

PM45-CNC Mach 3, Driver and Basic Parameter Setting

This document covers the following topics:

- 1) Download and Install Mach 3.
- 2) Install the JAMEN Driver.
- 3) Set Mach 3 parameters to communicate with the mill.

WARNING: This document does not cover personal safety issues. The user of this product must be familiar with machine shop procedures, machinery and safety practices. If you are not familiar with these matters, seek professional instruction.

NOTE: Do not modify any switches or setting in the control cabinet of the unit.

NOTE: Prior to first testing the machine, manually raise the head so the spindle is at least 4-5 inches above the table; furthermore, center the table below the spindle. The manual table cranks can be turned when the unit is not powered on.

NOTE: The parameters herein do not adjust all table limits as this will depend on how the user programs their CNC software.

NOTE: Care must always be taken when operating the machine. Pressing the red Reset button on the main menu or on the mill operator panel will stop the machine. Always watch the machine carefully and be prepared to press the Red Reset or emergency stop button.

The parameters and settings herein are a starting point for future modification and customization by the user. It is the user's responsibility to know and understand how to use Mach 3 to control the mill. Until the user gains familiarity with the system, make changes cautiously, always observe proper shop safety protocol and be prepared to press the Reset or Stop buttons.

General Considerations:

It is assumed the user of this product is familiar with computers as well as general knowledge of typical software installation procedures. This document does not show every possible screen the user will see during installation. Only the most significant screen-shots are shown. The user is expected to know how to follow on-screen installation instructions.

The computer on which Mach 3 will be run must have adequate processing power to run the software. Very important details about this are found on the ArtSoft website.

User Resources:

General Mach 3 instruction and essential information are contained in 5 videos:

<http://www.youtube.com/watch?v=R3futACR6dM>

<http://www.youtube.com/watch?v=ACx64oWwbMc>

<http://www.youtube.com/watch?v=ma7IMocQbv0>

<http://www.youtube.com/watch?v=3Ychv0q38MY>

http://www.youtube.com/watch?v=e5bWH_ET3E4

Mach 3 help and reading materials are available at the following location and are highly recommended:

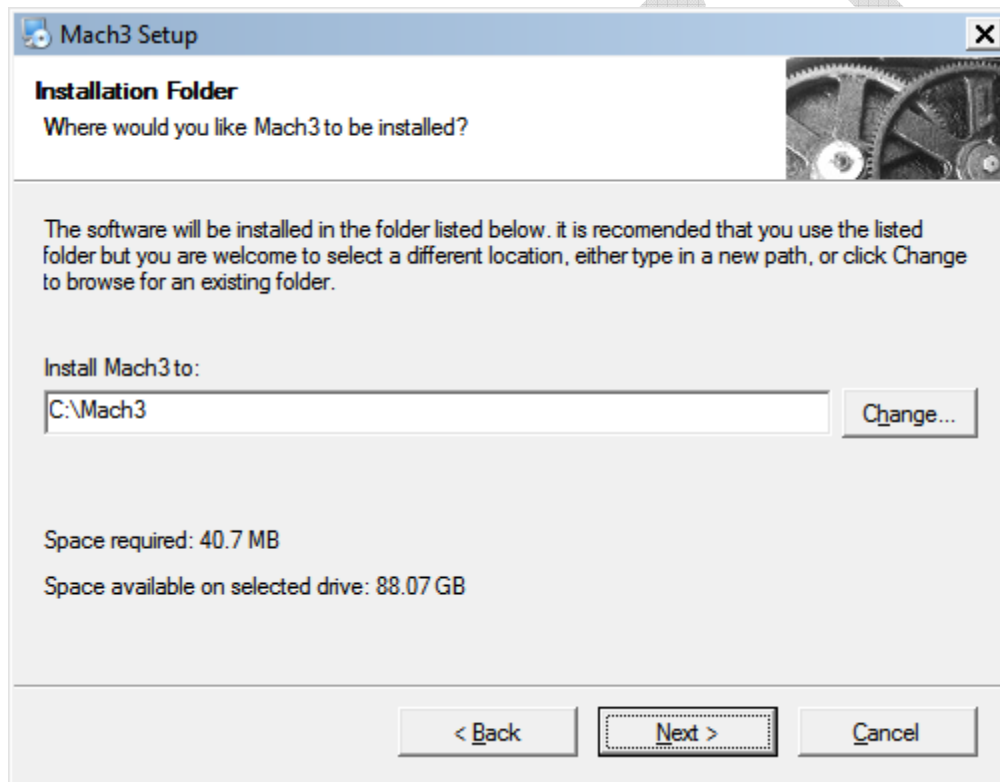
<http://www.machsupport.com/help-learning/>

PART I: Download and Install Mach 3.

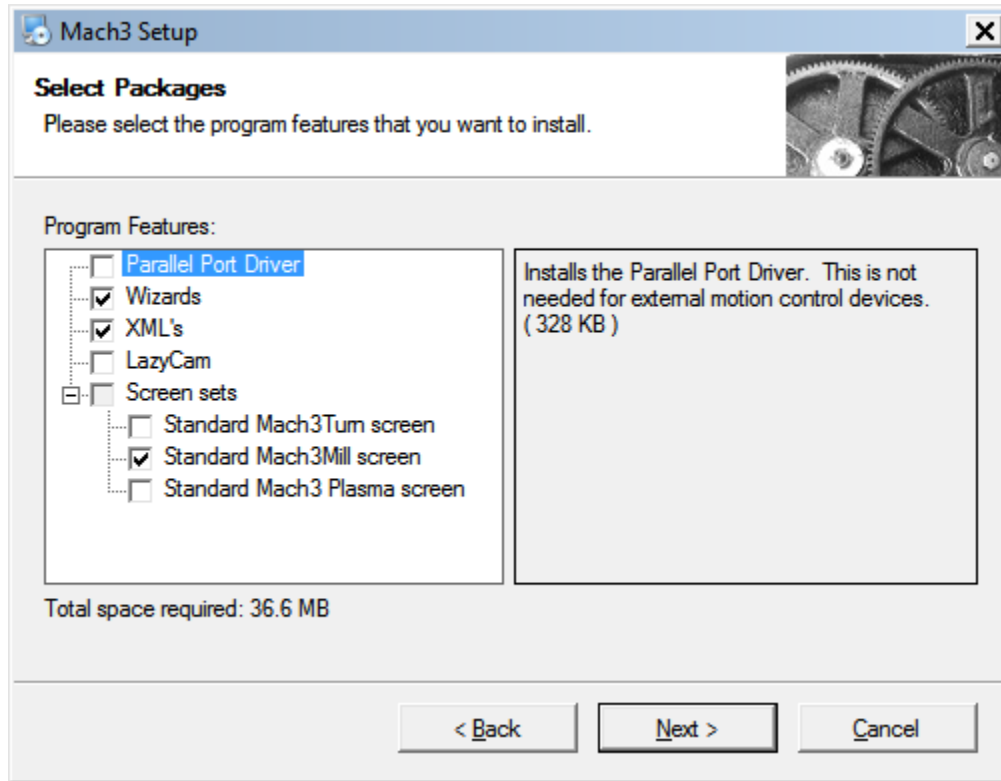
Download Mach 3 from the Artsoft website. The version that comes on the CD is a demo version. The demo product will operate your mill but, for full support from ArtSoft, the latest and licensed version is recommended.

<http://www.machsupport.com/software/downloads-updates/>

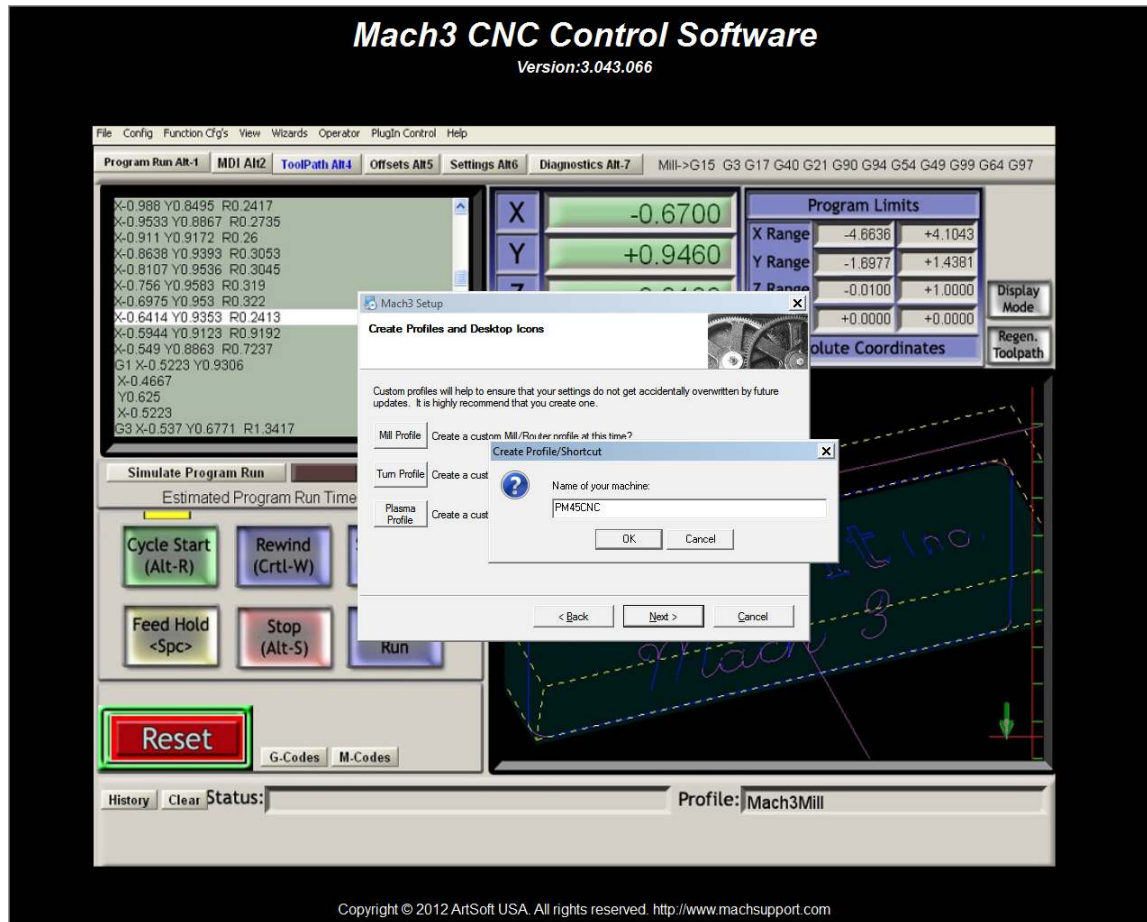
After obtaining the Mach 3 software (either from the supplied CD or from ArtSoft) install Mach3 in the default location or, a location of your choice.



Only select the basic Wizards, XML profiles and Mach3 Milling screens. Other options can be added at your choosing but, are not needed for the PM45CNC mill.



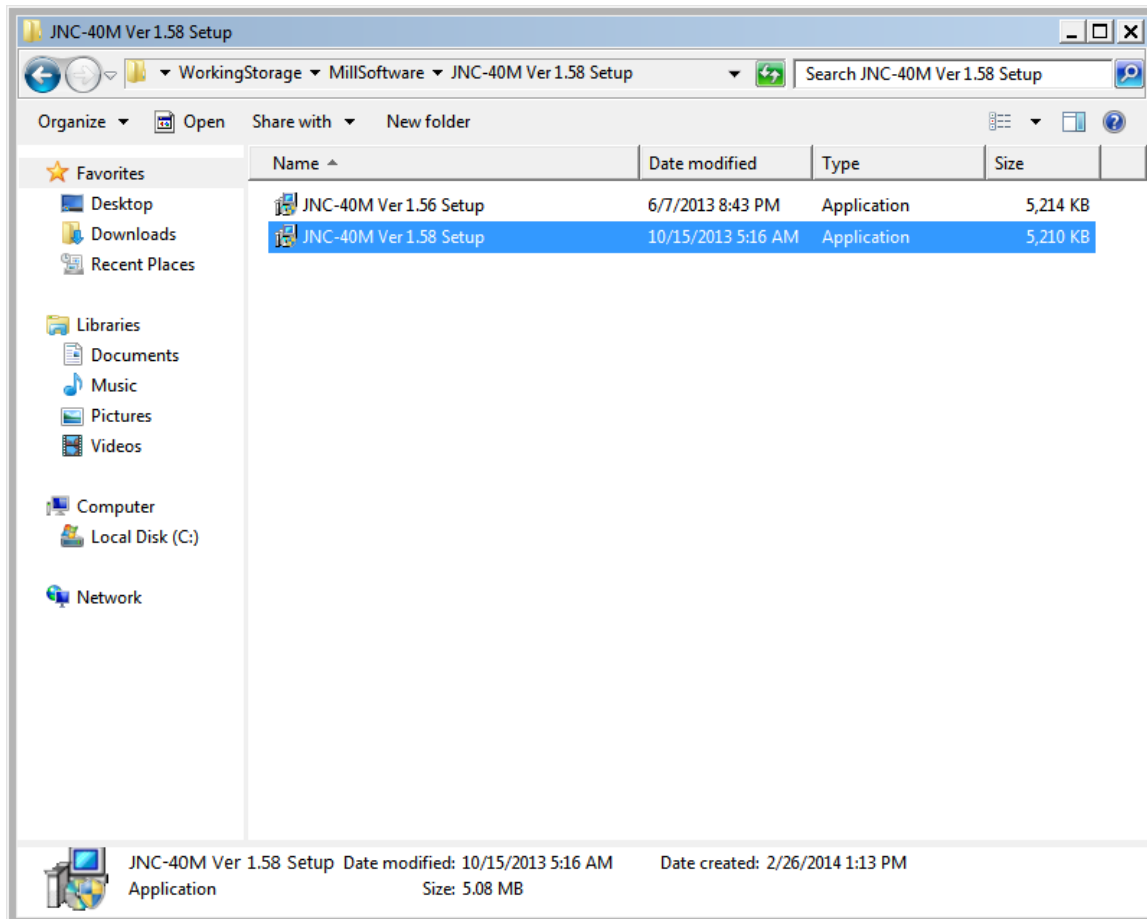
During installation, only a Mill Profile is needed for this machine. Create other profiles if you need them. A profile named PM45CNC (or other appropriate name) is necessary. This will be the profile you select when using your mill.



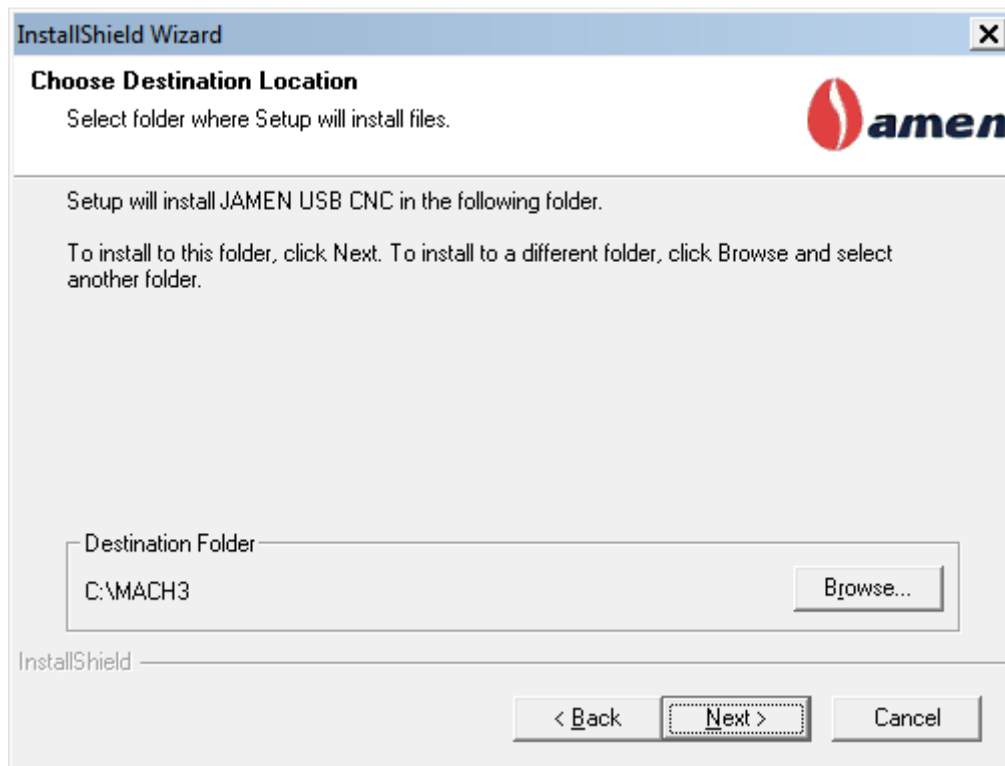
PART 2: Install the JAMEN Driver.

Once Mach 3 is installed, make sure the mill is turned off and USB not plugged in.

Select and install V1.58 of Jamen driver located on the CD that came with the Mill.



When prompted, install the USB driver files in the C:\Mach3 directory or, in the directory you chose when installing Mach 3.



When the installation is complete, turn the mill on and connect the supplied USB cord between the Mill and a USB port on your computer. The mill is powered on by first rotating the round dial on the left side of the control box and by pushing the green power button on the mill control head.

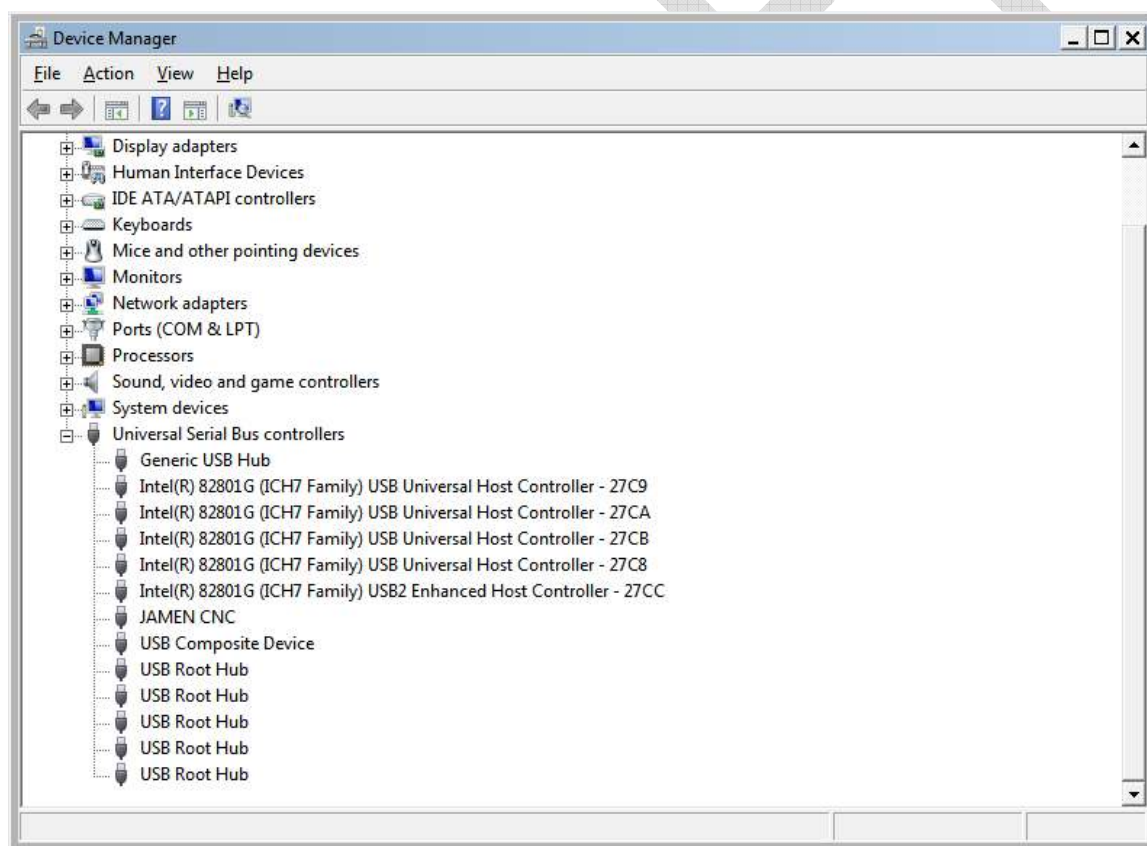
NOTE: Some systems might auto-detect the JAMEN hardware while some systems may not. If your computer auto-detects the JAMEN hardware skip to screen “SELECT DRIVER SOFTWARE” below.

Open the device manager for your computer and expand the entries in the Universal Serial Bus Controller section. In some cases, you may see a yellow Triangle and exclamation point next to the JAMEN entry. This will depend if you have previously attempted to install the driver or, if your computer auto-detected the new hardware. If you previously attempted to install the driver, right-click the JAMEN entry and uninstall it first followed by unplugging the USB cable and plugging it back in.

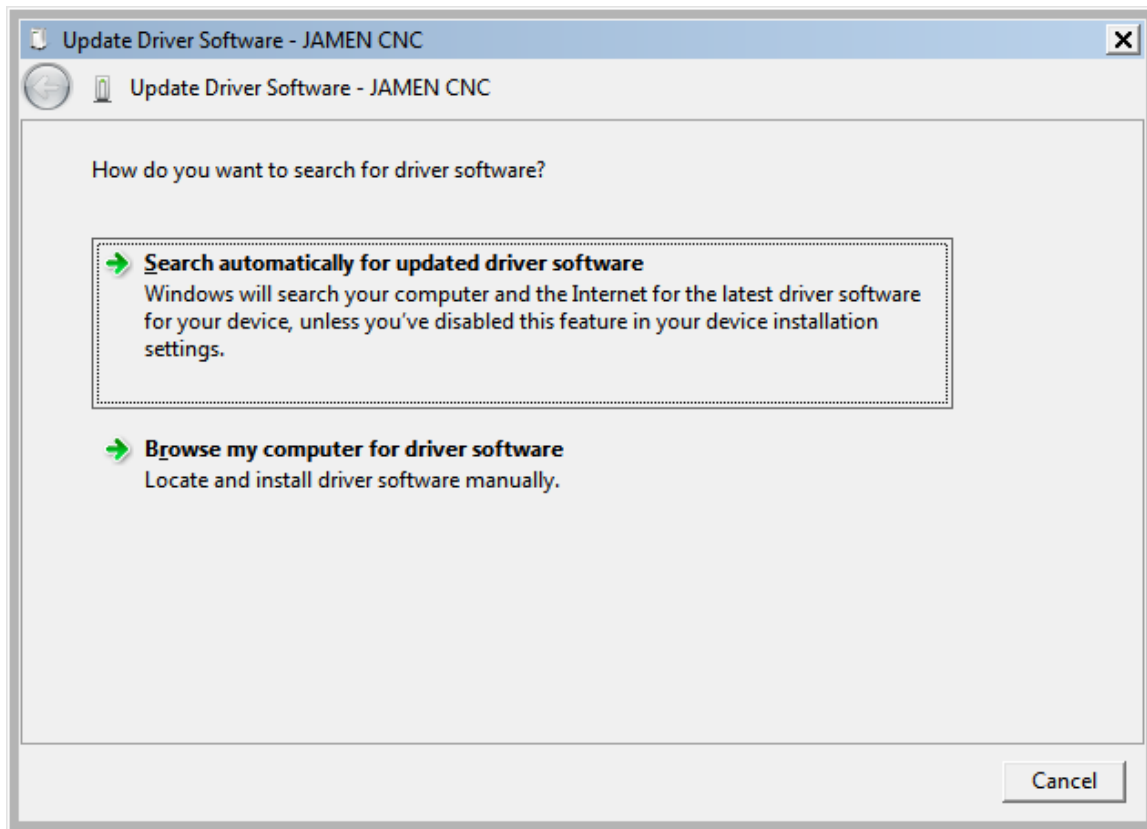
Right-click the JAMEN entry and select “Install/Update Driver”.

NOTE: Depending on operating system, the JAMEN device might show-up in some location other than Universal Serial Bus controller.

Example Device Manager for Win 7.

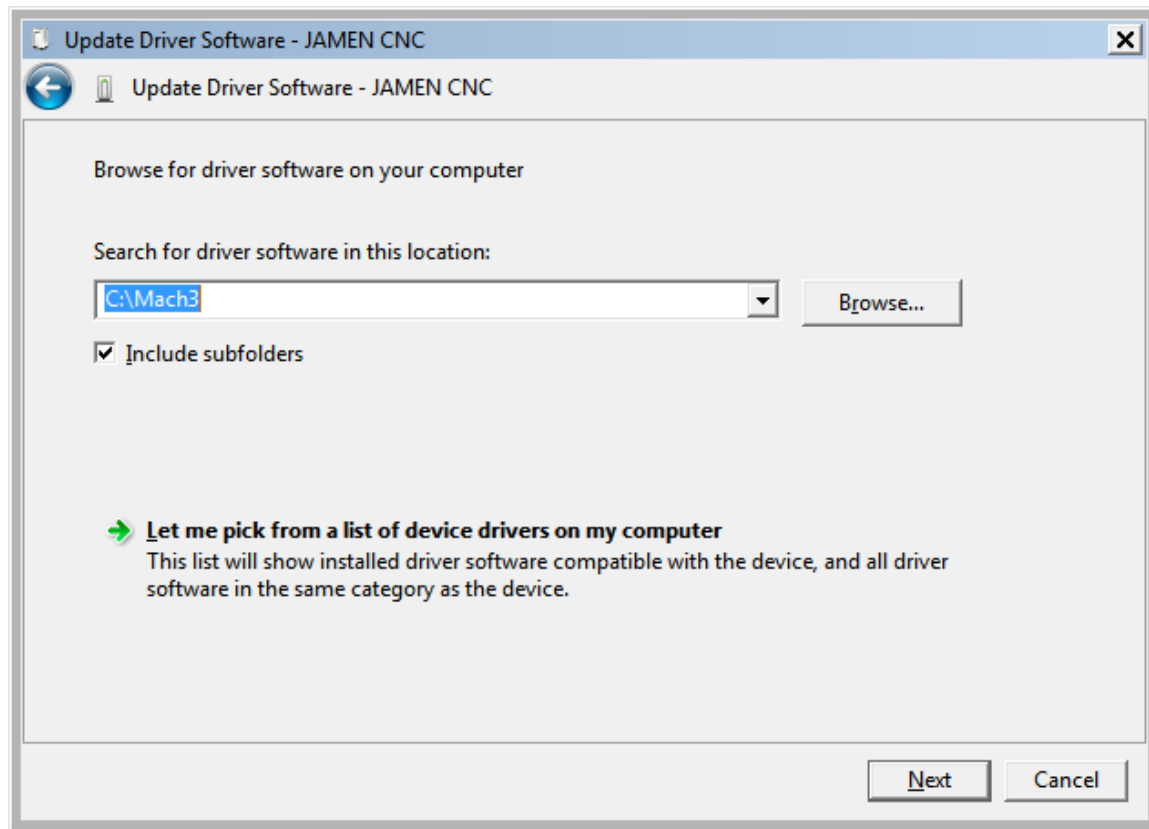


Upon seeing this screen, press "Browse my computer for driver software".



SELECT DRIVER SOFTWARE:

Use the Browse button and select the base installation directory of your Mach 3 software.



Upon pressing “Next”, the JAMEN driver will be installed and you are ready to run and configure Mach 3.

Part 3: Set Mach 3 parameters to communicate with the mill.

This section covers basic configuration of Mach 3 to establish communication between your computer and the mill.

WARNING: This document does not cover personal safety issues. The user of this product must be familiar with machine shop procedures, machinery and safety practices. If you are not familiar with these matters, it is highly advised you seek professional instruction.

NOTE: Do not modify any switches or setting in the control cabinet of the unit.

NOTE: Prior to using the machine, manually raise the head so the spindle is at least 4-5 inches above the table; furthermore, center the table below the spindle. The manual table cranks can be turned when the unit is not powered on.

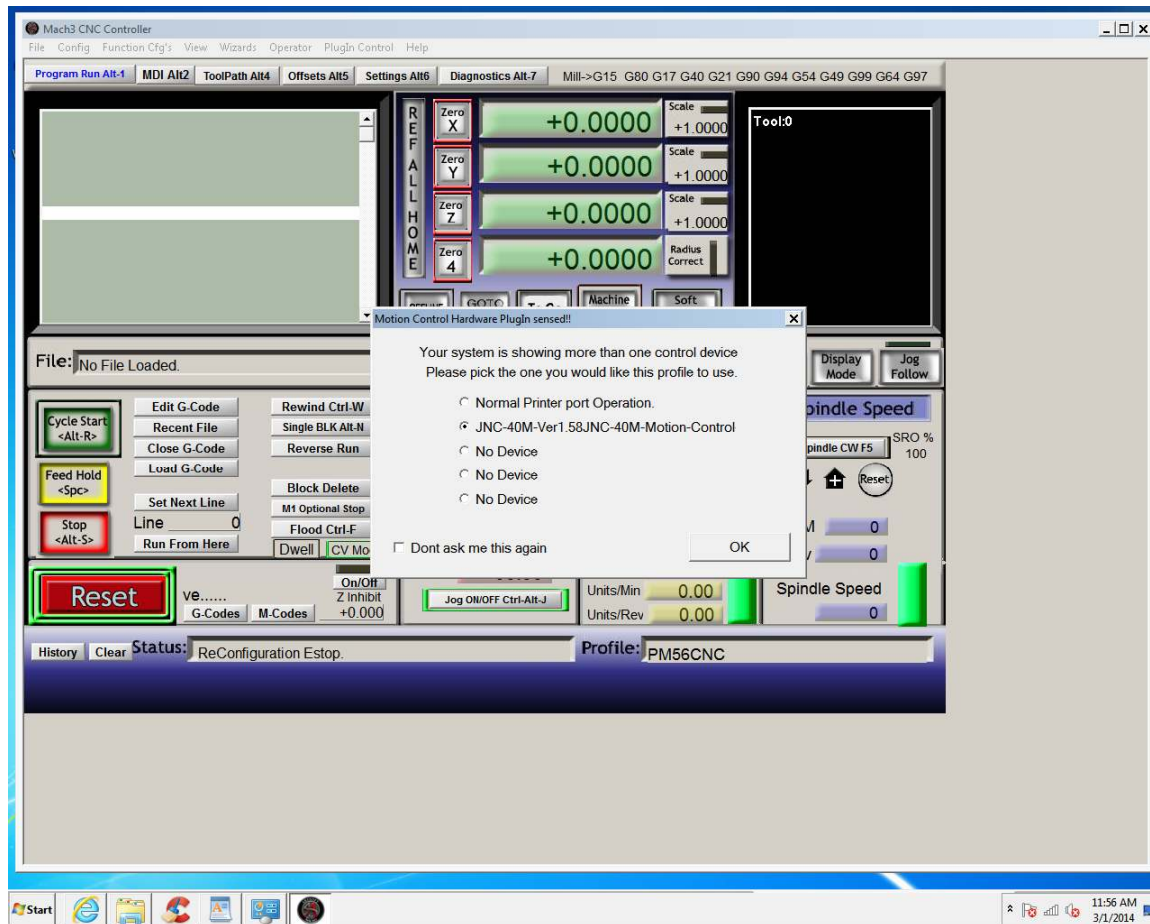
NOTE: This document does not describe how to use Mach 3 CNC software or CAM software.

NOTE: The parameters herein do not adjust all table limits as this will depend on how the user programs their CNC software.

NOTE: Care must always be taken when operating the machine. Pressing the red Reset button on the main menu or on the mill operator panel will stop the machine. Always watch the machine carefully and be prepared to press the Red Reset or emergency stop button.

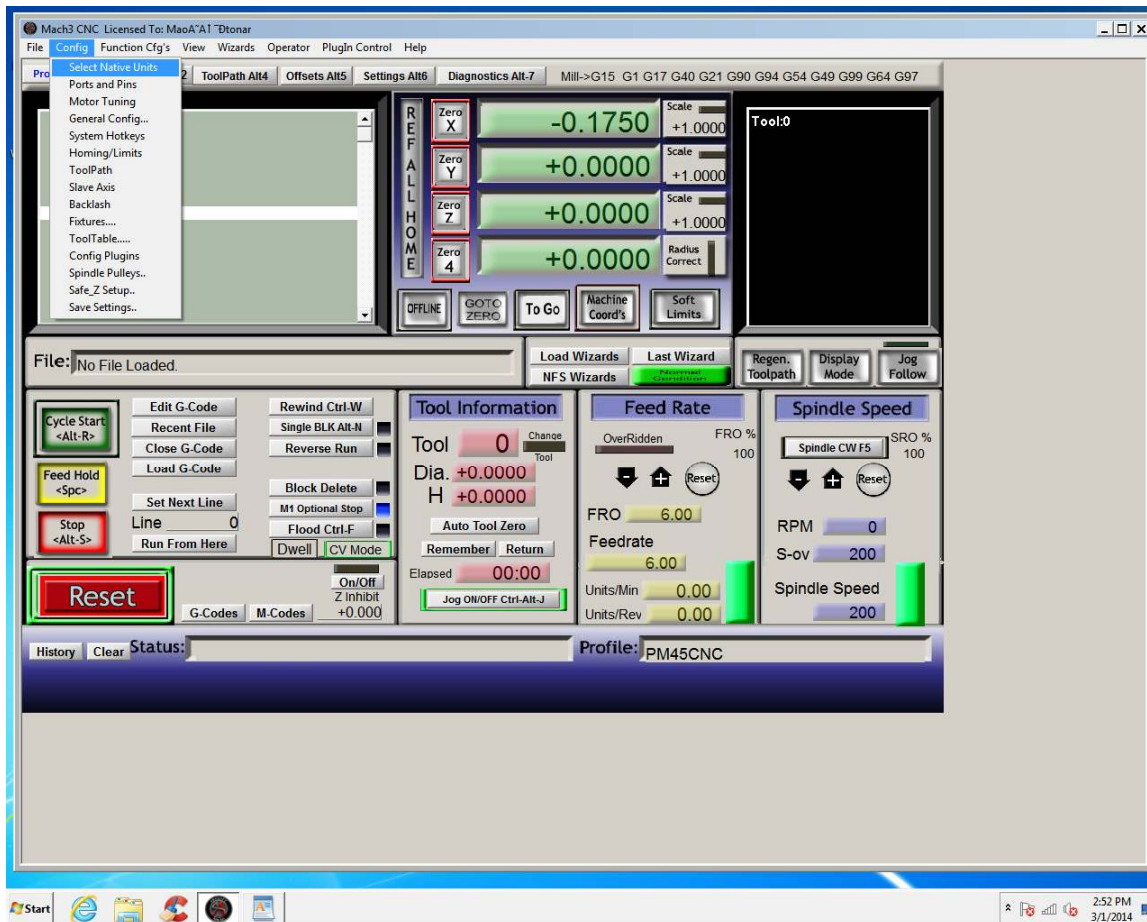
The parameters and settings herein are a starting point for future modification and customization by the user. It is the user's responsibility to know and understand how to use Mach 3 to control the mill. Until the user gains familiarity with the system, make changes cautiously, always observe proper shop safety protocol and be prepared to press the Reset or Stop buttons.

Locate and select the desktop Icon that corresponds to the Mill profile you created when installing Mach 3 and start the program. When Mach 3 starts, it will auto detect the controller. You must select the JNC motion control device.



Follow the menu directions to set the native measurement system.

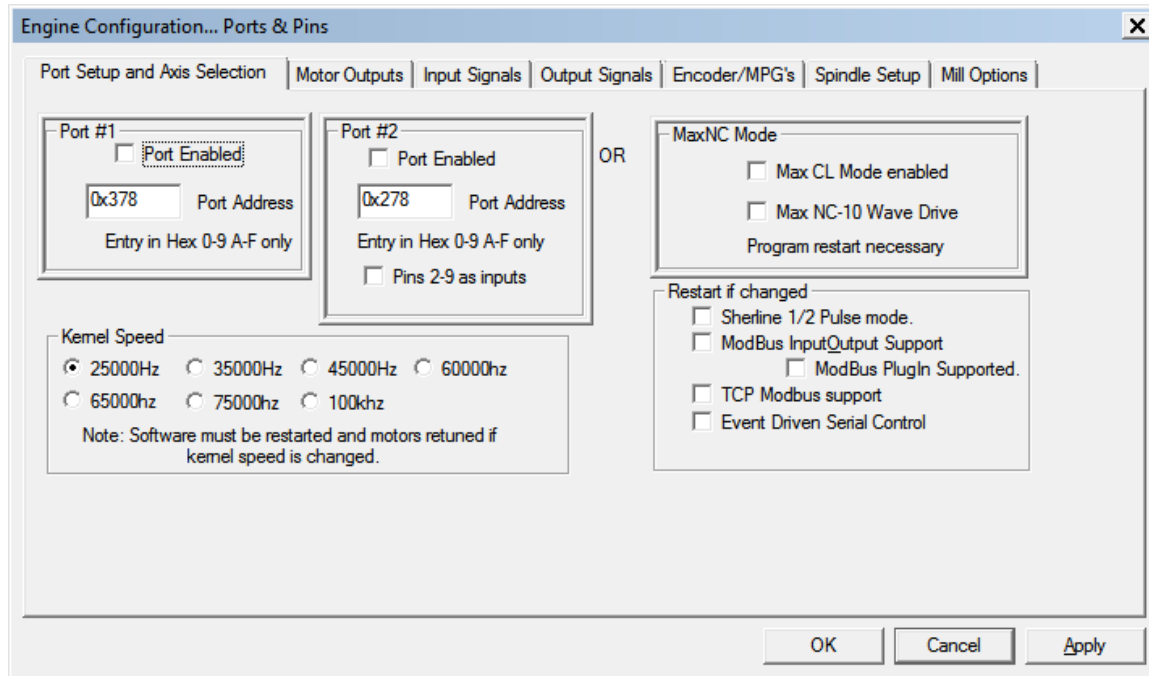
Select: Config-> Select Native Units. The US measurement system is chosen in this example.



NOTE: In all following screens, be certain to press the Apply button to make the setting permanent.

From the main menu of Mach 3, select:

Select: Config-> Select Ports and Pins and verify these settings.



From the main menu, set the general parameters as follows:

Select: Config-> General Config

General Logic Configuration

G20/G21 Control
☐ Lock DRO's to setup units

Tool Change
☐ Ignore Tool Change
☒ Stop Spindle. Wait for Cycle Start.
☐ Auto Tool Changer

Angular Properties
Unchecked for Linear
☒ A-Axis is Angular
☒ B-Axis is Angular
☒ C-Axis is Angular

Pgm End or M30 or Rewind
☐ Turn off all outputs
☐ E-Stop the system
☐ Perform G92.1
☐ Remove Tool Offset
☐ Radius Comp Off
☒ Turn Off Spindle

M01 Control
☒ Stop on M1 Command

Serial Output
ComPort # BaudRate
☒ 8-Bit 1 Stop ☐ 7 Bit 2-Stop

Program Safety
☐ Program Safety Lockout
This disables program translation while the External Activation #1 input is activated.

Editor
GCode Editor

Startup Models
☐ Use Init String on ALL "Resets"
Initialization String
Motion Mode
☒ Constant Velocity ☐ Exact Stop
Distance Mode ☒ Absolute ☐ Inc ☐ IJ Mode ☐ Absolute ☒ Inc
Active Plane of Movement
☒ X-Y ☐ Y-Z ☐ X-Z

Jog Increments in Cycle Mode
Position 1

Use 999 to indicate a Continuous Jog selection.

Position 10

Shuttle Wheel Setting
Shuttle Accel. Seconds

Inputs Signal Debouncing/Noise rejection
Debounce Interval x 40us
Index Debounce

General Configuration
☐ Z is 2.5D on Output #6
☒ Home Sw. Safety
Look Ahead Lines
☐ Ignore M calls while loading
☐ MS- Execute after Block
☐ UDP Pendant Control
☐ Run Macro Pump
☐ Charge Pump On in EStop
☒ Persistent Jog Mode.
☒ FeedOverride Persist
☐ No System Menu in Mach3
☐ Use Key Clicks
☐ Home Slave with Master Axis
☐ Include TLD in Z from G31
☒ Lock Rapid FRO to Feed FRO
Rotational
☐ Rot 360 rollover
☐ Ang Short Rot on G0
☒ Rotational Soft Limits

CV Control
☐ Plasma Mode
☒ CV Dist Tolerance Units..
☒ G100 Adaptive NurbsCV
☐ Stop CV on angles > Degrees

Axis DRO Properties
☐ Tool Selections Persistent.
☒ Optional Offset Save
☒ Persistent Offsets
☐ Persistent DROs
☐ Copy G54 from G59.253 on startup

Screen Control
☒ Hi-Res Screens
☐ Boxed DRO's and Graphics
☐ Auto Screen Enlarge
☒ Flash Errors and comments.

OK

Set the soft limits as follows:

Select: Config-> Homing/Limits

Motor Home/SoftLimits

Entries are in setup units.

Axis	Reversed	Soft Max	Soft Min	Slow Zone	Home Off.	Home N...	Auto Zero	Speed %
X		100.00	-100.00	1.00	0.0000			20
Y		100.00	-100.00	1.00	0.0000			20
Z		0.00	-12.50	1.00	0.1000			30
A		100.00	-100.00	1.00	0.0000			20
B		100.00	-100.00	1.00	0.0000			20
C		100.00	-100.00	1.00	0.0000			20

G28 home location coordinates

X	<input type="text" value="-9"/>	A	<input type="text" value="0"/>
Y	<input type="text" value="-3.5"/>	B	<input type="text" value="0"/>
Z	<input type="text" value="-4"/>	C	<input type="text" value="0"/>

OK

Set the Motor Output as follows:

Select: Config->Ports and Pins>Motor Outputs

Engine Configuration... Ports & Pins

Port Setup and Axis Selection | Motor Outputs | Input Signals | Output Signals | Encoder/MPG's | Spindle Setup | Mill Options

Signal	Enabled	Step Pin#	Dir Pin#	Dir LowActi...	Step Low A...	Step Port	Dir Port
X Axis		0	0			0	0
Y Axis		0	0			0	0
Z Axis		0	0			0	0
A Axis		0	0			0	0
B Axis		0	0			0	0
C Axis		0	0			0	0
Spindle		0	0			0	0

OK Cancel Apply

Set the motor input signals as follows. Carefully observe all numbers and settings. **Note: There are several screenshots spanning multiple pages on this set of configuration parameters. All other parameters other than the ones show are not significant.**

Select: Config->Ports and Pins-> Input Signals

Engine Configuration... Ports & Pins

Port Setup and Axis Selection | Motor Outputs | **Input Signals** | Output Signals | Encoder/MPG's | Spindle Setup | Mill Options

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey
X ++		1	5			0
X --		1	5			0
X Home		1	1			0
Y ++		1	5			0
Y --		1	5			0
Y Home		1	2			0
Z ++		1	5			0
Z --		1	5			0
Z Home		1	3			0

Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be used on this screen

Automated Setup of Inputs

OK Cancel Apply

Engine Configuration... Ports & Pins

Port Setup and Axis Selection | Motor Outputs | **Input Signals** | Output Signals | Encoder/MPG's | Spindle Setup | Mill Options

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey
A ++		1	5			0
A --		1	5			0
A Home		1	4			0
B ++		0	0			0
B --		0	0			0
B Home		0	0			0
C ++		0	0			0
C --		0	0			0
C Home		0	0			0

Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be used on this screen

Automated Setup of Inputs

OK Cancel Apply

Engine Configuration... Ports & Pins

Port Setup and Axis Selection | Motor Outputs | Input Signals | Output Signals | Encoder/MPG's | Spindle Setup | Mill Options

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey
Input #4		1	24			0
Probe		1	7			0
Index		0	0			0
Limit Ovrd		0	0			0
EStop		1	8			0
THC On		0	0			0
THC Up		0	0			0
THC Down		0	0			0
OEM Trig #1		0	0			0

Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be used on this screen

Automated Setup of Inputs

OK Cancel Apply

Engine Configuration... Ports & Pins

Port Setup and Axis Selection | Motor Outputs | Input Signals | Output Signals | Encoder/MPG's | Spindle Setup | Mill Options

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey
OEM Trig #1		1	9			0
OEM Trig #2		1	10			0
OEM Trig #3		1	11			0
OEM Trig #4		1	12			0
OEM Trig #5		1	13			0
OEM Trig #6		1	14			0
OEM Trig #7		1	15			0
OEM Trig #8		1	16			0
OEM Trig #9		1	17			0

Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be used on this screen

Automated Setup of Inputs

OK Cancel Apply

Engine Configuration... Ports & Pins

Port Setup and Axis Selection | Motor Outputs | Input Signals | Output Signals | Encoder/MPG's | Spindle Setup | Mill Options

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey
OEM Trig #10		1	18			0
OEM Trig #11		1	19			0
OEM Trig #12		1	29			0
OEM Trig #13		1	30			0
OEM Trig #14		1	31			0
OEM Trig #15		1	32			0
Timing		0	0			0
Jog X++		1	25			0
Jog X--		1	26			0

Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be used on this screen

Automated Setup of Inputs

OK Cancel Apply

Engine Configuration... Ports & Pins

Port Setup and Axis Selection | Motor Outputs | Input Signals | Output Signals | Encoder/MPG's | Spindle Setup | Mill Options

Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey
Jog X++		1	25			0
Jog X--		1	26			0
Jog Y++		1	28			0
Jog Y--		1	27			0
Jog Z++		1	22			0
Jog Z--		1	23			0
Jog A++		1	20			0
Jog A--		1	21			0

Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be used on this screen

Automated Setup of Inputs

OK Cancel Apply

Set the Output Signals exactly as shown. **Note: There are several screenshots spanning multiple pages on this set of configuration parameters. All other parameters other than the ones show are not significant.**

Select: Config->Ports and Pins-> Output Signals

Signal	Enabled	Port #	Pin Number	Active Low
Enable1		2	21	
Enable2		0	0	
Enable3		0	0	
Enable4		0	0	
Enable5		0	0	
Enable6		0	0	
Output #1		2	1	
Output #2		2	2	
Output #3		2	3	

Pins 2 - 9 , 1, 14, 16, and 17 are output pins. No other pin numbers should be used.

OK Cancel Apply

Signal	Enabled	Port #	Pin Number	Active Low
Output #7		2	7	
Output #8		2	8	
Output #9		2	9	
Output #10		2	10	
Output #11		2	11	
Output #12		2	12	
Output #13		2	13	
Output #14		2	14	
Output #15		2	15	

Pins 2 - 9 , 1, 14, 16, and 17 are output pins. No other pin numbers should be used.

OK Cancel Apply

Engine Configuration... Ports & Pins

Port Setup and Axis Selection | Motor Outputs | Input Signals | Output Signals | Encoder/MPG's | Spindle Setup | Mill Options

Signal	Enabled	Port #	Pin Number	Active Low
Output #12		2	12	
Output #13		2	13	
Output #14		2	14	
Output #15		2	15	
Output #16		2	16	
Output #17		2	17	
Output #18		2	18	
Output #19		2	19	
Output #20		2	20	

Pins 2 - 9 , 1, 14, 16, and 17 are output pins. No other pin numbers should be used.

OK

Cancel

Apply

Set the Spindle Setup parameters.

Select: Config->Ports and Pins-> Spindle Setup

Engine Configuration... Ports & Pins

Port Setup and Axis Selection | Motor Outputs | Input Signals | Output Signals | Encoder/MPG's | Spindle Setup | Mill Options

Relay Control

☐ Disable Spindle Relays

Clockwise (M3) Output #

CCW (M4) Output #

Output Signal #'s 1-6

Flood Mist Control

☐ Disable Flood/Mist relays Delay

Mist M7 Output #

Flood M8 Output #

Output Signal #'s 1-6

ModBus Spindle - Use Step/Dir as well

☐ Enabled Reg 64 - 127

Max ADC Count

Motor Control

☒ Use Spindle Motor Output

☒ PWM Control

☐ Step/Dir Motor

PWMBase Freq.

Minimum PWM %

Special Functions

☐ Use Spindle Feedback in Sync Modes

☐ Closed Loop Spindle Control

P I D

☒ Spindle Speed Averaging

General Parameters

CW Delay Spin UP Seconds

CCW Delay Spin UP Seconds

CW Delay Spind DOWN Seconds

CCW Delay Spin DOWN Seconds

☐ Immediate Relay off before delay

Special Options, Usually Off

☐ HotWire Heat for Jog

☐ Laser Mode. freq I

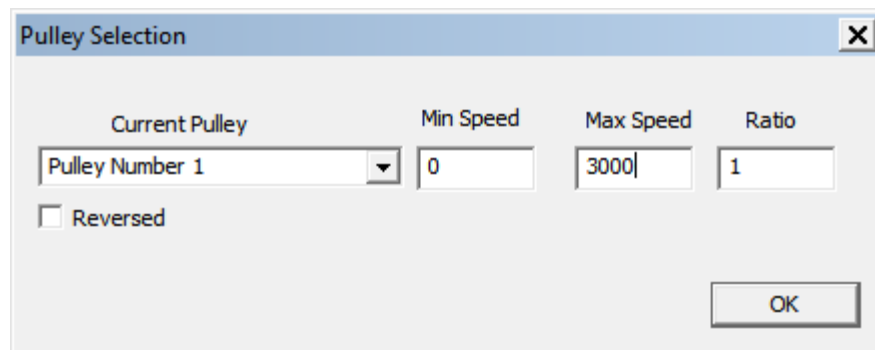
☐ Torch Volts Control

☐ Torch Auto Off

OK Cancel Apply

Set the Spindle Pulley parameters.

Select: Config->Spindle Pulleys



The image shows a 'Pulley Selection' dialog box with a title bar and a close button (X). It contains four input fields: 'Current Pulley' (a dropdown menu showing 'Pulley Number 1'), 'Min Speed' (a text box with '0'), 'Max Speed' (a text box with '3000'), and 'Ratio' (a text box with '1'). Below these fields is a checkbox labeled 'Reversed' which is currently unchecked. An 'OK' button is located at the bottom right of the dialog.

Current Pulley	Min Speed	Max Speed	Ratio
Pulley Number 1	0	3000	1

☐ Reversed

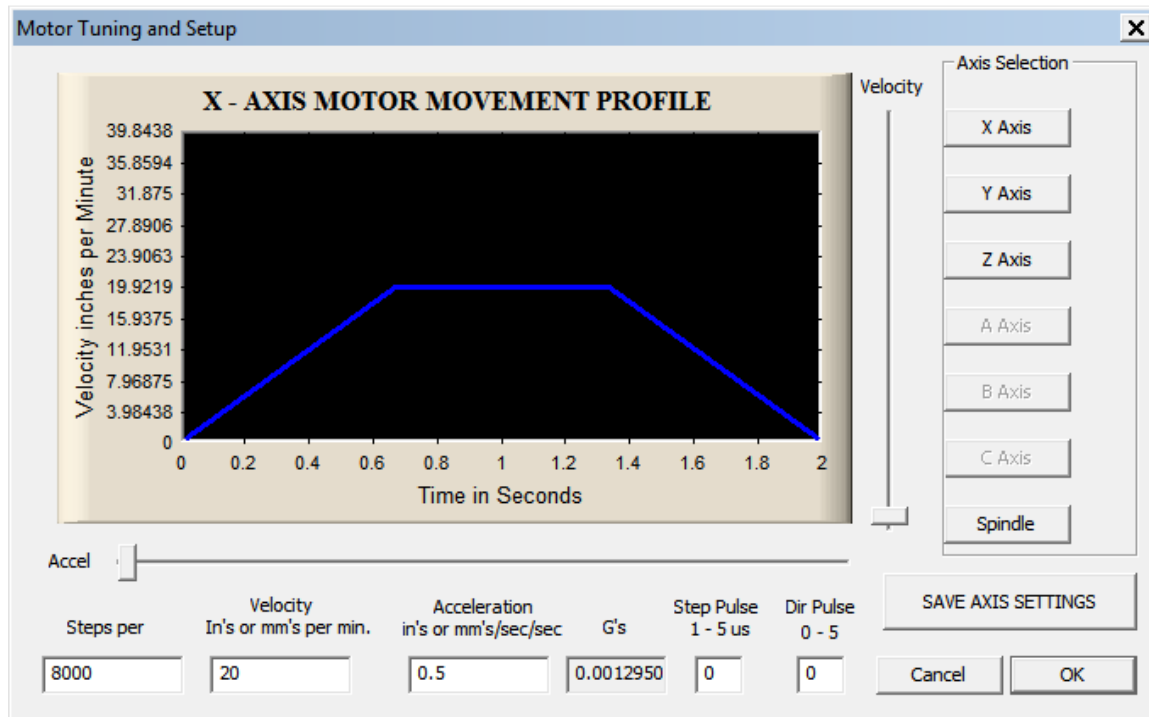
OK

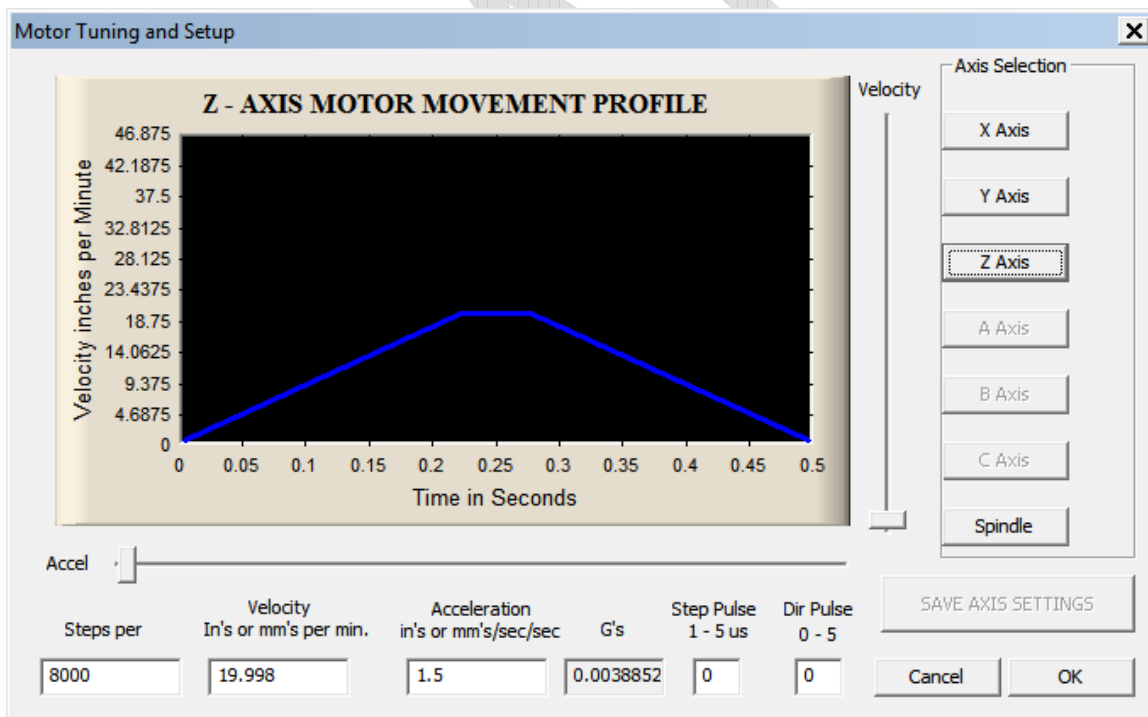
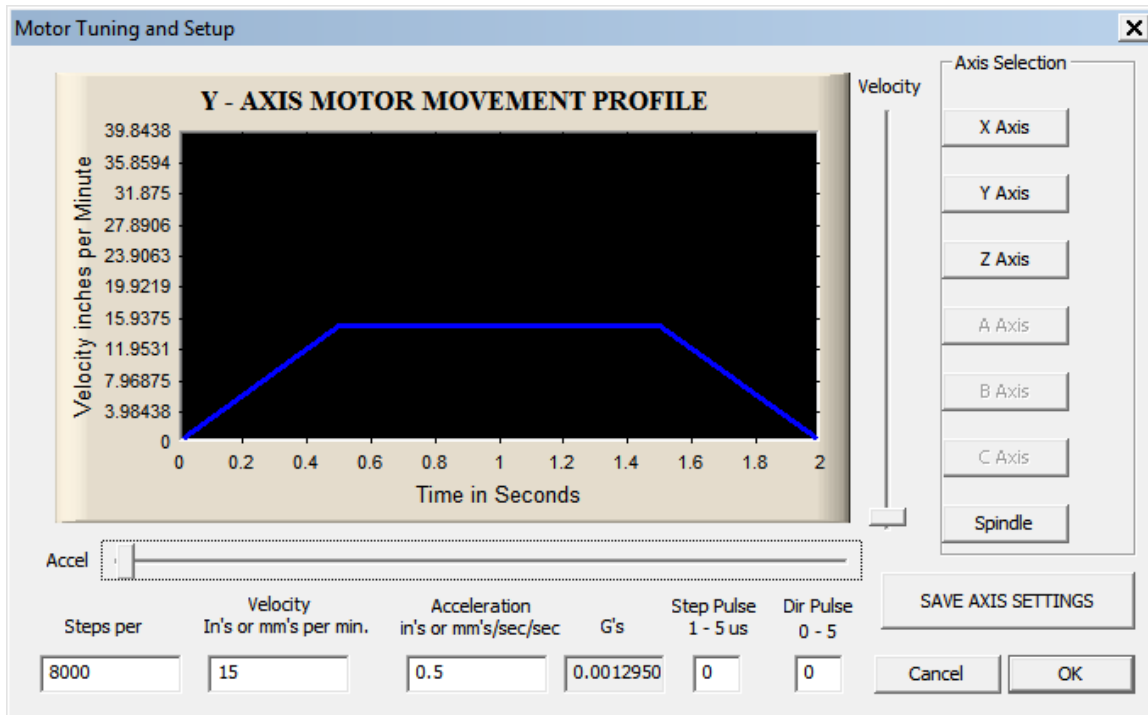
Set the Motor Tuning parameters for X, Y, Z and Spindle.

NOTE: The speed and acceleration parameters are set to fairly low values and can be increased once the operator has become familiar with the system.

NOTE: Each time a parameter setting is changed on the MotorTuning screens, the "SAVE AXIS SETTINGS" button must be pressed.

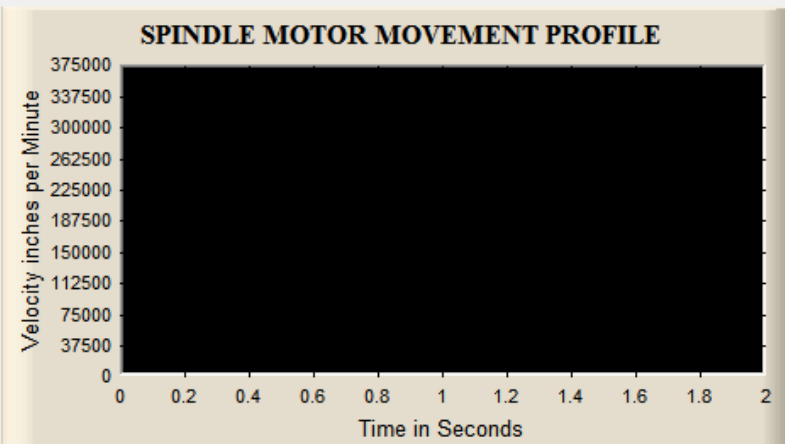
Select: Config->Motor Tuning (Four screens follow, do this for X, Y, Z and Spindle).





Motor Tuning and Setup

SPINDLE MOTOR MOVEMENT PROFILE



Velocity

Axis Selection

X Axis

Y Axis

Z Axis

A Axis

B Axis

C Axis

Spindle

Accel

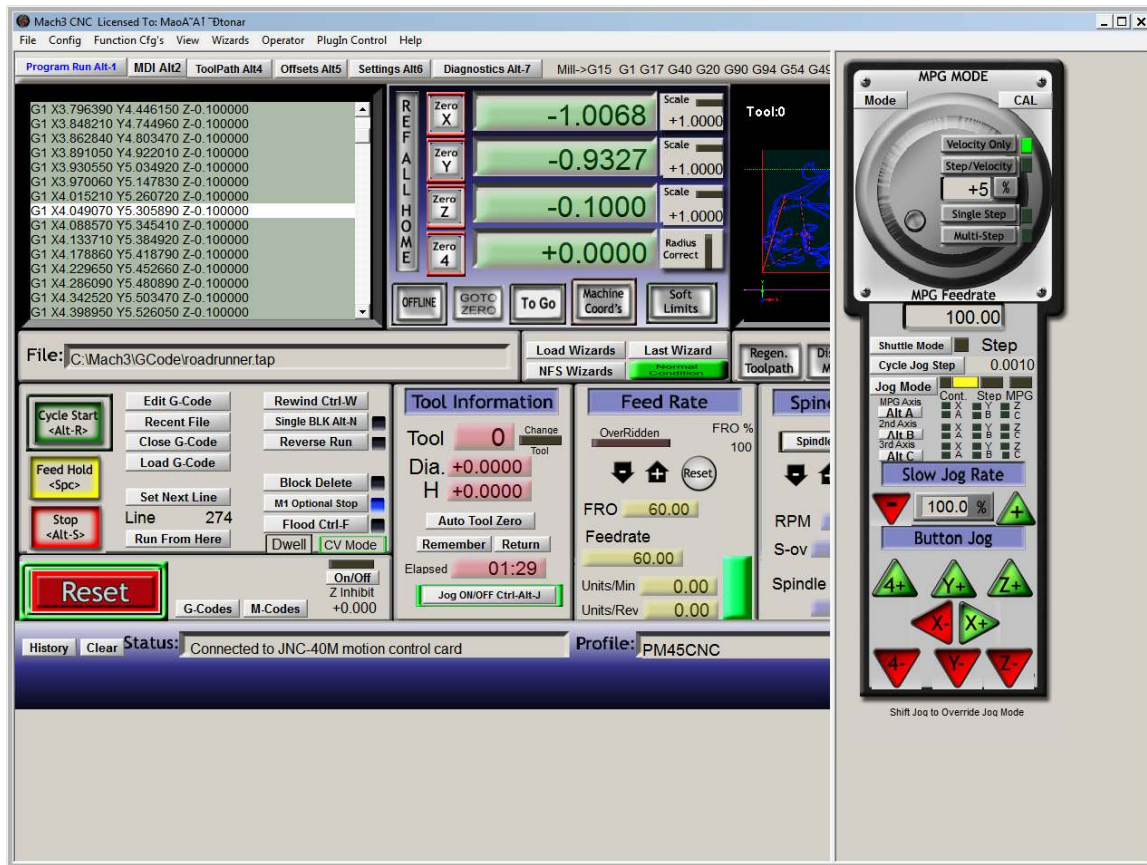
Steps per	Velocity In's or mm's per min.	Acceleration in's or mm's/sec/sec	G's	Step Pulse 1 - 5 us	Dir Pulse 0 - 5
1	120	4	0.0103607	0	0

SAVE AXIS SETTINGS

Cancel OK

It is advisable to exit the Mach 3 program and upon closing the application, save any profile information if prompted.

Upon restarting Mach 3, press the TAB key and the jog panel will appear on the right side of the screen. The Reset button must be pressed so it is not flashing. At this time, the X, Y and Z jog buttons can be pressed to operate the mill. In addition, the spindle panel on the main screen can be used to operate the spindle.



This concludes basic installation of Mach 3, the JAMEN driver and, configuration of basic communication parameters. **The parameters and settings herein are a starting point for future modification and customization by the user. It is the user's responsibility to know and understand how to use Mach 3 to control the mill. Until the user gains familiarity with the system, make changes cautiously, always observe proper shop safety protocol and be prepared to press the Reset or Stop buttons.**

Further information about this product can be found at <http://www.cmf-llc.com/pm-qmt-machines/>