

# Delta Tau® PMAC2™ with Copley Xenus PWM, Analog, or Stepper command mode



## Features

- PMAC2™ in PCI (4 to 32 Axis) and PC104 (4 to 8 Axis).
- 1-wire PWM or 2-wire +/-10V command for velocity or current mode.
- Alternative Step and Direction command in position mode
- Sinusoidal Commutation with Space Vector Modulation.
- High current loop bandwidths to 3K Hz for demanding control architectures.
- 20 Mega counts/second encoder frequencies.

**Motors** DC-Brush, DC-Brushless (Trapezoidal), or AC-Brushless (Sinusoidal)

**Amplifiers** AC powered Xenus™,

See also DC powered Accelus™, and AccelNet™ (PWM only)

See also PMAC2™ Dual analog command for use with 7xx5ACF in precision nanometer applications.

## **PMAC2™ Controllers**

### **PMAC2-PCI**

This board could be used installed in a PCI bus host computer or used as a stand-alone motion controller. The base version without options provides 4 axes (with PWM command, +/-10V command, or Step and direction) when combined with the appropriate accessory ACC-8x it provides up to 8 axes (PWM command ACC-8S, +/-10V command ACC-8E, or Step and direction ACC-8S)

### **Turbo PMAC2-PCI**

This board can be used installed in a PCI bus host computer or used as a stand-alone motion controller.

The base Turbo PMAC2-PC board can control up to 8 axes (with PWM command, +/-10V command, or Step and direction) the necessary channels to control up to 32 axes are provided by optional ACC-24P2 boards.

### **PMAC2A-PC/104**

This board can be used as a stand-alone motion controller or commanded by a host computer with its RS-232 serial port or the optional PC/104 bus interface, USB or Ethernet communication methods The base version without options provides 4 axes (with PWM command, +/-10V command, or Step and direction) When combined with the ACC-1P: it provides up to 8 axes (PWM command, +/-10V command, or Step and direction)

## PWM Application Note

Copley does manufacture the 7xx9AC, a direct H-Bridge amplifier for use with PMAC2 direct H-Bridge control. However, due to the low current loop bandwidth produced by the PMAC2 (typically 300Hz), Copley does not recommend the use of Direct H-Bridge control in most applications. Copley does recommend the use of the PMAC2 for PWM command with Copley Digital amplifiers for high current loop bandwidths (typically 3k Hz).

Note provided by Delta Tau:

On a PMAC2, I900 sets the PWM frequency for Channels 1-4 (these are the channels on the main PMAC2A-PC/104 board); and I906 sets the PWM frequency for Channels 5-8 (these are the channels on the ACC-1P Axis 5-8 board for the PMAC2A-PC/104). Using the default value of 6527 creates a PWM frequency of 4.5kHz and provides 13+ bits of resolution. On a Turbo PMAC2, the comparable variable is I7m00 for each Servo IC m (m= 0 - 9).

On a PMAC2, I904 sets the PWM deadtime for Channels 1-4 and I908 sets the PWM deadtime for Channels 5-8. In this mode of operation, these variables should be set to 0 (not the default), because no deadtime is required. On a Turbo PMAC2, the comparable variable is I7m04 for each Servo IC m.

On a PMAC2, I9n6 sets the output mode for Channel n (n = 1-8). Setting I9n6 to the default value of 0 specifies PWM outputs for Channel n. On a Turbo PMAC2, the comparable variable is I7mn6 for Servo IC m Channel n.

On the main PMAC2A-PC/104 board, The DIR\_n output will now serve as PWMnTOP.  
Example: On the PMAC2A-PC/104 J4(JMACH2):Machine Port 15pin "DIR\_1+" is now "PWM\_1TOP")

On most PMAC2 and Turbo PMAC2 systems, the "C" sub-channel for each Channel n is the easiest place to access a single-phase PWM signal. This signal is available on simple and inexpensive stepper-interface connectors and breakout boards. On these, the signal of interest is usually labeled as DIRn, for the sub-channel's alternate format of pulse-and-direction output. With I9n6 [I7mn6] set to 0, this signal will serve as PWMnTOP. (The PULSEn line will serve as PWMnBOT, which with zero deadtime will be the exact mirror of the top signal.)

With a command value of zero written to the register that drives this signal, PWMnTOP will have 50% duty cycle.

With a command value equal to +I900 [I7m00] written to this register, PWMnTOP will have 100% duty cycle.

With a command value equal to -I900 [-I7m00] written to this register, PWMnTOP will have 0% duty cycle.

Variable Ix02 for Motor x specifies the address of the register to which Motor x writes its servo-loop output. Typically the "x" motor number is the same as the "n" channel number, but this does not necessarily have to be the case. The default value of Ix02 writes to the "A" sub-channel command register of Channel n (n=x). To write to the "C" sub-channel command register, simply add 2 to the default value (e.g. for Channel 1-C, use address \$C004 instead of \$C002). In the Ix02 description in the manual, these are the same addresses as for stepper pulse output.

Variable Ix69 for Motor x specifies the maximum numerical output from the servo loop. To use the full range of PWM duty cycle, this should be set equal to the value of I900 or I906 [I7m00 for a Turbo].

# Xenus Wiring

