FIELDSCOUT®

pH 400, pH 600

pH Meter

PRODUCT MANUAL

Item # 2107, 2108

This manual will familiarize you with the features and operation of your new FieldScout pH 400 and pH 600 pH meters. Please read this manual thoroughly before using your instrument. For customer support, or to place an order, call Spectrum Technologies, Inc.

Warning!   The only user-replaceable parts in this meter are the batteries. These can be accessed by opening the battery compartment. Do not open the meter casing. Opening the meter may cause damage and will void the guarantee. Also, do not remove the SD memory card from the meter unless instructed to do so by a Spectrum Technologies.

All information provided in this manual is applicable at the moment of publication. Spectrum holds the right to change components, functions and procedures without notice.

Contents

1 General

The FieldScout pH 400/600 meter allows you to perform accurate pH measurements. We advise you to read the 'Quick Start' guide before use and keep this guide for future reference. We also advise you to read this manual to learn about the meter's many built in features.

The FieldScout pH meters and probes are designed for pH measurements. Do not use the meters or probes for other applications as this may cause damage.

1.1 Declaration of compliance

The FieldScout pH 400/600 pH meters are designed and produced in accordance with EMC-standards EN 61326-1: 2006.

As a result of this and adherence to other standards this meter is permitted to carry the CE-mark.

1.2 Warranty

This product is warranted to be free from defects in material or workmanship for one year from the date of purchase for the meter and for 6 months from the date of purchase for the probes. During the warranty period Spectrum will, at its option, either repair or replace products that prove to be defective. This warranty does not cover damage due to improper installation or use, lightning, negligence, accident, or unauthorized modifications, or to incidental or consequential damages beyond the Spectrum product. Before returning a failed unit, you must obtain a Returned Materials Authorization (RMA) from Spectrum. Spectrum is not responsible for any package that is returned without a valid RMA number or for the loss of the package by any shipping company.

1.3 Specifications

	pH 400	pH 600
pH		
Accuracy*	+/- 0.01	+/- 0.005
Resolution*	0.01	0.005
Range*	pH 0.00...16.00	pH 0.000...16.000
Calibration	Smart calibration wizard	
1-point	✓	✓
2-point	✓	✓
3-point		✓
5-point		✓
Buffer types		
Sentron	✓	✓
DIN, NIST, JIS		✓
Calibration reminder (user definable time)	✓	✓
Calibration Reports		
Display report	✓	✓
Save report file		max. 7
Send calibration report(s) to PC through USB		✓
Automatic Temperature Correction (ATC)	✓	✓
Temperature		
Accuracy*	+/- 0.5 °C (0.9 °F)	
Resolution*	0.1 °C (0.1 °F)	
Range*	-20...120 °C (0...248 °F)	
Display °C/°F	✓	✓
Options		
Languages	English, French, German, Dutch, Spanish	
Bias setting (user definable fixed offset value)	pH -9.99...9.99	
Powersave		
Display on/off button	✓	✓
Display auto off (user definable time)	✓	✓
Meter auto off (user definable time)	✓	✓
Button sound (on/off)	✓	✓
Data handling		
Store current measurement value(s) manually	max. 10	max. 500
Log measurement value(s) automatically at user definable interval 1-60 sec		max. 65000
Send logged data file to PC through USB		✓
Remote readout from PC through USB (max. 1 readout per sec.)		✓
Alarm setpoints and warnings (user definable min-max settings)		
pH	0...14 pH	
Temperature	0...80 °C (32...176 °F)	
Stability check (change in pH per unit time)	0.01...0.10 pH/30sec	
Physical properties		
Dimensions (W x H x D)	80mm x 160mm x 36mm (3.13" x 6.30" x 1.14")	
Weight (incl. batteries)	379 gram (13.4 oz)	
Power consumption		
Display on	220mA	
Display off	85mA	
Display	3.2" 240x320 LCD color display	
Operation	7h continuous / 26h with power save enabled	
Temperature	0...45 °C (4...115 °F) max. 90% rel.humidity	
Humidity	max. 75% relative humidity	
Storage	Batteries must be removed when long-time stored	
Temperature	0...60 °C (4...140 °F) max. 90% rel.humidity	
Humidity	max. 80% relative humidity	
Protection rating	IP65 (splash water resistant)	
Memory	2GB µSD-Card (Do not use µSDHC cards)	
Materials	According RoHS Directive 2011/65/EU Annex II	
Casing	PC/ABS	
Buttons, boot and caps	Silicone	
Connectors		
Probe connection	5-pin socket, push-pull	
Power adapter / PC-connection	USB Mini-B socket	
Galvanic isolation	4kV between meter and probe	
Protective rubber boot	White (7x05-005) or Grey (7x05-010)	
Batteries	3 x AA NiMH 2400mAh (15A-ANSI or IEC-LR6)	
Replacable	✓	✓
Rechargeable via USB (5VDC - minimum 500mA to start charging)	✓	✓
Recharge time (empty-full, with Sentron charger, @ 1000mA)	7 hours	
Realtime clock with date	✓	✓

* dependent of used probe type   *Specifications subject to change*

2 Installation

To start using your FieldScout pH meter for the first time, you will need to connect a probe to the meter and remove the battery isolator. In the sections below, you will find instructions on how to do this. In the Batteries section, you will also find instructions for charging and replacing batteries.

2.1 Batteries

2.1.1 First time use

The FieldScout meter is delivered with three pre-installed pre-charged AA rechargeable batteries. To activate the meter for the first time, pull the plastic strip (battery isolator) out of the battery compartment and press the power button.

2.1.2 Recharging batteries

When fully charged, the three AA rechargeable batteries with which the FieldScout meter was shipped provide 7 hours of operating under normal use.

To recharge the batteries, connect the meter to the power adapter using the supplied USB cable and place the power adaptor in a power outlet. The meter will recharge in approximately 7 hours.

In case the meter batteries are empty and will not be recharged soon, remove the batteries.

2.1.3 Replacing batteries

The three AA batteries required for operation of the meter are replaceable. The rechargeable batteries may lose capacity over their lifetime and replacement may be necessary when operating time on a battery charge becomes too short. To replace the batteries, open the battery compartment cover by turning the half turn screw counter clockwise and pulling the bottom of the battery cover outwards. When inserting the batteries ensure the orientation of the batteries have the correct + and - alignment as indicated in the figure below.

It is possible to temporarily install non-rechargeable batteries when the rechargeable batteries have run out and there are no other fully charged rechargeable batteries available (i.e. when using the meter in a remote location). This should be done with care as the non-rechargeable batteries should be removed immediately after use and before the meter is connected to a power adaptor or USB port.

Warning! Do not connect the meter to the power adaptor or to a USB when non-rechargeable batteries are installed. This may damage the batteries and/or meter.

2.1.4 Batteries and storage
In the event the meter is not used for a longer time period the batteries should be fully recharged and removed from the meter.

2.2 Connection of probe to meter
The probe is designed to work in combination with a FieldScout pH 400 or pH 600 meter. Push the probe's connector into the socket on the upper side of the meter. The (white) notch on the probe connector should be aligned with the meter, having the notch facing towards the front side of the meter. The connector is pushed down until it clicks into the meter's socket.

The probe can be disconnected from the meter by simply pulling the probe connector.

Connect the probe to the meter

Note: Do not turn the probe connector once inserted into the meter's socket. Also, make sure both meter and probe connector are clean and free from debris before connection.

Always pull the connector. Do not pull the probe's cable.
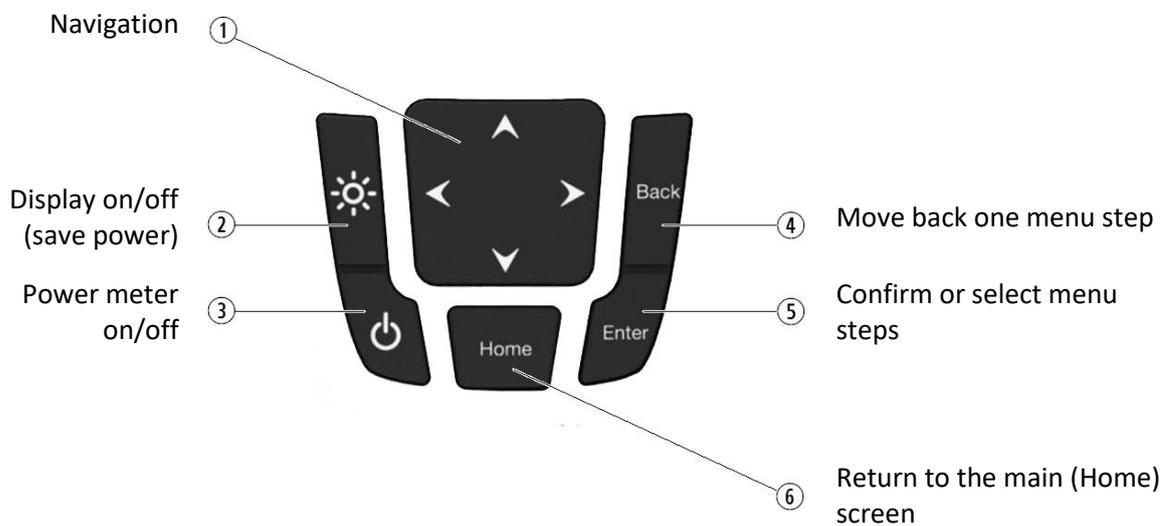
2.3 SD memory card

The battery compartment contains an SD card slot holder with a pre-installed SD card. This SD card is required for the meter's operation and should not be removed unless instructed by Spectrum Technologies.

3 Operation

Operation of the SI meter is done via the 6 keys below the screen.

3.1 Keypad

The FieldScout meter contains a keypad with six keys

Navigation ①

Display on/off (save power) ②

Power meter on/off ③

④ Move back one menu step

⑤ Confirm or select menu steps
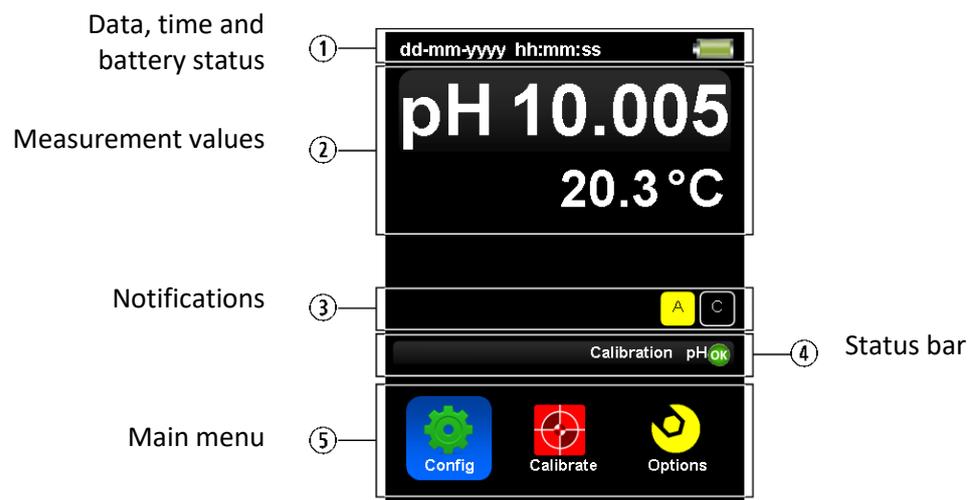
⑥ Return to the main (Home) screen

3.2 Home screen

The home screen displays all the key information required when making pH measurements. It contains five sections:

- Date, time, and battery status
- Measurement values
- Notifications
- Status bar
- Main menu

The FieldScout meter's home screen

3.2.1

3.2.2 Date, time and battery status

The top of the screen contains the actual date (DD-MM-YYY) and the time (user settable as 12- or 24-hour notation).

In the right hand corner the status of the battery is displayed:

Indicator	Battery status
	Charging
	100% capacity
	75% capacity
	50% capacity
	25% capacity
	Almost empty

3.2.3 Measurement values

The measurement values section on the home screen contains the pH and temperature recorded by the probe. When a probe is connected the pH value should be between 1 and 14. When no probe is connected the pH value will be 16.00(0) and the temperature will read -20°C (or -4°F).

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3.2.4 Notifications

When the main screen is displayed, some additional notifications regarding certain settings are displayed on the status bar.

Alarm (pH 600 only):

An alarm can be set when pH and/or temperature values go beyond user definable upper and lower limits. See chapters 6.1.1 and 6.1.2 for setting or changing the pH and temperature alarm settings.

Notification
of a *set* Alarm

Notification of
an *activated* Alarm

Calibration reminder:

A calibration reminder can be set to perform calibrations within a specific time interval. The time interval is user definable. See chapter 5.5 for setting or changing the calibration reminder function.

Notification of a *set*
calibration reminder

Notification of an
activated calibration
reminder

Stability check:

The stability check can be set to provide a warning when the rate of change of pH exceeds a certain threshold. See chapter 6.1.3 for setting or changing the stability check.

Notification of a *set*
stability check

Notification of an
activated stability check

Bias:

A user definable bias value can be set to adjust the displayed pH measurement value. See chapter 6.3 for setting or changing the bias.

Notification of a *set*
bias

Range:

A range notification is a default alarm (not user definable) and provides a warning when pH and / or temperature conditions exceed the specification limits of the equipment.

Notification of a
range alarm

3.2.5 Status bar

The status bar displays additional information about the meter status. What is displayed depends on whether the meter is on the home screen, in a sub menu or a function is being selected.

On the home screen, the status bar will display information regarding the probe, e.g. *Probe disconnected* or *Calibration OK*. When a sub menu is selected, it will show the menu name. When a function is being selected the status bar will provide useful instructions or status information such as *Place probe in next buffer*, *Take sample*, *Send data* etc.

3.2.6 Main menu

The meter's main menu has three icons: Config, Calibrate and Options. Selecting one of these main menu icons will bring up that feature's sub menu.

- The Config sub menu contains the general configuration options of the meter (e.g. display, language, time settings ...).
- The Calibrate sub menu contains all functions and options related to the calibration of the probe. These include performing a calibration, setting buffer type and recalling calibration report(s).
- The Options sub menu allows the user to set parameters and perform actions related to measurements and measurement values. In this sub menu, functions such as alarm thresholds, data acquisition and bias settings can be accessed.

4   Configuration (Config)

In the Config sub menu, a wide range of features such as energy saving, time and display language settings can be selected. All features in this menu relate to the operation of the meter itself. Options and settings related to the measurements can be found in the *Options* menu (Page 27).

4.1   Power save

The FieldScout meter has two options to save power and extend battery operation time: Display-off and Meter-off. Set either one, or both, of the options to maximize use of the battery capacity:

Display-off: switch off the display after a user definable inactive time.
When the display-off option is activated, the screen will switch off when the time since the last key has been pressed exceeds the selected duration. Pressing any key will turn the screen back on.

While the screen is turned off, the meter will still fully function and perform such actions as logging and measuring the signals from the connected probe. Pressing a key during the display-off mode will not prompt any action other than reactivating the display.

To set or change the Display-off setting:

Go to the *Config* menu, and choose *Power save.*	
Select *Display-off*.	
Toggle the *on/off* button and select the display-off time between 1 and 60 minutes.	

Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.
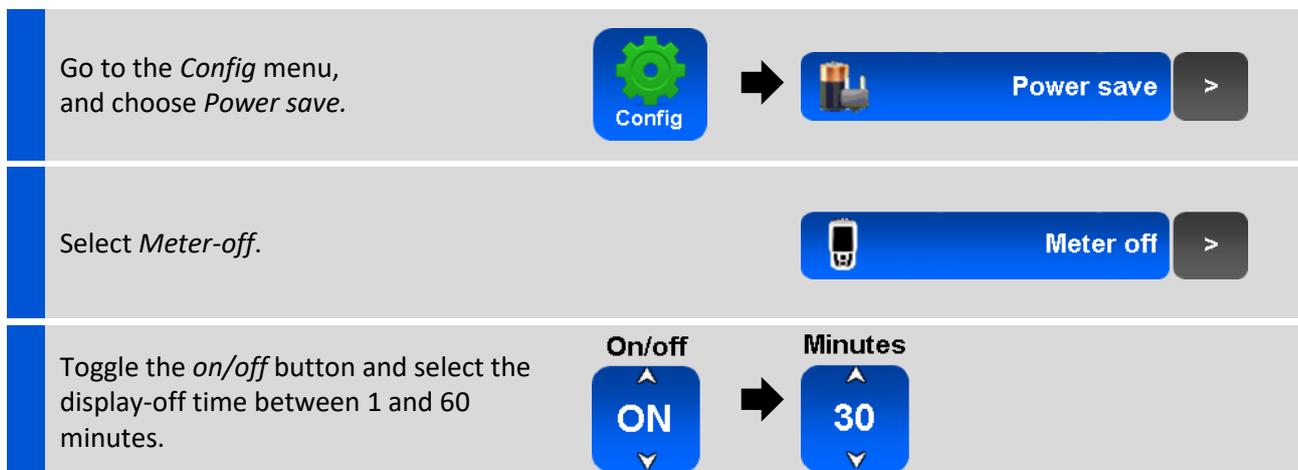
Meter-off: switch off the meter after a user definable inactive time period.

With the meter-off function activated, the meter will power down entirely after the selected time has expired since the last key action. The meter has to be turned back on in the same way as a "normal" power-up; by pressing the *ON* button on the keypad.

When the meter is switched off using this function, the meter is entirely powered down. This means the ISFET pH sensor circuit will be powered down as well. Because a new calibration is recommended after a startup, it is therefore recommended to perform a new calibration after an automatic *Meter-off* as well.

The meter will not power-down when the AC-adapter is connected.

To set or change the Meter-off setting:

Go to the *Config* menu, and choose *Power save.*	
Select *Meter-off*.	
Toggle the *on/off* button and select the display-off time between 1 and 60 minutes.	

Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.

Note: For the pH 600, the *meter-off* function will be automatically disabled for the period of active logging. Hence, setting this function will not affect measurements during continuous logging.
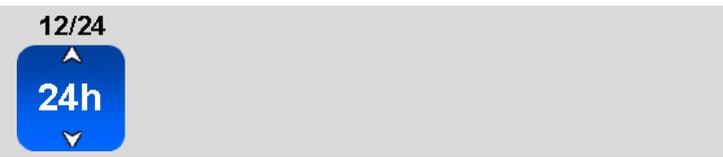
4.2   Time

The FieldScout meter is equipped with a highly accurate internal clock. The date and time are factory set to Central European Time (CET), which is 1 hour ahead of Coordinated Universal Time (UTC +01:00).

The meter's time setting can be adjusted to the local time and either 12- or 24-hour display can be selected.

To set the meter to your local time, adjust up to 24 hours forward or backward with respect to the factory preset time. The date will adjust accordingly when the 0:00 time is crossed. Time zones west of UTC should adjust time backward and time zones east of UTC should adjust time forward.

Daylight savings time is not set automatically and, if required, should be set manually.

To change the time and/or set the 12- or 24-hour clock:

Go to the *Config* menu, and select Time.	
Toggle the *12/24* button to set the display into either a 12- or 24-hour clock notation.	
Toggle the *Hours* and *Minutes* buttons to change the meter's current setting.	
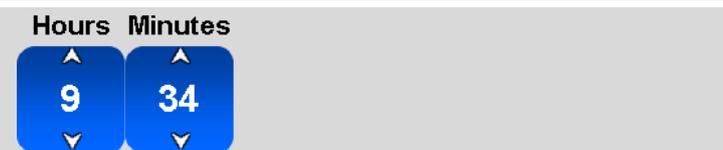
Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.

4.3   Button sound

When operating the FieldScout meter, audible sounds can be generated to provide feedback on button operation. Sound can be set to on or off. The volume of the sound cannot be altered.
The button sound setting has no influence on the audible notifications for set alarms.

To set or disable the button sound:

Go to the *Config* menu. Select and enter the *Button sound* option.	
Toggle and choose the button sound to *on* or *off*.	
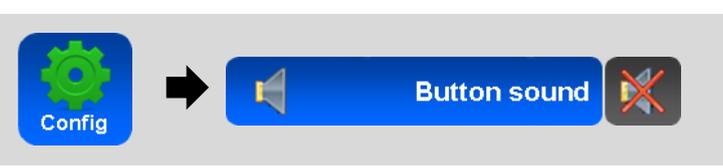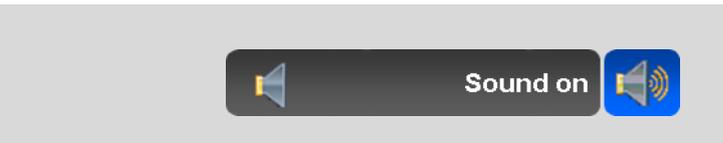
Confirm and apply with the *Enter* key, or exit with the *Back* key to discard any changes.

4.4 Temperature

The FieldScout meter can display temperature in either Celsius or Fahrenheit. The resolution is not influenced by the chosen unit setting.

To change the temperature unit:
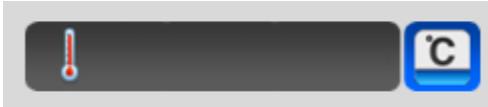
Go to the *Config* menu. Select and enter the *Temperature* option.		
Toggle and choose the desired unit setting.		

Confirm and apply with the *Enter* key, or exit with the *Back* key to discard any changes.

4.5 Language

The language in which the FieldScout meter displays menus and options can be changed into one of the five pre-installed languages; Dutch, English, French, German, and Spanish.

To change the language:

Go to the *Config* menu. Select and enter the *Language* option.		
Toggle and choose one of the available languages.		

Confirm and apply with the *Enter* key, or exit with the *Back* key to discard any changes.

5 Calibration

In order to perform accurate pH measurement with the FieldScout meter, it must be calibrated before use. Generally, a calibration should be performed each time the meter is switched on or when a different probe is attached. In practice this means calibration should be performed, at least, daily.

The calibration process consists of placing a probe attached to the FieldScout pH meter in one, or more buffer solutions of known pH. The type of calibration and the number of calibration points depend on several factors. In general, the more buffers that are used, the more accurate the calibration will be. A detailed explanation of the calibration process, and the considerations for choosing the number of calibration points, can be found in section 5.1.

The FieldScout meter displays calibration results at the end of each calibration and stores the calibration results in a report. This report is available for review at a later time. Please review section 5.4 for detailed information on accessing and interpreting calibration reports.

The FieldScout meter can provide a warning as a reminder to perform a calibration. The warning will be activated after a user definable time period since the last calibration. It is recommended to set this calibration reminder time at an appropriate setting for the intended application. This function is explained in section 5.5

The FieldScout pH 400 meter can only be calibrated using Sentron buffer sets. The pH 600 meter can be calibrated using Sentron, DIN, NIST and JIS buffer sets. The process for changing the buffer set configuration is explained in section 5.6 below.

5.1 Determining the calibration type

When starting a new pH measurement, the first step is to determine what calibration process is most appropriate for this application. Choosing the wrong calibration process may result in inaccurate measurements and possibly require the measurements to be repeated.

Calibrations can be either single or multiple point. The pH 400 meter allows 1 and 2 point calibration. The pH 600 allows 1, 2, 3 and 5 point calibration. In general, increasing the number of points used for calibration will increase the measurement accuracy. However, the calibration range should be as close as possible to the range over which measurements are expected to take place and extend to above and below the minimum and maximum expected measurement values.

1 point calibration, an option for quick pH measurements spanning $1 - 2$ pH.

Example:

A single point calibration would be an option for measurements where the objective is to quickly detect a difference from one single point e.g. pH 7, and the variation is always lesser than 1 pH in either direction. For a 1 point calibration a buffer should be available with a pH close to the point from which the deviations are to be measured

2 point calibration, recommended for accurate pH measurements spanning < 3 pH and quick measurements spanning $3 - 6$ pH.

Examples:

If, for instance, measurement values are expected to lie between pH 7 and pH 10, a 2 point calibration would be appropriate. A 2 point calibration would be performed with buffers with pH 7 and pH 10.

If, on the other hand, measurement values are expected lie between pH 6 and pH 10, a 2 point calibration performed with a pH 4 and pH 10 buffer would be acceptable. For most accurate measurements, however, a 3 point calibration with pH 4, pH 7 and pH 10 buffers should be considered.

3 point calibration, recommended for accurate pH measurements spanning $3 - 6$ pH and quick measurements spanning >6 pH.

Examples:

A series of measurements that are expected, for example, to take place between 4 and 10 pH would most accurately be performed when preceded by a 3 point calibration with pH 4 and pH 7 and pH 10 buffers.

Measurements expected to take place over a wider range of 7 pH, for example, between pH 2 and pH 11 could also be performed using a 3 point calibration with pH 2, pH 7 and pH 12 buffers, but would more accurately be measured using a 5 point calibration.

5 point calibration, recommended for accurate pH measurements spanning > 6 pH.

Examples:

Measurements expected to take place between pH 3 and pH 11 would require a full 5 point with pH 2, pH 4, pH 7, pH 10 and pH 12 buffers to achieve the most accurate measurements.

A number of experiments conducted sequentially that each have a relatively narrow range of expected values, but whose values overall are spread over a wide range, for which pH will be taken without interim calibrations between the experiments will require a 5 point calibration
- Experiment 1 values are expected between pH 2 and pH 3
- Experiment 2 values are expected between pH 7 and pH 9
- Experiment 3 values are expected between pH 9 and pH 12

5.2 Before calibration

To ensure the best possible calibration results, always observe the following guidelines:

- Only use the buffer set for which your meter is configured
- Only use fresh buffers for a calibration
- Make sure your buffer sets are at the same temperature range as the sample to be measured
- Before, during and after calibration, always clean and flush your probe. Please see the probe manual for instructions on how to clean the probe.
- Make use of the calibration reminder function to ensure calibrations are made at appropriate time intervals (see chapter 5.5)

When a new probe is attached to a meter, or when a probe has not been used for a while, the probe may react slowly or have low slope readings after calibration. In this case, the probe will need to be "soaked" (conditioned). This will reactivate an inactive probe and ensure produces stable readings. For more information on revitalization and treatment of the probe, please review the probe manual.

5.3   Performing a calibration

The calibration sequence is set up in such a way that it is easy to perform and minimal input is required. To rule out erroneous multi-point calibrations, the calibration can only take place for an increasing or decreasing pH sequence. Hence, a multi-point calibration must be started with either the highest or lowest pH value in the intended range.

To perform a calibration, first choose the number of calibration points for which the calibration is to be performed. Next, select the pH value of first buffer with which the calibration is to be started.

In most cases, the first selected buffer type, combined with the chosen number of calibration points, is sufficient to determine the calibration path. In some multiple point calibrations cases, however, a second buffer solution has to be selected in order for the meter to understand the desired calibration path.

The screen will continuously provide information about the status of the calibration and which step is to be taken next. After the calibration is completed, a report is shown with details of the performed calibration. This includes time, date, temperature, slope, and buffer type used.

To perform a calibration:

Go to the *Calibrate* menu, and choose *Calibrate.*	
Toggle and select *number of calibration points*.	
Toggle and select the calibration value to start with. *(some cases require a second calibration value to be entered)*	

Follow the instructions provided by the meter and when done, a calibration report is displayed. Exit the calibration report with the *Close* button.

Successful calibrations result in the display of the message *calibration OK* on the home screen status bar. If for any reason the calibration process has not been successful, a message will be displayed on the screen. Also, a calibration process may be aborted. In both cases the meter will automatically revert back to the last successful calibration settings. Be aware that this last calibration may have exceeded the recommended or user defined calibration interval.

5.3.1   Aborting a calibration

If a calibration is aborted by pressing the "back" or "home" button during the calibration process, the message "probe disconnected" will be displayed for a maximum of 120 seconds on the status bar on the main screen. Additionally, the measurement values will be out of range for this time period. Therefore, the probe will return to the state it was in prior to the calibration.

Recommendation: disconnect the probe from the meter to interrupt the waiting time described above. The calibration procedure must then be repeated completely.

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5.4   Calibration reports

After each calibration, a report is generated and stored in the meter's memory. The date of calibration, the buffers used, measured temperature and, in the case of a multi-point calibration, the calculated slopes are summarized in this report. Calibration reports are shown after each calibration and are stored by the meter.

5.4.1   Review calibration reports

A calibration report reviews how the last calibration process was performed. The report and results can also be opened from the *calibration reports* menu.

The pH 400 stores only the latest calibration report and only this last report can be reviewed:

To review a calibration report (pH 400):

Go to the *Calibrate* menu and choose *Calibration report.*	Calibrate ➡ 💻 **Calibration report** >

Exit the report with the *Close* button, or remove the report with the *Delete* button.

The pH 600 has the possibility to save, review and send the last seven calibration reports to a PC:

To review a calibration report (pH 600):

Go to the *Calibrate* menu and choose *Calibration reports.*	Calibrate ➡ 💻 **Calibration reports** >
Select *Browse reports*.	🔍 **Browse reports** >
Choose and select one of the calibration reports in the list.	YYYY-MM-DD 08:33 > / **YYYY-MM-DD 09:45** > / YYYY-MM-DD 11:16 >

Exit the report with the *Close* button, or remove the report with the *Delete* button.

5.4.2   Interpreting the displayed slope percentage

The slope percentage displayed in the calibration report is an indication of the calibration's success and the state of the probe.

Normal slopes should be between 105% – 95%.

Slopes outside these values, indicate polluted or aging probes. Although calibrations and measurements can be performed the measured values may be less accurate. In this case, be sure to replace the probe.

5.4.3 Send reports (pH 600 only)

The calibration reports in the meter's memory can be send to a PC via the USB port. All available reports will be sent sequentially. It is not possible to send individual reports.

To send the calibration reports via the USB port:

Go to the *Calibrate* menu and choose *Calibration reports.*		Calibration reports >
Select *Send reports*.		Send reports >

The message S*ENDING REPORTS* will appear in the status bar during data transfer.

5.4.4 Delete reports

Reports can be deleted via the *calibration reports* menu.

The pH 400 contains only the latest report. Deleting this report will only delete the overview, not the actual calibration values.

To delete an individual calibration report (pH 400):

Go to the *Calibrate* menu and choose *Calibration report.*		Calibration report >
At the opened report, select *Delete*.		Close Delete

Confirm the deletion with the *Yes* button, or cancel and return with the *No* button.

The pH 600 can hold up to ten calibration reports, these can be deleted individually or all at once. Deleting a report will only delete the overview, not the actual calibration values.

To delete an individual calibration report (pH 600):

Go to the *Calibrate* menu and choose *Calibration reports.*	Calibrate ➡ **Calibration reports** >
Select *Browse reports*.	**Browse reports** >
Choose and select one of the calibration reports in the list.	YYYY-MM-DD 08:33 > / YYYY-MM-DD 09:45 > / YYYY-MM-DD 11:16 >
At the opened report, select *Delete*.	✓ Close ✗ Delete

Confirm the deletion with the *Yes* button, or cancel and return with the *No* button.

To delete all calibration reports (pH 600):

Go to the *Calibrate* menu, and choose *Calibration reports.*	Calibrate ➡ **Calibration reports** >
Now select *Delete all reports*.	**Delete all reports** >

Confirm the deletion with the *Yes* button, or cancel and return with the *No* button.

5.5   Calibration reminder

In order to perform accurate measurements, it is necessary to periodically repeat the calibration process. How often this is necessary will depend on the application and the chemical composition of the samples measured.

To ensure that periodic calibrations take place on time for any specific application, it is possible to set a user defined calibration reminder time after which a notification is displayed on the main screen.

It is always advisable, after a series of measurements have been performed, to place the probe in a relevant pH buffer solution to check that the calibration is still accurate. The deviation of the displayed value from the buffer solution value will provide an indication if, and how much, drift occurred during the measurements. If this drift is too large, it may be necessary to repeat the measurements with intermediate calibrations.

To set or change the calibration reminder:

Go to the *Calibrate* menu and choose *Calibration reminder.*	
Toggle the *on/off* button and select the calibration reminder time between 1 minute and 60 hours.	

Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.

The *Calibration reminder* setting appears as a notification on the Home screen.

Notification of a *set* calibration reminder	Notification of an *activated* calibration reminder

After a new power-up or after (re-)connecting a probe, an automated calibration reminder will always be displayed regardless of the manual calibration reminder setting.

5.6 Buffer selection (pH 600 only)

There are a number of standard buffer set types that are commonly used for calibration of pH meters. The buffer sets consist of a range of predefined pH values for which buffers are prepared in a standard and reproducible way.

All FieldScout pH 400/600 meters are compatible with the Sentron buffer set. The pH 600 has the option of changing the buffer set. In addition to the standard Sentron buffer set, the pH 600 also supports DIN, NIST and JIS buffer sets. It is not possible to create a user-defined buffer set.

To change the buffer set:

Go to the *Calibrate* menu. Select and enter the *Buffer selection* option*.	Calibrate ➡ Buffer selection SEN
Toggle and choose one of the available buffer sets.	Sentron buffers SEN

Confirm and apply with the *Enter* key, or exit with the *Back* key to discard any changes.

Please see below for tables of temperature versus pH value for the various buffers.

5.6.1   SENTRON buffer set

The default buffer set for which the meter is configured is the SENTRON buffer set.

The Sentron buffer set consists of a set of five NIST-traceable buffers with a pH of 2.00, 4.00, 7.00, 10.00 and 12.00 at 25°C. The table containing the temperature dependence of the buffer set is presented in Table 1 below.

°C	°F	#1	#2	#3	#4	#5
5	41	2.01	4.00	7.10	10.22	12.70
15	59	2.01	4.00	7.04	10.14	12.38
25	**77**	**2.00**	**4.00**	**7.00**	**10.00**	**12.00**
35	95	2.00	4.02	6.98	9.91	11.63
45	113	2.00	4.04	6.96	9.81	11.38
55	131	2.00	4.07	6.96	9.76	11.12
65	149	2.00	4.10	6.95	9.71	10.86
75	167	2.00	4.12	6.94	9.66	10.60
85	185	2.00	4.15	6.93	9.61	10.34
95	203	2.00	4.17	6.92	9.56	10.08

Table 1: SENTRON

 Buffer set

Note that since the SENTRON buffer set is based on the NIST standard, they are available from other manufacturers as well.

5.6.2   DIN buffer set

The table containing the temperature dependence of the DIN buffer set as it is used in the FieldScout meter is presented in Table 2 below.

°C	°F	#1	#2	#3	#4	#5
5	41	3.12	4.67	6.87	9.43	13.57
15	59	3.08	4.65	6.82	9.32	13.17
25	**77**	**3.06**	**4.65**	**6.79**	**9.23**	**12.75**
35	95	3.04	4.65	6.77	9.14	12.45
45	113	3.04	4.67	6.76	9.05	12.14
55	131	3.04	4.69	6.76	8.96	11.83
65	149	3.03	4.71	6.75	8.87	11.52
75	167	3.02	4.73	6.75	8.78	11.21
85	185	3.01	4.75	6.74	8.69	10.90
95	203	3.00	4.77	6.74	8.60	10.59

Table 2: DIN Buffer set

5.6.3 NIST buffer set

The table containing the temperature dependence of the NIST buffer set as it is used in the FieldScout meter is presented in Table 3 below.

°C	°F	#1	#2	#3	#4	#5
5	41	1.67	4.00	6.95	9.40	13.21
15	59	1.67	4.00	6.90	9.28	12.81
25	**77**	**1.68**	**4.01**	**6.87**	**9.18**	**12.45**
35	95	1.69	4.02	6.84	9.10	12.13
45	113	1.70	4.05	6.83	9.04	11.84
55	131	1.72	4.08	6.83	8.99	11.57
65	149	1.73	4.11	6.84	8.94	11.33
75	167	1.75	4.15	6.85	8.90	11.11
85	185	1.78	4.18	6.87	8.88	10.91
95	203	1.81	4.23	6.89	8.83	10.73

Table 3: NIST Buffer set

5.6.4 JIS buffer set

The table containing the temperature dependence of the JIS buffer set as it is used in the FieldScout meter is presented in Table 4 below.

| °C	°F	#1	#2	#3	#4	#5
5	41	1.67	4.01	6.95	9.39	13.21
15	59	1.67	4.00	6.90	9.27	12.81
25	**77**	**1.68**	**4.01**	**6.86**	**9.18**	**12.45**
35	95	1.69	4.02	6.84	9.10	12.14
45	113	1.70	4.04	6.83	9.04	11.84
55	131	1.72	4.08	6.84	8.99	11.58
65	149	1.73	4.11	6.84	8.94	11.33
75	167	1.75	4.14	6.85	8.91	11.11
85	185	1.78	4.18	6.87	8.87	10.91
95	203	1.81	4.23	6.89	8.83	10.73

Table 4: JIS Buffer set

6 Options

The options menu contains various features such as alarms and data acquisition options (note that some options may only be available for the pH 600). All features in this menu relate to the actual measurement and/or measurement values. See **Configuration** (p. 12) for information on meter operation and settings (energy, time, display features, etc.).

6.1 *Alarms (pH 600 only)*

Alarms can be set to notify the user when measured values respectively surpass or fall below defined maximum and minimum thresholds. Alarm thresholds can be set for *pH*, *temperature* and/or *stability* (the rate of change of pH over time).

When an alarm is set, a notification will display on the main screen. A transparent indicator with the letter *A* indicates that an alarm is set. When an alarm is activated, an audible sound can be heard and the alarm indicator changes color to bright yellow.

Notification of a *set* alarm	Notification of an *activated* alarm
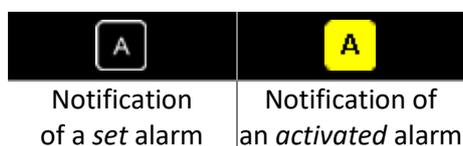
6.1.1 pH alarm

The pH alarm can be set for a minimum and maximum value. When the pH value exceeds the maximum value or falls below the minimum value of the set limits, the alarm is triggered and the meter will start beeping and the alarm notification is displayed on the main screen. The pH alarm can be set between a minimum of 0.00 and a maximum of 14.00. Setting the minimum to 0.00 or the maximum to 14.00 will, essentially, disable that portion of the alarm setting.

To set or change the pH alarm:

Go to the *Options* menu and choose *Alarms.*	
Select *pH*.	
Toggle the *on/off* button and select the *minimum* and *maximum* desired thresholds to trigger the alarm.	

Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.

6.1.2 Temperature alarm

The temperature alarm can be set for a minimum and maximum value. When the temperature exceeds the maximum value or falls below the minimum value of the set limits, the alarm is triggered and the meter will start beeping and the alarm notification is displayed on the main screen. The temperature alarm can be set between a minimum of 0.0 and a maximum of 80.0 degrees Celsius (32.0 and 176.0 degrees Fahrenheit). Setting the minimum to 0°C (32°F) or the maximum to 80°C (176°F) will, essentially, disable that portion of the alarm setting.

To set or change the temperature alarm:

Go to the *Options* menu and choose *Alarms.*	**Options** ➡ 🔔 **Alarms >**
Select *Temperature*.	🌡 **Temperature >**
Toggle the *on/off* button and select the *minimum* and *maximum* desired thresholds to trigger the alarm.	**On/off** ⌃ **ON** ⌄ ➡ **Min** ⌃ **10.0** ⌄ **Max** ⌃ **40.0** ⌄

Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.

6.1.3 Stability check

The stability check can be used to give a warning when a measurement has become unstable and rapid changes in the measured pH occur. The definition of "stable" may vary between applications and industries, therefore the FieldScout meter has a user definable stability criterion.

When set, the stability check displays a notification (SC) on the main screen when the measured pH value changes faster than the specified maximum rate of change. When the alarm is triggered the meter will also start beeping.

SC	SC
Notification of a *set* SC	Notification of an *activated* SC

The stability is expressed in a certain pH change per time unit (30 seconds). The default is set to 0,02pH/30 sec. The stability criteria can be set between 0.01 and 0.10 pH per 30 seconds. The time frame of 30 seconds cannot be changed. The meter's internal algorithm, the meter allows it to determine the set stability criterion within 8 seconds. Therefore, the stability check indication can be provided within around 8 seconds.

To set or change the stability check:

Go to the *Options* menu and choose *Alarms.*		Alarms >
Select *Stability check*.		Stability check >
Toggle the *on/off* button and select the desired minimum stability value.	On/off ON	pH/30 sec 0.02

Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.

6.1.4   Disable all alarms

When multiple alarms have been set and are no longer required, they can be deactivated by a single *Disable all alarms* action.

To disable all alarms at once:

Go to the *Options* menu and choose *Alarms.*		Alarms >
Select *Disable all alarms*.		Disable all alarms >

Confirm and apply with the *Yes* button, or discard and exit with the *No* button.

6.2 Storing measurements

FieldScout meters have several options for storing measurement data. These options, and how data can be transferred to a PC, are described below.

The meter distinguishes between manual recording of an individual measurement value and automated recording of a series of measurements. Storing a single measurement is referred to as "sampling" where automated measurements are referred to as "logging". The logging function is available for pH 600 meters only.

6.2.1 Sampling

Sampling is storing the current pH and temperature measurement values to the meter's memory. Sampled values can be looked up at a later time and/or sent to a PC. The sample will remain in the meter's memory, even when batteries are replaced, until it is erased.

The maximum number of samples which can be stored to the meter's memory is dependent on the meter type. The pH 400 can store up to 10 samples, the pH 600 can store up to 500 samples.

To take a sample:

Go to the *Options* menu and choose *Data acquisition.*	
Select *Sample*.	
Press *Take sample* to record the momentary measurement values.	

-*"TAKING SAMPLE" -* will appear in the status bar during sampling.

If the meter's memory is full, a message will appear saying "*MEMORY FULL*". One or more samples should be transferred to a PC (pH 600 only) or deleted from the meter's memory to proceed with sampling.

6.2.2 Changing the sample name prefix

Samples are given a default four character prefix "SAMP" follow by an automated sequential numbering of three digits starting with 000. Hence, the first samples taken with this prefix have names SAMP000, SAMP001, SAMP002 etc.

In order to better identify samples that have been taken it is possible to adjust the standard prefix into a custom one. The (default) name can be altered by four toggle buttons which can be set to the letters A-Z, the numbers 0-9 and the _ (underscore sign).

When changing the sample prefix name, the names of all existing sample names remain unchanged. It is not possible to change the name of an existing sample on the meter. Therefore, if a different sample prefix is desired, it is necessary to set the desired sample name prefix before the sample is taken.

The follow-up number is raised automatically for every unique name existing in the meter's memory, starting with 000. Once a number is deleted, or the memory has been emptied, counting will start over with the lowest possible number. It is possible to use multiple naming prefixes. In that case, each prefix's numbering sequence will be incremented independently.

To change the sample prefix:

Go to the *Options* menu and choose *Data acquisition.*	Options ➡ Data acquisition >
Select *Sample*.	Sample >
Press *Name sample*.	Name sample >
Change the characters by toggling the displayed buttons to the desired prefix name.	S A M P

Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.

6.2.3 Review/delete a single sample

Stored and saved samples can be looked up and viewed individually on the meter. All stored samples can be viewed using the *Browse sample* menu. After a sample is viewed, it can either be deleted or closed and viewed again at a later time.

To review and/or delete a sample:

Go to the *Options* menu and choose *Data acquisition.*	Options ➡ Data acquisition >
Select *Sample*.	Sample >
Press *Sample overview*.	Sample overview >
Choose and select one of the stored samples in the list.	SAMP000 > SAMP001 > SAMP002 >

Exit the sample overview with the *Close* button or follow the instructions below to delete the sample:

At the opened sample overview, select *Delete*.	Close Delete

Confirm the deletion with the *Yes* button, or cancel and return with the *No* button.

6.2.4 Logging (pH 600 only)

The FieldScout pH 600 meter is capable of logging data to the internal memory automatically at a predetermined time interval. This option can be used to analyze or monitor pH over a period of time without having to be present at the meter to record the data.

The log file will remain in the meter's memory until it is erased. This data will remain in the meter's memory when batteries are replaced. Section 6.2.7 gives instructions on how to send a log file to a PC for analysis.

To start a log:

Go to the *Options* menu and choose *Data acquisition.*		
Select *Log*.		
Press *Set log*.		
Toggle the *on/off* button and select the desired interval time.		

Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.

Once logging is setup and started, a recording icon will appear on the main screen.

Notification of an *activated log*

The maximum number of measurements per log file is 65,000. The total capacity of the SD card is approximately 49 million measurements. If a log file exceeds this amount of data points, a new file will be generated automatically. If the meter's memory is full, a "*MEMORY FULL*" message will appear. No more new data points are recorded when the meter memory is full but existing data will not be overwritten.

6.2.5   Changing the log name prefix

Log files are given a default four character prefix "LOG_" follow by an automated sequential numbering of three digits starting with 000. Hence, the first log files taken with this prefix have names LOG_000, LOG_001, LOG_002 etc.

In order to better identify logs that have been recorded, it is possible to adjust the standard prefix into a custom one. The (default) name can be altered by four toggle buttons which can be set to the letters A-Z, the numbers 0-9 and the _ (underscore sign).

When changing the log file prefix, the names of all existing samples names remain unchanged. It is not possible to change the name of an existing log file on the meter. Therefore, if a different sample prefix is desired, it is necessary to set the desired sample name prefix before beginning to log data.

The follow-up number is raised automatically for every unique name existing in the meter's memory, starting with 000. Once a number is deleted, or the memory has been emptied, counting will start over with the lowest possible number. It is possible to use multiple naming prefixes. In that case, each prefix's numbering sequence will be incremented independently.

To change the log name prefix:

Go to the *Options* menu and choose *Data acquisition.*	
Select *Log*.	
Press *Name log*.	
Change the characters by toggling the displayed buttons to the desired prefix name.	

Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.

The maximum number of data points for one log file is 65,000. When this value is reached, a new file will be automatically created with the same name but with a higher follow up number.

6.2.6 Review/delete a log file

It is possible to review some of the information from the log file such as start date time, end date/time, and the number of recorded data points on the meter. The actual measurement values within log files cannot be viewed on the meter as the number of recorded data points is usually large and not very meaningful in tabular form on a small screen. Log files can be transferred to a PC for further analysis. See chapter 6.2.7 for details on sending data to a PC.

All stored log files can be viewed from the *Browse logs* menu. When a log is viewed, it can either be deleted or closed and viewed again at a later time.

To review / delete a sample:

Go to the *Options* menu and choose *Data acquisition.*	Options ➡ Data acquisition >
Select *Log*.	Log >
Press *Log overview*.	Log overview >
Choose and select one of the stored logs in the list.	LOG_000 > / LOG_001 > / LOG_002 >

Exit the log overview with the *Close* button or follow the instructions below to remove the log file:

At the opened log overview, select *Delete*.	Close ✕ Delete

Confirm the deletion with the *Yes* button, or cancel and return with the *No* button.

6.2.7 Send data to a PC (pH 600 only)

To move a stored data point or data log to a PC, first connect the meter to the PC using the USB cable supplied with the meter. Second, open a "listening" program (e.g. HyperTerminal or Putty) to receive the data from the USB port. The Com port settings are as follows:

Data bits: 8   Stop bits: 1

Baud rate: 9600 bps   Parity: None

Timing: 1 second

To send data to a PC (pH 600):

Go to the *Options* menu and choose *Data acquisition.*	Options ➡	Data acquisition >
Select the *Send data* menu.		Send data >
Choose and select either to *send all logs*, *send all samples* or *send all data*.		Send all logs > Send all samples > Send all data >

- *SENDING DATA* - will appear in the status bar during the data transfer.

The downloaded data can be copied into a spreadsheet program for further analysis.

6.2.8 Query meter values

While connected to a PC, the pH 600's momentary measurement values can be queried from as well. This allows integration of pH measurements into a software application running on a PC. The meter must be connected to the PC using a USB cable and suitable software needs to be running to read/write to a USB port.

To query the meter, the string "ACT" needs to be sent to the USB port to which the meter is connected. The meter will return a string that contains date, time and the momentary pH and temperature values separated with a *"space"*. The string format is:

year – month – day	hours : minutes: seconds	pH value	temperature
Y Y Y Y / M M / D D	h h : m m : s s	P P . P P P	T T . T

The received data can be copied into a spreadsheet program or a custom program, for further analysis.

6.2.9 Erasing data / emptying the SD-card

The FieldScout meter will not overwrite stored samples and logs. To free up memory, it may be necessary to erase samples and/or logs. Deletion of individual samples or logs can be done via the browse feature. The procedure for deleting individual samples or logs is described in chapters 6.2.3 and 6.2.6 respectively. Alternately, all samples, all logs, or all data can be deleted at once.

To delete sets of data (pH 600):

Go to the *Options* menu and choose *Data acquisition.*	
Select the *Delete data* menu.	
Choose and select either to *delete all logs*, *delete all samples* or *delete all data*.	

Confirm the deletion with the *Yes* button, or cancel and return with the *No* button.
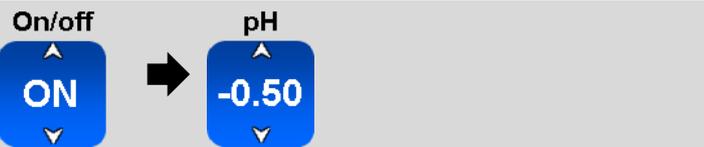
6.3 Bias setting

In certain exceptional cases it may happen that the pH measured by the Spectrum ISFET pH sensor differs from a glass pH electrode by a constant pH value. This difference occurs under certain circumstances and is due to the differences in how pH is measured by glass and solid state electrodes.

The offset is often seen in comparison measurements between Glass and ISFET, particularly in lactose products. Although both probes are calibrated simultaneously with the same buffer fluid, the measurements from the sample material may differ slightly.

To compensate for this difference, an offset (bias) can be set so the measurement values are the same. This setting can be done at either with the glass electrode or, when the glass measurement equipment has only limited functions, on the FieldScout meter.

Note that with a fixed offset, the displayed pH value is changed with respect to the calibrated values. Therefore measurement in a buffer fluid will contain the same offset in the readout.

To set or change the Bias:

Go to the *Options* menu and select *Bias.*	
Toggle the *on/off* button and select the bias offset between -9.99 and 9.99 pH.	

Confirm and apply with the *Set* button, or exit with the *Back* button to discard any changes.

The Bias setting appears as a notification on the Home screen.

Notification
of a *set* Bias

7 Maintenance

A FieldScout meter requires very little maintenance. In the event the meter becomes dirty, it can be cleaned using a damp cloth.

To avoid having the USB connector become clogged by dirt, keep the dust cover closed except when recharging or data transferring.

8 Troubleshooting guide

Screen message	Possible cause	Solution
uSDcard message	uSDcard could be damaged, is not present or has a bad connection.	Make sure the uSDcard is properly installed or replace with new one.
Probe disconnected	Probe not connected properly.	Re-connect the probe.
	Probe damaged.	Allign connector on white mark. See chapter 2.2 of meter manual.
	Probe cable damaged.	Contact distributor for possibilities on repair or replacement.
Probe error	General probe error, unable to achieve high performance measurement values. Most likely due to wear and/or aging.	Contact distributor for advice and/or sales of replacement items.
Replace probe soon	ISFET and/or reference are showing signs of wear and/or ageing due to use. high performance is in jeopardy.	Be advised to replace probe soon.
Probe degrading	ISFET and/or reference are affected by wear and/or ageing due to use.	Soak/clean the probe. See chapter 3 of probe manual. Also, be advised to plan for probe replacement.

Operating symptoms	Possible cause	Solution
Fixed pH and/or temperature value e.g.: 	pH	Temp.
---	---
16.00(0)	-20.0 °C		Probe in general, and/or ISFET /reference is not responding properly.	Re-connect the probe. Allign connector on white mark. See chapter 2.2 of meter manual.
		Contact distributor for possibilities on repair or replacement.
Slow calibration	Contaminated ISFET and/or reference.	Soak/clean the probe. See chapter 3 of probe manual. Brush the ISFET gently.
Fluctuating pH value		Contact distributor for possibilities on repair or replacement.
Slope to high/low	Calibration flaw.	Recalibrate, make sure to always use fresh pH buffers and buffers of the correct (selected) types: SENTRON/DIN/NIST/JIS.
	Contaminated ISFET and/or reference.	Soak/clean the probe. See chapter 3 of probe manual. Brush the ISFET gently.
Short working time of pH meter	Meter is not charged properly.	Re-connect and check the connection between charger and meter.
	Defect/degraded batteries.	See chapter 2.1.2 of meter manual.
	Defect charger and/or cable.	Replace all batteries.

USB data connection issue	USB cable connection fail	Re-connect the USB cable to meter and master (computer i.e.).
	Baud rate mismatch	Set master to right baud rate 9600 8 N 1

Warranty

This product is warranted to be free from defects in material or workmanship for one year from the date of purchase. During the warranty period Spectrum will, at its option, either repair or replace products that prove to be defective. This warranty does not cover damage due to improper installation or use, lightning, negligence, accident, or unauthorized modifications, or to incidental or consequential damages beyond the Spectrum product. Before returning a failed unit, you must obtain a Returned Materials Authorization (RMA) from Spectrum. Spectrum is not responsible for any package that is returned without a valid RMA number or for the loss of the package by any shipping company.

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