PCI-9221/9222/9223

16/32-CH 16-Bit 250/500 kS/s Multi-Function DAQ Cards with Encoder Input

PCI-9222/9223

PCI-9221

NEW

PCI CONVENTIONAL

Introduction

The PCI-9221/9222/9223 are ADLINK's next-generation high performance DAQ cards. PCI-9221/9222/9223 are 16-bit, 16/32-CH, 250/500 kS/s multi-function DAQ cards with 4/8 different input ranges. They also feature 2-CH 16-bit simultaneous analog outputs and programmable function I/O. The software-programmable function I/O supports a variety of applications, including TTL digital I/O, high-speed DIO (PCI-9222/9223 only), general-purpose timer/counter, pulse generation, encoder input, and PWM output. Analog input, analog output, and function I/O can operate at full speed simultaneously. For the PCI-9222/9223, multiple cards can be synchronized through the SSI (System Synchronization Interface) bus if more channels are needed. Ideal for mixed-signal tests, laboratory research, and factory automation, the PCI-9221/9222/9223 are the best single-board solutions on the market providing the best integration capability of multiple tasks with high performance and an affordable price.

Features

- Supports a 32-bit 3.3 V or 5 V PCI bus
- Programmable gains for analog input: 1, 2, 4, 5, 8, 10, 20, 40 (PCI-9222/9223) 1, 5, 10, 25 (PCI-9221)
- 2-CH 16-bit simultaneous analog outputs, up to 1 MS/s analog output update rate (PCI-9222/9223)
- Programmable function I/O, supporting modes:
  - TTL DI and TTL DO
  - 2 MHz High-Speed DIO (PCI-9222/9223 only)
  - General-purpose timer/counter
  - PWM outputs
  - Encoder inputs
- Dedicated 2-CH 4 MHz encoder inputs, supporting AB phase, and CW/CCW (PCI-9222/9223)
- Dedicated DMA channels for A/D, D/A, and high-speed DIO (PCI-9222/9223)
- External digital trigger for A/D, D/A, and high-speed DIO (PCI-9222/9223)
- Multiple card synchronization through SSI (System Synchronization Interface) bus (PCI-9222/9223)
- Auto-calibration

Operating Systems
- Windows Vista/XP/2000/2003
- Linux

Recommended Software
- AD-Logger
- VB.NET/VC.NET/VB/VC++/BCB/Delphi
- DAQBench

Driver Support
- DAQPilot for Windows
- DAQPilot for LabVIEW™
- DAQ-MTLB for MATLAB®
- D2K-DASK for Windows
- D2K-DASK/X for Linux

Terminal Boards

DIN-68S-01 (for PCI-9222/9223)
Terminal Board with One 68-pin SCSI-II Connector and DIN-Rail Mounting (Cables are not included. For more information on mating cables, refer to Section 12, Accessories.)

TB-9221-01 (for PCI-9221)
General-purpose Terminal Board with One 37-pin D-Sub Connector. Supports Differential to Single-ended Encoder Signal Conversion of PCI-9221's Function I/O Through Jumper Switching. (Cables are not included.)

DIN-37D-01 (for PCI-9221)
Terminal Board with One 37-pin D-sub Connector and DIN-Rail Mounting (Cables are not included.)

## SSI Bus Cables (for PCI-9222/9223) (for multiple cards synchronization)

- **ACL-SSI-2**
  SSI Bus cable for two devices
- **ACL-SSI-3**
  SSI Bus cable for three devices
- **ACL-SSI-4**
  SSI Bus cable for four devices

Ordering Information

- **PCI-9222**
  16-CH 16-bit 250 kS/s Multi-Function DAQ Card with Encoder Input

- **PCI-9223**
  32-CH 16-bit 500 kS/s Multi-Function DAQ Card with Encoder Input

- **PCI-9221**
  16-Bit Multi-Function DAQ Card with 2-CH Encoder Input

SSI bus cable for multiple cards synchronization for DAQ/DAQe-2000 series
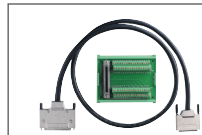
Terminal board DIN-68S-01 & 68-Pin SCSI-VHDCI cable ACL-10568-1

TB-9221-01

Pin Assignment

CN1 pin assignment for PCI-9223

AI0(AIH0)	34	68	AI16(AIL0)
AI1(AIH1)	33	67	AI17(AIL1)
AI2(AIH2)	32	66	AI18(AIL2)
AI3(AIH3)	31	65	AI19(AIL3)
AI4(AIH4)	30	64	AI20(AIL4)
AI5(AIH5)	29	63	AI21(AIL5)
AI6(AIH6)	28	62	AI22(AIL6)
AI7(AIH7)	27	61	AI23(AIL7)
AGND	26	60	AISENSE
AI8(AIH8)	25	59	AI24(AIL8)
AI9(AIH9)	24	58	AI25(AIL9)
AI10(AIH10)	23	57	AI26(AIL10)
AI11(AIH11)	22	56	AI27(AIL11)
AI12(AIH12)	21	55	AI28(AIL12)
AI13(AIH13)	20	54	AI29(AIL13)
AI14(AIH14)	19	53	AI30(AIL14)
AI15(AIH15)	18	52	AI31(AIL15)
AGND	17	51	AGND
AO0	16	50	AGND
AO1	15	49	AGND
NC	14	48	NC
NC	13	47	NC
NC	12	46	NC
NC	11	45	NC
NC	10	44	NC
NC	9	43	NC
NC	8	42	NC
NC	7	41	NC
NC	6	40	NC
NC	5	39	NC
NC	4	38	NC
NC	3	37	NC
NC	2	36	NC
NC	1	35	NC

CN1 pin assignment for PCI-9222

AI0(AIH0)	34	68	AI8(AIL0)
AI1(AIH1)	33	67	AI9(AIL1)
AI2(AIH2)	32	66	AI10(AIL2)
AI3(AIH3)	31	65	AI11(AIL3)
AI4(AIH4)	30	64	AI12(AIL4)
AI5(AIH5)	29	63	AI13(AIL5)
AI6(AIH6)	28	62	AI14(AIL6)
AI7(AIH7)	27	61	AI15(AIL7)
AGND	26	60	AISENSE
NC	25	59	NC
NC	24	58	NC
NC	23	57	NC
NC	22	56	NC
NC	21	55	NC
NC	20	54	NC
NC	19	53	NC
NC	18	52	NC
AGND	17	51	AGND
AO0	16	50	AGND
AO1	15	49	AGND
NC	14	48	NC
NC	13	47	NC
NC	12	46	NC
NC	11	45	NC
NC	10	44	NC
NC	9	43	NC
NC	8	42	NC
NC	7	41	NC
NC	6	40	NC
NC	5	39	NC
NC	4	38	NC
NC	3	37	NC
NC	2	36	NC
NC	1	35	NC

CN2 pin assignment for PCI-9222/9223

GP0/GPTC_CLK0	34	68	GP8/GPTC_CLK2
GP1/GPTC_UD0	33	67	GP9/GPTC_UD2
GP2/GPTC_GATE0	32	66	GP10/GPTC_GATE2
GP3/GPTC_AUX0	31	65	GP11/GPTC_AUX2
GP4/GPTC_CLK1	30	64	GP12/GPTC_CLK3
GP5/GPTC_UD1	29	63	GP13/GPTC_UD3
GP6/GPTC_GATE1	28	62	GP14/GPTC_GATE3
GP7/GPTC_AUX1	27	61	GP15/GPTC_AUX3
DGND	26	60	DGND
GPO0/GPTC_OUT0	25	59	GPO8
GPO1/GPTC_OUT1	24	58	GPO9
GPO2/GPTC_OUT2	23	57	GPO10
GPO3/GPTC_OUT3	22	56	GPO11
GPO4	21	55	GPO12
GPO5	20	54	GPO13
GPO6	19	53	GPO14
GPO7	18	52	GPO15
DGND	17	51	DGND
DGND	16	50	DGND
DGND	15	49	DGND
+5Vout	14	48	DGND
NC	13	47	NC
NC	12	46	NC
NC	11	45	NC
NC	10	44	NC
E24V	9	43	NC
EGND	8	42	NC
IEA0+	7	41	IEA1+
IEA0-	6	40	IEA1-
IEB0+	5	39	IEB1+
IEB0-	4	38	IEB1-
IEZ0+	3	37	IEZ1+
IEZ0-	2	36	IEZ1-
IORG0	1	35	IORG1

CN1 pin assignment For PCI-9221

GPO2	1	20	GPO3
DGND	2	21	GPO1/GPTC_OUT1
GPO0/GPTC_OUT0	3	22	GP7/IORG1/GPTC_AUX1
GP6/EZ1/GPTC_GATE1	4	23	DGND
GP5/EB1/GPTC_UD1	5	24	GP4/EA1/GPTC_CLK1
GP3/IORG0/GPTC_AUX0	6	25	GP2/EZ0/GPTC_GATE0
GP1/EB0/GPTC_UD0	7	26	GP0/EA0/GPTC_CLK0
GP0/EA0/GPTC_CLK0	8	27	AO1
AGND	9	28	AO0
AGND	10	29	AI15(AIL7)
AI7(AIH7)	11	30	AI14(AIL6)
AI6(AIH6)	12	31	AI13(AIL5)
AI5(AIH5)	13	32	AI12(AIL4)
AI4(AIH4)	14	33	AISENSE
AGND	15	34	AI11(AIL3)
AI3(AIH3)	16	35	AI10(AIL2)
AI2(AIH2)	17	36	AI9(AIL1)
AI1(AIH1)	18	37	AI8(AIL0)
AI0(AIH0)	19		

Specifications

Model Name	PCI-9221	PCI-9222	PCI-9223
Analog Input			
Resolution	16 bits		
Number of channels	16 SE/ 8 DIFF	16 SE/ 8 DIFF	32 SE/ 16 DIFF
Maximum sampling rate (single channel)	250 kS/s	250 kS/s	500 kS/s
Programmable gain	1, 5,10, 25	1, 2, 4, 5, 8, 10, 20, 40	1, 2, 4, 5, 8, 10, 20, 40
Input range	±5 V, ±1 V, ±500 mV, ±200 mV	±10 V, ±5 V, ±2.5 V, ±2 V, ±1.25 V, ±1 V, ±500 mV, ±250 mV	±10 V, ±5 V, ±2.5 V, ±2 V, ±1.25 V, ±1 V, ±500 mV, ±250 mV
Offset error	±2.6 mV typical, before calibration, ±0.5 mV typical, after calibration		
Gain error	±0.2% of FSR, before calibration, ±0.015% of FSR, after calibration		
-3 dB small signal bandwidth (gain=1)	1.8 MHz	1.5 MHz	1.5 MHz
System noise (gain=1)	0.1 mV$_{RMS}$	0.5 mV$_{RMS}$	0.5 mV$_{RMS}$
CMRR (gain=1)	71 dB	93.5 dB	93.5 dB
SFDR (Spurious-free dynamic range, gain=1)	95 dB	95 dB	88 dB
SINAD (Signal-to-noise and distortion ratio, gain=1)	85 dB	86 dB	84 dB
THD (Total harmonic distortion, gain=1)	-93 dB	-94 dB	-90 dB
SNR (Signal-to-noise ratio, gain=1)	86 dB	87 dB	86 dB
ENOB (gain=1)	13.5 bits	13.9 bits	13.5 bits
FIFO buffer size	1 k samples		
Trigger sources	Software, external digital	Software, external digital, SSI	Software, external digital, SSI
Trigger mode	Post trigger	Post trigger, retrigger, gate trigger	Post trigger, retrigger, gate trigger
External conversion source	Yes (up to 250 kS/s)	Yes (up to 250 kS/s)	Yes (up to 500 kS/s)
Input coupling	DC		
Overvoltage protection	±10 V	Continuous ±30 V	Continuous ±30 V
Input impedance	High impedance > 1 GΩ		
Data Transfer	Programmed I/O, Interrupt, Bus Mastering DMA		
Analog Output			
Number of channels	2 voltage outputs		
Resolution	16-bit		
Maximum update rate	1.25 kS/s (static)	1 MHz (simultaneous update)	1 MHz (simultaneous update)
FIFO	-	512	512
Output range	±5 V	±10 V	±10 V
Output driving capacity	±5 mA		
Slew rate	0.014 V/µs	20 V/µs	20 V/µs
Setting time (0.1% of full scale)	1396 µs	2.6 µs	2.6 µs
Offset error	±1 mV	±0.1 mV	±0.1 mV
Gain error	±2 mV	±0.1 mV	±0.1 mV
Rising time	390 µs	0.67 µs	0.67 µs
Falling time	395 µs	0.705 µs	0.705 µs
Function I/O			
Mode	Digital I/O[1] , General Timer/Counter[1], Pulse Generation[1]	Digital I/O, General Timer/Counter, Pulse Generation	Digital I/O, General Timer/Counter, Pulse Generation
Digital I/O	8DI/4DI (5 V TTL level)	16 DO (3.3 V TTL Level) / 16 DI (3.3 V or 5 V TTL Level)	16 DO (3.3 V TTL Level) 16 DI (3.3 V or 5 V TTL Level)
General Timer/Counter	Two 32-bit, Base clock: 40 MHz, external to 10 MHz	Four 32-bit, Base clock: 80 MHz, external to 10 MHz	Four 32-bit, Base clock: 80 MHz, external to 10 MHz
Pulse generation	Two PWM outputs (Modulation frequency: 0.005 Hz to 5 MHz; Duty cycle: 1%-99%)	Four PWM outputs (Modulation frequency: 0.01 Hz to 5 MHz; Duty cycle: 1%-99%)	Four PWM outputs (Modulation frequency: 0.01 Hz to 5 MHz; Duty cycle: 1%-99%)
Encoder Input			
Number of channels	2[2]		
Encoder type	CW/CCW encoder, x 1 AB phase encoder, x 2 AB phase encoder, x 4 AB phase encoder		
General specs.			
PCI Bus	5 V and 3.3 V universal PCI bus		
Auto-calibration	Yes		
I/O Connector	One 37-pin D-Sub connector	Two 68-pin SCSI-VHDCI female	Two 68-pin SCSI-VHDCI female
Operation temperature	0 to 45°C	0 to 55°C	0 to 55°C
Storage temperature	-20 to 80°C	-20 to 70°C	-20 to 70°C
Humidity	5 to 95% non-condensing		
Power requirements	+5 V 1A typical, +12 V 100mA typical, -12 V 100mA typical	+5 V 1.2 A typical +12 V 760 mA typical -12 V 50 mA typical	+5 V 1.2 A typical +12 V 760 mA typical -12 V 50 mA typical
Dimensions	120 mm x 87 mm	175 mm x 107 mm (not including connectors)	175 mm x 107 mm (not including connectors)

Note:

(1) The function I/O and encoder inputs share the same I/O pins of the PCI-9221. Only one of these modes can be selected.

(2) Dedicated

1 DAQ
2 PXI
3 Modular Instruments
4 GPIB & Bus Expansion
5 PAC
6 Motion
7 Distributed I/O
8 Serial Comm
9 Vision
10 Software & Utilities
11 cPCI & Industrial Systems
12 Accessories