DENFORD

COMPUTERISED MACHINES AND SYSTEMS

FANUC OM
(Offline Milling)
Programming
Manual
- DOS version

INTRODUCTION.

FANUC offline software is a very powerful Educational and Industrial system used for teaching the principles of CNC (Computer Numerically Controlled) Machine Tool operation and G and M code programming techniques.

In Education, students can learn to program CNC Machine Tools at the computer and prove their CNC programs using animated simulations of the cutting path.

In Industry, the ability to prove out CNC part programs away from the actual machine in a clean and quiet environment and store CNC Files on disk media has many obvious advantages.

Additionally, the use of the CNC Desktop Tutor overcomes the problems of group training by offering true MDI (Manual Data Input) programming at a computer rather than a machine.

USING THIS MANUAL.

This manual covers both the qwerty keyboard and the Desktop Tutor versions of the offline software.

Each section contains combined information on the keys required for both packages - see the next page.

Choose the relevant keys according to the package being operated.

Areas that are included for a specific package are also clearly marked.

CONVENTIONS USED IN THIS MANUAL.....

Coventions used in this manual follow this format :

For qwerty keyboard operation :

{.....} - Text enclosed by braces show the individual qwerty keyboard keys to press.

For example, {Escape} means press the "Escape" key.

For example, {Ctrl-F1} means press the "Ctrl" key and the "F1" key at the same time.

For example, {F5} {Escape} means press the "F5" key, then press the "Escape" key.

For Desktop Tutor operation :

[.....] - Square brackets with text show the individual Desktop Tutor keys to press, for example, [EDIT] means press the Tutor pad "Edit" key.

Additionally, any section involving use of the Desktop Tutor contains the Desktop Tutor graphic, as shown below. The keys required to complete each particular section are highlighted in grey. For example....

Desktop Tutor Keys Helpbox.
The following keys are used in this section:
[CURSOR ARROWS]
[EOB], [RESET]
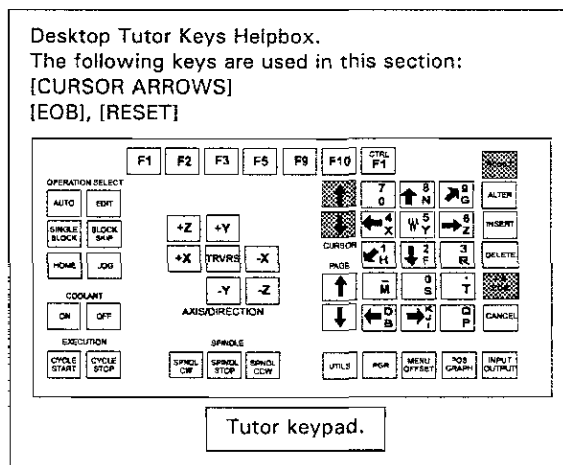
Tutor keypad.

The helpbox above would show that the [CURSOR ARROWS], [EOB] and [RESET] tutor keys are used at some point during that particular section.
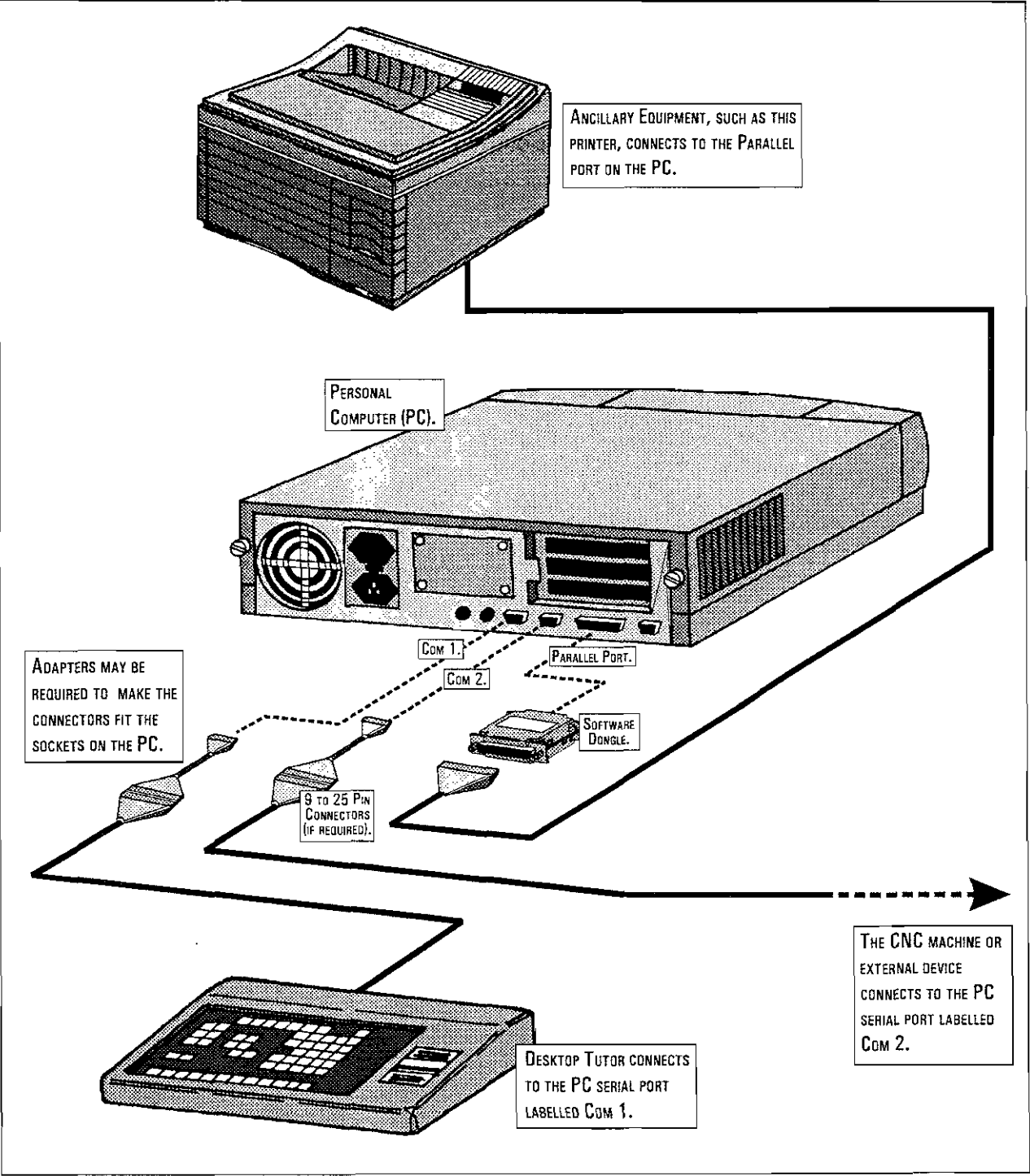
Common elements :

Italics. - Italics are used to show menu and text selections within the software.

Sections in the manual can be easily located using the indexing captions in the bottom corner of each page.

HARDWARE REQUIREMENTS.

- IBM PC, XT, AT and all 100% compatible computers.
- Standard 3.5 inch floppy drive.
- CGA, EGA, VGA graphics.
- Serial port (for Desktop Tutor connection).
- Serial port (for machine or external device connection).
- Parallel port (for security dongle).

Hardware
Connections.

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

Personal Computer (PC).

Adapters may be required to make the connectors fit the sockets on the PC.

Com 1.

Com 2.

Parallel Port.

Software Dongle.

9 to 25 Pin Connectors (if required).

The CNC machine or external device connects to the PC serial port labelled Com 2.

Desktop Tutor connects to the PC serial port labelled Com 1.

SOFTWARE INSTALLATION.

Both the qwerty keyboard and the Desktop Tutor offline software packages are contained on one 3.5 inch floppy disk each.

Note, although the pc keyboard is used to install both software packages, when the Desktop Tutor offline software is run, the pc keyboard will be disabled.

To install from a "DOS" prompt :

1) Insert the disk into the floppy drive, this is usually labelled as *A:*

2) Change to that drive letter, ie, type *A:* and press {Enter}.

3) Type *install* and press {Enter}.

4) Follow the on-screen instructions.

To install using "Windows 3.x" :

1) Insert the disk into the floppy drive, this is usually labelled as *A:*

2) In the "Program Manager", click "File" on the top menu bar, then select "Run" from the drop-down menu.

3) Type *A:install* in the dialog box and click "OK".
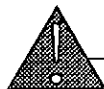
4) Follow the on-screen instructions.

To install using "Windows 95" :

1) Insert the disk into the floppy drive, this is usually labelled as *A:*

2) To view the contents of the disk, double-click the left mouse button on, first "My Computer", then "3 1/2 floppy (A:)".

3) Double-click the left mouse button on the Install file :

Install.exe

4) Follow the on-screen instructions.

Important -
Make backup copies of your disks and place the master copies in a safe dry location.

The following keys perform no functions when used with the offline software:

1) Operation Select [AUTO]

2) Operation Select [HOME]

3) Operation Select [JOG]
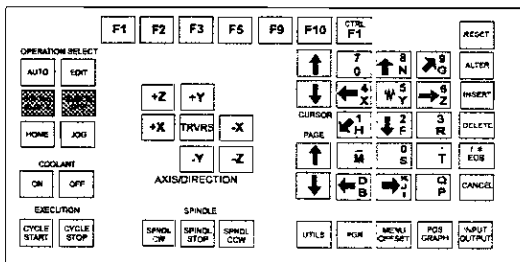
4) Coolant [ON]

5) Coolant [OFF]

The [EDIT] key can be used to directly access the *Edit and Simulate* screen display.
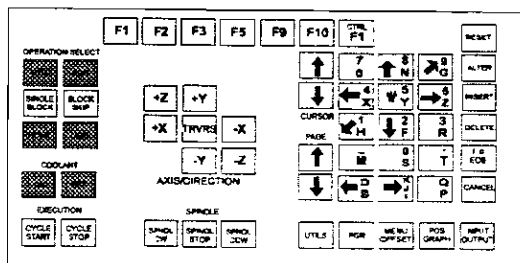
Tutor keypad.

The [SINGLE BLOCK] key is used to run a program in single blocks (ie, line by line).

The [BLOCK SKIP] key is used select the option to ignore, or include, specific program blocks (activated by a "/" character in front of the block).

Tutor keypad.

The [CYCLE START] key is used to:

1) Simulate any program currently loaded.

3) Resume a program which has been paused.

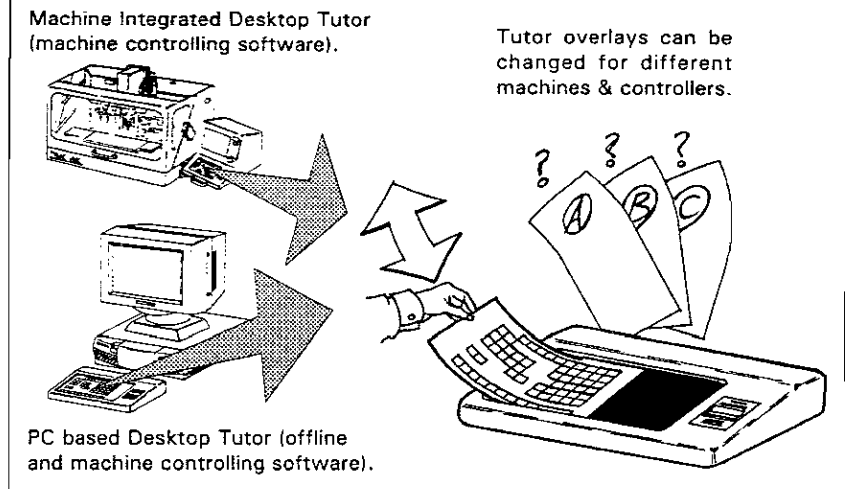The [CYCLE STOP] key is used to:

1) Stop a program currently running.

2) Pause a program currently running.
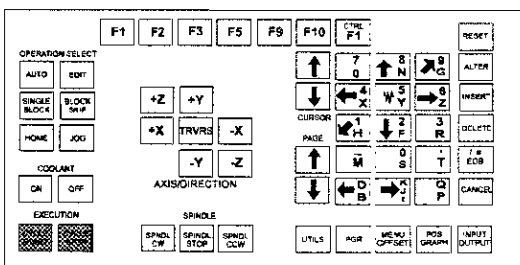
Tutor keypad.

OPERATING THE DESKTOP TUTOR CONTROL PANEL.

Machine Integrated Desktop Tutor (machine controlling software).

Tutor overlays can be changed for different machines & controllers.

PC based Desktop Tutor (offline and machine controlling software).

The Denford Desktop Tutor is the keypad input controller, equivalent to the qwerty keyboard on a pc. They are ideal for offline training and programming purposes since the Desktop Tutor is also used for MDI (manual data input) on the Denford series of CNC milling machines. Desktop Tutors are also fully flexible, since their overlays are interchangeable, according to the type of CNC machine and control method required.
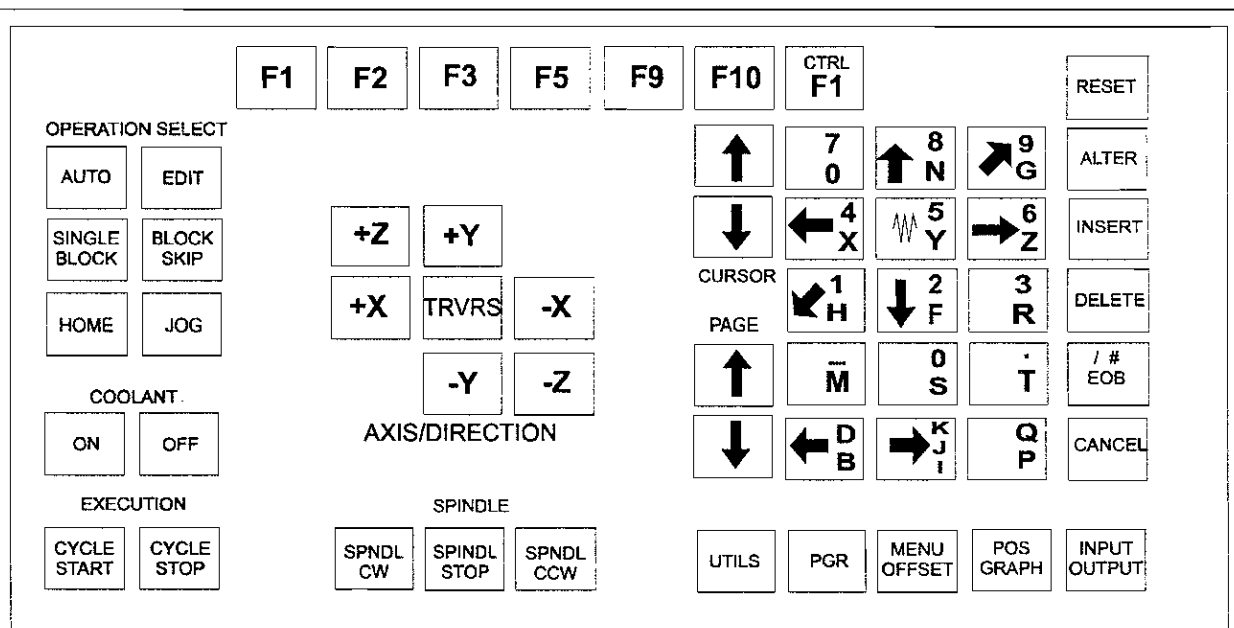
This section explains the uses of keys applicable to the offline software, on the Denford FANUC milling keypad controller overlay shown above.

The following keys perform no functions when used with the offline software:

1) Axis/Direction [+X]

2) Axis/Direction [-X]

3) Axis/Direction [+Y]

4) Axis/Direction [-Y]

5) Axis/Direction [+Z]

6) Axis/Direction [-Z]

7) Axis/Direction [TRVRS]

8) Spindle [SPNDL.CW]
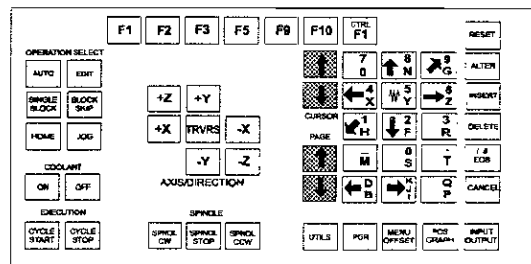
9) Spindle [SPNDL.STOP]

10) Spindle [SPNDL.CCW]
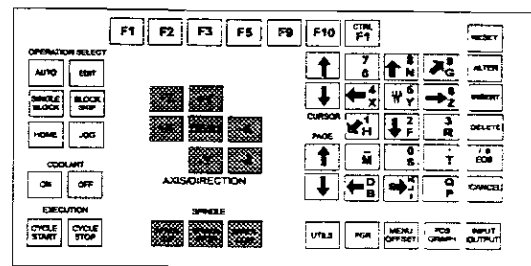
Tutor keypad.

The blue [CURSOR ARROWS] keys are used to:

1) Move up or down lines on purple Menu Selection screens.

2) Move up or down text lines when editing programs.

The blue [PAGE ARROWS] cursor keys are used to:

1) Move between the top and bottom lines of purple Menu Selection screens.

2) Move up or down between the pages of a program.

Tutor keypad.

The [ALPHA/NUMERICAL] keys are used to enter characters and numbers used in program data.

Multi-character keys will toggle between the characters shown according to the number of times the key is pressed.
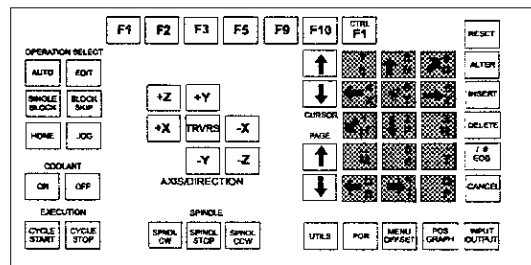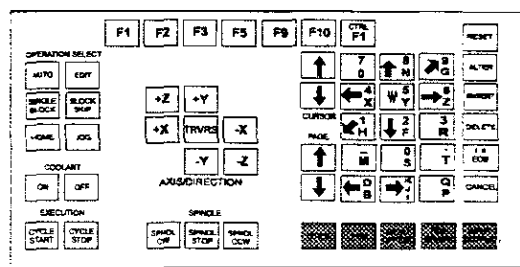
Tutor keypad.

The [UTILS] key is used to display any directives within a program, shown on screen as *[YELLOW LINES]*. Directives are Denford definitions for tool sizes, billet sizes etc....

The [PGR.] key is used to toggle between these screen modes: *Simulate Only*, *Edit only* or *Edit and Simulate*.

The [INPUT OUTPUT] key is used to select the *Remote Device Link Menu* (this menu allows data to be sent or received from external devices).

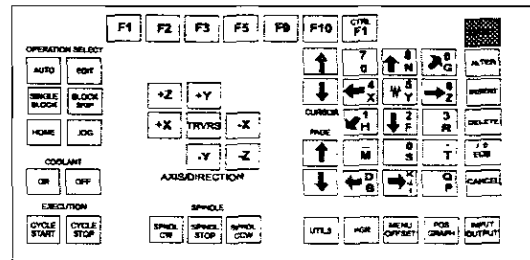The following keys perform no functions when used with the offline software:

1) [MENU OFFSET]

2) [POS. GRAPH]

Tutor keypad.

The [RESET] key is used to:

1) Move back through any menu screens accessed, one by one, until the highest (start) level is reached.

2) Clear any red warning or error messages from the screen.

3) Move to the top of a program.

Tutor keypad.

The [EOB] key is the 'End of Block' command, used to signify the end of sequence of events or to confirm choices within the software. It is the equivalent of the {Return} or {Enter} key on a pc.
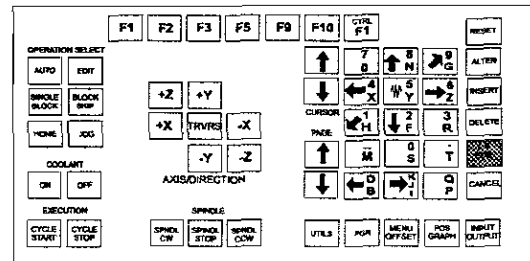
Tutor keypad.

The [ALTER] key is used to:

1) Change any words (made from an address letter and a number) in a program line.

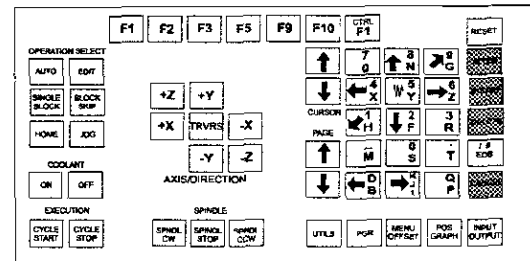2) Delete information in a text entry box/ window (ie, load/save boxes).

The [INSERT] key is used to place a word into a program line.

The [DELETE] key is used to:

1) Remove a word from a program line.
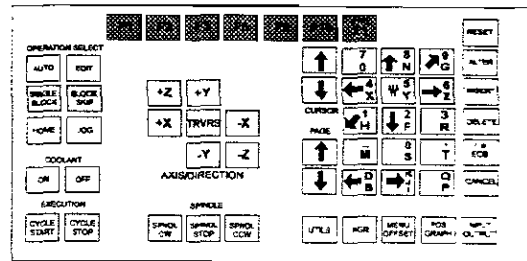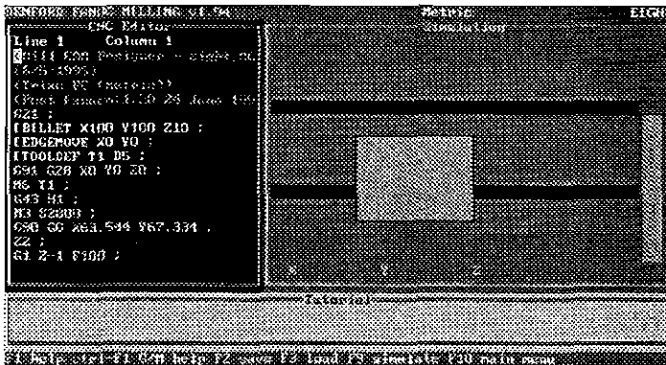
2) Remove unwanted characters that have been typed in.

The [CANCEL] key is used to:

1) Remove a word from a program data entry line.

2) Abort a running program.

Tutor keypad.

The [FUNCTION NUMBERS] keys are used as short-cuts to other screens. An information bar is usually displayed at the base of the screen displaying the functions allocated to each particular key.

Tutor keypad.

The Fast key Strip displays the function allocated to each key..

The [F1] key is used to display *General Help* screens concerning software features, commands and menus.

The [F2] key is used to save a program to the default drive.

The [F3] key is used to load a program from the default drive.

The [F5] key is used to display the *Data Information Help* screen.

The [F9] key is used to display the *Simulation Menu*.

The [F10] key is used to display the *Main Menu*.

The [CTRL F1] key is used to display *G and M code Help* screens concerning uses and definitions of G and M codes.

Starting the Offline Qwerty Software.

To run the qwerty keyboard offline software from a "DOS" prompt :

1) Change to the drive and directory where the software has been installed, eg, type *C:\Denford* and press {Enter}.

2) Type *fanucm* and press {Enter}.

The software will now load and show the default start-up screen.

To run the qwerty keyboard offline software using "Windows" :

1) Open the folder where the software has been installed, eg, C:\Denford

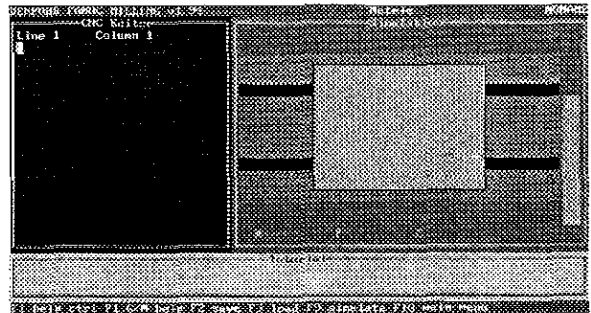2) Double-click the right mouse button on the *fanucm* icon :

Fanucm.exe

The software will now load and show the default start-up screen.

Note, "Windows 95" users can access the software through the *Start Menu*.

The default start-up screen is shown below.

STARTING THE OFFLINE TUTOR SOFTWARE.

To run the Desktop Tutor offline software from a "DOS" prompt :

1) Ensure that the Desktop Tutor is is connected to the pc Com/Serial port (default is Com1).

2) Change to the drive and directory where the software has been installed, eg, type *C:\Denford* and press {Enter} on the pc keyboard.

3) Type *fanucmd* and press {Enter} on the pc keyboard.

The software will now load and show the default start-up screen.

Note, the pc keyboard will be disabled from controlling the software.

To run the Desktop Tutor offline software using "Windows" :

1) Ensure that the Desktop Tutor is is connected to the pc Com/Serial port (default is Com1).

2) Open the folder where the software has been installed, eg, C:\Denford

3) Double-click the right mouse button on the *fanucmd* icon
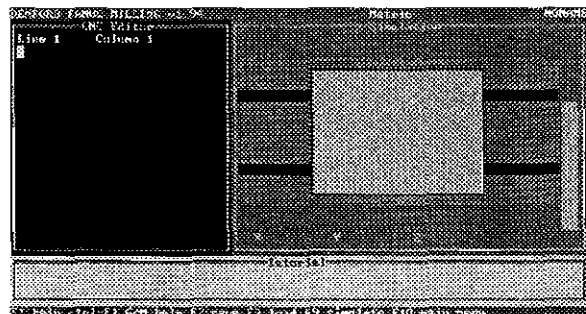
Fanucmd.exe

The software will now load and show the default start-up screen.

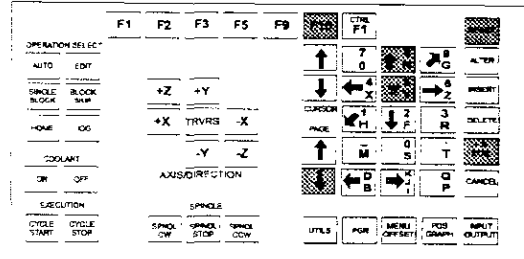Note, the pc keyboard will be disabled from controlling the software.

"Windows 95" users can access the software through the *Start Menu*.

The default start-up screen is shown below.

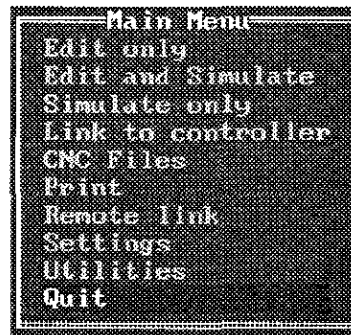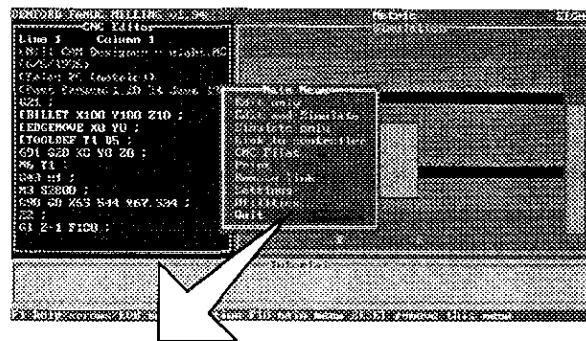# CLOSING THE OFFLINE SOFTWARE.

Desktop Tutor Keys Helpbox.
The following keys are used in this section:
[F10], [PAGE DOWN], [N], [Y], [EOB]

Tutor keypad.

Select the *Main Menu* by pressing the [F10] / {F10} key.

Press the [PAGE DOWN] / {Page Down} key to highlight '*Quit*', then press the [EOB] / {Enter} key to close the software.


When the *Quit* option is selected a message may be displayed, asking whether the current program being used needs to be saved.

If this program does not need to be saved, press the [N] / {N} key.

If this program does need to be saved, press the [Y] / {Y} key. Enter the filename (only number characters can be used with the Desktop Tutor) and press [EOB] / {Enter} to save the program on the currently selected drive.

Help Screens.

Tutor keypad.
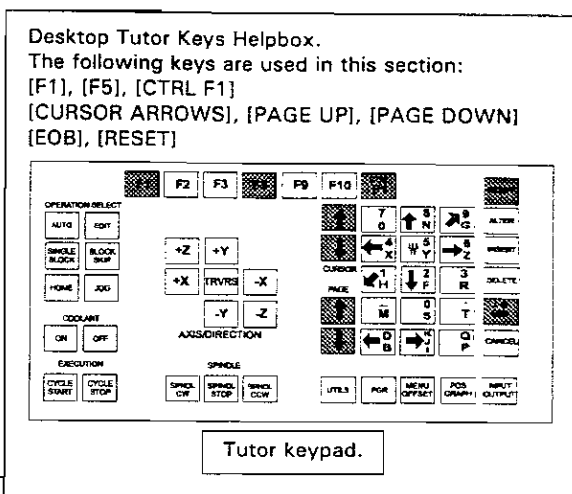
The offline software contains a powerful help system, split into 3 main sections :

1) General Help (assigned to the [F1] / {F1} key).

2) G and M code Help (assigned to the [CTRL F1] / {Ctrl-F1} key).

3) Data Information Help (assigned to the [F5] / {F5} key).

Options 1) and 2) are context sensitive. Context sensitive help displays information related to the position of the main screen cursor and is available at all times during the use of the software.

Help Screens
- General Help.

General Help.

Use the context sensitive *General Help* to find out anything about the software except G and M code uses and definitions.
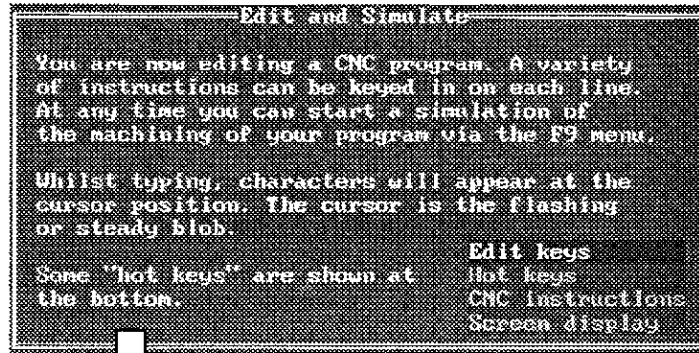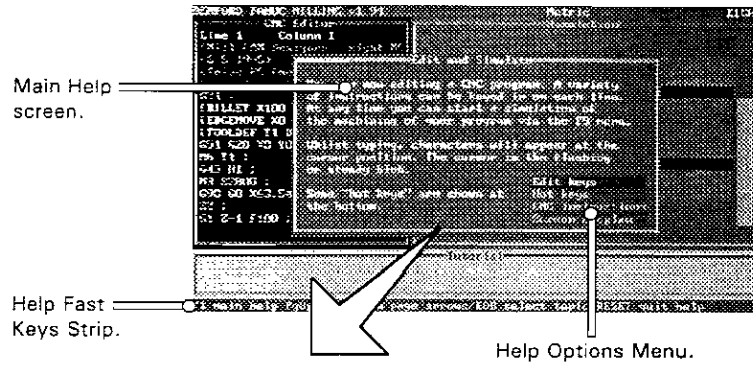
To select the *General Help* screen press the [F1] / {F1} key. The information on the help screen will depend on the position of the cursor when the [F1] / {F1} key was pressed (eg, if the cursor was highlighting an option in the Main Menu, the help screen will display information about options available within the Main Menu). Pressing the [F1] / {F1} key again will display a sub-related topic.
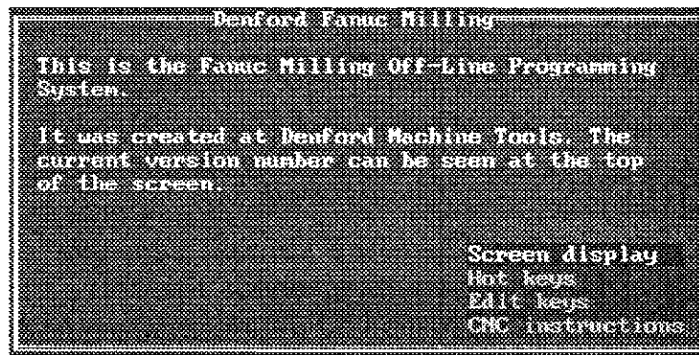
continued....

Help Screens
- General Help.

Main Help screen.

Help Fast Keys Strip.

Help Options Menu.

Press [F1] / {F1} key for Sub-related topic.

Navigate around the *General Help* screens using the following keys :

[CURSOR ARROWS] / {keyboard arrows} keys - Used to select categories from the pink/red help options menus.

[PAGE UP] / {Page Up} and [PAGE DOWN] / {Page Down} keys - Used to cycle through different help pages, when more than one page is available.

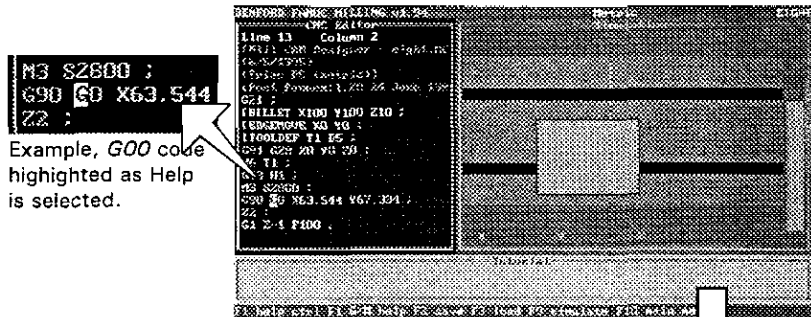[RESET] / {Escape} key - Used to exit the help screens.
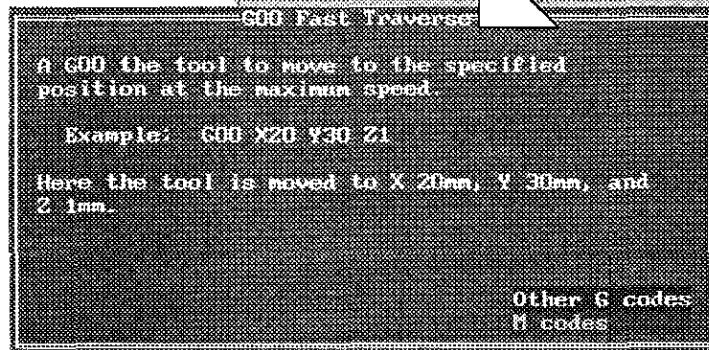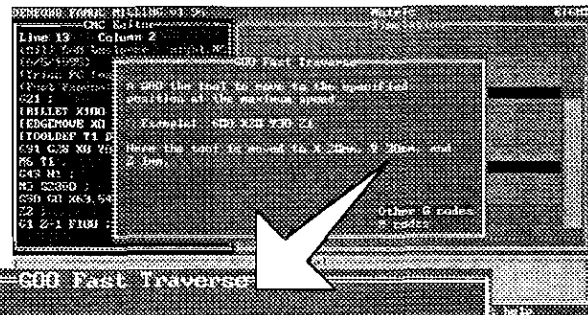
HELP SCREENS

- G AND M CODE

HELP.

G and M code Help.

Use the context sensitive *G and M code Help* to find out more about G and M code uses and definitions.

To select the *G and M code Help* screen press the [CTRL F1] / {Ctrl-F1} key. The information on the help screen will depend on the position of the cursor when the [CTRL F1] / {Ctrl-F1} key was pressed (eg, if the cursor was highlighting the code *G00*, the help screen would display information about that particular code, fast traverses).

Example, *G00* code highlighted as Help is selected.

Press [CTRL F1] / {Ctrl-F1} key for context sensitive G and M code Help.

Navigate around the *G and M code Help* screens using the following keys :

[CURSOR ARROWS] / {keyboard arrows} keys - Used to select categories from the pink/red help options menus.

[PAGE UP] / {Page Up} and [PAGE DOWN] / {Page Down} keys - Used to cycle through different help pages, when more than one page is available.

[RESET] / {Escape} key - Used to exit the help screens.

Help Screens - Data Information.
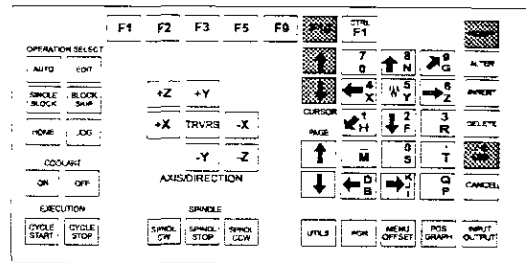
Data Information Help.

Use *Data Information Help* to find the date, time and current software/device settings.

To select the *Data Information Help* screen press the [F5] / {F5} key. Use the [PAGE UP] / {Page Up} and [PAGE DOWN] / {Page Down} keys to cycle through the information pages available. To exit the help screen, press the {RESET] / {Escape} key.
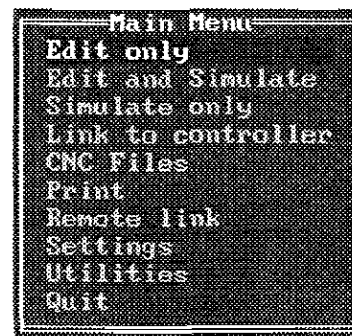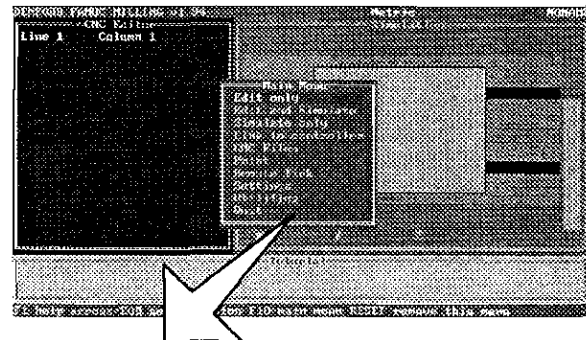
Main Menu.

Tutor keypad.

The *Main Menu* navigates around the most commonly used options of the offline software.

Select the *Main Menu* by pressing the [F10] / {F10} key. To select one of the ten options available, highlight the required option using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key to confirm this choice.

Unwanted menus can be removed by pressing the [RESET] / {Escape} key.

MAIN MENU.

The *Main Menu* contains ten options:

1) *Edit Only*. This option will display the full screen CNC File Editor with 241 characters sideways scrolling facility. The CNC File can be altered using this option. Simulation is not available from this section but pressing the [F9] / {F9} key will run a syntax check on the CNC code.

2) *Edit and Simulate*. This option will display the CNC File Editor, Simulation graphics and Tutorial windows as a split screen. If the CNC line is longer than the Editor window, a sideways scrolling facility will be offered. During CNC File editing, a graphical Simulation can be started at any time. When this Simulation has been completed, the cursor will return to its last position in the CNC File Editor. The CNC File can be altered using this option.

3) *Simulate Only*. This option will display the CNC File in full screen graphical format only. The Tutorial window is still displayed at the bottom of the screen. If an error occurs during a CNC File execution, the *Edit and Simulate Mode* will be automatically selected and the error code highlighted. The CNC File cannot be altered using this option.

4) *Link* to Controller. This option allows a CNC File to be downfed or loaded from an external FANUC controller via an RS 232 serial connection.

5) *CNC Files*. This option gives access to a sub-menu allowing CNC Files to be loaded, saved, deleted and the drive directories changed.

6) *Print*. This option will print the currently loaded CNC File in various formats.

7) *Remote Link*. This option gives access to a sub-menu allowing the machine controller to be linked to an external device (such as a paper tape punch etc) for CNC File transfer.

8) *Settings*. This option gives access to a sub-menu allowing many of the options listed above to be customised and configured.

9) *Utilities*. This option will allow access to other software products running through DOS.

10) *Quit*. This option will exit the machine controlling software and returns to DOS.

MAIN MENU -
LINK TO
CONTROLLER.

Desktop Tutor Keys Helpbox.
The following keys are used in this section:
[F10]
[CURSOR ARROWS]
[EOB], [RESET]
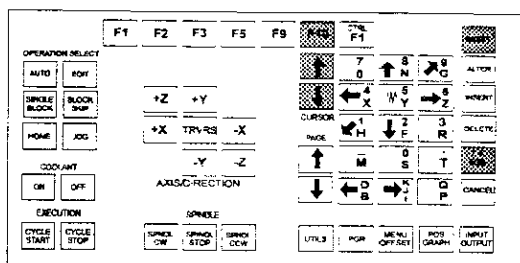
Tutor keypad.

The *Link* to Controller option allows a CNC File to be downfed or loaded from an external FANUC controller via an RS 232 serial connection (see page 1.2).
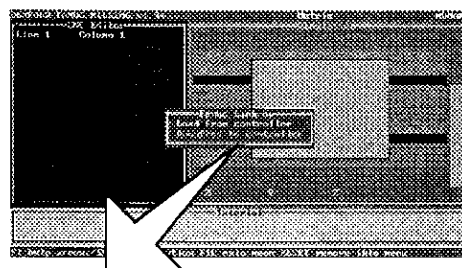
Select the *Main Menu* by pressing the [F10] / {F10} key. Highlight '*Link* to Controller' using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.
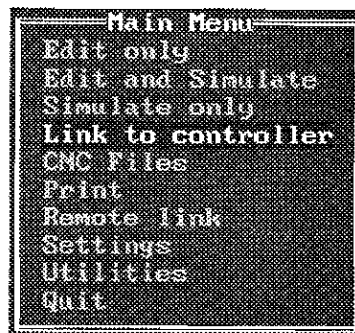
The *Link to Controller Sub-menu* contains two options:

1) *Load from Controller*. This option will allow a CNC File to be accepted from an outside source.

2) *Downfeed to Controller*. This option will allow a CNC File to be transferred to an outside source.

Select the required option using the [CURSOR ARROWS] / {keyboard arrows} keys, then press the [EOB] / {Enter} key.
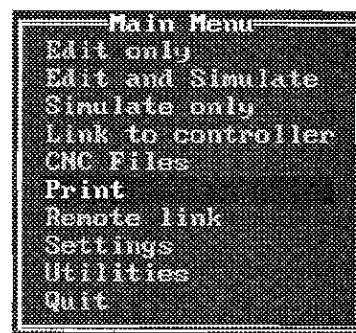
Press the [RESET] / {Escape} key to remove any unwanted menus from the screen.

MAIN MENU - PRINT.

Tutor keypad.
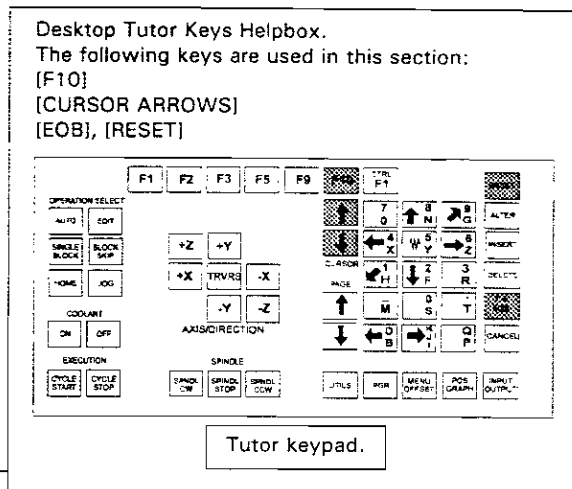
The *Print* option allows you to generate a paper copy of the currently loaded CNC File from a connected printer.

Select the *Main Menu* by pressing the [F10] / {F10}key. Highlight *'Print'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

The *Printing Sub-menu* contains two options :

1) *Line format with errors*. This option will print the CNC File as displayed in the Editor window with any errors highlighted.

2) *Line format no errors*. This option will print the CNC File as displayed in the Editor window without highlighting any errors.

MAIN MENU - PRINT.

Select the required option using the [CURSOR ARROWS] / {keyboard arrows} keys, then press the [EOB] / {Enter} key.
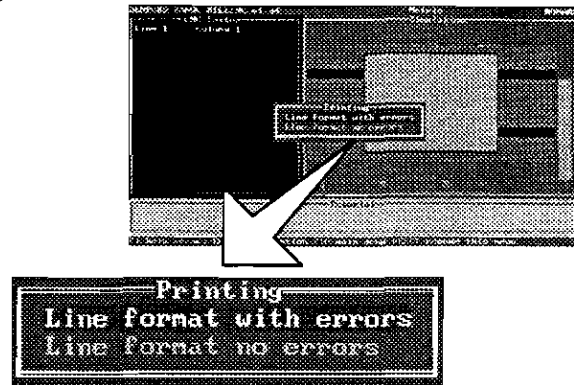
Press the [RESET] / {Escape} key to remove any unwanted menus from the screen.

PRINTING ERRORS.

If the printer does not respond, check the following :

1) Is the cabling between the computer and printer secure?

2) Is the printer set for Parallel or Serial communications?

3) Have the correct parameters been set in the "Settings Menu - Print Device" (see section 9.14) ?

4) Is the printer switched 'on' and is there enough paper available for the printout?

PAGE LAYOUT ERRORS.

If the layout on the printout is incorrect, the page widths and linefeeds can be changed in the "Settings Menu - Print Page Layout" (see section 9.15).

MAIN MENU - REMOTE LINK.
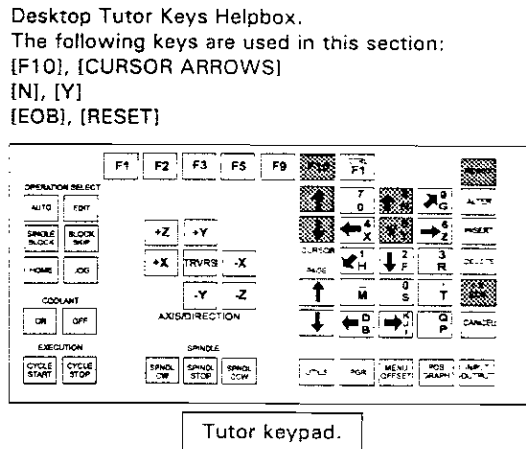
The *Remote Device* option allows a CNC File to be sent or received from a remote device, such as another computer, paper tape punch reader, data carrier etc....

Select the *Main Menu* by pressing the [F10] / {F10} key. Highlight *'Remote Link'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.
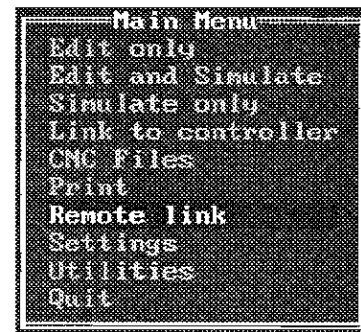
The *Remote Link Sub-menu* contains two options :

1) *Load from device*. This option will load the CNC File from the remote device.

2) *Send to device*. This option will send the CNC File to the remote device.

Select the required option using the [CURSOR ARROWS] / {keyboard arrows} keys, then press the [EOB] / {Enter} key.
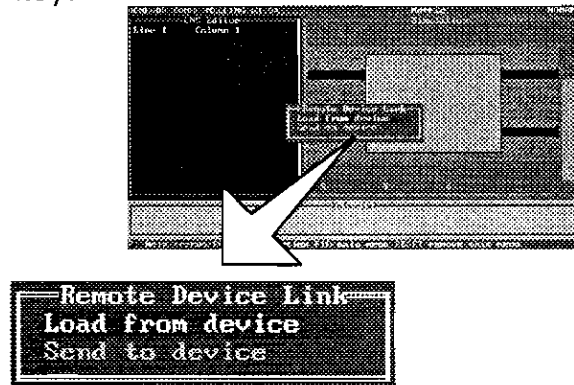
Main Menu - Remote Link.

continued....

Load from Device.

If there is a CNC File currently loaded in the offline software, you will be asked whether to merge the CNC File when loading from the remote device.

Press the [Y] / {Y} key to merge both CNC Files into one and the [N] / {N} key to clear the current CNC File from the offline software.

Send to Device.

You will be prompted with a *'Ready to send?'* message. Press the [Y] / {Y} key to send the CNC File and the [N] / {N} key to abort the operation.

During CNC File transfer, a *'Transmitting to device'* message window will be displayed, showing the number of bytes and lines sent. A *'Transmission completed'* message will be displayed to confirm that the whole CNC File has been sent to the remote device.

Press the [RESET] / {Escape} key to remove any unwanted messages and menus from the screen.

Communication Errors.

If an error is encountered, check the following :

1) Is the cabling between the computer and remote device secure?

2) Is the cable connected to the correct ports with the correct pin connections?

3) Have the correct parameters been set in the "Settings Menu - Remote Link" (see section 9.17)?

4) Is the remote device switched 'on' and ready to send or receive data?

MAIN MENU - UTILITIES.

Tutor keypad.

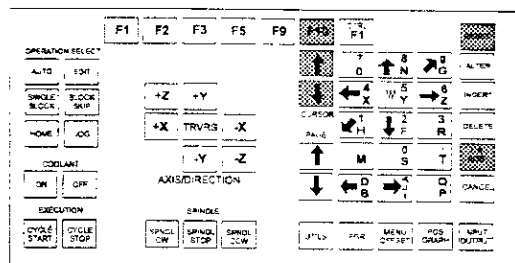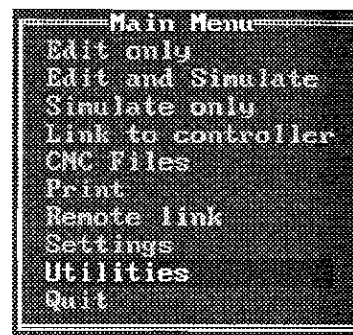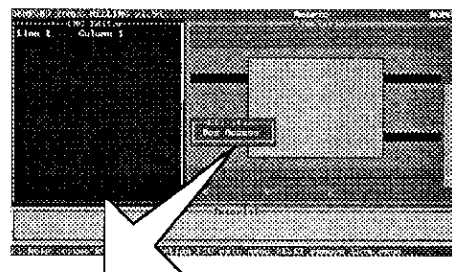The *Utilities* option allows access to other software packages (if available) and 'DOS'.

Select the *Main Menu* by pressing the [F10] / {F10} key. Highlight '*Utilities*' using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

Press the [EOB] / {Enter} key when '*Dos Access*' is highlighted to temporarily exit the offline software.
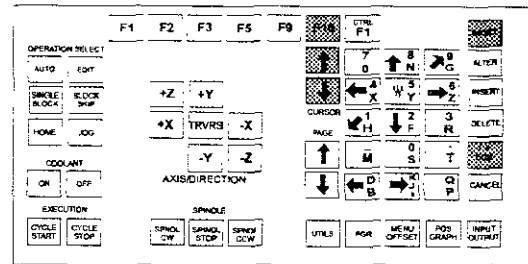
The *Utilities Menu* will give access to other programs and DOS mode. To return to the offline software, type '*EXIT*' at the DOS prompt or close the other program being used. In addition, Desktop Tutor users will also have to press the [EOB] key.

Press the [RESET] / {Escape} key to remove any unwanted menus from the screen.

CNC Files Menu.

Tutor keypad.

Select the *Main Menu* by pressing the [F10] / {F10} key. Highlight *'CNC Files'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key to confirm this choice.
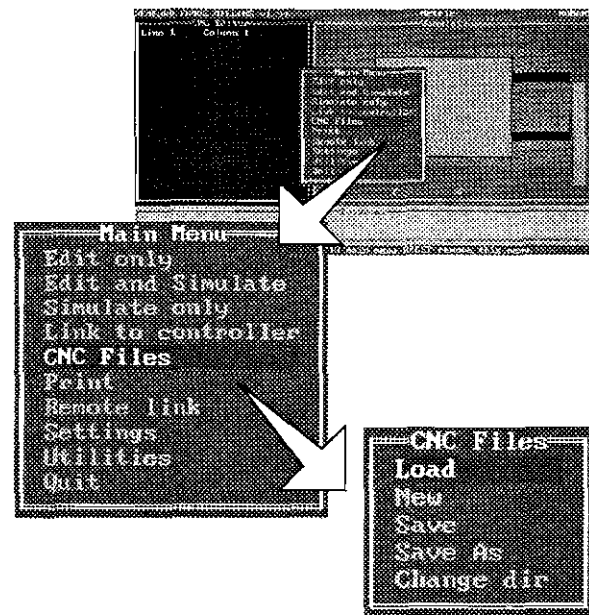
The *CNC Files Menu* contains 5 options :

i)   *Load* - Load a selected CNC File.

ii) *New* - Clear a currently loaded CNC File.

iii) *Save* - Overwrite a CNC File with the same name or save a newly created CNC File.

iv) *Save as* - Save a CNC File with a specific name.

v)   *Change dir* - Change the drive used to load and save CNC Files.
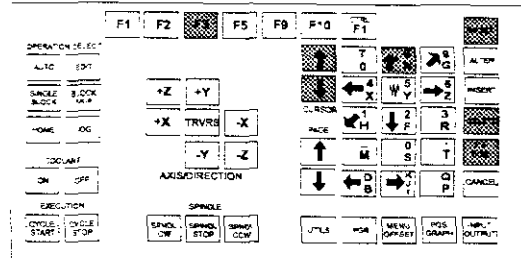
Press the [RESET] / {Escape} key to clear any menus.

CNC Files
Menu - Load.

Desktop Tutor Keys Helpbox.
The following keys are used in this section:
[CURSOR ARROWS], [EOB], [F3]
[NUMBERS] - not highlighted
[DELETE], [N], [RESET]

Tutor keypad.

⚠️ **Please Note** - the software will be set to read either the computers hard drive (usually C:) or the floppy disk drive (usually A:) by default. If you do not want to load the CNC Files from the default drive, then the drive destination must be changed. See page 6.8 "Changing the Drive Directory - CNC Files".

⚠️ **Please Note** - The [F3] / {F3} key can be used as a shortcut to loading from the currently selected drive and directory.

Highlight '*Load*' in the *CNC Files Menu* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {ENTER} key.
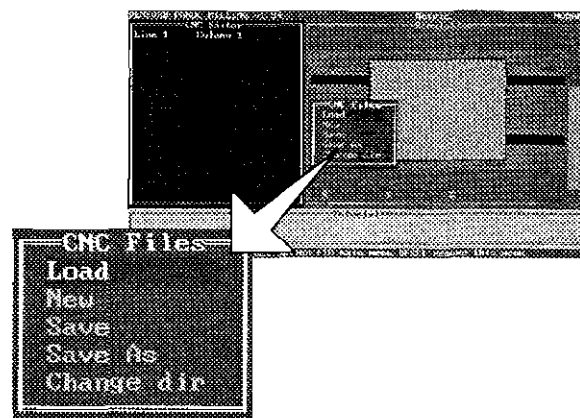
Type in the name of the CNC File you wish to load, using the [NUMBERS] / {Numbers} keys. Incorrect characters can be removed using the [DELETE] / {Backspace} key. Press the [EOB] / {ENTER} key to load the CNC File.

Note that CNC Files can only be saved with alphabet characters when using a Qwerty keyboard. If the filename contains any alphabet characters, it can only be loaded from a directory listing using Desktop Tutors (see the next page).
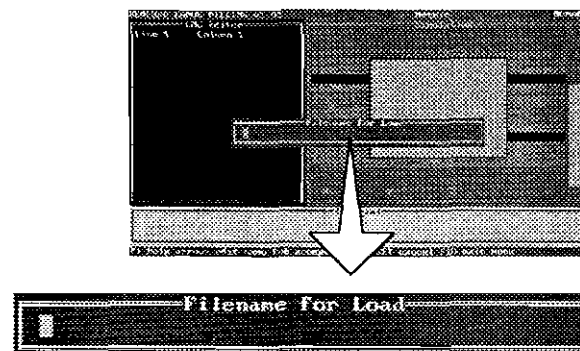
CNC Files
Menu - Load.

If the filename is unknown, press the [EOB] / {Enter} key to list all the CNC Files stored on the currently selected drive. CNC Files within these lists can be loaded by highlighting them using the [CURSOR ARROWS] / {keyboard arrows} keys and pressing the [EOB] / {Enter} key.
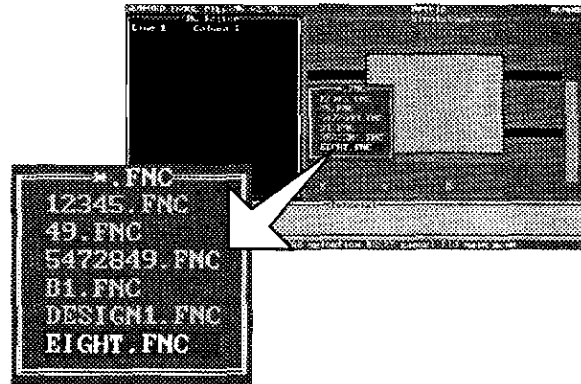
The name of the CNC File you have just loaded is displayed in the top right hand corner of the screen.
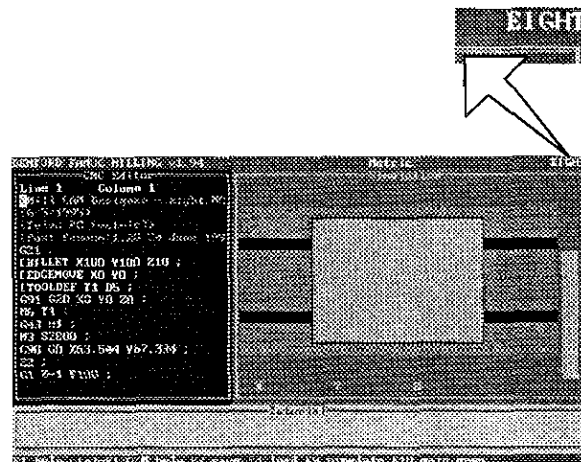
Note - If there is a CNC File currently in the editor when loading a new CNC File, the screen will display *'Do you want to merge?'* (ie, do you want to combine the program you wish to load with the program already loaded).

To merge CNC Files press the [EOB] / {Enter} key, otherwise, press the [N] / {N} key to clear the current CNC File and load the selected CNC File into the editor.

CNC Files Menu - Load.

If no CNC Files can be found on the selected drive, an error message will be displayed (see example below). To clear this message, press the [RESET] / {Escape} key. In most cases, this message is displayed when the computer is trying to read the CNC Files from the wrong drive or directory - refer to section 6.8 "Changing the Drive Directory - CNC Files".

```
══════════Error══════════
There are no matching files
```

The error message below will be displayed if the CNC File you want to load has been entered incorrectly or does not exist in the directory being read.

```
══════════Warning══════════
File not found - Starting new program
```

Press the [RESET] / {Escape} key to clear the screen of any unwanted menus, error messages or information.

CNC Files
Menu - New.
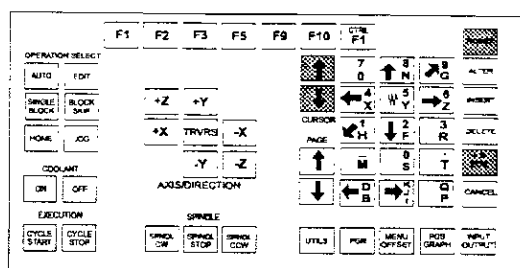
Tutor keypad.

The *'New'* command will clear any CNC File currently loaded in the editor.

Highlight *'New'* in the *CNC Files Menu* with the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.
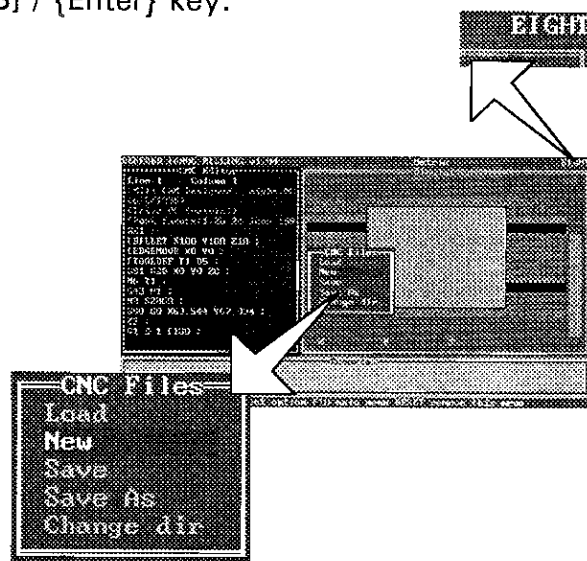
The current CNC File is cleared leaving the editor with no CNC File loaded.

Press the [RESET] / {Escape} key to clear the screen of any unwanted menus or information.

CNC FILES

MENU - SAVE.

Tutor keypad.

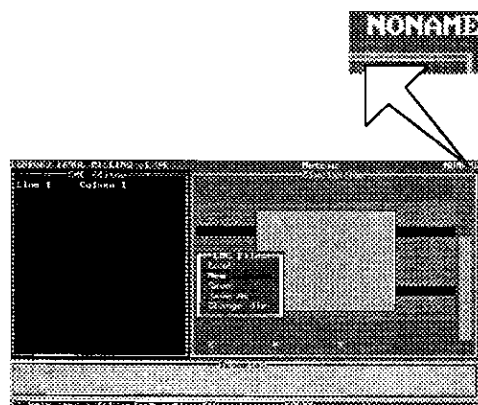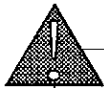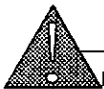⚠ **Please Note** - the software will be set to read either the computers hard drive (usually C:) or the floppy disk drive (usually A:) by default. If you do not want to save the CNC Files on the default drive, then the drive destination must be changed. See page 6.8 "Changing the Drive Directory - CNC Files".

⚠ **Please Note** - The [F2] / {F2} key can be used as a shortcut to saving to the currently selected drive and directory with the same filename.
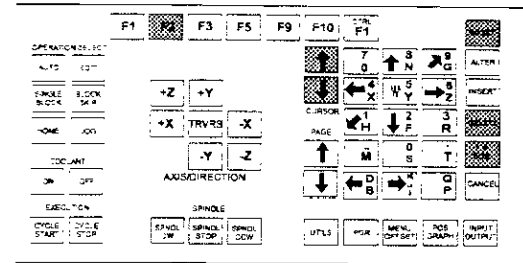
Highlight '*Save*' in the *CNC Files Menu* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.
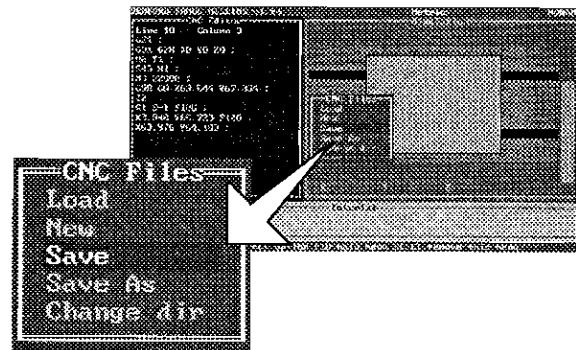
If the CNC File has never been saved, ie, it has just been manually entered, the software will prompt for a filename. Use the [NUMBERS] / {Numbers} keys to write a filename into the dialog box. Incorrect characters can be removed using the [DELETE] / {Backspace} key. Press the [EOB] / {Enter} key to save the CNC File.

Note that CNC Files can only be saved with alphabet characters when using a qwerty keyboard.

If a CNC File has been previously loaded, then edited, the '*Save*' command will overwrite the original CNC File with the new edited version - no filename dialog box will be displayed. Press the [RESET] / {Escape} key to clear the screen of any unwanted menus or information.

CNC FILES
MENU - SAVE AS.
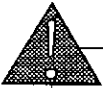
Desktop Tutor Keys Helpbox.
The following keys are used in this section:
[CURSOR ARROWS], [EOB]
[NUMBERS] - not highlighted
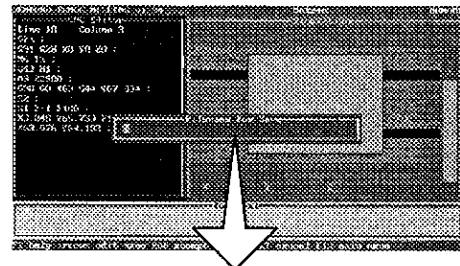[ALTER], [DELETE], [RESET]

Tutor keypad.

⚠ Please Note - the software will be set to read either the computers hard drive (usually C:) or the floppy disk drive (usually A:) by default. If you do not want to save the CNC Files on the default drive, then the drive destination must be changed. See page 6.8 "Changing the Drive Directory - CNC Files".
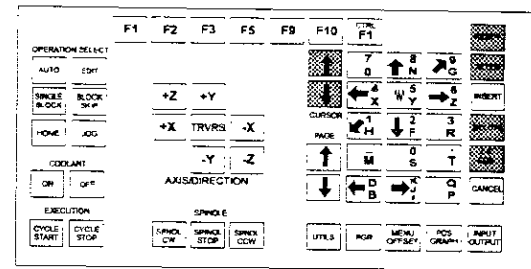
To save a newly edited CNC File with a different name from the original version, the '*Save as*' command must be used.

Highlight '*Save as*' in the *CNC Files Menu* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.
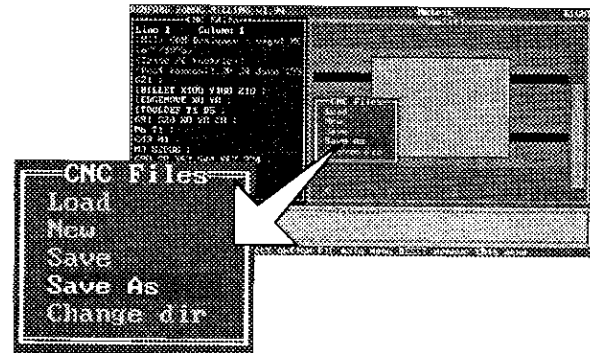
To remove the old filename, press the [ALTER] / {Delete} key, then enter the new filename using the [NUMBERS] / {Numbers} keys. Any characters typed in by mistake can be corrected using the [DELETE] / {Backspace} key.

Press [ALTER] / {Delete} key to remove the old filename.
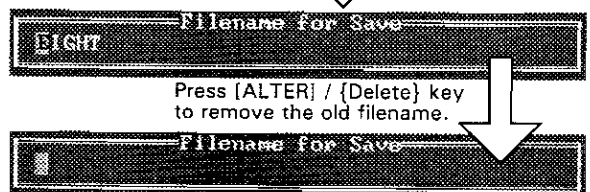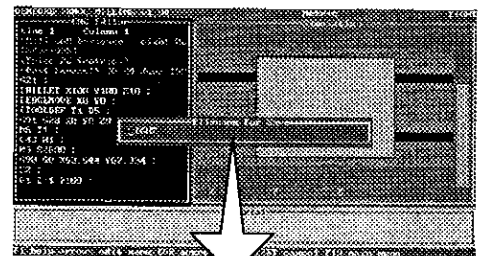
Press the [EOB] / {Enter} key to Save this new CNC File to the currently selected drive. Press the [RESET] / {Escape} key to clear the screen of any unwanted menus or information.

Changing the Drive Directory - CNC Files.
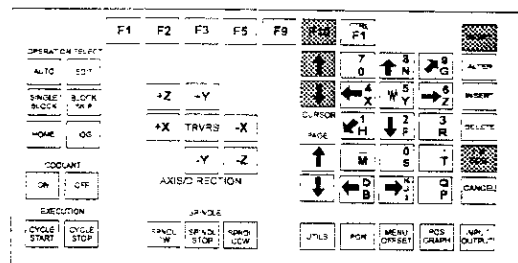
Tutor keypad.

Select the *Main Menu* by pressing the [F10] / {F10} key. Highlight '*CNC Files*' using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Escape} key to confirm this choice.
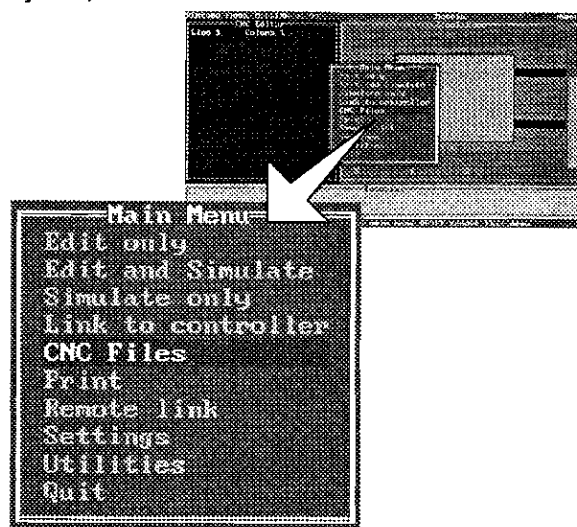
Highlight '*Change dir*' with the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Escape} key.
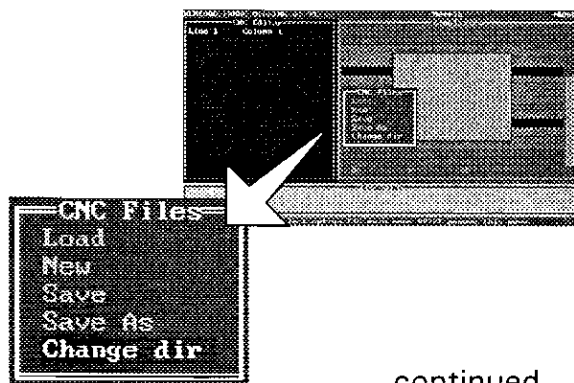
CHANGING THE DRIVE DIRECTORY - CNC FILES.

continued....

Highlight the drive required (in this example *'A:'* is selected) using the [CURSOR ARROWS] / {keyboard arrows} keys.
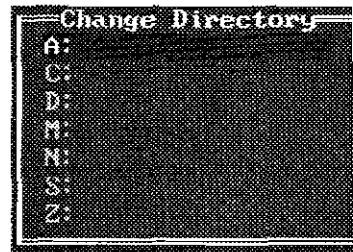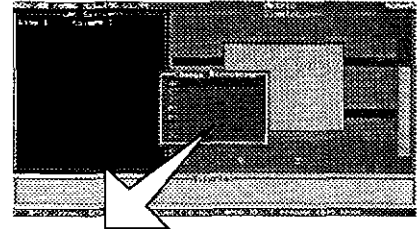
Upon pressing the [EOB] / {Enter} key the selected drive will be displayed.
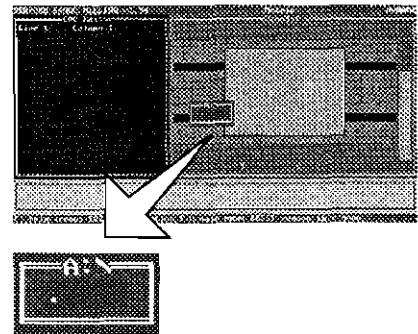
Press the [RESET] / {Escape} key to clear the screen of any unwanted menus or information.

SAVING CNC FILES ON A CHANGED DRIVE.

Tutor keypad.
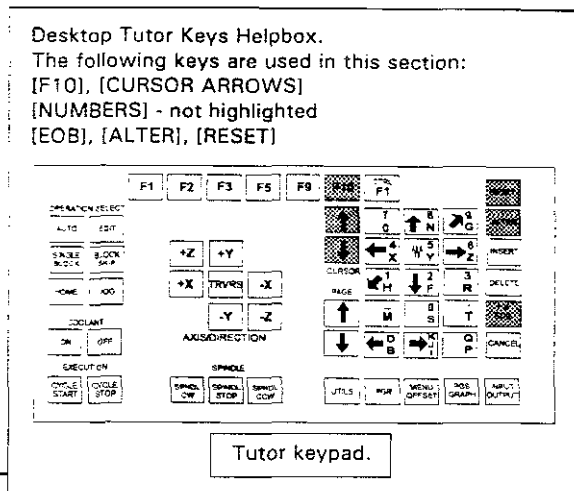
Select the *Main Menu* by pressing the [F10] / {F10} key, highlight *'CNC Files'* and press [EOB] / {Enter}. Highlight the *'Save as'* option and press the [EOB] / {Enter} key.
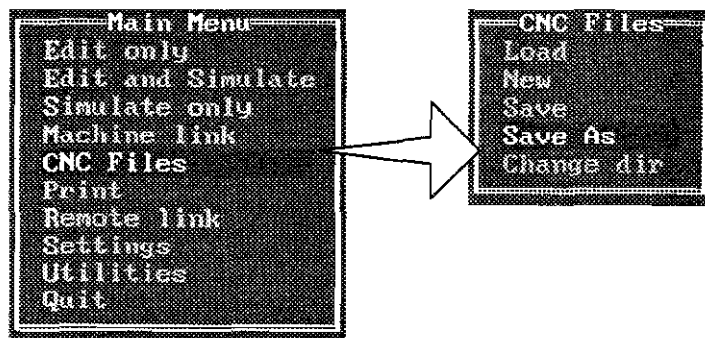
Note - the screen may display the previous setting for the drive. In the example above, the screen displays the drive as *'C:'* , even though it has just been changed to save on *'A:'* , as shown in the last section. If this occurs, press the [ALTER] / {Delete} key to reset to the new drive.

Press [ALTER] / {Delete} key to reset to the new drive and directory.
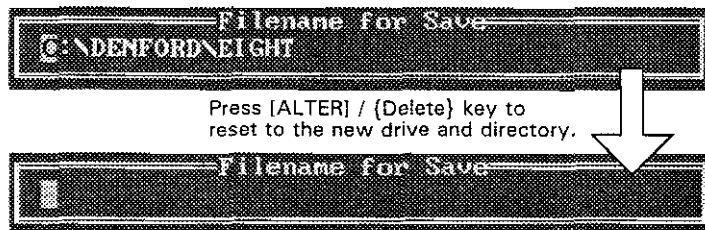
Enter the filename using the [NUMBERS] / {Numbers} keys and press [EOB] / {Enter} to confirm this. The CNC File will now be saved on the new drive.

Note that CNC Files can only be saved with alphabet characters when using a Qwerty keyboard.

LOADING CNC FILES ON A CHANGED DRIVE.

Select the *Main Menu* by pressing the [F10] / {F10} key, highlight '*CNC Files*' and press the [EOB] / {Enter} key. Highlight the '*Load*' option and press the [EOB] / {Enter} key.
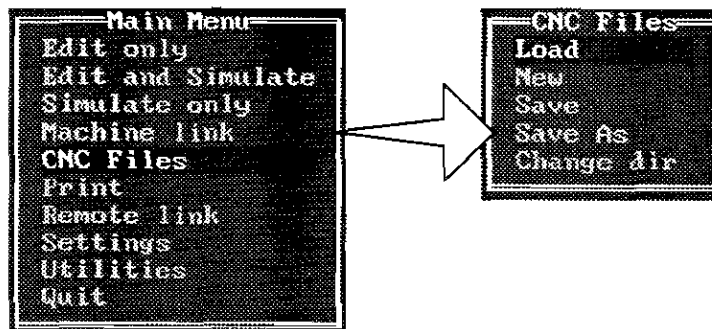
```
===========Main Menu===========
    Edit only
    Edit and Simulate
    Simulate only
    Machine link
    CNC Files
    Print
    Remote link
    Settings
    Utilities
    Quit
```

```
=======CNC Files=======
    Load
    New
    Save
    Save As
    Change dir
```

Note - the screen may display the previous setting for the drive. In the example above, the screen displays the drive as '*C:*' , even though it has just been changed to load from '*A:*' , as shown in the last section. If this occurs, press the [ALTER] / {Delete} key to reset to the new drive.

```
================Filename for Load================
C:\DENFORD\*
```

Enter the filename using the [NUMBERS] / {Numbers} keys and press [EOB] / {Enter} to confirm this. The CNC File will now be loaded from the new drive.

Note that CNC Files can only be saved with alphabet characters when using a Qwerty keyboard.

```
================Filename for Load================

```

If the filename is unknown, the list of CNC Files stored on the drive can be accessed by pressing the [EOB] / {Enter} key.

```
======*.FNC======
  12345.FNC
  49.FNC
  5472849.FNC
  B1.FNC
  DESIGN1.FNC
  EIGHT.FNC
```
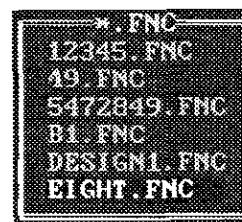
The screen below will be shown, if there are no matching files on the drive that is being read. To clear this, press the [RESET] / {Escape} key.

```
==========Error==========
There are no matching files
```

EDITING A CNC FILE - SCREEN VIEW OPTIONS.

Once a CNC File has been loaded, its content can be altered using the Editor windows.

Pages 7.1 - 7.2 apply to editing with both a qwerty keyboard and a Desktop Tutor.

Pages 7.3 - 7.6 apply to editing with a Desktop Tutor only.

Pages 7.7 - 7.10 apply to editing with a qwerty keyboard only.

CNC Files can be edited in two main screen view options:

> *Edit and Simulate*. The CNC File can be altered using the Editor side of the screen and then simulated using the graphical display(plan or 3d).
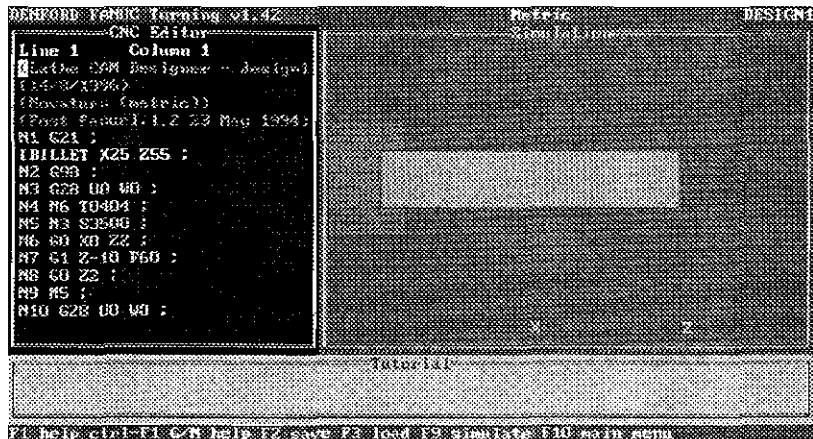
> *Edit only*. The CNC File can be altered using a full screen Editor window.
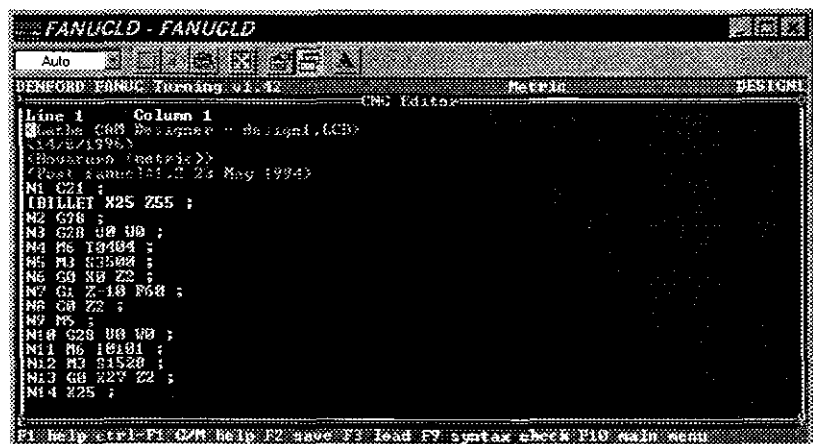
Editing a CNC File - Screen View Options.
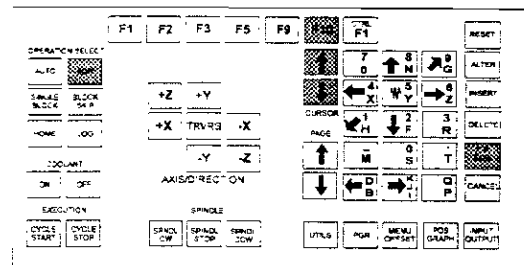
Tutor keypad.

Select the *Main Menu* by pressing the [F10] / {F10} key. Highlight either the '*Edit and Simulate*' or '*Edit only*' options, using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key to select the highlighted option.

Note - The '*Edit and Simulate*' option can be directly accessed on the Desktop Tutor by pressing the [EDIT] key.
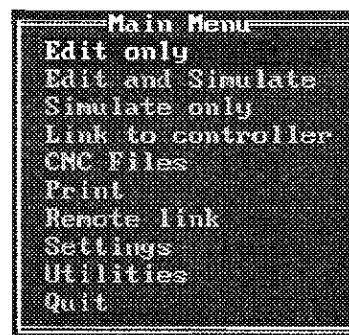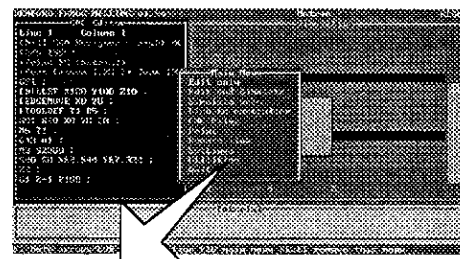
Editing a CNC File - Desktop Tutor Key Functions.
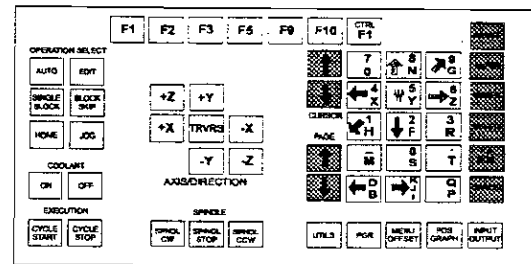
Tutor keypad.

When editing a CNC File using the Desktop Tutor, the following keys are used:

[CURSOR ARROWS] keys.
These keys will cycle the yellow cursor up or down through each program word/character in the CNC File.

[DELETE] key.
This key will remove the program word/character highlighted by the cursor in the CNC File.

[INSERT] key.
This key will place a 'new' program word/character (from the edit line) directly after the program word/character highlighted by the cursor in the CNC File.

[PAGE UP ARROW] and [PAGE DOWN ARROW] keys.
These keys will move the CNC File text up or down by one full screen page.

[EOB] key.
This key ends the program line, by placing an end of block character (; or /).

[CANCEL] key.
This key will clear any characters from the edit line.

[ALTER] key.
Pressing this key will replace the program word/character highlighted by the cursor in the CNC File with any 'new' text entered on the edit line.

DESKTOP TUTOR - EDITOR WINDOW LAYOUT.

All example screenshots are shown using the *'Edit and Simulate'* option.

The CNC File Editor window, in the *'Edit and Simulate'* option, is displayed by default on the left side of the screen. To alter the screen display properties, see section 9.3 "Change Settings - Editor" and section 9.18 "Change Settings - Miscellaneous".

The general layout of the CNC File Editor window is shown below:

A) Cursor position information bar.

B) Editor cursor.

C) Edit line.

A) The Cursor position information bar displays the exact location of the cursor by program line and column.

B) The yellow Editor cursor highlights the program word or character that can be edited. In this example it highlights the program word *'S2800'*, referring to the spindle speed.

C) The Edit line (at the bottom of the Editor window) is the area of the display where 'new' program words/ lines can be written, then inserted into the CNC File. In this example, a 'new' spindle speed of *'S1500'* has been entered on the edit line, using the tutor keypad.

Desktop Tutor - Editing a CNC File.
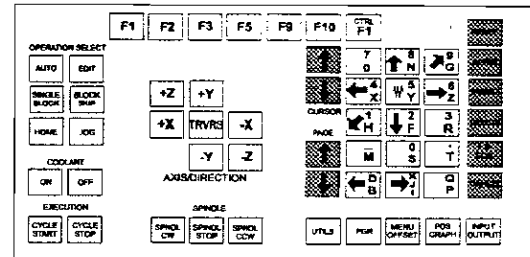
Tutor keypad.

Using the '*Edit and Simulate*' screen shown on the previous page as an example, the CNC File could be edited in a variety of different ways.

Selecting Program Text.

```
G43 H1 ;
M3 S2800 ;
G90 G0 X63.544
```

Using the main screen displayed on the previous page as an example, the program word '*S2800*' is highlighted in the CNC File by using the [CURSOR ARROWS] keys. As the [CURSOR ARROWS] keys are pressed, the corresponding program word is highlighted. Note that the Editor window can only display a certain number of lines on the screen. To move through a larger CNC File quickly use the [PAGE UP ARROW] and [PAGE DOWN ARROW] keys.

```
S  1500
```

The 'new' program word '*S1500*' is entered on the edit line using the tutor keypad.

Any 'new' program word, or set of words, is always entered from the edit line.

The [CANCEL] key is used to clear unwanted text from the edit line.

The [EOB] key will enter any text entered on the edit line as a 'new' program line in the CNC File.

Desktop Tutor - Editing a CNC File.

Inserting and Deleting Program Text.

```
G43 H1 ;
M3 S2800 ;        Edit line text.
G90 G0 X63.544    S    1500
```

⬇

```
G43 H1 ;
M3 S2800 S1500 ;
G90 G0 X63.544 Y67
```

If the [INSERT] key is pressed, any 'new' program word entered on the edit line is placed at the position of the cursor. The 'new' program line reads '*M3 S2800 S1500 ;*' as shown above.

Any 'new' text is placed directly after the last program word/character highlighted by the cursor.

To remove the highlighted program word '*S1500*', the [DELETE] key would be pressed whilst it is still highlighted.

Altering a Program Line.

```
G43 H1 ;
M3 S2800 ;        Edit line text.
G90 G0 X63.544    S    1500
```

⬇

```
G43 H1 ;
M3 S1500 ;
G90 G0 X63.544
```

If the [ALTER] key is pressed when '*S1500*' is entered on the edit line and '*S2800*' is highlighted by the cursor, '*S2800*' is replaced by '*S1500*'.

If [ALTER] is pressed when the edit line contains a number of program words, they will all be placed over the program word/character last highlighted by the cursor.

EDITING A CNC FILE - QWERTY KEYBOARD FUNCTIONS.

When editing a CNC File using the qwerty keyboard, the following keys are used:

{keyboard arrows} keys.
Moves the cursor up, down, left and right.

{Delete} key.
Deletes the one character highlighted by the cursor.

{Back arrow} key.
Deletes one character to the left of the cursor.

{Insert} key.
Toggles between the two settings *'insert'* and *'overwrite'*.

{Home} key.
Moves the cursor to the start of the current line.

{End} key.
Moves the cursor to the end of the current line.

{Page up} key.
Moves up a page.

{Page down} key.
Moves down a page.

{Ctrl-Page up} keys.
Moves to first program line.

{Ctrl-Page down} keys.
Moves to last program line.

{Ctrl-Y} keys.
Deletes all of the current line.

{Ctrl-N} keys.
Inserts a new blank line.

{Ctrl-R} keys.
Restores an edited line (only possible if you do not move off the line).

These keys relate to marking in *Anchor Mode*:

{F7} key.
Sets start of marked area.

{F8} key.
Sets end of marked area.

These keys relate to marking in *Drag Mode*:

{F7} key.

Starts making (use {keyboard arrows} to drag out the marked area).

{F8} key.
Stops marking. If pressed again cancels marked area.

These keys relate to program line group editing:

{Alt-D} keys.
Deletes marked area.

{Alt-M} keys.
Moves marked area to current cursor position.

{Alt-C} keys.
Copies marked area to current cursor position.

QWERTY KEYBOARD - EDITOR WINDOW LAYOUT.

All example screenshots are shown using the *'Edit and Simulate'* option.

The CNC File Editor window, in the *'Edit and Simulate'* option, is displayed by default on the left side of the screen. To alter the screen display properties, see section 9.3 "Change Settings - Editor" and section 9.18 "Change Settings - Miscellaneous".

The general layout of the CNC File Editor window is shown below:

A) Cursor position information bar.

B) Editor cursor.

A)   The Cursor position information bar displays the exact location of the cursor by program line and column. The current setting of the *Insert/Overwrite* feature is also highlighted at the right of this information bar.

B)   The yellow Editor cursor highlights the program word or character that can be edited. In this example the cursor highlights the text character '*8*' in the program word '*S2800*', referring to the spindle speed.

Note - the qwerty version of the software does not require an "Edit Line", since the qwerty keyboard is much more flexible than the Desktop Tutor when manipulating text characters.

Note - End of block characters are not displayed on the qwerty keyboard software Editor.

Qwerty Keyboard - Editing a CNC File.

Using the *'Edit and Simulate'* screen shown on the previous page as an example, the CNC File could be edited in a variety of different ways.

Selecting Program Text.

```
G43 H1
M3 S2800
G90 G0 X63.544
```

Using the main screen displayed on the previous page as an example, the program word *'S2800'* is highlighted in the CNC File by using the {keyboard arrows} keys. The yellow cursor can be moved up, down, left and right through the text in a similar way to many pc based word processor packages.

```
M3 S2800
```

Pressing the {Home} key will quickly select the start of the current program line.

```
M3 S2800
```

Similarly, pressing the {End} key will move the cursor to the end of the current program line.

Note that the Editor window can only display a certain number of lines on the screen. To move through a larger CNC File quickly use the {Page up} and {Page down} keys to cycle through the lines of the program.

```
CNC Editor
Line 1    Column 1    Insert
Mill CAM Designer -- eight.NC
(6/5/1995)
(Triac PC (metric))
(Post fanuca:1.20 24 June 199
G21
```

Pressing the {Ctrl-Page up} keys will quickly select the first line of the program.

```
M5
G91 G28 X0 Y0 Z0
M30
```

Similarly, pressing the {Ctrl-Page down} keys will select the last line of the program.

Qwerty Keyboard - Editing a CNC File.

Deleting Program Text.

```
G43 H1
M3 S3800
G90 G0 X63.544
```
⇩
```
G43 H1
M3 S200
G90 G0 X63.544
```

Pressing the {Delete} key will remove the character highlighted by the cursor.

```
G43 H1
M3 S2800
G90 G0 X63.544
```
⇩
```
G43 H1
M3 S800
G90 G0 X63.544
```

Pressing the {Backspace} key will remove one character to the left of the cursor.

```
G43 H1
M3 S2800
G90 G0 X63.544
```
⇩
```
G43 H1
G90 G0 X63.544
Z2
```

Pressing the {Ctrl-Y} key will remove all of the current program line.

Selecting Insert and Overwrite Edit Modes.

```
═══════CNC Editor═══════
Line 1      Column 1     Insert
```
⇧ ⇩
```
═══════CNC Editor═══════
Line 1      Column 1     Overwri
```

New program text can be entered in two modes, 'Insert' and 'Overwrite'. Pressing the {Insert} key will cycle between these two modes. The current setting of the mode is displayed in the top right-hand corner of the Editor window.

QWERTY KEYBOARD - EDITING A CNC FILE.

ENTERING PROGRAM TEXT USING INSERT MODE.

Insert Mode should be used to manually enter completely new programs.

When editing an existing program, *Insert Mode* is useful for adding new program words into the line.

```
╔══════════CNC Editor══════════╗
║ Line 12      Column 6    Insert ║
╚═══════════════════════════════╝
```

Check that the Editor window is set to *Insert Mode*, selected by pressing the {Insert} key.

```
G43 H1
M3 S2▌00
G90 G0 X63.544
```

⇩

```
G43 H1
M3 S21234▌00
G90 G0 X63.544
```

New characters / program words can be inserted at the cursor position by using the {alphabet} and {numbers} keys. Any characters typed in are placed to the left of the cursor position. In the example above, the charcters '*1234*' have been entered.

ENTERING PROGRAM TEXT USING OVERWRITE MODE.

When editing an existing program, *Overwrite Mode* is useful for altering program words.

```
╔══════════CNC Editor══════════╗
║ Line 12      Column 10   Overwri ║
╚═══════════════════════════════╝
```

Check that the Editor window is set to *Overwrite Mode*, selected by pressing the {Insert} key.

```
G43 H1
M3 S2▌00
G90 G0 X63.544
```

⇩

```
G43 H1
M3 S21234▌
G90 G0 X63.544
```

Any characters highlighted by the cursor, or to the right of the cursor, are replaced as new text is entered.

In the example above, the charcters '*1234*' have been entered.

QWERTY KEYBOARD - EDITING A CNC FILE.

CREATING A NEW BLANK PROGRAM LINE.

```
G43 H1
M3 SZ800
G90 G0 X63.544
```

⇩

```
G43 H1

M3 S2800
G90 G0 X63.544
```

Pressing the {Ctrl-N} keys will create a new blank program line directly before the program line on which the cursor is currently placed.

In the example shown above, the cursor is highlighting program line starting '*M3*', so the new program line is inserted between program lines starting '*G43*' and '*M3*'.
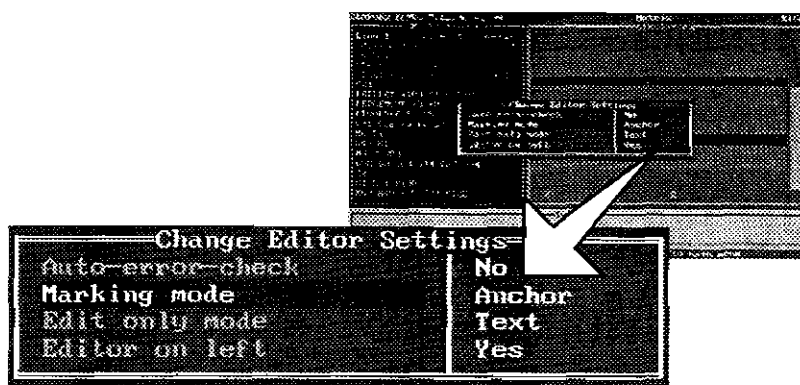
UNDO / RESTORE A PROGRAM LINE.

Pressing the {Ctrl-R} keys will undo any editing of a program line.

Note - this feature will only operate if the cursor has not been moved off the program line before pressing the {Ctrl-R} keys.

QWERTY KEYBOARD - EDITING A CNC FILE USING ANCHOR MODE.

CONFIGURING ANCHOR MODE.

Anchor Mode is used to select a group of program lines that can be copied, moved or deleted. Using *Anchor Mode* will not highlight program lines as they are selected.

To configure the Editor for *Anchor Mode* follow this procedure:

1) Press {F10}, highlight '*Settings*' and press {Enter}.

2) Highlight '*Editor*' and press {Enter}.

3) Highlight '*Marking Mode*' and press {Enter} until '*Anchor*' is shown.

4) Press {Escape} to clear the menus from the screen.

QWERTY KEYBOARD - EDITING A CNC FILE USING ANCHOR MODE.

SELECTING A GROUP OF PROGRAM LINES.

To select a group of program lines, follow this procedure:

```
═══════════CNC Editor═══════════
Line 10      Column 1      Overwri
(Mill CAM Designer - eight.NC
(6/5/1995)
(Triac PC (metric))
(Post fanuc:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
█6 T1
G43 H1
M3 S2800
G90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.848 Y65.733 F120
```

1) Position the cursor anywhere on the first program line of the group you wish to select and press the {F7} key.

   This marks the start point of the grouping.

   In the example above, program line starting 'M6' has been chosen as the start of the grouping.

```
═══════════CNC Editor═══════════
Line 13      Column 1      Overwri
(Mill CAM Designer - eight.NC
(6/5/1995)
(Triac PC (metric))
(Post fanuc:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
M6 T1
G43 H1
M3 S2800
█90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.848 Y65.733 F120
```
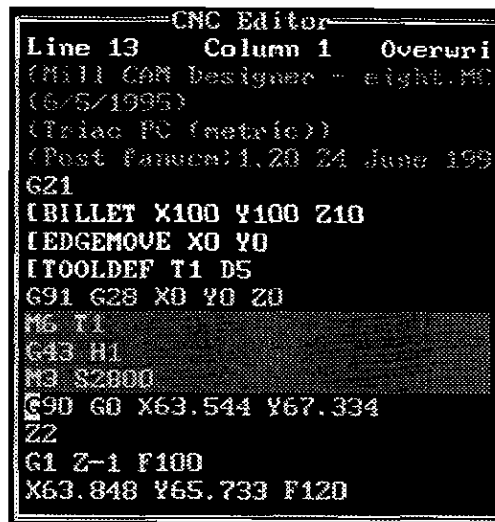
2) Move the cursor down to the program line directly after the last program line of your grouping and press the {F8} key.

   This marks the end point of the grouping.

   In the example above, a grouping of program lines starting 'M6, G43 and M3' was required, so the cursor was positioned on program line starting 'G90' to mark the end of this grouping.

Qwerty Keyboard - Editing a CNC File using Anchor Mode.

Selecting a Group of Program Lines.

```
━━━━━━━CNC Editor━━━━━━━
Line 13    Column 1    Overwri
(Mill CAM Designer - eight.MC
(6/5/1995)
(Triac PC (metric))
(Post Panuca:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
M6 T1
G43 H1
M3 S2800
G90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.848 Y65.733 F120
```

3) When the {F8} key is pressed the group of program lines will be highlighted in a green box.

If the cursor is moved to other parts of the program, the grouping will still be retained in memory.

Deselecting a Group of Program Lines.

To undo/clear a grouping of program lines, press the {F8} key on the program line that started the grouping.

QWERTY KEYBOARD - EDITING A CNC FILE USING DRAG MODE.

CONFIGURING DRAG MODE.
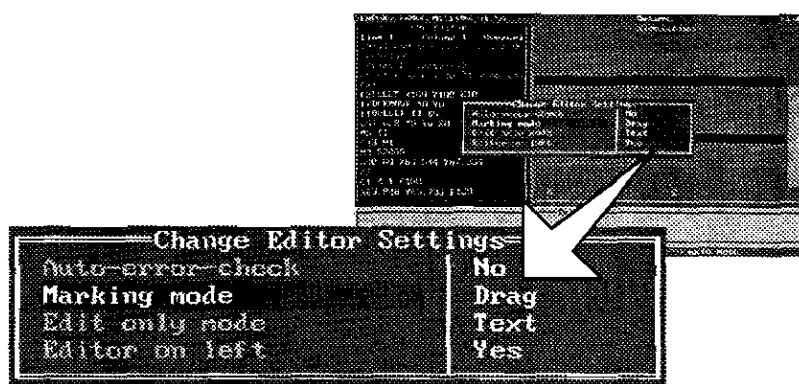
Drag Mode is used to select a group of program lines that can be copied, moved or deleted. Using *Drag Mode* will highlight program lines as they are selected, in a similar way to dragging around objects to select them in "Windows" packages.

To configure the Editor for *Drag Mode* follow this procedure:

1) Press {F10}, highlight *'Settings'* and press {Enter}.

2) Highlight *'Editor'* and press {Enter}.

3) Highlight *'Marking Mode'* and press {Enter} until *'Drag'* is shown.

4) Press {Escape} to clear the menus from the screen.

QWERTY KEYBOARD - EDITING A CNC FILE USING DRAG MODE.

SELECTING A GROUP OF PROGRAM LINES.

To select a group of program lines, follow this procedure:

```
═══════════CNC Editor═══════════
Line 10      Column 1      Overwri
(Mill CAM Designer - eight.MC
(6/5/1995)
(Triac PC (metric))
(Post famuca:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
M6 T1
G43 H1
M3 S2800
G90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.848 Y65.733 F120
```

1) Position the cursor anywhere on the first program line of the group you wish to select and press the {F7} key. The selcted program line will be highlighted in a green box.

   This marks the start point of the grouping.

   In the example above, program line starting '*M6*' has been chosen as the start of the grouping.

```
═══════════CNC Editor═══════════
Line 11      Column 1      Overwri
(Mill CAM Designer - eight.MC
(6/5/1995)
(Triac PC (metric))
(Post famuca:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
M6 T1
G43 H1
M3 S2800
G90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.848 Y65.733 F120
```

2) To group a number of program lines, press the {Down keyboard arrow}. As the cursor moves down, through the program, each program line included in the grouping is highlighted in the green box.

QWERTY KEYBOARD -

EDITING A

CNC FILE USING

DRAG MODE.

SELECTING A GROUP OF PROGRAM LINES.

```
═══════CNC Editor═══════
Line 12    Column 1    Overwri
(Mill CAM Designer - eight.MC
(6/5/1995)
(Triac PC (metric))
(Post fanuc:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
M6 T1
G43 H1
M3 S2000
G90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.840 Y65.733 F120
```

3) When all the required program lines are highlighted in the green box, press the {F8} key.

   This marks the end point of the grouping.

   In the example above, program lines starting '*M6, G43 and M3*' have been chosen as the grouping.

```
═══════CNC Editor═══════
Line 15    Column 1    Overwri
(Mill CAM Designer - eight.MC
(6/5/1995)
(Triac PC (metric))
(Post fanuc:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
M6 T1
G43 H1
M3 S2000
G90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.840 Y65.733 F120
```

4) If the cursor is now moved to other parts of the program, the grouping will still be retained in memory.

DESELECTING A GROUP OF PROGRAM LINES.

To undo/clear a grouping of program lines that have just been selected, press the {F8} key.

(ie, pressing the {F8} key once will end a grouping, pressing it again will clear the grouping).

Qwerty Keyboard - Editing a CNC File using Anchor or Drag Mode.

Copying a Group of Program Lines.

```
═════════CNC Editor════════
Line 15      Column 1      Overwri
(Mill CAM Designer - eight.NC
(6/5/1995)
(Triac PC (metric))
(Post fanuca:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
M6 T1
G43 H1
M3 S2800
G90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.848 Y65.733 F120
```

Pressing the {Alt-C} keys will place a copy of the grouping directly before the program line that the cursor is currently highlighting.

In the above example, the program lines starting '*M6, G43 and M3*' have been grouped and the cursor has been moved to highlight program line starting '*G1*'.

```
═══════Question═══════
Copy marked block?
```

When the {Alt-C} keys are pressed, a confirmation window will be displayed. Press the {Y} key to copy the grouping or the {N} key to clear the command.

```
═════════CNC Editor════════
Line 15      Column 1      Overwri
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
M6 T1
G43 H1
M3 S2800
G90 G0 X63.544 Y67.334
Z2
M6 T1
G43 H1
M3 S2800
G1 Z-1 F100
X63.848 Y65.733 F120
X63.976 Y64.183
```

In the above example, the grouping (program lines starting '*M6, G43 and M3*') has been successfully copied so it fits between program lines starting '*Z2*' and '*G1*'.

QWERTY KEYBOARD - EDITING A CNC FILE USING ANCHOR OR DRAG MODE.

MOVING A GROUP OF PROGRAM LINES.

```
═══════════CNC Editor═══════════
Line 15      Column 1      Overwri
(Mill CAM Designer - eight.NC
(6/5/1995)
(Triac PC (metric))
(Post famucm:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
M6 T1
G43 H1
M3 S2800
G90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.848 Y65.733 F120
```

Pressing the {Alt-M} keys will move the grouping to a position directly before the program line that the cursor is currently highlighting.

In the above example, the program lines starting '*M6, G43 and M3*' have been grouped and the cursor has been moved to highlight program line '*G1*'.

```
═══════════Question═══════════
Move marked block?
```

When the {Alt-M} keys are pressed, a confirmation window will be displayed. Press the {Y} key to move the grouping or the {N} key to clear the command.

```
═══════════CNC Editor═══════════
Line 12      Column 1      Overwri
(Mill CAM Designer - eight.NC
(6/5/1995)
(Triac PC (metric))
(Post famucm:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
G90 G0 X63.544 Y67.334
Z2
M6 T1
G43 H1
M3 S2800
G1 Z-1 F100
X63.848 Y65.733 F120
```

In the above example, the grouping (program lines starting '*M6, G43 and M3*') has been successfully moved from its original location so it now fits between program lines starting '*Z2*' and '*G1*'.

QWERTY KEYBOARD - EDITING A CNC FILE USING ANCHOR OR DRAG MODE.

DELETING A GROUP OF PROGRAM LINES.

```
=================CNC Editor=================
Line 15      Column 1      Overwri
(Mill CAM Designer - eight.NC
(6/5/1995)
(Triac PC (metric))
(Post fanuca:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
M6 T1
G43 H1
M3 S2800
G90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.048 Y65.733 F120
```

Pressing the {Alt-D} keys will delete the current grouping of program lines..

In the above example, the program lines starting '*M6, G43 and M3*' have been grouped and the cursor has been moved to highlight program line '*G1*'.

```
==============Question==============
Delete marked block?
```

When the {Alt-D} keys are pressed, a confirmation window will be displayed. Press the {Y} key to delete the grouping or the {N} key to clear the command.

```
=================CNC Editor=================
Line 10      Column 1      Overwri
(Mill CAM Designer - eight.NC
(6/5/1995)
(Triac PC (metric))
(Post fanuca:1.20 24 June 199
G21
[BILLET X100 Y100 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D5
G91 G28 X0 Y0 Z0
G90 G0 X63.544 Y67.334
Z2
G1 Z-1 F100
X63.048 Y65.733 F120
X63.976 Y64.183
X63.899 Y62.684
X63.62 Y61.21
```

In the above example, the grouping (program lines starting '*M6, G43 and M3*') has been successfully deleted.

SIMULATE - SCREEN VIEW OPTIONS.

Once a CNC File has been loaded, its action can be simulated on-screen. Remember that the name of the CNC File is displayed in the top right-hand corner of the display. In the example screenshots, a program called *EIGHT* has been loaded.

Simulating a program is useful for checking the order of cutting commands, the appearance of the end result and whether the program contains any mistakes.

CNC Files can be simulated in two main screen view options:

Edit and Simulate. The CNC File can be altered using the editor side of the screen and then simulated using the graphical display (plan or 3d).
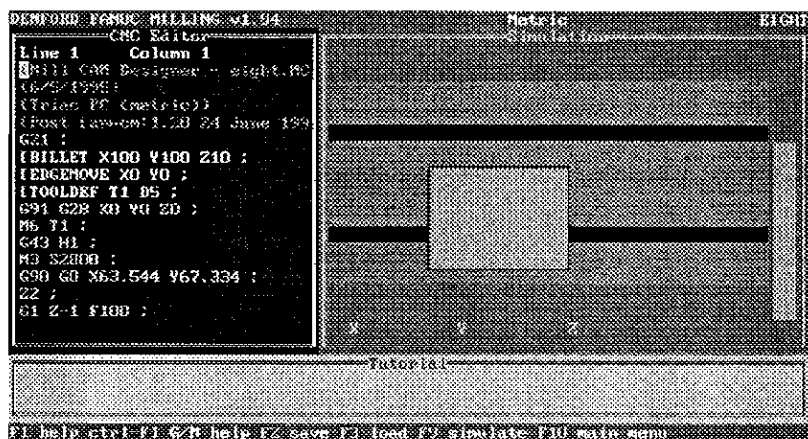
Simulate only. The CNC File can be simulated using a full screen graphical display (plan or 3d).
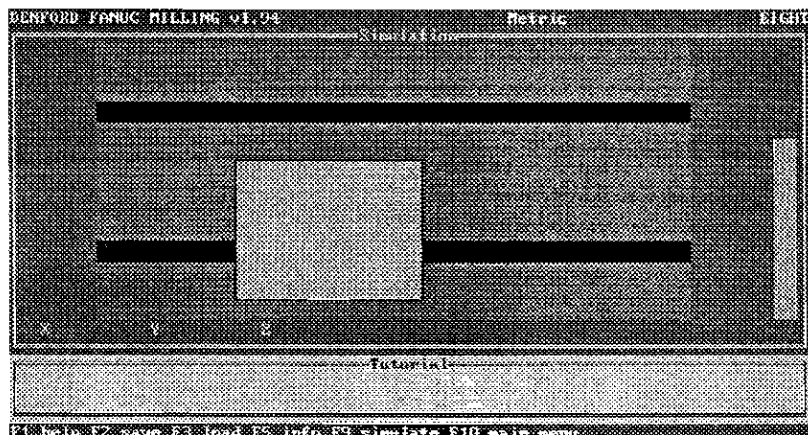
Simulate - Select Screen View.
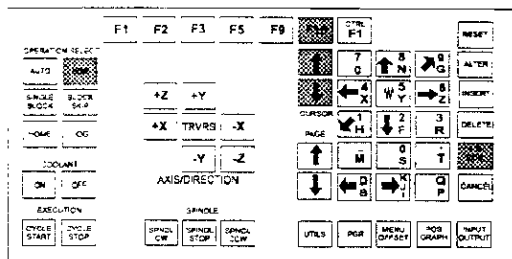
Tutor keypad.

The required screen view can be accessed by selecting the *Main Menu* by pressing the [F10] / {F10} key. Highlight either the *'Edit and Simulate'* or *'Simulate only'* options, using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key to select the highlighted option.

Note - The *'Edit and Simulate'* option can be directly accessed on the Desktop Tutor by pressing the [EDIT] key.

Main Menu
Edit only
Edit and Simulate
Simulate only
Link to controller
CNC Files
Print
Remote link
Settings
Utilities
Quit

Main Menu
Edit only
Edit and Simulate
Simulate only
Link to controller
CNC Files
Print
Remote link
Settings
Utilities
Quit
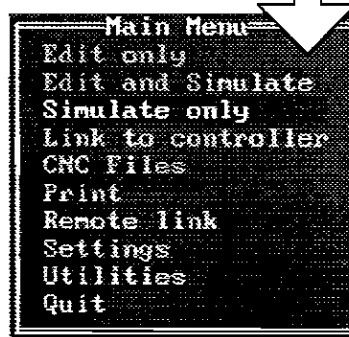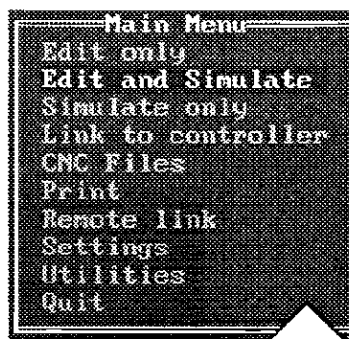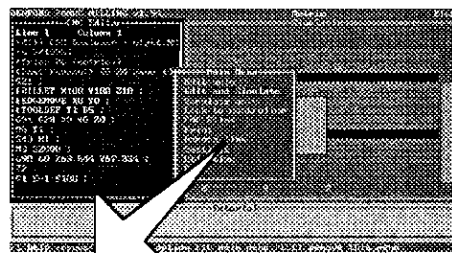
SIMULATION MENU - CHECK SYNTAX.

Keys Helpbox.
The following keys are used in this section:
[F9][CURSOR ARROWS]
[EOB], [JOG], [PAGE UP]
[CYCLE START], [CYCLE STOP], [RESET]
[8N UP ARROW], [2F DOWN ARROW]
[6Z RIGHT ARROW], [4X LEFT ARROW]
[9G UPPER RIGHT ARROW], [1H LOWER LEFT ARROW]
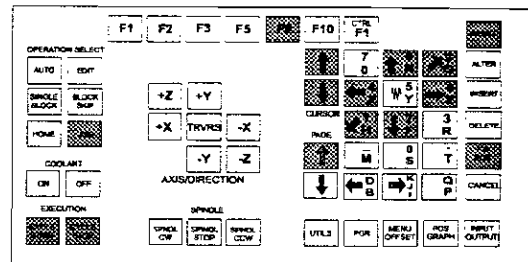
Tutor keypad.

To start simulating the CNC File (program) in the chosen screen view, select the *Simulation Menu* by pressing the [F9] / {F9} key. All example screenshots are shown using the *'Edit and Simulate'* option.

1) *Check Syntax*. This checks for illegal G-codes without running the program.

To run this option, highlight *'Check Syntax'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

The message indicating the results of this this exercise is cleared by pressing the [RESET] / {Escape} key.
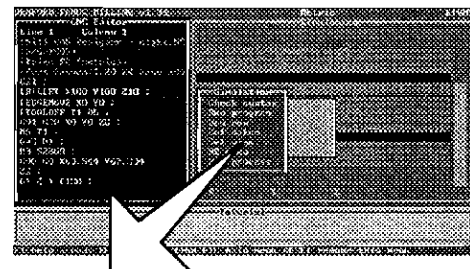
SIMULATION

MENU -

RUN PROGRAM.

2) *Run Program.* This instructs the computer to run through the program.

To start this option, highlight *Run Program* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.
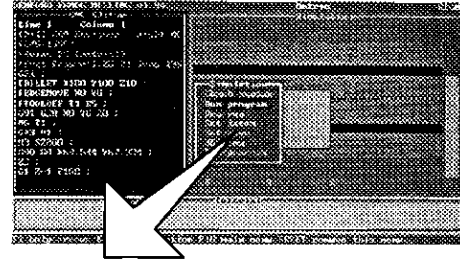
The *Run Program* option is set to run through the entire program cycle, from start to finish. Whilst the program is running, the written text will scroll down the screen and the pictorial view will be simultaneously updated.

Pressing the [CYCLE STOP] / {Escape} key at any time will abort the run. To reset back to the start of the program, press the [RESET] key twice on Desktop Tutors, or the {Page up} key continuously until the first lines of the program are visible on qwerty keyboards.
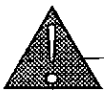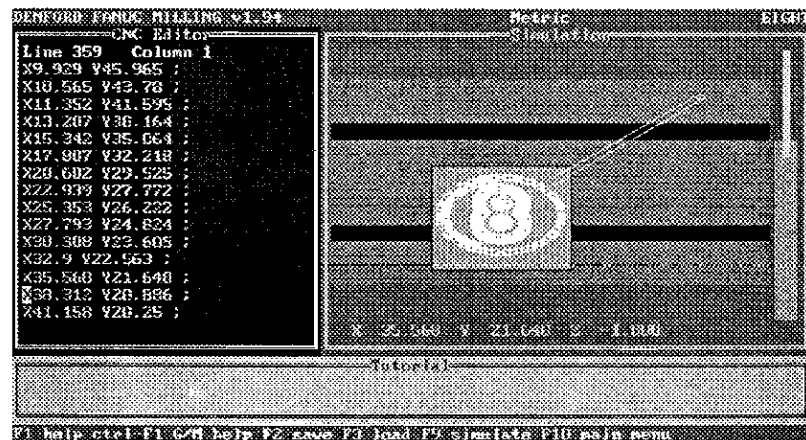
⚠ On Desktop Tutors, the [CYCLE STOP] key can also be used to pause a run. The remainder of the program will be run as a seperate cycle by pressing the [CYCLE START] key. Once this smaller cycle has finished press the [RESET] key to return to the start of the program.
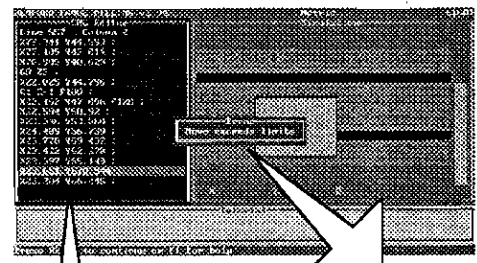
SIMULATION MENU - DRY RUN.

3) *Dry Run*. This option performs a *Check Syntax* and also checks the validity of the machining requirements (for example, any axis overtravel limits programmed into the offline software) by running the program in the computer memory.

To run this option, highlight *Dry Run* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.
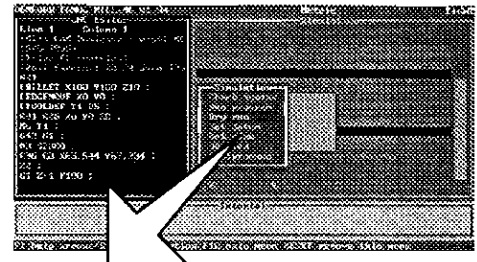
On short programs it may appear that nothing has happened, since the *Dry Run* operation may take less than a second to complete.

Dry Run will display any errors in your program, so if none are shown after pressing [EOB] / {Enter}, your CNC program has run correctly. Error messages are displayed with the appropriate incorrect line in your program highlighted. Any error messages which are displayed can be cleared by pressing the [RESET] / {Escape} key.

SIMULATION MENU - SET DATUM.

4) *Set Datum*. This allows the datum point for the graphical simulation to be set to match the co-ordinates of the 'real' work datum point used in the CNC File (ie, it simulates the tool offset that would be used on the 'actual' billet). To run this option, highlight *'Set Datum'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press [EOB] / {Enter}.

To select this option, highlight *Set Datum* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.
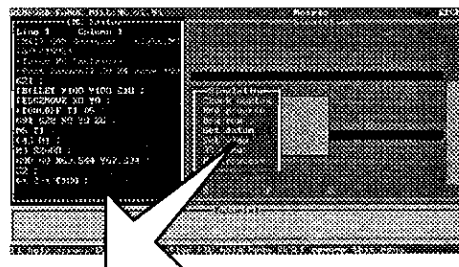
Use the following keys to move the position of the datum point (see screenshots on next page) :

[8N UP ARROW] / {Cursor up arrow} key = Purple/blue Crosshair up.

[2F DOWN ARROW] / {Cursor down arrow} key = Purple/blue Crosshair down.

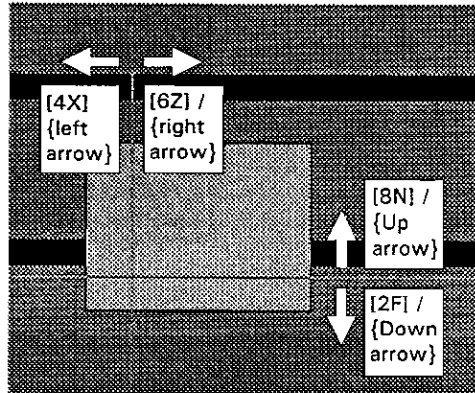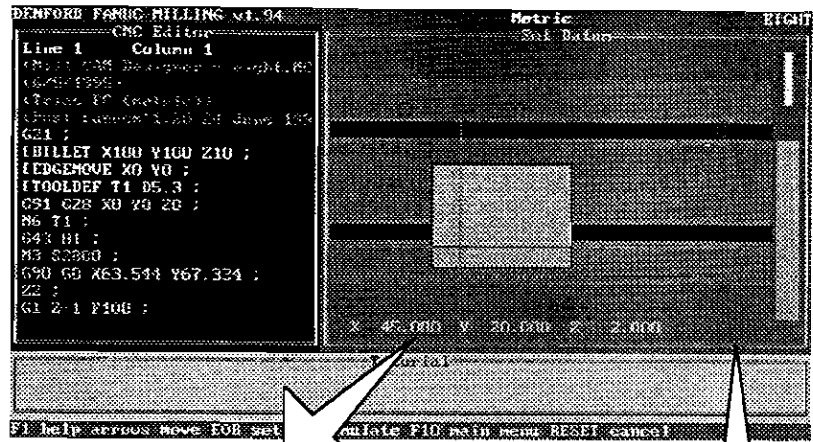[6Z RIGHT ARROW] / {Cursor right arrow} key = Purple/blue Crosshair right.

[4X LEFT ARROW] / {Cursor left arrow} key = Purple/blue Crosshair left.

[9G UPPER RIGHT ARROW] / {U} key = Yellow tool depth up.

[1H LOWER LEFT ARROW] / {D} key = Yellow tool depth down.

continued....

Simulation Menu - Set Datum.

4) *Set Datum.* continued....

[4X] / {left arrow}

[6Z] / {right arrow}

[8N] / {Up arrow}

[2F] / {Down arrow}

[9G] / {U}

[1H] / {D}
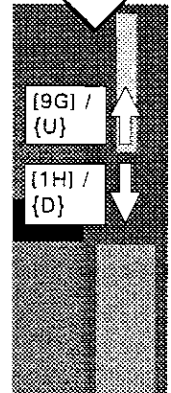
Press the [EOB] / {Enter} key to set the graphical datum point, then the [RESET] / {Escape} key to clear any unwanted menus from the screen.
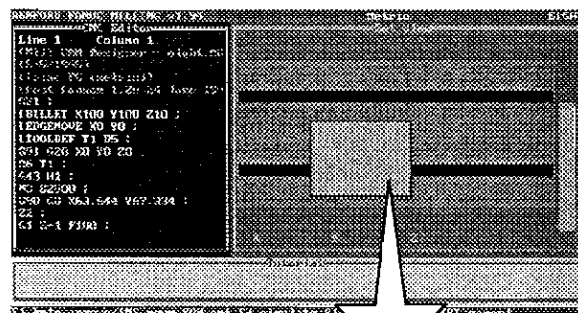
SIMULATION MENU - SET VIEW.

5) *Set View* (not applicable to the *Edit only* option). This allows the detail/magnification level of the pictorial view to be selected.

To select this option, highlight *Set View* using the [CURSOR ARROWS] / {keyboard arrows} keys and press [EOB] / {Enter}.
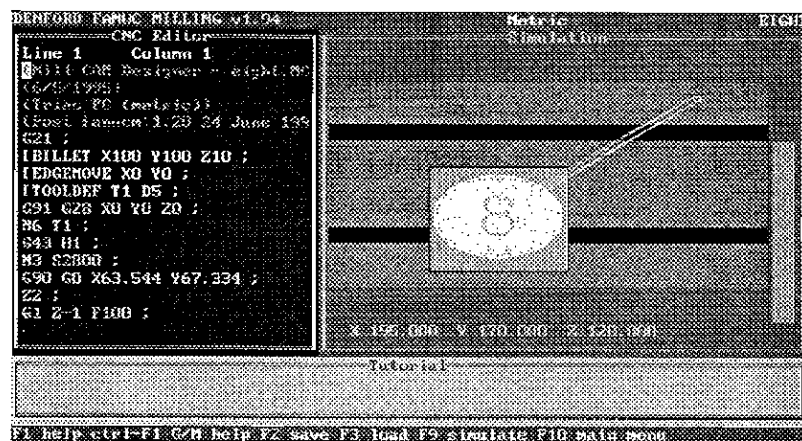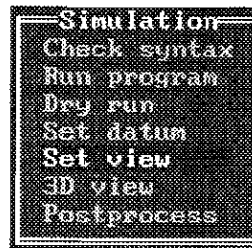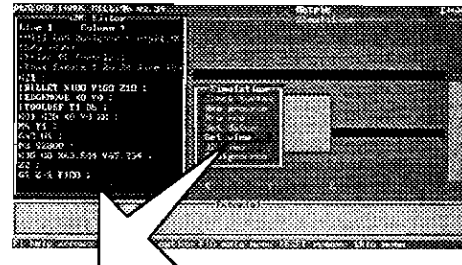
Simulation window shows 'small' billet.

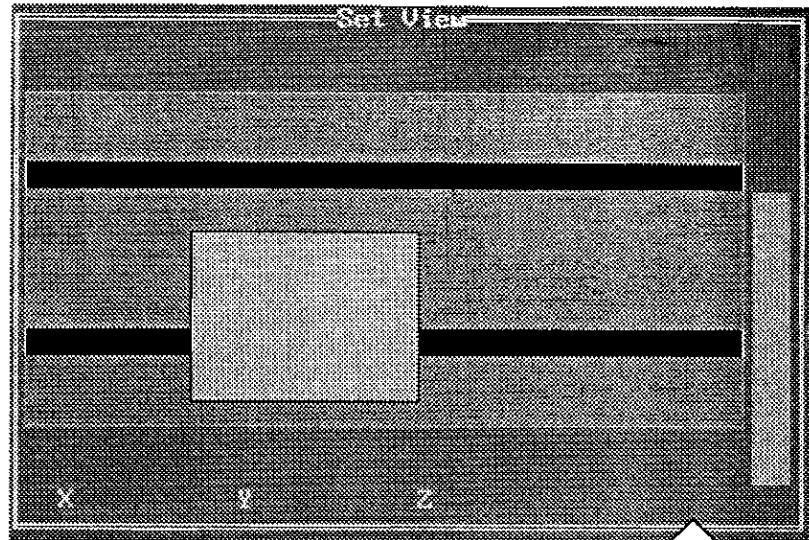*Set View* option selected from *Simulation Menu*.

Enlarged area of screen shown on next page....

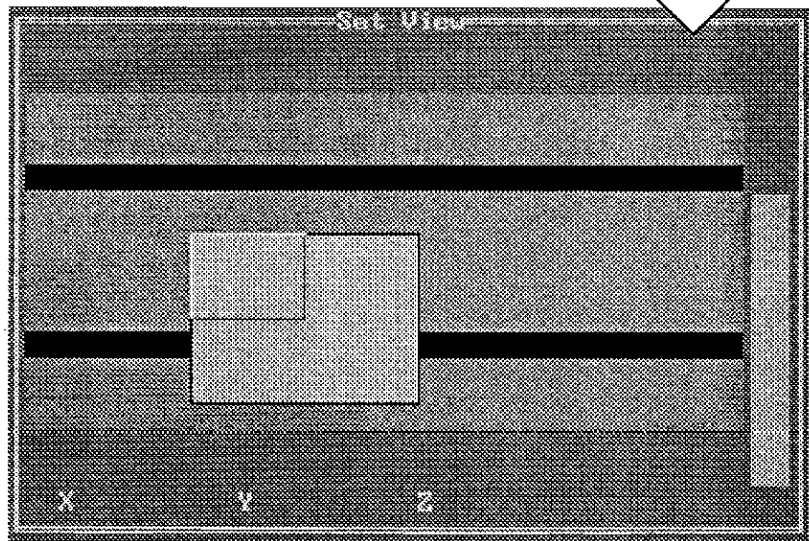# SIMULATION MENU - SET VIEW.

Press the [JOG] / {Space} key to cycle through the different views. To select the view highlighted press the [EOB] / {Enter} key.

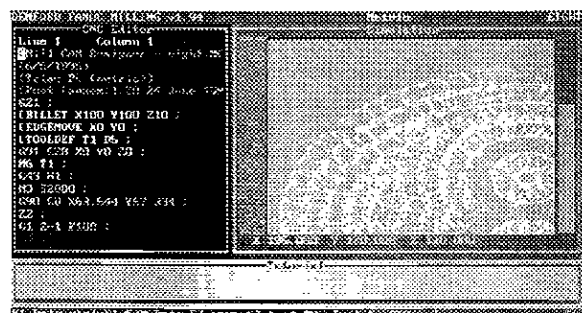Default view shows smallest billet size.

[JOG] / {Space} key toggles around the different sized views.

Magnified view shown by 'new' box outline around billet.

Now, when *Run Program* is selected, the plan pictorial view shown will be the one previously chosen in the *Set View* option.

SIMULATION MENU - 3D VIEW.

6) *3D View*. This allows a three dimensional model of the work to be displayed in place of the plan view.

To select this option, highlight *3D View* using the [CURSOR ARROWS] / {keyboard arrows} and press the [EOB] / {Enter} key.
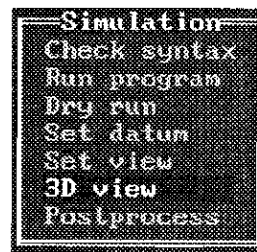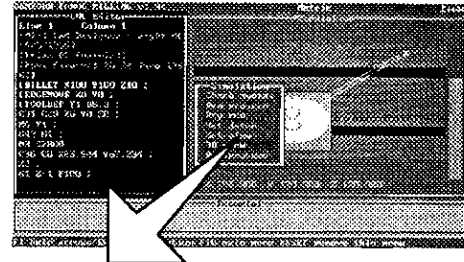
The *3D View* option will only display a static 3d view of the current stage of the work.

To return to the 2d plan view, select the *Run Program* option.

If a 3d view is permanently required during the *Run Program* operation, the 3d view must be set from the *Change Settings (Simulation) Menu* (see section 9.9).
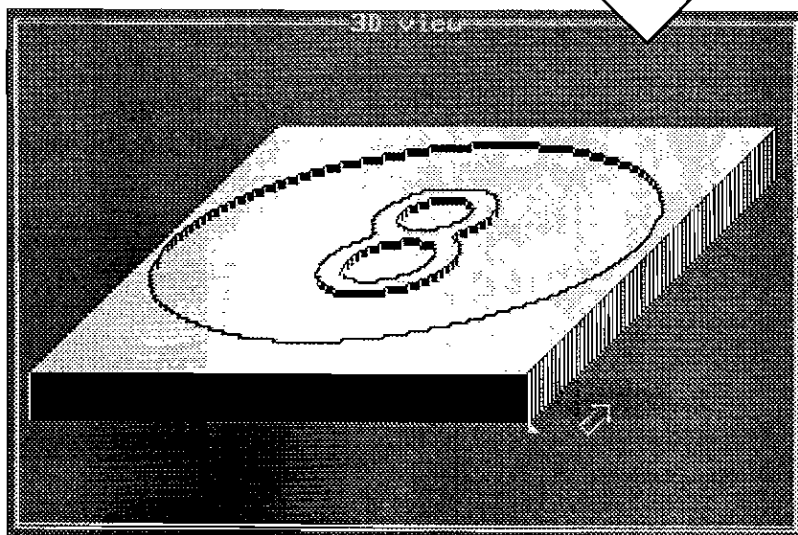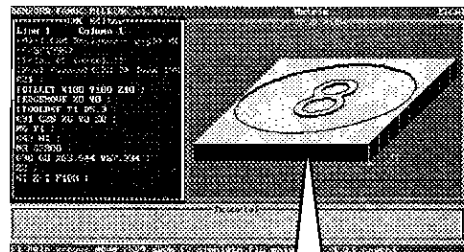
SIMULATION MENU - POSTPROCESS.

6) *Postprocess*. This simulates the program in the computer's memory, then writes a new file to disk, describing co-ordinate positioning and movements for that program.

The new file has the extension ".tnc" and will be saved in the last drive and directory set by the offline software (usually C:\Denford or C:\Denford\Data).

These new files can be used by the separate Denford Postprocessor software package to generate new CNC programs understood by other machine controllers (eg, Heidenhain).

The post process option will not alter the original ".fnc" file used to generate the new ".tnc" file.

To select this option, highlight *Postprocess* using the [CURSOR ARROWS] / {keyboard arrows} and press the [EOB] / {Enter} key.

Note - no message window will be displayed to indicate the program has been postprocessed.
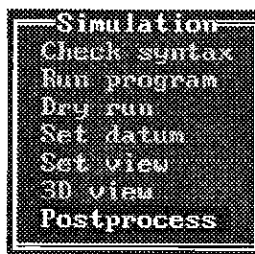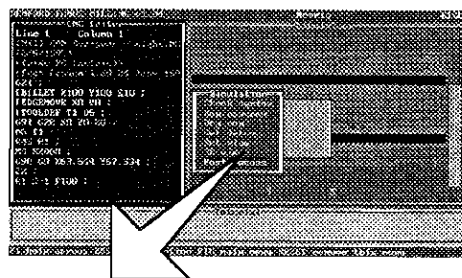
CHANGE SETTINGS - MENU.

The *Change Settings Menu* allows the offline software to be customised to suit the requirements of the end user.

When all the options have been fully configured, the settings should be saved to disk. Each time the software is started it will load these customised settings.
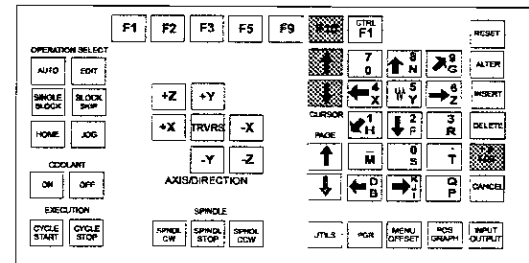
Keys Helpbox.
The following keys are used in this section:
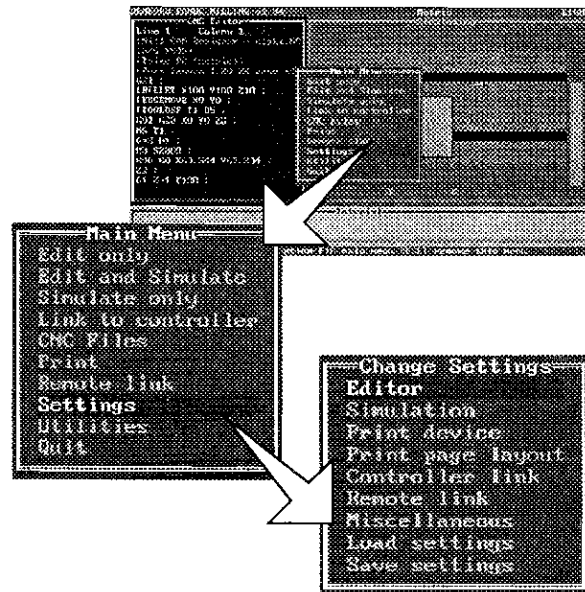[F10]
[CURSOR ARROWS]
[EOB]

Tutor keypad.

The *Change Settings Menu* is used to switch on and off the various options available within the machine controlling software.

Select the *Main Menu* by pressing the [F10] / {F10} key. Highlight '*Settings*' using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key to confirm this choice.

At the *Change Settings Menu*, select the required option and press the [EOB] / {Enter} key.

CHANGE
SETTINGS
- MENU.
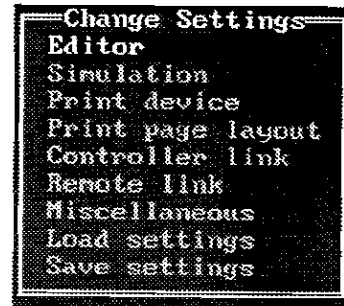
The *Change Settings Menu* contains nine options:

1) *Editor.* This option allows the CNC File Editor window to be customised.

2) *Simulation.* This option allows the graphics and views in the Simulation window to be customised.

3) *Print Device.* This option allows any printers attached to the pc to be configured.

4) *Print Page Layout.* This option allows the layouts of any printouts to be customised.

5) *Controller Link.* This option allows the communication protocols between the pc on which the offline software is running and an external FANUC controller to be configured.

6) *Remote Link.* This option allows the communication protocols between the pc on which the offline software is running and an external device to be configured.

7) *Miscellaneous.* This option allows the units of measurement, user's name and screen text size to be customised.

8) *Load Settings.* This option allows a collection of settings to be loaded from a disk.

9) *Save Settings.* This option allows the current collection of settings to be saved to a disk.
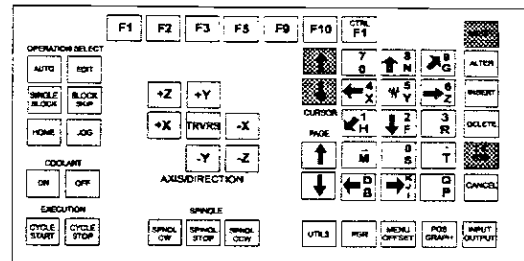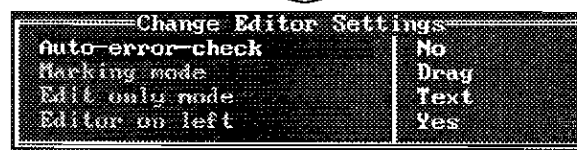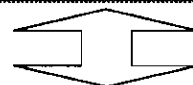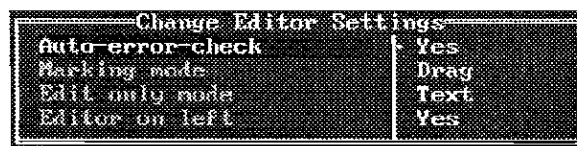
Change Settings - Editor.

Tutor keypad.

The *Change Settings (Editor) Menu* contains the following options:

1) *Auto-error Check*. This option, when set to '*Yes*', will check the validity of CNC program lines as they are manually entered. When the [EOB] / {Enter} key is pressed (to signify the end of a program line) an error description box will be displayed if an error is encountered. Press the [RESET] / {Escape} key to clear the error description box. The cursor will highlight where on the program line the error occurred.

To select this option, highlight '*Auto-error Check*' using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

The screen will indicate the current setting of the option. Continual pressing of the [EOB] / {Enter} key will toggle the option between '*Yes*' and '*No*'.

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

Change Editor Settings	
Auto-error-check	Yes
Marking mode	Drag
Edit only mode	Text
Editor on left	Yes

Change Editor Settings	
Auto-error-check	No
Marking mode	Drag
Edit only mode	Text
Editor on left	Yes

CHANGE

SETTINGS

- EDITOR.

2) *Marking Mode.*

The *Marking Mode* feature will only operate on qwerty keyboard versions of the offline software.

This option, will select between the *'Drag'* or *'Anchor'* methods of copying, moving and deleting parts of CNC Files.
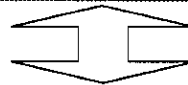
In *Anchor Mode*, program lines are not highlighted on-screen, as they are selected. In *Drag Mode*, program lines are highlighted on-screen, as they are selected.

To select this option, highlight *'Marking Mode'* using the {keyboard arrows} keys and press the {Enter} key.

The screen will indicate the current setting of the option. Continual pressing of the {Enter} key will toggle the option between *'Anchor'* and *'Drag'*.

When the setting is correct, press the {Escape} key until all the menus have been removed from the screen.
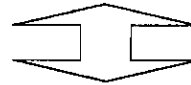
CHANGE SETTINGS - EDITOR.

3) *Edit Only Mode.* This option toggles the preference of the *Edit Only* display between '*Text*' or '*Graphics*'. In *Graphics Mode* preference is given to the appearance of the alphabet characters used by the offline software (ie, the software drivers). In *Text Mode* preference is given to the computer video card, giving a slight speed increase when scrolling the text and direct access to specific character maps controlled by the video card (ie, the computer drivers).

To select this option, highlight '*Edit Only Mode*' using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

The screen will indicate the current setting of the option. Continual pressing of the [EOB] / {Enter} key will toggle the option between '*Text*' and '*Graphics*'.

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

CHANGE SETTINGS - EDITOR.

3) *Edit Only Mode*. continued.....

'Edit Only Mode' set to *'Text'*.

'Edit Only Mode' set to *'Graphics'*.

CHANGE SETTINGS - EDITOR.

4) *Editor On Left*. This option, when set to *'Yes'*, will display the CNC Editor window on the left side of the screen (when the control is set in *'Edit and Simulate'* Mode). Selecting *'No'* will display the CNC Editor window on the right side of the screen (when the control is set in *'Edit and Simulate'* Mode).

To select this option, highlight *'Editor On Left'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

The screen will indicate the current setting of the option. Continual pressing of the [EOB] / {Enter} key will toggle the option between *'Yes'* and *'No'*.

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.
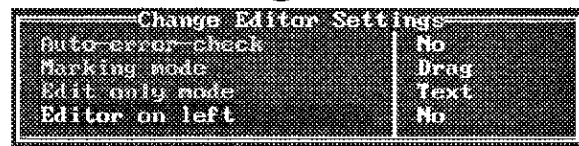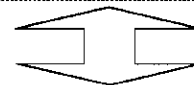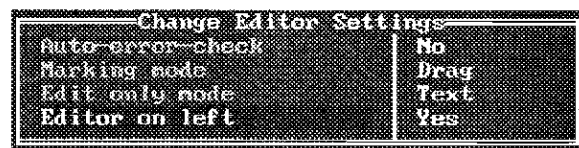
'Editor On Left' set to *'Yes'*.

'Editor On Left' set to *'No'*.
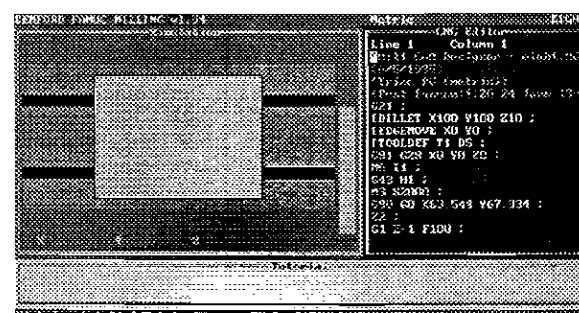
CHANGE
SETTINGS
- SIMULATION.
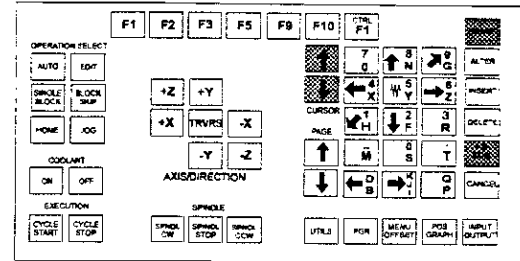
Tutor keypad.

The *Change Settings (Simulation) Menu* contains the following options:

1) *Simulation Window*. This option will switch the size of the graphical simulation window between wide and normal.

Normal splits the display screen to 50% editor window and 50% graphical simulation window. Wide increases the graphical simulation window, at the expense of the Editor window size.

To select this option, highlight '*Simulation Window*' using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

The screen will indicate the current setting of the option. Continual pressing of the [EOB] / {Enter} key will toggle the option between '*normal*' and '*wide*'.

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

Change Simulation Settings	
Simulation window	Wide
Short cuts	No
Show 3D	No
Display fast-traverses	Yes
Tool motion	No

Change Simulation Settings	
Simulation window	Normal
Short cuts	No
Show 3D	No
Display fast-traverses	Yes
Tool motion	No
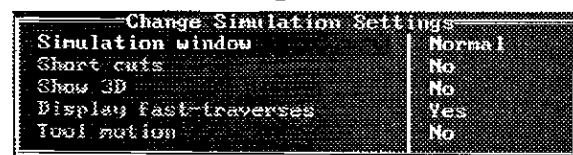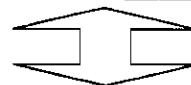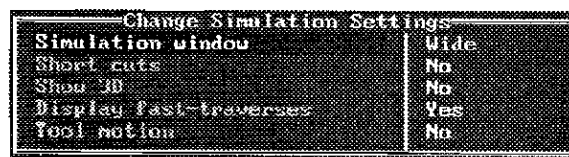
continued....

CHANGE SETTINGS - SIMULATION.

1) *Simulation Window.* continued....

Simulation Window set to '*Normal*'.
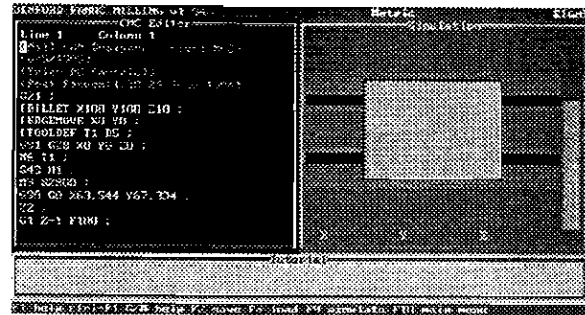
Simulation Window set to '*Wide*'.
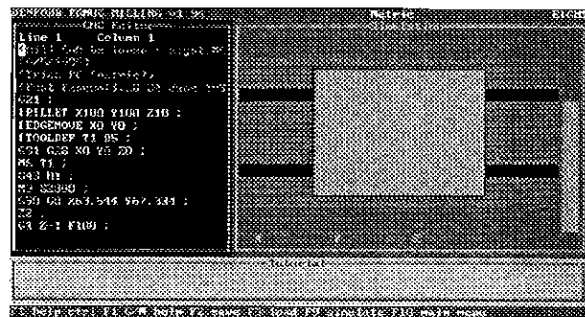
2) *Short Cuts.* This option is active when set to '*Yes*'.

Shorts Cuts, when set to '*Yes*', will speed up the simulation graphics by shortening any repetitive cycle commands (eg, peck drilling). The numbers of cycles required to complete the command are shown on screen by one single operation, rather than a series of repeat operations.

To select this option, highlight '*Short Cuts*' using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

The screen will indicate the current setting of the option. Continual pressing of the [EOB] / {Enter} key will toggle the option between '*Yes*' and '*No*'.

When the setting is correct, press the [RESET] / {Esacpe} key until all the menus have been removed from the screen.
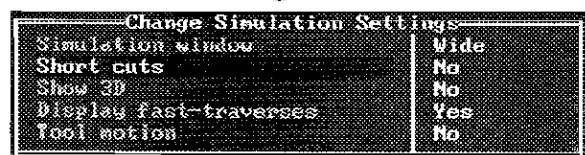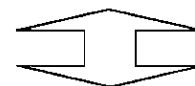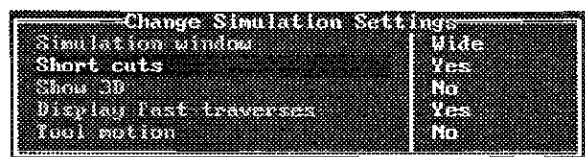
CHANGE

SETTINGS

- SIMULATION.

3) *Show 3d*. This option, when set to '*Yes*', will display the work as a three dimensional object.

To select this option, highlight '*Show 3d*' using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

The screen will indicate the current setting of the option. Continual pressing of the [EOB] / {Enter} key will toggle the option between '*On*' and '*Off*'.

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

Change Simulation Settings	
Simulation window	Wide
Short cuts	No
Show 3D	Yes
Display fast-traverses	Yes
Tool motion	No

Change Simulation Settings	
Simulation window	Wide
Short cuts	No
Show 3D	No
Display fast-traverses	Yes
Tool motion	No

continued.....

Change
Settings
- Simulation.

3) *Show 3d.* continued.....

When *'Run Program'* is selected, the work will be displayed in 3d, throughout the running of the program cycle.
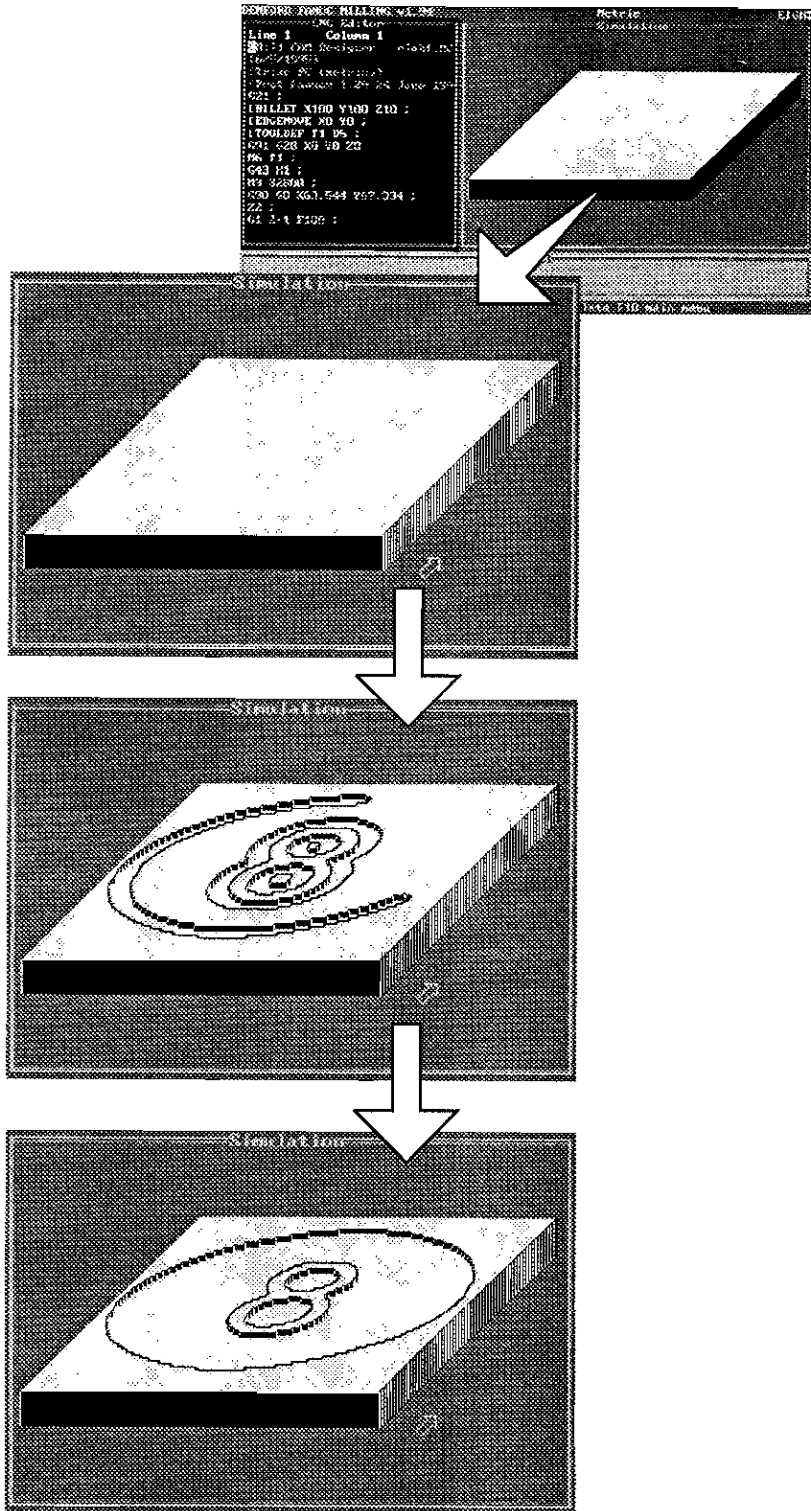
CHANGE SETTINGS - SIMULATION.

3) *Display Fast Traverses*. This option is active when set to *'Yes'* (not available for 3d views).

Display Fast Traverses, when set to *'Yes'*, will show all fast traverse movements as yellow dotted lines. Lines cut into the billet are shown in white.

To select this option, highlight *'Short Cuts'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

The screen will indicate the current setting of the option. Continual pressing of the [EOB] / {Enter} key will toggle the option between *'Yes'* and *'No'*.

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.


Display Fast Traverses set to *'Yes'*.

Display Fast Traverses set to *'No'*.
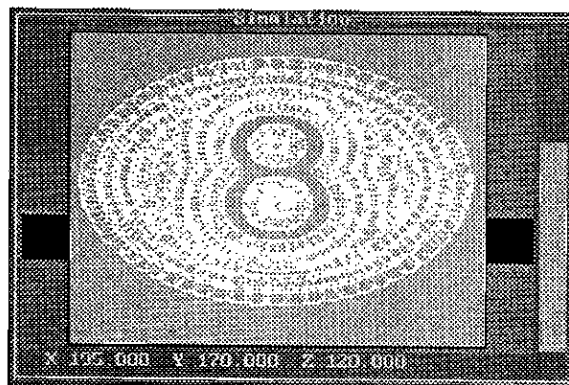
Change Settings - Simulation.

4) *Tool Motion.* This option, when set to *'Yes'* will display a graphic of the tool being used, showing it's path as it moves and cuts the material (not available for 3d views).

To select this option, highlight *'Tool Motion'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key.

The screen will indicate the current setting of the option. Continual pressing of the [EOB] / {Enter} key will toggle the option between *'Yes'* and *'No'*.

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

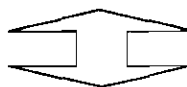When *'Run Program'* is selected, the tool motion will be shown , throughout the running of the program cycle. The program cycle will run slower with this option switched 'on'.

Yellow Fast traverses.

White cutting path.

Blue cutting tool.

CHANGE SETTINGS

- PRINT DEVICE.

Tutor keypad.

⚠ **Please note -**
Any changes made to these settings should be carried out by either your IT Manager or computer technician.

The *Print Device* option is used to configure the settings for any printers attached to the pc.

There are three different printer options, selected by pressing the [EOB] / {Enter} key when the cursor is highlighting the *'Device : Type'* :

1) *DOS Device* - A DOS Device is normally the parallel port which can be set to LPT1. LPT2. or PRN. Select this option if your printer has a parallel port.

2) *Serial Device* - Select the individual settings using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key to toggle between the different values.

3) *File* - This option is used to save the CNC File on disk, for printing off at a later date. The currently loaded CNC File will be saved with an extension ".LST".

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

CHANGE SETTINGS - PRINT PAGE LAYOUT.
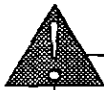
Keys Helpbox.
The following keys are used in this section:
[CURSOR ARROWS]
[EOB]
[RESET]
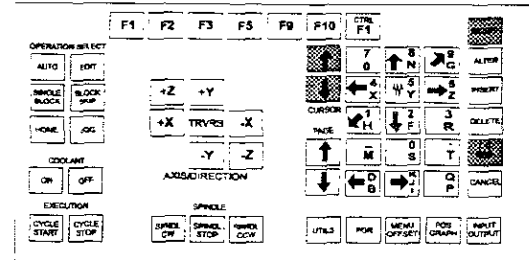
Tutor keypad.

The *Print Page Layout* option is used to customise any printouts taken from the control software.

If several printers are available, save each individual setting with a different filename (see page 9.22).

Select the individual settings on the *Change Print Page Layout Menu* using the [CURSOR ARROWS] / {keyboard arrows}. Press the [EOB] / {Enter} key to move the cursor across, type in the required values, then press the [EOB] / {Enter} key to confirm the new value.

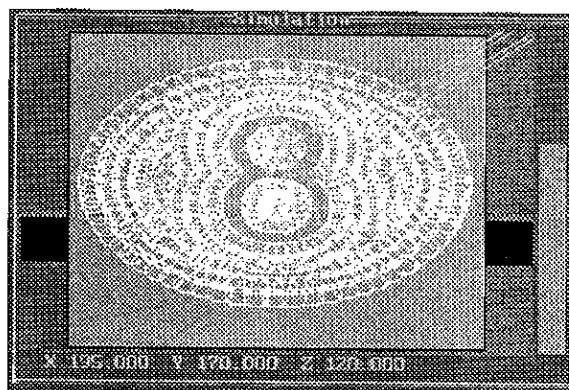When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

Change Print Page Layout

Page width	80
Page depth	60
Left margin	0
Top margin	0
Bottom margin	0
Column width	80
Carriage return nulls	0
Line feed nulls	0
Form feed nulls	0
Print line feeds	Yes

CHANGE
SETTINGS
- CONTROLLER
LINK.
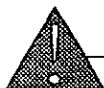
Keys Helpbox.
The following keys are used in this section:
[CURSOR ARROWS]
[EOB]
[RESET]
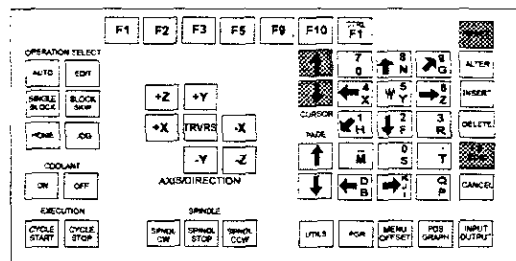
Tutor keypad.

The *Controller Link* option is used to configure the communication protocols between the pc and an external FANUC controller.

The unused serial port (usually COM2) on the pc should be used (if available) to link to the external FANUC controller.

To select the individual settings use the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key to toggle between the different values.
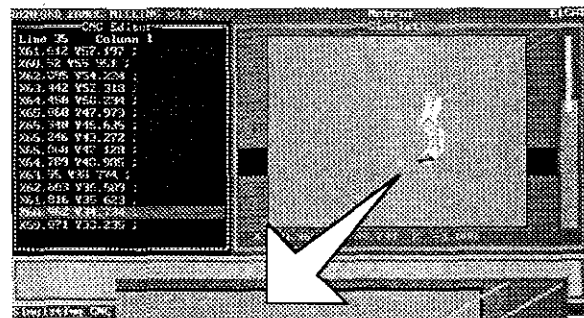
When the settings are correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

Change Machine Link	
Device name	COM2
Baudrate	9600
Parity	None
Data bits	8
Stop bits	1

Change Settings - Remote Link.
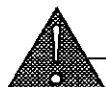
Tutor keypad.

⚠ Please note -
Any changes made to these settings should be carried out by either your IT Manager or computer technician.
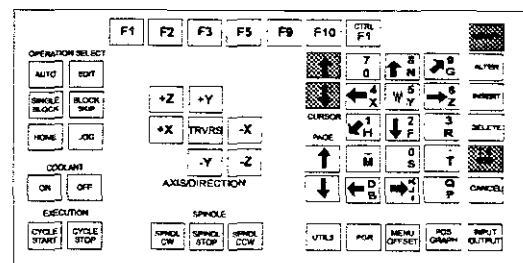
The *Remote Link* option is used to configure the communication protocols between the pc and an external device (such as a remote computer, paper tape punch, or printer).

The unused serial port (usually COM2) on the pc should be used (if available) to link to the external device.

To select the individual settings use the [CURSOR ARROWS] / {keyuboard arrows} keys and press the [EOB] / {Enter} key to toggle between the different values.

When the settings are correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

Change Remote Link	
Device name	COM2
Baudrate	4800
Parity	Odd
Data bits	7
Stop bits	1
Send line-feeds	Yes
End-of-file	ctrl-Z
Send XOFF at % full	100

CHANGE

SETTINGS

- MISCELLANEOUS.
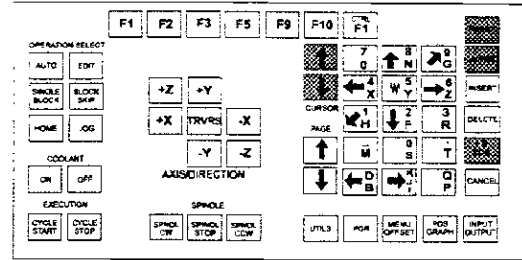
Tutor keypad.

The *Change Settings (Miscellaneous) Menu* contains the following options:

1) *Global Units*. This option, when set to *'Metric'*, will set the programming units of measurement as metric (millimetres). When set to *'Imperial'*, the programming units of measurement are set as imperial (inches).

To select this option, highlight *'Global Units'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key. Continual pressing of the [EOB] / {Enter} key will toggle the option between the two settings.

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.
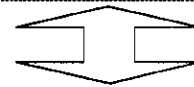
CHANGE SETTINGS
- MISCELLANEOUS.

2) *User's Name*. This option allows the user's name to be printed out on any subsequent CNC File printouts.

To select this option, highlight *'User's Name'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key to move the cursor across to the text *'A N Other'*.
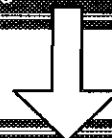
To delete the text *'A N Other'* press the [ALTER] / {Delete} key.

Enter the new text and press the [EOB] / {Enter} key to confirm (note - Desktop Tutor users can only enter numerical names).

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

CHANGE SETTINGS - MISCELLANEOUS.
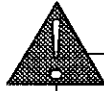
⚠️ Please note -
The screen text size option will operate when the main screen display is set to "EGA" mode but will NOT operate when set to "VGA" mode. The screen mode can be altered by opening a DOS window and editing the "fanuc.go" file, found in the root of the software directory. The screenshots in section 3) are taken from "EGA" displays.

3) *Screen Text Size*. This option, when set to *'Large'*, will set the text size to 25 lines on screen :
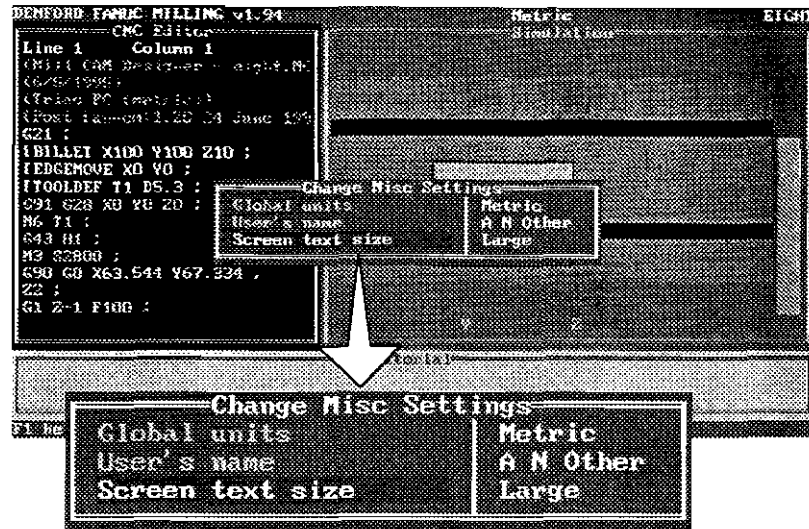
When set to *'Small'*, the text size is set to 43 lines on screen :
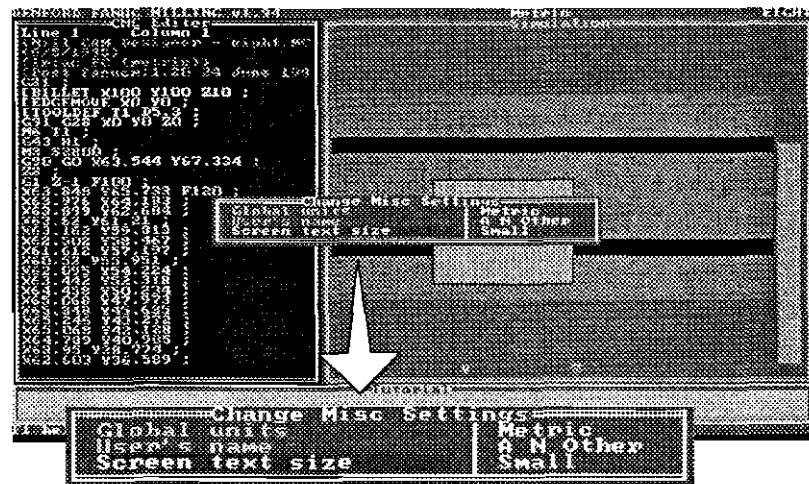
To select this option, highlight *'Screen Text Size'* using the [CURSOR ARROWS] / {keyboard arrows} keys and press the EOB] / {Enter} key. Continual pressing of the [EOB] / {Enter} key will toggle the option between the two settings.

When the setting is correct, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

Change
Settings
- Load Settings.
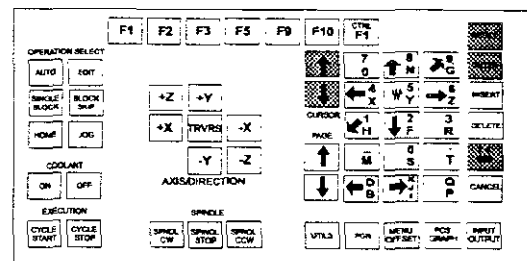
Tutor keypad.

The *Load Settings* option is used to load any previously saved offline software settings.

When the *Load Settings* option is selected,the default settings filename will appear in the edit window. The default filename is:

1) '*FANUCMD*' for Desktop Tutor controlled software.

2) '*FANUCM*' for qwerty keyboard controlled software.

To list all of the available Settings Files, clear the edit window by pressing the [ALTER] / {Delete} key and press the [EOB] / {Enter} key. Select the required settings file from the list using the [CURSOR ARROWS] / {keyboard arrows} keys and press the [EOB] / {Enter} key to load the highlighted file.
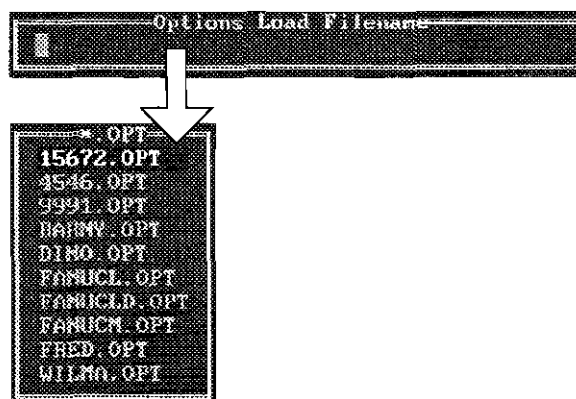
When the Setting File has been loaded, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

Change Settings - Save Settings.

Tutor keypad.

⚠ **Please note -**
If the current settings file is to become the 'new' default settings file, save the file with the name *'FANUCMD'* on Desktop Tutors, or *'FANUCM'* on qwerty keyboards and ensure it is saved on the machines hard drive.

The *Save Settings* option is used to save the currently loaded software settings.

When the *Save Settings* option is selected, the default settings filename will appear in the edit window. The default filename is:

1) *'FANUCMD'* for Desktop Tutor controlled software.

2) *'FANUCM'* for qwerty keyboard controlled software.

If the settings are saved with this default filename, they will be reloaded as the default settings whenever the offline software is restarted. To save the settings with a different name, press the [ALTER] / {Delete} key to clear the window. Type in the 'new' filename and press the [EOB] / {Enter} key. The 'new' Settings File will be saved on the currently selected drive.

When the Settings File has been saved, press the [RESET] / {Escape} key until all the menus have been removed from the screen.

PROGRAMMING TERMS AND CONVENTIONS.

This section describes the composition of a basic CNC part program, listing the following terms used:

1) Program Address characters.

2) G Codes used on Denford CNC Milling Machines.

3) M Codes used on Denford CNC Milling Machines.

4) Denford Directives (program codes specific to Denford CNC Machines).

WHAT IS A PART PROGRAM ?

A *Part Program* is a list of coded instructions which describes how the designed component, or part, 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 I.S.O. 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 next page....

COMPOSITION OF A PART PROGRAM.
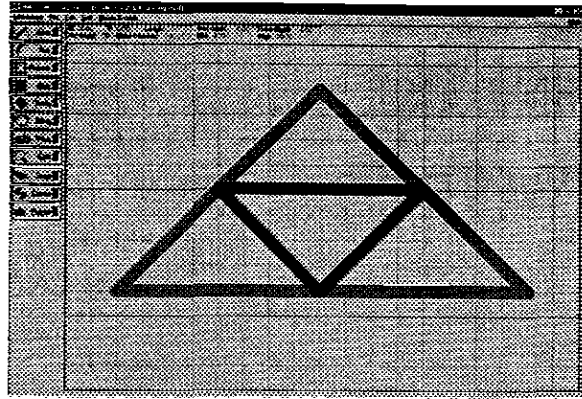
The component is designed "on-screen" using Mill CAM Designer.

This CAD/CAM software package automatically generates a G code part program suitable for Denford CNC machines, listed on the bottom left of this page....

PART PROGRAM EXAMPLE -

```
[MILL CAM DESIGNER - TRIANG.MCD]
[3/3/1997]
[NOVAMILL [METRIC]]
[POST FANUCM:1.20 24 JUNE 1994]
G21
[BILLET X80 Y55 Z10
[EDGEMOVE X0 Y0
[TOOLDEF T1 D2
N0010 G91G28X0Y0Z0;
N0020 M6T1;
N0030 G43H1;
N0040 M3S1500;
N0050 G90G0X40Y48;
N0060 Z2;
N0070 G1Z-0.5F100;
N0080 X72Y16F150;
N0090 X8;
N0100 X40Y48;
N0110 G0Z2;
N0120 X24Y32;
N0130 G1Z-1F100;
N0140 X56F150;
N0150 X40Y16;
N0160 X24Y32;
N0170 G0Z2;
N0180 M5;
N0190 G91G28X0Y0Z0;
N0200 M30;
```

ADDRESS EXAMPLE - G
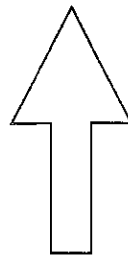
WORD EXAMPLE - G01
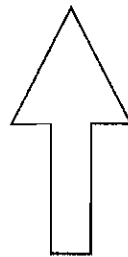
BLOCK EXAMPLE - N0130 G1Z-1F100;

DENFORD DIRECTIVE EXAMPLE - [BILLET

LISTING OF ADDRESS CHARACTERS.

N	- Program Sequence (line) number.
X	- Primary motion in X axis.
Y	- Primary motion in Y axis.
Z	- Primary motion in Z axis.
G	- Preparatory functions.
I	- Inremental distance parallel to X axis.
J	- Incemental distance parallel to Y axis.
K	- Incremental distance parallel to Z axis.
R	- Radius.
M	- Miscellaneous functions.
T	- Tool numbers.
S	- Spindle speeds.
F	- Feed rates.

G Codes Listing for Denford CNC Milling Machines.

NOTE: NOT ALL G CODES ARE AVAILABLE.

Group 1   GØØ Positioning (Rapid Traverse)

1	GØ1 Linear Interpolation (Cutting Feed)
1	GØ2 Circular Interpolation CW
1	GØ3 Circular Intepolation CCW
Ø	GØ4 Dwell, Exact Stop
6	G2Ø Input in Inches
6	G21 Input in millimeters
Ø	G28 Return to Reference Point
7	G4Ø Cutter Compensation Cancel
7	G41 Cutter Compensation Left
7	G42 Cutter Compensation Right
9	G73 Pecking Drill Cycle
9	G76 Fine Boring
9*	G8Ø Canned Cycle Cancel
9	G81 Drilling Cycle, Spot Boring
9	G82 Drilling Cycle, Counter Boring
9	G83 Peck Drilling Cycle
9	G85 Boring Cycle
9	G86 Boring Cycle
9	G87 Back Boring Cycle
9	G88 Boring Cycle
9	G89 Boring Cycle
3*	G9Ø Absolute Zero
3	G91 Incremental Command
5*	G94 Feed per Minute
5	G95 Feed per Revolution
1Ø*	G98 Return to Initial Point in Canned Cycle
1Ø	G99 Return to R in Canned Cycle

Notes.

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.

M CODES
LISTING FOR
DENFORD
CNC MILLING
MACHINES.

MØØ*	Program Stop
MØ1*	Optional Stop
MØ2*	Program Reset
MØ3	Spindle Forward
MØ4	Spindle Reverse
MØ5*	Spindle Stop
MØ6	Auto Tool Changer
MØ8	Coolant "A" ON
MØ9*	Coolant OFF
M1Ø	Work Clamp Open
M11	Work Clamp Close
M13	Spindle Forward and Coolant ON
M14	Spindle Reverse and Coolant ON
M15	Program Input Using "MIN P" (Special Function)
M2Ø	ATC Arm IN
M21	ATC Arm BACK
M22	ATC Arm DOWN
M23	ATC Arm UP
M24	ATC Drawbar UNCLAMP
M25	ATC Drawbar CLAMP
M27	Reset Carousel to Pocket One (MDI only)
M28	Reset Carousel to Pocket Position
M29	Select "DNC" Mode
M3Ø	Program Reset and Rewind
M32	Carousel CW
M33	Carousel CCW
M38	Door Open
M39	Door Close
M62	AUX. 1. ON
M63	AUX. 2. ON

M Codes Listing for Denford CNC Milling Machines.

M64	AUX. 1. OFF
M65	AUX. 2. OFF
M66	Wait for INPUT 1
M67	Wait for INPUT 2
M7Ø	Mirror in X ON
M71	Mirror in Y ON
M76	Wait for Input 1 to go LOW
M77	Wait for Input 2 to go LOW
M8Ø	Mirror in X OFF
M81	Mirror in Y OFF
M98	Sub- Program Call
M99	Sub-Program End

Notes.

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).

DENFORD DIRECTIVES.

Directives are program terms defined by Denford Limited.

They are used to help generate the 'Simulation Mode' 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 X1ØØ.Ø Y9Ø.Ø Z2Ø.Ø

This sets the measure to metric (Note - if set to Imperial the units would be inches) and defines the billet as1ØØmm long by 9Ømm wide, with a depth of 2Ømm.

[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.

[TOOLDEF

This directive sets the length and diameter of a cutting tool. The length of a tool is the distance from the spindle nose to the bottom of the cutter.

Example:

G21

[TOOLDEF T1 D8 Z65

This example defines tool number 1 as being 8mm in diameter, and 65mm long.

Denford Directives.

[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.

[EDGEMOVE

This directive will move the edges of the billet relative to the workpiece datum point. For the purposes of graphical simulation, the workpiece datum point is usually set as the lower front corner of the billet.

[EDGEMOVE is useful when a workpiece datum point written into a G-code program does not match this default (lower lefthand front corner) position on the billet.

It moves the graphic display of the billet so the workpiece datum point in the graphical simulation aligns with the workpiece datum point in the program.

Example:

G21

[EDGEMOVE XØ Y-2Ø

This example moves the billet Ømm on X and -2Ømm on Y from the workpiece datum point.

DENFORD

DIRECTIVES.

!

An exclamation mark is used to display a message in the tutorial messages window (shown in the lower part of the screen). The message will be shown until it is either cleared or replaced by another message.

Tutorial messages are shown coloured green, within the program, on-screen. Messages must be entered off-line since text cannot be entered with the tutor keyboard.

Example:

! NOW CUTTING 1Ømm BORDER

This example would print the line "NOW CUTTING 1Ømm BORDER" in the tutorial messages window in the lower part of the screen.

?

A question mark is used to display a message in the tutorial messages window (shown in the lower part of the screen). When the message is displayed the program will stop. A keypress is required to set the program running again. Any messages will be shown until they are either cleared or replaced by another message.

Tutorial messages are shown coloured green within the program, on-screen. Messages must be entered off-line since text cannot be entered with the tutor keyboard.

Example:

? CHECK THAT A 6mm SLOT DRILL IS PRESENT

This example would print the line "CHECK THAT A 6mm SLOT DRILL IS PRESENT" in the tutorial messages window and stop the program. A key would need to be pressed to allow the program to continue.

[CLEAR

This clears any messages currently displayed in the tutorial messages window.

GLOSSARY.

ABSOLUTE	In absolute programming, zero is the point from which all other dimensions are described.
ARC	A portion of a circle.
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 machine (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 X (horizontal left and right, parallel to the front edge of the table), Y (horizontal forward and backwards, parallel to the side edge of the table) and Z (directly vertical). Combinations of all 3 allow precise co-ordinates to be described.
BILLET	The actual material being machined, sometimes referred to as the "workpiece".
BLOCK	A collection of program words that collectively describe a machining operation.
CHARACTER	A number, letter or symbol as entered into a CNC program.
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.
CO-ORDINATES	Positions or relationships of points or planes. Co-ordinates are usually described using three numbers referring to the (X,Y,Z) axes, e.g. the co-ordinate (23,35,45) means X axis = +23 units, Y axis = +35 units and Z axis = +45 units.

CNC	Computer Numerical Control.
CUTTER SPEED	The velocity of the cutting edge of the tool relative to the workpiece. With circular tools, the cutting speed is related to the tool when new (maximum cutting diameter). Usually the effect of feedrate is ignored.
CYCLE	A sequence of events or commands.
DATUM	The 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.
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.
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	A symbol or indicator that defines the end of a block of data. The 'pc' equivalent of the 'return' key.
ERROR	The deviation of an attained value from a desired value.
G-CODE	The programming language understood by the machine controller.

FEEDRATE	The rate, in mm/min or in/min at which the cutting tool is advanced into the workpiece. For milling and drilling, the feedrate applies to the reference point on the end of the axis of the tool.
FILE	An arrangement of instructions or information, usually referring to work or control settings.
FORMAT	The pattern or way that data is organised.
G CODE	A preparatory code function in a CNC program that determines the control mode.
HARDWARE	Equipment such as the machine tool, the controller, or the computer.
INCREMENTAL	Incremental programming uses co-ordinate movements that are related from the previous programmed position. Signs are used to indicate the direction of movement.
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 used to indicate an auxiliary function (ie, coolant on, tool change etc.).
MACHINE CODE	The code obeyed by a computer or microprocessor system with no need for further translation.
MDI	MDI - Manual Data Input is the method used for 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.
PC	Personal computer.
PROGRAM	A systematic arrangements of instructions or information to suit a piece of equipment.
SPINDLE SPEED	The rate of rotation (velocity) of the machine head/ cutting tool, measured in RPM.
SOFTWARE	Programs, tool lists, sequence of instructions etc.....
TOOL OFFSET	When machining, allowances must be made for the size of tools being used, since they all differ in length. The tool offset is the amount the Z value must be moved (or offset), so that all the different cutting tool tips used line up with each other, on the surface of the piece of work being machined.
TOOLPOST	The holder for the various cutting tools. ATCs (Automatic Tool Changers) are mounted above the spindle centreline, whilst manual toolposts are mounted below it.
TRAVERSE	Movement of the cutting tool through the 3 machine axes between cutting settings.
WORK (WORKPIECE)	The actual material being milled. Quite often, this work is also secured onto a sub-table. The work is sometimes referred to as the 'billet'.
WORD	A combination of a letter address and digits, used in a CNC program (ie, G42, M04 etc.).