

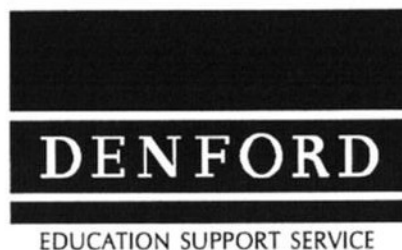
Denford



EDUCATION SUPPORT SERVICE

Lathe
CAM
Designer

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Lathe CAM Designer Users Manual

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1 Conventions used in this Manual

Underline

This is used to show key words. The full definition of these terms is given in Denny's Help Box.

Italics

Used to show menu and button selections. To pull down a menu move the pointer over the title and click once with the left mouse button. To select something from the menu move the pointer on to what is required, then click with the left button again. To select a button move the pointer over it and click once with the left mouse button.

[]

Square brackets contain any text that must be typed in.

[bold]

Square brackets with bold text show individual keys to press, e.g. [ENTER].

+

If a number of keys need to be pressed in sequence they are shown with plus signs.



This is used to show important notes.



This shows a right button mouse press.



This shows a left button mouse press.



2 Introduction



Introducing
Denny Denford

Denny's Help Box

"G-Code is a series of letters and numbers that make up the language used by CNC machinery"

"A billet is the piece of material you place in the lathe."

Lathe CAM Designer is a CNC design system which allows users to build up a turned component on screen, in a graphical environment. A file, in G-Code format, can then be produced automatically.

The design is created graphically by placing different styles of blocks together within a limited area. Each block, after being placed, can be manipulated to determine its exact size and shape. Lathe CAM Designer is co-ordinate based, allowing extremely accurate movements of the blocks by either; keyboard arrow keys or a mouse. A block may be deleted at any time.

A 'work area' is specified at the start of the program. This represents the billet size available in the lathe being used. No block can be placed or moved outside the work area, this acts as a safety feature whilst machining.



Introduction



Denny's Help Box

"Parted-off means to cut the finished work, from the remaining material with a special cutter."

Any design drawn can be drilled and parted-off.

Designs can be saved and loaded at any time, so a library of useful parts can soon be built up.

Lathe CAM designer has been developed to be as simple as possible to use. This, it is envisaged, will enable the use of CNC turning machines by a much wider range of ages and abilities than was previously practical. It will allow your CNC turning machine to be used as a 'everyday tool' rather than one reserved for special occasions.



3 Setting Up



Denny's Help Box

"A dialogue box is a box that appears in windows and allows you to input data."

Lathe CAM designer requires that your computer has:

- a hard disk,
- Windows version 3.10 or above installed,
- a minimum of 1 megabyte of memory.

Installation

Whilst running windows on your computer:

1. Insert the Lathe CAM Designer floppy disk into drive a:.
2. From program manager select run from the file menu.
3. A dialogue box will appear. Type in the command line box [a:install] and press [enter].
4. This will run the Denford install program. Simply pressing [enter] will install Lathe CAM



Setting Up

Designer on to your hard disk. It will also create a group window and place the Lathe CAM Designer icon in this group window.

Note.



It is recommended that you allow the Denford installation program to create its own directories and set up its default values. If you find these inconvenient, then feel free to alter them.

Denny's Help Box

"An icon is a small picture, displayed in windows, when you click twice on it the program associated with that icon will run."



Lathe CAM
Designers icon

"A group window is where a selection of icons can be stored together in the windows environment."



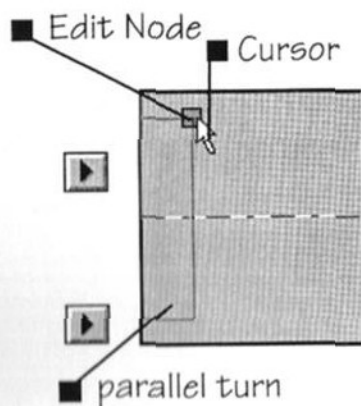
4 Quick Start




Denny's Help Box


"A parallel turn is when material is removed and the finished section is the same diameter along its length."

"An edit node is like a handle, you must click on with the cursor, which will allow you change the shape."



This section will enable you to become familiar with the features of Lathe CAM Designer. It will allow the user to 'get going', without referring to the reference section.


1. Run Lathe CAM by  on the Lathe CAM Designer icon. This will make the program run and display the start screen.

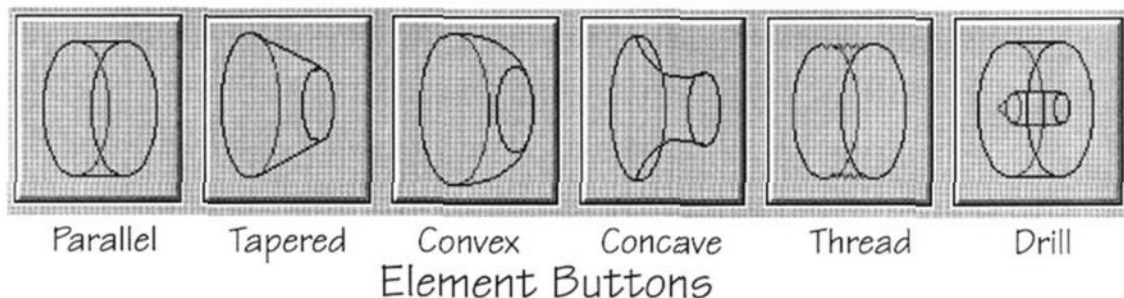
2. The start screen allows you to select the billet size, both the diameter and length. For now we will leave these as default values, so  on the 'OK' button.


3. You will now be presented with the design screen. The grey area represents the side of the work billet and the dashed line is the centre of the billet. The rectangle in the work area is the first element, a parallel turn. The green square is called the edit node (a green edit node identifies the selected element). You can alter this first, selected element by moving the cursor over the edit node pressing and holding the left mouse key and moving the mouse pointer.



Quick Start

4. New types of element may be added by  on the element buttons above the work area. Each new element be will placed to the right of the highlighted element.



5. Each element may be highlighted by clicking on its edit node once with the . The information about each element is given in the lower window. The icon in the information window shows you what type of element it is, the other data is numerical and gives the exact location and size of the element.



Quick Start

File
New
Open...
Save
Save As...
Print...
Printer Setup...
Alter Billet Size
Exit

Create G-code
Make file...
Set G-code parameters...
Set Lathe Tooling

6. Pressing [delete] on the keyboard will remove the highlighted element. To delete the whole drawing simply go to the new menu within the file menu.

7. When you have finished designing your shape, go to the make file section within create G-code menu. The code produced, is the code needed by your CNC turning machine to make your designed part.

8. The final step is to run your G- code on your machine and manufacture your part.

Note.

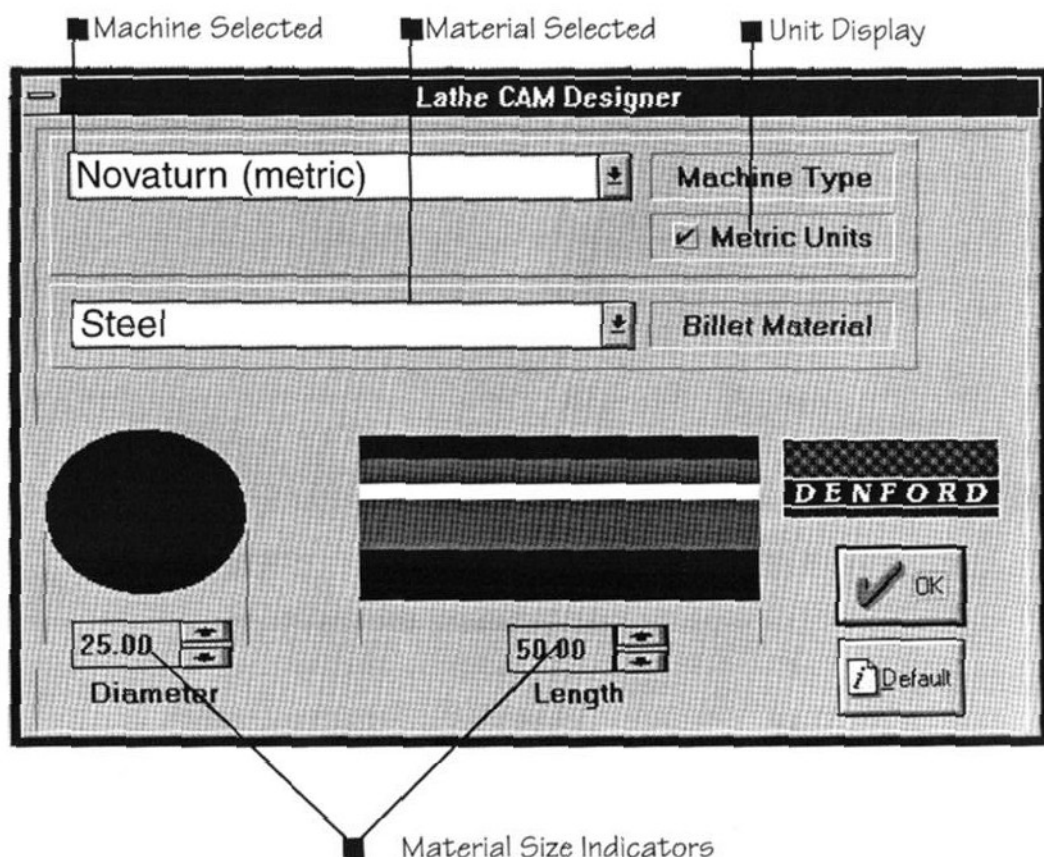


Most CNC turning machines are different in the way they read or load G-code instructions. Therefore no specific instructions can be given within this manual. Please check the machine manufacturer's manual for exact details.



5 Reference

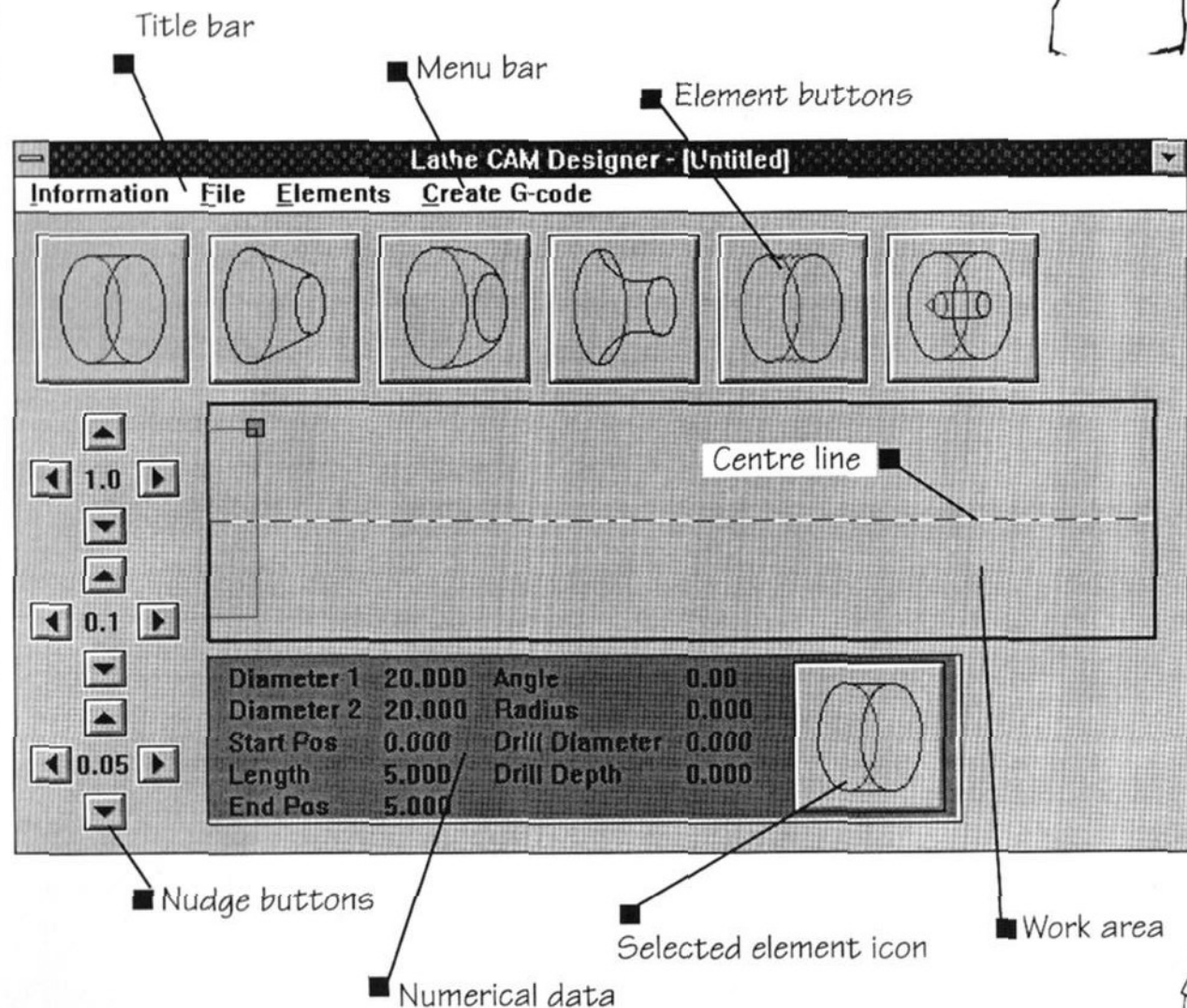
The material size screen appears when the program is started. From this screen changes to the selected Lathe, size and type of billet can be made.



Reference





Screen Layout



Reference

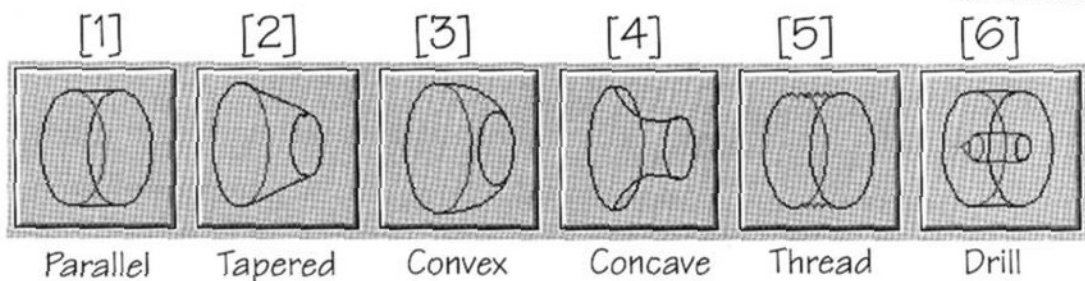
Work area: This is the area where the element blocks are placed and manipulated. The area represents the diameter and length of the billet. The dashed line shows the centre line of the billet.


Menu bar: Select the menu required using  and then select the item by using .

Title bar The title bar shows the name of the program 'Lathe CAM Designer' and the name of the file you are working on, if it has been saved.

Element buttons:

Short cut keys



There are 6 types of elements. They can be selected by:  on the button, using the short cut keys 1 to 6, or by selecting the element from the element menu:



Reference

Parallel: This will only allow you to draw a rectangle on the screen, representing a true cylinder with parallel sides. The diameters 1 and 2 will always be the same.

Tapered: This allows you to alter the diameter 2 of the cylinder, thus giving a cone shape. Diameter 2, the right hand diameter, may only be larger than diameter 1 by a small amount. The difference in diameters is restricted by the angle set within the LCD.INI file and is related to the back angle of your turning tools.
(See Advanced Setup)

Convex, Concave: These allow you to place radii on your work, which are restricted to 90 degree arcs.

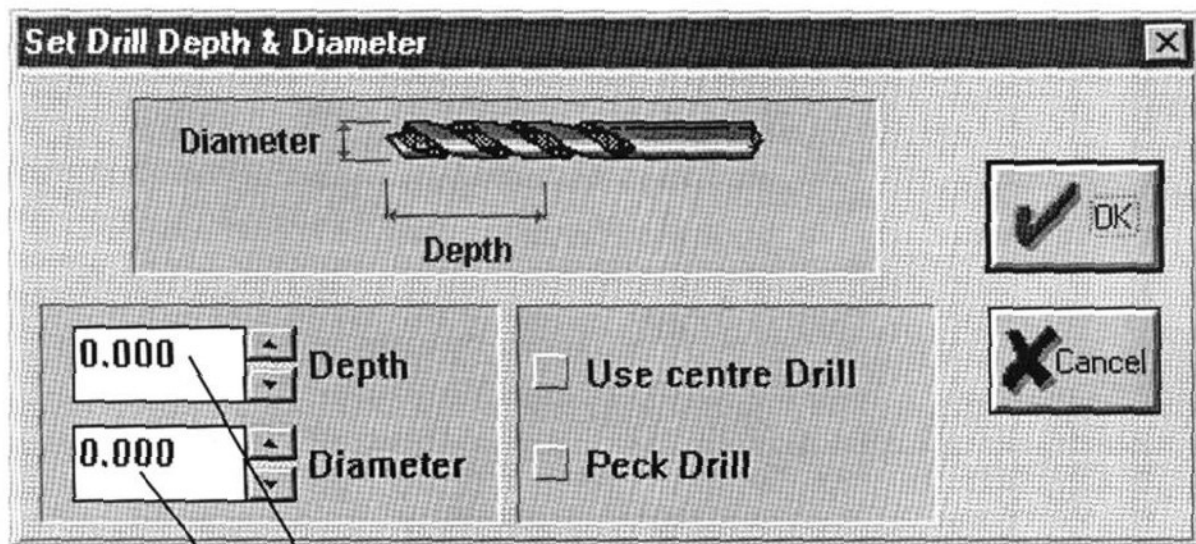
Thread: This allows you to place a thread on your design. You should ensure that the elements either side of the thread will allow the threading tool enough clearance (the program cannot detect how much clearance your machine will require). However, the program will automatically make an undercut to left of the thread. (if required see -Advanced Setup)



Reference

Drill: Once you have selected drill, a dialogue box will appear. The dialogue box will allow you to set both the diameter and the depth of a drilled hole.

Drilling dialogue box



Diameter box

Depth box

Peck Drill : During the drilling cycle swarf can build up in the drill flutes. This causes the drill bit to rise in temperature and wear prematurely. Peck cycle periodically withdraws the drill bit which helps to remove the build up of swarf.



Reference

Diameter 1	40.000	Angle	0.00	
Diameter 2	40.000	Radius	0.000	
Start Pos	0.000	Drill Diameter	0.000	
Length	5.000	Drill Depth	0.000	
End Pos	5.000			

Data Box

Select element icon: This icon shows what type of element is highlighted, the icon will look identical to the buttons used at the top of the screen. As you select different elements the icon will change.

Numerical data: This window shows the exact position and size of the selected element. Each heading means:

Diameter 1: The diameter of the left hand side of the element.

Diameter 2: The diameter of the right hand side of the element.

Start Pos: The absolute position of the left hand side of the element, measured from the left hand end of the billet.

Reference

Diameter 1	40.000	Angle	0.00
Diameter 2	40.000	Radius	0.000
Start Pos	0.000	Drill Diameter	0.000
Length	5.000	Drill Depth	0.000
End Pos	5.000		



Data Box

Length: The length of the element.

End Pos: The absolute position of the right hand side of the element measured from the left hand side of the billet.

Angle: This is the angle of the slope from diameter 1 to diameter 2. If the figure is negative then diameter 1 is smaller than diameter 2. The maximum negative angle is set by a value held in the file LCD.INI.


Radius: This will only have a value for convex and concave elements, and shows the radius of the arc on the highlighted element.













Drill diameter: This displays the drill diameter. It will be the same value that was entered when the drilling dialogue box was displayed.

Drill depth: This displays the drill depth. It will be the same value that was entered when the drilling dialogue box was displayed.



Reference

Nudge buttons: These allow very high accuracy when editing the shape of elements. You may use the  on the on screen buttons or use short cut keys. The short keys use the arrow keys plus other keys to obtain different degrees of accuracy.

Short cut keys	
	 1.0 
[ARROWS]	
	
	 0.1 
[ARROWS] + [SHIFT]	
	
	 0.05 
[ARROWS] + [CONTROL]	





If you use the combination [ARROWS] + [CONTROL] + [SHIFT] then you can nudge 0.001.



Reference

Create G-code
Make file...
Set G-code parameters...
Set Lathe Tooling

Create G-Code: This is a pull down menu that has 3 sub menu choices:

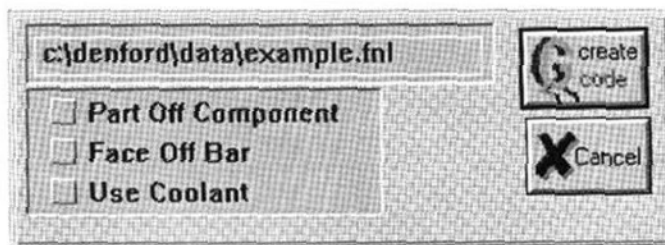
- make file: Selecting this option will prompt you to enter a file name that can be used to store your G-code under.(this will later be used to control your CNC turning machine). Once you have entered a valid filename and  on the 'OK' button, you see the generate G-code dialogue box, just  on the 'Create G-code' button. If you wish part off your component then you should first  on the 'part off component' tick box. If you wish to face off the component then  on the 'face off bar' tick box.

Denny's Help Box

Filenames

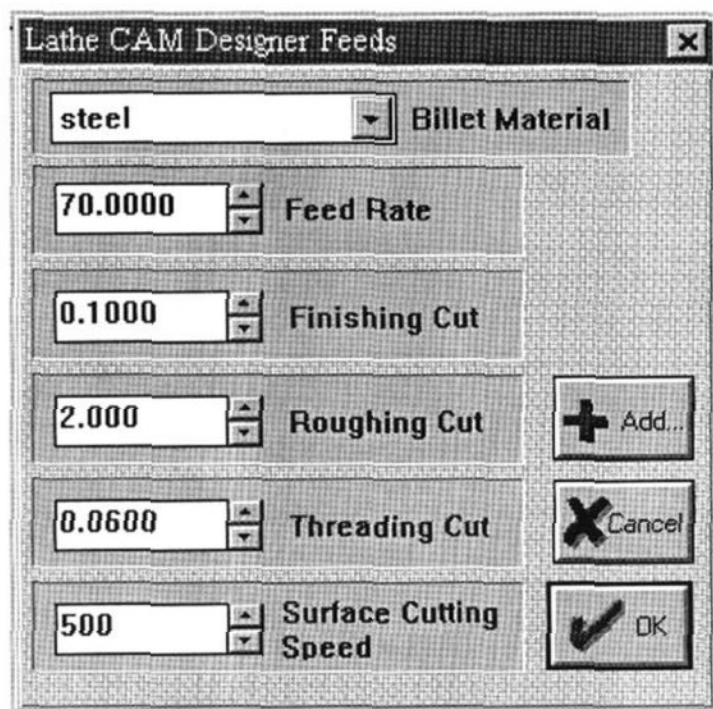
These are titles given to your saved files. They must not have more than eight characters, any spaces, or punctuation.

eg. lathecam



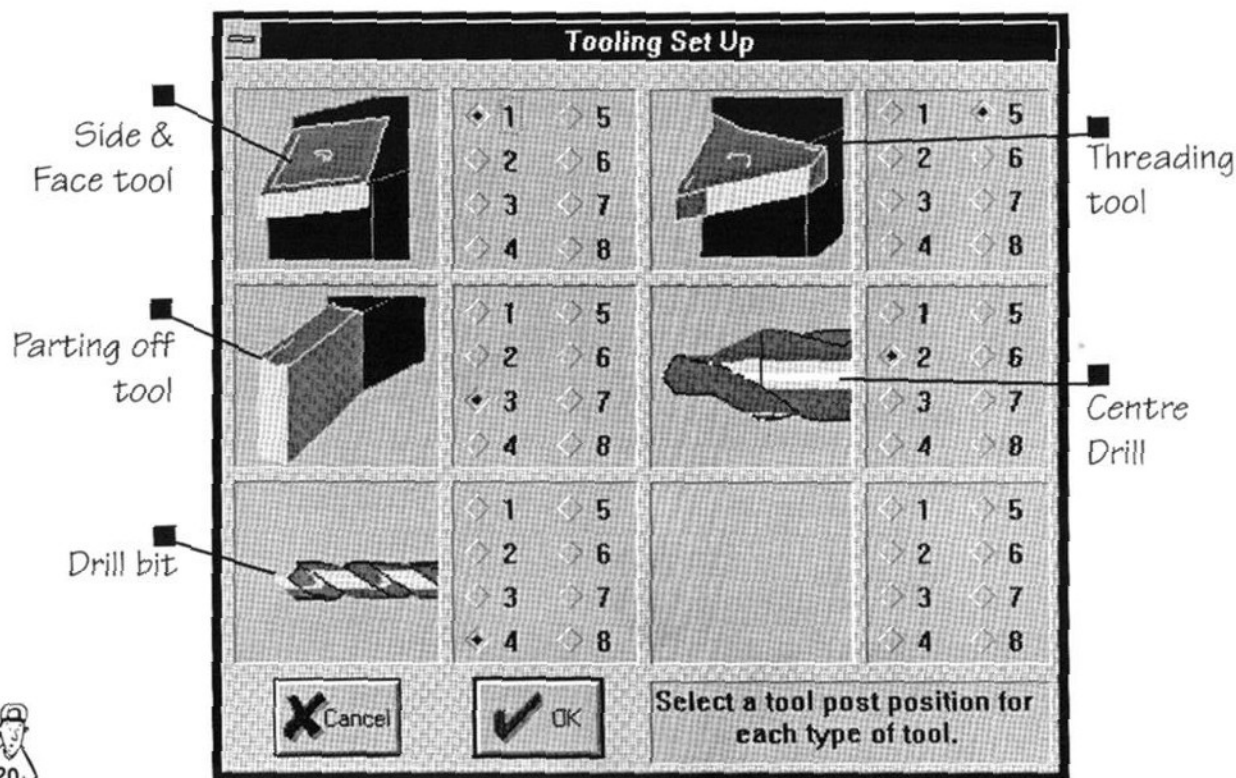
Reference

- **Set G-Code parameters:** This menu will select a dialogue box that will allow you to choose what sort of material you will be machining. You can select a material which will load cutting parameters appropriate for the material. These parameters can also be altered individually. These are feed rate, finishing cut, roughing cut and the surface cutting speed. For more information see Advanced setup.

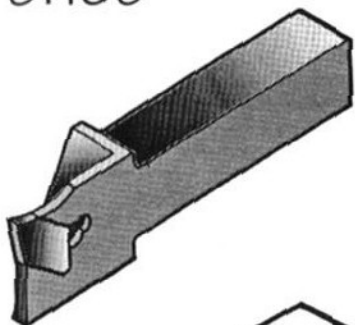


Reference

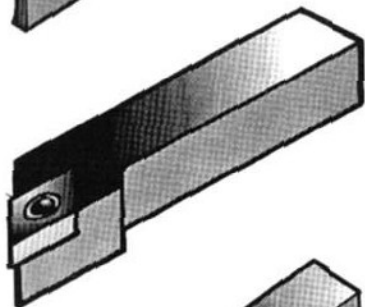
- **Set Lathe Tooling:** This menu will select a dialogue box that will allow you to match your CNC lathe toolpost numbers with the LatheCAM tooling setup, i.e. if tool 1 on the CNC lathe is a roughing tool, then tool 1 must be a roughing tool. This information is needed by the software so that when a tool change is required it can enter the correct number in the G-Code file.



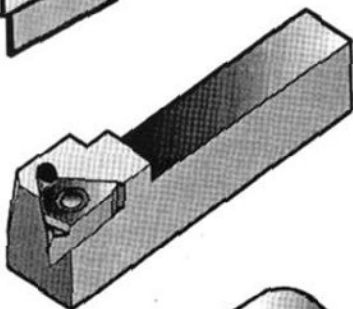
Reference



Parting tool- used mainly to remove work from the end of the billet, but on occasion it is used to make small undercuts



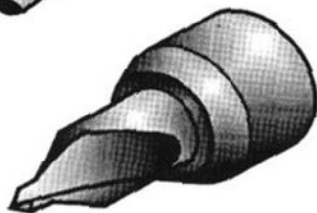
Roughing / Cutting tool - This is a right handed cutting tool. It is used on the outside of the billet and carries out the majority of the work.



Threading tool - The threading tool has only one function due to its sharp steeply angled cutting edge. This tool is able to create many different depths of thread.



Drill - The drill is used to make holes in the centre of the billet. The drill bits are available in a variety of lengths and widths. On a lathe the drill bit remains stationary as the billet revolves.



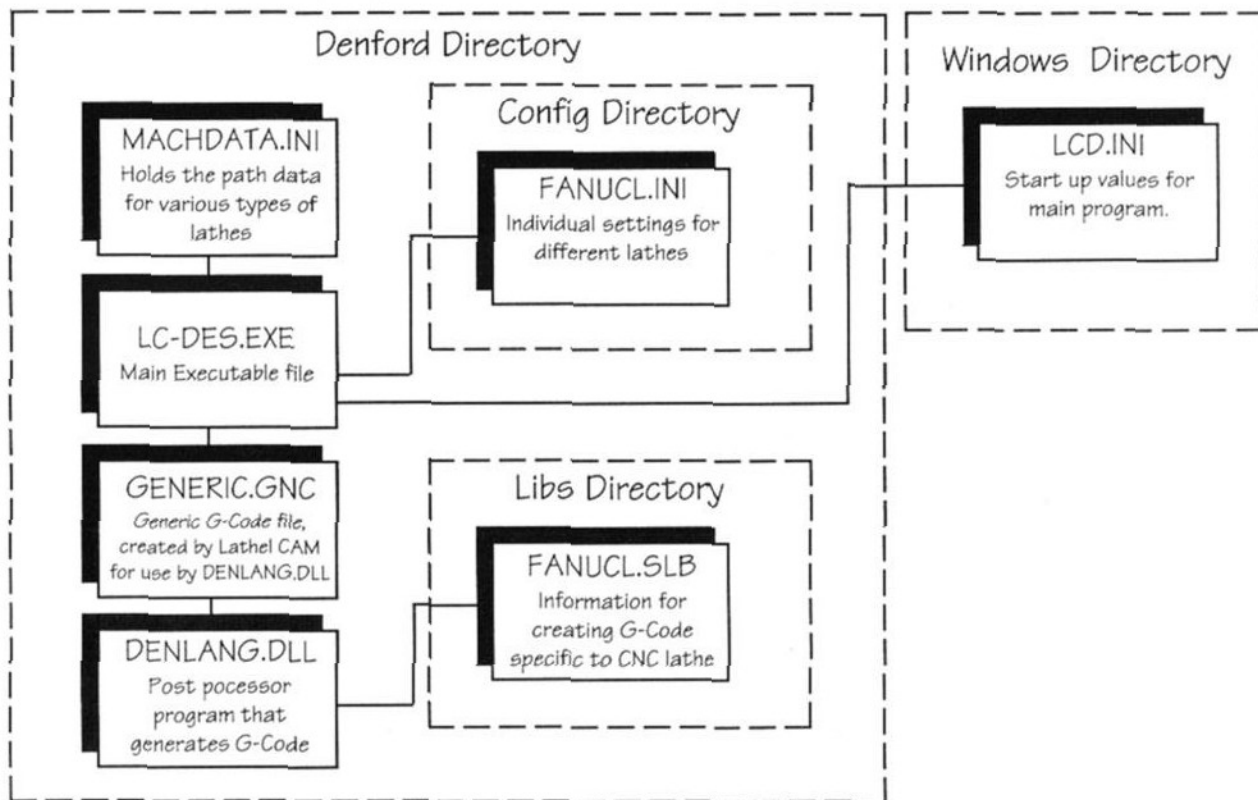
Centre Drill - This is a small rigid drill bit that has the function of making a small pilot hole. This guides the main drill bit to the centre of the billet.



6 Program Structure

Lathe CAM Designer uses and creates several files while it is running. The diagram below shows the position and function of these files.

Position and purpose of the main Lathe CAM Designer files



7 Advanced Program Setup

All of the program features are setup automatically by the installation program. It is possible to alter some program settings manually, to suit your particular needs. The program default values are stored in the file LCD.ini. This can be found in your windows directory. The following is an example of the file and a description of the contents.

[Settings]

diameter=25

length=50

material type=Steel

Machine=Starturn PC (metric)

Graphics Speed=1

Parting Feed rate %=50

-Most recently used material diameter.

-Most recently used material length.

-Most recently used material type.

-Most recently used machine.

-The speed at which the G-codes are generated

-The feed rate at which the parting tool advances

(This is a percentage of the cutting tool feed rate)

[Path data]

Gnc name=C:\denford\data\GENERIC.GNC

Lcd files=c:\denford\data\

g-code files=c:\denford\data\

-A temporary file generated by Lathe Cam

-Lathe Cam Designer files directory

-G-code files directory

[Materials]

Steel=120

Steel English=120

Brass=100

Plastic=300

Wax=500

Aluminium=170

These are the maximum cutting speeds for specific materials. The cutting speed is variable dependant on material type and the diameter of the billet



Advanced Program Setup

[Feed Rates]

Steel=70.00
Brass=140
Plastic=250
Steel English=2.3
Wax=300.00
Aluminium=140.00

Feed rates are how fast the tool moves through the material in mm per minute.

[Finish cut]

Steel=0.1000
Steel English=0.0200
Brass=0.5
Plastic=0.5
Wax=0.5000
Aluminium=0.5000

Finish cut, this is the amount of material left before the finishing cut

[Roughing cut increment]

Steel=2.0000
Steel English=0.08
Brass=3
Plastic=4.00
Wax=4.0000
Aluminium=3.0000

These values are the maximum amounts taken out in any roughing cut.

[Thread cut increment]

Steel=0.06
Steel English=0.08
Brass=0.06
Plastic=0.0.06
Wax=0.0880
Aluminium=0.0600

The maximum amount the tool removes on any single pass.



Advanced Program

Setup

[Thread]

pull out angle=60

Thread angle=60

Finish allowance=0.03

Thread Undercut=2

-Angle at which threading tool leaves billet

-Pitch of the thread

-Material left before the final cut

-Specifies which thread undercut you require



Thread Undercut options

[0] No undercut

[1] A small section of thread is removed at the end of the thread

[2] A piece of material is removed before the thread has been cut

[3] Material is removed from the thread and the workpiece

To gain access to the undercut options use a text editor and open the LCD.ini file. Undercut options are placed under [settings]
e.g. Thread Undercut=1



8 Glossary of Terms

Arc	Portion of a circle.
Centre Drill	A rigid drill bit used to make a hole which will guide the main drill.
CNC	(Computer Numeric Control). A system or machine that is controlled by a computer
Default Settings	Restore the machines initial settings.
Floppy Disk	A storage device for a computer. It can be removed and used to transport data.
Face off Bar	Takes rough edges off the end of the billet.
Hard Disk	A storage device for a computer. It cannot normally be removed from the computer, it is very fast and can hold a large amount of data.
Memory	The place where the computer stores data internally.
Part off Component	Cuts work area from the billet.
Roughing cut	Centres billet and removes the bulk of the material to make the approximate profile of the design, leaving enough material for the finishing cut.



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