NI DAQCard™-6062E Family Specifications

This document lists the I/O terminal summary and specifications for the NI DAQCard-6062E for PCMCIA.

I/O Terminal Summary

Note With NI-DAQmx, National Instruments revised its terminal names so they are easier to understand and more consistent among NI hardware and software products. The revised terminal names used in this document are usually similar to the names they replace. For a complete list of Traditional NI-DAQ (Legacy) terminal names and their NI-DAQmx equivalents, refer to *Terminal Name Equivalents* of the *E Series Help*.

Table 1. I/O Terminals

Terminal Name	Terminal Type and Direction	Impedance Input/ Output	Protection (V) On/Off	Source (mA at V)	Sink (mA at V)	Rise Time (ns)	Bias
AI <0..15>	AI	100 GΩ in parallel with 100 pF	25/10	—	—	—	±200 pA
AI SENSE	AI	100 GΩ in parallel with 100 pF	25/10	—	—	—	±200 pA
AI GND	—	—	—	—	—	—	—
AO 0	AO	0.1 Ω	Short-circuit to ground	5 at 10	5 at –10	10 V/µs	—
AO 1	AO	0.1 Ω	Short-circuit to ground	5 at 10	5 at –10	10 V/µs	—
AO EXT REF	AI	10 kΩ	25/15	—	—	—	—
AO GND	—	—	—	—	—	—	—
D GND	—	—	—	—	—	—	—
+5 V	—	0.45 Ω	Short-circuit to ground	250 at V_{CC}	—	—	—
P0.<0..7>	DIO	—	V_{CC} + 0.5	13 at (V_{CC} – 0.4)	24 at 0.4	1.1	50 kΩ pu[†]

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Table 1. I/O Terminals (Continued)

Terminal Name	Terminal Type and Direction	Impedance Input/ Output	Protection (V) On/Off	Source (mA at V)	Sink (mA at V)	Rise Time (ns)	Bias
AI HOLD COMP	DO	—	—	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
EXT STROBE*	DO	—	—	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 0/ (AI START TRIG)	AI/DIO	10 kΩ	V_{CC} + 0.5/±35	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu, 10 kΩ pd
PFI 1/ (AI REF TRIG)	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 2/ (AI CONV CLK)*	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 3/ CTR 1 SOURCE	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 4/CTR 1 GATE	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
CTR 1 OUT	DO	—	—	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 5/ (AO SAMP CLK)*	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 6/ (AO START TRIG)	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 7/ (AI SAMP CLK)	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 8/ CTR 0 SOURCE	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
PFI 9/CTR 0 GATE	DIO	—	V_{CC} + 0.5	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
CTR 0 OUT	DO	—	—	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu
FREQ OUT	DO	—	—	3.5 at (V_{CC} – 0.4)	5 at 0.4	1.5	50 kΩ pu

Caution: Exceeding the output limit in the Source and Sink columns can damage the NI DAQCard-6062E.

* Indicates active low.

† P0.<6..7> are also pulled up with a 10 kΩ resistor.

AI = Analog Input DIO = Digital Input/Output pu = pull-up
AO = Analog Output DO = Digital Output AI/DIO = Analog Input/Digital Input/Output

Note: The tolerance on the 50 kΩ pull-up resistors is large. Actual value might range between 17 kΩ and 100 kΩ.

Specifications

The following specifications are typical at 25 °C unless otherwise noted.

Analog Input

Input Characteristics

Number of channels ..... 16 single-ended,
16 pseudodifferential,
or 8 differential
(software-selectable on
a per-channel basis)

Type of A/D converter (ADC)..... Successive
approximation

Resolution ..... 12 bits, 1 in 4,096

Max sampling rate ..... 500 kS/s

Input signal ranges

Range (Software-Selectable)	Input Range	
	Bipolar	**Unipolar**
20 V	±10 V	—
10 V	±5 V	0 to 10 V
5 V	±2.5 V	0 to 5 V
2 V	±1 V	0 to 2 V
1 V	±500 mV	0 to 1 V
500 mV	±250 mV	0 to 500 mV
200 mV	±100 mV	0 to 200 mV
100 mV	±50 mV	0 to 100 mV

Accuracy Information

Nominal Range at Full Scale (V)	Absolute Accuracy							Relative Accuracy Resolution (mV)	
	% of Reading		Offset (mV)	Noise + Quantization (mV)		Temp Drift (%/°C)	Absolute Accuracy at Full Scale (mV)		
	24 Hours	1 Year		Single Pt.	Averaged			Single Pt.	Averaged
±10.0	0.0672	0.0714	9.83	6.100	0.975	0.0010	17.945	7.370	1.280
±5.0	0.0272	0.0314	4.92	3.050	0.488	0.0005	6.983	3.680	0.642
±2.5	0.0672	0.0714	2.47	1.530	0.244	0.0010	4.502	1.840	0.321
±1.0	0.0672	0.0714	1.001	0.610	0.098	0.0010	1.813	0.737	0.128
±0.5	0.0672	0.0714	0.511	0.305	0.049	0.0010	0.917	0.368	0.064
±0.25	0.0672	0.0714	0.266	0.208	0.029	0.0010	0.474	0.238	0.039
±0.1	0.0672	0.0714	0.119	0.098	0.012	0.0010	0.203	0.111	0.016
±0.05	0.0672	0.0714	0.070	0.071	0.008	0.0010	0.113	0.082	0.010
10 to 0	0.0272	0.0314	4.920	3.050	0.488	0.0005	8.555	3.68	0.642
5 to 0	0.0672	0.0714	2.470	1.530	0.244	0.0010	6.288	1.84	0.321
2 to 0	0.0672	0.0714	1.001	0.610	0.098	0.0010	2.528	0.737	0.128
1 to 0	0.0672	0.0714	0.511	0.305	0.049	0.0010	1.274	0.368	0.064
0.5 to 0	0.0672	0.0714	0.266	0.208	0.029	0.0010	0.653	0.238	0.039
0.2 to 0	0.0672	0.0714	0.119	0.098	0.012	0.0010	0.274	0.111	0.016
0.1 to 0	0.0672	0.0714	0.070	0.071	0.008	0.0010	0.149	0.082	0.010

Note: Accuracies are valid for measurements following an internal E Series calibration. Averaged numbers assume dithering and averaging of 100 single-channel readings. Measurement accuracies are listed for operational temperatures within ±1 °C of internal calibration temperature and ±10 °C of external or factory-calibration temperature. NI recommends a one-year calibration interval. The Absolute Accuracy at Full Scale calculations were performed for a maximum range input voltage (for example, 10 V for the ±10 V range) after one year, assuming 100 points of averaged data. Go to `ni.com/info` and enter info code `rdspec` for example calculations.

Transfer Characteristics

Relative accuracy ..... ±0.5 LSB typ dithered, ±1.5 LSB max undithered

Differential nonlinearity (DNL)..... ±0.75 LSB typ, –0.9, +1.5 LSB max

No missing codes ..... 12 bits, guaranteed

Offset error

- Pregain error after calibration..... ±16 µV max
- Pregain error before calibration ..... ±4 mV max
- Postgain error after calibration ... ±1 mV max
- Postgain error before calibration ..... ±265 mV max

Gain error (relative to calibration reference)

- After calibration (gain = 1)..... ±0.02% of reading max
- Before calibration ..... ±2.5% of reading max
- Gain ≠ 1 with gain error adjusted to 0 at gain = 1..... ±0.02% of reading max

Amplifier Characteristics

Input impedance

- Normal powered on ..... 100 GΩ in parallel with 100 pF
- Powered off ..... 820 Ω min
- Overload ..... 820 Ω min

Input bias current ..... ±200 pA

Input offset current..... ±100 pA

Common-mode rejection ratio (CMRR), DC to 60 Hz

Range	CMRR
10 to 20 V	85 dB
5 V	95 dB
100 mV to 2 V	100 dB

Dynamic Characteristics

Bandwidth

- Small signal (–3 dB)..... 1.3 MHz
- Large signal (1% THD)..... 250 kHz

Settling time for full-scale step

Range	Accuracy*		
	±0.012% (±0.5 LSB)	**±0.024% (±1 LSB)**	**±0.098% (±4 LSB)**
All	2.5 µs typ	2.5 µs typ, 4 µs max	2 µs typ

* Accuracy values are valid for source impedances <1 kΩ. Refer to *Multichannel Scanning Considerations* of the *E Series Help* for more information.

System noise (LSB_{rms}, not including quantization)

Range	Dither On	Dither Off
1 to 20 V	0.25	0.6
500 mV	0.4	0.75
200 mV	0.5	0.8
100 mV	0.8	1.0

Crosstalk (DC to 100 kHz)

- Adjacent channels .....–75 dB
- All other channels .....–90 dB

Stability

Offset temperature coefficient

- Pregain .....±5 µV/°C
- Postgain.....±240 µV/°C

Gain temperature coefficient.....±20 ppm/°C

Analog Output

Output Characteristics

Number of channels .....2 voltage

Resolution.....12 bits, 1 in 4,096

Max update rate, waveform generation

FIFO Mode		Non-FIFO Mode	
Internally Timed	**Externally Timed**	**1 Channel**	**2 Channels**
850 kS/s	850 kS/s	800 kS/s, system-dependent	400 kS/s, system-dependent

Type of D/A converter (DAC) .....Double-buffered, multiplying

FIFO buffer size .....2,048 samples (S)

Data transfers.....Interrupts, programmed I/O

Accuracy Information

Nominal Range (V)		Absolute Accuracy					Absolute Accuracy at Full Scale (mV)
Positive Full Scale	Negative Full Scale	% of Reading			Offset (mV)	Temp Drift (%/°C)	
		24 Hours	90 Days	1 Year			
10	–10	0.0177	0.0197	0.0219	8.37	0.0005	10.568

Note: Accuracies are valid for measurements following an internal E Series calibration. Averaged numbers assume dithering and averaging of 100 single-channel readings. Measurement accuracies are listed for operational temperatures within ±1 °C of internal calibration temperature and ±10 °C of external or factory-calibration temperature. NI recommends a one-year calibration interval. The Absolute Accuracy at Full Scale calculations were performed for a maximum range input voltage (for example, 10 V for the ±10 V range) after one year, assuming 100 points of averaged data. Go to `ni.com/info` and enter info code `rdspec` for example calculations.

Transfer Characteristics

Relative accuracy, or integral nonlinearity (INL)

- After calibration.....±0.5 LSB typ, ±1.0 LSB max
- Before calibration .....±4 LSB max

DNL

- After calibration.....±0.5 LSB typ, ±1.0 LSB max
- Before calibration .....±3 LSB max

Monotonicity .....12 bits, guaranteed after calibration

Offset error

- After calibration.....±1.0 mV max
- Before calibration .....±200 mV max

Gain error (relative to internal reference)

- After calibration.....±0.01% of output max
- Before calibration .....±0.7% of output max

Gain error (relative to external reference) .....±0.5% of output max, not adjustable

Voltage Output

Ranges..... ±10 V, ±AO EXT REF (software-selectable)

Output coupling ..... DC

Output impedance ..... 0.1 Ω max

Current drive ..... ±5 mA max

Protection ..... Short-circuit to ground

Power-on state..... 0 V (± 200 mV)

External reference input

- Range..... ±11 V
- Overvoltage protection..... ±25 V powered on, ±15 V powered off
- Input impedance ..... 10 kΩ
- Bandwidth (–3 dB) ..... 50 kHz

Dynamic Characteristics

Settling time for full-scale step..... 3.5 µs to ±0.5 LSB accuracy

Slew rate ..... 10 V/µs

Noise ..... 200 μV_{rms}, DC to 300 kHz

Glitch energy (at midscale transition)
- Magnitude
  - Reglitching disabled ..... ±80 mV
  - Reglitching enabled ..... ±30 mV
- Duration ..... 3 µs

Stability

Offset temperature coefficient ..... ±50 µV/°C

Gain temperature coefficient
- Internal reference ..... ±25 ppm/°C
- External reference ..... ±25 ppm/°C

Digital I/O

Number of channels ..... 8 input/output

Compatibility ..... 5 V/TTL

Digital logic levels on P0.<0..7>

Level	Min	Max
Input low voltage	0 V	0.8 V
Input high voltage	2.0 V	5.0 V
Input low current (V_{in} = 0 V)	—	–320 µA
Input high current (V_{in} = 5 V)	—	10 µA
Output low voltage (I_{OL} = 24 mA)	—	0.4 V
Output high voltage (I_{OH} = –13 mA)	4.35 V	—

Power-on state ..... Input (high-impedance)

Data transfers ..... Programmed I/O

Max transfer rate ..... 50 kwords/s, system dependent

Constant sustainable rate ..... 1 to 10 kwords/s, typ

Timing I/O

Number of channels ..... 2 up/down counter/timers, 1 frequency scaler

Resolution
- Counter/timers ..... 24 bits
- Frequency scalers ..... 4 bits

Compatibility ..... 5 V TTL/CMOS

Base clocks available
- Counter/timers ..... 20 MHz, 100 kHz
- Frequency scalers ..... 10 MHz, 100 kHz

Base clock accuracy ..... ±0.01%

Max source frequency up/down counter/timers ..... 20 MHz

Min source pulse duration ..... 10 ns in edge-detection mode

Min gate pulse duration ..... 10 ns in edge-detection mode

Data transfers ..... Interrupts, programmed I/O

Triggers

Analog Trigger

Source ..... AI <0..15>, external trigger (PFI 0/AI START TRIG)

Purpose
- Analog input ..... Start, reference, and pause trigger, sample clock
- Analog output ..... Start and pause trigger, sample clock
- Counter/timers ..... Source, gate

Level
- Internal ..... ±Full-scale
- External ..... ±10 V

Slope ..... Positive or negative (software-selectable)

Resolution ..... 8 bits, 1 in 256

Hysteresis ..... Programmable

Bandwidth (–3 dB)
- Internal ..... 500 kHz
- External ..... 2.5 MHz

External input (PFI 0/AI START TRIG)
- Impedance ..... 12 kΩ
- Coupling ..... DC
- Protection
  - When configured as a digital signal ..... –0.5 to V_{CC}
  - When configured as an analog trigger signal or disabled ..... ±35 V
  - Powered off ..... ±35 V

Digital Trigger

Purpose

- Analog input ..... Start, reference, and pause trigger, sample clock
- Analog output ..... Start and pause trigger, sample clock
- Counter/timers ..... Source, gate

External sources ..... PFI <0..9>

Compatibility ..... 5 V TTL

Response ..... Rising or falling edge

Pulse width ..... 10 ns min

Calibration

Recommended warm-up time ..... 30 minutes

Calibration interval ..... 1 year

External calibration reference ..... >6 and <9.999 V

Onboard calibration reference

- Level ..... 5.000 V (±2.5 mV) (actual value stored in EEPROM)
- Temperature coefficient ..... ±5 ppm/°C max
- Long-term stability ..... $\pm 15 \text{ ppm}/\sqrt{1{,}000 \text{ h}}$

Power Requirement (from PCMCIA I/O Channel)

+5 VDC (±5%) ..... 340 mA typ, 750 mA max

Power available at I/O connector .... +4.65 to +5.25 V at 250 mA

Note These power usage figures do not include the power used by external devices that are connected to the fused supply present on the I/O connector.

Under ordinary operation, the DAQCard has a current requirement of 320–350 mA. The current requirements of the DAQCard might increase to 450 mA in any of the following conditions:

- The analog inputs you are sampling are overdriven at high gains.
- The analog inputs are left floating when the DAQCard is not in use.
- The analog outputs are driving high loads.

Physical

PC card type ..... Type II

Weight ..... 33 g (1.1 oz)

I/O connector ..... 68-position female VHDCI connector

Environmental

Operating temperature ..... 0 to 40 °C

- Maximum device temperature .... 70 °C measured by internal temperature sensor
- Case temperature ..... 55 °C recommended max

Storage temperature ..... –20 to 70 °C

Relative humidity ..... 10 to 90%, noncondensing

Maximum altitude ..... 2,000 m

Pollution Degree (indoor use only) 2

Maximum Working Voltage

Maximum working voltage refers to the signal voltage plus the common-mode voltage.

Channel-to-earth ..... 11 V, Installation Category I

Channel-to-channel ..... 11 V, Installation Category I

Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 60950-1, EN 60950-1
- UL 60950-1
- CAN/CSA-C22.2 No. 60950-1

Note For UL and other safety certifications, refer to the product label, or visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

Emissions ..... EN 55011 Class A at 10 m
FCC Part 15A above 1 GHz

Immunity ..... EN 61326:1997 A2:2001, Table 1

CE, C-Tick, and FCC Part 15 (Class A) Compliant

Note For EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

Low-Voltage Directive (safety) 73/23/EEC

Electromagnetic Compatibility Directive (EMC) 89/336/EEC

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

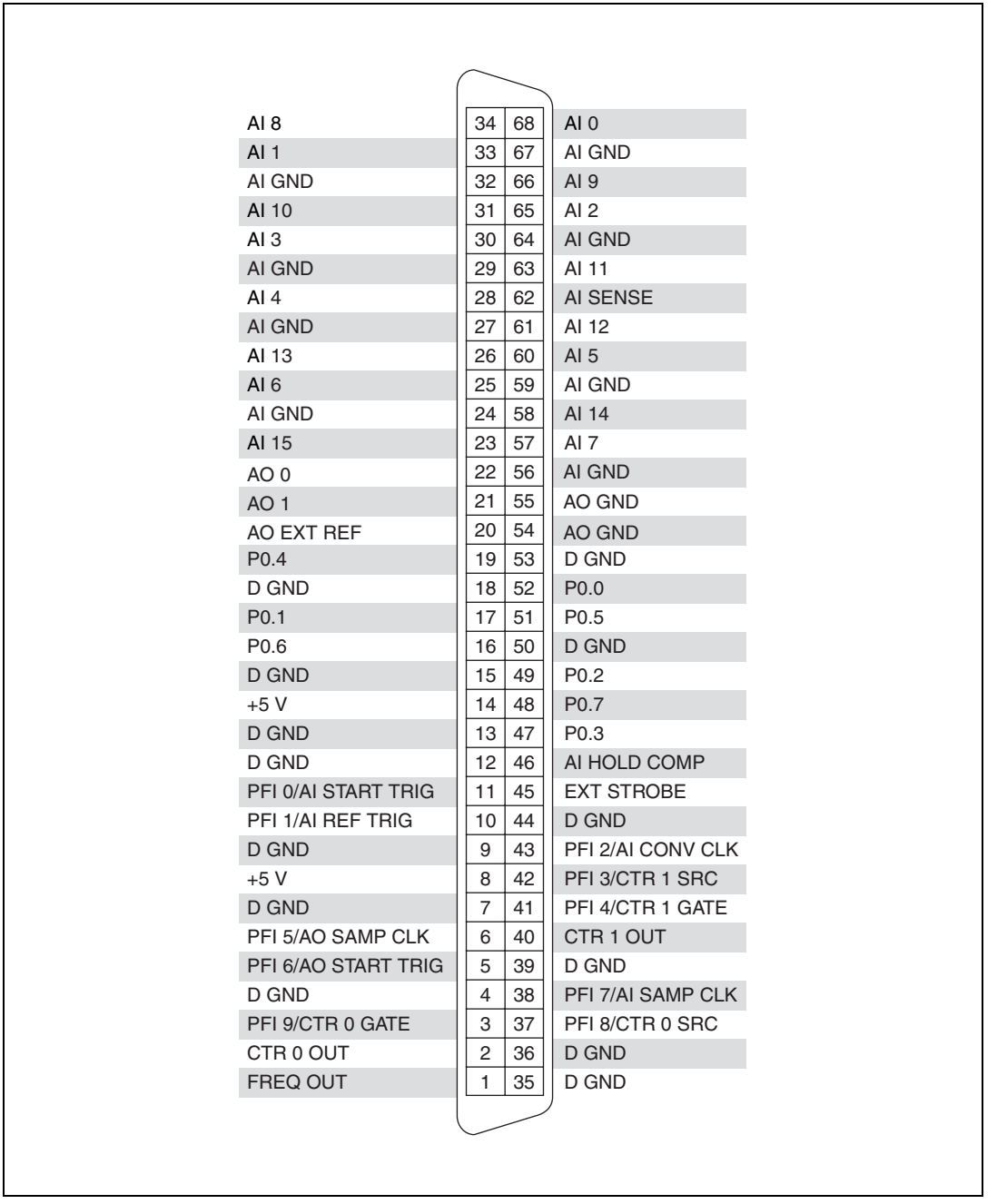

Figure 1. NI DAQCard-6062E Pinout