USB-200 Series
12-Bit DAQ Devices with 8 Analog Inputs

MEASUREMENT COMPUTING™

Features
- Low cost, USB DAQ devices with eight single-ended analog inputs
- Provides 12-bit analog input resolution
- Maximum sampling rates of 100 kS/s (USB-201) and 500 kS/s (USB-204)
- Eight individually-configurable digital I/O lines
- One 32-bit event counter input
- External pacer I/O
- No external power required
- Available with enclosure and screw terminals (USB-201/204) or as board-only with header connectors (USB-201-OEM/204-OEM)

Software
- TracerDAQ® software for acquiring and displaying data and generating analog signals
- Universal Library includes support for Visual Studio® and Visual Studio® .NET, including examples for Visual C++®, Visual C#®, Visual Basic®, and Visual Basic® .NET
- InstaCal software utility for installing, calibrating, and testing
- ULx for NI LabVIEW™
- DAQFlex open-source software framework – includes support for Linux®, and Mac® platforms
- Comprehensive drivers for DASYLab®
- Supported Operating Systems: Windows® 8/7/Vista®/XP SP2, 32-bit or 64-bit

Overview

The USB-200 Series incorporates a new design, providing improved cost/performance compared to our similarly priced 12-bit DAQ devices.

Each USB-200 Series device provides eight single-ended (SE) analog inputs, eight individually-configurable DIO channels, one event counter, and external pacer I/O.

The USB-204 (shown above) provides eight single-ended analog inputs, a maximum sampling rate of 500 kS/s, 8 digital I/O, and one event counter input.

USB-200 Series Selection Chart				
Model	Analog Inputs	Sampling Rate	Connectors	USB Cable and MCC DAQ Software CD Included
USB-201	8 SE (12-bit)	100 kS/s max	Screw Terminal	✔
USB-204	8 SE (12-bit)	500 kS/s max	Screw Terminal	✔
USB-201-OEM	8 SE (12-bit)	100 kS/s max	Header	–
USB-204-OEM	8 SE (12-bit)	500 kS/s max	Header	–

Analog Input

USB-200 Series devices provide eight 12-bit SE analog inputs. Both devices offer an analog input range of ±10 V.

Sampling Rate

When scanning continuously to computer memory (hardware-paced mode), each device has the following maximum aggregate sampling rates:

- USB-201/201-OEM: 100 kS/s
- USB-204/204-OEM: 500 kS/s

The maximum per-channel sampling rates for each device are listed in the following table:

Number of Channels	Max Sampling Rate (kS/s)	
	USB-201/ 201-OEM	USB-204/ 204-OEM
1	100	500
2	50	250
3	33.33	166.67
4	25	125
5	20	100
6	16.67	83.33
7	14.29	71.43
8	12.50	62.50

External Pacer I/O

Each USB-200 Series device provides one external clock input and one clock output for the analog input pacer. You can connect an external clock signal to the external clock input terminal. When using the internal clock, each device outputs the ADC sample clock.

Digital I/O

USB-200 Series devices provide eight TTL-level digital I/O lines. Each digital channel is software-selectable for input or output. When configured for input, you can use the digital I/O terminals to detect the state of any TTL-level input.

Pull-Up/Pull-Down Configuration

Each USB-200 Series device has a user-configurable internal jumper to configure the digital bits for pull-up or pull-down (default).

Event Counter Input

Both devices support one 32-bit TTL-level event counter that accepts inputs up to 1 MHz.

USB-200 OEM Versions

The USB-201-OEM and USB-204-OEM are board-only form factors with header connectors for OEM and embedded applications. All devices can be further customized to meet customer needs.

The USB-201-OEM and USB-204-OEM have the same specifications as the USB-201 and USB-204, but come in a board-only form factor with header connectors instead of screw terminals.

MCC DAQ Software

The USB-201 and USB-204 ship with the MCC DAQ software CD, which includes InstaCal, a software utility for installing, calibrating, and testing Measurement Computing hardware.

USB-201-OEM and USB-204-OEM customers can download this software from www.mccdaq.com/software.aspx.

In addition to InstaCal, MCC DAQ software also includes the following software packages:

TracerDAQ

TracerDAQ is an out-of-the-box application that can generate, acquire, analyze, display, and export data within seconds of installing Measurement Computing data acquisition hardware. TracerDAQ includes a strip chart, an oscilloscope, a function generator, and a rate generator, all of which are accessed through a common, easy-to-use interface.

TracerDAQ provides four virtual instrument applications used to graphically display and store input data.

Universal Library

The Universal Library (UL) is a set of programming libraries for developing applications with Visual Studio programming languages (and others) for use with Measurement Computing hardware. UL includes a complete function library that simplifies the configuration and operation of your measurement device. UL supports Visual Studio and Visual Studio .NET, and includes 64-bit driver support for Windows 8/7/Vista/XP.

ULx for NI LabVIEW

ULx for NI LabVIEW is a comprehensive library of graphical functions and example programs comprising all the power of the Universal Library and InstaCal. ULx for NI LabVIEW is compatible with NI LabVIEW 8.5 and later, and allows quick development of NI LabVIEW instrumentation, acquisition, and control applications with Measurement Computing hardware.

DAQFlex

For DAQ programming in virtually any OS, the DAQFlex framework combines a small footprint driver with a message-based command protocol. The simplicity of the driver is enabled with a message-based protocol that offers an efficient yet powerful interface to DAQ devices and a common command set that simplifies application development.

Software Available Separately

TracerDAQ Pro

TracerDAQ Pro is available as a purchased upgrade to TracerDAQ. TracerDAQ Pro supports more active channels, more samples per channel, and a selection of options and enhancements designed to address many test and measurement applications.

DASYLab

Customers needing more performance than TracerDAQ Pro provides can purchase DASYLab, an icon-based data acquisition, graphics, control, and analysis software package. DASYLab offers real-time analysis and control, and provides the ability to create custom graphical user interfaces without programming. Compared to other graphical programming environments, DASYLab has a very short user-learning curve. Many applications can be configured in a few minutes, rather than days or weeks.
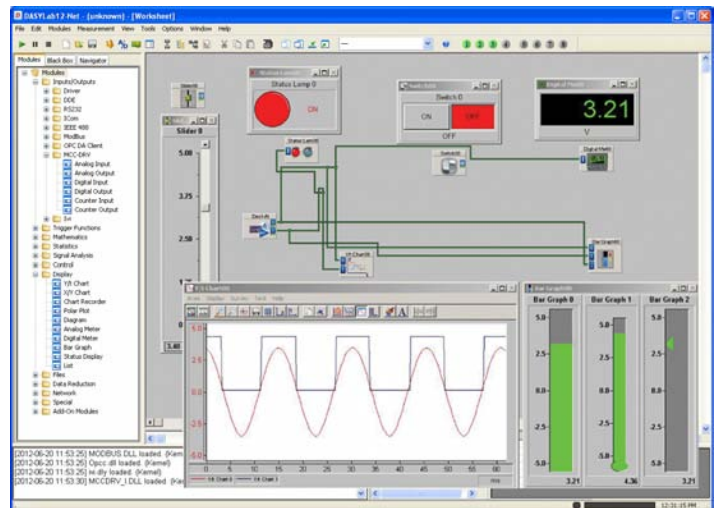
DASYLab gives users the ability to create applications by simply dragging-and-dropping functional icons on a worksheet, connecting the icons together, and running the program. DASYLab supports most MCC data acquisition hardware.

Specifications

Analog Input

A/D Converter Type: Successive approximation
ADC Resolution: 12 bits
Number of Channels: 8 SE
Input Voltage Range: ±10 V max
Absolute Maximum Input Voltage
    CHx to GND: ±25 V max (power on or power off)
Input Impedance: 1 MΩ (power on or power off)
Input Bias Current
    10 V Input: –12 µA
    0 V Input: 2 µA
    –10 V Input: 12 µA
Input Bandwidth, Small Signal (–3 dB)
    USB-201/201-OEM: 200 kHz
    USB-204/204-OEM: 1.0 MHz
Maximum Working Voltage
    Input Range Relative to AGND: ±10.1 V max
Crosstalk (Adjacent Channels, DC to 10 kHz): –75 dB
Input Coupling: DC
Sampling Rate
    Internal Pacer
        USB-201/201-OEM: 0.016 S/s to 100 kS/s, software-selectable
        USB-204/204-OEM: 0.016 S/s to 500 kS/s, software-selectable
    External Pacer
        USB-201/201-OEM: 100 kS/s max
        USB-204/204-OEM: 500 kS/s max
Sample Clock Source
    Internal A/D clock
    Pacer input terminal AICKI
Channel Queue: Up to eight unique, ascending channels
Throughput
    Software Paced: 33 to 4000 S/s typ, system dependent
    Hardware Paced
        USB-201/201-OEM: 100 kS/s max, system dependent
        USB-204/204-OEM: 500 kS/s max, system dependent
Warm-Up Time: 15 minutes min

USB-200 Series Block Diagram
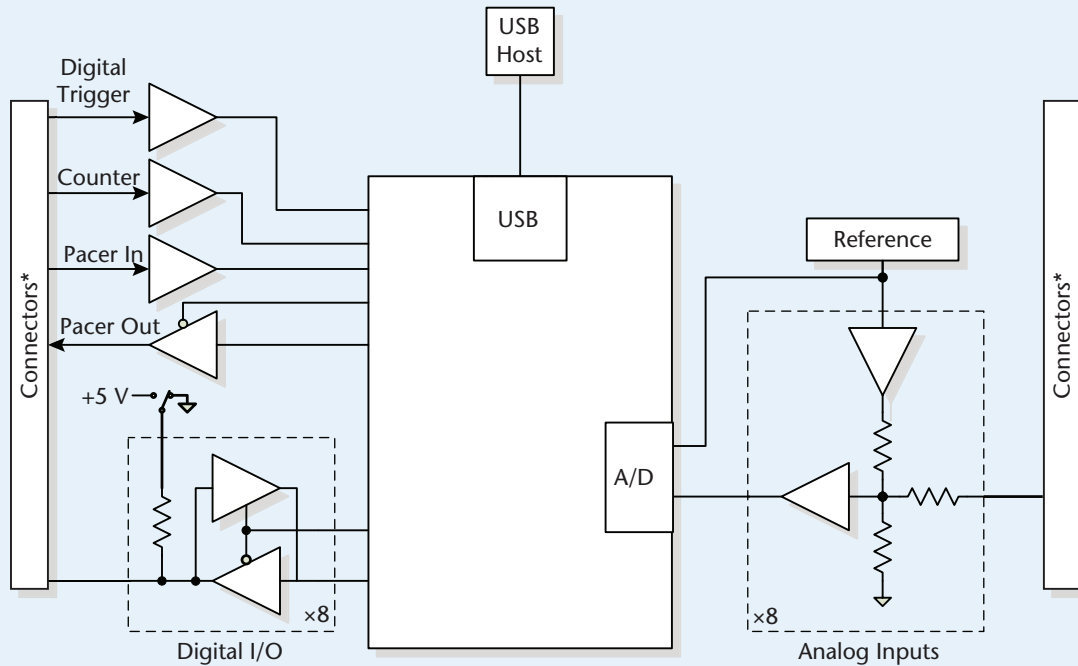
* Screw Terminal Connectors on USB-201/204
  Header Connectors on USB-201-OEM/204-OEM

Accuracy

Analog Input DC Voltage Measurement Accuracy

Range: ±10 V
Gain Error (% of Reading): 0.098
Offset Error: 11 mV
Absolute accuracy at Full Scale: 20.8 mV
Gain Temperature Coefficient (% Reading/°C): 0.016
Offset Temperature Coefficient (mV/°C): 0.87

Noise Performance

For the peak to peak noise distribution test, the input channel is connected to AGND at the input terminal block, and 12,000 samples are acquired at the maximum throughput.
Range: ±10 V
Counts: 5
LSBrms: 0.76

Analog Input Calibration

Recommended Warm-Up Time: 15 minutes min
Calibration Method: Factory
Calibration Interval: 1 year

Digital I/O

Digital Type: TTL
Number of I/O: 8
Configuration: Each bit may be configured as input (power on default) or output
Pull-Up Configuration: The port has 47 kΩ resistors that may be configured as pull-up or pull-down with an internal jumper. The factory configuration is pull-down.
Digital I/O Transfer Rate (System-Paced): 33 to 4000 port reads/writes per second typical, system dependent
Input Low Voltage Threshold: 0.8 V max

Input high voltage Threshold: 2.0 V min
Input Voltage Limits: 5.5 V absolute max, –0.5 V absolute min, 0 V recommended min
Output High Voltage: 4.4 V min (IOH = –50 µA), 3.76 V min (IOH = –24 mA)
Output Low Voltage: 0.1 V max (IOL = 50 µA), 0.44 V max (IOL = 24 mA)
Output Current: ±24 mA max

External Digital Trigger

Trigger Source: TRIG input
Trigger Mode: Software-selectable for edge or level sensitive, rising or falling edge, high or low level. Power on default is edge sensitive, rising edge.
Trigger Latency: 1 µs + 1 pacer clock cycle max
Trigger Pulse Width: 125 ns min
Input Type: Schmitt trigger, 47 kΩ pull-down to ground
Schmitt Trigger Hysteresis: 1.01 V typ, 0.6 V min, 1.5 V max
Input High Voltage Threshold: 2.43 V typ, 1.9 V min, 3.1 V max
Input Low Voltage Threshold: 1.42 V typ ,1.0 V min, 2.0 V max
Input Voltage Limits: 5.5 V absolute max, –0.5 V absolute min, 0 V recommended min

External Pacer Input/Output

Terminal Names: AICKI, AICKO
Terminal Types
    AICKI: Input, active on rising edge
    AOCKO: Output, power on default is 0 V, active on rising edge
Terminal Descriptions
    AICKI: Receives pacer clock from external source
    AICKO: Outputs internal pacer clock
Input Clock Rate: 500 kHz max
Clock Pulse Width
    AICKI: 400 ns min
    AICKO: 400 ns min
Input Type: Schmitt trigger, 47 kΩ pull-down to ground
Schmitt Trigger Hysteresis: 1.01 V typ, 0.6 V min, 1.5 V max

Input High Voltage Threshold: 2.43 V typ, 1.9 V min, 3.1 V max
Input Low Voltage Threshold: 1.42 V typ, 1.0 V min, 2.0 V max
Input Voltage Limits: 5.5 V absolute max, –0.5 V absolute min, 0 V recommended min
Output High Voltage: 4.4 V min (IOH = –50 µA), 3.80 V min (IOH = –8 mA)
Output Low Voltage: 0.1 V max (IOL = 50 µA), 0.44 V max (IOL = 8 mA)
Output Current: ±8 mA max

Counter

Pin Name: CTR
Counter Type: Event counter
Number of Channels: 1
Input Type: Schmitt trigger, 47 kΩ pull-down to ground
Input Source: CTR screw terminal
Resolution: 32 bits
Maximum Input Frequency: 1 MHz
Counter Read/Write Rates (Software Paced): 33 to 4,000 reads/writes per second typ, system dependent
High Pulse Width: 25 ns min
Low Pulse Width: 25 ns min
Schmidt Trigger Hysteresis: 1.01 V typ, 0.6 V min, 1.5 V max
Input High Voltage Threshold: 2.43 V typ, 1.9 V min, 3.1 V max
Input High Voltage Limit: 5.5 V absolute max
Input Low Voltage Threshold: 1.42 V typ, 1.0 V min, 2.0 V max
Input Low Voltage Limit: –0.5 V absolute min, 0 V recommended min

Memory

Data FIFO: 12 K (12,288) analog input samples
Non-Volatile Memory: 2 KB (768 B calibration storage, 256 B UL user data, 1 KB DAQFlex user data)

Power

Supply Current: 150 mA typ[1], 500 mA max (including user voltage, DIO and AICKO loading)
User Voltage Output Terminal (+VO): 4.5 V min, 5.25 V max
User Voltage Output Current: 100 mA max

Environment

Operating Temperature: 0 ˚C to 55 ˚C
Storage Temperature: –40 ˚C to 85 °C
Relative Humidity: 0% to 90% non-condensing

Mechanical

Signal I/O Connector
  USB-201/204: Two banks of screw-terminal blocks
  USB-201-OEM/204-OEM: Two 2 × 8 0.1 in. pitch headers,labeled W1 and W3
Dimensions (L × W × H):
  USB-201/204: 117.86 × 82.80 × 28.96 mm (4.64 × 3.26 × 1.14 in.) max
  USB-201-OEM/204-OEM: 98.30 × 76.71 × 14.61 mm (87 × 3.02 × 0.575 in.) max

USB Specifications

USB Device Type: USB 2.0 (full-speed, 12 Mbps)
USB Device Compatibility: USB 1.1, 2.0
USB Cable Type: A-B cable, UL type AWM 2725 or equivalent (minimum 24 AWG VBUS/GND, minimum 28 AWG D+/D–)
USB Cable Length: 3 m (9.84 ft) max

Ordering Information

Description	Part No.
USB-based DAQ device with eight 12-bit analog inputs, 100 kS/s, and 8 digital I/O lines (includes USB cable and MCC DAQ software CD)	USB-201
USB-based DAQ device with eight 12-bit analog inputs, 500 kS/s, and 8 digital I/O lines (includes USB cable and MCC DAQ software CD)	USB-204
Board-only USB-based DAQ device with eight 12-bit analog inputs, 100 kS/s, and 8 digital I/O lines	USB-201-OEM
Board-only USB-based DAQ device with eight 12-bit analog inputs, 500 kS/s,and 8 digital I/O lines	USB-204-OEM

Software

Icon-based data acquisition, graphics, control, and analysis software	DASYLab
Out-of-the-box virtual instrument suite with strip chart, oscilloscope, function generator, and rate generator – professional version	TracerDAQ Pro

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1 Total quiescent current requirement for the device, which includes up to 10 mA for the Status LED. This value does not include any potential loading of the digital I/O bits, AICKO, or user voltage.