The Power Clipper is a compact embedded solution for more cost sensitive and OEM applications, but packed with the power of the cutting edge Power PMAC processor and the unsurpassed custom-designed Digital Signal Processor. Galil® ASCII bundled into one compact panel-mount board.

**Output Control**
The Power Clipper provides servo/loop closure (position or torque) outputs:

- **Standard On-Board**
  - Analog +/-15V 13.5 bit Filtered PWM
  - Pulse and Direction

  With Accessory Stack Board
  - 8-16 Bit DAC
  - Sine Wave
  - PWM

**Encoder Support**
The Power Clipper can interface with one or a combination of the following types of motor feedback devices:

- Quadrature
- Halls (±10V/10°)
- Panasonic
- Another +/−10VDC
- LVDT / MLDT
- EnDat 2.1/2.2
- Panasonic
- Yaskawa
- NSK/NSK
- BISS-B/C
- Panasonic
- Yaskawa
- Nikon-D
- BiSS-B/C
- Mitutoyo
- Tamagawa
- SSI
- HiperFace
- Sinusoidal (with ACC-51S)
- Resolver (with ACC-8D Opt7)

**GP Inputs/Outputs**
- 32 general-purpose TTL I/O points, direction selectable by byte:
  - 16-point max port, Delta Tau I/O accessory compatible
  - 16-point “opto” port, Opta-22 style optically isolated modules compatible
- Supports thousands of I/O points
- “Handwheel” port with 2 each:
  - Quadrature encoder inputs
  - Pulse (PWM or PAM) output pairs
- 4 12-bit Analog Inputs and 1 Filtered PWM DAC Output (optional)
- PWM Laser

**Cabled Accessories**
- Additional 4-Axes (ACC-24ES) with optional 4 12-Bit Analog Inputs and 1 Filtered PWM DAC Output (ACC-24ES3)
- 4 Channels Dual 16-Bit True DAC (ACC-BES)
- 4 Channel Direct PWM Output (ACC-BFS)
- 2 or 4 Channel 16-bit Encoder Interpolator (ACC-S1S)
- 2 or 4 Channel Resolver (ACC-8B, Opt 7)

**Plug-In Stack Accessories**
- Additional 4-Axes (ACC-24ES) with optional 4 12-Bit Analog Inputs and 1 Filtered PWM DAC Output (ACC-24ES3)
- 4 Channels Dual 16-Bit True DAC (ACC-BES)
- 4 Channel Direct PWM Output (ACC-BFS)
- 2 or 4 Channel 16-bit Encoder Interpolator (ACC-S1S)
- 2 or 4 Channel Resolver (ACC-8B, Opt 7)

**Safety & Other Features**
- Watchdog output
- I2T protection
- Encoder count error and encoder loss detection
- Plus/Minus over-travel, home, and user inputs
- Software over-travel limits
- Warning/fatal following error limits
- High speed compare outputs
- Automatic brake control

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

**Compensation Tables**
- Position/torque compensation tables in 1D, 2D, or 3D
- with rollover and mirroring options
- 1st/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 circuitry tying encoder counts to digital I/O
- I2T on exact count (w/autocount interpolation) at any speed
- (within 10 nanoseconds)
- For probing, registration, measurement trigger, laser firing

**Gantry Control**
- Follows motor(s) executes leader’s trajectory
- Automatic skew removal on homing
- Automatic gantry cross-coupling servo control

**Electronic Gearing and Cams**
- Powerful master/slave techniques
- Position following (gearing) requires no program for motion
- External time base (cami) keeps full trajectory flexibility (non-returning, 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 Clipper**

**About the Power Clipper**
The Power Clipper is a compact embedded solution for more cost sensitive and OEM applications, but packed with the power of the cutting edge Power PMAC processor and the unsurpassed custom-designed Digital Signal Processor Gate3 ASIC bundled into one compact panel-mount board.

**Output Control**
The Power Clipper provides servo loop closure (position or torque) outputs:

- **Standard On-Board**
  - Analog +/-10V 13.5 bit Filtered PWM
  - Pulse and Direction

With Accessory Stack Board:
- 18-Bit True DAC
- Sine Wave
- PWM

**Encoder Support**
The Power Clipper can interface with one or a combination of the following types of motor feedback devices:

- Quadrature
- Halls (60°/120°)
- Analog +/- 10VDC
- LVDT / MLDT
- EnDat 2.1/2.2

**GP Inputs/Outputs**
- 32 general-purpose TTL I/O points, direction selectable by byte:
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  - 16-point "opto" port, Opto-22 style optically isolated modules compatible
- Supports thousands of I/O points
- "Handwheel" port with 2 each:
  - Quadrature encoder inputs
  - Pulse (PWM or PPM) output pairs
- 4/12-bit Analog Inputs and 1 Filtered PWM DAC Output (optional)

**Cabled Accessories**
- Additional 4-Axes (ACC-21ES3) with optional 4 12-Bit Analog Inputs and 1 Filtered PWM DAC Output (ACC-21ES3)
- 4 Channels Dual 18-Bit True DAC (ACC-BES)
- 4 Channel Direct PWM Output (ACC-BFS)
- 2 or 4 Channel 16-bit Encoder Interpolator (ACC-S15)
- 2 or 4 channel Resolver (ACC-IBD, Opt 7)

**Plug-In Stack Accessories**
- Additional 4-Axes (ACC-21ES3) with optional 4 12-Bit Analog Inputs and 1 Filtered PWM DAC Output (ACC-21ES3)
- 4 Channels Dual 18-Bit True DAC (ACC-BES)
- 4 Channel Direct PWM Output (ACC-BFS)
- 2 or 4 Channel 16-bit Encoder Interpolator (ACC-S15)
- 2 or 4 channel Resolver (ACC-IBD, Opt 7)

**Compensation Tables**
- Up to 256 cam tables (16K points each)
- External time base (cam) keeps full trajectory flexibility (non-returning, within 10 nanoseconds)
- Powerful master/slave techniques
- Follower motor(s) executes leader’s trajectory
- Automatic gantry cross-coupling servo correction

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- Specialized circuitry tying encoder counts to digital I/O
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- High speed compare outputs
- Automatic brake control

**Power Clipper**
A powerful and compact embedded solution for cost sensitive applications

**The Delta Tau Difference**

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

**Motor Servo Control**
- Extremely fast update rates (Phase and Servo)
- Standard PID with full feedforward model
- Powerful automatic tuning and analyzer tools
- Analog, Pulse Width Modulated (PWM), Frequency Modulated (PFM), DAC, 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®

**Coordinate Systems / Forward and Inverse Kinematics**
- Up to 256 axes of coordinated or independent motion
- Up to 128 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-velocity-time (PVT), LIN to PVT (curve fit), Spine move modes
- Seamless blending between linear, circular and PVT modes
- Automatic move 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
- G-code, M-code, and T-code ready
- Calculations and VO synchronous to motion
- Tool radius compensation, 2D or 3D

**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 loads
  - General-purpose routines
  - MATLAB®/Simulink® Embedded Code®
- Generated code
Power Clipper Connector Layout

POWER Clipper

POWERFUL AND COMPACT
For Embedded Cost Sensitive Applications

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