BTH-1208LS

Wireless Multifunction DAQ Device

MEASUREMENT COMPUTING

Features

- Eight 11-bit single-ended (SE) or four 12-bit differential (DIFF) analog input channels
- Acquires data over Bluetooth® or USB connection
- Maximum sampling rate of 1 kS/s over Bluetooth (continuous scan)
- Maximum sampling rate of 50 kS/s over USB (continuous scan) or Bluetooth (burst mode)
- Software-selectable analog input ranges of ±10 V (SE); ±20 V, ±10 V, ±5 V, ±4 V, ±2.5 V, ±2.0 V, ±1.25 V, and ±1.0 V (DIFF).
- Two 12-bit analog outputs
- Eight individually-configurable digital I/O lines
- One 32-bit event counter
- One external digital trigger input
- One external clock input
- Battery and USB power options
- Battery recharging capability
- BTH-1208LS-OEM comes as board-only device with header connectors

Software

- Universal Library for Android includes support and examples for the Android 3.1 platform (API level 12) and later
- 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™
- TracerDAQ® software for acquiring and displaying data and generating analog signals
- Comprehensive drivers for DASYLab®
- Supported Operating Systems:
  - Windows® 8/7/Vista® (SP2)/ XP (SP3), 32-bit or 64-bit
  - Android 3.1 and later
- Supported Windows Bluetooth stack protocols:
  - Microsoft® Bluetooth stack
  - Broadcom® Bluetooth stack (not supported by Windows XP SP3)

The BTH-1208LS provides wireless data acquisition up to 1 kS/s and can be hosted by either a Windows-based PC or Android-based device.

Overview

Finally, Bluetooth communication in a multifunction DAQ device! The BTH-1208LS offers short-range wireless data acquisition to a compatible host device – whether a Windows-based PC or an Android-based tablet, phone, or mini-PC.

The BTH-1208LS offers analog I/O, digital I/O, and counter input over both a Bluetooth or USB connection.

Two Operation Modes

The BTH-1208LS can operate wirelessly as a Bluetooth device or as a physically-connected USB device.

When operating as a Bluetooth device, the BTH-1208LS must be ***paired*** with the host device before it can wirelessly communicate acquired data. Pairing is a one-time procedure that establishes a bond with the host device.

The BTH-1208LS can transmit data up to 10 meters when operating as a Bluetooth device.

Analog Input

The BTH-1208LS provides up to eight 11-bit SE analog inputs or four 12-bit DIFF analog inputs.

The device offers a fixed ±10 V range for SE measurements, and ±20 V, ±10 V, ±5 V, ±4 V, ±2.5 V, ±2.0 V, ±1.25 V, and ±1.0 V ranges for DIFF measurements.

Users can start a hardware paced continuous scan with either a software command or with an external hardware trigger event.

When continuously scanning as a Bluetooth device, the BTH-1208LS supports a maximum aggregate scan rate of 1024 S/s. The total acquisition rate for all channels cannot exceed 1024 S/s.

The following table lists the per-channel sampling rates when continuously scanning from one to eight channels in Bluetooth mode.

Maximum Continuous Scan Rates (Bluetooth Mode)

# Channels Scanned	Scan Rate
1	1024 S/s
2	512 S/s
3	341.33 S/s
4	256 S/s
5	204.8 S/s
6	170.67 S/s
7	146.28 S/s
8	128 S/s

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When operating in burst IO mode as a Bluetooth device, the BTH-1208LS can acquire data at a maximum aggregate rate of 50 kS/s. Burst scans are limited to the depth of the onboard memory, as the data is acquired at a rate faster than it can be transferred to the computer. When using Bluetooth, the transfer rate for the acquired data to the host is still limited. Allow time between scans for the acquisition and the transfer of the data.

When operating as a USB device, the device supports a maximum aggregate scan rate of 50 kS/s. The total acquisition rate for all channels cannot exceed 50 kS/s.

The following table lists the per-channel sampling rates when continuously scanning from one to eight channels in Bluetooth mode.

Maximum Continuous Scan Rates (USB Mode)	
# Channels Scanned	Sampling Rate
1	50 kS/s
2	25 kS/s
3	16.70 kS/s
4	12.50 kS/s
5	10 kS/s
6	8.30 kS/s
7	7.14 kS/s
8	6.25 kS/s

Channel-Gain Queue
The channel-gain queue feature lets you configure a list of channels and gains for each scan. Each channel can have a different gain setting. The gain settings are stored in a channel-gain queue list that is written to local memory on the device. The channel-gain queue list can contain up to up to 8 elements in SE mode or four elements in DIFF mode. The elements must be unique and listed in ascending order.

Trigger Input
The BTH-1208LS external digital trigger input can be configured for either rising/falling edge, or high/low level.

External Clock Input
An external clock signal connection is provided to pace input scanning operations.

Analog Output
The BTH-1208LS includes two 12-bit analog outputs, each with an output range of 0 V to 2.5 V. The D/A is software paced, and throughput is system-dependent.

Digital I/O
The BTH-1208LS supports up to eight digital I/O lines. When configured for input, the digital terminals can detect the state of any TTL-level input.

Digital input voltage ranges of up to 0 V to 5.5 V are permitted, with thresholds of 0.8 V (low) and 2.0 V (high).

Each DIO channel is an open-drain output which can sink up to 50 mA for direct drive applications when used as an output.

Inputs are pulled high by default to 3.3 V through 47.5 kΩ resistors on the circuit board. The pull-up voltage is common to all 47.5 kΩ resistors.

Event Counter Input
The BTH-1208LS has a 32-bit event counter that can accept frequency inputs up to 1 MHz. The internal counter increments when the TTL levels transition from low to high.

Power Options
When connected to a USB power supply, BTH-1208LS receives 5 V power. USB provides both power and communication when the device is connected to a host USB port.

If rechargeable NiMH or NiCd batteries are installed, the batteries recharge when the device is connected to a USB host or USB power supply.

BTH-1208LS-OEM Also Available
The BTH-1208LS-OEM has the same fundamental specifications as the BTH-1208LS, but comes in a board-only form factor with header connectors instead of screw terminals. Connectors for user-supplied power. included instead of a battery compartment. The board can be powered by an external 5 V supply or a USB power supply in Bluetooth mode, or by the USB host device in USB mode.

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MCC DAQ Software

The BTH-1208LS ships with the MCC DAQ software CD, which includes InstaCal, a software utility for installing, calibrating, and testing Measurement Computing hardware on a Windows platform.

BTH-1208LS-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 for Android

Software API used to develop apps that communicate with supported Measurement Computing DAQ devices over the Android 3.1 platform (API level 12) and later. The UL for Android includes example projects and detailed documentation to help users develop, deploy, and run apps on Android-based devices.

Refer to Universal Library for Android Example Applications for descriptions of each example.

The Universal Library for Android provides an API to develop DAQ apps for Android-based tablets, phones, and mini-PCs.

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.

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General Information & Specifications

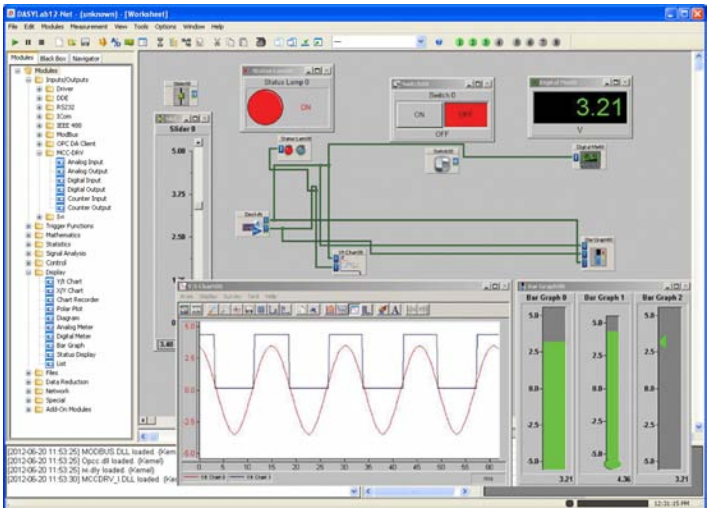
Software Available Separately

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

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 (CHx to GND)
Single-Ended Mode: ±10 V max
Differential Mode: –10 V min, 20 V max
Absolute Maximum Input Voltage (CHx to GND): ±25 V max
Input Impedance: 140 kΩ
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 or 4 differential; software-selectable
Input Ranges (Software-Selectable)
Single-Ended: ±10 V, G=2
Differential: ±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
Maximum throughput when scanning is system-dependent
Software Paced
10 S/s typ, system-dependent (Bluetooth)
250 S/s typ, system-dependent (USB)
Continuous Scan
0.014 S/s to 1024 S/s (Bluetooth)
0.014 S/s to 50 kS/s (USB)
Burst: 0.014 S/s to 50 kS/s to 12K (12,288) sample FIFO. Transfer rate to host is limited to 1024 S/s (Bluetooth)
Channel Gain Queue (Software-Selectable: 8 elements in SE mode, 4 elements in DIFF mode. One gain element per channel. Elements must be unique and listed in ascending order.
Resolution
Differential: 12 bits, no missing codes
Single-Ended: 11 bits (The AD7870 converter only returns 11 bits [0 to 2,047 codes] in single-ended mode)
Integral Linearity Error: ±1 LSB typ
Differential Linearity Error: ±0.5 LSB typ
Repeatability: ±1 LSB typ
Trigger Source (Software-Selectable): External digital (TRIG_IN)
Pacer **Source (Software-Selectable)**
Internal
External (AICKI), rising edge triggered

Analog Input 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 V	20.1
±1 V	24.1
Single-Ended Mode	
±10 V	4.0

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Analog Input Accuracy Components

Differential Mode (All Values are (±))				
Range	% of Reading	Gain Error at Full Scale	Offset	Accuracy at Full Scale
±20 V	0.2	40 mV	9.766 mV	49.766 mV
±10 V	0.2	20 mV	9.766 mV	29.766 mV
±5 V	0.2	10 mV	9.766 mV	19.766 mV
±4 V	0.2	8 mV	9.766 mV	17.766 mV
±2.5 V	0.2	5 mV	9.766 mV	14.766 mV
±2 V	0.2	4 mV	9.766 mV	13.766 mV
±1.25 V	0.2	2.5 mV	9.766 mV	12.266 mV
±1 V	0.2	2 mV	9.766 mV	11.766 mV
Single-Ended Mode (All Values are (±)				
±10 V	0.2	20	19.531	39.531

Noise Performance

Differential Mode		
Range	Typical Counts	LSBrms
±20 V	3	0.45
±10 V	3	0.45
±5 V	3	0.45
±4 V	4	0.61
±2.5 V	5	0.76
±2 V	7	1.06
±1.25 V	10	1.52
±1 V	12	1.82
Single-Ended Mode		
±10 V	6	0.91

Analog Output

Resolution: 12-bits, 1 in 4,096
Output Range: 0 V to 2.5 V
Number of Channels: 2
Throughput (Software Paced): 10 S/s single channel typ, system-dependent
Zero-scale offsets may result in a fixed zero-scale error producing a *dead-band* digital input code region. In this case, changes in digital input code at values less than 0x040 may not produce a corresponding change in the output voltage. The offset error is tested and specified at code 0x040.
Power On and Reset Voltage
USB Operation: Initializes to 000h code
Bluetooth Operation: The outputs can be individually configured to initialize to 000h or to have user-configurable values written to the outputs when the Bluetooth host device is connected or disconnected.
Output Current Drive (Each D/A OUT): 5 mA source capability
Slew Rate: 0.75 V/ µs typ

Analog Output Accuracy

All values are (±) accuracy tested at no load
Range: 0 V to 2.5 V
Accuracy (LSB): 8.0 typ, 73.0 max

Analog Output Accuracy Components

All values are (±)
Range: 0 V to 2.5 V
% of Reading: 0.16 typ, 1.44 max
Gain Error at Full Scale: 4.0 mV typ, 36.0 mV max
Offset: 1.0 mV typ, 9.0 mV max
Zero-scale offsets may result in a fixed zero-scale error producing a dead-band digital input code region. In this case, changes in digital input code at values less than 0x040 may not produce a corresponding change in the output voltage. The offset error is tested and specified at code 0x040.
Accuracy at Full Scale: 5.0 mV typ, 45.0 mV max

Digital Input/Output

Digital Type: 3.3 V open drain
Output Value Mapping:
0 Written: Output drives to DGND
1 Written: Output is pulled up to 3.3 V by internal resistor
Number of I/O: 8
Configuration: Individually configurable
Input Voltage Range: 0 V to 5.5 V
Each transistor source pin is internally connected to DGND
Pull Up/Pull-Down Configuration:47.5 kΩ pull-up resistors (to 3.3 V), 2.2 kΩ series resistors
Input High Voltage Threshold: 2.0 V min
Input High Voltage Limit: 5.5 V absolute max
Input Low Voltage Threshold: 0.8 V max
Input Low Voltage Limit: –0.5 V absolute min, 0 V recommended min
Output Voltage Range: 0 V to 3.3 V (no external pull up resistor), 0 V to 5.5 V max
The external pull-up is connected to the digital output bit through an external pull-up resistor. Adding an external pull-up resistor connects it in parallel with the internal 47.5 kΩ pull-up resistor of that particular digital input/output bit. Careful consideration should be made when considering the external pull-up resistor value and the resultant pull-up voltage produced at the load.
Output Off State Leakage Current: 1.0 µA typ
Does not include the additional leakage current contribution through the internal or any external pull-up resistor.
Sink Current Capability: 50 mA max (continuous) per pin
Transistor On Resistance: 0.7 Ω max
Power On and Reset State
USB Operation: All input
Bluetooth Operation: The digital I/O can either be all input at power on / reset or may be configured to have user-configurable patterns written to the DIO when the Bluetooth host is connected or disconnected. Each transistor source pin is internally connected to DGND.

External Trigger

Trigger Source: External digital; TRIG_IN terminal
Trigger Mode: Software configurable for edge or level sensitive, rising or falling edge, high or low level.
Trigger Latency: 10 µs max
Trigger Pulse width: 1 µs min
Input Type: Schmitt trigger, 47 kΩ pull-down to ground
Schmitt Trigger Hysteresis: 0.76 V typ, 0.4 V min, 1.2 V max
Input High Voltage Threshold:1.74 V typ, 1.3 V min, 2.2 V max
Input High Voltage Limit: 5.5 V absolute max
Input Low Voltage Threshold: 0.98 V typ, 0.6 V min, 1.5 V max
Input Low Voltage Limit: –0.5 V absolute min, 0 V recommended min

External Clock Input

Terminal Name: AICKI
Terminal Type: Input
Input Clock Rate: 50 kHz, max
Clock Pulse Width: 1 µs min
Input Type: Schmitt trigger, 47 kΩ pull-down to ground
Schmitt Trigger Hysteresis: 0.76 V typ
0.4 V min
1.2 V max
Input High Voltage Threshold: 1.74 V typ
1.3 V min
2.2 V max
Input High Voltage Limit: 5.5 V absolute max
Input Low Voltage Threshold: 0.98 V typ, 0.6 V min, 1.5 V max
Input Low Voltage Limit: –0.5 V absolute min, 0 V recommended min

Counter

Pin Name: CTR
Counter Type: Event counter
Number of Channels: 1
Input Type: Schmitt trigger, 47 kΩ pull-down to ground, rising edge triggered
Input Source: CTR screw terminal
Resolution: 32 bits
Maximum input frequency: 1 MHz
High Pulse Width: 500 ns min
Low Pulse Width: 500 ns min
Schmitt Trigger Hysteresis: 0.76 V typ, 0.4 V min, 1.2 V max
Input High Voltage Threshold: 1.74 V typ, 1.3 V min, 2.2 V max
Input High Voltage Limit: 5.5 V absolute max

Input Low Voltage Threshold: 0.98 V typ, 0.6 V min, 1.5 V max
Input Low Voltage Limit: –0.5 V absolute min, 0 V recommended min

Memory

FIFO: 12K (12,288) samples
Non-Volatile EEPROM: 2,048 bytes (768 bytes calibration, 256 bytes user, 1,024 bytes firmware use)

Microcontroller

Type: High performance 16-bit RISC microcontroller

Power

Supply Current, USB Source
During Enumeration: < 100 mA
After USB Enumeration or Connected to USB Charger/Supply: < 500 mA
Battery Power: Two AA cells; alkaline, NiCd, and NiMH cells supported
Battery Charging: NiMH and NiCd charging supported. Alkaline cells automatically detected and not charged.
When operating from batteries, there is a user configurable power-off timer that will turn the device off when there is no host connection for the specified amount of time. The timer can be disabled or set to a value from 1 – 255 minutes.

+VO Power Available (After USB Enumeration or Bluetooth Connection): 3.3 V nominal
+VO Output Current (After USB Enumeration or Bluetooth Connection: 50 mA max

Bluetooth

Device Type: Bluetooth 2.1
Device Compatibility: Backwards compatible with Bluetooth 2.0, 1.2, and 1.1
Bluetooth Profile: Serial Port Profile (SPP) The Bluetooth radio is disabled when the device is connected to a USB host.

USB

Device Type: USB 2.0 full speed
Device Compatibility: USB 1.1, USB 2.0

Environmental

Operating Temperature Range: 0 °C to 50 °C
Storage Temperature Range: –40 °C to 70 °C
Humidity: 0% to 90% non-condensing

Mechanical

Dimensions (L × W × H)
BTH-1208LS: 146.56 × 81.31 × 27.18 mm (5.77 × 3.28 × 1.07 in.)
BTH-1208LS-OEM (PCB Dimensions): 99.06 × 68.58 × 14.61 mm (3.90 × 2.70 × 0.58 in.)
USB Cable Length: 3 m (9.84 ft) max
User Connection Length: 3 m (9.84 ft) max

Signal Connector

Connector Type
BTH-1208LS: Screw terminal
BTH-1208LS-OEM: Three 2 × 8 pin, 0.1 in. pitch headers
Wire Gauge Range: 16 AWG to 30 AWG

Ordering Information

Part No.	Description
BTH-1208LS	Wireless DAQ device with 8 SE/4 DIFF analog inputs, 1 kS/s throughput in Bluetooth mode; 2 analog outputs; 8 digital I/O lines; and one 32-bit counter input channel
BTH-1208LS-OEM	Board-only wireless DAQ device with 8 SE/4 DIFF analog inputs, 1 kS/s throughput in Bluetooth mode; 2 analog outputs; 8 digital I/O lines; and one 32-bit counter input channel

Software

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