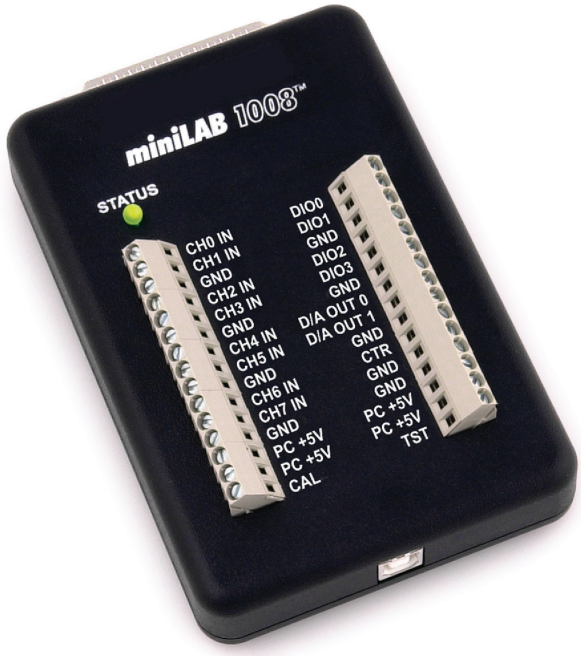
miniLAB 1008

Multifunction USB Device



The miniLAB 1008 features 8 single-ended or 4 differential analog inputs, two analog outputs, 28 bidirectional DIO lines, one 32-bit event counter, and a rugged enclosure

Features

- 8 single-ended or 4 differential analog inputs
- 11-bit (SE) or 12-bit (DIFF) resolution
- Two 10-bit analog outputs
- 28 bidirectional digital I/O
- One 32-bit external event counter
- No external power required

Supported Operating Systems

- Windows® 11/10/8/7/ Vista®XP, 32/64-bit

Overview

The miniLAB 1008 is an accurate, powerful, low-cost, USB-based data acquisition device featuring 8 single-ended or 4 differential 12-bit analog inputs, two 10-bit analog outputs, 32 total digital I/O lines (4 through screw terminals, 28 through a 37-pin connector), and an event counter.

Combined with Measurement Computing DAQ software, the miniLAB 1008 turns your personal computer into a data acquisition and control system that may be used to automate experiments, construct product test stands, or monitor and control production equipment.

The miniLAB 1008 is bus-powered, USB plug-and-play, and easy to use.

Analog Input

The miniLAB 1008 provides eight single-ended or four differential analog inputs.

When configured for single-ended mode, each input has 11-bit resolution and a range of ±10 V.

When configured for differential mode, each input has 12-bit resolution and software selectable ranges. A low-noise PGA provides gains of up to 20 and a dynamic range of up to 16 bits.

Sample Rate

The maximum continuous scan rate is an aggregate rate. The total acquisition rate for all channels cannot exceed 1.2 kS/s.

In hardware paced mode, users can acquire data from one channel at 1.2 kS/s, two channels at 600 S/s, four channels at 300 S/s, and so on, up to 8 channels at 150 S/s.

In software paced mode, the maximum throughput sample rate is 50 S/s.

When using burst scan mode, the maximum sample rate is 8 kS/s divided by the number of channels being read.

Analog Output

Two 10-bit analog output channels can be updated simultaneously at a rate up to 50 S/s per channel. One output can be updated at a rate up to 100 S/s. The output range is fixed at 0 V to 5 V.

Digital I/O

The miniLAB 1008 screw terminal provides four digital I/O bits. These bits are protected from overvoltage or short circuit conditions with 1.5 kΩ series resistors. Each bit is 5V/TTL compatible, and configurable for either input or output.

A 37-pin connector provides an additional 24 digital I/O bits as two 8-bit ports and two 4-bit ports. These bits are pulled up by default, are TTL compatible, and port-configurable for either input or output.

Counter Input

The 32-bit event counter accepts frequency inputs up to 1 MHz, and increments when the TTL level transitions from low to high.

Calibration

The miniLAB 1008 is factory-calibrated using a NIST-traceable calibration process. Specifications are guaranteed for one year.

The miniLAB 1008 also supports field calibration for users to calibrate the device locally with the InstaCal utility.

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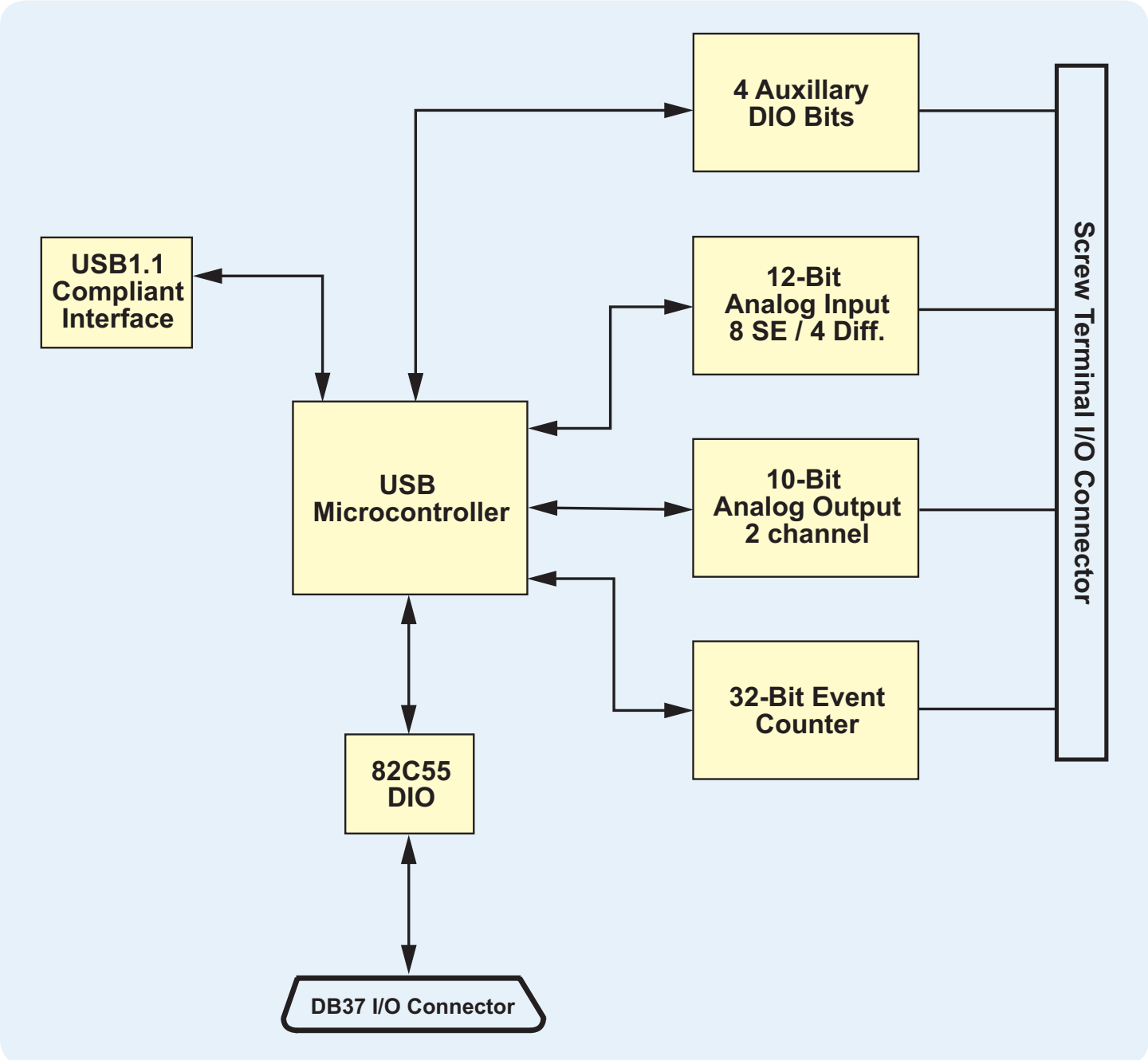
Functional Block Diagram



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Software Support

The miniLAB 1008 is supported by the software in the table below.

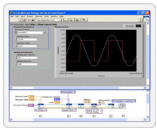
Ready-to-Run Applications

DAQami™		Data acquisition companion software with drag-and-drop interface that is used to acquire, view, and log data, and generate signals. DAQami can be configured to log analog, digital, and counter channels, and to view that data in real-time or post-acquisition on user-configurable displays. Logged data can be exported for use in Excel® or MATLAB®. Windows OS DAQami is included with the free MCC DAQ Software bundle.
InstaCal™		An interactive installation, configuration, and test utility for MCC hardware. Windows OS InstaCal is included with the free MCC DAQ Software bundle.
TracerDAQ™ and TracerDAQ Pro		Virtual strip chart, oscilloscope, function generator, and rate generator applications used to generate, acquire, analyze, display, and export data. Supported features may vary by hardware. The Pro version provides enhanced features. Windows OS TracerDAQ is included with the free MCC DAQ Software bundle. TracerDAQ Pro is available as a purchased software download.

General-Purpose Programming Support

Universal Library™ (UL) for Windows		Library for developing applications in C, C++, VB, C# .Net, VB .Net, and Python on Windows. The UL for Windows is included with the free MCC DAQ Software bundle. The UL Python API for Windows is available on GitHub (https://github.com/mccdaq/mcculw).

Application-Specific Programming Support

ULx for NI LabVIEW™		A comprehensive library of VIs and example programs for NI LabVIEW that is used to develop custom applications that interact with most MCC devices. Windows OS ULx for NI LabVIEW is included with the free MCC DAQ Software bundle.
DASYLab®		Icon-based data acquisition, graphics, control, and analysis software that allows users to create complex applications in minimal time without text-based programming. Windows OS DASYLab is available as a purchased software download. An evaluation version is available for 28 days.

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Specifications

All specifications are subject to change without notice.
Typical for 25 °C unless otherwise specified.

Analog Input

A/D converter type: Successive approximation type
Input voltage range for linear operation, single ended mode
CHx to GND: ±10 V max
Input voltage range for linear operation, differential mode
CHx to GND: –10 V min, +20V max
Absolute maximum input voltage
CHx to GND: ±40 V max
Input current:
Vin = +10 V: 70 µA typ
Vin = 0 V: –12 µA typ
Vin = –10 V: –94 µA typ
Input current is a function of applied voltage on the analog input channels. For a given input voltage, Vin, the input leakage is approximately equal to (8.181*Vin–12) µA.
Number of channels: 8 single-ended / 4 differential, software selectable
Input ranges,
Single-ended mode: ±10 V, G=2
Differential mode, software selectable:
±20 V, G=1
±10 V, G=2
±5 V, G=4
±4 V, G=5
±2.5 V, G=8
±2.0 V, G=10
±1.25 V, G=16
±1.0 V, G=20
Throughput
Software paced: 50 S/s
Continuous scan: 1.2 kS/s
Burst scan to 4K sample FIFO: 8 kS/s
Channel gain queue: Up to 8 elements with software configurable channel, range, and gain.
Resolution
Differential: 12 bits, no missing codes
Single-ended: 11 bits, 0-2047 codes
CAL accuracy
CAL = 2.5 V: ±0.05% typ, ±0.25% max
Integral linearity error: ±1 LSB typ
Differential linearity error: ±0.5 LSB typ
Repeatability: ±1 LSB typ
CAL current
Source: 5 mA max
Sink: 20 µA min, 200 nA typ
Trigger source: Software selectable, eternal digital, DIO0-DIO3

Accuracy

Differential mode	
Range	**Accuracy (LSB)**
±20 V	5.1
±10 V	6.1
±5 V	8.1
±4 V	9.1
±2.5 V	12.1
±2 V	14.1
±1.25	20.1
±1 V	24.1

Single-ended mode	
Range	**Accuracy (LSB)**
±10 V	4.0

Accuracy components, differential mode – all values ±				
Range	**% of Reading**	**Gain Error at FS (mV)**	**Offset (mV)**	**Accuracy at FS (mV)**
±20 V	0.2	40	9.766	49.766
±10 V	0.2	20	9.766	29.766
±5 V	0.2	10	9.766	19.766
±4 V	0.2	8	9.766	17.766
±2.5 V	0.2	5	9.766	14.766
±2V	0.2	4	9.766	13.766
±1.25 V	0.2	2.5	9.766	12.266
±1 V	0.2	2	9.766	11.766

Accuracy components, single-ended mode – all values ±				
Range	**% of Reading**	**Gain Error at FS (mV)**	**Offset (mV)**	**Accuracy at FS (mV)**
±10 V	0.2	20	19.531	39.531

Analog Output

D/A converter type: PWM
Resolution: 10-bits, 1 in 1024
Maximum output range: 0 -5 Volts
Number of channels: 2 voltage output
Throughput
Software paced; 100 S/s single channel mode, 50 S/s dual channel mode
Power on and reset voltage: Initializes to 000h code
Maximum voltage
No load: Vs
1 mA load: 0.99 * Vs
5 mA load: 0.98 * Vs
Vs is the USB bus +5V power. The maximum analog output voltage is equal to Vs at no-load. V is system dependent and may be less than 5 volts.
Output drive (each D/A OUT): 30 mA
Slew rate: 0.14 V/mS typ

Digital Input/Output (screw terminals)

Digital type: Discrete, 5V/TTL compatible
Number of I/O: 4, DIO[3:0], protected with 1.5 kΩ series resistors
Configuration: 4 bits, independently programmable for input or output.
Input high voltage: 3.0 V min, 15.0 V absolute max
Input low voltage: 0.8 V max
Output voltage (Note 4)
No load: Vs – 0.4 V min, Vs typ
1 mA load: Vs – 1.5 V
Input leakage current: ±1.0 µA
Output short-circuit current
Output high: 3.3 mA
Power-up / reset state: Input mode (high impedance)

Digital Input/Output (DB37 connector)

Digital type: 82C55
Number of I/O: 24 (Port A0 through Port C7)
Configuration: 2 banks of 8 and 2 banks of 4, or 3 banks of 8
Pull up/pull-down configuration: All pins pulled up to Vs via 47 kΩ resistors (default). Positions available for pull-down to ground. Selectable via 0 Ω resistor.
Input high voltage: 2.0 V min, 5.5 V absolute max
Input low voltage: 0.8 V max, –0.5 V absolute min
Output high voltage (IOH = –2.5 mA): 3.0 V min
Output low voltage (IOL = 2.5 mA): 0.4 V max

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Specifications (Cont'd) and Ordering

External Trigger

Trigger source: External digital, DIO[3:0], only DIO may be selected as a trigger input
Trigger mode: Software selectable, level sensitive. User configurable for TTL level high or low input.
Trigger latency: Burst, 25 µs min, 50 µs max
Trigger pulse width: Burst, 40 µs min
Input high voltage: 3.0 V min, 15.0 V absolute max
Input low voltage: 0.8 V max
Input leakage current: ±1.0 µA

Counters

Counter type: Event counter
Number of channels: 1
Input source: CTR screw terminal
Input type: TTL, rising edge triggered
Resolution: 32 bits
Schmidt trigger hysteresis: 20 mV to 100 mV
Input leakage current: ±1 µA
Maximum input frequency: 1 MHz
High pulse width: 500 ns min
Low pulse width: 500 ns min
Input low voltage: 0V min, 1.0 V max
Input high voltage: 4.0 V min, 15.0 V max

Non-Volatile Memory

Memory size: 8192 bytes
Memory configuration
0x0000 – 0x17FF: Read/Write, A/D Data (4k samples)
0x1800 – 0x1EFF: Read/Write, user data area
0x1F00 – 0x1FEF: Read/Write, calibration data
0x1FF0 – 0x1FFF: Read/Write, system Data

Power

Supply Current: 20 mA. This is the total current requirement and includes up to 5 mA for the status LED.
+5V USB power available
Connected to self-powered hub: 4.5 V min, 5.25 V max.
Connected to bus-powered hub: 4.1 V min, 5.25 V max
Self-powere hub refers to USB hubs and hosts with a power supply. Bus-powered refers to USB hubs and hosts without their own power supply
Output Current
Connected to self-powered hub: 450 mA min, 500 mA max. This is the total amount of current that can be sourced from the USB +5V, analog outputs and digital outputs.
Connected to bus-powered hub: 50 mA min, 100 mA max

General

USB controller clock error
25 °C: ±30 ppm max
0 to 70 °C: ±50 ppm max
–40 to 85 °C: ±100 ppm max
Device type: USB 1.1 low-speed
Device compatibility: USB 1.1, USB 2.0

Environmental

Operating temperature range: –40 to 85 °C
Storage temperature range: –40 to 85 °C
Humidity: 0 to 90% non-condensing

Mechanical

Case dimensions (L × W × H): 157 × 102 × 40 mm (6.2 × 0.08 × 1.57 in.), including connectors
USB cable length: 3 m (9.84 ft) max
User connection length: 3 m (9.84 ft) max

Order Information

Hardware

Part No.	Description
miniLAB 1008	USB-based multifunction DAQ device with eight 11-bit SE/four 12-bit DIFF analog inputs, two 10-bit analog outputs, one counter input, and 28 digital I/O lines

Software also Available from MCC

Part No.	Description
TracerDAQ Pro	Out-of-the-box virtual instrument suite with strip chart, oscilloscope, function generator, and rate generator – professional version
DASYLab	Icon-based data acquisition, graphics, control, and analysis software