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/LVTTL/CMOS)
• 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 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 for more details.

Information for OEM Customers
For information on special configurations and pricing, please visit ni.com/oem.

Ordering Information
NI USB-60081 .................................................................779051-01
NI USB-60091 .................................................................779026-01
NI USB-6008 Student-kit1,2 ...........................................779920-22
NI USB-6009 Student-kit1,2 ...........................................779921-22
1Includes NI-DAQmx Base Software, NI-Ready-to-Run Data Logger Software, and a USB cable.
2Includes LabVIEW Software, and a USB cable.
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>14.7</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>14.7</td>
<td>1.38</td>
</tr>
<tr>
<td>±10</td>
<td>7.33</td>
<td>0.84</td>
</tr>
<tr>
<td>±5</td>
<td>4.28</td>
<td>0.58</td>
</tr>
<tr>
<td>±4</td>
<td>3.59</td>
<td>0.53</td>
</tr>
<tr>
<td>±2.5</td>
<td>2.56</td>
<td>0.45</td>
</tr>
<tr>
<td>±2</td>
<td>2.21</td>
<td>0.42</td>
</tr>
<tr>
<td>±1.25</td>
<td>1.70</td>
<td>0.38</td>
</tr>
<tr>
<td>±1</td>
<td>1.53</td>
<td>0.37</td>
</tr>
</tbody>
</table>

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, LVCMOS
Internal pull-up resistor ............................................ 4.7 kΩ to ±5 V
Power-on state ....................................................... Input (high impedance)
Absolute maximum voltage range ................................ -5 to +5 V

Digital logic levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input low voltage</td>
<td>0.3</td>
<td>0.8</td>
<td>V</td>
</tr>
<tr>
<td>Input high voltage</td>
<td>2.0</td>
<td>5.0</td>
<td>V</td>
</tr>
<tr>
<td>Input leakage current</td>
<td>–</td>
<td>50</td>
<td>µA</td>
</tr>
<tr>
<td>Output low voltage (I = 8.5 mA)</td>
<td>–</td>
<td>0.8</td>
<td>V</td>
</tr>
<tr>
<td>Output high voltage (Push-pull, I = 8.5 mA)</td>
<td>2.0</td>
<td>3.5</td>
<td>V</td>
</tr>
<tr>
<td>Output high voltage (Open-drain, I = 0.6 mA, nominal)</td>
<td>2.0</td>
<td>5.6</td>
<td>V</td>
</tr>
<tr>
<td>Output high voltage (Open-drain, I = 8.5 mA, with external pull-up resistor)</td>
<td>2.0</td>
<td>–</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 kΩ to ±5 V
Maximum 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 (1 mA maximum) .................................... +4.85 V minimum
+2.5 V output (1 mA maximum) .................................. +2.5 V typical
+2.5 V output accuracy .......................................... 0.25 % max
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 by 8.51 by 2.31 cm (2.50 by 3.35 by 0.91 in.)
Dimensions (with connectors) ..................................... 8.18 by 8.51 by 2.31 cm (3.22 by 3.35 by 0.91 in.)
Weight (without connectors) ..................................... 59 g (2.1 oz.)
Weight (with connectors) .......................................... 84 g (3 oz.)
I/O Connectors ....................................................... USB series B receptacle
Screw-terminal wiring ............................................ (2) 16-position (screw-terminal) plug headers
(2) 16-position (screw-terminal) plug headers

Dimensions (without connectors) ............................... 3.22 by 3.35 by 0.91 in.
Dimensions (with connectors) ..................................... 3.22 by 3.35 by 0.91 in.
Weight (with connectors) .......................................... 84 g (3 oz.)
Weight (without connectors) ..................................... 59 g (2.1 oz.)
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**Bus Interface**

USB specification ............................................. USB 2.0 full-speed
USB bus speed ................................................. 12 Mb/s

**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 61326:1997 + A2:2001, Table 1

EMC/EMI ....................................................... CE, C-Tick, and FCC Part 15 (Class A) Compliant

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:

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.
NI Services and Support

NI has the services and support to meet your needs around the globe and through the application life cycle— from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit ni.com/services for more information.

Training and Certification
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The NI Professional Services Team is comprised of NI applications engineers, NI consulting services, and a worldwide National Instruments Alliance Partner Program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance for more information.

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We offer design-in consulting and product integration assistance if you want to use our products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem for more information.

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In offices worldwide, NI staff is local to the country, giving you access to engineers who speak your language. NI delivers industry-leading technical support through an online KnowledgeBase, applications engineers, and access to 14,000 measurement and automation professionals within NI Developer Exchange forums. Find immediate answers to your questions at ni.com/support.

We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit ni.com/ssp.

Hardware Services
NI Factory Installation Services
NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with ni.com/pxiadvisor.

Calibration Services
NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit ni.com/calibration.

Repair and Extended Warranty
NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit ni.com/services.