

Up to 8-Axis High-Performance Stepper/Servo Motion Controllers

NI 735x

- 8 axes of motion, maximum
- Each axis configurable for stepper or servo control
- 3D linear and circular interpolation
- 3D contouring
- Sinusoidal commutation for brushless motors
- Buffered breakpoints for high-speed integration
- High-performance architecture

Operating Systems

- Windows 2000/NT/XP
- LabVIEW Real-Time
- Linux and Mac OS X

Recommended Software

- LabVIEW
- NI Motion Assistant
- LabWindows/CVI
- Measurement Studio
- Motion Control Module for Measurement Studio

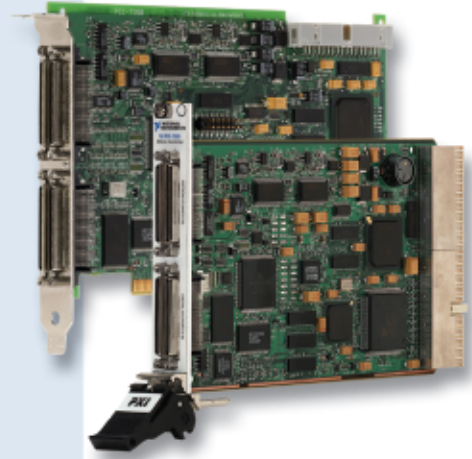
Other Compatible Software

- Visual Basic
- C/C++

Driver Software (included)

- NI-Motion

NEW



Overview and Applications

The NI 735x devices are PCI and PXI stepper and servo motion controllers for machine builders and users who need highest performance and high axis count in a small space. The NI PXI-7358 is the first 8-axis stepper or servo motion controller packaged as a 1-slot 3U PXI module. It offers the most advanced features, including sinusoidal commutation for brushless motors. Using this motion controller you can create a number of high-performance applications. NI 735x motion controllers are available in 2, 4, 6, and 8 axis versions for PXI and PCI.

Motion Control and LabVIEW Real-Time

Many motion applications require very high reliability and integration with other types of I/O. NI PXI motion controllers are compatible with NI LabVIEW Real-Time, with which you can create an integrated motion and I/O system that runs embedded in a real-time OS. A PXI motion controller with a PXI RT Series controller can run LabVIEW Real-Time and function as a stand-alone Ethernet-based motion controller. With this technology, you can create distributed motion control systems that integrate tightly with data acquisition or vision.

I/O Capabilities

NI 735x motion controllers have a variety of diverse I/O that is useful in many motion applications. The 64 bits of digital I/O can be used for a wide variety of applications such as opening or closing valves or turning on and off solid-state relays using the SSR adapter. These motion controllers also have eight channels of 16-bit analog I/O useful for reading potentiometers or even for very simple analog measurements.

Synchronizing Multiple Axes for Parallel Mechanism Applications

Because NI 735x controllers can have up to eight axes, they are ideal for controlling high-axis parallel mechanisms where all axes need to be tightly synchronized. Using any of the NI 735x controllers, you can use the Start Motion.flx function to start all axes at once and have them each follow the acceleration and velocity profiles you have defined. This is useful when working with parallel mechanisms such as hexapods when the axes must move simultaneously.

Static-Friction Compensation

Static friction is the friction present before the system starts moving. Static friction is often higher than dynamic friction and if the difference between the two is large enough, it can make the system difficult to tune. The new static-friction feature for the NI 735x motion controllers compensates for this because you can load the integral error at the beginning of the move. Preloading the integral error causes the motion controller to start out with a high initial voltage, which effectively builds up enough torque at the very beginning of the move to overcome static friction without losing control of the motion. To help you tune your system, NI has a special FREE application called the Piezo Tuning Wizard. After tuning your system using the Piezo Tuning Wizard, you can then easily program the system using NI LabVIEW and NI Motion Assistant just as you would program any other system.

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Sinusoidal Commutation

Brushless servo motors require special commutation. Although some motor drives have commutation built in, there are still many systems that require the motion controller to provide commutation. Sinusoidal commutation enables you to get the smoothest motion with a brushless servo motor. When using the sinusoidal commutation feature, you need a 2-axis resource. This means that if you wanted to control four brushless motors with sinusoidal commutation, an 8-axis NI 735x motion controller would become a 4-axis controller because two analog signals per axis are required to move the motor smoothly.

Increasing Integration Speed with New Breakpoint and High-Speed Capture Enhancements

Buffered breakpoints are a new feature designed to give you more power for your integrated timing and triggering applications. Using this feature you can send a buffer of position breakpoints to the controller that trigger a digital signal upon reaching the positions in the buffer. Buffered breakpoints will trigger at rates as high as 2 kHz. For equally spaced positions, you can use periodic breakpoints to achieve even higher speeds of 4 MHz. With periodic breakpoints, you supply a position modulus; and each time the position reaches that modulus position, the breakpoint will trigger. Another new feature that enhances integration speed is the new buffered high-speed position capture for the NI 735x. This feature captures positions based on a trigger that could come from an external source or from a data acquisition or machine vision device. The high-speed capture can capture positions at rates of up to 2 kHz.

Other New Features

For the NI 735x controllers, your PID update rate can be 62.5 μ s for every two axes. This means that for multiaxis applications, the PID rates can be twice as fast as those for previous boards. The NI 735x also has increased resolution for analog-to-digital conversion, giving you high resolution for analog position feedback.

Technical Support for Motion Software

As a complement to your motion software product, consider:

Technical Support – FREE through applications engineers worldwide, Web resources, and Premier Support – ni.com/support

Motion Control Fundamentals Training – Instructor-led courses – ni.com/training

Professional Services – Feasibility, consulting, and integration through our Alliance Program members – ni.com/alliance

For more information on NI services and support, visit ni.com/services

Ordering Information

NI PXI-7358 (8-axis)	778540-08
NI PXI-7356 (6-axis)	778540-06
NI PXI-7351 (4-axis)	778540-04
NI PXI-7352 (2-axis)	778540-02
NI PCI-7358 (8-axis)	778440-08
NI PCI-7356 (6-axis)	778440-06
NI PCI-7354 (4-axis)	778440-04
NI PCI-7352 (2-axis)	778440-02

Includes hardware and NI-Motion Software, libraries, and examples.

Accessories

NI Motion Assistant	778553-01
Wiring Interface	
NI UMI-7765	777978-01
NI UMI-7772	778556-01
NI UMI-7774	778558-01
Power Drives	
NI MID-7604	777936-01
NI MID-7602	778003-01
NI MID-7654	778005-01
NI MID-7652	778004-01

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Visit ni.com/info and enter **pxi7350**.

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Specifications

Performance

PID update rate range	62.5 to 500 μ s/sample
Maximum PID update rate	62.5 μ s/axis
4-axis PID update rate	250 μ s total
Multiaxis synchronization	< 1 update sample
Trajectory parameters	
Absolute position range	$\pm 2^{31}$ counts
Maximum relative move size	$\pm 2^{31}$ counts
Velocity range	Servo 1 to $\pm 20,000,000$ counts/s
Velocity range	Stepper 1 to 4,000,000 steps/s
Acceleration/deceleration	4,000 to 128,000,000 counts/s ²
Gear ratio	$\pm 32,767:1$ to $\pm 1:32,767$
Servo control loop modes	PID, PIVff, S-Curve, dual loop
PID (Kp, Ki and Kd) gains	0 to 32,767
S-curve time range	1 to 32,767 samples
Following error range	$\pm 32,767$ counts
Stepper outputs	
Maximum pulse rate	8 MHz (full, half, and microstep)
Minimum pulse width	120 ns at > 2 MHz
Step output mode	Step and direction or CW/CCW
Voltage range	0 to 5 V

System Safety

Watchdog timer function	Resets board to startup state
Shutdown input	Disable all axes and command outputs

Motion I/O

Stepper outputs	
Servo command analog outputs	
Voltage range	± 10 V, 16 bits (0.000305 V/LSB)
Programmable torque (velocity) limits	
Programmable offset	± 10 V (-32,768 to + 32,767)
Encoder inputs	Quadrature, incremental, single-ended
Maximum count rate	20 MHz
Forward, reverse, and home inputs	
Number of inputs	24 (3 per axis)
Control	Individual enable/disable, stop on input, prevent motion, find home

Trigger inputs	8
Maximum repetitive capture rate	2 kHz
Breakpoint outputs	
Number of outputs	8, programmable polarity
Maximum rate	4 MHz
Inhibit/enable output	
Number of outputs	8 (1 per axis), programmable polarity
Analog inputs	8, 16-bit resolution, ± 10 V range, 25ms scan rate
Analog outputs	8, 16-bit resolution, ± 10 V range

Digital I/O

Ports	8, 8-bit TTL ports, bit configurable, sink or source 24 mA
Open-loop PWM outputs	
Number of PWM outputs	2, 32 kHz
Clock sources	Internal or external

Power Requirements

+3.3 V ($\pm 10\%$)	2 A
+5 V ($\pm 5\%$)	2 A
+12 V ($\pm 5\%$)	30 mA
-12 V ($\pm 5\%$)	0 mA
Power consumption	18 W, maximum

Physical

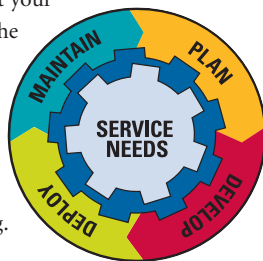
Dimensions (not including connectors)	
PXI	16 by 10 cm (6.3 by 3.9 in.)
PCI	17.5 by 9.9 cm (6.9 by 3.9 in.)
Connectors	
Motion I/O connector	68-pin female high-density VHDCI type
Digital I/O connector	68-pin female high-density VHDCI type

Environment

Operating temperature	0 to 55 °C
Storage temperature	-20 to 70 °C
Relative humidity range	10 to 90% (noncondensing)

NI Services and Support

NI has the services and support to meet your needs around the globe and through the application life cycle – from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit ni.com/services.



Training and Certification

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Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide NI Alliance Partner Program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.



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Hardware Services

NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI™ combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with ni.com/pxiadvisor.

Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit ni.com/calibration.

Repair and Extended Warranty

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National Instruments • Tel: (512) 683-0100 • Fax: (512) 683-9300 • info@ni.com

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