Power Brick Controller Connector Layout

8-Axis Model Shown

- Connectors #1 to 4
  - Fieldbus Diagnostics
  - Fieldbus
  - Analog I/O
  - DAC-Sine Output/Direct PWM
  - AMP1
  - AMP2
  - AMP3
  - AMP4
  - AMP5
  - AMP6
  - AMP7 & 8
  - Relays

- Connectors #5 to 8
  - PFM Output

- GP IO
  - Limits & Flags

- SD Card
  - USB
  - Ethernet
  - Watchdog & Abort
  - Fieldbus Diagnostics
  - Fieldbus #5 to 6
  - PFM Output

- DAC-Sine Output/Direct PWM
  - AMP1
  - AMP2
  - AMP3
  - AMP4
  - AMP5
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- DAC-Sine Output/Direct PWM
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- DAC-Sine Output/Direct PWM
  - AMP2
Power Brick Controller

New Ideas in Motion . . .

The Delta Tau Difference

About the Power PMAC

The power and flexibility of the Power PMAC allows the integration of the Power PMAC EtherLite in virtually any kind of industrial motion control application.

Motor Servo Control

- Extremely fast update rates (Phase and Servo)
- Standard PD with full feed-forward model
- Powerful automatic tuning and analyzer tools
- Analog, Pulse Width Modulated (PWM), Pulse-Frequency Modulated (PFM), MACRO or EtherCAT Outputs
- Vibration suppression filters
- Multiple 7th order notch and low pass filters
- Adaptive control for varying loads
- Cascaded loops (force, height, camera auto-focus control)
- Support for custom-written commutation routines
- Support for custom-written servo routines
- Custom routines directly in C or from MATLAB®/Simulink®

Programmable Logic Control (PLCs)

- Access to all registers
- Trigonometric, transcendental, vector and matrix functions
- 64-bit floating-point architecture optimized math
- Executive functions for standalone operation
- Data gathering of up to 128 hardware/software registers per servo cycle
- Program in PMAC Script
- Program in ANSI C:
  - Real time with preemptive kernel routines
  - General purpose routines
  - MATLAB®/Simulink® Embedded Coder®-generated code

Compensation Tables

- Position/torque compensation tables in 1D, 2D, or 3D
- with rollover and mirroring options
- 1/3rd order interpolation between points every servo cycle
- Up to 256 compensation tables (64k each)
- Support for superimposed compensation table results
- Backlash compensation, fixed or in tables

Hardware Position Capture and Compare

- Specialized count/cycle timing encoder counts to digital I/O
- JO on exact count (w/sub-count interpolation) at any speed (within 10 nanoseconds)
- For probing, registration, measurement trigger, laser firing

Gantry Control

- Follower motor(s) executes leader’s trajectory
- Automatic skew removal on homing
- Automatic gantry cross-coupling servo correction

Electronic Gearing and Cams

- Powerful master/servo techniques
- Position following (gearing) requires no program for motion
- External time base (can) keeps full trajectory flexibility (non-retuming, limited reversal, e.g. moving web application)
- Up to 256 cam tables (16k points each)
  - Position/torque profiles
  - Returning, forward/reverse travel
  - Extremely precise synchronized outputs

Power Brick Controller

The Power Brick Controller is a packaged, scalable, Machine and Motion Controller combining the brain of the cutting edge Power PMAC processor and the unsurpassed custom-designed Digital Signal Processor Gate3 ASIC in one compact 4 or 8-axis package.

Additional axes are available via MACRO (high speed fiber optic network) and/or EtherCAT for a possible total of 104 (8 + 32 MACRO + 64 EtherCat) axes of centralized and coordinated motion control.

Output Control

The Power Brick Controller provides servo loop closure (position or torque) outputs, and current loop closure (PWM option):
- Analog +/-10V 13.5-bit Filtered PWM
- 16-Bit True DAC (optional)
- Pulse and Direction
- Sine Wave
- Direct digital PWM

Encoder Support

The Power Brick Controller can interface with one or a combination of the following types of motor feedback devices:
- Quadrature
- Sinusoidal ±16K/64
- Resolver
- Halls (60°/120°)
- Kawasaki
- Analog +/-10VDC
- LVDT / MLDT
- Mitsubishi
- Panasonic
- Yaskawa
- Nikon D
- BISS-B/C
- EnDat 2.1/2.2
- Siemens
- Tamagawa
- SSI
- HiperFace

GP Digital Inputs/Outputs - Relays

The Power Brick Controller can be equipped with:
- 9 x general purpouse relays
- 32 x digital inputs
- 16 x general purpose relays
- 16 x digital inputs 12-24VDC, 500 mA

All protected and optically isolated. Can be either sinking or sourcing. Thousands of additional digital inputs and outputs can be added via various fieldbus options.

GP Analog Inputs/Outputs - PFM

The Power Brick Controller can carry up to:
- 8 x Pulse and Direction / PFM outputs
- 8 x 16-bit analog inputs (+/-10V)
- 8 x 14-bit analog outputs (+/-10A)

Fieldbus Connectivity

- CANopen (Master/Slave)
- EtherCAT (Master)
- DeviceNet (Master/Slave)
- PROFIBUS DP (Master/Slave)
- GATopen (Master/Slave)
- Open Modbus (Master/Slave)
- CC-Link (Slave)
- PROPNET-ID (RT Controller/Device)

Saftey & Other Features

- Abort input for safe stop
- Watchdog output
- 127 protection
- Dedicated brake relays and power input (24V)
- Plus/Minus over-travel, home, and user inputs
- Software over-travel limits
- Warning/fatal following error limits
- High speed compare outputs
- Video output

8-Axis Power Brick Controller (pictured here)

Power PMAC Unsurpassed Control, Convenient and Compact

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- 127 protection
- Encoder count error and encoder loss detection
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- Plus/Minus over-travel, home, and user inputs
- Software over-travel limits
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- EtherCAT (Master)
- EtherCAT/VP (Scanner/Adapter)
- PROFIBUS-DP (Master/Slave)
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Coordinate Systems / Forward and Inverse Kinematics
- Up to 256 axes of coordinated or independent motion
- Up to 129 independent coordinate systems
- Up to 32 independent axes per coordinate system
- Dynamic axes transformations (e.g. offsets, rotations, mirroring)
- Forward/Inverse kinematics for non-linear mechanisms
- User defined routines convert between tool tip coordinates and actuator positions
- Permits direct specification of tool tip path

Trajectory Generation - Motion Programs
- Auto-coordination of multiple sets of axes
- Linear, circular, rapid, position/torque-speed Velocity (PVT), LIN to PVT
- Supercam modes
- Seamless blending between linear, circular and PVT modes
- Automatic mode until trigger (hardware input)
- True S-Curve accel / decel
- All move modes supported with user kinematics
- Dynamic multi-block lookahead with velocity/acceleration control and jerk limit
- Sub-millisecond segmentation time
- Negative feedrate for true motion reversal in lookahead
- Move block execution rate up to 10,000 blocks/sec
- 0-mode, N-mode, and T-mode ready
- Calculations and I/O synchronous to motion
- Tool radius compensation, 3D or 3D

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- I/O on exact count (w/sub-count interpolation) at any speed
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