



Q-Log Data Recording Software

Advantages:

- Free download for up to 10 Intelligent Sensors per network
- 36 sensors or interfaces on the professional version software.
- Operates with the Keynes Controls SDI-12 / RS-485 media converters
- Easy expansion using USB Ports
- Graphical User Interface for sensor configuration and data display
- Terminal screen to capture events & sensor diagnostics
- Digital Panel Meter & Chart Plotting for simple data examination
- CSV file format for easy upload into a spreadsheet
- Enables multiple network strings to be supported into a single PC
- Up to 256 Columns of data for each log file
- Multi-instance Operations



Q-LOG

Data Recording & Configuration Tool
For Intelligent Instrumentation



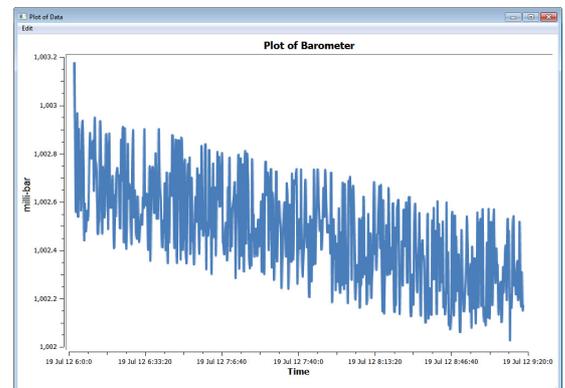
Options for SDI-12 &
RS-485 Digital Networks



**USB-SDI12-Pro
media converter**



Panel Meter Display



User-Defined Chart

1.0 Introduction

Q-Log is the Keynes Controls Data Recording and Display software and has been designed solely for use with intelligent sensors. The software operates as a stand-alone package and uses the Keynes Controls SDI-12 and RS-485 model dongles for communications to the sensors.

This software has been developed by Keynes Controls with the aim of ensuring data integrity and to remove where possible the Users requirement to understand programming techniques.

Q-Log gives the User a simple Windows environment for setting up and using intelligent sensors supporting the SDI-12 or RS-485 digital communications interface. Data is stored into a log file in CSV format for simply examination by a spreadsheet for uploading into a database. A series of panel meters and trend plots can be configured to display real-time results.

Q-Log uses a series of configuration files to define the setup and operation of a sensor. Any sensor or third-party interface that supports industry-standard commands can be integrated into the software without any requirement for complex upgrades.

Q-Log is modular and new applications can be added or custom developments undertaken on request.

A Quick User Guide can be found on page 30.

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Supported Operating Systems:

Q-Log supports Windows XP, 7 and 8 Microsoft operating systems.

Minimum System Requirement:

1 G Hz Intel Processor 1 Gb RAM - any hard disk for data file storage.

Log File location:

Mydocuments/Q-Log/Log where Mydocuments is the standard Windows directory

Manual Download:

The complete package can be downloaded free of charge at:

<http://www.aquabat.net/downloads/QlogSetupv1207.zip>

Directory Location:

The files after installation can be found:

C:/NAME/user/My Documents/QLOG

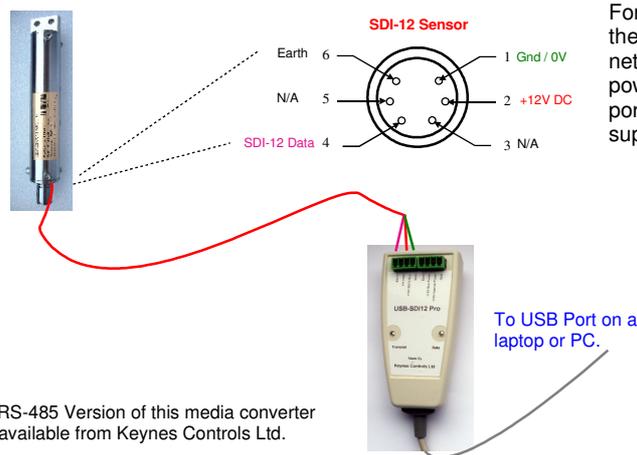
where name is Identifier for the computer.

IMPORTANT INFORMATION

For Microsoft 7 and 8 operating systems the installation Account Type has to be **'Admin'** as full access to the User file system for storage of the files.

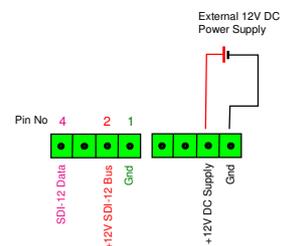
Administrator account is required for software installation.

USB-SDI12-Pro Media Converter Connections



No. 1 - 4 I-P-I Sensor Installation

For 1 to 4 I-P-I sensors simply connect them directly to the USB-SDI12-Pro network bus. The USB-SDI12-Pro device powers the sensors directly from the USB port of the PC without any external power supply.



Software Installation:

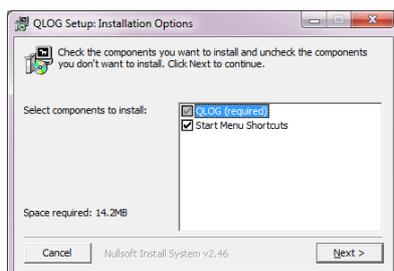
The Q-Log software loads automatically into pre-set directory structure.

Make sure the User account being used for the installation of the software is of type **'Admin'** -

- If this is not the case create a User account with **Admin** - See Control Panel - **User Accounts**
- Contact suitable IT personnel for installation rights.

Double-click on the **QlogSetupv1207.zip** file and follow the standard Windows software installation instruction

Setup Screen:



Press the 'Next' Button to start the installation

Press the 'Finish' Button at the end of the installation.

The information in this document is correct at the time of printing. Keynes Controls Ltd withhold the right to make changes without notice. Please contact Keynes Controls Ltd for the latest details regarding this product

2.0 System Expansion:

Q-Log is a fully-configurable general purpose data-acquisition system for sensors and interfaces deployed on the SDI-12 and RS-485 digital networks. It is ideally suited to fixed installations with distributed networks into multiple sites; sensor testing in a lab and for testing sensors and systems in the field.

In order to maintain data integrity and to simplify any post-processing operations, Q-Log runs as a separate program for each network that is installed. Should any network fail due to a problem with a remote sensor or cabling damage, then this will not prevent the rest of the networks from operating. Running separate networks isolates the PC from any problems and these can be fixed, removed or updated as and when required.

There is no practical limit to the number of different network strings that can be used.

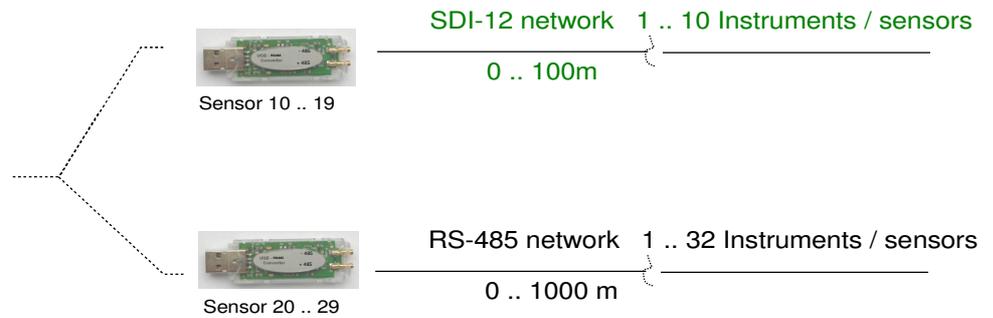
The image below shows 4 USB-SDI12/RS-485 media converters in use:

The professional Q-Log Software enables up to 36 sensors or instruments on a network

Select image to download a free copy of Q-Log

Example Network Type Installation Only - Free Version

Operates on all Windows Laptops / PCs / Tablets



The simplest form of data-acquisition system that can be created using Q-Log is by using the handheld media converter as shown below. A single device is perfect for testing sensors in the office, or lab, or for testing individual network strings when in the field.

Depending on the version of Q-Log in use, up to 10 sensors or interfaces can be used with the free version software; or up to 36 sensors using the professional version of the software on each network string.



Laptop / PC Computer

Media Converter
Part No USB-SDI12-Pro



USB Data Link

A key feature of the flexibility of Q-Log is its ability to operate with any third-party sensor, or to interface without the requirements for complex upgrades.

Q-Log uses a series of configuration files to define its operation and these can be appended or edited to allow third-party sensors not already supported.

All sensor configuration operations can appear in the tool menu system for easy access.

The only stipulation for sensor integration into Q-Log is that a sensor uses an ID string and industry-standard command sets.

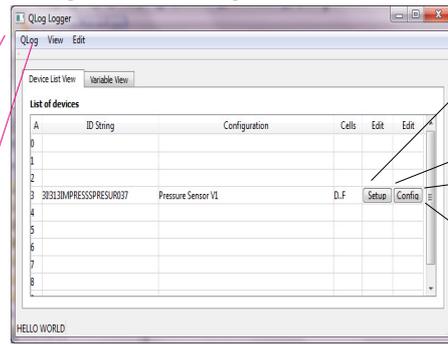
3.0 Software Windows layout

The details below demonstrate where to find the Q-Log configuration options:

Scan for Devices

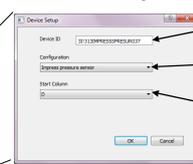
The Q-Log software scans the network and lists the identified instruments automatically. The network to be scanned is that specified in the 'Device Setup' Window.

'Q-Log Data Recording' Window:



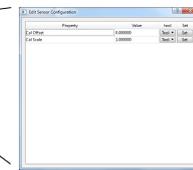
Display Identified Instrument/sensor list.

'Device Setup' Window



- Instrument ID String
- Configuration File Description
- Start Column for first data item in the Log file.

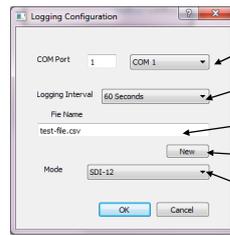
'Device Calibration' Window



- Sensor Offset Calibration Factor
- Sensor Gain Calibration Factor

(Example of use see page 34)

Logging Configuration Window:

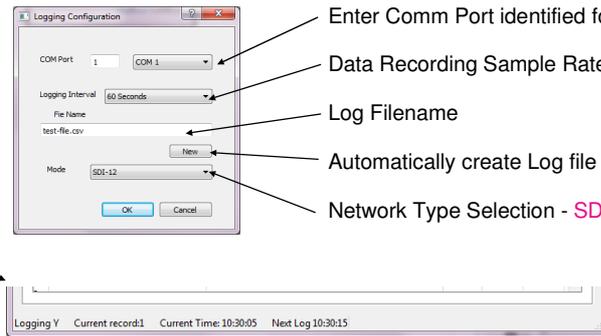


- Enter Comm Port identified for USB media converter
- Data Recording Sample Rate
- Log Filename
- Automatically create Log file name
- Network Type Selection - SDI-12 / RS485



Auto Assign:

Select the 'Auto Assign' menu option. The data log will be automatically configured for all the identified instruments. The User has the facility to manually adjust the Log file layout.

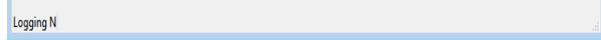


Title bar showing the Data Acquisition Status Message

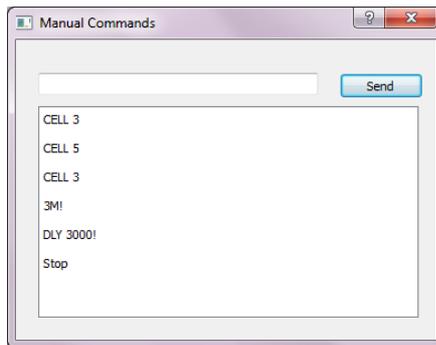
This status line only appears when the data acquisition operations are active.

Title bar showing the Data Acquisition Status: No Data

The status bar is clear indicating no data acquisition operations.

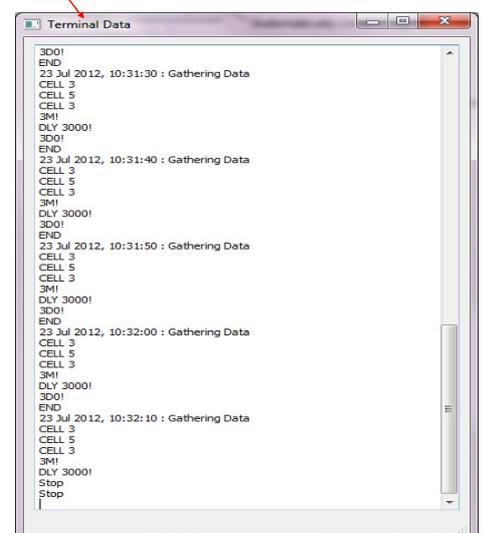


'Manual Commands' Window:



View results from the manual commands directly inside the 'Terminal Data' Window.

Console Window



GSM Remote Monitoring Configuration
Configuration Window for the automatic reporting operations when used with a GSM modem. Set the data download schedule is configured here.

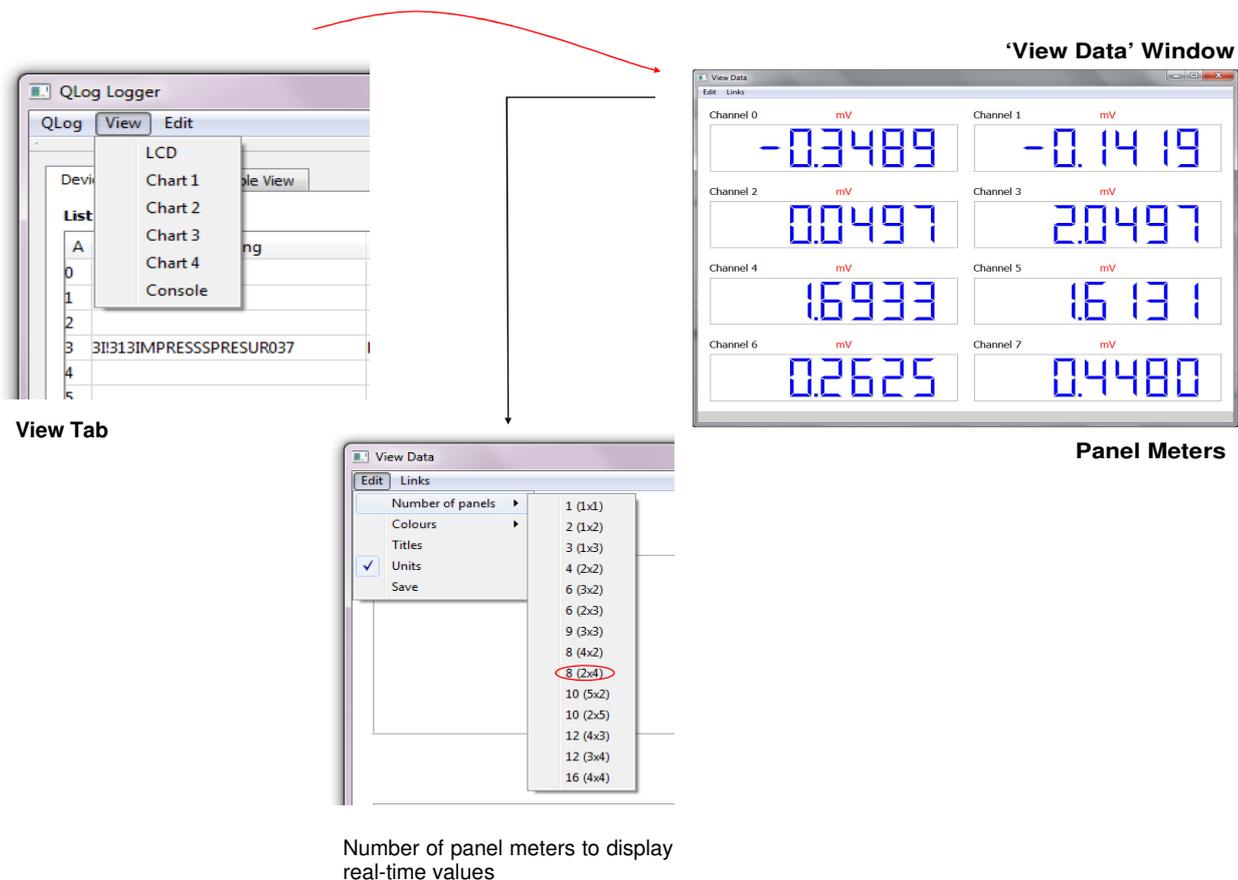
An example of the use of the **Auto Assign** option is shown in the VibWire-101 multi-channel data-acquisition system on page 20.

Configuring a Vibrating Wire data-acquisition system can be a complex task. Using the 'Auto Assign' option can speed up this process considerably. A single data log file is created with the columns compactly laid out and with the correct titles and units.

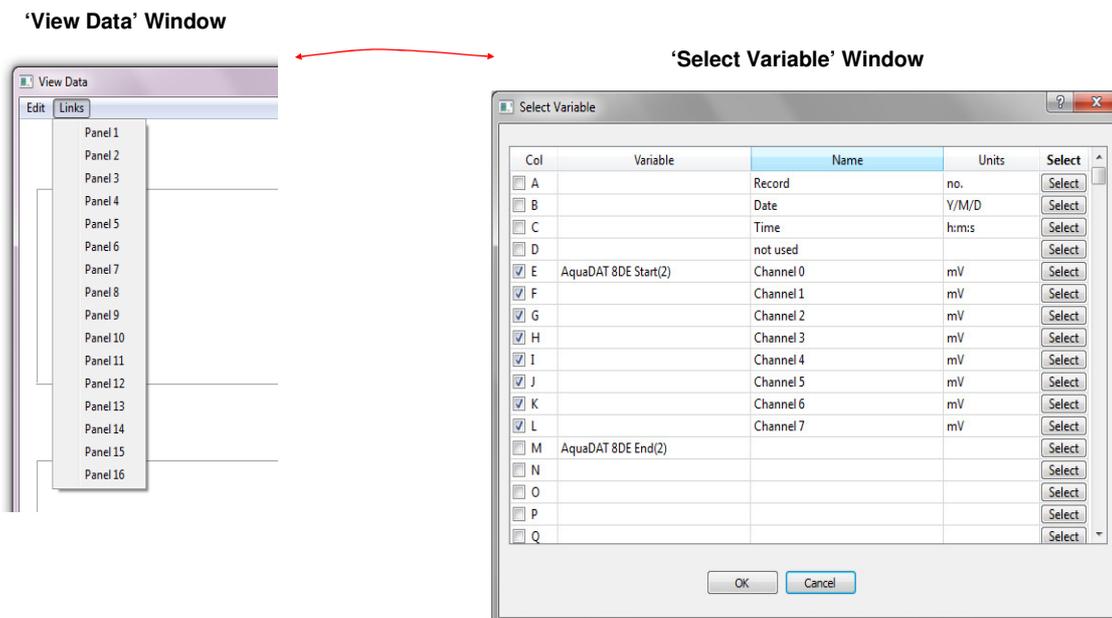
The 49 Channel VW data-acquisition system uses a spreadsheet format to assign the columns. The Auto Assign option calculates the cell positions D..AI = 32 cells, AJ.. AY = 16 cells and AZ..BA for the single channel VW-101. 2 cells are used for the single channel VW101 with Cell AZ for Freq and Cell BA for temperature.

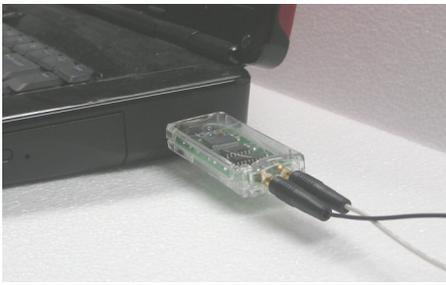
3.1 Selecting the number of Panel Meters:

The following Windows are used to setup the Panel Meter Display:



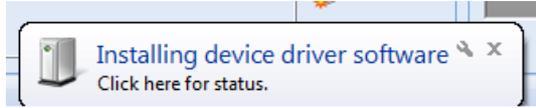
3.2 Panel Meter Data Selection:



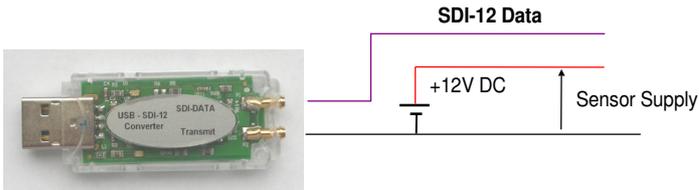


4.0 Network Dongle Installation - RS485 or SDI12

When the USB-SDI-12 or the USB-485 media converters are installed onto the USB port of a Windows operating system PC, or laptop, then a message similar to that below appears on the task bar. This message shows that the dongle has been correctly identified by the operating system and the driver is installing.



4.1 USB-SDI-12 Media Converter Wiring Diagram



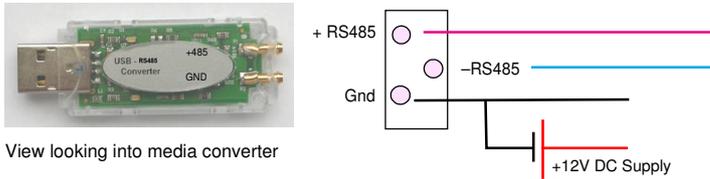
The dongle converts the USB port to a serial port for use with the sensors. The USB media converter is identified in the Windows operating system as a COMM port.

To find out which port is being used by the USB dongle go to:

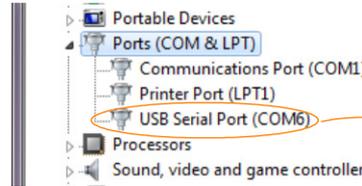
[Control Panel](#) → [System](#) → [Device Manager](#)

There are minor differences in the screens that appear when accessing the Device Manager Window from the different versions of the operating system, however they all show devices identified similar to the image below:

4.2 USB-RS485 Media Converter Wiring Diagram



View looking into media converter



COM 6 is shown identified by the operating system as being in use

5.0 Setting the COMM Port Number into Q-Log

Once the media converter USB dongle has been correctly identified by the operating system it can be used by the Q-Log software.

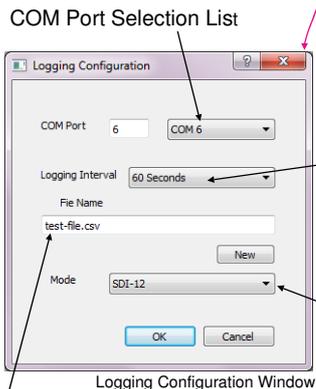
Q-Log currently uses a single USB dongle and this gives the User up to 256 columns of data to be recorded at any one time.

From the Q-Log Tab select: '**Configuration**' menu option.

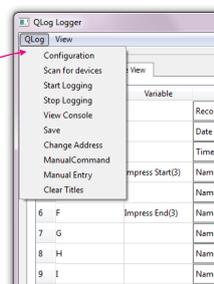
The '**Logging Configuration**' Window will appear.

Select the Comm Port used by the USB media converter from the pull-down list.

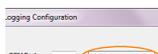
In the example opposite **COM 6** has been identified previously as the port in use by the USB dongle



Data Log File Name & Storage Location



Sample Rate



Enter the COM Port number identified in Device Manager List here.

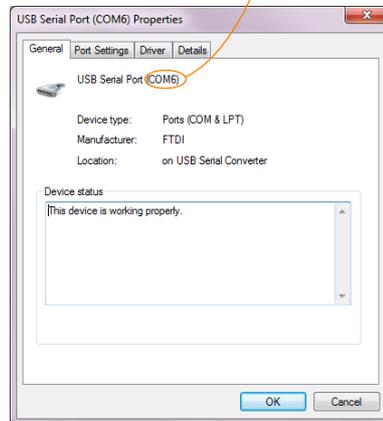


Select the Network Type

The network type is printed on the label of the media converter

Options: **SDI-12/RS485**

COM 6: This is the port number used in the Q-Log setup to identify the media converter dongle port.



This image is taken from the 'Properties' tab of the driver for the USB dongle.

The window shows the dongle installed and operating correctly.

5.1 Network Type Selection

Select the 'Mode' button

The network type options **SDI-12** & **RS-485** options will appear.

Select the correct network type from the list.

Press the '**OK**' button to confirm the network type.

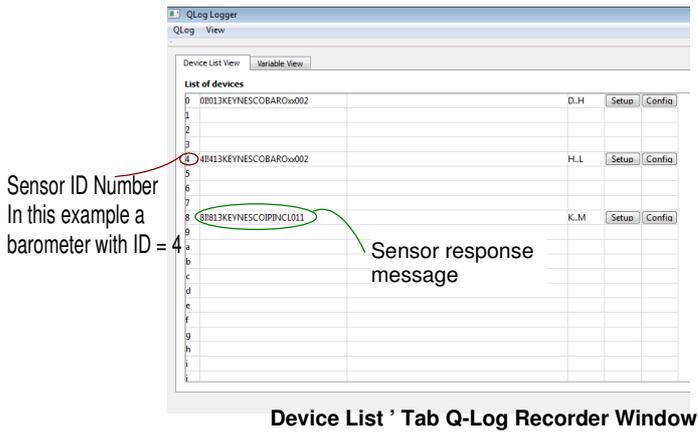
6.0 Scanning for Devices / Sensors:

The Q-Log software scans the network for the intelligent sensors or interfaces and displays each device in a table.

As each device is identified its ID number and response tag is shown in the table below. It is important that all sensors have a unique ID number in order for them to be correctly identified.

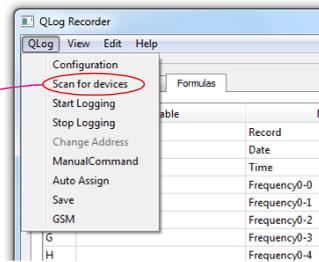
From the 'Q-Log' Tab select: 'Scan for devices' option.

A table similar to that shown below will appear:



Device List ' Tab Q-Log Recorder Window

The image below shows the Q-Log main menu

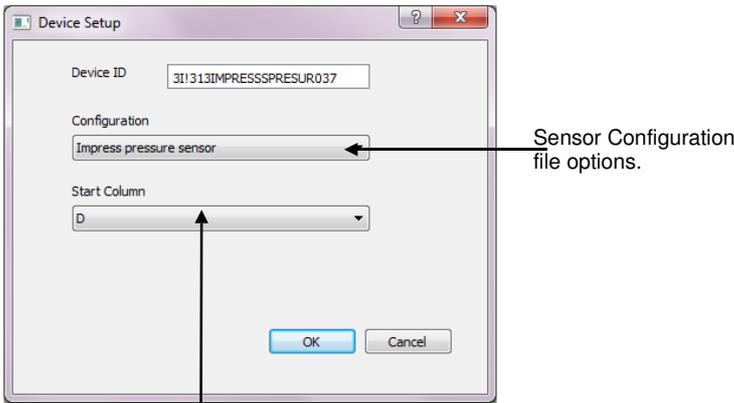


The Q-Log software has the network type assigned

Scan for devices makes locating and using the various sensors and interfaces a simple operation.

6.1 Device Setup:

1. Select the 'Setup' Tab and the following window will appear.

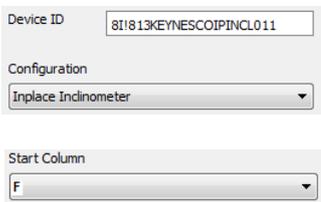


'Start Column' Selection Tab

Example: Storing data from a Dual-Axis I-P-I with ID=8 into a data file. This example is based on the 'List of devices' shown in the screen above.

The Dual-Axis In-Place-Inclinometer returns **3** data values by default. These are: X Axis (mm/m), Y Axis (mm/m) and Temp in Deg C.

Store the data into the 6th column of the data log, i.e., Column **F** where Column 1 = A.



Sensor ID=8 I-P-I Identifier

Standard Dual-Axis Configuration File

Store X-Axis data into Column **F**

Y-Axis will be stored into column **G** and Temp into column **H**. Additional parameters are stored into the next consecutive cell.

Once a sensor has been identified by the scan, a list of different configuration files supported by the sensor can be selected from the '**Configuration**' Tab.

Some sensors such as single axis I-P-I, have only 2 data items to send across the network, such as angle and temperature. For these sensors only a single Configuration file option is available. Any unwanted data can be ignored in the data table.

Other devices such as the VibWire-108 sensor interface have many optional configuration files due to the number of Vibrating Wire and temperature input sensor configuration options that can be used.

A VibWire-108 using only 2 sensor inputs will respond faster than a unit set for 8 sensors so choosing the best file to suit the application will speed up the measurement operation.

Action

Select the '**Configuration**' Tab.

A list of configuration files will appear in the form of a pull down menu. Select the most suitable file.

Storing Data

Select the '**Start Column**' tab:

A list of column locations in alphabetical order appears in the form of a pull-down list.

Select the 'Column storage location' letter for the start of the data storage.

Once the Configuration File and Column Storage parameters are set then:

Select '**OK**' to store the new option.

D
E
F
G
H

6th column in the data log

7.0 Starting & Stopping Data Acquisition:

Before starting any data-logging operation make sure that all devices on the network have been identified using the 'Scan for devices' option.

From the Q-Log Tab select: '**Start Logging**' option.

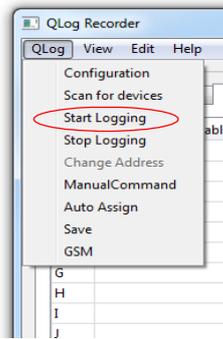
The blue status LED's on the media converter should start to illuminate when data is being transmitted.

The ✓ mark will appear by the 'Start Logging' menu option.

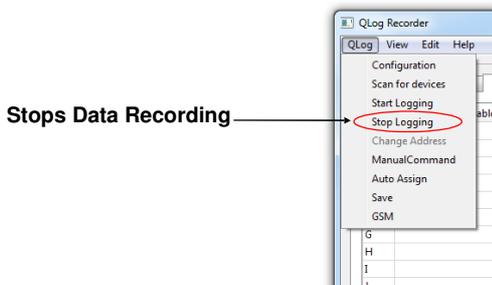
Stopping Data Logging:

Select the 'Stop Logging' Tab - see image below.

The status LED's on the media converter will no longer illuminate and the tick mark will disappear.



Start Data Acquisition



Stops Data Recording

8.0 Console Screen:

The Q-Log is provided with a Console window to show each command and response made by the sensors at each acquisition operation.

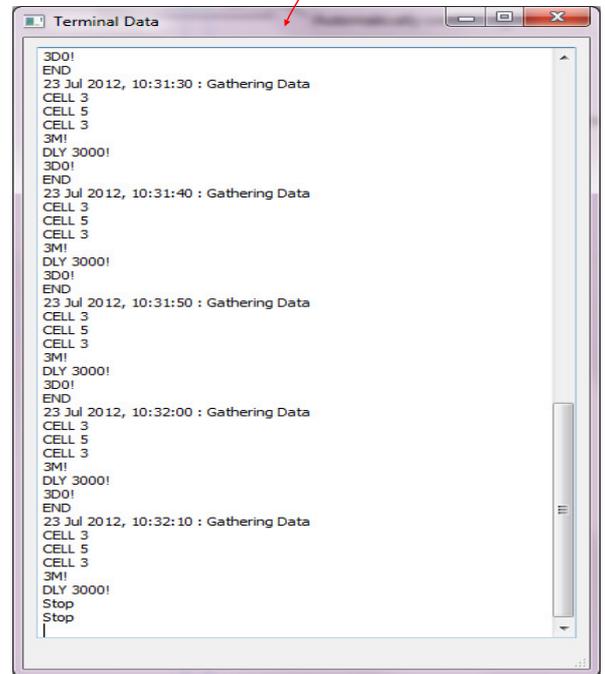
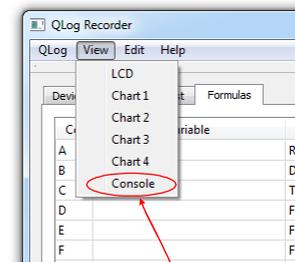
The window is ideal for diagnosing sensor setup problems.

The window saves only the last 1000 messages and instructions to the sensors.

Activating the Console Window

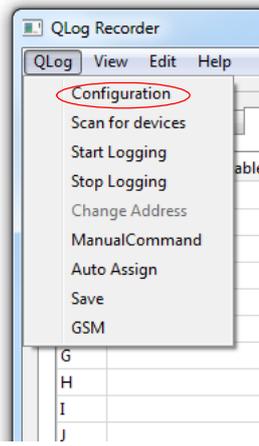
Select **View - Console**

The 'Console' Window shows the response from the sensors on the network or from the modem when undertaking remote recording operations.



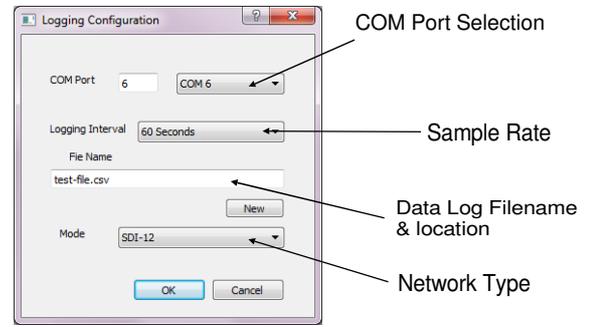
Console Window

9.0 Com Port Selection & Sample Rate Selection:

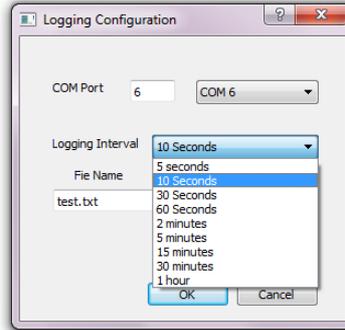


Select the 'Configuration' menu option
And the 'Logging Configuration' Window will appear.

Enter the 'Com Port' number for the USB
media converter being used.



Logging Configuration Window



Logging Time Period

10.0 Setting the Sample Rate

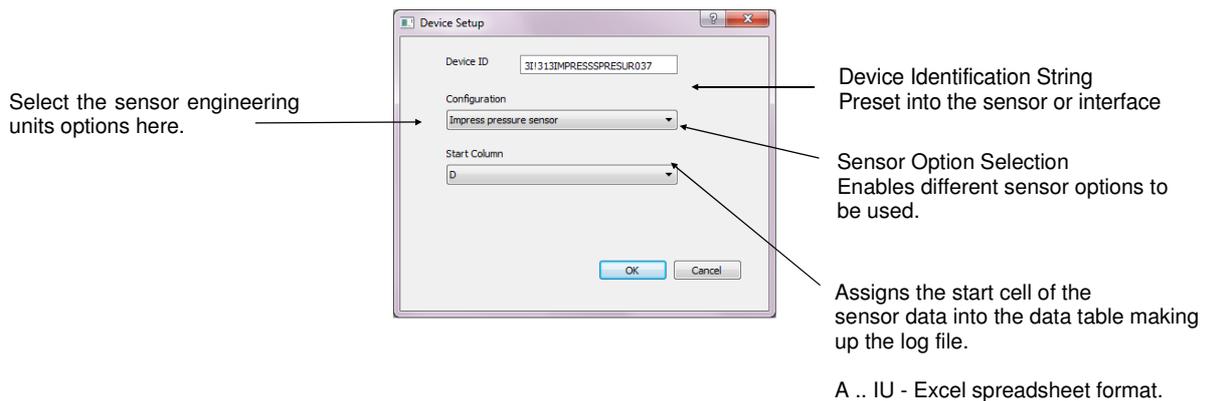
Select the 'Configuration' Tab from the main Q-Log menu. The 'Logging Configuration' Window will appear.

Select the 'Logging Interval' Tab. A list of possible samples rates will appear in the pull-down menu list.

Select 'OK' button to store the new sample rate.

The sample rate is set the same for all the sensors on a network.

Important Note: The fast sample rate is limited to the speed in which the slowest sensor responds.



10.1 Sensor Selection

Once the device on a network have been identified, then the different configuration options can be selected using the pull down menu list that will appear under the 'Configuration' title from within the 'Device Setup' Window, see above. The device options appear in this pull down menu list regardless of the type of network being used.

For example (See image above), a piezometer has been identified as ID=3 on a network. To adjust the sensor to use different engineering units, such as water height in units of mmH²O, mH²O, inches, then simply select the sensor configuration items from the available options list. The 'Configuration' menu system will list options available for the identified sensor automatically.

10.2 Manual Log File Layout Configuration:

There may be occasions where the manual configuration of Log file is required, for example, when adding a new sensor for a short period time. The columns in the Log file are identified like columns in a spreadsheet.

D = the first column to which User data can be assigned.

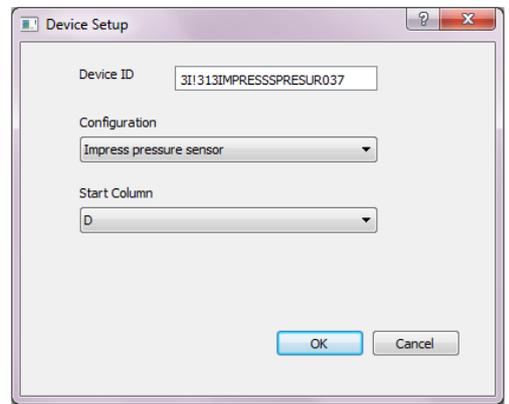
To manually adjust the location of a sensor or interface in the data log file:

Select the device to be configured from the 'Device List' Tab of the Q-Log window:

The 'Device Setup' window will appear.

Select the new starting position for the data using the 'Start Column' pull down menu.

Once the new cell position is selected press the 'OK' button to save the new configuration.



Example - Start column is D for a piezometer.

Important Note: Take care to check any configuration changes do not affect the recording of other devices on the network. Setting the same recording cell for multiple devices will corrupt the Log file.

Product:	ID string:
VibWire-101 VW sensor interface	13KEYNESCOVW101A011
VibWire-108 VW sensor interface	13KEYNESCOVW108A016
PIEZO-RM water level sensor	13KEYNESCOPRESR001
Barom-SDI-12 barometer	13KEYNESCOBAROMR003
I-P-I	13KEYNESCOIPINCL005
AquaDAT sensor interface	13KEYNESCOAQUDAT008
Single channel strain gage	13KEYNESCOSTRAIN027

10.3 Instrument Identifier Strings

The key to identifying a new sensor on a network is by the Identifier String. The identifier string is unique for each sensor type and instrument. This parameter has to be known for the specified sensor to be used within Q-Log. If this parameter is missing then the sensor will not be identified and its data will be ignored by the software.

10.4 AquaLOG data into Q-Log

The AquaLOG data logger stores data into an internal data table that references data in exactly the same way as the common spreadsheet packages such as Microsoft Excel. The first three values in each record are reserved and store the record number, date, and time respectively. The first free position in the AquaLOG data table is column 'D'.



AquaLOG Data Logger

AquaLOG Data Table Layout

A	B	C	D	E	F
Record No	Date	Time	736.01	1223.5	2334.7

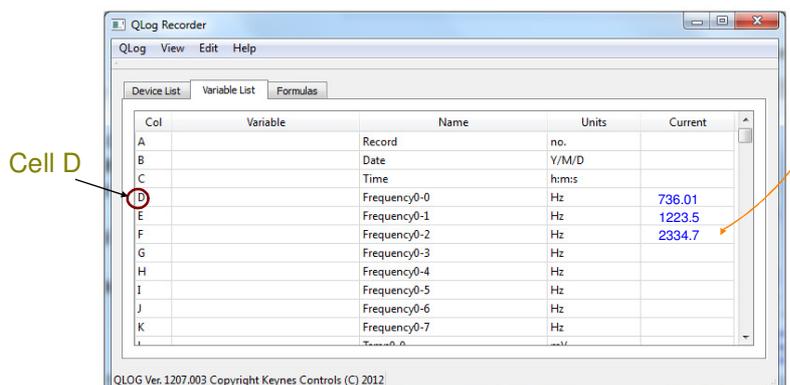
When data is downloaded from the AquaLOG it is stored as a CSV (Comma separated variable) text file.

The image opposite shows the 'Variable List' from the main Qlog Window and also demonstrates how the data values at cell positions in the AquaLOG data file are referenced in the 'Qlog' Variable List.

The AquaLOG log file cells are mapped to the same cell location in the Qlog Variable List.

Example

The example above shows Cell D in the AquaLOG data table is mapped to Cell D in the Qlog Variable List.



11.0 Charts:

The Q-Log software supports charts to show the overall trend for a specified data item in the Log file.

The free version of the software is limited to 4 simultaneous charts. Q-Log is not meant to be an in-depth analysis tool, which is best done in a spreadsheet or similar software.

11.1 Chart Configuration:

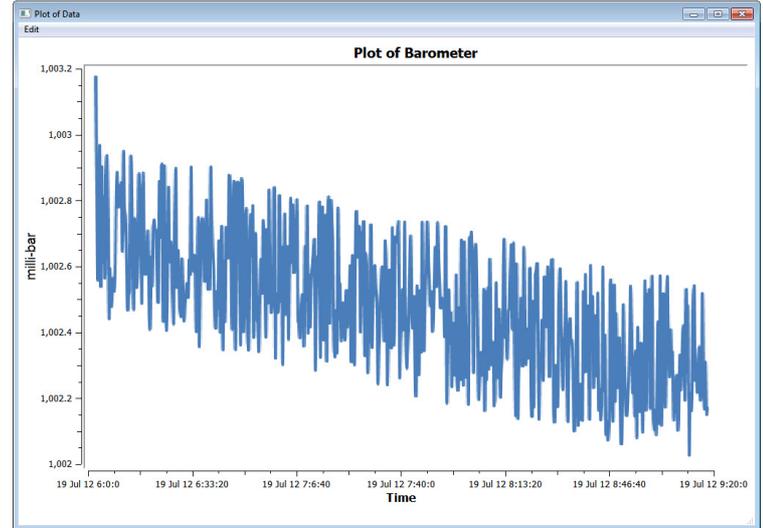
To make sure the software remains simple to operate the X- and Y-Axis auto-scale.

Y-Axis Units:

The Y-Axis engineering units displayed on the chart are set in the 'Variable View Tab' of the Q-Log window (see details on page 11). The engineering units are manually set so some knowledge of the application will be required in order to make sure these parameters are correct.

Chart Data Points:

The maximum number of data points that can be displayed into a single chart = 1000.



Barometer Chart

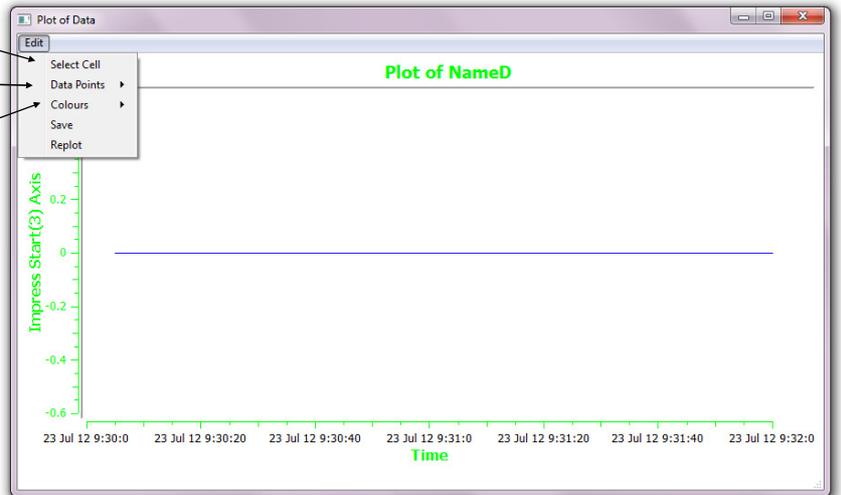
X-Axis Units

The X-Axis is always the time axis. The scale will depend directly upon the specified sample rate.

Select the 'Cell' to be plotted
This is any column on the
Log file.

Number of data points to plot
100, 200, 500, 1000, Current Log

Set the Data Series, Background and Axis colours.



Selecting a Chart

Select the 'View Tab' in the Q-Log window.

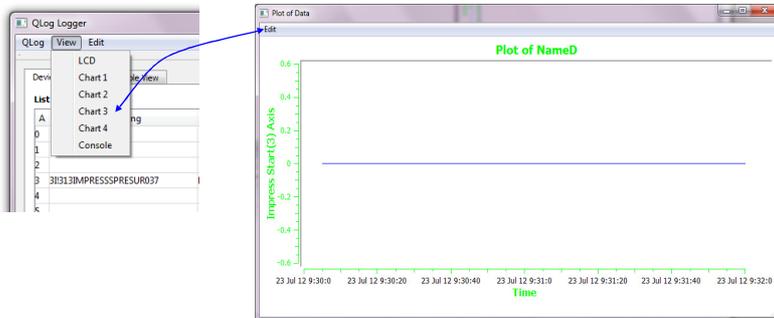
Select the chart to plot: options 'Chart 1 .. Chart 4'.

The un configured chart will appear.

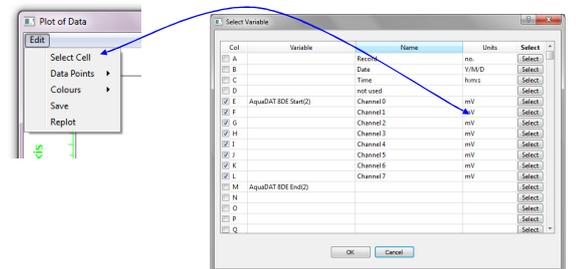
Select the 'Edit' Tab and a menu system will appear.

Press the 'Select Cell' Tab. The 'Select Variable' Window will appear.

Default Chart that appears before a cell is selected



Un configured Chart



The example above demonstrates the selection of 'Channel 1' for an 8-Channel differential input AquaDAT sensor interface to be displayed in a chart.

Using the 'Select Variable' window:

Press the 'Select' button for the channel to appear in the Chart.

The Chart Window will appear.

The example above demonstrates the selection of 'Chart 3' for the next data plot.

Once a chart is configured it can be left running in the background. Additional charts can be configured at any time.

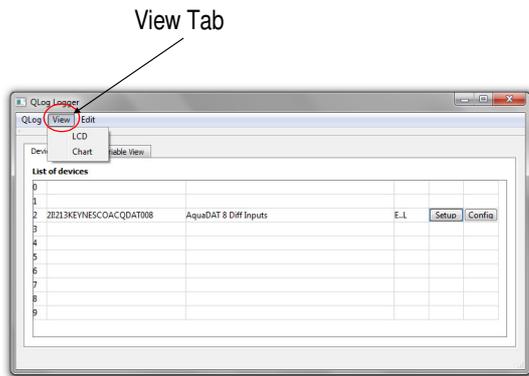
For slow sample rates set the number of points to 'Current Log'

12.0 LCD Panel Operation:

Data values from any single network can be viewed as a series of panel meters, or as a limited number of real-time traces.

The data that is displayed is limited to values from sensors on a single network only. If there are two networks connected to a PC, one being SDI-12, and the other RS-485, then only data values from the SDI-12 network can be observed together. Then data from the RS-485 network can be viewed by running another version of Q-Log and having it setup to operate with the other sensors.

The example below shows a single AquaDAT interface configured for 8-Channel Differential Inputs with an ID = 2:



12.1 Displaying Data

After the network scan and all of the instruments or sensors have been identified, it is then possible to select the parameters that are to be displayed. Q-Log does not display all the possible parameters of which it has the capability of storing and requires the User to select the values of interest.

Minimising the number of windows in the package ensures that the PC resources being used for data recording and display purposes are never overstretched. The data recording and displays will update reliably and this leaves the computer free for other applications.

1. Select the **'View'** tab

The options to select panel meter or chart display are shown.

12.2 Panel Meter Display Layout Options:

Q-Log can be configured to display real-time values in the form of a series of panel meters. The panel meters are displayed in the form of a grid. Each panel meter can show the real-time data value, Channel Name and Units.

Setting the number of Panel Meters:

Using the View Data Window:

Select the **'Edit'** Tab

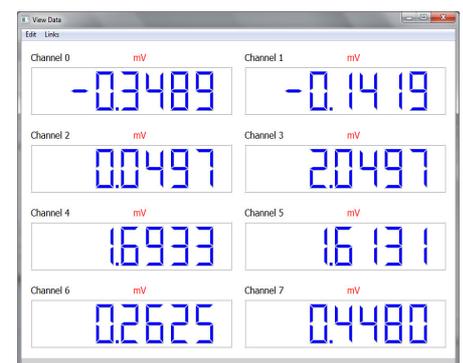
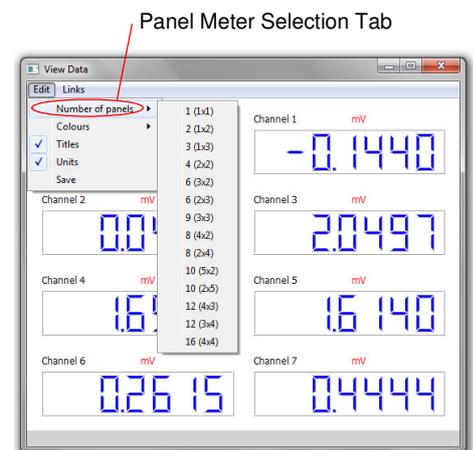
Select **'Number of panels'** tab

The list of possible panel meter display options will appear.

The display options show Row x Column. 4 X 2 = 4 rows 2 columns.

The example opposite shows a 4 x 2 Display

The example windows opposite were created based on using a single AquaDAT sensor interface configured for 8 differential inputs.



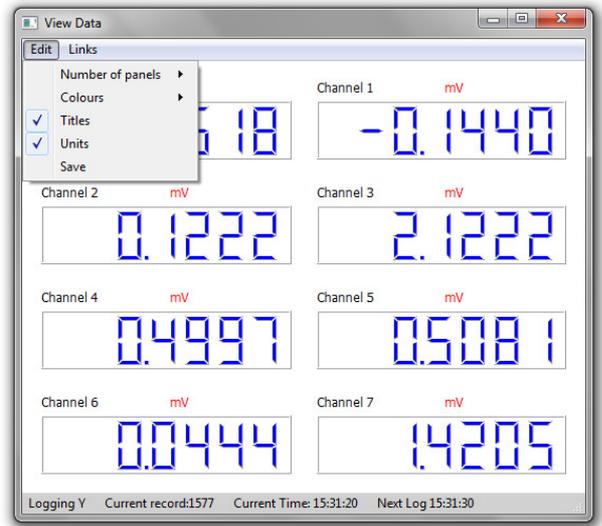
4 x 2 Panel

12.3 Panel Meter Titles - Units - On / Off:

The panel meter display can be configured to show a 'Title' and 'Units' for each parameter being displayed.

The settings for the Panel Meter display are globally set for each page.

Title Units



Switches Titles On/Off on the Panel Meter Window:

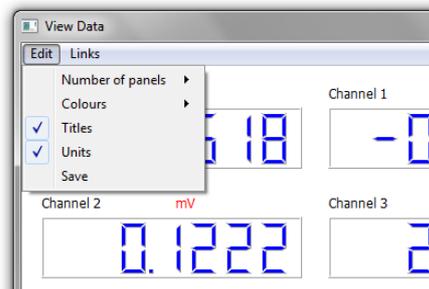
The LCD panel meter display can be configured to display or remove the data item Title and Units.

Using the 'View Data' Window:

Select the 'Titles' option :



With tick mark selected the Title will be displayed.



12.4 Displaying Engineering Units

The engineering units that are displayed on the screens are simply entered into the table opposite as text. The sensors used to acquire the data have to be suitably configured into the correct engineering units. The example is going to insert engineering units for use with an AquaDAT with ID = 2 for channel 0.

From the 'Select Variable' Window

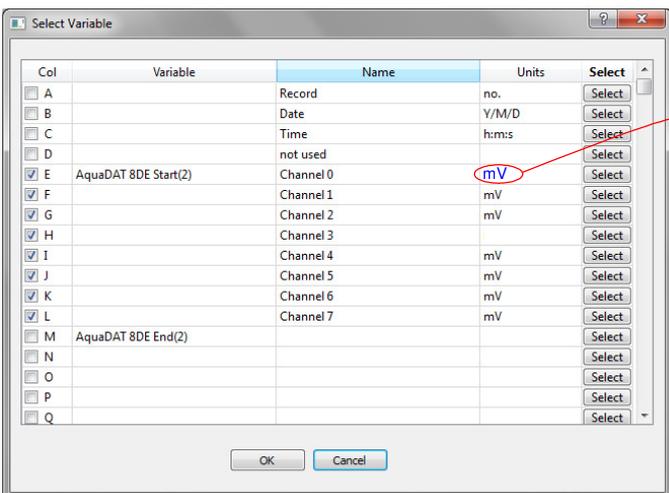
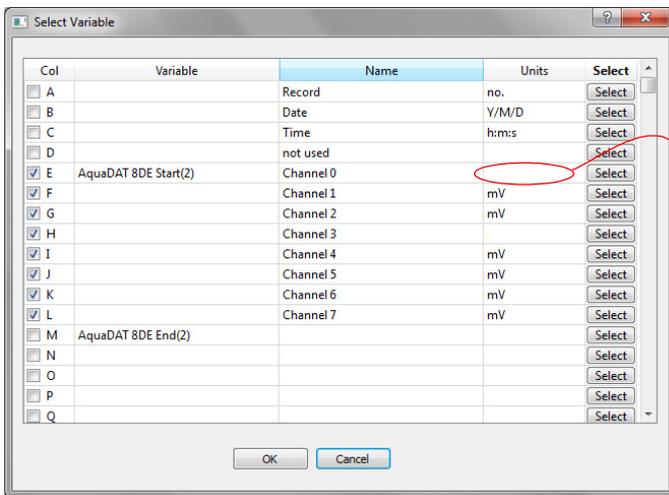
Select the 'Units' cell to be configured.

Cell to be configured

This cell can be edited and values deleted just like a cell in a spreadsheet.

Type the new 'Units' title into the specified cell:

In this example Channel 0 units is set to 'mV' .



Type 'mV' in the 'Units' cell for Channel 0.

The image opposite shows mV entered for channel 0 of

Repeat the 'Units', 'Titles' update for all the required cells.

Press the 'OK' button to store the new units.

13.0 Log Files

Data is stored in up to 256 individual columns as a comma-separated variable text file suitable for importing directly into a spreadsheet. The individual columns are identified in the same format as used by columns in a spreadsheet. Column D is the first User-defined location for data storage. Columns A .. C are already used by Q-Log to store Record Number, Date and Time.

Each time a new configuration is made and the data recording operations are started then a new heading line is written to the Log file. This action ensures that all related data is grouped together and that data values are clearly identified.

The Log file sample below shows how the log file will appear after a configuration change.

The column titles written to the Log file are those entered into the specified cells from the 'Variable List' tab from the main Q-Log window. The example below shows a Piezometer with the name 'Thames River 1' with units in 'm'.

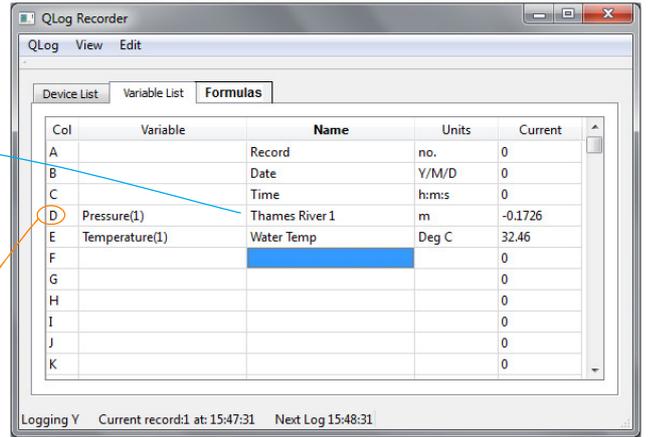
The Thames River 1 sensor water height data is stored into column D.

```
Record,Date,Time,,,,
0,26 Jul 2015, 15:42:41,-0.170500,32.889999,0.000000
1,26 Jul 2015, 15:43:00,-0.171000,32.830002,0.000000
2,26 Jul 2015, 15:44:00,-0.169800,32.730000,0.000000
3,26 Jul 2015, 15:45:00,-0.169500,32.470001,0.000000
Record,Date,Time,Pressure(1),Temperature(1),,
0,26 Jul 2015, 15:46:01,-0.000200,32.459999,0.000000
1,26 Jul 2015, 15:47:00,-0.170800,32.560001,0.000000
Record,Date,Time,Thames River 1,Water Temp,,
0,26 Jul 2015, 15:47:31,-0.172600,32.459999,0.000000
1,26 Jul 2015, 15:48:00,-0.171900,32.490002,0.000000
2,26 Jul 2015, 15:49:00,-0.172200,32.509998,0.000000
3,26 Jul 2015, 15:50:00,-0.172800,32.509998,0.000000
4,26 Jul 2015, 15:51:00,-0.172700,32.470001,0.000000
5,26 Jul 2015, 15:52:00,-0.170500,32.529999,0.000000
6,26 Jul 2015, 15:53:00,-0.172600,32.470001,0.000000
7,26 Jul 2015, 15:54:00,-0.172500,32.480000,0.000000
8,26 Jul 2015, 15:55:00,-0.173300,32.509998,0.000000
9,26 Jul 2015, 15:56:00,-0.172400,32.630001,0.000000
10,26 Jul 2015, 15:57:00,-0.171400,32.660000,0.000000
```

A B C D

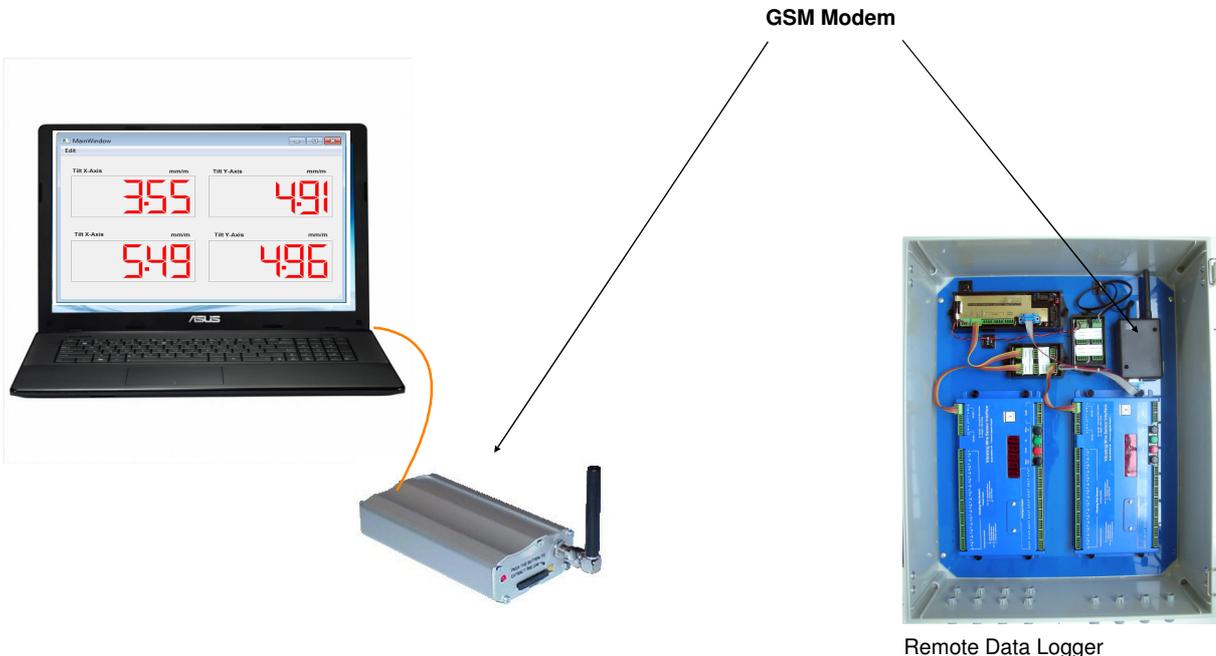
A = Record Number
 B = Date
 C = Time

Config Change



Remote Data Logger System

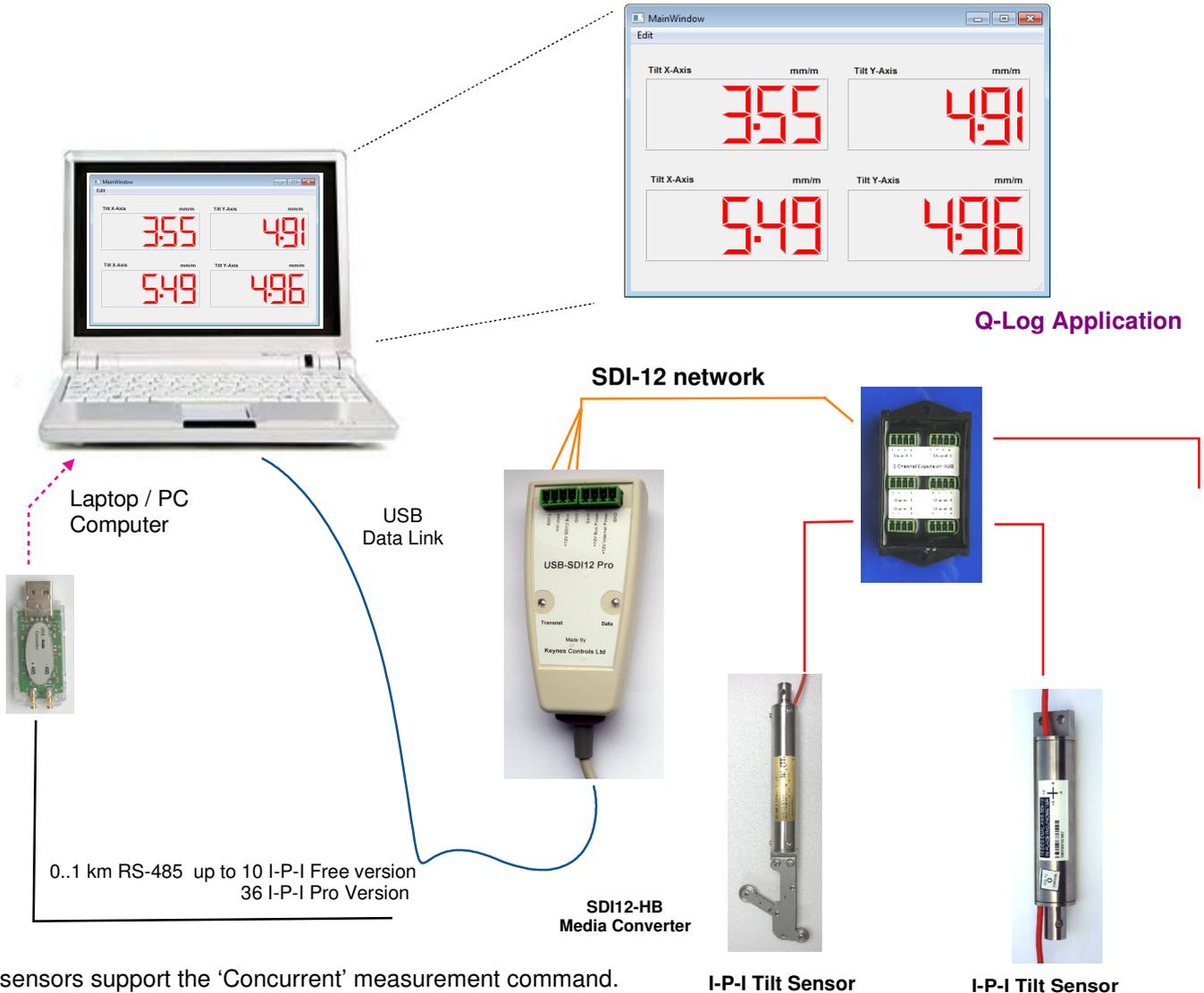
The diagram below shows the minimum system hardware required to create a remote data logging system.



14.0 In-place Inclinometer Data Acquisition System:

The diagram below shows how simple a PC-based inclinometer data-acquisition system can be put together using the USB media converter unit and the I-P-I range of sensors. All of the current inclinometers connect to a network and send values directly in engineering units into data recorders or PC / Laptop data-logging systems.

Angles and temperature values are all acquired and converted into engineering units within the sensor and then transmitted digitally across the network. This minimises noise and errors due to cabling losses and also has the advantage of fast installation and simple maintenance.



I-P-I sensors support the 'Concurrent' measurement command.

Theory of Operation:

Adding additional sensors to the system is very easy with Q-Log. Just plug the new sensor onto the network and 'Scan for devices'. The new sensor will be identified and the results appended to the log file.

Should a number of new devices be required and they are located some way from the PC then the addition of a new network may be the best option. Insert a new USB media converter into a spare USB port in the PC and start a further copy of Q-Log to identify and store results from the new sensors.

Each time Q-Log is running a new Log file separate from any other Log file is created. Each Log file is limited to 256 columns in order to simplify any data processing operations.

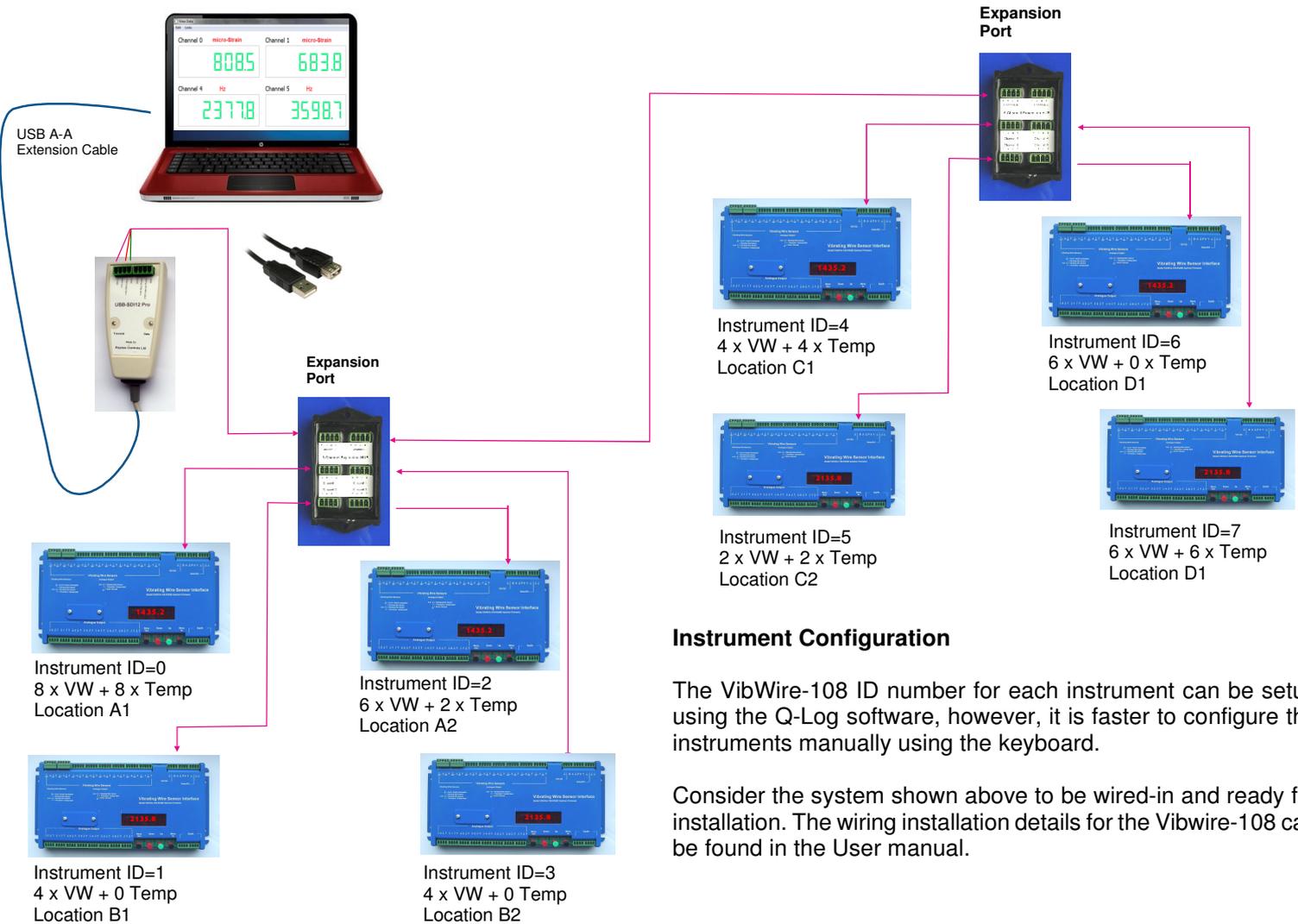
Auto-Zeroing

The I-P-I sensors are difficult to zero on installation. The Keynes Controls range of I-P-I can be automatically set to a starting angle of 0 degrees at the start of an acquisition operation and the results thereafter shown in the charts or on the LCD panel meter display.

15.0 VibWire-108 based Q-Log Data Recording Application:

The following example demonstrates a simple 8-unit VibWire-108 application that can be created using a single media converter and the **Q-Log** data recording and display software.

In this application the SDI-12 network has been chosen for data transmission.



Instrument Configuration

The VibWire-108 ID number for each instrument can be setup using the Q-Log software, however, it is faster to configure the instruments manually using the keyboard.

Consider the system shown above to be wired-in and ready for installation. The wiring installation details for the Vibwire-108 can be found in the User manual.

15.1 VibWire-108 Multi-instrument application:

A common application for Q-Log has traditionally been in the creation of distributed vibrating wire data-acquisition systems using the VibWire-108 interface.

It does not matter which network type is being used since all operations are transparent to the User and have a common interface.

Based upon the simple example above using 8 x VibWire-108 instruments, all the User has to do to create the application is to install the instruments and connect them to a suitable network media converter.

1. Start Q-Log
2. Make sure the USB media converters have been suitably identified and then '**Scan for devices**'.

Q-Log will identify the instruments on the network and produce a list of devices in the 'Variable List' tab (see details on page 18).

The '**Variable List**' shows a generic configuration of the instruments, and after they have been identified then all that is required is to set the suitable configuration option into the software.

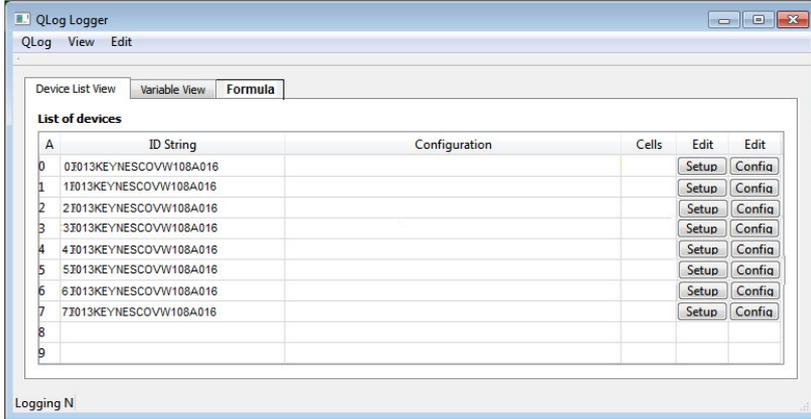
To simply any application set the VibWire-108 to operate with 8 sensors and simply select the correct number of channels for storage by Q-Log. The software ignores unwanted data values should they be sent across the network. To optimise the system for speed then the VibWire-108 instruments should be set to return only the number of data required by Q-Log.

15.2 An Example of VibWire-108 Data-Acquisition System Configuration:

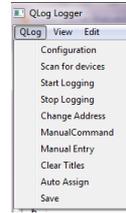
The following configuration details are based solely upon the example vibrating Wire data-acquisition system shown on page 17.

The Windows below show what

Stage 1 - Identifying the instruments on a network:



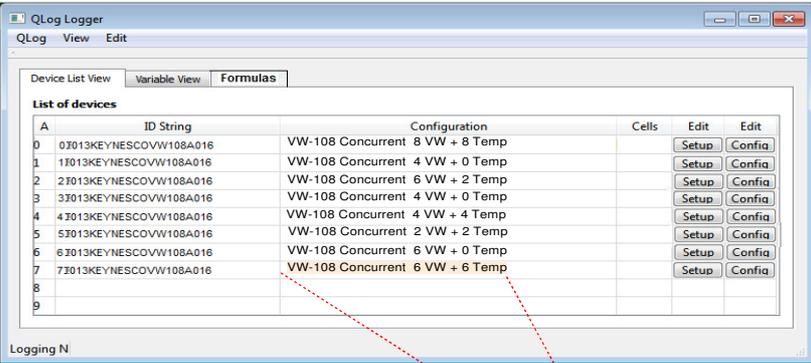
1. Scan the network for all available devices.



Select 'Scan for devices' menu option.

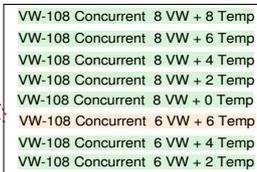
After a few seconds the Device List will update and show the updated table. The View Device table now shows the generic name for each device along with the ID number.

Stage 2 - Selecting the instrument configuration:



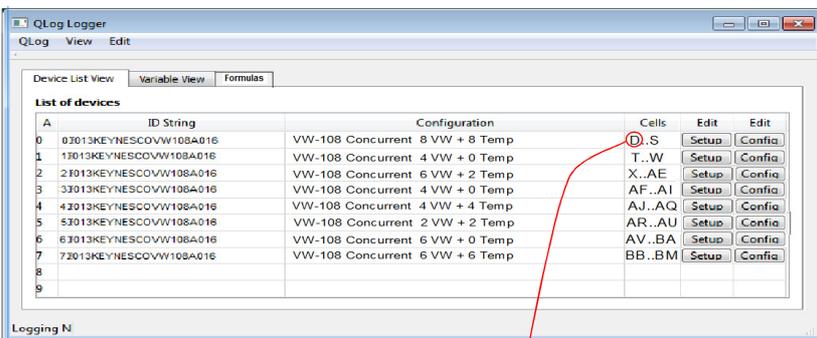
2. For each identified device press the 'Select' button.
3. Repeat the operation to configure all of the identified instruments.

The example considers the VibWire-108 instrument only, however, any other instrument or sensor on the network is identified and configured in the same way.

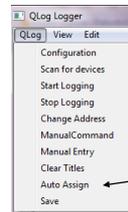


Select the 6 VW + 6 Temp sensor option

Stage 3 - Automatically configuring the Log File:



4. Press the 'Auto Assign' menu option.



Auto-Assign option From the main menu

First data item location

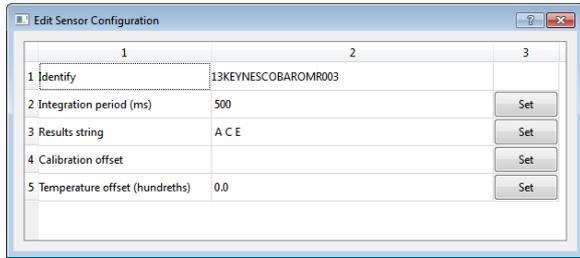
Column A	B	C	D
Record No	Date	Time	Data

For manual configuration simple press the 'Config' button and move the start position of the data to a new location. The new configuration setting will take effect as soon as the 'OK' button is pressed.

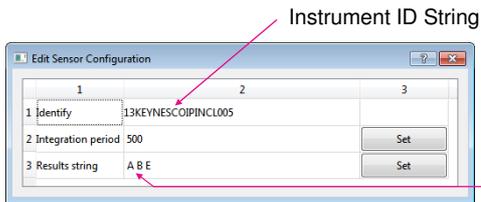
After selection of the 'Auto Assign' menu option then Q-Log automatically assigns the column locations for each data item being sent from the instruments. The Each column is identified in exactly the same way as that used in a spreadsheet. Column D in the results data table is the first free column into which User data can be stored. It should take just a few seconds to configure the Log File.

16.0 Sensor Configuration Files:

The images below show a sample of the device configuration files available with Q-Log. The configuration files can be edited to adjust their operation. Editing is done in any package that supports XML file structures. To add a new device to Q-Log simply edit one of the example files and store under a new name. All configuration files use the *.xml extension.



Barometer Configuration File

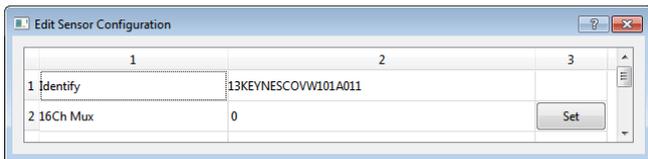


I-P-I Configuration File

The following example shows the parameters transmitted by a dual-axis I-P-I on receiving a 'Start Measurement' instruction. The parameters are preset into the instrument.

The parameters **A, B and E** refer to **mm/m - X Axis, mm/m - Y Axis, Temp Deg C**.

This version of the configuration file I-P-I returns 3 data values and these will be stored into consecutive columns in a Log file.



VibWire-101 with 1 x MUX-16/32 Expansion Unit Configuration File

17.0 Multi-parameter Sensor Configuration

Some sensors such as the PIEZO-RM range of sensors support a range of different configuration options to set parameters such as local gravity, engineering units, level offsets etc. Some management parameters such as the calibration date, range etc. may be required to be viewed by the User before deploying the sensor.

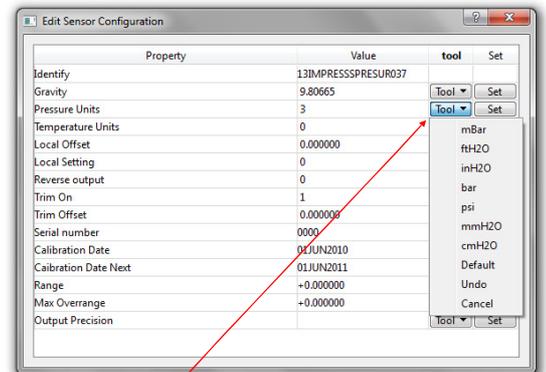
To observe management details such as the calibration date. Then



PIEZO-RM Water Level Sensor

From the 'Device List' Tab of the Q-Log Window

Press the 'Config' button adjacent to the the chosen sensor. See image below.



PIEZO-RM Configuration



For the PIEZO-RM range of sensors and no matter which digital network the device is deployed on, then the Configuration Window shown above will appear.

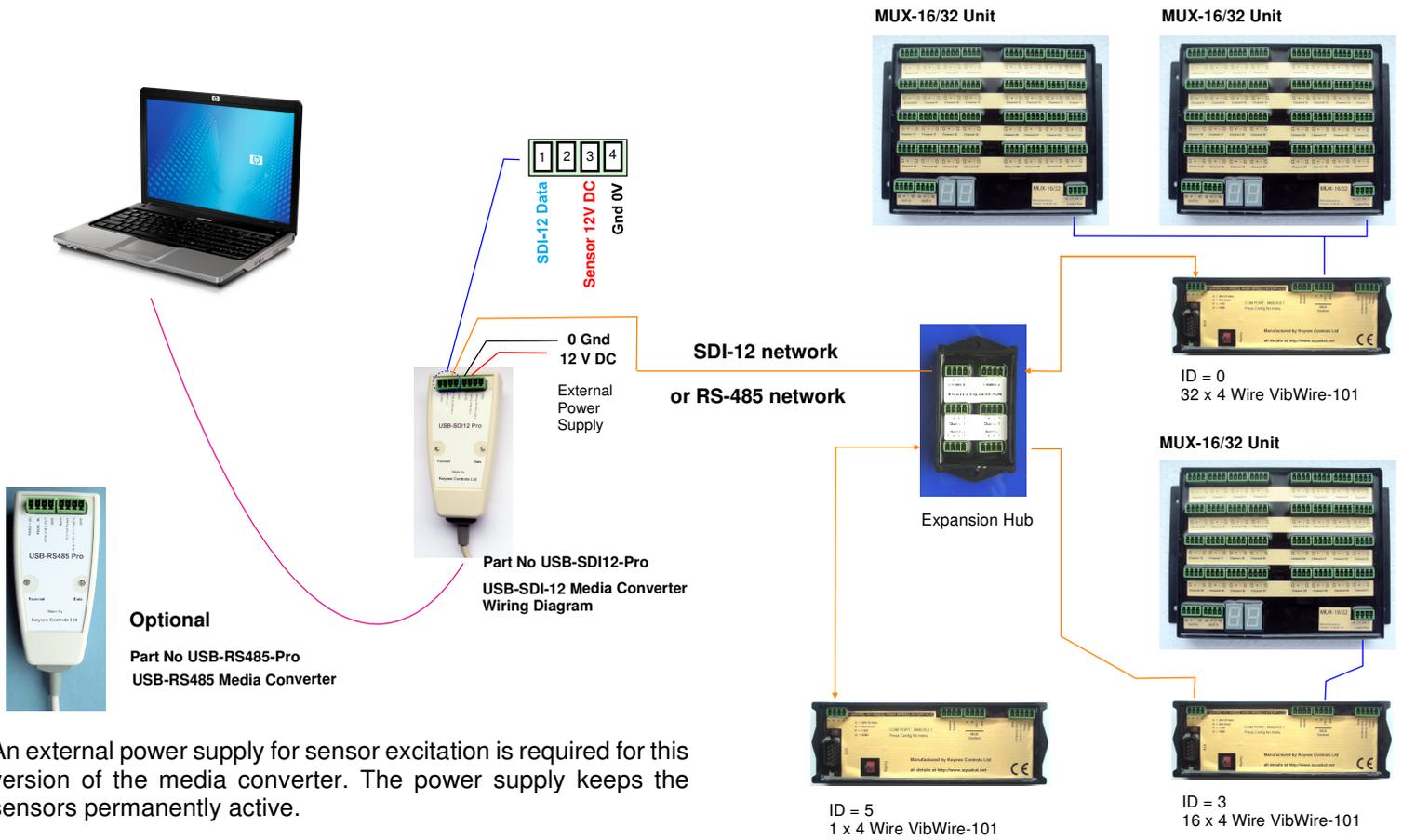
Select 'Tool' button adjacent to the parameter to be updated.

All of the additional configuration details that are shown in the menu system above are stored in the instrument configuration file.

Other sensors will have similar configuration Windows containing different options.

18.0 VibWire-101-based Large-Channel Count Q-Log Application:

The application below demonstrates how the Q-Log software is used with the VibWire-101 instrument to create a large-channel count vibrating wire sensor data-acquisition and display solution. The VibWire-101 is shown connected to the MUX-16/32 unit to offer either a 16 x 4-wire and 32 x 4-wire sensor interface. A single channel VibWire-101 is included to demonstrate how single-channel devices are handled within a large-channel count application.



An external power supply for sensor excitation is required for this version of the media converter. The power supply keeps the sensors permanently active.

Use the manual for the VibWire-101 to obtain the correct wiring details for this instrument and the MUX-16/32 unit.

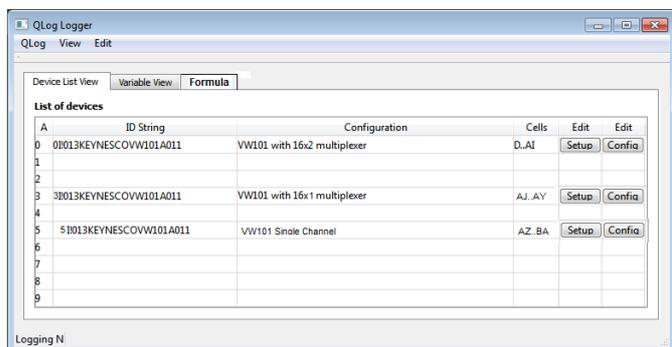
VibWire-101 Vibrating Wire Data-Acquisition System:

The individual VibWire-101 instruments are configured using the terminal port and RS-232/USB media converter. The VW-101 can only currently have a single sensor defined internally by the Q-Log. When the MUX-16/32 units to create large channel solutions then this device returns the results for each channel in digits (Hz^2). The formula processing in Q-Log adjusts the readings for engineering units.

Each instrument is

Once the 'Scan for Devices' operation is completed then the 'Device List View' Window will appear as shown below.

The 'Auto-Assignment' button automatically aligns the data table once the inputs are defined.



Download the VibWire-101 manual here

<http://www.aquabat.net/downloads/VibWire101UserManv3.pdf>

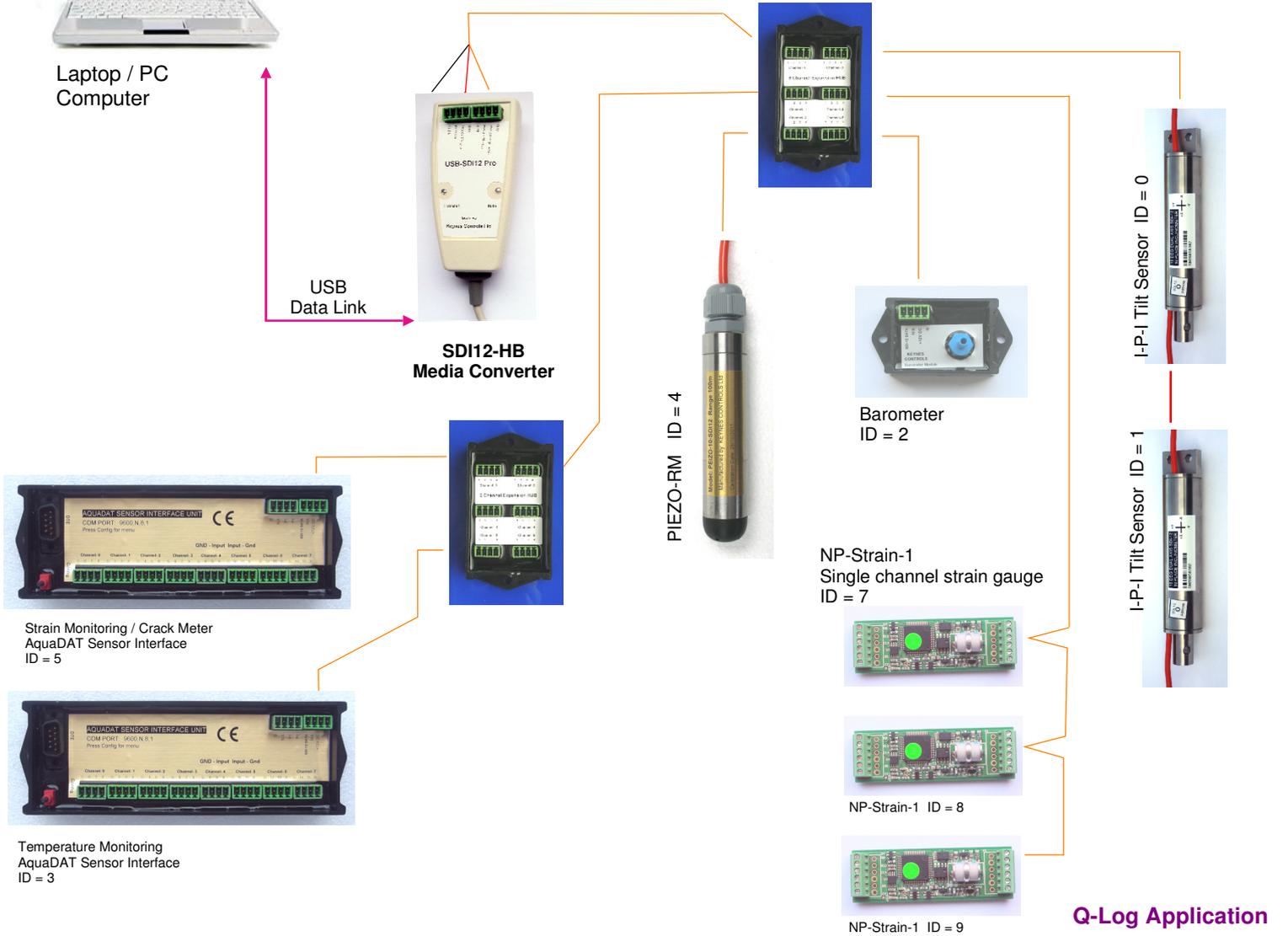
Example of the configuration Window used to to assign the VW sensor and temperature sensor parameters required to obtain engineering unit values back from the interface:

Col	Variable	Record	Name	Units	Current
1	A			no.	0
2	B	Date		Y/M/D	0
3	C	Time			0
4	D	Frequency Ch0(0)	Frequency	Hz	2535.4
5	E	Frequency Ch1(0)	Frequency	Hz	0.5852
6	F	Frequency Ch2(0)	Frequency	Hz	762.6
7	G	Frequency Ch3(0)	Frequency	Hz	764.3
8	H	Frequency Ch4(0)	Frequency	Hz	2100.8
9	I	Frequency Ch5(0)	Frequency	Hz	0
10	J	Frequency Ch6(0)	Frequency	Hz	2099.8
11	K	Frequency Ch7(0)	Frequency	Hz	750.9
12	L	Frequency Ch8(0)	Frequency	Hz	767.1
13	M	Frequency Ch9(0)	Frequency	Hz	1207.8
14	N	Frequency Ch10(0)	Frequency	Hz	1208.9
15	O	Frequency Ch11(0)	Frequency	Hz	1209.4
16	P	Frequency Ch12(0)	Frequency	Hz	762.5
17	Q	Frequency Ch13(0)	Frequency	Hz	1207.2
18	R	Frequency Ch14(0)	Frequency	Hz	2532.1
19	S	Frequency Ch15(0)	Frequency	Hz	1204.9
20	T	Temperature Ch0(0)	Temperature	Celcius	28.78
21	U	Temperature Ch1(0)	Temperature	Celcius	27.05
22	V	Temperature Ch2(0)	Temperature	Celcius	29.01
23	W	Temperature Ch3(0)	Temperature	Celcius	28.99

VibWire-101/VibWire-108 Sensor Interface only.

19.0 Example of a multi-instrument network system:

The following Q-Log example demonstrates the use of a range of intelligent sensors and the AquaDAT interface to form a simple geotechnical application. This example could simply be one of a number of distributed sensor systems around a site and can be expanded by incorporating additional USB media converters to the PC.



The example below demonstrates how the 'Device List' tab will appear for the sensors shown above. These instruments have been identified after a network scan and the data log configuration setup using the '**Auto Assign**' operation.

Notice how the data from separate sensors goes into consecutive columns in the results table. The data assignment has been made automatically but can be adjusted manually if required.

QLog Logger

QLog View Edit

Device List View Variable View

List of devices

A	ID String	Configuration	Cells	Edit	Edit
0	0113KEYNESCOIPINCL005	I-P-I Dual Axis + Temp	D..F	Setup	Confia
1	1113KEYNESCOIPINCL005	I-P-I Dual Axis + Temp	G..I	Setup	Confia
2	2113KEYNESCOBAROMR003	Barometer mH20 + Temp Deg C	J..K	Setup	Confia
3	3113KEYNESCOAQUDAT008	AquaDAT 6 DE Inputs	L..Q	Setup	Confia
4	4113KEYNESCOPIESR001	Piezo 10 m range	R..S	Setup	Confia
5	5113KEYNESCOAQUDAT008	AquaDAT 8 DE Inputs	T..AA	Setup	Confia
6	6113KEYNESCOPIESR001	Piezo 10 m range	AB..AC	Setup	Confia
7	7113KEYNESCOSTRAIN001	1 Channel Strain + Temp	AD..AE	Setup	Confia
8	8113KEYNESCOSTRAIN001	1 Channel Strain + Temp	AF..AG	Setup	Confia
9	9113KEYNESCOSTRAIN001	1 Channel Strain + Temp	AH..AI	Setup	Confia

Logging N

GSM Remote Monitoring

The Q-Log application has been designed and tested using Telit GSM modem. Other models can be used however the Hayes commands used to setup the modem may be different from those shown below.

The free version of Q-Log is limited to a single remote data logger outstation.

Modem Configuration

The following Hayes commands are used by the Telit GSM Modem

Modem : 9600 baud, 8 bit, no parity

PC Modem

AT+IPR=9600 baud rate
 AT#SELINT=0 original interface mode

 AT&D2 disconnect on DTR low
 AT&W save

Remote Logger

AT+IPR=9600 baud rate
 AT#SELINT=0 original interface mode
 AT&S0=1 auto answer
 AT&D0 ignore DTR
 AT&W save

Modem Model Number

Telit GT-864 modem : Tried and tested modem that has been proven to be reliable

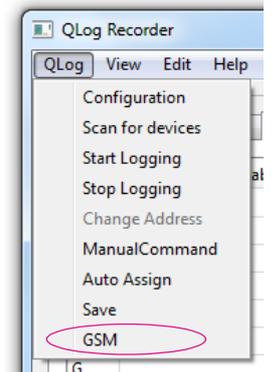
Modem Installation

To have the ability to download data upon demand then the modem on the remote logger has to be continually powered. The power management is now quite efficient

GSM Setup Options

To activate the GSM remote data download features

Select Qlog - GSM from the pull down menu. The GSM Dialog Window shown below will appear.



1st Download Time

2 ND Download Time

Modem Port Number

Number of columns in the log file.

Standard Download Times

Remote Out-station Modem mobile network data number

Day tab

Day of week Download selection

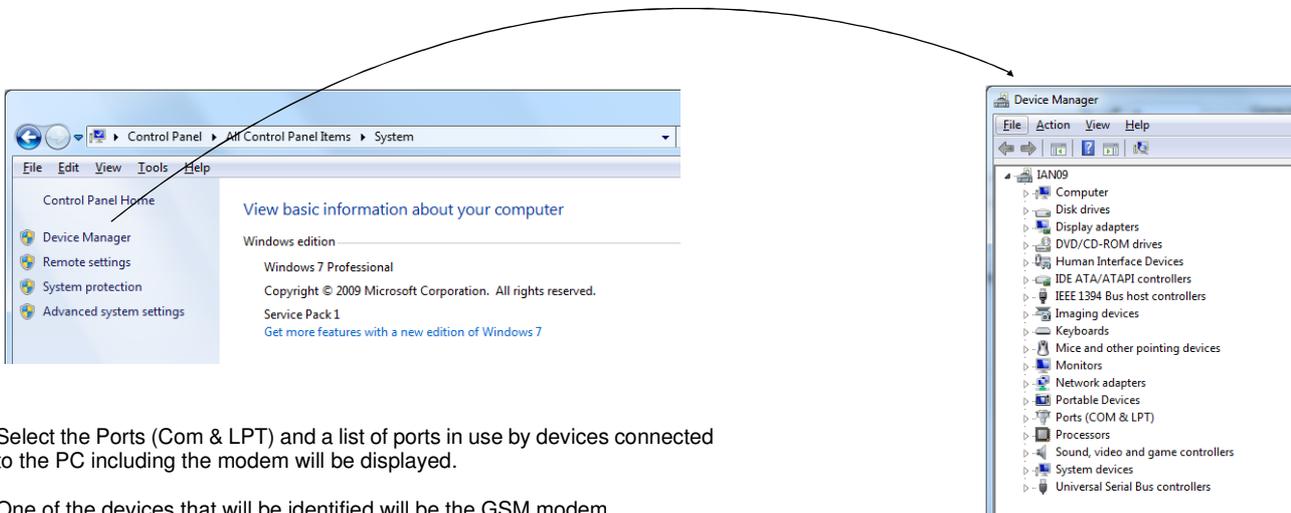
20.4 Identify the Modem Port

The modem Comm Port used by the PC is identified in the operating system using the Control Panel.

The example below shows how to identify the modem comm port using the **Microsoft Windows 7 Operating System**.

PC is identified from the **Control Panel - System - Device manager - Ports (Com & LPT)**

The options may vary slightly between different versions of the Windows Operating System but is essentially the same as that shown below:



Select the Ports (Com & LPT) and a list of ports in use by devices connected to the PC including the modem will be displayed.

One of the devices that will be identified will be the GSM modem.



In the example Com Port 8 is shown to be used by the GSM modem.

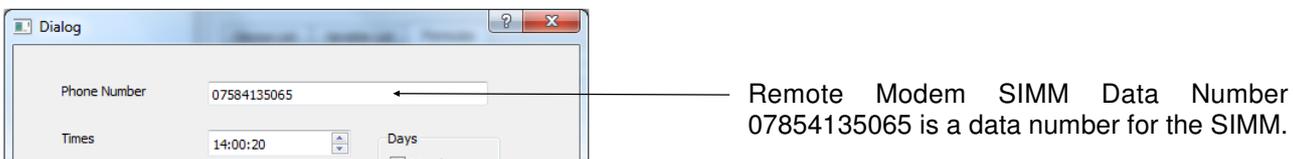
The Com Port number is use by the modem will change depending on what hardware is in use by the PC running Q-Log.

20.5 Remote Data Logger Telephone Number

Enter the Modem telephone number into the 'Phone Number' text box.

It is common for data SIMMS to be supplied with 2 x telephone numbers. Make sure the 'Data Number' is correctly identified and entered into the text box on the GSM Dialog Window.

Select 'OK' button to store new parameters.



20.6 Number of columns in the results file

The number of columns of data that can be used to store data from the remote instrumentation can be defined.

Setting the number of columns simplifies any future data analysis operations and makes the files easier to handle in packages such as Excel. Set the number of columns to be slightly larger than the number of data items returned by the remote data logger system.

The example shows how to configure the log file for 40 columns of data.



20.7 Automatic Data Downloads

Q-Log has the ability to download data from the remote data logger automatically or on demand.

Data can only be downloaded from a remote data logger so long as the modem connected to the logger can make a network connection. In any Keynes Controls remote data loggers this is generally done by keeping the GSM modem powered continually.

20.8 Automatic Download Options

The data download options within Q-Log have been kept simple to make sure they are reliable.

The options for automatic download are:

1. One download per day at preset time
- 2.. Two. downloads per day at preset time

The aim of the download is to make sure the data is extracted reliably from the remote location. It is best practice to get the data out as often as is practical in order to minimise data loss.

Each option can be set to operate for any day of the week and if the configuration is left unattended it will repeat the operation week in ,week out until adjusted to stop. The days of the week for the download are set using the 'Day' Tab.

20.9 Hourly Downloads - Continuous Operation

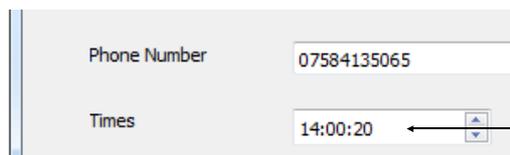
3. Hourly download.

The hourly download option takes priority over any other setting. Once activated Q-Log downloads data each hour any will do this continually until stopped. This is the most reliable of operations and makes sure data is extracted fast and efficiently. The latest recorded data is downloaded and appended to the Q-Log data files.

21.0 Data on demand

Data on demand is obtained by setting the first download time tab to a couple of minutes later than the current PC time.

On detecting the new download time the call will be made from the data logger PC running Q-Log to the remote data logger. Information will be extracted and transferred to the data log file. All the data from the previous download until the latest record in the data logger will be extracted and stored to the log file.



The screenshot shows a configuration window with two fields. The first field is labeled 'Phone Number' and contains the text '07584135065'. The second field is labeled 'Times' and contains the text '14:00:20'. To the right of the 'Times' field is a small vertical scroll bar with up and down arrows. A black arrow points from the pink text on the right towards the 'Times' field.

Set the time to 14:01:00 and the next download will start when the clock reaches this time.

21.1 Data Amounts

The most reliable form of data transfer is small data blocks at any one time. The GSM mobile phone network is most likely to allow small amounts of data without any error but may be limited by the network provider to prevent large downloads.

21.2 Data Correction Operations

Once a remote data connection is made to the logger unit Q-Log examines the data logger log file and extracts only the latest data that has been stored. Data is sent in blocks of 5 records so should the network fail only a minimum amount of data needs to be re-sent.

22.0 Common Mobile Phone Network Error

The most common error observed in the remote transfer of data and shown in the 'Terminal Port' Window is:

No Carrier - Most common occurrence is due to the failure of the mobile phone network and shows no data transfer possible

Solution: If data has been sent previously and 'No Carrier' message is displayed then leave everything also and wait for next scheduled download. The problem should be automatically solved by the network supplier. To try a new download immediately simply adjust the time control to start the download immediately.

22.1 Common Modem Errors - Failure to Communicate

The most common cause of failing to configure the system for remote downloading is by installing the wrong type of SIMM into one, or both of the modems used by the PC and remote data logger unit.

The modems supplied directly by Keynes Controls for remote data applications always uses the Hayes Command set for configuration and testing. The Hayes command set contains a command that can identify the type of call being made from specified SIMM installed in a modem.

Command: **AT+CRC=<mode>**

Set command controls whether or not the extended format of the incoming call indication is used.

Parameter **<mode>**

- 0 - disables extending format reporting (factory default).
- 1 - enables extended format reporting.

When enabled, an incoming call is indicated to the **TE** with unsolicited result code:

+CRING:<type>

instead of the normal **RING**.

where

<type> - call type:

DATA

FAX - facsimile (TS 62)

VOICE - normal (TS 11)

22.1 Additional Commands

Command: **AT+CRC?** Read command returns the current value of the parameter **<mode>**.

Command: **AT+CTC=?** Test command returns supported values of the parameter **<mode>**.

22.2 Example Downloads

Timed Download

The 'Dialog' window for 'Timed Download' configuration shows the following settings: Phone Number: 07584135065; Times: 02:00:00 and 21:00:00; Serial Port: 8; Columns: 40; Connection Interval: Twice Daily (selected); Days: Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday (all selected); Monday is unselected. OK and Cancel buttons are at the bottom.

Example - 2 data downloads daily at 02:00:00 AM and 21:00:00 each day except on Monday.

Hourly Download

The 'Dialog' window for 'Hourly Download' configuration shows the following settings: Phone Number: 07584135065; Times: 02:00:00 and 16:00:00; Serial Port: 5; Columns: 40; Connection Interval: Hourly (selected); Days: Tuesday, Thursday, Saturday, and Sunday (all selected); Monday, Wednesday, and Friday are unselected. OK and Cancel buttons are at the bottom.

Example - Hourly download continuous operation.

In this example the hourly download takes priority over any other setting.

Data will be downloaded each hour commencing from the start of the setting of the 'Hourly' Option. The first download will be at the start of the next hour.

23.0 Formula

Q-Log can be configured to undertake simple formula processing. Any complex data processing operation is best suited to post process analysis using third party packages such as Microsoft Excel, Matlab or Maple.

The main benefit for Q-Log applications is that it keeps all operations simple. There are no complex manuals to study and the screens are intuitive. The various formulae are entered under 'Formula' tab from the main 'Q-Log' Window, see the image on page XX.

One of the most common applications is to convert vibrating wire sensor details into engineering units.

VW Sensor Interfaces Data Operations

The VibWire-108-SDI12 and VibWire-108-RS485 model interfaces are intelligent devices and can have individual sensor inputs configured to supply frequency data values as Hz, Digits (Hz²), or engineering units.

The VibWire-101-SDI12 and VibWire-101-RS485 models support many more channels than the VibWire-108 interfaces, but in order to minimise the hardware configuration they are restricted to supply frequency data values in Hz or Digits only.



User manual: <http://www.aquabat.net/downloads/VibWire101UserManv3.pdf>

Take care when deciding on the formulae to be used in any calculation that the data type being used is of the correct type.

The worked example in the next section shows how to convert VW crack meter frequency value into engineering units.

Example - Data Record

Record No	Date	Time	D	E	F	where
1200	29012013	11:00	2245	1124.6	2267.1	D = Crack Meter Data Hz
1201	29012013	11:10	2345	1126.7	2268.1	example data values only

23.1 Example 1 - VW Crack meter Raw Data Format: Hz

A single vibrating wire crack meter is attached to a VibWire-108-SDI12 interface unit and connected to a laptop. The VibWire-108 has been configured to supply data values in units of Hz.

The data values

Engineering Units: **mm** (milli-meter).

The crack meter as a F₀ reading at installation of 2330 Hz, F₁ is current sensor frequency from the results table, and the sensor Calibration Const = 0.0795.

The crack meter data is configured to use **Cell D** in Q-Log variable list.

Formula used in the data processing: $E = K (F_1^2 - F_0^2) / 1000 \text{ mm}$

Q-Log formula $W = K * ((D * D) - (2330 * 2330)) / 1000 \text{ mm}$ where W = Cell storing results

Formula simplifies to $W = 0.000795 * ((D * D) - (2330 * 2330))$ where T = K / 1000 = 0.0795/1000

where W = cell location in the Formula list.

There is no restriction to where the formula can be inserted into the table. It is good practice to keep the formula variables away from the immediate data variables that change after each measurement.

23.2 Updating Data Values

The formula processing operates for both GSM connected data loggers and for network based sensors. The Q-Log software only supports SDI-12 and RS-485 digital networks.

SDI-12 & RS-485 network

The data processing using the formula is undertaken automatically after each data acquisition operation.

To plot the calculated values make sure the processed cell is selected.

GSM Data Downloads

Data that is downloaded is processed as it is read by Q-Log. Since the remote download operation is not continuous the data value most often shown in the 'Variable View' Window is the latest value that has been downloaded.

23.3 Latest data values show in the Variable List

Looking at the 'Variable View' tab data will appear as

Col	Variable	Name	Units	Current
1	A	Record	no.	0
2	B	Date	Y/M/D	0
3	C	Time		0
4	D	Frequency Ch0(0)	Hz	.2345
5	E	Frequency Ch1(0)	Hz	0.5852
6	F	Frequency Ch2(0)	Hz	762.6

Example Data Value from VibWire Interface.

The W cell is shown in this example but in practice any cell can be used. It is good practice to keep the calculated values away from the raw data values. This reduces the chance that the data can be mis-interpreted.

$$\text{Cell W} = 0.000795 * (D * D - 2330 * 2330)$$

Col	Variable	Name	formula
V			
W		Crack Meter	= 0.000795 *((D * D) - (2330 * 2330))
X			
Y			
Z			
AA			
AN			

The 2330 value is the F0 value

Alternatively

V = 2330 can be set as a constant and the formula can be changed to:

$$\text{Cell W} = 0.000795 * ((D * D) - (V * V))$$

Col	Variable	Name	Units	Current
V			Hz	5.5749
W		Crack meter	mm	
X			mm	

The calculated cell now shows the engineering units in mm.

23.4 Example 2 - VibWire-108 configures to give results in digits formula modification

Units = Digits (Hz²) Units : meters

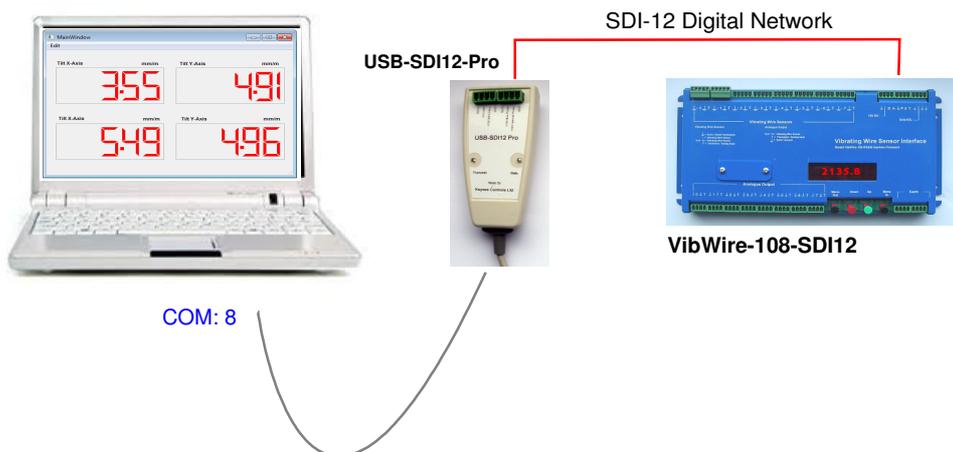
Formula becomes $W = 0.000795 * (D - (2330 * 2330))$ or $V = (2330 * 2330) / 1000 = 5428.9$

this formula will give the same answer as the above example but with the vibrating wire sensor undertaking some of the calculations. Take care to set the units correctly.

24.0 Example - Single VibWire-108-SDI12 Vibrating Wire Sensor Application

The following pages shows how to configure a single VibWire-108-SDI12 in the Q-Log using the USB-SDI12-Pro media converter configured to operate using Com Port 8 in the Microsoft Windows operating system. The VibWire-108-SDI12 has ID = 0.

A single Vibrating Wire interface can be powered directly from the **USB-SDI12-Pro** media converter.

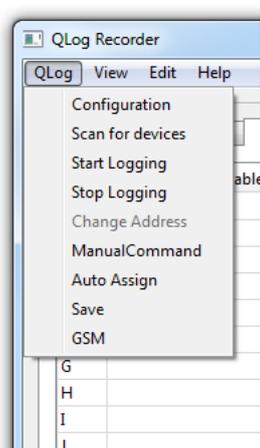


Step-1

Make sure that the Comm Port used by the USB-SDI12-Pro media converter has been identified correctly in the operating system.

In the example the USB-SDI12-Pro media converter is using 'Comm 8'.

Start Qlog



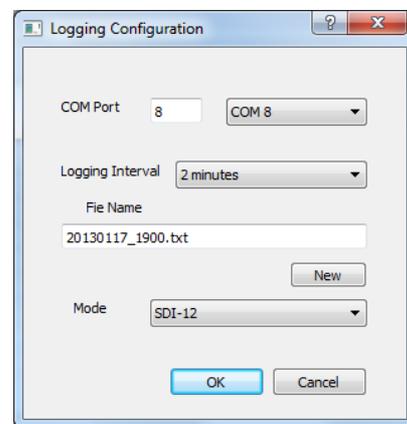
Step-2

Select the **Configuration** option and the 'Logging Configuration' Window will appear.

Set the Comm Port to 8

Set the Mode to 'SDI-12'

when the details are inserted the Logging Configuration will look like that opposite.



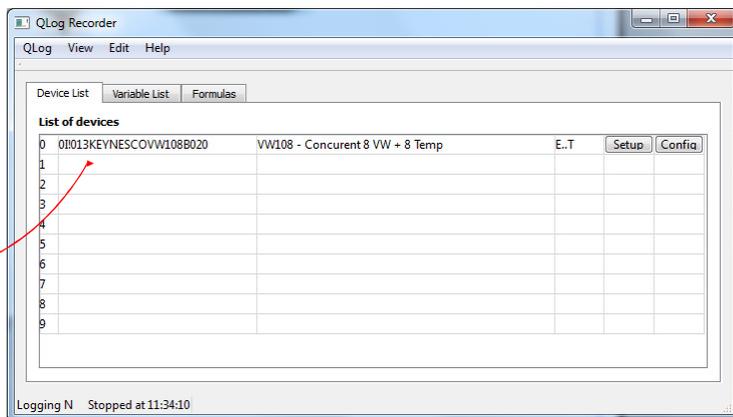
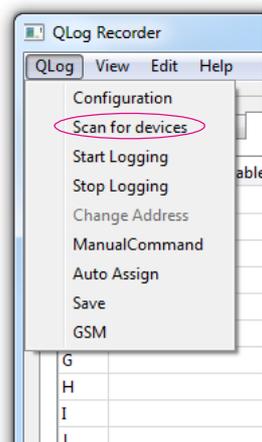
Each SDI-12 sensor or interface uses an individual ID number to identify it on a network.

In this worked example the VibWire-108-SDI12 has an ID = 0.

Step-3

Select the 'Scan for devices' option.

The status LED indicator will flash and after a few seconds the Q-Log screen will show the VibWire-108-SDI12 has been identified.



Q-Log Main Window

24.1 Data Acquisition Rate

The data acquisition rate is shown in the 'Logging Configuration' Window to be set at 2 mins.

Use the pull down menu options to adjust this figure. The VibWire-108 takes approximately 30 seconds to scan 8 vibrating wire sensors.

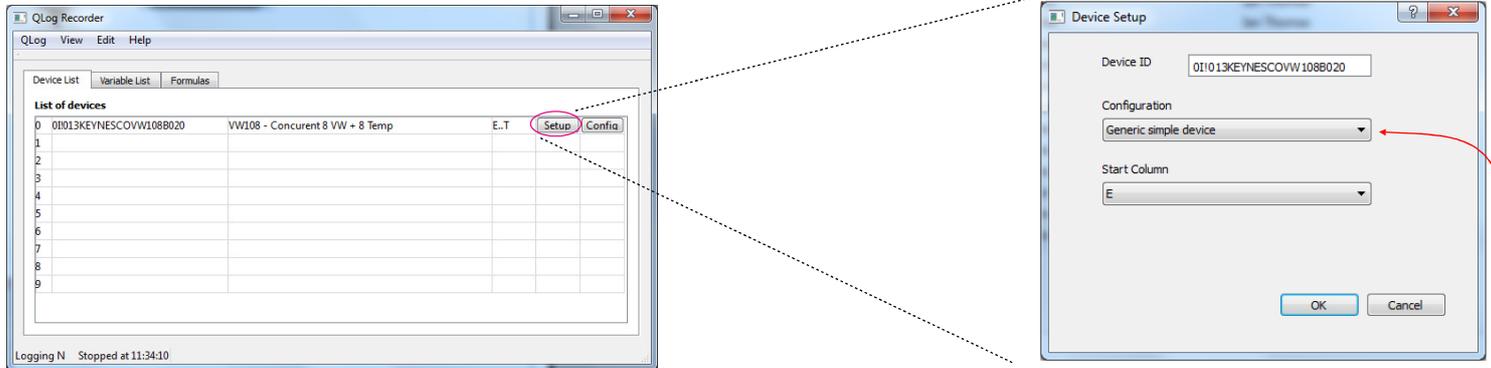
24.2 Selecting the VibWire-108 data options.

The VibWire-108-SDI12 can be configured to use 1 to 8 vibrating wire sensors and return all of the data values. The maximum number of data values that can be returned is 16. There are a maximum of 8 frequency values and 8 temperature values.

To minimise the scan time of the VibWire-108 then the number of channels in use is set on the device itself. The default configuration of the VibWire-108 is 8 x Freq + 8 x Temp channels.

Step-4

Press the 'Setup' button and the 'Device Setup' Window will appear.

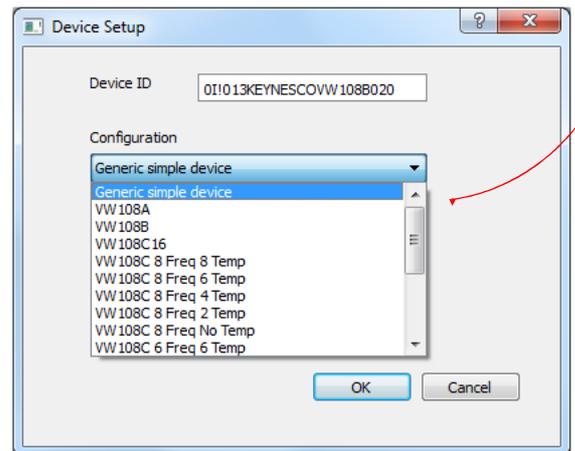


24.3 Store 8 x Frequency + 8 x Temperature Values

Select the Pull down menu options under the 'Configuration' title in the 'Device Setup' Window.

The number and type of data values that are stored to the data file are shown in the list.

Select the option '**VW108C 8 Freq 8 Temp**' and 16 values will be stored to the data file.



Further Technical Information

The number of data values returned to Q-Log is set in the sensor or instrument. If the VibWire-108 is not physically configured to return 16 data values then Q-Log cannot store them. The '0' value will appear in any column in the data file when a value is missing.

To speed scanning of a series of vibrating wire sensors, the number of channels to be used can be set in the instrument.

It takes approximately 12 seconds to scan 4 channels of a VibWire-108. The instrument can only 4 x 2 = 8 values.

Data Table Positions

To position data into a specified column in the data file simply the start position using the pull down menu list available under the 'Start Column' in the '**Device Setup**' Window.

The example above shows that the first data value from the VibWire-108-SDI12 is stored into column '**E**'.

Depending on the configuration option chosen the number of data values to be stored is automatically assigned.

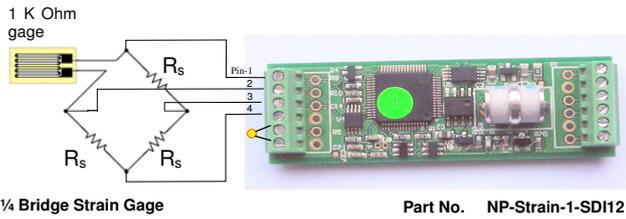
A VibWire-108-SDI12 with 4 channels in operation will start at column 'E' and finish at 'L'

25.0 Strain Gauge Application

The following pages details how to use the **NP-Strain-1** single channel SDI-12 interface card to undertake a strain gauge measurement.

A 1K Ohm ¼ bridge strain gage is attached to the **NP-Strain-1** card.

The device is calibrated for the measurements to be undertaken and set to give engineering output values in micro-strain.



The image opposite demonstrates how a ¼ bridge strain gauge is connected to the NP-Strain-1 interface card.

25.1 Connection to a PC

The image opposite demonstrates how to connect the NP-Strain-1 card to a PC for data recording operations.

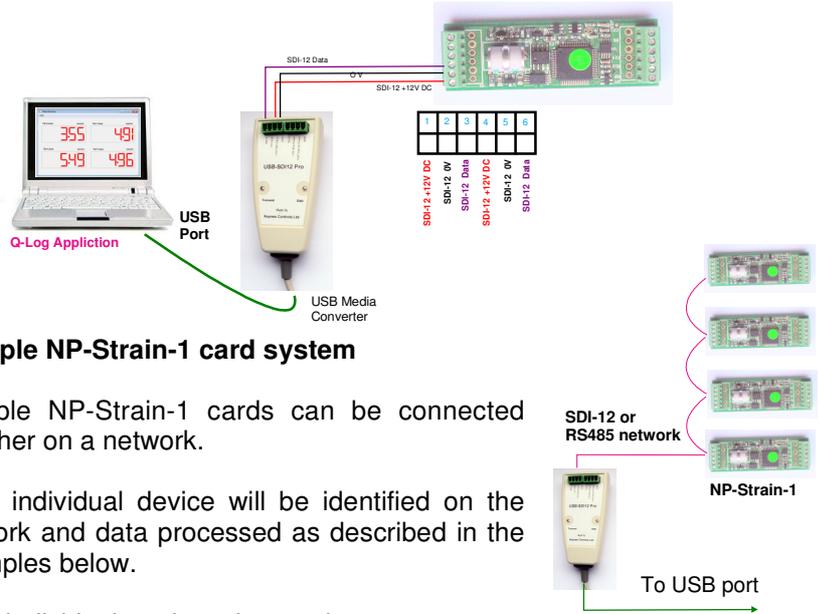
The USB-SDI12-Pro media converter powers the NP-Strain-1 card directly from the computer USB port.

Part Numbers

USB-SDI12-Pro Media converter
NP-Strain-1-SDI12 Single channel strain gauge SDI-12 interface

Further information

USB-RS485-Pro 485 version media converter



Multiple NP-Strain-1 card system

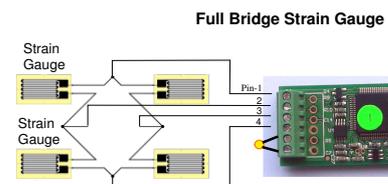
Multiple NP-Strain-1 cards can be connected together on a network.

Each individual device will be identified on the network and data processed as described in the examples below.

Each individual card can be used

25.2 Bridge Circuit Options

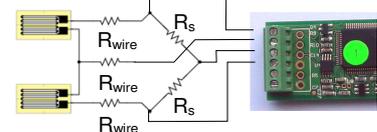
The images below show how the different bridge options are connected to the NP-Strain-1 card.



Example circuit shows a full (N=4) bridge strain gauge and thermistor

$$\epsilon = \frac{(e_o)}{(GF)3.3}$$

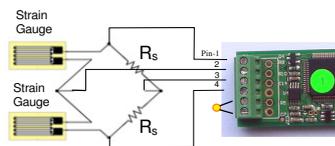
3 Wire Strain Gauge Interface



Example circuit shows a half bridge strain gauge (N=2) with 3 wire interface - reduces cable length effects.

$$\epsilon = \frac{2(e_o)}{(GF)3.3}$$

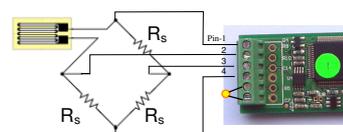
½ Bridge Strain Gauge



Example circuit shows a half (N=2) bridge strain gauge and thermistor.

$$\epsilon = \frac{2(e_o)}{(GF)3.3}$$

¼ Bridge Strain gauge



Example circuit shows a quarter (N=1) bridge strain gauge and thermistor.

$$\epsilon = \frac{4(e_o)}{(GF)3.3}$$

Strain calculation using 1, 2 or 4 active arms

$$\epsilon = \frac{4(e_o)}{(N)(GF)E_x}$$

N = 4 for full bridge
 2 for half bridge
 1 for quarter bridge

GF = Gage Factor
 E_x = Bridge Excitation = 3.3 V
 ε = strain
 e_o = Output Voltage
 N = Number of effective arms

Bridge Zero Offset Correction

The NP-Strain-1 sensor does not zero correct the bridge and assumes the User will correct the error in post processing of the data.

Temperature coefficient of Gage Factor (TCGF)

This is the change of sensitivity of the device to strain with change in temperature. This can be compensated for in the calibration equations but it is recommended to be post process corrected in any data analysis.

Temperature Measurement

A precision thermistor is used by the NP-Strain-1 card to make local temperature measurements.

26.0 Worked Example - Setting the calibration factors into the NP-Strain-1 card

A ½ bridge strain gauge with resistance $R_o = 350 \text{ Ohm}$ with $GF = 2.0$ Excitation voltage = 3.3 V D, Range = +/- 1500 micro-Strain is fitted to the **NP-Strain-1** interface card. It is observed that the bridge offset is 0.23 V DC with no load.

It is noted under test using a strain gage calibrator that at 1500 micro-Strain bridge voltage = 0.2345 V DC and at 200 micro-Strain the bridge voltage was measured at 0.23066 V DC.

NP-Strain-1 card is to be configured to return data values in engineering units.

Engineering Units

In order to have the NP-Strain-1 card return data in engineering units then the strain gage calibration factors have to be set.

The output from the strain gauge is presumed to be linear over range

For the example above the following factors will be used m (gain) = 338.541 and Offset $C = -778.8802$

$Y_{out} = V_{in} \cdot 338.541 - 778.8802$ where V_{in} is the bridge output voltage as measured by the NP-Strain-1 card.

The calibration factors are included as examples only.

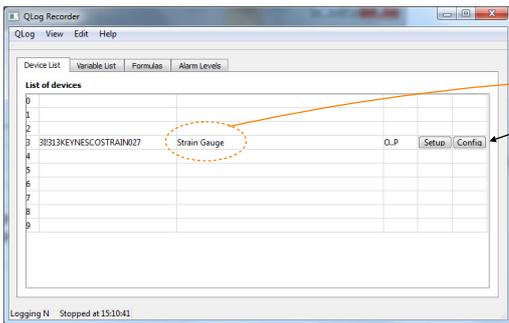
26.1 Entering Configuration values using Q-LOG

1. Scan the chosen network for devices

Identify the NP-Strain-1 card to have the calibration factors installed.

2. Press the **'Config'** button from the 'Device Calibration Window' shown below will appear.

NP-Strain-1 card with ID = 3



Press the **'Config'** button

Select the **'Strain Gauge'** option.

This operation ensures that the correct number and type of data is returned to the Q-LOG software.

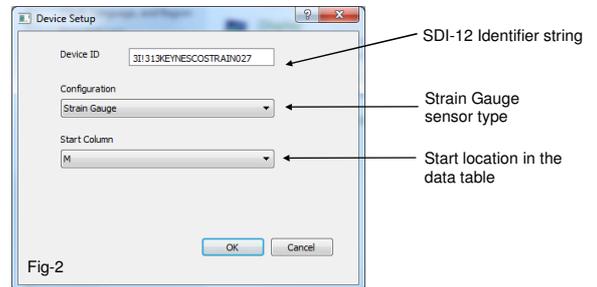
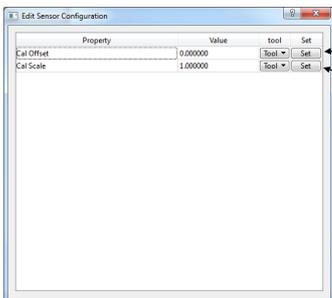


Fig-2
Q-LOG Device Setup Window

ID number
3113KEYNESCOSTRAIN027 Strain gauge
Identifier string for the strain gauge card

'Device Calibration' Window



Enter **-778.8802** - press 'Set' to confirm value - Offset value

Enter **338.541** - Scale value

Once the calibrations are set into the device then the NP-Strain-1 card will report data values in **engineering units**.

25.2 Returned data values

Once the calibration factors are set, then the command

SDI-12 command: **3M! 3D0!**
RS-485 command: **%3M! 3D0!** (Keynes 485 intelligent instruments)

will return

Data: micro-Strain, Temp (Deg C)

27.0 Strain Gauge Application - Q-Log Formula Processing

The following example demonstrates how to use Q-Log software formula processing; to convert a direct strain gauge reading into engineering units.

The same procedure to convert a raw voltage reading into strain value, regardless to the device making the reading. Keynes Controls use the AquaDAT sensor interface, or the NP-Strain-1 card to make strain gauge readings.

Example

A 1/2 bridge strain gauge with resistance $R_o = 350 \text{ Ohm}$ with $GF = 2.0$ Excitation voltage = 3.3 V D, Range = +/- 1500 micro-Strain is fitted to the **NP-Strain-1** interface card. It is observed that the bridge offset is 0.23 V DC with no load.

It is noted under test using a strain gage calibrator that at 1500 micro-Strain bridge voltage = 0.2345 V DC and at 200 micro-Strain the bridge voltage was measured at 0.23066 V DC.

For the example above the following factors will be used m (gain) = **338.541** and Offset $C = -778.8802$

How to determine the value of the calibration factors is not part of this example.

Formulae

Output $\mu\text{-strain} = V_{in} * 338.541 - 778.8802$ where V_{in} is the war input voltage to the NP-Strain-1 card.

The output from the strain gauge is presumed to be linear over range

Temperature

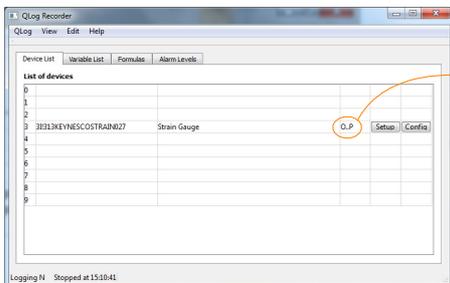
Celsius to Fahrenheit: $(^{\circ}\text{C} \times 9/5) + 32 = ^{\circ}\text{F}$

Therefore the formula for Q-Log will be

Strain: [Cell D] =(O*338.541)-778.8802

Temp: [Cell E] =(P*9/5)+32

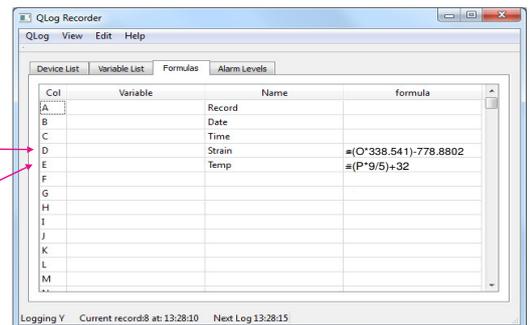
– converts temp in Deg C from NP-Strain-1 card to Deg F



Q-Log - Main Window

where O = raw strain data value and P = temp in Deg C

1. Select the 'Formula' tab and the Window below will appear.
2. Enter the strain and temperature formula into cells 'C' and 'D' respectively.



Formula Window

This Window identifies the sensors and interfaces that have been identified on the network.

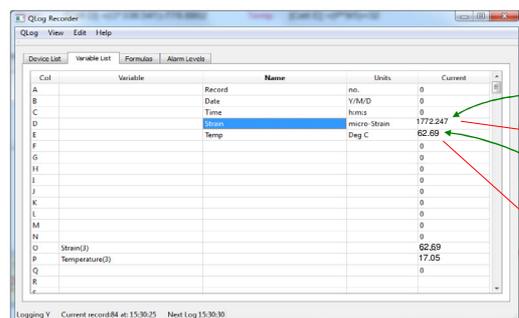
Inserted formulae

Strain: [Cell D] =(O*338.541)-778.8802

Temp: [Cell E] =(P*9/5)+32

Real time results

Engineering units



Variable Window - shows real-time results

value in $\mu\text{-Strain}$

Deg Fahrenheit



2 x 2 Panel meter display

All of the formulae used by an application are shown in this Window.

Panel meter 2 x 1 display used to show present the results acquired by the NP-strain-1 card.

The Variable Window displays both the raw and engineering data values.

QLog Quick Installation & Set-up Guide

27.0 Installation

The installation file for Q-Log consists of a single Zip file that is freely downloaded from the Keynes Controls Web Site

Download the latest copy of the software from

<http://www.aquabat.net/QLOGFree/qlogv2.html>

Open the Zip file to obtain access to the QLog setup file within. This is an automatic operation for most Microsoft Windows Operating systems.

Then

- Start the application QLogsetup
- Select components to install
- Click next
- Change the destination directory if required
- Click Install
- When completed click Close

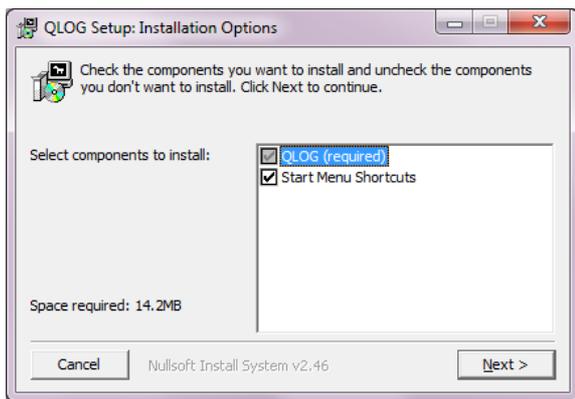
IMPORTANT NOTE

The Q-Log software communicates to the intelligent sensors using a network connected to a PC using one of the media converters.

Q-Log supports both RS-485 and SDI-12 networks.

For any sensors to be identified then the Comm Port being used by the media converter has to be known.

Details of how to identify the Com Port in use are shown on Page 7. The actual Windows screens will differ slightly between the different versions of the Operating System but will be similar to what is shown.



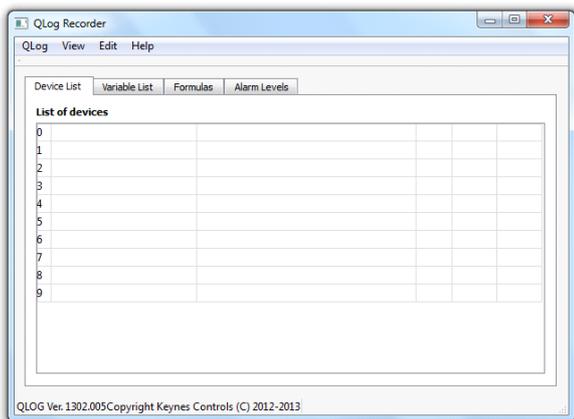
The default Q-Log installation Window.

Select 'Next' to complete the installation.

QLog will now be available from your START menu

Starting up first time

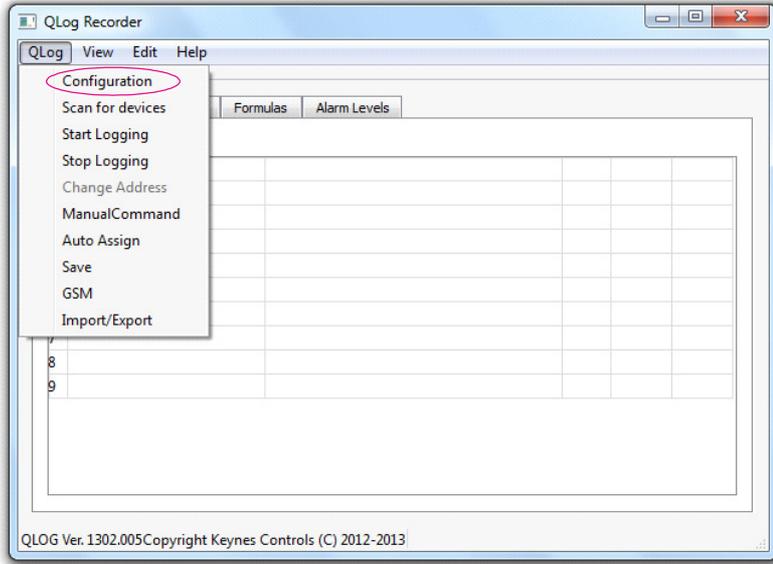
Select START\Qlog



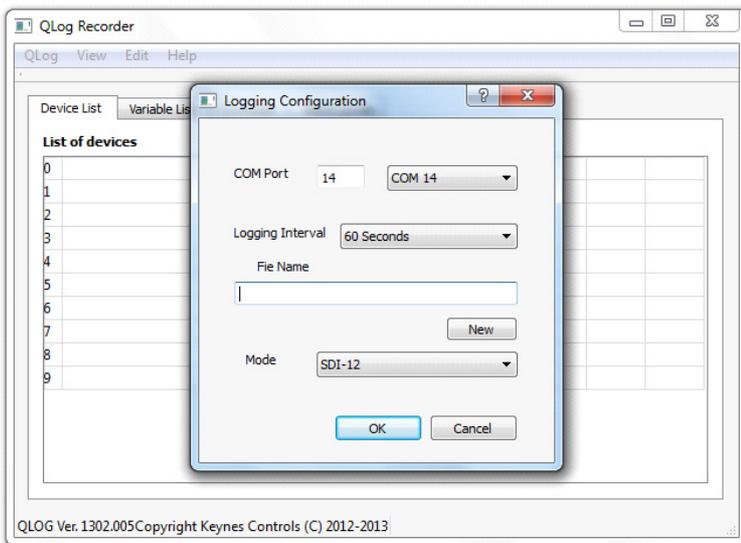
The default Q-Log Window as shown opposite will appear.

There are currently no instruments identified by the software.

On the QLog window select **QLog\Configuration**



The following Window will appear



Com Port

Enter the COM Port for the USB media converter used to connect the sensors to the PC.

In this example the Com Port No is shown as 14.

Logging Rate

Select the desired sample rate from the pull down menu options

The example shows a sample rate of 60 seconds

File Name

Enter the file name to store the results into the box provided.

Mode

Ensure that the correct network media converter type is assigned.

SDI-12 or RS-485

In this example the SDI-12 media converter is shown being used.

Using the Logging Configuration Window select the following

1. COM Port. (The drop down box will provide a list of ports. To determine which one your devices are using select 'START\Control Panel\System' then click on 'Device Manager' and 'Com Ports'. As there may be several Com Ports in use on your computer verify your devices connection by disconnecting and reconnecting the USB lead. The Com Port number in question will disappear and then reappear again in the list)
2. Ignore 'Logging Interval' for now, this can be adjusted later.
3. Enter a file name for Data Logging and click 'New'
4. Select a mode from the drop down list, e.g. SDI-12 or RS485 for locally connected devices.
5. Click OK

Next select QLog\Scan for devices.

The list thus produced will allow setting up of relevant parameters for each device.

This completes the initial start-up procedure.

The relevant manuals for each device now needs to be read in conjunction with the QLog main manual for device specific set up and configuration.

Installation Errors

The most common installation errors are:

1. Installation of Q-Log using standard User Account instead of '**Admin Account**'