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**PXI-6070E**

# NI 6070E/6071E Family Specifications

This document lists the I/O terminal summary and specifications for the devices that make up the NI 6070E/6071E family. This family includes the following devices:

- NI DAQPad-6070E
- NI PCI-MIO-16E-1 (NI 6070E)
- NI PXI-6070E
- NI PCI-6071E
- NI PXI-6071E

## 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 <16..63> <sup>†</sup> | AI                          | 100 GΩ in parallel with 100 pF | 25/15                   | —                | —              | —              | ±200 pA |
| AI SENSE, AI SENSE 2 <sup>†</sup>    | AI                          | 100 GΩ in parallel with 100 pF | 25/15                   | —                | —              | —              | ±200 pA |
| AI GND                               | —                           | —                              | —                       | —                | —              | —              | —       |
| AO 0                                 | AO                          | 0.1 Ω                          | Short-circuit to ground | 5 at 10          | 5 at -10       | 20 V/μs        | —       |
| AO 1                                 | AO                          | 0.1 Ω                          | Short-circuit to ground | 5 at 10          | 5 at -10       | 20 V/μs        | —       |
| AO EXT REF                           | AI                          | 10 kΩ                          | 25/15                   | —                | —              | —              | —       |
| AO GND                               | —                           | —                              | —                       | —                | —              | —              | —       |

**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                              |
|------------------------|-----------------------------|-------------------------|-------------------------|---------------------------|----------------|----------------|-----------------------------------|
| D GND                  | —                           | —                       | —                       | —                         | —              | —              | —                                 |
| +5 V                   | —                           | 0.1 $\Omega$            | Short-circuit to ground | 1 A                       | —              | —              | —                                 |
| P0.<0..7>              | DIO                         | —                       | $V_{CC} + 0.5$          | 13 at ( $V_{CC} - 0.4$ )  | 24 at 0.4      | 1.1            | 50 k $\Omega$ pu                  |
| AI HOLD COMP           | DO                          | —                       | —                       | 3.5 at ( $V_{CC} - 0.4$ ) | 5 at 0.4       | 1.5            | 50 k $\Omega$ pu                  |
| EXT STROBE*            | DO                          | —                       | —                       | 3.5 at ( $V_{CC} - 0.4$ ) | 5 at 0.4       | 1.5            | 50 k $\Omega$ pu                  |
| PFI 0/ (AI START TRIG) | AI/DIO                      | 10 k $\Omega$           | $V_{CC} + 0.5/\pm 35$   | 3.5 at ( $V_{CC} - 0.4$ ) | 5 at 0.4       | 1.5            | 9 k $\Omega$ pu, 10 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ pu                  |
| CTR 1 OUT              | DO                          | —                       | —                       | 3.5 at ( $V_{CC} - 0.4$ ) | 5 at 0.4       | 1.5            | 50 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ 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 k $\Omega$ pu                  |
| CTR 0 OUT              | DO                          | —                       | —                       | 3.5 at ( $V_{CC} - 0.4$ ) | 5 at 0.4       | 1.5            | 50 k $\Omega$ pu                  |

**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     |
|--|-----------------------------|------------------------|-----------------------|--------------------------------|----------------|----------------|----------|
| FREQ OUT   | DO                          | —                      | —                     | 3.5 at (V <sub>CC</sub> - 0.4) | 5 at 0.4       | 1.5            | 50 kΩ pu |
| <p>* Indicates active low.<br/>                     † NI PCI/PXI-6071E only.<br/>                     AI = Analog Input      DIO = Digital Input/Output      pd = pull-down<br/>                     AO = Analog Output      DO = Digital Output      pu = pull-up<br/>                     AI/DIO = Analog Input/Digital Input/Output</p> <p><b>Note:</b> The tolerance on the 50 kΩ pull-up resistors is large. Actual value might range between 17 kΩ and 100 kΩ.</p> |                             |                        |                       |                                |                |                |          |

## Specifications

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

### Analog Input

#### Input Characteristics

Number of channels

|                |  |
|----------------|--|
| NI 6070E ..... | 16 single-ended or 8 differential (software-selectable per channel)  |
| NI 6071E ..... | 64 single-ended or 32 differential (software-selectable per channel) |

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

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

Maximum sampling rate ..... 1.25 MS/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 |

Input coupling .....DC

Maximum working voltage (signal and common mode) ..... Each input should remain within ±11 V of ground

Overvoltage protection

Powered on .....±25 V

Powered off.....±15 V

Inputs protected

NI 6070E.....AI <0..15>, AI SENSE

NI 6071E.....AI <0..63>, AI SENSE, AI SENSE 2

|                                 |  |
|---------------------------------|--|
| FIFO buffer size                |  |
| NI DAQPad-6070E.....            | 2,048 samples (S)  |
| NI PXI-6070E.....               | 512 S  |
| NI PCI/PXI-6071E.....           | 512 S  |
| NI PCI-MIO-16E-1.....           | 512 S  |
| DMA (PCI and PXI only)          |  |
| Channels.....                   | 3  |
| Data sources/destinations.....  | Analog input, analog output, counter/timer 0, or counter/timer 1 |
| Data transfers                  |  |
| NI DAQPad-6070E.....            | Interrupts, programmed I/O                                       |
| NI PXI-6070E.....               | DMA, interrupts, programmed I/O                                  |
| NI PCI/PXI-6071E.....           | DMA, interrupts, programmed I/O                                  |
| NI PCI-MIO-16E-1.....           | DMA, interrupts, programmed I/O                                  |
| DMA modes .....                 | Scatter-gather (single-transfer, demand-transfer)                |
| Configuration memory size ..... | 512 words (1 word = 8 bits)                                      |

## Accuracy Information

| Nominal Range (V)   |                     | Absolute Accuracy |        |             |                           |          |                   |                                      | Relative Accuracy Resolution (mV) |          |
|---------------------|---------------------|-------------------|--------|-------------|---------------------------|----------|-------------------|--------------------------------------|-----------------------------------|----------|
| Positive Full Scale | Negative Full Scale | % of Reading      |        | Offset (mV) | Noise + Quantization (mV) |          | Temp Drift (%/°C) | Absolute Accuracy at Full Scale (mV) | Single Pt.                        | Averaged |
|                     |                     | 24 Hours          | 1 Year |             | Single Pt.                | Averaged |                   |                                      |                                   |          |
| 10                  | -10                 | 0.0672            | 0.0714 | 6.38        | 6.10                      | 0.846    | 0.0010            | 14.369                               | 7.37                              | 1.11     |
| 5                   | -5                  | 0.0272            | 0.0314 | 3.20        | 3.05                      | 0.423    | 0.0005            | 5.193                                | 3.68                              | 0.557    |
| 2.5                 | -2.5                | 0.0672            | 0.0714 | 1.61        | 1.53                      | 0.211    | 0.0010            | 3.605                                | 1.84                              | 0.278    |
| 1                   | -1                  | 0.0672            | 0.0714 | 0.653       | 0.610                     | 0.085    | 0.0010            | 1.452                                | 0.737                             | 0.111    |
| 0.5                 | -0.5                | 0.0672            | 0.0714 | 0.335       | 0.305                     | 0.042    | 0.0010            | 0.735                                | 0.368                             | 0.056    |
| 0.25                | -0.25               | 0.0672            | 0.0714 | 0.176       | 0.208                     | 0.024    | 0.0010            | 0.379                                | 0.238                             | 0.032    |
| 0.1                 | -0.1                | 0.0672            | 0.0714 | 0.081       | 0.098                     | 0.011    | 0.0010            | 0.163                                | 0.111                             | 0.015    |
| 0.05                | -0.05               | 0.0672            | 0.0714 | 0.049       | 0.071                     | 0.007    | 0.0010            | 0.091                                | 0.082                             | 0.009    |
| 10                  | 0                   | 0.0272            | 0.0314 | 3.20        | 3.05                      | 0.423    | 0.0005            | 6.765                                | 3.68                              | 0.557    |
| 5                   | 0                   | 0.0672            | 0.0714 | 1.61        | 1.53                      | 0.211    | 0.0010            | 5.391                                | 1.84                              | 0.278    |
| 2                   | 0                   | 0.0672            | 0.0714 | 0.653       | 0.610                     | 0.085    | 0.0010            | 2.167                                | 0.737                             | 0.111    |
| 1                   | 0                   | 0.0672            | 0.0714 | 0.335       | 0.305                     | 0.042    | 0.0010            | 1.092                                | 0.368                             | 0.056    |
| 0.5                 | 0                   | 0.0672            | 0.0714 | 0.176       | 0.208                     | 0.024    | 0.0010            | 0.558                                | 0.238                             | 0.032    |
| 0.2                 | 0                   | 0.0672            | 0.0714 | 0.081       | 0.098                     | 0.011    | 0.0010            | 0.235                                | 0.111                             | 0.015    |
| 0.1                 | 0                   | 0.0672            | 0.0714 | 0.049       | 0.071                     | 0.007    | 0.0010            | 0.127                                | 0.082                             | 0.009    |

**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  $\pm 1$  °C of internal calibration temperature and  $\pm 10$  °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  $\pm 10$  V range) after one year, assuming 100 points of averaged data. Go to [ni.com/info](http://ni.com/info) and enter info code `rdspec` for example calculations.

## Transfer Characteristics

### Relative accuracy

Dithered .....±0.5 LSB typ  
Undithered .....±1.5 LSB max

Differential nonlinearity (DNL) .....±0.5 LSB typ,  
±1.0 LSB max

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

### Offset error

Pregain error after calibration .....±12  $\mu$ V max  
Pregain error before  
calibration .....±2.5 mV max  
Postgain error after calibration ...±0.5 mV max  
Postgain error before  
calibration .....±100 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  $\neq$  1 with gain error  
adjusted to 0 at gain = 1 .....±0.02% of reading max

## Amplifier Characteristics

### Input impedance

Normal powered on .....100 G $\Omega$  in parallel  
with 100 pF  
Powered off .....820  $\Omega$  min  
Overload.....820  $\Omega$  min

Input bias current.....±200 pA

Input offset current .....±100 pA

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

| Range         | CMRR   |
|---------------|--------|
| 20 V          | 95 dB  |
| 10 V          | 100 dB |
| 100 mV to 5 V | 106 dB |

## Dynamic Characteristics

### Bandwidth

Small signal (-3 dB) .....1.6 MHz  
Large signal (1% THD) .....1 MHz

Settling time to full-scale step

| Device   | Range         | Accuracy*          |                        |                        |
|----------|---------------|--------------------|------------------------|------------------------|
|          |               | ±0.012% (±0.5 LSB) | ±0.024% (±1 LSB)       | ±0.098% (±4 LSB)       |
| NI 6070E | 20 V          | 2 µS typ, 3 µS max | 1.5 µS typ, 2 µS max   | 1.3 µS typ, 1.5 µS max |
|          | 10 V          | 2 µS typ, 3 µS max | 1.5 µS typ, 2 µS max   | 0.9 µS typ, 1 µS max   |
|          | 200 mV to 5 V | 2 µS typ, 3 µS max | 1.5 µS typ, 2 µS max   | 1 µS typ, 1.5 µS max   |
|          | 100 mV        | 2 µS typ, 3 µS max | 1.5 µS typ, 2 µS max   | 1.9 µS typ, 2 µS max   |
| NI 6071E | 20 V          | 3 µS typ, 5 µS max | 1.9 µS typ, 2.5 µS max | 1.2 µS typ, 1.5 µS max |
|          | 10 V          | 3 µS typ, 5 µS max | 1.9 µS typ, 2.5 µS max | 1.2 µS typ, 1.3 µS max |
|          | 200 mV to 5 V | 3 µS typ, 5 µS max | 1.9 µS typ, 2.5 µS max | 1.2 µS typ, 1.5 µS max |
|          | 100 mV        | 3 µS typ, 5 µS max | 1.9 µS typ, 2.5 µS max | 1.3 µS typ, 1.5 µS max |

\* 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<sub>rms</sub>, not including quantization)

| Range     | Dither Off | Dither On |
|-----------|------------|-----------|
| 1 to 20 V | 0.25       | 0.5       |
| 500 mV    | 0.4        | 0.6       |
| 200 mV    | 0.5        | 0.7       |
| 100 mV    | 0.8        | 0.9       |

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 outputs  
 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                       |
| 1 MS/s           | 950 kS/s         | 800 kS/s,<br>system<br>dependent | 400 kS/s,<br>system<br>dependent |

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

FIFO buffer size .....2,048 S

Data transfers.....DMA, interrupts,  
 programmed I/O

DMA modes .....Scatter-gather  
 (single-transfer,  
 demand-transfer)



## 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 | ±5.93       | 0.0005            | 8.127                                |
| 10                  | 0                   | 0.0177            | 0.0197  | 0.0219 | ±3.49       | 0.0005            | 5.685                                |

**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](http://ni.com/info) and enter info code `rdspec` for example calculations.

### Transfer Characteristics

|   |   |
|---|---|
| Relative accuracy, or integral nonlinearity (INL) |   |
| After calibration .....                           | ±0.3 LSB typ,<br>±0.5 LSB max               |
| Before calibration .....                          | ±4 LSB max                                  |
| DNL   |   |
| After calibration .....                           | ±0.3 LSB typ,<br>±1.0 LSB max               |
| Before calibration .....                          | ±3 LSB max                                  |
| Monotonicity .....                                | 12 bits, guaranteed<br>after calibration    |
| Offset error                                      |   |
| After calibration .....                           | ±1.0 mV max                                 |
| Before calibration .....                          | ±200 mV max                                 |
| Gain error  |   |
| (relative to external reference) .....            | 0 to 0.67% of output max,<br>not adjustable |

### Voltage Output

|                        |   |
|------------------------|---|
| Ranges .....           | ±10 V, 0 to 10 V,<br>±AO EXT REF,<br>0 to AO EXT REF<br>(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  |       |
| Powered on .....        | ±25 V |
| Powered off .....       | ±15 V |
| Input impedance .....   | 10 kΩ |
| Bandwidth (-3 dB) ..... | 1 MHz |

### Dynamic Characteristics

|   |  |
|---|--|
| Settling time for full-scale step ..... | 3 μs to ±0.5 LSB<br>accuracy           |
| Slew rate .....                         | 20 V/μs                                |
| Noise .....                             | 200 μV <sub>rms</sub> ,<br>DC to 1 MHz |
| Glitch energy (at mid-scale transition) |  |
| Magnitude                               |  |
| Reglitching disabled .....              | ±20 mV                                 |
| Reglitching enabled .....               | ±4 mV                                  |
| Duration .....                          | 1.5 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 $\mu$ A |
| Input high current ( $V_{in} = 5$ V)        | —      | 10 $\mu$ A   |
| Output low voltage<br>( $I_{OL} = 24$ mA)   | —      | 0.4 V        |
| Output high voltage<br>( $I_{OH} = -13$ mA) | 4.35 V | —            |

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

Data transfers ..... Programmed I/O

Transfer rate (1 word = 8 bits), maximum with NI-DAQ,  
system-dependent

NI DAQPad-6070E ..... 5 kwords/s

NI PXI-6070E..... 50 kwords/s

NI PCI/PXI-6071E ..... 50 kwords/s

NI PCI-MIO-16E-1 ..... 50 kwords/s

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 scaler ..... 4 bits

Compatibility ..... 5 V/TTL

Base clocks available

Counter/timers ..... 20 MHz, 100 kHz

Frequency scaler ..... 10 MHz, 100 kHz

Base clock accuracy .....  $\pm 0.01\%$

Max source frequency ..... 20 MHz

Min source pulse duration ..... 10 ns, edge-detect mode

Min gate pulse duration ..... 10 ns, edge-detect mode

Data transfers ..... DMA, interrupts,  
programmed I/O

DMA modes ..... Scatter-gather  
(single-transfer,  
demand-transfer)

## Triggers

### Analog Trigger

Source ..... All analog input channels,  
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 .....  $\pm$ Full-scale

External .....  $\pm 10$  V

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

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

Hysteresis ..... Programmable

Bandwidth (-3 dB)

Internal ..... 2 MHz

External ..... 7 MHz

External input (PFI 0/AI START TRIG)

Impedance ..... 10 k $\Omega$

Coupling ..... DC

Protection

When configured as  
a digital signal ..... -0.5 to  $V_{CC} + 0.5$  V

When configured as an analog  
trigger signal or disabled .....  $\pm 35$  V

Powered off .....  $\pm 35$  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>, RTSI <0..6>                           |
| Compatibility .....    | 5 V TTL   |
| Response .....         | Rising or falling edge                            |
| Pulse width .....      | 10 ns min   |

## RTSI Trigger

|              |   |
|--------------|---|
| PCI .....    | 7 |
| DAQPad ..... | 4 |

## PXI Trigger Bus (PXI Only)

|                     |   |
|---------------------|---|
| Trigger lines ..... | 6 |
| Star trigger .....  | 1 |

## Calibration

### Recommended warm-up time

|                        |            |
|------------------------|------------|
| NI DAQPad-6070E .....  | 30 minutes |
| NI PXI-6070E .....     | 15 minutes |
| NI PCI/PXI-6071E ..... | 15 minutes |
| NI PCI-MIO-16E-1 ..... | 15 minutes |

Calibration interval.....1 year

### Onboard calibration reference

|                               |  |
|-------------------------------|--|
| Level .....                   | 5.000 V ( $\pm 3.5$ mV),<br>over full operating<br>temperature, actual value<br>stored in EEPROM |
| Temperature coefficient ..... | $\pm 5$ ppm/ $^{\circ}$ C max  |
| Long-term stability .....     | $\pm 15$ ppm/ $\sqrt{1,000}$ h   |

## Bus Interface

Type.....Master, slave

## Power

### Bus Requirement

|   |       |
|---|-------|
| PCI/PXI-6070E/6071E<br>+5 VDC ( $\pm 5\%$ ) ..... | 1.1 A |
| DAQPad-6070E<br>9 to 25 VDC .....                 | 17 W  |



**Note** Excludes power consumed through +5 V available at the I/O connector.

### I/O Connector Power

Power available at I/O connector.... +4.65 to +5.25 VDC  
at 1 A

Discharge time with BP-1

battery pack DAQPad-6070E ..... 2.5 h

## Physical

Dimensions (not including connectors)

|   |  |
|---|--|
| NI DAQPad-6070E .....                   | 30.7 cm $\times$ 25.4 cm $\times$<br>4.3 cm<br>(12.1 in. $\times$ 10 in. $\times$ 1.7 in.) |
| NI PXI-6070E/6071E .....                | 16 cm $\times$ 10 cm<br>(6.3 in. $\times$ 3.9 in.)   |
| NI PCI-6071E,<br>NI PCI-MIO-16E-1 ..... | 17.5 cm $\times$ 10.7 cm<br>(6.9 in. $\times$ 4.2 in.)                                     |

### Weight

|   |                      |
|---|----------------------|
| NI DAQPad-6070E .....                   | 1955 g (4 lb 4.9 oz) |
| NI PXI-6070E .....                      | 203 g (7.1 oz)       |
| NI PCI-6071E/<br>NI PCI-MIO-16E-1 ..... | 115 g (4.1 oz)       |
| NI PXI-6071E .....                      | 214 g (7.5 oz)       |

### I/O connector

|                |                                |
|----------------|--------------------------------|
| NI 6070E ..... | 68-pin male 0.050 D-type       |
| NI 6071E ..... | 100-pin female 0.050<br>D-type |

## Maximum Working Voltage

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

NI DAQPad-6070E

|                          |                                  |
|--------------------------|----------------------------------|
| Channel-to-earth .....   | 11 V,<br>Installation Category I |
| Channel-to-channel ..... | 11 V,<br>Installation Category I |

|  |                                  |
|--|----------------------------------|
| NI PXI-6070E, NI PCI/PXI-6071E, NI PCI-MIO-16E-1 |                                  |
| Channel-to-earth .....                           | 11 V,<br>Installation Category I |
| Channel-to-channel .....                         | 11 V,<br>Installation Category I |

## Environmental

|   |                             |
|---|-----------------------------|
| Operating temperature .....                 | 0 to 55 °C                  |
| Storage temperature .....                   | -20 to 70 °C                |
| Relative humidity .....                     | 10 to 90%,<br>noncondensing |
| Maximum altitude .....                      | 2,000 m                     |
| Pollution Degree<br>(indoor use only) ..... | 2                           |

### NI PCI-6071E OEM

|                                   |  |
|-----------------------------------|--|
| Maximum ambient temperature ..... | 50 °C for use in Class 1,<br>Division 2 hazardous<br>locations |
|-----------------------------------|--|

## Safety

### NI PCI-MIO-16E-1, PXI-6070E, PCI/PXI-6071E

These devices meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1
- CAN/CSA-C22.2 No. 61010-1



**Note** For UL and other safety certifications, refer to the product label, or visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

### NI DAQPad-6070E

The device meets the requirements of the following standards for safety and 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](http://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<br>FCC Part 15A above<br>1 GHz |
| Immunity .....  | EN 61326:1997<br>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](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

|                     |    |    |                   |
|---------------------|----|----|-------------------|
| AI 8                | 34 | 68 | AI 0              |
| AI 1                | 33 | 67 | AI GND            |
| AI GND              | 32 | 66 | AI 9              |
| AI 10               | 31 | 65 | AI 2              |
| AI 3                | 30 | 64 | AI GND            |
| AI GND              | 29 | 63 | AI 11             |
| AI 4                | 28 | 62 | AI SENSE          |
| AI GND              | 27 | 61 | AI 12             |
| AI 13               | 26 | 60 | AI 5              |
| AI 6                | 25 | 59 | AI GND            |
| AI GND              | 24 | 58 | AI 14             |
| AI 15               | 23 | 57 | AI 7              |
| AO 0                | 22 | 56 | AI GND            |
| AO 1                | 21 | 55 | AO GND            |
| AO EXT REF          | 20 | 54 | AO GND            |
| P0.4                | 19 | 53 | D GND             |
| D GND               | 18 | 52 | P0.0              |
| P0.1                | 17 | 51 | P0.5              |
| P0.6                | 16 | 50 | D GND             |
| D GND               | 15 | 49 | P0.2              |
| +5 V                | 14 | 48 | P0.7              |
| D GND               | 13 | 47 | P0.3              |
| D GND               | 12 | 46 | AI HOLD COMP      |
| PFI 0/AI START TRIG | 11 | 45 | EXT STROBE        |
| PFI 1/AI REF TRIG   | 10 | 44 | D GND             |
| D GND               | 9  | 43 | PFI 2/AI CONV CLK |
| +5 V                | 8  | 42 | PFI 3/CTR 1 SRC   |
| D GND               | 7  | 41 | PFI 4/CTR 1 GATE  |
| PFI 5/AO SAMP CLK   | 6  | 40 | CTR 1 OUT         |
| PFI 6/AO START TRIG | 5  | 39 | D GND             |
| D GND               | 4  | 38 | PFI 7/AI SAMP CLK |
| PFI 9/CTR 0 GATE    | 3  | 37 | PFI 8/CTR 0 SRC   |
| CTR 0 OUT           | 2  | 36 | D GND             |
| FREQ OUT            | 1  | 35 | D GND             |

**Figure 1.** NI PXI-6070E/PCI-MIO-16E-1 Pinout

|          |    |    |              |
|----------|----|----|--------------|
| PFI 9    | 2  | 1  | P0.7         |
| PFI 8    | 4  | 3  | P0.6         |
| PFI 7    | 6  | 5  | P0.5         |
| PFI 6    | 8  | 7  | P0.4         |
| PFI 5    | 10 | 9  | P0.3         |
| PFI 4    | 12 | 11 | P0.2         |
| PFI 3    | 14 | 13 | P0.1         |
| PFI 2    | 16 | 15 | P0.0         |
| PFI 1    | 18 | 17 | CTR 1 OUT    |
| D GND    | 20 | 19 | D GND        |
| USER 2   | 22 | 21 | USER 1       |
| FREQ OUT | 24 | 23 | AI HOLD COMP |
| +5 V     | 26 | 25 | EXT STROBE   |
| +5 V     | 28 | 27 | AI SENSE     |
| D GND    | 30 | 29 | AI GND       |

Figure 2. NI DAQPad-6070E BNC Pinout

|                     |    |     |            |
|---------------------|----|-----|------------|
| AI GND              | 1  | 51  | AI 16      |
| AI GND              | 2  | 52  | AI 24      |
| AI 0                | 3  | 53  | AI 17      |
| AI 8                | 4  | 54  | AI 25      |
| AI 1                | 5  | 55  | AI 18      |
| AI 9                | 6  | 56  | AI 26      |
| AI 2                | 7  | 57  | AI 19      |
| AI 10               | 8  | 58  | AI 27      |
| AI 3                | 9  | 59  | AI 20      |
| AI 11               | 10 | 60  | AI 28      |
| AI 4                | 11 | 61  | AI 21      |
| AI 12               | 12 | 62  | AI 29      |
| AI 5                | 13 | 63  | AI 22      |
| AI 13               | 14 | 64  | AI 30      |
| AI 6                | 15 | 65  | AI 23      |
| AI 14               | 16 | 66  | AI 31      |
| AI 7                | 17 | 67  | AI 32      |
| AI 15               | 18 | 68  | AI 40      |
| AI SENSE            | 19 | 69  | AI 33      |
| AO 0                | 20 | 70  | AI 41      |
| AO 1                | 21 | 71  | AI 34      |
| AO EXT REF          | 22 | 72  | AI 42      |
| AO GND              | 23 | 73  | AI 35      |
| D GND               | 24 | 74  | AI 43      |
| P0.0                | 25 | 75  | AI SENSE 2 |
| P0.4                | 26 | 76  | AI GND     |
| P0.1                | 27 | 77  | AI 36      |
| P0.5                | 28 | 78  | AI 44      |
| P0.2                | 29 | 79  | AI 37      |
| P0.6                | 30 | 80  | AI 45      |
| P0.3                | 31 | 81  | AI 38      |
| P0.7                | 32 | 82  | AI 46      |
| D GND               | 33 | 83  | AI 39      |
| +5 V                | 34 | 84  | AI 47      |
| +5 V                | 35 | 85  | AI 48      |
| AI HOLD COMP        | 36 | 86  | AI 56      |
| EXT STROBE          | 37 | 87  | AI 49      |
| PFI 0/AI START TRIG | 38 | 88  | AI 57      |
| PFI 1/AI REF TRIG   | 39 | 89  | AI 50      |
| PFI 2/AI CONV CLK   | 40 | 90  | AI 58      |
| PFI 3/CTR 1 SRC     | 41 | 91  | AI 51      |
| PFI 4/CTR 1 GATE    | 42 | 92  | AI 59      |
| CTR 1 OUT           | 43 | 93  | AI 52      |
| PFI 5/AO SAMP CLK   | 44 | 94  | AI 60      |
| PFI 6/AO START TRIG | 45 | 95  | AI 53      |
| PFI 7/AI SAMP CLK   | 46 | 96  | AI 61      |
| PFI 8/CTR 0 SRC     | 47 | 97  | AI 54      |
| PFI 9/CTR 0 GATE    | 48 | 98  | AI 62      |
| CTR 0 OUT           | 49 | 99  | AI 55      |
| FREQ OUT            | 50 | 100 | AI 63      |

Figure 3. NI 6071E Pinout

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