

# Mid-Range Stepper/Servo Motion Controllers

## NI 734x

- Up to 4 axes of motion
- Configurable stepper or servo control
- Up to 4 MHz stepper output rate
- 3D linear and circular interpolation
- 3D contouring
- 62  $\mu$ s PID loop update rate
- Patented step generation technology for smooth stepper motion

### Operating Systems

- Windows Vista/XP/2000
- LabVIEW Real-Time

### Recommended NI Software

- LabVIEW
- NI Motion Assistant
- LabWindows™/CVI
- Measurement Studio

### Other Compatible Software

- Visual Basic
- C/C++

### Driver Software (included)

- NI-Motion



## Overview and Applications

NI 734x motion controllers are for end users and machine builders who need to develop powerful applications quickly and easily. With the proper drive, you can use NI 734x motion controllers for stepper/servo motor control and piezoelectric control. These controllers also have four general-purpose analog inputs that you can use in simple application monitoring or as feedback for closed-loop control.

## Features

NI 734x controllers offer advanced features such as blended motion trajectory control and fully coordinated circular, linear, point-to-point, gearing, and vector-space control in either embedded motion operation or host-centric programming environments. NI also provides contouring capability for more complex moves. NI 734x controllers use a high-performance motion controller architecture. The CPU and DSP components operate together to optimize closed-loop control, automate systems control, and implement motion command processing functions. The onboard CPU uses an embedded real-time operating system that has event-driven multitasking control. With this state-of-the-art approach, several motion control programs and processes can operate simultaneously on the controller, independently of the host PC and with no outside program interaction unless the host program or user configuration initiates it.

## Distributed Control with LabVIEW Real-Time

You can use the NI-Motion driver software with the NI LabVIEW Real-Time Module. With this technology, you can create powerful, distributed motion control systems using a PXI RT Series controller, the LabVIEW Real-Time Module, and a PXI-734x motion controller. You can program this type of system using LabVIEW on a separate computer. The main advantages of a real-time system are high reliability and the capability to create powerful distributed motion control solutions that connect to the main PC using standard Ethernet.

Feature	NI 734x
Number of Axes	2, 4
PAC Platforms	PCI, CompactPCI/PXI
Linear, Circular, Spherical, and Helical Interpolation; Blending	✓
Trapezoidal, S-Curve Profiles	✓
Closed-Loop Stepper Control	✓
Contouring, Electronic Gearing, Onboard Programming	✓
Sinusoidal Commutation for Brushless Servo Motors	–
Buffered Breakpoints, Buffered High-Speed Capture, 4 MHz Periodic Breakpoints	–
Number of Axes per 62.5 $\mu$ s PID Rate	1
PWM Lines/DIO Lines/Analog Input Resolution	2/32/12-bit
Maximum Step Output Rate/Encoder Input Rate	4 MHz/20 MHz
Programming API	NI-Motion Driver
Software	NI Motion Assistant, NI LabVIEW, C, Visual Basic

# Mid-Range Stepper/Servo Motion Controllers

## NI 7340 Connector Pinouts

(two 68-pin VHDCI connectors)

Axis 1 Dir (CCW)	1	35	Axis 1 Step (CW)
Digital Ground	2	36	Axis 1 Encoder Phase A
Digital Ground	3	37	Axis 1 Encoder Phase B
Axis 1 Home Switch	4	38	Axis 1 Encoder Index
Trigger 1	5	39	Axis 1 Forward Limit Switch
Axis 1 Inhibit	6	40	Axis 1 Reverse Limit Switch
Axis 2 Dir (CCW)	7	41	Axis 2 Step (CW)
Digital Ground	8	42	Axis 2 Encoder Phase A
Digital Ground	9	43	Axis 2 Encoder Phase B
Axis 2 Home Switch	10	44	Axis 2 Encoder Index
Trigger 2	11	45	Axis 2 Forward Limit Switch
Axis 2 Inhibit	12	46	Axis 2 Reverse Limit Switch
Axis 3 Dir (CCW)	13	47	Axis 3 Step (CW)
Digital Ground	14	48	Axis 3 Encoder Phase A
Digital Ground	15	49	Axis 3 Encoder Phase B
Axis 3 Home Switch	16	50	Axis 3 Encoder Index
Trigger 3	17	51	Axis 3 Forward Limit Switch
Axis 3 Inhibit	18	52	Axis 3 Reverse Limit Switch
Axis 4 Dir (CCW)	19	53	Axis 4 Step (CW)
Digital Ground	20	54	Axis 4 Encoder Phase A
Digital Ground	21	55	Axis 4 Encoder Phase B
Axis 4 Home Switch	22	56	Axis 4 Encoder Index
Trigger 4	23	57	Axis 4 Forward Limit Switch
Axis 4 Inhibit	24	58	Axis 4 Reverse Limit Switch
Digital Ground	25	59	Host +5 V
Breakpoint 1	26	60	Breakpoint 2
Breakpoint 3	27	61	Breakpoint 4
Digital Ground	28	62	Shutdown
Analog Output	29	63	Analog Output
Analog Output	30	64	Analog Output
Analog Output Ground	31	65	Reserved
Analog Input 1	32	66	Analog Input 2
Analog Input 3	33	67	Analog Input 4
Analog Reference (Output)	34	68	Analog Input Ground

Motion I/O Connector

+5 V	1	35	Digital Ground
PCLK	2	36	Digital Ground
Reserved	3	37	Digital Ground
Reserved	4	38	DPull
PWM1	5	39	Digital Ground
Reserved	6	40	Reserved
Reserved	7	41	Digital Ground
Reserved	8	42	Digital Ground
PWM2	9	43	Digital Ground
Port 1:bit 0	10	44	Port 1:bit 1
Digital Ground	11	45	Port 1:bit 2
Port 1:bit 3	12	46	Digital Ground
Port 1:bit 4	13	47	Port 1:bit 5
Digital Ground	14	48	Port 1:bit 6
Port 1:bit 7	15	49	Digital Ground
Port 2:bit 0	16	50	Digital Ground
Port 2:bit 1	17	51	Port 2:bit 2
Digital Ground	18	52	Port 2:bit 3
Digital Ground	19	53	Port 2:bit 4
Digital Ground	20	54	Port 2:bit 5
Port 2:bit 6	21	55	Digital Ground
Port 2:bit 7	22	56	Digital Ground
Port 3:bit 0	23	57	Port 3:bit 1
Digital Ground	24	58	Port 3:bit 2
Port 3:bit 3	25	59	Digital Ground
Port 3:bit 4	26	60	Port 3:bit 5
Digital Ground	27	61	Port 3:bit 6
Port 3:bit 7	28	62	Digital Ground
Port 4:bit 0	29	63	Port 4:bit 1
Digital Ground	30	64	Port 4:bit 2
Port 4:bit 3	31	65	Digital Ground
Port 4:bit 4	32	66	Port 4:bit 5
Digital Ground	33	67	Port 4:bit 6
Port 4:bit 7	34	68	Digital Ground

Digital I/O Connector

### Ordering Information

NI PCI-7342 (2 axes).....	778916-02
NI PCI-7344 (4 axes).....	778916-04
NI PXI-7342 (2 axes).....	779036-02
NI PXI-7344 (4 axes).....	779036-04

Includes NI-Motion software libraries and examples.

### Accessories

NI Motion Assistant.....	778553-01
Wiring Interfaces	
UMI-7764.....	777978-02
UMI-7772.....	778556-01
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
P70530.....	780097-01
P70360.....	780098-01

### BUY NOW!

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to [ni.com/info](http://ni.com/info) and enter **ni7340**.

## Mid-Range Stepper/Servo Motion Controllers

### Specifications

#### Performance

PID update rate range .....	62.5 to 500 $\mu$ s/sample
Maximum PID update rate .....	62.5 $\mu$ s/axis
4-axis PID update rate .....	250 $\mu$ s total
Multiaxis synchronization .....	<1 update sample
Trajectory parameters	
Absolute position range .....	$\pm 2^{31}$ counts
Maximum relative move size .....	$\pm 2^{31}$ counts
S-curve time range .....	1 to 32,767 samples
Following error range .....	$\pm 32,767$ counts
Velocity range .....	Servo: 1 to $\pm 20,000,000$ counts/s
Velocity range .....	Stepper: 1 to 4,000,000 steps/s
Acceleration/deceleration .....	244 to 512,000,000 counts/s <sup>2</sup> at a PID rate of 250 $\mu$ s
Gear ratio .....	$\pm 32,767:1$ to $\pm 1:32,767$
Servo-control loop modes .....	
PID (Kp, Ki, and Kd) gains .....	PID, PIVff, S-curve, dual loop
PID (Kp, Ki, and Kd) gains .....	0 to 32,767
Stepper outputs	
Maximum pulse rate .....	4 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

Servo command analog outputs	
Voltage range .....	$\pm 10$ V, 16 bits (0.000305 V/LSB)
Programmable torque (velocity) limits and programmable offset .....	
programmable offset .....	$\pm 10$ V (-32,768 to +32,767)
Encoder inputs .....	
Quadrature, incremental, single-ended .....	Quadrature, incremental, single-ended
Maximum count rate .....	20 MHz
Forward, reverse, and home inputs	
Number of inputs .....	12 (3 per axis)
Control .....	Individual enable/disable, stop on input, prevent motion, find reference
Trigger inputs .....	
4 (one per axis) .....	4 (one per axis)
Maximum repetitive capture rate ..	100 Hz
Breakpoint outputs .....	
4 (one per axis), programmable polarity ..	4 (one per axis), programmable polarity
Maximum repetitive rate .....	100 Hz
Inhibit/enable output .....	
4 (one per axis), programmable polarity ..	4 (one per axis), programmable polarity
Analog inputs .....	
4, 12-bit resolution, $\pm 10$ V range, 25 $\mu$ s scan rate/enabled channel ..	4, 12-bit resolution, $\pm 10$ V range, 25 $\mu$ s scan rate/enabled channel
Analog outputs .....	
4, 16-bit resolution, $\pm 10$ V range ..	4, 16-bit resolution, $\pm 10$ V range

#### Digital I/O

Ports .....	4, 8-bit TTL ports, bit configurable, sink or source 24 mA outputs
Open-loop PWM outputs	
Number of PWM outputs .....	2, 50 kHz
Clock sources .....	Internal or external

#### Power Requirements

PCI and PXI	
+5 V ( $\pm 3\%$ ) .....	1 A
+12 V ( $\pm 3\%$ ) .....	30 mA
-12 V ( $\pm 10\%$ ) .....	30 mA
Power consumption .....	5.7 W, maximum

#### Physical

Dimensions (not including connectors)	
PCI .....	17.5 by 9.9 cm (6.9 by 3.9 in.)
PXI .....	16 by 10 cm (6.3 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 $^{\circ}$ C
Storage temperature .....	-20 to 70 $^{\circ}$ C
Relative humidity range .....	10 to 90% (noncondensing)

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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](http://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](http://ni.com/calibration).

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