



# DELTA TAU

APPLICATION NOTE

IMTS 2014  
BOOTH E-5145

## New Motion Controller Boosts Machining Speed and Accuracy



Looking to improve machining speed, accuracy and surface finish? You may want to take a close look at your motion controllers. On modern machine tools with well-designed mechanical systems, a weak or outdated controller often limits machine performance. A state-of-the-art controller, by contrast, will have the computational muscle and the advanced control algorithms needed to maximize the machine's capabilities.

The Power PMAC™ from Delta Tau takes state-of-the-art to a new level. With a souped up CPU and a huge 2GB program buffer, this next-generation controller has greatly improved computational power and generates trajectories which run 25% faster than the company's previous controllers—which were already among the fastest available. This speed increase translates directly into cycle time reductions and throughput improvements.

Even at high speeds, the Power PMAC offers significantly improved path accuracy as well as smoothness for high surface quality. Compared to previous models, the Power PMAC cuts path errors by 50% and boosts trajectory resolution by a factor of ten.

Taking full advantage of all the computational power, the Power PMAC offers a wide range of advanced control functions. Among them are:

**A special lookahead function.** This new control function algorithmically evaluates trajectories in advance of their execution. This optimized trajectory maximizes speed, acceleration and smoothness—all the while ensuring that no acceleration or velocity limits are violated on any axis. This trajectory planning happens automatically without input from the user while the program runs.

Setting up the lookahead function is also easy. The user only needs to specify a maximum process feed rate value, and the lookahead function will regulate all velocities.

**Path fidelity parameters.** Power PMAC also ups the ante on the number of control parameters aimed at maintaining path fidelity. These include control of the trajectory data resolution down to 10's of  $\mu\text{sec}$ , independent control of coordinate system acceleration-deceleration times and an axis-by-axis control of maximum motor acceleration.

**Enhanced servo tuning.** The Power PMAC incorporates a variety of new tuning algorithms to enable higher servo gains, which contributes to improved path accuracy. All the tuning algorithms have been designed with ease-of-implementation in mind. For example, a new position-velocity loop setup utility lets users create sophisticated position and velocity loop filters—including single, double and low pass filters of various orders. The utility also makes it simple to set up velocity loop filters independently of the position loop. Power PMAC's other tuning features include a trajectory pre-filter utility that removes the effects of low frequency resonances and an adaptive control function that allows users to quickly dial in a desired servo stiffness.

**Application-specific parameters.** Power PMAC addresses a variety of machining applications that are especially sensitive to motion control capabilities. These applications include 3D contour machining, micromachining and engraving as well as waterjet, plasma and laser machining. To support these applications, the controller has a wide range of specialized control parameters. Examples are blended move corner acceleration limit, a corner angle break point setting and a corner radius setting. Power PMAC also offers an automatic linear to PVT conversion, which provides a superior path when many points are spaced closely together on a contour.

**Electronic cam.** In conjunction with Cam-Sculptor software, Power PMAC supports table-based *electronic cams*. The controller can develop customized cyclic optimal trajectories for one motor as a function of a second motor's position. It also auto-calculates the necessary torque offset values and allows digital outputs to be specified at different cam-generated zones.

To download a Power PMAC white paper and full technical specifications, visit [www.deltatau.com/PowerPMAC](http://www.deltatau.com/PowerPMAC).