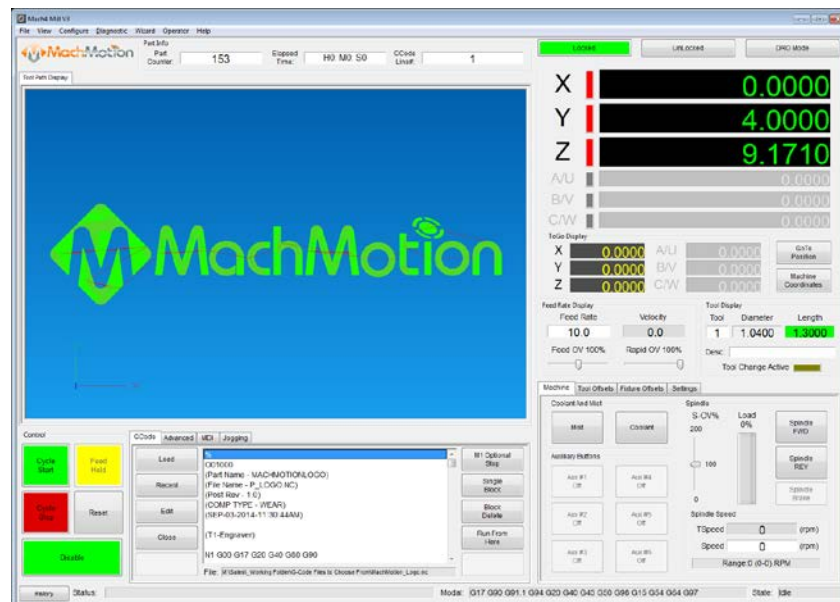


1000 Series Mill Control OPERATING MANUAL



2/10/15

G0131

This manual covers the operation of the 1000 Series Mill Control.

Formatting Overview:

- Menus, options, icons, fields, and text boxes on the screen will be bold (e.g. the **Help** icon).
- Clickable buttons will be bold and within brackets (e.g. the **[OK]** button).
- Directory names, commands, and examples of editing program files will appear in Courier New font

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1000 Series Mill Control

G0131

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1 INTRODUCTION

1.1 Control Startup

To open the control software double-click on the Mill profile icon on the desktop or open the Mach4 Loader and choose a profile from the list.

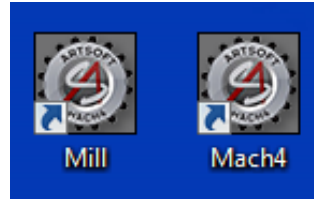


FIGURE 1 – CONTROL ICONS

1.2 Overview

This manual gives the process for basic operation of a mill using the MachMotion control screen. Depending on the control type, the control screen will display slightly different. The two screens are shown below, followed by a brief summary of the different sections of the screen.

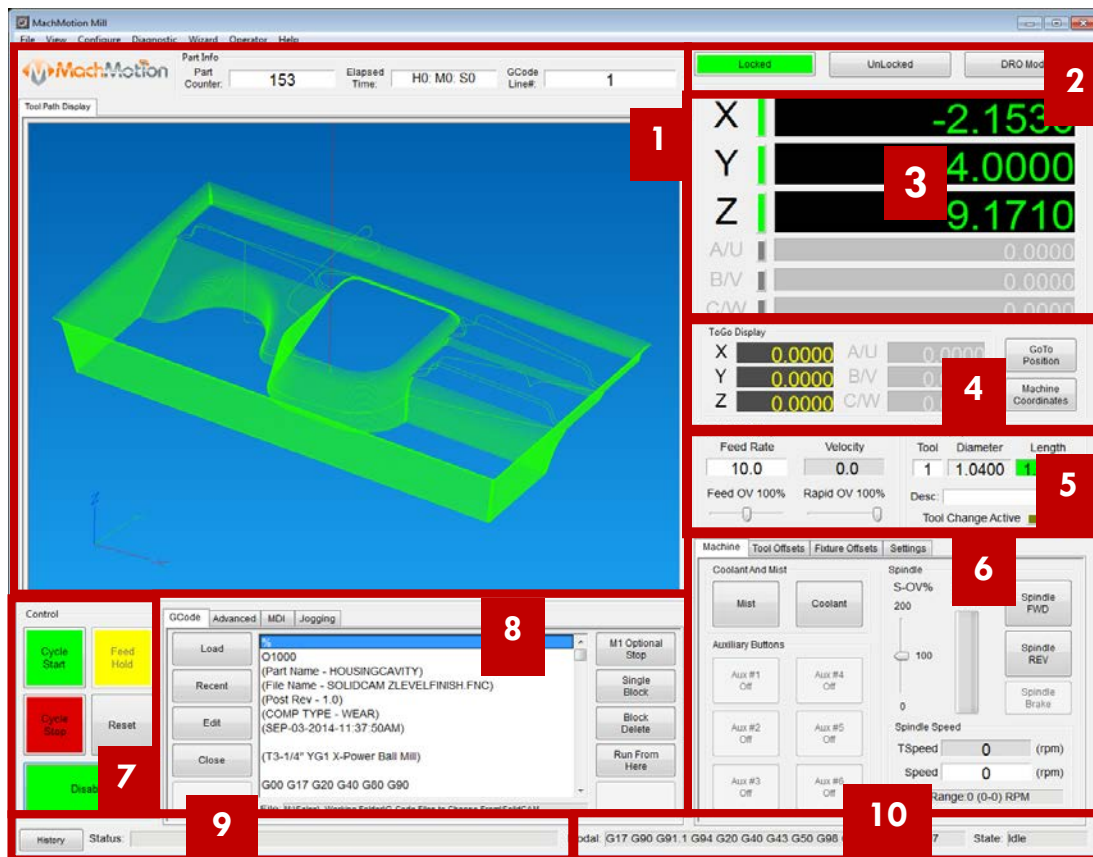


FIGURE 2A – STANDARD CONTROL SCREEN OVERVIEW

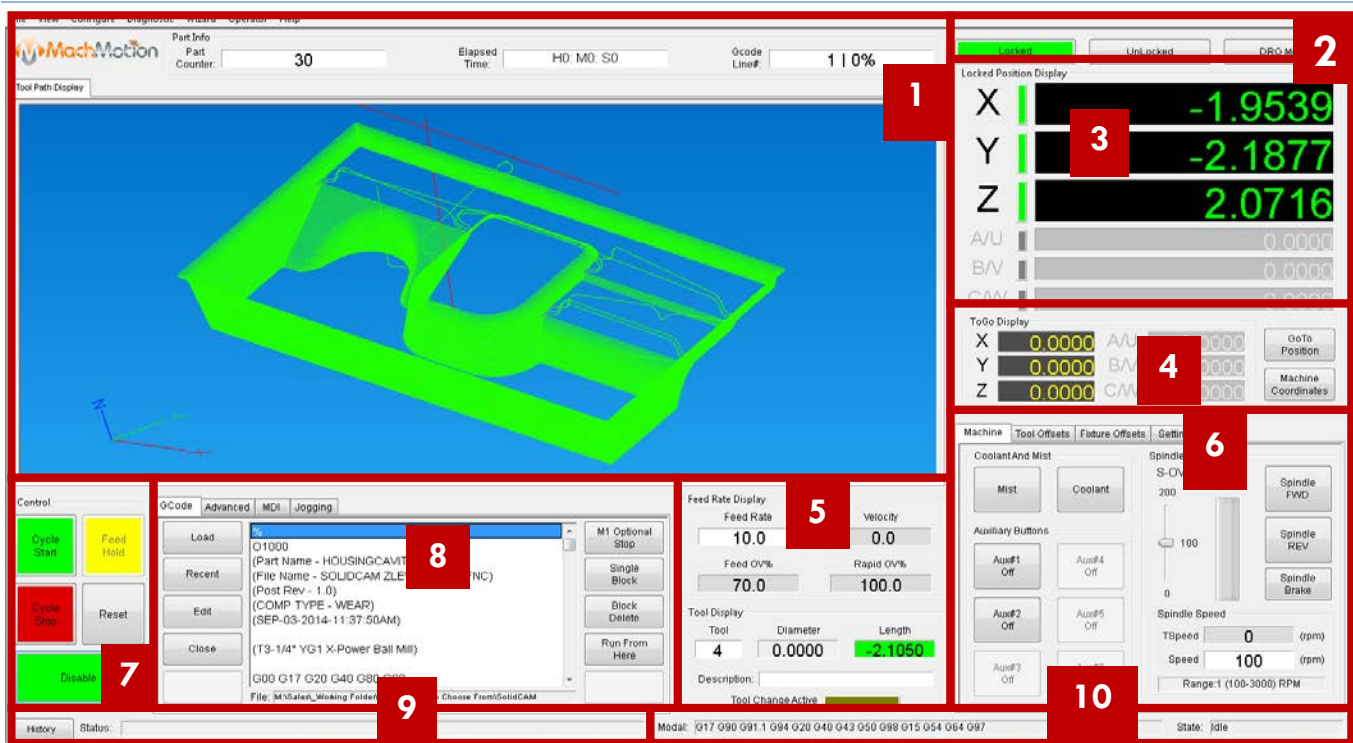


FIGURE 2B – WIDESCREEN CONTROL SCREEN OVERVIEW

For a quick reference, the description of each zone is located below.

1. The tool path window shows the path the tool will take when a G-Code file is loaded. G-Code line number display (can also show percentage complete with setting change) and part counter display.
2. Unlock the screen to access certain features/settings. Use DRO mode to measure or run in manual mode. DRO mode is has no effect on fixture offsets.
3. The axis DROs show the current location and homing state (Green DROs indicate part coordinates, brown DROs indicate machine coordinates. The axis label LEDs turn green when the axis is homed).
4. The axes DROs display the remaining travel distance to complete the current line of G-Code. Change between part and machine coordinates by clicking **[Machine Coordinates]**.
5. Feed rate control and status
6. Spindle control and status, Mist & Coolant, and Auxiliary Buttons. Change between tabs for offsets and settings.
7. The Control section is used to Enable/Disable system, Start and Stop programs, and Feed Hold. Reset will rewind the program and return to the default state of G-Code settings.
8. G-Code control and other functions
9. View current/last status message. Click **[History]** to view status messages and clear status line.
10. Displays current G-Code modals and the state of the control.

2 HOMING

To home the mill, begin by enabling the system (Figure 2 #7). Click **[UnLocked]** button (Figure 3). To home all axes press the **[Home All]** button. Each axis can also be homed using the individual axis home buttons. Once an axis has been homed, the axis LED display will be green.



FIGURE 3 – MILL HOMING

3 PROGRAMMED MOVEMENT

3.1 MDI

To command a movement using the MDI feature, press the MDI tab.

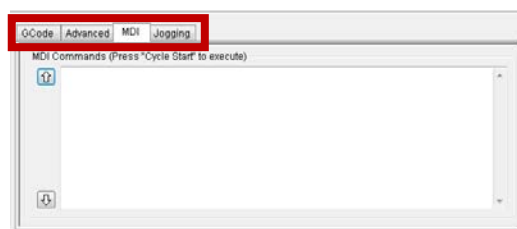


FIGURE 4 - MDI TAB SELECTION

Enter the desired G-Code command into the field and press [**Cycle Start**] to execute the command(s). The up/down arrow buttons will scroll through the history of cycled commands.

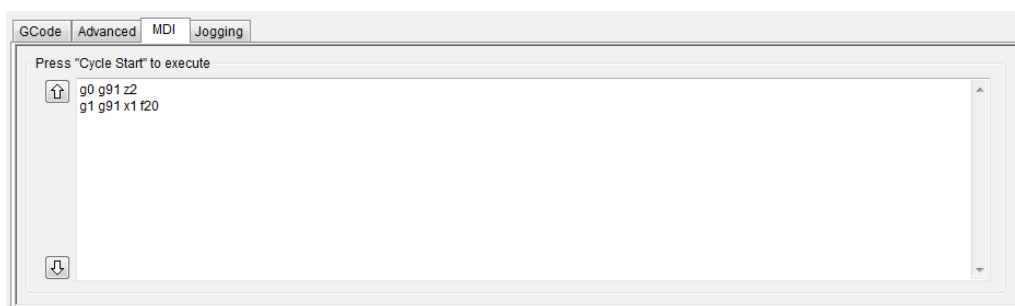


FIGURE 5 - EXAMPLE MDI COMMAND

3.2 G-Code

The primary method of commanding motion is using G-Code files. G-Code files can be hand written, generated by a wizard, or generated from CAD files using a CAM program.

3.2.1 G-Code File Controls

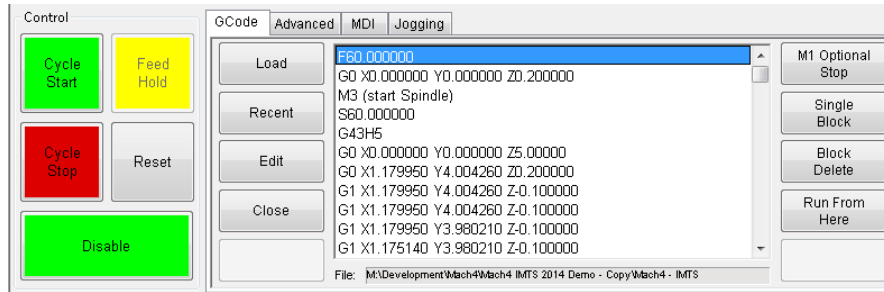


FIGURE 6 - G-CODE CONTROLS

1. Cycle Start – Starts a loaded G-Code file
2. Feed Hold – Pauses a running G-Code file which can then be restarted by pressing Cycle Start
3. Cycle Stop – Stops a running G-Code file or other commanded movement
4. Reset – Rewinds a loaded G-Code file to the beginning and resets G-Code modals to default configuration
5. Load – Opens a file browser to select an existing G-Code file
6. Recent – Opens a selection window with the ten most recent run G-Code files
7. Edit – Opens a loaded G-Code file to allow easy editing
8. Close – Closes the loaded G-Code file
9. M1 Optional Stop – Stops program with M1 command
10. Single Block – Run the G-Code line by line
11. Block Delete – Ignores designated lines within the G-Code file
12. Run From Here – Run the loaded G-Code file starting at selected line

3.2.2 Running a G-Code File Example

To run a G-Code file, follow the steps below:

1. Press the **[Load]** button (Figure 6) then select a G-Code file and press **[Open]**
2. Jog the machine to the work piece zero point
3. Zero the axes by selecting **[UnLocked]** and then **[Zero All]** (Figure 7)
4. Before running G-Code, it is good practice to go back to **[Locked]** mode. All offsets are saved when **[Locked]** is pressed.
5. Press **[Cycle Start]** to run the program (Figure 6)
6. If it is necessary to stop in the middle of a program to inspect the part press **[Feed Hold]** (Figure 6)
7. If it is necessary to end a program before it has completely run press **[Cycle Stop]** (Figure 6)

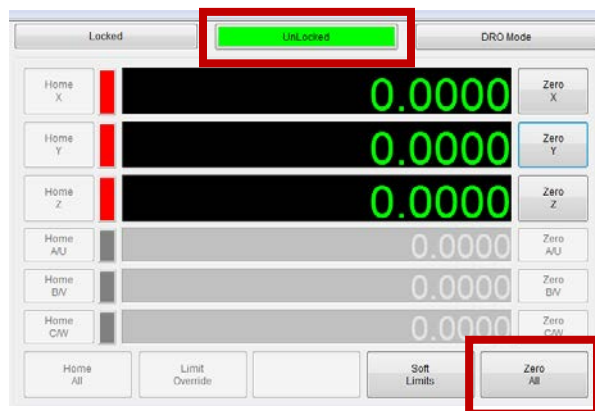


FIGURE 7 – ZERO THE AXES

3.2.3 Running a G-Code File with the Single Block Option

If it is necessary to run a G-Code file line-by-line, follow the steps below:

1. Click the **[Single Block]** button (Figure 6)
2. Press **[Cycle Start]** button to begin the file (Figure 6)
3. The line will run and then enter feed hold.
4. To run successive lines, continue pressing **[Cycle Start]**
5. When finished running lines, press **[Single Block]** to put it back in normal run mode

3.2.4 Block Delete Option

The Block Delete option (Figure 6) allows for specially marked lines to be ignored when running a G-Code file. Consider the following:

```
N1 M3 S2000
N2 /G00 G91 Z-1
N3 G00 G91 X4 Y5
N4 /4 G01 G91 Z3
N5 /M00
N6 G01 G91 Z5
N7 /8 M5
N8 M30
```

With the Block Delete options selected as noted in Figure 8, the N2, N5, and N7 lines would be ignored.

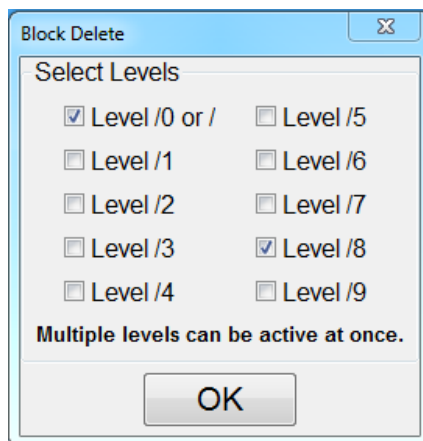


FIGURE 8 – ZERO THE AXES

3.2.5 Running a G-Code File with the Run From Here Option

If for whatever reason a program needs to be started in the middle, use the Run From Here feature by following these steps:

1. Use the Up/Down arrows in the G-Code file window to select the line to start from (Figure 6)
2. Press the **[Run From Here]** button (Figure 6)
3. Select the **[Change to Needed Tool]** button if applicable (Figure 9)
4. Enter desired value in the Feed Rate field (Figure 9)
5. Select axis to move and press **[Move Selected]** button (Figure 9) to move the axis into position
6. Select desired Auxiliary Settings and press **[Turn On Selected Auxiliaries]** button (Figure 9)
7. Press **[Cycle Start]** to begin the file at selected starting line (Figure 6)

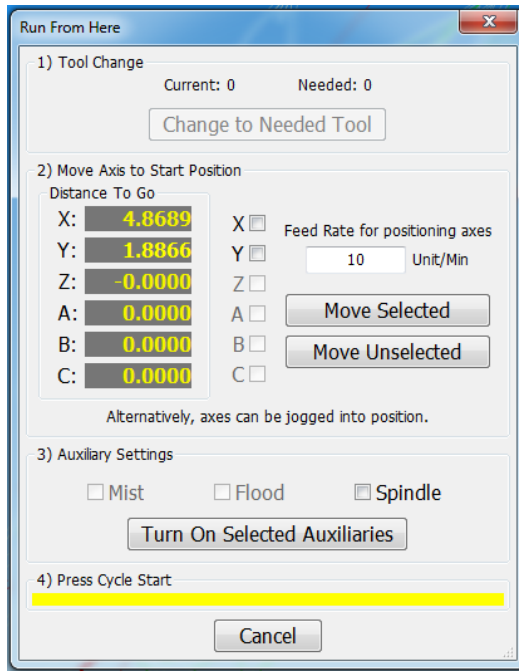


FIGURE 9 – RUN FROM HERE

3.2.6 Tool Path Screen

Below are the controls to manipulate the tool path screen:

1. Zoom – right click with the mouse and move mouse up/down
2. Rotate – left click with the mouse and rotate the part by moving the mouse
3. Pan – press Ctrl on the keyboard and left click with the mouse, then pan by moving the mouse (one-hand control option is to use left and right mouse click and move the mouse. No Ctrl press needed)

3.3 Advanced

The *Advanced* tab has various settings and axis details for the G-Code file to be run as well as options for the tool path display.

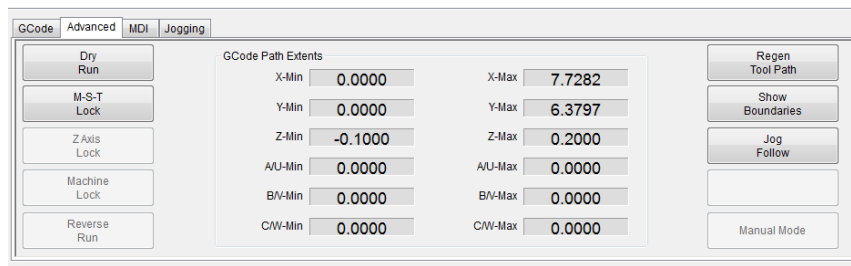


FIGURE 10 - ADVANCED CONTROLS

3.3.1 Dry Run

The Dry Run option will process the G-Code file without turning on Mist or Coolant.

3.3.2 M-S-T Lock

The M-S-T Lock mode prevents the Mist, Spindle, and Tool Changes from activating when running a G-Code file (ignores M-, S-, and T-Codes).

3.3.3 Regen Tool Path

Clicking the [**Regen Tool Path**] button regenerates the Tool Path window display.

3.3.4 Show Boundaries

Clicking the [**Show Boundaries**] button displays a dotted line around the area of range of travel determined by values set in soft-limits.

3.3.5 Jog Follow

Jog Follow sets the tool path screen to keep the current position in the range of view

4 TOOLS, TOOL OFFSETS, AND CUTTER COMPENSATION

4.1 Tools and Tool Offsets

Defining tools depends on the tool setter/gage-block position type. The tool setter/gage-block position type options are fixed (e.g., a bed mill) and random (e.g., a knee mill).

4.1.1 Fixed Tool Set Height

If the table height (work surface) of the machine is adjustable, the Setter Position needs to be updated before you begin a job.

1. Change the tool number to the number for the new tool
2. Put the new tool in the spindle
3. Touch the tool off on the tool setter/gage block
4. Go to the **Tool Offset** tab (Figure 11)
5. Press the [**Manual Calculate Tool Length**] button to record tool length
6. Repeat steps 1-6 for each additional tools

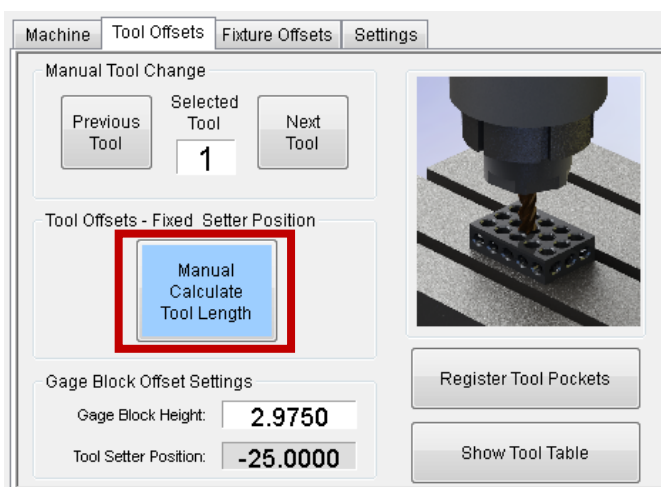


FIGURE 11 - TOOL WINDOW

4.1.2 Random Tool Set Height

1. Put the master tool in the spindle
2. Press [**UnLock**] to unlock the screen
3. Set the tool number to 1 (Figure 2 #5)
4. Verify the gage block height setting
5. Touch the master tool off on the tool setter/gage block
6. Press the [**Calculate Setter Position**] button
7. Remove master tool and place the new tool in the spindle

8. Change the tool number to the number for the new tool
9. Touch the master tool off on the tool setter/gage block
10. Press the [**Manual Calculate Tool Length**] button to record tool length
11. Repeat steps 7-10 for each additional tools

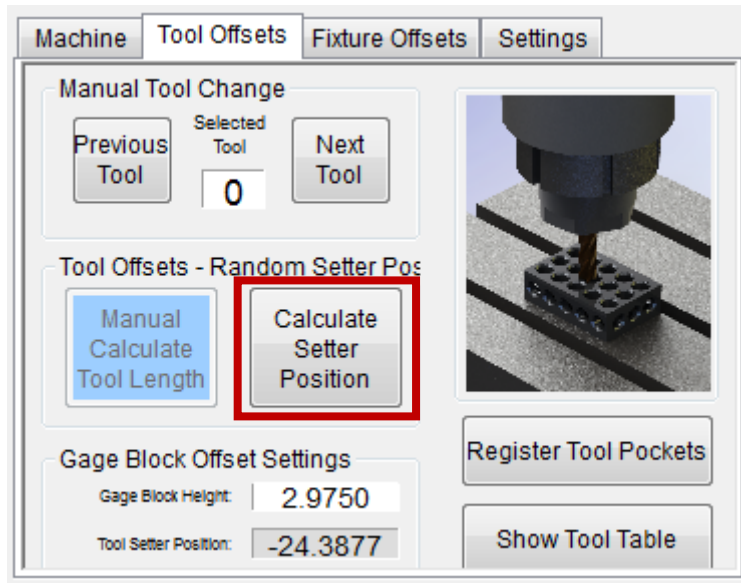


FIGURE 12 RANDOM TOOL SET HEIGHT

Note: The master tool does not have to be an actual tool. It can be a blank rod or the bottom of the empty spindle. The main point is that it should be a specific and consistent reference point.

4.1.2.1 SETTING UP ADDITIONAL TOOLS AFTER CALCULATING SETTER POSITION:

1. Define the master tool as stated above
2. Change the tool number to the number for the new tool
3. Put the new tool in the spindle
4. Touch the tool of on the same surface as the master tool
5. Go to the **Tool Offset** tab (Figure 11)
6. Press the [**Manual Calculate Tool Length**] button
7. Repeat steps 2-6 for each additional tool

Tool diameters can be set in the *Diameter* field (Figure 2 #5) or in the *Tool Table* (Figure 13). Tool diameters are required only if cutter compensation is being used.

4.1.3 Auto Tool Setter

With an auto tool setter, the process is the same, however, instead of manually touch the tool of on the gage block/setter, press [**Auto Calculate Tool Length**].

	Length	Length Wear	Dia	Dia Wear	Description
Tool#1	0.0000	0.0000	0.0000	0.0000	
Tool#2	0.0000	0.0000	0.0000	0.0000	
Tool#3	0.0000	0.0000	0.0000	0.0000	
Tool#4	0.0000	0.0000	0.0000	0.0000	
Tool#5	0.0000	0.0000	0.0000	0.0000	
Tool#6	0.0000	0.0000	0.0000	0.0000	
Tool#7	0.0000	0.0000	0.0000	0.0000	
Tool#8	0.0000	0.0000	0.0000	0.0000	
Tool#9	0.0000	0.0000	0.0000	0.0000	
Tool#10	0.0000	0.0000	0.0000	0.0000	
Tool#11	0.0000	0.0000	0.0000	0.0000	

FIGURE 13 - TOOL TABLE

5 SPINDLE CONTROL

5.1 G-Code Spindle Control

The spindle is controlled through G-Code using the M-Codes M3 (Clockwise), M4 (Counterclockwise), and M5 (Off). To control the spindle speed in RPMs an S word is added.

For example, M3 S2000 would turn the spindle on in the clockwise direction at 2000 RPM.

5.2 Manual Spindle Control

5.2.1 Spindle

To control the spindle separately from G-Code use the spindle control on the Machine screen.

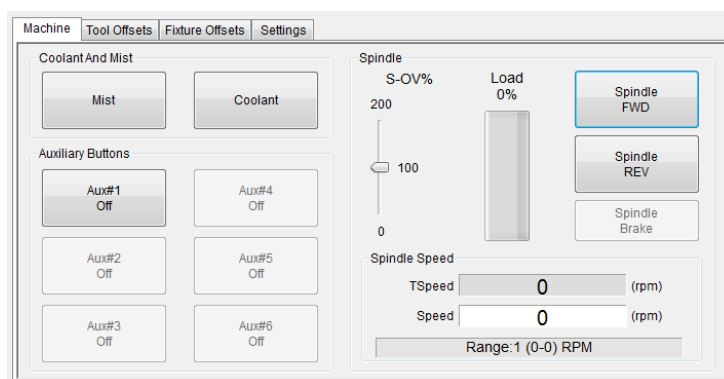


FIGURE 14 - SPINDLE CONTROL

1. S-OV% – Spindle Override Percentage
2. Load – The load of the spindle
3. Spindle FWD – Turns spindle on clockwise
4. Spindle REV – Turns spindle on counterclockwise

5. TSpeed – True Spindle speed (if feedback encoder is installed)
6. Speed – Commanded Speed
7. Range – Pulley number selected and speed range

5.2.2 Mist

[Mist] turns on and off the Mist control (Figure 14).

5.2.3 Coolant

[Coolant] turns on and off the Coolant control (Figure 14).

6 FIXTURE OFFSETS

All G-Code files have their own coordinate system. In order to allow parts to be located on the table at any desired location, the part offset can be defined to adjust the actual location of the part on the table. Part offsets can be defined and saved using G54-G59P120. The functionality is designed to allow different tooling setups to have predefined zero points to allow for streamlined setup.

Setting up saved part offsets is done through the **Fixture Offsets** tab. You can view the fixture table and change the values directly by clicking the [Show fixture Table] button. The values can also be set by using the MDI command to select the G-Code number for the fixture offsets to be stored in. Once the machine is at the desired zero position, and the edge finder diameter has been set, the edge finder offset buttons can be used to set the values. Use the [Calculate Z Fixture Offset] button for setting the Z offset.

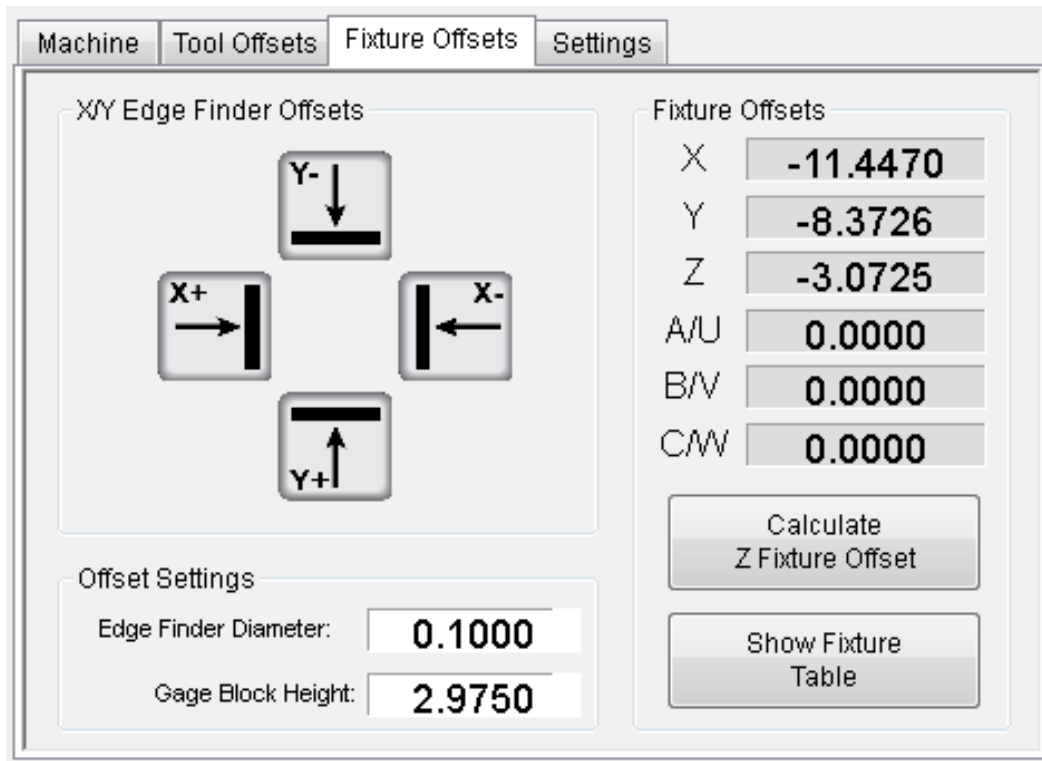


FIGURE 15 – FIXTURE OFFSETS

7 APPENDIX A – STARTUP PROCEDURE

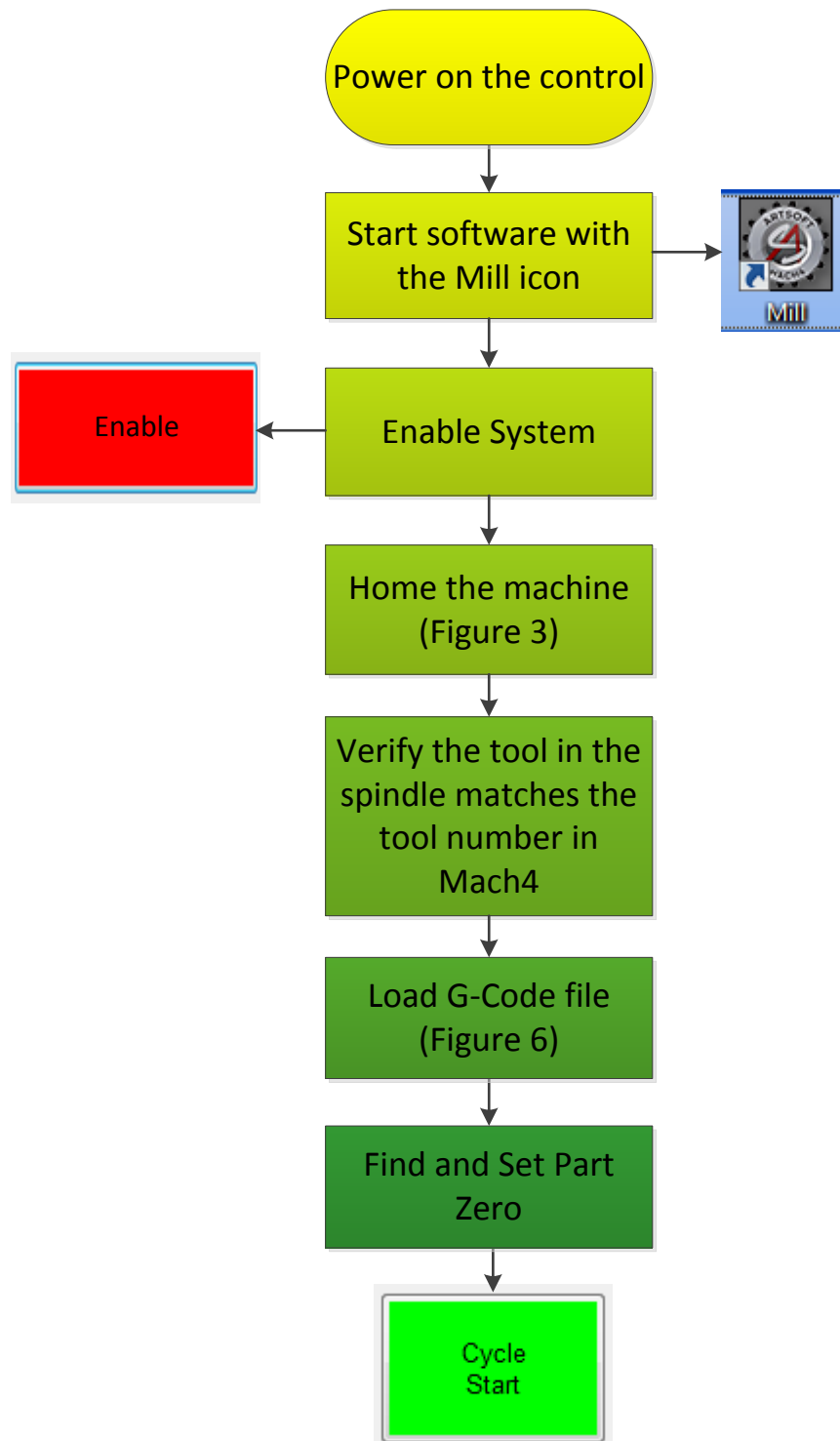


Figure 16

8 APPENDIX B

8.1 Warranty Information

MachMotion guarantees all products to be free from manufacturer defects for a period of one year from the date of purchase. Products which prove to be defective under normal conditions and proper use, during the warranty period, will be repaired or exchanged free of charge. For warranty service the customer must contact MachMotion for an RMA number and then return the defective product to MachMotion. If a product is sent to MachMotion without an RMA number, the product may be misdirected or delayed. When a product or part is exchanged, any replacement item becomes the customer's property and the replaced item becomes MachMotion's property.

If the defect is found to be caused by improper use or installation, the warranty is void. Otherwise the product will be repaired or exchanged and returned to the address located on the Product Return/Repair Form. MachMotion will cover ground shipping cost for the replacement/repaired product being returned to the customer. MachMotion does offer expedited shipping at the customer's expense.

If a replacement product is needed quickly, a replacement can be sent immediately. In this case the customer will be charged for the replacement part at the time of the order and be refunded that charge when the defective component is returned to MachMotion, assuming the defective item falls under the warranty guidelines. MachMotion will issue a refund within two work weeks after receiving the faulty component.

8.2 Additional Resources

Additional manuals and resources can be found at MachMotion.com

The Mach Motion Team

<http://www.machmotion.com>

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