

# DI-155 USB Data Acquisition Starter Kit



- ✓ Low-cost, Compact USB Data Acquisition Starter Kit
- ✓ Four Differential Analog Inputs
- ✓  $\pm 2.5$  to  $\pm 50$  V full scale range
- ✓ 13-bit Resolution
- ✓ Up to 10 kHz Sample Throughput Rate
- ✓ Maximum single channel sample rate of 10 kHz
- ✓ 4 Digital Inputs incl. 1 Counter and 1 Timer
- ✓ 4 High Voltage Digital Outputs
- ✓ Provided with WINDAQ Software

## DI-155 Description

The new DI-155 is a full-featured data acquisition system at a starter kit price that will change the way you measure price and performance. It combines analog input and digital I/O flexibility to yield a nearly indestructible solution for tough industrial measurements. Four armored differential analog inputs measure from  $\pm 2.5$  to  $\pm 50$  volts full scale across eight independently programmable ranges per channel. Their armored design allows them to tolerate transient over-voltages to  $\pm 150$  VDC or peak AC, so the DI-155 absorbs abuse and bounces back for more. And the DI-155's 13-bit ADC operates at a maximum throughput rate of 10 kHz, so you won't miss any signal activity that might blow past more costly but less capable instruments.

Then there's the digital I/O. Each of the DI-155's four digital input bits will tolerate up to  $\pm 30$  V without damage. Use them as four discrete inputs, or program one for a counter and another as a timer for frequency, RPM, or cycle count measurements. And each of the DI-155's digital outputs can switch loads as great as 30 volts and can sink as much as 500 mA.

The DI-155 is powered directly from the connected computer's USB port, so you don't have to wrestle with external power supplies. And it's provided with our powerful WINDAQ software for Windows that allows a real time display of any combination of analog and digital channels, and the ability to stream acquired data to disk in recorder-like fashion. Two of the DI-155's 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.

## DI-155 Close-up

Screw terminals for signal inputs

**Analog In Channels 3 and 4**  
 $\pm 2.50, 3.125, 5, 6.25, 10, 12.50, 25, 50$   
 VFS per channel max

⊗ = No Connection

**Digital Out Channels**  
 30 VDC max., 0.5 A sink current max.

**Remote Event push-button**  
 Trigger events either from the remote event inputs (through WINDAQ software) or by pushing this button.

**Digital In Channels**  
 DI0 and DI1 can be used for Remote Events and Start/Stop control using WinDAQ software  
 DI2 and DI3 can be used for Counter/Timer applications

All inputs may be programmed to operate as a 4-bit digital input port.

**LED Indication**  
**Power LED** indicates power is applied  
**Active LED** indicates the device is scanning input data  
**Digital LED** indicates use of a digital input

**Model DI-155**

**DATAQ INSTRUMENTS**

[www.dataq.com](http://www.dataq.com)

Data Acquisition Starter Kit

Download software at [dataq.com/di155](http://dataq.com/di155)

**Bulkhead Mounting Ears**

**Analog In Channels 1 and 2**  
 $\pm 2.50, 3.125, 5, 6.25, 10, 12.50, 25, 50$   
 VFS per channel max

⊗ = No Connection

**Digital In Channels**  
 DI0 and DI1 can be used for Remote Events and Start/Stop control using WinDAQ software  
 DI2 and DI3 can be used for Counter/Timer applications

All inputs may be programmed to operate as a 4-bit digital input port.

Screw terminals for signal inputs

## DI-155 Major Features and Benefits

### Four Differential Analog Input Channels

Measure as many as four system variables at the same time.

### 13-bit ADC resolution

Provides 610 microvolt resolution on the DI-155's most sensitive measurement range.

### Ruggedized Inputs

All four DI-155 analog inputs and both discrete inputs are over-voltage protected. Accidents that happen are quickly forgiven.

### Noise-cancelling Analog Input Configuration

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

### USB Interface

The DI-155 is provided with a built-in USB interface, allowing it to be connected and run with any laptop or desktop PC. The USB interface provides power to the DI-155, eliminating clumsy external power supplies.

### Wide OS support

Signed drivers are provided with the DI-155 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/>.

### Four High Voltage Digital Outputs

Four digital outputs are provided that can handle loads up to 30 VDC or peak AC and 500 mA.

### Published Protocol

Program the DI-155 with any programming language under any operating system using our published set of commands and responses for DI-155 configuration, analog input and digital I/O.

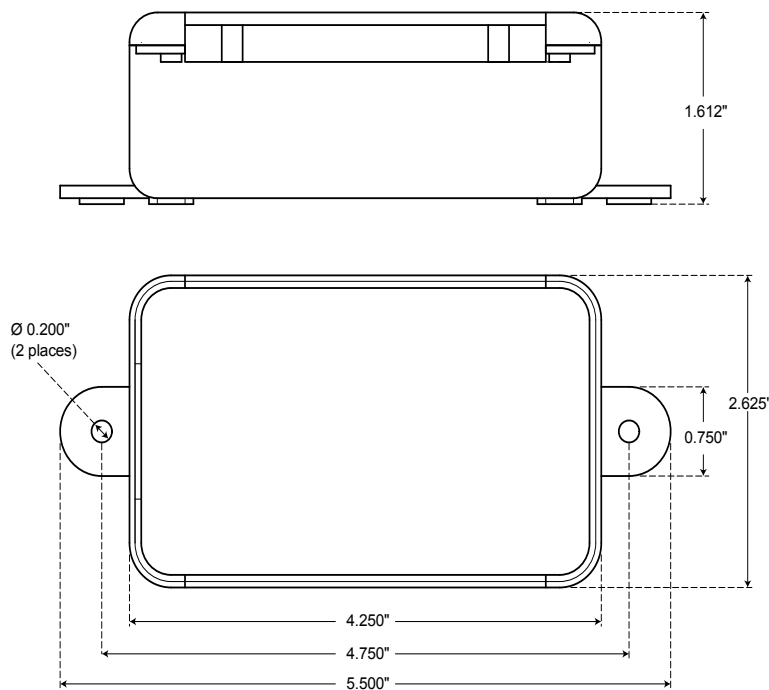
### Four Digital Inputs

Four general-purpose discrete inputs allow remote event and stop/start operations with WINDAQ software. Two of the four double as counter inputs for rate and totalize operations.

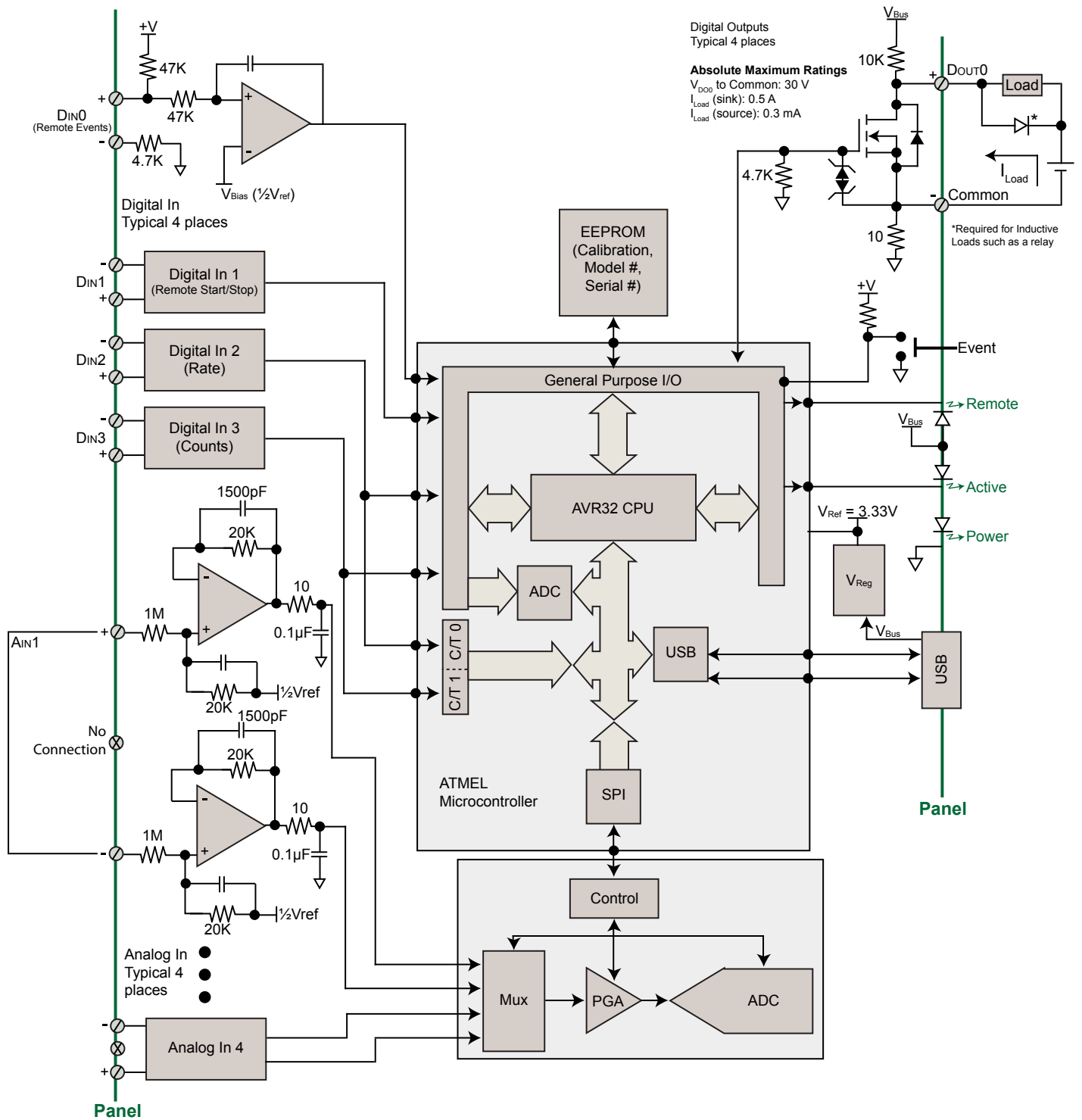
### Included WINDAQ software

Our WINDAQ data acquisition software offers real time display and disk streaming for the Windows environment up to 240 Hz. 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-155 purchase. [View the Multimedia Tutorial](#) for more information. Optional Unlock Code WinDac/HS-155 unlocks the 240 Hz real time recording restriction to allow sample rates to the full 10 kHz capability of the hardware.

## DI-155 Dimensional Drawing

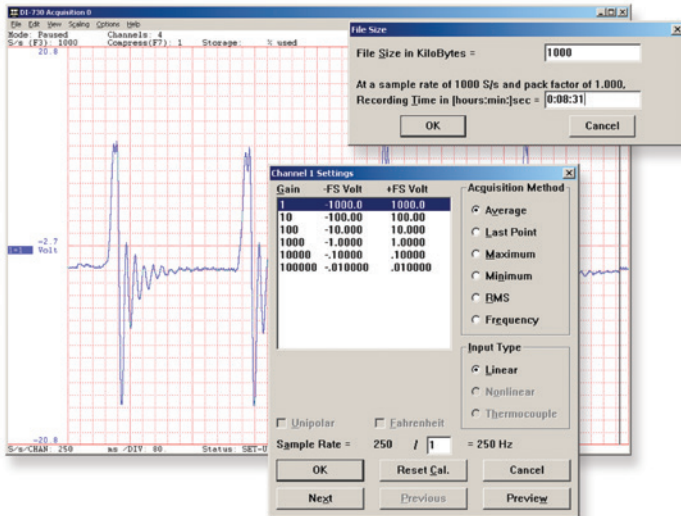


# DI-155 Block Diagram



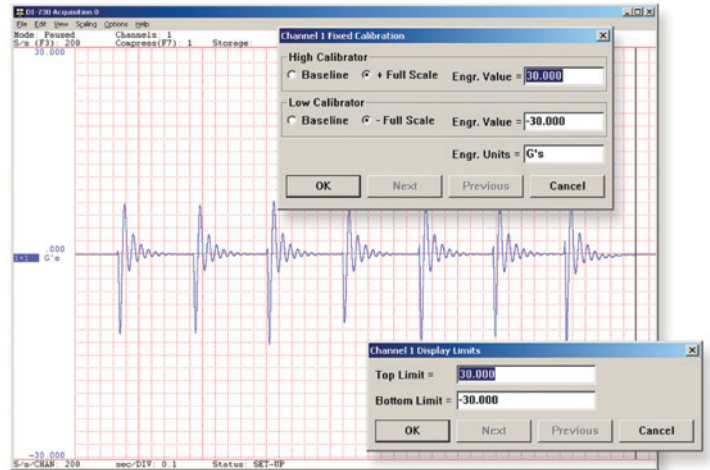
## Setup

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 from 1.26 samples per hour to 240 samples per second (10,000 Hz with High Speed option).



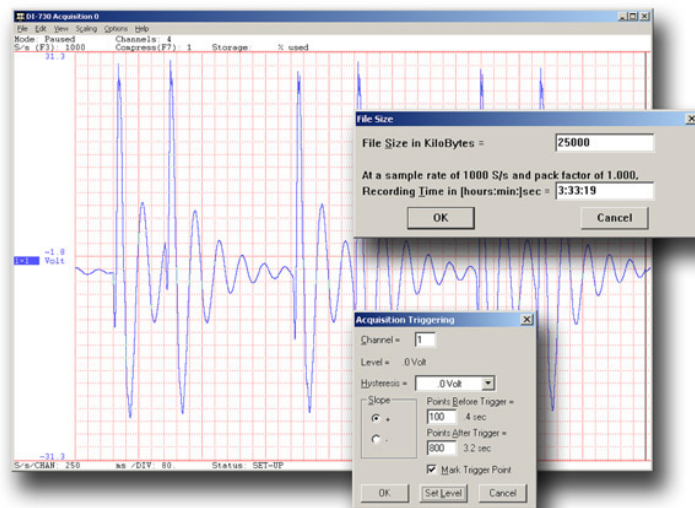
## Calibrate

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.



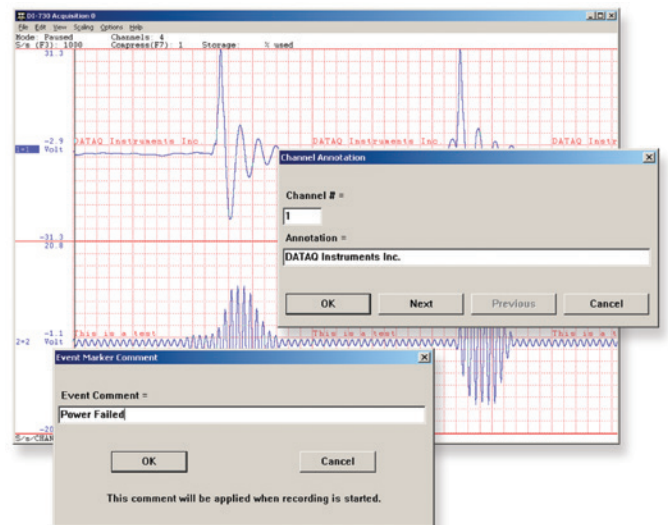
## Record

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.



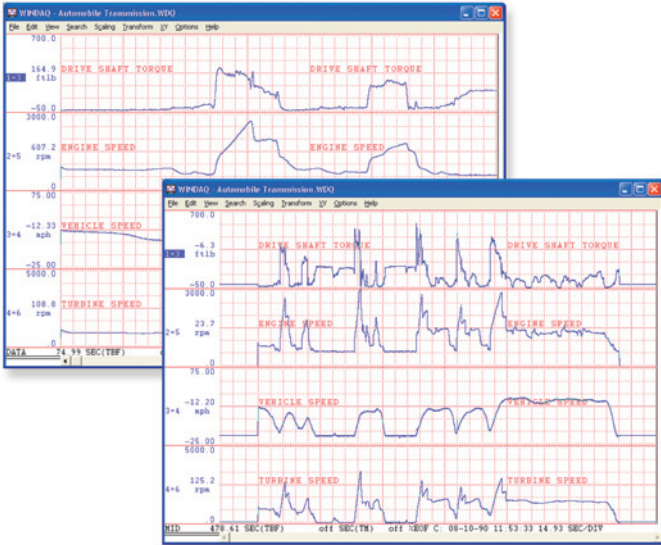
## Annotate

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.



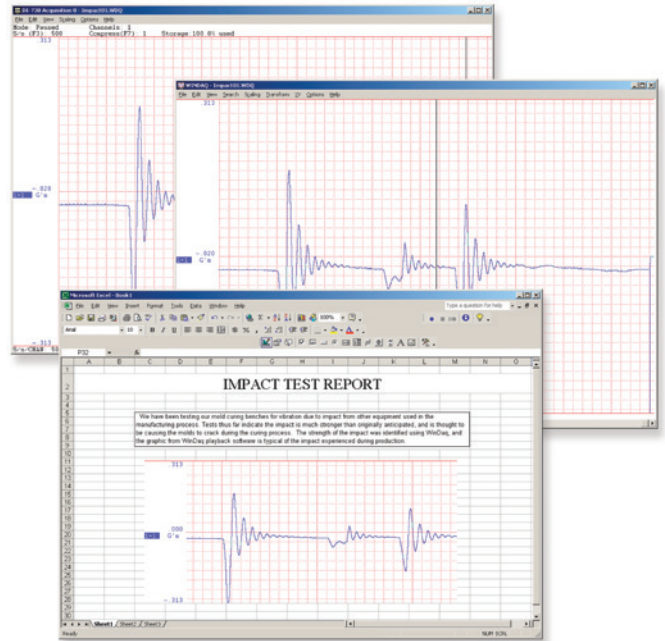
## Playback

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.



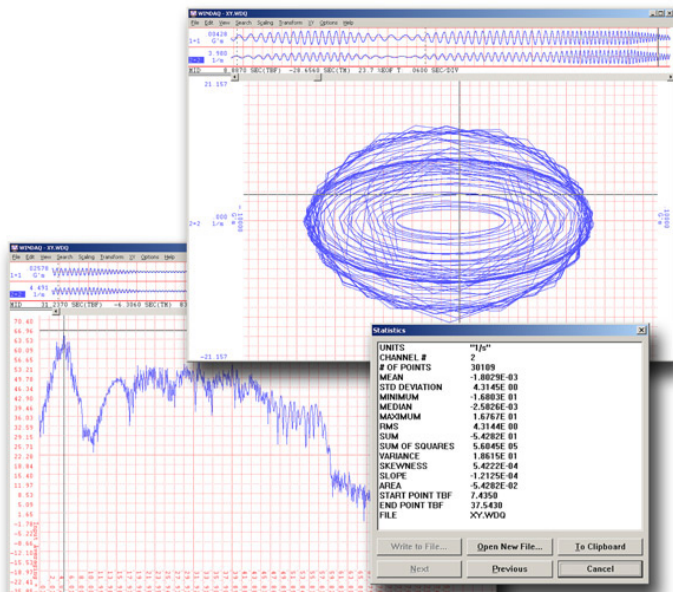
## Multitask

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.



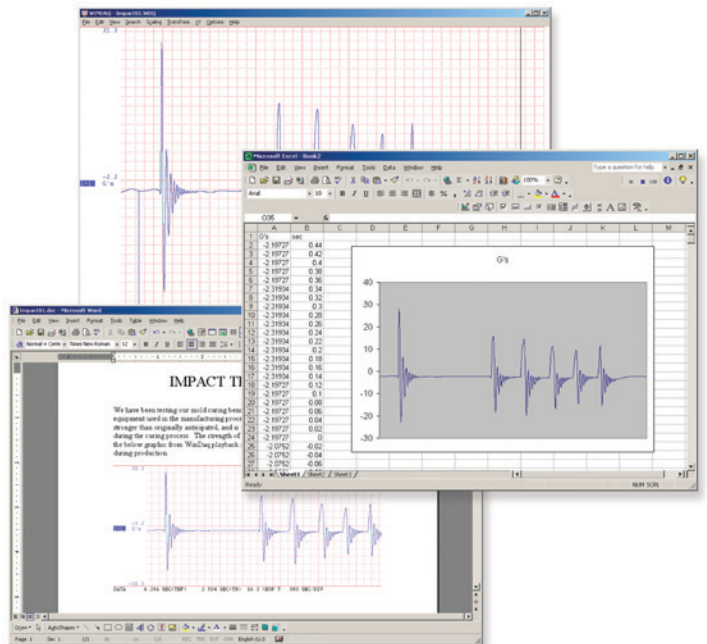
## Analyze

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.



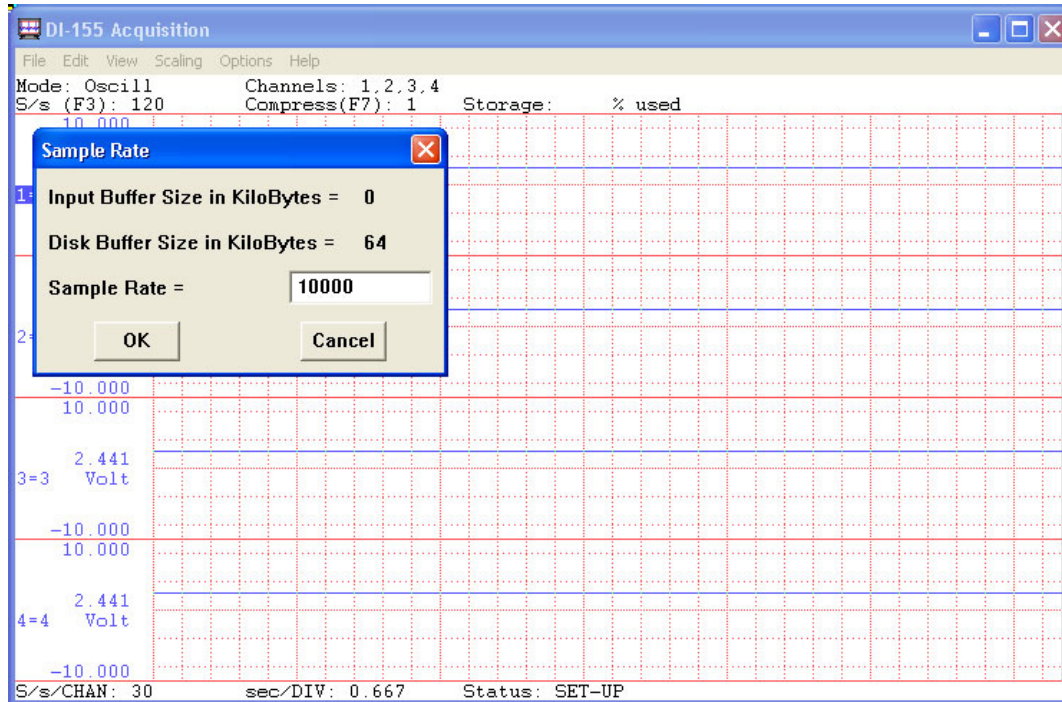
## Export

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.



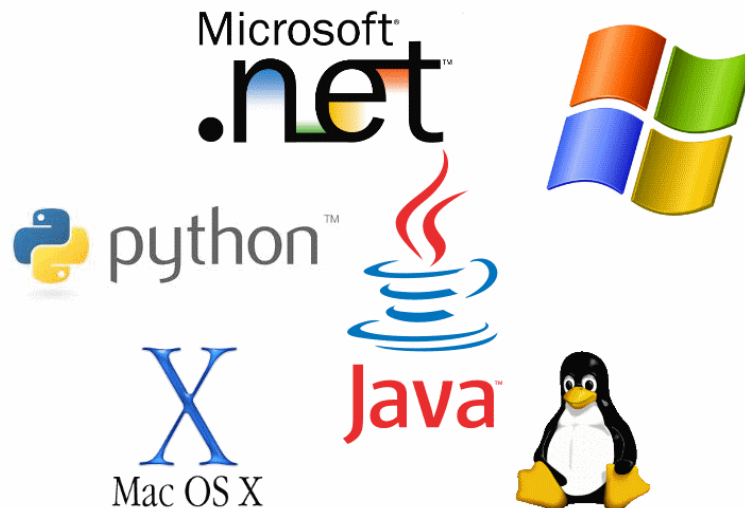
## WINDAQ/HS Unlock Code Upgrade

A WINDAQ High Speed upgrade allows you to sample at the maximum 2.5 kHz per channel capability of DI-155, up to a maximum throughput rate of 10 kHz for four enabled channels.



## Published and Supported Instrument Protocol

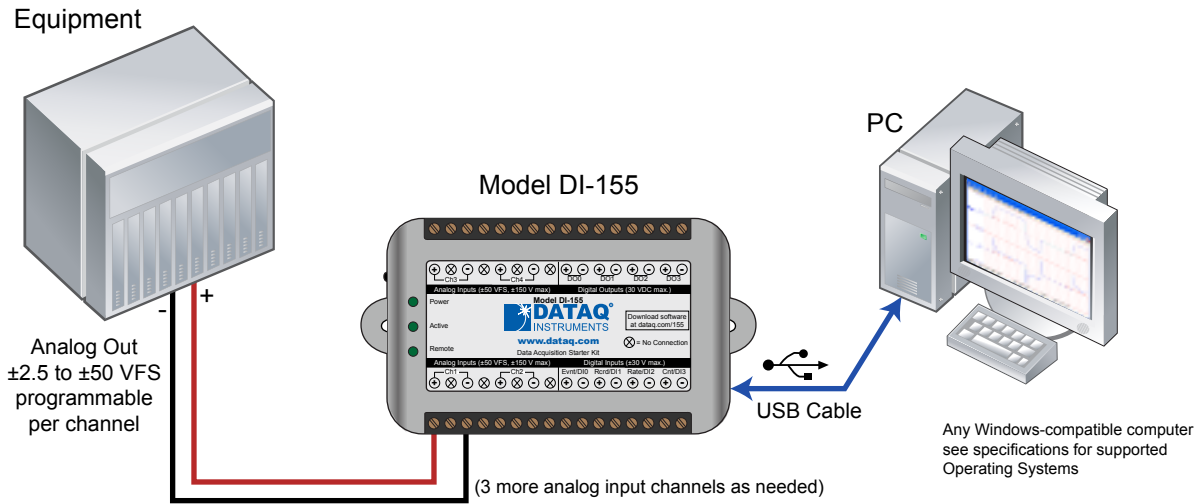
We know that there are some applications for the DI-155 that only you can program, from single unit special-purpose applications, to OEM requirements by the hundreds of units. We further realized that Windows might not be the best development environment in these situations, and the range of programming environment preferences runs wide and deep. For all these reasons DATAQ Instruments has decided to publish and maintain a document that defines the DI-155 protocol, the command set that defines how to communicate with the DI-155 at the instrument level. With this information at your disposal you are not bound to any particular operating system or programming language, so how you use the DI-155 is limited only by instrument's hardware and your own imagination.



# Typical DI-155 Applications

## Replace Traditional Chart Recorders

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

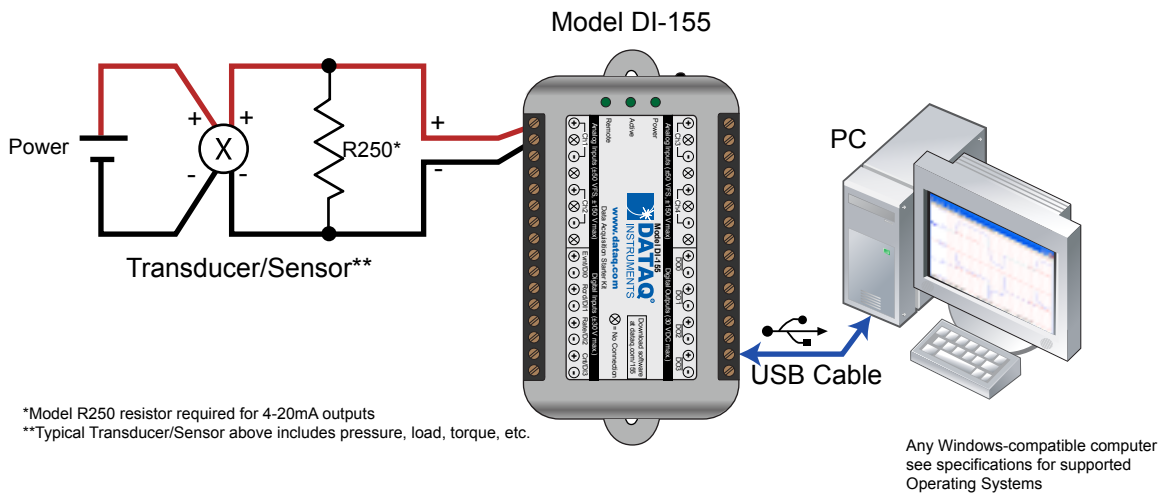


Examples of “Equipment” above include gas chromatographs, liquid chromatographs, spectrometers, bio-amplifiers\*, etc.

\* 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:



\*Model R250 resistor required for 4-20mA outputs  
\*\*Typical Transducer/Sensor above includes pressure, load, torque, etc.

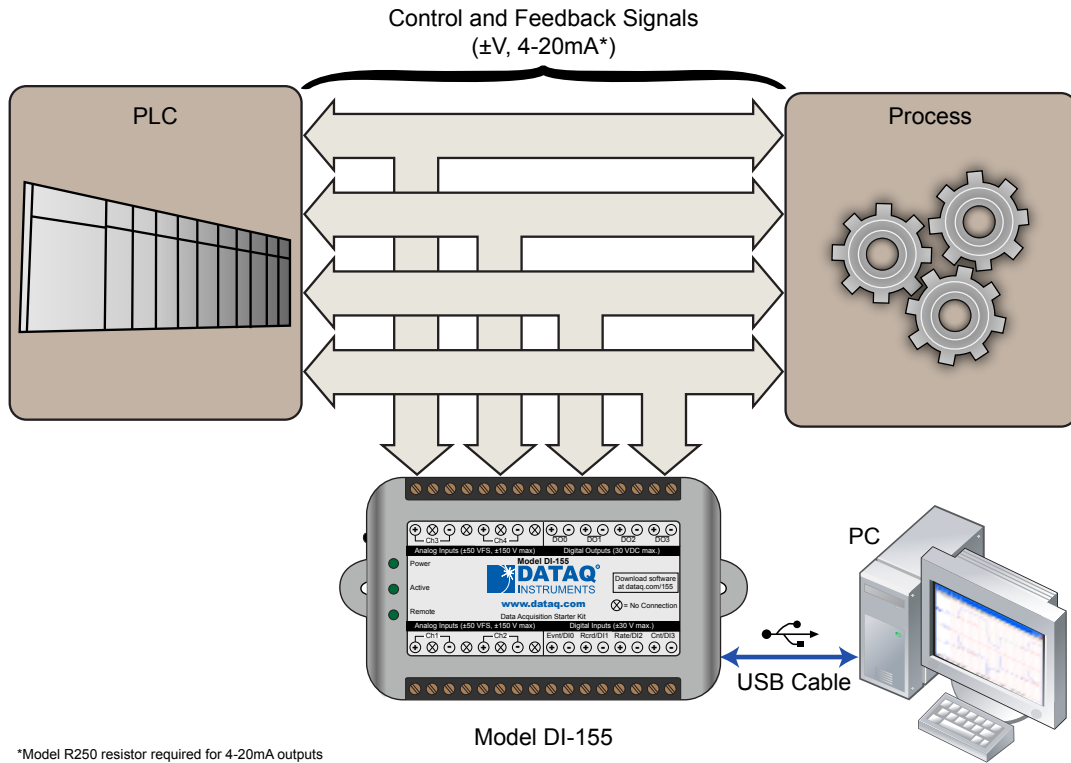
Typical Transducer/Sensors above include pressure, load, torque, Etc.



# Typical DI-155 Applications (continued)

## Process Monitoring

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



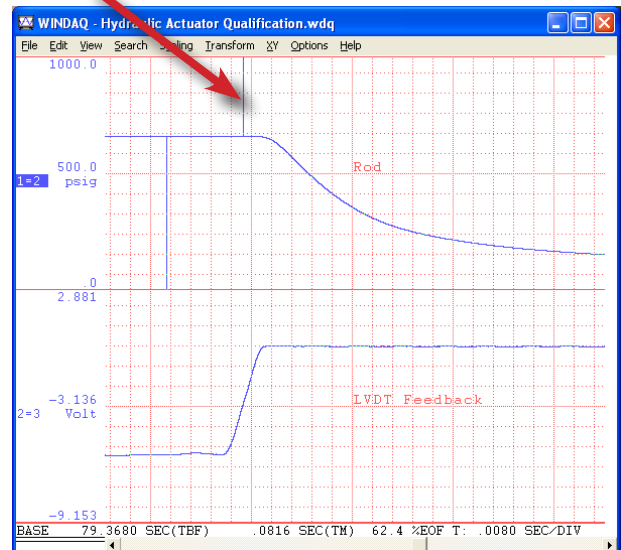
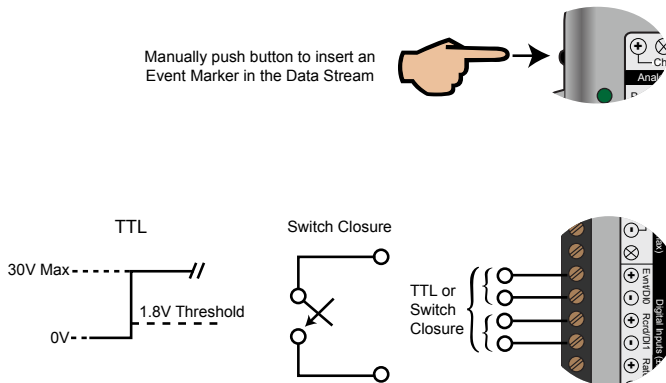
\*Model R250 resistor required for 4-20mA outputs

Any Windows-compatible computer  
see specifications for supported  
Operating Systems

## Remote Control Close Up

The DI-155 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-155 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.

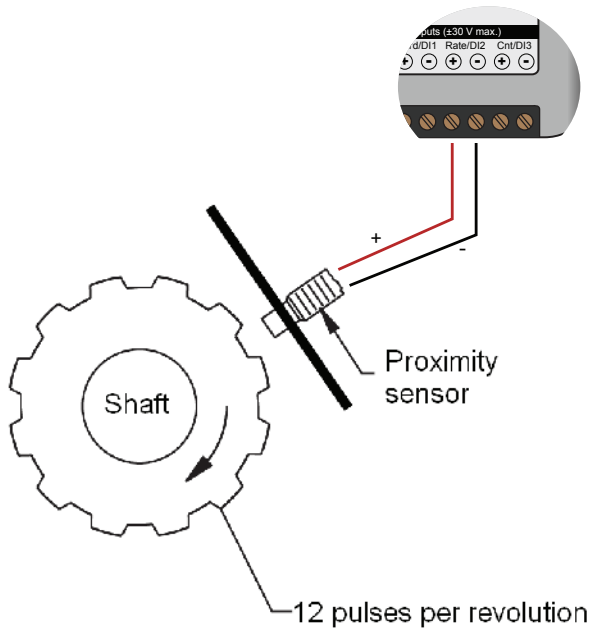
### Event Marker



## Typical DI-155 Applications (continued)

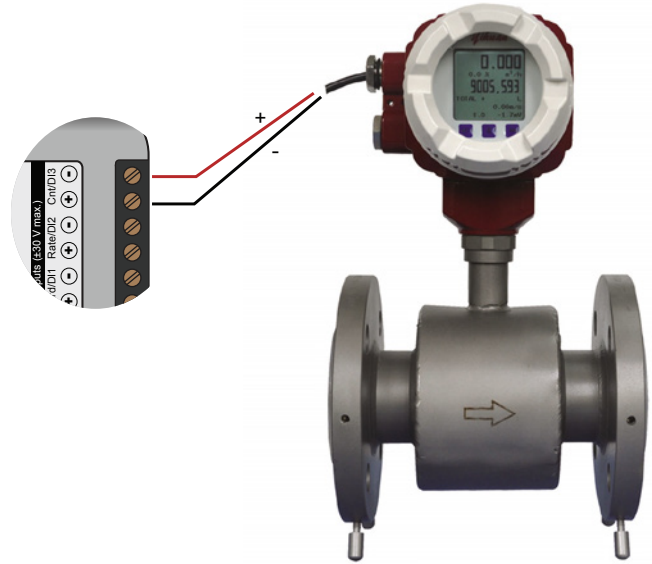
### Rate Measurements

The DI-155's Rate input is used to acquire a frequency representing RPM, flow, or any other pulse stream.



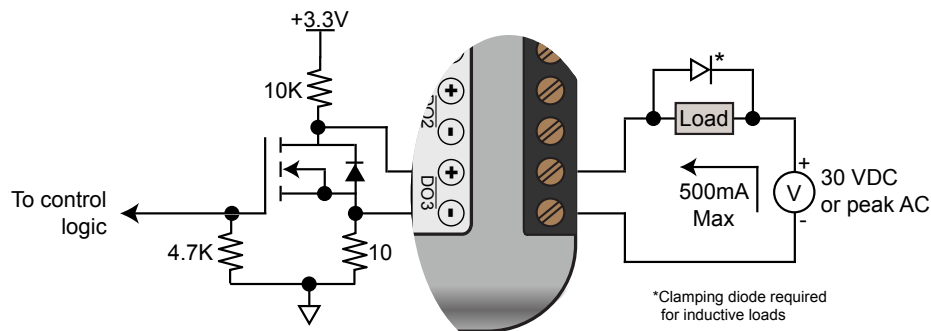
### Count Measurements

Use the DI-155'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-155'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-155 protocol, or via WinDaq software using a [third party software add-on](#).



# DI-155 Specifications

## Signal Inputs

### Analog Inputs

Number of Channels:	4
Configuration:	Differential
Programmable measurement ranges per channel:	$\pm 2.50, 3.125, 5, 6.25, 10, 12.50, 25, 50$ VFS
Input impedance:	2 M $\Omega$ , differential
Isolation:	none
Absolute Accuracy (@ 25°C, excluding common mode error):	$\pm 10$ V FS range: 0.20% of FS All other ranges: 0.50% of FS
Absolute maximum input without damage:	$\pm 75$ V peak continuous $\pm 150$ V peak, one minute or less
Maximum common mode voltage:	$\pm 20$ V peak
Minimum common mode rejection:	40 db @ DC
Channel-to-channel crosstalk rejection:	72 db minimum @ any throughput

### Digital Inputs

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

### Reserved Inputs (Digital Inputs)

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

## ADC Characteristics

Resolution:	Overall approx. 1 part in 8,192 (13-bit) Above zero: approx. 1 part in 4,095 Below zero: approx. 1 part in 4,096
Max sample throughput rate:	10 kHz
Max sample rate for a single channel:	10 kHz
Min sample throughput rate:	Hardware only: 11.44 Hz with WinDaq Software: 0.000350 Hz
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 $\Omega$

## Counter/Rate (DI2 and DI3)

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

## Indicators and Connections

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

## Power

Power Consumption:	< 1 watt, via USB interface
--------------------	-----------------------------

## 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 $\times$ 5.5W $\times$ 1.53H in. (6.67D $\times$ 13.97W $\times$ 3.89H cm.)
Weight:	< 4 oz. (< 140 grams)

## Software Support

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

## Ordering Guide

Description	Order No.
<b>DI-155 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-155
<b>Unlock Code</b> Optional unlock code for high speed data acquisition that allows recording at sample rates up to 10 kHz.	WINDAQ/HS-155
<b>R250</b> Optional precision 250-ohm 4-20 mA shunt resistor ( <a href="#">see non-isolated implementation here</a> ).	R250



241 Springside Drive  
Akron, Ohio 44333  
Phone: 330-668-1444  
Fax: 330-666-5434

### Data Acquisition Product Links

(click on text to jump to page)  
[Data Acquisition](#) | [Data Logger](#)