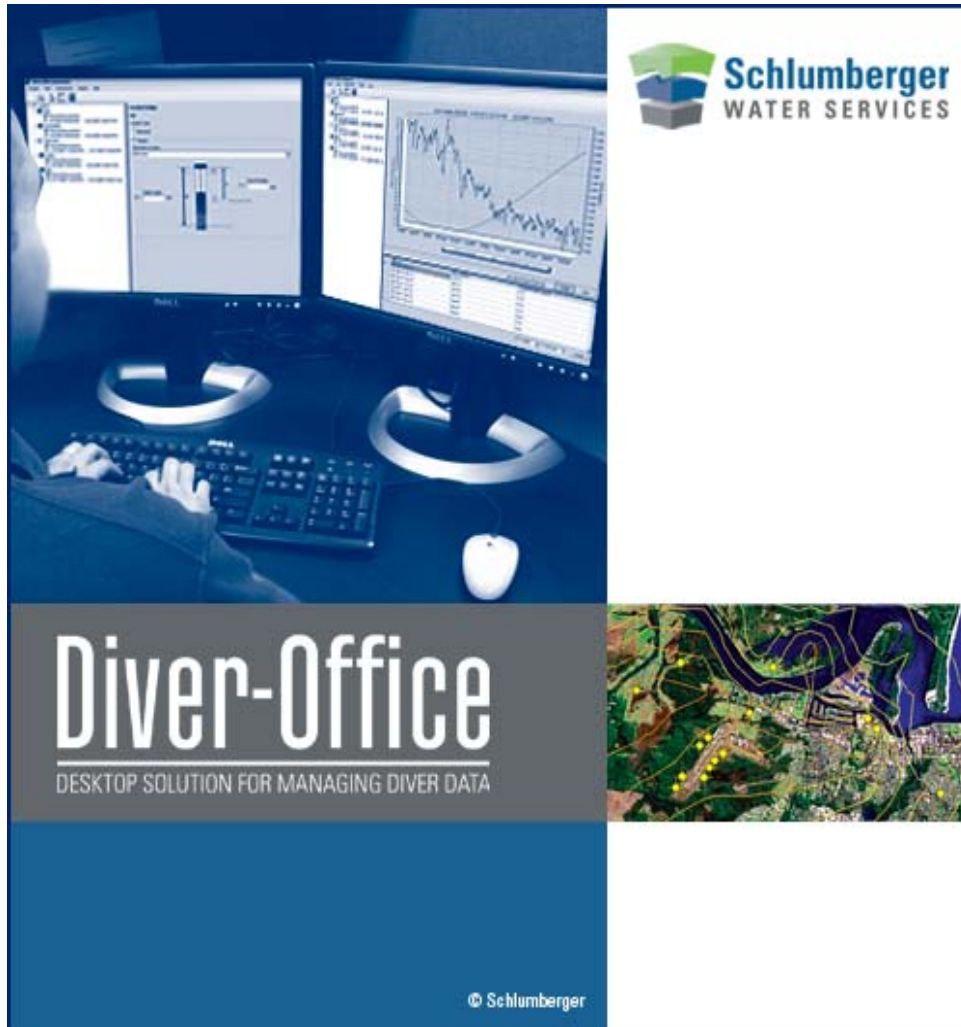


# Diver-Office User's Manual



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# Preface

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## Obtaining Technical Support

To help us handle your technical support questions as quickly as possible, please have the following information ready before you call, or include it in a detailed technical support e-mail:

- A complete description of the problem including a summary of key strokes and program event (or a screen capture showing the error message, where applicable)
- Product name and version number
- Product serial number
- Computer make and model number
- Operating system and version number
- Total free RAM
- Number of free bytes on your hard disk
- Software installation directory
- Directory location for your current project files

You may send us your questions via e-mail, fax, or call one of our technical support specialists. Please allow up to two business days for a response.

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# 1 Introduction to Diver-Office

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Diver-Office is a software package developed to read and program Diver groundwater dataloggers, download Diver monitoring data, and process and display Diver data. In combination with one or more Diver dataloggers, Diver-Office constitutes a complete and flexible measurement system.

Diver-Office has the following key features:

- Easy-to-use, intuitive interface.
- Read/Program Diver dataloggers
- Start/Stop Diver dataloggers, with various start methods
- Calibrate CTD-Divers
- Import/Export monitoring data in multiple formats
- View time series data in a plot or tabular form
- Import LoggerDataManager 5.x databases
- Perform barometric compensation on water level data

This chapter will guide you through the installation and introduce you to the Diver-Office interface.

## 1.1 Installing Diver-Office

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### 1.1.1 System Requirements

Diver-Office requires the following minimum system configuration:

- Pentium processor, 800 MHz
- 256 MB of RAM
- 100 MB available hard drive space for installation. Additional space for database is required. Diver-Office supports databases up to 300 MB.
- One available USB port or one Serial COM port
- Windows 2000 (SP4), Windows XP (SP2 or later, 32 & 64-bit), Windows Vista Business (32 & 64-bit)
- Screen resolution: 1024 x 768, color: 16 bits)
- Microsoft SQL Server 2005 Compact Edition (Included in installation package)

If you have any problems with your particular system configuration, please make sure that you followed the installation instructions precisely. If the problem is still unresolved, please contact your hardware experts or IT department.

### 1.1.2 List of Supported Devices

#### Reading Units

Diver-Office supports the following Reading Units:

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<b>Reading Unit RS232</b>	AS 315
<b>Reading Unit USB</b>	AS 324

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<b>Diver USB Reading Unit</b>	AS 330
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## Divers

Diver-Office supports the following Diver groundwater dataloggers:

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<b>Cera-Diver</b>	DI701 DI702 DI705 DI710
<b>Mini-Diver</b>	DI500 DI501 DI502 DI505 DI510
<b>Micro-Diver</b>	DI601 DI602 DI605 DI610
<b>(M)TD-Diver</b>	DI240 DI241 DI243 DI245
<b>Baro-Diver</b>	DI250 DI500
<b>CTD-Diver (ceramic)</b>	DI261 DI263 DI265
<b>CTD-Diver (stainless steel)</b>	DI218 DI219 DI221 DI223 DI224
<b>TD-Diver</b>	DI212 DI213 DI214 DI215 DI217 DI220

---

## Interface Cables

Diver-Office supports the following Diver interface cables:

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<b>Direct Read Interface Cable</b>	AS 325
<b>PC Interface Boostercable</b>	AS 326
<b>DRC USB Interface Cable</b>	AS 327
<b>Direct Read Interface (short)</b>	AS 328
<b>FT-US232B EVALCABLE</b>	HAD 211

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## 1.1.3 Installation

### Diver-Office Software

Diver-Office is distributed on CD-ROM, through our website, and on our FTP site. To download Diver-Office from our website, please visit [www.swstechnology.com](http://www.swstechnology.com) and navigate to the Diver-Office product page.

To install Diver-Office from a CD-ROM disk, please follow the directions below:

**Note:** If you wish to install Diver-Office on Windows Vista, you must first disable User Account Control (UAC). To do so, follow the steps below:

- Click **Start/Control Panel**
- In the search bar, type **UAC**.

- The first result returned by the search will be *User Accounts – Turn User Account Control (UAC) on or off*. Click on it and then click **Continue**. The UAC window will open.
  - Deselect the option **Use User Account Control (UAC) to help protect your computer** and press the **OK** button.
  - Restart your computer before proceeding with the Diver-Office installation described below.
  - Once the installation has finished, you can enable UAC if desired.
1. Place the CD into your CD-ROM drive and the initial installation screen should load automatically. Once loaded, an installation interface with several different tabs will be presented.

If the installation screen does not load automatically,

- Open Windows Explorer, and navigate to the CD-ROM drive.
  - Double-click the **Diver-Office.MSI** to initiate the installation.
2. Please take the time to explore the installation interface, as there is information concerning other SWS products, our worldwide distributors, technical support, consulting, training, and how to contact us.
  3. On the initial Installation tab, you may choose from the following two buttons: Diver-Office Installation and Diver-Office User's Manual.
  4. The User's Manual button will display a PDF of the manual, which requires Adobe Acrobat Reader to view. If you do not have the Adobe Reader, a link has been created in the interface to download the appropriate software.
  5. The Installation button will initiate the installation of Diver-Office on your computer. Diver-Office must be installed on your local hard disk in order to run. Follow the installation instructions, and read the on-screen instructions carefully.
  6. Once the installation is complete, you will see the Diver-Office short-cut on your Desktop screen.

## 1.1.4 Uninstalling Diver-Office

There may be instances where you will need to uninstall (remove) Diver-Office from your system (i.e if the software is to be transferred to another computer, or you need to reinstall on the current computer). To uninstall Diver-Office,

Locate the **Add/Remove Programs** option in Window's **Control Panel**

Select **Diver-Office** as the program to be removed

Follow the on-screen instructions.

Once you are finished, re-boot the system to ensure all system files are updated.

## 1.1.5 Uninstalling Reading Unit Drivers

To uninstall the reading unit drivers, follow the instructions below:

1. Using **Windows Explorer**, navigate to the location where Diver-Office is installed. By default the directory is:

*C:\Program Files\Diver-Office\Reading Unit Drivers\x32*



2. In the **x32** folder, there will be a file called **FTDIUNIN.exe**. Double click on this file to start uninstalling the drivers.
3. You will be prompted with a warning message asking you to unplug your reading unit before proceeding. Please do so, and then click [**Continue**] to continue.
4. Click [Finish] to complete the uninstallation.

## 1.1.6 Backing Up Your Database

Microsoft SQL Server Compact Edition is installed to your computer during the Diver-Office installation. This is the main database engine for Diver-Office. In other words, all of your downloaded and imported Diver data will be stored in a SQL Server database. The database file is **WHI.sdf** and is located in the root of the installation directory, e.g, c:\Program Files\Diver-Office. When you add data to your Diver-Office project, this database file will grow in size, and vice versa.

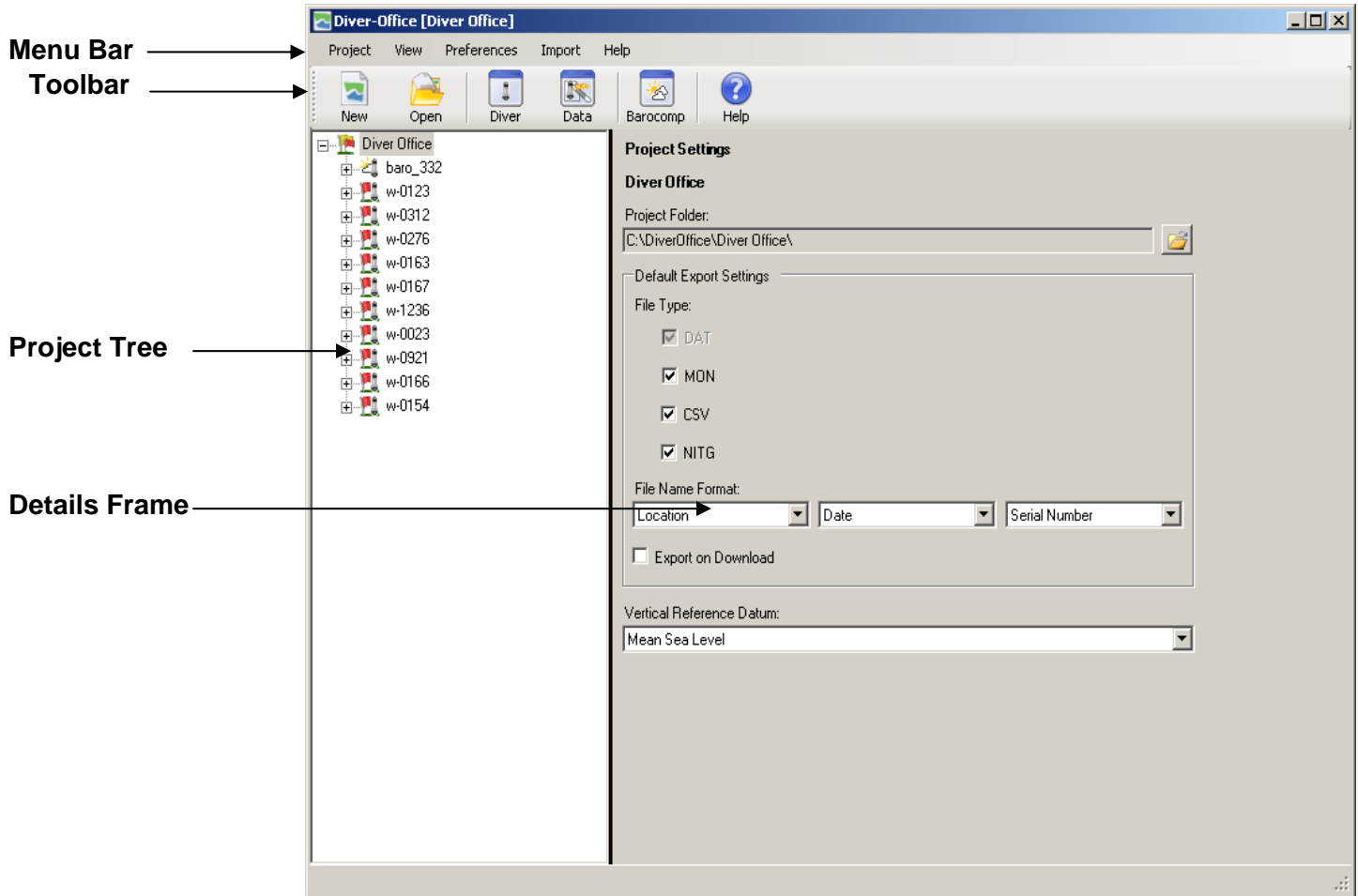
Please consider the following limitations regarding Microsoft SQL Server Compact Edition.

- **WHI.sdf** **must** be located in the same folder as the **DiverOffice.exe**.
- Only databases up to 300MB in size are supported. Databases beyond this limit will hinder the performance of the application.

It is good data management practice to regularly back up your database to avoid any unexpected data loss. Backing up your database is very simple. To do so, follow the steps below:

1. In Windows Explorer, navigate to the Diver-Office installation directory.
2. Locate the **WHI.sdf** file. Right-click on it and select **Copy**.
3. In a safe and secure location, e.g., on another location on your computer or on separate harddrive, right-click and select **Paste**.

## 1.2 Diver-Office Interface Layout



A typical Diver-Office window is shown above. The different sections are described below.

**Menu Bar:** Contains menu commands with access to the features that are available in Diver-Office.

**Toolbar:** Contains several short-cut buttons for the most frequently used Diver-Office features. Each button is described below.



**New** button creates a new project



**Open** button opens an existing project



**Read Diver** button opens the Diver settings dialog



**Data** button opens the **Data** dialog.



**Barometric Compensation** button opens the **Data** dialog.



**Help** button opens the Diver-Office help document.

**Project Tree:** A tree view listing all project locations and their respective time series data and manual measurements.

**Details Frame:** A context-sensitive window that changes depending on which level of the tree-view is selected.

## 1.3 Online Help

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This manual is supplied to you in two forms: as a PDF document, and as an online help file. To view the online help version of this manual, select **Help > Contents**.

## 2 Using Diver-Office

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This chapter describes the features in Diver-Office that can be accessed through the project tree and the menu bar. The following content has been organized to coincide with the structure and layout of the Diver-Office interface. First, each level of the project tree is described in detail. Following this section, each item in the main menu is described.

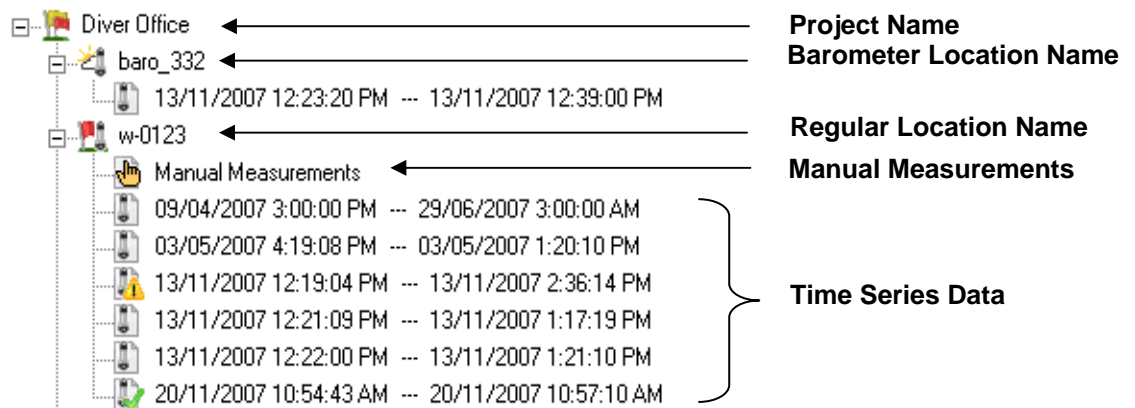
In this chapter, you will find information on:

- Project Tree navigation
- Project settings
- Location settings
- Manual measurements
- Viewing data
- Importing/Exporting Diver data
- Filtering time series data.
- Setting Diver communication
- Creating user-defined pumping tests
- Setting default units

### 2.1 Navigating Diver-Office Using Project Tree

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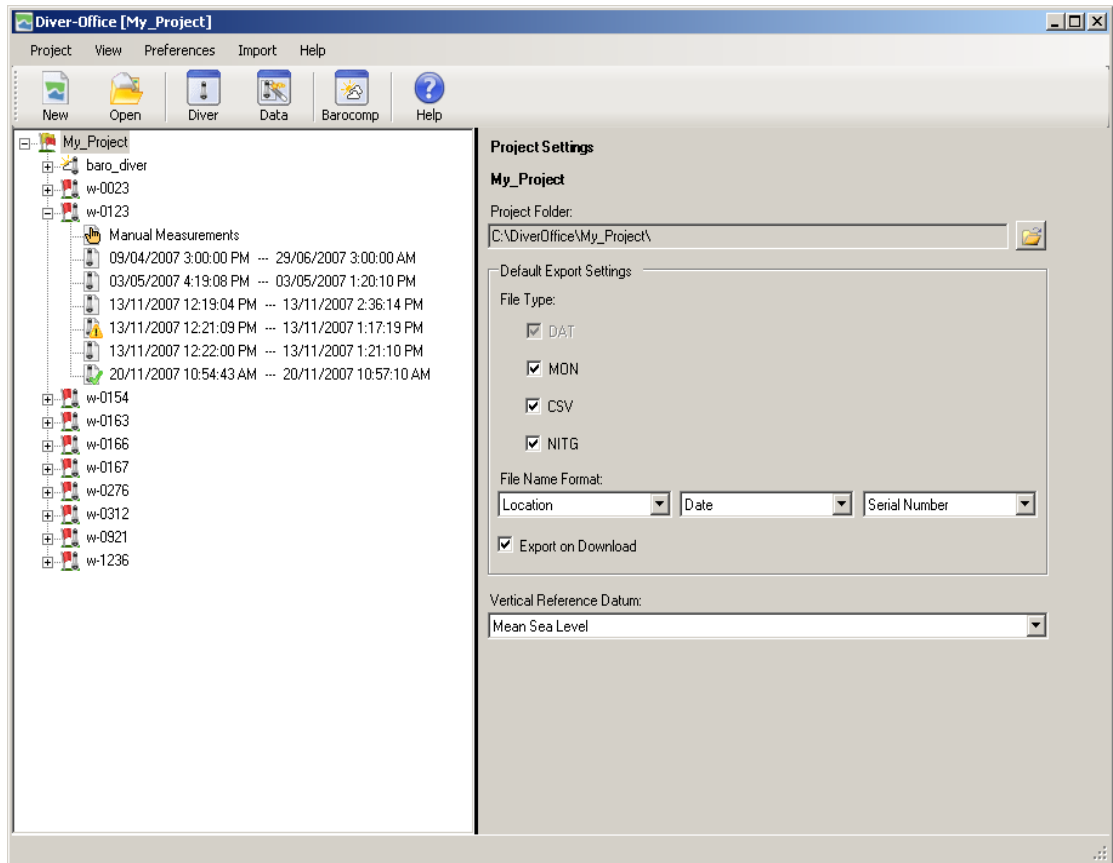
The **Project Tree** lists all of the locations for the current project along with each locations manual measurements and time series data. The basic structure of the project tree is shown below.



When a project tree item is selected, its corresponding information will be shown in the adjacent details frame. The following sections describe each tree item in more detail.


#### 2.1.1 Project Settings

When the project tree root is selected (project name), the **Project Settings** will be shown in the adjacent details frame (shown below).



Here you can define the project settings for the current project. The available settings include:

**Project Folder:** The folder location where all time series data (\*.MON, \*.CSV and \*.NITG) will be exported to. With every Diver download, a binary DAT file is created, and stored a subfolder DAT of this location.

To change the location of the project folder, click the **Open**  button and specify a new location.

**Vertical Reference Datum:** The vertical reference datum used at monitoring locations. Please note that this setting does not have any affect on barometric compensation calculations. If you do not know the name of your vertical reference datum please do not change the default (Mean Sea Level) setting.

**Default Export Settings:**

**File Type:** Select which file types to generate when exporting time series data.

<b>DAT</b>	A binary format exported with every Diver download.
<b>MON</b>	An ASCII file format supported by SWS software.
<b>CSV</b>	Comma Separated Values format, compatible with Microsoft Excel.
<b>NITG</b>	A standard database format in The Netherlands

**File Name Format:** Specify the naming convention for exported time series files. This allows you to associate a filename with three strings (serial number of Diver, location of Diver and timestamp of download). If the timestamp is not included as part of the filename (e.g. only

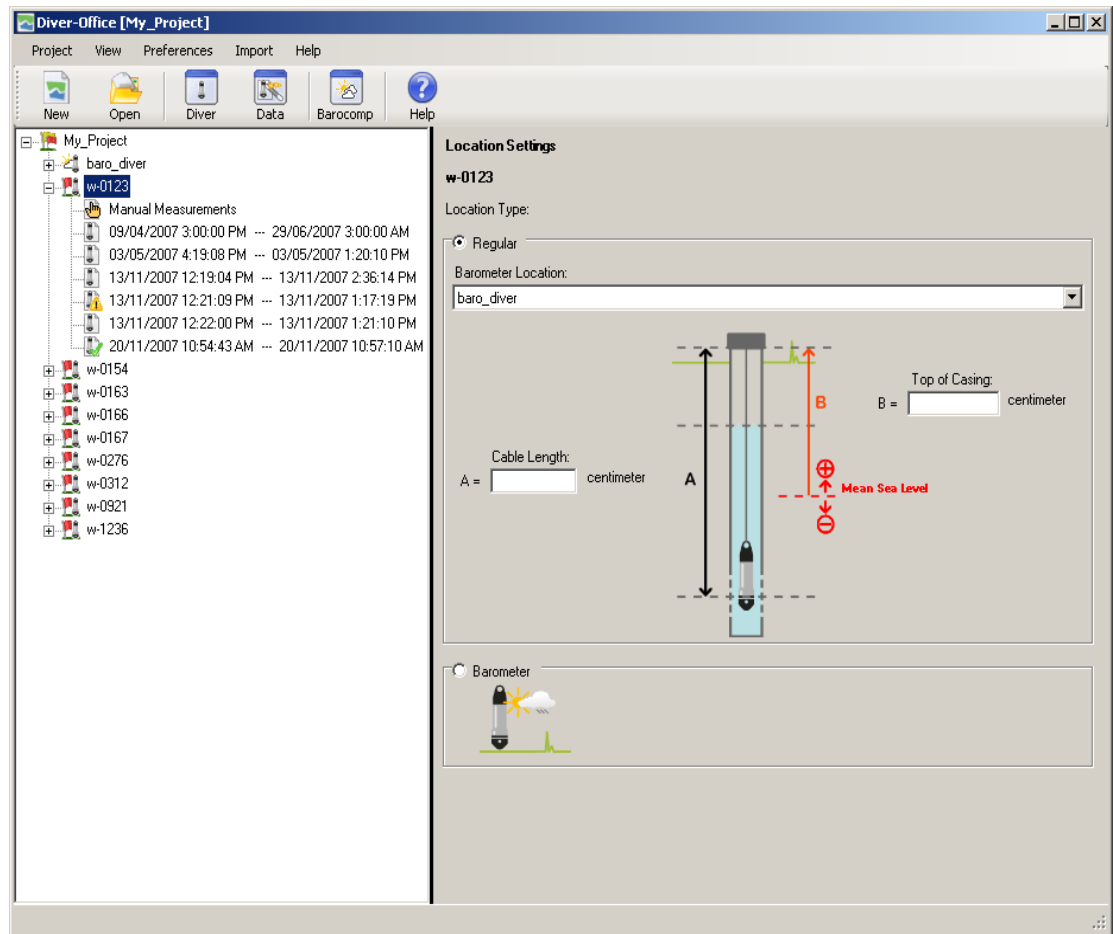
serial number plus location name are included in name format), then a **\_1**, **\_2** etc. extension will be added to each file in order to make the filename unique.

**NOTE:** It is good practice to include the timestamp in the filename.

**Export on Download:** Select this option to export data whenever data is downloaded from a Diver.

## 2.1.2 Location Settings

When a location is selected from the Project Tree, the location settings will be shown in the details frame. (shown below).



The location settings include the following:

**Location Type:** Select between **Barometer** and **Regular**. A barometer location type contains sampled barometric time series data, whereas a regular location type contains groundwater time series data e.g., pressure, temperature and conductivity. The location type is represented by an icon in the Project Tree, as shown below:

 **Barometer location**

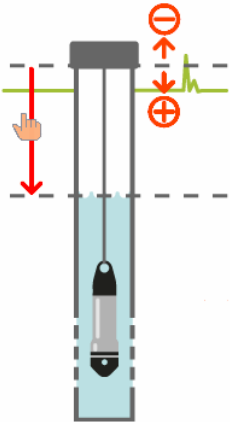
 **Regular location**

If the location is a regular location type, then you must specify a corresponding barometer location before you can compensate its time series data. The dropdown list will contain all the locations in the current project that have been set as a Barometer location type.

Depending on which barometric compensation method you wish to use, you may also need to specify a **cable length** and **top of casing** length. These values are represented schematically on the diagram as length **A** and **B**, respectively. Please see “Barometric Compensation Methods” on page 34 for more information on the requirements for Barometric Compensation.

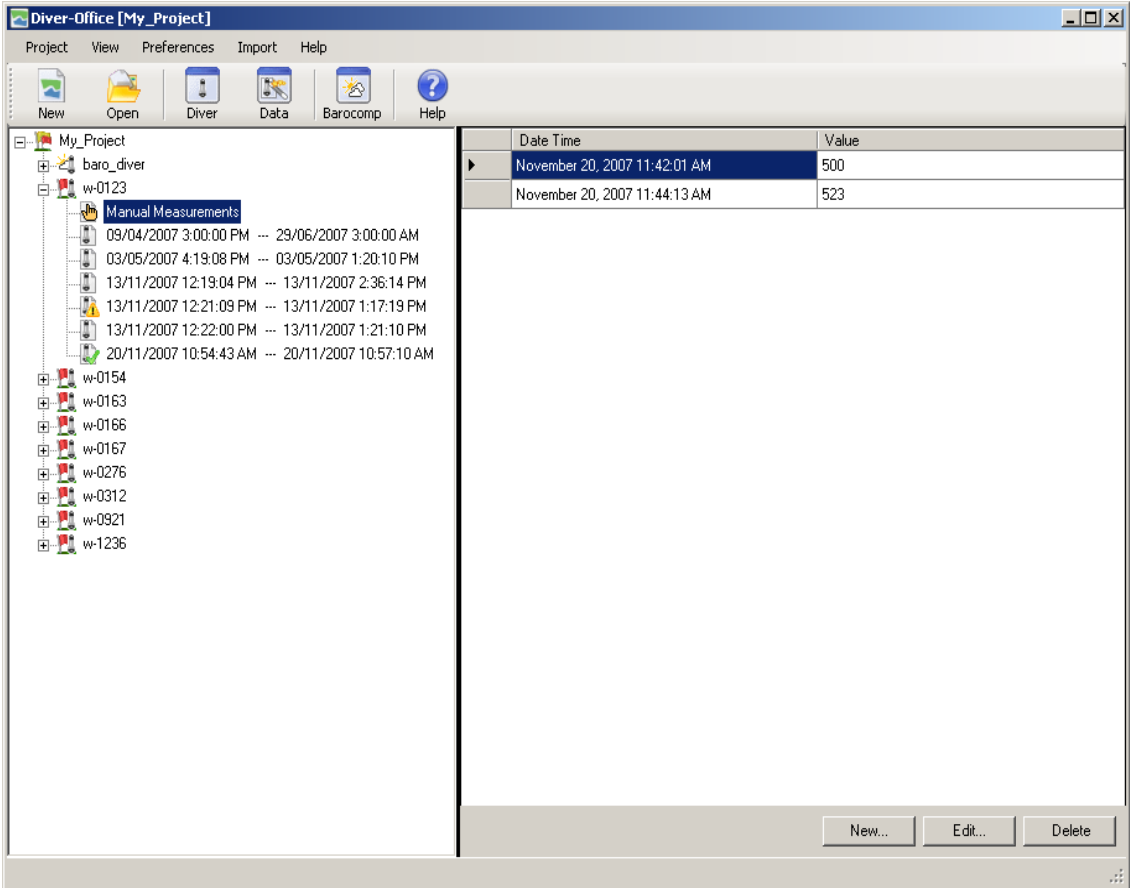
### 2.1.3 Manual Measurements

A **Manual Measurement** is the difference between the water level in a borehole and the top of casing, measured by an operator using a measuring tape (depicted in the diagram below).



Manual Measurements can be stored in Diver-Office, and then used for barometric compensation instead of cable lengths.

When the Manual Measurements tree item is selected, the following screen will display.



Click the **[New...]** button to add a new manual measurement to the location.

Click the **[Edit...]** button to edit an existing manual measurement.

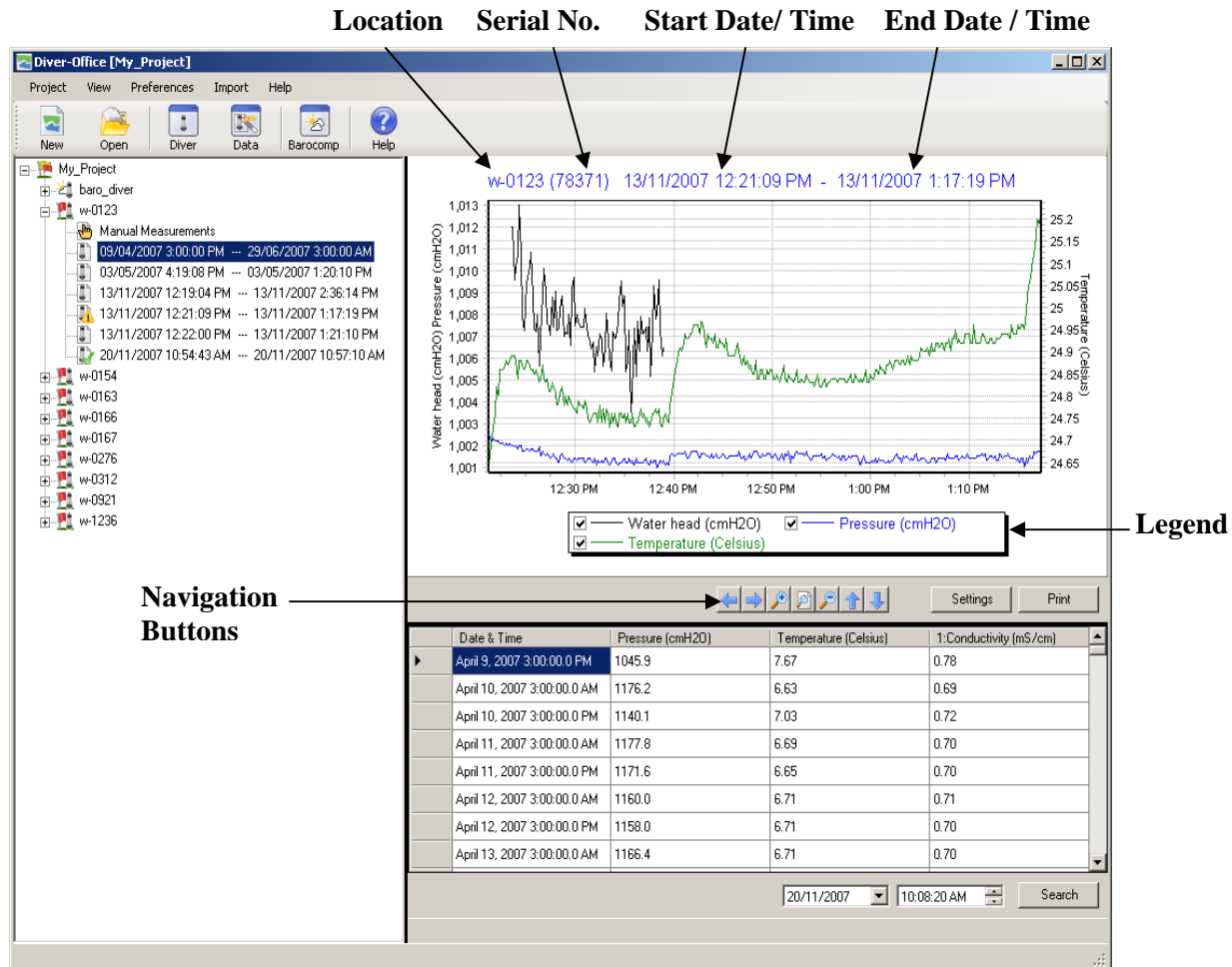
To remove a manual measurement, simply select the manual measurement from the list and click the **[Delete]** button.

## 2.1.4 Time Series Data

In the tree view, the start and end time, and barometric compensation status is shown for each time series, for the selected location. The barometric compensation status can be either compensated, partially compensated or uncompensated. Each status is represented by an icon, as shown below:






When a time series tree item is selected, the time series data will appear in both plot and table form (as shown below).



The buttons located below the plot legend allow you to navigate the time series data shown on the plot.



-  **Move Left**
-  **Move Right**
-  **Zoom In**
-  **Reset Settings**
-  **Zoom Out**
-  **Move Up**
-  **Move Down**

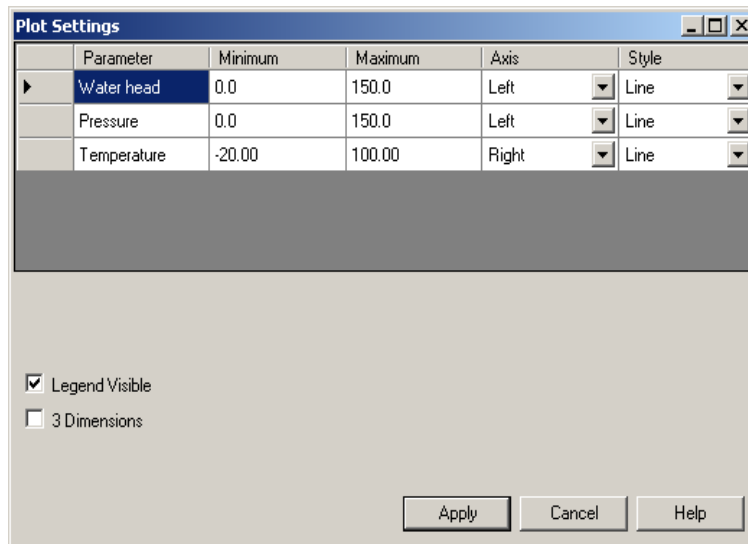
To **Search** for a particular point in the time series table, specify the date and time (located below the time series table) and click the **[Search]** button. If a match exists, Diver-Office will then highlight and focus on the time series point in the time-series table.

## Plot Settings

By default, the plot will show all the available parameters recorded for that particular Diver-type. To show/hide parameters, simply click on the corresponding check box in the plot legend (shown below).



You can further modify the appearance of the plot by clicking on the **[Settings]** button.



For each parameter, select an **Axis** (left or right) and a **Style** (line or bar). You may show/hide the plot legend or show the plot in **3-Dimensions** by clicking on the appropriate checkbox.

Click **[Apply]** to make the changes to the plot. The changes will apply to the graphs of all time series.

## Printing Time Series Plots

To print a time series plot, simply click the **[Print]** button. The windows print dialog will open where you can specify the desired print settings.

## 2.2 Diver-Office Main Menu

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### 2.2.1 Project

#### **New... (CTRL+N)**

Creates a new project in Diver-Office. Upon clicking, you will be prompted to enter a name for the new project.

#### **Open... (CTRL+O)**

Opens an existing Diver-Office project. Upon clicking, select the desired project and click **Open**.

#### **Delete (CTRL+D)**

Deletes the current project. Upon clicking you will be prompted to confirm.

#### **Settings (CTRL+S)**

Shows the project settings for the current Diver-Office project. Please refer to “Project Settings” on page 12 for more information on project settings.

#### **Exit (ALT+F4)**

Closes Diver-Office.

### 2.2.2 View

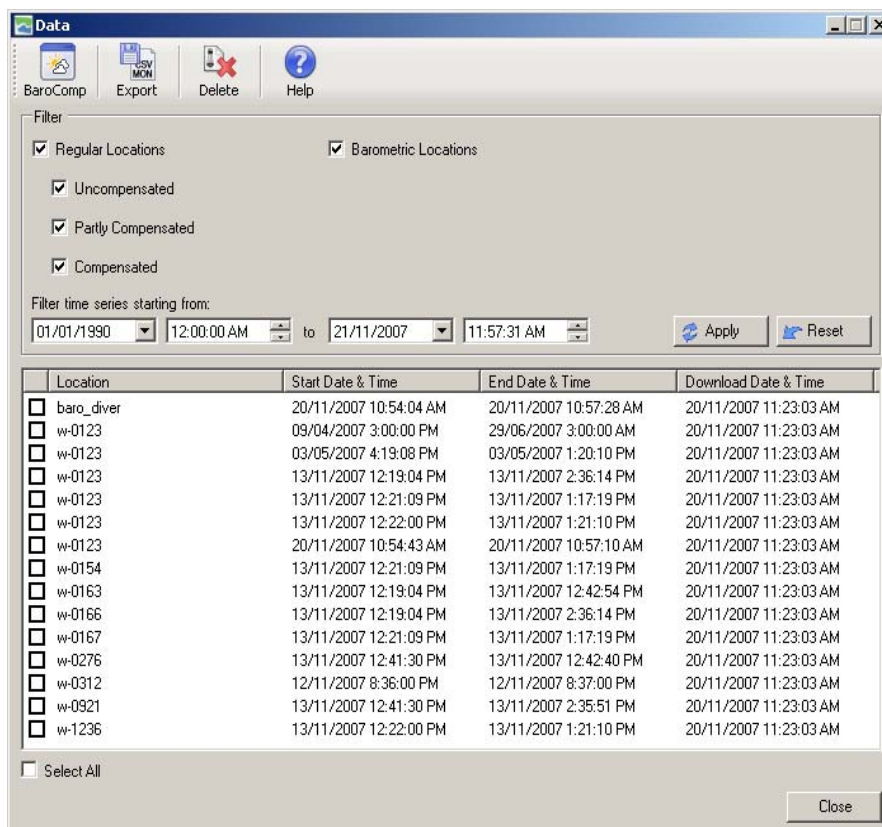
#### **Diver (CTRL+R)**

Opens the Diver dialog (shown below).

Please refer to “*Programming and Reading Divers*” on page 25 for more information on this dialog.

#### **Data (CTRL+A)**

This menu item will open the **Data** dialog (shown below).



The Data dialog contains a toolbar at the top with shortcuts to some of the key features in Diver-Office. Below is a description of each toolbar option:



**Barometric Compensation** button opens the barometric compensation dialog from which you can perform barometric compensation on selected time series data.



**Export Data** button allows you to export selected time series data to MON, CSV and/or NITG file types.



**Delete Data** button allows you to delete selected time series data from current project.



**Help** button opens the Diver-Office help document.

## Filtering Time Series Data


By default, the Data dialog will populate all the time series data that exists in the current Diver-Office project. However, you can filter the time series data by location type, barometric compensation status and/or by start/download time.

To filter the time series data by barometric compensation status, enable/disable the checkbox(es) beside the desired barometric compensation status (e.g Uncompensated, Partly Compensated, and Compensated). For example, if you would only like to see all the time series that have been compensated, select the **Compensated** checkbox, and unselect the Uncompensated and Partly Compensated checkbox.

To filter the time series data by start/download time, specify the desired start and end time in the respective text boxes.

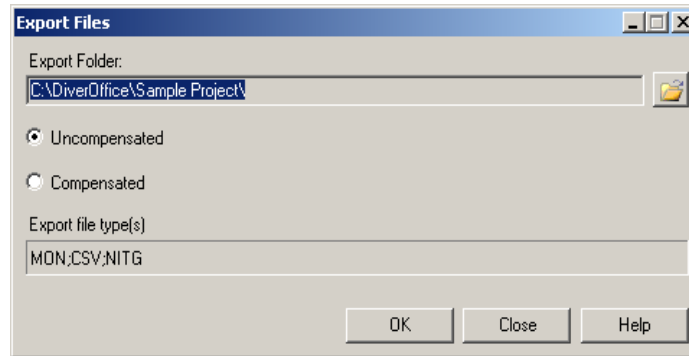
To apply the filter, click the  **Apply** button.


All the time series data that satisfy the filter criteria will be displayed in the table below.

To reset the time and date filter criteria, click the  **Reset** button.

## Exporting Time Series Data

You can export time series data from the **Data** dialog by selecting the checkbox(es) beside the desired time series, and then clicking the **Export** button from the toolbar. The following dialog will display:



The **Export Folder** is the destination folder in which all exported data is stored on your computer. By default, the folder is set to the Diver-Office project folder. You can change the export folder by clicking on the **Open**  button and selecting a new destination folder. When data is exported, it is always saved in a corresponding subfolder, e.g., MON, CSV and DAT, based on the exported file types.

You can export the time series data in either uncompensated form or compensated form, by selecting the desired option.

Click the **[Ok]** button to export the data. The data will be exported in the file formats specified in the Project Settings. Please see section “*Project Settings*” on page 12 for more information on setting the Default Export Settings.

## Barometric Compensation

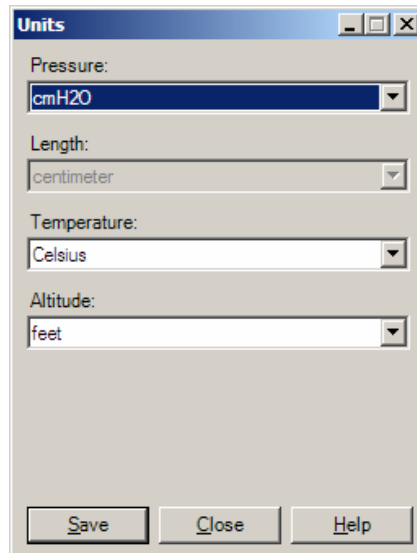
You can perform barometric compensation on selected time series data in the **Data** dialog. Simply select the checkbox(es) for the desired time series data and click the **BaroComp** button from the toolbar.

This will open the Barometric Compensation dialog. Please refer to Chapter 3: Barometric Compensation on page 34 for more information.

## 2.2.3 Preferences

### Units (CTRL+U)

Opens the default unit settings for the current Diver-Office project. The following dialog will display.

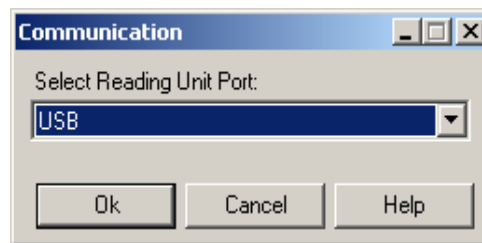


To change the units, simply select the desired units from the dropdown list boxes and click the **[Save]** button.

**Note:** The **Length** unit always appears grayed-out and is dependent on the **Pressure** unit. For example, if the pressure unit is mH2O, the length unit will automatically change to metres.

## Communication (CTRL+SHIFT+C)

Opens the Diver communication settings for the current Diver-Office project. The following dialog will display:



If you are using a USB Reading Unit/Interface Cable to communicate with Diver dataloggers, you must select USB as the reading unit port. If you are using a Diver that requires a serial port connection, then you must select the appropriate COM port from the dropdown list box.

Once selected, click **[Ok]** to apply the changes.

## Pumping Test (CTRL+P)

Certain Divers can be programmed with a user-defined pumping test sample method. The basic principle of a pumping test is that the sample interval increases over time. Here you can create, edit and delete a user-defined pump test (only for Micro-Diver and Cera-Diver). Upon selecting, the following dialog will display:

Step	#Samples	# Intervals	Sample Rate (Seconds)
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0

To add a new pumping test, click the **Add New Pump Test** button. The fields below will become active.

Specify a **Name**, **Description** (optional), and **Base Sampling Interval**. Next, define the number of samples and number of intervals required for each step in your sampling method. Please note that the total number of samples must add up to the total memory of the Diver, or else you will be unable to save the sample method.

Once finished, click the **[Save]** button. The sample method will now be added to the list of sample methods.

To delete a pumping test sample method, select the method from the dropdown list and click the **Delete Selected Pump Test** button.

To edit a pumping test sample method, select the desired pump test from the dropdown list and click the **Edit** button.

## Languages

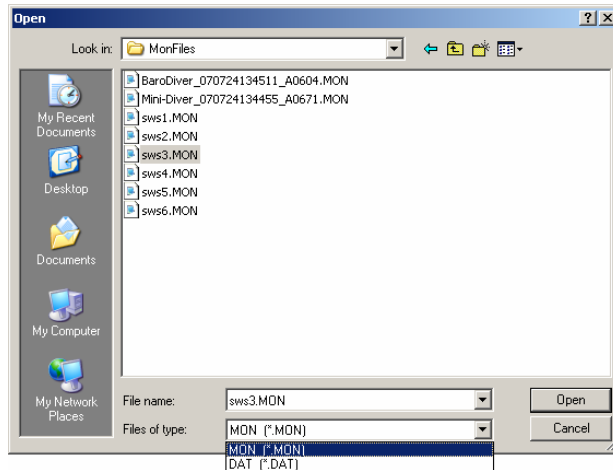
This option allows you to change the Diver-Office language. Select between **English** and **Nederlands**. Upon selecting you will be prompted with the following message:

Click **[Ok]** to restart Diver-Office and load the selected language.

## 2.2.4 Import

### Diver Data (CTRL+E)

This option allows you to import Diver datalogger data into Diver-Office, from both MON and DAT file formats. When selected, the following dialog will display.



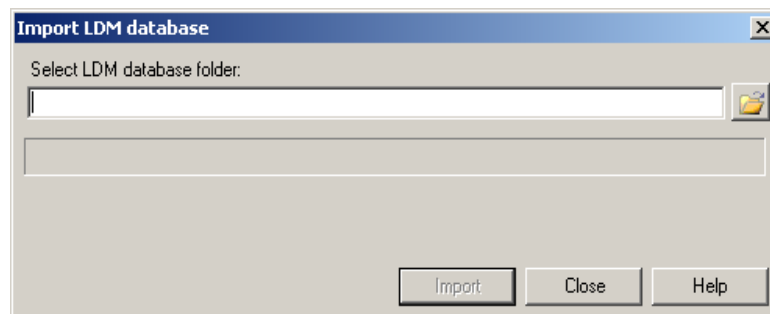
Here you can browse and select the desired data file(s) to import. You can make multiple selections by holding the CTRL key on your keyboard and clicking each file. Once selected, click the **[Open]** button to import the data into Diver-Office.


**NOTE:** Diver-Office supports MON files generated in LoggerDataManager version 4.0 and higher, Diver-Pocket, Diver-Office and DiverMate.

If the location in the data file already exists in the Diver-Office project, the measurements will be added to that location. If the location in the data file does not exist in the Diver-Office project, it will be added to the Project Tree.

### LDM Data (CTRL+L)

This option allows you to import data from a *LoggerDataManager 5* or higher databases into a Diver-Office project.



To import LDM data, click on the  **Open** button, and browse to the desired LDM database folder. By default this directory will be:

*C:\Program Files\LDM\EXE*

Select the **DB** folder, and click **[Ok]**.

After validating the LDM database, Diver-Office will transfer the data and import it into the current project. Please note it's possible that some data in your LDM database may not be imported into Diver-Office. In this case, it is likely that these time-series data were originally downloaded to LDM from Divers not supported by Diver-Office.

**NOTE:** This feature only supports databases from LDM version 5 and higher.

## **2.2.5 Help**

### **Help (F1)**

Displays the Diver-Office Online Help documentation.

### **About... (CTRL + B)**

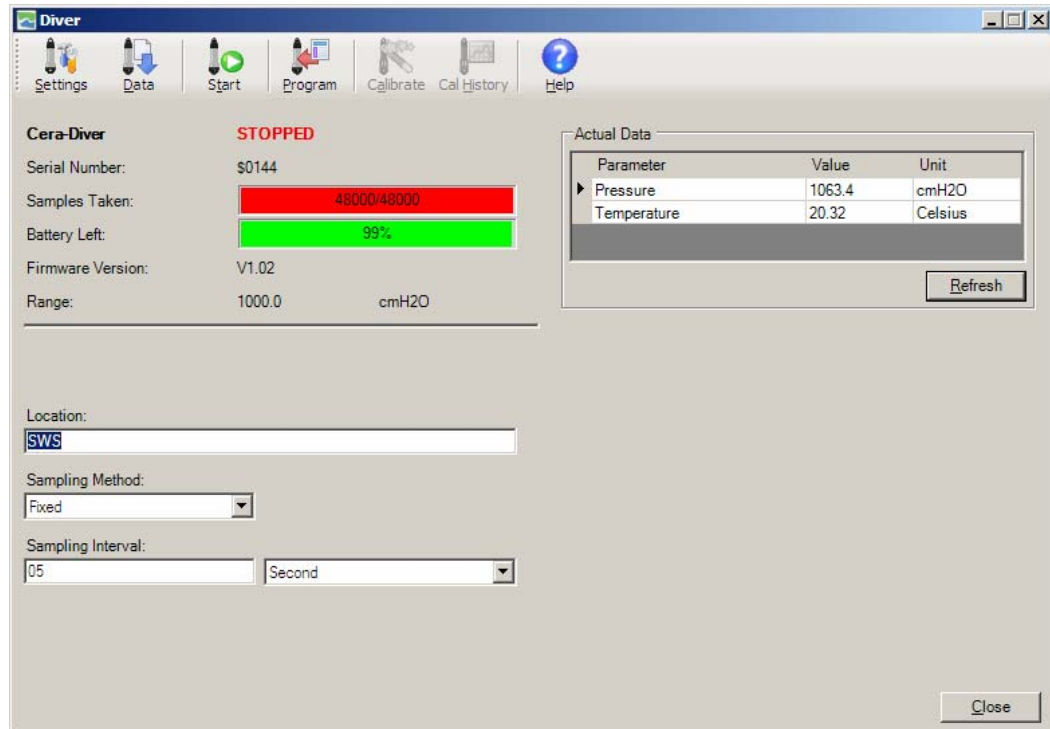
Displays the Diver-Office information dialog. This contains the version number and information on how to contact Schlumberger Water Services.



## 3 Programming and Reading Divers

---

The **Diver** dialog can be accessed by clicking **View** from the main menu and then selecting **Diver**, or by selecting the Diver button from the toolbar. Alternatively, you can press CTRL + R on your keyboard. Upon clicking, Diver-Office will attempt to read and display the settings of the connected Diver. The following dialog will show:



The **Diver** dialog (shown above) is the main interface in which you can communicate with Divers. From this dialog you can,

- Read Diver settings.
- Program Diver settings
- Start/Stop Divers
- Download Diver data into Diver-Office.
- Read actual data from connected Divers.
- Calibrate CTD-Diver

Each of these procedures is described in the following sections.

Please note that in order to communicate with Divers you have to select the appropriate communication method from **Preferences/Communication** dialog, and the Diver must be connected to the computer (see below).

### 3.1 Connecting to a Diver

---


The method used to connect Divers depends on the manner in which the Diver is installed in the borehole:

Divers suspended in the borehole on a steel cable will need to be removed from the borehole prior to connection. The Diver is connected to the computer using a reading unit.


Divers suspended on a DDC (Diver Data Cable) do not need to be removed from the borehole. Simply use an interface cable to connect the Diver to the computer.


## 3.2 Reading Diver Settings and Data

---

To read the settings from a Diver, simply click the  **Settings** button. The following settings will be returned:

Setting	Description
<b>Diver Type</b>	The type of Diver (e.g Mini-Diver, Micro-Diver, CTD-Diver)
<b>Diver Status</b>	The status of the Diver can either be STARTED or STOPPED. If you use future start or smart future start, the status can also be FUTURE START.
<b>Serial Number</b>	The serial number of the Diver.
<b>Memory Left</b>	Displays the amount of memory left in the Diver as a progress bar.
<b>Battery Left</b>	Displays the amount of battery power remaining in the Diver
<b>Firmware Version</b>	Firmware version of the Diver.
<b>Range</b>	The pressure range of the Diver.
<b>Conductivity Range</b>	The conductivity range of the Diver ( <i>CTD-Diver only</i> ).
<b>Location</b>	The assigned location for the Diver.
<b>Sampling Method</b>	The sampling method, e.g., Fixed, Event Based, User Defined Pumping Test.
<b>Sampling Interval</b>	The time between two successive measurements
<b>Altitude</b> ( <i>if applicable</i> )	The altitude above sea level


To download the data recorded by the Diver click the **[Data]** button . During the data download the progress is indicated by a progress bar. Once the data has been downloaded it will be exported if this option is selected in the Project Settings. Subsequently, the program will jump to the tree view where the downloaded time series will be selected and a graph/table of the data will be shown.

To return to the Diver window click the **Read Diver** button .

## 3.3 Programming Diver Settings

---

Once the settings have been read, you can modify and program the following settings: **Location**, **Sample Method**, **Sample Interval**, **Altitude** (if applicable) and **Conductivity Range** (if applicable). Each setting is described in more detail below.

Once you have defined the settings for the Diver, click the **[Program]** button  to save the settings to the Diver.

### 3.3.1 Location

A location is a unique name given to a Diver and is usually associated with the physical location in which the Diver is deployed, i.e., a specific well and a specific well screen. Since the Location name will be used as part of the filename for exporting data, the Location name does not accept special characters that would lead to an invalid filename.

### 3.3.2 Sample Method and Sample Interval

The Sample Method may be **Fixed**, **Event Based**, one of the predefined pumping test settings (**Setup A**, **B** or **C**), or **User Defined (for the Micro-Diver and Cera-Diver only)**. Each sampling method is described below:

#### Fixed

When this method is selected, the Diver will take and store samples in regular time intervals. The time interval must be specified in the **Sampling Interval** text box.

For example, with a 10-second fixed sample interval, the Diver will take a measurement every 10 seconds on all channel settings and then store these values in internal memory, with the date and time.

#### Event Based

When you select this method, the Diver compares each sample to the last stored sample and calculates a difference. A new sample is only stored when:

- the difference exceeds a specified percentage from the last stored sample on the leading parameter. Generally, the leading parameter is pressure. For the *CTD-Diver* the leading parameter is conductivity.
- If no samples were stored for the past 250 samples.

If you select this method, the **Variation** field will be displayed. In the field **Variation**, specify the appropriate difference threshold. Enter this difference as a percentage of the total range of the Diver. The percentage must lie between 0.1% and 25%. Also, you must specify a **Sampling Interval**.

#### Predefined Pumping Tests

Diver-Office includes three convenient predefined pumping tests available from the Sampling Method dropdown list box for Divers that support this feature, e.g., TD-Diver, Cera-Diver and Micro-Diver.

The specifications of these predefined sampling methods are as follows:

##### **Pumping Test Setup A**

Base Sample Rate: 0.5 seconds.

Step	Number of Samples	Number of Intervals
1	1200	1
2	5400	2
3	41400	10

### **Pumping Test Setup B**

Base Sample Rate: 1 second

Step	Number of Samples	Number of Intervals
1	600	1
2	1080	5
3	5400	10
4	40920	30

### **Pumping Test Setup C**

Base Sample Rate: 5 seconds

Step	Number of Samples	Number of Intervals
1	120	1
2	270	4
3	900	12
4	1800	60
5	44910	240

### **User Defined Pump Test (Cera-Diver and Micro-Diver only)**

If none of the predefined pump tests are suitable, you can define and select your own customized pump test sampling method. To read more on how to create pumping tests, please see *Pumping Test on page 21* for more information.

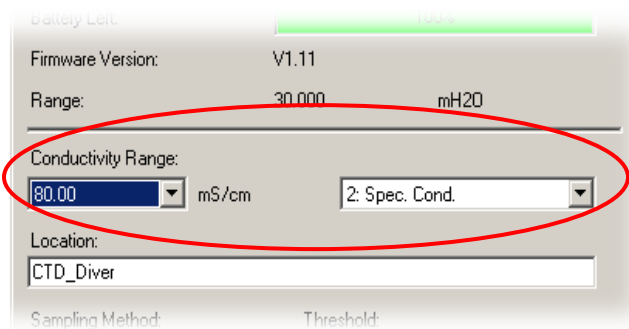
### 3.3.3 Altitude

Enter a value for the altitude above sea level of the location of the Diver. This only applies to the TD- and CTD-Divers. The value entered should be in the same units that are programmed in the Diver, e.g, meters or feet. The value must lie within the following range:

- 300 m to 3,000 m (-984 ft to 9,842 ft)

### 3.3.4 Conductivity Range

For CTD-Diver DI-263, two additional fields will appear in the Location settings when the diver settings are read. (shown below).



For the **Conductivity Range**, choose between 80.00 or 30.00 mS/cm. In the adjacent dropdown list box, select between **1. Conductivity** or **2. Spec. Cond.** Please refer to your Diver manual for more information on these settings.

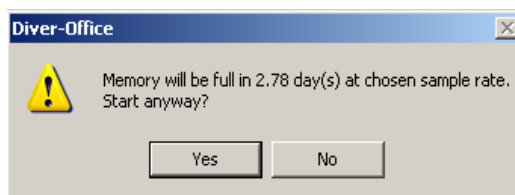
## 3.4 Starting a Diver

---

Before you can start a Diver, the settings must have been read and the Diver status must be STOPPED.

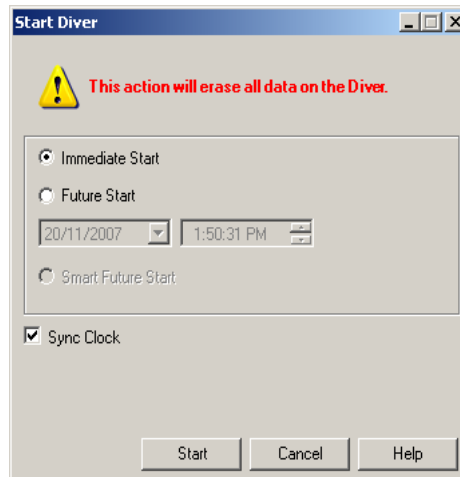
To start the Diver, click the  **Start** button from the toolbar.

Upon clicking, you may be prompted with a warning message indicating the estimated operating time until the Diver memory is full, at the chosen sample rate. An example is shown below:



If the given time estimate is suitable, click [Yes] to continue. Otherwise, click [No] to return to the Diver dialog where you can modify the sample interval.

Upon clicking [Yes], the **Start Diver** dialog will display (shown below):



Here you can select from the following three start methods:

### Immediate Start

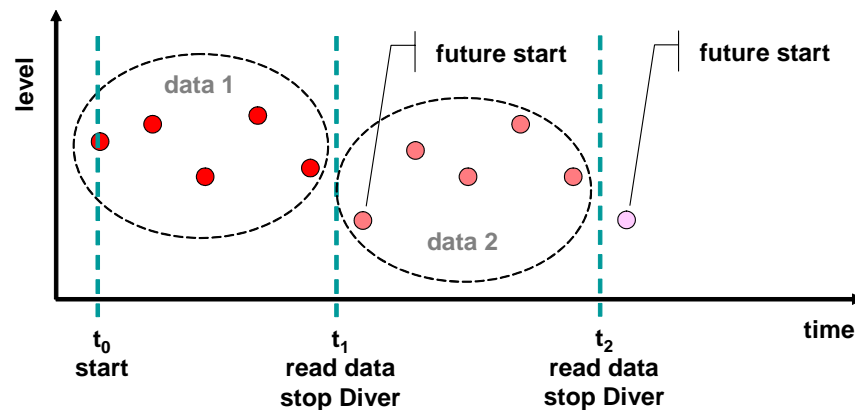
Select this option to start the Diver immediately. Upon clicking **[Start]**, the Diver will begin to take and record samples, as defined in the Diver settings.

### Future Start

Select this option to start the Diver at a specified time in the future. Use the date and time boxes to enter the desired future start time.

### Smart Future Start (SFS)

This option is useful in situations where you want to stop the Diver, download its data and then continue collecting data at the specified sample interval. In other words, this option allows you to download data in contiguous segments, while maintaining a consistent sample interval. SFS can be explained best through the diagram shown below.




At  $t_0$  the Diver is started. At  $t_1$ , the Diver is stopped and the data is downloaded. Upon restart, the Diver is started using the Smart Future Start time. At  $t_2$ , the Diver is stopped again and the data is downloaded. Upon restart, the Diver is started using the Smart Future Start time, etc.

After selecting the desired start method, click the **[Start]** button to save the start settings to the Diver.

**Note:** Starting a Diver will erase all data on the Diver. Please be sure to download your data before starting the Diver.

## 3.5 Stopping a Diver

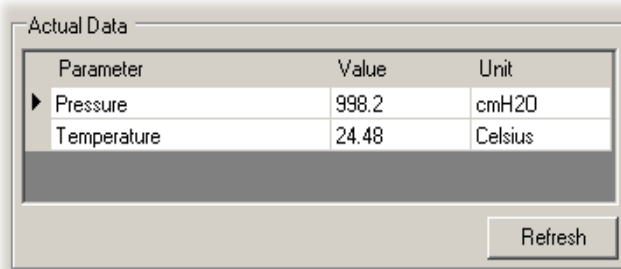
---

To stop a Diver you must first read the settings of the Diver, and then click the  **Stop** button. A confirmation screen will display to prevent accidental stopping of the Diver.

## 3.6 Actual Data

---

The **Actual Data** frame (shown below) allows you to view the most recent measurements stored in the Diver's memory.



Parameter	Value	Unit
▶ Pressure	998.2	cmH2O
Temperature	24.48	Celsius

If the Diver is started and is connected to Diver-Office, e.g., through an interface cable, click the **[Refresh]** button to update the table with the most recent measurements stored in the Diver.


## 3.7 Calibrate CTD-Diver

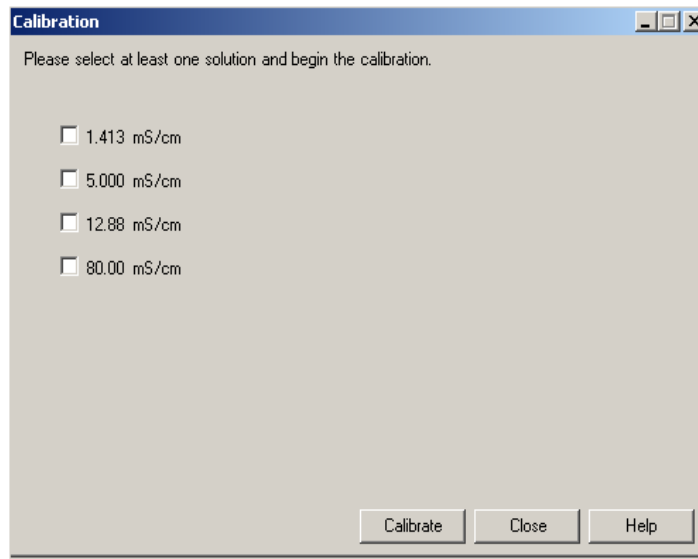
---

Diver-Office allows you to calibrate the ceramic CTD-Diver as well as retrieve the calibration history from the CTD-Diver. It is recommended that you regularly calibrate the CTD-Diver to ensure that it accurately measures conductivity. You can read more about the calibration in the product manual of the CTD-Diver.

It is extremely easy to calibrate a CTD-Diver with Diver-Office. You only need to place the CTD-Diver in a calibration solution with a standard conductivity. These solutions can be obtained from suppliers of laboratory equipment.

The ceramic CTD-Diver can be calibrated at a maximum of four points. The solutions should have a temperature between 5 °C(41 °F) and 30 °C(86 °F).It is advisable to place the fluid(s) in the room where the calibration is to take place long before actual calibration starts to allow the fluid temperature to stabilize.

To calibrate a CTD-Diver, click the  **Calibrate** button located in the **Diver** dialog toolbar. **Note:** This button will only become available if the Diver is recognized as a CTD-Diver. Upon clicking, the following dialog will display.



Select the check box(es) next to the appropriate solution(s) that will be used to calibrate the Diver.

Click the **[Calibrate]** button to begin calibrating the CTD-Diver.

A message will appear stating that all data on the CTD-Diver will be erased by the calibration process. Click **[Yes]** to continue or click **[No]** to cancel.

You will be prompted to immerse the CTD-Diver in the selected solution. Click **[OK]** to continue. If you are using multiple solutions, you will be prompted to calibrate from lowest concentration to the highest concentration specified.


Diver-Office will then calibrate the CTD-Diver according to the specified solutions. If the calibration is successful, a confirmation message will appear. If the calibration fails,

- check to make sure you are using the appropriate calibration solution
- ensure that the Diver is connected securely to the Reading Unit
- ensure that the Diver's sensors are submerged in the solution

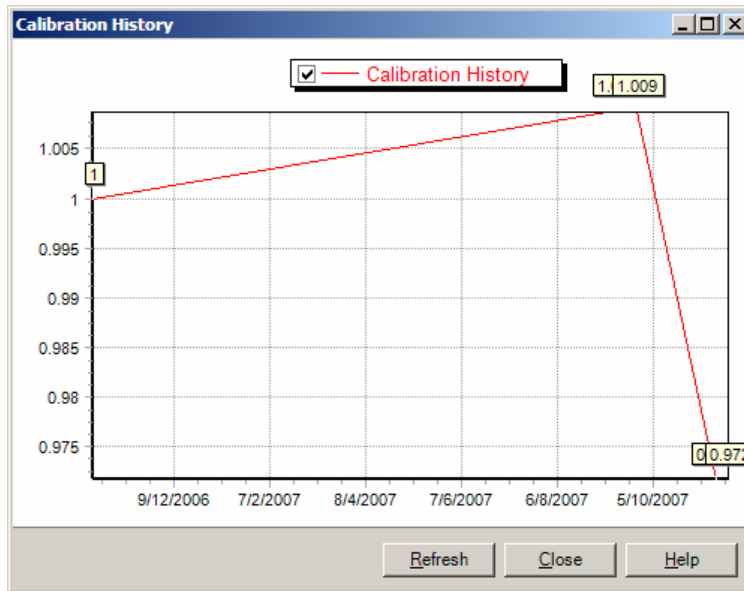
## 3.8 Calibration History

---

Every time a CTD-Diver is calibrated, the calibration settings are saved to the Diver's internal memory.

To view the calibration history of a CTD-Diver, click on the  **Calibration History** button from the Diver dialog toolbar. The calibration history will be plotted on a graph, as shown below.





This feature is useful for monitoring changes in calibration over time which may aid in explaining significant variations in anomalies. **Note:** In order to view a CTD-Divers calibration history, the Diver must be connected to the reading unit/interface cable.

### Zooming

Using the mouse, left-click and drag the cursor downwards to zoom into a point of interest on the graph. Release the left-button of the mouse to zoom into the defined area. To zoom back out, click the **[Refresh]** button.

# 4 Barometric Compensation

---

## 4.1 What is Barometric Compensation

---

A Diver measures the groundwater level with a highly accurate pressure sensor that measures an absolute pressure. This pressure is equal to the ‘weight’ of the water column above the measuring instrument plus the prevailing air pressure. Subtracting these air pressure measurements from the absolute pressure measurement ‘compensates’ for air pressure variations. This can be done quickly and easily using Diver-Office.

The process uses linear interpolation for air pressure values if they are not measured at the same time as the water level. The sampling speed of the barometer does not have to be the same as the Diver measurements it compensates. It only has to register the variations in the atmospheric pressure; a measurement with a fixed sampling speed of 1 per 30 minutes is usually good enough.

Divers measure the groundwater level with respect to the Diver itself (e.g water column height above the Diver). However, Diver-Office allows you to express water levels with respect to an external reference (e.g vertical reference datum, top of well casing ). The following section describes the three different barometric compensation methods, the barometric compensation procedure, and the compensation results.

### Using a Baro-Diver

SWS manufactures a Baro-Diver that samples and records atmospheric pressure. This Diver can be located at various positions, for instance: in an Office, in the well (in the part where there is no water) or on a floating device such that the distance between the air-water interface and the Baro-Diver is always constant. The latter configuration will avoid large temperature variations in the Baro-Diver.

Usually only one Baro-Diver suffices for more than one Diver. The area where the Divers are deployed must have the same barometric pressure. This depends on the terrain (mountains and lakes can affect barometric pressure) and how large the deployment area is. Sometimes more than one Baro-Diver is used for one iso-barometric data, where one functions as a backup in case the other Baro-Diver fails.

Baro-Diver data can be downloaded, and assigned to any location for barometric compensation. Please refer to “Location Settings” on page 14 for information on how to assign a Baro-Diver location to a regular location.

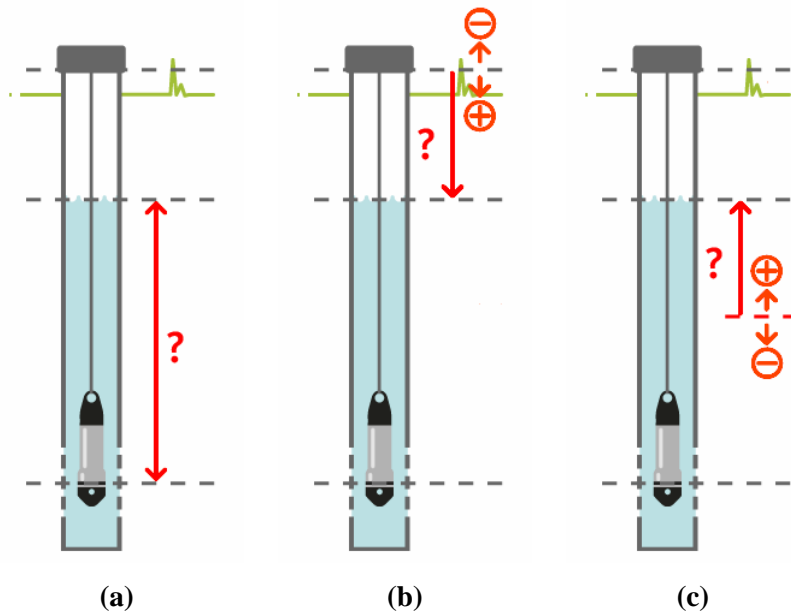
## 4.2 Barometric Compensation Methods

---

Water levels can be compensated and expressed in the following three ways:

- The height of the water column above the Diver
- With respect to the top of well casing (ToC)
- With respect to a vertical reference datum

These three different options are depicted in the picture below. In the last two options either a cable length must be given or a manual measurement must be used.



**The 3 different Barometric Compensation methods.**

**NOTE:** The direction of the plus and minus sign changes for the water column with respect to the vertical reference datum or the top of casing. If the water level is above the vertical reference datum it has a **positive** value. If the water level is below the top of casing it has a **positive** value. The same holds for the manual measurement. If the water level is above the top of casing the manual measurement has a negative value.

## 4.3 Setting Up Your Project

Depending on which barometric compensation method that you wish to use, you may have to provide additional location information before performing barometric compensation. For example, options (b) and (c) require that you either have performed manual measurements or that you have specified a cable length and a top of casing (ToC) measurement. The table below outlines the required parameters for each barometric compensation option.

Please refer to “*Location Settings*” on page 14 for more information on defining a cable length and ToC measurement for a location. Also, refer to “*Manual Measurements*” on page 15 for more information on adding manual measurements for a location.

Parameter	Water Column	Vertical Reference Datum		Top of Casing	
		Cable Length	Manual Measurement	Cable Length	Manual Measurement
Barometer	•	•	•	•	•
Top of Casing		•	•		
Cable Length		•		•	
Manual Measurement			•		•
Vertical Reference Datum		•	•		

• = Required Parameter

For the barometer and the manual measurement, there are additional requirements with respect to the time series of the Diver that will be compensated:

- The barometer time series and the Diver time series must (partly) overlap
- If the manual measurement is used it must fall within the barometer time series and the Diver time series.

If these conditions are not met, the Barometric Compensation cannot be performed.

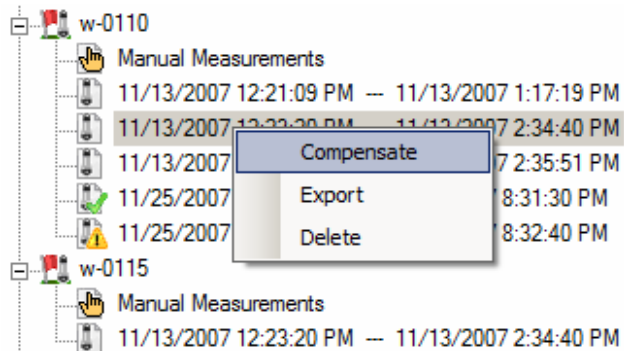
## 4.4 Compensating the Data

---

Barometric Compensation can be done in one of two ways: from the time series node in the project tree or from the data filter dialog.

### From the Project Tree

To compensate time series data from the project tree, simply right-click on the desired time series, and select Compensate from the pop-up menu (shown below).

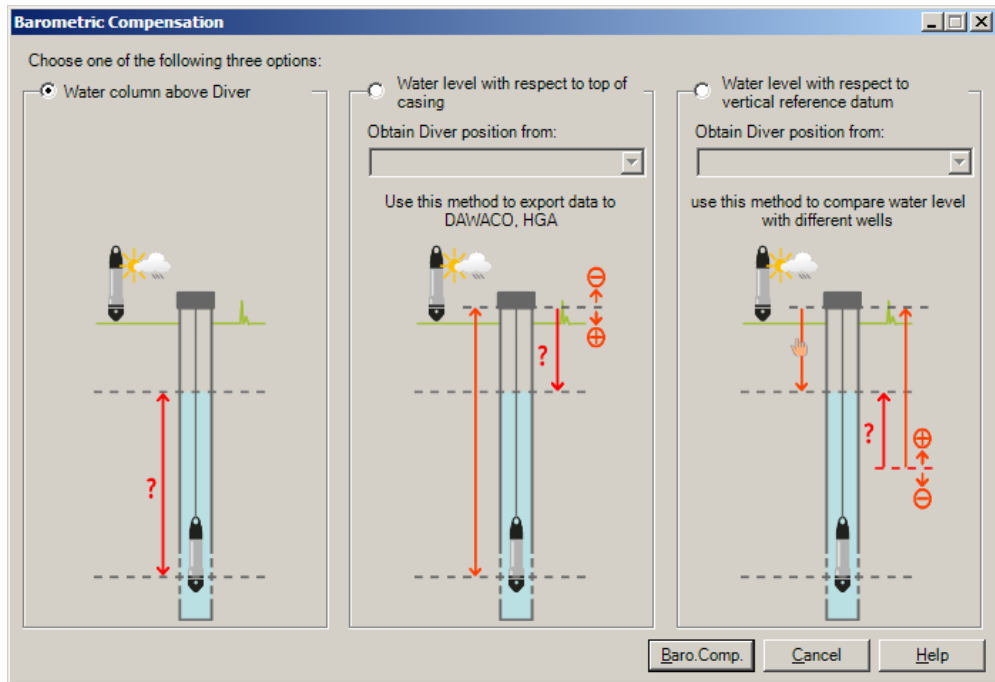


### From the Data Dialog

To compensate time series data from the Data dialog,

- Go to **View / Data**, or press **CTRL + A** on your keyboard.
- Select the desired time series data from the table by selecting the corresponding checkbox(es).
- Click the [**Baro. Comp.**] button

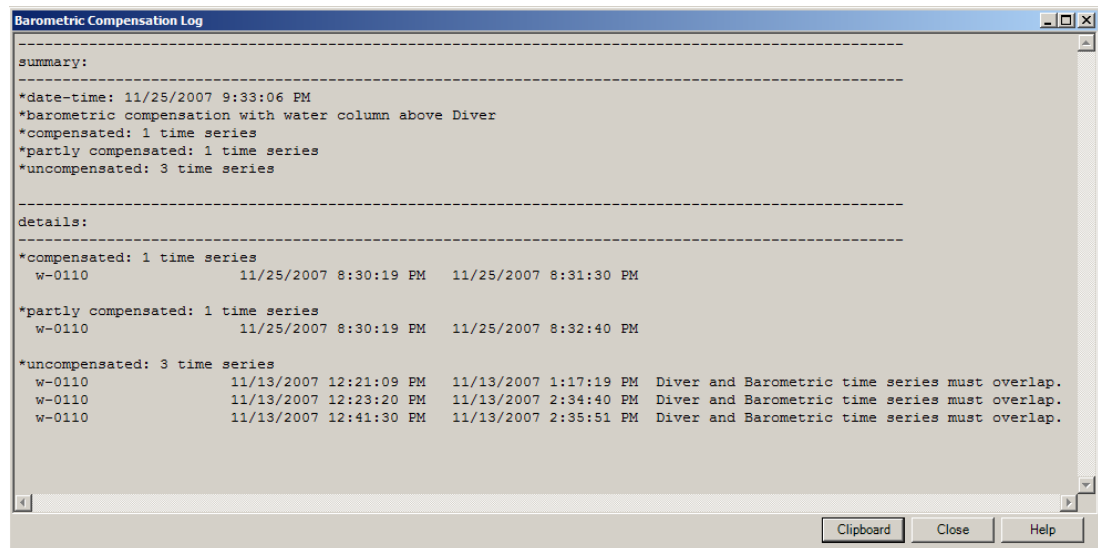
In both cases, the following Barometric Compensation dialog will open (shown below).



Here you can select the appropriate barometric compensation method. Once selected, click the **[Baro. Comp]** button.

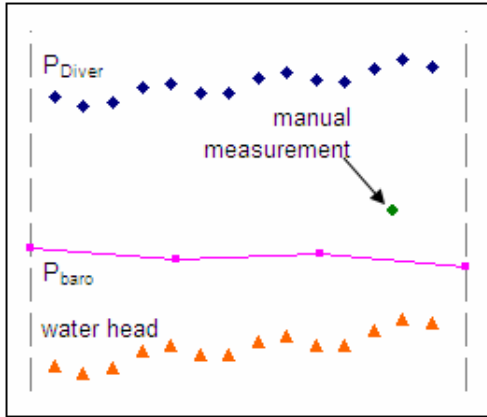
## 4.5 Barometric Compensation Results

The results of the barometric compensation are presented in a **Barometric Compensation Log**. This log will open whenever you attempt to compensate time series data. An example of the log is shown below.



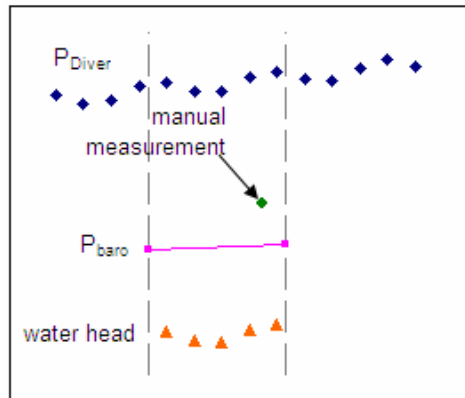
The barometric compensation log includes the date and time of the compensation, the compensation method used, and the results of the compensation, i.e., compensated, partly compensated, uncompensated, for each of the selected time series.

There are six possible outcome scenarios that can be displayed in the Barometric Compensation Log. These scenarios are depicted in the diagrams on the following page:



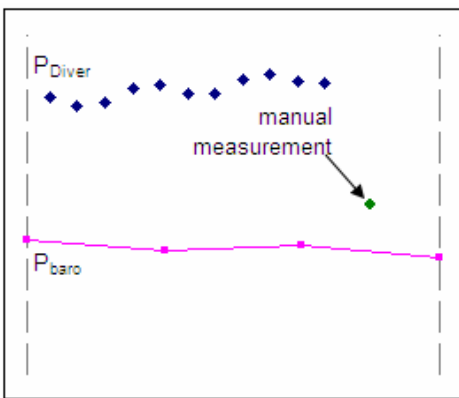
time

**compensated**



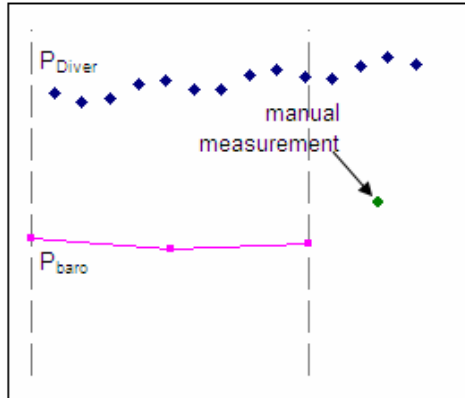
time

**partly compensated**



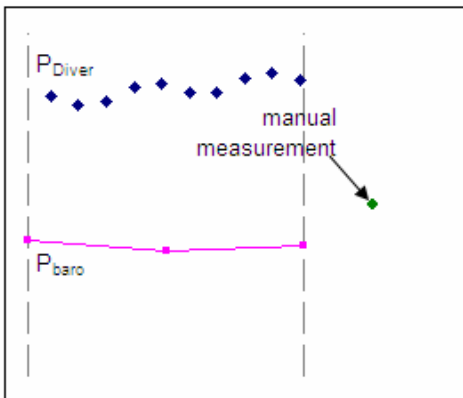
time

**uncompensated** – manual measurement not in time span of time series



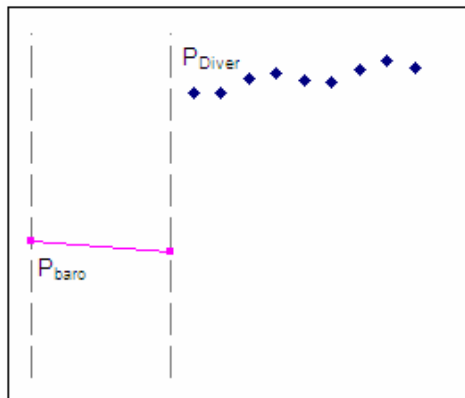
time

**uncompensated** – manual measurement not in time span of barometer time series



time

**uncompensated** – manual measurement not in time span of Diver time series and barometer time series



time

**uncompensated** – no overlap of Diver time series and barometer time series



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