SediMeter Software Manual

ver 1.0.1

Document Scope

This is a user manual for the SediMeter™ software, version 1.0. It is intended as a reference to assist users in getting the most out of the software. It is, however, not exhaustive, as the application inherits many features and shortcuts from its development platform (LabView) that are not documented here. Right-clicking on different parts of the user interface brings up context sensitive menus that provide a wealth of options that are beyond the scope of this manual to document.

Document Version

Rev. 1.0, 2008-02-26

Software Scope

SediMeter™ ver 1.0 is the communication and data management application for SediMeter models in the 2nd generation. They have model number SM2, and a 4 digit serial number (e.g., SM2-0001). SM2 comes in different versions identified by a letter, and some software features are not supported in some of the versions. Only version 2A supports all features.

Supported Operating Systems

The application has been tested under XP SP2 and Vista, but is designed to also run under Windows 2000.

Drivers

The communication with the SediMeter instrument can be either by USB or RS-485, or both, depending on model in the SM2 family. To use USB the drivers from Silabs have to be installed. To use RS-485, the computer must have either a RS-485 port, or an adapter, e.g. a USB to RS-485 adapter, in which case drivers for that adapter must be installed. Links to the latest USB driver updates are available at www.lindorm.com/downloads, and may need to be installed if the operating system is upgraded in the future.

Legal Notices

Copyright

Warranty

This software is supplied as-is and a license to use it is extended free of charge. No express or implied warranty is made regarding the usefulness for a specific purpose, beyond what is mandated by applicable law. The user must verify that the software performs in the way required by the specific circumstances.

Contents

Installation

Insert the CD and follow the instructions. Do not change the default directories, as it may prevent the software from working properly. You will get warnings that the software has not being certified; this is normal (it would be cost prohibitive to certify the software, since every time a minor update was made it would have to be re-certified).

Installing USB drivers

Locate the setup file identified in the ReadMe document, and double-click it. Again, you may get warnings (at least under Vista) that the drivers have not been certified; this is normal.

USB drivers are not required for using the software with SediMeter instruments that do not support USB.

Step-by-step instructions

Preparing a SediMeter for deployment as stand-alone logger

1. Connect the SediMeter to the computer using either USB or RS-485
2. Start SediMeter.exe
3. Select the [virtual] serial port that the SediMeter is connected to (e.g., COM1)
4. Select the connection type, USB or RS-485
5. Click Open Connection
6. If RS-485, enter the NetAddr of the SediMeter in Send To; if USB, leave it as 0
7. Click on the Setup tab
8. Enter start time in UTC to any time within the next 24 hours (00:00:01 < hh:mm:ss < 23:59:59)
9. Enter measurement interval (00:00:05 < hh:mm:ss < 23:59:59)*
10. Optionally enter burst sample interval (in units of 1/32756 s) and count (from 0 for none, to 84), making sure that the burst sampling is finished at least 1 s before the next measurement starts (a too tight margin results in temperature readings that are too low since the reference voltage has insufficient time to stabilize)
11. Click Set to send the settings to the connected SediMeter (to verify that the settings were implemented, click Get to read the settings back; the time difference indicator should now show 0)
12. Click the Special tab
13. Select Log Mode
14. Click Set
15. Click the Connect tab
16. Click the Connect button to free the COM serial port
17. Disconnect the SediMeter

* A measurement interval of less than 5 seconds, although possible to enter, risks depleting the LED capacitor thus decreasing the light output, and compromising the measurement accuracy.

Setting up real-time monitoring

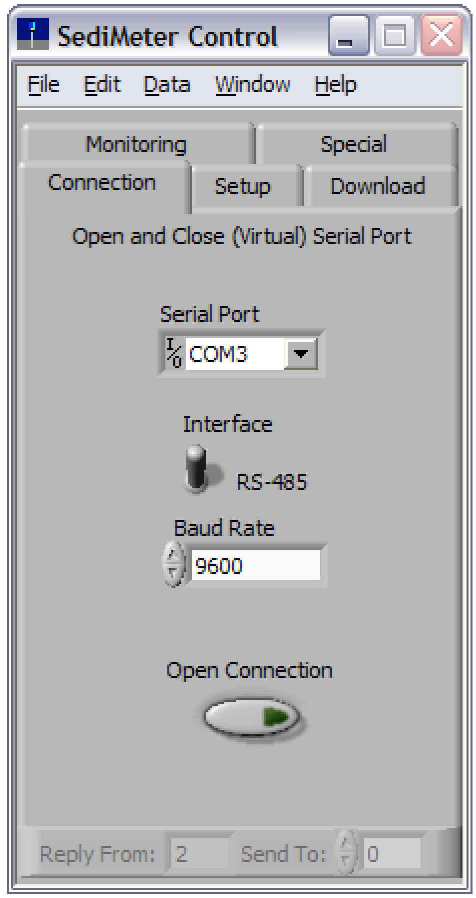
1. Connect the SediMeter(s) using RS-485
2. Set each SediMeter to RS485 mode (by using the NavPin or by clicking the Reset tact switch on the printed circuit board)
3. Start SediMeter.exe
4. Select the serial port of the RS-485 network
5. Select RS-485 protocol
6. Click Open Connection
7. Select menu item Edit -> SediMeter List…
8. Click ROLL CALL to update the list (you may edit it manually, but if you do you cannot verify that the SediMeters are online)
9. Go through the list and make sure that all the SediMeters are listed (if some is missing, use its NavPin and display to make sure it is in RS485 mode)
10. Close the SediMeter List window (File -> Close, or Ctrl+W)
11. Select the Setup tab
12. Enter measurement interval (00:00:05 < hh:mm:ss < 23:59:59)*
13. Optionally enter burst sample interval (in units of 1/32756 s) and count (from 0 for none, to 84), making sure that the burst sampling is finished before the next measurement starts and with time for download in between*
14. Make sure the Send To field says 0 (for broadcast)
15. Click the SET button to send the settings to all the connected SediMeters and synchronize their clocks with the computer time
16. If you wish to verify that the settings were implemented, set the NetAddr of one of the SediMeters in the Send To field and click GET to read the settings back; the time difference indicator should now show 0
17. Select menu Data -> Monitor Real Time… (Ctrl+M); it will take one measurement period for data to appear
18. To log data to file, enter a path and filename in the Log File field (in the middle of the right margin of the window) and click the LED to the right of the browse button to start and stop logging [if you entered a filename in the Monitoring tab of the SediMeter Control window, this field will be populated with that data]
19. To view data, select a SediMeter NetAddr in the top right corner of the window
20. To turn monitoring off, use the Monitoring menu (it cannot be turned back on)

* A measurement interval of less than 5 seconds, although possible to enter, risks depleting the LED capacitor thus decreasing the light output, and compromising the measurement accuracy. Other factors to consider are the duration of burst sampling, and the time it takes to download the data from all the SediMeters in the network (ca 0.5 s per instrument in transfer time, plus the time it takes the computer to process the data; this depends also on other processes running in Windows).

User Interface Description

SediMeter Control window

When starting the application the SediMeter Control window appears. The Connection tab is open, and the other tabs are inaccessible.



Front panel objects

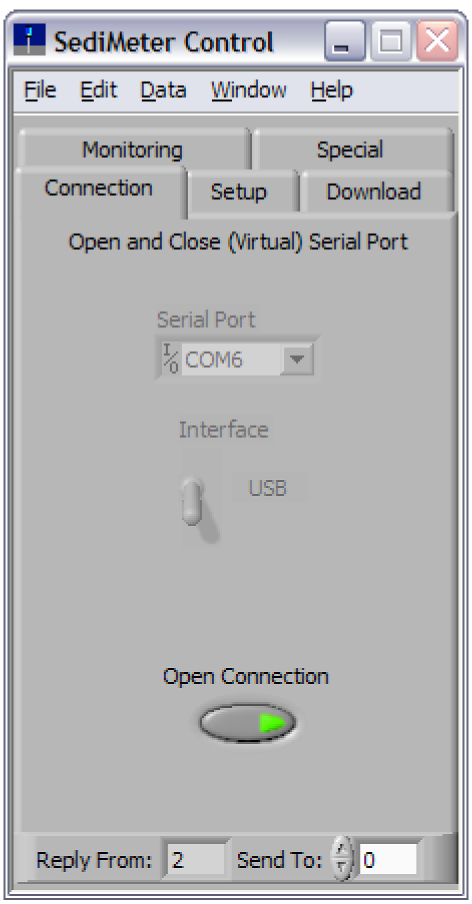
Connection tab

Serial Port pull-down menu

Select the COM port the SediMeter is connected to. Use the Refresh option if you connect a SediMeter when the application is running.

Interface switch

Select USB (default) or RS-485 depending on how you have connected the SediMeter. If you select RS-485 a new control will open, Baud Rate. However, at the moment only one baud rate is supported (9600 baud), why it just serves as information.



Open Connection button

Click to open the serial port. When you do (and there is no error), the remaining tabs get unlocked, and the footer of the window becomes un-dimmed.

Window Footer

Send To selector

Every message that is transmitted starts with a one-byte address code, the NetAddr. A value of 0 (zero) signifies a broadcast to all connected instruments. A value of 1 to 255 is used to address a specific SediMeter.

Use 0 for USB and for broadcast commands in RS-485. However, to get a reply from an instrument in RS-485, you must enter that SediMeter's NetAddr in the Send To field (in USB the SediMeter will reply even if the command is sent to 0; however, if you have NetAddr 1 connected, and enter any value other than 0 or 1 in this field, the SediMeter will not respond and you will get an error message).

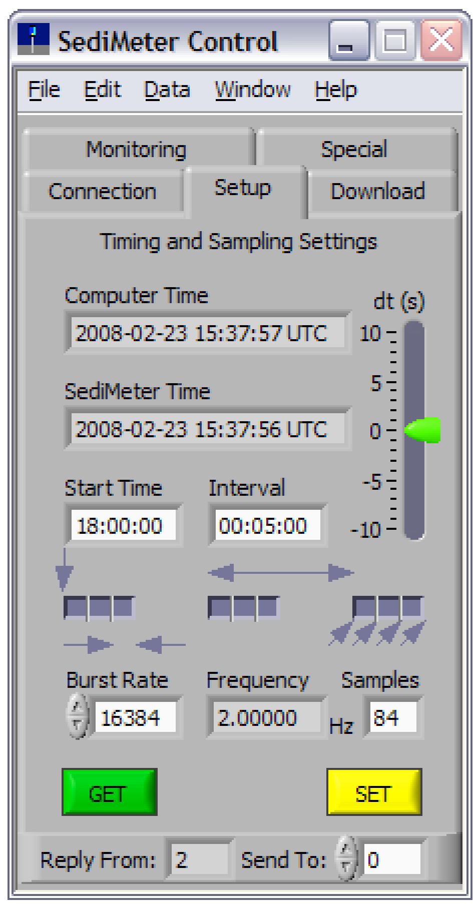
Reply From indicator

When a SediMeter responds, this field will indicate the NetAddr of the instrument that responded. This may be useful in USB mode, when you can have several SediMeters connected at the same time to different COM ports. Use this field to know which one you are communicating with at the moment. (You must disconnect and re-connect to another COM port to change which one you communicate with.)

Setup tab

Computer Time indicator

This indicates the present date and time that the computer is set to, in ISO style format and in the UTC time zone (corresponding to GMT, the time at 0° longitude). [The SediMeter also uses the UTC time zone; although there is an option for setting the local time zone in the instrument, there is presently no software control for changing that setting.]



SediMeter Time indicator

This indicator is dimmed until the time has been read from the SediMeter. Changing the Send To selector dims it again.

dt (s) indicator

When the SediMeter clock is read the difference compared to the computer clock is calculated, and the number of seconds is shown in this indicator. A positive value means that the SediMeter is ahead of the computer clock.

The SediMeter time may be set to within 0.02 s by this software, but due to drift the difference increases with time. You may want to record this value when downloading data. You can click the end values and change them to adjust the scale (e.g., from –1 to 1 s), if required.

Dual function controls / SediMeter indicators

When you open the Setup tab default values will be shown in the fields Start Time, Interval, Burst Rate, and Samples. You can edit these values. Whatever is in these fields when you click SET (see below) will be sent to the SediMeter(s). When you click GET (see below) the present setting of the selected SediMeter is retrieved and presented in these fields.

Start Time control/indicator

The start time for self-timed logging in the format hh:mm:ss. The next time that the SediMeter clock reaches this time, and it is in Logging Mode, it will start logging. Each time a measurement is made, this setting in the SediMeter will be increased by the amount specified as the Interval.

Example: If the time is 15:30 on a Monday, and you want the SediMeter to start logging at 00:00 on Wednesday, enter 00:00:00 in this control and set the SediMeter to Sleep Mode. Then some time on Tuesday (between 00:00:01 and 23:59:59) change the SediMeter mode to Log Mode.

Interval control/indicator

The interval between measurements in hh:mm:ss. The minimum value you can set is 1 s. However, the capacitor that provides the SediMeter sensor with power needs at least 2 seconds to re-charge, if fed by the standard two 3.6 V batteries. Use short measurement intervals at your own risk. If the white LED shines visibly less bright at the second and following measurements, the interval is certainly insufficient.

Burst Rate control/indicator

The interval between sampling of the two optional sensors *within* one and the same measurement. The unit is 1/32768th s, the rate of the SediMeter clock crystal. The range is $2 \leq$ Burst Rate ≤ 65535.

Samples control/indicator

The number of burst samples to take per measurement. The range is $0 \leq$ Samples ≤ 84.

Frequency indicator

This indicator converts the Burst Rate value to a frequency value in Hz. The range is $16384 \geq$ Frequency ≥ 0.5 (corresponding to the Burst Rate range given above).

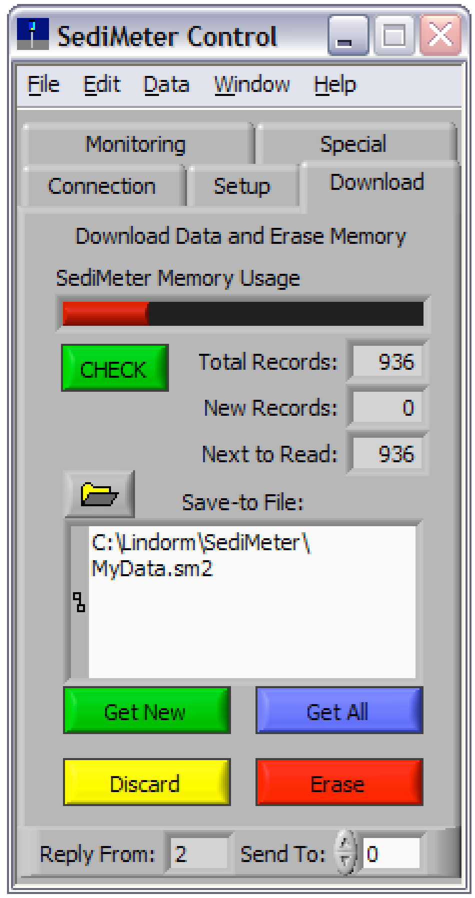
SET button

When clicking this button, the SediMeter selected in the Send To field is programmed with the values presently in the Computer Time, Start Time, Interval, Burst Rate, and Samples fields. If using the RS-485 protocol with more than one SediMeter is connected, selecting 0 in the Send To field causes all connected SediMeters to be exactly synchronized by this command.

GET button

When clicking this button, settings are downloaded from the SediMeter selected in the Send To field (which may only be left as 0 if using USB). The SediMeter Time, Start Time, Interval, Burst Rate, Frequency, Samples, Reply From, and dt (s) are all updated as a result.

Download tab



This tab deals exclusively with the built-in 2 MB flash memory. (For memory card operation refer to the SediMeter Instrument Manual.)

The Send To and Reply From fields work as before. Broadcasts over the RS-485 link are not supported for any action on this tab.

Checking the memory usage

A number of controls and indicators work together for checking the memory.

CHECK button

Click this at any time to request information from the SediMeter and update the associated indicators (this command is never sent automatically).

SediMeter Memory Usage indicator

This refers to the 2 MB (4096 records of 512 bytes each) built in memory. Blue color indicates new data, whereas red color indicates "read" data. Data may be marked as read by several ways: By being downloaded (read); by being discarded from this tab (see below); by the SediMeter being Reset (using the Reset button on the PCB, or by being without power for a number of minutes); or by using the SediMeter NavPin user interface to mark it as read.

Total Records indicator

The number of 512-byte records currently in the internal memory. Since memory is being used in a round-robin fashion there may be room for new data even if this shows 4096.

New Records indicator

The number of records that have been recorded but not yet marked as read. When this value reaches 4096 the memory is considered full, and the SediMeter will cease measuring.

Next to Read indicator

This is a pointer maintained by the SediMeter to the next record that has not yet been read, with a range of 0 to 4095.

Save-to File control

The full path and file name (including extension) for where to save data to be downloaded. Although you may type in the path and filename, it is probably easier to use the browse button (with the folder icon on it).

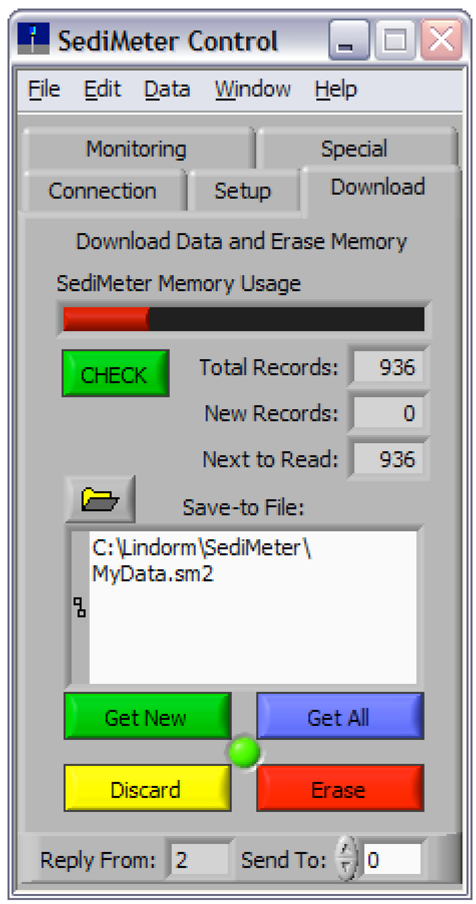
Enter a path and file before clicking on any of the download buttons below this field.

Get New button

Clicking this button downloads the new (un-read) records from the selected SediMeter to the indicated file. Download starts with the record that is "Next to Read".

After the download is finished a new window opens with the raw data. There is no need to click Save in that window; the data has already been saved to the file, so you may just close it after verifying that the data has arrived as expected.

Get All button



Clicking this button downloads all records from the selected SediMeter to the indicated file. Download starts with the first record, number 0.

After the download is finished a new window opens with the raw data. There is no need to click Save in that window; the data has already been saved to the file, so you may just close it after verifying that the data has arrived as expected.

If the memory has been recorded in a round robin fashion, the file generated will not contain data in a strict chronological order. It is possible to restore order by making a copy of the file, and deleting the older end from one, and the newer beginning from the other.

Discard button

This marks all records in the SediMeter memory as "read". It does so by changing the "next to read" pointer to the same value as the internal "next to write" pointer, thus simulating a Reset. Use this button to discard data without erasing the memory.

The internal memory is flash, and it has a limited lifetime in terms of read and write cycles. To prevent premature failure of the first page of memory, the round robin memory method may be used. It is very unlikely that the lifetime will be reached in this application anyway, so this is just an added precaution.

Erase button

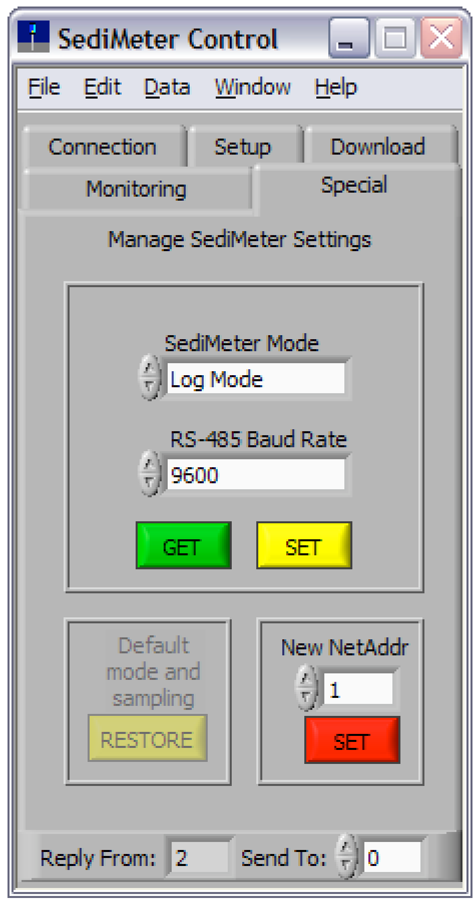
This erases the built in flash memory (or rather, the data in it). A red indicator appears during the erasing. When done, which takes around a minute, the red indicator turns green (see illustration). As mentioned, the memory usage indicators do not change automatically; click CHECK if you wish to double-check that erasing was successful.

Note that there is no Undo on the Erase command. *Be careful not co click it by mistake!*, since it does not ask for confirmation before executing.

Special tab

If you are connected to a network of SediMeters by RS-485, be extremely cautious with changing these settings, as you risk disconnecting a SediMeter in such a way that you would have to retrieve it to the surface to re-establish communication.

SediMeter Mode control/indicator



Select the mode for the SediMeter. RS-485 is only on in RS485 Mode. Self-timed measurements only take place in Log Mode. As an indicator this shows the mode of the connected SediMeter.

If the setting is changed wile connected by RS-485, the connection will be lost if the SET button is subsequently clicked.

RS-485 Baud Rate control/indicator

At present only 9600 baud is supported (and always 8 data bits, 1 stop bit, and no parity).

If the setting is changed wile connected by RS-485, the connection would be lost if the SET button was subsequently clicked.

(Yellow) SET button

Clicking this button sends the values of the mode and baud fields to the SediMeter selected by the Send To field (or to the entire RS-485 network if Send To equals 0).

GET button

Clicking this retrieves the mode and baud rate setting from the selected SediMeter and updates the respective fields.

New NetAddr control

In the extremely unlikely situation that you have two SediMeters that will be used on the same RS-485 net, and they have the same NetAddr in hardware, you can override the hard programmed NetAddr temporarily until the next SediMeter Reset (this change can also be made using the NavPin and SediMeter display).

To use, enter the new and unique NetAddr here (range: 1 ≤ NetAddr ≤ 255, but since no SediMeter has a hardware NetAddr higher than 250 we suggest you use 251 ≤ NetAddr ≤ 255).

(Red) SET button

Click to temporarily change the NetAddr in a SediMeter. The usage depends on how you are connected, as follows.

USB: Enter the New NetAddr and click SET. The Reply From will say 0, since no reply is sent. Click the green GET button to update the Reply From field, and verify success.

RS-485: Enter the New NetAddr in the appropriate field, enter the old NetAddr in the Send To field, and click SET. The Reply From field will say 0, since no reply is sent. Enter the new NetAddr in the Send To field and click the green GET button to update the Reply From field, and verify that communication works. WARNING: If you issue a change NetAddr command with 0 in the Send To field, every connected SediMeter will get the same NetAddr, and you will be unable to communicate until they are reset or their NetAddr is changed using the NavPin or USB.

RESTORE button

This presently disabled button is intended for reverting several SediMeter settings to their factory defaults.

Monitoring tab

This tab contains a checklist of things to do to start real time monitoring. There is only one control.

Save to File control

Select path and file for where to store the data collected during real time monitoring. Click on the Browse button, or type in the path and file name.

Menus

File menu

Open… Ctrl+O

Opens a window called untitled.sm2 without any data (see “*.sm2 window” below). Use the menus in that window to actually open a data file.

Exit Ctrl+Q

Quits the application.

Edit menu

Cut Ctrl+X

Removes the selected text from a field and places it in the clipboard.

Copy Ctrl+C

Creates a copy of the selected text in the clipboard.

Paste Ctrl+V

Creates a copy of the text in the clipboard in the selected field at the place of the insertion cursor.

Raw Data…

Opens the *.sm2 window (see below) with the data presently in memory. If there are no data in memory, it opens as untitled.sm2, just as if selecting “File -> Open…”.

Calibration Coefficients…

Opens the SediMeter Calibration Coefficients window (see below).

SediMeter List…

Opens the SediMeter List window (see below).

E-Mail Alerts…

This menu item is disabled in the present version. When activated it will provide a means for defining alarm levels that trigger e-mail alerts in real time monitoring.

Data menu

Analyze Logged… Ctrl+A

Opens the SediMeter Data window (see below) in post-processing mode. This menu item is disabled until some data have been opened, either through download, *.sm2 file open, or *.ld2 file import.

Monitor Real Time… Ctrl+M

Opens the SediMeter Data window (see below) in real-time monitoring mode. The measurement interval, burst rate, and number of samples are all taken from the respective fields in the Setup tab. Measurements start immediately, and are timed by the computer, but the time recorded in the file is the time of the SediMeter clock.

Follow the checklist under the Monitoring tab prior to selecting this menu item!

Web Server

This item turns on and off the web server on the default port. A checkmark indicates when it is on. Do not turn it on if another application on the computer is running a web server (or any other process) on that port.

When on, the web server presents the SediMeter Data window as an image, automatically updated every 60 seconds. The page can be viewed from any web browser by entering the domain or IP of the computer in the browser address field. For instance, if the IP is 192.168.1.100, type http://192.168.1.100 to view the web page.

The actual document is C:\Lindorm\SediMeter\www\SediMeter.html (provided that C: is the Windows volume). You can edit that document in a text editor to put in your custom information before and after the SediMeter Data window.

Window menu

The content of this menu is a list of the currently open windows of the application. Note that in some cases you may need to close one window in order to access all features of another window.

Help menu

Show Tip Strips Ctrl+T

Turns off or back on the tip strips that appear when you idle the mouse above a control or indicator. They are on by default.

Show Context Help Ctrl+H

Turns on or back off a context-sensitive help window. It displays more in depth help about the items you idle over with the mouse, than the tip strips provide. This is off by default.

About…

Shows the About window. Click anywhere in it to close it.

*.sm2 file window

This window gives access to the raw data files, type *.sm2. You may close this window but the data set remains in memory until you open another dataset, download another data set, start real time monitoring, or close the application.

Front panel objects

An *.sm2 file may contain data from a single SediMeter, or from an entire SediMeter network of up to 255 SediMeters. For each SediMeter there is one record per measurement. This creates a 2D matrix of measurements, which occupies the main portion of the front panel. The right hand side of the window represents a single record.

Record selector

Use this to step through the records from one and the same SediMeter. To find the last record, right-click in the white field to open a context-sensitive menu and select “Show Last Element”.

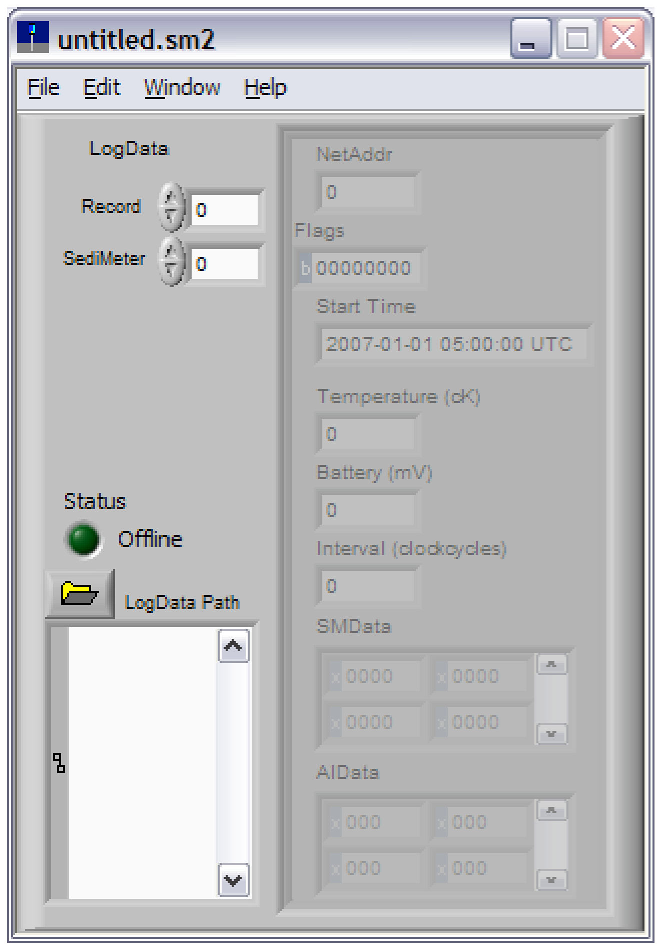
SediMeter selector

Use this to step through synchronous records from different SediMeters (such as created by an RS-485 monitoring network).

Cluster indicator

Each record is a cluster of various elements. This is an indicator, meaning that the data are not editable. The only possible edit in this window is to remove records from both ends (see below). This is by design, so as to preserve data integrity.

The content of a data record is described in the following.



NetAddr

The NetAddr of the SediMeter. Unless the user has changed it temporarily, this is related to the serial number (serial numbers 001, 251, 501 etc. = NetAddr 1, serial numbers 002, 252, 502 etc. = NetAddr 2, and so on).

Flags

These 8 binary flags indicate the setup and options of the SediMeter. If the last one (LSB) equals 1, the time is UTC, otherwise it is in some local time zone.

Start Time

This is the time of the (start of the) measurement.

Temperature (cK)

The temperature measured by the built-in sensor, in cK (centikelvin). Divide by 100 and subtract 273.15 to convert to ºC (degrees Celsius).

Battery (mV)

The voltage measured over the storage capacitor at the end of the measurement (actually when the white LED is lit). This is related to, but not the same as, the battery voltage, since there is a current-limiting resistor in between. If this value falls below 5500 mV measurements will still be made, but the calibration will not be valid since the emitted IR light intensity is affected negatively.

Interval (clockcycles)

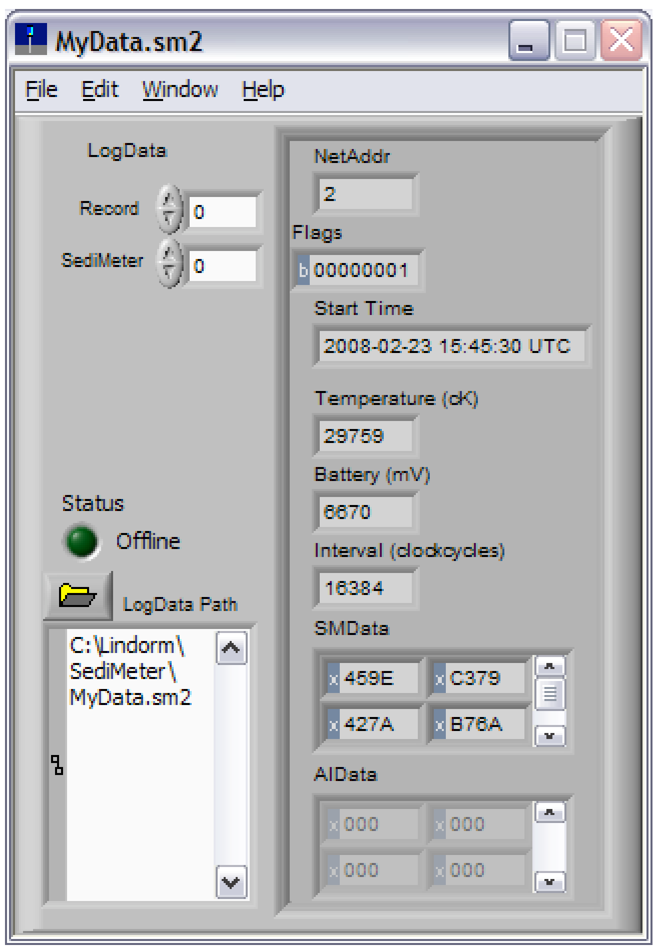
The interval in 32768[ths] of seconds for the optional sensors in the AIData table.

SMData

A table with SediMeter data, 2 columns with 36 rows. The top row is OBS #1, i.e., the lowermost optical backscatter detector. The left column is the measurement with the LED off, the right with the LED on. The values are 16-bit hexadecimal values, 0000 ≤ x ≤ FFFF, where 0000 represents 0 V and FFFF represents 2.5 V. (The A/D-converter has 12 bit resolution; by adding 16 measurements the number gets 16 bits.)

AIData

A table with optional sensor data, 2 columns with 0 to 84 rows. The top row is the first of the optional burst samples. The left column is channel A6 (usually pressure), the right A7 (usually light). The values are 12-bit hexadecimal values, 000 ≤ x ≤ FFF, where 000 represents 0 V and FFF represents 2.5 V.



Status

This indicator currently has no use.

LogData Path

The full path and filename of the present data.

Menus

File menu

Open… Ctrl+O

Use this to open a previously created *.sm2 file.

Merge… CtrlM

This is currently not in use.

Save Ctrl+S

Saves the current data to the same file

as last time. Use this to save the data after removing any records that represent measurements before the instrument was deployed, or after it was retrieved.

Save As…

Opens a browser dialog for picking a new path and file where to save the current data.

Import LogDator File…

Use this for importing data from an *.ld2 file, which is the file format created by the SediMeter when storing data on an MMC or SD card (refer to the SediMeter Instrument Manual for instructions on how to record on memory cards).

Export Text File…

This command exports the SediMeter data table as a tab-delimited ASCII file (in decimal, not hexadecimal, number format). Column one is the 16-bit value when the LED is off, column two is the value with the LED on. Row one is OBS #1, row 36 is OBS #36, of the first measurement of the first SediMeter.

If there are more than one SediMeters in the file, the first measurement of the other SediMeters are first output, before the second measurement of the first SediMeter. These successive data are output in the following rows, so that generated file will have 2 columns, and “36 * number of SediMeters * number of measurements” rows.

Close Ctrl+W

Closes the window.

Edit menu

Cut, Copy, and Paste function as previously described.

Delete submenu

First Record Ctrl+F

Deletes the first record (with index 0).

Last Record Ctrl+L

Deletes the last record. To commit the changes to disk, select Save or Save As.

Window menu

The Window menu functions as previously described.

Help menu

The Help menu functions as previously described (although Show Tip Strips is not presently implemented in this window; the workaround is to turn them on or off in the SediMeter Control window).

SediMeter List window

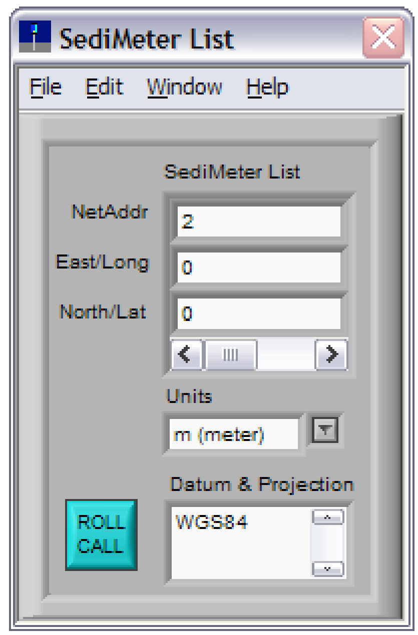
When the application is started, it reads the contents of the file C:\Lindorm\SediMeter\SM_Network.smnt. The contents of that file can be inspected and edited in this window.

The *.smnt file contains a definition of the SediMeter network, for the purpose of real time monitoring. The SediMeters listed here will be polled during monitoring. If one of them is not on the network, a time-out error will result. If a SediMeter on the network is not listed here, it will not get polled.

Front panel objects

SediMeter List

This is a 1D table, that you can navigate through using the horizontal scroll bar. In the right-most position you see the next unused position, where you can make a new entry.



NetAddr

The NetAddr of a SediMeter on the network.

East/Long (optional)

The easting or longitude of this SediMeter.

North/Lat (optional)

The northing or latitude of this SediMeter.

Units

The units for East/Long and North/Lat. The options are degrees and meters.

Datum & Projection

A free text description of the projection parameters associated with East/Long and North/Lat.

ROLL CALL button

This button queries each of the possible 255 NetAddr values, and updates the SediMeter List. If a SediMeter in the list does not respond, it is removed; if one responds that was not in the list, it is added to it; and finally the list is sorted in NetAddr order. Newly added NetAddr entries get coordinates (0,0).

Use this feature to automatically edit the list, and to verify that all units communicate.

Menus

File menu

Open… Ctrl+O

Opens a *.smnt file that you choose. Use this and the Save Copy As… commands to maintain records of different networks on the same computer.

Save Ctrl+S

Saves the data to the file C:\Lindorm\SediMeter\SM_Network.smnt (provided C: is the Windows startup volume).

Save Copy As…

Saves a copy of the data to a file and path you select.

Close Ctrl+W

Closes the window (but leaves the data in memory).

Edit menu

Cut, Copy, and Paste work as previously described.

Delete All

Deletes all entries in the SediMeter List (but leaves Units and Datum intact).

Window menu

As previously described.

Help menu

As previously described.

SediMeter Data window

This window is the main human interface for the data. The same window is used for presenting pre-recorded data and for real time monitoring.

Front panel objects

SediMeter NetAddr control

This control selects from which SediMeter to plot data. Even if the data file only contains data from one SediMeter, you should still use this control as the first action, since that causes the data to populate the indicators.

SediMeter Backscatter Intensity graph

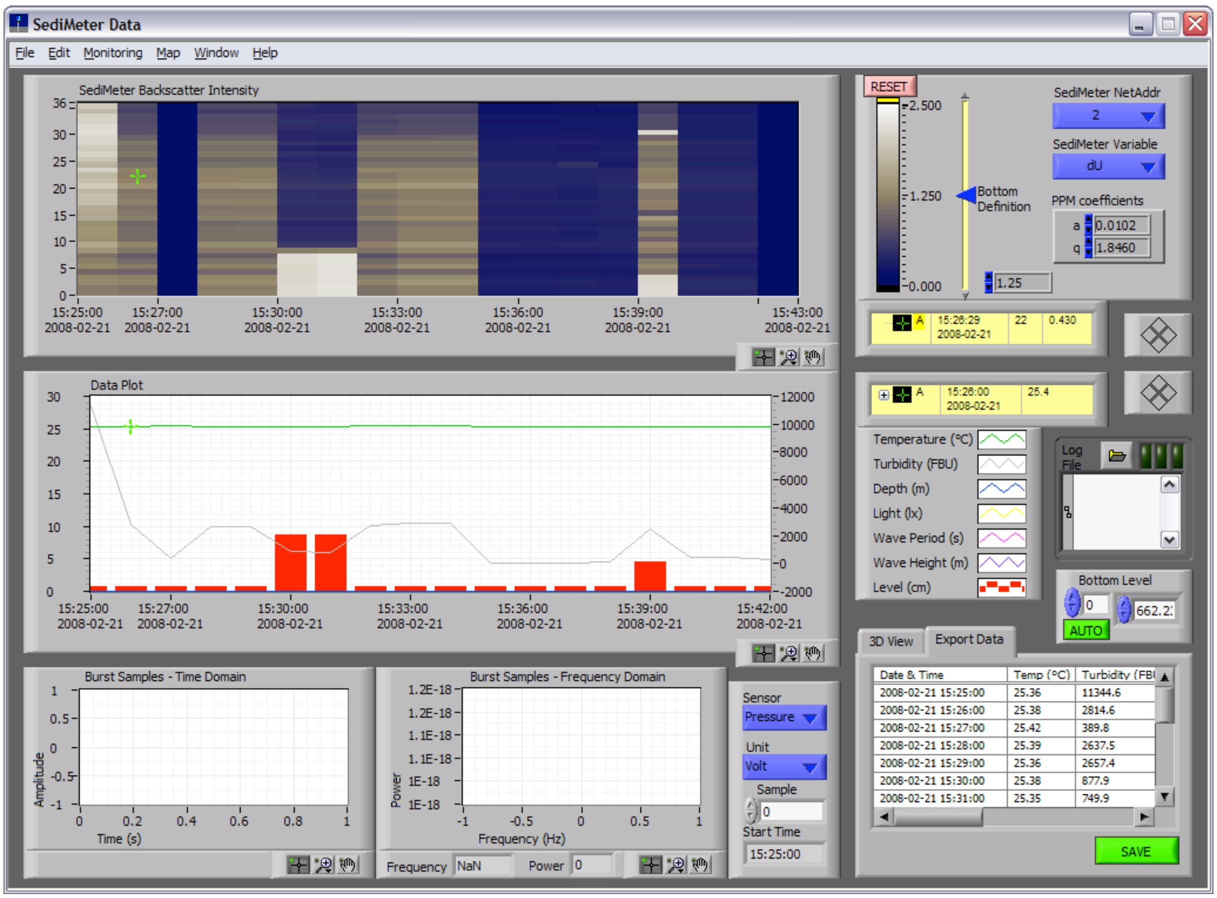
This graph shows the SediMeter data with time on the X-axis, OBS detector on the Y-axis, and signal level as color. The color scale is indicated on the Z-scale ramp to the right of the graph itself.

The color scale is editable. Move the mouse over a scale marker (e.g., 1.250). When the cursor changes to a double arrow you can drag the scale marker up or down. You can also right-click it and change its color. If you drag from the end markers you get new intermediate points.

Out-of-range values are as a default black on the negative side, and yellow on the positive side. Left-click those fields to change the out-of-range colors.

Undo button

Resets the color scale of the Z-scale ramp to the default. This button is only active when the scale is 0–2.5 V (see below). Note that the out-of-range colors are not changed by this command.



SediMeter Variable control

Use this control to select which parameter to plot in the intensity chart. The options are as follows:

Item	Meaning	Range
Uoff	voltage with the IR LED off	0–2.5 V
Uon	voltage with the IR LED on	0–2.5 V
RAW	signal after correction for internal reflections and background light	0–2.5 V
FBU	FBU = RAW * K (formazin backscatter units)	auto
PPM	PPM = a * FBU^q (a and q are the PPM coefficients)	auto
dU	dU = Uon – Uoff	0–2.5 V

PPM coefficients control

These coefficients are used to estimate the sediment concentration in PPM according to the following equation:

$$PPM = a \cdot FBU^q$$

The values of a and q have to be determined empirically for each specific case. The default coefficients are just examples that may give results that are off by an order of magnitude.

Bottom Definition slider and digital control

This control tells the software what to use as the definition for bottom. It operates on the variable that currently is selected by the SediMeter Variable control. Its range corresponds to the Z-scale ramp range.

Maneuver the control by dragging the slider, by clicking the yellow line, by clicking the triangles at the end of the yellow line, by clicking the blue arrows in the digital field, or by typing in a value in the digital field. As you move the control the red interpreted bottom Level in the Data Plot graph updates interactively. Compare the shape of the interpreted Level with your visual interpretation of the bottom in the SediMeter Backscatter Intensity graph.

Graph controls

A number of controls are common for two or more graphs. They are explained here.

Graph cursor

The two large graphs have graph cursors. One cursor is defined for each graph in a light yellow field (the cursors are named “A”). To the right of the cursor name and icon there are columns for the cursor’s current X position, Y position, and in the case of the intensity graph, the Z value at that point.

If the cursor is not visible in the graph, right-click the cursor (+) in the cursor control and select “Bring to Center”. To be able to drag the cursor in the chart, make sure the cursor symbol (+) is selected in the Graph Palette (see below). You can also move the cursor by clicking on the diamond-shaped controls to the right of the cursor control.

The cursor for the line graph will snap to a line. Right-click on the cursor in the cursor control to bring up the context-sensitive menu and select which line to snap to.

Graph Palette

In the bottom right corner of each graph there is a palette with three choices; cursor, magnifying glass, and a hand for dragging. The magnifying choices are, from left to right on the first line: Zoom in in both dimensions, zoom in in the X dimension, zoom in in the Y dimension. On the second line: Fit all data to the graph, zoom in to the point of clicking, zoom out around the point of clicking.

Changing X and Y axis scales

The X-axes all have auto scale as default. To be able to zoom in in the X dimension, you must first turn off auto scaling. Right-click on the graph to bring up a menu where you can turn off "AutoScale X."

The intensity graph has manual scaling on the Y-axis, from 0 to 36. If you happen to change the scale and want to restore it, simply select the lowest value and type in 0, then select the highest value and type in 36. Click in a neutral part of the window to exit edit mode and enter the changes.

The Data Plot has double Y-axes. To turn AutoScale on or off on either one of them you must right-click on one of the scale values of the scale in question.

Other features

You can change the legend color, line type etc., and edit the names in the legend.

The intensity chart can be exported as an image by using the Copy Data command in the context-sensitive menu. The exported image includes all items that presently are visible. You may wish to turn off the Graph Palette and the Cursor Legend prior to copying the image. You do that by bringing up the context-sensitive menu (right-click) and de-select them under Visible Items.

The other graphs can be exported as a simplified image (better for including in a report) in a similar way.

Each graph also has a Scale Legend, although it is off as default. The scale legend provides a graphical user interface for setting AutoScale, to scale-to-data once, and for accessing menus for changing a number of settings of the graphs.

The line graphs have an Annotation feature. Right-click on a line to bring up a context-sensitive menu with Create Annotation as one choice. After you have created it you can change its color and other attributes. This may be used for marking in the graph when certain things happened, such as taking a calibration reading with another method.

Data Plot

This graph plots temperature, turbidity, and bottom level. If the sensors are present for it, it may also plot depth, (visible) light, wave period, and wave height, where the latter two are estimates based on burst sampled pressure readings.

The level is estimated based on the SediMeter Variable and Bottom Definition presently selected. There is a possibility to manually edit spurious data points, in the Bottom Level pane (see below).

The turbidity is estimated as the median of the top 6 OBSes. This variable is plotted on the right hand side Y-axis, all the others are using the left side Y-axis.

Bottom Level

This is a 1D list of interpreted bottom level in cm. The index is the record number, starting at 0. As long as the button is green and says AUTO, the automatic bottom tracing function is active. Clicking the button so it turns blue and reads MAN turns off the automatic feature. Changes in SediMeter Variable and Bottom Definition will have no effect on the bottom curve when this is set to MAN. In this setting the values for each individual point can be edited so as to remove erroneous values caused by artifacts in the data.

Note that if you click the MAN button and change to AUTO mode, you loose all manual edits. If you wish to save them, do so before going back to Auto (see export method below).

Export Data tab

This tab contains a table with data. It is essentially the same data as in the Data Plot graph, but with battery voltage added.

SAVE button

Click the Save button for saving a tab-delimited ASCII file with the data in the Export Data table.

3D View tab

This tab contains an Active X control showing a 3D view of the SediMeter backscatter data. The variable shown is the one presently selected by the SediMeter Variable control (see above).

Dragging with the mouse changes the point of view. Dragging with the Alt key depressed zooms in and out. Dragging with the Shift key depressed pans the image.

NOTE: This control is very processor-intensive. If there are many records in the file you should be careful to click on this tab since it may make the entire window unresponsive, which means that it may be difficult to click the Export Data tab to the foreground again.

Burst Samples

The two smaller graphs in the bottom of the window are for the optional sensors on A6 and A7. Select which one of the two by the control Sensor. Select unit (Volt for raw, and Real for converted) with the control Unit. Select which measurement to plot with the control Sample. The indicator Start Time will show the time when the measurement started (ca 0.5 s before the start of the burst sampling).

Burst Samples – Time Domain

This graph shows the measured value over time.

Burst Samples – Frequency Domain

This graph shows the power spectrum of the signal (V^2_{rms}). The estimated frequency of peak power is shown below the graph, along with the estimated power of that peak.

Calculation: The measured signal is passed through a 3rd order Butterworth lowpass filter, followed by a 7-term B-Harris time domain window, and an auto power spectrum function.

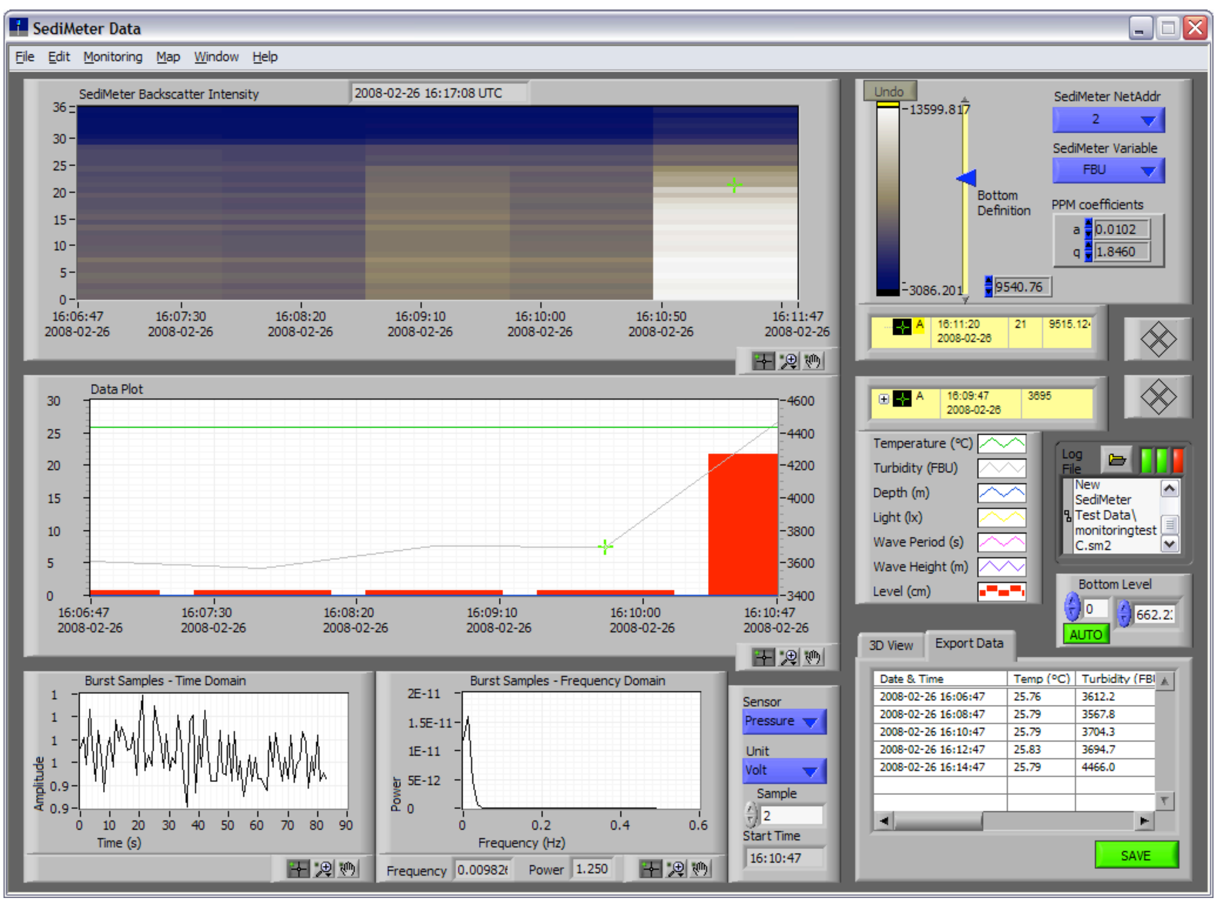
Controls and indicators for real-time monitoring only

Clock

In real-time monitoring there is a clock showing computer date and time in the top center of the window.

Log File control

In the middle part of the right edge of the window there is a group of 4 objects related to real time monitoring. The Log File path control field gets its initial value from the Save to File field under the Monitoring tab in the SediMeter Control window. It is also possible to change the value in this window, either by writing or using the browse button.



Writing to File control: Green LED

When the window opens the logging to file is off. Click the leftmost of the three LEDs over the Log File field to turn logging on or off.

Monitoring indicator: Green LED

The central of the three LEDs is an indicator for monitoring. To turn off monitoring, use the Monitoring menu.

Timing error indicator: Red LED

The rightmost of the three LEDs is a warning for timing error. This turns red if the application is unable to issue a Measure Now-command in time.

Timing errors are typically caused by not using a sufficiently large Interval, in relation to the burst sampling and the number of instruments on the network. In the illustration above, the Interval was set to 1 minute, but data could only be read every second time. Note how the rightmost time on the graphs do not agree with the computer time above the graphs, as a result.

Another reason for timing errors may be that the computer has been busy with some other process, whether caused by the operating system, the user, or something else. Note that this application is multi-threaded, and that the user interface and the monitoring run as different processes, why it benefits from being run on a dual-core computer.

If the SediMeter does not respond in time an error is generated, with a dialog. This may happen if the SediMeter List contains a NetAddr of a SediMeter that is not connected, or which for some other reason has stopped responding.

Menus

File menu

Export…

This item is not active.

Close… Ctrl+W

Closes the window. This item is not active during an ongoing monitoring. First stop the monitoring (in the Monitoring menu). The window will not close until the present monitoring loop has finished, the duration of which depends on the interval you have set (if you have a very long interval you may be better of quitting the application in the SediMeter Control window rather than waiting for this).

Edit menu

Cut, copy, and Paste work as previously described.

Monitoring menu

This menu has one item. It reads Off and is dimmed in post-processing mode. It reads On and is active and selected in real time monitoring mode.

On/Off

To turn off monitoring, de-select this item. Note that the application carries out 2 more measurements before stopping logging, so it may take up to 2 times the measurement interval before the window is done.

When you turn off monitoring the File -> Close item becomes operable. However, if you select Close before monitoring has finished, the window will stay open but unresponsive until all processes related to it are terminated (between 1 and 2 measurement intervals).

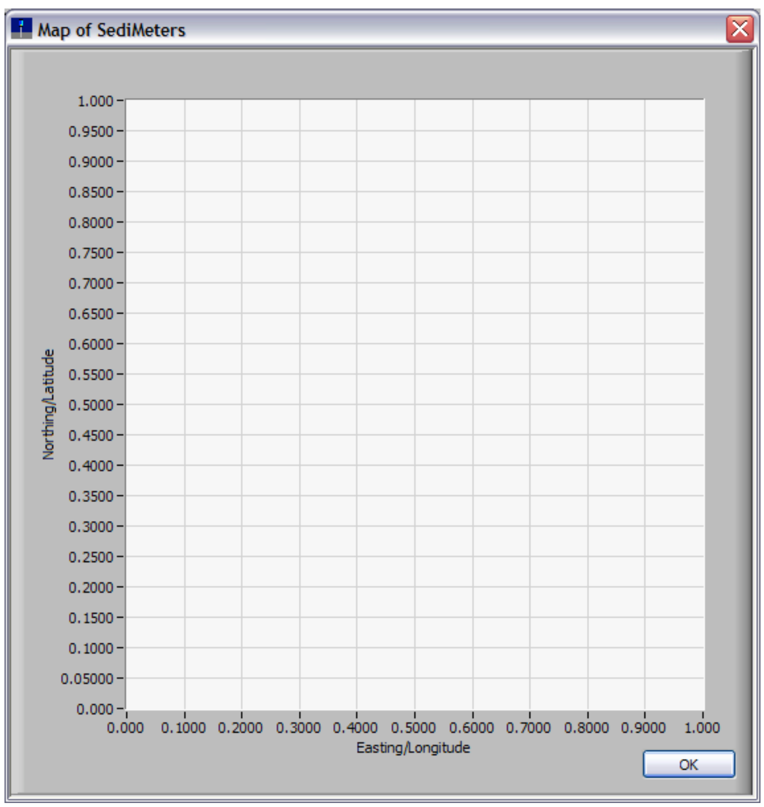
Bug in ver. 1.0.1: If you turn on monitoring, turn it off, closes the window, and then turn it on again, monitoring will start and the LED will be lit, but this menu item will be Off, dimmed, and inactive so you will not be able to turn monitoring off as intended. The Close item will be active, though, and the window may close.

Workaround: Re-launch the application to restart real time monitoring.

Map menu

Network…

This opens the Map of SediMeters window (see below).



Interpolate…

This item is currently not active.

Window menu

The content is as previously described.

Help menu

The content is as previously described.

Map of SediMeters window

This window contains a single object, a map showing the relative position of the SediMeters in the network. The positions are those entered in the SediMeter List window (this example shows an empty window, sorry about that).

Click OK to close.

SediMeter Calibration Coefficients window

This window is for editing the calibration coefficients, with the help of which the measured voltages are converted to real world physical units. Only the temperature calibration is not done here, as the conversion parameters are programmed into the LogDator.

The right half of the window contains a list of calibration coefficients (only one of which is visible at a time). The left half contains a table to facilitate editing the coefficients. The table of KABC-coefficients can also be exported and imported as a tab-delimited ASCII file. It can thus conveniently be generated in a spreadsheet application, and imported here. The two buttons in the middle of the window allows data to be copied back and forth from the KABC table.

Front panel objects

KABC table

This table contains 4 coefficients (K, A, B, C) for each OBS (#1 is the lowest, #36 the highest, closest to the logger). This table is a help for editing, and it is not part of the calibration coefficient list.

Use the yellow buttons with << and >> signs to copy the data between the KABC table and the currently visible calibration record to the right.

SediMeter Calibration Coefficients table

This is a 1D-table of the calibration coefficient data cluster. Use the horizontal scroll bar at its base to change record.

Each record consists of a cluster of the following data:

NetAddr

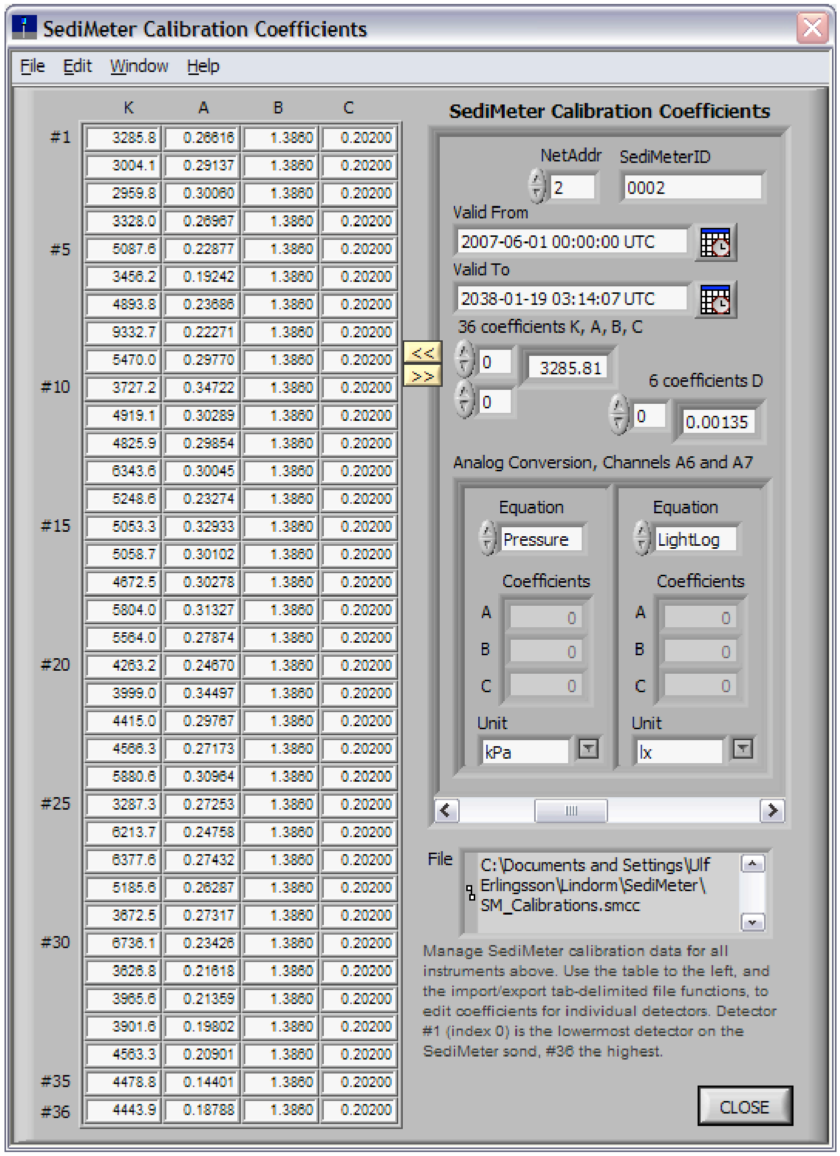
The NetAddr of the SediMeter. If a temporary NetAddr is used, the temporary number must also be used here.

SediMeterID

A free text identifier of the SediMeter. The model and serial number may for instance be used.

Valid From

This calibration coefficient record will not be used for measurements before this date and time.



Valid To

This calibration coefficient record will not be used for measurements after this date and time. If you re-calibrate, set an end-date of the old record equal to the start date of the new one.

36 coefficients K, A, B, C

A 2D table corresponding to the KABC table in the left half of the window. The lower index selects column, the upper one selects row. Row index 0 corresponds to OBS #1.

Coefficient K is the factor used to convert the corrected voltage to FBU.

Coefficient A is the signal level in volt when the LED is on and the instrument is deployed in clear water, with no ambient IR light, and no reflector within several decimeters.

Coefficients B and C are used for correcting for background light. Unless the instrument is deployed very near the surface, this correction is not even needed. It is recommended to let B=1.386 and C=0.202 unless you have a compelling reason to re-calibrate (contact Lindorm tech support in that case for instructions).

6 coefficients D

Coefficient D is the signal level in volt when the LED is off and there is no ambient IR light present (that is, the background level in darkness). There are only 6 of these since the 36 OBSes are divided in 6 groups. D[0] is used for OBS #1, #7, #13, #19, #25, and #31, while D[1] is used for OBS # 2, #8, etc. This value is typically around one to a few mV, and zero may be an acceptable approximation in most cases.

Analog Conversion, Channels A6 and A7

This is a 1D table with 2 entries, one for each channel of optional sensors in the analog-to-digital converter. Channels A6 and A7 measure a voltage in the range 0 V – 2.5 V. The sensor signal can be connected directly to the A/D input, or via the OP-AMPs that are provided on the LogDator PCB.

Equation control

The optional sensors presently offered are pressure and (visible) light. The setting of this control should match the electrical connections in the hardware.

The light sensor can be connected to give a logarithmic scale (as in a light meter for a camera), or a linear scale. Chose LightLog or LightLin accordingly.

A logarithmic scale has a greater dynamic range and can give useful values also in low light situations. A linear scale gives better resolution in high light situations, which may be more useful for measuring incident light available for photosynthesis.

Coefficients control

The meaning of these coefficients depends on the equation chosen. Refer to information about the optional sensor in question.

Unit control

The real world unit of the value after conversion. The options are kPa, hPa, Pa, and m for the pressure sensor (m refers to meter water column, i.e., m depth), and lx (lux) for light intensity.

File indicator

This field gives the path and filename of where you last saved the calibration file using the Save As… menu command. When using the Save menu command, this is the file it will be saved to.

Close button

Closes the window. Hitting Enter on the keyboard also activates this button.

The calibration coefficients remain in memory, but not the KABC table data (it gets repopulated with default values each time the window is opened).

Menus

File menu

Open… Ctrl+O

Use this for opening another calibration file than the default one (the file C:\Lindorm\SediMeter\SM_Calibrations.smcc, assuming C: is the Windows volume, is opened automatically on application launch). The file to open must be of type *.smcc.

Save Ctrl+S

Saves the calibration table to file. If the File indicator field is empty, it gets saved to the default location (C:\Lindorm\SediMeter\SM_Calibrations.smcc), otherwise it gets saved to the file in the File field.

Save As…

Opens a browser allowing the calibration table to be saved under a new name or in a new location. The full path will appear in the File field after the save, and become the target of future Save commands.

Import KABC table…

Use this for importing a tab-delimited ASCII file (a text file, a common extension being .txt) with 36 rows in 4 columns, corresponding to the KABC table on the front panel. The table may conveniently be generated in a spreadsheet program.

Tip: Use the >> copy button to populate the coefficient table from the KABC table after importing. Make sure you have the correct coefficient table visible when you click the >> button.

Export KABC table…

Exports the contents of the KABC table as a tab-delimited ASCII text file, that may be opened in a spreadsheet program, for instance.

Tip: Use the << copy button to populate the KABC table from the coefficient table before exporting.

Close Ctrl+W

Closes the window. The calibration coefficients remain in memory, but not the KABC table data (it gets repopulated with default values each time the window is opened).

Edit menu

The Cut, Copy, and Paste items function as previously described.

Window menu

The content of this menu is as previously described.

Help menu

The content of this menu is as previously described.