Prodigy® Motion Boards

Prodigy® Motion Boards provide high performance board-level motion control for scientific, automation, industrial, and robotic applications. Available in PCI, PC/104, standalone, and machine controller configurations, these boards support multiple motor types including brushless DC, step, and DC brush motors, and are available in 1, 2, 3, and 4-axis configurations. Programmable versions of the board include PMD’s C-Motion Engine that allows user code to run directly on the board, off-loading the system host or enabling stand-alone operation. The Machine controller version has on-board Atlas amplifiers that eliminate the need for external amplifiers along with enhanced analog and digital I/O.

Based on PMD’s industry-leading Magellan® Motion Processor, the Prodigy boards provide user-selectable profile modes including S-curve, trapezoidal, velocity contouring, and electronic gearing with on-the-fly parameter change. Servo loop compensation utilizes a full 32-bit position error, PID with velocity and acceleration feedforward, integration limit and dual biquad filters for sophisticated control of complex loads.

The Pro-Motion GUI makes it easy to set-up and analyze system parameters and motion performance. PMD’s C-Motion and VB-Motion libraries simplify the program development process and allow the use of industry standard C/C++ or Visual Basic programming languages.

**FEATURES**

- Uses PMD’s advanced Magellan® Motion Processor
- PCI, PC/104, Stand-alone, and Machine-controller configurations
- Available in 1, 2, 3, and 4-axis configurations
- Supports brushless DC, step, and DC brush motors
- S-curve, trapezoidal, electronic gearing, and velocity-contouring
- PC/104 (ISA), PCI-bus, Ethernet, CANbus or serial communications
- Advanced PID filter with feedforward and dual biquad filters
- High speed loop rate: 50 μsec/axis
- Up to 256 microsteps per full step resolution
- Incremental quadrature and Absolute SSI encoder support
- Includes Pro-Motion®, C-Motion® and VB-Motion® development software
- 6-step commutation and field oriented control modes
- High precision 16-bit DAC or PWM amplifier output
- General purpose digital I/O and analog I/O
- Two directional limit switches, plus high speed index, and home inputs per axis

**C-MOTION® ENGINE VERSIONS**

- Board-level execution of C-Motion code
- Downloaded user application code runs at 96 MIPs
- C-Motion Engine development tools

**MACHINE CONTROLLER VERSION**

- On-board high performance Atlas® amplifiers
- Extensive fault detection including over & undervoltage, motor short, and overtemp
- Up to 1KW peak output power per axis
- Single voltage supply drives motors and board logic

**CONFIGURATION**

![System Host](#) **Prodigy Board** **Axis 1**

![Motor](#) ![Encoder](#) ![Amp](#)

**Axis 2**

![Motor](#) ![Encoder](#) ![Amp](#)

**Axis 3**

![Motor](#) ![Encoder](#) ![Amp](#)

**Axis 4**

![Motor](#) ![Encoder](#) ![Amp](#)

*System host optional for Prodigy Programmable PC/104 and Stand-Alone boards
**External amps used with non-Machine Controller board
### Technical Overview

#### Configurations
- Standard or CME
- CME

#### Model
- PR82 or PR83
- PR92 or PR93
- PR13
- PR33

#### Number of axes supported
- 1, 2, 3 or 4 axes

#### Supported motor types
- DC Brush
- Brushless DC
- Step motor

#### Servo loop rates
- 51.2 µsec to 1.6 sec. Minimum depends upon number of enabled axes and use of trace

#### Encoder formats supported
- Quadrature
- Absolute SSI

#### Quadrature decode rate
- 8 Mcounts/sec

#### Capability for onboard amplifier
- No

#### Motor output signals
- Analog ±10V, PWM, pulse & direction

#### General purpose digital I/O
- 8 input, 8 output

#### General purpose analog input
- 8 10-bit channels (0 to 3.3V)

#### General purpose analog outputs
- N/A

#### Limit switches
- 2 per axis; one for each direction of travel

#### CME version user program memory
- 256 KB Flash / 8 KB RAM

#### Communication modes
- Standard: PC104 bus, serial, CANbus
- Standard: PCI bus, serial, CANbus
- serial, CANbus, Ethernet

#### On-board amplifier voltage range
- N/A

#### On-board amplifier max current, continuous
- N/A

#### Dimensions
- 4.35” x 3.78” x 0.6” (11.1cm x 9.6cm x 1.5cm)
- 5.8” x 4.20” x 0.58” (14.7cm x 10.7cm x 1.5cm)
Development Tools

1 EASY START-UP
Developers Kit

Includes
• Prodigy Developer’s Kit board
• Pro-Motion CD and User’s Guide
• Development software CD with C-Motion and VB-Motion software
• Complete manual set
• Complete cable & prototyping connector set

2 TUNE & OPTIMIZE
Pro-Motion® GUI

Pro-Motion is a sophisticated, easy-to-use Windows-based exerciser program for use with PMD motion control ICs, modules, and boards.

Features
• Motion oscilloscope graphically displays processor parameters in real-time
• Autotuning
• Ability to save and load settings
• Axis wizard
• Distance and time units conversion
• Motor-specific parameter setup
• Axis shuttle performs programmable motion between two positions
• Communications monitor echoes all commands sent by Pro-Motion to the board
• Advanced Bode analysis for frequency machine response

3 BUILD THE APP
C-Motion®

C-Motion is a complete, easy-to-use, motion programming language that includes a source library containing all the code required for communicating with PMD motion ICs, board, and modules.

C-Motion features include:
• Extensive library of commands for virtually all motion design needs
• Develop embeddable C/C++ applications
• Complete, functional examples
• Supports serial, CAN, Ethernet, and SPI communications

Example C-Motion code for executing a profile and tracing some processor variables

```c
// set the trace buffer wrap mode to a one time trace
SetTraceMode(hAxis1, PMDTraceOneTime);

// set the processor variables that we want to capture
SetTraceVariable(hAxis1, PMDTraceVariable1, PMDAxis1, PMDTraceActualPosition);
SetTraceVariable(hAxis1, PMDTraceVariable2, PMDAxis1, PMDTraceActualVelocity);
SetTraceVariable(hAxis1, PMDTraceVariable3, PMDAxis1, PMDTraceCommandedVelocity);

// set the trace to begin when we issue the next update command
SetTraceStart(hAxis1, PMDTraceConditionNextUpdate);

// set the trace to stop when the MotionComplete event occurs
SetTraceStop(hAxis1, PMDTraceConditionEventStatus,
PMDEventMotionCompleteBit, PMDTraceStateHigh);

SetProfileMode(hAxis1, PMDTrapezoidalProfile);

// set the profile parameters
SetPosition(hAxis1, 200000);
SetVelocity(hAxis1, 0x200000);
SetAcceleration(hAxis1, 0x1000);
SetDeceleration(hAxis1, 0x1000);

// start the motion
Update(hAxis1);
```
<table>
<thead>
<tr>
<th>VELOCITY &amp; TORQUE CONTROL ICs</th>
<th>MAGELLAN* MOTION CONTROL ICs</th>
<th>ATLAS* DIGITAL AMPLIFIERS</th>
<th>PRODIGY* MOTION BOARDS</th>
<th>ION* DIGITAL DRIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Axes</td>
<td>1</td>
<td>1, 2, 3, 4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Format</td>
<td>• 64-pin TQFP</td>
<td>• 144-pin TQFP 100-pin TQFP</td>
<td>• Compact: 20-pin solderable module Ultra Compact: 19-pin solderable module</td>
<td>• PCI  PC/104 Standalone Machine Controller</td>
</tr>
<tr>
<td>Voltage</td>
<td>3.3 V</td>
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<td>12 - 56 V</td>
<td>12 - 56 V / 20 - 195 V</td>
</tr>
<tr>
<td>Features</td>
<td>• Velocity control</td>
<td>• Position control</td>
<td>• Torque/current control Field oriented control Trace buffer</td>
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<tr>
<td>Motor Types</td>
<td>• Brushless DC</td>
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<tr>
<td>Communication</td>
<td>• Standalone</td>
<td>• Parallel</td>
<td>• SPI</td>
<td>• Ethernet RS232/485 CANbus PCI and PC/104 bus</td>
</tr>
<tr>
<td>Loop Rate</td>
<td>20 kHz – current 10 kHz – velocity</td>
<td>50 – 75 usec/axis</td>
<td>20 kHz – current 50 – 150 usec/axis</td>
<td>20 kHz – current 10 kHz – position</td>
</tr>
</tbody>
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**FOR ORDERING PCI, PC/104 OR STANDALONE VERSIONS**

**FOR ORDERING MACHINE CONTROLLER VERSION**

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<th>PMD PRODUCT OVERVIEW</th>
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<td><strong>Atlas digital amplifiers</strong></td>
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<td><strong>Prodigy motion boards</strong></td>
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<td><strong>Ion digital drives</strong></td>
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To place an order or for additional information and questions, contact PMD customer support.

**About Performance Motion Devices**

Performance Motion Devices (PMD) is a worldwide leader in motion control ICs, boards and modules. Dedicated to providing cost-effective, high performance motion systems to OEM customers, PMD utilizes extensive in-house expertise to minimize time-to-market and maximize customer satisfaction.

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