DATAQ INSTRUMENTS

The way PC-based instrumentation should be

DI-188

4-Channel Open Source USB Data Acquisition Starter Kit

Arduino-Compatible module inside

User's Manual

Manual Revision C

Warranty and Service Policy

Product Warranty

DATAQ Instruments, Inc. warrants that this hardware will be free from defects in materials and workmanship under normal use and service for a period of 90 days from the date of shipment. DATAQ Instruments' obligations under this warranty shall not arise until the defective material is shipped freight prepaid to DATAQ Instruments. The only responsibility of DATAQ Instruments under this warranty is to repair or replace, at its discretion and on a free of charge basis, the defective material.

This warranty does not extend to products that have been repaired or altered by persons other than DATAQ Instruments employees, or products that have been subjected to misuse, neglect, improper installation, or accident.

DATAQ Instruments shall have no liability for incidental or consequential damages of any kind arising out of the sale, installation, or use of its products.

Service Policy

1. All products returned to DATAQ Instruments for service, regardless of warranty status, must be on a freight-prepaid basis.

2. DATAQ Instruments will repair or replace any defective product within 5 days of its receipt.

3. For in-warranty repairs, DATAQ Instruments will return repaired items to the buyer freight prepaid. Out of warranty repairs will be returned with freight prepaid and added to the service invoice.

Table of Contents

1. Introduction

This manual contains information designed to familiarize you with the features and functions of the DI-188 USB data acquisition starter kit. These high-end Starter kits contain features and functionality normally reserved for more expensive data acquisition systems.

Features

The **DI-188** data acquisition instrument is a portable data recording module that communicates through your computer's USB port. Power is derived from the interface port so no external power is required. Features include:

- 4 fixed differential analog inputs protected to ±30V (transient).

- Optional Arduino-compatible sensor Grove ports protected to +3V.

- ±10V full scale measurement range.

- 12-bit analog-to-digital resolution.

- 8kHz max sample throughput rate.

- Seeeduino XIAO status LEDs.

- Driver-less COM port support for Windows 10 and higher (Lower OS may require Arduino® IDE installation first)

- Free WinDaq recording and playback software allowing you to record at the full speed of the instrument.

- Included open-source firmware based on Seeeduino's XIAO Arduino®-compatible module

- Transparent instrument protocol for programming the device in operating systems other than Windows.

Analog Inputs

The **DI-188** features four differential channel inputs located on a single eight-position screw terminal block for easy connection and operation.

Utilize the functionality of WINDAQ software to experience all the features encased in these small, inexpensive instruments.

Optional Sensor Inputs

Optional I2C Grove ports can be added to DI-188 for WINDAQ expansion at extra cost. These optional ports are direct exposure of XIAO module's GPIO, which is protected to only 3.3V, so extra care must be exercised when using them

Software

All software required to record and playback waveforms is included with the purchase of any DI-188 data acquisition starter kit via download.

WinDaq Dashboard

The WinDaq Dashboard utility allows you to start WinDaq software with your Dataq devices. Units available for synchronized recording using ChannelStretch™ are shown in compatible blocks of devices (the DI-188 does not support ChannelStretch or stand-alone data logging).

WINDAQ® *Recording and Playback Software*

WINDAQ Acquisition and WINDAQ Waveform Browser allow you to record and playback data acquired through your instrument. WINDAQ software is an invaluable resource to record and analyze your data and is available for free from our web site (www.dataq.com).

WINDAQ Acquisition software can be used to record waveforms directly and continuously to disk while monitoring a real time display of the waveforms on-screen. It operates, displays, and records waveform signals in real time at the full sample rate of the DI-188.

WINDAQ Waveform Browser playback software (also known as "WWB") offers an easy way to review and analyze acquired waveforms. A built-in data file translator allows the user to display multiple waveforms acquired by WINDAQ Acquisition software or any of a wide range of data acquisition packages. The software's disk-streaming design allows data files of any length to be graphically displayed rapidly, in normal or reverse time directions. Seven standard cursor-based measurements, frequency domain, and statistical analysis functions help simplify waveform analysis and interpretation. WINDAQ Waveform Browser is free and installed when installing WINDAQ Software.

Help

All WINDAQ software utilizes context-sensitive help. Help may be accessed through the Help menu or by pressing the F1 key with any pull-down menu item selected. This will take you directly to the Help topic most relevant to that particular function or feature. Help topics discuss in detail each function available in the software.

2. Specifications

Analog Inputs

Number of Channels:	4
Channel Configuration:	Differential
Voltage Measurement Range:	±10V Full Scale fixed
Input Impedance:	1MΩ
Isolation:	none
Typical accuracy: @ 25°C, excluding common mode error	±50 mV
Absolute maximum input without damage:	±30 V peak, continuous
System noise:	7.8 mV rms
Maximum common mode + differential voltage:	± 10 V
Common mode rejection ratio:	40 dB (dc - 60 Hz)
Channel-to-channel crosstalk rejection:	-80 dB

Optional Grove Ports

Number of ports:	To use these ports, order and install the connector yourself. Programing is required, see examples on Dataq Github
Type:	Grove Ports for Arduino®-compatible Sensors
Threshold levels:	Defined by XIAO module
Absolute maximum applied voltage (V):	3.3 V DC

ADC Characteristics

Resolution:	12-bit Above zero ADC counts: 2,047 Below zero ADC counts: 2,048
Maximum sample rate per channel:	8 kHz, 1 enabled channel 4 kHz, 2 enabled channels 2 kHz, 4 enabled channels
Min. sample throughput rate:	0.01 Hz
Sample rate timing accuracy:	50 ppm

Indicators and Connections

Interface:	USB 2.0 (USB C connector)
Indicators (LED):	LEDs on XIAO module
Input Connections:	One 8-position terminal strip

Power

Power Consumption: <0.2 Watt, via USB interface

Environmental

Operating Temperature: 0°C to 50°C (32°F to 122°F)

Operating Humidity: 0 to 90% non-condensing

Storage Temperature: -20°C to 60°C (-4°F to 140°F)

Storage Humidity: 0 to 90% non-condensing

Physical Characteristics

Dimensions: 2.0D × 2.5W × 0.55H in.
                                            (5.08D × 6.35W × 1.40H cm.)

Weight: 0.8 oz (without optional Grove connector)

Software Support

WINDAQ software: OS support: Check Online at https://www.dataq.com/products/
                                            windaq/windows-compatibility/

Programming: Open source XIAO Arduino-compatible firmware. Instrument proto-
                                            col

Windows Support   Driver-less COM port support for Windows 10 and higher.

                                            Older Windows may require the installation of Arduino IDE

3. Installation

WINDAQ DI-188 Starter Kit (basic) does not include USB-C cable. Verify that you have the following:

•   A DI-188 USB data acquisition instrument.

If the item is missing or damaged, call DATAQ Instruments at 330-668-1444. We will guide you through the appropriate steps for replacing missing or damaged items. Save the original packing material in the unlikely event that your unit must, for any reason, be sent back to DATAQ Instruments.

Installing WINDAQ Software

All software for the DI-188 can be installed via a downloadable executable directly from the DATAQ Instruments web site. No CD is shipped with the device. You may burn the executable onto a CD or flash drive to transport the software to a computer with no internet connection.

1.   Disconnect all DATAQ Instruments USB devices from your Computer.

2.   Download software at run.dataq.com.

3.   Save the executable (Dataq Software Suite Web Setup.exe) to your local hard drive.

4.   Double-click on the executable to extract the program and begin software installation.

5.   Follow the on-screen prompts and enter all required information.

6.   Software installation is complete - you will now see a "Successful Installation" box - click **OK** to exit WINDAQ Installation.

You can now plug the device(s) into your PC. Click on the "WinDaq Dashboard" shortcut to access WINDAQ software.

Connecting the Instrument to Your Computer

DI-188 instruments can be connected to your computer's USB port using a USB-C cable. No external power is required. Connect one end of the communications cable to the instrument port and the other to your PC's port.

4. Controls, Indicators, and Connections

USB-C Connection

Grove Ports
At Extra Cost

Analog In
Channels 1-4
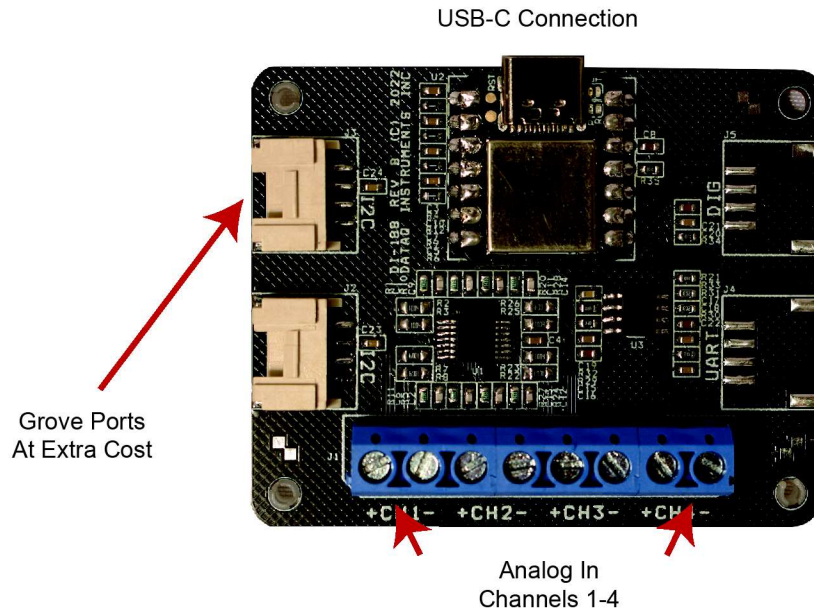
USB-C Connection

To use DI-188, one needs to purchase a USB-C cable to connect and power the instrument through your computer's USB port.

Connect Input Signals

Make input signal connections to the 8-position screw terminals. Each terminal is labeled directly on the circuit board

DI-188 Signal Connections

Refer to the following for screw terminal port identification.

Ch#: Analog channels 1-4 (±10VFS, ±100V transient Max.)

Connect Signal Leads

Connect signal leads to the DI-188:

1. Insert the stripped end of a signal lead into the desired terminal directly under the screw.

2. Tighten the pressure flap by rotating the screw clockwise with a small screwdriver. Make sure that the pressure flap tightens only against the signal wire and not the wire insulation. Do not over-tighten.
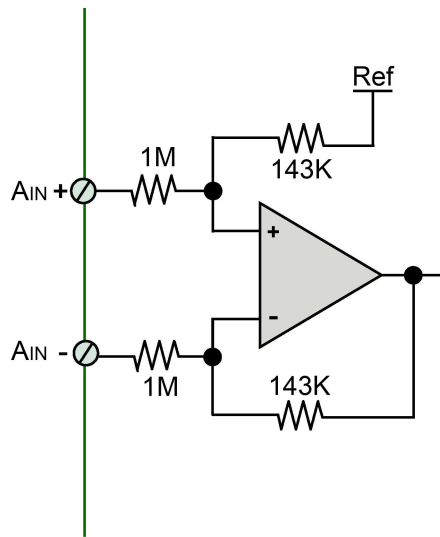
3.   Tug gently on the signal lead to ensure that it is firmly secured.
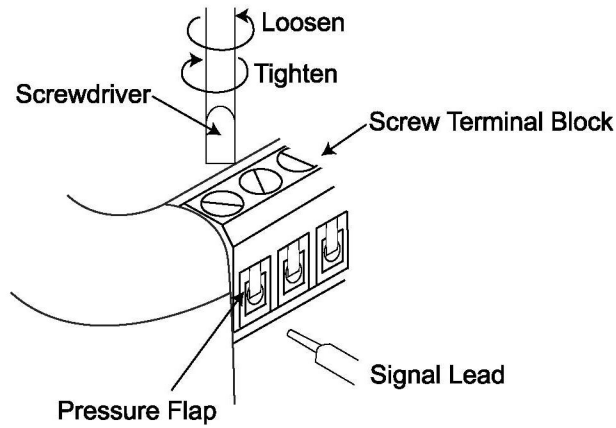
When an input signal is connected and WINDAQ Acquisition software is run, WINDAQ's real time display immediately reveals the input waveform on your computer's monitor.

Analog Inputs

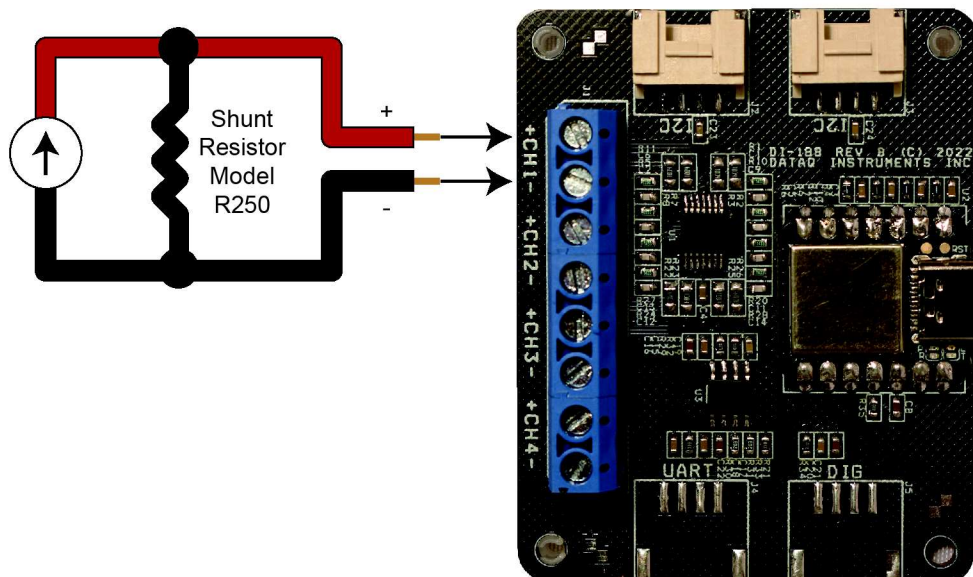Four differential analog inputs measure ±10 Volts. Designed to withstand ±30V.

Use the following diagram to connect Analog Input Channel 1.
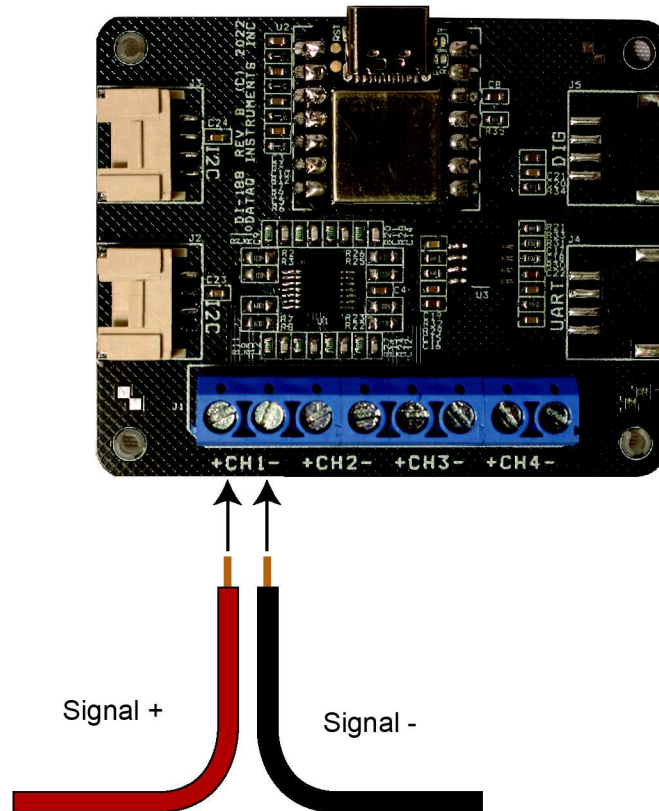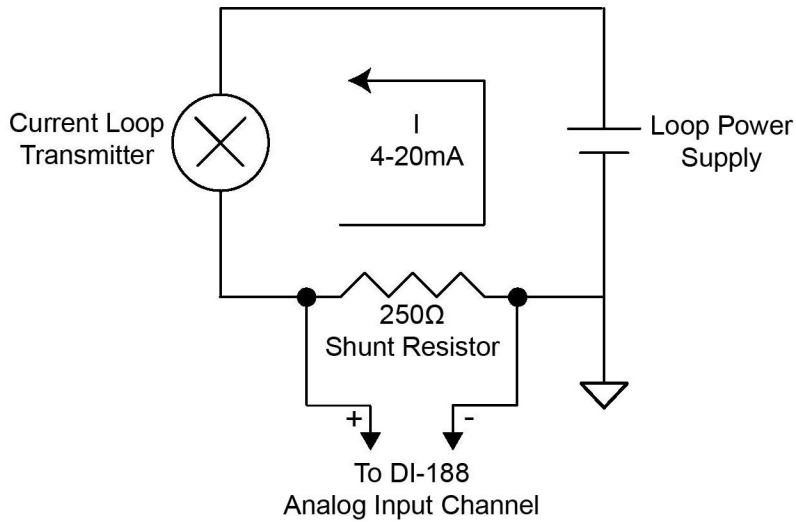

## 4-20mA Current Loop Measurements

Use the following diagram for 4-20mA current loop measurement connections.

The shunt resistor should be placed on the low side of the circuit as shown below:


Set the engineering units as desired and define upper/lower levels in WINDAQ as 1V = 4mA for the low value and 5V = 20mA for the high value. For example, when using WINDAQ Acquisition software, in the EU Settings dialog box:
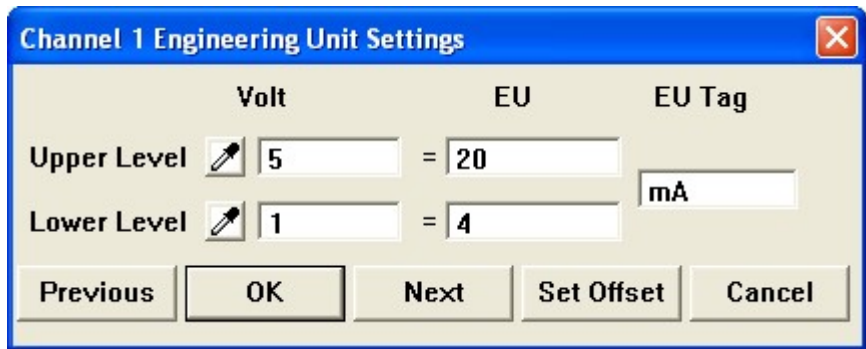
Enter the following values:

	Volt	EU	EU Tag
Upper Level	5	20	mA
Lower Level	1	4	

You can also associate these values to a physical measurement such as pressure, load, flow, torque, etc. Read the Help files for more information regarding Engineering Units Settings.
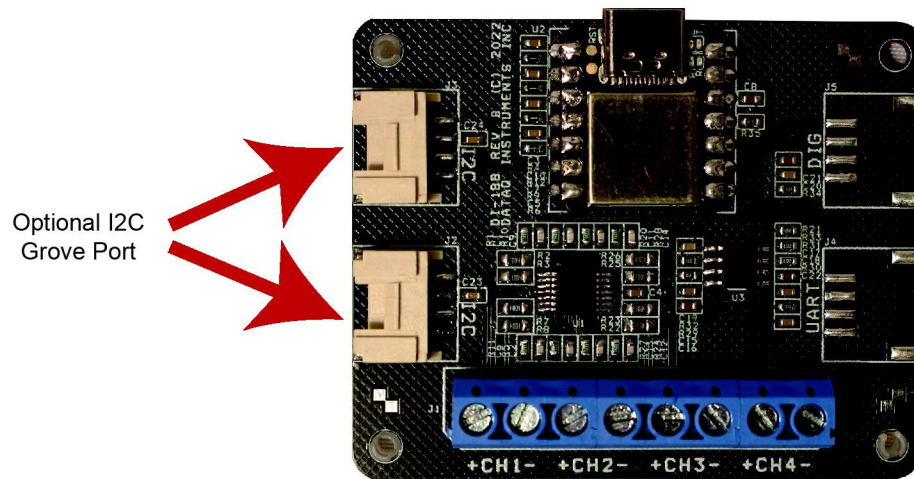
Four Status
LEDs on XIAO
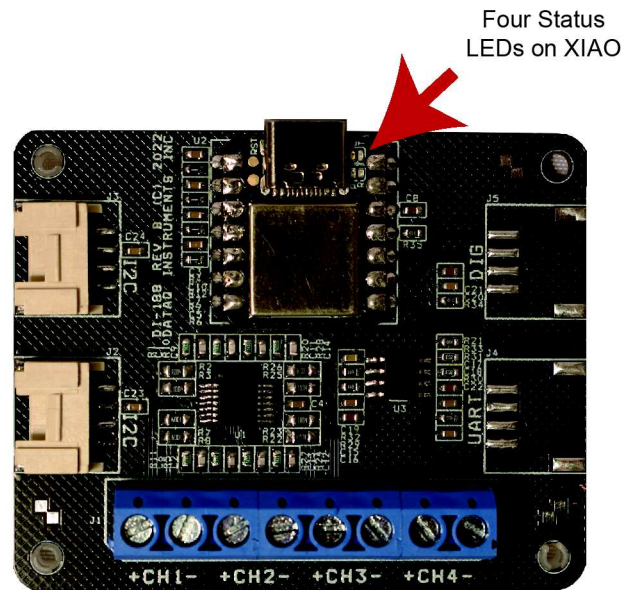
LED Indicators

The DI-188's XIAO module provides four LEDs for status and notification, power, transmit, receive and user

Power: Green LED indicates power is applied via the USB cable.

Transmit: Blue Indicates the device is sending out data

Receive: Blue LED indicates the device is receiving data.

**User:** Yellow LED can be programmed by user.

Optional I2C
Grove Port

Optional I2C Grove ports

The DI-188 extends XIAO module's I2C port via grove connector at extra cost. Through I2C port, one can modify the open source Arduino®-compatible firmware and add I2C-based sensors to WinDaq. For programming of I2C sensors, please visit Arduino® support community.

Warning: grove ports are direct exposure of XIAO GPIOs, with max voltage of 3.3V, so please exercise care when using them

5. Dimensional Drawing

Ø0.118
(4 places)

1.70   2.00

2.20

2.50
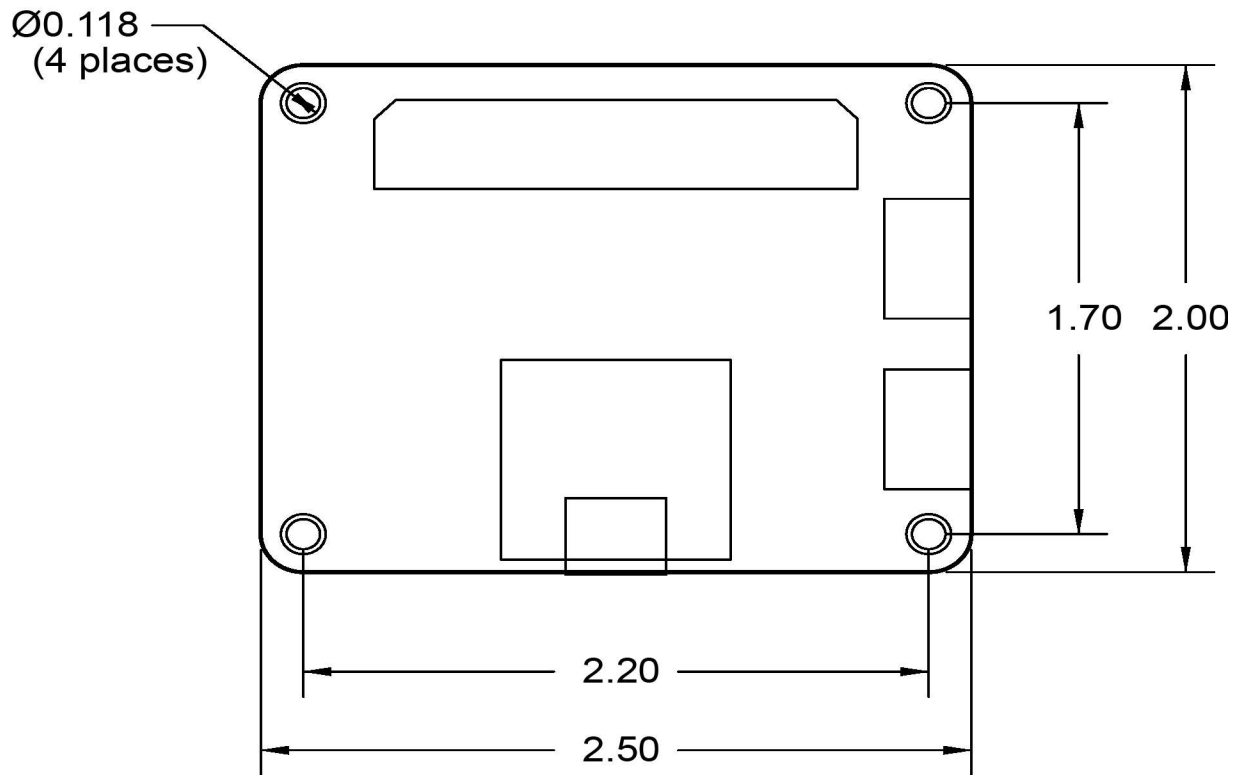
DATAQ®
INSTRUMENTS

DATAQ Instruments, Inc.
241 Springside Drive
Akron, Ohio 44333
Telephone: 330-668-1444
Fax: 330-666-5434
E-mail: support@dataq.com

Direct Product Links
(click on text to jump to page)
Data Acquisition | Data Logger