

DI-1100 Low-cost USB Data Acquisition (DAQ) System



- ✓ Four armored analog differential inputs
 - ✓ Up to ± 100 V without damage
 - ✓ Fixed measurement range of ± 10 V full scale
- ✓ 12-bit analog-to-digital resolution
- ✓ 20 kHz per channel with all four channels enabled
- ✓ Two digital input ports support WinDaq software:
 - ✓ Remote event trigger
 - ✓ Remote stop/start recording
- ✓ Wide-ranging software support includes:
 - ✓ Ready-to-run WinDaq software
 - ✓ .NET Class for Visual Studio program development
 - ✓ Published protocol for software development in non-Windows operating systems

DI-1100 Description

Hardware Overview

The DI-1100 is a new release in a long line of low-cost starter kits from DATAQ Instruments. It's an updated replacement and alternative for the DI-145 USB data acquisition starter kit.

Suitable for measuring preamplified analog signals, the DI-1100 in tandem with the included WinDaq software allows real time data acquisition, playback, and analysis performance equal to or better than other products that cost many times its low price. Predecessors of this instrument have been sold to over 35,000 hobbyists and professionals for countless data acquisition applications around the world. The DI-1100 continues this legacy with a higher resolution and faster ADC than its predecessor while retaining its noise-cancelling differential analog inputs that are level-protected to ± 100 VDC or peak AC. This is our fastest, most flexible, and value-oriented starter kit ever. The DI-1100 offers four analog input and two discrete (digital) input channels. The analog inputs offer a fixed measurement range of ± 10 VFS, and are multiplexed to an integrated 12-bit ADC. Digital inputs are protected to ± 30 V dc. Sample rates as slow as 20 Hz and as fast as 40 kHz with a single enabled channel are supported.

Software Overview

Model DI-1100 starter kit is provided with comprehensive software support. For point-and-click, ready-to-run applications the DI-1100 is supplied with our popular WinDaq software. WinDaq allows a real time display of any combination of analog channels and the ability to stream acquired data to disk in recorder-like fashion, even at the fastest rate supported by the hardware. This is true streaming performance, continuous, without gaps, and simultaneously to both the real time display and disk. Record only a few readings, or as many as 4 GB. The DI-1100's two digital inputs are dedicated for remote stop/start and remote event operations using WinDaq software. WinDaq also includes software to review recorded data files, including waveform analysis and data file export to Microsoft Excel and other applications.

Sometimes, you need a more focused application. Consider a production application where an instrument makes the same measurements and generates the same results repeatedly. This situation defines the need for a custom program, and the DI-1100 supplies the tools you need to get it done. For Windows applications a .Net class is provided that accesses all DI-1100 measurement features. It's provided with a comprehensive example program that can act as the foundation for your unique application. For operating systems other than Windows the DI-1100's device protocol is fully documented.

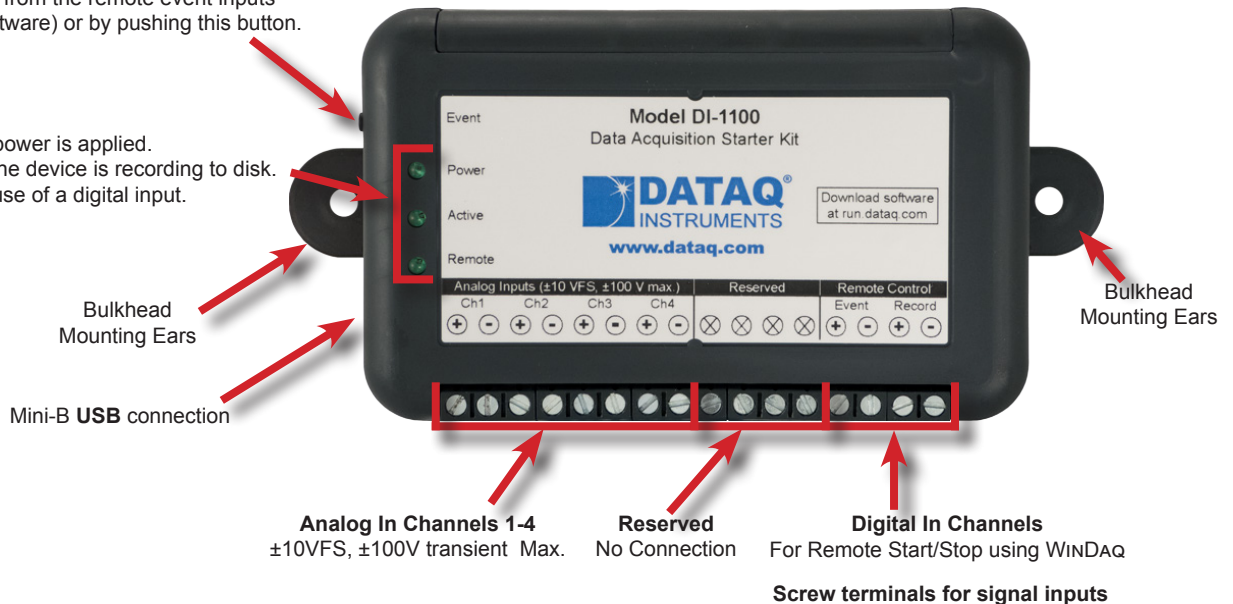
DI-1100 Close-up

Remote Event push-button

Trigger events either from the remote event inputs (through WinDaq software) or by pushing this button.

LED Indication

Power LED indicates power is applied.
Active LED indicates the device is recording to disk.
Digital LED indicates use of a digital input.



DI-1100 Major Features and Benefits

Four Analog Input Channels

Measure as many as four system variables at once with a fixed ± 10 V full scale range.

Differential Analog Input Configuration

Enhanced noise immunity and common mode volt tolerance.

12-bit Measurement Resolution

Yields measurement resolution of ± 4.8 mV across its ± 10 V range.

Armored Inputs Absorb Mistakes

Both analog and digital inputs are protected to ± 100 and ± 30 V dc respectively.

Fast Analog Channel Sample Rate

Observe fast phenomena that other products in the DI-1100's price range would miss. Maximum sample rate per channel is a function of the number of enabled channels:

Enabled Channels	Sample Rate per Channel
1	40 kHz
2	30 kHz
3	24 kHz
4	20 kHz

Two Digital Input Ports

Allows remote control of WinDaq's stop/start recording and event marker functions. Each port is protected to ± 30 V dc.

Supports 4-20 mA Measurements

Process current (current loop) measurements are possible using an external shunt resistor (model R250 sold separately.)

USB-powered

The instrument is powered directly from the connected USB port to eliminate the need for clumsy external power supplies.

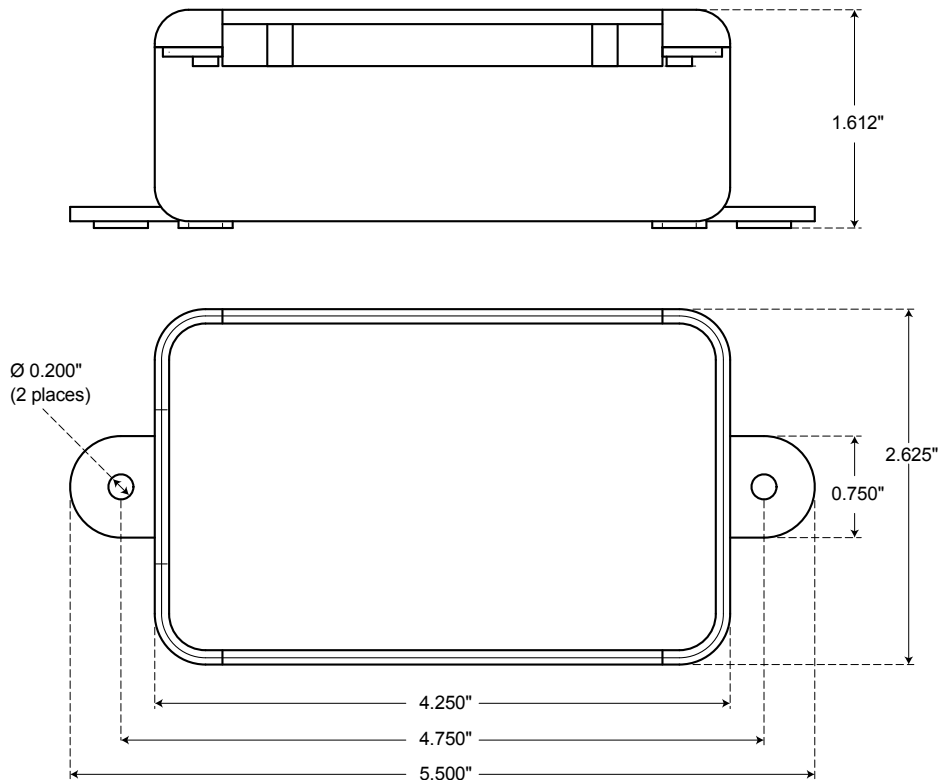
Comprehensive Programming Support

The instrument is offered with a comprehensive .Net class for the Windows programming environment. Its device protocol is fully documented for use with operating systems other than Windows.

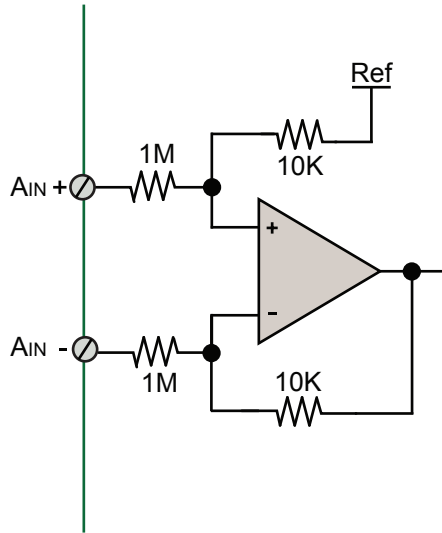
Ready-to-run Software Support

Provided with ready-to-run WinDaq software for point-and-click DAQ performance with a real time display, disk-streaming recording, and playback and analysis.

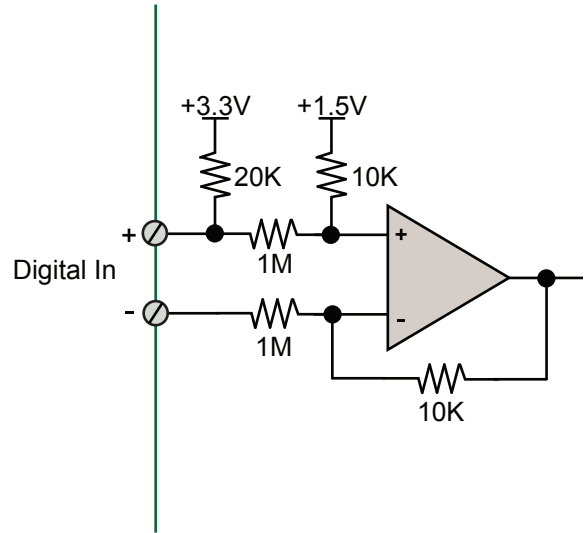
DI-1100 Dimensional Drawing



Analog Input



Digital Input Port



DI-1100 Scan List Flexibility

The DI-1100 maintains an internal scan list of as many as four different items at once. The scan list provide an internal menu of the analog channels to be scanned. It operates at any desired throughput rate, and allows multi-channel analog measurements to synchronize, independent of operating system and other latencies.

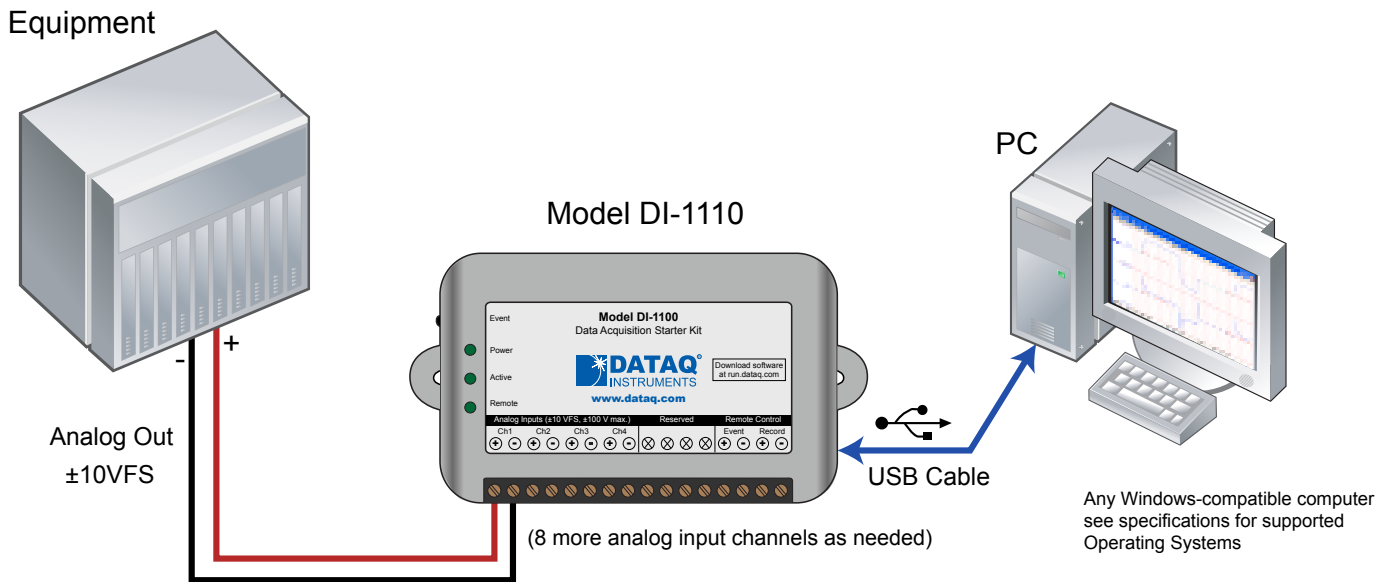
Item	Scan List Positions	Comments
Analog channels	Up to four	One scan list position is consumed for each enabled analog channel

DI-1100 Analog Measurements

Four analog input channels with a fixed measurement range of ± 10 V full scale are supported by the DI-1100. Though not isolated inputs, each offers differential input capability with some rejection of common mode voltages (those that appear simultaneously and in-phase on both inputs.) These channels are also hardened to tolerate excessive voltages to protect against wiring mishaps (see specifications).

Traditional Chart Recorder Replacement

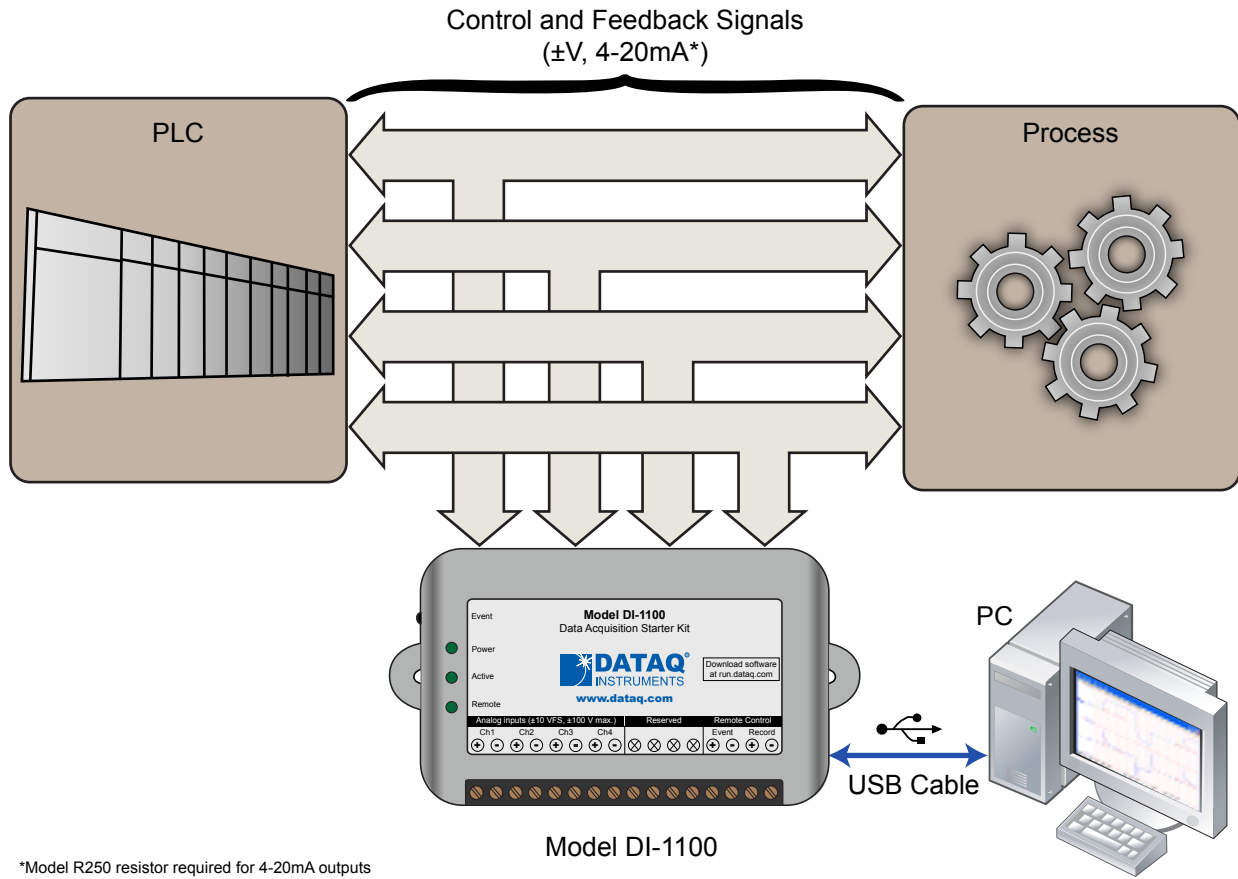
Digitize and record measurements from instruments with high-level analog outputs. Examples of “Equipment” include gas chromatographs, liquid chromatographs, spectrometers, bio-amplifiers*, etc.



* DATAQ Instruments' hardware and software products are NOT designed to be used in the diagnosis and treatment of humans, nor are they to be used as critical components in any life support systems whose failure to perform can reasonably be expected to cause injury to humans.

Process Monitoring

Trend plot and record control and feedback signals to troubleshoot process glitches.

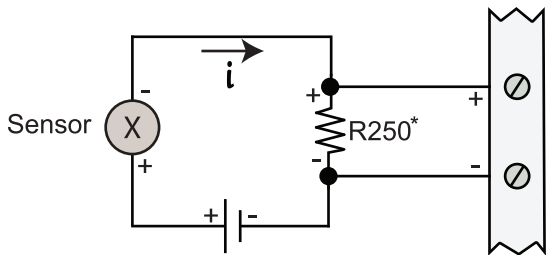


*Model R250 resistor required for 4-20mA outputs

Any Windows-compatible computer
see specifications for supported
Operating Systems

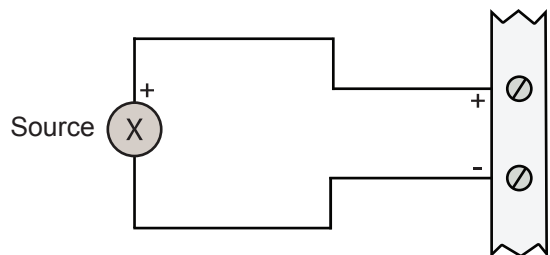
Typical Analog Measurements

4-20mA current (low-side shunt)



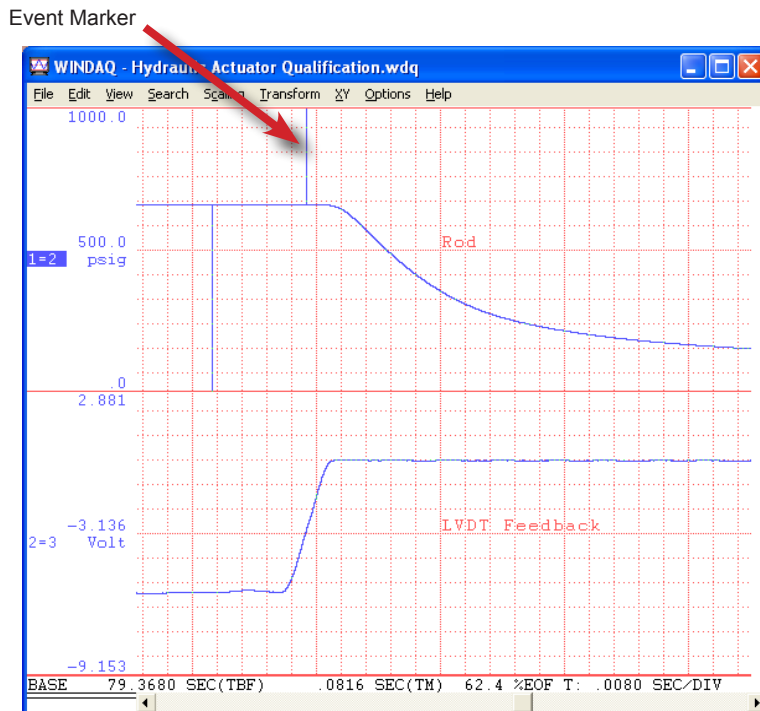
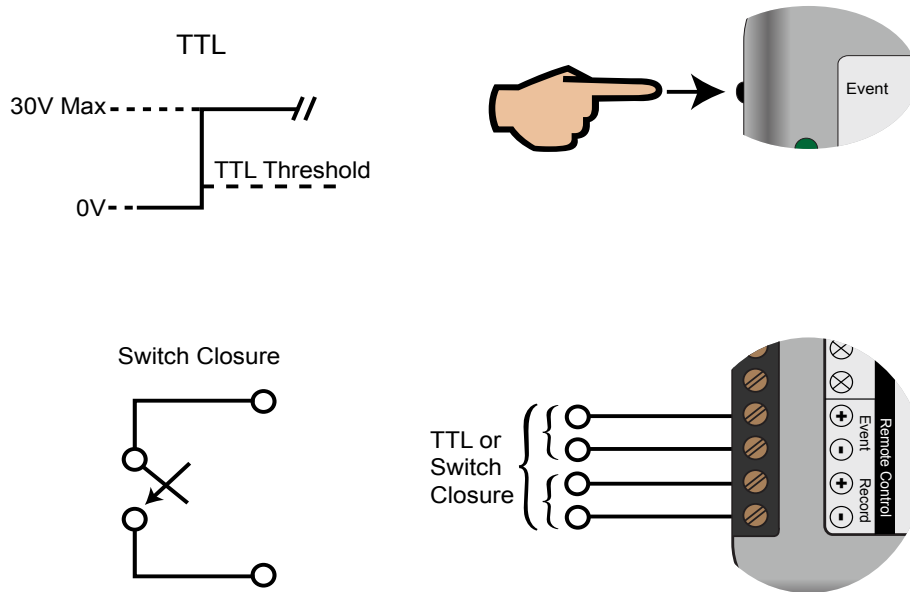
*Optional (see ordering guide)

Voltage source



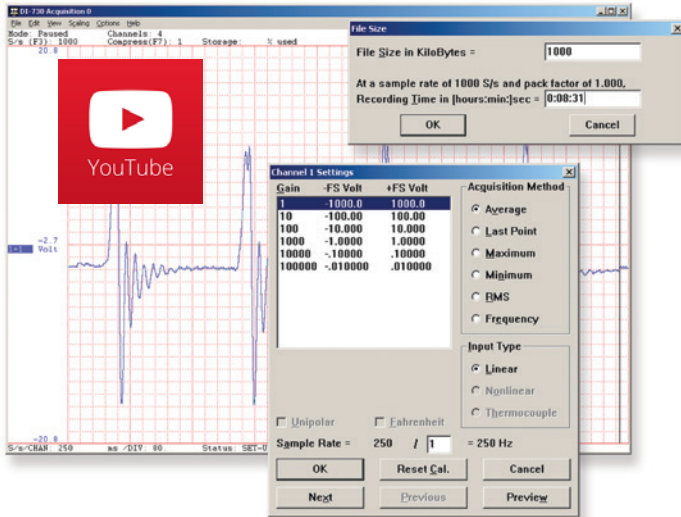
Remote Control Close Up

The DI-1100 supports several methods to increase measurement flexibility and data record interpretation. The remote record feature allows you to synchronize WinDaq recordings to external processes by remotely enabling and disabling WinDaq's stream-to-disk feature. Remote events allow you to insert an event marker in the data stream (see inset) to identify when an event occurred relative to recorded waveform activity. Events can be activated by the pushbutton on the DI-1100 enclosure, though a keyboard keystroke (which also allows you to record a description), or remotely via the remote event input. The stream-to-disk function can also be controlled through the keyboard, or through the remote record input. Valid remote record and event signals are switch closures, or discrete levels with a maximum input of ± 30 V with TTL trigger thresholds. The DI-1100 provides two digital input ports. Each is armored to tolerate up to ± 30 V without damage. In addition, each port is internally pulled-up, so it's easy to use with external dry-contact switches.



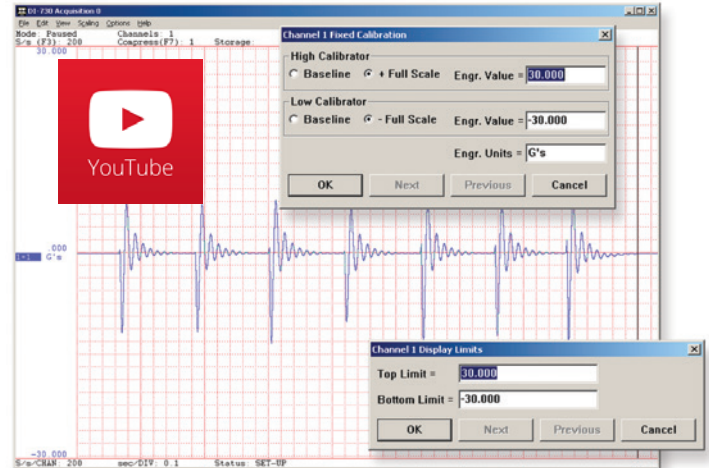
Setup

Double-click and enter the channels you want to acquire into the WINDAQ scan list. Click to select signal averaging, true RMS, frequency, and peak or valley detection per channel. Click to define a single to 4-channel display — either triggered sweep (oscilloscope-like) or scrolling (chart recorder-like). Click again to define a sample rate ranging from one sample every 2.2 hours to 20 kHz per channel with all four channels enabled.



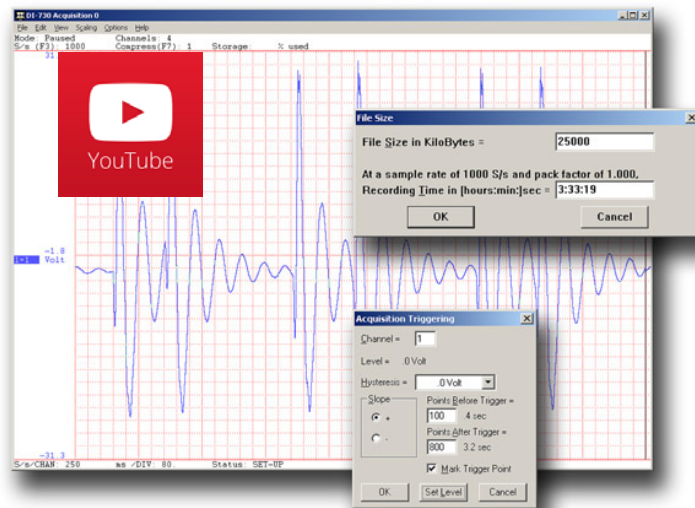
Calibrate

Define calibration per channel to display waveform values in meaningful units such as psi, °F or °C, amps, rpm, watts, horsepower — any unit of measure you need.



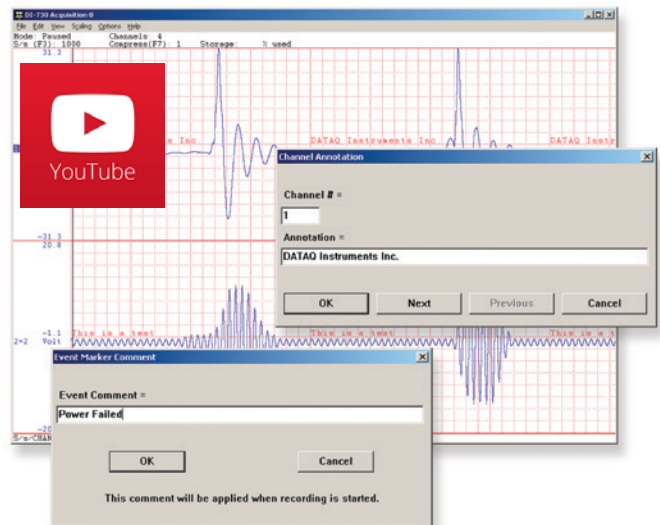
Record

Choose a continuous waveform recording mode or the triggered mode with selectable trigger level, slope, and post-trigger times. WINDAQ automatically time- and date-stamps, then streams acquired data to disk — record as much data as you need. At the same time, WINDAQ supplies a real-time graphical display of any or all channels so you always know where you are and where you're going.



Annotate

Of course, you can label any channel with text that describes it — “Motor 1,” “Engine speed,” “Vertical position,” etc. But WINDAQ also allows you to supply commented event markers while you record — “Beginning test phase 1,” “Small vibrations noticed,” “Starting cool-down cycle,” etc. Your comments and our acquired data combine to form a complete diary of your data acquisition session.



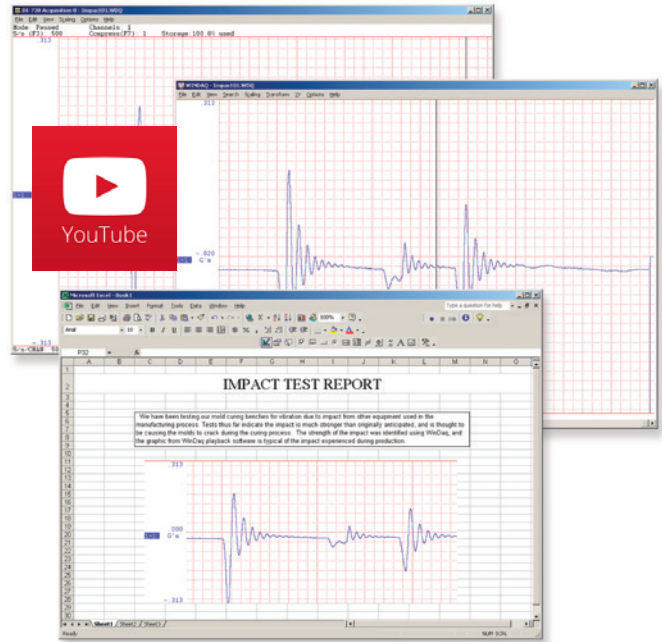
Playback

Recording is only half the solution. WINDAQ's Waveform Browser playback software allows you to graphically manipulate waveforms in ways you've never seen on a PC. Compress an entire recording to one screen-width for a bird's eye view, then expand around an area of interest for a closer look. Use the cursor to measure amplitudes and timing with precision. Move to any event marker with the click of a mouse button.



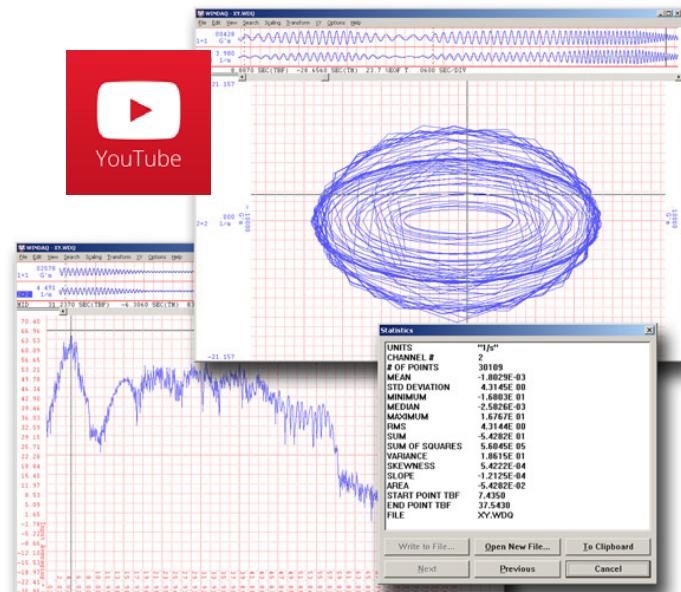
Multitask

Double your productivity and let WINDAQ record while you review last week's results from your spreadsheet, or compose a memo with your word processor. You can even play back data already stored to disk while you're still recording.



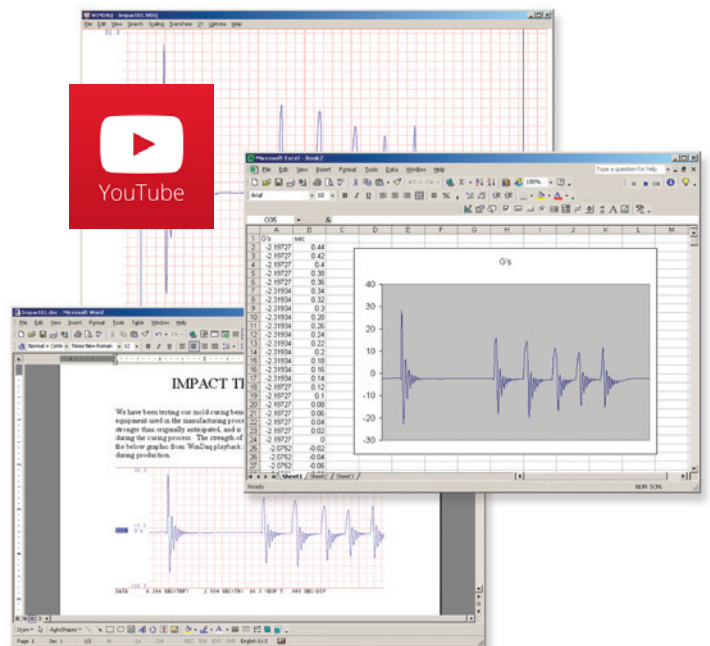
Analyze

Waveform interpretation is easy with our built-in analysis functions. Apply frequency and filtering analysis with the WINDAQ Waveform Browser FFT and DFT functions. Analyze any range of waveform data with the statistics function. Use X-Y plotting to examine the relationship of one channel to another. Optional Advanced CODAS analysis functions allow waveform peak detection, integration, differentiation, arithmetic operations, and more.



Export

The WINDAQ Waveform Browser can export any range of data to your spreadsheet, or any other analysis or presentation package you use. You can even copy a graphical image displayed by the WINDAQ Waveform Browser and paste it directly into a word processing document. Finally, export any range of waveform graphics to your printer for a hard copy record.



Published Protocol and .Net Class

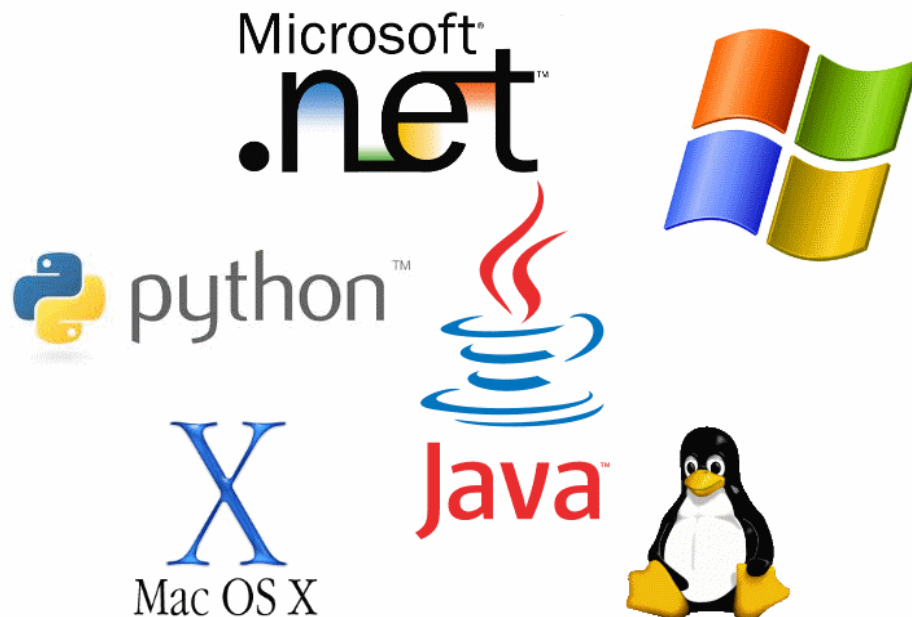
Sometimes you can't use a ready-to-run application like WinDaq. You need to develop your own software to perform in precisely the way you need. That requirement defines the need for programming support, and we provide the tools necessary for you to move forward with a program that is uniquely your own.

Included .NET Class

Microsoft's object-oriented programming languages commonly referred to as .NET ("Dot Net") offer a powerful environment for developing custom applications for the DI-1100. All of the .NET languages are supported by our included class library, which supports all DI-1100 features. Well commented example programs exercise every aspect of the hardware, forming a foundation for you to get your own applications up and running quickly and painlessly.

Included DI-1100 Protocol Documentation

As you probably suspect when you run our point-and-click WinDaq data acquisition software, there's a lot going on beneath the surface. WinDaq software needs to take the data acquisition configuration that you design using its menu system and communicate that to the hardware. These are things such as sample rate, the number of channels enabled, the specific channel numbers enabled, etc. Diving down to the lowest level of program activity, past the WinDaq user interface, beyond the device driver to the actual commands sent to the data acquisition hardware and the format of the responses they evoke, is the protocol. The protocol defines the exact set of commands a program can send to the hardware, and how the hardware will react as a result. So, if you know the command and response definitions for the DI-1100 (i.e. its protocol), the instrument can be folded into virtually any operating system and any programming language: Python, C++, Linux, Windows, OSX, etc., etc. The choice is yours.



DI-1100 Specifications

Signal I/O

Analog Inputs

Number of Channels: 4
 Configuration: Differential
 Full Scale Range: ± 10 V full scale fixed
 Input impedance: $1\text{M}\Omega$
 Isolation: none
 Absolute accuracy: ± 12.5 mV @ 25°C
 @ 25°C , excluding common mode error
 Absolute maximum input without damage: ± 75 V peak, continuous
 ± 100 V peak, one minute or less
 System noise: 7.8 mV rms
 Maximum common mode voltage: ± 10 V
 Common mode rejection ratio: 40 dB (dc - 60 Hz)
 Channel-to-channel crosstalk rejection: -80 dB

Digital Inputs

Number of ports: 2 (reserved)
 Type: MOSFET switch
 Threshold levels: TTL-compatible
 Absolute maximum applied voltage (V): ± 30 V dc

Reserved Digital Inputs

Port 1: WinDaq remote events
 Port 2: WinDaq remote start/stop

Power

Power Consumption: <1.0 Watt, via USB interface

ADC Characteristics

Resolution: 12-bit
 Above zero ADC counts: 2,047
 Below zero ADC counts: 2,048
 Maximum sample rate per channel:
 40 kHz, 1 enabled channel
 30 kHz, 2 enabled channels
 24 kHz, 3 enabled channels
 20 kHz, 4 enabled channels
 Minimum sample throughput:
 915.5 Hz (0.0006104 Hz with WinDaq software)
 Sample rate timing accuracy: 50 ppm

Indicators and Connections

Interface: USB 2.0 (mini-B style connector)
 Indicator lights: 3 LEDs, (2) Green, (1) RGB
 Input Connections: One 16-position terminal strip

Environmental

Operating Temperature: 0 to 50°C
 Operating Humidity: 0 to 90% RH non-condensing
 Storage Temperature: -20 to 60°C
 Storage Humidity: 0 to 90% non-condensing

Physical Characteristics

Enclosure: Hardened Plastic
 Mounting: Desktop; bulkhead
 Dimensions: $2.625\text{D} \times 5.5\text{W} \times 1.53\text{H}$ in.
 ($6.67\text{D} \times 13.97\text{W} \times 3.89\text{H}$ cm.)
 Weight: 3.6 oz.

Software Support

WinDAQ software: OS support: View Online (<http://www.dataq.com/products/windaq/windows-compatibility/>)
 Programming: DATAQ .NET Class, Instrument protocol, ActiveX Control

Ordering Guide

Description	Order No.
DI-1100 USB Data Acquisition (DAQ) System Includes instrument, 6-ft. USB cable, screwdriver, and WinDaq software via Internet download (run.dataq.com)	DI-1100
250Ω 4-20 mA shunt resistor $\pm 0.1\%$, 0.5 Watts max., ± 50 ppm/ $^\circ\text{C}$	R250



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Data Acquisition Product Links

(click on text to jump to page)

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