Power PMAC Motion Specifications

Number of Axes:
- Supports up to 256 motors simultaneously

Number of Coordinate systems:
- Up to 128 independent coordinate systems

Servo Loop Update Rate:
- 1-axis: up to 60kHz
- 4-axis: up to 40kHz
- 8-axis: up to 20kHz

Encoder Update Rate:
- 10 MHz line rate and 40 MHz count rate for standard A/B Quad with Capture & Compare

Programmed Move Block Execution Rate:
- Up to 10,000 Blocks/sec

Move Modes:
- Blended linear and circular interpolation modes
- Rapid Point-to-point, triggered, alterable
- PVT, Spline and on-the-fly transition between blended and modern spline modes
- Dynamic Lookahead for velocity and acceleration limiting
- True jerk control

Compensation Tables and Methods:
- 10, 20 or 3D Compensation Tables with optional rollover
- 3rd-order interpolation between points every servo cycle
- Supports up to 256 Comp tables
- Torque compensation tables
- Backlash compensation
- Tool radius compensation: 2D & 3D

Servo Features:
- Standard digital PID feedback filter
- Velocity, acceleration, and friction feedforward
- 7th-order polynomial filters
- Gains changeable at any time
- Programmable input, integrator, and output limits
- User-written algorithms in C or MATLAB®/Simulink®

Commutation Features:
- Sinusoidal commutation of AC servo motors
- Vector control of AC induction motors
- Digital current-loop closure with direct PWM output

Motion Program Features:
- Automatic sequenced execution of moves
- Automatic coordination of multiple axes
- Ability to execute G-code programs
- Calculations and VG synchronous to motion
- Axes programmed in user engineering units
- Motion values as constants or expressions

Coordinate Systems and Master/Slave Features:
- User-defined coordinate systems for automatic coordination of axes
- Separate coordinate systems for independent motion of axes
- Multi-axis axis support (e.g. gantries)
- Dynamic axis transformations (e.g. offsets, rotations, mirroring)
- User-written kinematic algorithms for non-Cartesian geometries
- Electronic gearing (no programming required)
- Electronic cams with programmable profiles

Safety Features:
- Hardware and software overtravel limits
- Amplifier enable/fault handshaking
- Following error limits
- Integrated current limit
- Encoder loss detection
- Watchdog timer
- Error-correcting memory

Worldwide Support

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www.motiontech.com.au
**The Delta Tau Difference**

- Epics
- MATLAB
- G-Code programming
- ANSI C Language
- PMAC Script Language

**Power PMAC...the next generation of motion control**

- Dynamic Multi-Block Lookahead
- Forward and Inverse Kinematics
- S-curve Acceleration
- Position Capture and Compare
- Electronic Gearing and Cams
- Multiple Coordinate Systems
- Blended and Splined Moves

**CONTROL EVERYTHING:**

Delta Tau’s Open Architecture Platform provides complete flexibility to choose multiple types of motors, feedback devices, encoders and fieldbuses so you can create a system perfect for your application. Additional axes, feedback, I/O and fieldbus interfacing is obtained by sliding accessory cards into the 3U rack system, available in 3 choices of rack widths (largest 21-slot version pictured on the left).

**Programming Languages**
- PMAC Script Language
- ANSI C Language
- G-Code programming
- MATLAB®/Simulink® compiled code

**Epics**

**Feedback**
- Quadrature Encoder
- Sin/Cos Encoder
- Absolute Encoder
- Resolver

**Serial Encoders:**
-SSI, EnDat
- 2.1/22, Hiperface
-Nikon D, Mitutoyo, Tamagawa
-Sigma iMV/iV, Biss/V/C

**Motors**
- Brush DC
- Brushless AC/DC
- AC Induction
- Stepper
- Pico
- Hydraulic
- Galvanometer
- Voice Coil

**Industrial Fieldbuses**
- MACRO (Master/Slave)
- EtherCAT (Master/Slave)
- EtherCAT IP Adapter (Server)
- DeviceNet (Master/Slave)
- PROFINET (Master/Slave)
- CANopen (Master/Slave)
- CC-Link (Slave)
- Modbus (Client/Server)

**Power PMAC CPU Capabilities**
- Up to 1.2 GHz Single/Dual Core
- Full real-time Operating System
- Full file management system (programs, data, files, etc.)
- Dedicated controller runs in the RT Linux environment
- Full 32/64-bit architecture
- Hardware 64-bit double precision floating point math
- Support for large memory
- High performance MOSFET-based drives capable of controlling 3-phase AC/DC brushless rotary/linear servo, 2-phase stepper, and DC brush motors.

**Power Brick Family**

- Power Brick AC - The Power PMAC is combined with high power (240 VAC nominal mains) modern IGBT drives capable of controlling 3-phase AC/DC brushless rotary/linear servo, AC induction, and DC brush motors.
- Power Brick LV - A lower power version of the AC model (60 VDC nominal mains) with high performance MOSFET-based drives capable of controlling 3-phase AC/DC brushless rotary/linear servo, 2-phase stepper, and DC brush motors.
- Power Brick Controller - A version without amplifiers, instead providing analog +/-10V control (18-bit true DAC or 12-bit filtered PWM) and/or direct-PWM servo drive control.

**Power PMAC EtherLite**

- A Standalone Controller that can output both MACRO and EtherCAT and most industrial networks simultaneously.

**Power Clipper**

- A software based Power PMAC Kernel, capable of running on any x86 CPU with Windows or Linux RTOS

**Soft Power PMAC**

- A lower power version of the AC model (60 VDC nominal mains) with high performance MOSFET-based drives capable of controlling 3-phase AC/DC brushless rotary/linear servo, 2-phase stepper, and DC brush motors.

**Multiple Types of Communication Simultaneously**

**Power PMAC Family**

- Power UMAC
  - Power UMAC 465 CPU
    - Single/Dual Core
    - Multiple Speeds
    - Linux RTOS with optional Video output
  - Power Compact UMAC CPU
    - Linux RTOS
    - Custom Designs

**Power Brick Family**

- Power Brick AC
- Power Brick LV
- Power Brick Controller

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**Multiple Types of Communication Simultaneously**

- 1Gb-Ethernet
- 2nd Ethernet (host port, or Ethernet® and Modbus Communications)
- USB port for mass storage
- SD card for additional storage
- RS232 Serial Communications

**Power Brick EtherLite**

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The Power PMAC...the next generation of motion control

The Power UMAC: a motion computer with the latest hardware and software technology, providing the most high-performance, flexible machine controller in the world. The Power PMAC is a general-purpose embedded computer. It runs under a hard real-time Linux OS with a sophisticated motion and machine control application built in. With the capability for a full operator interface, the Power PMAC eliminates the need for a separate PC. Users can also program in the easy-to-use Script language or the standard C language, leveraging its sophistication and flexibility.

Dynamic Multi-Block Lookahead
- Evaluates planned trajectory against motor limits
- Slows just enough to stay within position, velocity, acceleration limits
- Executes fastest possible traversal within machine constraints

Forward and Inverse Kinematics
- Simplifies programming for non-Cartesian mechanisms
- User routines convert between tool tip and actuator mechanisms
- Permits direct specification of tool tip path

S-curve Acceleration
- Automatically limits rate of change of acceleration (jerk)
- Specified by jerk magnitude or S-curve time
- Provides smooth profiles with reduced high-frequency content

Position Capture and Compare
- • Position Capture and Compare
- • Forward and Inverse Kinematics
- • Electronic Gearing and Cams
- • Electronic Gearing and Cams
- • Multiple Coordinate Systems
- • Multiple Coordinate Systems
- • Blended and Splined Moves
- • Blended and Splined Moves

Gantry Control with Skew Correction
- • Multiple motors automatically slave commanded trajectory
- • Automatic removal of power-on skew in homing search sequence
- • Optional cross-coupling servo correction

Electronic Gearing and Cams
- • Powerful master/slave techniques
- • Position following (laying) requires no program for motion
- • External time base (cam) keeps full trajectory flexibility

Multiple Coordinate Systems
- • Axes acting together should be in same Coordinate System
- • Axes acting independently should be in separate Coordinate Systems
- • Separate Coordinate Systems act as independent machines

Blended and Splined Moves
- • Automatic on-the-fly transition for multiple programmed moves
- • Controlled, specified, acceleration of transitions
- • For single-axis profiles or multi-axis paths

CONTROL EVERYTHING:
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Feedback
- Quadrature Encoder
- Sin/Cos Encoder
- Absolute Encoder
- Resolver
- NI-ET’s Serial Encoders: SSI, EnDat 2.1/2.2, Hiperface
- Nikon-D, Mitutoyo, Tamagawa
- Sigma HMI/IV, Biss-IV/C
- 32K/4K/A4NIA

Motors
- Brush DC
- Brushless AC/DC
- AC Induction
- Stepper
- Pico
- Hydraulic
- Galvameter
- Voice Coil

Industrial Fieldbuses
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Power PMAC Family

Power UMAC
- Power UMAC 465 CPU
- Single/Dual Core, Multiple Speeds, Linux RTOS with optional Video output

Power Compact UMAC
- Linux RTOS
- Custom Designs

Power PMAC CPU Capabilities
- • Up to 1.2 GHz Single/Dual Core
- • Full real-time Operating System (Linux OS w/ real-time kernel)
- • Full file management system (programs, data, files, etc.)
- • Dedicated controller runs in the RT Linux environment
- • Full 32/64-bit architecture
- • Hardware 64-bit double precision floating point math
- • Support for large memory - 1GB or 2GB DOWN active memory with error correction - 64MB NOR flash for Kernel and Bootloader - 512MB or 1/4/8 GB built-in NAND flash for user project (built-in)
- • Interface for SD Card (SDHC, 33GB support)
- • Interface for USB 2.0 Devices (Hard drive, USB Stick, Keyboard, Mouse, etc.)
- • 2 ethernet 1Gbps ports
- • Built-in USB2.0 Interface
- • Optional 4x PCI Express (PCIe) port
- • Optional Direct Video Interface (DVI Output)
- • DVI output, 2 extra USB ports

Power Brick Family
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The Delta Tau Difference

- Epics
- MATLAB
- ANSI C Language
- Separate PC.
- Users can also program in the easy-to-use Script language or the standard C language, leveraging its sophistication and flexibility.
- Sophisticated motion and machine control application built in. With the capability for a full operator interface, the Power PMAC eliminates the need for a separate PC.

Software PMAC
- A software-based Power PMAC Kernel, capable of running on any x86 CPU with Windows or Linux RTOS

Power PMAC EtherLite
- A Standalone Controller that can output both MACRO and EtherCAT and most industrial networks simultaneously.

Power Clipper
- Utilizing a cost-effective Linux based CPU, the Power Clipper will give you all the software and motion features from the Power PMAC within a low-cost, embedded solution.

 Silicon Controls
- Custom Designs
- Linux RTOS
- Power Compact UMAC CPU
- DVI output, 2 extra USB ports
- Optional Direct Video Interface
- Optional 4x PCI Express (PCIe) port
- Built-in USB2.0 Interface
- 2 ethernet 1Gbps ports
- SD card for additional storage
- Single-port
- Master
- 10/100 Ethernet
- RS232 Serial Communications
- USB (for mass storage)
- Communications
- Ethernet® and/or Modbus
- 2nd Ethernet (host port, or EtherCAT and/or Modbus Communications
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• 3rd-order interpolation between points every servo cycle
• Supports up to 256 Comp tables
• Torque compensation tables
• Backlash compensation
• Tool radius compensation: 2D & 3D

Number of I/O:
• Supports up to 8,000 points

Servo Features:
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