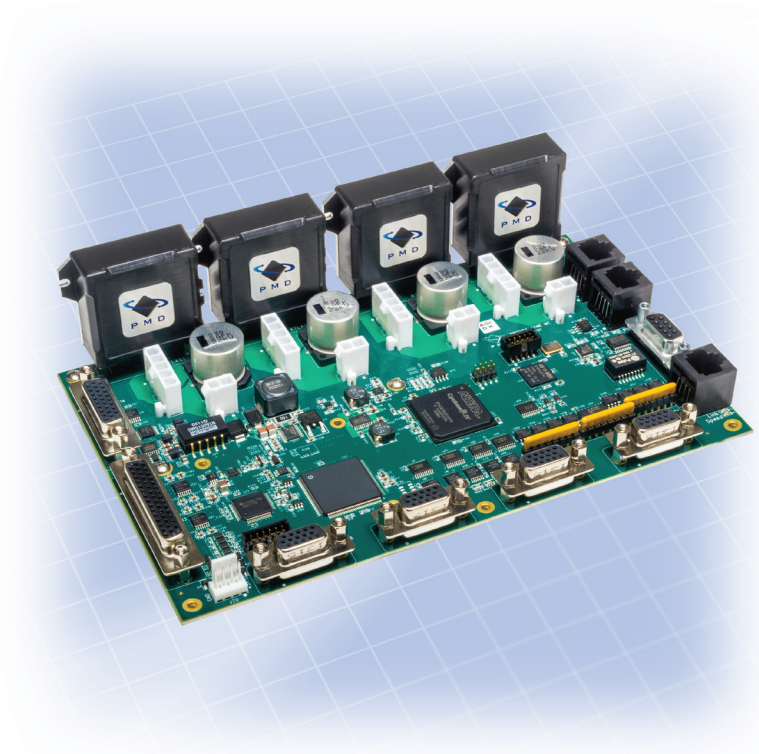
PERFORMANCE**MOTION**DEVICES

Prodigy®/**CME** Machine Controller **Card**



Prodigy®/CME Machine Controller Cards

provide high performance motion control for medical, scientific, automation, industrial, and robotic applications. Available in 1, 2, 3, and 4-axis configurations, these cards support DC brush, brushless DC, and step motors and allow user-written C-language code to be downloaded and run directly on the card. The Prodigy/CME Machine Controller has on-card Atlas® amplifiers that eliminate the need for external amplifiers. To build a fully functioning system only a power supply, motors, and cabling are needed.

Based on PMD's industry-leading Magellan® Motion Processor, the Prodigy/CME Machine Controller cards 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.

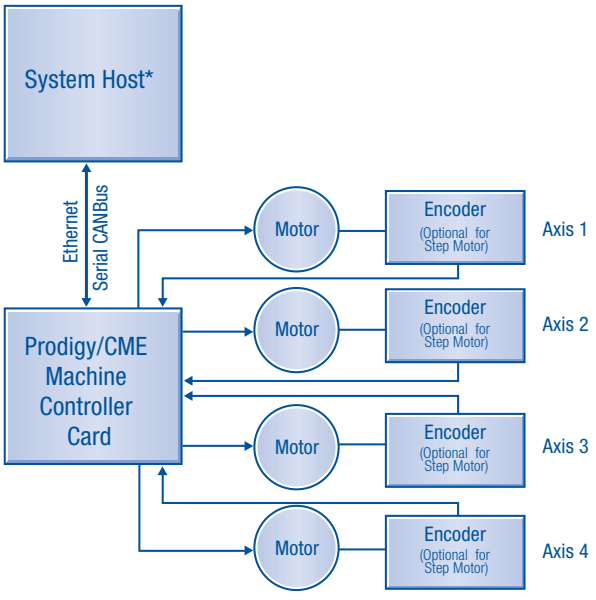
Up to four on-card Atlas amplifiers provide high performance amplification for even the most demanding applications. These compact and powerful units provide field oriented control, safety monitoring, and industry-leading drive efficiencies.

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

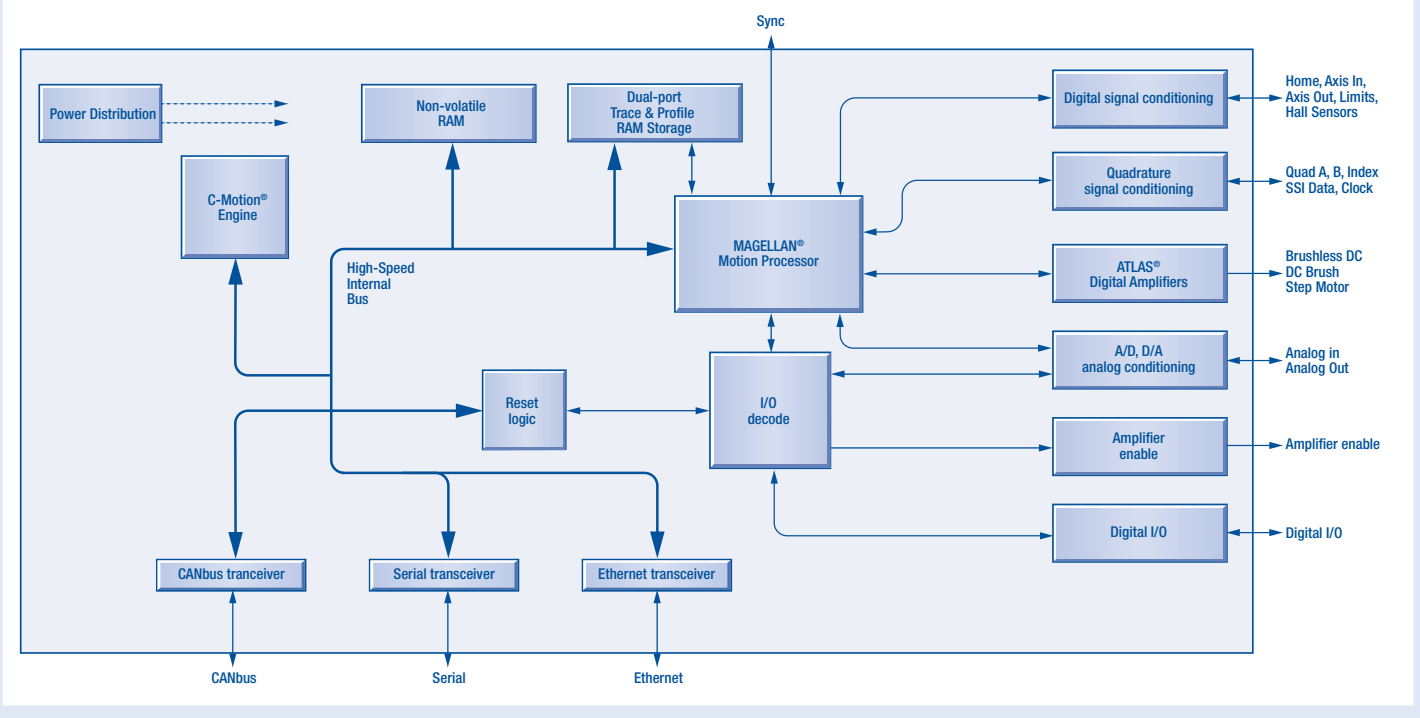
- Complete all-in-one machine controller
- Available in 1, 2, 3, and 4-axis configurations
- Uses PMD's advanced Magellan® Motion Processor
- Supports DC brush, brushless DC, and step motors
- On-card high performance Atlas® amplifiers
- S-curve, trapezoidal, electronic gearing, and velocity-contouring
- Ethernet, CANbus and serial communications
- Board-level execution of user application code at 96 MIPs
- High speed loop rate: 50 µsec/axis
- Up to 256 microsteps per full step resolution
- Up to 1KW peak output power per axis
- Extensive fault detection including over & undervoltage, motor short, and overtemp
- Single voltage supply drives motors and card logic
- Incremental quadrature and Absolute SSI encoder support
- 6-step commutation and field oriented control modes
- Profile and servo changes on-the-fly
- Advanced PID filter with feedforward and dual biquad filters
- High-speed hardware performance trace (up to 468 KB)
- 8 channels of high precision 16-bit analog input & output
- 12+ channels of general purpose digital I/O
- Two directional limit switches, high speed index, and home inputs per axis
- C-Motion Engine development tools
- Support for external amplifiers via +/- 10V analog output
- Includes Pro-Motion®, C-Motion® and VB-Motion® development software

› CONFIGURATION



*System host optional

Technical**Overview**



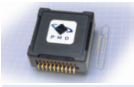
› SPECIFICATIONS

	Machine Controller
Configurations	CME
Model	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	40 Mcounts/sec
Capability for onboard amplifier	Yes, Atlas Digital Amplifier
Motor output signals	Analog ± 10V
General purpose digital I/O	8 bi-directional, 4 input, 4 output
General purpose analog input	8 16-bit channels (± 10V)
General purpose analog outputs	8 16-bit channels (± 10V)
Limit switches	2 per axis: one for each direction of travel
CME version user program memory	256 KB Flash / 8 KB RAM
CME version stack memory	8 KB RAM
Dual ported RAM	128 KB or 468 KB (enhanced memory option)
Communication modes	Serial, CANbus, Ethernet
On-card amplifier voltage range	12 - 56 V
On-card amplifier continuous current output	DC Brush Motor: 14 ADC Brushless DC Motor: 10 Arms Step motor: 9 Arms
Dimensions	7.80'' x 4.88'' x .78" (19.8cm x 12.4cm x 1.98cm)

Voltage Input
12-56 VDC
Microstepping resolution
256
PWM frequency
20, 40, 80 kHz
Current Loop rate
20 kHz
Mechanical Dimensions
1.52" (38.5 mm) x 1.52" (38.6 mm) x .60" (15.2 mm)
Weight
1.0 oz (28.5 g)

ATLAS® Digital Amplifiers

ATLAS® Digital amplifiers are compact single-axis amplifiers that provide high performance torque control of DC brush, brushless DC, and step motors. They are packaged in a compact solderable module and utilize standard through-hole pins for all connections.



	Continuous current output	Peak current output	Continuous power output
Brushless DC	10 Arms	25 A	590 W
DC Brush	14 ADC	25 A	670 W
Step Motor	9 Arms	25 A	610 W

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

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.

Development Tools & Accessories

› DEVELOPER'S KIT

Includes

- Machine controller card
- L-bracket base with optional heat sink attachment (1, 2, or 4 axis version)
- Up to 4 ATLAS® digital amplifiers
- Complete stub cable set
- Pro-Motion CD and User's Guide
- Development Software CD with C-Motion and VB-Motion Software, ATLAS and Magellan documentation

› C-MOTION® SOFTWARE

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 processors, cards and ATLAS Digital Amplifiers. C-Motion may be used to communicate with ATLAS Digital Amplifiers through a Magellan motion processor, either as part of a PMD card or a user-designed product.

C-Motion features include:

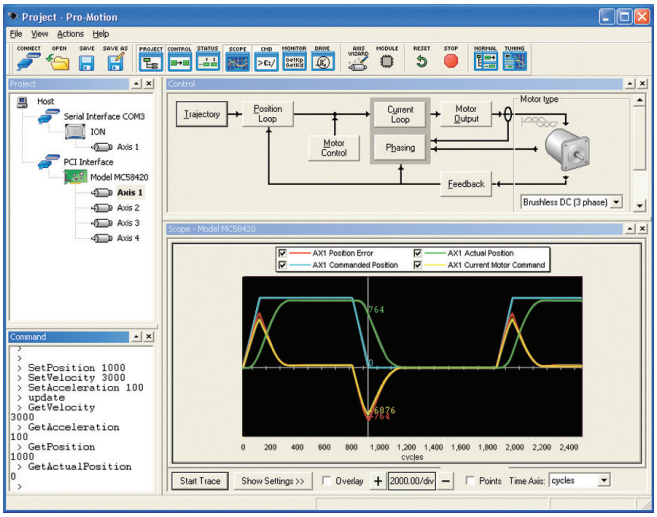
- Extensive library of commands for virtually all motion design needs
- Develop embeddable C/C++ applications
- Many complete, functional examples available
- Supports serial, CAN and Ethernet communications

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);
```

› PRO-MOTION® GUI



Pro-Motion is a sophisticated, easy-to-use Windows-based exerciser program for use with the ATLAS Digital Amplifiers, ION Digital Drives and other PMD motion control ICs and cards.

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 continuous back and forth motion between two positions
- Communications monitor echoes all commands sent by Pro-Motion to the card

› PMD PRODUCT OVERVIEW

	MOTOR CONTROL IC	MAGELLAN® MOTION PROCESSOR ICs	ATLAS® DIGITAL AMPLIFIERS	PRODIGY® MOTION CARDS	ION® DIGITAL DRIVES
					
No. Axes	1	1, 2, 3, 4	1	1, 2, 3, 4	1
Format	• 64-pin TQFP	• 144-pin TQFP • 100-pin TQFP	• 20-pin solderable module	• PCI • PC/104 • Standalone • Machine Controller	• Fully enclosed module
Voltage	3.3 V	3.3 V	12 - 56 V	PCI, PC/104, Standalone: 5 V Machine Controller: 12 - 56 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	• Torque/Current Control • Field Oriented Control • Trace Buffer • Amplification • Pulse & Direction Input • SPI Interface • User Configuration Storage	• Position control • Profile generation • Commutation • Network communications • Signal conditioning • Multi-motor support • Analog output • PWM output • Trace buffer • Programmable • General purpose user I/Os	• Position control • Profile generation • Commutation • Network communications • Field oriented control • Torque/current control • Trace buffer • Amplification • Pulse & direction input • Programmable • General purpose user I/Os
Motor Types	• Brushless DC	• DC brush • Brushless DC • Step Motor	• DC brush • Brushless DC • Step Motor	• DC brush • Brushless DC • Step Motor	• DC brush • Brushless DC • Step Motor
Communication	• Standalone • RS232/485	• Parallel • RS232/485 • CANbus	• SPI	• PCI and PC/104 bus • Ethernet • RS232/485 • CANbus	• CANbus • Ethernet • RS232/485
Loop Rate	20 kHz – current 10 kHz – velocity	50 – 75 µsec/axis	20 kHz – current	50 – 150 µsec/axis	20 kHz – current 10 kHz – position

› FOR ORDERING MACHINE CONTROLLER VERSION

P R 3 3 □ □ □ □ □ □ 5 8 □ 2 0 C P □ . □

Socket Version
N = No sockets
S = Sockets installed

Hardware Configuration
M = Standard memory config
L = Enhanced memory config

Atlas #1 Type Code
0=3

Atlas #2 Type Code
0=3

Atlas #3 Type Code
0=3

Atlas #4 Type Code
0=3

# of Axes
1-4

Magellan CP Version
(contact PMD)

Atlas Type Codes

0 = None
1 = Brushless DC, Vertical, tabs
2 = DC Brush, Vertical, tabs
3 = Step motor, Vertical, tabs.

P M D

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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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