

USB/PCIe/PXIe-5500 Series

Family of Multi-functional Data Acquisition Boards



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Overview

The USB/PCIe/PXIe-5500 Series is a family of multifunction data acquisition boards, which can run on PCIe, PXIe, TXI (Thunderbolt) and USB buses.

Depending on the model number, a 5500 series provide different AI channels, AO channels, sampling rate. USB 5500 Series only supports USB 3.0 bus mode.

Main Features

- 32 single-ended or 16 differential 18-bit analog input channels
- 18 bits ADC
- 7 voltage ranges:
 $\pm 10V/\pm 5V/\pm 2V/\pm 1V/\pm 0.5V/\pm 0.2V/\pm 0.1V$
- 64M samples FIFO buffer for analog input
- 4 simultaneous 16-bit analog output channels
- 32M sample FIFO buffer for analog output
- 6 ports digital IO, 8 channels per port
- 4 general 32-bit timer/counter
- DMA for analog input and output
- Analog/Digital/Software Trigger



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Hardware Specifications

Analog Input Specifications

Analog Input	5510	5511	5515	5516
Number of channels	32 SE / 16 DIFF		16 SE / 8 DIFF	
ADC resolution (Bits)	18			
Single channel maximum sample rate	2M Sample/s	1.25M Sample/s	2M Sample/s	1.25M Sample/s
Multichannel maximum sample rate (aggregate)	1M Sample/s	625K Sample/s	1M Sample/s	625K Sample/s
Clock	100 MHz			
Input range(V)	$\pm 10/\pm 5/\pm 2/\pm 1/\pm 0.5/\pm 0.2/\pm 0.1$			
Maximum Working Voltage(V)	± 11 V (ref. AIGND)			
Input mode	RSE / NRSE / Differential			
Input impedance	$>1\text{ G}\Omega \parallel 100\text{ pF}$			
Input coupling	DC			
Overvoltage protection	± 25 V			
CMRR	85 dB			
Crosstalk	Adjacent Channel : -80 dB			
	Non-adjacent Channel : -95 dB			
	Differential: -65 dB			
DNL	No Missing Code			
INL	70 ppm of Range Typical			
Input FIFO	64M Samples			
Trigger type	Digital, Analog, Software			
Trigger mode	StartTrigger, ReferenceTrigger, ReTrigger			
Analog trigger voltage range	± 10 V Software Programmable			
Overvoltage Protection	Continuous : 20m A, ± 25 V			
	Instantaneous : 40 mA, ± 25 V			

Basic DC AI Accuracy, DAQ Mode

JY5500 Basic Accuracy = \pm(% Reading+% Range), DAQ Mode											
Nominal Range (V)	Resolution (18-bits) (uV)	24 Hour Tcal $\pm 1^{\circ}$		90 Days Tcal $\pm 5^{\circ}$		24 Hr Full Scale Accuracy	90 Days Full Scale Accuracy	Full Scale Accuracy (%)	Max Input Frequency @2MHz Fs (Hz)		
0.1	0.8	0.005	+	0.065	0.016	+	0.093	70 uV	110 uV	0.109	140
0.2	1.5	0.003	+	0.031	0.011	+	0.046	70 uV	110 uV	0.057	70
0.5	3.8	0.001	+	0.013	0.007	+	0.019	70 uV	130 uV	0.026	30
1	7.6	0.001	+	0.008	0.006	+	0.010	90 uV	160 uV	0.016	18
2	15.3	0.001	+	0.006	0.006	+	0.008	140 uV	270 uV	0.014	14
5	38.1	0.003	+	0.007	0.008	+	0.009	480 uV	840 uV	0.017	19
10	76.3	0.003	+	0.005	0.009	+	0.006	760 uV	1500 uV	0.015	15

Valid for one channel only. 95% of Confidence Interval
 Max sampling rates for 5510,5511,5515,5516: 2M, 1.25M, 2M, 1.25M
 Add 20% to Gain and Offset Errors From 91 Days to 1 Year. Preliminary
 10 V range: valid for $\pm 9.5V$
 Source impedance $\leq 100\Omega$
 Add accuracy adjustment for temperature and multiple channels
 Max input frequency = (total accuracy/range)*Sample Rate/10, only 24 Hr. data provided
 All accuracy data in this table are tested with 1m shield cable.
 Specs subject to minor changes

Additional DC AI Accuracy Adjustment, DAQ Mode

JY5500 Temperature Accuracy Adjustment = \pm(% Reading+% Range)				
Nominal Range (V)	Temperature Coefficients (/ $^{\circ}C$)		Full-Scale Temp Adjustment (uV/ $^{\circ}C$)	
0.1	0.0010	+	0.0025	3 uV
0.2	0.0007	+	0.0013	4 uV
0.5	0.0004	+	0.0006	5 uV
1	0.0002	+	0.0003	6 uV
2	0.0002	+	0.0002	9 uV
5	0.0005	+	0.0002	30 uV
10	0.0006	+	0.0002	70 uV

For all sample rates
 All accuracy data in this table are tested with 1m shield cable.
 Specs subject to minor changes when more tests become available

JY5500 Multi-Channel Accuracy Adjustment (μV)		
Nominal Range (V)	Sample Rate (Hz) per Channel	Full-Scale Multi-Channel Adjustment (μV)
0.1	≤ 200 K/N	0
0.1	500 K/N	45 μV
0.1	1 M/N	98 μV
0.2	≤ 200 K/N	0
0.2	500 K/N	23 μV
0.2	1 M/N	136 μV
0.5	≤ 200 K/N	0
0.5	500 K/N	32 μV
0.5	1 M/N	314 μV
1	≤ 200 K/N	0
1	500 K/N	70 μV
1	1 M/N	683 μV
2	≤ 200 K/N	0
2	500 K/N	109 μV
2	1 M/N	904 μV
5	≤ 200 K/N	0
5	500 K/N	693 μV
5	1 M/N	2,904 μV
10	≤ 200 K/N	0
10	500 K/N	2,375 μV
10	1 M/N	5,713 μV

N: Number of channels from 2 to 32
 Use the next higher sample rate for the not listed sample rates
 1 M/N not recommended for a DC measurement.
 TB68 Terminal Block + 2m ACL-2006868-2 Cable
 Source Impedance: $\leq 25 \Omega$
 All accuracy data in this table are tested with 1m shield cable.
 Preliminary, subject to changes.

Basic DC AI Accuracy, DS Mode

JY5510, 5515 Basic Accuracy = \pm(% Reading+% Range),DSMode								
Nominal Range (V)	Max Sample Rate for 1 Channel	Resolution (μ V)	24 Hour Tcal \pm 1C°	90 Days Tcal \pm 5°C	24 Hr Full Scale Accuracy	90 Days Full Scale Accuracy	Max Input Frequency Fs (Hz)	
0.1	1 K	0.8	0.0024 + 0.0106	0.0052 + 0.0166	13 μ V	22 μ V	0.013	
0.1	10 K	0.8	0.0024 + 0.0087	0.0052 + 0.0148	11 μ V	20 μ V	0.111	
1	1 K	7.6	0.0008 + 0.0015	0.0029 + 0.0023	23 μ V	52 μ V	0.002	
1	10 K	7.6	0.0008 + 0.0013	0.0029 + 0.0021	22 μ V	50 μ V	0.022	
10	1 K	76.3	0.0007 + 0.0010	0.0031 + 0.0015	171 μ V	463 μ V	0.002	
10	10 K	76.3	0.0007 + 0.0009	0.0031 + 0.0014	161 μ V	453 μ V	0.016	

Valid for one channel only. 95% of Confidence Interval
 DS Mode for 5510, 5515 only
 Use the next higher sample rate for not listed sample rates
 Use DAQ Mode when the sample rate>10 KHz
 Add 20% to Gain and Offset Errors From 91 Days to 1 Year. Preliminary
 10 V range: valid for \pm 9.5 V
 Source impedance \leq 100 Ω
 Add accuracy adjustment for temperature and multiple channels
 Max input frequency = (total accuracy/range)*Sample Rate/10, only 24 Hr. data provided
 All accuracy data in this table are tested with 1m shield cable.
 Specs subject to minor changes when more tests become available

AC Accuracy for One Channel

JY5500 Total Absolute AC Accuracy for One Channel							
	0.1V	0.2V	0.5V	1V	2V	5V	10V
[10Hz,50K]	0.28%	0.24%	0.23%	0.22%	0.17%	0.16%	0.15%
[50K,100K]	0.79%	0.66%	0.57%	0.74%	0.48%	0.39%	0.38%
[100K,200K]	2.42%	2.09%	1.90%	2.12%	1.28%	1.00%	1.00%

Valid for one channel measurement of sinusoidal input
 90 days, Tcal \pm 5°C. For one year AC accuracy, add 20%. Preliminary
 Sample Rate \geq 1.25M. No specs for Sample Rate<1.25MHz.
 DC Coupling
 10 V range: valid for \pm 9.5V
 Source impedance \leq 100 Ω
 All accuracy data in this table are tested with 1m shield cable.
 95% confidence level

In the case where the multi-channel sampling rate is less than 200k/N, the single-channel AC precision result is applicable.

Analog Output Specifications

Analog Output	5510	5511	5515	5516
Number of channels	4		2	
DAC resolution	16 bits			
Maximum update rate(simultaneous)	1 channel	2.86 M Sample/s		
	2 channels	2 M Sample/s		
	3 channels	1.54 M Sample/s		
	4 channels	1.25 M Sample/s		
Clock	100 MHz			
Clock accuracy	Jitter <20 ps			
Output range(V)	±10, ±5			
Output mode	RSE			
Output impedance	2 ohm			
Output coupling	DC			
Output current drive	±10 mA			
Output FIFO	32M Samples			
Trigger type	Digital, Software			
Trigger mode	StartTrigger			

AO Absolute Accuracy

JY5500 Basic AO Accuracy = ±(% of Output+% of Range)									
Nominal Range (V)	Resolution (16-bits) (uV)	24 Hour Tcal ±1C°		90 Days Tcal ± 5°		24 Hr Full-Scale Accuracy	90 Days Full-Scale Accuracy	Full Scale Accuracy (%)	Max Update Rate (S/s)
5	153	0.003	+ 0.006	0.009	+ 0.008	470 uV	840 uV	0.017	2.86M
10	305	0.004	+ 0.005	0.013	+ 0.005	810 uV	1800 uV	0.018	2.86M

Valid for all update rates.
 Add accuracy adjustment if temperature is outside calibration temperature range.
 Add 20% to Gain and Offset Errors From 91 Days to 1 Year. Preliminary.
 Maximum update rates(simultaneous)
 1 Ch: 2.86M; 2 Ch: 2M; 3 Ch: 1.54M; 4 Ch: 1.25M
 All accuracy data in this table are tested with 1m shield cable.
 Specs subject to minor changes when more tests become available.

Digital IO Specifications

DIO	5510/5511	5515/5516
Number of channels	Port (0,1,2,3,4,5)	Port (0,1,2)
Ground reference	D_GND	
Directional control	Independent control of each port	
Clock	10 MHz	
DI FIFO	16M Samples	
DO FIFO	16M Samples	
Initial state	Input	
Digital Input	Logic Low: V_{IL} Min : 0 / Max : 1.0 V	
	Logic High: V_{IH} Min : 2V / Max : 5.3V	
Digital Output	Logic Low : 0 V, I_{OL} Max: 24 mA	
	Logic High : 2.6 V~5 V, I_{OH} : -24 mA~0 mA	
Overvoltage Protection	Continuous 30 mA, -3.9 V~8.9 V Instantaneous 200 mA, ± 25 V	
	Duty cycle of instantaneous current pulse does not exceed 15%	

Counter/Timer Specifications

CI/CO	5510	5511	5515	5516
Number of channels	4		2	
Resolution	32			
CI	edge count, period measurement, frequency measurement, pulse width measurement, two-edge interval measurement, orthogonal coding, etc.			
CO	Single, finite and continuous pulse			
Clock	200 MHz			
FIFO	4M Samples			
Input	Gate, Source, Aux			
Output	OUT			

PFI Specifications

PFI	5510	5511	5515	5516
Number of channels	16			
External digital trigger interface	Trigger voltage 3.3 V TTL; trigger edge: Rising/Falling			
Initial state	Input			

Power Specifications

Power	5510	5511	5515	5516
3.3V	2.09 A		2.12 A	
12V	0.28 A		0.25 A	

USB Power Supply

Power	USB-5510	USB-5511	USB-5515	USB-5516
12V	4A			

Physical and Environment

Operating Environment

Ambient temperature range	0 °C to 50 °C
Relative humidity range	20% to 80%, noncondensing

Storage Environment

Ambient temperature range	-20 °C to 80 °C
Relative humidity range	10% to 90%, noncondensing

Order Information

- PXIe-5510 (PN: JY2005510-01)
32-ch AI (18-Bit, 2 MS/s), 4-ch AO (16-Bit, 2.86MS/s), 48 DIO, PXIe Multifunction I/O Card
- PXIe-5511 (PN: JY2005511-01)
32-ch AI (18-Bit, 1.25 MS/s), 4-ch AO (16-Bit, 2.86 MS/s), 48 DIO, PXIe Multifunction I/O Card
- PXIe-5515 (PN: JY2005515-01)
16-ch AI (18-Bit, 2 MS/s), 2-ch AO (16-Bit, 2.86MS/s), 24 DIO, PXIe Multifunction I/O Card
- PXIe-5516 (PN: JY2005516-01)
16-ch AI (18-Bit, 1.25 MS/s), 2-ch AO (16-Bit, 2.86 MS/s), 24 DIO, PXIe Multifunction I/O Card
- PCIe-5510 (PN: JY2105510-01)
32-ch AI (18-Bit, 2 MS/s), 4-ch AO (16-Bit, 2.86MS/s), 48 DIO, PCIe Multifunction I/O Card
- PCIe-5511 (PN: JY2105511-01)
32-ch AI (18-Bit, 1.25 MS/s), 4-ch AO (16- Bit, 2.86 MS/s), 48 DIO, PCIe Multifunction I/O Card
- PCIe-5515 (PN: JY2105515-01)
16-ch AI (18-Bit, 2 MS/s), 2-ch AO (16-Bit, 2.86MS/s), 24 DIO, PCIe Multifunction I/O Card
- PCIe-5516 (PN: JY2105516-01)
16-ch AI (18-Bit, 1.25 MS/s), 2-ch AO (16-Bit, 2.86 MS/s), 24 DIO, PCIe Multifunction I/O Card
- USB-5510 (PN: JY2105510-02)
32-ch AI (18-Bit, 2 MS/s), 4-ch AO (16-Bit, 2.86MS/s), 32DIO PCIe Multifunction I/O Module
- USB-5511 (PN: JY2105511-02)
32-ch AI (18-Bit, 1.25 MS/s), 4-ch AO (16-Bit, 2.86 MS/s), 32DIO PCIe Multifunction I/O Module
- USB-5515 (PN: JY2105515-02)
16-ch AI (18-Bit, 2 MS/s), 2-ch AO (16-Bit, 2.86MS/s), 24DIO PCIe Multifunction I/O Module
- USB-5516 (PN: JY2105516-02)
16-ch AI (18-Bit, 1.25 MS/s), 2-ch AO (16-Bit, 2.86 MS/s), 24DIO PCIe Multifunction I/O Module

Accessories

- TB-68 (PN: JY2000068-03)
68-Pin SCSI Shielded I/O Connector Block
- TB-68CI (PN: JY2010068-02)
68-Pin SCSI Shielded I/O Connector Block with 8ch current converter
- TB-68CI-16 (PN: JY2010068-03)
68-Pin SCSI Shielded I/O Connector Block with 16ch current converter
- DIN-68S-01 (PN: JA9114029-01)
SCSI 68-pin Terminal board w/o cable
- ACL-2006868-1 (PN: JY2006868-01)
1M 68pin VHDCI68M-SCSI68M cable
- ACL-2006868-2 (PN: JY2006868-02)
2M 68pin VHDCI68M-SCSI68M cable



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