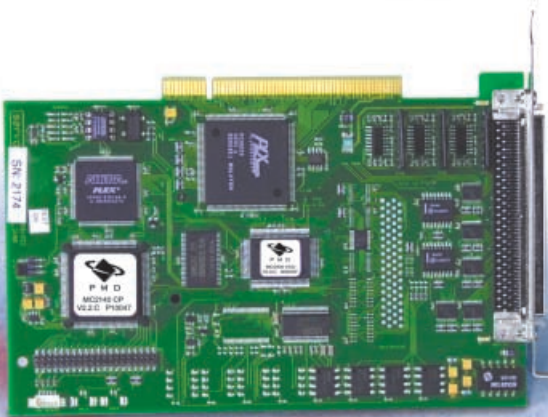


P M D

PERFORMANCE MOTION DEVICES

Magellan Motion Controllers

MAGELLAN - PCI



MAGELLAN - PC/104



>> The Magellan™ Motion Controllers provide high-performance board level motion control for scientific, automation, industrial, and robotic applications. Available in PCI-bus or PC/104-bus configurations, these motion cards support multiple motor types, including DC brush, brushless DC, microstepping and pulse & direction motors. The Magellan Motion Controllers are available in 1, 2, 3 and 4-axis versions and are designed in surface mount technology.

User selectable profile modes include S-curve, trapezoidal, velocity contouring and electronic gearing. The Magellan Motion Controller accepts input parameters such as position, velocity, acceleration and jerk from the host and generates a corresponding trajectory on-the-fly. Servo loop compensation utilizes a full 32-bit position error,

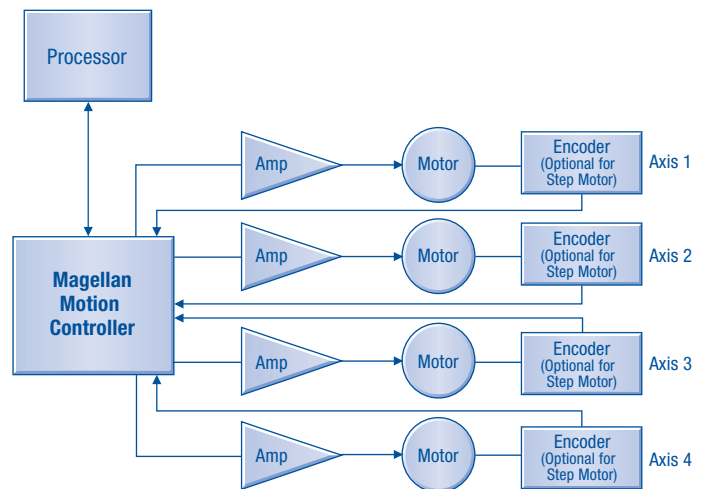
PID with velocity and acceleration feedforward, integration limit and dual bi-quad filters for sophisticated control of complex loads.

The Magellan Motion Controller provides a flexible and powerful instruction set utilizing standard C or C++ programming language to initialize and control the motion application. These cards are extensively supported by state-of-the-art software tools, resources and programs, including PMD's Pro-Motion® Windows® GUI, and C-Motion® API, comprised of a C-source code library for developing applications in Windows or DOS.

> FEATURES

- Uses ultra-advanced Magellan Motion Processor
- PCI-bus and PC/104-bus configurations
- Available in 1, 2, 3 and 4-axis versions
- Supports DC brush, brushless DC, microstepping and pulse & direction motors
- Standard C or C++ language programming using C-Motion
- S-curve, trapezoidal, electronic gearing, and external profile modes
- PCI-bus, CANbus or serial communications
- Separately programmable acceleration and deceleration values
- Profile & servo changes-on-the-fly
- Advanced PID filter with feedforward and dual bi-quad filters
- Loop rate up to 50 μ sec/axis
- Incremental and parallel encoder input
- Dual-loop encoder input
- Pulse and direction output up to 5 Mpulses/sec
- 6-step (hall-based) and sinusoidal commutation
- High-speed motion trace for servo tuning and diagnostics
- High-precision 16-bit DAC output to amplifier
- PLC-style programmable inputs and outputs
- General purpose digital and analog I/O
- Two directional limit switches, index input, and home indicator per axis

> CONFIGURATION



Technical Overview

> SPECIFICATIONS

Available configurations

PCI-bus or PC/104-bus card
1, 2, 3 or 4-axes

Position range

-2,147,483,648 to
+2,147,483,647 counts

Velocity range

-32,768 to +32,767 counts/cycle with
a resolution of 1/65,536 counts/cycle

Acceleration & deceleration ranges

-32,768 to +32,767 counts/cycle² with
a resolution of 1/65,536 counts/cycle²

Jerk range

0 to 1/2 counts/cycle³ with a resolution of
1/4,294,967,296 counts/cycle³

Electronic gear ratio range

-32,768 to +32,767 with a resolution of
1/65,536 (negative and positive direction)

Profile modes

S-curve point-to-point (Position, velocity,
acceleration, and deceleration)

Trapezoidal point-to-point (Position,
velocity, acceleration, and deceleration)

Velocity-contouring (Velocity, acceleration,
and deceleration)

Electronic gear (Encoder or 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 versions)

Scalable PID with Vel + Acc feedforward,
integration limit, offset bias, dual bi-quad filter,
settable derivative sampling time and output
motor command limiting.

Filter parameter resolution

(not used with pulse & direction versions)

16 bits

Position error tracking

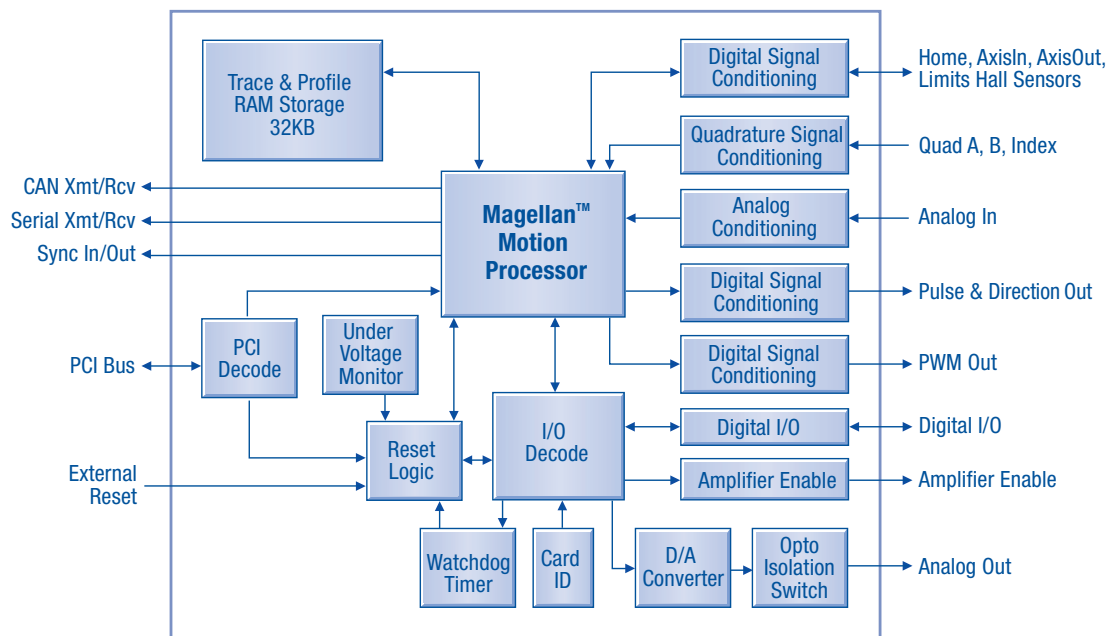
Motion error window allows axis to be stopped
upon exceeding programmable window

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

Emergency stop

5V TTL input (either for smooth stop, abrupt
stop or motor off) uses the AxisIn signal

> INTERNAL BLOCK DIAGRAM



Position error resolution

32 bits

Motor output modes

DAC: 16 bits ± 10 V output

PWM: 10-bit resolution at 20 kHz, 50/50
supports 2 or 3 phase motors; Sign magnitude
supports 1 and 2 phase motors only

Pulse and Direction Output:

5 MPulses/sec, TTL & Differential

Hall sensor inputs

3 hall effect inputs per axis (TTL level signals)

Commutation rate

10 kHz

Maximum encoder rate

Incremental: up to 5 Mcounts/sec

Parallel-word: up to 160 Mcounts/sec

Software-invertible signals

Encoder A, Encoder B, Hall A, Hall B,
Hall C, Index, Home, AxisIn, AxisOut,
PositiveLimit, NegativeLimit
(all individually programmable per axis)

Servo loop timing range

51.2 μ sec to 1.6 sec

Minimum servo loop timing

50-75 μ sec/axis (based on number of
enabled axes, and use of trace)

Limit switches

2 per axis: one for each direction of travel

Position-capture triggers

2 per axis: index and home signals

Other digital signals (per axis)

1 AxisIn signal per axis
1 AxisOut signal per axis

Analog input

8 x 10-bit analog inputs (0-2.048 V)

RAM/external memory support

32 KBytes of dual-port RAM

Trace modes

One-time; Continuous

Number of trace variables

27 (only 4 can be used at the same time)

Communication modes

16-bit parallel, serial, CANbus

Number of host instructions

102-154

I/Os

8 digital inputs, 8 digital outputs,
DAC: 16 bits ± 10 V output,
4 digital outputs for amplifier enable,
8 analog inputs: (0-2.048 V)

Parallel encoder word size

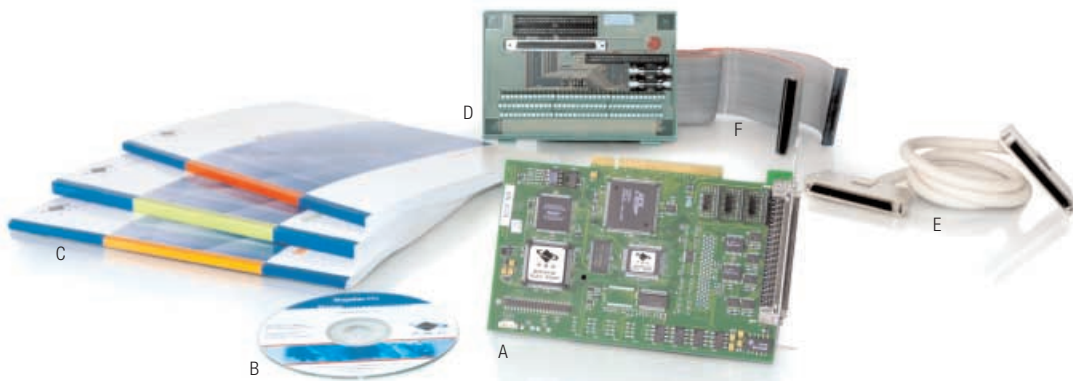
16 bits

Dimensions

PCI: Half size PCI-Bus card; 6.9" x 4.4"
PCI/104: 3.8" x 3.5"

Products & Development Tools

> MOTION CONTROLLER AND ACCESSORIES



A | **Magellan-PCI or Magellan-PC/104 Motion Controller** for DC servo, brushless DC, microstepping and pulse & direction. See *Part Number Summary* for complete list of part numbers.

B | **Installation CD** – includes complete Pro-Motion and C-Motion software.

C | **Magellan Motion Controller Documentation**

Accessories

D | **IM-1000** – Breakout interconnect module provides convenient jack-

screw type terminators for the 100-pin cable. Used with Cable-1003 or Cable-1006. *Optional*

E | **Cable-1003** (3-ft) or **Cable-1006** (6-ft) – 100 position, shielded round cable with locking connectors (amp) to connect Magellan-PCI Motion Controller to the IM-1000. *Optional*

F | **Cable-2003** – 50 position ribbon cable (3-ft) to connect Magellan PC/104 Motion Controller to the IM-1000. *Optional*

Also Available (not pictured)

» **Cable 3003** – Interface cable used with 68-pin connector. This connector is generally used only with commutation requirements. *Optional*

» **Cable 4003** – Serial port cable (3-ft) that connects to a serial I/F connector. This cable allows serial communications to the PCI card and should be used only if serial port communications are desired. *Optional*

» **DC-1000** – Parallel encoder input adapter allows parallel-word and other encoders that use the SSI interface format to connect directly to the board. *Optional*

> C-MOTION® SOFTWARE

C-Motion is a “C” source code library that provides a convenient set of callable routines for controlling your Magellan Motion Processor.

Features

- Axis virtualization
- Communicate to multiple processors
- Easily linked to any “C/C++” application

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, PMDTrace1, PMDAxis1, PMDTraceActualPosition);
SetTraceVariable(hAxis1, PMDTrace3, PMDAxis1, PMDTraceActualVelocity);
SetTraceVariable(hAxis1, PMDTrace4, PMDAxis1, PMDTraceCommandedVelocity);
```

// set the trace to begin when we issue the next update command

```
SetTraceStart(hAxis1, PMDTraceConditionUpdate);
```

// set the trace to stop when the MotionComplete event occurs

```
SetTraceStop(hAxis1, PMDTraceConditionEventStatus,
PMDEventMotionCompleteBit, PMDTraceStateHigh);
SetProfileMode(hAxis1, PMDTrap);
```

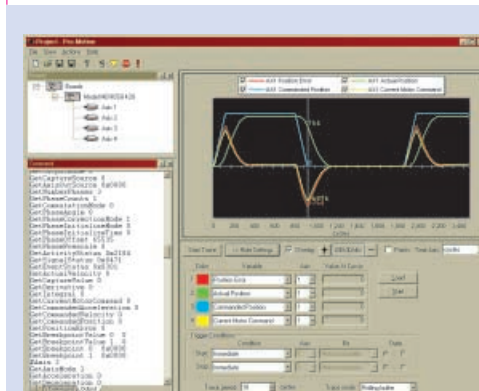
// set the profile parameters

```
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 Magellan based chips and cards.

Features

- Motion oscilloscope graphically displays processor parameters in real-time
- Interactive servo tuning
- Ability to save and load current settings
- Distance and time units conversion

- Motor-specific parameter setup
- Axis shuttle performs continuous back and forth motion between two positions
- Command window for direct text command entry. It also serves as a communications monitor that echoes all commands sent by Pro-Motion to the card.

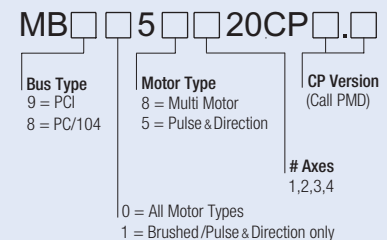
> FAMILY FEATURES

	MOTOR CONTROL IC	NAVIGATOR/PILOT	MAGELLAN	MOTION CARDS
No. Axes	1	1, 2, 4	1, 2, 3, 4	1, 2, 3, 4
Format	<ul style="list-style-type: none"> • 64-pin PQFP 	<ul style="list-style-type: none"> • 132-pin PQFP • 100-pin PQFP 	<ul style="list-style-type: none"> • 144-pin TQFP • 100-pin TQFP 	<ul style="list-style-type: none"> • PCI • PC/104
Voltage	3.3 V	5 V	3.3 V	5 V
Function	<ul style="list-style-type: none"> • Velocity control • Torque control • Commutation • Current feedback 	<ul style="list-style-type: none"> • Position control • Profile generation • Commutation 	<ul style="list-style-type: none"> • Position control • Profile generation • Commutation • Network communication • Multi-motor support 	<ul style="list-style-type: none"> • Position control • Profile Generation • Commutation • Signal Conditioning • Analog Output • Trace Buffer
Motor Types	<ul style="list-style-type: none"> • Brushless DC 	<ul style="list-style-type: none"> • DC brush • Brushless DC • Microstepping • Pulse & direction 	<ul style="list-style-type: none"> • DC brush • Brushless DC • Microstepping • Pulse & direction 	<ul style="list-style-type: none"> • DC brush • Brushless DC • Microstepping • Pulse & direction
Communication	<ul style="list-style-type: none"> • Standalone • Serial 	<ul style="list-style-type: none"> • Parallel • Serial point to point • Serial multi-drop 	<ul style="list-style-type: none"> • Parallel • Serial point to point • Serial multi-drop • CANbus 	<ul style="list-style-type: none"> • Through bus
Loop Rate	20 kHz	100 – 150 µSec/axis	50 - 75 µSec/axis	50 - 75 µSec/axis

> PART NUMBER SUMMARY

No. Axes	DC Brush, Brushless DC, Microstepping, Pulse & Direction		Pulse & Direction Only		DC Brush and Pulse & Direction Only	
	Magellan-PCI	Magellan-PCI/104	Magellan-PCI	Magellan-PCI/104	Magellan-PCI	Magellan-PCI/104
1	MB9058120	MB8058120	MB9055120	MB8055120	MB9158120	MB8158120
2	MB9058220	MB8058220	MB9055220	MB8055220	MB9158220	MB8158220
3	MB9058320	MB8058320	MB9055320	MB8055320	MB9158320	MB8158320
4	MB9058420	MB8058420	MB9055420	MB8055420	MB9158420	MB8158420

> HOW TO ORDER



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About Performance Motion Devices

Performance Motion Devices (PMD) is the recognized worldwide leader in chip-based motion systems. Dedicated to providing cost effective, high performance motion systems to OEM customers, PMD utilizes extensive in-house expertise to maximize time to market and customer satisfaction.

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