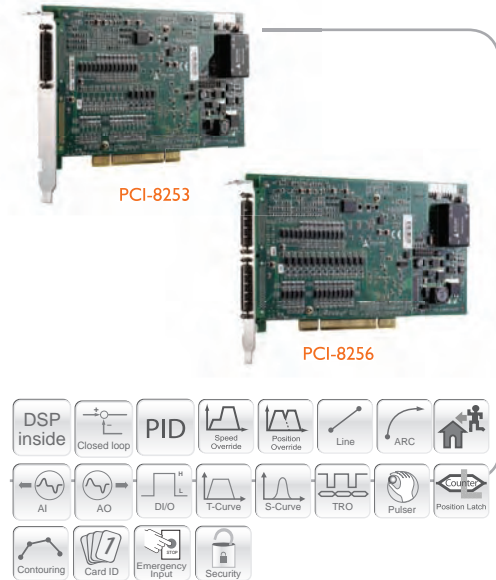


PCI-8253 / PCI-8256

DSP-based 3/6-axis Analog Motion Control Cards



Features

- 32-bit PCI bus, Rev. 2.2, 33 MHz
- On-board 250 MHz DSP
- 3/6 axes of ± 10 volts analog command for controlling servo motors by differential command signal
- Maximum servo update rate is less than 300 μ s for 6 axes
- Built-in PID with feed-forward gain closed loop control algorithm – reducing the following error
- Available with 3/6 encoders – providing up to 6 axes of closed-loop control, support EA/EB and index interface
- Encoder feedback frequency up to 20 MHz
- Digital filter for encoder input to reduce noise disturbance
- 1/2 channel up to 1 MHz high speed trigger pulse output for PCI-8253/PCI-8256
- A/D inputs (3/6 channels, 14-bit, ± 10 V)
- Manual pulse generator interface
- 4-bit board ID for multiple boards indexing
- One dedicated emergency input pin
- High speed position latch function via ORG and Index signals
- On-board 512 kb flash ROM for motion kernel and non-volatile data – PID parameters
- Programmable interrupt source control to host PC
- Dedicated motion I/O for per axis
- General purpose I/O: 4DI/4DO for PCI-8253 and 8DI/8DO for PCI-8256
- Watch dog timer for safety control
- Support for up to 16 cards in one system
- ADLINK Softmotion DSP provides comprehensive trajectory control functions:
 - Jogging mode
 - Any 2-4 axes linear interpolation
 - Any 2 axes circular interpolation
 - Multi-axis synchronized motion
 - Trapezoidal, S-curve velocity profile
 - Position override & speed override in anytime
 - Programmable acceleration/deceleration
 - Variety of homing modes via ORG and index signals
 - Linear and FIFO position comparison method for high speed trigger output
 - E-gear (Electronic gear) and ECAM (Electronic CAM)
 - Contouring function by point table description
 - Gantry mode
 - Ring counter (32-bit) for rotatory encoder input
 - Motion trajectory & PID parameters can be changed on-the-fly

Specifications

Analog Input / Output Channels

■ Number of Channels	3 for PCI-8253; 6 for PCI-8256
■ Analog Output	± 10 Volt with 16-bit D/A Converter
■ Analog Input	± 10 Volt with 14-bit A/D Converter

Encoder Input Channels

■ Number of Channels	3 for PCI-8253; 6 for PCI-8256
■ Max. Encoder Input Frequency	20 MHz under 4 x AB mode
■ Encoder Counter	6, 32-bit
■ Pulse Command Type	AB phase and CW/CCW modes

Trigger Channels

■ Number of High speed Channels	1 for PCI-8253; 2 for PCI-8256
■ Number of Low Speed Channels	1 for PCI-8253; 2 for PCI-8256
■ Maximum Trigger Pulse Frequency	1 MHz for high speed trigger; 25 KHz for low speed trigger
■ Trigger Pulse Width	0.3 μ s to 300 ms

Motion I/O Interface Signals

■ I/O Pins	Differential and 2500 VRMS, optically isolated
■ Incremental Encoder Signals Input Pin	EA and EB
■ Encoder Index Signal Input	EZ
■ Mechanical Limit Switch Signal Input Pins	\pm EL and ORG
■ Servomotor Interface I/O Pin	INP, ALM, ERC, SVON, RDY
■ Position Compare Output Pin	CMP

General Purpose I/O

■ Digital Input	8-CH isolated digital input
■ Input Voltage	0 to 24 V
■ Input Resistance	2.4 K Ω @ 0.5 W
■ Digital Output	8-CH isolated digital output
■ Output Voltage	5 V (min.); 35 V (max.)
■ Output Type	NPN open collector Darlington transistors
■ Current Sink	90 mA

Analog Input (A/D)

■ Resolution	12-bit
■ Input Channel	4 single-ended
■ Input Range	± 10 V, bipolar
■ Conversion Time	8 μ s
■ Sampling Rate	110 K samples/sec (Max.)
■ Accuracy	0.01% of FSR, ± 1 LSB

General Specifications

■ Connectors	68-pin SCSI-type connector
■ Operating Temperature	0 $^{\circ}$ C to +55 $^{\circ}$ C
■ Storage Temperature	+20 $^{\circ}$ C to +80 $^{\circ}$ C
■ Humidity	5% to 95%, non-condensing

Software Support

Windows[®] Platform

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments:
Visual Basic, Visual C++, Borland C++ Builder, and Delphi

MotionCreatorPro 2[™]

MotionCreatorPro 2[™] is a Windows-based application development software package included with the PCI-8253/PCI-8256. MotionCreatorPro 2[™] is useful for debugging a motion control system during the design phase of a project. An on-screen display lists all installed axes information and I/O signal status of the PCI-8253/PCI-8256. By using this utility, you can easily tune the axis parameter servo gain (PID plus feed forward gain) reducing the efforts on gain tuning. Furthermore, the sampling windows makes more accurate in motion data analysis, moreover, integrates with axis parameter and PID gain on-the-fly change, thus, the PCI-8253/PCI-8256 provides precise positioning control with less effort.



Ordering Information

- **PCI-8253**
DSP-based 3-axis analog motion control card
- **PCI-8256**
DSP-based 6-axis analog motion control card

Accessories

Terminal Board

- **DIN-825-J3A0**
Terminal board for Mitsubishi MR-J3S-A servo amplifiers
- **DIN-685-01**
Terminal board with 68-pin SCSI-II connector with DIN socket

Cabling

- **ACL-10568-1**
See Section 12, Accessories

Introduction

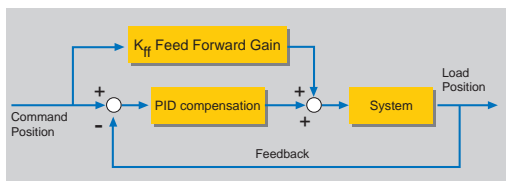
DSP-based Analog Motion Controller

The PCI-8253/PCI-8256 controllers combine a 250 MHz 32-bit MIPS processor, 12,000 logic element FPGA (Field Programmable Gate Array), I/O buffering circuitry, ADLINK softmotion, and motion control characterization software to control the position/velocity of as many as six ± 10 V analog command servo axes.

ADLINK Softmotion

PCI-8253/PCI-8256 leverages ADLINK softmotion technology, 250 MHz DSP and 20 MHz encoder rate to meet faster servo update rate up to 50 μs/axis and control requirement in real application. PCI-8253/PCI-8256 not only realizes the gantry control with closed-loop and error handling, but also adopts the feed-forward gain to reduce speed profile following error to meet precise velocity and position control.

PID Control Plus Feed Forward G



Pin Assignment

SPI (PCI-8253 & PCI-8256)

No.	Name	I/O	Function of Axis	No.	Name	I/O	Function of Axis
1	AOUT1+	O	Analog output (+),(1)	35	AOUT1-	O	Analog output (-),(1)
2	AOUT2+	O	Analog output (+),(2)	36	AOUT2-	O	Analog output (-),(2)
3	AOUT3+	O	Analog output (+),(3)	37	AOUT3-	O	Analog output (-),(3)
4	AGND	SG	Analog ground	38	AGND	SG	Analog ground
5	AIN1	I	Analog input, (1)	39	AGND	SG	Analog ground
6	AIN2	I	Analog input, (2)	40	Rsv.	-	Reserved
7	AIN3	I	Analog input, (3)	41	Rsv.	-	Reserved
8	EA1+	I	Encoder A-phase (+),(1)	42	EA1-	I	Encoder A-phase (-),(1)
9	EB1+	I	Encoder B-phase (+),(1)	43	EB1-	I	Encoder B-phase (-),(1)
10	EZ1+	I	Encoder Z-phase (+),(1)	44	EZ1-	I	Encoder Z-phase (-),(1)
11	ALM1	I	Servo alarm,(1)	45	ORG1	I	Home limit, (1)
12	SVON1	O	Servo-ON, (1)	46	PEL1	I	Positive limit, (1)
13	ZSP1	I	ZeroSpeed 1	47	MEL1	I	Negative limit, (1)
14	TRG1+	O	Trigger Output, +(1)	48	TRG1-	O	Trigger Output, -(1)
15	TRG2+	O	Trigger Output, +(2)	49	TRG2-	O	Trigger Output, -(2)
16	EA2+	I	Encoder A-phase (+),(2)	50	EA2-	I	Encoder A-phase (-),(2)
17	EB2+	I	Encoder B-phase (+),(2)	51	EB2-	I	Encoder B-phase (-),(2)
18	EZ2+	I	Encoder Z-phase (+),(2)	52	EZ2-	I	Encoder Z-phase (-),(2)
19	DOCOM	-	Digital output common	53	DICOM	-	Digital input common
20	ALM2	I	Servo alarm, (2)	54	ORG2	I	Home limit, (2)
21	SVON2	O	Servo-ON, (2)	55	PEL2	I	Positive limit, (2)
22	ZSP2	I	ZeroSpeed 2	56	MEL2	I	Negative limit, (2)
23	EA3+	I	Encoder A-phase (+),(3)	57	EA3-	I	Encoder A-phase (-),(3)
24	EB3+	I	Encoder B-phase (+),(3)	58	EB3-	I	Encoder B-phase (-),(3)
25	EZ3+	I	Encoder Z-phase (+),(3)	59	EZ3-	I	Encoder Z-phase (-),(3)
26	ALM3	I	Servo alarm,(3)	60	ORG3	I	Home limit, (3)
27	SVON3	O	Servo-ON, (3)	61	PEL3	I	Positive limit, (3)
28	ZSP3	I	ZeroSpeed 3	62	MEL3	I	Negative limit, (3)
29	DOCOM	-	Digital output common	63	IEMG	I	Emergency Stop
30	DOCOM	-	Digital output common	64	DICOM	-	Digital input common
31	EDO1	O	Digital Output, (1)	65	EDI1	I	Digital Input, (1)
32	EDO2	O	Digital Output, (2)	66	EDI2	I	Digital Input, (2)
33	EDO3	O	Digital Output, (3)	67	EDI3	I	Digital Input, (3)
34	EDO4	O	Digital Output, (4)	68	EDI4	I	Digital Input, (4)

SP2 (PCI-8256 only)

No.	Name	I/O	Function of Axis	No.	Name	I/O	Function of Axis
1	AOUT4+	O	Analog output (+),(4)	35	AOUT4-	O	Analog output (-),(4)
2	AOUT5+	O	Analog output (+),(5)	36	AOUT5-	O	Analog output (-),(5)
3	AOUT6+	O	Analog output (+),(6)	37	AOUT6-	O	Analog output (-),(6)
4	AGND	SG	Analog ground	38	AGND	SG	Analog ground
5	AIN4	I	Analog input, (4)	39	AGND	SG	Analog ground
6	AIN5	I	Analog input, (5)	40	Rsv.	-	Reserved
7	AIN6	I	Analog input, (6)	41	Rsv.	-	Reserved
8	EA4+	I	Encoder A-phase (+),(4)	42	EA4-	I	Encoder A-phase (-),(4)
9	EB4+	I	Encoder B-phase (+),(4)	43	EB4-	I	Encoder B-phase (-),(4)
10	EZ4+	I	Encoder Z-phase (+),(4)	44	EZ4-	I	Encoder Z-phase (-),(4)
11	ALM4	I	Servo alarm, (4)	45	ORG4	I	Home limit, (4)
12	SVON4	O	Servo-ON, (4)	46	PEL4	I	Positive limit, (4)
13	ZSP4	I	ZeroSpeed 4	47	MEL4	I	Negative limit, (4)
14	TRG3+	O	Trigger Output, +(3)	48	TRG3-	O	Trigger Output, -(3)
15	TRG4+	O	Trigger Output, +(4)	49	TRG4-	O	Trigger Output, -(4)
16	EA5+	I	Encoder A-phase (+),(5)	50	EA5-	I	Encoder A-phase (-),(5)
17	EB5+	I	Encoder B-phase (+),(5)	51	EB5-	I	Encoder B-phase (-),(5)
18	EZ5+	I	Encoder Z-phase (+),(5)	52	EZ5-	I	Encoder Z-phase (-),(5)
19	DOCOM	-	Digital output common	53	DICOM	-	Digital input common
20	ALM5	I	Servo alarm,(5)	54	ORG5	I	Home limit, (5)
21	SVON5	O	Servo-ON, (5)	55	PEL5	I	Positive limit, (5)
22	ZSP5	I	ZeroSpeed 5	56	MEL5	I	Negative limit, (5)
23	EA6+	I	Encoder A-phase (+),(6)	57	EA6-	I	Encoder A-phase (-),(6)
24	EB6+	I	Encoder B-phase (+),(6)	58	EB6-	I	Encoder B-phase (-),(6)
25	EZ6+	I	Encoder Z-phase (+),(6)	59	EZ6-	I	Encoder Z-phase (-),(6)
26	ALM6	I	Servo alarm,(6)	60	ORG6	I	Home limit, (6)
27	SVON6	O	Servo-ON, (6)	61	PEL6	I	Positive limit, (6)
28	ZSP6	I	ZeroSpeed 6	62	MEL6	I	Negative limit, (6)
29	DOCOM	-	Digital output common	63	Rsv.	-	Reserved
30	DOCOM	-	Digital output common	64	DICOM	-	Digital input common
31	EDO5	O	Digital Output, (5)	65	EDI5	I	Digital Input, (5)
32	EDO6	O	Digital Output, (6)	66	EDI6	I	Digital Input, (6)
33	EDO7	O	Digital Output, (7)	67	EDI7	I	Digital Input, (7)
34	EDO8	O	Digital Output, (8)	68	EDI8	I	Digital Input, (8)