PENTAIR

PENTAIR ENVIRONMENTAL SYSTEMS

SensorMate V2.1 USER MANUAL

FOR MP47 & MP65

Version 2.1

CONTENTS

1. About SensorMate **4**

2. System Requirements **4**

2.1 Loading SensorMate onto a PC 4

2.2 Communicating with Sensors via PC/Laptop 4

3. Starting SensorMate **5**

4. Status **6**

5. Function Buttons **8**

5.1 Monitor 8

5.1.1 View Monitor Data 9

5.2 Start Logging 10

5.3 Stop Logging 11

5.4 Add Note 11

5.5 Collect Data 12

5.5.1 Collecting Data 12

5.5.2 View Collected Data 13

5.5.3 Launch Windows Explorer 13

5.6 Set Clock 14

5.7 Clear Memory 15

6. Setup Sensor **16**

6.1 General Information 16

6.1.1 Sensor Name 16

6.1.2 Sensor ID 17

6.1.3 Firmware Version 17

6.1.4 Factory Calibration Date 17

6.1.5 Memory Capacity 17

6.1.6 Memory Used 17

6.1.7 Wrap Memory (When full) 17

6.2 Channels 18

6.2.1 Sensor channels 19

6.3 Specific Channel Information 21

6.3.1 Battery Channel 21

6.3.2 Pressure 22

6.3.3 DO PPM 23

6.3.4 Turbidity 24

7. Schedules **25**

7.1 Schedule Information 26

7.2 Logging Settings 27

7.3 Averaging 27

7.4 Add Schedule 28

7.5 Start Method 29

7.6 Simple trigger 30

8. Modbus Registers **31**

8.1 Show registers button 32

8.2 Stop Method 33

8.3 Deleting a Schedule 33

9. User Calibration **34**
9.1 One Point Offset 35
9.2 One Point Span 35
9.3 Two Points: Span and Offset 35
9.4 Restore factory default 35
9.5 User Calibration Procedure 36
9.6 To check a user calibration: 36
9.7 To adjust or repeat a user calibration: 36
9.8 Pressure Sensor Datum 37
9.8.1 Depth 38
9.8.2 Surface Level 39
9.8.3 Top of Case 40

10. Contact Us **41**

1. About SensorMate

SensorMate is a Windows compatible user-interface for Greenspan, MP Series Sensors. The software interacts with a MP series sensor using RS232 serial communications.

Primary functions of this software include:

- User friendly sensor set-up.
- Starting or stopping logging.
- Data collection from the sensor.
- Display of real-time sensor readings.
- Sensor user calibration.
- Set-up Modbus registers

2. System Requirements

- PC compatible computer with Windows XP (Service Pack 3), Vista or Windows 7.
- A USB port for the Flash Drive.
- A minimum of 10MB free hard drive space.
- Microsoft Excel software package or similar (for viewing .csv data file).
- A .pdf viewer (to read manuals).
- A means of serial communication (COM port) between the computer and the sensor. This may be a native COM port, a USB to serial converter, or the Greenspan 5CC-840 USB Comms Cable.

***Note** - Some brands of USB to serial converter may not be compatible with SensorMate.*

2.1 Loading SensorMate onto a PC

The SensorMate software consists of a single main program file and three support files. These four files are normally provided zipped up on a USB Flash Drive. Unzip all 4 files to the same folder. Run the SensorMate.exe to use the program. Shortcuts to the SensorMate.exe file can be created as appropriate. Usually no special permission (i.e. Administrator rights) is required for a user to perform these tasks.

2.2 Communicating with Sensors via PC/Laptop

Greenspan sensors can be connected to a PC/Laptop using a Greenspan USB to HS7 comms cable (Part # 5CC-840). This cable connects directly to the HS7 plug on the sensor.

User Manual and driver files for the USB to HS7 comms cable (Part # 5CC-840) are included on the USB Flash Drive.

***Note -** Comms cables supplied by Greenspan may vary depending on the sensor's configuration. For example, if the MP sensor is supplied with a battery pack option which is fitted with a different connector, the relevant comms cable will be offered.*

3. Starting SensorMate

1. Plug in cables as per Sensor User Manual.
2. Ensure the sensor is powered.
3. Run (Double click) the SensorMate.exe file or shortcut.
4. The Connect Window will appear as shown in Figure 1.

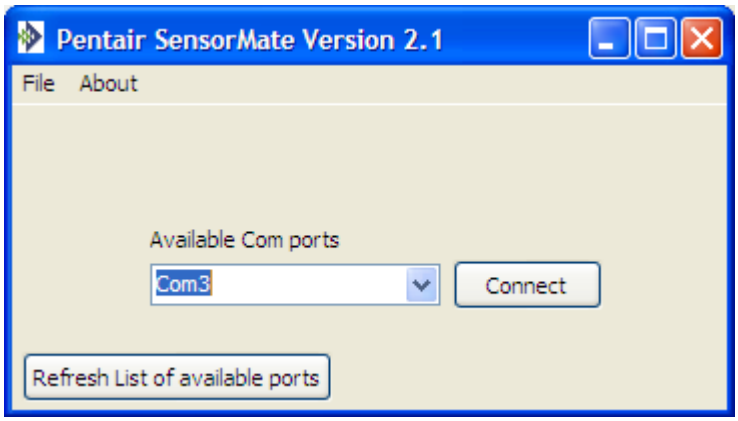

Figure 1 – Connect Window

5. Select the correct COM port and click on **Connect**.

Tip - *Your computer may have other devices which are assigned a COM port that appears in the list shown in the connect window. If you are uncertain as to which COM port a comms cable is assigned, use the "Refresh List of available ports" to check the COM port list before and after re-plugging the comms cable.*

The Connect Window has a menu bar with File and About menu items:

- **File:** Gives an alternative "Exit" that closes the Connect Window and the SensorMate application.
- **About:** Displays the software version details.

4. Status

The Main Window will appear, as shown in Figure 2, when successfully connected to the sensor. After connection, the **Status** button is selected. The Status window shows a schedule overview. The window cannot be re-sized or minimized. Closing the window using the Windows task manager does not ensure that the correct exit sequence is carried out on the software, com ports, USB devices and sensor. To exit the Software a **Disconnect** button is provided on the bottom left of the screen.

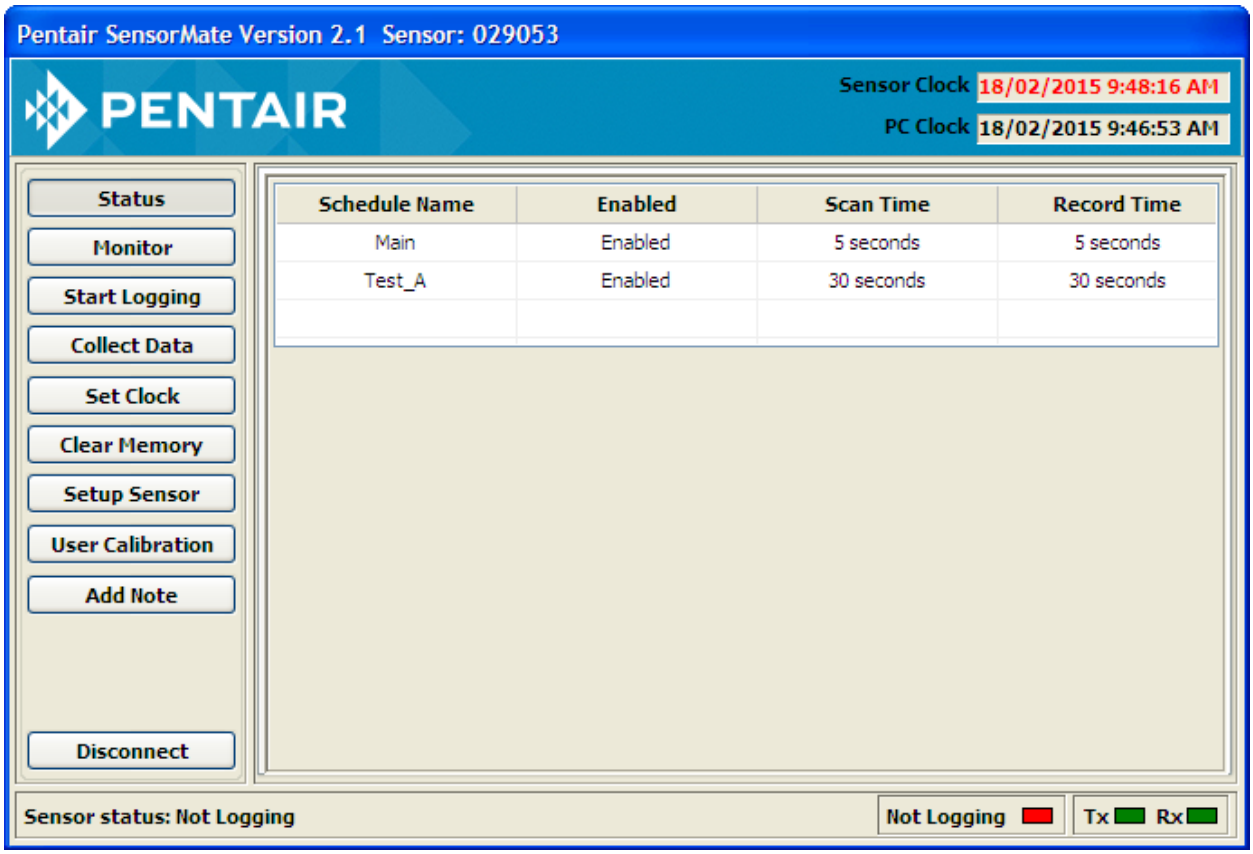

Figure 2 – Main Window after connection

Items in the menu bar include:

- **The SensorMate software version**
- **Sensor:** The "Sensor Name" is retrieved from the sensor's memory and displayed at the top of the screen. The default name is the factory serial number, this can be changed to a more descriptive name, such as "site location" if required. The "Sensor Name" is used to create file and folder names when data is downloaded from the sensor.

Items in the main window include:

- **Sensor Clock and PC Clock:** The sensor's date and time is shown with the current PC (computer) date and time. If the times differ by more than 1 minute the sensor time will be shown in red.

Note - *Changing the PC time while connected to a sensor will change the displays but the actual time set in the sensor will not change until the "Set Clock" function is used.*

- **Control Buttons:** Buttons are provided on the left to allow the user to navigate the functions of the SensorMate software. The user selects various functions by clicking on the buttons. Specific information on these functions is contained further in this manual.

- **Informative Text:** A text box on the bottom left of the window provides the user with feedback during various tasks SensorMate performs.

- **Logging Status:** The text will show **Logging** and the indicator will be green when the sensor is taking readings and storing to internal memory.

- **TX and RX indicators:** These indicator lights flash when data is being transferred between the PC and sensor.

5. Function Buttons

5.1 Monitor

The Monitor function provides the user with real-time overview of all channel readings as well as the last reading which was logged by the sensor for each channel. Sensor memory information is also displayed.

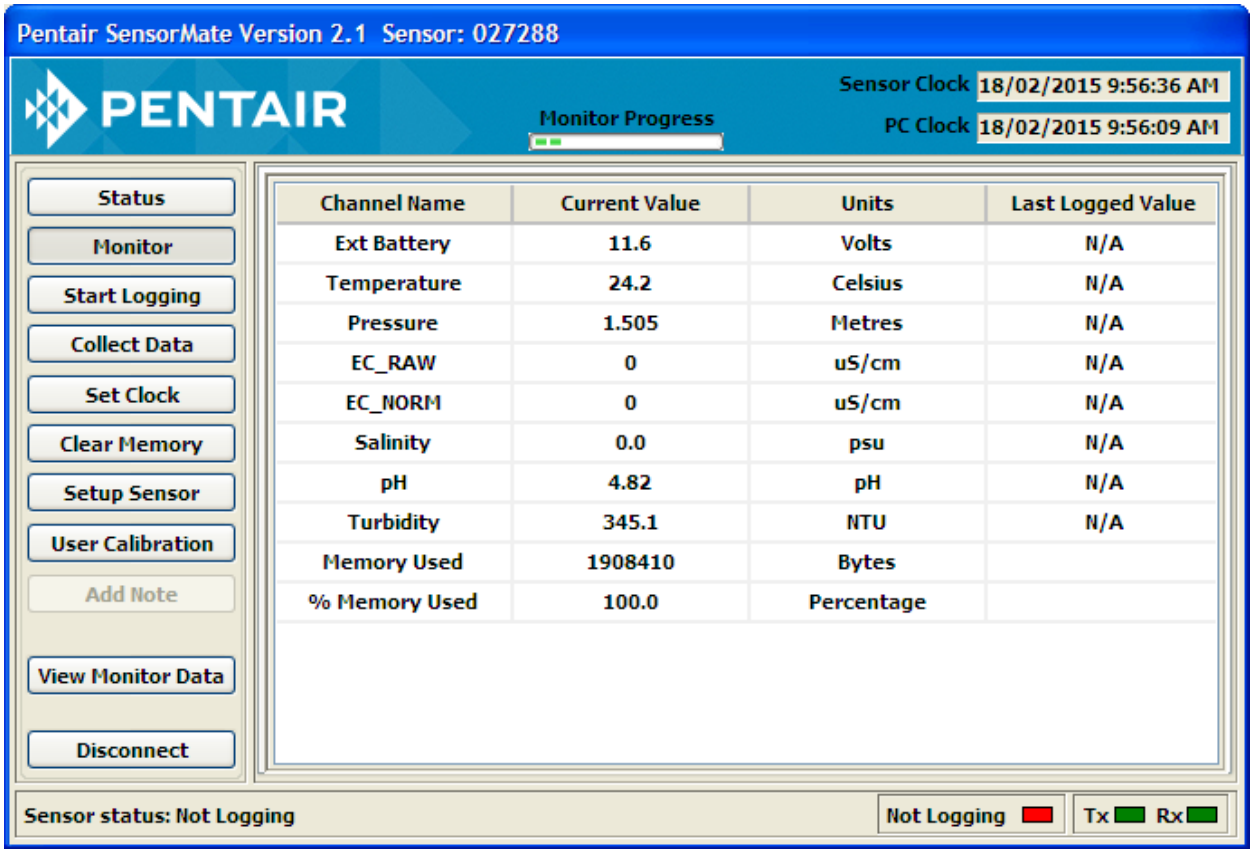

Figure 3 – Monitor Screen

The display updates every 5 to 15 seconds depending upon the sensor type and enabled channels. A Monitor progress bar gives an indication for the timing of updates. By default, all available channels are selected and will be displayed on the monitor screen. A user can de-select channels if required (see Setup Sensor).

The symbol N/A in the Last Logged Value column indicates the channel has not been logged since a sensor reset or power down.

The Last Logged Value will update only when data is logged to the sensor memory according to the Record Interval setting for enabled schedules.

5.1.1 View Monitor Data

While the Monitor screen is open, the values are recorded in a temporary file (monitor.csv) and a **View Monitor Data** button appears on the left. Clicking the **View Monitor Data** will open this file (Refer Figure 4).

Date/time	Ext Batter	ODOTemp	Pressure	EC_RAW	EC_NORM	Salinity	pH	DO % Sat	DO ppm
	Volts	Celsius	Metres	uS/cm	uS/cm	psu	pH	% Sat	ppm
03/03/2014 15:01:46	11.2	26.5	13.501	0.9	0.9	0	6.5	120.3	88
03/03/2014 15:01:52	11.2	26.53	13.501	0.9	0.9	0	6.6	120.5	88.1
03/03/2014 15:01:59	11.2	26.54	13.501	0.9	0.9	0	6.6	120.3	87.9
03/03/2014 15:02:06	11.2	26.54	13.501	1	0.9	0	6.6	120.2	87.9
03/03/2014 15:02:13	11.2	26.53	13.501	0.6	0.6	0	6.5	120.3	88
03/03/2014 15:02:20	11.2	26.49	13.501	0.8	0.8	0	6.7	120.5	88.2
03/03/2014 15:02:30	11.2	26.41	13.501	1	1	0	6.7	120.6	88.3
03/03/2014 15:02:36	11.2	26.45	13.501	0.7	0.7	0	6.7	120.7	88.4
03/03/2014 15:02:43	11.2	26.48	13.502	0.8	0.8	0	6.7	120.5	88.2
03/03/2014 15:02:50	11.2	26.49	13.501	0.8	0.8	0	6.7	120.7	88.3
03/03/2014 15:02:57	11.2	26.51	13.501	0.7	0.7	0	6.8	120.3	88
03/03/2014 15:03:04	11.2	26.49	13.501	0.7	0.7	0	6.6	120.6	88.2
03/03/2014 15:03:11	11.2	26.5	13.501	0.8	0.8	0	6.7	120.7	88.3
03/03/2014 15:03:18	11.2	26.48	13.502	0.8	0.8	0	5.9	120.4	88.1
03/03/2014 15:03:25	11.2	26.42	13.501	0.8	0.8	0	6.5	120.8	88.5
03/03/2014 15:03:32	11.2	26.41	13.501	0.7	0.7	0	6.8	120.6	88.4
03/03/2014 15:03:39	11.2	26.44	13.501	0.7	0.7	0	6.8	120.3	88.1
03/03/2014 15:03:46	11.2	26.47	13.501	0.6	0.6	0	5.6	120.3	88
03/03/2014 15:03:53	11.2	26.45	13.501	0.7	0.7	0	6.2	120.4	88.1
03/03/2014 15:04:00	11.2	26.43	13.501	0.7	0.7	0	6.7	120.6	88.3
03/03/2014 15:04:07	11.2	26.39	13.501	0.6	0.6	0	6.9	120.6	88.4
03/03/2014 15:04:14	11.2	26.36	13.501	0.6	0.6	0	6.6	120.6	88.4
03/03/2014 15:04:21	11.2	26.39	13.501	0.6	0.6	0	5.5	120.3	88.2
03/03/2014 15:04:28	11.2	26.37	13.501	0.5	0.5	0	6.5	120.5	88.3
03/03/2014 15:04:35	11.2	26.36	13.501	0.7	0.7	0	6.8	120.4	88.3
03/03/2014 15:04:42	11.2	26.31	13.501	0.5	0.5	0	6.9	120.6	88.5
03/03/2014 15:04:49	11.2	26.32	13.501	0.6	0.6	0	6.9	120.3	88.2
03/03/2014 15:04:56	11.2	26.35	13.501	0.6	0.5	0	7	120.5	88.4
03/03/2014 15:05:03	11.2	26.32	13.501	0.6	0.6	0	7	120.6	88.5
03/03/2014 15:05:09	11.2	26.25	13.501	0.6	0.6	0	7	120.6	88.6
03/03/2014 15:05:16	11.2	26.27	13.501	0.6	0.5	0	5.5	120.7	88.7
03/03/2014 15:05:23	11.2	26.25	13.501	0.6	0.6	0	6.6	120.6	88.6
03/03/2014 15:05:30	11.2	26.31	13.501	0.6	0.6	0	6.9	120.5	88.4
03/03/2014 15:05:37	11.2	26.32	13.501	0.6	0.5	0	7	120.5	88.4

Figure 4 – View Monitor Data output

This feature may be useful to verify sensor operation and stability. Use the **Save As** functions if you wish to keep this data as the default file will be overwritten every time the monitor screen is opened.

> ***Tip -*** *The default date/time format used in Excel does not display seconds. Use a "Custom" cell format of dd/mm/yyyy hh:mm:ss to display the date/time as above.*

5.2 Start Logging

The **Start Logging** button opens the start logging window (Refer Figure 5). Users have the opportunity to enter initials and comments which are recorded in the sensors data file. These comments may be useful for future reference. The **Clear Logger Memory** check box can be selected if the user wishes to remove all old data from the sensor.

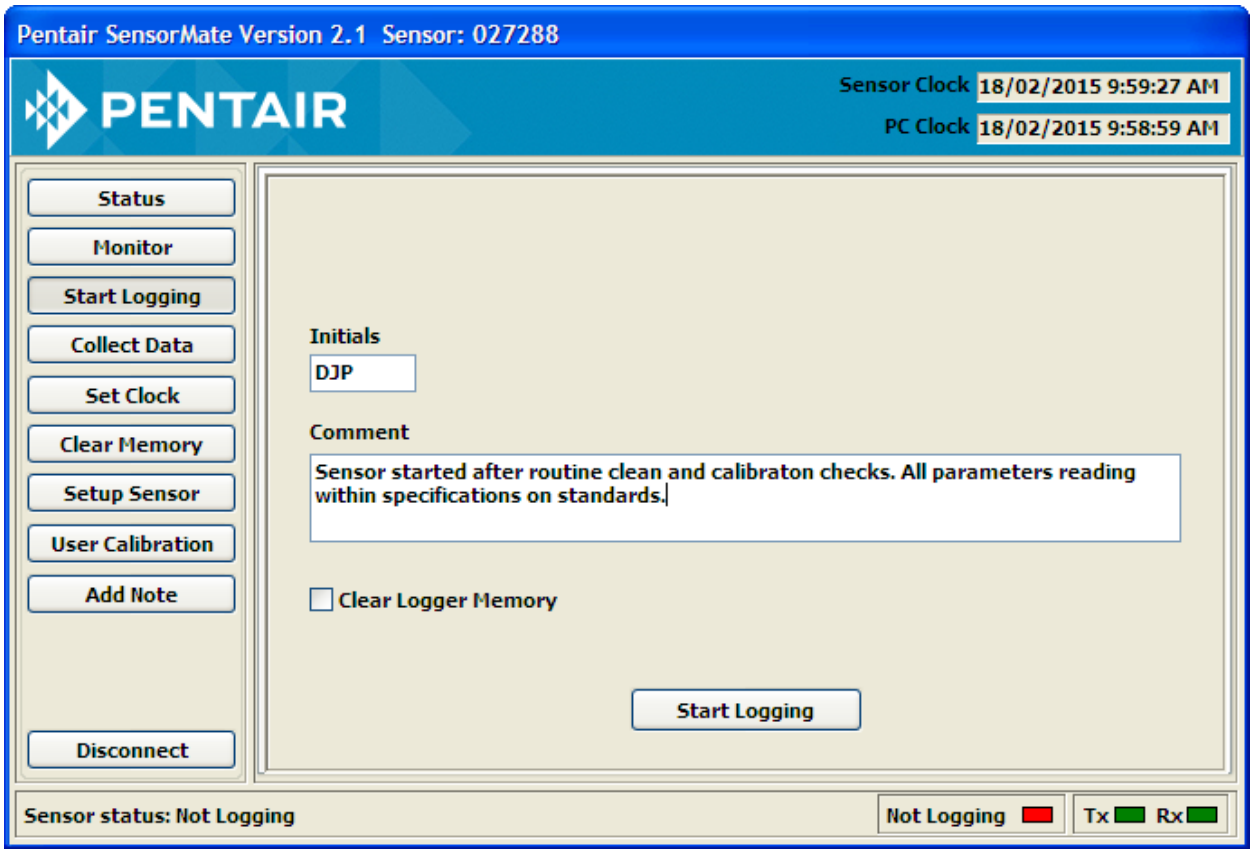

Figure 5 – Start Logging Window

Once the **Start Logging** button is clicked (in the window's centre panel), the appropriate commands are sent to the sensor and SensorMate returns to the "Status" window. The button text changes to **Stop Logging** and the informative text changes to Sensor status: Logging. The Status box changes to **Logging** and green indicator. Measurements are stored to internal memory within the sensor at intervals as set up.

Once logging has commenced, the Set Clock, Clear Memory, Setup Sensor and User Calibration buttons are not available.

5.3 Stop Logging

The **Stop Logging** button is displayed when the sensor's status is logging. When pressed the opportunity to send initials and comments to the sensor's data file is also provided.

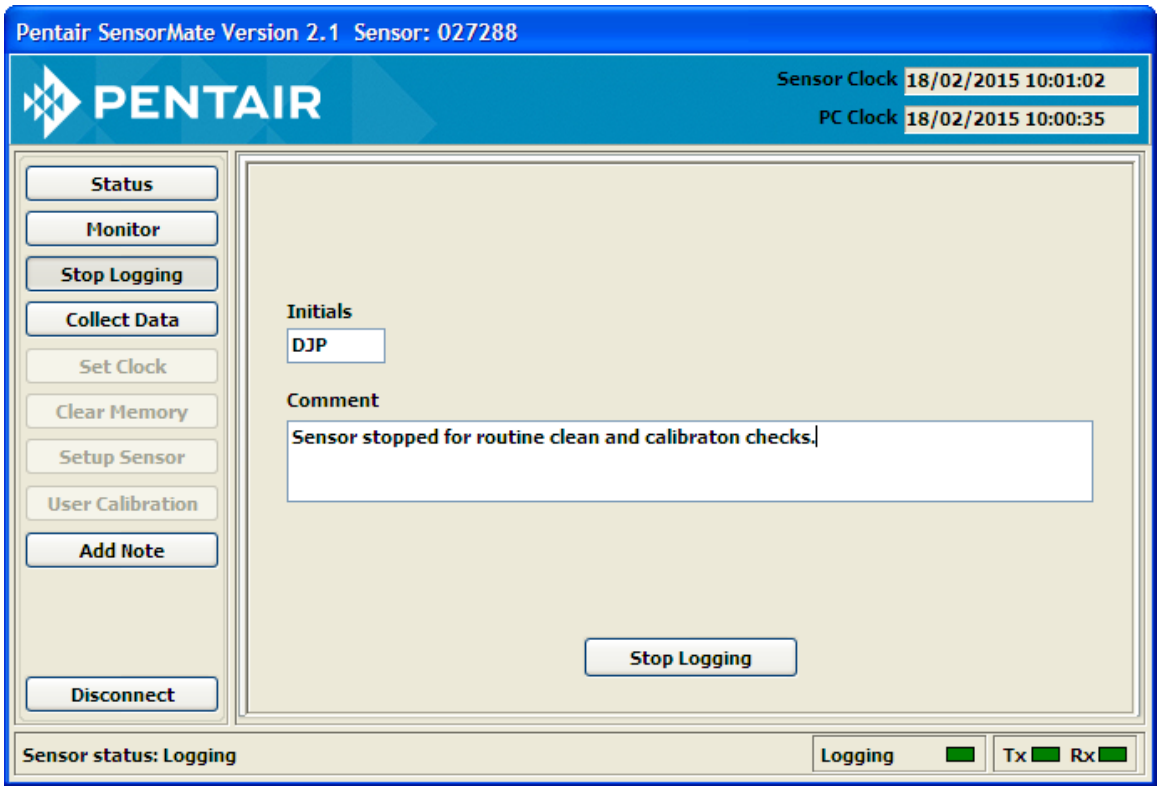

Figure 6 – Stop Logging Window

Note - *The use of commas is excluded from the Initials and Comments boxes. The programs commonly used to display the .csv data file (e.g. Excel) use commas to delineate where one piece of data ends and the next piece starts. Allowing commas would display the data in a way not intended.*

5.4 Add Note

The Add Note button can be pressed at any time. This gives the opportunity to include text information in the sensor's data file. The text is saved to memory and time stamped with the Date/time of when the Ok button is clicked.

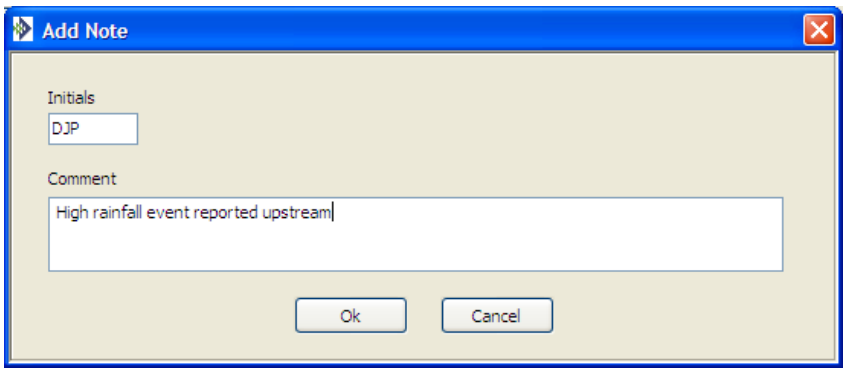

Figure 7 – Add Note Window

5.5 Collect Data

Clicking on the **Collect Data** button (Refer Figure 8) activates the collect data window pane which allows logged data to be collected from the sensor. Data is stored by the sensor in binary format and this binary information is transferred during data collection. SensorMate then translates this binary data and creates both a Greenspan data file (.dat) and a comma separated values file (.csv). CSV files can be imported into spreadsheet applications for graphing and analysis.

SensorMate creates a folder using the "Sensor Name" and saves the data files to this folder. SensorMate will also generate a default file name that uses the "Sensor Name" and today's date.

Data can be collected at any time and does not require logging to be stopped. The sensor stores data in non-volatile memory so that logged data is not lost when the sensor is powered off.

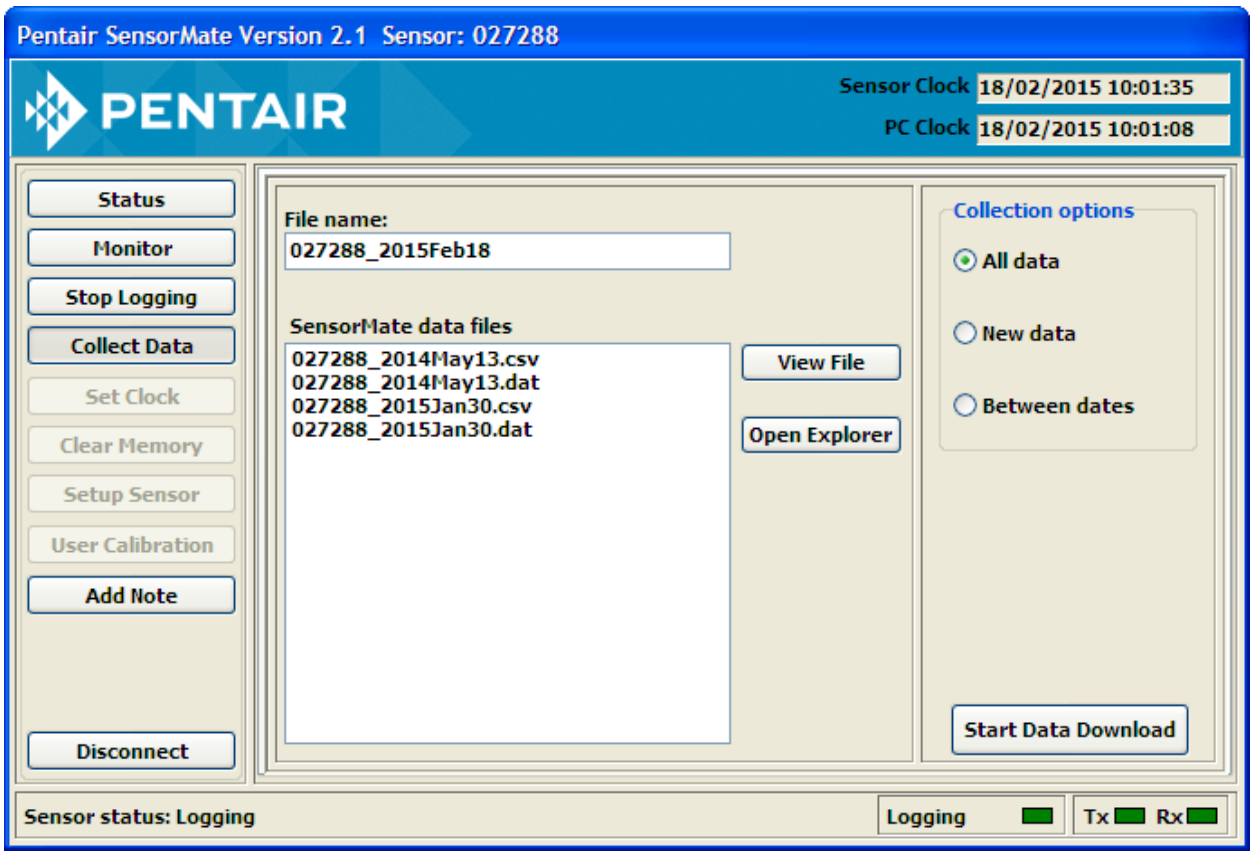

Figure 8 – Collect Data Window

5.5.1 Collecting Data

Data can be collected in a number of ways and saved to a filename that is created by SensorMate or entered by the user. Typically collecting data involves the following steps:

1. Check the **File name** and either use the auto-generated file name or enter a new filename. SensorMate creates filenames by combining the sensor name (MP65 Demo in the example of Figure 4) and the date (_2014Mar03).

2. Choose between available **Collection Options:**
   If you would like to obtain
   a. All data stored in the sensor, select **All data**.

b. Only data that has been logged since the last time that data was collected from the sensor, select **New data**. The new data will be appended to the selected data file.
c. Only data that was stored between a defined start and stop date, select **Between dates**.

3. You may now collect data by clicking the **Start Data Download** button.

Note - *SensorMate will create a new file if there is any data in the selected file when All data or between dates options are selected. This will ensure that no data is lost by having the file overwritten.*

5.5.2 View Collected Data

To view collected data while still connected to the sensor:

1. From the list of files shown, select the file you would like to view by clicking on the filename and clicking on the **View** button or
2. Double click on the file you would like to view.

Note - *It is assumed that the PC has a program installed and associated with the file types (e.g. Excel set up to open when .csv files are launched or Aquagraph with .dat files)*

5.5.3 Launch Windows Explorer

This button activates Windows Explorer and opens the folder containing the collected data files. From Windows Explorer files can be copied, pasted, renamed and deleted.

5.6 Set Clock

The **Set Clock** function is used to set the date and time in the sensor (Refer Figure 9). Normally the sensor is set to the same date and time as the PC by selecting **Synchronise with PC clock** and then clicking on **Update Logger Clock.**

To set the sensor clock to a time that is different to the PC, select **Set time manually**, enter the date and time you wish to set in the sensor and click on **Update Logger Clock.**

> ***Tip -*** *It is good practice to collect and save all data prior to setting the clock. It is also recommended to clear the sensor memory after the sensor clock has been set. Setting the sensor clock to a date/time that is earlier than is on recorded data may cause a problem.*

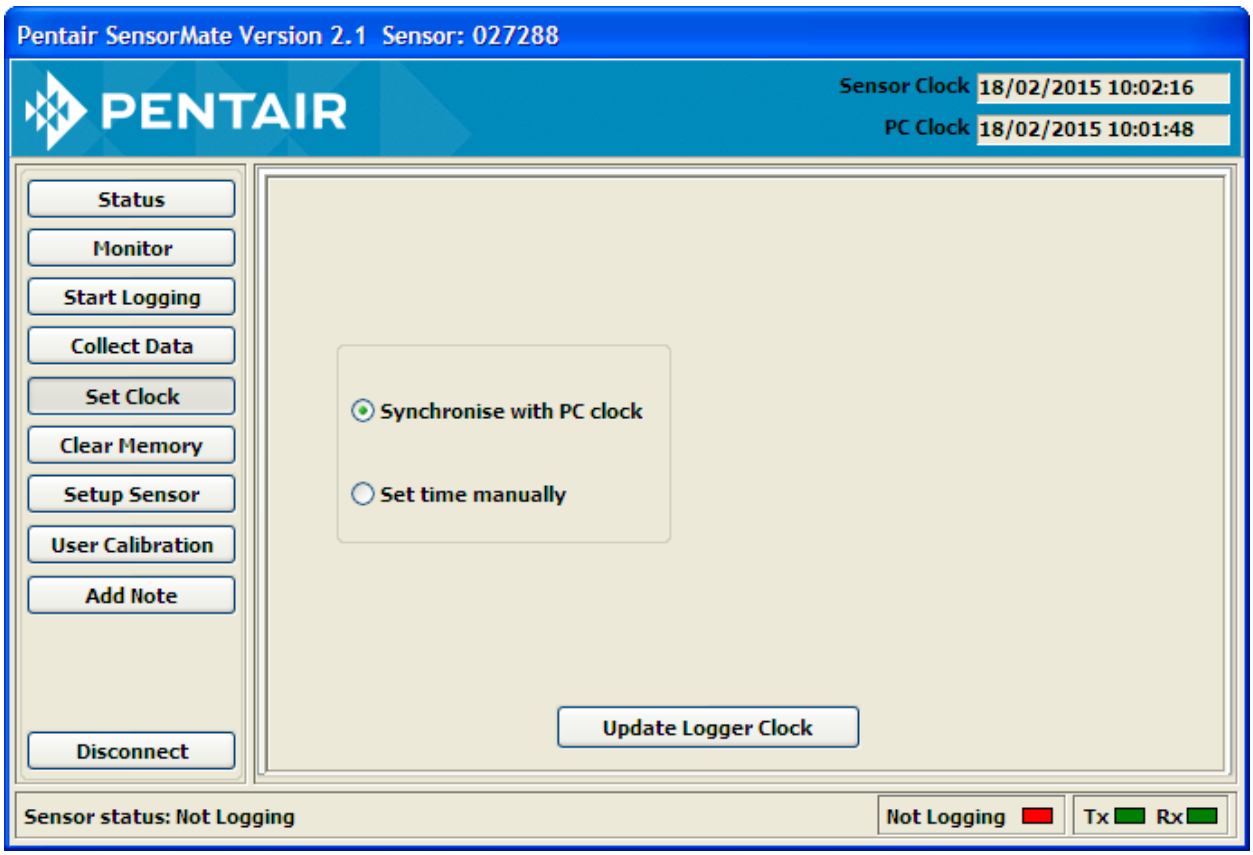

Figure 9 - Set Clock

5.7 Clear Memory

This button clears the logged readings and comments stored in the sensor's data file. Clearing the memory does not delete schedules or other sensor settings. This tool is not available when the status is **Logging**. A warning will appear to confirm the action was not an accidental click on the Clear Memory button.

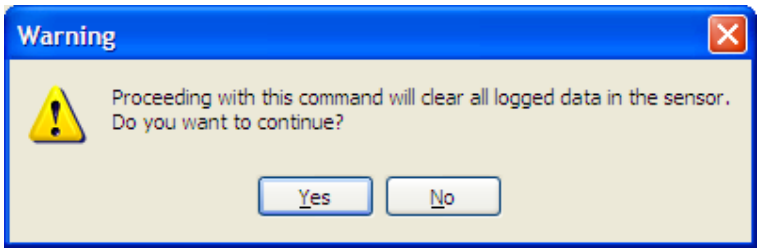

Figure 10– Clear Memory Warning

Tip - *It is good practice to collect all data and save to a unique file name prior to clearing memory.*

6. Setup Sensor

Clicking on the **Setup Sensor** button will open a new window with 2 panes. The left pane allows the navigation to more detailed information regarding the sensor's channels and logging schedules. Navigation is achieved by clicking on text using left and right mouse buttons, similar to navigation within Windows Explorer.

6.1 General Information

Clicking on the **Setup Sensor** button will open the General Information window (shown in Figure 11) which provides the user with details of the connected sensor. Clicking on the sensor name at the top of the left panel will return to the General Information.

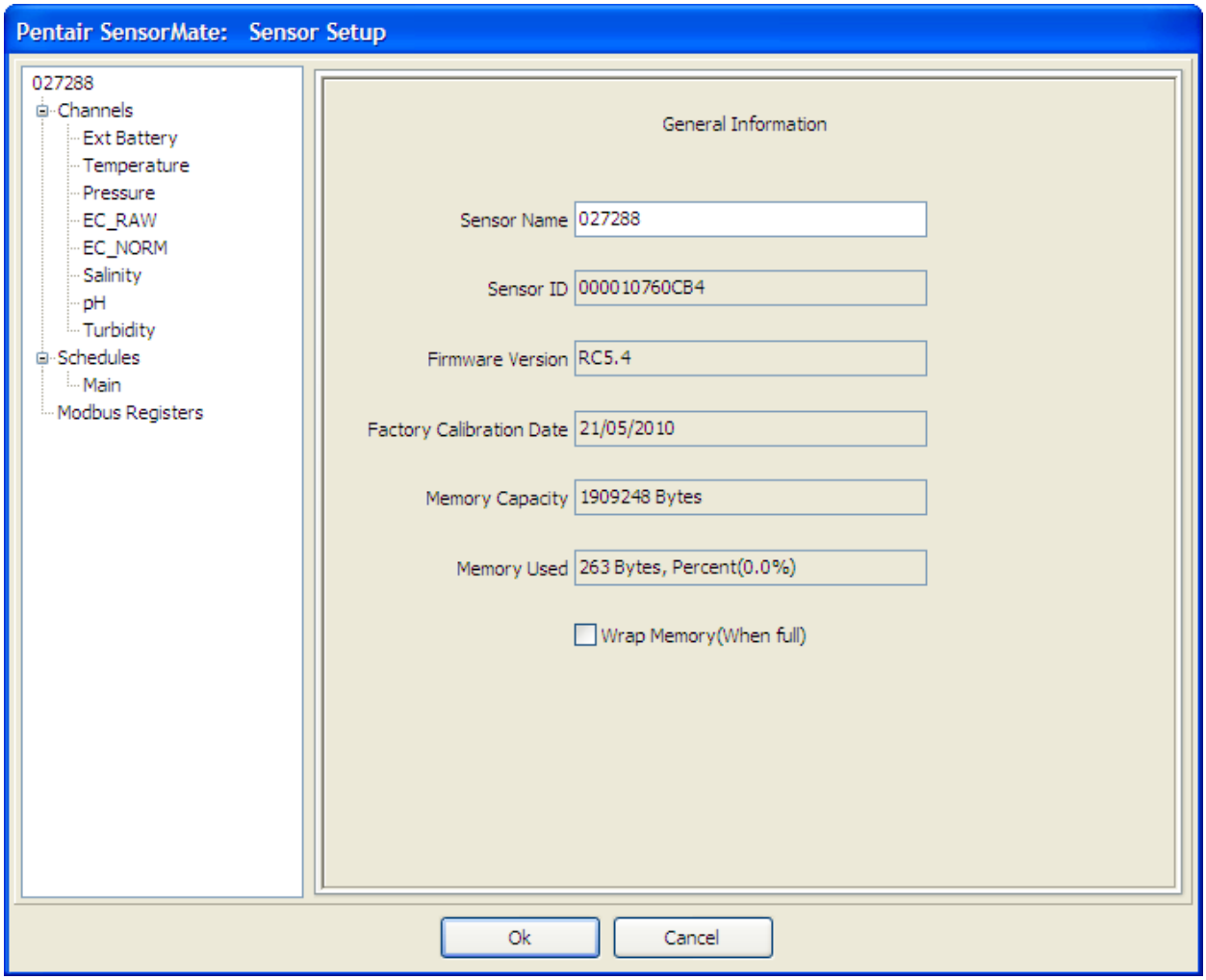

Figure 11 – Setup Sensor (General Information window)

6.1.1 Sensor Name

The "Sensor Name" is retrieved from the sensor's memory and displayed at the top of the general Information. The default name is the factory serial number. The "Sensor Name" is used to create file and folder names when data is downloaded from the sensor. A customer can change this to a more descriptive name by editing the text in the box and pressing Ok. Up to 19 characters can be used but many symbols are not accepted.

6.1.2 Sensor ID

This displays the unique hexadecimal number that is carried on an ID chip on the main sensor circuit board.

6.1.3 Firmware Version

Displays the version of the firmware loaded into the main sensor circuit board.

Tip - *Older 3000 series sensors can be have their firmware upgraded allowing extra functionality (e.g. Modbus) if required.*

6.1.4 Factory Calibration Date

This displays the date of last factory calibration.

6.1.5 Memory Capacity

This is the amount of space available to store data. The sensor uses non-volatile flash memory to store data. Data is not lost if power is removed from the sensor.

6.1.6 Memory Used

This is the amount of data that has been stored within non-volatile memory in the sensor.

6.1.7 Wrap Memory (When full)

Logged data is stored within non-volatile memory in the sensor and the memory has a fixed size (4MB). As the sensor logs data, the memory fills and may eventually become full. The **Wrap Memory** check box allows the user to select whether the memory should fill and not store future readings (unchecked) or to wrap around and overwrite the oldest (earliest data) in memory (checked).

Note - *If not using the Memory Wrap function – the memory will fill and then no more data will be logged. (I.e. all the data from the start of the logging period will be retained until it is cleared).*

6.2 Channels

Clicking on Channels in the left panel will bring up a list of channels that are available for monitoring. The channels that are checked will appear on the monitor screen. The factory default is set that all available channels will be checked (Refer Figure 12).

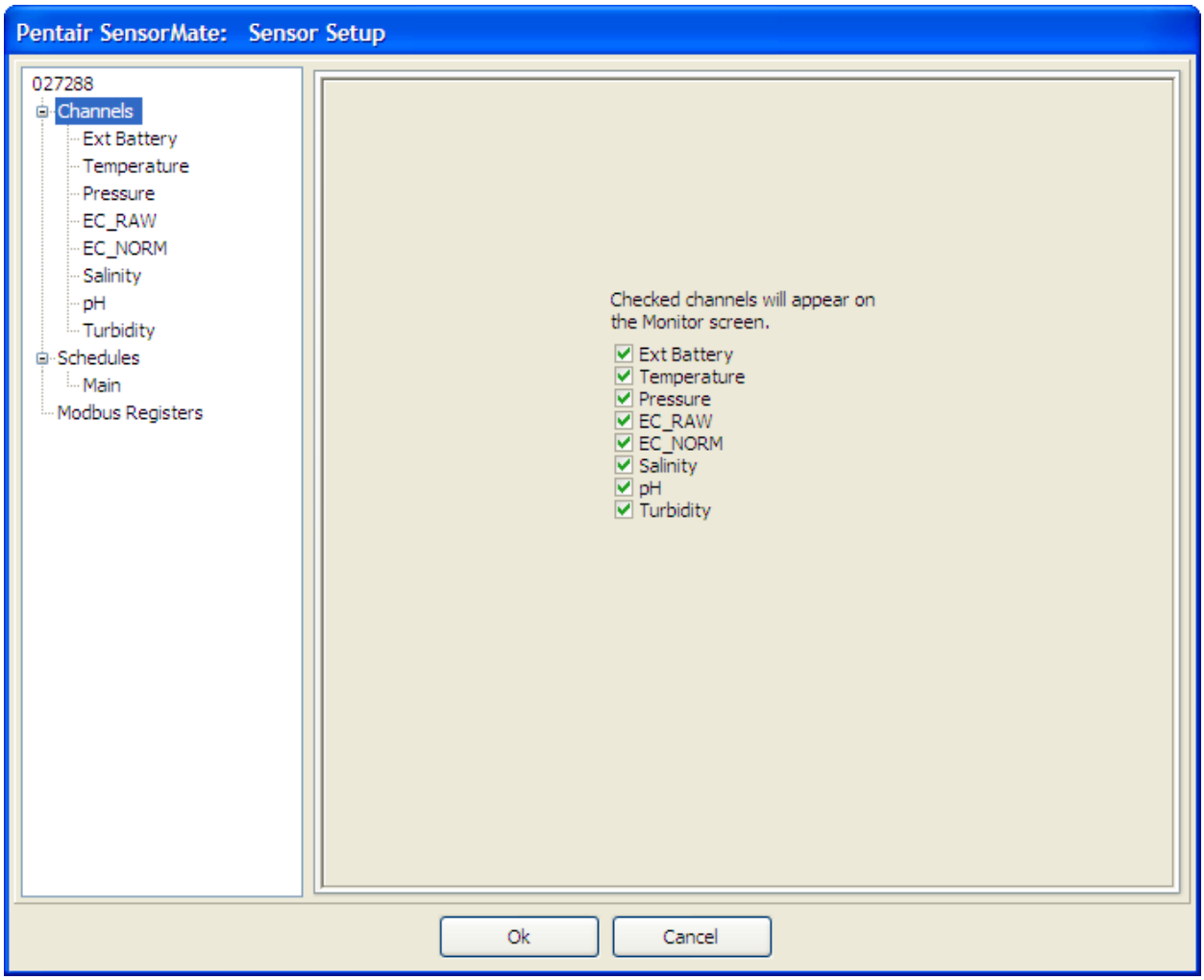

Figure 12– Setup Sensor (Channels)

Note - *The checked channels will also be the channels used for SDI-12 and Modbus output.*

6.2.1 Sensor channels

Clicking on an individual channel will bring up information related to that channel including Channel Name, Unit Type, Unit Name, Channel Precision and Enable Data Variation (Refer Figure 13).

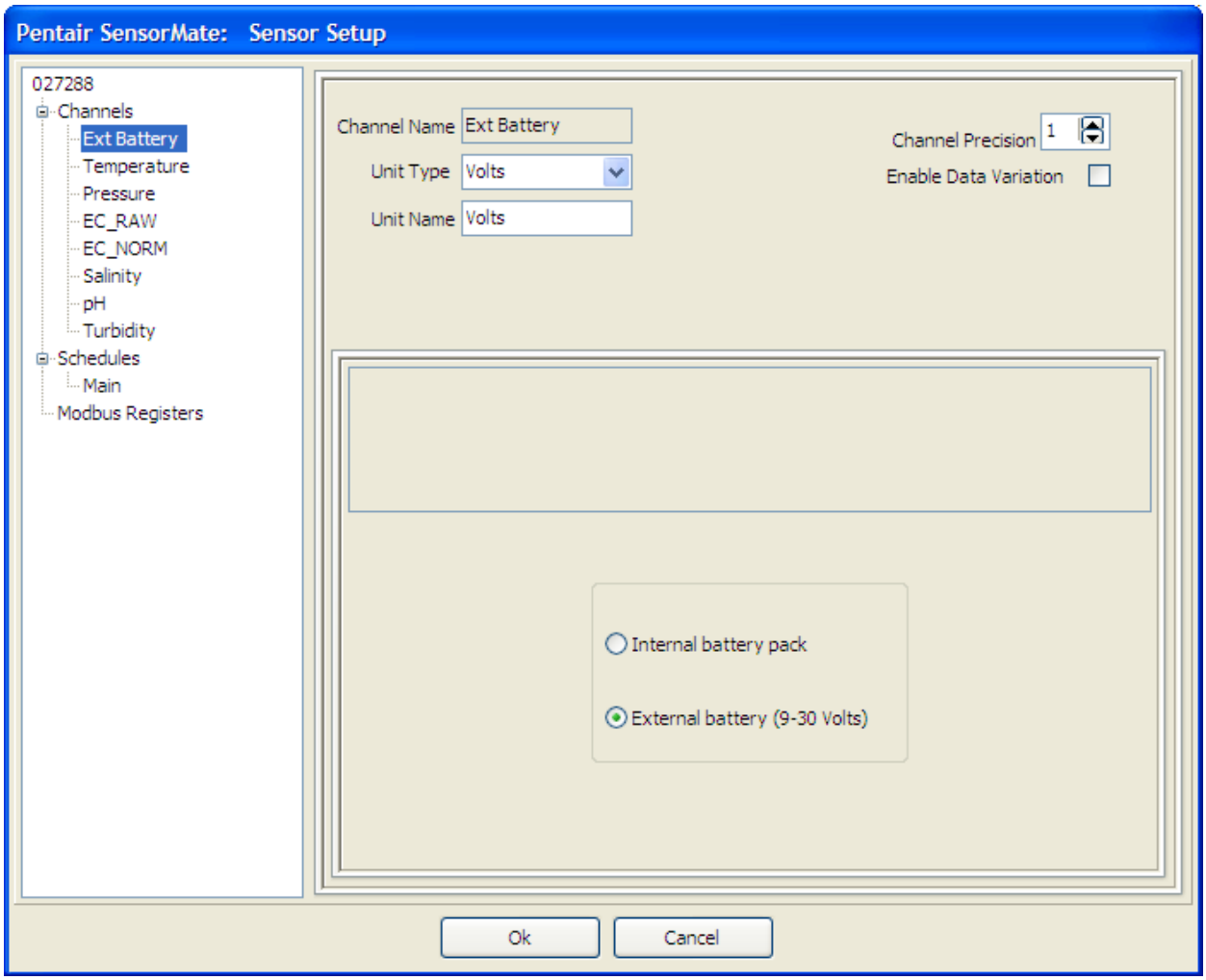

Figure 13 – Setup Individual Sensor Channels

6.2.1.1 Channel Name

This is the name given to an individual parameter that can be set up to log data. The factory provides default names. A user can rename these channels by first clicking on the channel in the left pane to highlight it then left clicking on the highlighted channel. This will reveal a rename channel option which will open an input box shown below (Refer Figure 14). Enter a new name and press Ok to save.

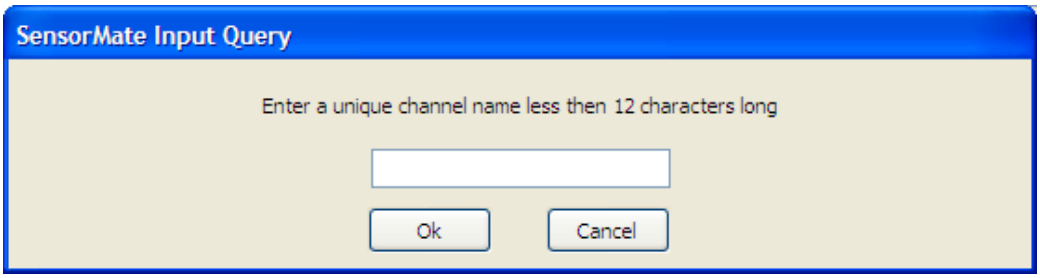

Figure 14 – Change Channel Name

6.2.1.2 Unit Type

Many channels have alternative units that can be selected from a drop down list for the channels. When a different unit is selected the sensor automatically converts the result to the new unit.

> **TIP:** *It is recommended to clear the memory after changing the unit.*

6.2.1.3 Unit Name

Default names are provided for the different unit conversions. These names are included in the header information of data files.

6.2.1.4 Enable Data Variation

Data variation is *event logging* of a particular channel. Enabling data variation can allow for the recording of channel values only when significant changes occur, such as changes of water levels due to flood events. Setting a sensor for data variation can help to avoid filling the memory with repetitive data and accumulation of large data files.

> ***Note -*** *Data variation requires at least one schedule to be scanning the channel. Data variation logging cannot be performed unless the channel is scanned. Data variation is only useful when the recording rate is significantly longer than the scan rate. Channels will be logged according to the schedule Record Interval whether Data Variation is enabled or disabled.*

The concept of **Data Variation** is illustrated in Figure 15. In this figure the black dots represent scanned channel values (according to the scan interval in a schedule) and the red dots represent recorded values (in accordance with the record interval in a schedule) that are logged to memory.

In this example the **Data Variation Value** is set to a value of 10.0. If data variation is enabled, the sensor checks the difference between each scanned reading (black dot) and the last recorded reading (red dot). If, in this example, the difference between the readings is greater than 10.0, then the reading is logged.

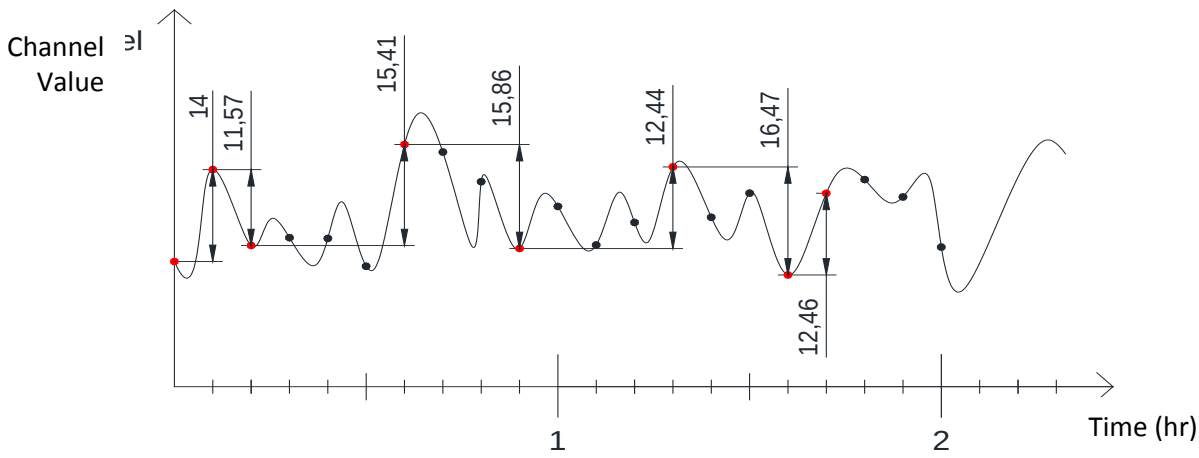

Figure 15- Figure illustrating the concept of Data Variation.

6.3 Specific Channel Information

Some channels, including Ext Battery, Pressure, DO ppm and Turbidity have additional information and settings.

6.3.1 Battery Channel

Greenspan sensors can be powered from an external battery or from an optional internal battery pack. The name of the channel is automatically set when the power source option is changed (Refer Figure 16)

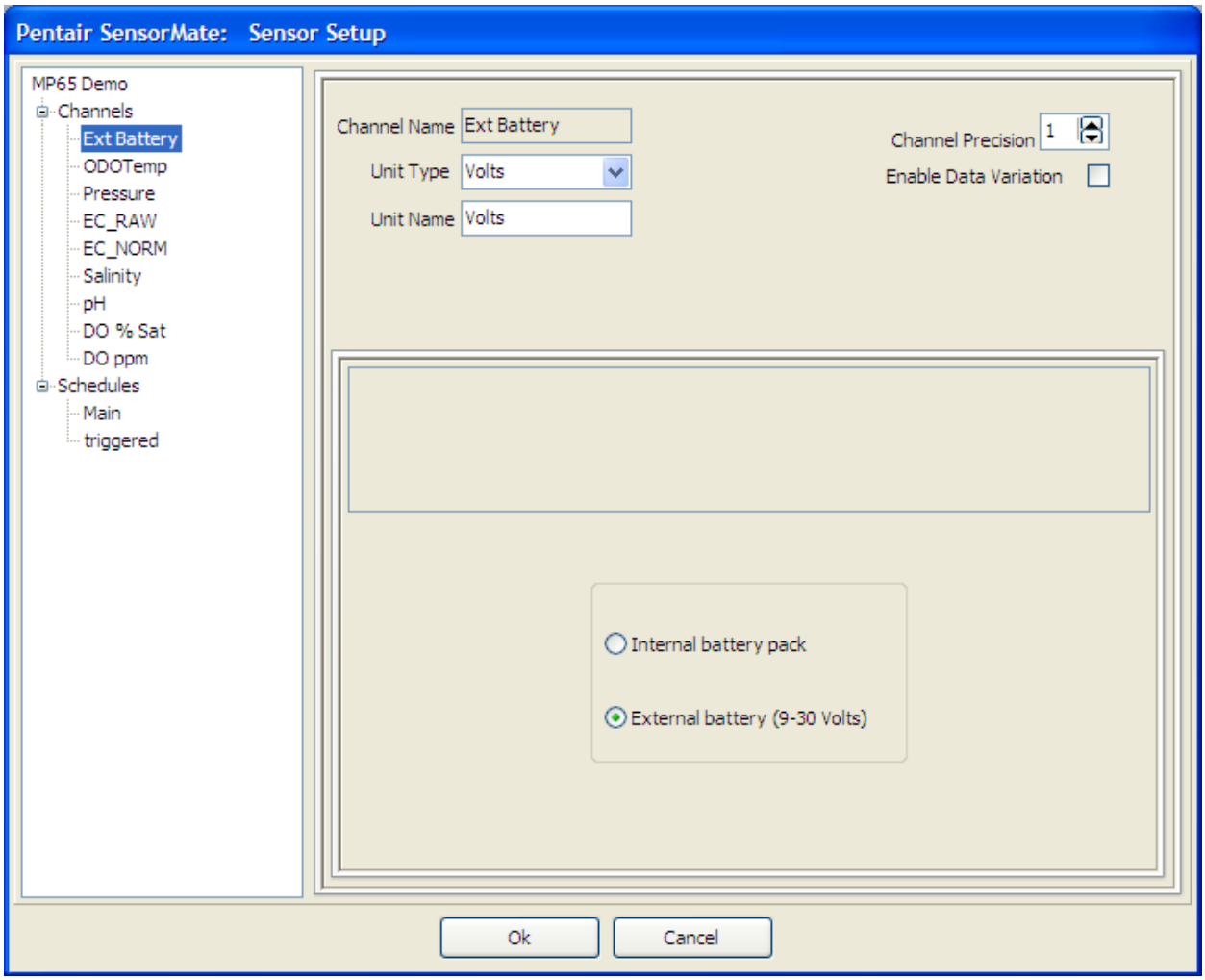

Figure 16 – Battery Channel

Note - *Only select Internal battery pack if the sensor is built with that option. Changing the Power Source may cause unexpected results in the collected data files. Where possible collect and save all data and clear the memory before changing the power source.*

6.3.2 Pressure

The pressure channel on Greenspan MP Sensors is primarily used to indicate water levels. The default unit is metres of water as defined by AS/NZS 1376:1996. To display level measurements for fluids that have a density different to water, the user can enter a value which is the specific gravity of the fluid being measured (Refer Figure 17).

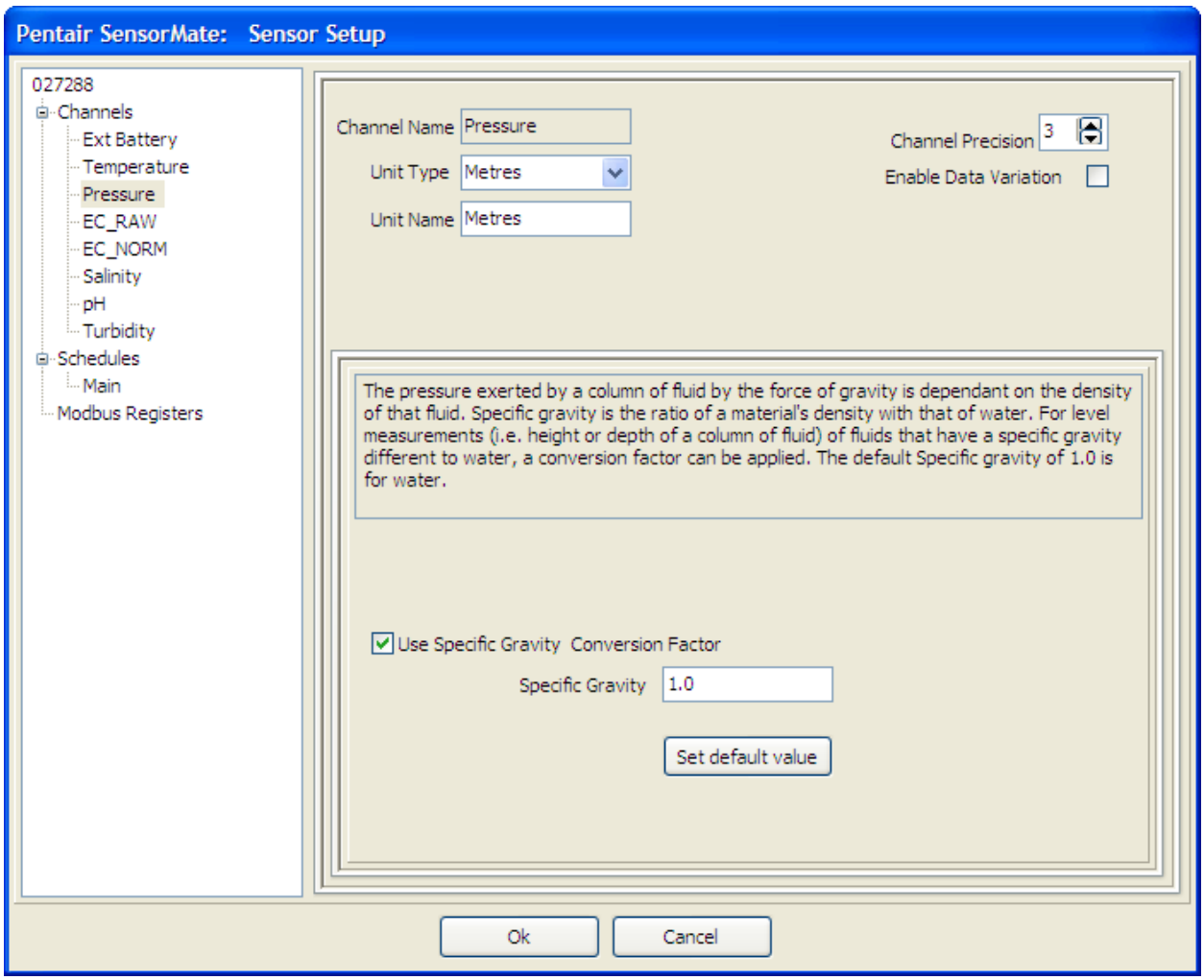

Figure 17 – Pressure Channel

6.3.3 DO PPM

The DO ppm channel is derived from the DO %Sat channel. Atmospheric pressure is used in the calculation. Where it is known that the average Barometric pressure is significantly different to 1 Atmosphere, the calculated result will be improved by entering an estimated barometric pressure (Refer Figure 18).

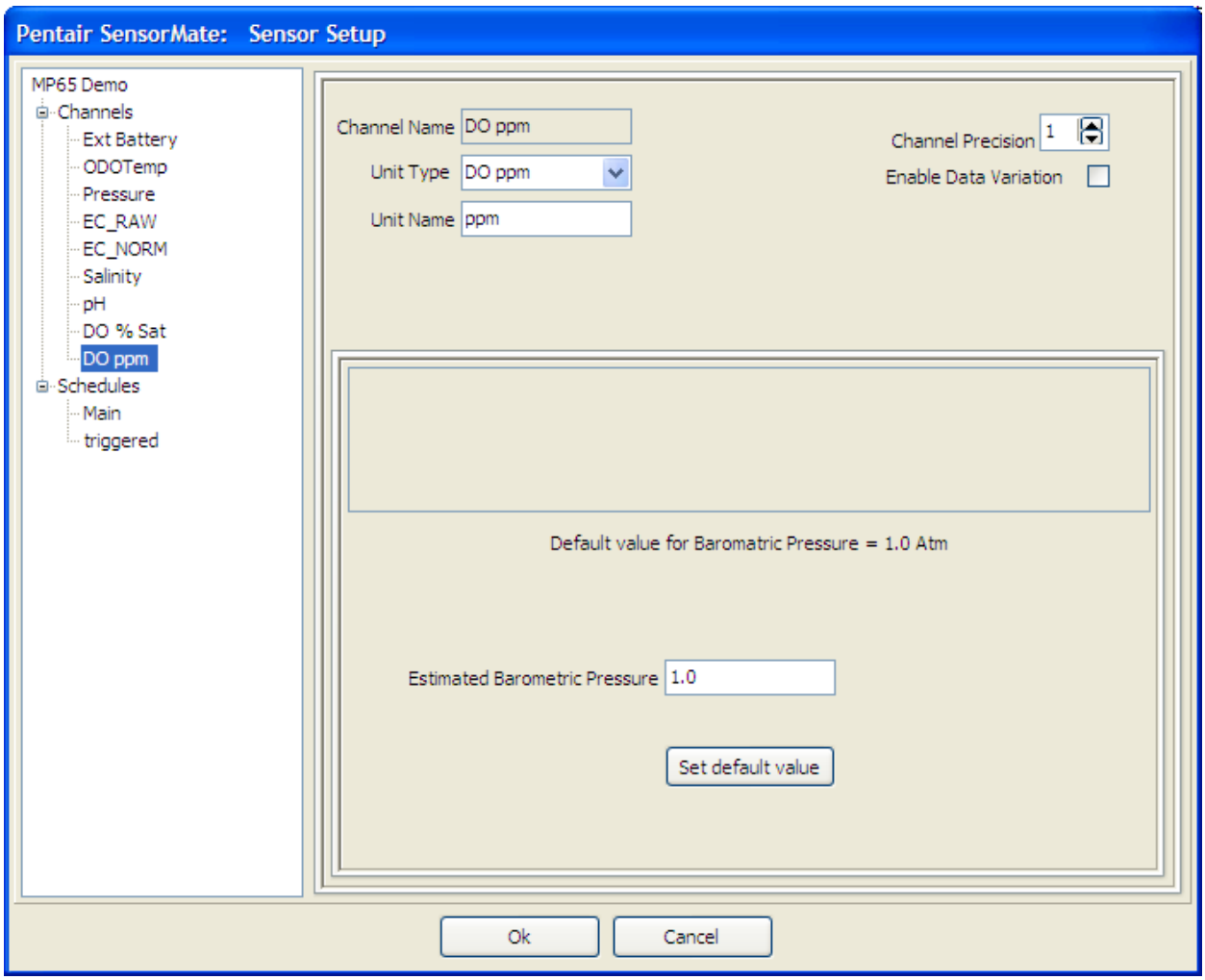

Figure 18 – DO PPM Channel

6.3.4 Turbidity

The Turbidity sensor includes a wiping mechanism to physically remove buildup of material from the optical interface between the sensor and the water. Settings for the wiping can be configured in the turbidity channel setup (Refer Figure 19). When a sensor "wakes up" to complete a scan (i.e. take readings), it calculates if the number of scans or the wipe interval in minutes has been reached.

Manual wiping can be performed by clicking on the **Wipe lens now** button.

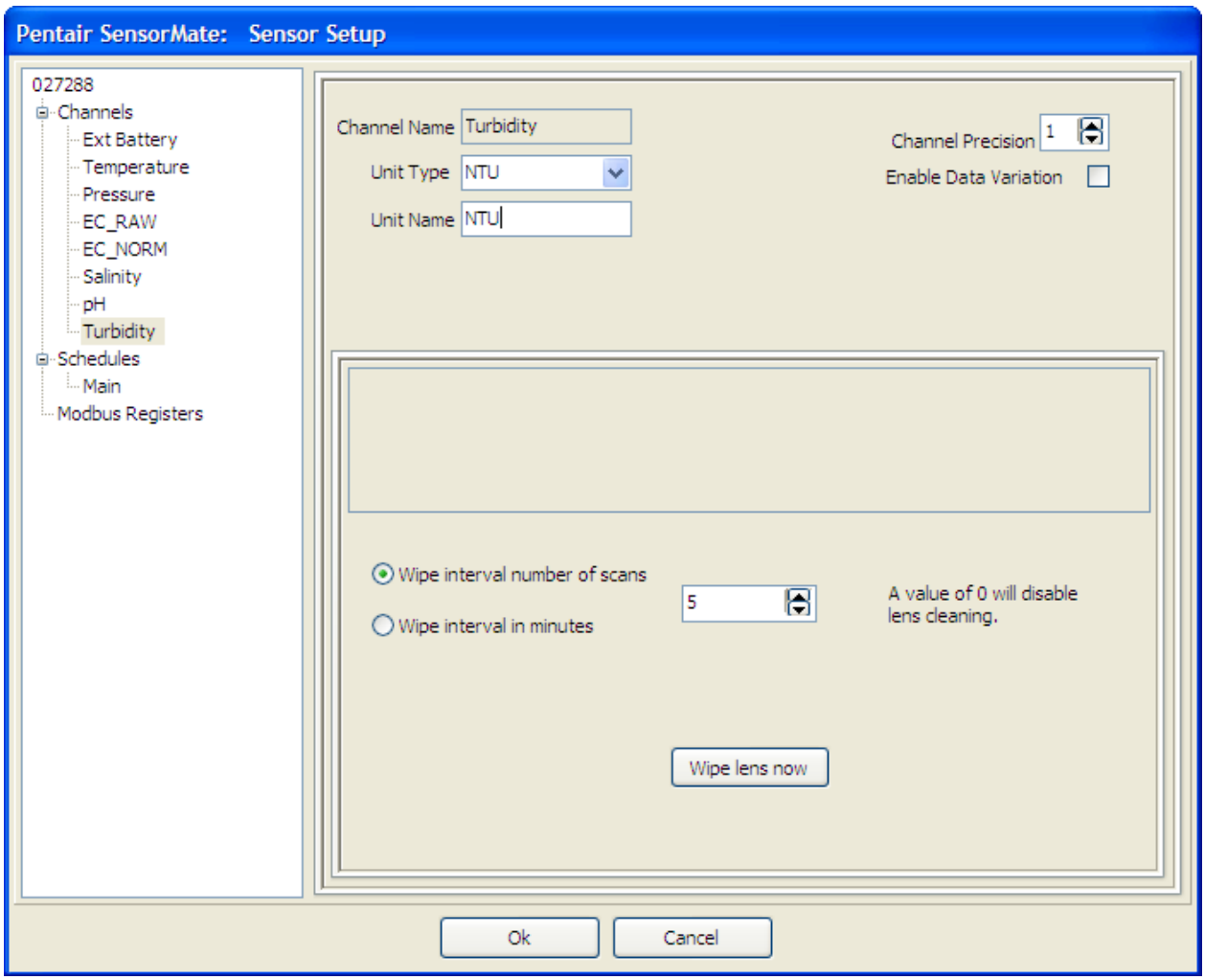

Figure 19 – Turbidity Channel

7. Schedules

Schedules control when channels are read and data recorded. Clicking on Schedules brings up an overview of the schedules. At least 1 schedule must be set up and up to 4 schedules can be used. Schedules are given a name which appears in the tree on the left of the screen (Refer Figure 20). Sensors will typically leave the factory with one schedule with the name of Main, set to Scan and record all available channels every 3 minutes.

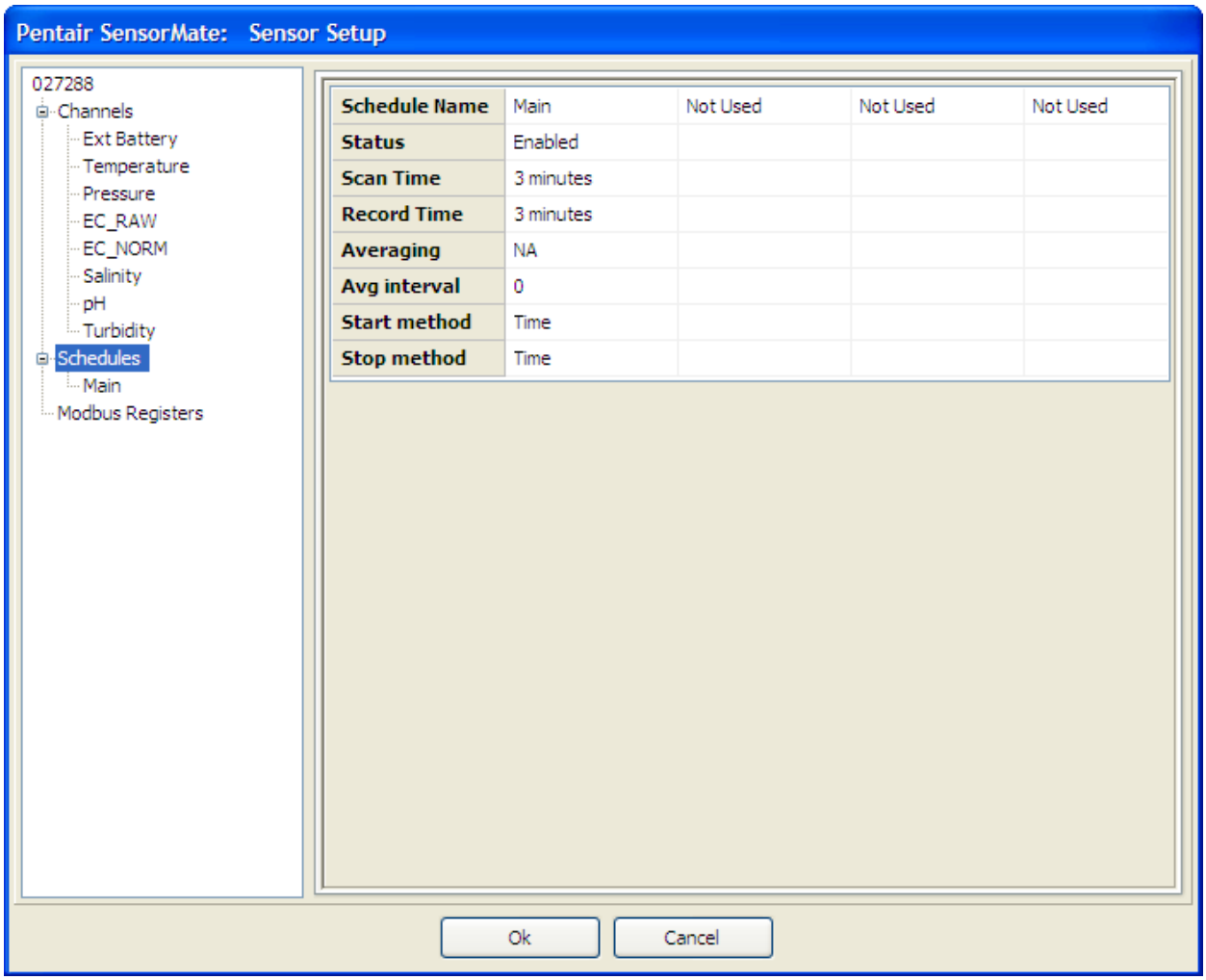

Figure 20 – Sensor Setup – Main Schedule

7.1 Schedule Information

Clicking on the schedule name brings up further information relating to the schedule (Refer Figure 21).

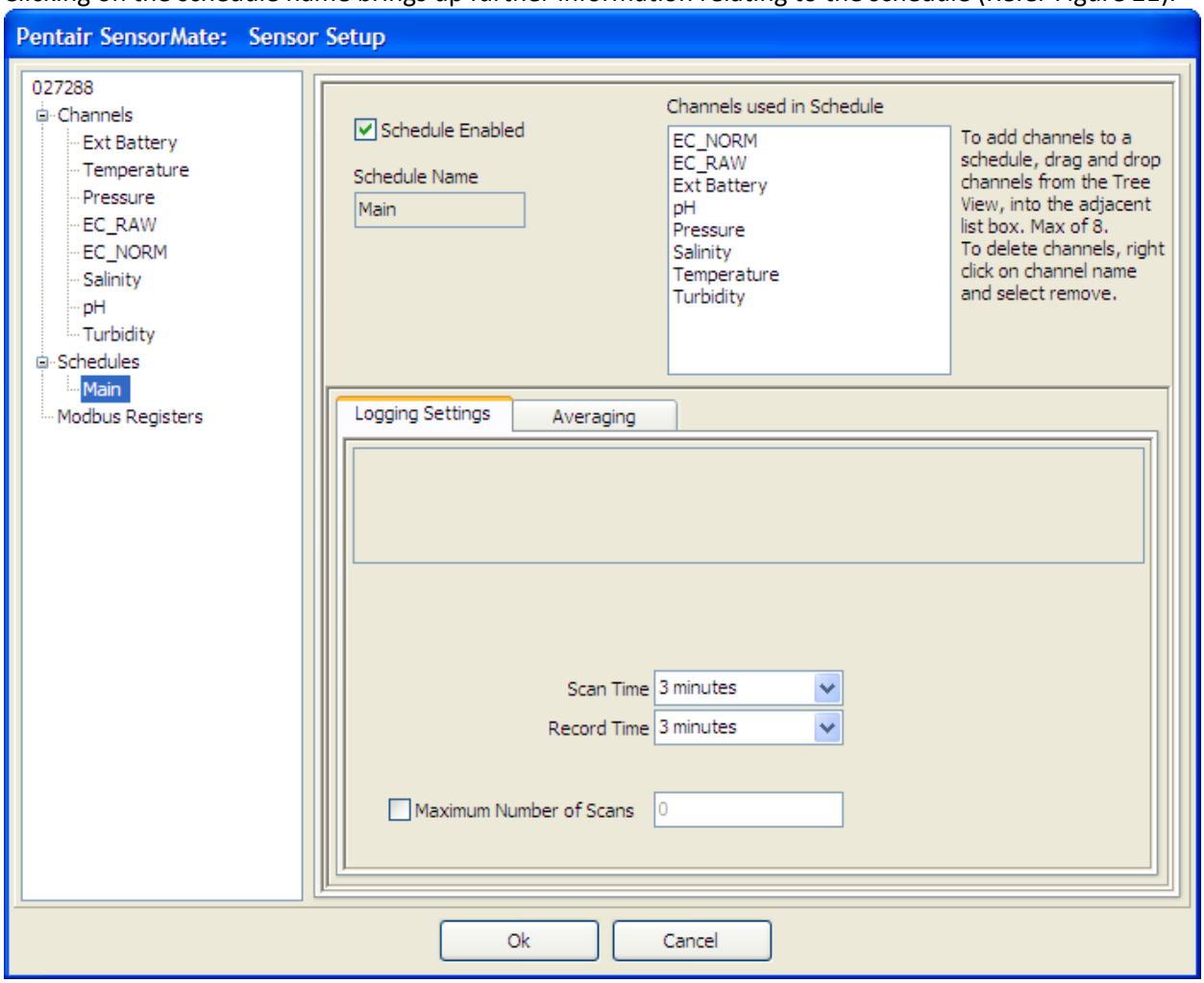

Figure 21 – Schedule Information

To change the name of the schedule, right click the highlighted name and a **Rename Schedule** option can be selected (Refer Figure 22).

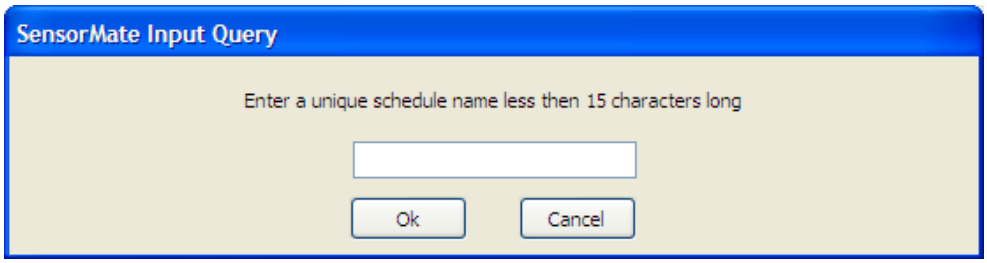

Figure 22 – Change Schedule Name

Schedule Enabled allows schedules to be set up and then disabled if not required for the particular deployment. At least one schedule must be enabled.

A list of the **Channels used in Schedule** is displayed. Channels can be added by dragging from the left and dropping into the list. Right clicking on a channel in the list brings up a **Remove Channel** option.

7.2 Logging Settings

Scan Time is the interval that the sensor will take readings for all the channels in the list. Available times can be selected from a dropdown list (Refer Figure 21).

Record Time is always a multiple of the scan time. The channel readings collected during a scan are written to the data file according to the Record Time setting.

Maximum Number of Scans can be selected if the number of scans needs to be limited.

7.3 Averaging

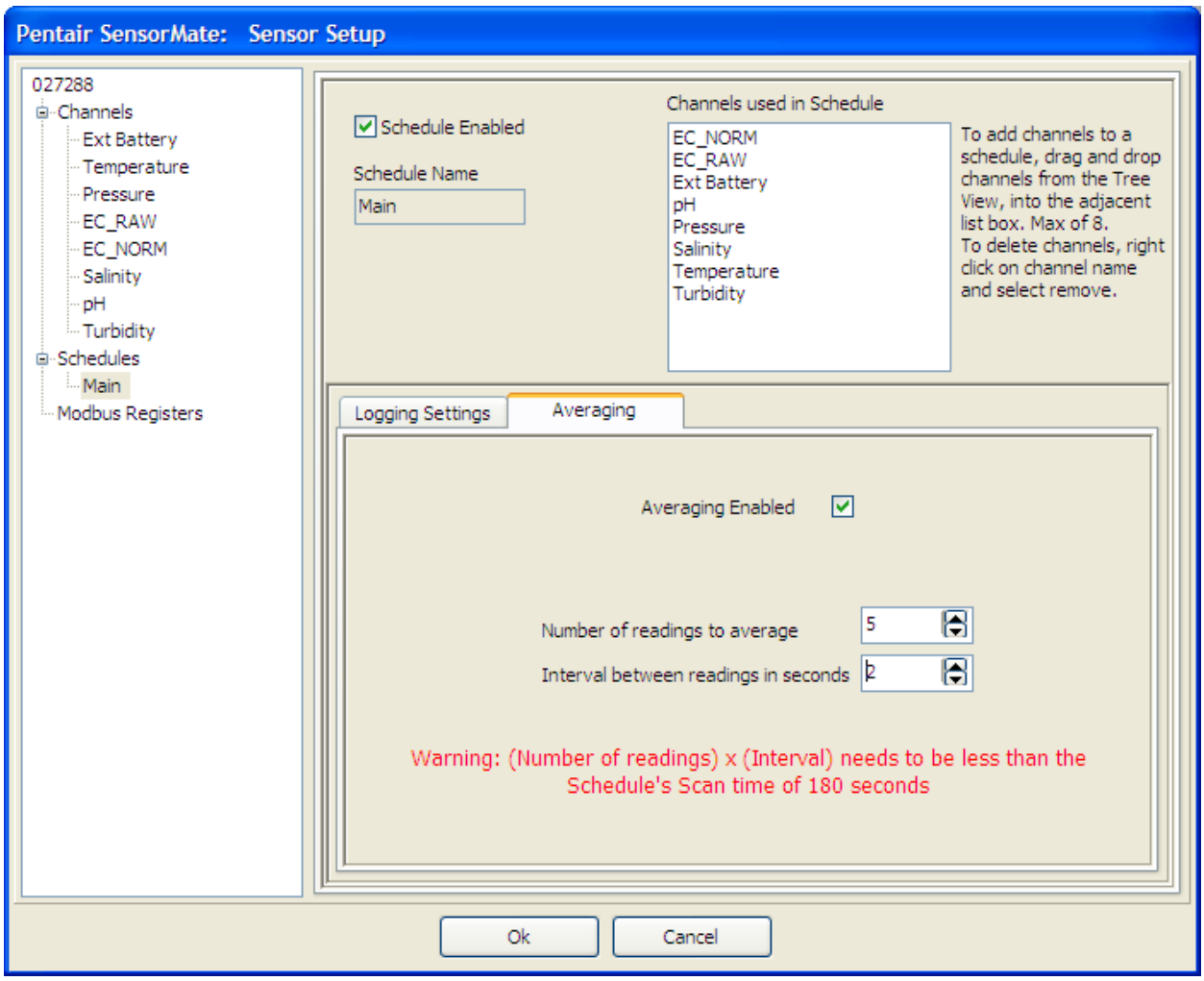

Figure 23 – Averaging Settings

Averaging enabled when checked, takes multiple readings and records an average of those readings. This can be useful to smooth data (e.g. minimize the effect of waves on a water level reading).

> ***Note -*** *The time to take the multiple readings must be less than the Scan time.*

7.4 Add Schedule

Right clicking in the left panel will bring up an Add Schedule option. When selected, a new window will open so that a schedule name can be entered (Refer Figure 24).

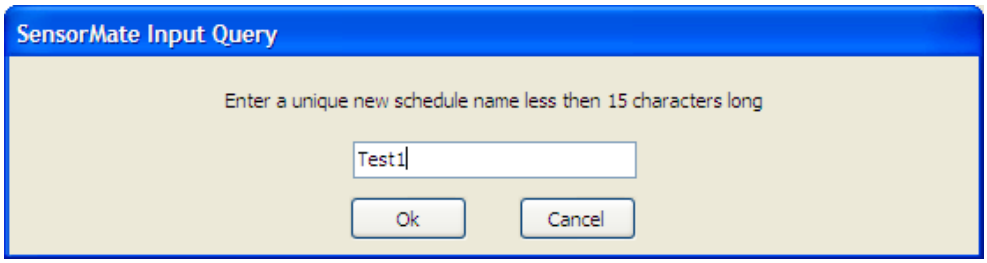

Figure 24 – Add a new Schedule

When the name is entered, clicking **Ok** will open a Channel selection form. Checked Channels will be used in the Schedule (Refer Figure 25).

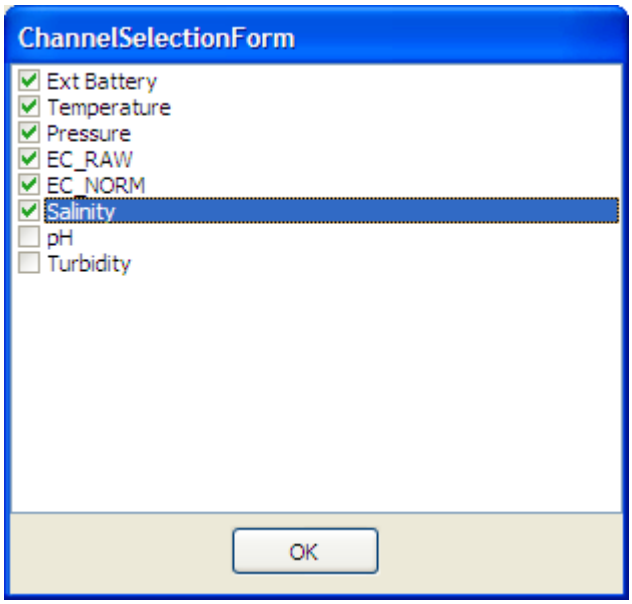

Figure 25 – Channel Selection for Schedule

Pressing Ok will return to the Sensor Setup window. Clicking on the new Schedule will allow for detailed schedule settings including **Channels Used in Schedule, Scan Time, Record Time, Maximum Number of Scans** and **Averaging**. Additionally, Start Method and Stop Method is available for schedules 2, 3 and 4.

7.5 Start Method

The default method to start a schedule is Time (Refer Figure 26). This is useful if data is required at specific times (e.g. at 15 minutes past the hour, every 4 hours). The sensor will work out transducer warm up times, averaging, Turbidity wipes and other requirements so that the final readings and calculations are complete in the second when data is due to be logged.

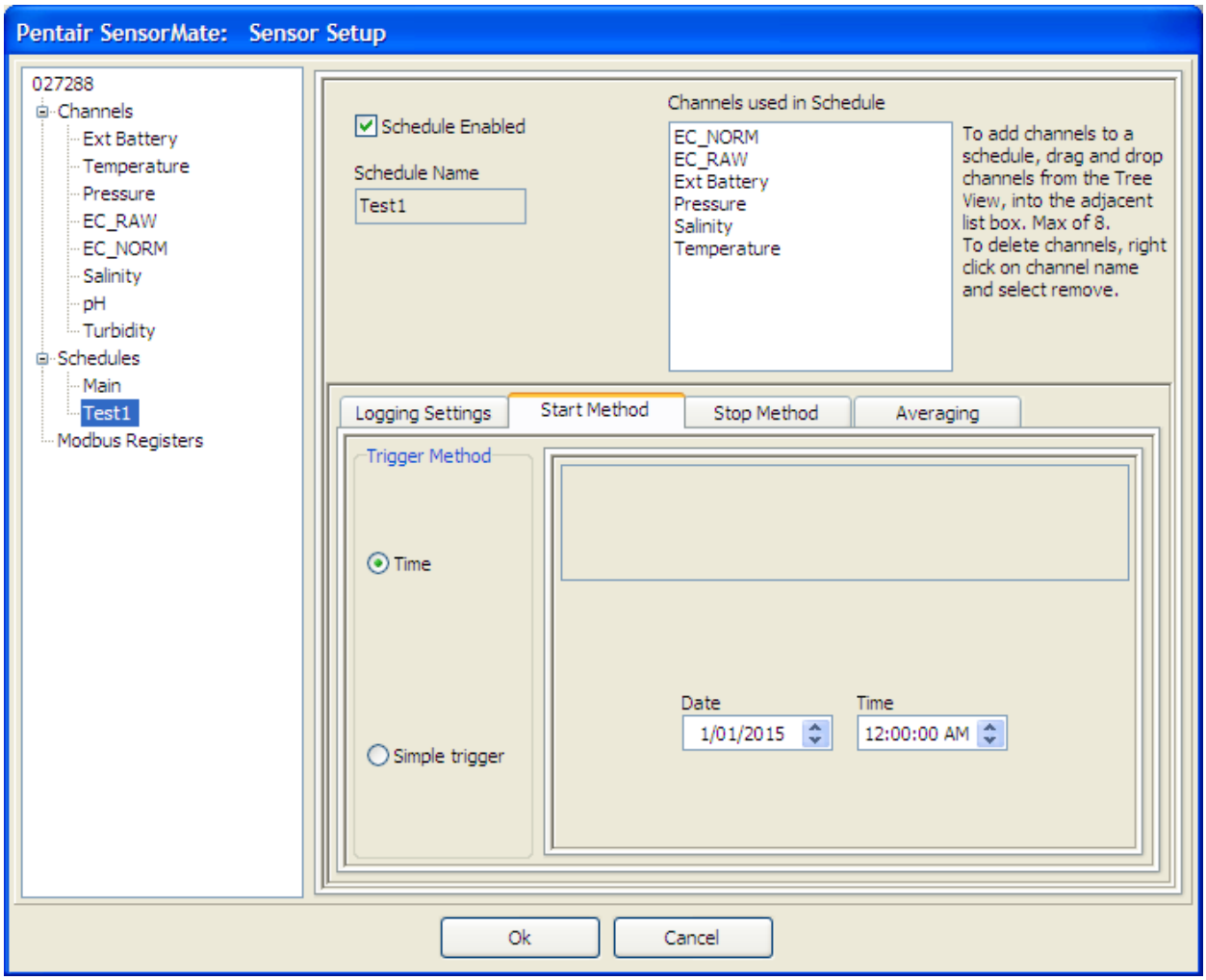

Figure 26 – Start Method Settings

7.6 Simple trigger

The schedule can also be set to start from a simple trigger (Refer Figure 27). This can be used to capture data during events (e.g. flood peaks). To use Simple trigger another schedule must be scanning so that channel readings are being taken. One of these Channels is selected and a condition is chosen. Conditions available are **Rising** above a **Set Point Value**, **Falling** below a **Set Point Value** and **Data Variation** greater than a **Variation Value**.

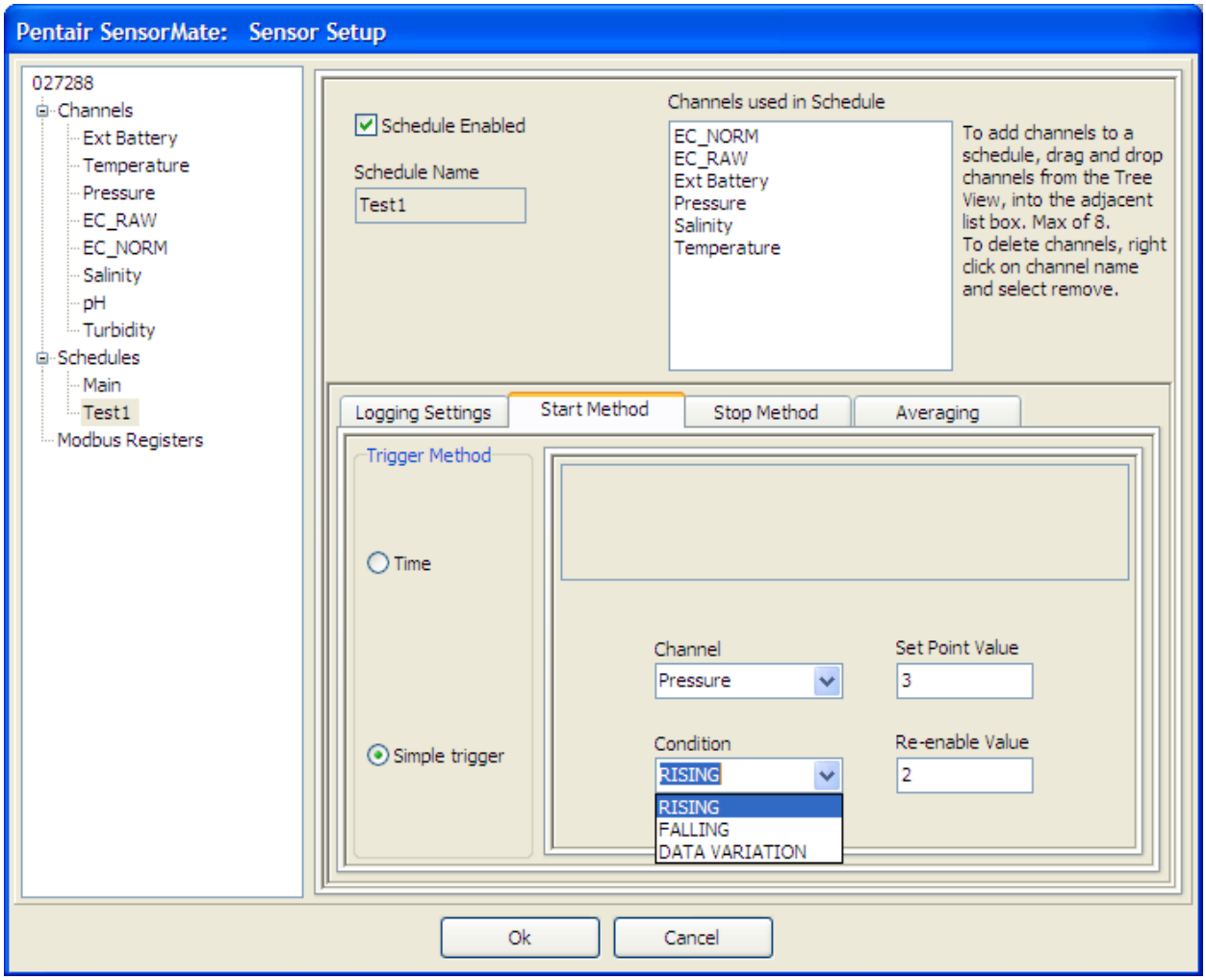

Figure 27 – Simple Trigger Settings

8. Modbus Registers

Sensor information can be mapped to Modbus holding registers. This provides an easy transfer of data to the many devices that support Modbus.

When “Modbus Registers” is clicked in the Sensor Setup tree, al list of available channels will be displayed with a selection box (Refer Figure 28). Selecting a Sensor channel will allocate 6 holding registers for channel information. A table will update and display the holding registers allocated. The **Ok** button must be pressed to send this setup to the sensor.

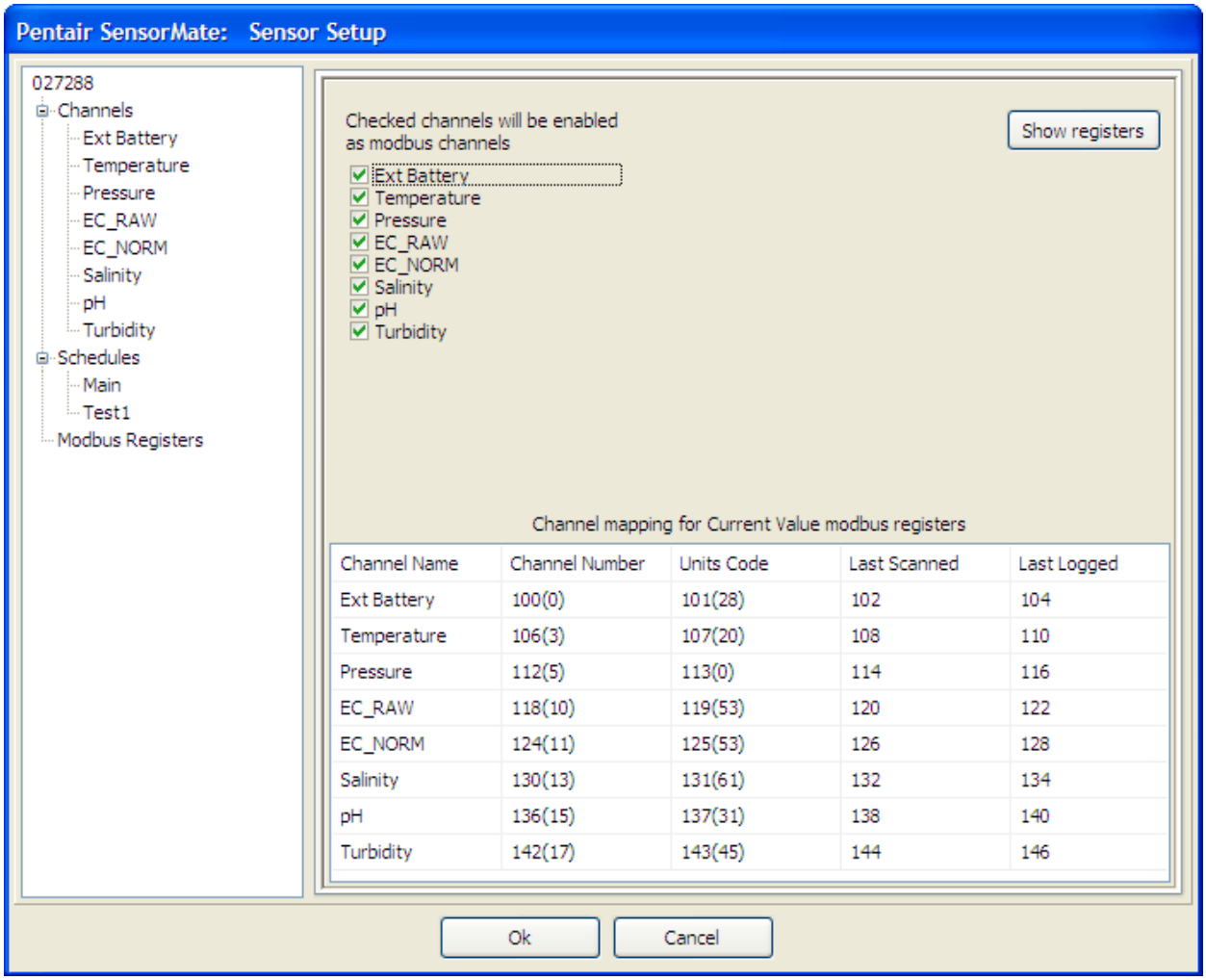

Figure 28 – Available Channels for Modbus

8.1 Show registers button

There is a “Show registers” button that provides other information that is also written to holding registers.

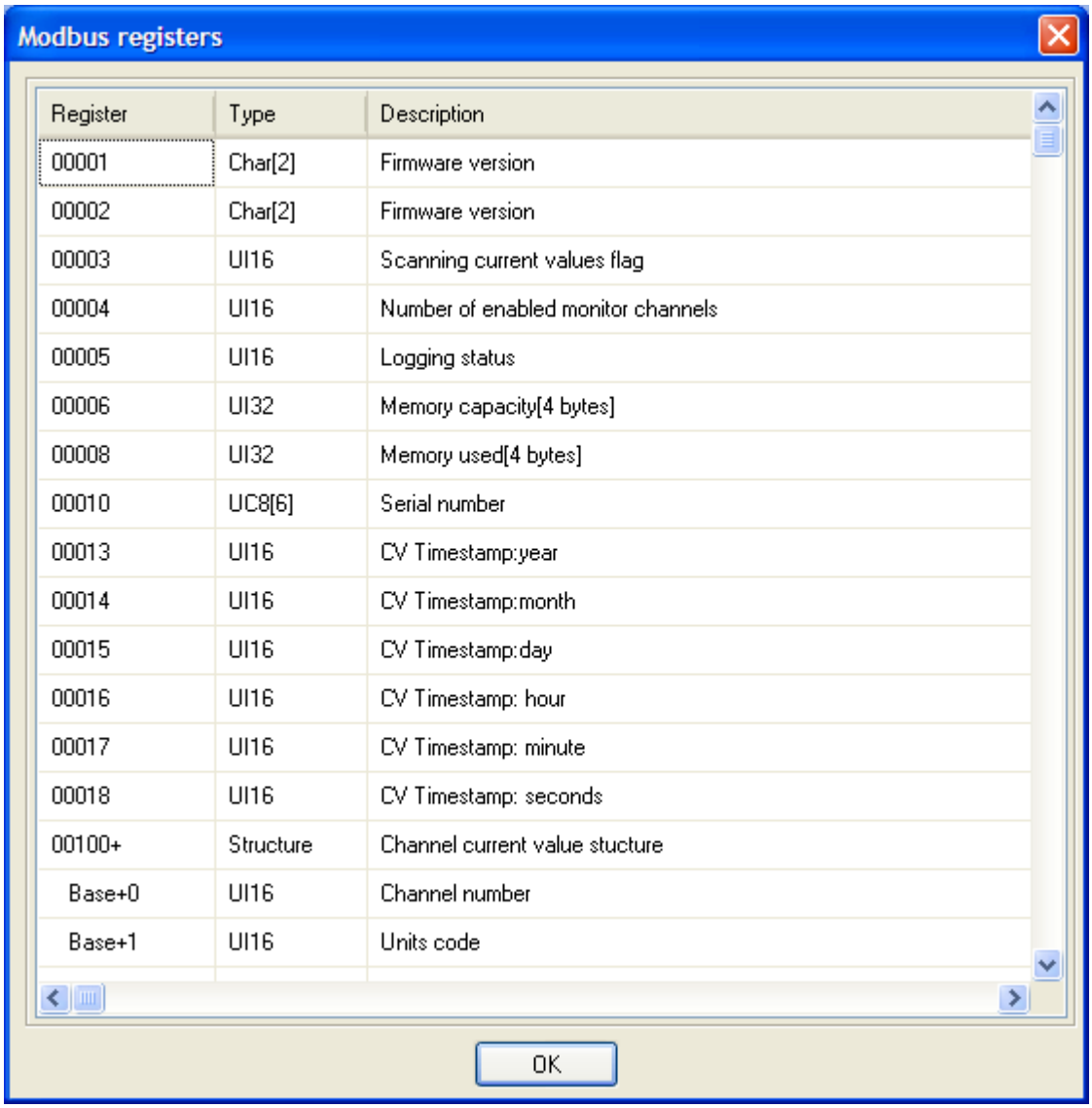

Figure 29– Modbus Registers

8.2 Stop Method

The schedule can also be stopped using Time or a Simple trigger (Refer Figure 30). If a simple trigger is used the schedule will start again if the Start Method Simple trigger conditions are met.

Tip - *The Maximum Number of Scans can also be used to stop a schedule.*

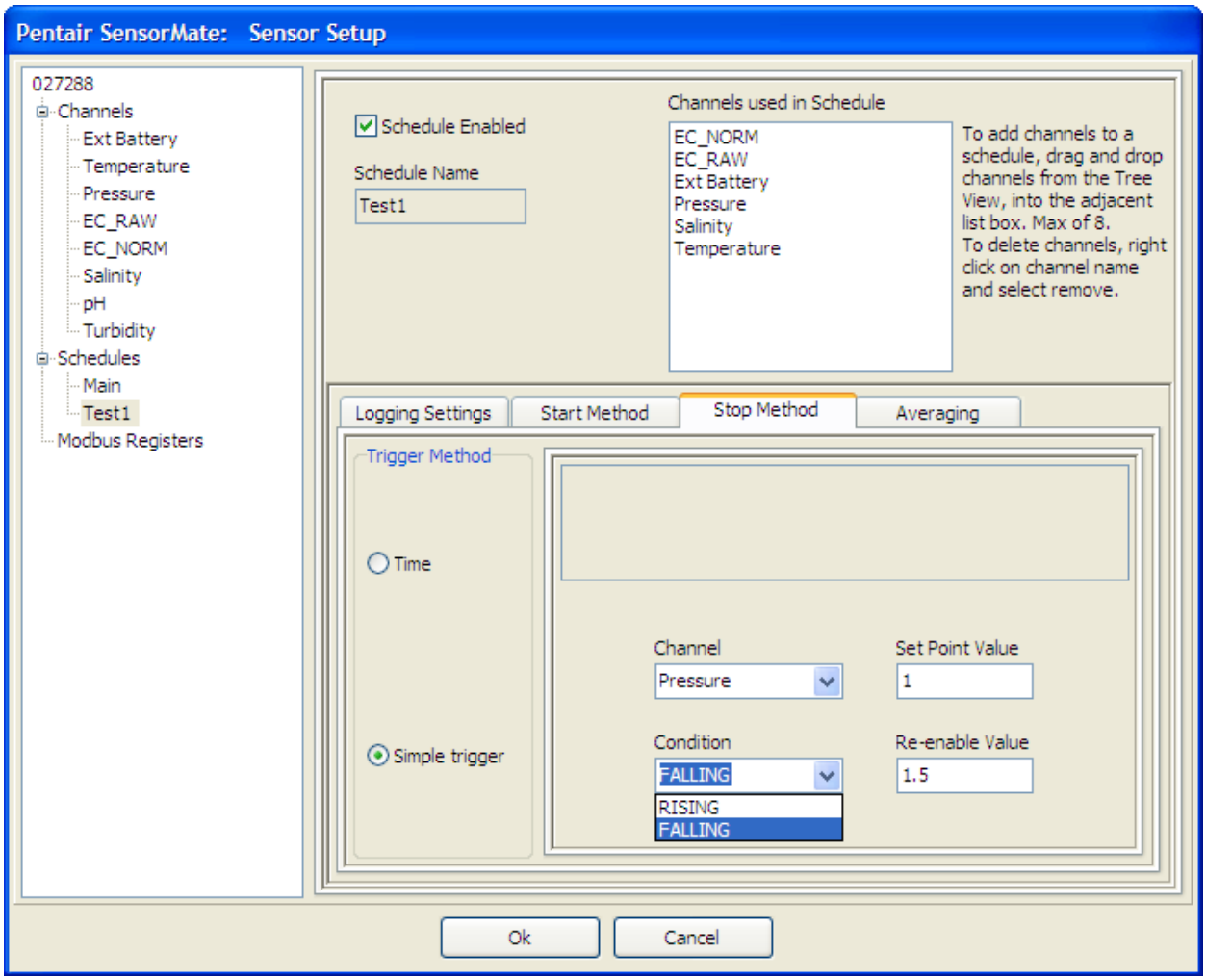

Figure 30 – Stop Method Settings

8.3 Deleting a Schedule

The sensor must have at least one schedule enabled. When there are two or more schedules, right clicking on a schedule will allow the **Delete Schedule** option to be selected.

Note - *There may be some schedule settings within the sensor that are not visible using SensorMate. Deleting a schedule will reset all settings to default values.*

Hint - *Adding a new schedule, deleting it and adding it again will ensure all special schedule settings are reset and data will be logged as expected.*

9. User Calibration

Some users verify sensor performance over time by checking them against known standards. The **User Calibration** function in SensorMate (Refer Figure 31) allows for small corrections to be applied to most sensor channels. User calibration also allows for any previously applied correction factors to be removed, restoring the sensor to the original factory calibration (factory default). User calibration does not change or affect the original factory calibration which can be restored at any time.

Most channel readings depend on temperature. Always ensure that the temperature of the sensor is stable and not changing. If the sensor is placed in different solutions during calibration ensure that either the temperature of each solution is the same, or allow sufficient time for the sensor to thermally stabilize in each solution. When using different solutions it is recommended to wipe the sensor clean before placing it in a different solution.

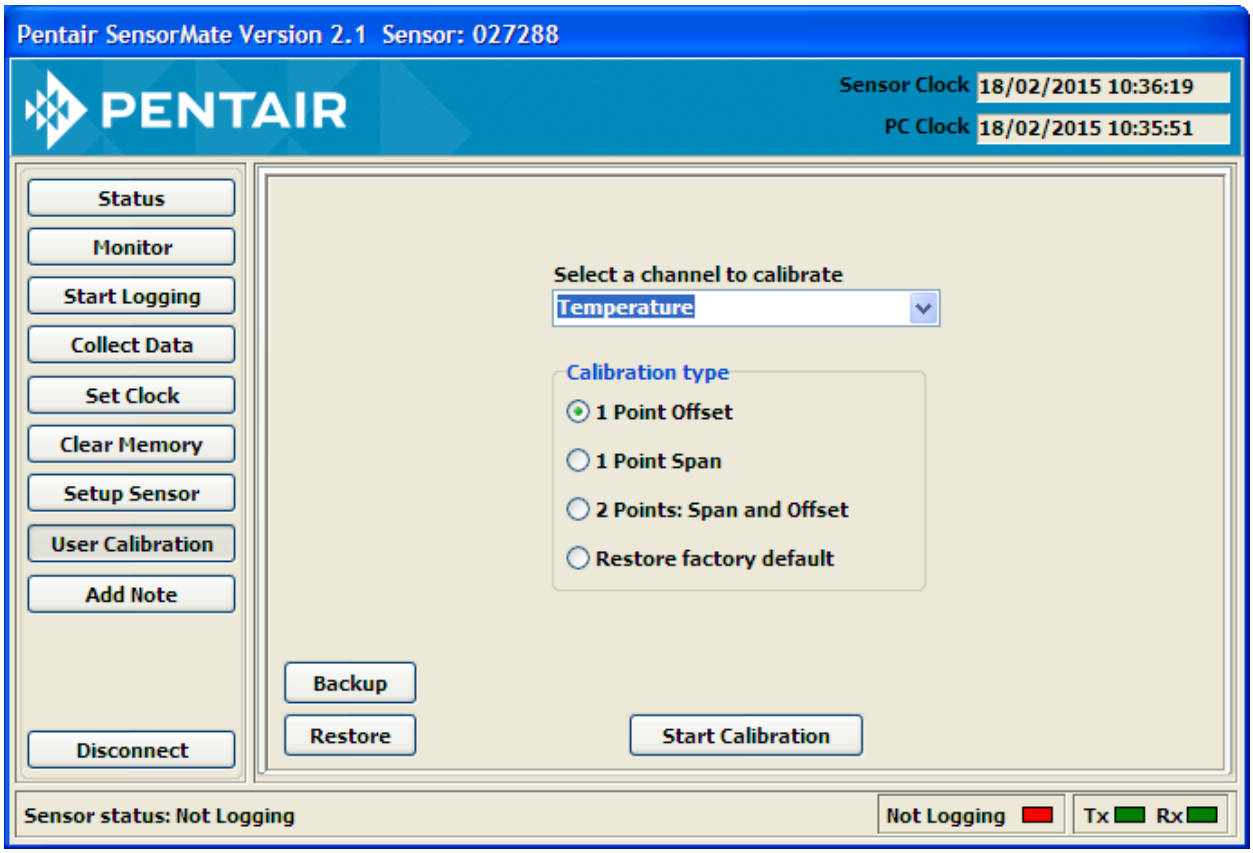

Figure 31 – User Calibration

Note - *User calibration is always performed in factory default units. For example, pressure will be calibrated in meters and temperature in Celsius (as shown in Figure 32).*

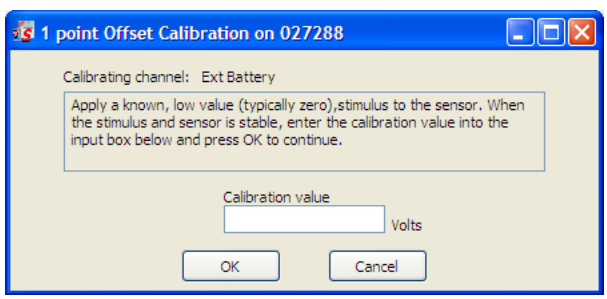

Figure 32 – Default Units example

There are three types of calibration available for all channels. These are:

9.1 One Point Offset

The 1 point offset method allows a channel to be calibrated at one operating point. A window will appear for the user to enter a new value for the channel. For example a pressure sensor may be reading 0.1 metres. The sensor can be calibrated to read 0.0 metres using a one point offset calibration.

SensorMate calculates the difference between the entered value and the current value from the sensor and stores the offset (an additive factor) within the sensor. This offset is then applied to all future readings from the sensor. The offset can be removed at any time by restoring the factory default value which is zero offset.

9.2 One Point Span

The 1 point span method allows a channel to be calibrated at one operating point. A window will appear for the user to enter a new value for the channel. For example a pressure sensor may read 0.00 metres in air and then 9.95 metres when submerged to 10.0 metres. The sensor can be calibrated to read 10.00 metres using a one point span calibration.

SensorMate calculates the difference between the entered value and the current value from the sensor and calculates a corrective span (a multiplying factor) within the sensor. This span is then applied to all future readings from the sensor. The span can be removed at any time by restoring the factory default value which is a span of 1.0.

9.3 Two Points: Span and Offset

This method is the most commonly used to adjust channel readings across a range of values. There are two values to be entered, a 'low' channel reading and a 'high' channel reading. The values to be entered are new values at two operating points. This calibration process works best when there is a large difference between the 'low' and 'high' readings. For example a pressure sensor may read -0.05 in air and 10.05 when immersed to 10.00 metres. The sensor can be calibrated to read 0.00 to 10.00 metres.

Note - *SensorMate does not check the difference between the entered high and low values. If the difference between the entered values is small then the channel readings may not be valid.*

SensorMate calculates corrective slope and offset values that are stored in the sensor and apply to future channel readings. The slope and offset can be removed at any time by restoring factory defaults which sets the corrective slope to 1.0 and the offset to 0.0.

9.4 Restore factory default

Any corrective slope and offset values for the channel are reset so that there is no correction of channel readings from the sensor. This means the sensor will provide channel values as calibrated in the Greenspan factory.

To perform a user calibration:
Prior to performing a user calibration check the current reading using the **Monitor** window in SensorMate. Ensure that the channel to be calibrated is stable and reading consistently.

Note - *Once user calibration has commenced it is not possible to view channel readings in the monitor window. The monitor window can however be used to validate channel readings after user calibration.*

Note - *Some channels, notably DO, Temperature and pH have a relatively slow response. The response time can be checked by moving the sensor from solution to solution and viewing the channel value using the Monitor window prior to a user calibration. Ensure that the channel to be calibrated has had sufficient time to stabilize before starting the user calibration process and entering the actual value.*

9.5 User Calibration Procedure

1. Choose the channel to calibrate using the **Channel** drop down list box.

2. Choose the calibration type, as described above.

3. Click the **Calibrate** button and enter the desired value(s) of the channel. Note that it is not possible to enter the offset or span factors.

Note - *Ensure that the power supply and communications to the sensor are good prior to performing a user calibration. If power or communications are lost in the midst of a calibration please restore the factory default for the channel before continuing with calibration.*

9.6 To check a user calibration:

After the **Calibrate** button is clicked and the new channel value(s) are entered the sensor readings can be viewed using the **Monitor** window (as described below) to verify that the calibrated channel is the desired value. Where solutions have been prepared for calibration move the sensor from one solution to the other and observe the readings to check the calibration.

9.7 To adjust or repeat a user calibration:

If a further adjustment is needed there is no need to restore factory defaults prior to performing another user calibration.

9.8 Pressure Sensor Datum

When a Pressure channel is available in a sensor an additional option is given in the User Calibration (Refer Figure 33).

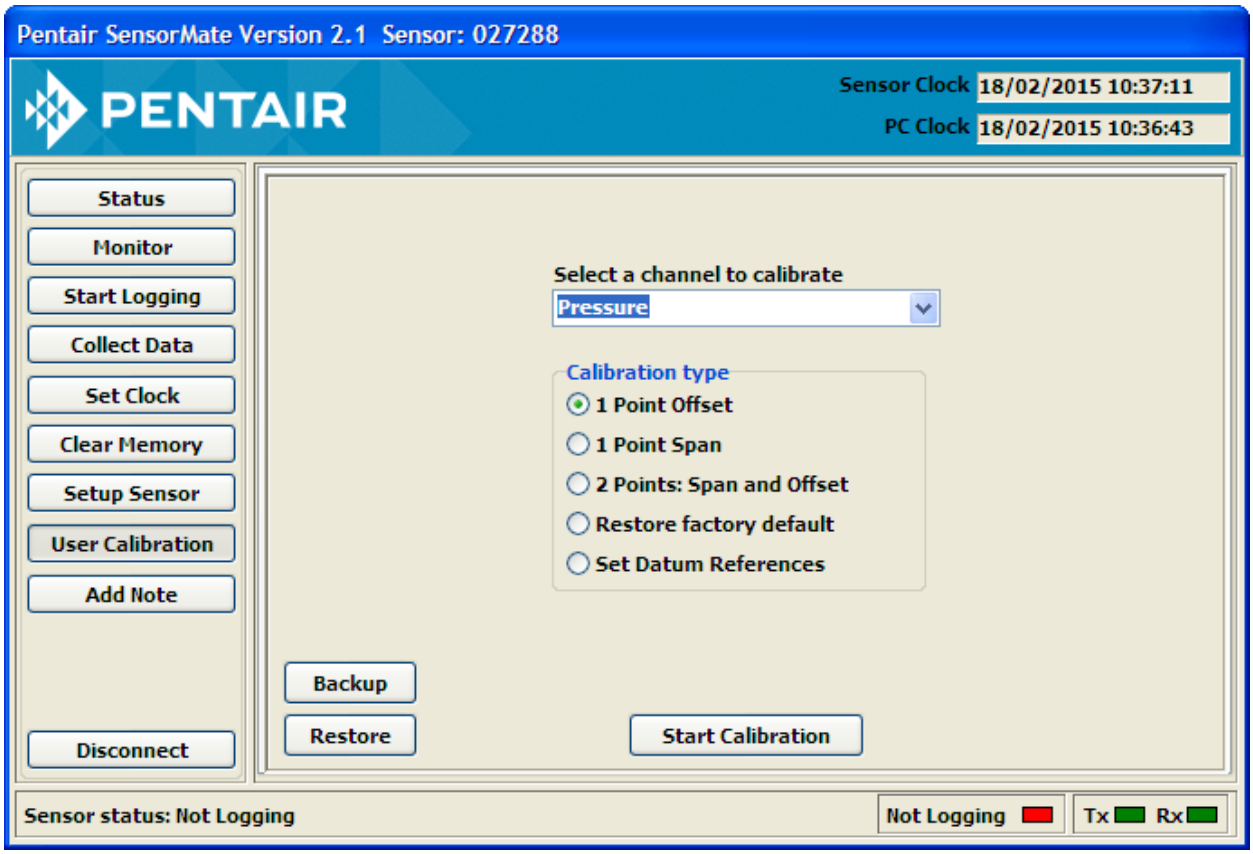

Figure 33 – Pressure Sensor User Calibration Screen

Selecting the **Set Datum Reference** will allow special settings for the pressure sensor.

9.8.1 Depth

The factory default setting is **Depth** where the sensor reads the length of the column of water above the sensor (Refer Figure 34). The units displayed are retrieved from the sensor settings. The Take reading button will send a command to the sensor to read channels that are set up in the Monitor screen and the display will update after a few seconds.

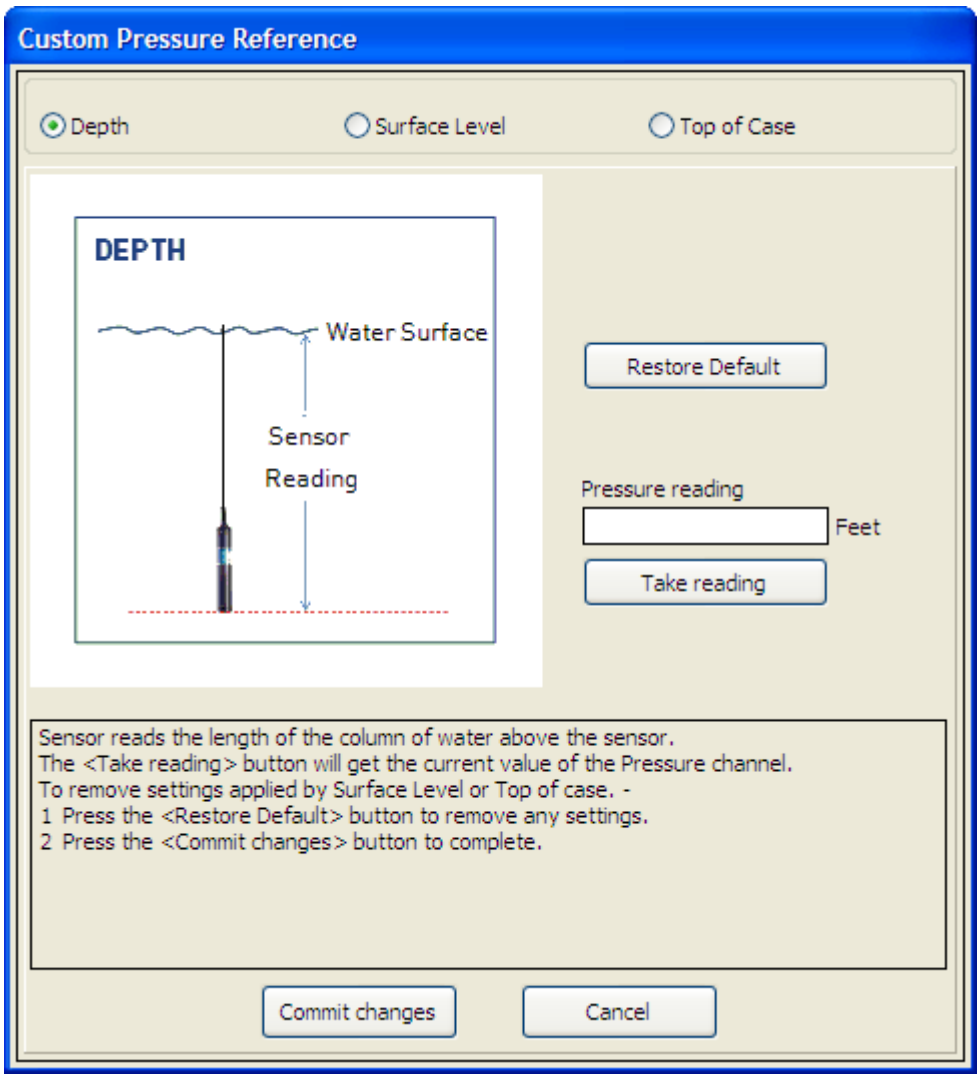

Figure 34 – Pressure Sensor Datum - Depth

Clicking **Restore Default** and then **Commit Changes** will return the sensor to this default setting.

9.8.2 Surface Level

The sensor can be set to provide reading from a Datum or reference point (Refer Figure 35). The units displayed are retrieved from the sensor settings. The Take reading button will send a command to the sensor to read channels that are set up in the Monitor screen and the display will update after a few seconds.

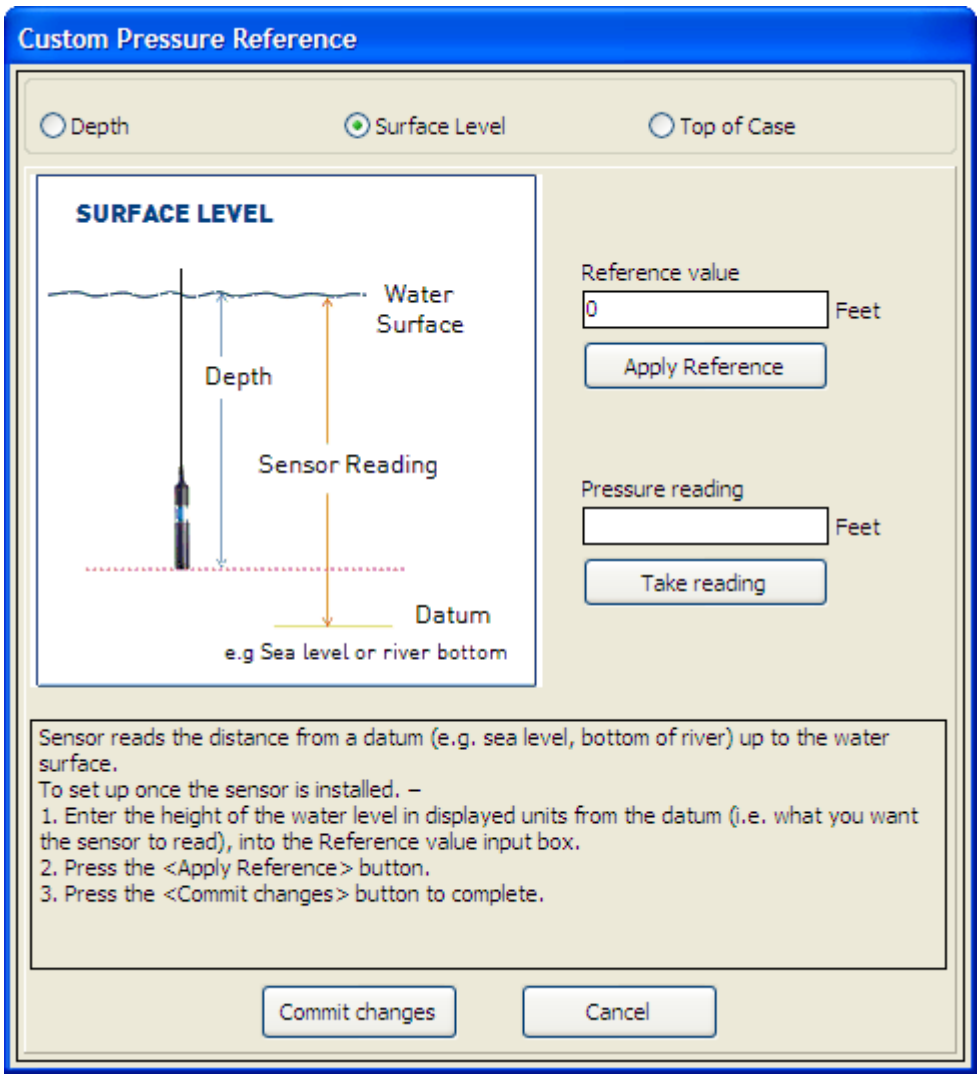

Figure 35 – Pressure Sensor Datum – Surface Level

With the sensor installed, a **Reference value** is entered. The value is the level you want the sensor to read. Clicking **Apply Reference** and then **Commit changes** will calculate the offset needed to give the reference value and apply this to all future readings.

9.8.3 Top of Case

The sensor can be set to provide reading from a Datum or reference point down to the water surface (Refer Figure 36). As the water level rises the sensor readings will get smaller. The units displayed are retrieved from the sensor settings. The Take reading button will send a command to the sensor to read channels that are set up in the Monitor screen and the display will update after a few seconds.

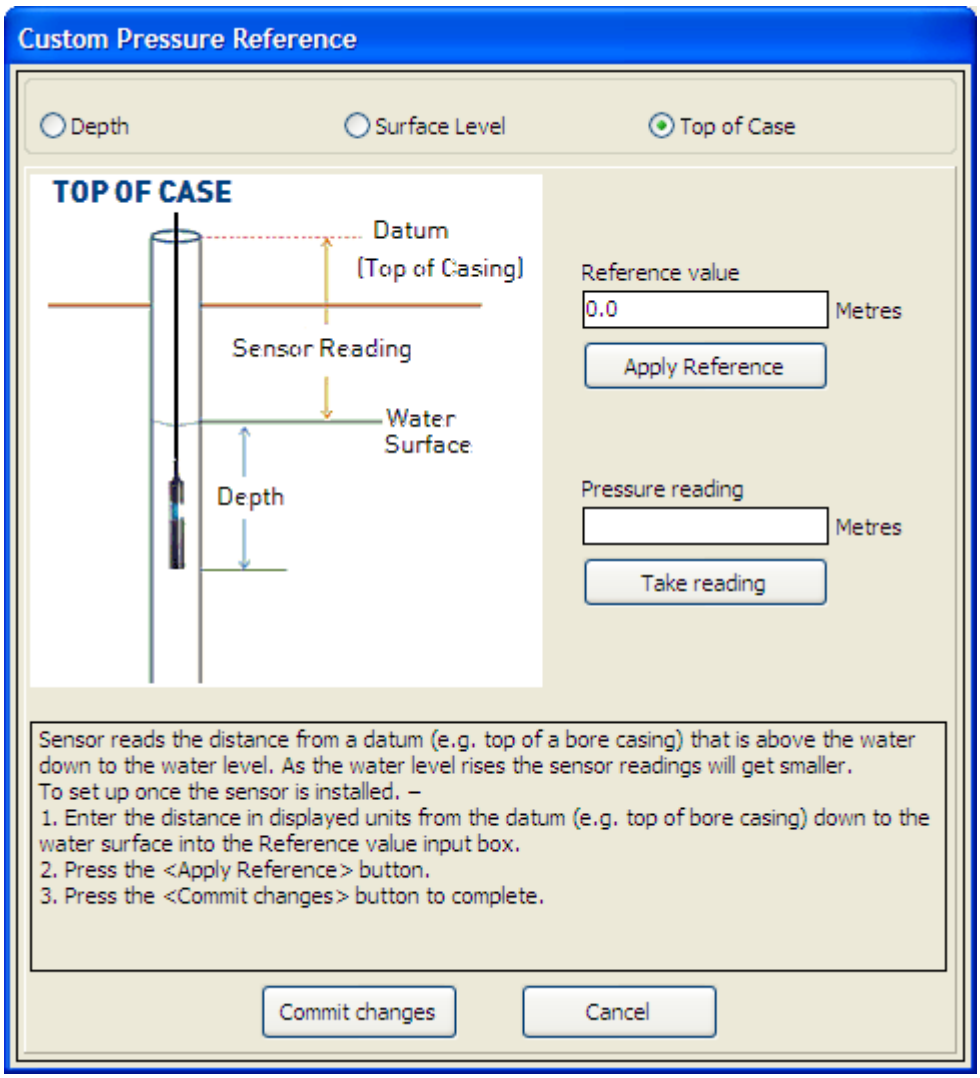

Figure 36 – Pressure Sensor Datum – Top of Case

With the sensor installed, a **Reference value** is entered. The value is the distance, measured in the units displayed; you want the sensor to read. This is usually from the top of a bore casing down to the water. Clicking **Apply Reference** and then **Commit changes** will calculate the offset needed to give the reference value and apply this and a negative gain to all future readings.

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