right side of the saddle.

Turn in a clockwise direction to tighten the screw. **Do not overtighten this screw.** A slight degree of movement must be left in the slideway to allow Z axis movement. Easier access to the locking screw can be obtained by gently pulling the flexible bedway cover away from the top slideway.

Automatic
Indexing
Toolpost
Model shown.

View
Direction

Back of saddle.

Location   - □ X

All Models (Automatic Toolpost shown):
Look behind the top right side of the saddle.

Locking Screw.

Top Slideway.
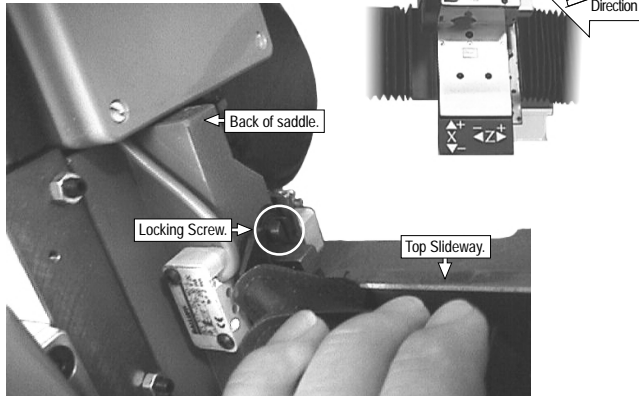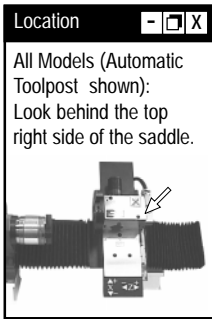
3) Re-tighten the gib strip locking screw. Turn in a clockwise direction to tighten the screw.

4) Traverse the saddle left and right along the bedway, to ensure that the Z axis movement is smooth.

5) Continue points 1) to 4) until all slack has been eliminated from the Z axis.

Note: If the Z axis movement is not smooth, loosen the gib strip, but this time turn the gib strip adjustment screw counter-clockwise to introduce a little slack back into the system. Run the saddle left and right along the bedway again, to assess the smoothness of movement.

7: X Axis Gib Strip Adjustment

The X axis gib strip is adjusted using the five combined locking nuts and grubscrews positioned on the right side of the cross slide.

X Axis Gib Strip Adjustment Method:

1) Using a 5mm spanner, release each of the five locking nuts on the gib strip adjusting grubscrews. To loosen, turn each locking nut in a counter-clockwise direction.

Location

All Models (Automatic Toolpost shown): Look behind the top right side of the saddle.

Location of the five cross slide locknuts and adjusting grubscrews.

Right side of cross slide.

Quickchange Manual Toolpost Model shown.
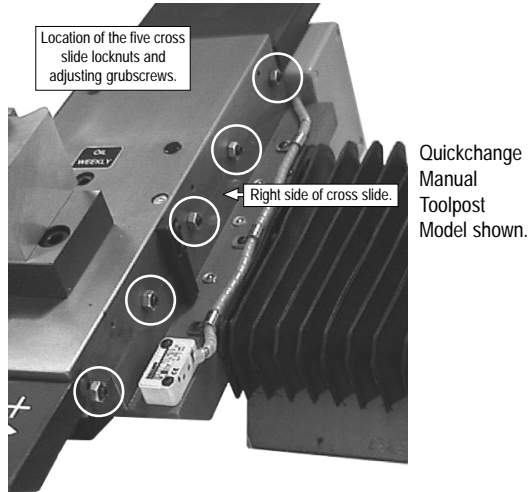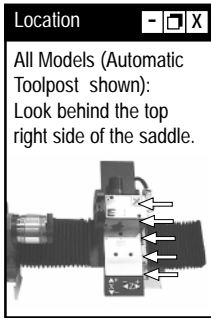
2) Using a 2.5mm allen (hex) key, reduce any free play in the X axis by tightening each of the five grubscrews evenly. To tighten, turn each grubscrew in a clockwise direction. **Do not overtighten these grubscrews.** Run through the same sequence of tightening each of the five grubscrews until a slight drag is experienced on movement of the slideway.

7: X Axis Gib Strip Adjustment

3) Re-tighten the five locking nuts whilst holding their grubscrew positions steady with the allen (hex) key. To tighten, turn each locking nut in a clockwise direction.

Quickchange Manual Toolpost Model shown.

Use a 2.5mm allen (hex) key to turn the gib strip adjusting grubscrews.
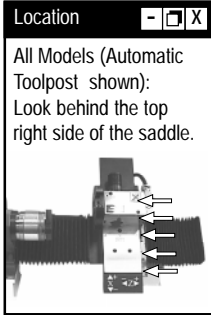
4) Traverse the cross slide up and down across the saddle, to ensure that the X axis movement is smooth.

5) If the movement is not smooth, loosen the gib strip by repeating steps 1) to 3), but turn the gip strip adjustment grubscrews counter-clockwise. Run the cross slide up and down across the saddle again, to assess the smoothness of movement.

8: Electronics Panel Layout

The photo below labels all important areas of the Novaturn CNC lathe electrical panel, contained in the electrical control box.

Please note that the layout of your electrical panel may differ from the photo, depending on components and options fitted to your Novaturn. Before commencing any work, refer to the schematic diagram of the electrical panel, contained in the folder behind the electrical control box door.

⚠ Warning.

Never attempt to open the electrical control box door with the mains power switched ON. Note that hazardous voltages can still exist immediately after switching the isolator to the OFF position. Always wait at least 5 minutes before entering the electrical control box.

Note	- □ X
The electrical diagrams for your Novaturn are held in a folder inside the electrical control box. Further electrical schematics are available on request.	

Note	- □ X
Depending on the specification of the machine, some electrical cabinet doors may be fitted with locks.	

Note*	- □ X
Depending on your machine spec. the 24V power supply may be fitted below the Denstep motion control board, to the left of the bank of relay modules.	

Novaturn Electronics Panel Layout.

Denstep Motion Control Board.
Relay Modules.
Main Fuse Rack.
Isolator.
24V Power Supply.
Toolpost Control Board (when fitted).
Spindle Drive Board.
Control Transformer.
Spindle Choke.
Ferrite Core.
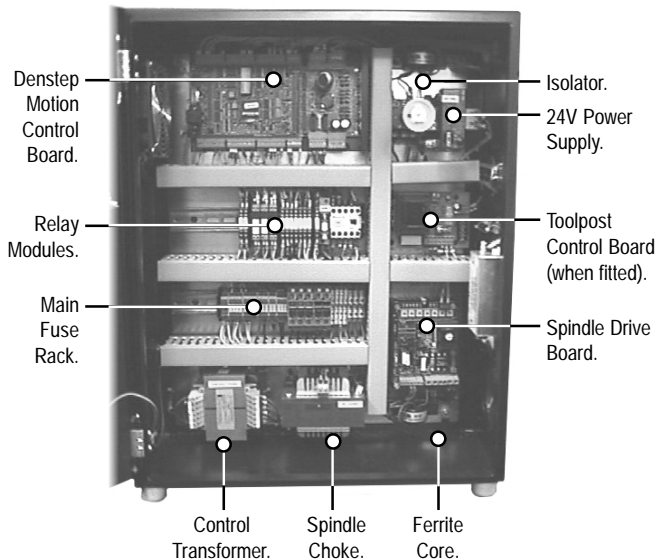
8: The Denstep Motion Control Board

The denstep motion control board is mounted in the top lefthand corner of the electrical control box. It controls the motors that drive the two CNC lathe axes.

Seven Segment LED Display.

Fuse.
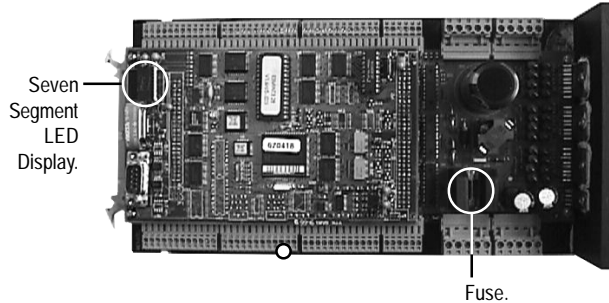
LED Status and Fault Display.

The LED display is mounted on the lefthand side of the denstep motion control board.

Display.	Meaning.
0	No comms board address fault.
-	Servo power off.
8	Servo power up and idle.
c	Cam profiling.
ͨ	Cam table (superscript).
C	Circular interpolation.
Ǝ	Encoder following mode.
F	Flying shear (static symbol).
H	Homing (datuming).
J	Jogging (velocity) mode.
o	Offset mode.
P	Linear positional mode.
q	Torque control mode.
S	Stop asserted.
U	Pulse following mode.

Errors are all shown with a flashing dot.

Display.	Meaning.
ℇ	External error.
E	Software abort or interpreter error.
F	Maximum servo following error exceeded.
L	Limit switch open.

8: The Spindle Drive Board

The spindle drive board, mounted in the bottom righthand corner of the electrical control box, controls the motor for the programmable spindle.

Two Spindle Drive Status LEDs.
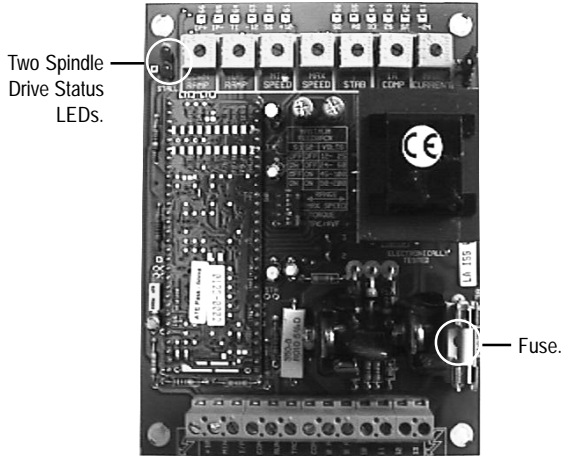
Fuse.

Spindle Drive LED Status.

The two spindle drive status LEDs are mounted in the top lefthand corner of the spindle drive board.

Display.	Meaning.
ON LED	Spindle drive board operational. If this is not lit, check the spindle drive board fuse (shown in the diagram above) then the fuse labelled F1 on the main fuse rack (see the diagram on page 111).
STALL LED	Motor stall. This indicates a faulty motor or component on the spindle drive board.

9: Technical Support

Denford Limited provides unlimited telephone 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 FAQs (Frequently Asked Questions) and Technical Support Documents on our website:

http://www.denford.com

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.
- Registered user's name / company name.
- The controller software name and version number.
- 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,
Birds Royd, Brighouse, West Yorkshire, HD6 1NB, UK.
Telephone: 01484 712264
Fax: 01484 722160
ISDN: 01484401157:01484401161
E-mail: service@denford.co.uk
Technical Support: Monday to Friday 8.30am - 4.30pm GMT

For USA please contact:
Denford Inc.
815 West Liberty Street, Medina, Ohio 44256, USA.
Telephone: 330 7253497
Fax: 330 7253297
E-mail: service@denford.com
Technical Support: Monday to Friday 8.30am - 4.30pm Eastern

9: VR CNC Turning Software Communications Troubleshooting

VR CNC Turning Software Communications Troubleshooting:

1) Your computer communicates with your Novaturn using an RS232 serial cable. Check the RS232 cable is plugged into a valid COM port on the computer. Note that COM ports are sometimes labelled as serial ports. Identify whether it is COM1 or COM2. The opposite end of this cable is secured to the RS232 port on the electrical control box.

2) Check all mains power connections between the Novaturn and the electrical control box are correctly fitted and secure. Power up the Novaturn, using the isolator switch fitted on the electrical control box, before starting the VR CNC Turning software.

3) Check the COM port being used on your computer matches the COM port number specified in the "Machine Properties" window.

From the main menubar at the top of the screen, click "Setup | Setup Machine Parameters". You may be required to enter a password. The default password is "denny". Type the password and click [OK].

The "Machine Properties" window will open with the "Novaturn" set as the active machine and its listing expanded. Click the "Communications" property title. Change the "COM Port" setting to match the number of the COM port being used by your CNC machine RS 232 cable. Note that the hardware resources (IRQ. etc.) are those specified in the Windows Control Panel.

Note   [-][□][X]

The password used to access the "Machine Properties" window can be changed by the user. Remember that the default password listed here will not be recognised if you have changed it.

If you change any passwords, we recommend you make a note of them in the Notes section in this manual.

Note   [-][□][X]

If "Novaturn" is NOT listed with a tickmark as the active machine, right click over the "Novaturn" title to display a pop-up menu, click "Make Active", then click [OK]. You must restart the VR CNC Turning software.
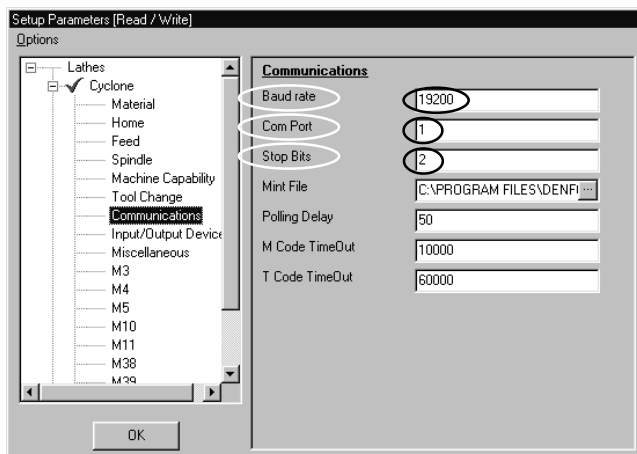
9: VR CNC Turning Software Communications Troubleshooting

The "Baudrate" must be set to read "19200". Baudrate is the speed at which data can be transferred through your COM ports. The "Stop Bits" must be set to read "2". Stop Bits are the data signals sent after each data character has been transferred.

Click the [OK] button to save and apply any changes made to the property listings.

4) Check the LED display status on your Novaturn control card (The Denstep Motion Control Board). The control card is the main electrical board in the Novaturn. A problem with this card can cause problems with communications. Look for the LED display mounted on the main control card. A blinking dot with an L or the number 8 should be shown. If the LED is not lit, check the control board fuse. If no display continues to be shown, call Denford Customer Services for assistance.

5) Check the COM port is functioning correctly. Consult your IT person or Computer Support Centre for help with these issues. Check the COM port settings in Windows by accessing the Device Manager. Check the com ports enabled and labelled properly in the computer BIOS. Check the physical COM port itself functional. For example, Windows and the BIOS may show that the COM ports are fine, but the port is not seen by any external devices.

6) When all else fails....

a) Thoroughly check the condition of the RS232 cable. If the cable is bad, communication will not occur.

b) Try another computer.

c) Check for support on the Denford website (www.denford.com).

9: DOS CNC Turning Software Communications Troubleshooting

DOS CNC Turning Software Communications Troubleshooting:

1) Your computer communicates with your Novaturn using an RS232 serial cable. Check the RS232 cable is plugged into a valid COM port on the computer. Note that COM ports are sometimes labelled as serial ports. Identify whether it is COM1 or COM2. The opposite end of this cable is secured to the RS232 port on the electrical control box.

2) Check all mains power connections between the Novaturn and the electrical control box are correctly fitted and secure. Power up the Novaturn, using the isolator switch fitted on the electrical control box, before starting the DOS CNC Turning software.

3) Check the COM port being used on your computer matches the COM port number specified in the "FLSTEP.GO" file of the DOS CNC Turning software. If you are unsure, assume the COM port being used is COM1. The GO file can be opened using Windows Notepad.

   Find the line ending with the word "MACHINE". If the RS232 cable is plugged into COM1, the line should read $3F8 4 MACHINE. If the RS232 cable is plugged into COM2, the line should read $2F8 3 MACHINE. Change the line to read the correct port number being used, then save the file.

4) Remove the "HIMEM.SYS" line from the "CONFIG.SYS" file. Often times environmental factors will interfere with proper communication.

5) Check the LED display status on your Novaturn control card (The Denstep Motion Control Board). The control card is the main electrical board in the Novaturn. A problem with this card can cause problems with communications. Look for the LED display mounted on the main control card. A blinking dot with an L or the number 8 should be shown. If the LED is not lit, check the control board fuse. If no display continues to be shown, call Denford Customer Services for assistance.

9: DOS CNC Turning Software Communications Troubleshooting

continued...

6) Check the COM port is functioning correctly. Consult your IT person or Computer Support Centre for help with these issues. Check the COM port settings in Windows by accessing the Device Manager. Check the com ports enabled and labelled properly in the computer BIOS. Check the physical COM port itself functional. For example, Windows and the BIOS may show that the COM ports are fine, but the port is not seen by any external devices.

7) When all else fails....

a) Thoroughly check the condition of the RS232 cable. If the cable is bad, communication will not occur.

b) Try another computer.

c) Check for support on the Denford website (www.denford.com).

10: Specification of Novaturn CNC Lathe

Standard Equipment:
Novaturn CNC lathe.
Electrical power box.
Quick change toolpost and holder.
Manual self centring 3 jaw chuck.
Set of internal and external jaws.
Swarf tray.
CNC lathe operating software.
CNC lathe and controller software manuals.
Set of maintenance tools and spare parts list.

Extra Equipment:
8 Station programmable turret (Automatic Tool Changer).
Various tooling packages.
Additional CAD/CAM software.
Additional (offline) machine controller software licenses.
Machine work bench.
Video conferencing system.
Training.
PC & PC workstation.
Pneumatic vice.
Pneumatic safety guard door.
Spray Mist Coolant.
Tailstock.
Compressor.

Mechanical Details:
Swing over bed 160mm (6 1/4″).
Swing over cross slide 80mm (3″).
Distance between centres 270mm (10 5/8″).
Travel X axis 140mm (5 1/2″).
Travel Z axis 225mm (8 7/8″).
Spindle bore 21mm (3/4″).
Spindle taper No. 3
Tailstock taper No. 2
Ballscrews (X & Z) 16mm (5/8″) diameter, with 5mm (0.2″) pitch.

10: Specification of Novaturn CNC Lathe

Safety Features:
Manual operation, totally enclosed, interlocked, safety guard door.
Emergency stop button.
2D and 3D simulation graphics to verify part programs prior to
machining.
Isolator switch.

Dimensions:
Machine width 820mm (32 3/8″).
Machine height 560mm (22″).
Machine depth 690mm (27 1/4″).
Electrical control box width 480mm (19″).
Electrical control box height 640mm (25 1/4″).
Electrical control box depth 230mm (9 1/8″).
Length of cable between machine and electrical control box
1500mm (59″).
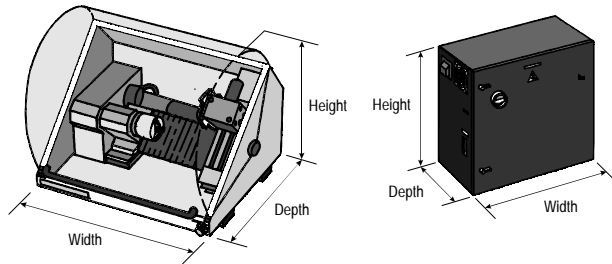
Weights:
Machine weight 88 KG (195 lb).
Electrical control box weight 35 KG (77 lb).

Electrical Details:
Mains supply required: 50/60 Hz, 1 Phase, 220/240 Volts, 10 AMP.
Spindle motor: 1.5 HP.
Axis stepper motors: 200 steps/rev.

10: What is a Part Program?

A Part Program is a list of coded instructions which describes how the designed part, or component, will be manufactured. This part program is also called the CNC File.

These coded instructions are called data - a series of letters and numbers. The part program includes all the geometrical and technological data to perform the required machine functions and movements to manufacture the part.

The part program can be further broken down into separate lines of data, each line describing a particular set of machining operations. These lines, which run in sequence, are called blocks.

A block of data contains words, sometimes called codes. Each word refers to a specific cutting/movement command or machine function. The programming language recognised by the CNC, the machine controller, is an International Standards Organisation code, which includes the G and M code groups.

Each program word is composed from a letter, called the address, along with a number.

These terms are illustrated on the following pages.

10: Composition of a Part Program

Part Program example:

(Lathe CAM Designer - ØØ5Ø.LCD)

(Novaturn lathe (metric))

OØØ5Ø;

NØØ1Ø G21;

[BILLET X1Ø Z2Ø;

NØØ2Ø G98;

NØØ3Ø G28UØWØ;

NØØ4Ø M6TØ1Ø1;

NØØ5Ø M3S2546;

NØØ6Ø GØØX1ØZ2;

NØØ7Ø X12;

NØØ8Ø X1Ø;

NØØ9Ø GØ1Z-13.5F1Ø;

NØ1ØØ X12;

NØ11Ø GØØZ2;

NØ12Ø X8;

NØ13Ø M3S3183;

NØ14Ø GØ1Z-8.26;

NØ15Ø X1Ø;

NØ16Ø GØØZ2;

NØ17Ø X6;

NØ18Ø M3S4ØØØ;

NØ19Ø GØ1Z-6.26;

NØ2ØØ X8;

NØ21Ø X12;

NØ22Ø GØØZ2;

NØ23Ø GØ1ZØ;

NØ24Ø X4;

NØ25Ø Z-5;

NØ26Ø M3S2829;

NØ27Ø X9Z-1Ø;

NØ28Ø Z-14;

NØ29Ø X12;

NØ3ØØ GØØZ2;

NØ31Ø M5;

NØ32Ø G28UØWØ;

NØ33Ø M3Ø;

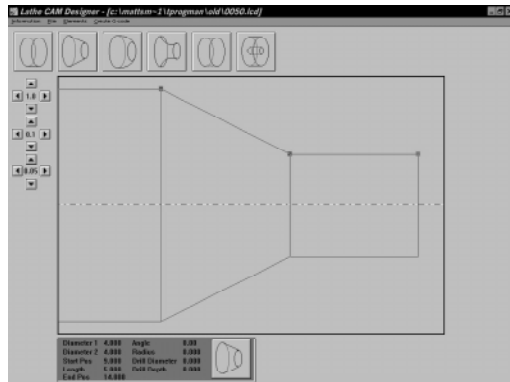Denford Directive Example - [BILLET

Address example - G

Word example - GØ1

Block example - NØ14Ø GØ1Z-8.26;

A component is designed using a CAD/CAM software package, such as Lathe CAM Designer.

The CAD/CAM software package automatically generates the part program, including all the G and M codes required to manufacture the component.

10: G Codes List

Note - Not all G codes may apply to your CNC machine.

G Code	Group	Function
GØØ*	1	Positioning (Rapid Traverse)
GØ1	1	Linear Interpolation (Feed)
GØ2	1	Circular Interpolation CW
GØ3	1	Circular Interpolation CCW
GØ4	Ø	Dwell
G2Ø	6	Inch Data Input
G21*	6	Metric Data Input
G28	Ø	Reference Point Return
G4Ø*	7	Tool Nose Radius Compensation Cancel
G41	7	Tool Nose Radius Compensation Left
G42	7	Tool Nose Radius Compensation Right
G5Ø	Ø	Work Co-ordinate Change/ Max. Spindle Speed setting
G7Ø	Ø	Finishing Cycle
G71	Ø	Stock Removal in Turning - X
G72	Ø	Stock Removal in Facing - Z
G73	Ø	Pattern Repeating
G74	Ø	Peck Drilling in Z Axis
G75	Ø	Grooving in X Axis
G76	Ø	Multiple Thread Cutting Cycle
G81	1	Deep hole drilling (No FANUC)
G9Ø	1	Diameter Cutting Cycle A (Outer/Inner)
G92	1	Thread Cutting Cycle
G94	1	Cutting Cycle B (End Face Cycle)
G96	2	Assessed Surface Speed Control
G97*	2	Assessed Surface Speed Control Cancel
G98*	11	Feed Per Minute
G99	11	Feed Per Revolution

Code listing full and correct at the time of printing (Sept, 2001).

Note `- □ X`

G codes from group Ø are non-modal (they must be programmed into every program block when required). All other G codes are modal (they remain active through subsequent program blocks, until replaced or cancelled by a G code from their particular group).

The G codes indicated by an asterisk (*) are reactivated as defaults when the machine started.

10: M Codes List

Note - Not all M codes may apply to your CNC machine.

M code ... Function
MØØ* ..... Program stop
MØ1* ...... Optional stop
MØ2* ...... End of program
MØ3 .... Spindle forward (clockwise)
MØ4 .... Spindle reverse (counter clockwise)
MØ5* ...... Spindle stop
MØ6 .... Automatic tool change
MØ8 .... Coolant on
MØ9* ...... Coolant off
M1Ø .... Chuck open
M11 .... Chuck close
M13 .... Spindle forward and coolant on
M14 .... Spindle reverse and coolant on
M25 .... Tailstock quill extend
M26 .... Tailstock quill retract
M3Ø .... Program stop and reset
M38 .... Door open
M39 .... Door close
M4Ø .... Parts catcher extend
M41 .... Parts catcher retract
M62 .... Auxiliary output 1 on
M63 .... Auxiliary output 2 on
M64 .... Auxiliary output 1 off
M65 .... Auxiliary output 2 off
M66* ...... Wait for auxiliary output 1 on
M67* ...... Wait for auxiliary output 2 on
M76 .... Wait for auxiliary output 1 off
M77 .... Wait for auxiliary output 2 off
M98 .... Sub program call
M99 .... Sub program end and return

Code listing full and correct at the time of printing (Sept, 2001).

Note	■ ❑ X

Not all M codes listed are available, all M codes marked with an asterisk (*) will be performed at the end of a program block (ie, after any axis movement).

10: List of Program Address Characters

N - refers to the Program Sequence line (block) number.

X - refers to the absolute distance travelled by the slide tool in the X axis direction.

U - refers to the incremental distance travelled by the slide tool in the X axis direction.

Z - refers to the absolute distance travelled by the slide tool in the Z axis direction.

W - refers to the incremental distance travelled by the slide tool in the Z axis direction.

G - refers to Preparatory functions (G codes).

M - refers to Miscellaneous functions (M codes).

T - refers to the tooling management (tool number and tool offset).

S - refers to the Spindle speed.

F - refers to the Feed rate.

10: Denford Directives

Directives are program terms defined by Denford Limited.
They are used to help generate the 2D and 3D graphics used by the machine controlling software.

[BILLET

This directive allows a billet that appears in a simulation window to be given a size. The billet definition should be placed at the start of a program, after the units of measurement have been set.
Example:
G21
[BILLET X3Ø.Ø Z9Ø.Ø
This sets the measure to metric (Note - if set to Imperial the units would be inches) and defines the billet length (Z) at 9Ømm with a diameter (X) of 3Ømm. Note that the length value does not include the extra material required to physically hold the billet in the chuck jaws.

[SUBPROGRAM

This directive allows a program with a non-numeric name to be called as a subprogram.
Example:
[SUBPROGRAM Ø2ØØ FRED
M98 PØ2ØØ
This example assigns a subprogram number of Ø2ØØ to the program named FRED, then calls the subprogram Ø2ØØ.

[STEP

This directive runs an on-screen program in single steps. This means the program will run one program line, then wait for the operator to prompt it to move to the next line; this continues until the program is instructed to stop this function.
The directive applies to both simulation and actual machining with a program.

[NO STEP

This directive runs an on-screen program without single steps. This means the program will run as originally intended with no pausing, unless a pause is requested from within the program itself.
The directive applies to both simulation and actual machining with a program.

[SHOW

This directive allows the machining operations to be graphically simulated on-screen.

[NOSHOW

This directive stops the machining operations from being graphically simulated on-screen.

EC Declaration of Conformity

The responsible person .... Mr J.M. Boyle.

Business Name .... Denford Limited.

Address .... Birds Royd,
Brighouse,
West Yorkshire,
HD6 1NB,
United Kingdom.

Declares that the machinery described:

Manufacturer .... Denford Limited.

Model Name .... Novaturn Series CNC Lathe.

Serial Number .... (please refer to warranty card and/or machine casing).

conforms to the following directives: .... The Machinery Directive 89/392/EEC as amended by Directive 91/368 EEC and Directive 93/44/EEC and CE Marking Directive 93/68/EEC.

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

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

Signature ....

Position within company .... Senior Design Engineer.

Signed at .... Denford Limited,
Birds Royd,
Brighouse,
West Yorkshire,
HD6 1NB,
United Kingdom.

Back of the Novaturn EC Declaration of Conformity Certificate.

Novaturn Series Noise Level Test Results

Test Report No: NL - ST5 - Ø1.
Machinery Manufacturer: Denford Limited.
Machinery Type/Model: Novaturn Series
Test Specification in accordance with BS4813 : 1972.

Instrumentation used: Cirrus CRL 2.35A
Test Site: Denford Limited, Demonstration Room.
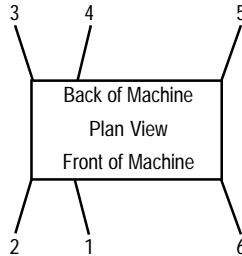
General Machine Test Conditions:
Chuck on size: Standard.
Splash guard on: Not Applicable.
Machine mounting: Bench mounted.
Additional equipment: None.
Test positions:

```
   3        4              5
    \       |             /
     \      |            /
      +-------------------+
      | Back of Machine   |
      |   Plan View       |
      | Front of Machine  |
      +-------------------+
     /      |            \
    /       |             \
   2        1              6
```

Background Noise   :   51 dB (A)
Maximum Spindle Speed   :   18ØØ revs/min
Spindle Direction   :   Clockwise

Spindle RPM	Speed Range	Feed mm/rev	Sound Levels dB (A) Position						
			1	2	3	4	5	6	Mean
1ØØ	N/A	N/A	53	53	53	52	52	52	52
5ØØ	N/A	N/A	54	53	53	53	53	53	53
1ØØØ	N/A	N/A	54	54	54	53	54	53	54
15ØØ	N/A	N/A	58	55	54	53	54	54	55
18ØØ	N/A	N/A	58	55	55	54	54	54	55

Back of the Novaturn Series Noise Level Test Results Certificate.

11: Glossary

ABSOLUTE .... In absolute programming, zero is the point from which all other dimensions are described.

ALLEN .... See hex.

ARC .... A portion of a circle.

ATC .... See programmable turret.

AUTOMATIC CYCLE .... A mode of control operation that continuously runs a cycle or stored program until a program stop or end of program word is read by the controller.

AUXILIARY FUNCTION ...... The function of the CNC lathe (ie, F, S, T, M codes etc.), other than co-ordinate based commands.

AXIS (AXES) .... The planes of movement for the cutting tool, usually referred to as Z (left and right, parallel to the chuck centreline) and X (forwards and backwards, at right angles to the chuck centreline). Combinations of both allow precise co-ordinates to be described.

BED .... The base of the CNC lathe.

BEDWAYS .... The Z axis of the machine.

BILLET .... The actual material being machined, sometimes referred to as the "workpiece" or "stock".

BLOCK .... A collection of program words that collectively describe a machining operation. A single program line in the CNC file.

CAROUSEL .... The rotating section of a programmable turret, containing a number of stations. Also referred to as the turret disc.

CHARACTER .... A number, letter or symbol as entered into a CNC program.

CHUCK .... The clamping system that holds the billet, driven by the spindle.

CIRCULAR INTERPOLATION ... G-code term for a programmed arc movement.

COMMAND .... A signal (or group of signals) instructing one step / operation to be carried out.

CONTEXT SENSITIVE .... When shortcut keys are used to call a Context Sensitive helpfile, the pages displayed relate directly to the current active elements within the software.

CO-ORDINATES .... Positions or relationships of points or planes. Co-ordinates are usually described using two numbers referring to the X and Z axes, eg. the co-ordinate X-14, Z-10 means -14 units along the X axis and -10 units along the Z axis.

CNC .... Computer Numerical Control.

CNC FILE .... The sequence of commands describing the manufacture of a part on a CNC lathe, written using G and M codes, also called the CNC program.

CUTTING SPEED .... The velocity of the rotating workpiece relative to the stationary cutting edge of the tool.

CROSS SLIDE .... The fixture that moves across the saddle (X axis) onto which the toolpost is mounted.

11: Glossary

CSS .... Constant Surface Speed. The spindle is automatically adjusted according to the diameter being machined, so that the material always passes the cutting edge of the tool at a constant rate.

CYCLE .... A sequence of events or commands.

DATUM .... The zero point (co-ordinate) from which a series of measurements are taken.

DESKTOP TUTOR .... The input control keypad for the machine. Keypad overlays are interchangeable according to the type of controller required. Replaces the qwerty keyboard and mouse.

DIRECTORY .... An area of a disk containing the names and locations of the files it currently holds.

DISK .... A computer information storage device, examples, C: (drive) is usually the computers hard (internal) disk and A: (drive) is usually the floppy (portable 3.5" diskette) disk.

DOS .... Disk Operating System.

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.

FEEDRATE .... The rate, in mm/min or in/min at which the cutting tool is advanced into the workpiece.

FILE .... An arrangement of instructions or information, usually referring to work or control settings.

FORMAT .... The pattern or way that data is organised.

FNL .... FANUC Lathe file, extension ".fnl". 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 (eg. a cutting operation).

GIB STRIP .... A metal or plastic strip, often tapered, that is attached to one edge of a slideway. Used to compensate for any free play that occurs in a slideway through wear.

HARDWARE .... Equipment such as the machine tool, the controller, or the computer.

HEX .... Hexagon shape, commonly used on bolts and accessed using a hex key. Sometimes referred to as allen bolts or allen keys.

HOME .... Operation to send the axes of the CNC lathe to their extreme limits of movement. Defines the machine datum, also called the home position.

11: Glossary

INCREMENTAL .... Incremental programming uses co-ordinate movements that are related from the previous programmed position. Signs are used to indicate the direction of movement.

INDEXING TOOLPOST ...... See programmable turret.

INPUT .... The transfer of external information (data) into a control system.

INTERFACE .... The medium through which the control/computer directs the machine tool.

M CODE .... A miscellaneous code function in a CNC program that determines an auxiliary function (eg. coolant on, tool change etc.).

MACHINE CODE .... The code obeyed by a computer or microprocessor system with no need for further translation.

MACHINE DATUM .... A fixed zero reference point, used to define the co-ordinate based grid system of the CNC lathe. All machining co-ordinates originate from this point.

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 lathe to ensure machining occurs in the correct place on the billet. Offsets shift the entire co-ordinate based grid system of the CNC lathe so the machine recognises our (moveable) workpiece datum as zero, rather than the (fixed) machine datum.

PART DATUM .... Used as a zero reference point in a CNC file. All machining co-ordinates originate from this point within the program. Commonly set at the centreline on the X axis and the face end of the billet on the Z axis.

PC .... Personal computer.

PROFILE .... The outside shape of an object. The term tool profile is used to describe the shapes of the different cutting tool tips.

PROGRAM .... A systematic arrangements of instructions or information to suit a piece of equipment.

PROGRAMMABLE TOOLPOST .. Area where cutting tools are held, also referred to as an automatic indexing toolpost, programmable turret or ATC (automatic tool changer). An 8 station programmable turret could hold a maximum of 8 tool profiles. The tool being used to machine the billet can be automatically changed for any other tool fitted to the programmable turret, using software or CNC commands.

SADDLE .... The fixture that moves along the bedways (Z axis) onto which the cross slide is mounted.

SPINDLE SPEED .... The rate of rotation (velocity) of the chuck, measured in RPM.

11: Glossary

SOFTWARE .... Programs, tool lists, sequence of instructions etc...

STATION .... The position of a tool profile in a programmable turret, eg. station 3 would refer to position number 3 on the programmable turret.

TOOL .... The interchangeable part of the machine that cuts the material. On automatic indexing toolposts cutting tools must be mounted facing down. On quickchange manual toolposts, cutting tools must be mounted facing up.

TOOL OFFSET .... When machining, allowances must be made for the different sizes of tools used. The tool offset is the amount the X and Z value must be moved (or offset), so that all the different cutting tool tips used with the same CNC program line up with each other against a common reference point.

TOOLPOST .... The area on the CNC lathe where tool profiles are held. Manual toolposts can only hold one tool at a time. An automatic indexing toolpost can hold a number of different tools and change between them automatically.

TRAVERSE .... Movement of the cutting tool through the 2 machine axes, between cutting settings.

TURRET .... See programmable toolpost.

TXT .... Standard Windows text only file, extension ".txt".

WORK (WORKPIECE) .... The actual material being machined. The work is sometimes referred to as the a "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.

WORD .... A combination of a letter address and digits, used in a CNC program (ie. G01, M03 etc.).

VIRTUAL REALITY .... A fully interactive, three dimensional, computer based simulation of a real world object or event.

12: Index

12: Index