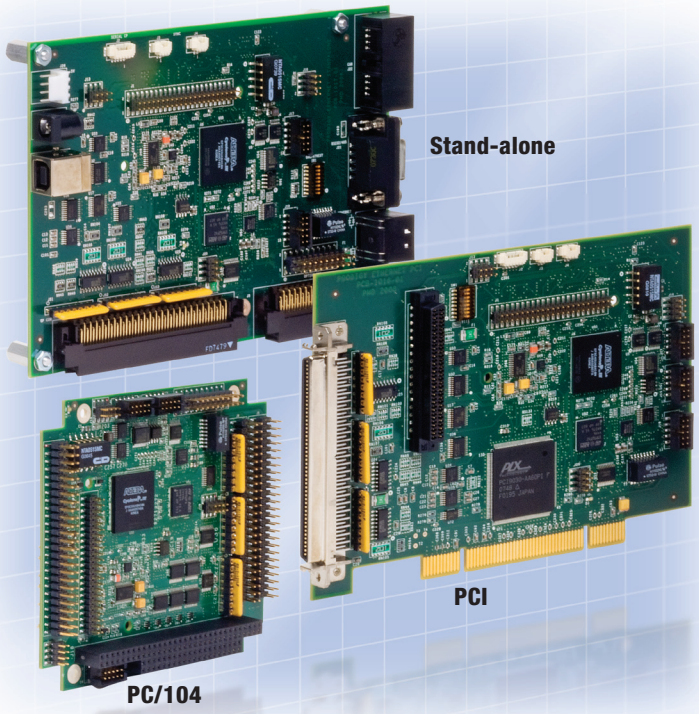
PMD PERFORMANCEMOTIONDEVICES

ProdigyMotionCards



Prodigy® Motion Cards

provide high performance board-level motion control for scientific, automation, industrial, and robotic applications. Available in PCI, PC/104 and stand-alone configurations, these cards support multiple motor types including DC brush, brushless DC, step, and microstepping motors, and are available in 1, 2, 3, and 4-axis configurations. Programmable (Prodigy/CME) versions of the card include PMD's C-Motion Engine that allows user's C-Motion® code to run directly on the card, off-loading the system host or enabling stand-alone operation.

Based on PMD's industry-leading Magellan® Motion Processor, the Prodigy cards provide user-selectable profile modes including S-curve, trapezoidal, velocity contouring, and electronic gearing. The cards accept input parameters such as position, velocity, acceleration, and jerk from the on-board C-Motion Engine or an external host and generate a corresponding trajectory on-the-fly. 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. Pro-Motion also includes tools that support C-Motion code development. 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.

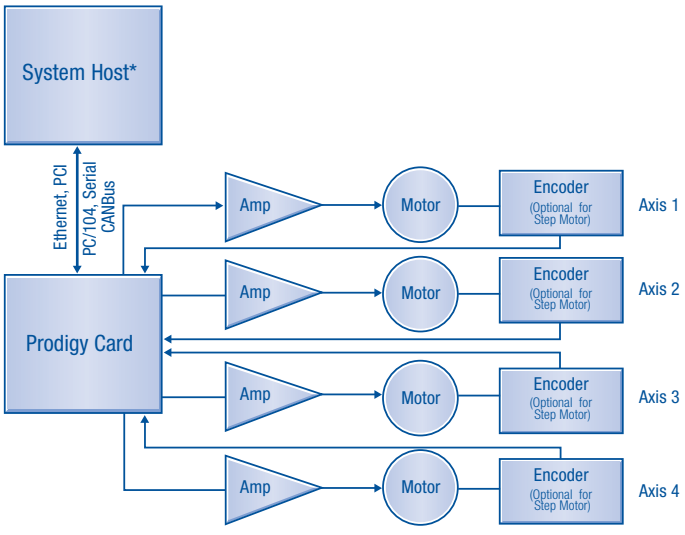
› FEATURES

- Uses PMD's advanced Magellan® Motion Processor
- PCI, PC/104 and Stand-alone configurations
- Available in 1, 2, 3, and 4-axis configurations
- Supports DC brush, brushless DC, step, and microstepping motors
- S-curve, trapezoidal, electronic gearing, and velocity-contouring
- PC/104 (ISA), PCI-bus, Ethernet, CANbus or serial communications
- Independently programmable acceleration and deceleration values
- Profile and servo changes on-the-fly
- Advanced PID filter with feedforward and dual biquad filters
- Watchdog timer
- High speed loop rate: 50 µsec/axis
- Incremental encoder (8 Mcounts/sec) and parallel word encoder (160 Mcounts/sec)
- Includes Pro-Motion®, C-Motion® and VB-Motion® development software
- Dual loop encoder inputs
- Pulse & direction output up to 5 Mpulses/sec
- 6-step (Hall-based) and sinusoidal commutation
- High-speed motion trace for servo tuning diagnostics (up to 64 KB)
- High precision 16-bit DAC or PWM output to amplifier
- Real-time breakpoints (2 per axis)
- General purpose digital I/O and analog inputs
- Two directional limit switches, plus high speed index, and home inputs per axis

C-MOTION® ENGINE FOR PROGRAMMABLE VERSIONS

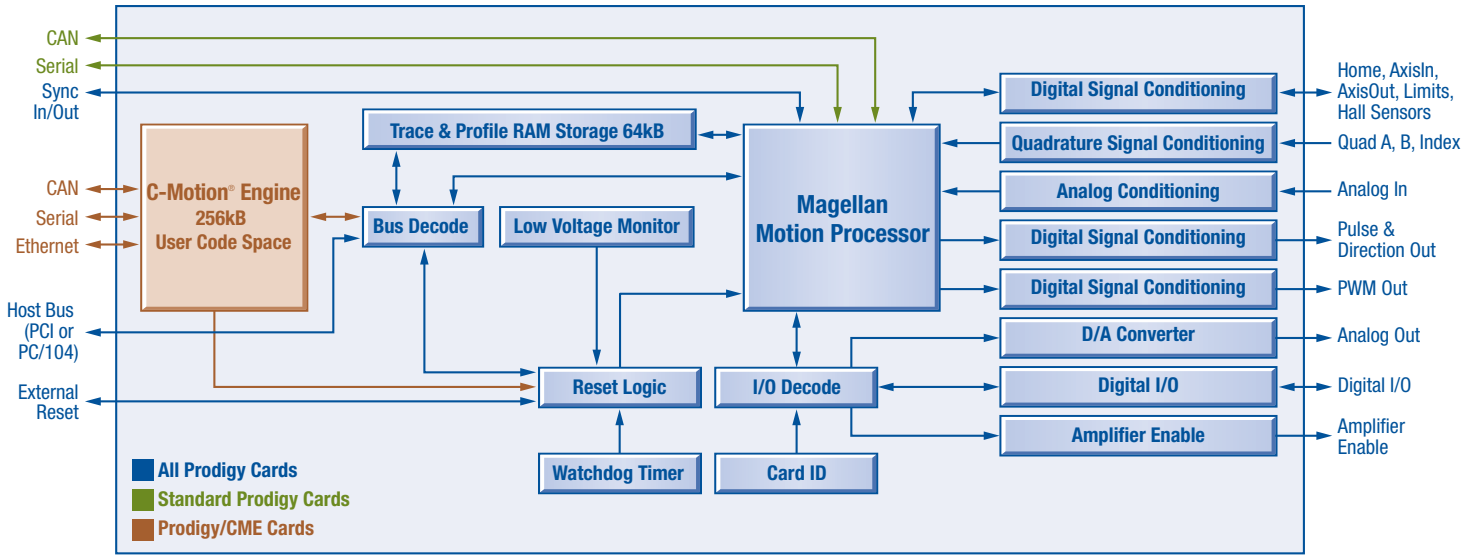
- Board-level execution of C-Motion code
- 256 KB of programmable user code space
- Code execution rate up to 96 MIPS
- C-Motion Engine development tools

› CONFIGURATION



*System host optional for Prodigy Programmable PC/104 and Stand-Alone cards

Technical**Overview**



› SPECIFICATIONS

	Standard (Prodigy)	Programmable (Prodigy/CME)
Configurations	PCI or PC/104	PCI, PC/104 or Stand-alone
Model	PR92, PR82	PR93, PR83, PR13
Number of axes supported	1, 2, 3 or 4 axes	
Supported motor type	DC Brush, Brushless DC, Step Motor, Microstep	
Position range	-2,147,483,648 to +2,147,483,648 counts	
Velocity range	-32,768 to +32,767 counts/cycle with a resolution of 1/65,536 counts/cycle	
Electronic gearing range	-32,768 to +32,767 with a resolution of 1/65,536	
Servo loop rate	**Range:** 51.2 µsec to 1.6 sec Minimum: 51.2 – 76.8 µsec/axis (depends upon number of enabled axes, and use of trace)	
Maximim encoder count rate	8 Mcount per sec	
Motor output modes	Analog ±10V PWM 10-bit @ 20kHz and 8-bit @ 80 kHz Pulse & Direction 5 Mpulses/sec (TTL or Differential)	
General purpose I/Os	8 digital inputs – 8 digital outputs 8 10-bit analog inputs (0-3.3V)	
Limit switches	2 per axis: one for each direction of travel	
Position-capture triggers	2 per axis: index and home signals	
Synchronization I/O	1 µsec maximum deviation ≤ 1 µsec	
User program memory size	N/A	256 KB Flash / 8 KB RAM
DPRAM/external memory support	40 KB of dual-port RAM	64 KB of dual-port RAM
Trace modes	One-time, Continuous Number of trace variables: 27 (up to 4 can be used at the same time)	
Communication modes	16-bit parallel, serial, CANbus	**PCI & PC/104:** 16-bit parallel, Ethernet, serial, CANbus **Stand-alone:** Ethernet, serial, CANbus
Dimensions:	**PCI:** 5.8" L x 4.2" W x 0.575" H **PC/104:** 4.35" L x 3.775" W x 0.6" H	**PCI:** 5.8" L x 4.2" W x 0.575" H **PC/104:** 4.35" L x 3.775" W x 0.6" H **Stand-alone:** 6.3" L x 4.232" W x 0.8" H

Profile modes	
S-curve point-to-point:	Position, velocity, acceleration, deceleration, jerk
Trapezoidal point-to-point:	Position, velocity, acceleration, deceleration
Velocity-contouring:	Velocity, acceleration, deceleration
Electronic gearing:	Encoder trajectory position of one axis used to drive a second axis. Master and slave axes and gear ratio parameters

Filter modes
(not used with pulse & direction version)

Scalable PID with Velocity, Acceleration feedforward, Integration limit, Offset bias, Dual biquad filter, Settable derivative sampling time, Output motor command limiting.

Position error tracking

Motion error window – user defined action upon exceeding programmable window.

Tracking window – allows flag to be set if axis exceeds a programmable position error window.

Communication Options	
Serial	Point-to-Point Multi Drop
Ethernet	TCP UDP

Development Tools & Accessories

C-MOTION® SOFTWARE

C-Motion is a motion control programming library system that provides a convenient set of callable C/C++ programming routines which contain all the code required to communicate with and control PMD motion processors, cards and digital drives.

C-Motion Engine Programming

For the programmable versions of the Prodigy Motion Cards, Pro-Motion includes a download utility that facilitates downloading of C-Motion programs to the C-Motion® Engine on the Prodigy Motion Card via one of the communications links. Also included are a programming editor, compiler, and debugging tool. The editor allows the application specific C/C++ coding to be easily combined with C-Motion source code libraries.

Example C-Motion code for executing a profile and tracing some processor variables
The information captured in this example could be used for tuning the PID filter.

```
// 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);
```

ACCESSORIES AND CABLES

Prodigy Motion Card Documentation Set

Pro-Motion – Windows-based development environment that simplifies Prodigy configuration as well as motor set-up, tuning, testing, and C-Motion Engine development support.

Installation CDs – Includes C-Motion and VB-Motion software libraries and C-Motion Engine development tools.

IM-1000 – Breakout interconnect module that provides convenient jack-screw terminators for the 100-pin cable. Used with Cable-1003, Cable-1006, Cable-2003, or Cable-5003

Cable-1003 (3-ft.) or **Cable-1006 (6-ft.)** – 100 position, shielded round cable with locking connectors to connect the PCI cards to the IM-1000.

Cable-2003 (3-ft.) – 50 position ribbon cable that connects the PC/104 cards to the IM-1000. *Note: 1-3 cables required, depending on application. Contact PMD.*

Cable-5003 (3-ft.) – 100 position ribbon cable to connect the stand-alone card to the IM-1000.

Cable-3003 (3-ft.) – Interface cable used with 68-pin connector on the PCI cards.

Cable-7003 (3-ft.) – 60 position ribbon cable to connect from the Option Connector on the stand-alone card.

Cable-4203 (3-ft.) – RS232 serial cable for communicating to the standard cards. *Note: For serial port communications only.*

Cable-4301-KIT – Cable kit to allow RS232 communication to the programmable PCI & PC/104 cards.

Cable-4355 (5-ft.) – RS232 serial port adapter for communication to stand-alone cards

Cable-4505 (5-ft.) – Ethernet cable for the downloadable PCI & PC/104 cards.

Cable-4555 (5-ft.) – Ethernet cable for the stand-alone cards.

Cable-4701-KIT – Cable kit to allow CANbus communication to the programmable PCI & PC/104 cards.

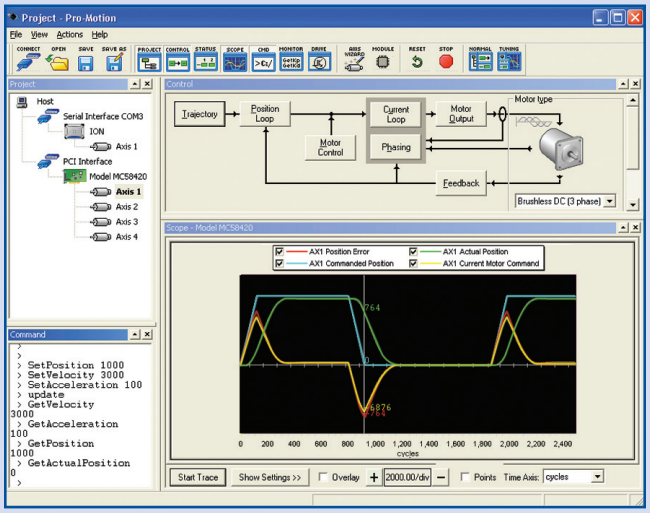
Cable-4705-KIT – Cable kit to allow CANbus communication to the stand-alone cards.

PW-2001-KIT – Power supply kit for the programmable PC/104 cards.

PW-5001-KIT – Power supply kit for the stand-alone cards.

DC-1000 – Parallel encoder input adapter for SSI interface format.

PRO-MOTION® GUI



ProMotion is a powerful, easy-to-use Windows-based development environment for use with the Prodigy Motion Cards.

Features

- Step by step axis wizard for easy motor set up
- Motion oscilloscope shows tuning and systems parameters in real time
- Autotuning of position loop
- Graphical control of windows for easy set up of parameters
- Distance and time units conversion
- Continuous axis display window
- Programmable motion shuttle
- Supports parallel bus, serial, CANbus, and Ethernet communications
- Support for C-Motion® Engine code development and board-level programming

›PMD PRODUCT OVERVIEW

	CHIPS		CARDS	DRIVES
	MOTOR CONTROL IC 	**MAGELLAN® MOTION PROCESSOR** 	**PRODIGY® MOTION CARDS** 	**ION® DIGITAL DRIVES** 
No. Axes	1	1, 2, 3, 4	1, 2, 3, 4	1
Format	• 64-pin TQFP	• 144-pin TQFP • 100-pin TQFP	• PCI • PC/104 • Stand-alone	• Fully enclosed module
Voltage	3.3 V	3.3 V	5 V	12 - 56 V / 20 - 195 V
Function	• Velocity control • Torque/Current control • Commutation • Field-oriented control	• Position control • Profile generation • Commutation • Network communications • Multi-motor support	• Position control • Profile generation • Commutation • Network communications • Signal conditioning • Multi-motor support • Analog output • PWM output • Trace buffer • Programmable	• Position control • Profile generation • Commutation • Network communications • Field oriented control • Torque/current control • Trace buffer • MOSFET Amplifier • Pulse & direction input (ION 3000 model only)
Motor Types	• Brushless DC	• DC brush • Brushless DC • Pulse & direction • Microstep	• DC brush • Brushless DC • Pulse & direction • Microstep	• DC brush • Brushless DC • Microstep
Communication	• Stand-alone • RS232/485	• Parallel • RS232/485 • CANbus	• PC-bus • Ethernet • RS232/485 • CANbus	• CANbus • RS232/485
Loop Rate	20 kHz – current 10 kHz – velocity	50 – 75 µsec/axis	50 – 150 µsec/axis	20 kHz – current 10 kHz – position

›HOW TO ORDER PRODIGY

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Bus type
9 = PCI
8 = PC/104
1 = Stand-alone

Card type
2= Standard (Prodigy)
3= Programmable (Prodigy/CME)

Connector orientation
Empty = Standard
H = Horizontal (stand-alone only)
V = Vertical (stand-alone only)

Axes
1, 2, 3, 4

CP version
(contact PMD)

Standard version only

Developer's Kits available

Performance Motion Devices, Inc.

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About Performance Motion Devices

Performance Motion Devices, Inc (PMD) provides OEMs worldwide with innovative, high performance chip, card, and drive-based motion control solutions. With over 2.5 million installed axes, PMD has the motion control expertise to simplify customer's designs and lower overall costs. PMD products are used to control brush, brushless and stepping motors in the medical, commercial and industrial markets.

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