

MACH4 TANGENTIAL

Tangential takes place on one page: "Program Run." The Tangential Profile is intended to operate Machinery equipped with a rotational axis independent of, but usually associated in, the Z axis direction. Machines include, but are not limited to, drag knife, oscillating knife, water jet, and crease rollers.

Unlike a Milling Machine or a router, A Tangential Machine interprets g code a bit differently. Operating in Tangential Mode, an axis (usually A) will rotate to interpolate G02 and G03 (arc moves), while a mill/router will interpolate arcs using the X and Y.

The screenshot displays the Mach4 software interface in the "Program Run" mode. The interface is divided into several functional areas:

- Current Positions:** A table showing the current position for Reference All Axes (Home), De-Ref. All Axes, and Soft Limits (Off) for X, Y, Z, and A axes, all at 0.0000.
- Machine Coordinates:** A section with buttons for "Go To Work Zero", "Machine Coordinates", "Distance To Go", "Remember Position", and "Return to Position".
- G Code / MDI:** A text area for entering G code or MDI commands.
- Rapid Rate / Feed Rate:** Sliders and buttons for adjusting RRO% (0% to 100%) and FRO% (0% to 250%).
- Tool Path:** A large blue area showing a 3D coordinate system with X, Y, and Z axes.
- Control Panel:** Includes buttons for "Cycle Start Gcode", "Feed Hold", "Stop", "Reset", "Disable", "Load G Code", "Recent G Code", "Edit G Code", "Rewind G Code", "Close G Code", "History", "Set Material Origin", "RETRACT", "Single Block", "Flood On (M08) Off (M09)", "Block Skip", "Skip", "Optional Stop (M01)", "Jog Rate%" (50.0), "Button Jog Mode", "Continuous", "Incremental Jog Step" (0.0010), "Jogging" buttons (Z+, Y+, A+, X-, X+, Z-, Y-, A-), "Regen Tool Path", "Keyboard Disabled", "Axes Limits Override", "Vacuum Table M114 M115", "Tangential On", "Help Docs.?", "Newest Addition", "Tool Information" (Current Tool: 4, Change to Next Tool, Next Tool: 12, Tool Change, Active Offset: 0), and "Arc Smoothing" (5.000).
- Bottom Status Bar:** Shows "G0 G17 G90 G91.1 G94 G20 G40 G49 G80 G98 G50", "Profile: Mach4_Tangential_BE", and "Screen: wx4_Tangential.set".

Standard Mach4 Features included with Tangential:

CURRENT POSITIONS TAB:

Reference All Axes (Home) -

Standard Mach4 homing facility with the ability to “home in place.”

De-Ref All Axes -

Standard Mach4 De-ref

Soft Limits On/Off-

Standard Mach4 Soft Limits toggle function

Zero X, Y, Z, A -

Standard current work coordinates zeroing

X, Y, Z, A LEDs -

X, Y, Z, A “home indicators.”

X, Y, Z, A DROs -

Multiple position coordinate display for X, Y, Z, and A. Machine Position, Current Work Coordinates, and Distance To Go can be displayed.

Go To Work Zero Button -

Standard Mach4 Go To Work Zero function; can be located and edited in the screen load script.

Machine Coordinates Button -

Toggle between machine coordinates and current work coordinates. There is an associated LED when viewing machine coordinates.

Distance To Go Button -

Toggle between Distance To Go and current work coordinates while running MDI or a g code file. There is an associated LED when viewing Distance To Go.

Remember Position Button -

Standard Mach4 Remember Position function; located in the screen load script.

Return To Position Button -

Standard Mach4 Return To Position function; located in the screen load script.

G Code/MDI Display Tabs -

Standard display of g code files or MDI commands.

Rapid Rate Control Group -

Standard RRO Control. Includes a slider, + and - increments, and 100, 50, and 0% buttons

Feed Rate Control Group -

Standard FRO Control. Includes a feed rate DRO, slider, + and - increments, and 100, 50, and 0% buttons.

Control Group -

Standard Mach4 control group.

Cycle Start -

Standard Mach4 g code file functions.

Feed Hold -

Standard Mach4 g code file functions.

Stop -

Standard Mach4 g code file functions.

Reset -

Standard Mach4 g code file functions.

Disable -

Standard Mach4 g code file functions.

Load G Code Button -

Standard Mach4 G Code file functions.

Recent G Code Button -

Standard Mach4 g code file functions.

Edit G Code Button -

Standard Mach4 g code file functions.

Rewind G Code Button -

Standard Mach4 g code file functions.

Close G Code Button -

Standard Mach4 g code file functions.

Single Block Button -

Standard Mach4 Single Block enable toggle. There is an associated LED when enabled.

Flood On(M08) Off(M9) Button -

Standard Mach4 Coolant On/Off toggle. There is an associated LED when enabled.

Block Skip Button-

Standard Mach4 Block Skip toggle. There is an associated LED when enabled.

Optional Stop (M01) Button -

Standard Mach4 Optional Stop toggle. There is an associated LED when enabled.

Jog Rate % -

Standard Mach4 Jog Rate control. Slider and percentage DRO are linked and work back and forth. Button Jog Mode will toggle between continuous and incremental jog modes. Incremental Jog Step button will change the step increments.

Jogging Facility -

Positive and negative directional buttons for X, Y, Z, and A Axes. These are touch screen friendly.

Regen Tool Path Button -

Standard Mach4 tool path regeneration for the current g code file.

Keyboard Enable/Disable Button -

Standard Mach4 Keyboard Enable/ Disable function.

Axes Limits Override Button-

Standard Mach4 Axes Limits Override function.

Vacuum Table Toggle Button -

Standard Mach4 Vacuum On/Off toggle, which is also associated with M114 and M115 macros for on/off.

Help Docs Button -

Standard Mach4 Help Docs facility.

Newest Editions Button -

Standard Mach4 Newest Editions; displays new features added to Mach4.

Tangential-Specific Features:

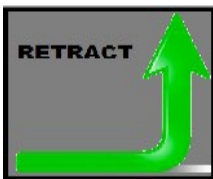
Set Material Origin Button -

This button will set the current work coordinates for X and Y to zero. Z and A are not set with this button.



Retract Button -

Although this is a standard function in Mach4 Router, while in Tangential Mode, users will not need to turn on the spindle before continuing the g code file with the Cycle Start Button.



G Code Extents Buttons -

Users can click on any of the Extents buttons and the machine will travel to the farthest points of the current g code file in relations to the current work coordinates. **Use extreme caution.** There aren't any Z moves. These buttons are intended for use with nesting checks and maximum material usage.



Lift Angle DRO -

This is a user input dro for setting the max angle to enable knife lift to complete arcs. When Mach interpenetrates the angle is will exceed this value, Motion in X, and Y will stop momentarily . The Knife will “exit”, or lift out of the material (controlled by Lift Distance), A axis rotation, Knife re-enters the material to finish the arc.

Lift angle is also represented by Pound variable 500. #500 can be called in a G Code file or an MDI command and the Lift Angle will be updated with the value that follows the equals sign after #500. The new value will also be displayed in the Lift Angle DRO as well as the Register Diagnostics facility.

EX: #500=22.5

The example above will set #500 to 22.5

Use cation when setting this value. The new value will completely overwrite the previous value.



Lift Distance DRO -

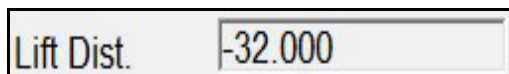
This is user input dro that will control the distance the Knife will “exit” or lift out of the Material when lift angle has forced the lift for rotation.

Lift Distance is also represented by Pound variable 501. #501 can be called in a G Code file or an MDI command and the Lift Distance will be updated with the value that follows the equals sign after #501. The new value will also be displayed in the Lift Dist. DRO as well as the Register Diagnostics facility.

EX: #501=.125

The example above will set #501 to .125

Use cation when setting this value. The new value will completely overwrite the previous value.



Arc Smoothing -

Arc Smoothing is a user input angular value for setting the resolution tolerance in arc-to-arc transitions. This value should be treated just like a motor tuning constant. The value will also differ from machine to machine depending on, but not limited to, steps per unit, motor type, drive and/or motor resolution.

Setting this value will involve a similar process as motor tuning X, Y, and Z.

Once a value has been achieved that eliminates “jerky” motion when cutting ellipses and large continuous arcs, that value will become a constant for that machine and will remain a constant until changed by the user.

Arc Smoothing is set up as a Register called “arcSmoothinReg” and can be found in the Register Diagnostics facility. It is a Register, so value can be stored, recalled and applied when Tangential mode is Enabled. When Tangential mode is disabled the Arc Smoothing Value will be set to Zero.

Arc Smoothing is also represented by pound variable 510. #510 can be called and changed in a g code file or an MDI command. However, once a value for a particular Machine has been achieved, that value should become a constant and not be changed.



*******!!THE NEXT SECTION IS EXTREMELY IMPORTANT!!*******

Tangential On Button -

The Tangential On/Off Button will toggle Mach4 in and out of tangential mode. Users can take advantage of this feature when a milling head is also installed on the machine or if tangential moments need to be disabled for any operations at all.

Tangential On/Off is represented by Pound Var 502. #502 simply enables or disables tangential mode. Important note: the pound variable mentioned in the previous section-- Arc Smoothing #510--will change when #502 changes.

Ex:

Tangential Enabled: When #502=1, tangential mode is enabled. When this happens, the value for Arc Smoothing #510 is applied.

Ex:

Tangential Disabled: When #502=0, tangential mode is disabled. When this happens, the value for Arc Smoothing #510 is set to Zero. When tangential is disabled, arc motion will be interpreted with X and Y, not the rotational axis used in tangential.

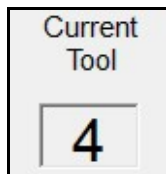
As mentioned above: #510 should not be called from g code or MDI (unless users have full

understanding of what the results will be). However, #502 can be called and set from g code or MDI and #510 will be put into the appropriate state for operation. If #502 is changed from g code/MDI the Tangential On/Off Button will also be put into the appropriate state as well, so the button will follow the state of #502.



Current Tool -

Displays the current tool.



Next Tool DRO -

User input DRO to enter a "Next Tool" for a manual tool change.



Change to Next Tool Button -

The Change to Next Tool button will execute a tool change to the tool number displayed in the Next Tool DRO. One click will start the tool change and a second will finish the tool change.



Active Offset -

This DRO will display the active length offset (if active; G43 Hxx) number for the current tool in use.

