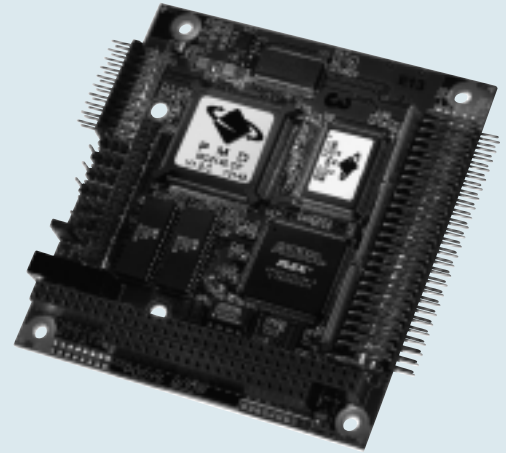# Navigator-PC/104™ Motion Controller For Servo or Step Motors

Features

- Available in 1, 2 and 4-axis configurations.
- DC brushed, step or brushless DC motors (using external commutation).
- Motion profiles include S-curve, trapezoidal, velocity contouring and electronic gearing.
- Independently programmable acceleration and deceleration.
- Advanced PID filter with velocity and acceleration feed forward, bias offset and 32-bit position error.
- Velocity and acceleration changes on-the-fly for trapezoidal and velocity-contouring profiles.
- Incremental encoder quadrature input and optional parallel input for absolute encoder or resolver.
- 256KB onboard memory to store complex motion sequences and trace variables.
- Trace capabilities for system performance checks, servo-tuning, maintenance and diagnostics.
- Encoder rate to 5.0 Mcounts/sec.
- 10-bit 20 kHz PWM or 16-bit DAC motor control output to amplifier for servos +/-10v. Up to 5 MHz pulse and direction output for step motors.
- Advanced breakpoint capability allows precise sequencing of events.
- PLC-style programmable inputs and outputs, including per-axis programmable input and output.
- 8 general purpose digital inputs and outputs, 4 amplifier enable outputs.
- 8 general-purpose analog inputs.
- Two-directional limit switches, index input and home/high speed latch input indicator per axis.
- Axis settled indicator and tracking window in addition to automatic motion error detection.

General Description

The Navigator-PC/104™ Motion Controllers for servo or step motors are PC/104 cards that plug directly into a PC/104 connector. The Navigator-PC/104 boards are used in embedded control systems for industrial control, automation and robotic applications. They are available in 1, 2 and 4-axis configurations. The boards are designed for surface mount technology and use PMD's Navigator chipset, for either DC brushed, step or brushless DC motors (using external commutation). They are equipped with additional 256 KB memory to store extensive motion sequences and/or motion trace information to perform complex motion profiles without interrupting the host and to store motion trace information to gather comparison values for system performance checks, servo-tuning, maintenance and diagnostics.

With 124 to 168 commands, depending on model, the Navigator-PC/104 instruction set offers flexibility and versatility to software application programmers. Instructions are used to initialize and control the motion controller. User selectable profiling modes supported by the motion controller include S-curve, trapezoidal, velocity contouring and electronic gearing. The Navigator-PC/104 accepts input parameters such as position, velocity, acceleration and jerk from the host and generates a corresponding trajectory. The Navigator-PC/104 series compact design allows you to pay only for what you need and to be able to upgrade easily if necessary. Just stack additional cards to increase the number of axes.

The Navigator-PC/104 cards are extensively supported by state of the art software tools, resources and programs. Pro-Motion™ software, a Windows™ Graphical User Interface (GUI), provides a quick and convenient way to exercise the card. It allows system parameters, profile information and other useful motion information to be set and stored. In addition, Pro-Motion provides a powerful "motion oscilloscope" function that allows up to four real-time motion variables to be displayed at the same time, simplifying servo tuning and machine performance optimization. Complementing Pro-Motion is C-Motion™, an Application Programmer's Interface (API) comprised of a C-source code library for developing applications in DOS or Windows environments.

Technical Specifications

Available configurations	1, 2 or 4-axis		**Maximum encoder rate**	Incremental (up to 5 Mcounts/sec)
Operating modes	***Closed loop*** (motor command is driven from output of servo filter) ***Open loop*** (motor command is driven from user-programmed register)		**Servo loop timing range**	100 μsec nominal (exact time is 102.4 μsec) per enabled axis
			Limit switches	2 per axis: one for each direction of travel, digitally filtered
Communication modes	16/16 parallel		**Position-capture triggers**	2 per axis: index and home signals (high speed position latch)
Position range	-2,147,483,648 to +2,147,483,647 counts		**Other digital signals (per axis)**	1 AxisIn signal per axis, 1 AxisOut signal per axis
Velocity range	-32,768 to +32,767 counts/sample with a resolution of 1/65,536 counts/sample		**Software-invertible signals**	Encoder A, Encoder B, Index, Home, AxisIn, AxisOut, PositiveLimit, NegativeLimit (all individually programmable per axis)
Acceleration & deceleration ranges	-32,768 to +32,767 counts/sample^2 with a resolution of 1/65,536 counts/sample^2			
Jerk range	0 to 1/2 counts/sample^3, with a resolution of 1/4,294,967,296 counts/sample^3		**Analog input**	8 x 10-bit analog inputs (0 - 4.096 V)
			RAM/external memory support	256 KBytes (128 K Double Word Memory Positions)
Profile modes	***S-curve point-to-point*** (Velocity, acceleration, jerk and position parameters) ***Trapezoidal point-to-point*** (Velocity, acceleration, deceleration and position parameters) ***Velocity-contouring*** (Velocity, acceleration and deceleration parameters) ***Electronic gear*** (Encoder or trajectory position of one axis used to drive a second axis. Master and slave axes and gear ratio parameters)		**Trace modes**	One-time Continuous
			Number of trace variables	27 (only 4 can be viewed at the same time)
			Number of host instructions	124-168
			Emergency stop	5V TTL input (either for smooth stop, abrupt stop or motor off) uses the AxisIn signal
			I/Os	8 digital inputs / TTL, active low 4 axis specific inputs 8 digital outputs / TTL, active low 4 digital outputs for amplifier enable 4 axis specific outputs 8 analog inputs (0 - 4.096 Volts)
On the fly control	Of profile and filter parameters with pre-load and individual axis or simultaneous multi-axis update			
Electronic gear ratio range	-32,768 to +32,767 with a resolution of 1/65,536 (negative and positive direction)		**Special profile mode combinations**	Trapezoidal mode with Electronic gearing S-curve mode with Electronic gearing
Filter modes (not for step motor versions)	Scalable PID + Velocity feedforward + Acceleration feed forward + Bias. Also integration limit, settable derivative sampling time and output motor command limiting		**Master/Slave change**	Automatic Master/Slave change possible if programmed in user-defined Software
Filter parameter resolution (not for step motor versions)	16 bits		**Motor check**	Programmable max. motion error with or without automatic motor shutdown
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)		**Connectors**	2 x 50 position flat ribbon
			Dimensions	3.8 in. x 3.5 in.; form factor = 100% fully compliant PC/104 Compatible
			Power Supply	4.80V to 5.25V, 1A

Motor output modes	DAC: 16 bits ±10V output
	PWM: 10-bit resolution at 20 KHz (1 and 2 axes);
	10 KHz for 4 axes
	   50/50 supports 2 or 3 phase motors
	   Sign magnitude supports 2 phase motors only
	Pulse and Direction Output: 5 MHz, TTL & Differential			

Ordering Information

MB802110 - 1-axis PC/104 motion controller for servo motors including 16 uncommitted I/Os and 8 analog inputs
MB802120 - 2-axis PC/104 motion controller for servo motors including 16 uncommitted I/Os and 8 analog inputs
MB802140 - 4-axis PC/104 motion controller for servo motors including 16 uncommitted I/Os and 8 analog inputs
MB802510 - 1-axis PC/104 motion controller for step motors including 16 uncommitted I/Os and 8 analog inputs
MB802520 - 2-axis PC/104 motion controller for step motors including 16 uncommitted I/Os and 8 analog inputs
MB802540 - 4-axis PC/104 motion controller for step motors including 16 uncommitted I/Os and 8 analog inputs

OPTIONS:
Cable-2003 - 50-position flat ribbon with IDC connectors (1 required for 2 axes, 2 required for 4 axes)
IM-1000 - interface and interconnect board (1 for each set of 4 axes); Mounting: Phoenix EN snap-on rail
DC-1000 - Daughter card for SSI-format encoders

*For Industrial temrperature versions please contact PMD.

P M D

MB800DS1.0-0403