DATAQ® INSTRUMENTS

The way PC-based instrumentation should be

DI-4108 and DI-4208

8-Channel High Speed Data Acquisition Systems with Programmable Gain,
Expandability with ChannelStretch™, and Stand-alone Capability

User's Manual

Manual Revision G

DATAQ® INSTRUMENTS

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 1 year 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-4108 and DI-4208 USB and Ethernet data acquisition systems.These systems are identical excluding gain ranges.

Features

Both the DI-4108 and DI-4208 data acquisition instruments are portable data recording modules that communicate through your computer's USB and/or Ethernet port with stand-alone capability. Features include:

- 8 fixed differential analog inputs protected to 120 V rms.*

- USB, Ethernet, and Power over Ethernet (PoE) interface options.

- 7 digital ports protected to +25V.*

- Up to 16-bit measurement resolution (dependent on sample rate).

- The DI-4108 has programmable measurement ranges of ±200, ±500 mV, ±1, ±2, ±5, ±10 Volts.

- The DI-4208 has programmable measurement ranges of ±2, ±5, ±10, ±20, ±50, ±100 Volts.

- Up to 160 kHz maximum throughput sampling rate.

- Adaptable low-pass filter per channel - corner frequency set as a function of sampling rate

- A multi-purpose push-button for WINDAQ remote events and start/stop recording.

- Multi-color LED indication for easy notification of device status.

- Free WinDaq/Lite data acquisition recording software. Records up to four channels of data. Purchase an unlock code to record more than four channels.

- Stand-alone option allows the user to configure a recording session through their PC then record data in the field to removable flash memory via the USB drive port (**without** being connected to their PC). Stand-alone data logging requires Unlock code to record more than 1 channel to removable flash memory.

- Counter channel.

- Frequency channel.

- ChannelStretch™ Technology allows you to sync up to 16 DI-1120, -4108, or -4208 instruments in any combination with a total throughput of 480kHz or more (requires unlock code for each device).*

- Included .Net Class supports programming under any .Net programming language.*

- Fully documented instrument protocol for programming the device in operating systems other than Windows.*

*WinDaq/Unlock required per device to use ChannelStretch™ and to record more than four total channels when using WinDaq software. These restrictions do not apply when programming the device yourself.

Analog Inputs

Both the DI-4108 and DI-4208 feature eight differential channel inputs located on a single sixteen-position screw terminal block for easy connection and operation. Gain measurement ranges of ±200, ±500 mV, ±1, ±2, ±5, ±10 Volts for the DI-4108 or ±2, ±5, ±10, ±20, ±50, ±100 Volts for the DI-4208 are programmable on a per channel basis. Analog channels are protected to 120 V rms.

Utilize the functionality of WINDAQ software to experience all the features encased in these small, inexpensive instruments. An Unlock Code is required to record more than four channels of any type on either device or to syn-

chronize multiple units when using WinDaq software. There are no restrictions when programming the instruments yourself.

Digital I/O

The DI-4208 contains seven digital ports, which may be used as a general-purpose digital input or for a specific function as designated on the device. Digital port D0 may be used for WinDaq Events; Digital port D1 may be used for WinDaq remote Start/Stop; Digital port D2 may be used for rate measurements; Digital port D3 may be used for counts; Digital ports D4 and D5 are general purpose digital input ports. Please Note: Digital outputs are not supported in WinDaq software. Each port may be configured as a switch using either the provided protocol or .Net class.

Software

All software required to record and playback waveforms is included with the purchase of any DI-4108 or 4208 data acquisition system via download. Use the WinDaq Dashboard to access WinDaq Acquisition software or to setup the stand-alone configuration.

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 Lite Data Acquisition software (free) 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 up to four channels in real time. An optional unlock code is available to record the rest of the channels on the device or to allow you to sync multiple units.

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:	8
Channel Configuration:	Differential
Measurement range per channel:	DI-4108: Programmable ±200, ±500 mV, ±1, ±2, ±5, ±10 V DI-4208: Programmable ±2, ±5, ±10, ±20, ±50, ±100 V
Input impedance:	DI-4108: 100 kΩ differential DI-4208: 795 kΩ differential
Absolute accuracy:	0.25% of full scale range @ 25°C, excluding common mode error
Absolute maximum input without damage:	120 V rms (normal mode + common mode)
Maximum common mode voltage:	
Common mode range:	±20 V dc or peak ac
Common mode rejection ratio:	50 dB (dc - 60 Hz)
Channel-to-channel crosstalk rejection:	-80 dB

ADC Characteristics

Resolution:	12- to 16-bit Above zero ADC counts: 2,047 to 32,767 Below zero ADC counts: 2,048 to 32,768
Max. throughput sample rate:	Standard: 160 kHz Stand-alone: 20 kHz to 160 kHz (dependent on flash memory)
Min. throughput sample rate:	Standard: 20 Hz (2.2 samples per hour with WinDaq) Stand-alone: 0.0017 Hz
Sample rate timing accuracy:	100 ppm

Digital Ports

Number of Ports:	7
Type:	MOSFET switch
Configuration:	Programmable as digital input or switch
Threshold levels	TTL compatible
Absolute maximum applied voltage (V):	25 V dc

Reserved Digital Inputs

Port 1:	WINDAQ remote events
Port 2:	WINDAQ remote start/stop
Port 3:	Rate input
Port 4:	Count input

Count/Rate/Digital Inputs

Internal pull-up value:	4.7 kΩ
Input high voltage threshold:	2.4 V

Input low voltage threshold:	0.8 V
Terminal count:	65,535
Maximum rate frequency:	50 KHz with one enabled channel 20 KHz with 2-4 enabled channels 10 KHz with 5-7 enabled channels
Minimum rate frequency:	0.5 Hz
Maximum count frequency:	50 kHz

Digital Ports Programmed as Switch

Maximum drain voltage:	25V
Maximum sink current:	100 mA

Ethernet Interface

Type:	10/100Base-T
Connector:	RJ-45
Protocol:	TCP/IP
Server Type:	DHCP or Fixed IP

Removable Memory

Type:	MLC, pSLC, or SLC flash memory (with USB SD card reader); USB thumb drive
Required Format:	FAT32
Number of Channels:	1; Unlock code required for 2 or more

Indicators and Connections

USB Interface:	USB 2.0 (mini-B style connector)
Button:	Multi-function control (Start, Stop, Save Configuration, Apply Configuration)
USB A Connector (Drive):	USB drive for Stand-alone data logging Cannot be used concurrently with the USB interface
Input connections:	Two 16-position screw terminal strips
Status LED:	One multicolor LED for status indication

USB ChannelStretch™ Operation

Total Max Units:	16
Max Channel Count:	128 Analog, 112 Digital
Max Throughput:	≥480 kHz (higher speeds may result in data loss)
Channel skew between any 2 units:	10 µS, typical
Synchronization Conditions:	Syncs with any combination of DI-1120, DI-4108, DI-4208, and DI-4718B USB instruments. All synced instruments must operate at the same sample rate per channel, regardless of channel number, type, or range. All instruments must be connected to the same USB controller. The use of USB hubs are recommended to meet this requirement.

Ethernet ChannelStretch™ Operation

Total Max Units:	16
Max Channel Count:	128 Analog, 112 Digital
Max Throughput:	≥50 kHz (higher speeds may result in data loss)
Channel skew between any 2 units:	10 µS, typical
Synchronization Conditions:	Syncs with any combination of DI-1120, DI-4108, DI-4208, and DI-4718B Ethernet instruments. For most accurate synchronization, all instruments should be connected to the same Ethernet switch.

Power

Power Consumption:	<1.0 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

Enclosure:	Hardened plastic
Mounting:	Desktop; bulkhead
Dimensions:	6.68D × 3.28W × 1.13H in. (169.67D × 83.31W × 28.7H cm.)
Weight:	5.7 oz. (162 grams)

Software Support

WINDAQ software:	OS support: Check online at http://www.dataq.com/products/windaq/windows-compatability/
Programming:	Instrument Protocol, .NET class

3. Installation

The following items are included with each DI-4108 or DI-4208 Data Acquisition System. Verify that you have the following:

- A DI-4108 or DI-4208 data acquisition instrument.

- 6-foot USB cable; Ethernet versions also provide a 5-foot Ethernet cable and an AC power supply if required (PoE versions do not come with a power supply).

- A DATAQ Instruments screwdriver for signal lead connections.

- A USB flash drive with WinDaq software. Can also be used for stand-alone data logging.

If an 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.

Install WINDAQ Software

All software for the DI-4108 and DI4208 can be installed via a download-able executable directly from the DATAQ Instruments web site. The software is also available on the provided USB flash drive.

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

2. Plug the USB flash drive into your computer's USB port or go to http://run.dataq.com to download the software.

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 appropriate program group (specified above — default is Start > Programs > WINDAQ) and click on "WinDaq Dashboard" to access WINDAQ software.

Connect the Instrument to Your Computer

All DI-4108 and DI-4208 instruments can be connected to your computer's USB port using the provided USB cable. No external power is required when connected via the USB port. Connect one end of the communications cable to the instrument port and the other to your PC's port. Ethernet devices are equipped with a USB port and can be used as a USB device. Open the WinDaq Dashboard to run WinDaq Data Acquisition software, set the device clock, and configure and record data to a thumb drive.

Note: Use a powered USB hub or a USB port on your PC. Non-powered USB hubs may not have sufficient power to run the instrument.

Install an Ethernet Device on Your Local Area Network

All Ethernet instruments are shipped DHCP-enabled. We recommend you setup a DHCP reservation on your network for your data acquisition applications.

1. Find the MAC address of your DI-4x08. The device MAC address is printed on the bottom label of the device:
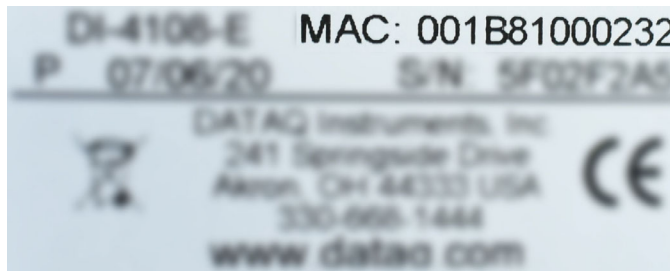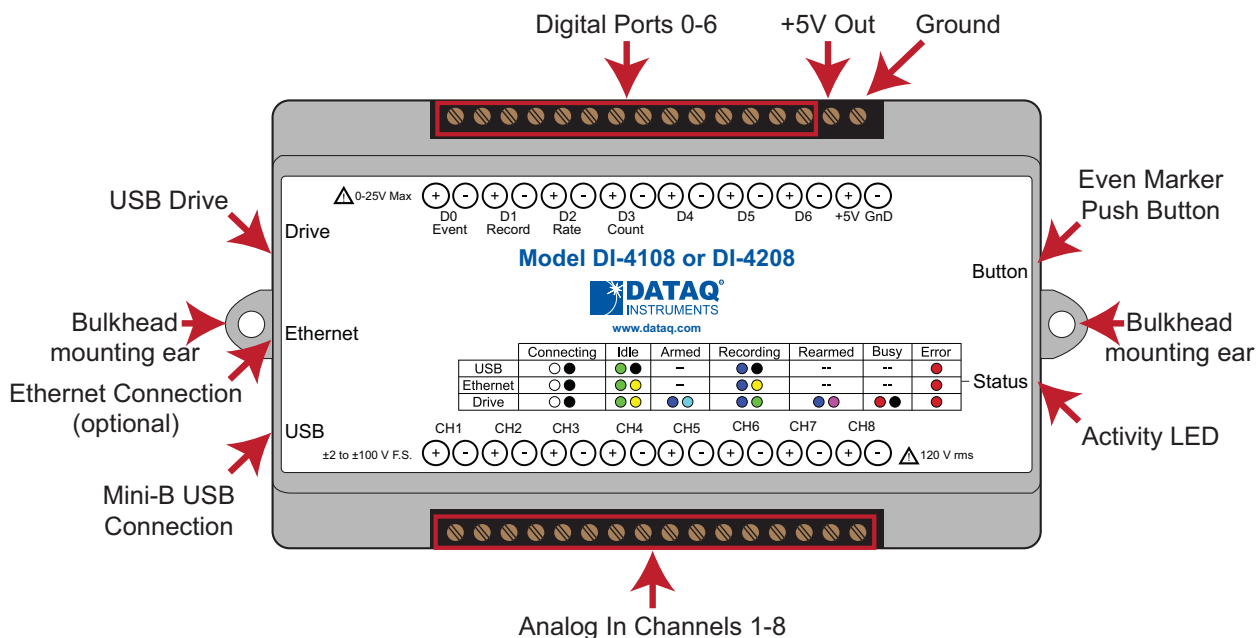

2. Login to your Router and ensure the DHCP server is enabled.

3. Access the DHCP Reservations, Static DHCP, or IP Allocations page/table.

4. Enter the MAC address of your device in the table (you may need to enter colons for proper format - for example, 001B1000232 may need to be 00:1B:81:00:02:32), enter an unused IP address in the table row (or allow your router to select it for you if possible), and Select/Enable for DHCP Reservation.

5. Save your router settings.

6. Connect your DI-4x08 unit into your Local Area Network using the supplied Ethernet Cable.

7. Apply Power to the device if required. PoE devices can derive power from a PoE switch.

Open the WinDaq Dashboard utility to access device settings and run WinDaq Data Acquisition software. The WinDaq Dashboard allows you to set the device clock, change your Ethernet settings (DHCP/Static), setup and record to a thumb drive, access files on the thumb drive, and view live data.

If your device is not discovered in WinDaq Dashboard, connect it to your computer via the USB cable and configure the Ethernet settings to allow for DHCP.

If the device is available in WinDaq Dashboard but you cannot run WinDaq Acquisition software, you may have the application blocked in Windows Firewall. See https://www.dataq.com/blog/data-acquisition-software/is-the-windows-defender-firewall-blocking-windaq/ for more information and resolution.

4. Controls, Indicators, and Connections

Digital Ports 0-6   +5V Out   Ground

USB Drive

Even Marker
Push Button

Bulkhead
mounting ear

Ethernet Connection
(optional)

Bulkhead
mounting ear

Activity LED

Mini-B USB
Connection

Analog In Channels 1-8

	Connecting	Idle	Armed	Recording	Rearmed	Busy	Error
USB	○●	●●	–	●●	--	--	●
Ethernet	○●	●●	–	●●	--	--	●
Drive	○●	●●	●●	●●	●●	●●	●

Model DI-4108 or DI-4208

Mini-B USB Connection

Use the supplied USB cable to connect and power the instrument through your computer's USB port.

Screw Terminals

All input signal connections are made to the 16-port screw terminals. Each terminal is labeled on the instrument case.

⚠ CAUTION ⚠

Never touch exposed screw terminal connector pins or screws.

To avoid ESD damage in handling the device, take the following precautions:

Ground yourself with a grounding strap or by touching a grounded object before and during your handling of the instrument.

DI-4108 Signal Connections

Refer to the following for screw terminal port identification.

Drive — 0-25V Max — D0 Event (+ −), D1 Record (+ −), D2 Rate (+ −), D3 Count (+ −), D4 (+ −), D5 (+ −), D6 (+ −), +5V (+), GnD (−)

Model DI-4108

DATAQ INSTRUMENTS — www.dataq.com

Button

Ethernet

	Connecting	Idle	Armed	Recording	Rearmed	Busy	Error
USB	○●	●●	--	●●	--	--	●
Ethernet	○●	●●	--	●●	--	--	●
Drive	○●	●●	●●	●●	●●	●●	●

Status

USB — CH1 CH2 CH3 CH4 CH5 CH6 CH7 CH8

±200mV to ±10 V F.S. (+ − + − + − + − + − + − + − + −) — 120 V rms
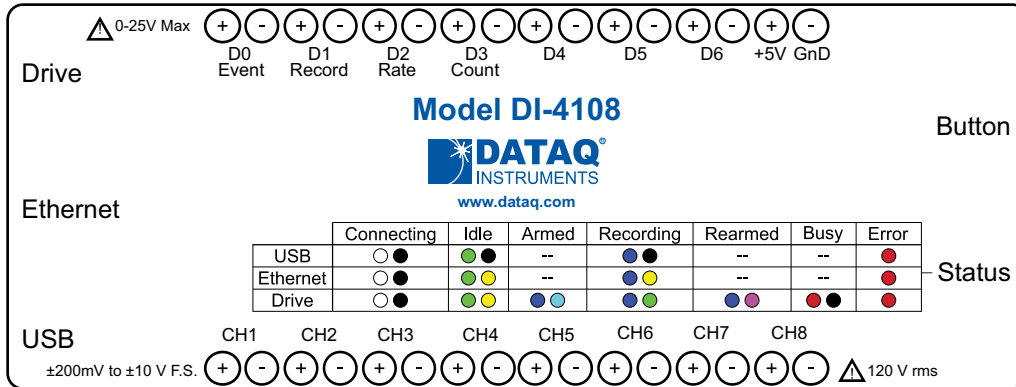
Ch#: Analog channels 1-8 (Programmable ±200, ±500 mV, ±1, ±2, ±5, ±10 Volts, 120 V rms max.)

D#: Digital port (0-6). Can also be used for specific WINDAQ functions (+25 Vmax).
- **D0 Event** — WINDAQ Remote Event Marker (or general-purpose)
- **D1 Record** — WINDAQ Remote Start/Stop (or general-purpose)
- **D2 Rate** — Rate Input (or general-purpose)
- **D3 Count** — Counter Input (or general-purpose)
- **D4** and **D5** — General-purpose digital ports
- **D6 Ext Trig** — External Trigger (or general-purpose)

+5V: +5V out. Max current = 100mA.

GnD: Ground.

DI-4208 Signal Connections

Refer to the following for screw terminal port identification.

Drive — 0-25V Max — D0 Event (+ −), D1 Record (+ −), D2 Rate (+ −), D3 Count (+ −), D4 (+ −), D5 (+ −), D6 (+ −), +5V (+), GnD (−)

Model DI-4208

DATAQ INSTRUMENTS — www.dataq.com

Button

Ethernet

	Connecting	Idle	Armed	Recording	Rearmed	Busy	Error
USB	○●	●●	--	●●	--	--	●
Ethernet	○●	●●	--	●●	--	--	●
Drive	○●	●●	●●	●●	●●	●●	●

Status

USB — CH1 CH2 CH3 CH4 CH5 CH6 CH7 CH8

±2 to ±100 V F.S. (+ − + − + − + − + − + − + − + −) — 120 V rms
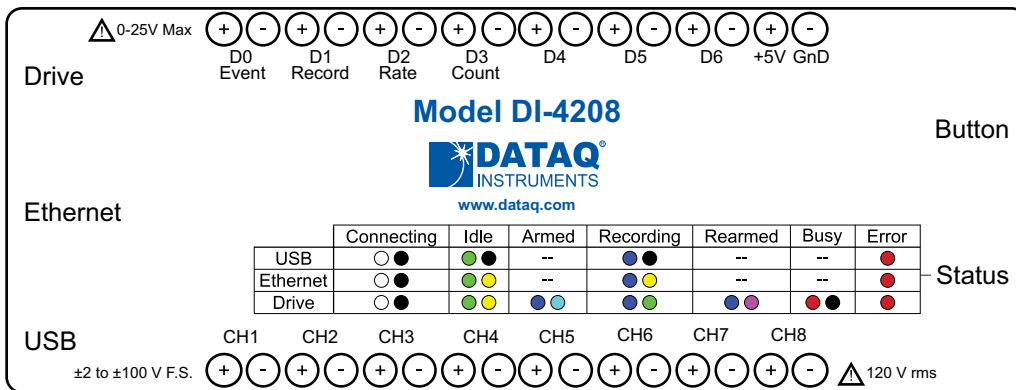
Ch#: Analog channels 1-8 (Programmable ±2, ±5, ±10, ±20, ±50, ±100 Volts, 120 V rms max.)

D#: Digital port (0-6). Can also be used for specific WINDAQ functions (+25 Vmax).
- **D0 Event** — WINDAQ Remote Event Marker (or general-purpose)
- **D1 Record** — WINDAQ Remote Start/Stop (or general-purpose)
- **D2 Rate** — Rate Input (or general-purpose)
- **D3 Count** — Counter Input (or general-purpose)
- **D4** and **D5** — General-purpose digital ports
- **D6 Ext Trig** — External Trigger (or general-purpose)

+5V: +5V out. Max current = 100mA.

GnD: Ground.

Connecting Signal Leads

Connect signal leads to the DI-4108 or DI-4208:

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.
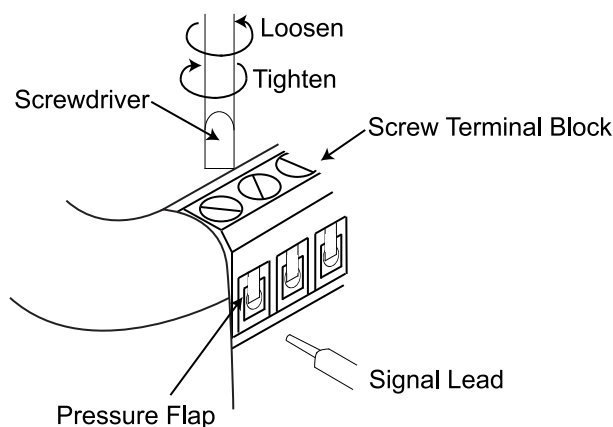
When an input signal is connected and WINDAQ Acquisition software is run, WINDAQ's real time display immediately reveals the input waveform on your computer's monitor.

Analog Inputs

Eight differential analog inputs measure ±200, ±500 mV, ±1, ±2, ±5, ±10 Volts on the DI-4108or ±2, ±5, ±10, ±20, ±50, ±100 Volts for the DI-4208 (CH1 to CH8, programmable per channel) . Designed to withstand 120 Vrms.
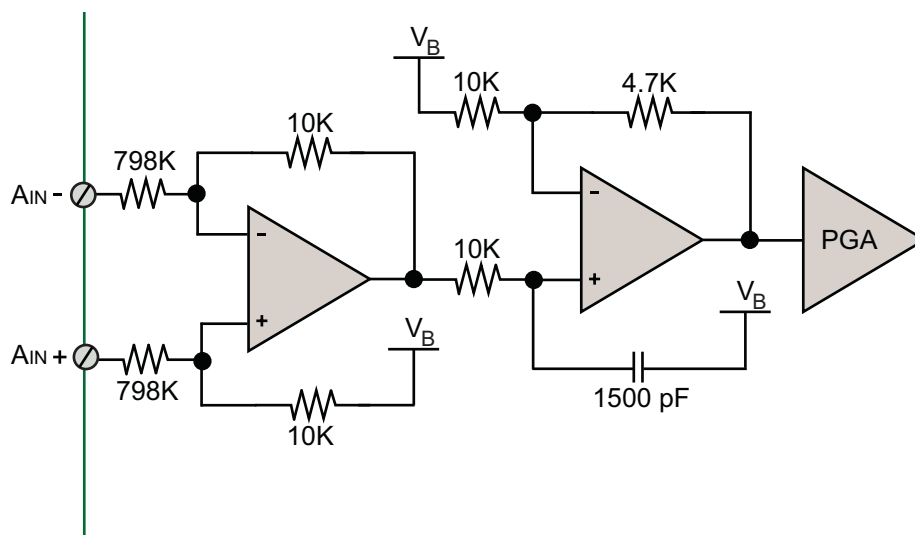
Use the following diagram to connect Analog Input Channel 1.
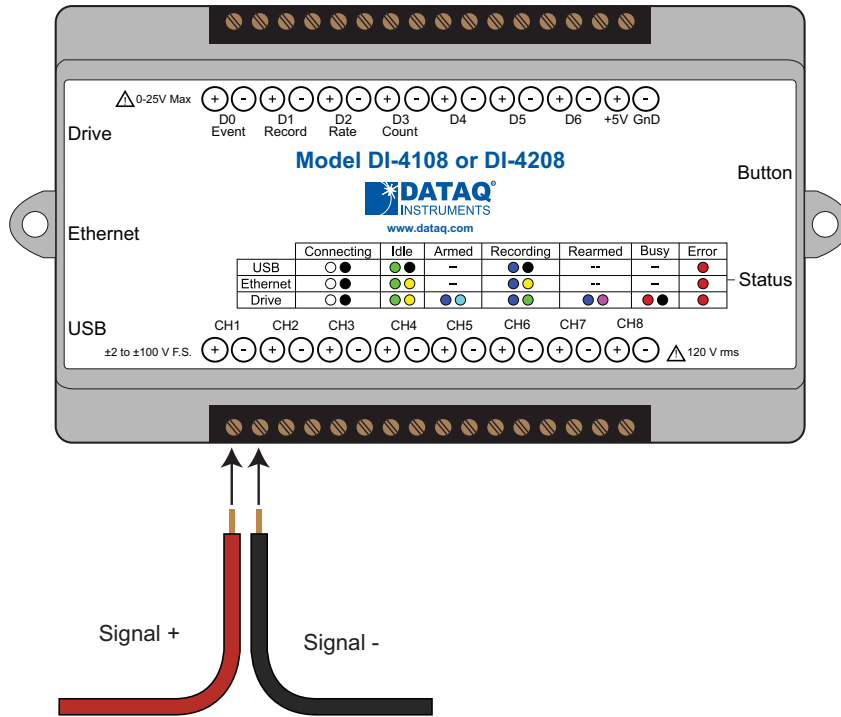
Specify a full scale range for the channel in the menu item **Edit** > **Channel Settings**.
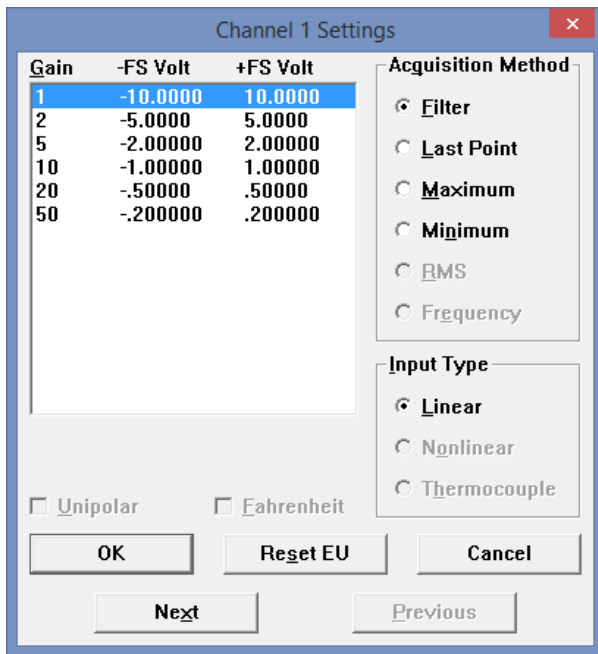
DI-4108 Channel Settings   DI-4208 Channel Settings
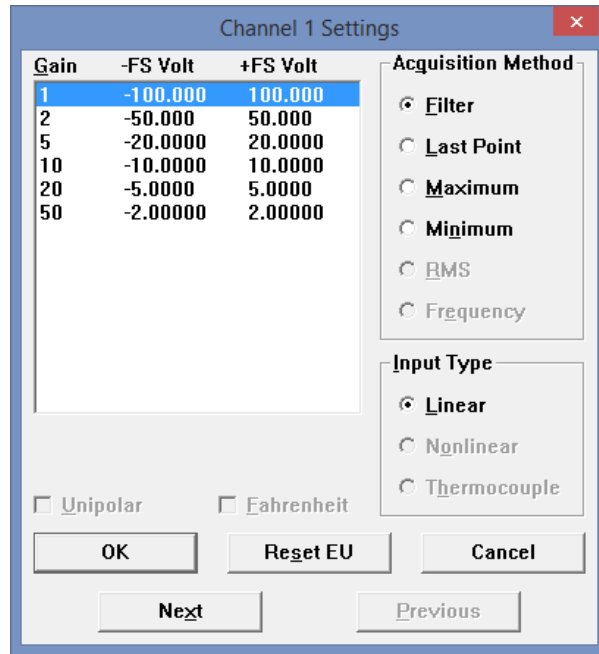
Scroll through all enabled channels with the **Next** and **Previous** buttons.

Low-pass Filter

Each analog channel employs a low-pass filter with automatic corner frequency selection. The filter is a CIC (cascaded integrator comb) type that uses as many as 512 samples per channel to calculate in real time as data is acquired. Filter response is optimized when sampling frequency is set to ten times the highest frequency of interest.

Typical Low-pass Filter Frequency Response
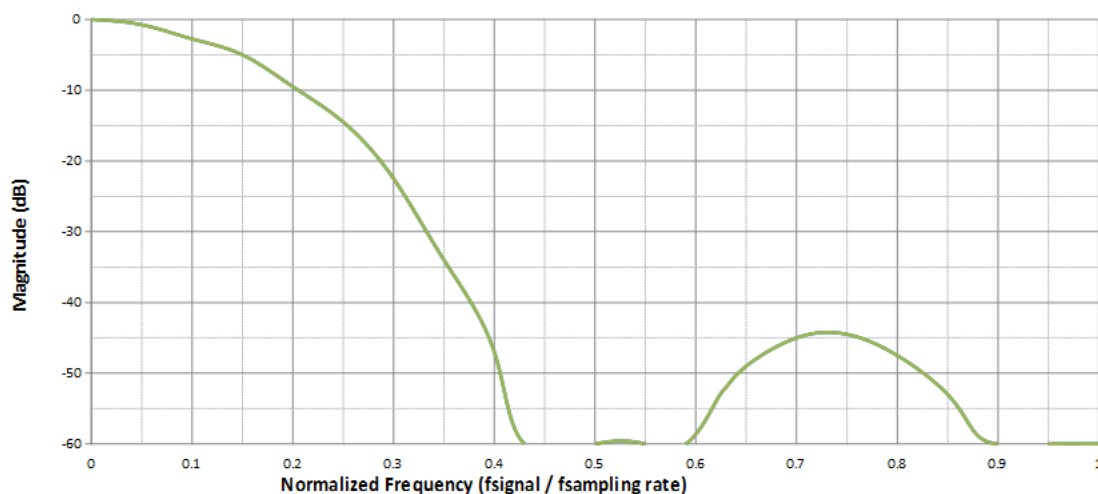
The DI-4108 and DI-4208 calculate its own Last Point, Maximum, Minimum, and Filter data making it available at the programming level. Acquisition methods "RMS" and "Frequency" are permanently disabled for the DI-4108 and DI-4208, as are Input Types "Nonlinear" and "Thermocouple" and selections for "Unipolar" and "Fahrenheit."

Resolution as a Function of Sample Rate

The resolution of the DI-4108 and DI-4208 is a function of sample rate. The lower the sample rate the higher the resolution. ADC resolution (R) is a function of selected sample rate per channel (F), and the number of enabled analog channels (C):

$$R = \frac{\log\left(\dfrac{160000}{FC}\right)}{\log(4)} + 12$$

C	Enabled Channels
1	1
2	2
4	3-4
8	5-8

ADC Resolution vs Sample Rate
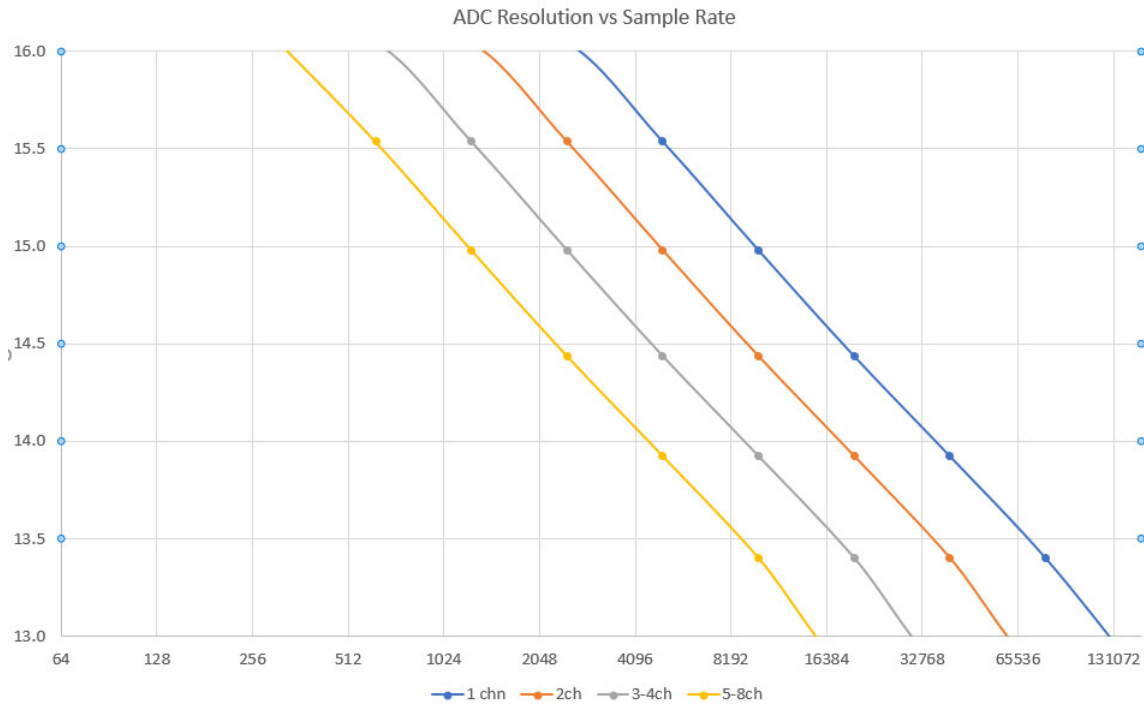
Digital Ports

The DI-4108 and DI-4208 contain 7 general-purpose digital ports. Each digital port can be configured as a digital input or used as a switch to control an external load (up to 25 V and 100 mA). Many of the ports also provide specific functionality in WINDAQ or a third-party program.

> D0 Event is for WINDAQ Remote Events. This bit inserts an event marker in your data.
> D1 Record is for WINDAQ Remote Storage. This bit can be programmed to begin recording data.
> D2 Rate is for Rate measurements: 10Hz to 50kHz.
> D3 Count is for Counter/Timer measurements up to 65,536.
> D4 and D5 are general-purpose digital inputs.
> D6 Ext Trig is for third-party external triggers.

Equivalent Digital I/O Circuit:
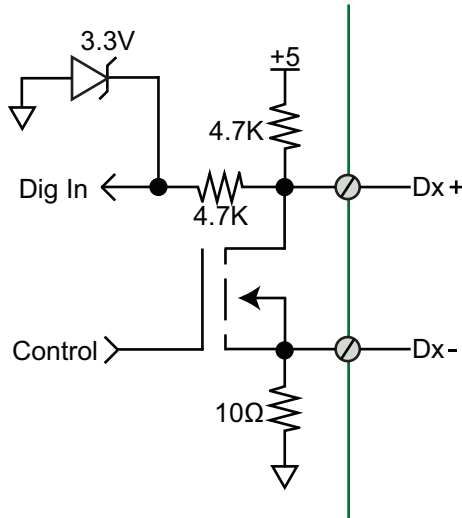
WINDAQ Remote Events (D0 Event)

To use a switch closure or TTL signal to record WINDAQ Event Markers, connect signal leads to the appropriate Remote Control Event terminals on the DI-4108 or DI-4208 as shown below.
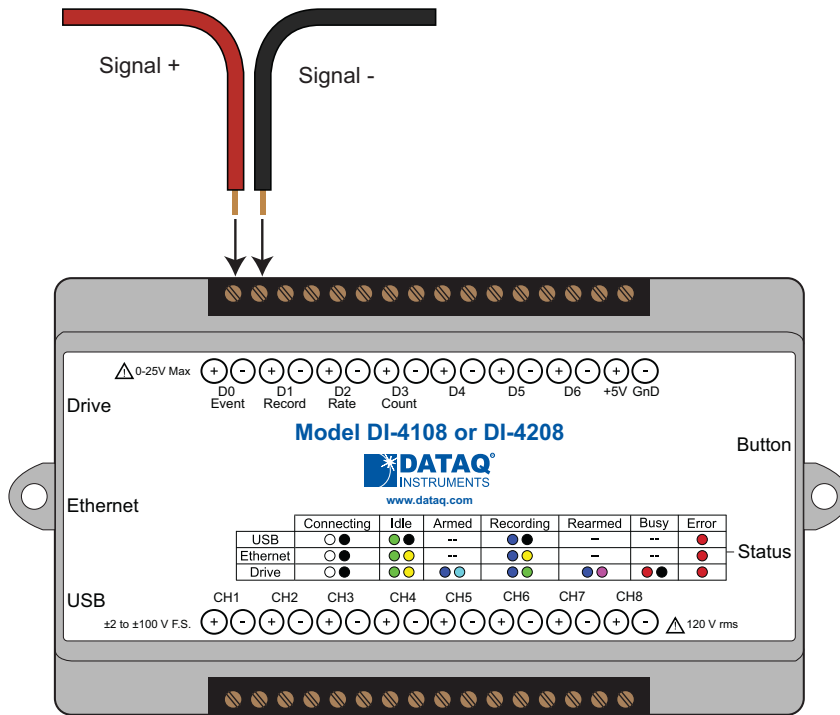

Once the switch closure or TTL signal is connected, activate Remote Events through WINDAQ Acquisition Software. Events may be automatically placed on the rising or falling edge of the trigger signal. Use the menu command **Options** > **Remote Events +** to set WINDAQ to place event markers on low-to-high transitions of the Event input. Use the menu command **Options** > **Remote Events -** to set WINDAQ to place event markers on high-to-low transitions of the Event input.

Event markers may also be placed in your data file manually by pressing the push button on the instrument. You must enable Remote Events in WINDAQ to use the button (use the menu command **Options** > **Remote Events +** *or* **Options** > **Remote Events -**).
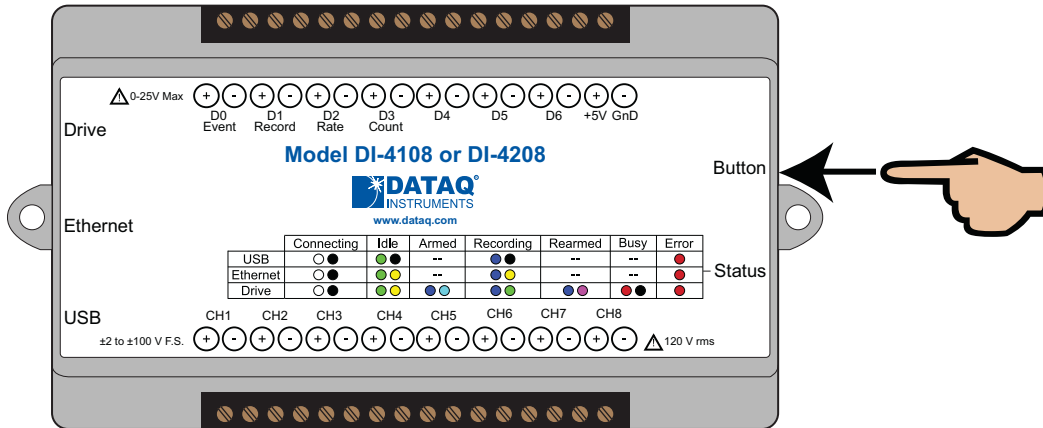
An example event marker in a WINDAQ data file is shown below.
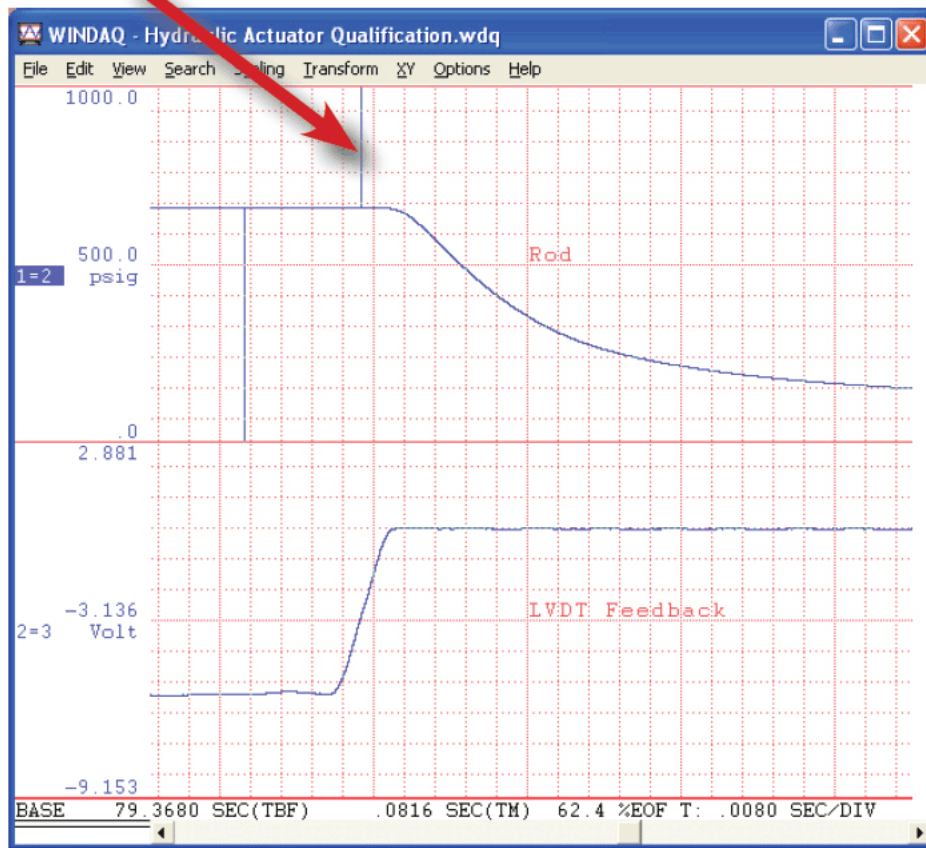
Please Note: Event Markers do not display in the real-time WINDAQ acquisition software - they only display in the WINDAQ playback software (WWB).

WINDAQ Remote Storage (D1 Record)

To use a switch closure or TTL signal to begin recording data remotely, connect signal leads to the appropriate Remote Control Record terminals on the DI-4108 or DI-4208 as shown below.
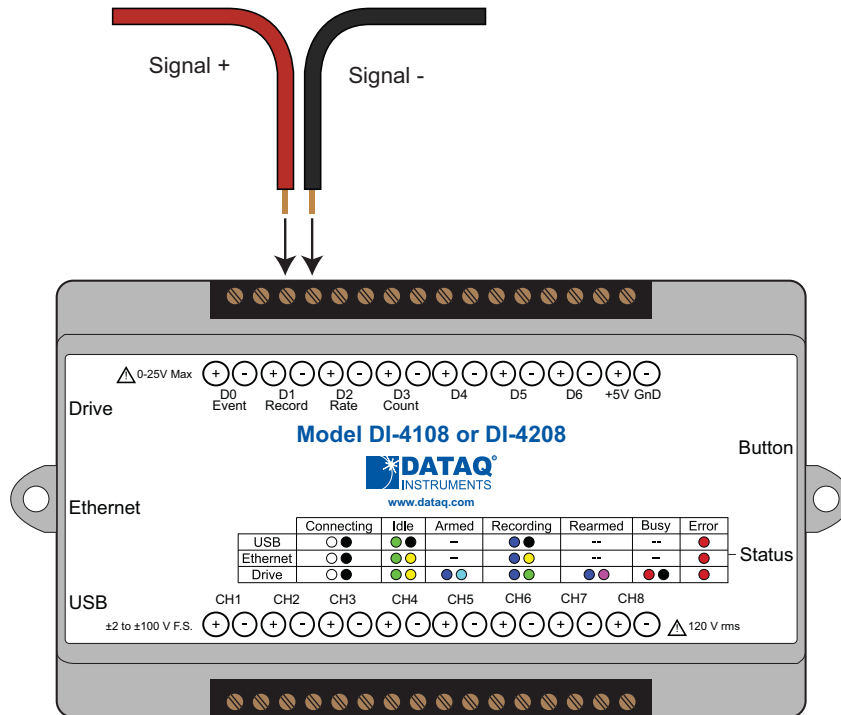
Once the switch closure or TTL signal is connected, activate Remote Storage (Record) through WINDAQ Acquisition Software. Storage to Disk may be automatically placed on the rising or falling edge of the trigger signal. Use the menu command **Options** > **Remote Storage 1** to set WINDAQ to begin recording on low-to-high transitions of the Record input. Use the menu command **Options** > **Remote Storage 0** to set WINDAQ to begin recording on high-to-low transitions of the Record input.

WINDAQ Rate (D2 Rate)

Enable channel 10 to record Rate, or the number of falling-edge transitions per unit of time that are applied to this input. Click on **Edit** > **Channels** in the WINDAQ Acquisition menu to open the Channel Selection grid. Channel 10 is

the designated Rate channel. Click on the Channel 10 channel box to enable/disable Rates. The Channel 10 channel box will display an "R" when enabled.
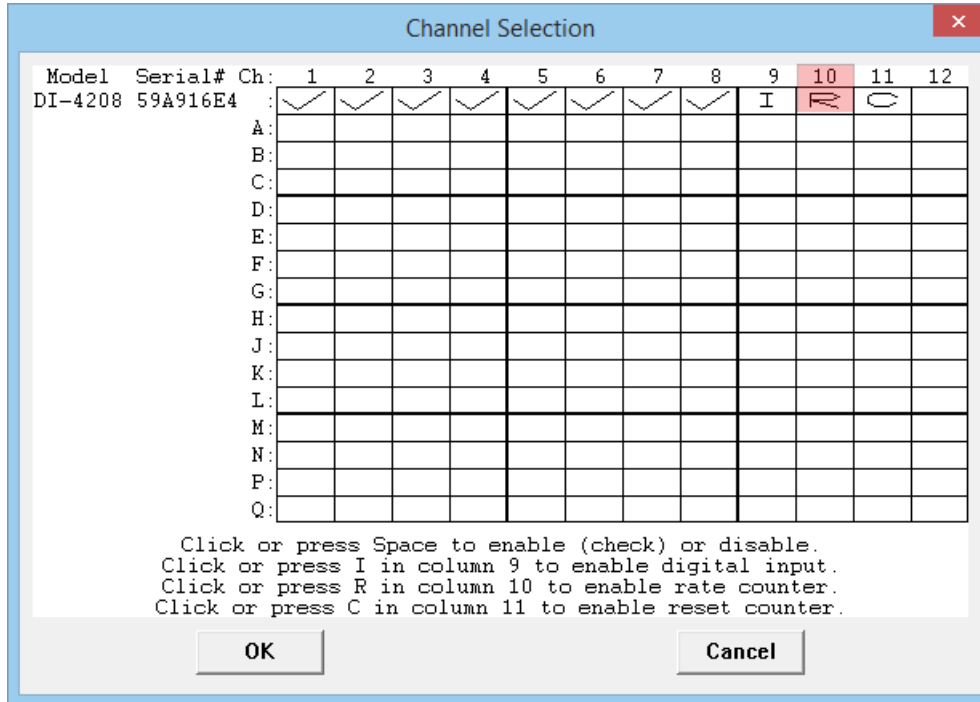
Connect any TTL pulse stream (25 VDC max) to the D2 Rate channel on the DI-4108 or DI-4208.
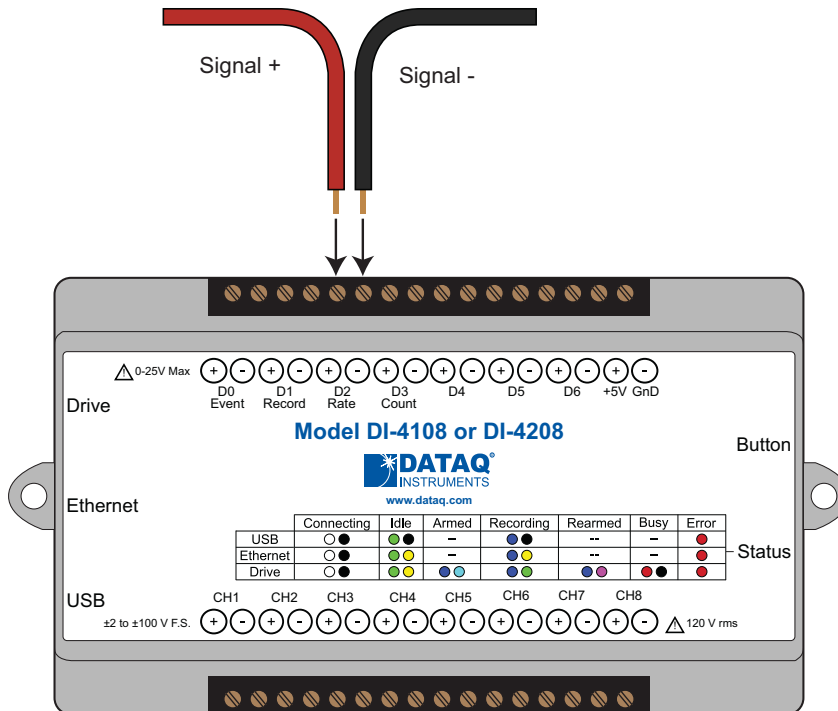
Select Channel 10 in the channel display, then select **Edit** > **Channel Settings** in the menu to specify a full scale range for the Rate channel. Ranges of 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000, and 50000 Hz are available. Choose a range that comes closest to your expected full scale rate or frequency. For example, if you need to

measure the output of a flow meter that can measure a maximum flow rate of 100 gallons per minute, and the output frequency at that rate is 100 Hz, you would choose the 100 Hz range setting. A range setting of 200 Hz full scale sacrifices half of the instrument's resolution at 200 gallons per minute, and a range of 50 Hz allows measurements to only 50 gallons per minute full scale.
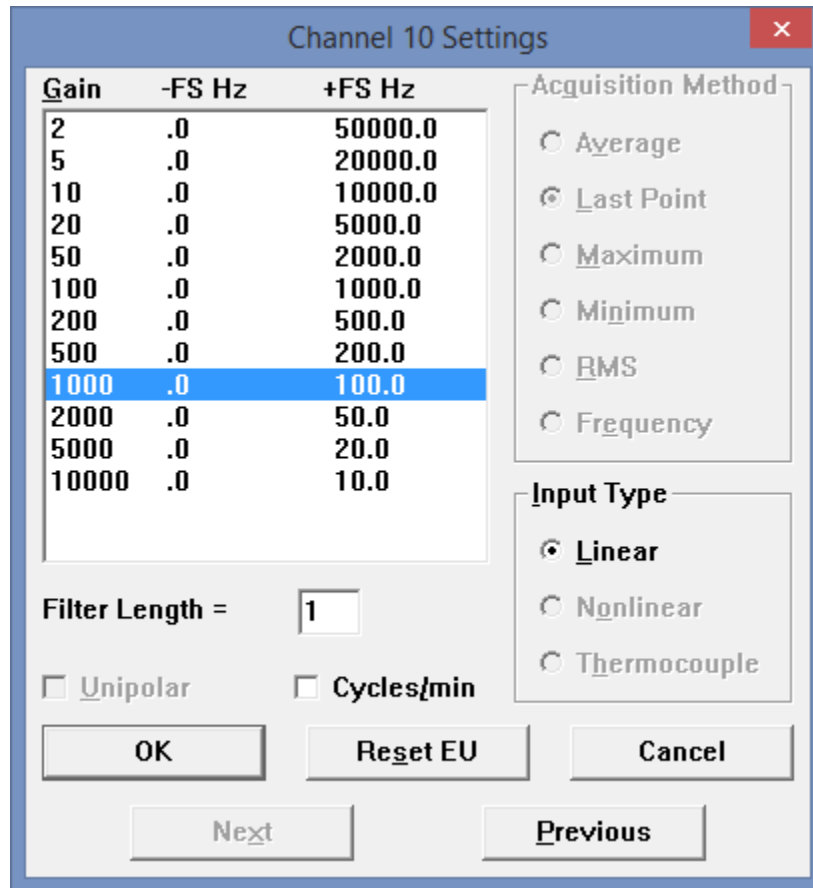
Check the "Cycles/min" box to display and select frequencies reported in cycles per minute instead of cycles per second (the measurement interval remains the same). Tachometer measurements in units of RPM (revolutions per minute) is just one example that benefits from selecting this option. For example, if the 100 Hz range setting is selected and "Cycles/min" is checked, the full scale range is actually 6000 cycles per minute.

Please Note: To measure the maximum rate, which is defined as 2 times the Maximum Sample Rate/Channel , the current values of Maximum Sample Rate/Channel divided by Sample Rate per Channel MUST be an integer.

WINDAQ Counter (D3 Count)
Enable channel 11 to record Counts, or the number of falling-edge transitions that are applied to this input. The count may be reset via WINDAQ software or under program control as necessary. Click on **Edit** > **Channels** in the WINDAQ

Acquisition menu to open the Channel Selection grid. Channel 11 is the designated Count channel. Click on the Channel 11 channel box to enable/disable Counts. The Channel 11 channel box will display a "C" when enabled.
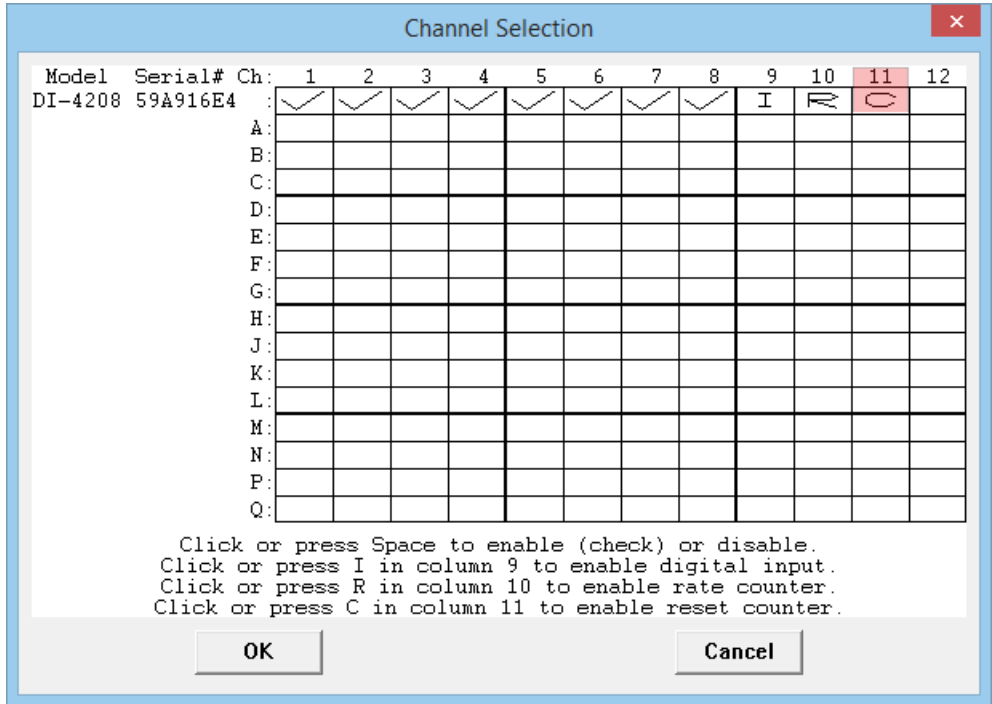

The counter channel accumulates counts over time whether recording or in standby mode as soon as the Counter channel is enabled. The *accumulated* values will be recorded to your data file unless you reset the counts to zero. The maximum count value is 65,535 before the counter resets to zero automatically.

Use the Edit > **Reset Count** command in WINDAQ Acquisition software to reset counts immediately to zero. This feature is available in both standby and record modes.

Use the Edit > Preferences > **Reset Count on New File Record** in WINDAQ Acquisition software to reset the count at the start of a new file or when using the Edit > Preferences > Record Next File on Full or Open Next File on Full feature to reset counts to zero every time a new file is started.

Use the Edit > Preferences > **Reset Count on Manual Record** in WINDAQ Acquisition software to reset counts to zero every time you begin or resume recording a data file using the File > Record command (F4).

Connect any TTL pulse stream (25 VDC max) to the D3 Count channel on the DI-4108 or DI-4208.
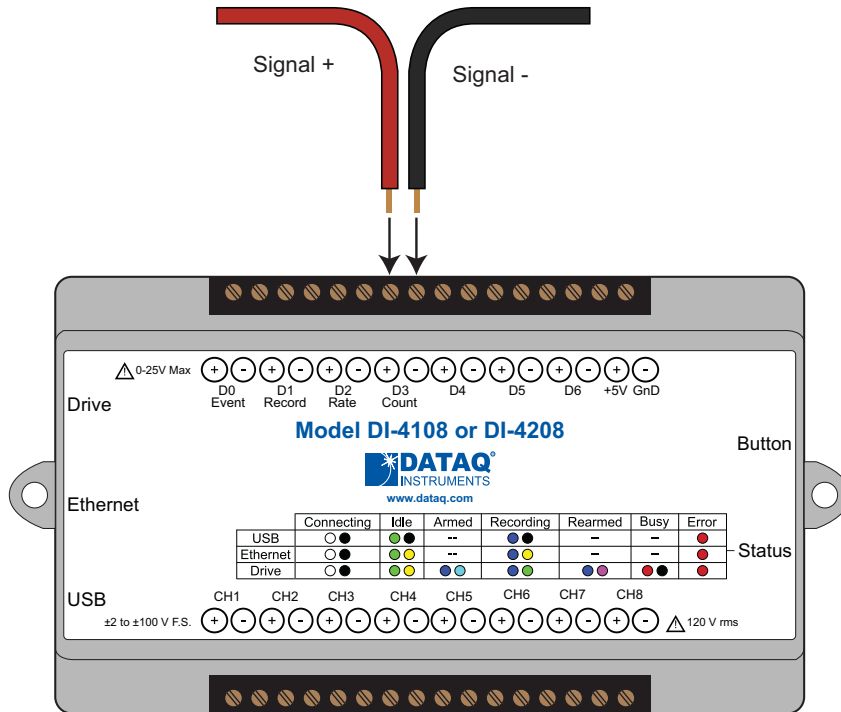
General Purpose Digital Inputs

Enable Channel 9 for general-purpose digital input functions. Click on **Edit** > **Channels** in the WINDAQ Acquisition menu to open the Channel Selection grid. Channel 9 is the designated Digital Input channel. Click on the Channel 9 channel box to enable/disable the digital inputs. The Channel 9 channel box will display an "I" when enabled.
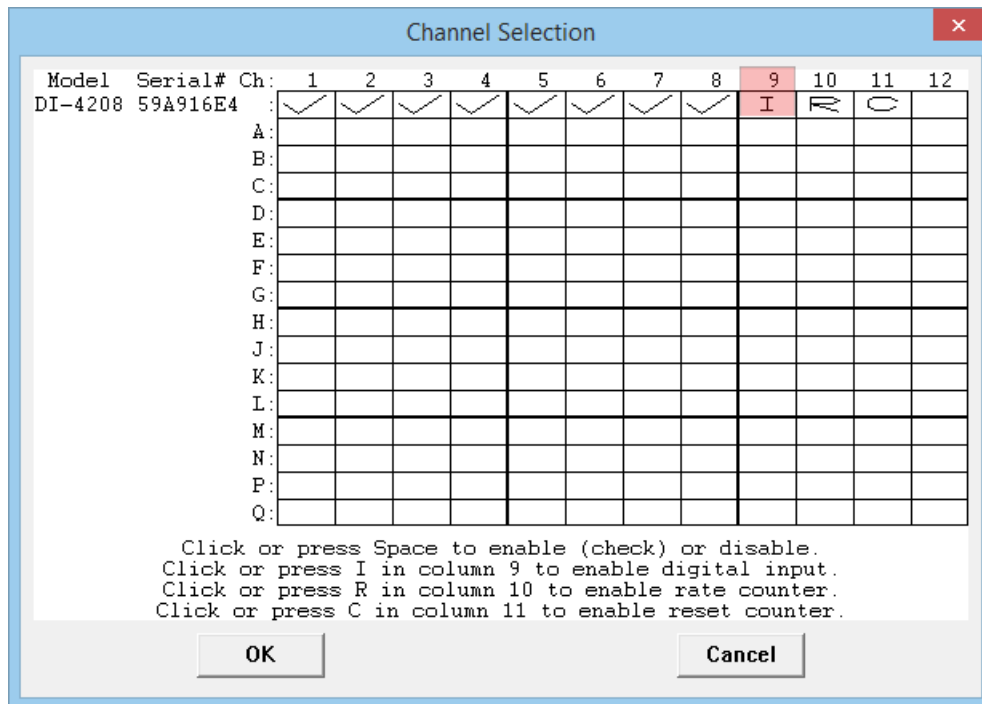
Channel 9 records and displays all the digital inputs, even the state of the Rate and Count inputs if those channels are enabled. With Channel 9 selected in the display window click **Scaling** > **Digital Plot** to show a digital display and make the data more meaningful on screen.

General Purpose Digital Outputs
Take care when configuring the load to be switched to ensure that the digital port is not damaged:
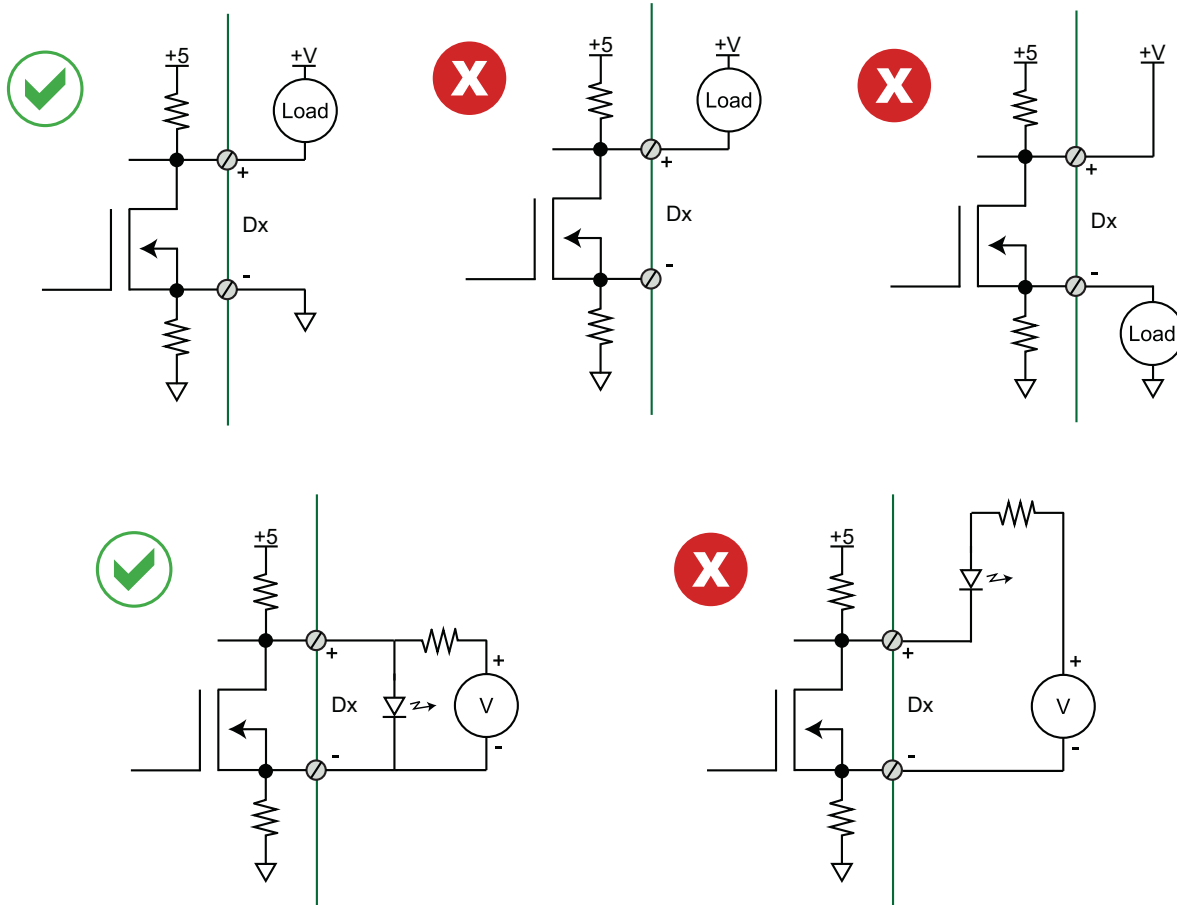
4-20mA Current Loop Measurements

Use the following diagram for 4-20mA current loop measurement connections.
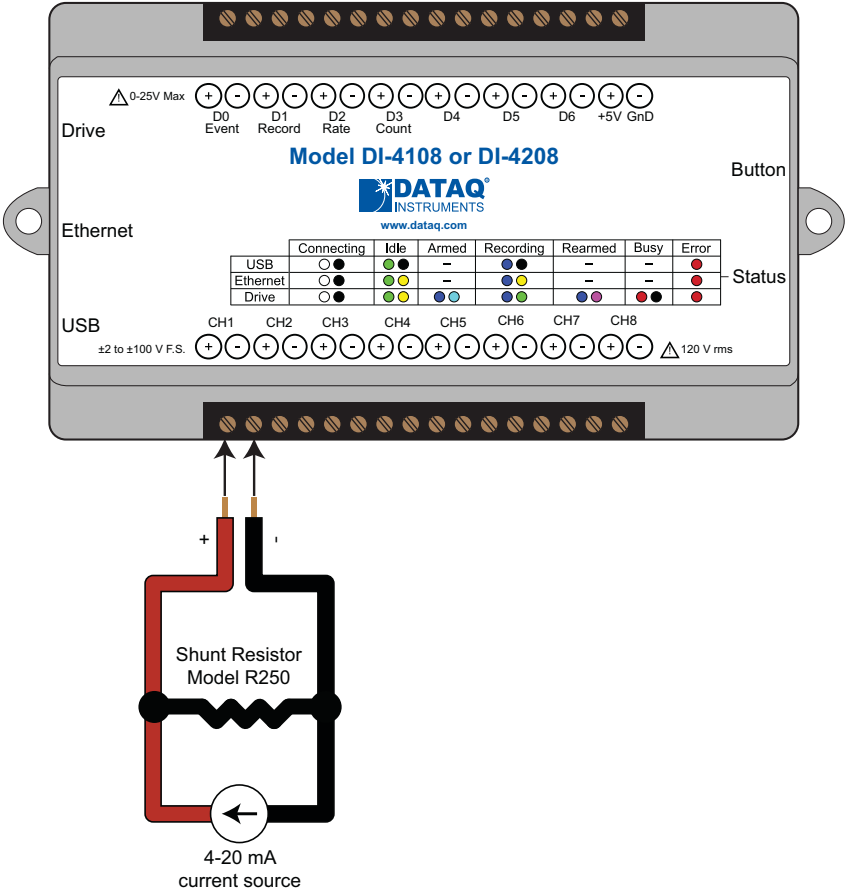
The shunt resistor should be placed on the low side of the circuit as shown below:
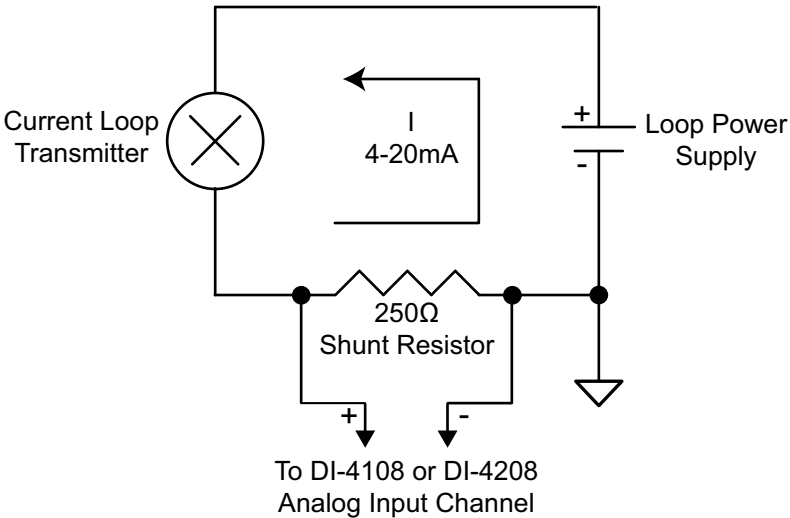
Set the engineering units as desired and define upper/lower levels in WINDAQ as 1V = 4mA for the low value and 5V = 20mA for the high value. For example, when using WINDAQ Acquisition software, in the EU Settings dialog box:
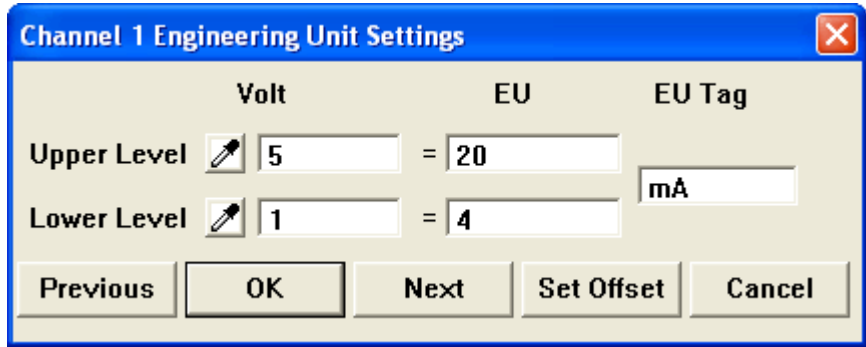
Enter the following values:

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

Visit our website at http://www.dataq.com/blog/data-acquisition/4-20-ma-current-loop-measurements/ to address all popular 4-20mA configurations.

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.

Mode LED Indicator

Indicates what mode the instrument is currently in. Use the chart on the top of the instrument for quick reference. Use the table provided below for a more detailed description of each available state as well as a description of some states not displayed on the label.

State	Mode	Description
Blinking White	Connecting	The device is looking for a connection to your PC or USB thumb drive. It will check the USB interface first, then the Ethernet and USB thumb drive. Once a connection is established the device will enter Idle mode.
Blinking Green	Idle USB Connected	The device is connected to and communicating with your PC through the USB port. The USB thumb drive and Ethernet port are not accessible.
Blinking Green/ Yellow	Idle Ethernet or USB Drive Connected	The device is connected to and communicating with your PC through the Ethernet port or the device is in Stand-alone mode. The USB interface is not accessible.
Blinking Blue	Acquiring Data to PC via USB Interface	WinDaq Acquisition Software is running and the device is acquiring data to your PC via the USB interface.

Blinking Blue/ Yellow	Acquiring Data to PC via Ethernet Interface	WinDaq Acquisition Software is running and the device is acquiring data to your PC via the Ethernet interface.
Blinking Blue/ Green	Recording Data to USB thumb Drive	The device is acquiring data and recording to your USB thumb drive. Do not remove power - power interruption could result in data file corruption.
Blinking Blue/ Cyan	Armed USB thumb Drive is waiting for a trigger condition	The device is acquiring data and waiting for a trigger condition to begin recording to your USB thumb drive. Do not remove power or the USB thumb drive - either could result in data file corruption.
Blinking Blue/ Cyan	Re-armed USB thumb Drive is waiting for a trigger condition	The device is acquiring data and waiting for another trigger condition to continue recording to your USB thumb drive. Do not remove power or the USB thumb drive - either could result in data file corruption.
Blinking Red	Busy USB thumb Drive is busy	The device is reading from or writing to the USB thumb drive. Do not remove power or the USB thumb drive - either could result in data file corruption.
Solid Red	Error	The device is unable to perform any operations. Cycle power or use the control button to resolve the error.
Solid White	Button Pushed	The LED turns white to indicate the control button is engaged.
Blinking Yellow	Idle USB connected in CDC mode	The device is connected to and communicating with your PC through the USB port in CDC mode. WinDaq software will not run. The USB thumb drive and Ethernet port are not accessible.

Control Button Operations

The Control Button can be used to stop or start recording data to the USB thumb drive when using the instrument as a stand-alone data logger. The Control Button can also be used to reconfigure the instrument to factory default settings. The Control Button can also be used to create an instantaneous event marker when running WINDAQ Acquisition software.

Record Data to USB Thumb Drive

Record data to an installed USB thumb drive. The device must be in Idle mode and set for USB Drive (mode LED must be flashing Green/Yellow). After the button is pressed, the mode LED will flash Blue/Green or Blue/Cyan to indicate it is in a recording mode.

Stop Recording to USB Thumb Drive

Manually stop recording to the USB thumb drive (when the mode LED is flashing Blue/Green, Blue/Cyan, or Blue/Magenta). After the button is pressed the mode LED will flash Green/Yellow to indicate Idle.

Fix Errors

The Control Button can also be used to fix some common operating errors. When the instrument is in Error mode (mode LED is solid red), some action must be taken to fix the error before you can use it. Generally, the Control Button can be used to make the instrument operational again when in Error mode.

Switching between LibUSB and CDC Modes

The native communication mode of DI-4108 and DI-4208 instruments is LibUSB but it can be switched to the USB CDC (Communication Device Class). CDC mode allows the USB port of DI-4108 and DI-4208 devices to appear like a traditional RS-232 port, which is common across most operating systems and development languages. ***Please note: LibUSB communication is required** for WinDaq Acquisition software and programming with our .NET SDK. Only switch to CDC mode when writing your own programs at the protocol level (for example, Python applications).* Use the following sequence to switch your device to/from LibUSB/CDC modes:

1. Connect the device to your PC via the USB port.

2. Apply power to the device.

3. When mode LED stops blinking white and is in Idle mode, push and hold the Control button. This must be completed within five seconds after the device is in Idle mode.

4. When the mode LED turns red, release the Control button.

5. The Mode LED will flash white then indicate Idle in either LibUSB or CDC mode:

    •   CDC mode: Blinking Yellow

    •   LibUSB mode: Blinking Green

Save Ethernet and Stand-alone configuration to Thumb Drive

Save Ethernet settings and/or stand-alone configuration settings using the Control Button. Ethernet and Stand-alone configurations can also be saved to the thumb drive via the Dashboard (preferred method). Device must be in Idle mode for Ethernet or USB thumb Drive (mode LED blinks green/yellow). The Unlock Code must be purchased for your device in order to save the stand-alone configuration.

1. Format your USB thumb drive using your PC.

2. Confirm device is in Idle mode for USB Flash Drive (mode LED blinks Green/Yellow).

3. Push and hold the Control button.

4. Plug the formatted (empty) thumb drive into the device (Drive) while holding the button in.

5. Release the button when the mode LED changes to Red/Black.

6. The device will read and load the configuration files to the thumb drive and revert to Idle mode when complete.

Configuration files include network.json (Ethernet configuration) and config.whd or config.whc (WinDaq configuration). Use the WinDaq Dashboard to create configuration files.

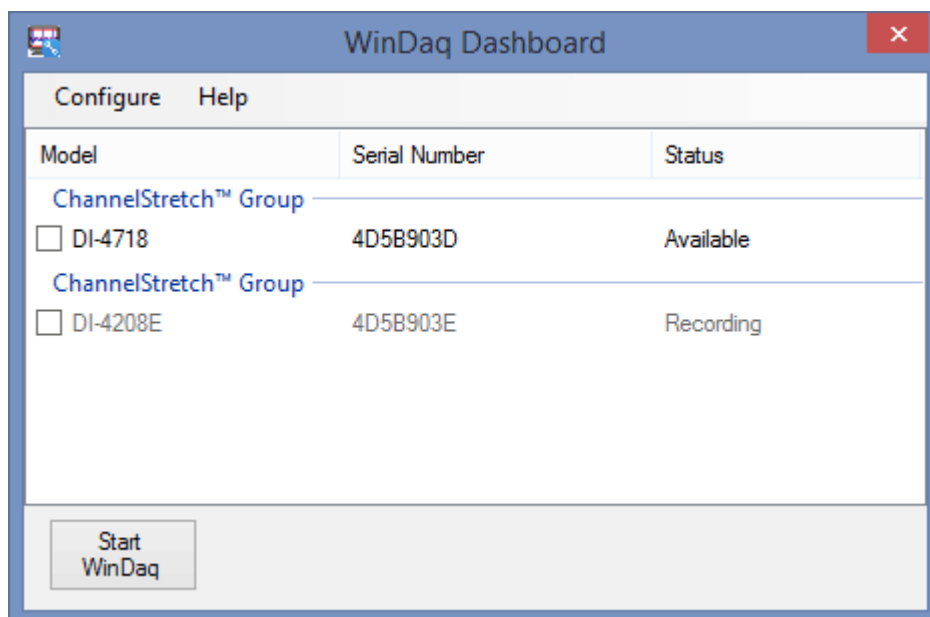### *Apply Ethernet and Stand-alone Configuration to Device*

Load Ethernet settings or stand-alone configuration settings using the Control Button. Ethernet and Stand-alone configurations can also be applied via the Dashboard (preferred method). Device must be in Idle mode for Ethernet or USB thumb Drive (mode LED blinks green/yellow). The Unlock Code must be purchased for your device in order to apply the stand-alone configuration.

1. Save configuration files to your USB thumb drive.

2. Confirm device is in Idle mode for USB Flash Drive (mode LED blinks Green/Yellow).

3. Push and hold the Control button.

4. Plug the thumb drive into the device (Drive) while holding the button in.

5. Release the button when the mode LED changes to Red/Black.

6. The device will read and load the configuration files to the device and revert to Idle mode when complete.

Configuration files include network.json (Ethernet configuration) and config.whd or config.whc (WinDaq configuration). Use the WinDaq Dashboard to create configuration files.

WinDaq Dashboard

The WinDaq Dashboard allows you to run WinDaq Data Acquisition software, sync the device clock with your PC, modify Ethernet settings, configure your instrument for stand-alone data logging to record data to a USB flash drive, and access the USB thumb drive via the Ethernet interface. Devices in a ChannelStretch™ Group can synchronize data recording in that group. Select all the devices under a ChannelStretch group and click on the Start WinDaq button. Stand-alone data logging is not available using ChannelStretch.

Use the Configure menu to access the Stand alone setup window.
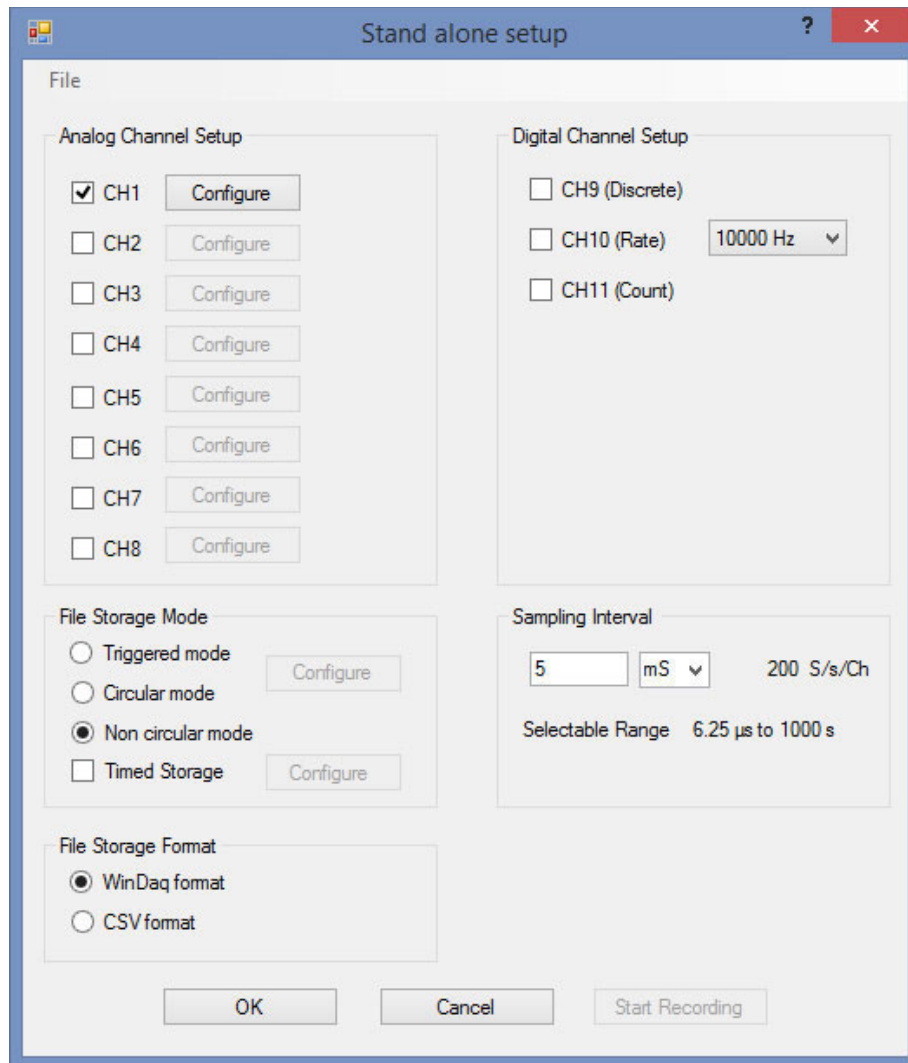
Select and configure all channels available on your device, select a sampling interval, and setup recording Trigger conditions. The Stand alone configuration also allows you to Save/Load configurations via the File menu. Use the help file provided in WinDaq Dashboard to learn more. ***Please Note:*** *You cannot record to the USB thumb drive while the device is connected to your computer's USB port.*

ChannelStretch™

Expand the channel count of your DI-4718B with ChannelStretch. Both the DI-4718B-U and the DI-4718B-E can synchronize with other USB devices via the USB interface. The DI-4718B-E can also synchronize with other Ethernet instruments via the Ethernet interface. Connect up to 16 DI-4718B, DI-1120, DI-4108, and/or DI-4208 devices with a powered USB hub (or multiple cascaded/connected powered USB hubs) or Ethernet switch to record more than 8 channels of data to a single WinDaq file. This provides a total of up to 128 analog channels and 112 digital ports at a maximum throughput rate of 480 kHz. Cascade multiple USB hubs or Ethernet switches to expand port count. Synchronized instruments must have the same sample rate per channel, regardless of channel number, type, or range. The WinDaq/Unlock option **per instrument** is required to synchronize two or more devices when using WinDaq software.

Connection

All USB devices must be on the same USB controller (or hub)* in order to synchronize data acquisition. All Ethernet devices must be on the same subnet as the PC that is recording the data (preferably the same Ethernet switch).

ChannelStretch™ Technology
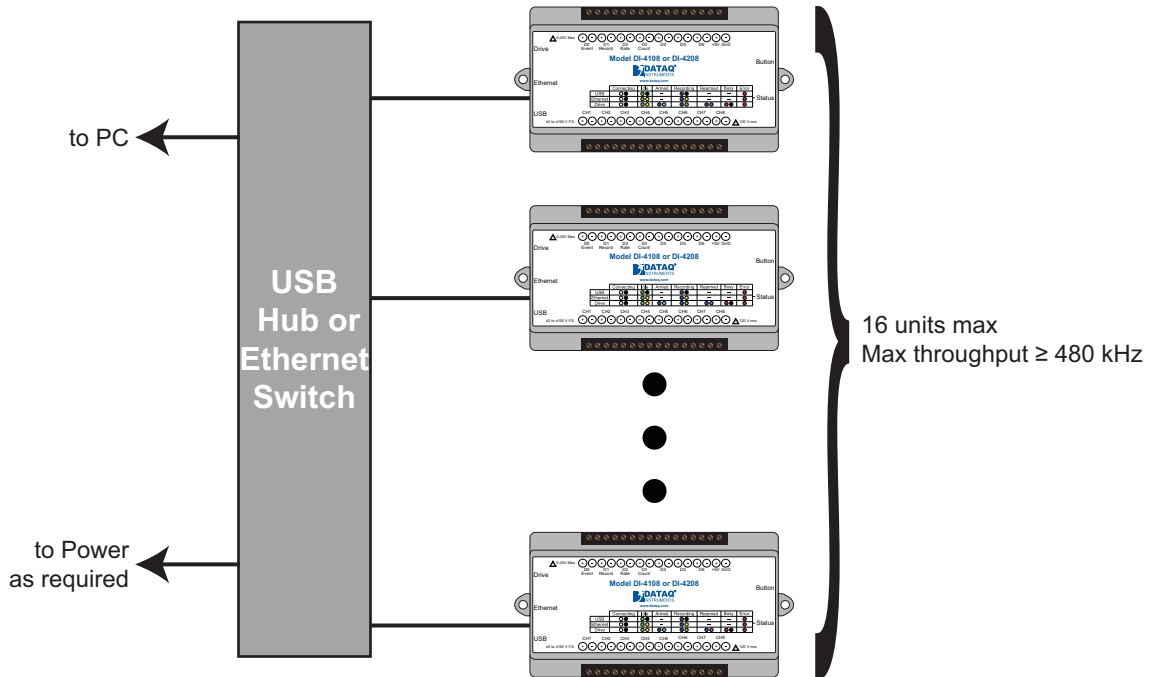
Please Note: Because of the way Windows operating systems manage USB controllers, the only way to be absolutely sure you are on the same controller is to use a powered USB hub.

Channel Selection

Devices are listed in the Channel Selection grid in alpha-numeric order of the serial numbers of the device. Devices must be connected to the USB hub before starting WinDaq.
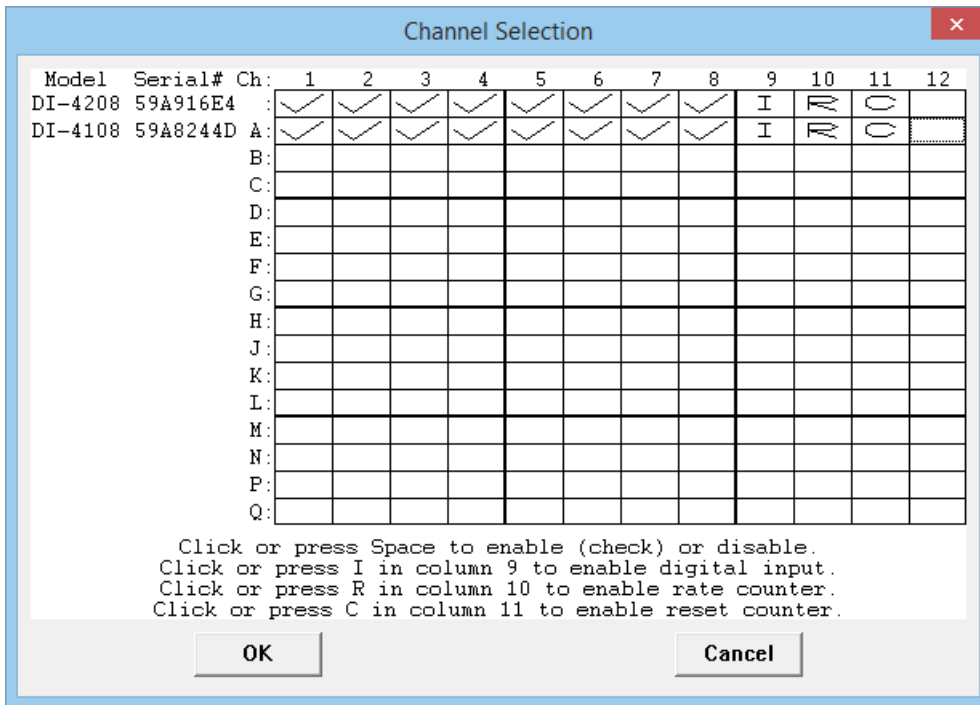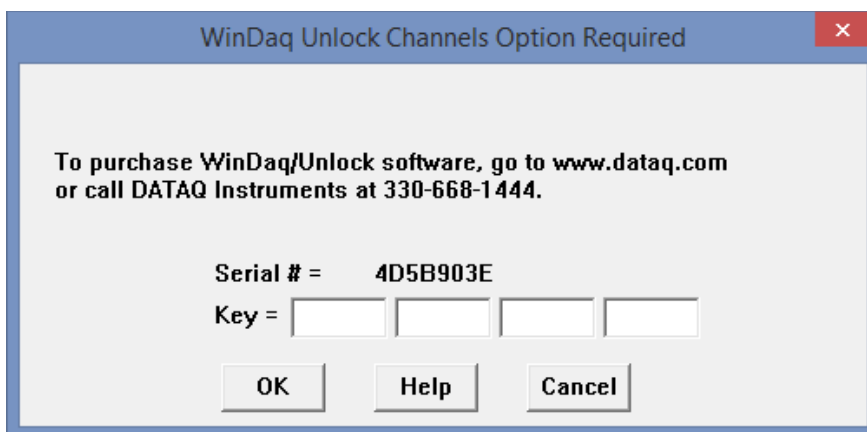
5. Unlock WinDaq

The DI-4108 and DI-4208 will record up to four channels using WinDaq/Lite software and a single channel to the USB thumb drive. An unlock code is required to record more than 4 channels or to use ChannelStretch™ to synchronize multiple instruments (unlock code required for each unit to be synchronized). Go to https://www.dataq.com/products/di-4108/ or https://www.dataq.com/products/di-4108/ to purchase either unlock code or call 330-668-1444. Once purchased, you will be given a Key code to enter into WinDaq (for WinDaq/Unlock) or the WinDaq Dashboard (for SA-Enabled).

WinDaq/Unlock

Allows you to record more than four channels to WinDaq and unlocks ChannelStretch.

1. Start WinDaq Acquisition software.

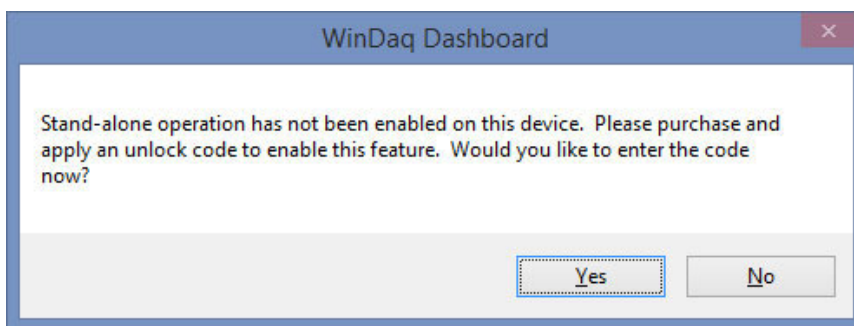2. Click the menu item **Help** > **Unlock WinDaq**.

3. Enter the Key in the appropriate dialog boxes.
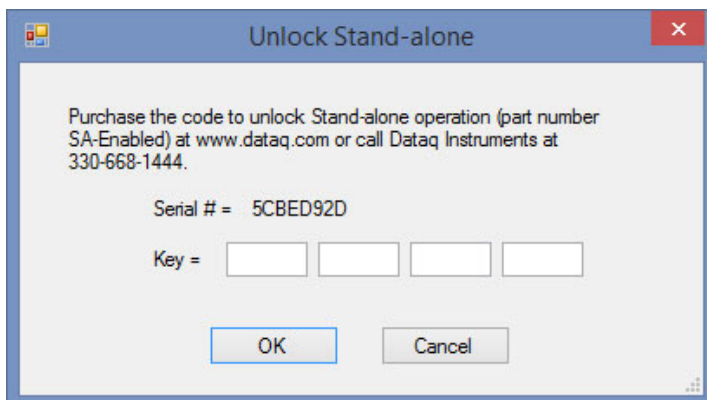
4. Click **OK**.

SA-Enabled

Allows you to unlock all channels for stand-alone data logging as well as all the channels in WinDaq.

1. Start WinDaq Dashboard software.

2. Select your device and click the menu item **Configure** > **Stand Alone Setup**.
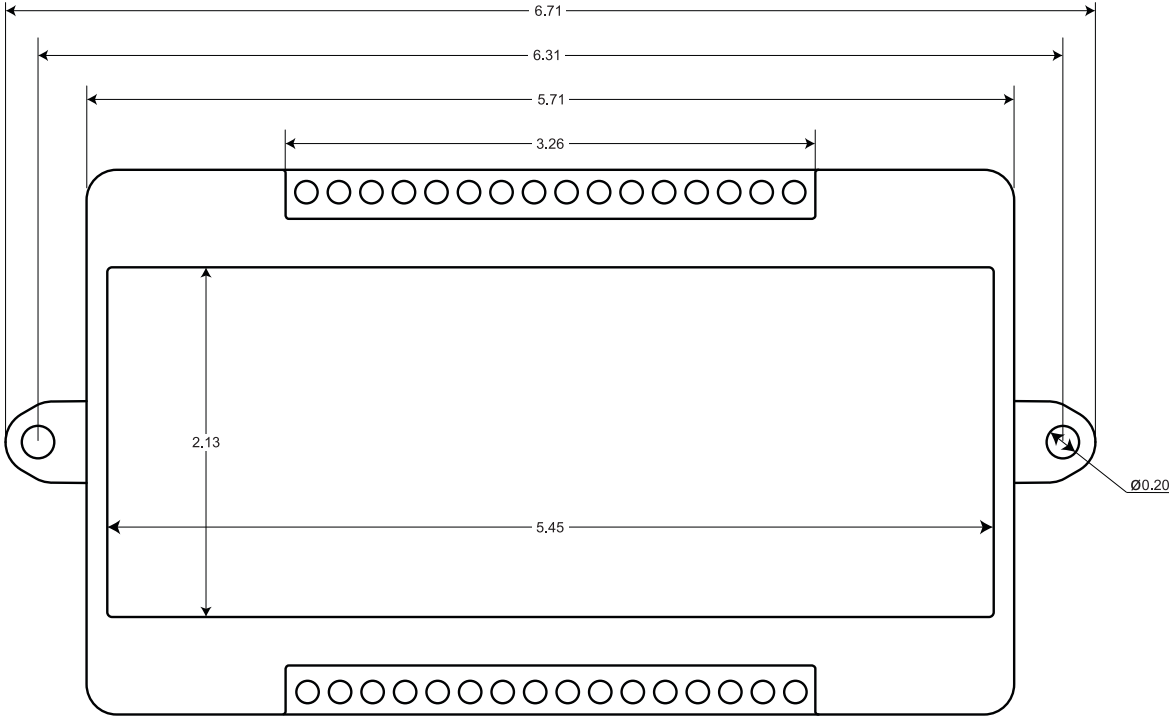
3. Click on the **Yes** button to enter your code. Click on the **No** button to go to Stand-alone configuration for a single channel.
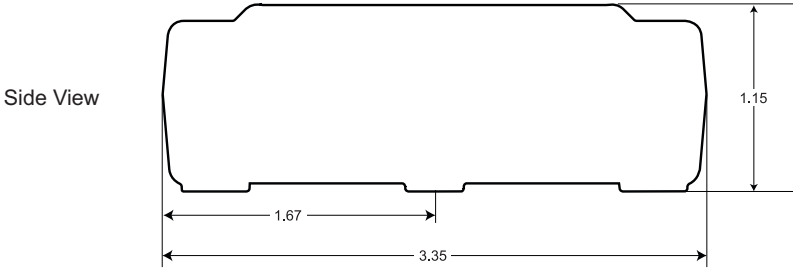

4. Enter the Key in the appropriate dialog boxes.

5. Click **OK**.

6. Dimensional Drawing

Top View

Side View

All dimensions in inches