

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

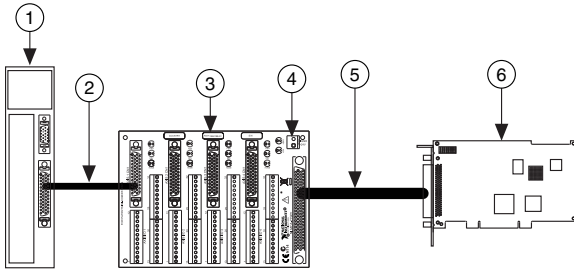
NI PCI-7390 100-Pin D-Sub Connector Pinout

BUY ONLINE at ni.com or CALL 800 813 3693 (U.S.)

4-Axis Position (Pulse) Command Motion Controller

Direct Connectivity to Yaskawa Sigma II Drives

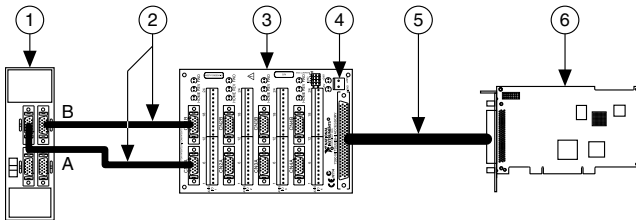
The NI MCA-7790Y accessory connects the PCI-7390 and Yaskawa Sigma II drives. To connect a Yaskawa drive to the PCI-7390, connect a 50-pin cable from the drive to the MCA-7790Y, an SCSI 100-pin cable (included) from the MCA-7790Y to the PCI-7390, and a 24 V power supply to the MCA-7790Y.



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 Mitsubishi J2S Series Drives

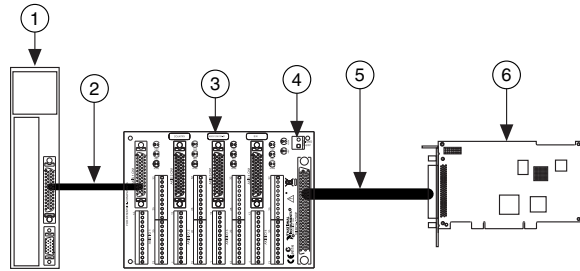
The NI MCA-7790M accessory connects the PCI-7390 and Mitsubishi MR-J2S drives. To connect a Mitsubishi drive to the PCI-7390, connect two 20-pin cables from the drive to the MCA-7790M, an SCSI 100-pin cable (included) from the MCA-7790M to the PCI-7390, and a 24 V power supply to the MCA-7790M.



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

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

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**.

BUY ONLINE at ni.com or CALL 800 813 3693 (U.S.)

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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