



EZ-DAQ™

User Manual

Version 2.0

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IMPORTANT

Before beginning installation procedures, these installation and operating instructions should be studied carefully. The installation and operation should also be in accordance with local regulations and accepted codes of good practice.

Information Record

Model #: _____

Serial #: _____

Sold By: _____

Date Purchased: _____

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SOFTWARE CODE

The software code is copyrighted 2008 by Durham Geo Slope Indicator.
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SOFTWARE LICENSE AND REGISTRATION

The purchase of one EZ-DAQ-Soft™ software program gives the purchaser the right to install the program on multiple machines.

INTRODUCTION

1.0 Overview

The EZ-DAQ is an Ethernet-connected digital readout that can sensor readings and transmit them to a computer running the EZ-DAQ data acquisition software to save test results as CSV files.

The EZ-DAQ can read and display up to 8 sensors at a time and can store up to 24 separate calibrations. Each calibration can have its own input range, unit name, and decimal place setting. The EZ-DAQ displays up to 8 readings at a time. The current EZ-DAQ software can retrieve blocks of 4 sensor readings at a time, and allows setting intervals to use different sampling rates if test protocols require this.

The EZ-DAQ stores the calibrations in non-volatile memory and requires a password to change calibrations.

Sensor input type:

- mV
- V

Sensor input range:

- 150 mV
- 500 mV
- 1V
- 5V
- 10V

The sensor input range can either run from negative to positive or from zero to the maximum input. The EZ-DAQ allows selecting the input range as part of the calibration for each sensor. The EZ-DAQ connects over standard Ethernet protocol and can connect to a local area network or with a point to point connection to a USB to Ethernet adapter.

2.0 System Requirements

- The software was initially tested for Microsoft Windows 98, 2000, NT and XP
 - Note: If using a later version of Windows, you may need to run in XP compatibility mode if you encounter errors. EZ-DAQ software is not compatible with Windows 95 or Windows ME. Windows ME is not compatible with Windows ME either.
 - DGSi makes no guarantees that this will run on a Windows emulator under a Linux system or other non-Windows OS. We currently do not have native Linux or Mac OS versions of the software.
- 500 MHz processor (Faster processor recommended)
- 64 MB RAM (128 MB(+) recommended)
- Approximately 12 MB free disk space
- VGA display
- USB 2.0 port or Ethernet port

To users in countries that use a comma (,) instead of a decimal point (.) after whole numbers: EZ Daq software only functions with use of decimal point. To change settings: Go to Control Panel – Region and Language – Additional Settings – Decimal Symbol. Select (.). Click OK and OK again.

IMPORTANT NOTE

 *If using an uninterruptable power supply, make sure your power supply has enough capacity to power the EZ-DAQ, PC, and test equipment.*

3.0 Summary of Installation instructions — Software for PC (details on p.12)

On your PC, run the setup.exe installation file provided and follow the on-screen prompts. The setup.exe program can also uninstall the EZ-DAQ software, but you may need to delete some files manually. You will need administrator privileges to install the software and Ethernet adapter for any version of Windows released in the past 20 years.

4.0 Summary of Installation Instructions — Ethernet Adaptor (details on p.16)

DGSi has used several different USB to Ethernet adapters. Windows will normally find the driver if the computer is connected to the Internet and install it automatically.

EZ-DAQ PANEL

1.0 Screen Description

EZ-DAQ Panel Home Screen

The home screen appears at startup. It displays the firmware version number. There are three buttons on this screen:

- **Sensors:** Brings up the sensor display screen.
- **Login:** Touch this to enter the calibration password.
- **Advanced:** This button is only available if you have entered the calibration password. The advanced menu includes network / IP address settings, check the analog to digital converter readings, and adjust noise filtering settings.



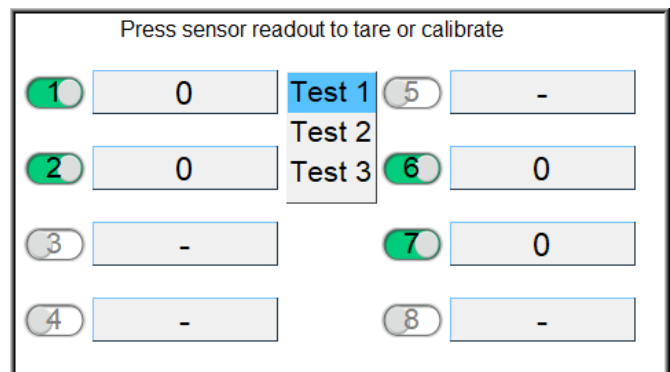
Sensor display screen

This screen shows the readings from all eight sensor connections on the EZ-DAQ. Each sensor input displays the sensor reading, units selected for the sensor, and a switch that allows turning the sensor off and on. Touching the sensor readout or its units brings up the following options (shown at right):

- **Tare:** Set the current sensor reading to the zero point. You must hold this button for at least half a second; this feature is to prevent accidentally moving the tare point.
- **Config:** Change the calibration, units, or input range for the sensor.
- **Home:** Returns to the home screen.
- **Cancel:** Returns to the sensor display screen. This will not cancel pressing the Tare button.



The numbers on the switches next to the sensor readings correspond to the connection on the back of the unit. The sensor number listed on the submenu and calibration screen is a calibration number. The EZ-DAQ can store up to 24 calibrations, three for each sensor input. The menu in the center of the sensor display screen allows you to select three

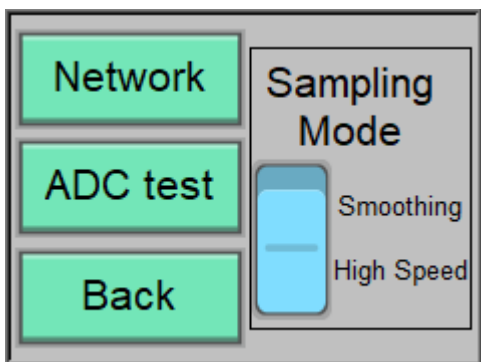


separate tests. Each test has a separate set of calibrations for all eight sensors. This allows moving a single EZ-DAQ between multiple test machines or switching to different sensor ranges on a test setup. The center of the display will also have an Advanced button if you have logged in to adjust the calibration, which works the same way as the Advanced button on the home screen.

The current EZ-DAQ software allows reading either the left or right column when saving to a file, but does not allow logging both columns or selecting a group of four sensors that mixes and matches between columns. Connect the sensors in such a way that all sensors needed for a test are either on the top or bottom row of connectors on the rear of the EZ-DAQ and set the calibrations to match.

Advanced setting screen

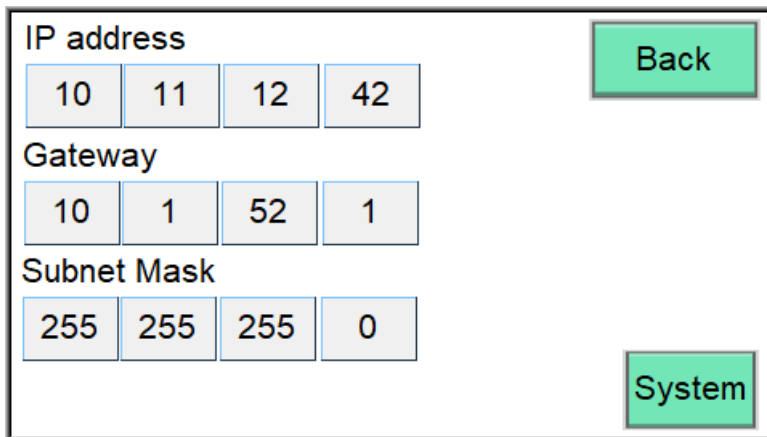
This screen allows for network setup, noise filtering, and other tests.



The sampling mode has two settings.

- Smoothing: The EZ-DAQ will report readings as a moving average over a one-second period. This reduces noise for tests where the sampling interval is one second or more.
- High speed: The EZ-DAQ updates its readings ten times per second and does not conduct any averaging. Use this mode only when running tests that require more than one sample per second.

The Network button lets you configure the EZ-DAQ's IP address settings.



The default IP address is 10.11.12.42. If connecting to a network, check with your IT department for what IP addresses are available, and what to use for the gateway and subnet masks. The EZ-DAQ always uses a static IP address due to how the PC software communicates.

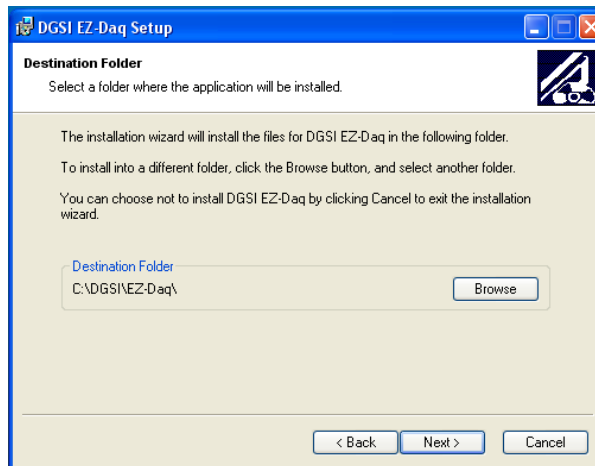
The System menu brings up a number of non-adjustable settings for factory diagnostics and repair.

The ADC Test lets you view the raw analog to digital inputs from the sensors. This is mostly useful for troubleshooting sensor input problems.

EZ-DAQ-Soft™ PC SOFTWARE

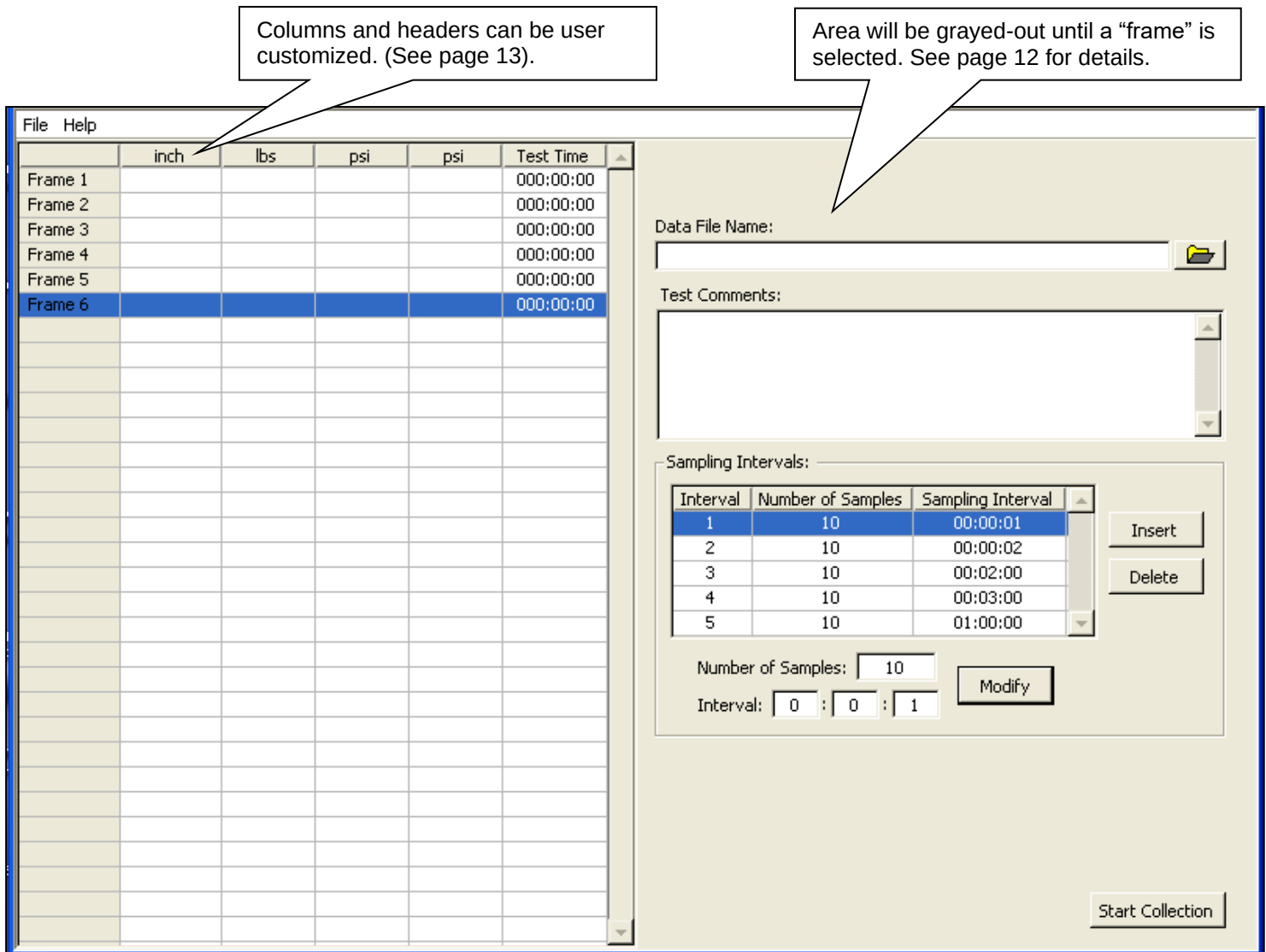
1.0 EZ-DAQ-Soft™ Software Installation

DGSI may provide the software on a CD, download, or USB thumb drive. You will need administrative rights to install the software on your computer. Start by running the Setup.exe file. The setup will first ask for a folder. The default folder is C:\DGSI\EZ-Daq but you can change this by clicking the Browse button and selecting a different installation folder. Once you click Next, the software will install and launch.



When you run the program, the main screen will appear.

This picture shows the program open and Frame 6 selected. The user can now enter sample interval information, test comments, etc. for test #6.



2.0 Communications

The EZ-DAQ transmits data over Ethernet. There are several ways to connect this to your computer:

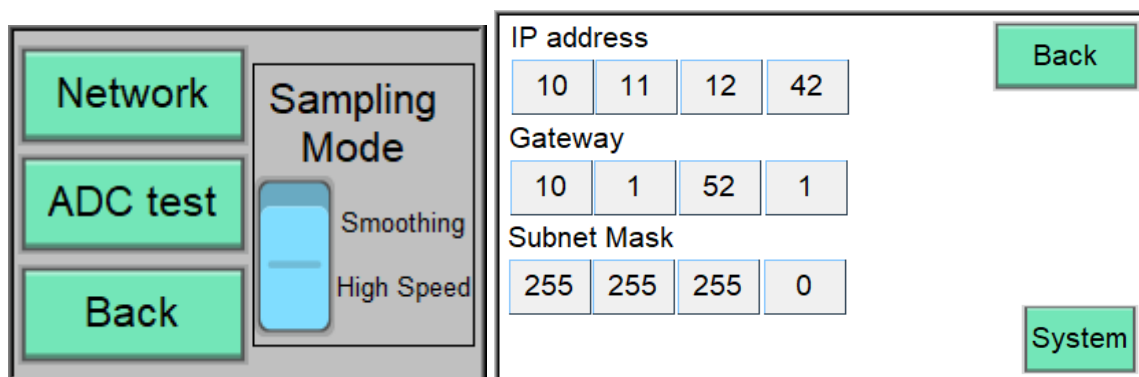
- Connect it to a LAN or switch hub and set up the EZ-DAQ's IP address.
- Plug the EZ-DAQ directly into a computer's Ethernet port, if the computer does not use it to connect to a network.

- Use a USB to Ethernet adapter (included with the EZ-DAQ) to connect the EZ-DAQ directly to the computer without disturbing existing Ethernet connections.

If using a point-to-point connection where the EZ-DAQ is connected only to the computer and not over a network, use a standard Ethernet cable, not a crossover cable. Note that many network adapters will be able to use either cable style, but this is frequently not the case for older equipment, such as if you really are trying to run the EZ-DAQ software under Windows 98.

The EZ-DAQ uses a static IP address since the software looks for the unit based on IP address. The default address is 10.11.12.42. If connecting the EZ-DAQ to a LAN, contact your IT department to check for what IP addresses are available.

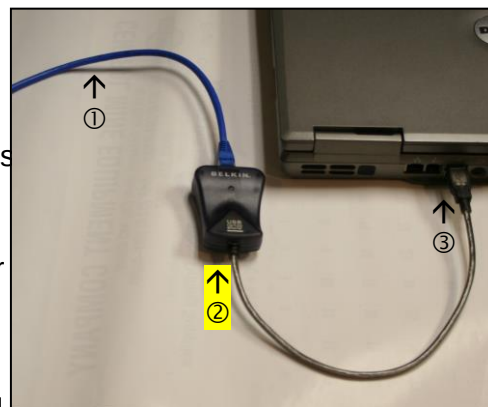
To change the IP address, you will first need to push the Login button on the EZ-DAQ panel home screen. Enter the calibration password (the default is 1234) and make sure the Calibrate / setup indicator light is on. Push the Back button to return to the home screen, and the Advanced button will be visible. Push the Advanced button, then push the Network button from the menu that appears. This will allow you to change the IP address, gateway, and subnet mask settings.



If you are not using the default IP address of 10.11.12.42, you will need to open the EZ-Daq.ini file, located in the folder where you have installed the EZ-DAQ software on your PC, normally C:\DGS\EZ-Daq. Edit the line that begins with "IPAddress=" to the address you have set in the EZ-DAQ, and save the file.

If using a USB to Ethernet adapter, plug the Ethernet cable (①) into the adapter (②) and plug the USB to Ethernet adapter into an available USB port (③). DGSi has used several USB to Ethernet adapters; these pictures and screen shots show a Belkin adapter. Others will be similar.

The computer will normally identify the Ethernet adapter and download the drivers. The installation CD includes drivers for the Belkin adapter; other adapters may include their own driver CD. If not, a web search for the adapter's part number will usually find the drivers. If you



are not able to locate the drivers for your specific adapter, contact DGSi support with pictures of your adapter and its packaging.

The pictures below show what happens when Windows detects the Belkin adapter; others are similar.



Setup of EZ-Daq communications is now complete.

3.0 EZ-DAQ-Soft™ — Individual Test Setup

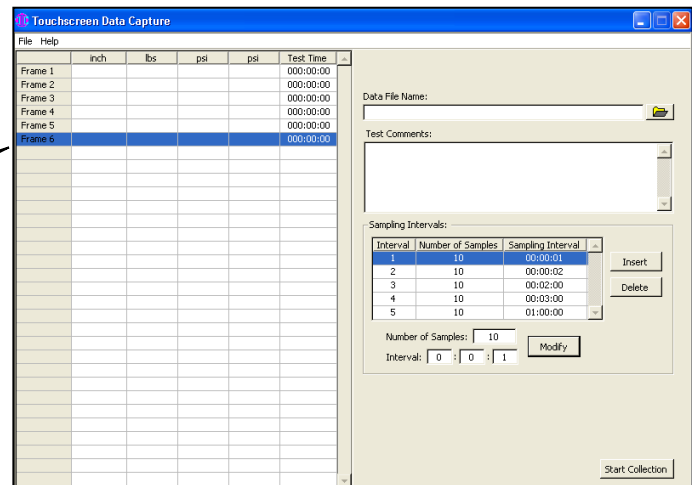
Make sure the EZ-DAQ is powered up and all the communication settings are configured before opening the EZ-DAQ software on your PC. If the EZ-DAQ software is not able to establish communication with the EZ-DAQ, it will close and display an error message. If this happens when the EZ-DAQ is powered on, please check the steps outlined in section 2.0 of this chapter:

- Make sure the IP address set on the EZ-DAQ matches the IP address specified in the EZ-Daq.ini file.
- If you are connected to a LAN, check to make sure the IP address, subnet mask, and gateway are set correctly.
- Make sure the Ethernet cable is a straight-through, standard cable instead of a crossover cable.
- If using a USB to Ethernet adapter, make sure the driver is installed correctly and does not report any errors.

When you start the EZ-DAQ software, it opens to the test screen. This screen displays the live data from the EZ-DAQ and records up to four sensors at a time. The software divides the sensors into six frames of four sensors (which may or may not correspond to actual load frames). Test 1 includes frames 1 and 2, test 2 includes frames 3 and 4, and test 3 includes frames 5 and 6. The odd-numbered frames use sensor inputs 1 through 4, while the even-numbered frames use sensor inputs 5 through 8 on the rear of the EZ-DAQ.

First, select which frame you will record. The EZ-DAQ software does not allow mixing and matching sensors between frames. Note that the EZ-DAQ only updates the eight sensor readings in the active test group. Make sure the sensors displayed on the EZ-DAQ are the same sensors you intend to log with the computer.

Select the test first.



Data File Name: To save a recording, start by selecting the Data File Name field and entering a file name. The folder icon allows browsing to a specific folder. You must save the file before you can start collecting data.

Test Comments: The Test Comments field lets you add comments that will be at the beginning of the test file. Test files are saved as plain text (ASCII) data.

Sampling Intervals: The Sampling Intervals field lets you set the sampling rate and the number of samples collected. You can set several different intervals with different sampling rates. The “Insert” button inserts a new row above the row selected defaulting to 1 sample at a 1 second interval, while the “Modify” button applies the settings specified by “Number of Samples” and “Interval” to the selected row. The “Delete” button removes the currently selected row.

The software does not save the sampling interval settings. It will return to its default sample settings if you close and re-open the program. You can change the default sample settings by editing the EZ-Daq.ini file.

Note that setting the sample interval to zero seconds will cause the software to sample at its maximum rate, typically 100 samples per second. The EZ-DAQ itself only updates its samples at a maximum of 10 samples per second. If running at maximum sampling rate, use the EZ-DAQ's Advanced menu to set the sampling mode to "High Speed" instead of "Smoothing". The "Smoothing" method averages the samples over a 1 second interval, which will delay response if you need accuracy less than one second. heart of EZ-DAQ-Soft™ is the test screen, which allows the user to select the test on which the data will be captured.

4.0 How to customize your PC screen

Customize for your test names.

C:\DGS\IEZ-DAQ\IEZ-DAQ\IEZ-DAQ.ini

Descriptions can be changed in the EZ-DAQ.ini file.

The screenshot shows the DGS EZ-Daq software interface. The main window displays a data table with columns for Travel, Load, PSI, Grapes, and Test Time. The table has rows for various tests, including Consol, Triaxial, CBR, LBR, Test 5, and Test 6. Annotations point to the EZ-DAQ.ini file and the software interface, highlighting how to customize test names and descriptions.

[Proface Setup]
 IPAddress=10.11.12.42
 UDPPort=1024
 ReadingStartMemAddress=100
 RangesStartMemAddress=200
 NumSensors=24
 ColHeader0=""
 ColHeader1="Travel"
 ColHeader2="Load"
 ColHeader3="PSI"
 ColHeader4="Grapes"
 ColHeader5="Test Time"
 RowHeader0="Consol"
 RowHeader1="Triaxial"
 RowHeader2="CBR"
 RowHeader3="LBR"
 RowHeader4="Test 5"
 RowHeader5="Test 6"

Interval	Number
1	
2	
3	
4	
5	

Number of Samp
 Interval: 0

The illustration above shows how the PC software can be customized to match your company's particular test names in your lab. This file is in the folder where you have installed the EZ-DAQ software, normally C:\DGS\EZ-Daq. The .ini file is easily editable and can be opened with notepad or any other similar text editor.

IMPORTANT NOTE

It is always a good idea when dealing with .ini files to make a backup copy before making changes to the file.

The items under [Paths] specify where to save supporting files. Normally you should not move the ErrorFileDirectory or PlotSetupFile settings. The DefaultOutputDirectory setting sets where to save recorded data; changing this can save time browsing to a different file location if you usually save your files to the same folder.

The settings under [Proface Setup] allow changing the settings to fit your test configuration. Here are the individual settings:

IPAddress: Set to match the IP address selected on the EZ-DAQ. The default address is 10.11.12.42, but if you are using the EZ-DAQ over a LAN instead of point to point configuration, you will probably need to change this.

UDPPort: Specifies the port number used to make a connection. Current EZ-DAQ firmware leaves this set to 1024; do not change this.

Do not change ReadingStartMemAddress, RangesStartMemAddress, or NumSensors.

The ColHeader entries set the names that appear at the top of the column, while the RowHeader entries set the names of the rows on the right-hand side. ColHeader0 is the column that lists the row names, and ColHeader5 lists the test time. The column headers in between list the sensor types. Although the current EZ-DAQ allows setting a different sensor name for all 24 sensors, the computer software currently only allows four sensor names and is not able to read the sensor names from the EZ-DAQ.

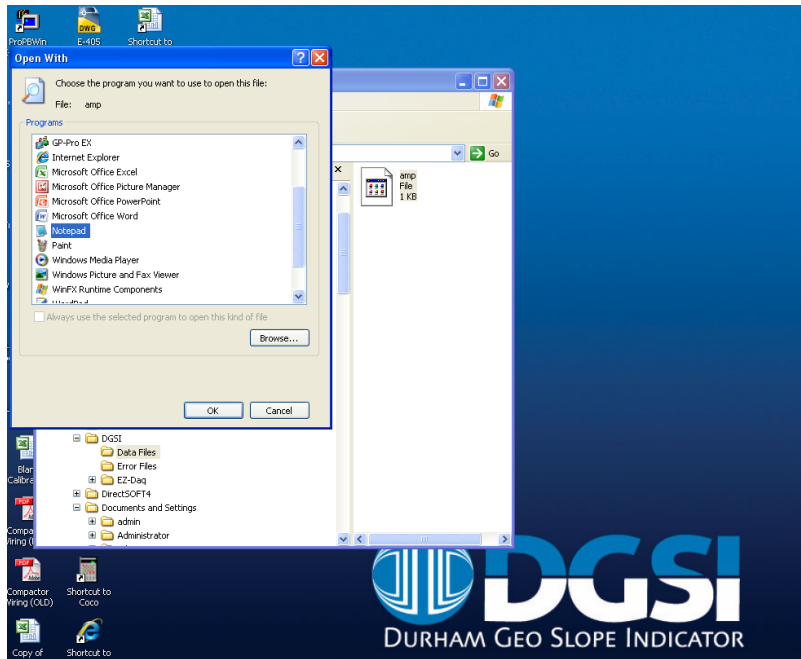
The software does not make use of the SensorMaxRange parameters.

The DataPrecision numbers set the decimal places. The INI file has individual settings for each sensor, starting the numbering from zero.

The items under [Sampling Intervals] set the default number of samples and how far apart to take the samples in seconds. You can set the sampling rates in the main program, but if you run many tests using the same number of samples and intervals, setting them here will save time.

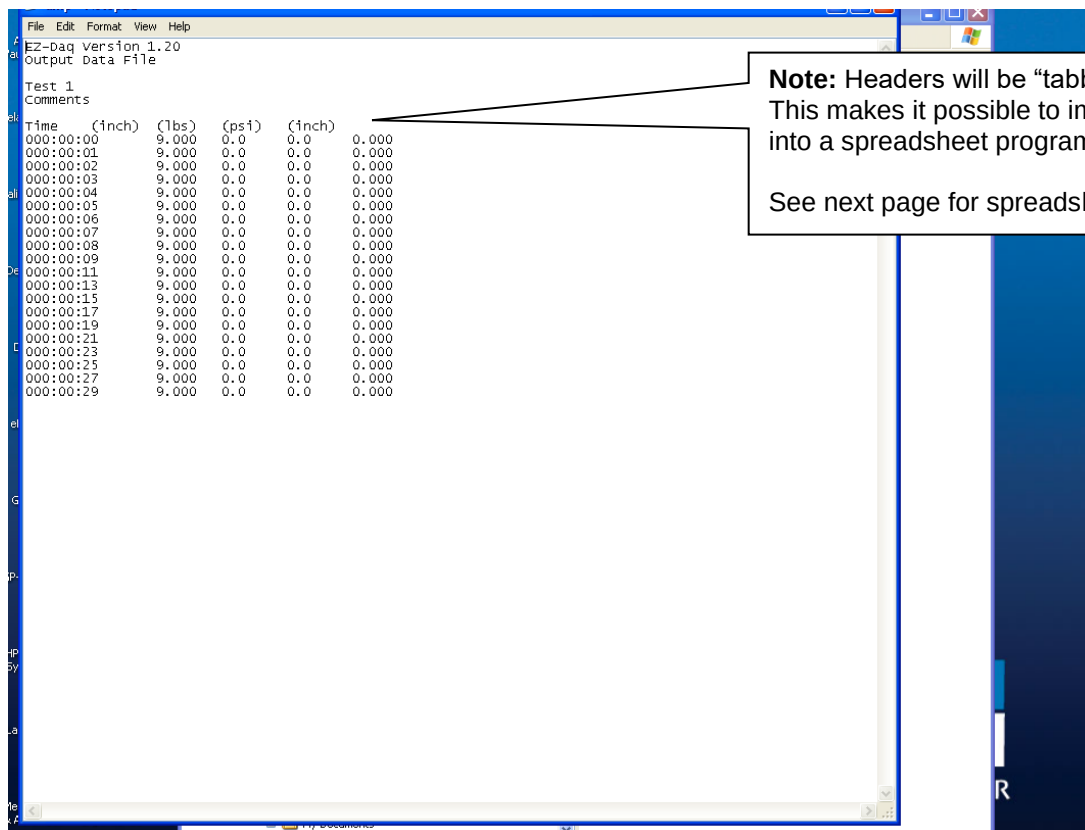
The setting under [DGS Soil-Daq] to hide a window does not have any effect in current Windows versions.

5.0 Displaying Your Results



The EZ-DAQ software creates an output file as soon as you click “Start Test.” The default folder is C:\DGSi\Data Files, but you can change the location in the file dialog or change the default folder by editing the INI file.

The file is a plain text which you can import into a spreadsheet program like Excel or LibreOffice Calc. If viewing with a text editor such as Notepad, the headers on the column will be offset one tab to the left of the columns. The columns will line up correctly if imported into a spreadsheet program.



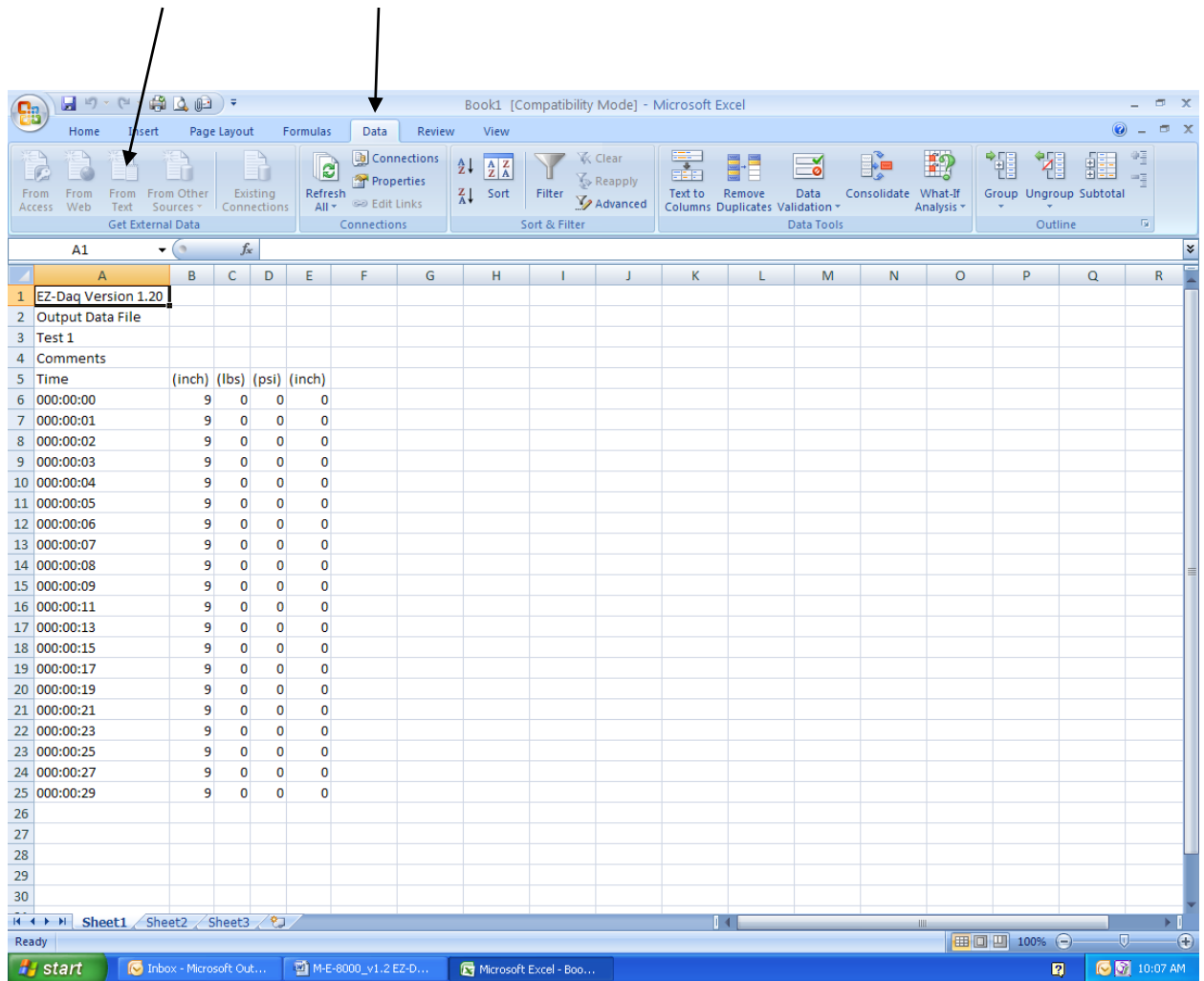
Note: Headers will be “tabbed” over a space. This makes it possible to import delimited data into a spreadsheet program.

See next page for spreadsheet example.

The following image is an example of exporting data to a spreadsheet.

“From Text “

“Data” tab



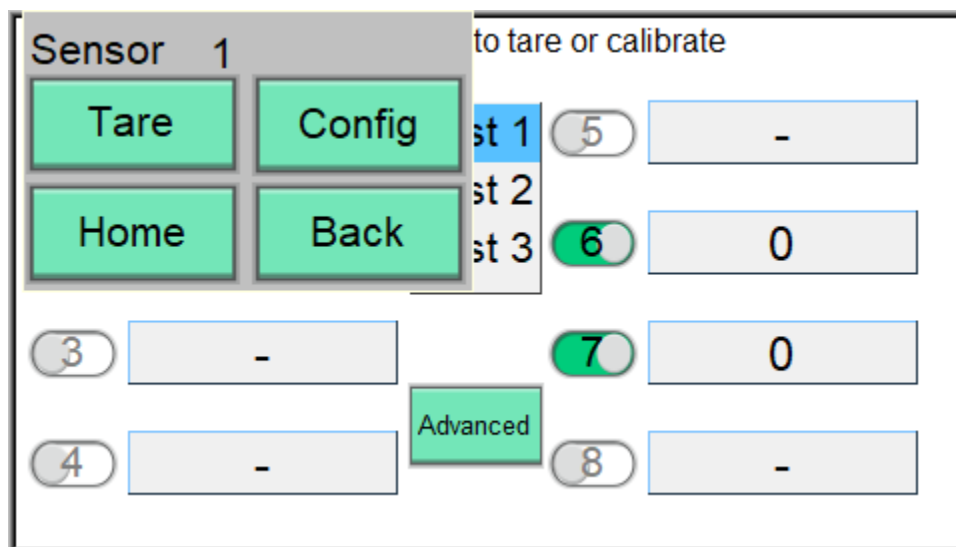
The above Microsoft Excel 2007 spreadsheet file was imported using the “Data” tab and “From Text” button to use the delimited setting.

CALIBRATION

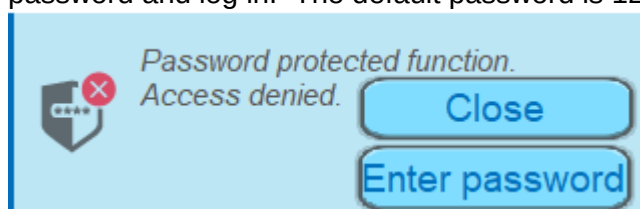
1.0 Sensor calibration

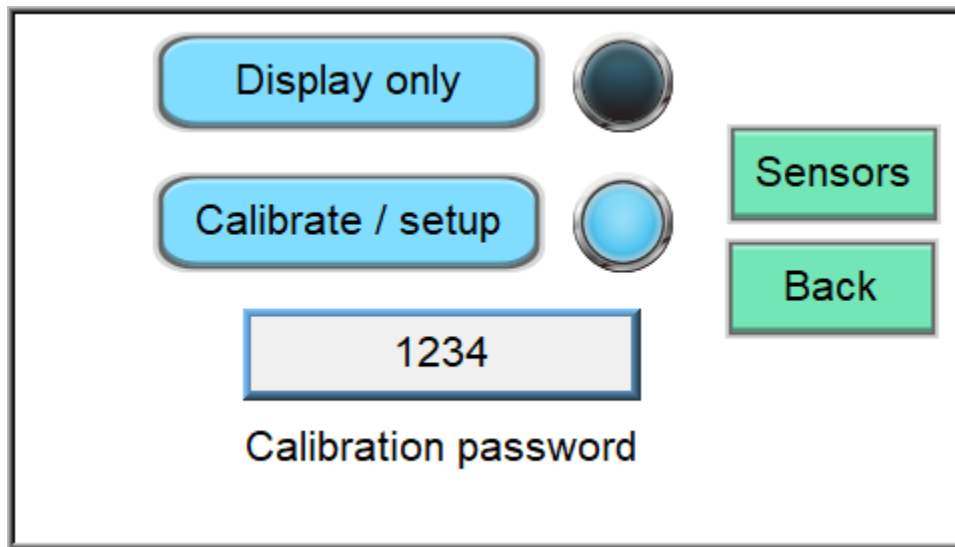
Note: Normally DGSi will build and calibrate the EZ-DAQ and sensors as a matched package to order. DGSi offers recalibration to NIST-traceable standards if you send in the EZ-DAQ and sensors as a matched set. This chapter is intended for certified calibration technicians who already have a standard procedure and equipment for calibration; it just covers the settings one would adjust on an EZ-DAQ as part of an overall calibration procedure.

The EZ-DAQ does not require a computer connection to calibrate, and current EZ-DAQ computer software does not have any functions that affect calibration. Calibration readings are stored in non-volatile memory inside the EZ-DAQ unit and will remain when the unit is powered off.



To calibrate a sensor, push the sensor reading indicator and select the “Config” button in the screen that pops up. If you are not logged in, the EZ-DAQ give you the option to enter a password and log in. The default password is 1234.





Display only

Calibrate / setup

1234

Calibration password

Sensors

Back

Once you are logged in, you can access the sensor calibration screen.

Sensor no.	1	Units	Inch
	mV	ADC	Reading
Low input	-3.51	32000	0.00
High input	14.79	36000	1.00
Current	-150.00	0	-8.00
Back	Input Range	Decimals	2
		Tare	0.00

The top row displays the sensor number and the name of the units for the sensor. Selecting the unit name will allow you to change the name. If you wish to convert a sensor from reading English to metric units or vice versa, you will also need to convert the low reading, high reading, and tare values from the old units to the new ones.

The center of the screen is divided into low input, high input, and current values. Each of these has three associated numbers. The mV reading is the voltage from the sensor in millivolts. The ADC (analog to digital conversion) is the raw number read from the analog to digital converter on a scale of 0 to 65535. The reading shows the value converted to engineering units. The low input allows setting the sensor reading at the sensor's lowest value – a load cell would have zero applied force, a displacement transducer would be fully extended, a pressure transducer would have zero applied pressure, etc. The high input reads the highest value the sensor is calibrated for.

The “Set Current” buttons allow the EZ-DAQ to automatically record the ADC readings at the low and high range of sensor input. Press and hold the button for one second to store the reading. A quick press will not trigger saving the reading to prevent accidentally resetting the calibration data. You can also select the ADC readings to use an on-screen keyboard to directly enter ADC readings. The EZ-DAQ calculates millivolts from the ADC readings and the millivolt numbers cannot be edited.

The lowest row allows other changes. The input range button brings up a screen allowing you to select different voltage based input ranges (shown at right). The decimals box allows you to adjust the number of decimal places to display. The tare reading displays and allows you to adjust the current tare. It's normally best to set the tare from the main sensor display, but you may need this feature if copying a calibration from one test set to another or troubleshooting sensor reading issues.

Input 1	+/- 10 V
	+/- 5 V
	+/- 1 V
	+/- 500 mV
	+/- 150 mV
	0 - 10 V
	0 - 5 V
	0 - 1 V
	0 - 500 mV
	0 - 150 mV

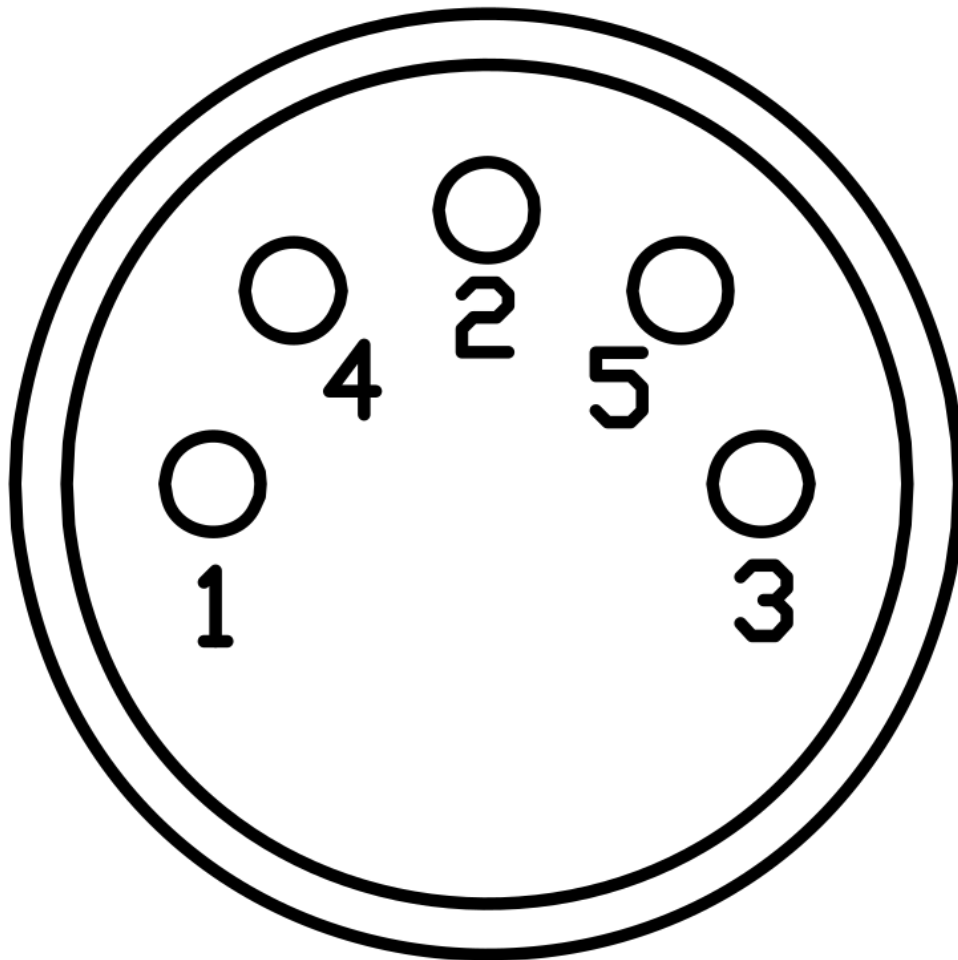
Normally, DGSi will build and calibrate the EZ-DAQ with a set of sensors when ordered. The EZ-DAQ requires recalibration if changing out one of the sensors, even if it is another sensor of the exact same type. We recommend recalibrating once a year. When sending the EZ-DAQ in for calibration, DGSi will need both the EZ-DAQ unit and the sensors to be calibrated.

2.0 Wiring

The EZ-DAQ uses 5 pin DIN connectors with the following pinout:

1. Sensor negative output
2. Sensor positive output
3. No connection
4. Ground
5. +10 VDC supply

The picture below shows pin numbering, looking into the connector on the back of the unit.



TROUBLESHOOTING

1.0 Troubleshooting:

Problem: EZ-DAQ panel shows values but they do not show up on PC software.

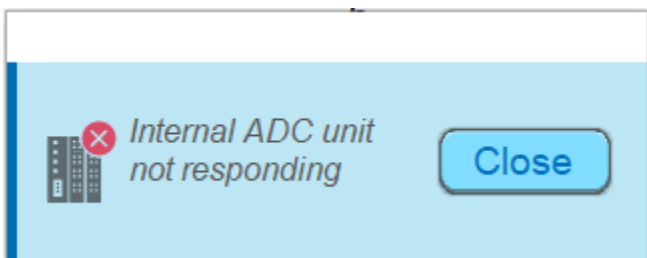
This indicates a problem with communication between the computer and the EZ-DAQ panel. Check to be sure the IP address shown on the EZ-DAQ (you may need to log into the Advanced settings to see this) matches the IP address given in the C:\DGS\EZ-Daq\Config.ini file. The default setting is 10.11.12.42. If using a USB to Ethernet adapter, confirm the USB adapter is working.

Problem: USB to Ethernet adapter not working.

The most common cause is the drivers not being installed. DGSi has used a variety of Ethernet adapters depending on availability. The EZ-DAQ CD includes drivers for the Belkin adapter. If using another adapter, try searching the Internet for drivers using the model number as a search term. Contact DGSi with the model number of your USB adapter if you are unable to find drivers for it or if reinstalling the drivers does not work.

Problem: EZ-DAQ panel unit turns on but shows **no** values in the boxes.

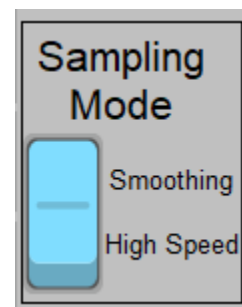
Confirm that the sensor is switched on (the switch next to its reading is green) and that the sensor contains valid calibration data. If the sensors are configured correctly and activated but do not show data, this may be an internal communication error between the front panel and the analog to digital conversion module or other internal glitch. Contact DGSi for support if this happens.



If this is accompanied by a message of "Internal ADC not responding", this indicates an internal fault. Contact DGSi technical support for repairs.

Problem: EZ-DAQ panel or software shows unstable values.

Confirm the sensor is securely plugged in and there is no damage to the sensor or cable. If you are not running tests requiring multiple samples in a second, use the advanced sensor setting menu to change the sampling mode from "High Speed" to "Smoothing". You can also use the ADC test to check the stability of the sensor reading; a correctly functioning sensor should not move by more than 4-5 ADC counts.



LIMITED WARRANTY

Durham Geo-Enterprises, Inc. / Slope Indicator ("DGSi") warrants the products manufactured by DGSi to be free of defects of workmanship and material on a product basis. The products accompanied by this Warranty Statement are warranted for a period of ONE (1) YEAR from the date of delivery to the customer. If the customer is an authorized distributor of DGSi's products, the warranty shall be for a period of ONE (1) YEAR from the date of delivery to the authorized distributor's customer.

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For further assistance:

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