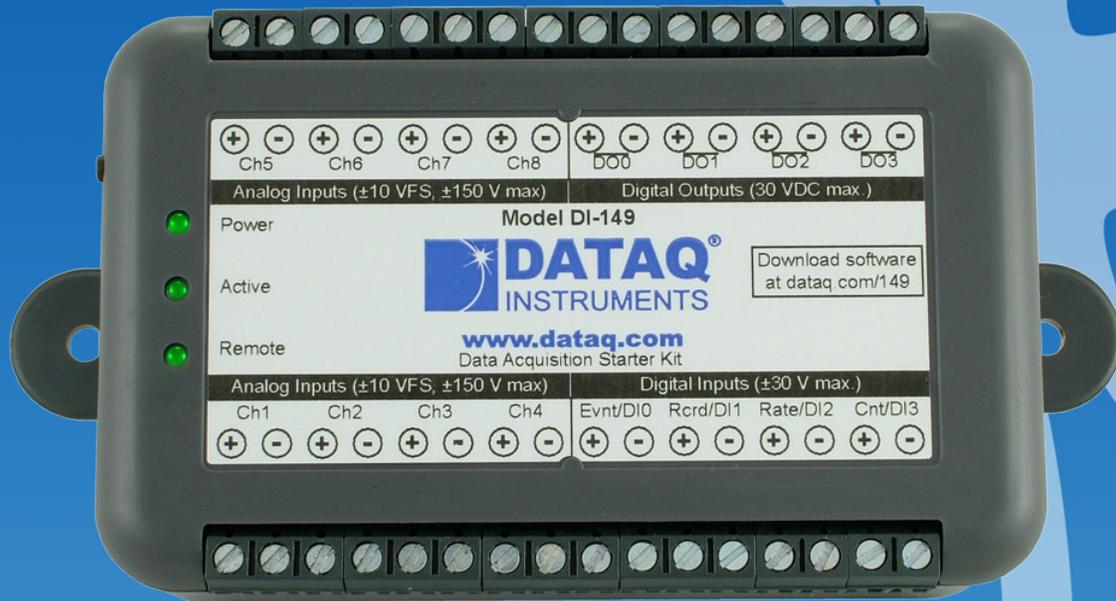


# DI-149 USB Data Acquisition Starter Kit



- ✓ Low-cost, Compact USB Data Acquisition Starter Kit
- ✓ Eight  $\pm 10$  V Differential Analog Inputs
- ✓ Analog Inputs Protected to  $\pm 150$ V
- ✓ 10-bit Resolution
- ✓ Up to 10 kHz Sample Rate
- ✓ 4 Digital Inputs incl. 2 Counter/Timers
- ✓ Provided with WinDAQ Software
- ✓ Optional Unlock Code for turnkey high speed sampling

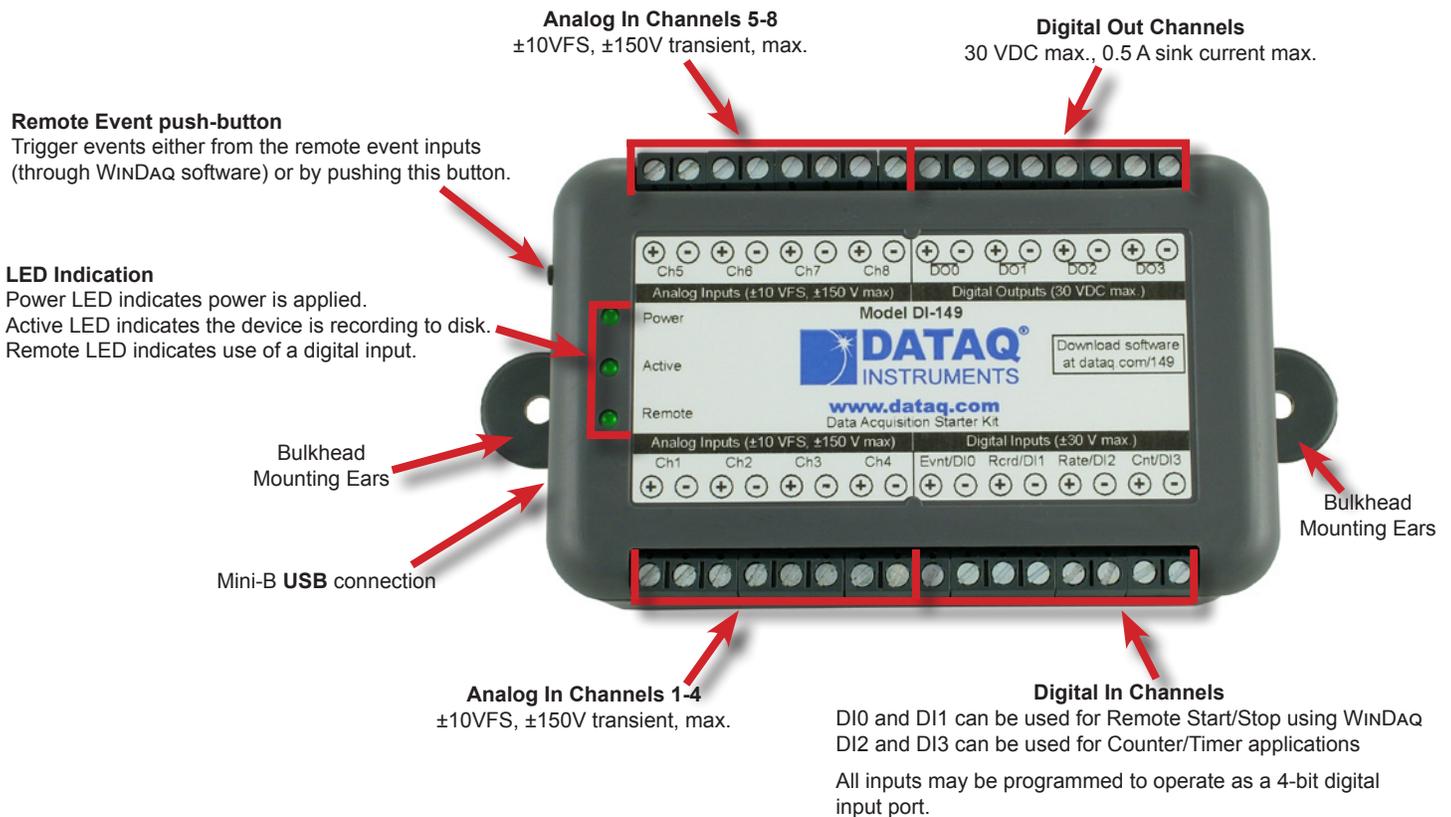
## DI-149 Description

The DI-149 is a new product for general-purpose data acquisition applications in a long line of low-cost starter kits from DATAQ Instruments. Suitable for measuring preamplified analog signals, the DI-149 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 ten times or more than its low price. Predecessors of this instrument have been sold to thousands of hobbyists and professionals for countless data acquisition applications around the world. The DI-149 continues this legacy with noise-cancelling differential analog inputs that are transient-protected to  $\pm 150$  VDC or peak AC. This tough and tolerant starter kit is an eight-channel version of the popular DI-145, with some enhanced capability.

The DI-149 offers eight analog inputs and four each discrete (digital) input and output channels. Two of the digital inputs (bits D2 and D3) can be used to measure rate up to 10 kHz and counts up to 16,383. The analog inputs offer a fixed measurement range of  $\pm 10$  VFS at 10 bits of resolution. Sample rates as slow as 11.44 Hz (0.3052 Hz when using WINDAQ software) and as fast as 10 kHz (divided by the number of enabled channels) are supported. Included WINDAQ software allows a real time display of any combination of analog, digital, or counter/timer channels, and the ability to stream acquired data to disk in recorder-like fashion. Two digital inputs may be used 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.

The DI-149 is supplied with WINDAQ software, which limits total sample throughput to 240 Hz or lower. An unlock code for higher speeds allows the DI-149 to operate at 10 kHz. No throughput restrictions exist at the programming level.

## DI-149 Close-up



## DI-149 Features

### Eight Analog Input Channels

Connect the DI-149 to any preamplified signal in the typical range of  $\pm 5$  to  $\pm 10$ VFS.

### 10-bit ADC resolution

Provides 19.5 mV resolution across the entire DI-149 measurement range.

### Ruggedized Inputs

All eight DI-149 analog inputs transient-protected to  $\pm 150$  VDC or peak AC and four discrete inputs protected to  $\pm 30$  VDC or peak AC. Accidents that happen are quickly forgiven.

### Noise-cancelling Analog Input Configuration

The noise-immunity of differential inputs minimizes the effects of common mode noise so often encountered in industrial measurements.

### Built-in USB interface

The DI-149 is provided with a built-in USB interface. Connect and run it with any laptop or desktop PC. The USB interface provides power to the DI-149, eliminating clumsy external power supplies.

### Four Digital Inputs

Four discrete inputs allow remote event and stop/start operations with WINDAQ software. Two double as counter/timer inputs for rate and totalize operations.

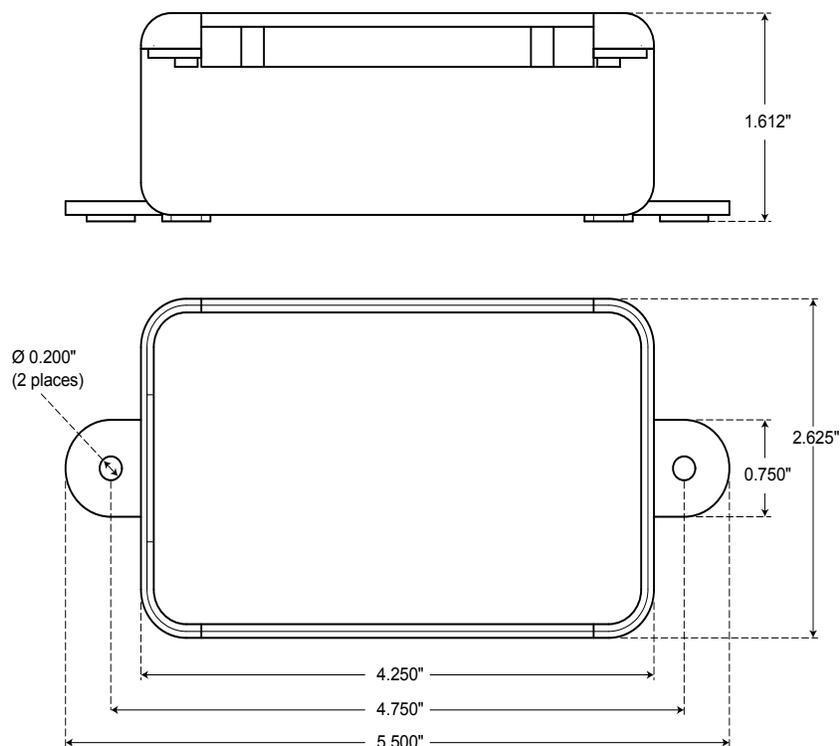
### Wide OS support

Signed drivers are provided with the DI-149 that allow trouble-free installation for Windows XP and both 32- and 64-bit versions of Windows Vista, Windows 7, and Windows 8. For the latest OS support, check online at <http://www.dataq.com/products/windaq/windows-compatibility/>.

### Included WINDAQ software

Our WINDAQ data acquisition software offers real time display and disk streaming for the Windows environment up to 240 Hz (optionally unlocked for 10 kHz). The real time display can operate in a smooth scroll or triggered sweep mode of operation, and can be scaled into any unit of measure. Event markers with comments allow you to annotate your data acquisition session with descriptive information as you're recording to disk. Raise your productivity to new heights with WINDAQ's unique multitasking feature. Record waveform data to disk in the background while running any combination of programs in the foreground — even WINDAQ Playback software to review and analyze the waveform data as it's being stored! Playback supports waveform analysis (Statistics, X-Y plots, frequency analysis) and the ability to export data to Microsoft Excel. WINDAQ recording and playback software is provided free with every DI-149 purchase. [View the Multimedia Tutorial](#) for more information. An Optional unlock code allows sample rates to the full 10 kHz capability of the hardware.

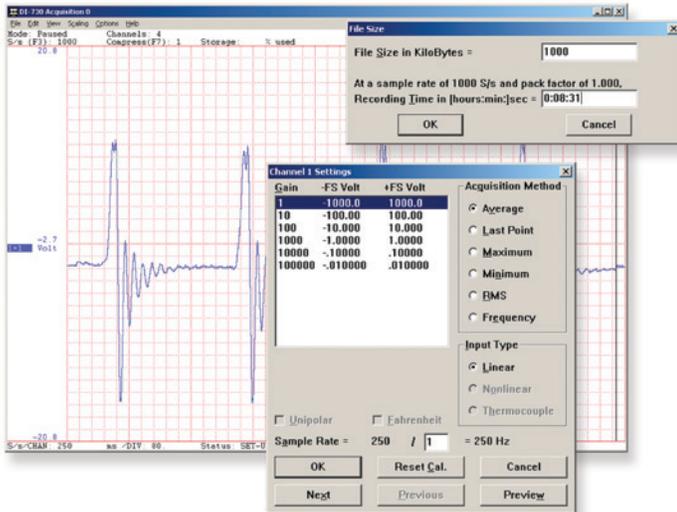
## DI-149 Dimensional Drawing





## 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 analog channel. Click to define a single to 8-channel display — either triggered sweep (oscilloscope-like) or scrolling (chart recorder-like). Click again to define a sample rate ranging from 18 samples per minute to 240 samples per second (10,000 Hz with Unlock Code).



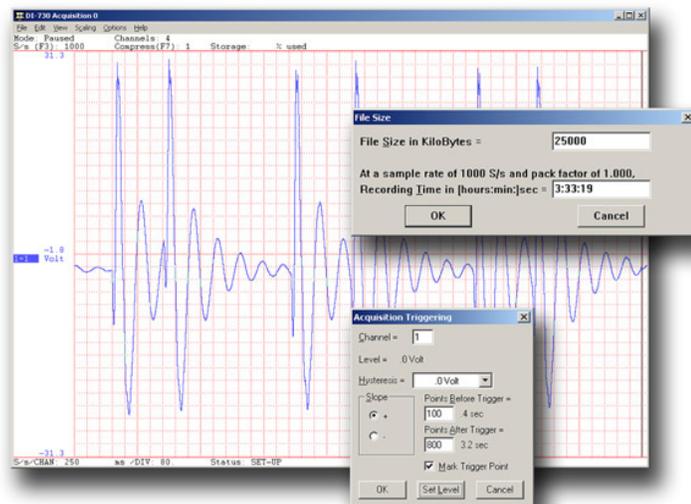
## Calibrate

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.



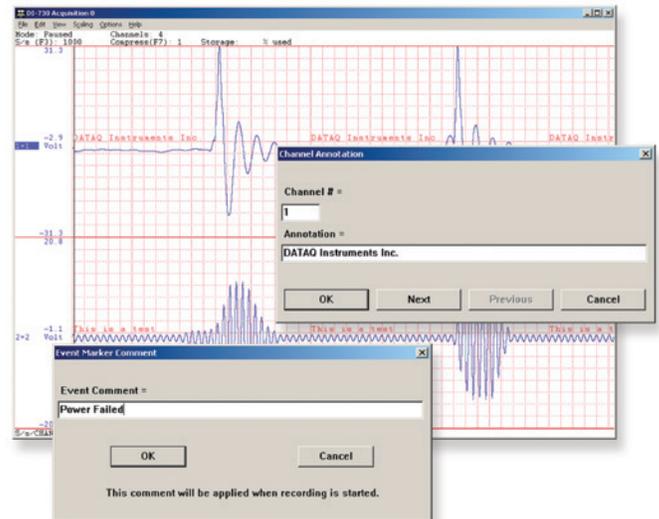
## Record

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.



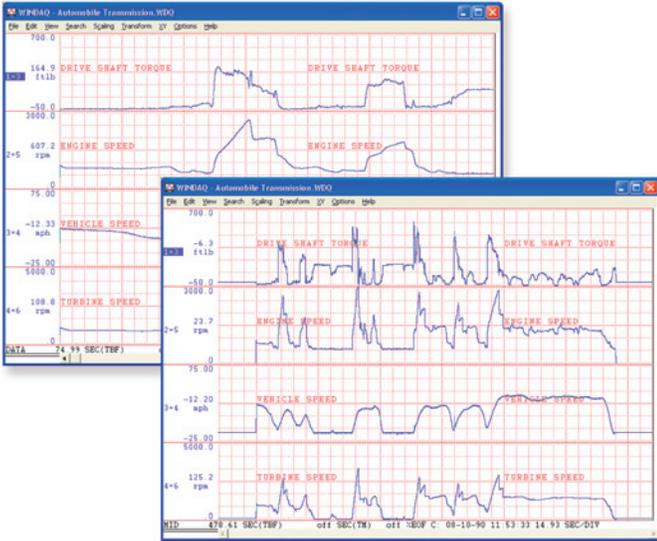
## Annotate

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.



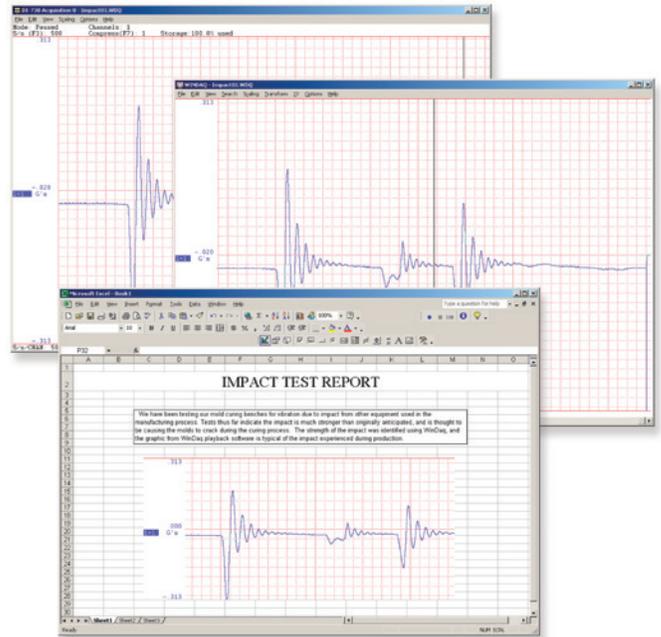
## Playback

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.



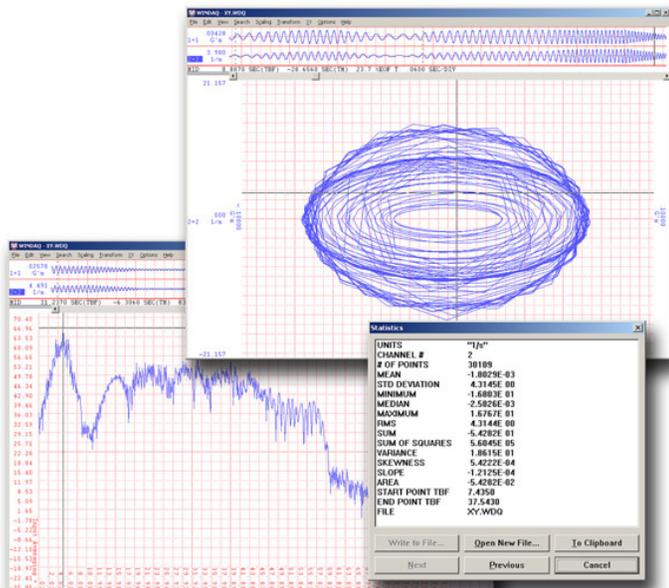
## Multitask

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.



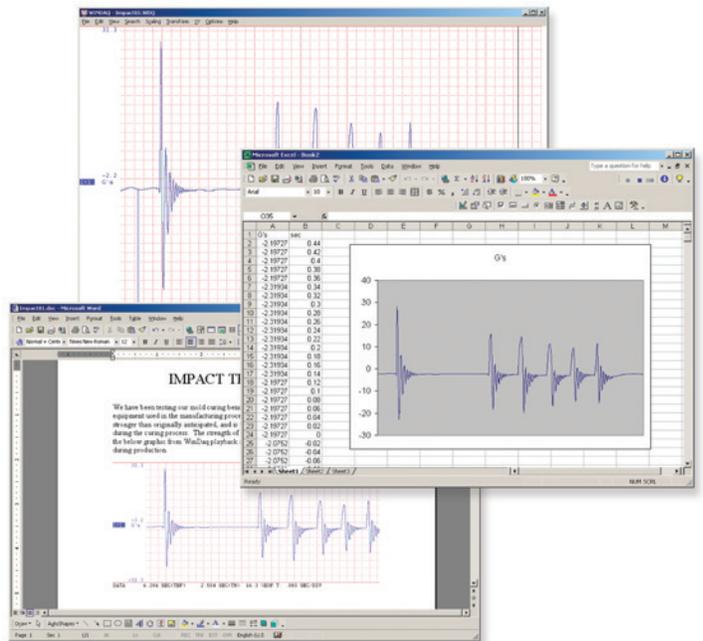
## Analyze

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.



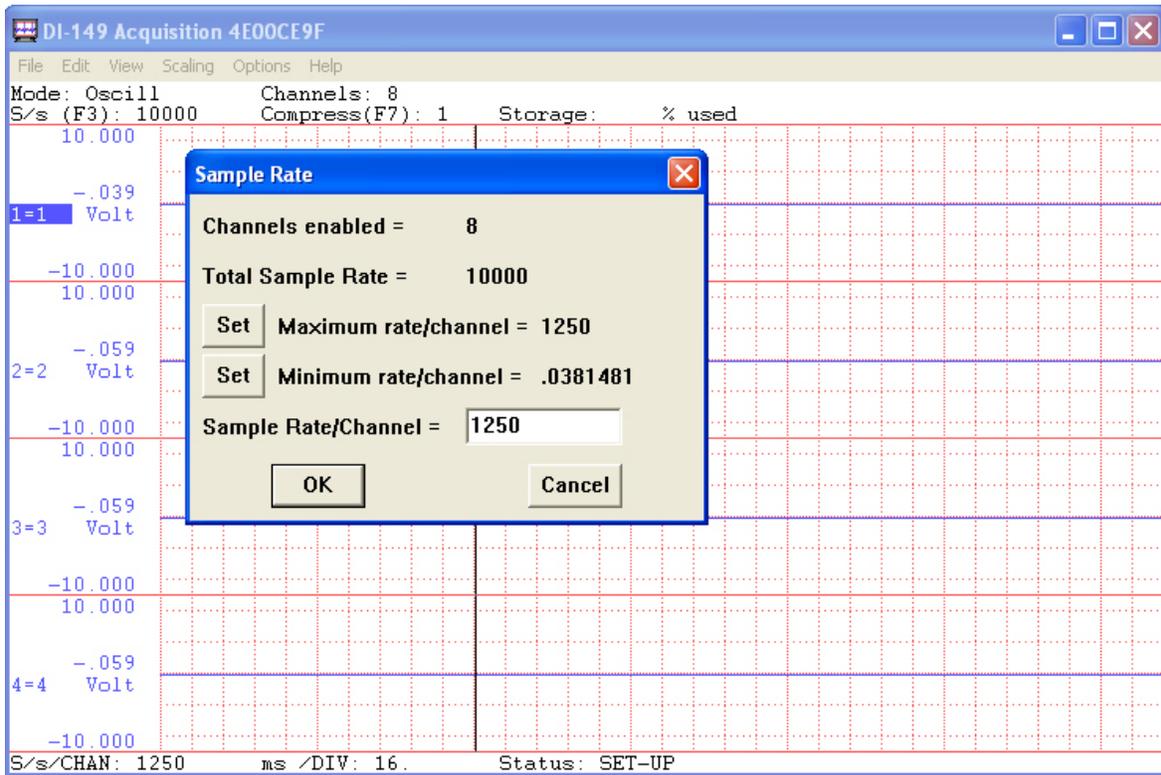
## Export

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.



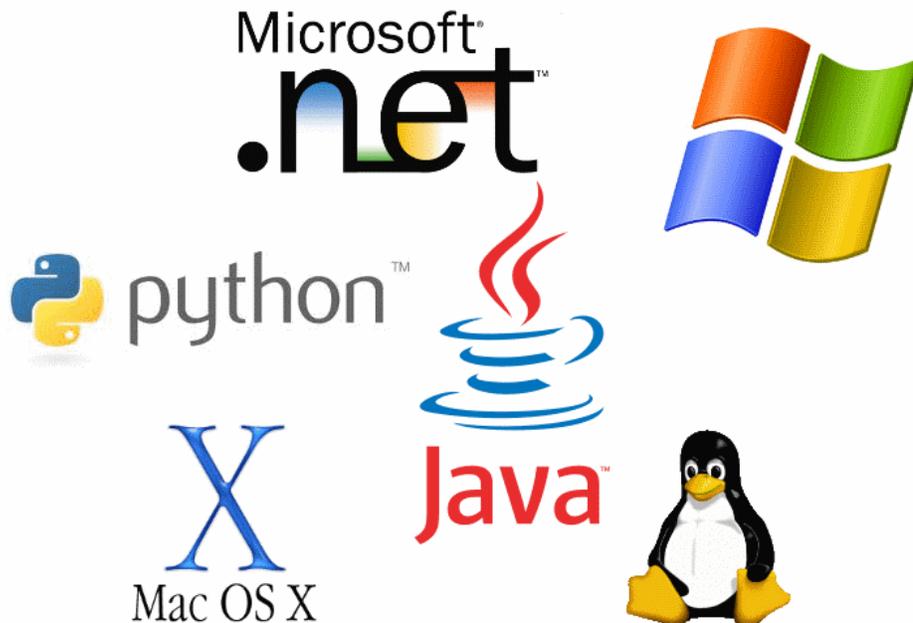
## WINDAQ Unlock Code for High Speed

The Unlock Code for WINDAQ High Speed allows you to sample and record data at the maximum 10 kHz sample rate capability of DI-149 the hardware.



## Supported Instrument Protocol and Other Software Tools

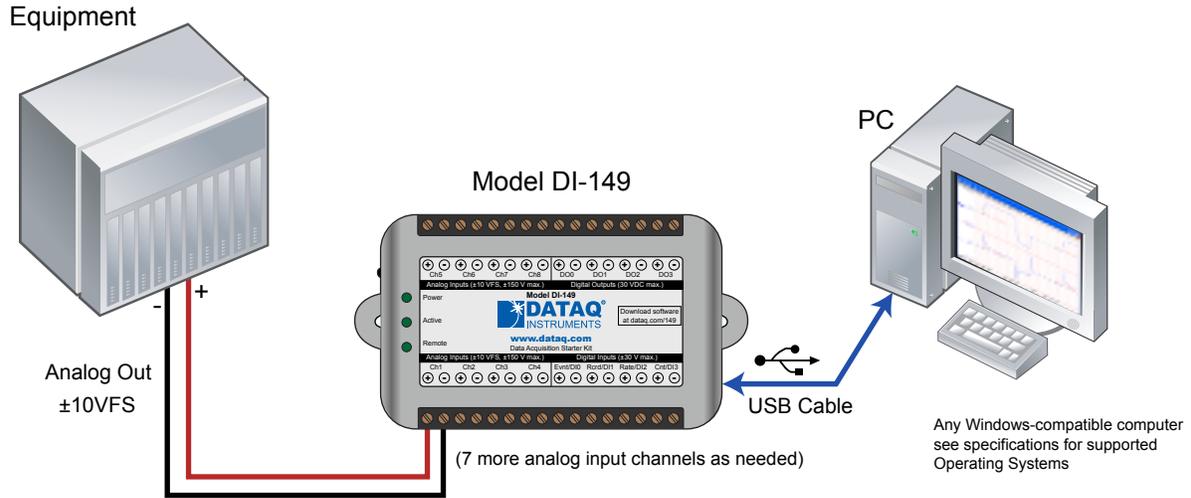
We know that there are some applications for the DI-149 that only you can program, from single unit special-purpose applications, to OEM requirements by the hundreds of units. We further realized that Windows might not be the best development environment in these situations, and the range of programming environment preferences runs wide and deep. For all these reasons DATAQ Instruments has decided to publish and maintain a document that defines the DI-149 protocol, the command set that defines how to communicate with the DI-149 at the instrument level. With this information you are not bound to any particular operating system or programming language, so how you use the DI-149 is limited by the instrument's hardware and your own imagination. [Click here to view the current DI-149 protocol document](#). Windows programmers may take advantage of our provided [DLL](#) or [ActiveX Control](#).



# Typical DI-149 Applications

## Replace Traditional Chart Recorders

Replace traditional chart recorders by digitizing and recording the measurements of specialized instruments with high-level monitor outputs:

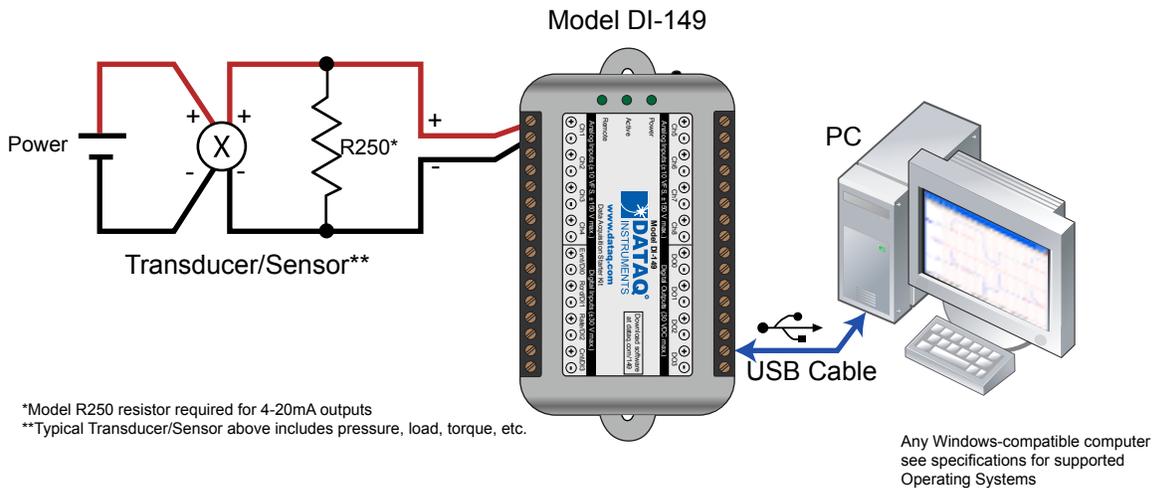


Examples of “Equipment” above include gas chromatographs, liquid chromatographs, spectrometers, bio-amplifiers\*, etc.

\* 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 significant injury to humans.

## Amplified Transducer Monitor

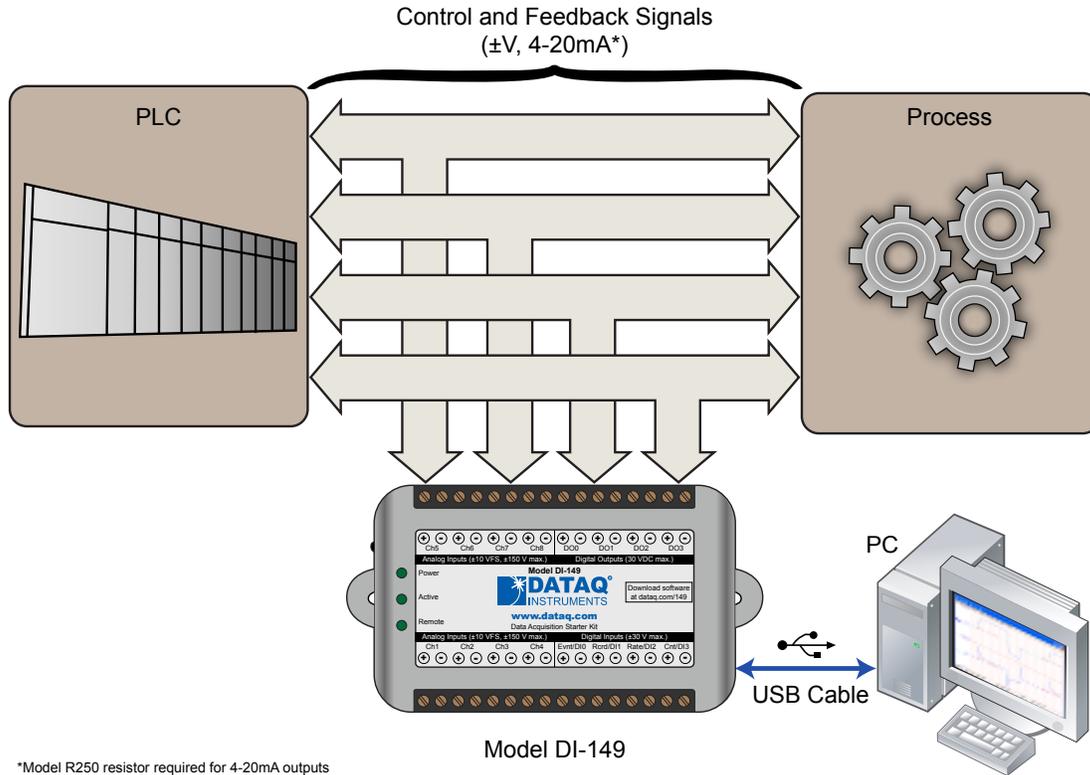
Connecting directly to the output of amplified voltage- or current-mode transducers:



# Typical DI-149 Applications (continued)

## Process Monitoring

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

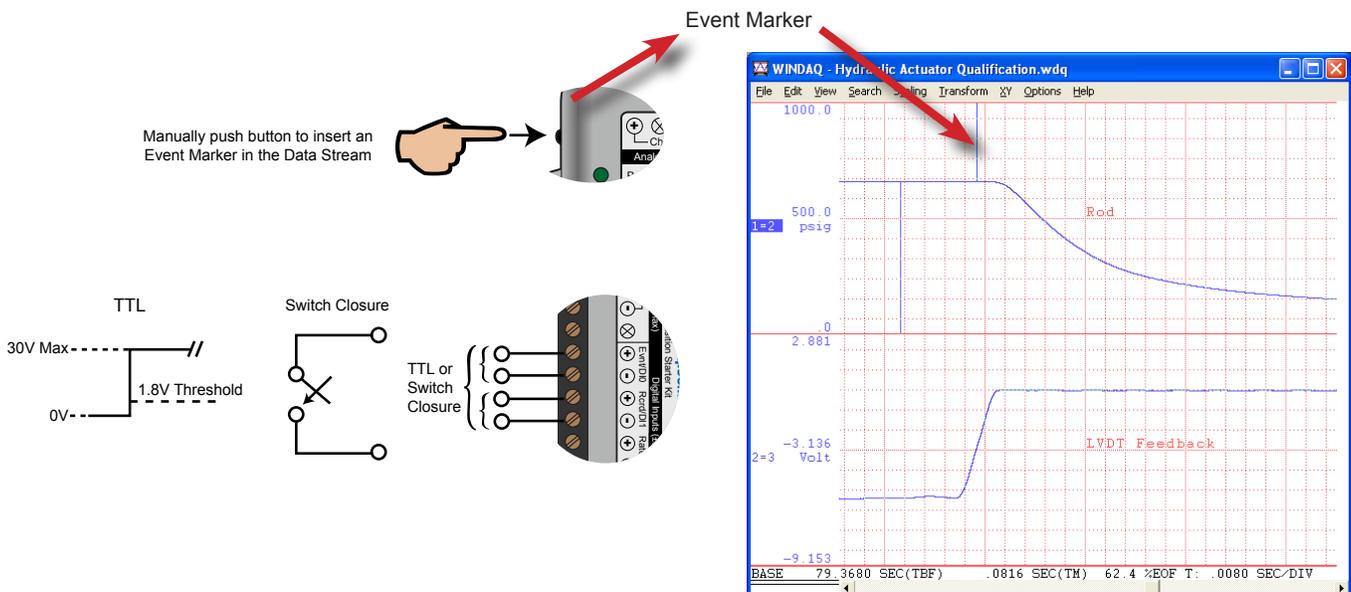


\*Model R250 resistor required for 4-20mA outputs

Any Windows-compatible computer  
see specifications for supported  
Operating Systems

## Remote Control Close Up

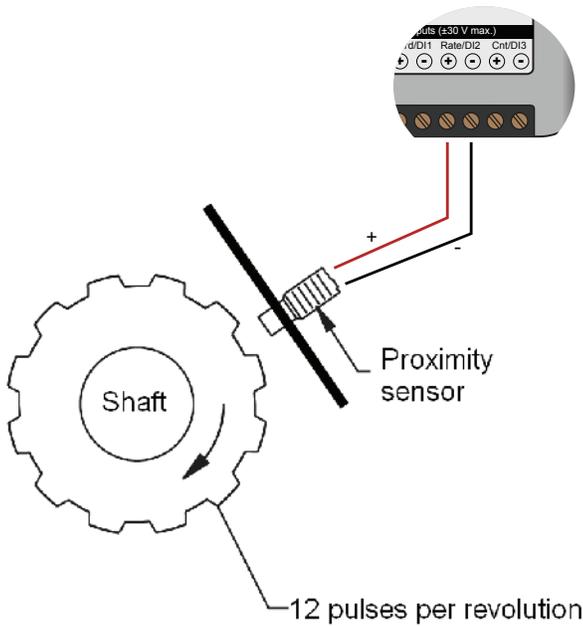
The DI-149 supports several methods to increase measurement flexibility and data record interpretation. The remote record feature allows you to synchronize WINDAQ recordings to external processes by remotely enabling and disabling WINDAQ's stream-to-disk feature. Remote events allow you to insert an 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-149 enclosure, through 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 and a threshold of 1.8 V.



## Typical DI-149 Applications (continued)

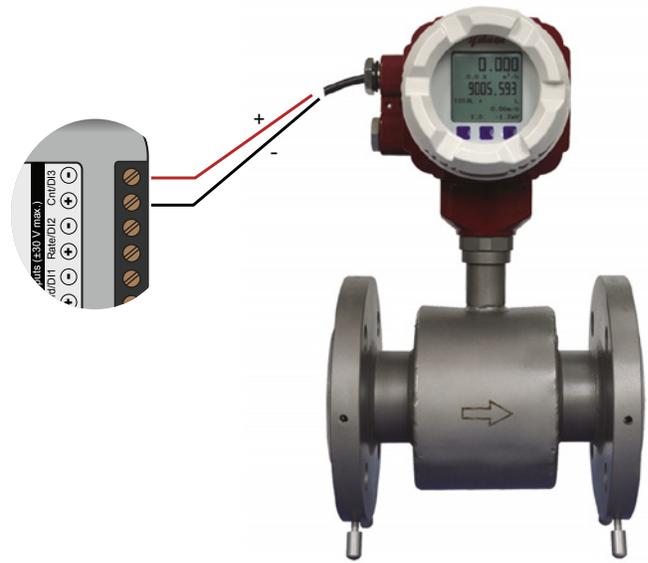
### Rate Measurements

The DI-149's Rate input is used to acquire a frequency representing RPM, flow, or any other pulse stream.



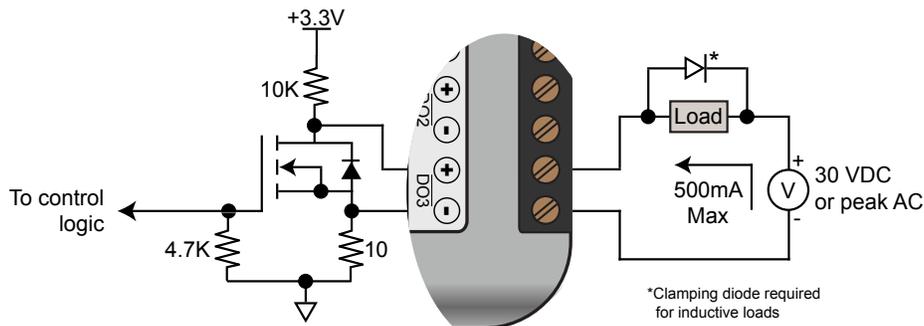
### Count Measurements

Use the DI-149's Count input to accumulate a tally of applied discrete pulses to track test cycles, extract volume from flow, or any other general-purpose totalizing application.



## Digital Outputs

The DI-149's digital outputs are not your ordinary transistor switches. Each of four channels features a dedicated MOSFET that can handle high voltage and current loads with built-in electrostatic discharge protection. It can switch loads of up to 30 Volts (DC or peak AC) and 500 mA with an on resistance of less than 2 Ohms. Use it to control relays where the load to be switched exceeds the 30 V, 500 mA spec of the port, or to control the load directly where it does not. Software access to the digital output ports can be through the [DI-149 protocol](#), the Windows DLL or ActiveX Control or via WINDAQ software using a [third party software add-on](#).



# DI-149 Specifications

## Signal Inputs

### Analog Inputs

Number of Channels:	8
Configuration:	Differential
Full Scale Range:	±10VFS
Input impedance:	2 MΩ, differential
Isolation:	none
Overall inaccuracy:	±64mV (at 25°C)
Minimum common mode rejection:	40db @ 50-60 Hz and @ 25°C
Max input without damage:	±75 V peak continuous ±150 V peak, one minute or less
Max common mode voltage:	±10V
Analog frequency response:	-3db @ 1,000 Hz

### Digital Inputs

Number of Channels:	4 (2 shared with counter/timer inputs)
Pull-up value:	47 KΩ
Isolation:	none
Input high voltage threshold:	1.8 V minimum
Input low voltage threshold:	1.4 V maximum
Absolute maximum values:	±30 VDC

### Reserved Inputs (Digital Inputs)

Digital In 0:	WinDAQ remote events
Digital In 1:	WinDAQ remote start/stop

## ADC Characteristics

Resolution:	Overall: approx. 1 part in 1,024 (10-bit) Above zero: approx. 1 part in 511 Below zero: approx. 1 part in 512
Max sample throughput rate:	10,000 Hz*
Min sample throughput rate:	11.44 Hz (0.000350 Hz with WinDAQ software)
Sample rate timing accuracy:	50 ppm

## Digital Outputs

Number of Channels:	4
Isolation:	none
Absolute max ratings:	Voltage: 30 VDC or peak AC Sink current: 0.5 A Source current: 3 mA On resistance < 2 Ω

\* 11,000 Hz for 11 enabled channels (8 analog, 3 digital)

## Counter/Rate (DI2 and DI3)

Number of Channels:	2 (shared with digital inputs)
Port Assignment:	Rate = DI2; Counter = DI3
Pull-up value:	47 KΩ
Isolation:	none
Input high voltage threshold:	1.8 V minimum
Input low voltage threshold:	1.4 V maximum
Absolute maximum values:	±30 VDC
Terminal count:	16,384 (14-bit)
Maximum Rate Frequency:	The lesser of 10 kHz or 2 × burst rate/channel
Minimum Rate Frequency:	0.75 Hz
Maximum Count Frequency:	The lesser of 5 kHz or 0.50 × burst rate/channel (assumes 50% duty cycle square wave)
Rate averaging:	none

## Indicators and Connections

Interface:	USB 2.0 (mini-B style connector)
Indicators (LED):	Power, Active, Digital
Input Connections:	Two 16-position terminal strips

## Power

Power Consumption:	<1.0 Watt, via USB interface
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## Environmental

Operating Temperature:	0°C to 55°C (32°F to 131°F)
Operating Humidity:	0 to 90% non-condensing
Storage Temperature:	-20°C to 45°C (-4°F to 113°F)
Storage Humidity:	0 to 90% non-condensing

## Physical Characteristics

Enclosure:	Hardened Plastic
Mounting:	Desktop; bulkhead
Dimensions:	2.625D × 5.5W × 1.53H in. (6.67D × 13.97W × 3.89H cm.)
Weight:	< 4 oz. (< 140 grams)

## Software Support

WinDAQ software:	OS support: Check online at <a href="http://www.dataq.com/products/windaq/windows-compatibility/">http://www.dataq.com/products/windaq/windows-compatibility/</a> Sample Rate Limit: 240 Hz (10 kHz with optional unlock code)
Programming:	<a href="#">DATAQ Instruments SDK</a> , <a href="#">Instrument protocol</a> , <a href="#">DLL</a> , and <a href="#">ActiveX Control</a>

## Ordering Guide

Description	Order No.
<b>DI-149 Data Acquisition Starter Kit</b> Data acquisition device with USB cable, screwdriver, and free WinDAQ software via Internet download ( <a href="http://run.dataq.com">run.dataq.com</a> ).	DI-149
<b>Unlock Code</b> Optional unlock code for high speed data acquisition that allows recording at sample rates up to 10 kHz.	WinDAQ/HS-149
<b>R250</b> Optional precision 250-ohm 4-20 mA shunt resistor ( <a href="#">see non-isolated implementation here</a> ).	R250



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## Data Acquisition Product Links

(click on text to jump to page)

[Data Acquisition](#) | [Data Logger](#)