Chapter 3 Introducing the Mach3 Screens and Commands

You are now ready to try a "dry run" of Mach3. It will be easier to understand how to set up your actual machine tool after you have experimented a bit with the software. You can "pretend" to machine and learn a lot even if you do not have a CNC machine tool yet. If you do have one, then make sure it is not yet connected to the PC.

Mach3 is designed so that it is very easy to customize its screens to suit the way you work. This means that the screens you see may not look exactly like those in this manual if you bought a preconfigured system from a vendor. If there are major differences, then your system supplier should have given you a revised set of screenshots to match your system.

3.1 Screens

If you created your own custom profile as shown in Figure 2-2 and Figure 2-3, Mach3 will have created a shortcut icon on the desktop with the name of your custom profile. Double-click the appropriate icon to launch the program using that profile. You can also double-click the Mach3 Loader icon to run the program, select from a list the name of the profile to use, then click the *OK* button. (You did create your own profile as described in Section 2.3, didn't you? If not, go back and read that section.)
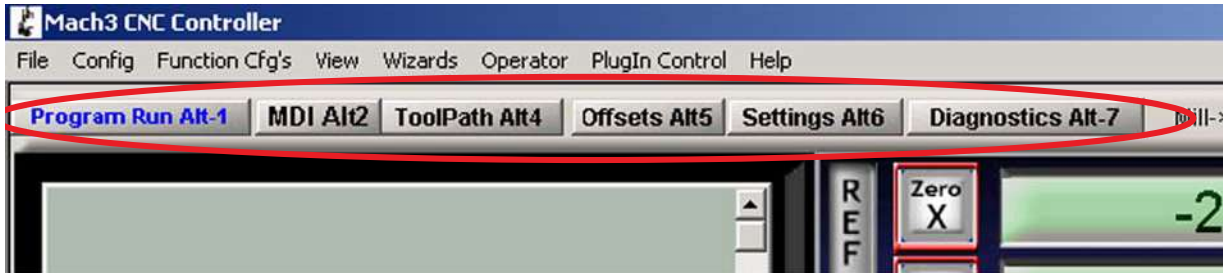
If you have installed more than one driver or third-party motion control plugin, you may see a screen similar to Figure 3-1. (The content of the screen you see will depend on what you have installed.) Select what you want to use by clicking the appropriate button, then click the *OK* button.

Figure 3-1: Select Control Device Screen

You should see the Mill Program Run screen. The other major screens, identified on tabs are MDI (manual data input), Tool Path, Offsets, Settings, and Diagnostics, as shown in Figure 3-2. Be sure the Program Run screen is selected; its name will be displayed in blue.

Figure 3-2: Screen Selection Tabs

Notice the red *Reset* button. It will have a flashing Red/Green LED (simulation of a light emitting diode) above it and some yellow LEDs lit. If you click the button, then the yellow LEDs will go out and the flashing LED turns to solid green. Mach3 is ready for action!

If you cannot reset, then the problem is probably something plugged into your parallel port or ports (a "dongle" perhaps), or the PC has previously had Mach3 installed on it with an unusual allocation of port pins to the Emergency Stop (EStop signal). By clicking on the *Offline* button you should be able to reset the system. **Most of the tests and demonstrations in this chapter will not work unless Mach3 is reset out of EStop mode.**

3.1.1 Types of Objects on Screens

You will see that the Program Run screen is made up of the following types of objects:

• Buttons (for example, Reset, Stop Alt-S, etc.)

• DROs, or Digital Readouts. **Anything with a number displayed will be a DRO**. This may be a more general use of the term "DRO" than you are accustomed to. The main DROs are of course the current positions of the X, Y, Z, A, B, and C axes, but there are also DROs for feed rate, spindle speed, and other values.

• Simulated LEDs (in various sizes and shapes)

• GCode display window (with its own scroll bars)

• Toolpath display (blank square on your screen at the moment)

There is one further important type of control that is not on the Program Run screen:

• MDI (Manual Data Input) line on the MDI screen

Buttons, data entry boxes, and the MDI line are your inputs to Mach3.

DROs can be displays by Mach3 or can be used as inputs by you. The background color changes when you are inputting.

The GCode window and Toolpath displays provide information from Mach3 to you. You can, however, manipulate both of them (for example, scroll the GCode window and zoom, rotate, and pan the Toolpath display).

3.1.2 Using Buttons and Shortcuts

Most standard screen buttons have a keyboard hotkey, which may be a single key or a key combination. This is often shown as part of the name on the button itself or in a label near it. For example, the shortcut to go to the MDI screen is *Alt-2*. Pressing the named key or key combination when the screen is displayed is the same as clicking the button with the mouse. You might like to try using the mouse and keyboard shortcuts to turn on and off jogging, to turn on Flood coolant, and to switch to the MDI screen. Notice that letters are sometimes combined with the *Control* or *Alt* keys. Although letters are shown as uppercase (for ease of reading), **do not** use the shift key when typing the shortcuts.

In a workshop, it is often convenient to minimize the times when you need to use a mouse. Physical switches on a control panel can be used to control Mach3 by use of a keyboard emulator board (for example, the Ultimarc IPAC). This connects in series with your keyboard and will send Mach3 "pretend" key presses to activate buttons using the keyboard shortcuts.

If a button does not appear on the current screen, then its keyboard shortcut is not active.

There are certain special keyboard shortcuts which are global across all screens. Chapter 5 shows how those are set up.

3.1.3 Data Entry to DROs

You can enter new data into any DRO by clicking in it with the mouse, by clicking its hotkey (where set), or by using the global hotkey to select DROs and moving to the one that you want with the arrow keys).

Try entering a feedrate like 45.6 on the Program Run screen. Click in the feedrate box and type the numbers. You **must** press the *Enter* key to accept the new value, or press the *Esc* key to revert to the previous one. *Backspace* and *Delete* are not active when inputting to DROs.

Caution: It is not always sensible to put your own data into a DRO. For example, the display of your actual spindle speed is computed by Mach3. Any value you enter will be overwritten. You can put values into the axis DROs, but you should not do it until you have read the *Using Mach3Mill* manual in detail. It is **not** a way of moving the tool!

3.2 Jogging

You can move the tool relative to any place on your work manually by using various types of jogging. Of course, on some machines, the tool itself will move and on others it will be the machine table or slides that move. We will use the words "move the tool" here for simplicity. Whether the tool moves or not, the frame of reference used will assume tool movement. That is, "move the tool to the left" may actually be achieved by moving the table to the right.

The jogging controls are on a special "fly-out" screen. This is shown and hidden by using the *Tab* key on the keyboard. Figure 3-3 gives a view of the flyout.

Figure 3-3: Control Buttons Flyout

You can also use the keyboard for jogging. The arrow keys are set by default to give you jogging on the X and Y axes and Pg Up/PgDn jogs the Z axis. You can re-configure these keys to suit your own preferences. You can use the jogging keys on any screen with the *Jog ON/OFF* button on it.

In Figure 3-3, you will see that the Step LED is shown lit. The *Jog Mode* button toggles between *Continuous, Step,* and *MPG* modes,
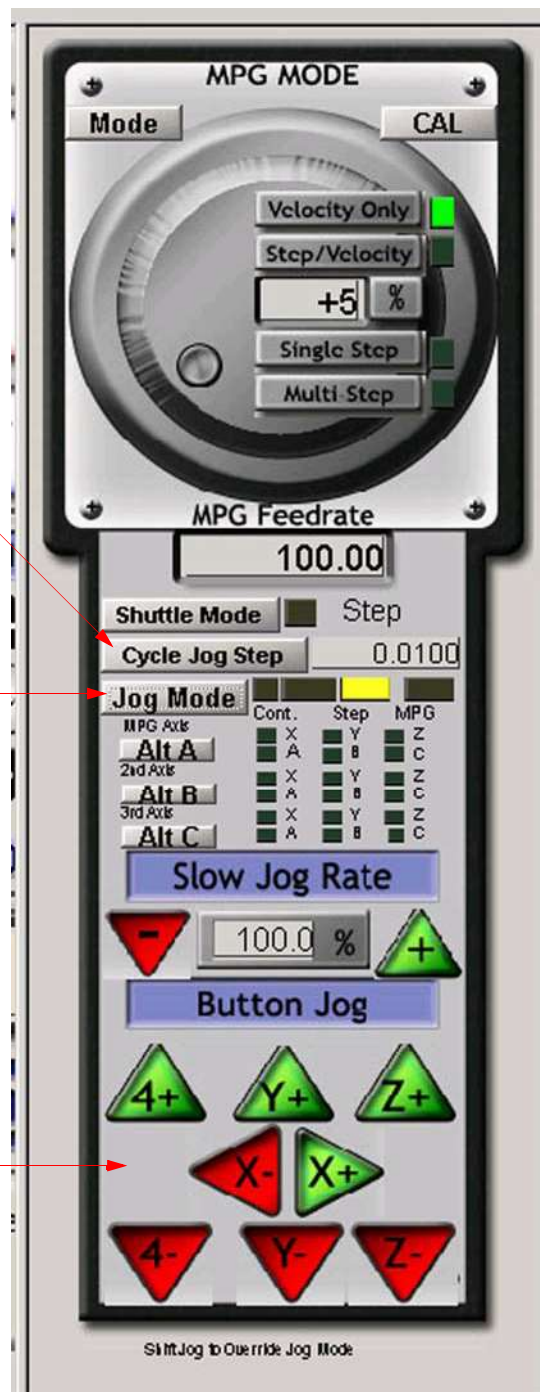
In Continuous mode, the chosen axis will jog for as long as you hold the key down. The speed of jogging is set by the *Slow Jog Percentage* DRO. You can enter any value from 0.1% to 100% to get whatever speed you want. The *Up* and *Down* screen buttons beside this DRO will alter its value in 5% steps. If you depress the *Shift* key, then the jogging will occur at 100% speed whatever the override setting. This allows you to quickly jog to near your destination.

In Step mode, each press of a jog key will move the axis by the distance indicated in the *Step* DRO. You can cycle through a list of predefined Step sizes with the *Cycle Jog Step* button. Movement will be at the current Feedrate.

Rotary encoders can be interfaced (via the parallel port input pins) to Mach3 as Manual Pulse Generators (MPGs). It is used to perform jogging by turning its knob when in *MPG* mode. The buttons marked *Alt A*, *Alt B,* and *Alt C* cycle through the available axes for each of three MPGs, and the LEDs define which axis is currently selected for jogging.

The another option for jogging is a joystick connected to the PC games port or USB. Mach3 will work with any Windows-compatible "analog joystick" (so you could even control your X axis by a Ferrari steering wheel!). The appropriate Windows driver will be needed for the joystick device. The 'stick is enabled by the *Joystick* button and, for safety, must be in the central position when it is enabled.

If you have an actual joystick and it has a throttle control, then this can be configured either to control the jog override speed or the control the feed rate override (see Chapter 5 again). Such a joystick is a cheap way of providing very flexible manual control of your machine tool. In addition, you can use multiple joysticks (strictly Axes on Human Interface Devices) by installing manufacturer's profiler software or, even better, the KeyGrabber utility supplied with Mach.

Now would be a good time to try all the jogging options on your system. Don't forget that there are keyboard shortcuts for the buttons, so why not identify them and try them. You should soon find a way of working that feels comfortable.

3.3 Manual Data Input (MDI) and Teaching

Use the mouse or keyboard shortcut to display the MDI (Manual Data Input) screen.

This has a single line for data entry. You can click in it to select it or press *Enter*, which will automatically select it. You can type any valid line that could appear in a part program and it will be executed when you press *Enter*. You can discard the line by pressing *Esc*. The Backspace key can be used for correcting mistakes in your typing.

If you know some GCode commands, you can try them out. Or you can try:

```
G00 X1.6 Y2.3
```

Figure 3-4: MDI Example

That command will move the tool to coordinates X = 1.6 units and Y = 2.3 units. (It is G zero not G letter O.) You will see the axis DROs move to the new coordinates.

Try several different commands (or G00 to different places). If you press the up or down arrow keys while in the MDI line, you will see that Mach3 scrolls you backward and forward through the history of commands you have used. That makes it easy to repeat a command without having to re-type it. When you select the MDI line you will see a flyout box giving you a preview of this remembered text.
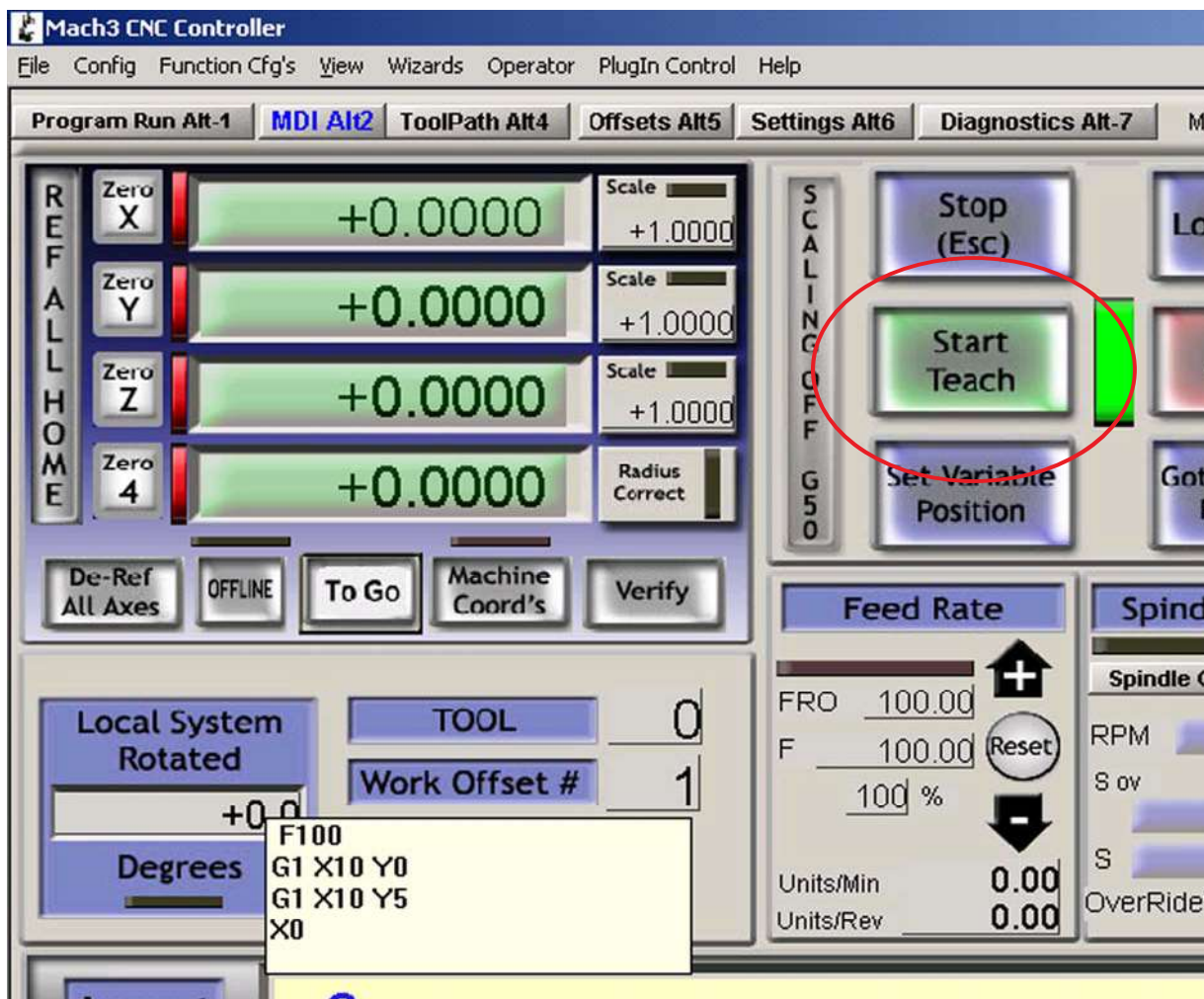
An MDI line (or block, as a line of GCode is sometimes called) can have several commands on it. They will be executed in the "sensible" order as defined in the *Using Mach3Mill* manual – not necessarily from left to right. For example setting a feed speed using a command like F2.5 will take effect before any feed speed movements, even if the F2.5 appears in the middle or even at the end of the line (block). If in doubt about the order that will be used, enter each MDI command on a separate line.

3.3.1 Teaching

Mach3 can remember a sequence of lines that you enter using MDI and write them to a file. This file can then be run again and again as a GCode program.

On the MDI screen, click the *Start Teach* button. The LED next to it will light to remind you that you are teaching. Type in a series of MDI lines. Mach3 will execute each command as you press *Enter* after each line. Mach3 will store the sequence of commands you enter in a named Teach file.
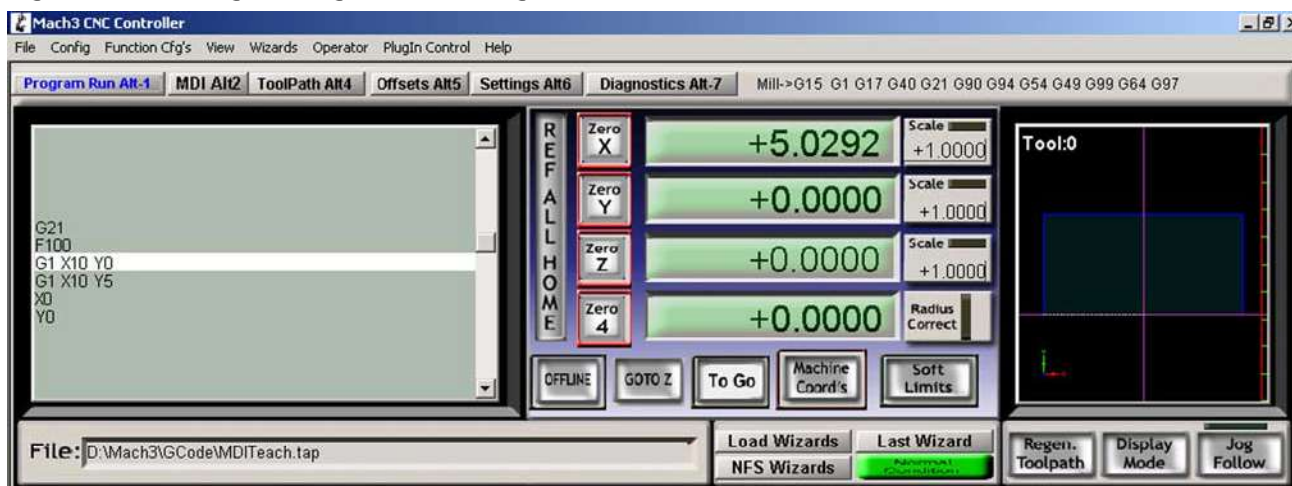
Figure 3-5: Teaching a Rectangle

You can type your own code, or try:

```
g21
f100
g1 x10 y0
g1 x10 y5
x0
y0
```

All the 0 are zeros, not capital Os. When you have finished, click *Stop Teach*. Next, click *Load/Edit* and go to the Program Run screen. You will see the lines you typed displayed in the GCode window (Figure 3-6). If you click Cycle Start, then Mach3 will execute your program.

Figure 3–6: Taught Program Running

If you use the editor, you will be able to correct any mistakes and save the program in a file of your own choosing.

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