

4-Axis Position (Pulse) Command Motion Controller

NI PCI-7390

- 4-axis motion controller with direct connectivity to Yaskawa Sigma II, Mitsubishi MR-J2S, and Panasonic Minas A drives
- Built-in optical isolation for protection against ground loops, spikes, and surges
- 8 DI, 8 DO general-purpose isolated 24 V digital lines
- Programmable velocity and acceleration parameters for trapezoidal and S-curve velocity profiles
- Position capture inputs and position compare outputs for I/O synchronization
- Easy application development with NI LabVIEW, NI Motion Assistant, C, and Visual Basic

Operating Systems

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

Recommended NI Software

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

Driver Software (included)

- NI-Motion



Overview

The NI PCI-7390 is a position (pulse) command stepper motion controller with isolation designed for use with drives that accept position (p-) command mode or step (pulse) command input. The PCI-7390 has accessories specifically designed for direct connectivity to Yaskawa Sigma II, Mitsubishi MR-J2S, and Panasonic Minas A drives. The PCI-7390 provides fully programmable motion control for up to four independent or coordinated axes of motion. It features dedicated motion I/O for limit and home switches and additional I/O for general-purpose functions such as in-position, inhibit input/drive alarm, and servo ready. You can use the PCI-7390 controller for point-to-point and straight-line vector moves. The PCI-7390 also performs arbitrary and complex motion trajectories through circular, spherical, or helical interpolation. The PCI-7390 uses quadrature encoders for position and velocity feedback (closed-loop only) and provides advanced encoder functions such as trigger (position capture) inputs and breakpoint (position compare) outputs.

Software

The PCI-7390 is shipped with the NI-Motion driver, which includes a VI library for NI LabVIEW software and functions for NI LabWindows/CVI, C, and Visual Basic. For other languages, you can execute all setup and motion control functions by calling into a dynamic link library (DLL). The NI-Motion VI library implements the full API, along with a useful set of example programs. The NI-Motion software also includes a series of example programs for use with ANSI C-based LabWindows/CVI. NI Motion Assistant offers a point-and-click interface for creating motion

control sequences quickly and easily. When you have created a motion task, you can use NI Motion Assistant to generate the task in LabVIEW or C code or code recipes to speed up development.

Hardware

The PCI-7390 is a high-performance controller that uses an advanced dual-processor architecture including a 32-bit CPU combined with a digital signal processor (DSP) and a custom field-programmable gate array (FPGA). The PCI-7390 uses the DSP for all closed-loop control and motion trajectory generation. The DSP chip is complemented by a custom FPGA that performs the high-speed encoder interfacing, position capture (trigger) input and position compare (breakpoint) output functions, motion I/O processing, and pulse generation for hard real-time functionality. The embedded CPU runs a multitasking, real-time OS and handles host communications, command processing, multi-axis interpolation, error handling, general-purpose digital I/O, and overall motion system integration functions.

The PCI-7390 also offers high-performance encoder features such as position capture triggers and position compare breakpoints for high-speed synchronization of motion with actuators, sensors, and other parts of the complete motion system. You can program a position compare output to transition when the associated encoder value equals the breakpoint position. You can use a breakpoint output to directly control actuators or as a trigger to synchronize data acquisition or other functions in the motion control system.

4-Axis Position (Pulse) Command Motion Controller

Feature	NI PCI-7390
Number of Axes	4
PAC Platforms	PCI
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 µs PID Rate	1
DIO Lines	8 input, 8 output
Maximum Step Output Rate/Encoder Input Rate	4 MHz/4 MHz
Programming API	NI-Motion Driver
Software	NI Motion Assistant, NI LabVIEW, C, Visual Basic

The 100-pin SCSI I/O connector provides all the signals for four axes of closed-loop motion control, including encoder feedback, limit and home inputs, breakpoint (position compare) outputs, trigger (position capture) inputs, inhibit (alarm) inputs, and in-position inputs. The connector also can provide shutdown (emergency stop) input, drive (servo) ready inputs, inhibit (drive enable) outputs, alarm clear outputs, and general-purpose inputs and outputs. All inputs and outputs are optically isolated.

The PCI-7390 incorporates the NI RTSI bus, which provides high-speed connectivity among National Instruments products, including image acquisition and data acquisition products. Using the RTSI bus, you can easily synchronize several functions to a common trigger or timing event across multiple motion, image, or data acquisition devices.

NI PCI-7390 100-Pin D-Sub Connector Pinout

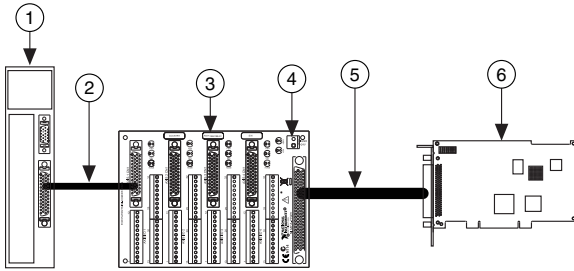
Isolated +5V OUT	50	100	Isolated +5V OUT
Isolated Ground	49	99	Isolated Ground
+24V IN	48	98	Axis 2 General-Purpose Output 0
General-Purpose Output Supply	47	97	Axis 3 General-Purpose Output 0
Axis 1 General-Purpose Output 0	46	96	Axis 4 General-Purpose Output 0
Axis 1 General-Purpose Output 1/Axis 1 Inhibit-Out*	45	95	Axis 3 General-Purpose Output 1/Axis 3 Inhibit-Out*
Axis 1 Encoder Phase A +	44	94	Axis 3 Encoder Phase A +
Axis 1 Encoder Phase A -	43	93	Axis 3 Encoder Phase A -
Axis 1 Encoder Phase B +	42	92	Axis 3 Encoder Phase B +
Axis 1 Encoder Phase B -	41	91	Axis 3 Encoder Phase B -
Axis 1 Index (Encoder Phase Z) +	40	90	Axis 3 Index (Encoder Phase Z) +
Axis 1 Index (Encoder Phase Z) -	39	89	Axis 3 Index (Encoder Phase Z) -
Isolated Ground	38	88	Isolated Ground
Axis 1 Step (CW) +	37	87	Axis 3 Step (CW) +
Axis 1 Step (CW) -	36	86	Axis 3 Step (CW) -
Axis 1 Dir (CCW) +	35	85	Axis 3 Dir (CCW) +
Axis 1 Dir (CCW) -	34	84	Axis 3 Dir (CCW) -
Axis 1 Breakpoint (Position Compare)	33	83	Axis 3 Breakpoint (Position Compare)
Axis 1 VI_COM	32	82	Axis 3 VI_COM
Axis 1 Trigger (Position Capture)	31	81	Axis 3 Trigger (Position Capture)
Axis 1 Forward Limit Switch	30	80	Axis 3 Forward Limit Switch
Axis 1 Reverse Limit Switch	29	79	Axis 3 Reverse Limit Switch
Axis 1 Home Switch	28	78	Axis 3 Home Switch
Axis 1 Inhibit-In (Alarm)	27	77	Axis 3 Inhibit-In (Alarm)
Axis 1 In-Position	26	76	Axis 3 In-Position
Axis 1 General-Purpose Input 0	25	75	Axis 3 General-Purpose Input 0
Axis 1 General-Purpose Input 1*/Axis 4 Drive (Servo) Ready	24	74	Axis 3 General-Purpose Input 1*/Axis 4 Drive (Servo) Ready
Isolated Ground	23	73	Isolated Ground
Axis 2 General-Purpose Output 1/Axis 2 Inhibit-Out*	22	72	Axis 4 General-Purpose Output 1/Axis 4 Inhibit-Out*
Axis 2 Encoder Phase A +	21	71	Axis 4 Encoder Phase A +
Axis 2 Encoder Phase A -	20	70	Axis 4 Encoder Phase A -
Axis 2 Encoder Phase B +	19	69	Axis 4 Encoder Phase B +
Axis 2 Encoder Phase B -	18	68	Axis 4 Encoder Phase B -
Axis 2 Index (Encoder Phase Z) +	17	67	Axis 4 Index (Encoder Phase Z) +
Axis 2 Index (Encoder Phase Z) -	16	66	Axis 4 Index (Encoder Phase Z) -
Isolated Ground	15	65	Isolated Ground
Axis 2 Step (CW) +	14	64	Axis 4 Step (CW) +
Axis 2 Step (CW) -	13	63	Axis 4 Step (CW) -
Axis 2 Dir (CCW) +	12	62	Axis 4 Dir (CCW) +
Axis 2 Dir (CCW) -	11	61	Axis 4 Dir (CCW) -
Axis 2 Breakpoint (Position Compare)	10	60	Axis 4 Breakpoint (Position Compare)
Axis 2 VI_COM	9	59	Axis 4 VI_COM
Axis 2 Trigger (Position Capture)	8	58	Axis 4 Trigger (Position Capture)
Axis 2 Forward Limit Switch	7	57	Axis 4 Forward Limit Switch
Axis 2 Reverse Limit Switch	6	56	Axis 4 Reverse Limit Switch
Axis 2 Home Switch	5	55	Axis 4 Home Switch
Axis 2 Inhibit-In (Alarm)	4	54	Axis 4 Inhibit-In (Alarm)
Axis 2 In-Position	3	53	Axis 4 In-Position
Axis 2 General-Purpose Input 0	2	52	Axis 4 General-Purpose Input 0
Axis 2 General-Purpose Input 1*/Axis 4 Drive (Servo) Ready	1	51	Axis 4 General-Purpose Input 1*/Axis 4 Drive (Servo) Ready

NI PCI-7390 100-Pin D-Sub Connector Pinout

4-Axis Position (Pulse) Command Motion Controller

Direct Connectivity to Yaskawa Sigma II Drives

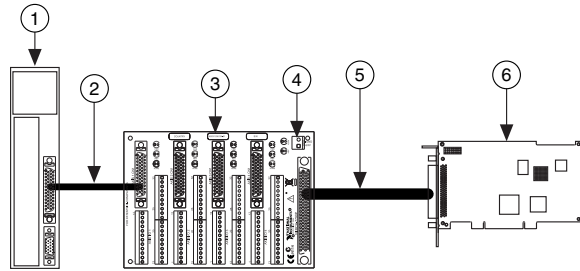
The NI MCA-7790Y accessory connects the PCI-7390 and Yaskawa Sigma II drives. To connect a Yaskawa drive to the PCI-7390, connect a 50-pin cable from the drive to the MCA-7790Y, an SCSI 100-pin cable (included) from the MCA-7790Y to the PCI-7390, and a 24 V power supply to the MCA-7790Y.



1. Yaskawa Sigma II Series Drive
2. 50-Pin Cable
3. NI MCA-7790Y
4. Power Supply Connection
5. SCSI 100-Pin Cable
6. NI PCI-7390

Direct Connectivity to Panasonic Minus A Drives

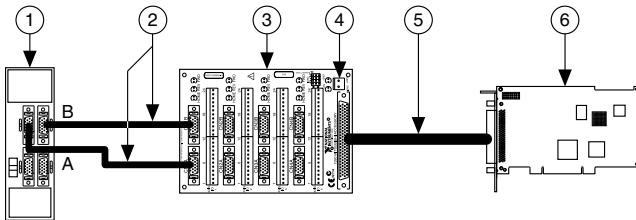
The NI MCA-7790P accessory connects the PCI-7390 and Panasonic Minus A drives. To connect a Panasonic drive to the PCI-7390, connect a 50-pin cable from the drive to the MCA-7790P, an SCSI 100-pin cable (included) from the MCA-7790P to the PCI-7390, and a 24 V power supply to the MCA-7790P.



1. Panasonic Minus A Series Drive
2. 50-Pin Cable
3. NI MCA-7790P
4. Power Supply Connection
5. SCSI 100-Pin Cable
6. NI PCI-7390

Direct Connectivity to Mitsubishi J2S Series Drives

The NI MCA-7790M accessory connects the PCI-7390 and Mitsubishi MR-J2S drives. To connect a Mitsubishi drive to the PCI-7390, connect two 20-pin cables from the drive to the MCA-7790M, an SCSI 100-pin cable (included) from the MCA-7790M to the PCI-7390, and a 24 V power supply to the MCA-7790M.



1. Mitsubishi MR-J2S Series Drive
2. 20-Pin Cables
3. NI MCA-7790M
4. Power Supply Connection
5. SCSI 100-Pin Cable
6. NI PCI-7390

Connectivity to Other Drives with Position (Pulse) Command Input

You can use the CB-100 kit to connect the PCI-7390 motion controller to other drives that accept a position (pulse) command input. Connect the PCI-7390 to the two CB-50 connector blocks with an R1005050 cable (terminal blocks and cable included in the CB-100 kit). Wire the drive to the screw terminals on the CB-50 connector blocks.

Ordering Information

NI PCI-7390.....779034-01

Accessories

NI MCA-7790Y kit (for Yaskawa drives)779611-01
 NI MCA-7790M kit (for Mitsubishi drives)779612-01
 NI MCA-7790P kit (for Panasonic drives).....779613-01
 CB-100 kit (for other drives)777812-01
 NI Motion Assistant778553-01
 20-pin cable 194466-02
 50-pin cable194604-02

BUY NOW!

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to ni.com/info and enter **pci7390**.

4-Axis Position (Pulse) Command Motion Controller

Specifications

Performance

Trajectory update rate range	62.5 to 500 μ s/sample
Maximum update rate	62.5 μ s/axis
4-axis update rate	250 μ s total
Multiaxis synchronization	<1 update period
Trajectory parameters	
Absolute position range	$\pm 2^{31}$ steps
Maximum relative move size	$\pm 2^{31}$ steps
S-curve time range	1 to 32,767 samples
Following error range	1 to 32,767 counts
Velocity range	1 to 4,000,000 steps/s
Acceleration/deceleration	244 to 512,000,000 steps/s ² at a PID update rate of 250 μ s
Stepper outputs	
Maximum pulse rate	4 MHz (full, half, and microstep)
Minimum pulse width	50 ns at 4 MHz
Step output mode	Step and direction or CW/CCW
Voltage range	0 to 5 V optically isolated

System Reset

Watchdog timer function	Resets board to startup state
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Motion I/O

Quadrature encoder inputs		
Maximum count rate	4 MHz quadrature	
Forward, reverse, and home inputs		
Number of inputs	12 (3 per axis)	
Control	Individual enable/disable, stop on input, prevent motion, find reference	
Trigger (position capture) inputs		4 (one per axis)
Maximum repetitive capture rate ..	100 Hz	
Breakpoint (position compare) outputs..		4 (one per axis)
Maximum repetitive rate	100 Hz	

Digital I/O

Inputs	8, sinking or sourcing
Outputs	8, sinking or sourcing

Bus Power Requirements

+5 V ($\pm 5\%$)	600 mA maximum
+12 V ($\pm 5\%$)	50 mA maximum

Physical Characteristics

Dimensions	17.8 by 9.9 cm (7.03 by 3.9 in.)
Motion I/O connector	100-pin SCSI

Environment

Operating temperature	0 to 55 $^{\circ}$ C
Storage temperature	-20 to 70 $^{\circ}$ C
Relative humidity	10 to 90%, noncondensing

NI Services and Support



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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.

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