Warranty and Service Policy

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

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

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

Service Policy

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

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

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

This manual contains information designed to familiarize you with the features and functions of the DI-145 USB data acquisition starter kit. These high-end Starter kits contain features and functionality normally reserved for more expensive data acquisition systems.

Features

The DI-145 data acquisition instrument is a portable data recording module that communicates through your computer's USB port. Power is derived from the interface port so no external power is required. Features include:

- 4 fixed differential analog inputs protected to ±150V (transient).
- Two dedicated digital I/O ports for Remote control protected to ±30V.
- ±10V full scale measurement range.
- 240 samples per second maximum sampling rate.
- A push-button to tag remote events in WinDAQ software.
- Three status LEDs for easy notification of system status.
- Backwards compatible with the DI-194RS serial port data acquisition system protocol.

Analog Inputs

The DI-145 features four differential channel inputs located on a single sixteen-position screw terminal block for easy connection and operation (other terminals used for digital I/O or reserved). Note: The DI-145 does not support Gain.

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

Digital Inputs

The DI-145 contains two digital lines (bits) for WinDAQ remote control operations (Remote Start/Stop and Remote Events). Connect switch closures or discrete levels with a maximum input of 30V and a threshold of 1.8V. The inputs float at 1 level, about 3.3V relative to the “-” terminal, and require sinking about 50μA to bring them down to 0.8V and guarantee a 0. When no Options Remote are enabled in WinDAQ, the Event input appears inverted in data bit 0 and the Record input appears inverted in data bit 1 of data for the first enabled channel.

Software

All software required to record and playback waveforms is included with the purchase of any DI-145 data acquisition starter kit via download.

WinDAQ® Recording and Playback Software

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

WinDAQ Acquisition software can be used to record waveforms directly and continuously to disk while monitoring a real time display of the waveforms on-screen. It operates, displays, and records waveform signals in real time at the full sample rate of the DI-145 (240Hz maximum throughput).
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.

The DATAQ Instruments Hardware Manager
This software can be found in the Start menu under the WinDAQ program group called DATAQ Instruments Hardware Manager. Access WinDAQ Acquisition software and manage multiple DATAQ Instruments devices in this easy-to-use point and click environment. View the Help files by clicking on View Help in the Help menu or by pressing F1.

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**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>4</td>
</tr>
<tr>
<td>Channel Configuration</td>
<td>Differential</td>
</tr>
<tr>
<td>Voltage Measurement Range</td>
<td>±10V Full Scale</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>1MΩ, each input to ground</td>
</tr>
<tr>
<td>Isolation</td>
<td>none</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.25% of FSR</td>
</tr>
<tr>
<td>Overall inaccuracy</td>
<td>±64mV (at 25°C)</td>
</tr>
<tr>
<td>DC common mode rejection</td>
<td>40 db (at 25°C)</td>
</tr>
<tr>
<td>Max input without damage</td>
<td>±75 V peak, continuous; ±150 V peak, one minute or less</td>
</tr>
<tr>
<td>Max common mode voltage</td>
<td>±10V</td>
</tr>
<tr>
<td>Analog frequency response</td>
<td>-3db @ 100 Hz</td>
</tr>
</tbody>
</table>

**Digital Inputs**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>2</td>
</tr>
<tr>
<td>Pull-up value</td>
<td>47 KΩ from + input to 3.3V</td>
</tr>
<tr>
<td>Pull-down value</td>
<td>4.7 KΩ from - input to USB ground</td>
</tr>
<tr>
<td>Input high voltage threshold</td>
<td>1.8 V minimum</td>
</tr>
<tr>
<td>Input low voltage threshold</td>
<td>1.4 V maximum</td>
</tr>
<tr>
<td>Absolute maximum values</td>
<td>±30 VDC</td>
</tr>
</tbody>
</table>

**Reserved Inputs (Digital Inputs)**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital In 0</td>
<td>W INDAQ remote start/stop</td>
</tr>
<tr>
<td>Digital In 1</td>
<td>W INDAQ remote events</td>
</tr>
</tbody>
</table>

**ADC Characteristics**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>Overall: 1 part in 1,024 (10-bit)</td>
</tr>
<tr>
<td></td>
<td>Above zero: 1 part in 511</td>
</tr>
<tr>
<td></td>
<td>Below zero: 1 part in 512</td>
</tr>
<tr>
<td></td>
<td>1 ADC Count = ±19.5 mV</td>
</tr>
<tr>
<td>Max. sample throughput rate</td>
<td>240 Hz</td>
</tr>
<tr>
<td>Min. sample throughput rate</td>
<td>0.44 samples per minute</td>
</tr>
<tr>
<td>Sample rate timing accuracy</td>
<td>50 ppm</td>
</tr>
</tbody>
</table>

**Indicators and Connections**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>USB 2.0 (mini-B style connector)</td>
</tr>
<tr>
<td>Indicators (LED)</td>
<td>Power, Active, Digital</td>
</tr>
<tr>
<td>Input Connections</td>
<td>One 16-position terminal strip</td>
</tr>
</tbody>
</table>
**Power**

Power Consumption: 0.30 watts, via USB interface

**Environmental**

Operating Temperature: 0°C to 35°C (32°F to 95°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: 3.6 oz.

**Software Support**

WINDAQ software: OS support: Check Online
Sample Rate Limit: 240 Hz
Backwards compatibility: DI-194RS compatibility mode supports Linux and MatLab
Programming: DATAQ Instruments SDK
3. Installation

The following items are included with each WINDAQ Starter Kit. Verify that you have the following:

- A DI-145 USB data acquisition instrument.
- USB cable.
- A DATAQ Instruments screwdriver for signal lead connections.

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.

Installing WINDAQ Software and the DATAQ Instruments Hardware Manager

All software for the DI-145 can be installed via a downloadable executable directly from the DATAQ Instruments web site. No CD is shipped with the device. You may burn the executable onto a CD to transport the software to a computer with no internet connection.

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

2. Go to run.dataq.com in your web browser.

3. Click on the WinDaq Software link (requires subscription).

4. Sign up for our newsletter to receive the download link (you can opt-out after download).

5. Double-click on the downloaded file to extract the program and begin software installation.

6. Follow the on-screen prompts and enter any required information.
7. 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 “DATAQ Instruments Hardware Manager” to access **WINDAQ software**.

**Connecting the Instrument to Your Computer**

**DI-145** instruments can be connected to your computer’s USB port using the provided USB cable. No external power is required. Connect one end of the communications cable to the instrument port and the other to your PC’s port.

*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.

**DATAQ Instruments Hardware Manager**

The DATAQ Instruments Hardware Manager is installed when installing any **DI-145** instrument. This software allows you to effectively manage multiple devices installed on the same PC. The DATAQ Instruments Hardware Manager may be accessed through the Windows Program Manager Group as specified during installation (default is Start > Programs > WINDAQ > DATAQ Instruments Hardware Manager). All available devices will automatically appear in the list box when you run the software.

![DATAQ Instruments Hardware Manager](image)

The Hardware Manager allows you to start **WINDAQ** Acquisition software (select the device and click on the **Start Windaq** button) and must be used when multiple DATAQ Instruments devices are installed. It also provides crucial information about your device needed for custom programming (Serial # and COM Port).

*Please note:* The description of **DI-145** models cannot be modified.

Click on the Help button for help with the DATAQ Instruments Hardware Manager.
4. Controls, Indicators, and Connections

Please note: The SD card slot is not used in the DI-145. Allowing foreign materials to enter the device through the SD card slot may result in damage to the instrument.

Mini-B USB Connection
Use the supplied USB cable to connect and power the instrument through your computer’s USB port.

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

DI-145 Signal Connections
Refer to the following for screw terminal port identification.

Ch#: Analog channels 1-4 (±10VFS, ±150V transient Max.)
Remote Control Event: Digital Input bit 0—Remote Event Marker
Remote Control Record: Digital Input bit 1—Remote Start/Stop
Reserved NC: No connection—reserved.
Use the following diagram to connect Analog Input Channel 1.

**Connecting Signal Leads**

To connect signal leads to the DI-145:

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.
**WINDAQ Remote Controls (Digital Inputs)**

The DI-145 contains 2 digital inputs for WINDAQ Remote Events (inserts an Event Marker) and Remote Storage (Record data). 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.

### WINDAQ Remote Events

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-145 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 DI-145 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 (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-145 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.

### 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:

![Circuit Diagram]

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:

![Channel 1 Engineering Unit Settings]

Enter the following values:

<table>
<thead>
<tr>
<th>Volt</th>
<th>EU</th>
<th>EU Tag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Level</td>
<td>5</td>
<td>20 mA</td>
</tr>
<tr>
<td>Lower Level</td>
<td>1</td>
<td>4 mA</td>
</tr>
</tbody>
</table>

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.

**LED Indicators**

The DI-145 provides three green LEDs for instrument status and notification.

- **Power**: Indicates power is applied via the USB cable.
- **Active**: Indicates the device is in use either by WINDAQ Acquisition Software or a custom user-developed program.
- **Remote**: Indicates when the Event Button is pushed or the Event terminals are connected via a relay contact or digital input.
5. DI-145 Block Diagram
6. Dimensional Drawing

[Diagram showing dimensional measurements]

- 1.612"
- 5.500"
- 4.750"
- 4.250"
- 0.750"
- 2.625"
- 4.250"
- 4.750"
- 5.500"
Direct Product Links
(click on text to jump to page)
Data Acquisition | Data Logger