

# Cyber Mill

## Bench-top personal CNC system 35-005

### ISO FORMAT PROGRAMMING

Supports the most widely used G and M codes.

### POST PROCESSOR

DXF and HPGL files from CAD packages automatically convert to G and M codes.

### GRAPHICAL SIMULATION

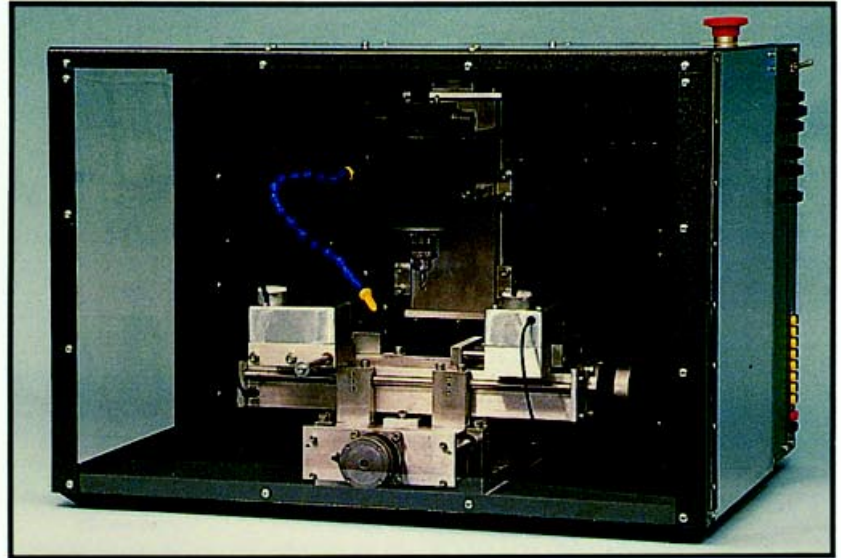
Before cutting, the program may be checked by running it either on-line or off-line.

### PEN ADAPTER

Plotter pen with adapter for the chuck for drawing the part before cutting.

### MOTORISED VICE

Programmable, motorised vice and parts centralisers are included to facilitate loading and un-loading by robot.



The Cyber Mill is a miniature bench-top machine-tool trainer which is operated from a personal computer and provides an excellent and economical introduction to ISO format programming using industry-standard G and M codes.

Working with a cutter with a diameter of up to 6.5mm, re-cyclable wax, plastics, engraving

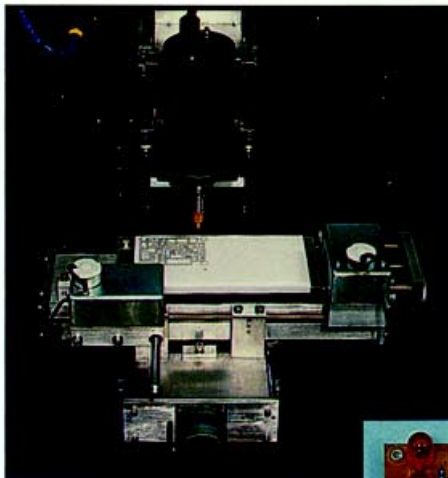
material, printed circuit boards and aluminium may be cut cleanly and accurately.

Each door has a safety interlock.

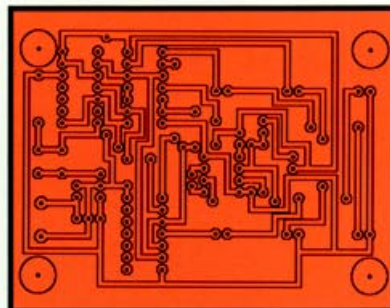
The motorised vice and parts centraliser operate under program control for automatic loading and unloading by robot and the software includes provision for operating in a

robotic work-cell.

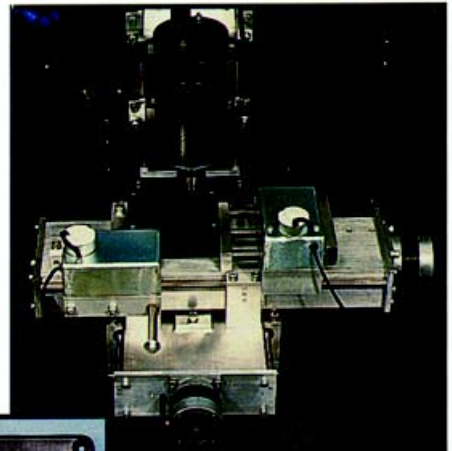
Included in the software is a post processor to allow manufacture of Computer Aided Designed (CAD) components. AutoCAD, AutoSketch and other packages that produce DXF or HPGL output may be used to supply designs to be cut.



Checking the PCB using the drawing table with plotter pen and pen adapter before cutting round the tracks.



Routing around the tracks of a PCB used in a student project.



Cutting out the lid for the box that houses this project.



A completed electronic die. This is included as one of the student exercises in the manual and all files required for its making are supplied with the Cyber Mill.

Also Included in WALLI for Windows is a post-processor for the Gerber files which define the tracks on a PCB (printed circuit board) and originate from all PCB design packages such as Quickroute, EasyPC etc.

These files are converted into G and M code which enables the mill to use an engraving cutter to cut round the tracks of the PCB thereby avoiding the use of chemicals for etching.

The drilling files from the PCB design packages are also converted into G and M code with suitable drilling depth for the PCB to be drilled rapidly and accurately.



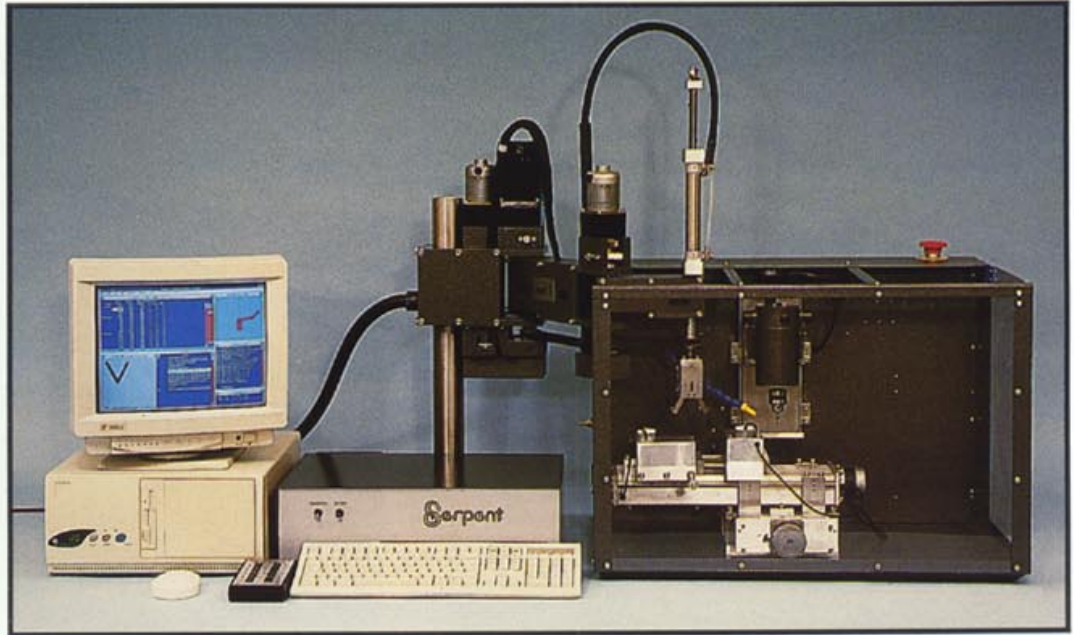
# G and M Codes

- G00 Rapid positioning: point to point
- G01 Linear interpolation
- G02 Circular interpolation Arc CW
- G03 Circular interpolation Arc CCW
- G04 Dwell
- G05 End subroutine
- G06 End loop
- G28 Subroutine start
- G36 Face milling cycle
- G38 Pause for input
- G39 Set output
- G65 Call subroutine
- G70 Imperial
- G71 Metric (default)
- G73 Loop cycle
- G81 Drilling cycle
- G82 Drilling cycle with dwell
- G83 Loop cycle
- G90 Absolute programming
- G91 Incremental programming
- G92 Set Zero Datum
- G98 Configure engrave
- G99 Engrave text
  
- M00 Program stop
- M02 End of program
- M03 Spindle CW
- M04 Spindle CCW
- M05 Spindle OFF
- M08 Swarf blaster ON
- M09 Swarf blaster OFF
- M68 Clamp workpiece
- M69 Unclamp workpiece

# SPECIFICATION

<b>X TRAVEL (left-right)</b>	200mm
<b>Y TRAVEL (front-back)</b>	100mm
<b>Z TRAVEL (vertical)</b>	75mm
<b>SPEED</b>	8mm/sec maximum
<b>MECHANICAL RESOLUTION</b>	0.0075mm
<b>PROGRAMMING RESOLUTION</b>	0.1mm
<b>JOG BUTTONS</b>	2 speed 0.01mm resolution
<b>SPINDLE MOTOR</b>	140W with switch-mode controller
<b>SPINDLE SPEED</b>	0-4500rpm (9 speeds)
<b>CHUCK</b>	6.5mm capacity

<b>DIMENSIONS</b>	710mm width 536mm depth 490mm height
<b>CONTROL SYSTEM</b>	Internal micro-processor
<b>WORKCELL INTERFACE</b>	Digital outputs 8 Digital inputs 8
<b>SWARF BLASTER</b>	Air operated - requires compressed air at 3-8 bar
<b>MOTORISED VICE</b>	
<b>PRESSURE</b>	100N
<b>STROKE</b>	50mm
<b>PARTS CENTRALISER</b>	
<b>PRESSURE</b>	100N
<b>STROKE</b>	100mm



Before machining a new design, it is reassuring to have checked it out carefully by simulation.

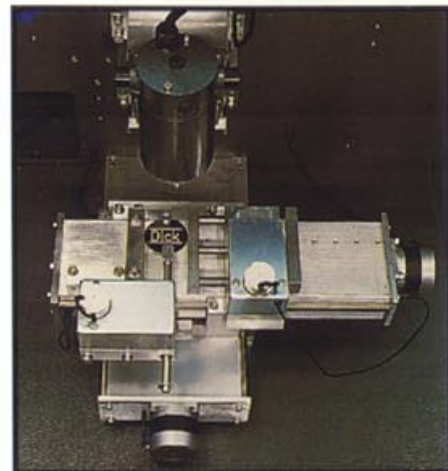
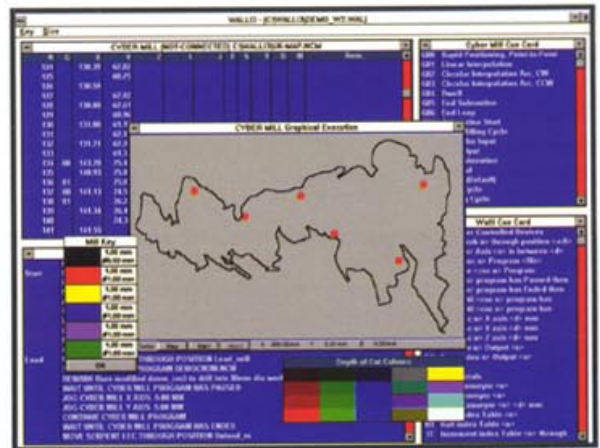
The first simulation is on the screen and a graphics window is available to run the displayed CNC program.

After defining the size of the blank that is to be cut, the graphics may be single stepped or run through to completion. A TURBO button allows

the finished part to be seen directly.

A further check is to run the plotter pen simulation. A drawing table is provided with the mill. Onto this is clipped a sheet of paper and the plotter pen with the adapter, which is also provided, is fitted into the chuck.

Selecting Draw from the Run Menu allows the cutter route, for a specified depth, to be drawn on the paper.



A clean and inexpensive means of demonstrating CNC machining is the cutting of engraving material. The 3mm thick plastic is a sandwich of three coloured layers.

Cutting through an outer layer reveals the core in a contrasting colour.

The text or design can be prepared with either a CAD or a drawing package. The finished design is then saved as a DXF or HPGL file

(a standard feature in Windows programs).

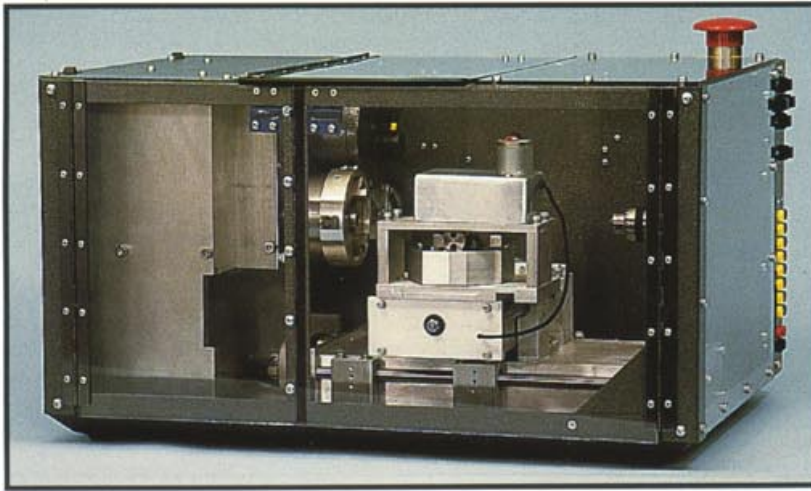
When the DXF or HPGL file is imported by WALLI for Windows, G and M code is automatically generated. This may then be used for engraving signs, name-plates key identification discs etc.

Additionally WALLI for Windows has its own text generator which is accessed by use of special G codes G98 and G99.



# Cyber Lathe

## Bench-top CNC training lathe 35-006



The Cyber Lathe is a miniature bench-top machine-tool trainer which is operated from a personal computer and provides an excellent and economical introduction to ISO format programming using industry-standard G and M codes.

A variety of materials including, aluminium, re-cyclable wax, wood and plastics may be cut cleanly and accurately.

The motorised chuck operates under program control for automatic loading and unloading by robot and the software includes provision for operating in a robotic work-cell.

The automatic tool changer is fitted with two tools. In the clockwise position the left tool is

in place to cut profiles and square edges on its right side. In the other position the left tool will cut profiles and square edges on its left side. In this position the right tool, is in place to perform thread cutting.

"Wizards" are provided to simplify entry of code for roughing out and for thread and arc cutting.

Also included in the software is a post processor to allow for the manufacture of Computer Aided Designed (CAD) components. AutoCAD, AutoSketch and other drawing packages that produce DXF or HPGL output may be used to supply designs to be cut.

Safety interlocks are fitted to each of the doors.

### ISO FORMAT PROGRAMMING

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### POST PROCESSOR

DXF and HPGL files from CAD packages automatically convert to G and M codes.

### GRAPHICAL SIMULATION

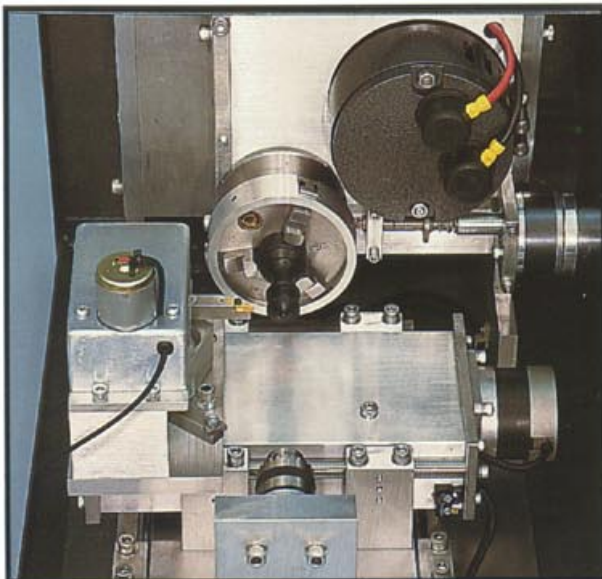
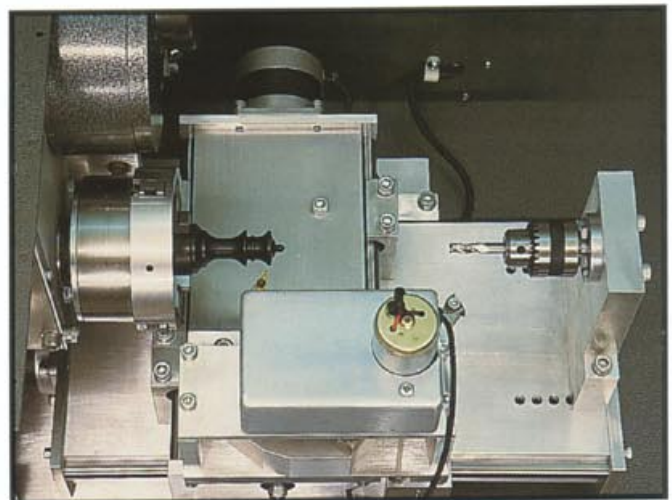
Before cutting, the program may be checked by running it graphically either on-line or off-line.

### AUTOMATIC TOOL CHANGER

Fitted with 2 cutting tools. Choice of 3 cutting edges for turning and thread cutting.

### MOTORISED CHUCK

Programmable, motorised chuck is included to facilitate loading and un-loading by robot..



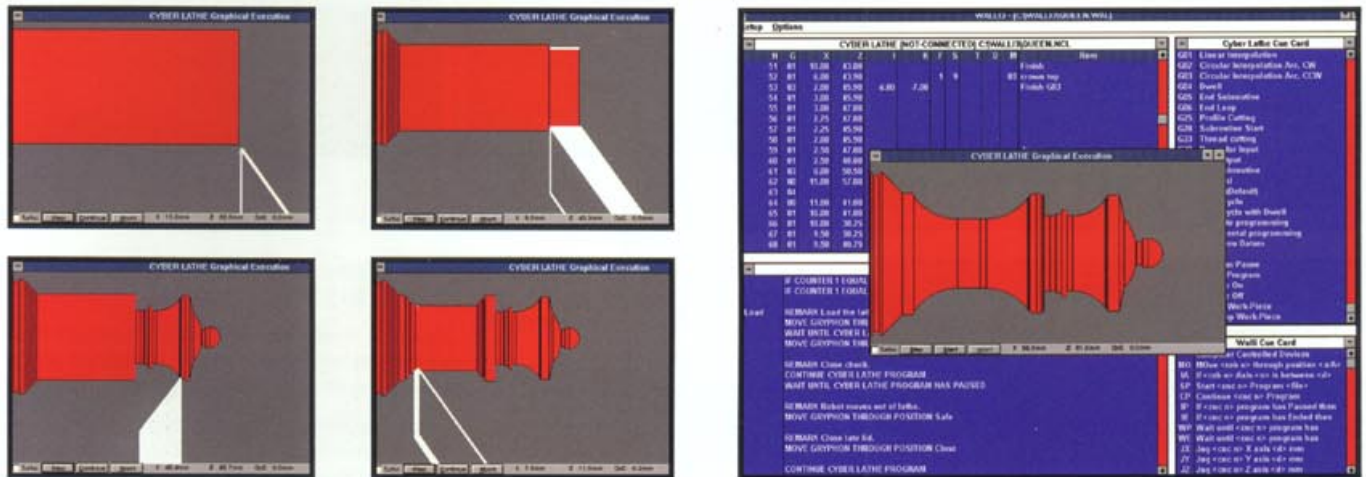
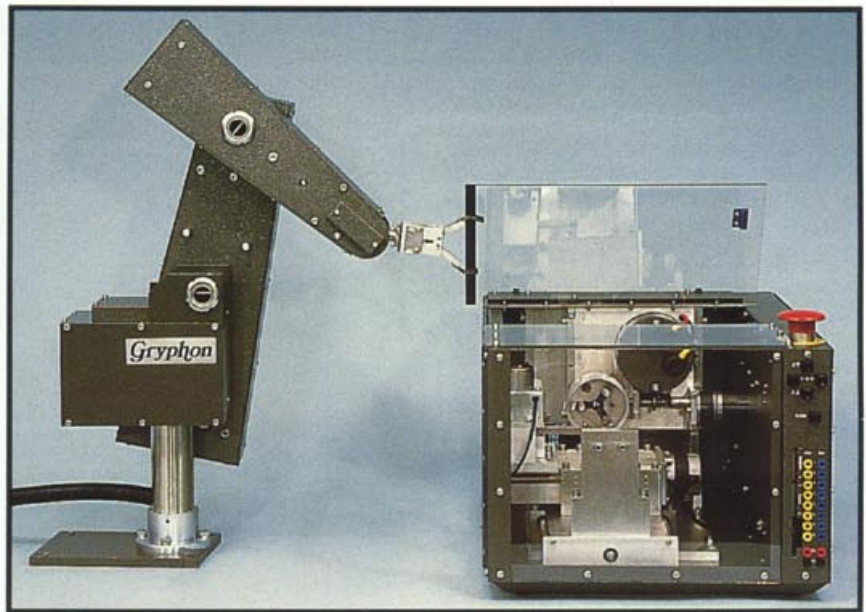
## G and M Codes

<b>G00</b> Rapid positioning: point to point	<b>G71</b> Metric (default)
<b>G01</b> Linear interpolation	<b>G73</b> Loop cycle
<b>G02</b> Circular interpolation Arc CW	<b>G83</b> Peck cycle with dwell
<b>G03</b> Circular interpolation Arc CCW	<b>G90</b> Absolute programming
<b>G04</b> Dwell	<b>G91</b> Incremental programming
<b>G05</b> End subroutine	<b>G92</b> Shift Zero Datum
<b>G06</b> End loop	
<b>G25</b> Profile cutting	<b>M00</b> Program stop
<b>G28</b> Subroutine start	<b>M02</b> End of program
<b>G33</b> Thread cutting	<b>M03</b> Spindle ON
<b>G38</b> Pause for input	<b>M05</b> Spindle OFF
<b>G39</b> Set output	<b>M68</b> Clamp workpiece
<b>G65</b> Call subroutine	<b>M69</b> Unclamp workpiece
<b>G70</b> Imperial	



# SPECIFICATION

Z TRAVEL (left-right)	150mm
X TRAVEL (front-back)	60mm
SPEED	8mm/sec maximum
MECHANICAL RESOLUTION	0.0075mm
PROGRAMMING RESOLUTION	0.01mm
JOG BUTTONS	2 speed 0.01mm resolution
CHUCK MOTOR	300W with switch-mode controller
CHUCK SPEED	0-2000rpm (8 speeds)
CHUCK	30mm capacity
TOOL CHANGER	2 positions 35° apart
TOOLS	11mm Vee 35° 60° thread cutter 6mm end mill
DIMENSIONS	589mm width 433mm depth 315mm height
CONTROL SYSTEM	Internal micro-processor
WORKCELL INTERFACE	Digital outputs 8 Digital inputs 8



Before machining a new design it is highly desirable to confirm that the design is correct and that it is possible to make it. This can be readily achieved by graphical simulation.

After defining the size of the blank that is to be cut, the graphics may be single stepped or run through to completion. A TURBO button allows the finished part to be seen directly.

During cutting, both the path of the tool and the material being removed during that cut are displayed upon the screen.

# COMPUTER INTERFACE BOARD

## RJ45 INTERFACE BOARD

To operate any active device (robot, mill, lathe or expander box), an interface board must be fitted to the controlling computer.

One board is all that is necessary to control a complete system of up to eight active devices.

The RJ45 interface board plugs into one of the expansion slots of the computer (ISA standard type as used in all computers capable of running WINDOWS).

Typically a 2m lead, fitted with RJ45 type plugs, is taken from the board to the first robot and 1m leads are then used to link the other devices in a daisy chain.

### SPECIFICATION

I/O MAPPED AT	220h (default)
JUMPER SELECTABLE TO	260h, 2A0h, 2E0h 320h, 360h, 3A0h
TRANSMISSION SPEED	2Mbit/sec
DATA TYPE	Serial on 4 twisted pairs

