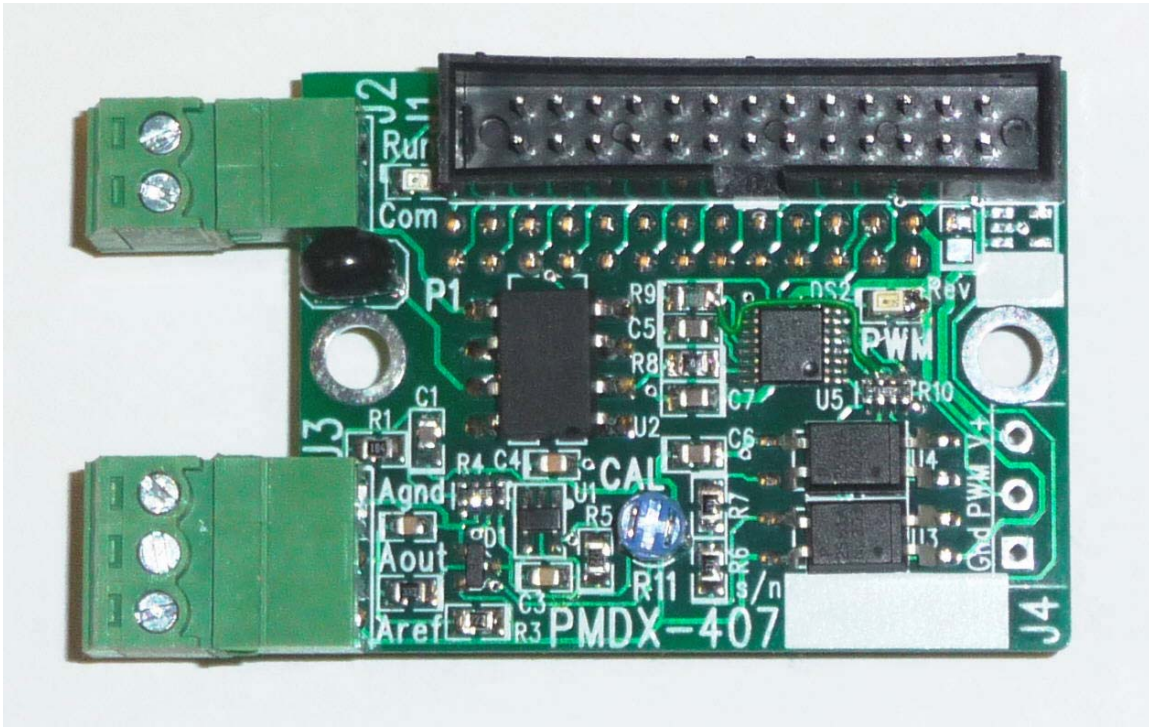# PMDX-407
Isolated Basic Speed Control
for use with SmartBOB-USB

Quick Start Guide

Document Revision: 0.2

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This document applies to units built on artwork revision PCB-520A.

This is a rough draft and users are cautioned that there may be errors in this document!! If you discover errors in this document, please report them to us.

1.0 Overview

The PMDX-407 is an accessory board for use with the PMDX-410 and PDMX-422 SmartBOB-USB boards. For additional support, please see our web forum:

http://www.pmdx.com/PMDX-Forums/

1.1 Updates to This Manual and Application Notes

Please see the PMDX web site for updates to this manual:

http://www.pmdx.com/PMDX-407

1.2 Installing the PMDX-407 on your SmartBOB-USB

The PMDX-407 mounts directly on top of the PMDX-410 or PMDX-422 board. The connector on the underside of the PMDX-407 plugs into J2 on the SmartBOB-USB. Alignment is important as it is mechanically possible to plug it in with the pins shifted or with the board reversed.

Correct alignment can be confirmed by verifying that the mounting holes on the PMDX-407 are directly above the corresponding holes in the SmartB)B-USB.

1.3 Powering the PMDX-407

The standard PMDX-407 is powered directly by the board onto which it is installed. The PMDX-407-S Stand Alone Version has J4 populated and +5 to +12 VDC should be provided there.

2.0 Jumpers

JP1 on the PMDX-422 or PMDX-410 must be set to the ON position to power the PMDX-407.

There are no jumpers to configure on the PMDX-407. All configuration is done with the Config-Plugin screen in Mach4.

3.0 LEDs

- **<u>Run</u>**
Located next to the J2 terminal strip. This LED illuminates when the PMDX-407 is commanding the spindle to run.

- **<u>PWM</u>**
Located next to the silkscreen label "PWM". This LED illuminates when the spindle is running. Brightness of this LED is proportional to the requested speed. The LED will be at maximum brightness at full spindle speed. At very low speeds the LED may be so dim as to appear to be off.

4.0 Connectors

4.1 Connector to SmartBOB-USB (P1)

This 26 pin ribbon female socket mates with the 26 pin ribbon header at J2 on the PMDX-410 or PMDX-422. P1 is on the underside of the PMDX-407 board.

4.2 Pass through port (J1)

J1 is a 26 pin ribbon header that provides access to all the signals normally available from J2 of the PMDX-410 or PMDX-422 on which a PMDX-407 is installed. These signals are passed directly from J2 of the SmartBOB-USB to J1 of the PMDX-407 without modification. A typical use of J1 would be to connect a PMDX-134 board to a SmartBOB-USB that has a PMDX-407 installed.

4.3 Run connector (J2)

J2 is a 2 pin pluggable terminal strip. This output is an isolated low current solid state relay that can be used to activate the RUN input of a VFD or can be used to switch power to activate a small contactor such as the PMDX-ContactorMD20-120. This output is not polarity sensitive and can switch up to 120 VAC at 80mA of load current.

Com – Connect to the common or return for the spindle drive command input.

Run – Connect to the Run or Fwd input of the spindle drive command inputs.

The Run output of the PMDX-407 is equivalent to "dry" switch contacts.

If you need direction control, you will need to use a manual switch or use the relay on a PMDX-422 board to accept the Run signal from the PMDX-407 and connect it to the Fwd or Rev input on the spindle drive as needed.

4.4 Analog speed control output (J3)

J3 is a 3 pin pluggable terminal strip. It provides an isolated analog speed control voltage output. Power for the analog section is taken from the Aref terminal. Normally the VFD or DC spindle drive will provide a reference voltage intended to operate an external potentiometer. If you have a spindle drive that does not provide a reference voltage, you will need to provide an isolated external power source for the Aref terminal of J3.

Aref – Connect to the Reference voltage output from the spindle drive. This is most often +10 VDC output from the spindle drive, but other voltages between +5 VDC and +15 VDC may be used. If your spindle drive does not provide a reference voltage you must supply one from an isolated external supply. Connect the positive output of the supply to the Aref terminal and connect the negative output of the supply to the Agnd terminal of the PMDX-407.

Aout – Connect to the analog speed control input of the spindle drive. The voltage presented by the PMDX-407 will vary from almost 0 to almost the reference voltage supplied on Aref.

Agnd – Connect to the analog ground input of the spindle drive.

4.5   Connector for Stand Alone Version (J4)

J4 is the power and input signal interface for the PMDX-407-S stand alone version. You must supply power between +5 VDC and +12 VDC to operate the control circuits of the PMDX-407. The only control signal required is a PWM signal that varies in duty cycle to control the spindle interface. A signal whose PWM signal is mostly On or Active high will result in maximum speed. A signal whose PWM signal is mostly Off will result in minimal speed. The recommended PWM frequency is 100 HZ. When the PWM signal is completely off the spindle will be turned off.

      Gnd – Logic and power ground input

      PWM – Duty cycle modulated speed control input and on/off control. Absence of PWM pulses will stop the spindle. PWM is an Active High input.

      V+   - Power source for control circuits of the PMDX-407. This supply must be between +5 VDC and +12 VDC for proper operation.

5.0   Configuring the Mach4 plug-in for use with the PMDX-407

5.1   Initial Mach4 Configuration

All configuration for the PMDX-407 is done with the Mach4 plug-in configuration process for the PMDX-SmartBOB-USB boards. You should have your SmartBOB-USB connected and configured before you attempt to install the PMDX-407.

5.2   Configuring the PMDX-407 in the plugin

- Start Mach4Hobby with the SmartBOB-USB and PMDX-407 connected.
- From the top menu bar, select >Configure >Plugins
- Find the PMDX-SmartBOB-USB and make sure it is enabled, and select its Configure button
- In the PMDX plugin dialog, select the Feature tab at the top
- Select the PMDX-407 under PWM spindle control
- Set the minimum spindle speed as a percentage of maximum. Most spindles will have a speed below which they have insufficient torque to be usable (risking tool breakage because the tool stops turning) and below which the motor's internal fan will not keep the motor cooled properly.
- If you do not have a spindle speed sensor, you will likely find it handy to enable the "Report calculated spindle speed to Mach4 as actual spindle speed" so that the on-screen readout (if provided) indicates approximate spindle speed.
- Click "OK" at the bottom of the two dialog boxes to close them.

6.0   Calibration of the analog output voltage

The full scale output voltage for maximum RPM can be adjusted using the small blue potentiometer (R11) labeled CAL on the board. Use Mach4 to request the maximum speed and adjust the potentiometer for the target voltage using a meter, or adjust for the target speed using the display on the spindle drive or the actual speed feedback in Mach4 if spindle feedback is available. Approach the target speed from a lower speed and turn the potentiometer clockwise until the target speed is reached or no further speed increase is available. Do not adjust further clockwise as this will affect calibration at lower speeds.