

***Unless otherwise stated, this manual uses the term "PMDX-125" generically to refer to both the PMDX-125 and PMDX-126 boards. The PMDX-125 Plug-In will work with either a PMDX-125 or PMDX-126 board.***

## 1.0 Terms of Use

### PMDX-125 and PMDX-125 plug-in software for Mach control software Terms of Use

The PMDX-125 is intended for integration by the purchaser into industrial control systems. It is solely the purchaser's responsibility to assure that the system is configured in a manner consistent with applicable safety requirements. Practical Micro Design, Inc. does not control how this board and associated software is integrated into the purchaser's system and is not responsible for guaranteeing the safety of the system.

The PMDX-125 is not guaranteed to be fail-safe. The system into which the PMDX-125 is installed must provide fail-safe protection and emergency stop capability.

The PMDX-125 contains circuitry that may be connected to dangerous voltages. Care must be taken so that the user cannot come in contact with these voltages. An enclosure that allows for modest ventilation, but prevents intrusion by operator's hands and foreign objects, especially conductive byproducts of machining operations, should be utilized with this board. Interlock switches on power circuits should remove power when the enclosure is opened. Automated machine tools, into which the PMDX-125 may be integrated, can cause injury. Precautions should be taken to assure that operators are trained in their proper operation and safety procedures, and that they are protected from moving parts that may be under remote control and may move unexpectedly.

The PMDX-125 may not be used in life support or other critical safety applications.

Practical Micro Design, Inc. and PMDX reserve the right to change, without notice, the specifications, and information contained in this manual. While every effort has been made to ensure that the information contained in this manual is correct, Practical Micro Design, Inc. and PMDX do not assume responsibility for any errors that may appear. This software is provided without warranty of any kind whether express, statutory or implied, including all implied warranties of merchantability and fitness for a particular purpose. Practical Micro Design, Inc. and PMDX shall not in any event be liable for any direct, consequential, incidental, indirect or special damages even if advised of the possibility of such damages. In particular, Practical Micro Design, Inc. and PMDX shall have no liability for any damage, loss or corruption of data or programs stored in or used in conjunction with this software, nor shall the authors be liable for the cost of retrieving or replacing damaged lost or corrupted data.

***By downloading or using this software, you acknowledge acceptance of these Terms of Use.***

## 2.0 Overview

This document covers the installation and configuration of the PMDX-125 Mach3 plug-in, version 2012.06.22. The PMDX-125 Mach3 plug-in is a software module used to enable the expanded input and output capabilities of the PMDX-125 Multi-Mode Breakout Board.

### Terminology:

G-code

M-code Names of two types of commands commonly used to program numerically-controlled machines. See <http://en.wikipedia.org/wiki/G&M> for more information.

plug-in

Mach3 software module (also called a "DLL" in Microsoft Windows terminology). These reside in the "Plugins" subdirectory of the Mach3 install directory and have names ending in ".dll" (for example, "PMDX-125.dll" which is installed from PMDX-125.m3p, see section 4.0).

SmoothStepper USB-based interface board for use with Mach3, produced by Warp9 Tech Design, Inc. (<http://www.warp9td.com>)

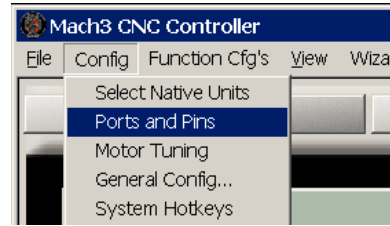
#### Conventions:

When talking about Mach3 menus and configuration screens, this document refers to them using "->" to separate sub-menu items.

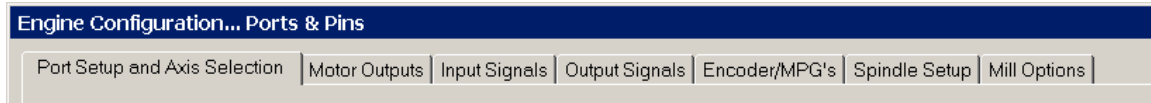
For example, when this document says:

*Go to the "Config->Ports and Pins" dialog*

it means to go to the "Config" menu and select the "Ports and Pins" item as show in the image to the right. This will open the dialog box that allows you to change the Mach3 hardware configuration.



In the Mach3 *Ports and Pins* dialog box, there are several tabs across the top:



Clicking on one of these tabs will display a different group of configuration information. This document refers to these like this:

*Go to the "Config->Ports and Pins" dialog, "Input Signals" tab*

That means to open the *Ports and Pins* dialog box, then click on the *Input Signals* tab along the top.

## 2.1 System Requirements

The PMDX-125 plug-in is designed to operate in the following environment:

- We currently recommend Mach3 version 3.043.037. Go to the Mach3 "Help -> About Mach3" menu to see the version number. The PMDX-125 plug-in has not been tested against versions of Mach3 older than 3.043.022 (the current "lockdown" version) and may or may not work. We cannot provide support for Mach3 versions earlier than this version. The Mach3 "lockdown" version 3.043.022 and the latest "development" version are available from the Mach3 downloads page (<http://www.machsupport.com/downloads.php>). However, version 3.043.037 is *not* available directly from the Mach3 downloads page. It is available using this URL:  
<http://www.machsupport.com/downloads/Mach3Version3.043.037.exe>
- If you need to use an MPG (manual pulse generator) with the PMDX-125 in *Expanded I/O Mode* or *Expanded Input Mode*, you will need Mach3 version 3.043.037 or higher. Specifically, you need the Mach3 parallel port driver (Mach3.sys) version 580 or higher. To find the driver version number, use the Mach3 "DriverTest.exe" utility (located in the main Mach3 directory, usually "C:\Mach3"). It will show the driver version in the "Version" box. If your DriverTest.exe does not show the parallel port driver version then you will need to install a newer version of Mach3.
- PC operating system, processor speed and memory requirements are the same as for Mach3. Specifically the processor speed is crucial. As of the date of this document that requirement was for 1 GHz or greater. Mach3 *may* function on processors that are slower than that, but the PMDX-125 plug-in will not.

## 2.2 When to use the PMDX-125 Plug-In

Use the PMDX-125 plug-in and the PMDX-125's expanded modes if you are using a single parallel port (i.e. NOT using two parallel ports, and NOT using a SmoothStepper or other USB or Ethernet motion controller) and:

- You need more input or output signals than are normally provided by that parallel port (12 outputs and 5 inputs including E-Stop).
- Or you need to control both of the PMDX-125 on-board relays AND have access to the parallel port "pin 1" and "pin 14" outputs as low-voltage digital outputs.

### 2.3 When NOT to use the PMDX-125 Plug-In

You do not need to (and SHOULD NOT) use the plug-in or the PMDX-125's expanded modes if:

- You configure the PMDX-125 for "Normal Mode" or "Normal Mode with Charge Pump". These two operational modes do not support the expanded I/O features that the plug-in provides.
- You are using two parallel ports connected to the PMDX-125. In this case you should have the PMDX-125 configured in "Normal Mode" or "Normal Mode with Charge Pump".
- If you are using the PMDX-125 with a SmoothStepper or other USB or Ethernet motion controller. The PMDX-125's expanded modes are not supported with the SmoothStepper. The SmoothStepper has two parallel ports and supports all input and output signals available on the PMDX-125 when configured in "Run Normal" or "Run Normal with Charge Pump" modes (see the *PMDX-125 User's Manual*). Furthermore, the PMDX-125 plug-in will not function if the SmoothStepper plug-in is active.

### 2.4 Plug-In and PMDX-125 Expanded Mode Capabilities

The PMDX-125 has three operating modes that interface with the Mach3 plug-in and allow for more outputs and/or inputs than are normally available on a single parallel port: *Expanded Input Mode*, *Expanded Output Mode* and *Expanded-I/O Mode*. You may need to use *Expanded Output Mode* if you have high-speed inputs that cannot tolerate the lower sampling rate used in *Expanded I/O Mode* (see note 3), or if Mach3 needs to be able to read the input signals during E-Stop. The differences between these three modes are:

Mode	Capabilities
Common to all modes	<ul style="list-style-type: none"> <li>• Parallel port 1 pin 10 is configured as the E-Stop input (see note 5)</li> <li>• Parallel port 1 pin 17 (output "17" on connector J6) is the "charge pump" signal (see note 5)</li> </ul>
Expanded Input Mode	<ul style="list-style-type: none"> <li>• Inputs "11", "12", "13" and "15" on connector J12 are available as multiplexed inputs (see note 3 and section 7.6)</li> <li>• Inputs "E", "F", "G" and "H" on connector J11 are available as multiplexed inputs (see note 3 and section 7.6)</li> <li>• Outputs "1", "14" and "16" on connector J6 are available as "full speed" outputs (see note 2)</li> </ul>
Expanded I/O Mode	<ul style="list-style-type: none"> <li>• Outputs "A" through "D" on connector J5 are available as "low speed" outputs (see note 1)</li> <li>• Both on-board relays are available as "low speed" outputs, separate from other output signals (see note 1)</li> <li>• Outputs "1" and "14" on connector J6 are available as "full speed" outputs (see note 2)</li> <li>• Output "16" and "17" on connector J6 are reserved for bit stream data and "charge pump OK", respectively</li> <li>• Inputs "11", "12", "13" and "15" on connector J12 are available as multiplexed inputs (see note 3 and section 7.6)</li> <li>• Inputs "E", "F", "G" and "H" on connector J11 are available as multiplexed inputs (see note 3 and section 7.6)</li> </ul>
Expanded Output Mode	<ul style="list-style-type: none"> <li>• Outputs "A" through "D" on connector J5 are available as "low speed" outputs (see note 1)</li> <li>• Both on-board relays are available as "low speed" outputs, separate from other output signals (see note 1)</li> <li>• Outputs "1" and "14" on connector J6 are available as "full speed" outputs (see note 2)</li> <li>• Output "16" and "17" on connector J6 are reserved for bit stream data and "charge pump OK", respectively</li> <li>• Inputs "11", "12", "13" and "15" on connector J12 are available as full-speed inputs (see note 4 and section 7.7)</li> <li>• Inputs "E", "F", "G" and "H" on connector J11 are NOT available unless a 2nd parallel port is connected to J17 (and therefore don't need expanded mode and this plug-in).</li> </ul>

**Note 1:** “Low speed” outputs are controlled via a bit stream from the Mach3 PMDX-125 plug-in to the PMDX-125 breakout board. Due to limitations in Mach3 driving the bit stream used in expanded modes on the PMDX-125, these outputs are updated in 1 to 2 seconds typically. ***These outputs are not suitable for step and direction signals or any signal that must change rapidly.*** See section 7.3 for more information on configuring delays into Mach3 for these outputs.

**Note 2:** “Full speed” outputs are controlled directly from the parallel port. This is the way that Mach3 normally handles outputs signals. These signals can be used for step and direction or any other purpose.

**Note 3:** “Multiplexed” inputs are sampled at one-half of the Mach3 kernel frequency. For example, if the Mach3 kernel frequency is 25 KHz, then these inputs are sampled at 12.5 KHz. Most input functions should work OK with multiplexed inputs. An exception might be if you are running spindle encoder inputs through the PMDX-125 into Mach3 and expect encoder pulse rates above one-quarter of the kernel frequency (6.25 KHz for a kernel frequency of 25 KHz).

**Note 4:** “Full speed” inputs are sampled by Mach3 at the kernel frequency. These provide the highest sample rate possible under Mach3.

**Note 5:** The plug-in will force the configuration of the “charge pump” to be on port 1 pin 17, and will override any changes that the user makes in the Config->Ports and Pins dialog. Likewise, the plug-in will force the E-Stop signal to port 1 pin 10.

### 3.0 Caveats & Limitations

- **DO NOT** alter the charge pump configuration in Mach3 *Ports and Pins, Output Signals* configuration screen. Doing so may temporarily enable the charge pump signal even while Mach3 is in E-Stop. The PMDX-125 plug-in configures and manipulates the charge pump settings as needed for proper operation and it will over-ride any settings you make.
- **DO NOT** alter the EStop configuration in the Mach3 *Ports and Pins, Input Signals* configuration screen. The PMDX-125 plug-in will automatically configure the EStop input as needed to function with the PMDX-125 breakout board.
- **DO NOT** use the PMDX-125 plug-in unless the PMDX-125 breakout board has its DIP switches set for either “Run in Expanded I/O Mode”, “Run in Expanded Output Mode” or “Run in Expanded Input Mode”.
- The PMDX-125 plug-in assumes that the PMDX-125 breakout board is connected to parallel port #1 as defined in the “Port #1” section of the main Mach3 *Ports and Pins* dialog box.
- The PMDX-125 plug-in ignores the Mach3 “Charge Pump2” signal in the Mach3 *Config->Ports and Pins, Output Signals* tab.
- Mach3 provides an “Automated Setup of Inputs” button on the *Config->Ports and Pins, Input Signals* tab. This feature **does not work** when the PMDX-125 and plug-in are in *Expanded I/O Mode* or *Expanded Input Mode* (i.e. the Mach3 automated setup does not recognize the multiplexed inputs).

### 4.0 Installing the Plug-In

Download the latest plug-in ZIP file from the PMDX web site (<http://www.pmdx.com>, then look for “Support” and then “Downloads”). Extract the contents of the ZIP file to a temporary directory. Look for the file named “PMDX-125.m3p”. An “m3p” file is a Mach3 plug-in file (not to be confused with “mp3”, which is an audio file). Double-click on the “PMDX-125.m3p” file. This will automatically copy the file into your Mach “Plugins” directory and rename it to PMDX-125.dll.

**WARNING – This will overwrite any PMDX-125 plug-in already installed in the Mach3 “Plugins” directory and it will NOT issue any warning that it is overwriting a file.**

## 4.1 Determining the Plug-In Version

To see what version of the PMDX-125 plug-in is installed, display the PMDX-125 plug-in configuration dialog box as described in section 8.0. The version number is displayed in the blue title bar at the top of the dialog box.

## 5.0 Configure the PMDX-125

There are several configuration options to consider:

### Selecting Expanded Mode:

Set DIP Switches "Config2", "Config1" and "Config0" as follows (see also the *DIP Switch Settings* section in the *PMDX-125 User's Manual*):

	<i>Config 3</i>	<i>Config 2</i>	<i>Config 1</i>
<i>Expanded I/O Mode</i>	closed	open	closed
<i>Expanded Output Mode</i>	closed	open	open
<i>Expanded Input Mode</i>	open	closed	closed

### Relays K1 and K2

<i>Relay K1 Control Signal</i>	<i>PMDX-125 Jumper JP1</i>	<i>PMDX-125 DIP Switch "Config 7"</i>	<i>Mach Output Port #</i>	<i>Mach Output Pin #</i>
Parallel port pin 1	"Pin 1"	"don't care"	1	1
Bit stream data (see note)	"multimode"	Closed	9	1
From option card on J18 (PMDX-107, for example)	"multimode"	Open	None (not used directly by Mach)	None (not used directly by Mach)

<i>Relay K2 Control Signal</i>	<i>PMDX-125 Jumper JP2</i>	<i>PMDX-125 DIP Switch "Config 8"</i>	<i>Mach Output Port #</i>	<i>Mach Output Pin #</i>
Parallel port pin 14	"Pin 14"	"don't care"	1	14
Bit stream data (see note)	"multimode"	closed	9	14
"Outputs Enabled" (aka "machine ready")	"multimode"	open	None (not used directly by Mach)	None (not used directly by Mach)

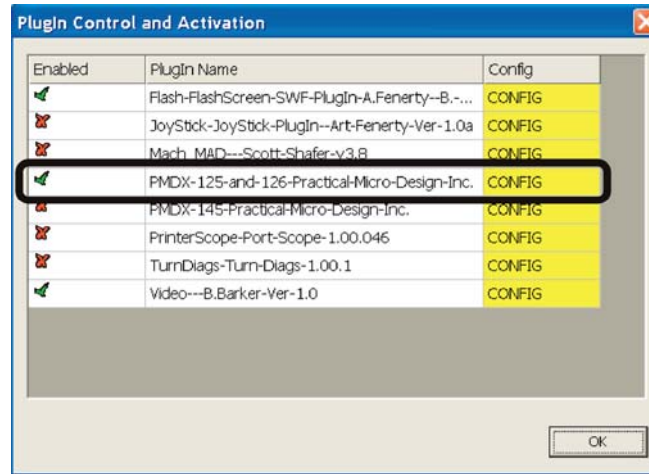
**Note:** The "bit stream data" option for controlling either relay is only available when the PMDX-125 and plug-in are configured for *Expanded I/O* or *Expanded Output* modes. This option is NOT available in *Expanded Input* mode.

**WARNING** – If either relay is controlled from the bit stream data, Mach3 must be configured with a delay after it changes that signal. See sections 2.4 and 7.3.

## 6.0 Enable the Plug-In

To enable the plug-in:

- Start Mach3
- Open the *Config->Config Plugins* dialog box. You should see the PMDX-125 plug-in listed among the other available plug-ins (see picture below)
- Click on the red "X" next to the PMDX-125 plug-in to change it to a green check mark
- Then click on "OK"
- ***Exit Mach3 and then re-start it before continuing***



**Note:** The number of plug-ins and the order in which they are listed may be different on your PC

## 7.0 Configure Mach3

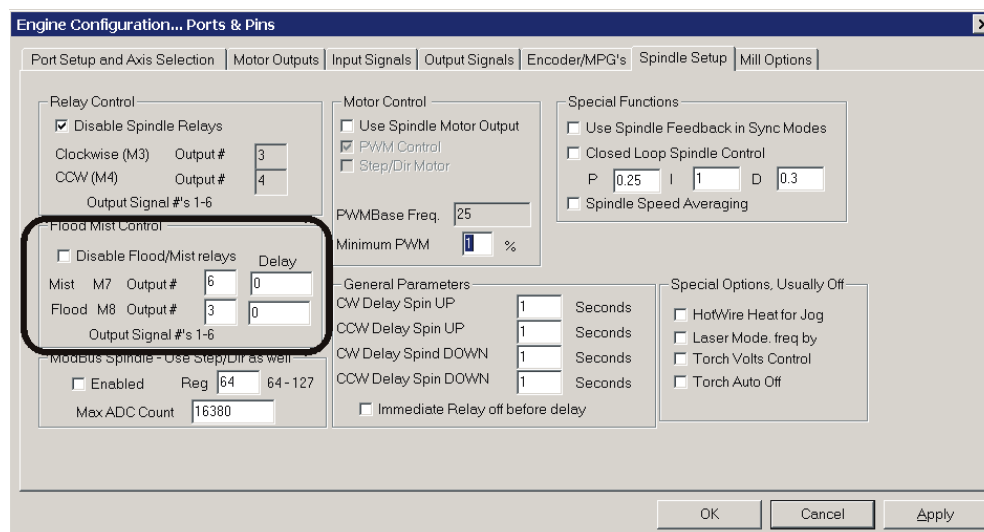
### 7.1 Background Information

For dedicated input and output signals, such as "X Home", "EStop", "Charge Pump", etc., Mach3 allows you to directly assign parallel port pin numbers to those signals. Do so by opening the *Config->Ports and Pins* dialog, then click on the *Input Signals* or *Output Signals* tab and scroll down until you see the signal name.

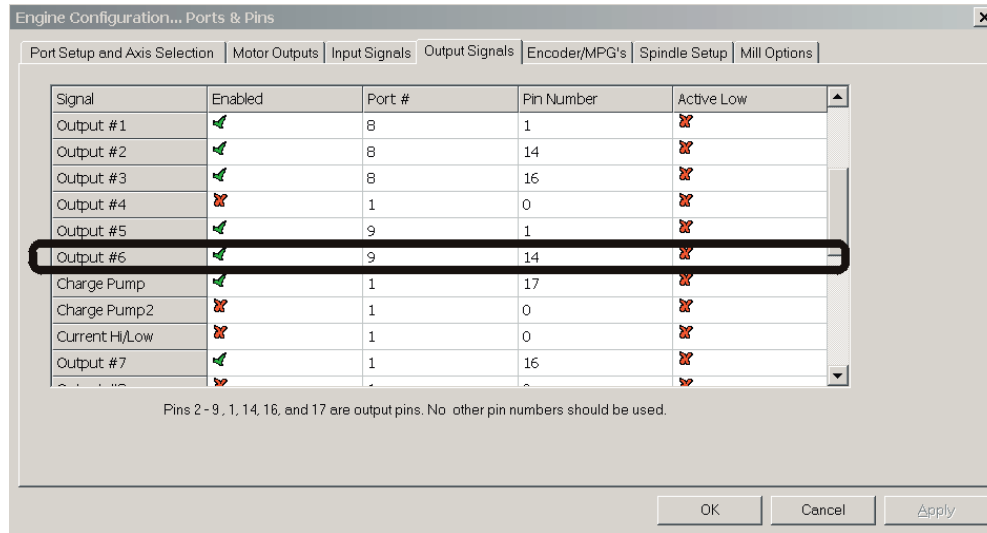
For generic inputs and outputs, Mach3 uses a two-level naming scheme. Generic outputs are labeled "Output #1" through "Output #20" in the *Config->Ports and Pins, Output Signals* tab. These outputs include those signals used by the *Spindle Setup* dialog for coolant pumps and spindle direction control (outputs 1 to 6 only). They also include outputs that are controlled by Mach3 macros (can use any output). Please refer to the Mach3 documentation for more information on using and writing macros. Generic inputs are labeled "Input #1" through "Input #4" in the *Config->Ports and Pins, Input Signals* tab.

When dealing with M-codes, the M-code controls the output signal. Mach3 then looks up the signal to see which parallel port and pin to use for that signal.

For example, to configure an output for use as the "mist" coolant signal, first go to the *Config->Ports and Pins* dialog box, then click on the *Spindle Setup* tab (see image below).



Along the left side is a section titled "Flood Mist Control". Make sure the "Disabled Flood/Mist relays" check box is NOT checked. Then enter an output number (1 through 6) in the box next to the "Mist M7 Output #" line (we will use output #6 for this example). Then click on the "APPLY" button. Click on the **Output Signals** tab and scroll down until you see "Output #6" (see image below). Enable the output by clicking on the red "X" to change it to a green check mark. Then enter the parallel port number and pin number of the signal that you wish to act as the "coolant mist" signal. In this example we have configured the output for parallel port 9 pin 14, which is the PMDX-125's expanded output signal for relay K2 (see section 7.5). Click on the "APPLY" button and then click the "OK" button.



## 7.2 Configuration Restrictions

Mach3 restricts which output signals can be used for the spindle relays and flood/mist controls (see the *Config->Ports and Pins* dialog on the *Spindle Setup* tab). These must be signals **Output #1** through **Output #6** as shown in the *Config->Ports and Pins* dialog on the **Output Signals** tab. These six outputs can then be assigned to any output pin on the parallel port (see section 7.1), or to the expanded outputs on the PMDX-125.

The expanded modes of the PMDX-125 hardware and plug-in place additional restrictions on how signals may be used:

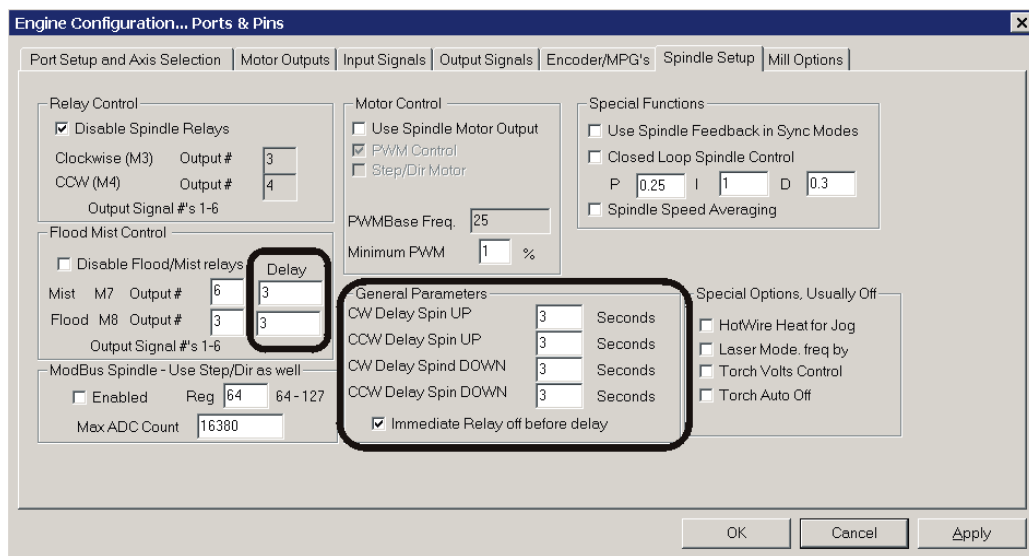
- The **Charge Pump** signal must be assigned to parallel port #1 pin 17. The PMDX-125 plug-in forces this assignment whenever the plug-in is enabled. You do not need to configure the **Charge Pump** signal (and **should not**, see section 3.0).
- The **Charge Pump2** output signal should not be enabled. If your system requires the use of **Charge Pump2** please contact PMDX support (see our web page at <http://www.pmdx.com> and click on the "Contact Us" link).
- **Motor Outputs (step and direction)** must **not** be assigned to any of the PMDX-125 expanded output signals. They must be assigned directly to parallel port output pins. These can be pins 2 through 9 and pins 1 and 14 on parallel port #1. If you attempt to assign a step or direction signal to an expanded output (port 8 or 9) the plug-in will display an pop-up error message.
- The **EStop** input signal must be assigned to parallel port #1 pin 10 with a red "X" in the "active low" column. The PMDX-125 plug-in forces this assignment whenever it is enabled. You do not need to configure the **EStop** signal (and **should not**, see section 3.0).

**WARNING - The current version of the PMDX-125 plug-in does NOT check for configuration errors such as assigning an output signal to more than one function. Nor does it check if you have the Charge Pump2 enabled.**

### 7.3 Expanded Outputs and Mach3 Delays

As noted in section 2.4, for “low speed” outputs, there is a 1 to 2 second (typical) delay from when Mach3 commands a signal to change and when the PMDX-125 is able to actually change the signal. “Low speed” signals are any output that is assigned to the pseudo parallel ports 8 or 9 (as shown in section 7.5). PMDX recommends a delay of 3 seconds to account for worst-case system performance. Note that this delay is in addition to any spindle spin-up delay or coolant flow delays that you might need.

Any “low speed” output must have delays inserted into Mach3 to account for the update delay. If you are writing your own macros, insert a delay after changing the output. If you are writing M-code, use the “P” command (pause) after the M-code that changes the output signal. If you are using the outputs for coolant control or spindle direction control, you can set the delay directly in the Mach3 configuration screen. Open the *Config->Ports and Pins* dialog then click on the *Spindle Setup* tab. Under the “Flood Mist Control” section, there are “Delay” entries for each control. Under the “General Parameters” section, there are delay fields for spin-up and spin-down in each direction. You should also check the “Immediate Relay off before delay” check box.



### 7.4 Required Configuration

#### **NOTE – Mach3 User Interface Quirks**

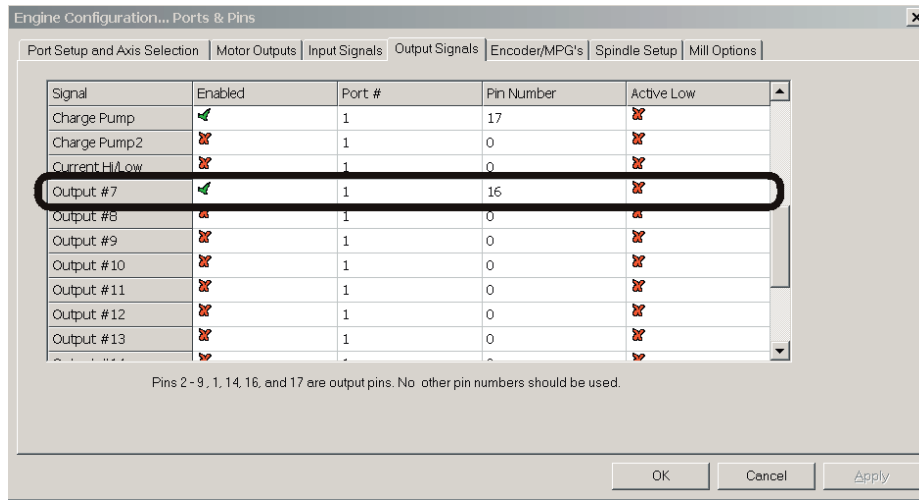
Due to quirks in the Mach3 user interface, when you change settings in any tab of the *Ports and Pins* dialog, you should click on the “Apply” button first and then the “OK” button. If you don’t click on “Apply” and instead just click on “OK”, Mach3 may not store your changes. This is true for Mach3 versions at least through R3.043.062.

Also, if you double-click on a cell in the *Ports and Pins*, *Output Signals* or *Input Signals* tabs, the scroll bars may disappear from the dialog box and the names in the “Signal” may be overwritten. If you see this happen, press the “ESC” key or click on “Cancel” to abort the changes. Then re-display the *Ports and Pins* dialog box.

- (1) **Do not alter the EStop (Emergency Stop) input or Charge Pump output.** These are automatically configured by the PMDX-125 plug-in (see section 3.0).
- (2) **If you are using Expanded Input mode, skip this step. If you are using Expanded I/O or Expanded Output Mode** then configure one of the “Output” signals for parallel port #1 pin 16. This will function as the expanded output bit stream to the PMDX-125 board. Since Mach3 limits some spindle controls to **Output #1** through **Output #6**, we suggest using an output between **Output #7** and **Output #20** for this signal. The sample shown below uses **Output #7**. Go to the *Config->Ports and Pins* dialog, click on the *Output Signals* tab and scroll down until you see the desired



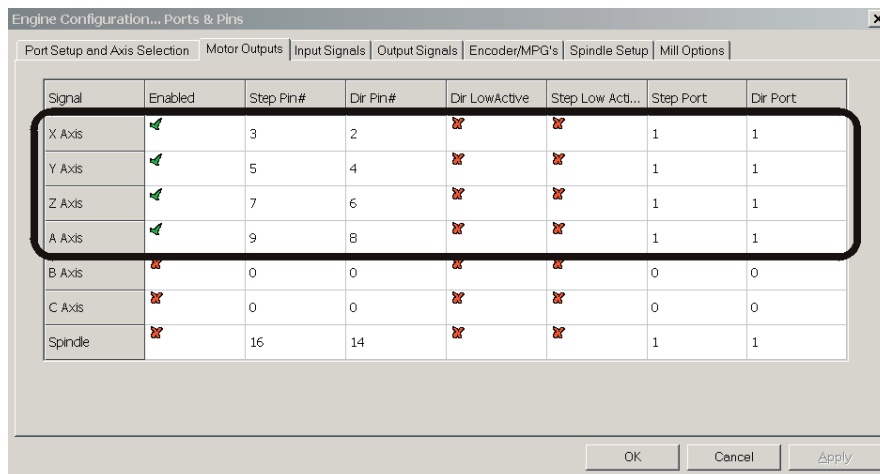
output line. Then click on the red "X" in the "Enabled" column to change it to a green check mark. Change the "Port #" to "1" and the "Pin Number" to "16". Leave the red "X" in the "Active Low" column. If there is a green check mark in the "Active Low" column, click on it to change it to a red "X". Then click on the "Apply" button.



- (3) Motor step and direction signals should be assigned to parallel port #1 pins 2 through 9 or pins 1 and 14. By convention, the step and direction signals are usually assigned to pins 2 through 9 for systems containing up to 4 axis, with pins 1 and 14 used for the fifth axis if needed (with pin 1 as the step and pin 14 as the direction). The example below shows a 4-axis system using pins 2 through 9. Note that the step and direction signals may be assigned to different pins than the default Mach3 configuration. That is OK. Generally, the PMDX-125 does not care which pins are step and which are direction (unlike the PMDX-132 which requires a certain configuration). This is just an example configuration. You are free to assign the step and direction functions however you like. However, if you wish to use the PMDX-125's built-in test modes, you must assign the step signals either to pins 1, 2, 4, 6, 8 (with direction signals on 3, 5, 7, 9 and 14), or pins 1, 3, 5, 7, 9 (with direction signals on 2, 4, 6, 8 and 14). See the *Test Modes* section in the *PMDX-125 User's Manual* for more information.

Refer to the documentation for your motor drivers or experiment with your system to determine if the *Dir Low Active* or *Step Low Active* columns should be checked. For GeckoDrive products G203V, G540 and all drives that use GND as the common reference, the *Step Low Active* should have a red "X". For GeckoDrive products G201 and all drives that use +5V as the common reference, the *Step Low Active* should have a green check mark.

To configure the step and direction signals, click on the *Motor Outputs* tab and enter your configuration. Click on the "APPLY" button when done.



## 7.5 Expanded Output Configuration

This section explains how to configure Mach3 to use the expanded outputs available in both the PMDX-125's *Expanded I/O Mode* and the *Expanded Output Mode*.

In order to assign Mach3 outputs to the PMDX-125's expanded output signals we use two pseudo parallel port numbers that do not map to physical parallel ports. The plug-in then reads the status of these signals and sends it to the PMDX-125 board. The table below shows the Mach3 port and pin mapping for the expanded outputs.

Relay	Mach3 Port	Mach3 Pin	Connector J5	Mach3 Port	Mach3 Pin
Relay K1 (on J9)	9	1	pin "A"	8	1
Relay K2 (on J10)	9	14	pin "B"	8	14
			pin "C"	8	16
			pin "D"	8	17

*Table 1 – Pseudo Port and Pin Numbers for Expanded Outputs*

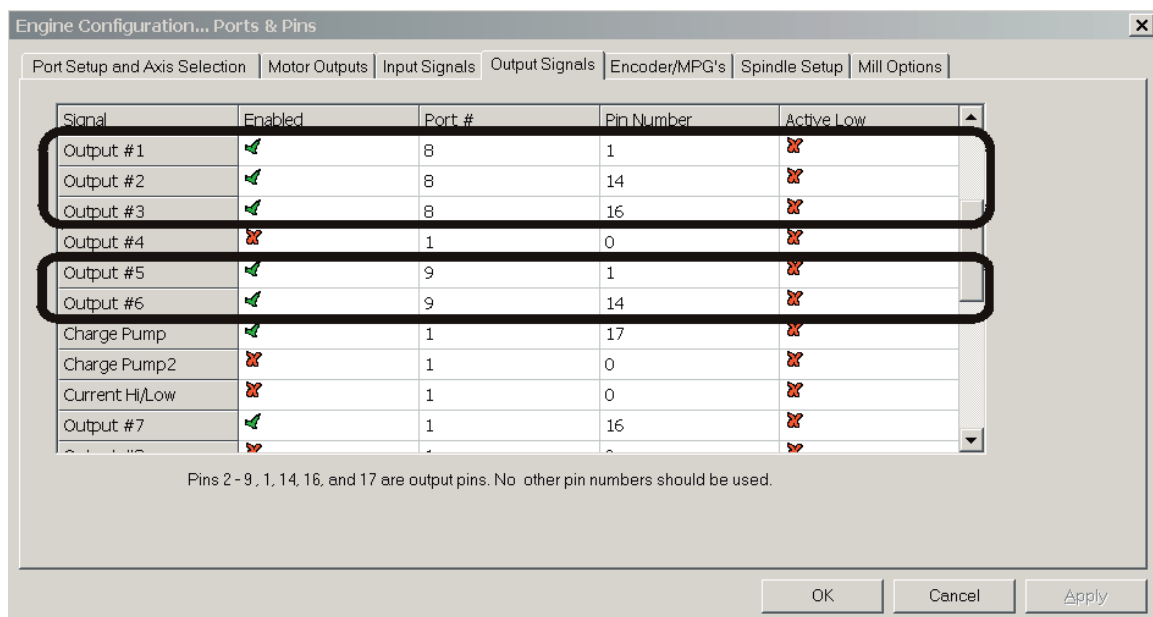
Just because the PMDX-125 is operating in one of its expanded modes does not mean that the relays need to be controlled from the expanded output signals. You may still control the relays directly from parallel port #1 pins 1 and 14, or from the other sources mentioned in section 5.0.

In *Expanded I/O* or *Expanded Output* mode, you may control the relays directly from parallel port pins 1 and 14 (where they operate with no delays from Mach3), or from the PMDX-125's expanded outputs (where they operate with a delay as described in section 2.4).

**NOTE** – In order for the relays to respond to the port 9 pin 1 or 14 assignments shown above, the relay jumpers on the PMDX-125 must be configured to "multimode" as described in section 5.0 for control via the bit stream.

The following figures show a sample output signal configuration. It has PMDX-125 connector J5 pins "A", "B" and "C" mapped to Output #1, Output #2 and Output #3 respectively. Pin "D" is not used. Relay K1 is mapped to Output #5 and Relay K2 is mapped to Output #6.

To configure the output signals for your system, go to the *Config->Ports and Pins* dialog, click on the *Output Signals* tab and then scroll down until you see *Output #1*. Note that outputs 7 through 20 are listed below the *Charge Pump* and *Current Hi/Low* signals. Enter your configuration then click on the "APPLY" button.



## 7.6 Multiplexed Input Configuration

This section explains how to configure Mach3 to use the multiplexed inputs available in the PMDX-125's *Expanded Input Mode* or *Expanded I/O Mode*. If you have the PMDX-125 and/or the plug-in configured in *Expanded Output Mode*, see section 7.7.

The PMDX-125 hardware and plug-in provide two sets of 4 inputs that are multiplexed onto the parallel port #1 pins 11, 12, 13 and 15. To assign these signals inside Mach3, we use parallel port number 1 and pseudo parallel port number 8. The table below shows the mapping from PMDX-125 connector signals to Mach3 pseudo port pin numbers.

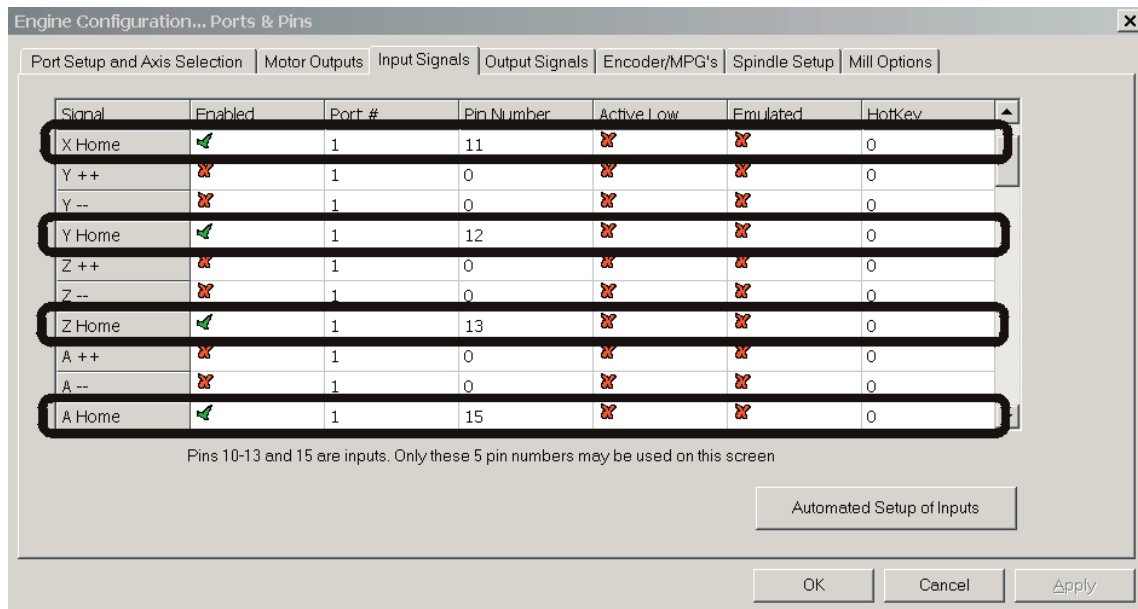
Connector J12	Mach3 Port	Mach3 Pin	Connector J11	Mach3 Port	Mach3 Pin
pin "11"	1	11	pin "E"	8	11
pin "12"	1	12	pin "F"	8	12
pin "13"	1	13	pin "G"	8	13
pin "15"	1	15	pin "H"	8	15

Table 2 – Pseudo Port and Pin Numbers for Multiplexed Inputs

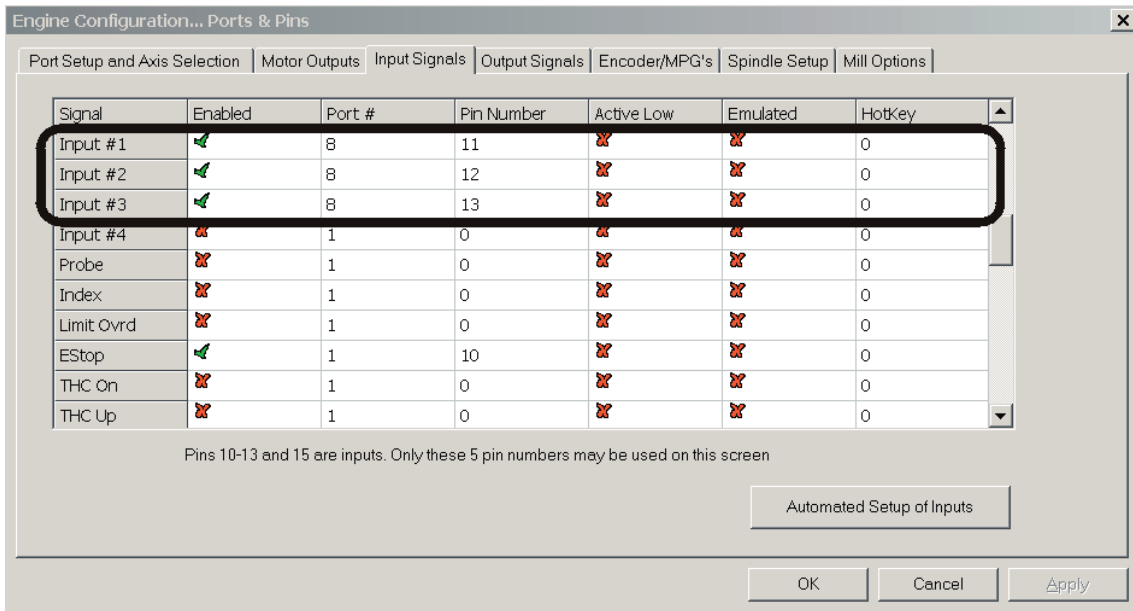
The following two figures show a sample input signal configuration. This is only an example. You may assign the multiplexed input signals to *any* Mach3 input except for the *EStop* input (see section 3.0)

Note that Mach3 allows a single input pin to be used for multiple functions. Typically, this is used to gang all of the home switches onto a single input, or multiple limit switches onto a single input.

The first figure shows that the "home" signals for the X, Y, Z and A axis are assigned to the PMDX-125 connector J11 pins "11", "12", "13" and "15".



The next figure shows the Mach3 signals *Input #1* through *Input #4* assigned to PMDX-125 connector J12 pins "E", "F" and "G" (note that "H" is not assigned). This is just an example of how you might configure your system. Enter your configuration data then click on the "APPLY" button, then the "OK" button to close the *Ports and Pins* dialog.



## 7.7 Standard Input Configuration

This section explains how to configure Mach3 to use the standards inputs available in the PMDX-125's *Expanded Output Mode* (i.e. NOT using multiplexed inputs). If you have the plug-in configured in *Expanded Input Mode* or *Expanded I/O Mode* then see section 7.6.

When using *Expanded Output Mode*, simply assign the inputs for PMDX-125 connector J11 pins "11", "12", "13" and "15" as you normally would in Mach3 (i.e. to parallel port #1 pins 11, 12, 13 and 15).

## 7.8 Spindle Control (PMDX-107) Configuration

The PMDX-125 Mach3 Plug-In will work with a PMDX-107 to control spindle speed and direction. However, the configuration needed for the spindle control differs depending on which expanded mode is selected.

### 7.8.1 Expanded Input Mode

When the PMDX-125 is configured for *Expanded Input Mode*, both Mach3 and the PMDX-107 should be configured the same as if expanded mode were NOT enabled.

***PMDX-107 Configuration:*** The PMDX-107 should have its DIP switches set for "Normal Mode". Set the PMDX-107 DIP switches "Config1" and "Config2" both to "off". For more information on the PMDX-107 DIP switch settings, please see the *PMDX-107 User's Manual*.

***Mach3 Configuration:*** Mach3 should be configured to output the spindle speed PWM signal on parallel port 1 pin 16, and the spindle direction signal on parallel port 1 pin 14. For more information on configuring Mach3, please see our application note *AN-001: Mach3 Sample Configuring with 3 Axis and PWM Spindle Speed Using a Single Parallel Port*, available on our web site under "Support" and then "Application Notes". Note that this application note used to be called *AN-Gen-1*.

### 7.8.2 Expanded Output Mode or Expanded I/O Mode

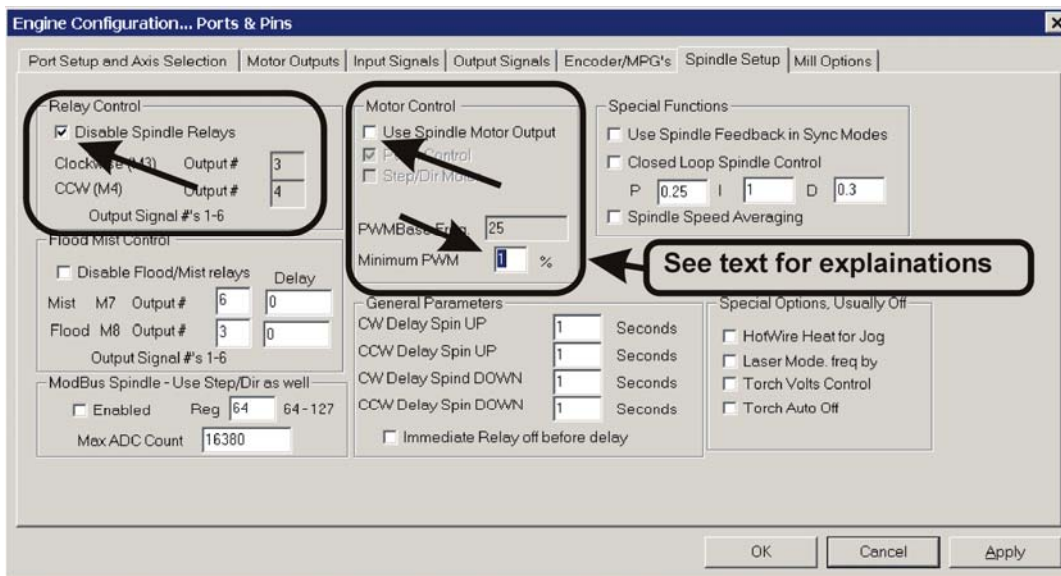
When the PMDX-125 is configured for either *Expanded I/O Mode* or *Expanded Output Mode*, Mach3 and the PMDX-107 require special configuration settings.

***PMDX-107 Configuration:*** The PMDX-107 must be configured for *Expanded Mode*. Set the PMDX-107 DIP switch "Config1" to "on" and "Config2" to "off". Please refer to the *PMDX-107 User's Manual* for more information on setting the DIP switches.

**Plug-In Configuration:** If you will be using a PMDX-107 Isolated Speed Control with either *Expanded I/O* or *Expanded Output* modes, you must check the “Enable Spindle” box on the PMDX-125 Plug-In Configuration dialog. See section 8.0 for more information.

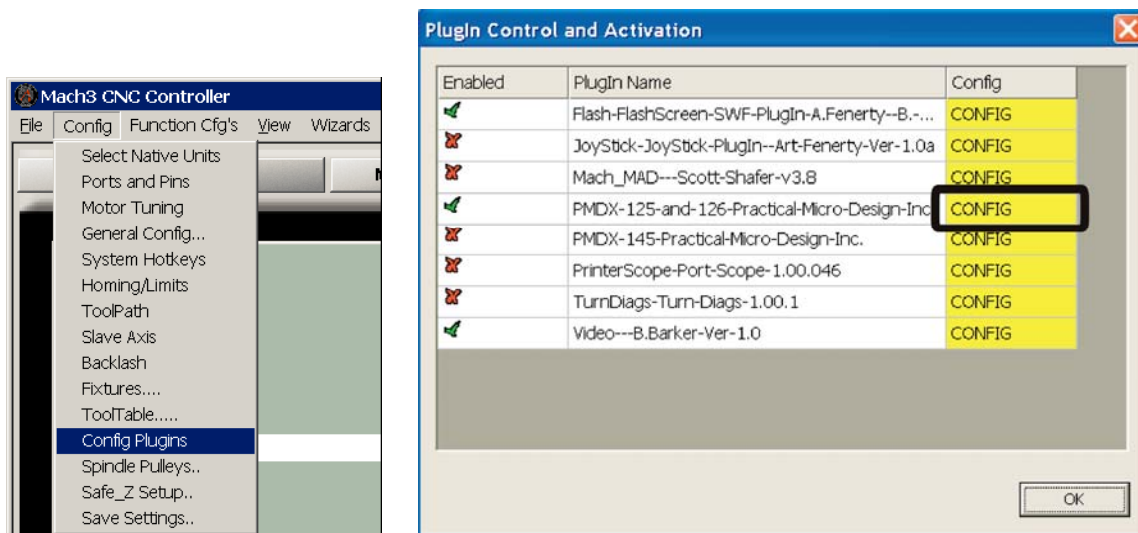
**Mach3 Configuration:** Mach3 should be configured as if there is no spindle motor control. Don't worry, Mach3 will still “control” the spindle speed and direction internally, and the plug-in will detect this and drive the PMDX-107 as needed. Go to the Mach3 “Config”, “Ports and Pins” dialog, then click on the “Spindle Setup” tab (see below). There are three items that need to be set:

- In the “Relay Control” section, put a check mark in the “Disable Spindle Relays” box
- In the “Motor Control” box, UN-check the “Use Spindle Motor Output” box. Note that this will disable the “Spindle” axis on the “Motor Outputs” tab.
- Also in the “Motor Control” box, set the “Minimum PWM” percentage to match the capabilities of your spindle controller (i.e. minimum spindle speed as a percent of max speed, usually somewhere between 1% and 10%).

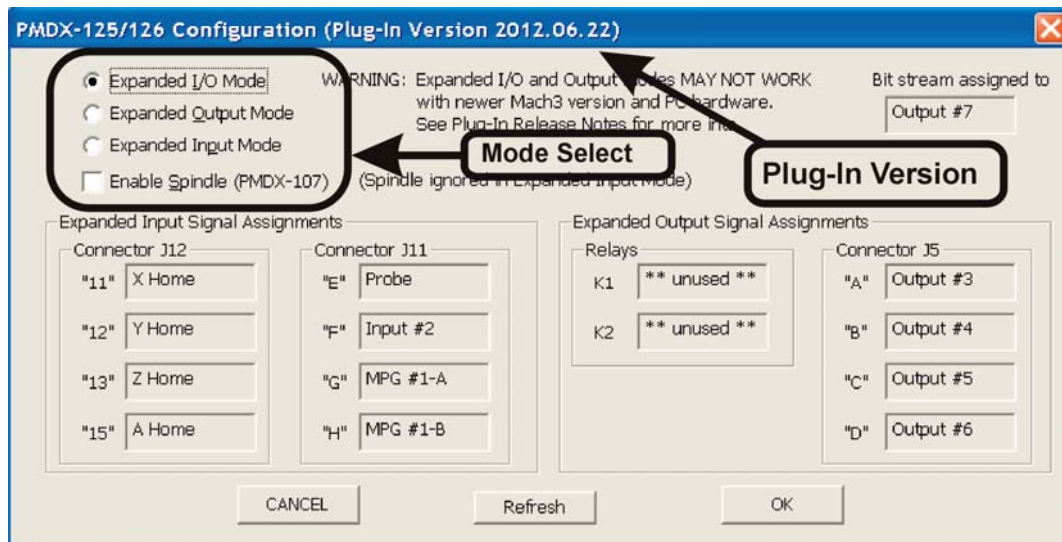


## 8.0 Configure the Plug-In

From within Mach3, open the *Config->Config Plugins* dialog box.



Click on the "CONFIG" box to the right of the PMDX-125 plug-in. This displays the PMDX-125 Configuration dialog box as shown below. For now, you can ignore everything in this dialog except for the mode select options and the "Enable Spindle" check-box in the upper left corner. Also note that the plug-in version number is displayed in the title bar at the top of the dialog box.



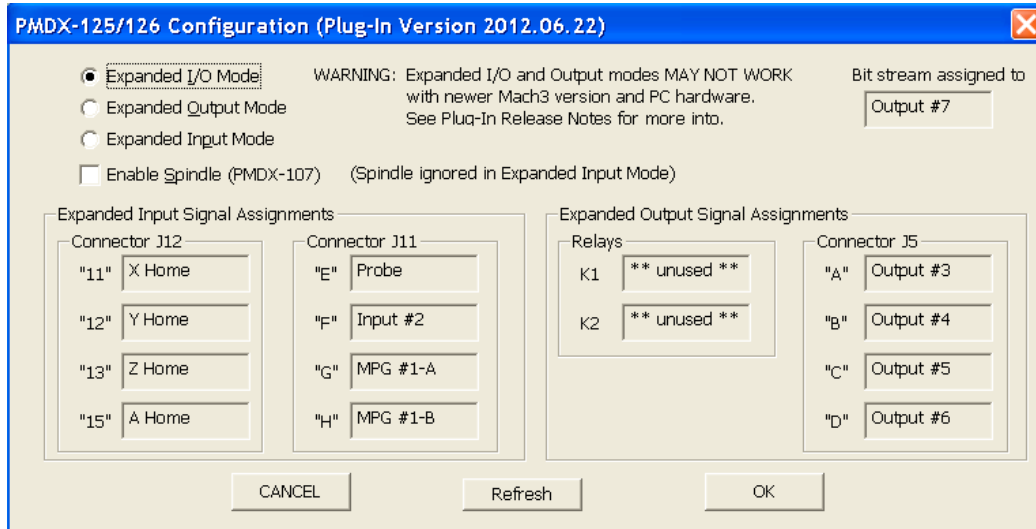
Select the desired operating mode. ***This must match the DIP Switch settings you made in the "Configure the PMDX-125" step as outlined in section 5.0.***

If you select either ***Expanded I/O*** or ***Expanded Output*** modes and you are using a PMDX-107 Isolated Speed Control, you must check the "Enable Spindle" box. If you are not using a PMDX-107, then you should leave this box un-checked. When ***Expanded Input*** mode is selected, this box is grayed out and the plug-in ignores the setting.

Click on OK to activate the configuration and close the ***PMDX-125 Configuration*** dialog box. Or click CANCEL to ignore any changes you made.

## 9.0 Verify Mach3 Settings in Plug-In Dialog

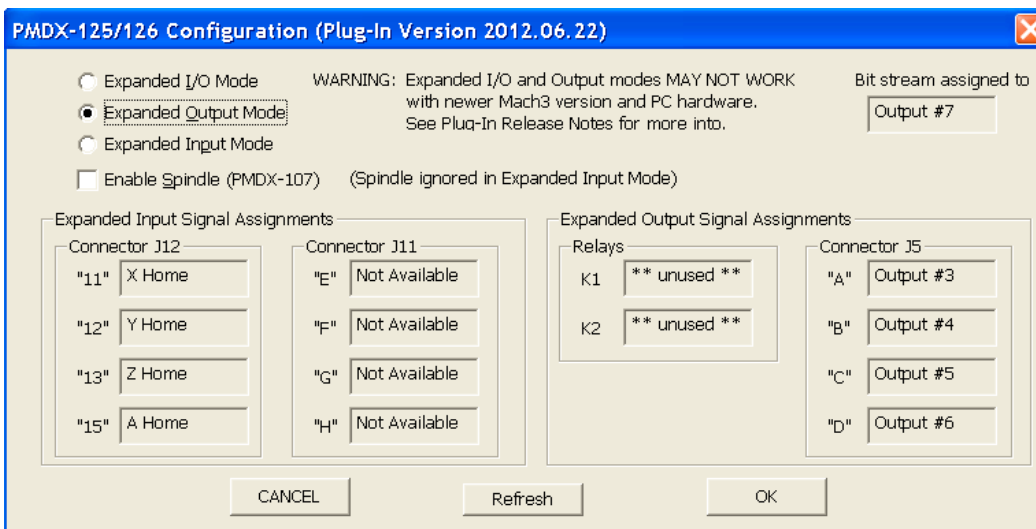
Any time you change any of the input or output pin settings in Mach3, you can open the PMDX-125 Configuration dialog to verify that the PMDX-125 is using the signals that you intend it to use. Go to the *Config->Config Plugins* dialog box. Click on the "CONFIG" box next to the PMDX-125 plug-in to display the PMDX-125 configuration dialog box.



This dialog shows all of the Mach3 input and output signals that are assigned to the PMDX-125's input and output signals. Verify that the information shown matches your desired configuration as set in the *Configure Mach3* step as outlined in section 7.0.

If a signal is marked as "\*\*\* unused \*\*" that means that the plug-in was unable to find an input or output that is assigned to the corresponding pseudo port and pin. The corresponding output on the PMDX-125 will remain at a logic low outputs (approx. 0V).

If you have the PMDX-125 plug-in configured for *Expanded Output Mode*, then the dialog box will look something like the following. Note that the signals "E" through "H" under connector J11 are marked as "Not Available". That is because *Expanded Output Mode* does not multiplex the input signals, so those signals not available to the plug-in. They are only available to Mach3 if you use a second parallel port connected to connector J17, in which case they will be parallel port #2 pins 11, 12, 13 and 15, respectively.



**NOTE** – The PMDX-125 Configuration dialog box does not update dynamically. If you change the expanded mode setting, click on “OK” to activate the new setting and close the dialog box. Then re-display the configuration dialog to see the expanded input and output signal assignments as they apply to the new mode setting.

If you have the PMDX-125 plug-in configured for *Expanded Input Mode*, then the dialog box will look something like the following. Note that the signals “A” through “D” under connector J15 are marked as “Not Available”. That is because *Expanded Input Mode* does not support these additional output signals. They are only available to Mach3 if you use a second parallel port connected to connector J17, in which case they will be parallel port #2 pins 1, 14, 16 and 17, respectively. Also note that relays K1 and K2 are marked as “DIPSW & JPxx”. This means that the function of the relays is determined by the settings of some of the DIP switches and the given jumper. Please refer to section 5.0 and the PMDX-125 User’s Manual for more information on the relay settings.

**PMDX-125/126 Configuration (Plug-In Version 2012.06.22)**

Expanded I/O Mode      WARNING: Expanded I/O and Output modes MAY NOT WORK with newer Mach3 version and PC hardware. See Plug-In Release Notes for more info.      Bit stream assigned to **\*\* unused \*\***

Expanded Output Mode

**Expanded Input Mode**

Enable Spindle (PMDX-107)      (Spindle ignored in Expanded Input Mode)

Expanded Input Signal Assignments		Expanded Output Signal Assignments	
Connector J12	Connector J11	Relays	Connector J5
"11" X Home	"E" Probe	K1 DIPSW & JP1	"A" Not Available
"12" Y Home	"F" Input #2	K2 DIPSW & JP2	"B" Not Available
"13" Z Home	"G" MPG #1-A		"C" Not Available
"15" A Home	"H" MPG #1-B		"D" Not Available

CANCEL      Refresh      OK