Low-Cost Multifunction DAQ for USB

NI USB-6008, NI USB-6009

- Small, portable multifunction data acquisition devices
- 12 or 14-bit input resolution, at up to 48 kS/s
- Built-in, removable connectors for easier and more cost-effective connectivity
- 2 true DAC analog outputs for accurate output signals
- 12 digital I/O lines (TTL/LVTT/C莫斯)
- 32-bit event counter
- Student kits available

Operating Systems
- Windows 2000/XP
- Mac OS X
- Linux

Recommended Software
- LabVIEW
- LabWindows/CVI

Measurement Services Software (included)
- NI-DAQmx Base
- Ready-to-Run Data Logger

Hardware Description
The National Instruments USB-6008 and USB-6009 multifunction data acquisition devices provide reliable data acquisition at a low price. With plug-and-play USB connectivity, these devices are simple enough for quick measurements, but versatile enough for more complex measurement applications.

Software Description
The NI USB-6008 and USB-6009 include a ready-to-run data logger application that acquires and logs up to eight channels of analog data. For more functionality, NI-DAQmx Base software is a multiplatform driver with a subset of the NI-DAQmx programming interface. Use it to develop customized DAQ applications with NI LabVIEW or C-based development environments.

Recommended Accessories
The USB-6008 and USB-6009 have built-in connectivity, so no additional accessories are required.

Common Applications
The USB-6008 and USB-6009 are ideal for a number of applications where economy, small size, and simplicity are essential, such as:
- Data logging – Log environmental or voltage data quickly and easily
- Academic lab use – The low price facilitates student ownership of DAQ hardware for completely interactive lab-based courses. Academic pricing available. Visit [ni.com/academic](http://ni.com/academic) for details.
- Embedded OEM applications

Information for Student Ownership
To supplement simulation, measurement, and automation theory courses with practical experiments, NI has developed the USB-6008 and USB-6009 student kits that include LabVIEW Student Edition and a ready-to-run data logger application. These kits are exclusively for students, giving them a powerful, low-cost hands-on learning tool. Visit [ni.com/academic](http://ni.com/academic) for more details.

Information for OEM Customers
For information on special configurations and pricing, please visit [ni.com/oem](http://ni.com/oem).

Ordering Information
NI USB-6008 \(^1\) ........................................................................... 779051-01
NI USB-6009 \(^1\) ........................................................................... 779026-01
NI USB-6008 Student-kit \(^1,2\) ............................................... 779320-22
NI USB-6009 Student-kit \(^1,2\) ............................................... 779321-22
\(^1\) Includes NI-DAQmx Base Software, NI-Ready-to-Run Data Logger Software, and a USB cable.
\(^2\) Includes LabVIEW Software, and a USB cable.

Operating Systems
- Windows 2000/XP
- Mac OS X
- Linux

Recommended Software
- LabVIEW
- LabWindows/CVI

Measurement Services Software (included)
- NI-DAQmx Base
- Ready-to-Run Data Logger

<table>
<thead>
<tr>
<th>Product</th>
<th>Bus</th>
<th>Analog Inputs</th>
<th>Input Resolution (bits)</th>
<th>Max Sampling Rate (kS/s)</th>
<th>Input Range (V)</th>
<th>Analog Outputs</th>
<th>Output Resolution (bits)</th>
<th>Output Rate (Hz)</th>
<th>Output Range (V)</th>
<th>Digital I/O Lines</th>
<th>32-bit Counter</th>
<th>Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB-6009</td>
<td>USB</td>
<td>8 SE/4 DI</td>
<td>14</td>
<td>48</td>
<td>±1 to ±20</td>
<td>2</td>
<td>12</td>
<td>150</td>
<td>0 to 5</td>
<td>12</td>
<td>1</td>
<td>Digital</td>
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<td>0 to 5</td>
<td>12</td>
<td>1</td>
<td>Digital</td>
</tr>
</tbody>
</table>

1 SE = single ended; DI = differential
Low-Cost Multifunction DAQ for USB

Specifications
Typical at 25 °C unless otherwise noted.

Analog Input
Absolute accuracy, single-ended

<table>
<thead>
<tr>
<th>Range</th>
<th>Typical at 25 °C [mV]</th>
<th>Maximum [0 to 55 °C] [mV]</th>
</tr>
</thead>
<tbody>
<tr>
<td>±10</td>
<td>1.47</td>
<td>1.38</td>
</tr>
</tbody>
</table>

Absolute accuracy at full scale, differential

<table>
<thead>
<tr>
<th>Range</th>
<th>Typical at 25 °C [mV]</th>
<th>Maximum [0 to 55 °C] [mV]</th>
</tr>
</thead>
<tbody>
<tr>
<td>±20</td>
<td>1.47</td>
<td>1.38</td>
</tr>
<tr>
<td>±10</td>
<td>7.73</td>
<td>84.8</td>
</tr>
<tr>
<td>±5</td>
<td>4.28</td>
<td>58.4</td>
</tr>
<tr>
<td>±4</td>
<td>3.59</td>
<td>53.1</td>
</tr>
<tr>
<td>±2.5</td>
<td>2.56</td>
<td>45.1</td>
</tr>
<tr>
<td>±2</td>
<td>2.21</td>
<td>42.5</td>
</tr>
<tr>
<td>±1.25</td>
<td>1.70</td>
<td>38.9</td>
</tr>
<tr>
<td>±1</td>
<td>1.53</td>
<td>37.5</td>
</tr>
</tbody>
</table>

*Input voltages may not exceed the working voltage range.

Number of channels: 8 single-ended / 4 differential
Type of ADC: Successive approximation

ADC resolution (bits)

<table>
<thead>
<tr>
<th>Device</th>
<th>Differential</th>
<th>Single-Ended</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB-6008</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>USB-6009</td>
<td>14</td>
<td>13</td>
</tr>
</tbody>
</table>

Maximum sampling rate (system dependent)

<table>
<thead>
<tr>
<th>Device</th>
<th>Maximum Sampling Rate (kS/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB-6008</td>
<td>18</td>
</tr>
<tr>
<td>USB-6009</td>
<td>48</td>
</tr>
</tbody>
</table>

Input range, single-ended: ±10 V
Input range, differential: ±20, ±10, ±5, ±4, ±2.5, ±2, ±1.25, ±1 V
Maximum working voltage: ±10 V
Overvoltage protection: ±35 V
FFO buffer size: 512 B
Timing resolution: 41.67 ns (24 MHz timebase)
Timing accuracy: 100 ppm of actual sample rate
Input Impedance: 144 k Ω
Trigger source: Software or external digital trigger
System noise: 0.3 LSB (±10 V range)

Analog Output
Absolute accuracy (no load): ±7 mV typical, ±36 mV maximum at full scale
Number of channels: 2
Type of DAC: Successive approximation
DAC resolution: 12 bits
Maximum update rate: 150 Hz, software-timed
Output range: 0 to ±5 V
Output impedance: 50 Ω
Output current drive: 5 mA
Power-on state: 0 V
Slew rate: 1 V/µs
Short-circuit current: 50 mA

Digital I/O
Number of channels: 12 total
Direction control: Each channel individually programmable as input or output
Output driver type: USB-6008: Open-drain
USB-6009: Each channel individually programmable as push-pull or open-drain
Compatibility: CMOS, TTL, LV TTL
Internal pull-up resistor: ±2.5 V to 5 V
Power-on state: Input [high impedance]
Absolute maximum voltage range: ±5 V to ±8 V

Digital logic levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>0.0</td>
<td>0.8</td>
<td>V</td>
</tr>
<tr>
<td>µA</td>
<td>5.0</td>
<td>50</td>
<td>µA</td>
</tr>
<tr>
<td>V</td>
<td>2.0</td>
<td>3.5</td>
<td>V</td>
</tr>
<tr>
<td>V</td>
<td>2.0</td>
<td>5.0</td>
<td>V</td>
</tr>
</tbody>
</table>

Counter
Number of counters: 1
Resolution: 32 bits
Counter measurements: Edge counting (falling edge)
Pull-up Resistor: 4.7 k Ω to 5 V
Minimum input frequency: 5 MHz
Minimum high pulse width: 100 ns
Minimum low pulse width: 100 ns
Input high voltage: 2.0 V
Input low voltage: 0.8 V

Power Available at I/O Connector
5 V output (200 mA maximum) +5 V typical
5 V output (200 mA maximum) +4.85 V minimum
+2.5 V output (1 mA maximum) +2.5 V typical
+2.5 V output (1 mA maximum) +2.5 V typical
+5 V output (100 mA maximum) +5 V typical
+0.3 V output (20 mA maximum) +0.3 V typical

Voltage reference temperature drift: 50 ppm/°C max

Physical Characteristics
If you need to clean the module, wipe it with a dry towel.

Dimensions (without connectors): 6.35 x 8.51 x 2.31 cm
Dimensions (with connectors): 8.18 x 8.51 x 2.31 cm
Weight (without connectors): 255 g
Weight (with connectors): 282 g
I/O Connectors: USB series B receptacle
Screw-terminal wiring: 16 to 28 AWG
Screw-terminal torque: 0.22 to 0.25 N • m
Screw-terminal wiring: 16 to 28 AWG
Screw-terminal torque: 0.22 to 0.25 N • m

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**Low-Cost Multifunction DAQ for USB**

**Bus Interface**
- USB specification: USB 2.0 full-speed
- USB bus speed: 12 Mbps

**Power Requirement**
- USB (4.10 to 5.25 VDC): 80 mA typical, 500 mA maximum
- USB Suspend: 300 µA typical, 500 µA maximum

**Environmental**
The USB-6008 and USB-6009 are intended for indoor use only.

**Operating Environment**
- Ambient temperature range: 0 to 55 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)
- Relative humidity range: 10% to 90%, non-condensing (tested in accordance with IEC-60068-2-56.)

**Storage Environment**
- Ambient temperature range: -40 to 85 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)
- Relative humidity range: 5% to 90%, non-condensing (tested in accordance with IEC-60068-2-56.)
- Maximum altitude: 2,000 m (at 25 °C ambient temperature)
- Pollution Degree: 2

**Certifications and Compliances**
The USB-6008 and USB-6009 are designed to 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, search by model number or product line, and click the appropriate link in the Certification column.

**Voltages**
Connect only voltages that are within the absolute maximum limits of the connection point. See pertinent specification section for appropriate limits.

**Hazardous Locations**
The USB-6008 and USB-6009 are not certified for use in hazardous locations.

**Electromagnetic Compatibility**
- Emissions: EN 55011 Class A at 10 m, FCC Part 15A above 1 GHz
- Immunity: Industrial levels per EN 61000-4-3, Table 1

Note: The USB-6008 and USB-6009 may experience temporary variations in analog input readings when exposed to radiated and conducted RF noise. Device returns to normal operation after RF exposure is removed.

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

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.
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