DNA/DNR-AI-207

16-Channel Analog Input / Data Acquisition Board with CJC

10-Year Availability Guarantee

- DNA-AI-207 for use in "CUBE" chassis
- DNR-AI-207 for RACKtangle™ I/O chassis
- 16 differential analog input channels (plus one dedicated CJC channel)
- Maximum sampling rate of 1kHz per channel
- 18-bit resolution; ±10V input range
- Gains - 1,2,4,8,10,20,40,80,100,200,400,800
- Direct Inputs for thermocouples (w/ DNA-STP-AI-U or DNA-STP-AI-207TC panel)
- Embedded averaging engine

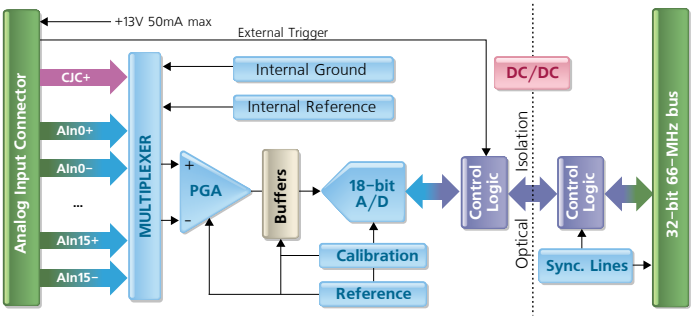
Supports **UEIDaq Framework** Data Acquisition Software Library for Windows. Linux and QNX drivers available. Visit our website for more details.

General Description:

The DNA-AI-207 and DNR-AI-207 are 16-channel A/D boards compatible with UEI's popular Cube and RACKtangle chassis respectively. The boards are electronically identical. Each board features 16 differential input channels, 18-bit resolution, and 12 software selectable input ranges. Each channel may be sampled at up to 16 kS/s, though the maximum board throughput is 16 kS/s so applications monitoring multiple channels will reduce the per channel sample rate (e.g. 1 kS/S for 16 channels, 2 kS/S for 8 channels, etc.). Additionally, the DNx-AI-207 provides a dedicated CJC channel that can be used for reading from the built-in CJC sensor on the DNA-STP-AI-U or AI-207TC terminal panels. When used with DNA-STP-AI-U or 207TC panel, the DNA-AI-207 layer also features a direct connection to RTDs or thermocouples (with open TC detection). The software included will perform all required RTD/TC linearization and CJC compensation and return data in °C or °F if desired.

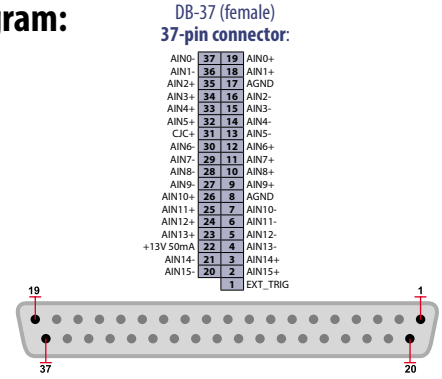
Another key feature of the DNx-AI-207 is the oversampling engine, allowing the board to automatically acquire as many samples as possible for the given gain/speed and average them, thus dramatically improving the noise floor.

Block Diagram:



Pinout Diagram:

DB-37 (female)
37-pin connector:



Technical Specifications:

Number of channels:	16 fully differential plus 1 single-ended dedicated CJC channel
Programmable DIO line	1 (external trigger)
ADC resolution	18 bits
Sampling rate	1 S/s - 16 kS/s per channel; 16 kS/s max aggregate for entire board
FIFO size	512 samples
Input bias current	±5nA max, ±0.5nA typical
Input impedance	10MΩ
Gains	1,2,4,8,10,20,40,80,100,200,400,800
Frontend bandwidth	48kHz @ -3dB
Common mode rejection	100dB typical
Oversampling ratio	2 to 8192, selected automatically
Accuracy	±287.59 µV at ±10 V input range. Please see table on page 3 for other ranges. (Typical test results also depicte on pages two and three.)
Isolation	350 Vrms
Overvoltage protection	-40V to +55V
Power consumption	1.4W (stand-by); 2.2W max
Operating temp. (tested)	-40°C to +85°C
Operating humidity	95%, non-condencing
Vibration *IEC 60068-2-6* *IEC 60068-2-64*	5 g, 10-500 Hz, sinusoidal 5 g (rms), 10-500Hz, broadband random
Shock *IEC 60068-2-27*	50 g, 3 ms half sine, 18 shocks @ 6 orientations 30 g, 11 ms half sine, 18 shocks @ 6 orientations
MTBF	637,000 hours

Connection Options:

Part #	Description
DNA-CBL-37S	Shielded 37 conductor cable
DNA-CBL-37	Unshielded ribbon 37 conductor cable
DNA-STP-AI-U	Universal screw terminal panel supports Thermocouple CJC measurment and RTD excitation
DNA-STP-AI-207TC	Dedicated thermocouple screw terminal panel

Test Results

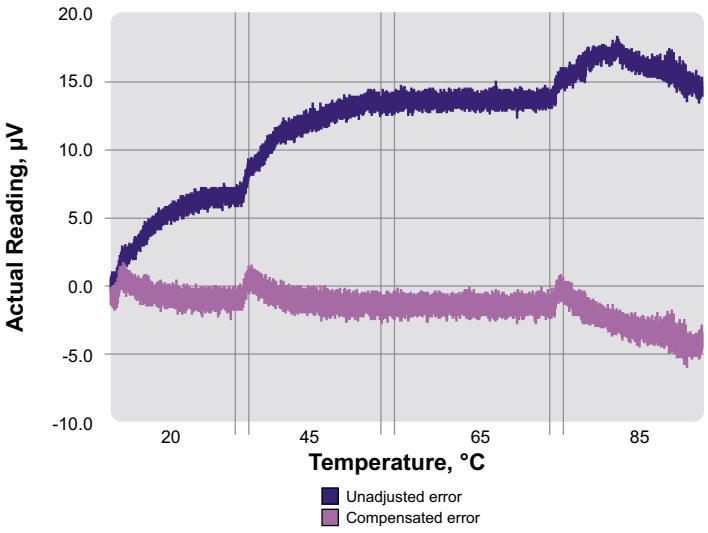
All tests were conducted under the following conditions: device under test was located inside the temperature-controlled chamber. All signal sources were connected outside of the test chamber at a room temperature (except for where noted otherwise).

The table below represents the ***Channel-to-Channel Crosstalk*** test results. Crosstalk test was conducted by applying ±8V sinewave on the first channel (gain=1) and 0V on the rest of the channels. Then channels were acquired sequentially at the different gains. Results (in microvolts) are summarized in the following table.

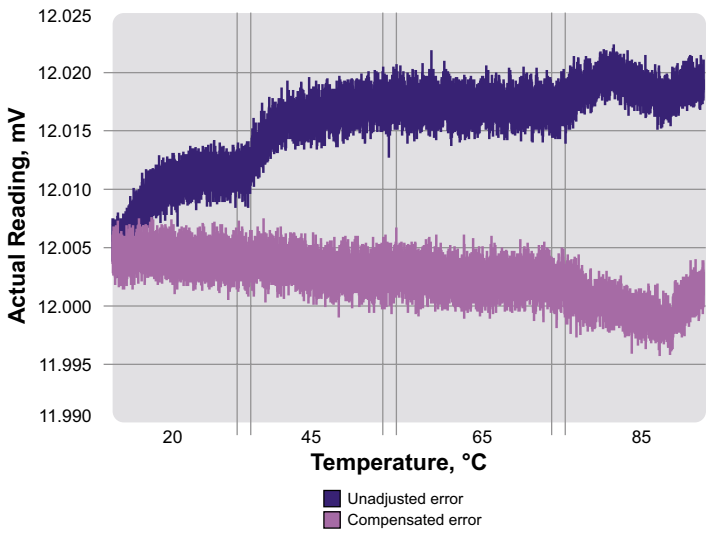
	Spped (Hz)	1000	500	200	100	50	20	10
Gain (voltage)	*All measurements are in microvolts*							
1 (±8V)	peak-peak	419.625	190.725	76.300	0*	0	0	0
	RMS	97.527	33.047	22.443	0	0	0	0
8 (±1.25V)	peak-peak	123.983	47.675	9.500	8.900	0	0	0
	RMS	30.383	9.012	0.459	1.458	0	0	0
80 (±125mV)	peak-peak		36.950	11.200	7.150	0	0	0
	RMS		8.377	2.143	1.422	0	0	0
200 (±50mV)	peak-peak			16.025	9.525	0	0	0
	RMS			2.933	1.773	0	0	0
400 (±25mV)	peak-peak			13.725	7.650	0	0	0
	RMS			2.621	1.443	0	0	0
800 (±12.5mV)	peak-peak			10.100	6.650	0	0	0
	RMS			2.179	1.182	0	0	0

* 0 - No noticeable crosstalk observed

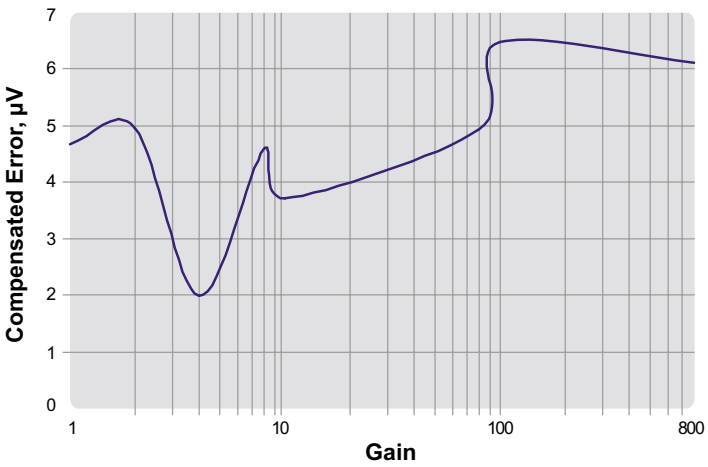
Unadjusted/Compensated Offset Error vs Temperature
(Shorted inputs on all channels; G=800)



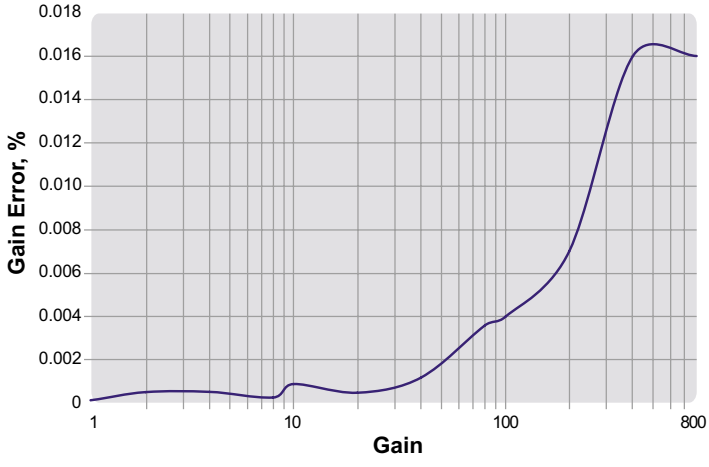
Unadjusted/Compensated Gain Error vs Temperature
(12.005 mV applied to all channels; G=800)



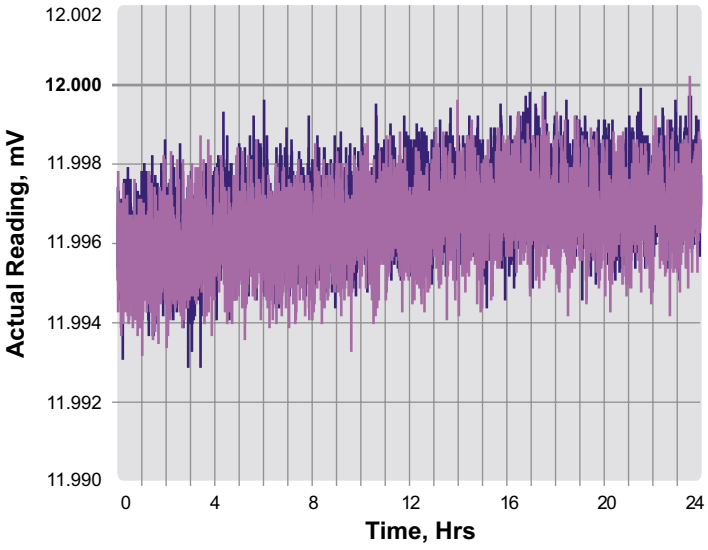
Offset Error vs Gain
(Offset error is calibrated for the gain of 1)



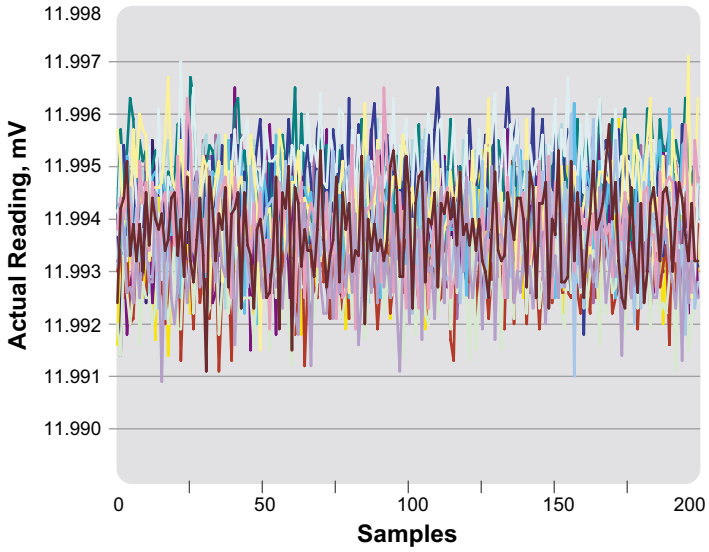
Gain Error vs Gain
(Gain error is calibrated for the gain of 1)



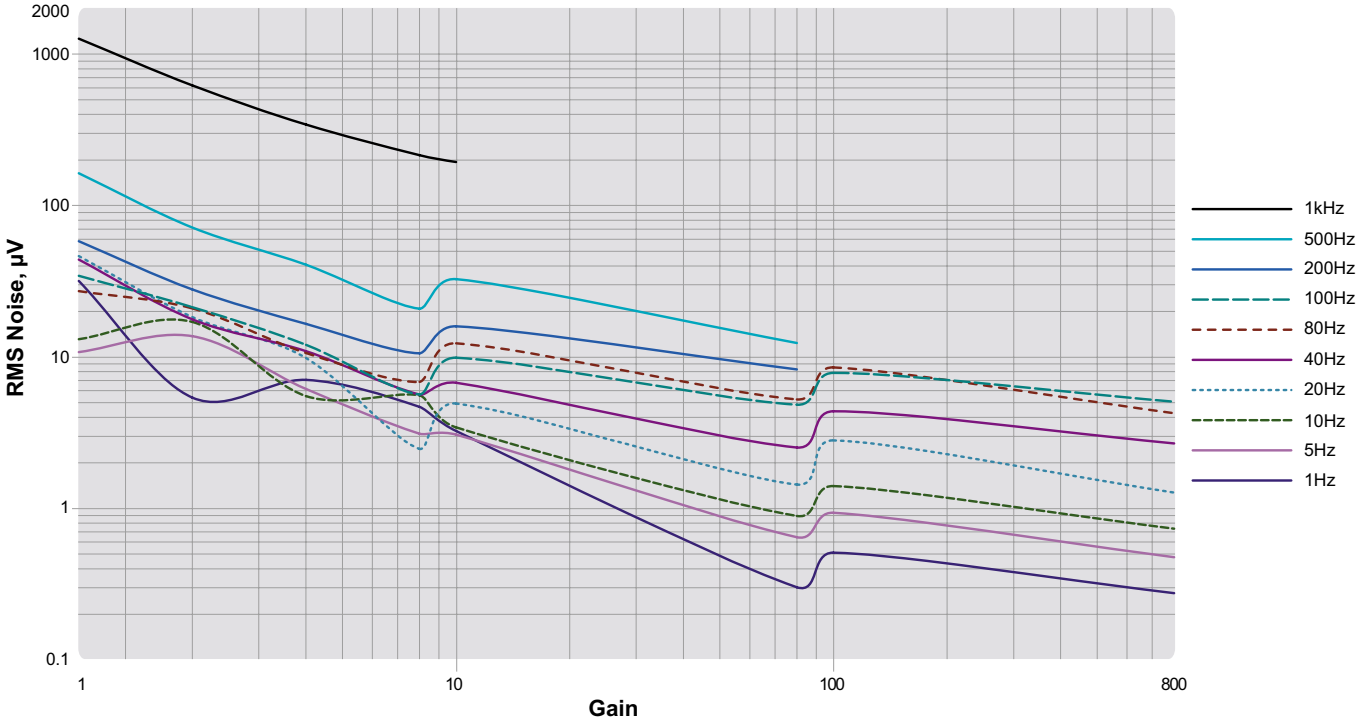
Long-term Temperature Stress at 65°C
(12.00 mV acquired at the gain of 800; 3Hz acquisition rate)



Typical Reading of 12.0 mV
(12.0 mV applied to all 16 channels; G=800)



The diagram below represents the ***RMS Noise vs Gain vs Acquisition Rate*** test results.



Accuracy Specifications

Voltage Measurement Accuracy

Input Range	Max Error (µV)	Max Error (%)
±10 V	±287.59	.0029
±5 V	±143.79	.0029
±2.5 V	±110.04	.0044
±1.25 V	±55.02	.0044
±1 V	±60.02	.0060
±0.5 V	±30.01	.0060
±0.25 V	±18.82	.0075
±0.125 V	±9.41	.0075
±0.1 V	±9.53	.0095
±0.05 V	±4.76	.0095
±0.025 V	±3.14	.0126
±0.0125 V	±2.34	.0187

Temperature accuracy with DNA-STP-AI-U or AI-207TC

Thermocouple Type	Max Error (CJC 25°C), °C	Max Error (CJC 0 to 85°C), °C
B	±1.6	±1.9
C	±1.2	±1.5
E	±0.9	±1.2
J	±0.7	±1.0
K	±1.2	±1.5
N	±1.6	±1.9
R	±2.4	±2.7
S	±2.3	±2.6
T	±1.2	±1.5

Error Includes:

- Input measurement error
- Input noise (shorted input, P-P noise)
- Error due to linearization math
- CJC measurement error

Error Does Not Include:

- Inherent thermocouple error
- Error caused by thermal gradient on STP