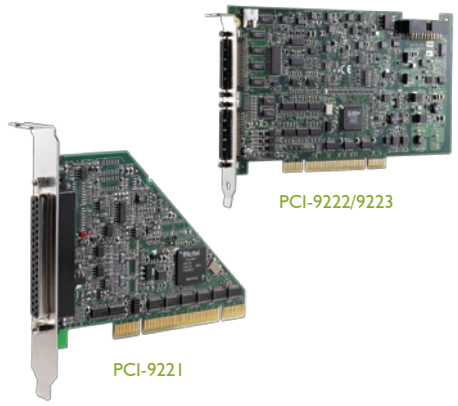
PCI-9221/9222/9223

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



Introduction

The PCI-9221/9222/9223 are ADLINK's 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 7/Vista/2000/XP/Server 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 & Cables

DIN-68S-01 (for PCI-9222/9223)

Terminal Board with One 68-pin SCSI-II Connector and DIN-Rail Mounting (Cables are not included.)

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.)

ACL-10568-1 (for PCI-9222/9223)

68-pin SCSI-VHDCI cable (mating with AMP-787082-7), 1 M

ACL-10137-1MM (for PCI-9221)

37-pin D-sub male/male cable, 1 M

*** For more information on mating cables, please refer to P2-59/60.**

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

ACL-SSI-2/3/4

SSI Bus cable for two, three, and 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

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	AI29AIL13)
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

GPI0/GPTC_CLK0	34	68	GPI8/GPTC_CLK2
GPI1/GPTC_UD0	33	67	GPI9/GPTC_UD2
GPI2/GPTC_GATE0	32	66	GPI10/GPTC_GATE2
GPI3/GPTC_AUX0	31	65	GPI11/GPTC_AUX2
GPI4/GPTC_CLK1	30	64	GPI12/GPTC_CLK3
GPI5/GPTC_UD1	29	63	GPI13/GPTC_UD3
GPI6/GPTC_GATE1	28	62	GPI14/GPTC_GATE3
GPI7/GPTC_AUX1	27	61	GPI15/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	GPI1/ORG1/GPTC_AUX1
GPI6/EZ1/GPTC_GATE1	4	23	DGND
GPI5/EB1/GPTC_UD1	5	24	GPI4/EA1/GPTC_CLK1
GPI3/ORG0/GPTC_AUX0	6	25	GPI2/EI0/GPTC_GATE0
DGND	7	26	GPI1/EB0/GPTC_UD0
GPI0/EA0/GPTC_CLK0	8	27	AO1
AOGND	9	28	AO0
AIGND	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
AIGND	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 Specifications			
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