

Instruction Manual

2700 Series Benchtop Meters

pH 2700 • ION 2700 • CON 2700 • DO 2700 • PC 2700



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1. Introduction

Thank you for selecting our 2700 series research benchtop meter. This microprocessor-based instrument incorporates a large LCD for clear viewing, yet offers a small footprint to conserve space.

Each meter includes a convenient slide-out calibration card for quick reference. All models (except for DO 2700) include an electrode arm and metal bracket which can be easily attached to the left or right side of the meter according to your preference.

The 2700 series benchtop meter replaces our popular 1100 and 2100 series meters that were introduced in 2001.

Please note that this manual serves all 2700 models, so not all sections of the manual will be relevant to each model. The chart below lists the parameters served for the various models:



	pH 2700	ION 2700	CON 2700	DO 2700	PC 2700
pH & mV	✓	✓			✓
Ion		✓			✓
Cond / TDS / Salinity / Resistivity			✓		✓
Dissolved Oxygen				✓	
Temperature	✓	✓	✓	✓	✓

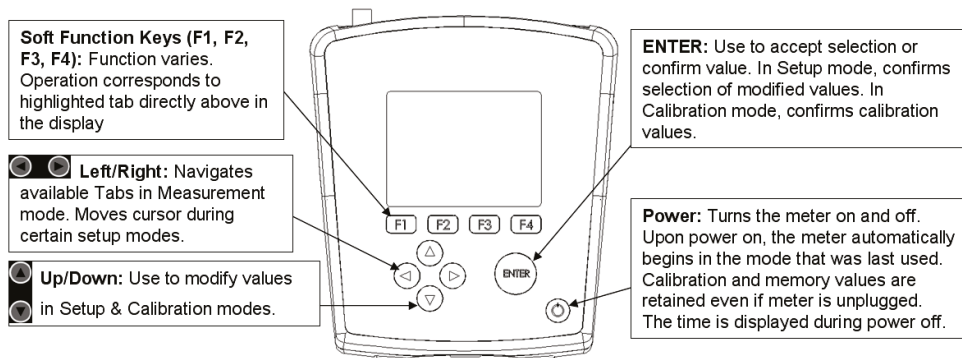
We take great pride in every instrument we manufacture and hope this one serves you well.

If you are viewing an electronic version of this manual, you can use [hyperlinks](#) located in the Table of Contents and elsewhere by holding down the CTRL key as you click the hyperlink.

Find other helpful tips listed in grey boxes like this one!

2. Getting Started

Keypad and Display



Auto Read is enabled. When flashing, the instrument has detected a 'Stable' reading and locked the value. Press **MEAS** to resume live reading. See [Section 3—Auto Read](#) to disable this feature, or go to **SETUP...SYSTEM...AUTO READ**.

Stable

Based on the stability criteria settings in System Setup, the instrument has detected a stable reading.



Password Protection: Enabled. Requires password for all calibration and setup menus



Password Protection: Disabled. No password required for any menu.



Print Setting Timed interval is active; data is being output at regular intervals.



"High Alarm", "Low Alarm", or "Cal Due" alarm limit had been reached. High/Low alarms also have an audible notification..

ID:

Sample ID: User selectable five digit number to identify samples.



Measuring Range # of displayed value (1 thru 5). Applicable to Conductivity, TDS, Salinity, or Resistivity measurements only

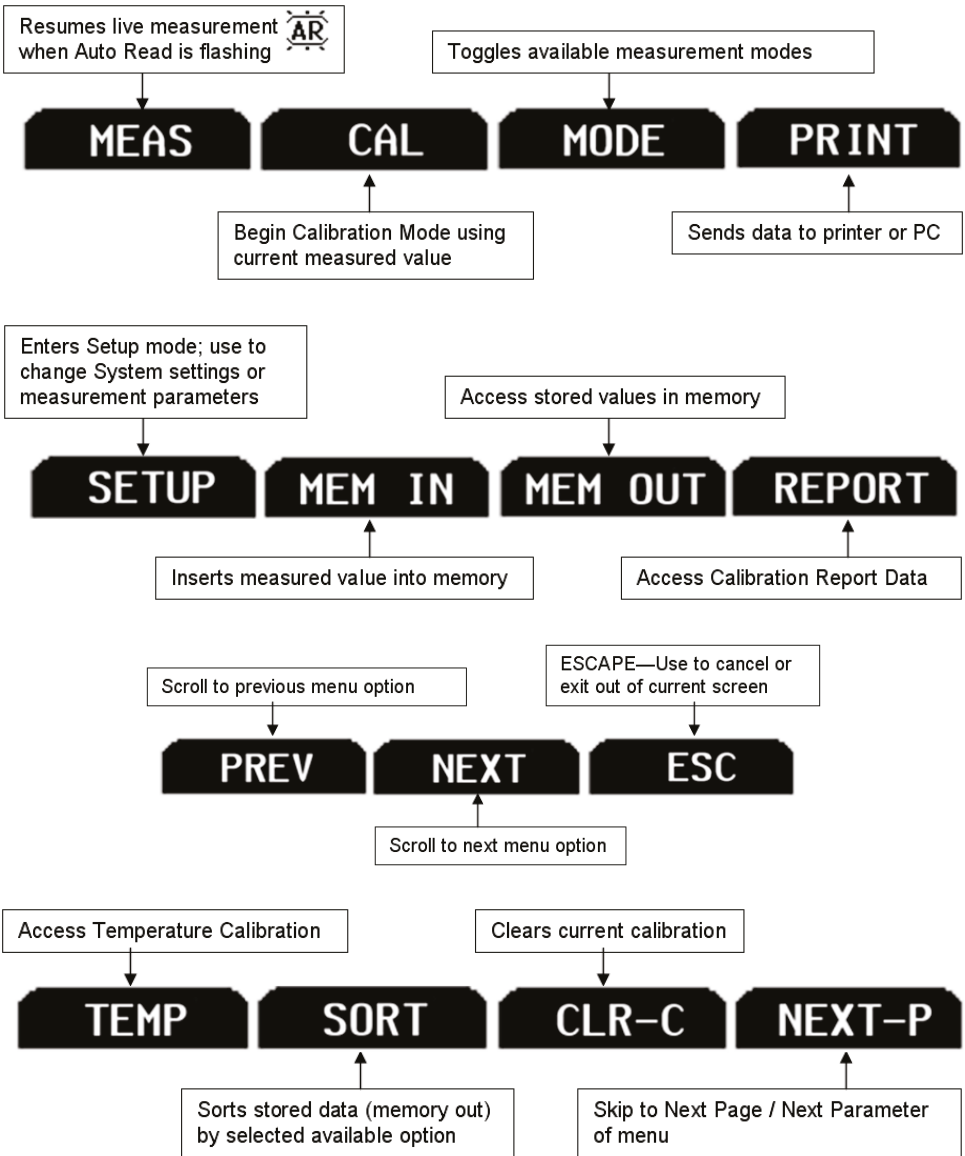
(ATC)

Automatic Temperature Compensation is active; temperature is being actively acquired with attached electrode. ATC is recommended.

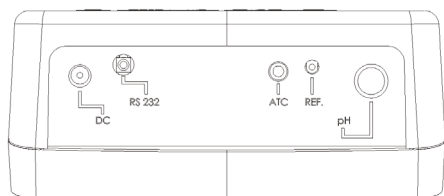
(MTC)

Manual Temperature Compensation is active. A temperature sensor may not be attached so the default temperature is used. See [Section 9—Temperature Calibration](#) to calibrate the ATC or MTC temperature values.

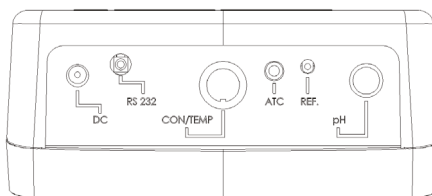
Navigation of Tabs



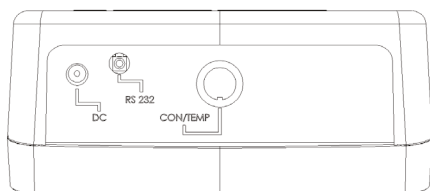
Meter Connections



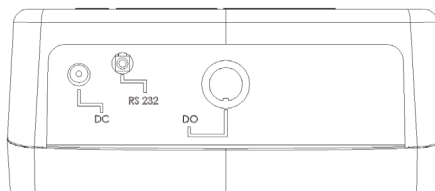
**pH 2700
ION 2700**



PC 2700



CON 2700



DO 2700

DC	Power supply
RS-232	RS-232 output, 2.5 mm jack for RS-232 cable
CON/TEMP	8-pin DIN connection for 2-cell or 4-cell Con/TDS/Temp electrodes
DO	8-pin DIN connection for Dissolved Oxygen/Temp self stirring electrode
ATC	For Automatic Temperature Compensation probe. For PC 2700, this corresponds to the temperature measurement associated with the BNC ("pH") input.
REF	Pin connection for half cell reference electrodes. Requires separate half cell electrode in the BNC ("pH") input. Note: REF is not commonly used and is not required.
pH	BNC connection for combination pH, ORP (Redox), or Ion Selective Electrodes (ISE), or half-cell indicating electrodes.

3. System Setup & Configuration

Use the System Setup to customize operation of your 2700 series meter.

Press **SETUP** from the measurement screen and then press **ENTER** when **SYSTEM** is highlighted to access these settings.

The following settings can be customized for each model:

[STABILITY](#)

[PRINT SET](#)

[STABILITY CRITERIA](#)

[DATE & TIME](#)

[AUTO READ](#)

[PASSWORD](#)

[BACKLIGHT](#)

[CLEAR DATALOG](#)

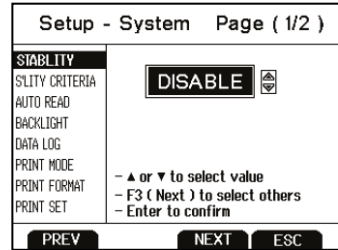
[DATALOG](#)

[FACTORY RESET](#)

[PRINT SETUP](#)

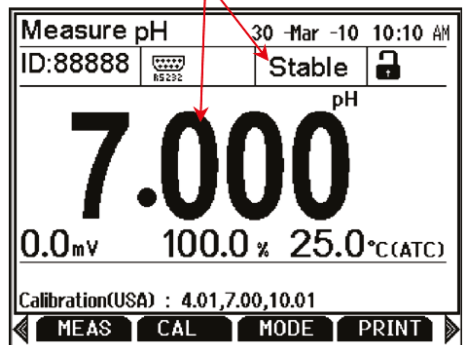
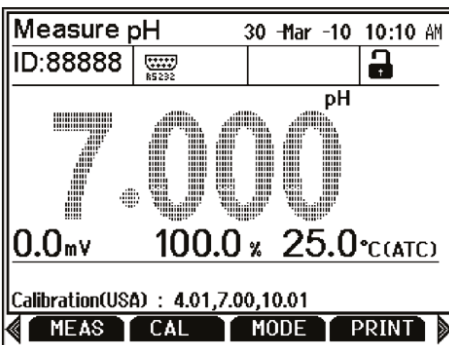
[CONTRAST](#)

[PRINT FORMAT](#)



Stability

To aid with measurement and calibration, your meter has a unique feature that provides an obvious visual indication when the reading becomes stable. If the Stability feature is **enabled**, the digits on the primary reading will be faded when unstable, becoming solid when stable. If this feature is **disabled**, the primary reading will always be solid. The image below on the left is an unstable reading during pH Measurement mode with Stability enabled. The image on the right shows a stable reading.



Stability Criteria

The 2700 allows adjustment of the Stable indicator which relates to how fast and frequent it appears. There are three levels of adjustment; **SLOW**, **MEDIUM**, & **FAST**.

To display a 'Stable' reading more quickly and more often, use "FAST" setting. MEDIUM or SLOW is recommended for most applications. When Auto Read is enabled, a stability criteria setting of "SLOW" is recommended to for best results.

SLOW: The Stable indicator will take longer to appear and will appear less frequently. Use this setting if you want the best results and don't mind waiting longer to get them.

MEDIUM: This is the factory default setting. It provides a balanced response which works best for most applications.

FAST: The Stable indicator will appear quickest of any setting. If you find that the Stable indicator frequently appears and disappears, you may want to select a slower setting. This setting is not recommended when AUTO READ is enabled. It is also not suitable for most non-refillable electrodes which are generally slower to respond.

Auto Read

If AUTO READ is enabled, the measured value will automatically lock when the Stable indicator appears. A flashing "AR" icon confirms this condition. To resume a live reading again, it is necessary to press **MEAS** each time Stable appears. Disable this feature to continuously view the active reading.



Backlight

Select "**PERMANENTLY ON**" on to keep the backlight on at all times that the meter is powered on. This will offer the best visibility but consumes the most power.

Select "**ON WITH KEY PRESS**" to turn on the backlight for a specified time after any key press. Select "0" to keep the backlight off at all times that the meter is powered on.

Data Log (storing data to internal memory)

Select **“SINGLE”** to manually save one point at a time. Press the **“MEM IN”** function key any time during measurement to save data.

Select **“TIMED”** to automatically save data at selectable intervals— ranging from 3 to 3600 seconds. Data will be collected until the data limit is reached or until **“SINGLE”** data log is selected. This feature is useful for gathering data from a single sample over time. Note that **“MEM IN”** is not available during TIMED setting. As data is collected, the display will indicate how much memory has been used.

To view stored data, use **“MEM OUT”**. Note: the more data that has been acquired memory, the longer the data will take to display.

Print Setup

Adjust the RS-232 output settings for baud rate, parity, data bit, and stop bit to match your printer or computer settings as necessary.

Print Format

When utilizing the RS-232 output; choose **“TEXT/PRINTER”** option to send the data in an easily viewable format—best for printing.

Choose **“CYBERCOMM”** option to send the data as a comma separated value (CSV)—best for exporting data into spreadsheet software.

Print Set

This is identical to the Data log function, but data is sent via RS-232 output instead of internal memory.

Select **“SINGLE”** to manually output one value at a time—best for printing or collecting data to your PC from many samples.

Select **“TIMED”** to automatically output live data at selectable intervals— ranging from 3 to 3600 seconds. Data will be output until **“SINGLE”** Print set is selected. This feature is most useful for gathering data for use with software. Unlike the Data Log setting, data can be saved to memory using **“MEM IN”** during TIMED setting.

Date & Time

Setting the correct date and time is required for GLP and will apply to power off, measurement, data log, and print functions. Instrument has battery backup to retain date/time settings upon power loss. Factory reset will not apply to date and time setting once it has been set. Changes related to daylight savings time must be manually entered.

Date Format: Select (MM DD YY) or (DD MM YY)

Time Format: Select 12Hrs (AM/PM) or 24Hrs

Password

Select "**ENABLE**" to restrict access to Calibration and Setup modes. When password protection is enabled, password entry is required before performing any calibration, or making changes to the setup mode. Setup parameters can be viewed, but can not be changed without correct password entry. The password is a user selectable number from 1 to 99999.

Select "**DISABLE**" if password protection is not desired.

The meter does not allow you to edit setup parameters or perform a new calibration unless you enter the correct password. If an incorrect password is entered 3 consecutive times, the meter returns to measurement mode.

In the event the password can not be recovered, a password can be provided via a written request to Eutech Instruments/Oakton Instruments. The instrument serial number and your contact information are required.

Clear Datalog

Select "**YES**" to delete all saved data that was manually or automatically stored into memory. This step is most commonly required when the "TIMED" data log interval is not turned off and as a result, fills the memory to capacity. When the memory is full, deleting the saved data is required in order to save additional data/ The 2700 will never erase old data in favor of new data when the memory is full.

If you wish to view, print or send the saved data to a PC before deleting, use the "**MEM OUT**" function from measurement mode.

Factory Reset

Select “**YES**” to reset the 2700 to the factory default settings except; Date & Time, Temperature calibration, and data stored in memory.

Contrast Adjustment

Optimize the contrast setting of your 2700 display for best visibility in your surrounding lighting conditions. Test various contrast settings for best results. This setting will be applied to both backlight and non-backlight conditions.

4. Setup pH & mV

Use Setup pH or mV mode to customize these parameters. Note: mV setup offers Sample ID and Alarm setting only.

Press **SETUP** from the measurement screen and then press **ENTER** when **pH** or **mV** is selected.

Sample ID

This is a user selectable number from 1 to 99999. Incorporating a sample ID to identify one or more data points is useful to distinguish data that is saved into memory or sent to a PC or printer. Use the up/down arrow keys to adjust the values and left/right arrow keys to move the cursor.

The screenshot shows the 'Setup - pH' menu. The 'SAMPLE ID' field is highlighted and contains the value '88888'. Below it, the 'BUFFER GROUP' field is empty. The 'CAL POINTS' field is empty. The 'RESOLUTION' field is empty. The 'ALARM' field is empty. The 'CAL DUE' field is empty. At the bottom, there are three buttons: 'PREV', 'NEXT', and 'ESC'. To the right of the 'SAMPLE ID' field, there are instructions: '- ▲ or ▼ to select value', '- ◀ or ▶ to move cursor', '- F3 (Next) to select others', and '- Enter to confirm'.

Buffer (Group Selection)

Choose one of (6) pH buffer groups for calibration; USA, NIST, DIN, USER 1, USER 2, and CUSTOM. The pH values in the selected buffer group are used for auto-recognition during pH calibration. Choose the appropriate buffer group, based on the pH calibration standards you intend to use.

The screenshot shows the 'Setup - pH' menu. The 'BUFFER' field is highlighted and contains the value 'USA'. Below it, the 'CAL POINTS' field contains the values '1.68', '4.01', '7.00', '10.01', and '12.45'. The 'RESOLUTION' field is empty. The 'ALARM' field is empty. The 'CAL DUE' field is empty. At the bottom, there are three buttons: 'PREV', 'NEXT', and 'ESC'. To the right of the 'BUFFER' field, there are instructions: '- ▲ or ▼ to select value' and '- F3 (Next) to select others'.

Buffer Group	pH Values
USA	1.68, 4.01, 7.00*, 10.01, 12.45
NIST	1.68, 4.01, 6.86*, 9.18, 12.45
DIN	1.09, 3.06, 4.65, 6.79*, 9.23, 12.75
USER 1	1.68, 4.01, 7.00*, 9.18, 12.45
USER 2	1.68, 4.01, 6.86*, 10.01, 12.45
CUSTOM	Any 2 - 5 values, ≥ 1.0 pH unit apart

Cal Points

Specify the number of pH calibration points you intend to calibrate with. Select the number of calibration points from 1 to 5 with preset buffer groups or from 2 to 5 points with custom buffer group.

For example, if you have selected the USA buffer group which contains 5 standards, but you will only be using 3 standards (pH 4, 7, and 10), selecting 3 calibration points here will speed up the calibration process—the 2700 will automatically recognize calibration is finished after the 3rd point has been completed.

Setup - pH	
SAMPLE ID	No of Cal Points : 3
BUFFER GROUP	
CAL POINTS	
RESOLUTION	
ALARM	- ▲ or ▼ to select value
CAL DUE	- F3 (Next) to select others
	- Enter to confirm
PREV	NEXT ESC

Resolution

Select your desired pH resolution; 0.0, 0.00, or 0.000. **Tip:** Don't choose more than you really need—0.00 is the factory default setting since it is most commonly used. Choosing 0.000 will lead to more "unstable" conditions and cause a delay in obtaining the final reading as the last digit (which is often not needed) changes.

Setup - pH	
SAMPLE ID	Resolution : X.XXX
BUFFER GROUP	(Example 7.000)
CAL POINTS	
RESOLUTION	
ALARM	- ▲ or ▼ to select value
CAL DUE	- F3 (Next) to select others
	- Enter to confirm
PREV	NEXT ESC

Alarm

The 2700 offers a visual and audible alarm to alert you when the High or Low values that have been set from this menu are exceeded.

"High Alarm" or "Low Alarm" will blink on the display if the values are exceeded while simultaneously, a loud, intermittent beeping sound is heard. The alarms will continue until the conditions are no longer met, and will only be active during measurement mode.

Setup - pH	
SAMPLE ID	Alarm : OFF
BUFFER GROUP	Hi : 20.000
CAL POINTS	Low : -2.000
RESOLUTION	- ▲ or ▼ to select value
ALARM	- ▲ or ▼ to move cursor
CAL DUE	- F3 (Next) to select others
	- Enter to confirm
PREV	NEXT ESC

Cal Due

When enabled, the "Cal Due" indicator blinks if the number of days since the last calibration has been exceeded. Set the number of days from 1 to 31.

Setup - pH	
SAMPLE ID	Calibration Due : OFF
BUFFER GROUP	No Of Days : 0
CAL POINTS	
RESOLUTION	- ▲ or ▼ to select value
ALARM	- ▲ or ▼ to move cursor
CAL DUE	- F3 (Next) to select others
	- Enter to confirm
PREV	NEXT ESC

5. pH Calibration (with preset buffer group)

For best results, periodic calibration with known accurate standards is recommended prior to measurement. Calibrate with standards that bracket your intended measuring range while including a neutral point (7.00, 6.86, or 6.79). For example, if you expect to measure samples from pH 6.2 to 9.5, calibration with 4.01, 7.00, and 10.01 will work well.

The 2700 series meters can be calibrated with up to 5 preset or custom buffers (up to 6 with DIN buffer group). The non-volatile memory retains all calibration values upon meter shut down.

The 2700 series automatically recognizes the following pH calibration buffers in the groups listed below. See [Section 4—Buffer](#) to select a different buffer group;

Buffer Group	pH Values
USA	1.68, 4.01, 7.00*, 10.01, 12.45
NIST	1.68, 4.01, 6.86*, 9.18, 12.45
DIN	1.09, 3.06, 4.65, 6.79*, 9.23, 12.75
USER 1	1.68, 4.01, 7.00*, 9.18, 12.45
USER 2	1.68, 4.01, 6.86*, 10.01, 12.45
CUSTOM	Any 2 - 5 values, ≥ 1.0 pH unit apart

**Required as 1st calibration point value (offset determination)*

To eliminate temperature errors associated with the pH electrode, attach the automatic temperature compensation (ATC) probe for best accuracy. Without temperature compensation, pH accuracy will worsen as samples deviate from 25°C and pH 7.

If the pH electrode has been stored dry, soak in storage solution for 10 minutes before calibrating or taking readings to saturate the pH electrode surface and minimize drift. If storage solution is not available, use a neutral pH buffer. Do not reuse buffer solutions after calibration. Contaminants in the solution can affect the calibration, and eventually the accuracy of the measurements.

- 1) Turn meter on, press **MODE** if needed for pH Measurement.
- 2) Rinse the pH and ATC electrodes with clean water then submerge in neutral pH buffer—the 1st calibration point must be either 7.00, 6.86, or 6.79 depending on the buffer group used.
- 3) Press **CAL** to enter calibration mode.

If the meter is password protected, you will be prompted to enter a password. See [Section 3—Password](#).

- 4) The primary display is the un-calibrated measured value. The 2700 automatically searches for and selects the appropriate value from your buffer group in the secondary display. This value will blink when the 'Stable' indicator appears. Selecting **CLR-C** will clear the existing calibration.

Primary display: un-calibrated measured values for pH, mV and temperature

Calibration - pH Stable

7.000

0.0 mV 25.0 °C (ATC)

- Press ENTER to accept calibration

7.00

First Cal Point must be 7.00

TEMP ESC

Secondary display: pH buffer automatically selected. In this example, pH 7.00 of USA buffer group)

- 5) Press **ENTER** to accept the calibration value of the measured buffer. When successful the accepted value will be visible inside of a beaker icon. Percentage slope is visible after two or more calibration points have been completed.

Calibration - pH Stable

10.010

-177.0 mV 25.0 °C (ATC)

- Press ENTER to accept calibration

4.01

100 %

7.00

10.01

TEMP ESC

- 6) Repeat Steps 4 & 5 with additional pH buffers in any order or press **ESC** to escape and save your calibration. When the specified number of calibration points is met, the pH calibration report page is automatically displayed. To specify a different number of pH calibration points see [Section 4—Cal Points](#).

CALIBRATION REPORT - pH

Date & Time : 10 Nov 09 , 09:12:23

Buffer Group : USA

mV Offset : 0.0 mV

Temperature : 25.0 °C (ATC)

Cal Overdue days : -- NA --

Slope Details :

100 %

100 %

4.01

7.00

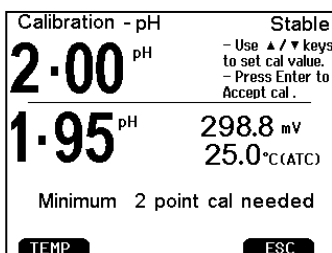
10.01

TEMP ESC

6. pH Calibration (with custom buffers)

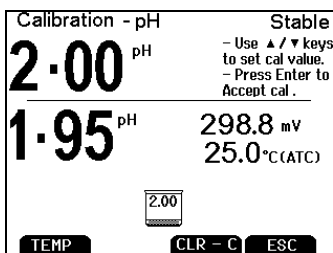
Buffer Group	pH Values
CUSTOM	Any 2 - 5 values, ≥ 1.0 pH unit apart

- 1) Turn meter on, press **MODE** if needed for pH measurement mode.
- 2) Rinse the pH and ATC electrodes then submerge in your custom pH buffer—any pH value can be used.
- 3) Press **CAL** (enter password if required) to enter calibration mode. If desired, select **CLR-C** to clear the previous calibration. The lower pH value corresponds to the factory default setting for reference. When stable, use the up/down arrows to adjust the upper pH value to your custom pH buffer value.

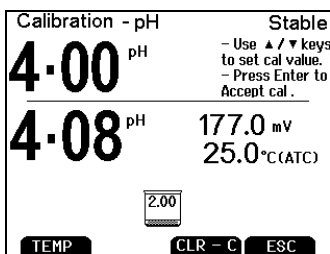


For best results, enter the value of the buffer that corresponds to the measured temperature. For example, pH 10 buffer is actually 10.06 at 20°C, so adjust to 10.06 instead of 10.00 if the temperature is 20°C.

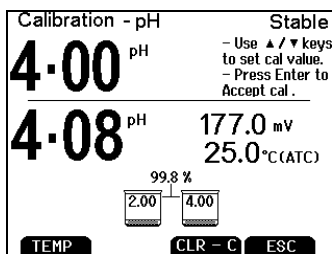
- 4) Press **ENTER** to accept the calibration value. When successful, the accepted value will be visible inside of a beaker icon.



- 5) Rinse the pH and ATC electrodes then submerge in next custom pH buffer. Use any pH value that is at least 1.0 pH unit from custom pH standards that have already been calibrated.



- 6) Repeat Step 5 with additional pH buffers (up to 5 custom buffers) in any order. Press ESC to escape and save your calibration at any time. When the specified number of calibration points is met, the pH calibration report page is automatically displayed. Percentage slope is visible after two or more calibration points have been completed.



Additional pH calibration notes:

A single point (called “offset”) calibration is allowed with pH 7.00, 6.86, or 6.79 buffers but is not allowed with Custom buffer group. Although single point calibration is allowed with preset buffer groups, we do not recommend this. Instead, perform at least a 2-point calibration on a regular basis.

As soon as the first calibration value is accepted during a new calibration, all prior calibration values are erased.

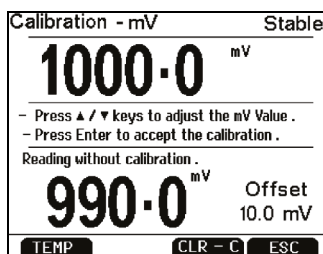
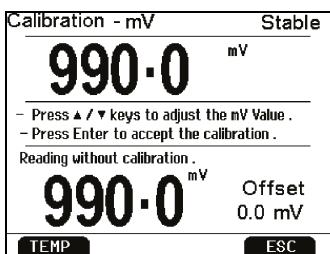
The pH calibration is a calibration of the complete meter / electrode(s) system together, not the individual meter or electrode.

7. Millivolt (mV) Calibration (Offset Adjustment)

Oxidization Reduction Potential (ORP or Redox) as measured by an ORP electrode in mV units is not a precise measurement, but is useful as a relative indicator. As such, mV offset adjustment is not meant to enhance accuracy, but rather to make readings comparable to a reference.

Commercial ORP solutions are commonly used as a check standard—a meter/electrode system is verified to be close to a given value although adjustments are not made. These solutions can be used as a calibration standard in which adjustments are made in an attempt to match the ORP value, however results are often difficult to reproduce.

- 1) Turn meter on, connect an ORP electrode, and press **MODE** if needed for mV (or R.mV) measurement.
- 2) Dip the ORP electrode into a solution with a known mV value (i.e. Zobel, Light's, quinhydrone, or iodidetriiodide) with brief or slow stirring.
- 3) Press **CAL** when the reading is stable. The upper display shows the active millivolt value (mV) while the lower display shows the factory default mV value without calibration. The example below at right shows a mV calibration that had previously been calibrated with a 10.0 mV offset.



- 4) Adjust the upper display using up/down arrows, press **ENTER** to accept the calibration offset. The maximum adjustable value is ± 150 mV from the factory default mV value.

Additional mV calibration notes:

When an offset has been stored successfully, R.mV replaces mV in measurement mode.

8. Temperature Setup

Use Setup Temperature mode to desired temperature units; ° C or ° F.

Press **SETUP** from the measurement screen and then press **ENTER** when **TEMPERATURE** is selected.

Choose ° C or ° F temperature units of measure.

Setup - Temperature	
TEMPERATURE	Unit : ° C
	Press - ▲ / ▼ to set value - Enter to confirm
	PRINT ESC

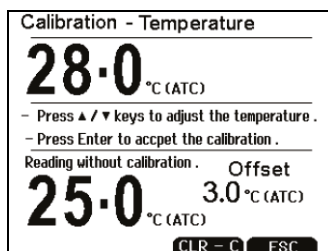
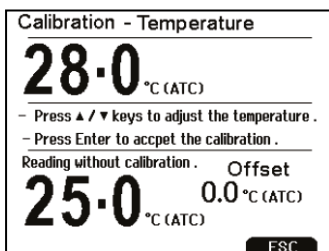
Automatic Temperature Compensation (ATC) is automatically applied when a temperature sensor is connected.

Manual Temperature Compensation (MTC) of 25 ° C is used if the temperature sensor is not connected. See [Section 9—Temperature Calibration](#) to adjust the MTC temperature value.

9. Temperature Calibration

The thermistor sensor used for automatic temperature compensation and measurement is both accurate and stable, so require frequent calibration isn't required. Temperature calibration is recommended upon electrode replacement, whenever the temperature reading is suspect, or if matching against a certified thermometer is desired.

- 1) Connect the temperature probe to the meter and place into a solution with a known accurate temperature such as a constant temperature bath. The temperature probe may be separate or built into a pH, Conductivity, or Oxygen electrode. The PC 2700 has two temperature sensors available—one built into Conductivity, and another for use with the BNC connection.
- 2) When the reading is stable, press **CAL** from any mode, then press **TEMP**.
- 3) The upper display shows the active temperature while the lower display shows the factory default temperature without calibration. The example below at right shows a temperature calibration that had previously been calibrated with a 3.0 °C offset.



- 3) Adjust the upper display using up/down arrows, press **ENTER** to accept the calibration temperature. The maximum adjustable value is ± 5 °C (or ± 9 °F) from the factory default temperature value.

Additional temperature calibration notes:

For Manual Temperature Compensation (MTC) the procedure is the same although the maximum adjustable value is the full temperature range of the parameter, and connection of a separate ATC probe is not necessary. For nearly all applications however, ATC is recommended.

If calibration is performed, be sure that the thermometry source used as a reference is accurate!

10. Conductivity, TDS, Salinity, & Resistivity Setup

Use Setup mode to customize Conductivity, TDS, Salinity, & Resistivity parameters.

Press **SETUP** from the measurement screen and then press **ENTER** when **Conductivity, TDS, Salinity, or Resistivity** is selected.

Sample ID

This is a user selectable number from 1 to 99999. Incorporating a sample ID to identify one or more data points is useful to distinguish data that is saved into memory or sent to a PC or printer. Use the up/down arrow keys to adjust the values and left/right arrow keys to move the cursor.

Setup - Conductivity	
SAMPLE ID	Sample ID : 02100
CAL METHOD	
CAL POINTS	
PURE WAT COEFF	
TEMP COEFF	
NORM TEMP	
CELL CONSTANT	- ▲ or ▼ to select value
ALARM	- ◀ or ▶ to move cursor
CAL DUE	- F3 (Next) to select others
	- Enter to confirm
PREV	NEXT ESC

Cal Method (conductivity mode only)

The 2700 is capable of automatic or manual calibration for conductivity, and manual calibration for TDS, Salinity, and Resistivity. This option allows you to select **AUTO** (automatic) or **MANUAL** conductivity calibration.

In the automatic calibration mode, the meter will automatically select one of (4) conductivity calibration standard values depending on the range and normalization temperature being used (see table below).

Setup - Conductivity	
SAMPLE ID	
CAL METHOD	Cal Method : MANUAL
CAL POINTS	
PURE WAT COEFF	
TEMP COEFF	
NORM TEMP	
CELL CONSTANT	- ▲ or ▼ to select value
ALARM	- Next / Prev to select others
CAL DUE	- Enter to confirm
PREV	NEXT ESC

Range #	Conductivity Range	Automatic Calibration Values	
		Normalization Temperature	
		25 °C	20 °C
r 1	0.00 – 20.00 µS	None	None
r 2	20.1 – 200.0 µS	84 µS	76 µS
r 3	201 – 2000 µS	1413 µS	1278 µS
r 4	2.01 – 20.00 mS	12.88 mS	11.67 mS
r 5	20.1 – 200.0 mS	111.8 mS	102.1 mS

If you will only use one or more of the (4) calibration standards listed here,

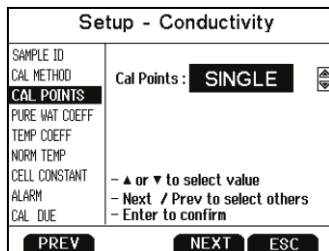
automatic calibration is recommended. Otherwise, manual calibration should be selected.

The factory default is automatic conductivity calibration. Note that automatic calibration is not available for conductivity range 1.

Cal Points

Use **SINGLE** for Single-Point Calibration (SPC) to apply a single calibration value across all ranges.

Use **MULTI** for Multi-Point Calibration (MPC) to calibrate each range individually. This will restrict an individual calibration so that it is applied to one range only. When using multi-point calibration, perform a calibration in each range that you expect to use for best results.

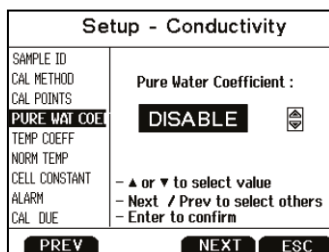


The factory default is SPC. SPC or MPC will be shown with the calibration details in measurement mode.

Pure Water Coefficient

Choose **ENABLE** to automatically apply pure water temperature correction for measurements below 2 μS (ultra pure water).

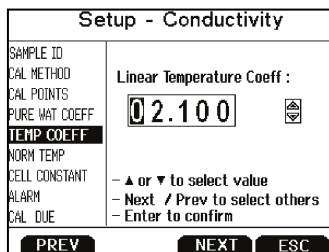
Note: this option does not apply to Salinity mode.



Temperature Coefficient (linear)

The temperature coefficient is the amount of change in conductivity per degree temperature (% per $^{\circ}\text{C}$). The factory default setting is a temperature coefficient of 2.1 % per $^{\circ}\text{C}$. For most applications this will provide good results. The meter allows adjustment from 0.0 to 10.0.

TIP: Select 0.0% for uncompensated measurements. The temperature will be measured by the electrode and displayed in measurement mode—without compensation.



Note: this option does not apply to Salinity mode.

For more information, see [Section 20—Calculating Temperature Coefficients](#).

Normalization Temperature (°C)

When Automatic Temperature Compensation is used, measurements are adjusted by the temperature coefficient to the normalization temperature.

Adjust the value from 15.0 to 35.0 °C.

Note: Use the normalization temperature that is referenced on your calibration standard(s). This will usually match the 2700 factory default value (25 °C).

Setup - Conductivity		
SAMPLE ID	Normalization Temperature : 25.0	
CAL METHOD		
CAL POINTS		
PURE WAT COEFF		
TEMP COEFF		
NORH TEMP		- ▲ or ▼ to select value
CELL CONSTANT		- ◀ or ▶ to move cursor
ALARM		- F3 (Next) to select others
CAL DUE		- Enter to confirm
PREV		NEXT ESC

TDS Factor (TDS mode only)

The TDS conversion factor is the number used by the 2700 to convert from conductivity to TDS. The TDS conversion factor automatically adjusts the reading. Select the desired TDS factor from 0.400 to 1.000.

See [Section 21—Calculating TDS Conversion Factor](#) for information on Calculating TDS factor

Setup - TDS		
SAMPLE ID	TDS Factor : 0.600	
CAL POINTS		
PURE WAT COEFF		
TEMP COEFF		
NORM TEMP		
TDS FACTOR		- ▲ or ▼ to select value
CELL CONSTANT		- ◀ or ▶ to move cursor
ALARM		- F3 (Next) to select others
CAL DUE		- Enter to confirm
PREV		NEXT ESC

Cell Constant

The 2700 includes a probe with a nominal cell constant (k) of 1.0. Use probes with k = 0.1 and 10 (sold separately) for improved performance in extreme sample ranges. The factory default is 1.0 to match the included probe. Cell constant can be adjusted from 0.010 to 10.000.

Setup - Conductivity		
SAMPLE ID	Cell Constant : 01.000	
CAL METHOD		
CAL POINTS		
PURE WAT COEFF		
TEMP COEFF		
NORM TEMP		
CELL CONST		- ▲ or ▼ to select value
ALARM		- ◀ or ▶ to move cursor
CAL DUE		- F3 (Next) to select others
PREV		NEXT ESC

k = 0.1 ideal for low measurements <20 µS (<10 ppm).

k = 1.0 ideal for mid-range measurements

k = 10 ideal for high measurements >20 mS (>10 ppt).

Alarm

The 2700 offers a visual and audible alarm to alert you when the High or Low values that have been set from this menu are exceeded.

“High Alarm” or “Low Alarm” will blink on the display if the values are exceeded while simultaneously, a loud, intermittent beeping sound is heard. The alarms will continue until the conditions are no longer met, and will only be active during measurement mode.

Setup - Conductivity	
SAMPLE ID	Alarm : <input type="text" value="ON"/>
CAL METHOD	Hi : <input type="text" value="10.00"/> mS
CAL POINTS	Low : <input type="text" value="100.0"/> μ S
PURE WAT COEFF	
TEMP COEFF	
NORM TEMP	
CELL CONSTANT	- \blacktriangle or \blacktriangledown to select value
ALARM	- \blacktriangleleft or \blacktriangleright to move cursor
CAL DUE	- F3 (Next) to select others
	- Enter to confirm
	<input type="button" value="PREV"/> <input type="button" value="NEXT"/> <input type="button" value="ESC"/>

Cal Due

When enabled, the “Cal Due” indicator blinks if the number of days since the last calibration has been exceeded. Set the number of days from 1 to 31.

Setup - Conductivity	
SAMPLE ID	Calibration Due : <input type="text" value="ON"/>
CAL METHOD	No Of Days : <input type="text" value="6"/>
CAL POINTS	
PURE WAT COEFF	
TEMP COEFF	
NORM TEMP	
CELL CONSTANT	- \blacktriangle or \blacktriangledown to select value
ALARM	- \blacktriangleleft or \blacktriangleright to move cursor
CAL DUE	- F3 (Next) to select others
	- Enter to confirm
	<input type="button" value="PREV"/> <input type="button" value="NEXT"/> <input type="button" value="ESC"/>

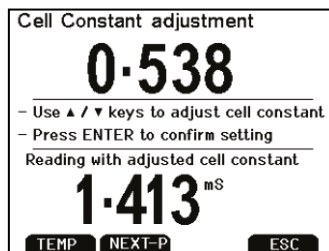
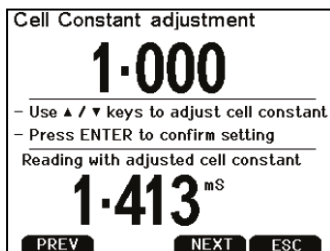
11. Conductivity Calibration (automatic)

For best results, periodic calibration with known accurate standards is recommended prior to measurement. Calibrate with standards that are close in value to your intended sample(s).

When using multi-point calibration, perform a calibration in each range that you expect to use for best results.

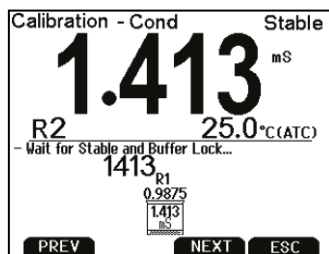
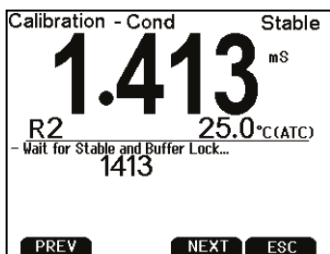
If the conductivity electrode has been stored dry for some time, soaking in alcohol or clean water for a few minutes can help performance.

- 1) Turn meter on, press **MODE** if needed for conductivity measurement mode.
- 2) Press **CAL** if needed to enter calibration mode. Rinse the electrode with clean water then submerge into your conductivity standard— either 84 μS , 1413 μS , 12.88 mS, or 111.8 mS. Provide stirring for best results.
- 3) Use the up/down arrows to adjust the cell constant manually or press **NEXT** to keep the nominal cell constant value and proceed with a typical automatic calibration (recommended). If adjusting the cell constant manually, press **ENTER** after 'Stable' appears to confirm the adjustment.



Before and after a manual calibration constant adjustment

- 4) Wait for the meter to lock on the calibration standard and press **ENTER** after 'Stable' appears to confirm the calibration point. The calibrated value, Range (R) that was calibrated and the calculated cell constant are now shown.



Before and after a one-point automatic conductivity calibration with 1.413 mS

- 5) For multi-point calibration repeat steps 2 & 3 with additional standards. Press ESC to save the calibration, or press **NEXT** to view the calibration report. Calibrate one point per range, up to 4.

Additional automatic conductivity calibration notes:

A maximum of one calibration point per range can be performed. If multiple calibration points are used in the same range, the most recent one will replace the previous one.

When the electrode is replaced, it is best to clear the calibration to the factory default values.

Rinse or immerse the probe before calibration and between samples with clean water (deionized water is ideal).

To protect from erroneous calibrations, the allowable tolerance is $\pm 40\%$ of the factory default value.

For best results always begin with your lowest calibration standard value, followed by the next lowest, and so on.

Low conductivity standard solutions (less than 20 μS) are unstable and are very temperature dependent. As a result, reproducible calibration results are challenging in lowest measurement range #1 (0.00 to 20.0 μS).

“2 Cell” or “4 Cell” electrode is automatically detected and displayed on the measurement screen when connected.

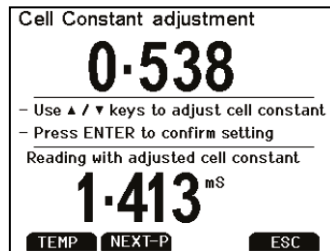
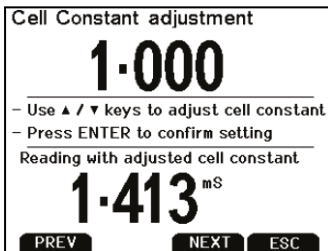
12. Conductivity, TDS, Salinity, & Resistivity Calibration (manual adjustment)

For best results, periodic calibration with known accurate standards is recommended prior to measurement. Calibrate with standards that are close in value to your intended sample(s).

When using multi-point calibration, perform a calibration in each range that you expect to use for best results.

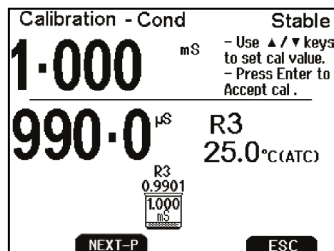
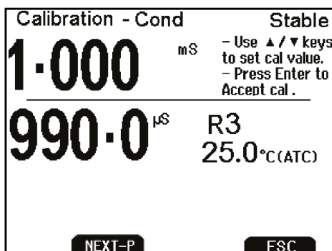
If the electrode has been stored dry for some time, soaking in alcohol or clean water for a few minutes can help performance.

- 1) Turn meter on, press **MODE** if needed for the appropriate mode.
- 2) Press **CAL** if needed to enter calibration mode. Rinse the electrode with clean water then submerge into your calibration standard.
- 3) Use the up/down arrows to adjust the cell constant manually or press **NEXT** to keep the nominal cell constant value and proceed with a typical manual calibration (recommended). If adjusting the cell constant manually, press **ENTER** after 'Stable' appears to confirm the adjustment.



Before and after a manual calibration constant adjustment

- 4) The upper display is the active reading while the lower display is the factory default value without calibration. Use the up/down arrows to adjust the upper display to match the desired calibration value. Press **ENTER** after 'Stable' appears to confirm the calibration. The calibrated value, Range (R) that was calibrated and the calculated cell constant are now shown.



Before and after a manual calibration

- 5) For multi-point calibration repeat with additional standards. Press ESC to save calibration or press **NEXT** to view the calibration report. Calibrate one point per range, up to 5 points.

Additional manual calibration notes:

A maximum of one calibration point per range can be performed. If multiple calibration points are used in the same range, the most recent one will replace the previous one.

When the electrode is replaced, it is best to clear the calibration to the factory default values.

Rinse or immerse the probe before calibration and between samples with clean water (deionized water is ideal).

To protect from erroneous calibrations, the allowable tolerance is $\pm 40\%$ of the factory default value.

For best results always begin with your lowest calibration standard value, followed by the next lowest, and so on.

Low conductivity standard solutions (less than 20 μS) are unstable and are very temperature dependent. As a result, reproducible calibration results are challenging in lowest measurement range #1 (0.00 to 20.0 μS).

Note: If using the 2-cell electrode, the protective probe guard can be removed temporarily for cleaning however it must be re-attached during measurement and calibration. Erroneous results will occur while the probe guard is removed.



13. Ion Setup

Use Setup Ion mode to customize this parameter. Press **SETUP** from the measurement screen and then press **ENTER** when **ION** is selected.

Sample ID

This is a user selectable number from 1 to 99999. Incorporating a sample ID to identify one or more data points is useful to distinguish data that is saved into memory or sent to a PC or printer. Use the up/down arrow keys to adjust the values and left/right arrow keys to move the cursor.

Setup - Ion	
SAMPLE ID	Sample ID : <input type="text" value="88888"/>
MEASURE UNIT	
ALARM	
CALIBRATION DUE	
- ▲ or ▼ to select value - Next / Prev to select others - Enter to confirm	
PREV	NEXT ESC

Measure Unit

Select ppm, molar, or mg/L ion concentration units.

Setup - Ion	
SAMPLE ID	Measure Unit: <input type="text" value="ppm"/>
MEASURE UNIT	
ALARM	
CALIBRATION DUE	
- ▲ or ▼ to select value - Next / Prev to select others - Enter to confirm	
PREV	NEXT ESC

Alarm





The 2700 offers a visual and audible alarm to alert you when the High or Low values that have been set from this menu are exceeded.

“High Alarm” or “Low Alarm” will blink on the display if the values are exceeded while simultaneously, a loud, intermittent beeping sound is heard. The alarms will continue until the conditions are no longer met, and will only be active during measurement mode.

Setup - Ion	
SAMPLE ID	Alarm : <input type="text" value="OFF"/>
MEASURE UNIT	Hi : <input type="text" value="0.001"/>
ALARM	Low : <input type="text" value="19999"/>
CALIBRATION DUE	
- ▲ or ▼ to select value - Next / Prev to select others - Enter to confirm	
PREV	NEXT ESC

Cal Due

When enabled, the “Cal Due” indicator blinks if the number of days since the last calibration has been exceeded. Set the number of days from 1 to 31.

Setup - Ion	
SAMPLE ID	Calibration Due : OFF  
MEASURE UNIT	No Of Days : 0  
ALARM	
CAL DUE	
	- ▲ or ▼ to select value - Next / Prev to select others - Enter to confirm
PREV	NEXT ESC

Refer to your Ion Selective Electrode instruction manual for details on conditioning, storage, maintenance, calibration standard preparation, Ionic Strength Adjustment, troubleshooting, etc. Each ISE is unique and requires care and operation that is specific to the electrode and ion of interest.

14. Ion Calibration

The ION 2700 can measure ion concentration such as ammonia or fluoride when using an ion selective electrode (ISE) for the specific ion of interest.

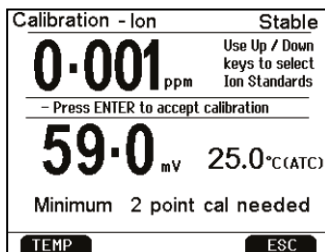
Ion calibration is required with at least two standards from (8) available values; 0.001, 0.01, 0.1, 1.0, 10, 100, 1000, and 10000.

The primary display will show “- - -” when ion calibration is required for ion measurement.

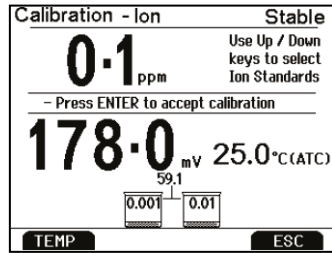
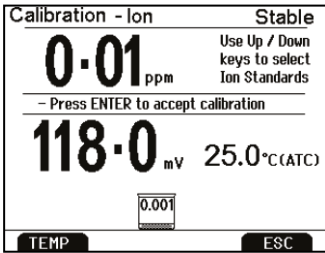
Prepare ion calibration standards that bracket your measurement range. Follow the ion selective electrode instruction manual for the appropriate ionic strength adjustment and sample preparation.

For best results always begin with your lowest calibration standard value, followed by the next lowest, and so on.

- 1) Connect the ISE and press **MODE** as needed for concentration mode.
- 2) Rinse the ISE with clean water then dip into your lowest calibration standard and stir. Press **CAL**. Use up/down arrows to match the upper display to your calibration standard.

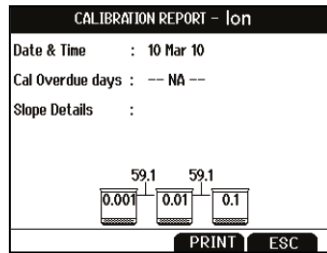
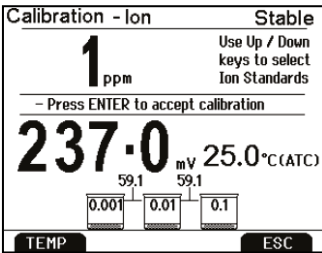


- 3) The lower display is the mV reading of the ISE. Press **ENTER** when this value is stable to accept the calibration point.
- 4) Rinse the ISE with clean water and dip into your next lowest calibration standard and stir. Press **ENTER** after “Stable” appears to accept the next calibration point.



Before and after a two point ion calibration using 0.001 and 0.01 standards

- 5) The mV/decade slope value will be displayed if the calibration is successful. "Slope Error" indicates that the calibration for the current point was not successful. This occurs when the slope (mV difference between two consecutive points) is < 15 mV/decade or > than 90 mV/decade.
- 6) Repeat steps 4 & 5 with additional ISE standards or press **ESC** to escape and save your calibration.



At left; a three point ion calibration, at right; the Ion calibration report

To view the Ion Calibration Report at any time from the measure screen, press **REPORT**.

15. Dissolved Oxygen Setup

Use Setup Dissolved Oxygen mode to customize the parameter. Press **SETUP** from the measurement screen and then press **ENTER** when **DO%** or **DO (mg/L)** is selected for percent saturation or concentration modes respectively. Note that setup parameters differ slightly depending on which is selected.

Sample ID

This is a user selectable number from 1 to 99999. Incorporating a sample ID to identify one or more data points is useful to distinguish data that is saved into memory or sent to a PC or printer. Use the up/down arrow keys to adjust the values and left/right arrow keys to move the cursor.

Setup - DO %	
SAMPLE ID	Sample ID : 30000
OFFSET CAL	
PRESSURE UNIT	
PRESSURE CAL	
PRESSURE COMP	- ▲ or ▼ to select value
ALARM	- ◀ or ▶ to move cursor
CALIBRATION DUE	- Next / Prev to select others - Enter to confirm
PREV	NEXT ESC

Offset Cal (% saturation only)

Use this feature to offset the meter's value to another DO meter. Using the % saturation mode, observe the reading a sample solution after it has stabilized. Similarly, observe the reading of the same sample using another DO meter as a reference. The probe of the reference meter should be immersed in the same sample at the same depth.

Setup - DO %	
SAMPLE ID	Offset Value : +10.0
OFFSET CAL	
PRESSURE UNIT	
PRESSURE CAL	
PRESSURE COMP	- ▲ or ▼ to select value
ALARM	- ◀ or ▶ to move cursor
CAL DUE	- Next / Prev to select others - Enter to confirm
PREV	NEXT ESC

The DO 2700 allows $\pm 10\%$ offset adjustment. Note that subsequent user calibrations will reset the offset adjustment back to the factory default value of 0.0 % offset.

Pressure Unit (% saturation mode only)

Select mmHg or kPa pressure units.

Setup - DO %	
SAMPLE ID	Pressure Unit : mmHg
OFFSET CAL	
PRESS UNIT	
PRESSURE CAL	
PRESSURE COMP	- ▲ or ▼ to select value
ALARM	- ◀ or ▶ to move cursor
CAL DUE	- Next / Prev to select others - Enter to confirm
PREV	NEXT ESC

Pressure Cal (% saturation mode only)

The DO 2700 includes a built-in barometer that is factory calibrated. While frequent pressure adjustment is not required, adjustments can be made in the Adjusted Pressure field. The Measured Pressure is the active pressure value measured by the DO 2700.

Note: if adjusting, “true” barometric pressure—that has not been corrected to sea level, must be used. Pressure reported by weather services are almost always corrected and therefore are not appropriate for entry in the adjusted pressure field here.

Setup - DO %	
SAMPLE ID	Measured Pressure : 760.0
OFFSET CAL	Pressure
PRESSURE UNIT	Adjusted Pressure : 765.0
PRESS CAL	
PRESSURE COMP	- ▲ or ▼ to select value
ALARM	- ◀ or ▶ to move cursor
CAL DUE	- Next / Prev to select others
	- Enter to confirm
PREV	NEXT ESC

Pressure Compensation (% saturation mode only)

Select **ENABLE** or **DISABLE**.

Setup - DO %	
SAMPLE ID	Pressure Compensation :
OFFSET CAL	DISABLE
PRESSURE UNIT	
PRESSURE CAL	
PRESS COMP	- ▲ or ▼ to select value
ALARM	- Next / Prev to select others
CAL DUE	- Enter to confirm
PREV	NEXT ESC

Measure Unit (concentration mode only)

Select mg/L or ppm concentration units.

Setup - DO (mg/L)	
SAMPLE ID	Measure Unit : mg/L
MEAS UNIT	
SALINITY VALUE	
ALARM	- ▲ or ▼ to select value
CALIBRATION DUE	- Next / Prev to select others
	- Enter to confirm
PREV	NEXT ESC

Salinity Value (concentration mode only)

Enter the salinity value of your samples in parts per thousand (ppt) units. Select from 0 to 50.0 ppt.

Setup - DO (mg/L)	
SAMPLE ID	Salinity Value : <input type="text" value="15.0"/>
MEASURE UNIT	
SAL VALUE	
ALARM	- ▲ or ▼ to select value - ◀ or ▶ to move cursor
CALIBRATION DUE	- Next / Prev to select others - Enter to confirm
PREV	NEXT ESC

Alarm

The 2700 offers a visual and audible alarm to alert you when the High or Low values that have been set from this menu are exceeded.

“High Alarm” or “Low Alarm” will blink on the display if the values are exceeded while simultaneously, a loud, intermittent beeping sound is heard. The alarms will continue until the conditions are no longer met, and will only be active during measurement mode.

Setup - DO %	
SAMPLE ID	Alarm : <input type="text" value="OFF"/>
OFFSET CAL	Hi : <input type="text" value="300.0"/>
PRESSURE UNIT	Low : <input type="text" value="050.0"/>
PRESSURE CAL	
PRESSURE COMP	- ▲ or ▼ to select value - ◀ or ▶ to move cursor
ALARM	- Next / Prev to select others - Enter to confirm
CAL DUE	
PREV	NEXT ESC

Cal Due

When enabled, the “Cal Due” indicator blinks if the number of days since the last calibration has been exceeded. Set the number of days from 1 to 31.

Setup - DO (mg/L)	
SAMPLE ID	Calibration Due : <input type="text" value="OFF"/>
MEASURE UNIT	No Of Days : <input type="text" value="1"/>
SALINITY VALUE	
ALARM	- ▲ or ▼ to select value - ◀ or ▶ to move cursor
CAL DUE	- Next / Prev to select others - Enter to confirm
PREV	NEXT ESC

16. Dissolved Oxygen Calibration

The DO 2700 utilizes a self-stirring polarographic electrode with a built-in temperature sensor. The electrode is designed for use in BOD bottles.

Power the meter on 5-15 minutes before calibration or taking a measurement as this will allow adequate time for the electrode to warm up. Longer warm up times are recommended when the membrane cap and/or electrolyte is replaced—this permits the probe to use up all oxygen retained inside the cap.

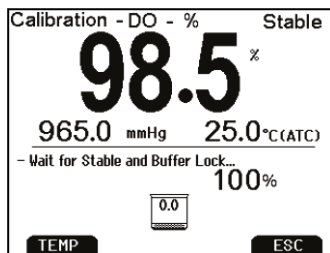
The DO 2700 has two modes; % saturation and concentration (mg/L or ppm). In % saturation mode, the DO 2700 will accept either a one (100%) or two point (100% & 0%) calibration. For a one point calibration, 100% air calibration is recommended. For best accuracy below 2.0 ppm, use zero oxygen solution to calibrate 0%. 0% calibration followed by 100% calibration is not recommended—always perform 100% calibration first.

Always rinse the probe with clean water before and after each calibration/sample measurement. When performing air calibration, gently shake remaining water droplets from the probe's membrane.



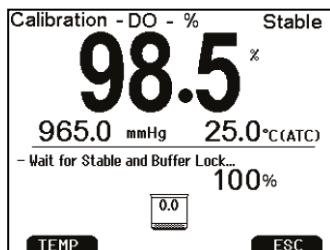
100 % Calibration

- 1) Power meter on with DO electrode attached for 5-15 minute warm up.
- 2) Rinse the probe well with clean water then place into a BOD bottle partially filled with water (100 mL or so).
- 3) Press **MODE** if needed for % measurement mode.
- 4) Press **CAL**. The primary reading is the current measured value. Note: the stirrer is not required for air calibration. For air-saturated water calibration however, switch the stirrer motor on (the switch is located at the top of the electrode) during calibration and measurement.
- 5) Allow the reading to stabilize and lock on 100%. Press **ENTER** to confirm the calibration.
- 6) Press **ESC** to return to measurement mode, or continue with 0% calibration in step 7 if desired.



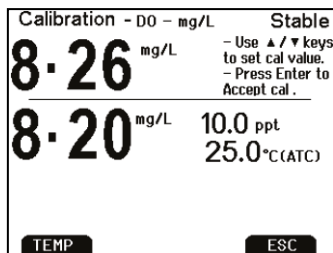
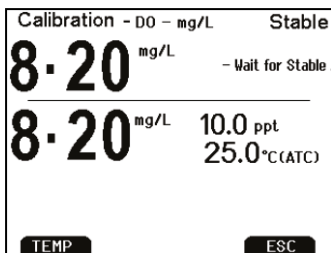
0% Calibration

- 7) After completing steps 1 thru 6 for 100% saturation calibration, place your electrode in zero oxygen solution (0.08M sodium sulfite). Continuous stirring is not required.
- 8) The primary reading is the current measured value. **Be patient—the reading can take several minutes to reach 0% saturation!**
- 9) When the reading has finally stabilized and locked on 0% press **ENTER** to confirm the calibration.



mg/L or ppm (Concentration) Calibration

- 1) Connect the DO electrode and power on DO 2700 for 5-15 minute warm up.
- 2) Press **MODE** if needed for concentration measurement mode.
- 3) Rinse the probe well with clean water then place into your solution with a known dissolved oxygen concentration value (i.e. determined by titration or another instrument).
- 4) Press **CAL** and switch the stirrer on. The upper reading is the current measured value. The lower reading is the factory default reading for comparison, along with salinity and temperature correction shown.

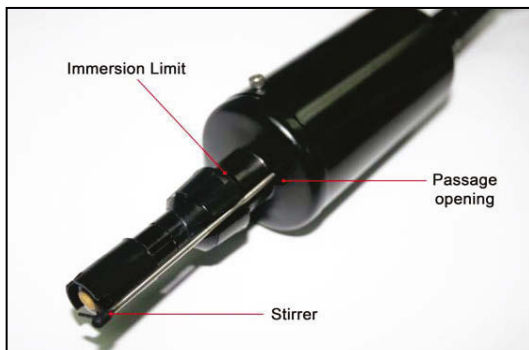


A manual DO concentration calibration

- 5) Allow the reading to stabilize. Use the up/down arrows to adjust the upper reading to match the DO concentration of your solution. The minimum concentration calibration value is 2.00 mg/L. Press **ENTER** to confirm the calibration.

Additional dissolved oxygen calibration notes:

- Keep the membrane free from contact with solid objects.
- Use with aqueous solutions only.
- Do not submerge the probe past the immersion limit (see below).



- See [Section 22—DO Electrode Maintenance](#) for additional information.
- Calibration adjustment is limited to $\pm 40\%$ of the factory default value to prevent erroneous calibrations.
- If % calibration is attempted with a value of 10.1% to 49.9%, a “Calibration Error” will result. The following table lists corresponding calibration values in % saturation calibration mode:

% Saturation (of factory default value)	Calibration Value
less than 10%	0%
10.1% to 49.9%	Calibration Error
50% to 150%	100%

- Calibration of the concentration mode will only replace the previous concentration calibration and does not affect the % saturation calibration.
- To offset your % saturation reading to match another instrument, see [Section 15—Offset Calibration](#).
- Perform daily calibration for best results. New calibration values will automatically override the previous calibration.

17. Transferring and Printing Data

To send data directly to a printer or PC, connect the 30X427301 / 35420-01 cable to the RS-232 output port of the 2700. To connect to a USB port, an additional adapter cable is required; see [Section 25—Replacements & Accessories](#).

The 2700 can be used to:

- Print/send one or more data points directly to a dedicated printer or to a PC. Press **PRINT** from measurement mode or from the **MEM OUT** screen.
- Print/send the calibration report to a printer or PC. Press **REPORT** from measurement mode.
- Send live data to a PC at intervals 3 seconds or higher. In the System Setup, select a “**TIMED**” Print Set.

Choose the “**TEXT/PRINTER**” Print Format option to transfer the data in an easily viewable format—best for printing.

Choose the “**CYBERCOMM**” Print Format option to send the data as a comma separated value (CSV)—best for exporting data into software

To make changes to the printer, datalog, and output settings, see [Section 3—System Setup](#).

Certain 2700 models will include a complimentary software application called **CyberComm 2700**. For details on installation, connection and usage of this software, please read the manual that is included on the software CD. If you did not receive a CD or lost the CD that was included with your instrument, check our website.

The 2700 is also compatible with 3rd party capture software.



18. Calibration Report

Calibration report provides detailed information on the most recent calibration. It includes date & time, calibration standard(s), offset, temperature, number of days calibration is over due slope information, etc.

The calibration report is automatically displayed after a complete calibration.

To view the calibration report at any other time, press **REPORT** from the desired measurement screen.

To send the calibration report to a printer or PC, press **PRINT**.

CALIBRATION REPORT - pH

Date & Time : 10 Nov 09 , 09:12:23
 Buffer Group : USA
 mV Offset : 0.0 mV
 Temperature : 25.0 °C (ATC)
 Cal Overdue days : -- NA --
 Slope Details :
 100 % 100 %

4.01	7.00	10.01
------	------	-------

PRINT **ESC**

CALIBRATION REPORT - Ion

Date & Time : 10 Nov 09 , 23:12:55
 Cal Overdue days : NA
 Slope Details :
 mV
 Slope 59.0 56.5 60.0 55.0 58.2 59.4 59.6

0.001	0.01	4.00	1	10	100	1000	10000
-------	------	------	---	----	-----	------	-------

PRINT **ESC**

CALIBRATION REPORT - Cond

Date & Time : 10 Nov 09 , 23:12:55
 Cell Constant : 1.000
 Cal Overdue days : NA
 Cal Details : R3, R4

R3	R4
0.9875	0.9997
1.413	12.88
ms	ms

PRINT **ESC**

CALIBRATION REPORT - TDS

Date & Time : 10 Nov 09 , 23:12:55
 Cell Constant : 1.000
 Cal Overdue days : NA
 Cal Details : R1,R2,R3, R4,R5

R4
0.9984
6.410
ppt

PRINT **ESC**

CALIBRATION REPORT - DO - %

Date & Time : 10 Nov 09 , 23:12:55
 0.5 % Calibrated to : 0 %
 37.0 % Calibrated to : 100 %
 Calibration Temp : 25.0 C
 Cal at pressure : 760.0 mmHg
 Offset Adjusted : 0.2
 Cal Due Days : NA

PRINT **ESC**

CALIBRATION REPORT - DO - mg/L

Date & Time : 10 Nov 09 , 23:12:55
 Calibration Factor : 1.255
 Calibration Temp : 25.0 C
 Cal at Pressure : 760.0 mmHg
 Cal at Salinity : 10.0 ppt
 Cal at : 8.26 mg/L (ppm)
 Cal Due Days : NA

PRINT **ESC**

Examples of Calibration Reports from different parameters

19. Dissolved Oxygen Theory

Dissolved Oxygen (DO) refers to the volume of oxygen that is contained in water. There are two main sources of DO in water; atmosphere and photosynthesis. Waves and tumbling water mix air into the water where oxygen readily dissolves until saturation occurs. Oxygen is also produced by aquatic plants and algae during photosynthesis.

The amount of DO that can be held by water depends on 3 factors:

1. TEMPERATURE:

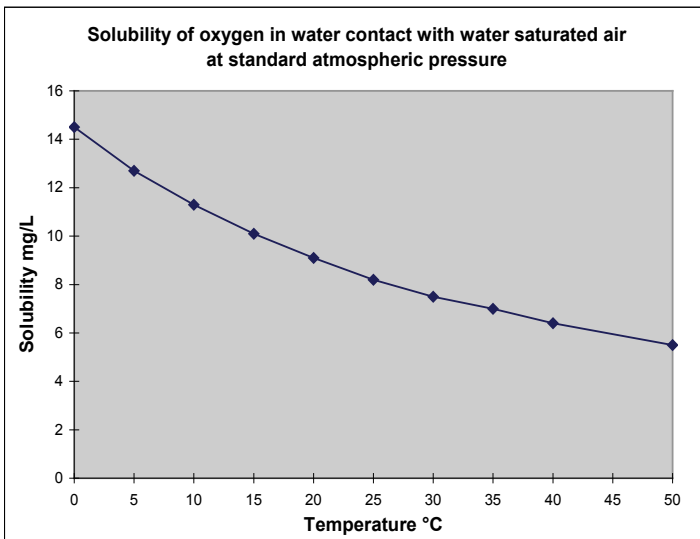
DO increases with decreasing temperature
(colder water holds more oxygen)

2. SALINITY:

DO increases with decreasing salinity
(freshwater holds more oxygen than saltwater does)

3. ATMOSPHERIC PRESSURE:

DO decreases with decreasing atmospheric pressure
(amount of DO absorbed in water decreases as altitude increases)



DO Solubility in Water vs. Temperature

Measurement

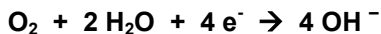
Units

One measure of DO in water is parts per million (ppm) which is the number of oxygen molecules (O_2) per million total molecules in a sample. The “mg/L” unit is equivalent to ppm (a liter of water weighs 1 million milligrams—one part in a million is similar to one milligram in a liter). Calculating the % saturation is

another way to analyze DO levels. % saturation is the measured DO level divided by the greatest amount of oxygen that the water could hold under various temperature and atmospheric pressure conditions multiplied by 100.

What Is Being Measured?

DO probes respond to the partial pressure of oxygen in liquid or gas being measured—they measure the “pressure” of oxygen rather than concentration. All of the oxygen entering the probe is consumed at the cathode where it is electrochemically reduced to hydroxyl ions producing an electrical current within the probe:



Since all oxygen entering the probe is chemically consumed, the partial pressure of oxygen in the electrolyte is zero. Therefore, a partial pressure gradient exists across the membrane and the rate at which oxygen enters the probe is a function of the partial pressure of oxygen in the gas or in liquid being measured.

When a probe is placed in air saturated water, the current it produces will not be affected by the temperature or salinity of the water. The DO concentration in the water, however, will vary with temperature and salinity. Because it is convenient to report DO concentration in mg/L or ppm, it is necessary to adjust for temperature and salinity of the water to get correct readings in these units.

If DO were to be reported in terms of partial pressure or % Saturation, then temperature and/or salinity compensation for oxygen solubility would not be necessary. Most probes are temperature compensated—i.e. they convert the “partial pressure measurement” to mg/L of DO at whatever temperature the water happens to be at for a given salinity and barometric pressure.

Air Calibration

Understanding the principle of air calibration is easy, once you know that it is partial pressure that the probe is responding to. When the probe is in air, it is measuring the partial pressure of oxygen in air. If water is air saturated, then the partial pressure of oxygen in the water will be the same as it is in air. Therefore, all you need to know is the temperature of the air in which the probe is placed. By consulting solubility tables for oxygen at the particular barometric pressure and salinity of the water being measured, the corresponding concentration (mg/L or ppm) can be found for air saturated water at the air calibration temperature, and the meter can be set accordingly. Because most meters are temperature compensated, they will still give correct readings in mg/L even though the actual water temperature may be different to the air calibration temperature. Note: The closer the air calibration temperature is to the water temperature, the more accurate the calibration.

Applications

Oxygen is essential for fish, invertebrate, plant, and aerobic bacteria respiration. DO levels below 3 ppm are stressful to most aquatic organisms. Levels below 2 or 1 ppm will not support fish. Fish growth and activity usually require 5 to 6 ppm of DO, an important consideration for Aqua-culture industry.

Low DO indicates a demand on the oxygen of the system. Natural organic material such as leaves accumulate in the stream and create an oxygen demand as it is decomposed. Organic materials from human activities also create an oxygen demand in the system. Micro-organisms consume oxygen as they decompose sewage, urban and agricultural run-off, and discharge from food-processing plants, meat-packing plants and dairies. There is an optimum DO level for this process and if the DO level falls too low, the micro-organisms die and the decomposition ceases. When DO level is too high, this indicates too much power is used than necessary for aeration resulting in an inefficient process.

In boiler water application, presence of oxygen in the water will increase corrosion and helps build up boiler scale that inhibits heat transfer. In such instance it is critical to keep DO concentration to a minimum.

Some pollutants such as acid mine drainage produce direct chemical demands on oxygen in the water. DO is consumed in the oxidation-reduction reactions of introduced chemical compounds such as nitrate (NO_3^{1-}) and ammonia (NH_4^{1+}), sulfate (SO_4^{2-}), and sulfite (SO_3^{2-}) and ferrous (Fe_2^+) and ferric (Fe_3^+) ions.

These are important consideration for water and wastewater treatment industry.

20. Calculating Temperature Coefficients

To determine the temperature coefficient of your sample solution use this formula:

$$tc = 100 \times \frac{C_{T_2} - C_{T_1}}{C_{T_1}(T_2 - 25) - C_{T_2}(T_1 - 25)}$$

Where:

tc = Temperature coefficient **25** = 25 °C

C_{T1} = Conductivity at Temp 1 **C_{T2}** = Conductivity at Temp 2

T1 = Temp 1

T2 = Temp 2

A controlled temperature water bath is ideal for this procedure.

1. Immerse the probe into a sample of your solution and adjust the temperature coefficient to 0% (that is, no compensation) by following instructions as described in [Section 10—Temperature Coefficient](#).
2. Wait for 5 minutes. Note T1 and CT1 (conductivity at T1).
3. Condition the sample solution and probe to a temperature (T2) that is about 5 °C to 10 °C different from T1, and note the conductivity reading C_{T2}.

Record your results for future reference. Ideally T1 and T2 should bracket your measurement temperature, and should not differ by more than 5 °C.

4. Calculate the temperature coefficient of your solution according to the formula shown above.
5. Enter the calculated temperature coefficient into the meter.

The calculated temperature coefficient will now be applied to all the meter readings.

21. Calculating TDS Conversion Factor

You can calibrate TDS using the value of the calibration standard solution at a standard temperature such as 25 °C. To determine the conductivity-to-TDS conversion factor use the following formula:

$$\text{Factor} = \text{Actual TDS} \div \text{Actual Conductivity @ 25 °C}$$

- **Actual TDS:** Value from the solution bottle label or as a standard made using high purity water and precisely weighed salts.
ppm = milligram of salt(s) per liter of water = mg/L
ppt = gram of salt(s) per liter of water = g/L
- **Actual Conductivity:** Value measured using a properly calibrated Conductivity/Temperature meter.

Both the Actual TDS and the Actual Conductivity values must be in the same magnitude of units. For example, if the TDS value is in ppm the conductivity value must be in μS ; if the TDS value is in ppt the conductivity value must be in mS.

Check your factor by multiplying the conductivity reading by the factor in the above formula. The result should be in TDS value.

When the TDS factor is set to 1.0, Conductivity = TDS.

22. DO Electrode Maintenance

Changing the Membrane Cap

The DO 2700 electrode utilizes a cap attached to a pre-installed membrane that is easily replaced. Replace the membrane cap if it becomes damaged or worn over time as needed. When calibration can not be completed, look to replace the electrolyte first as this may help. Replace the membrane cap and electrolyte together using the following procedure.

- 1) Unscrew the old membrane cap from the probe. Before installing a new membrane, clean the probe tip with deionized water to remove any contaminants.
- 2) With the membrane cap removed fill it approximately 50% full using the electrolyte solution. Screw the membrane cap on moderately tight (do not over-tighten). A small amount of electrolyte should overflow—indicating that all of the air has been removed.
- 3) Rinse off excess electrolyte with deionized water.

Electrode Cleaning

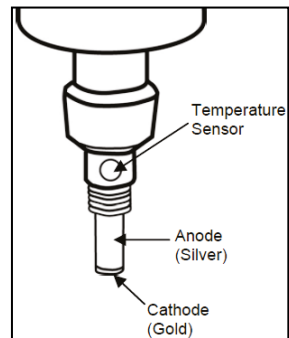
Cleaning the BOD probe is only necessary after erratic readings result; usually after many months of use. Avoid excessive and un-necessary cleaning, as it can reduce the life of the probe.

Gold Cathode

The gold cathode can become tarnished or plate with silver after extended use. It is cleaned with the adhesive backed sanding disc in the Membrane Kit provided with the probe. Stick the disc to a flat object, like a bottle cap, and gently sand the gold cathode with a twisting motion about 3 times or until all silver deposits are removed. The gold will have a matte finish.

Silver Anode

It is normal for a dark layer of silver chloride to cover the silver anode. After prolonged use it may become necessary to clean the anode. Soak the probe in 14% ammonium hydroxide for 2 to 3 minutes or overnight in a 3% ammonium hydroxide solution. Rinse with deionized water, recharge the electrode, and install a new membrane.



23. Troubleshooting

Parameter	Cause	Solution
pH	Won't accept 1 st calibration point	New calibrations must begin with neutral standard (7.00 or 6.86)
pH	Cal points are too close	Custom pH buffer calibration values must be at least 1.0 pH unit apart.
pH	Reading is 7.00 and won't change	Electrode tip may be cracked or broken. Replace electrode.
pH or Ion	Slope error / Calibration error	Calibration values are too far apart, or too far from ideal values. Check the electrode, use fresh buffers, and check meter settings. Electrode may require filling solution, conditioning, or complete replacement. Refer to electrode manual.
Ion	Display reads "--"	2-point Ion calibration is required; no calibration is stored in memory.
Conductivity	Can't adjust / can't calibrate	AUTO calibration values (84 μ S, 1413 μ S, 12.88 mS, or 111.8 mS) are not used. Change Cal Method to MANUAL.
Conductivity	2 nd Calibration point replaces the 1st	Only one point per range can be calibrated. Re-consider your SINGLE or MULTI Cal Points setting in Section 10.
TDS	Standard does not match	Adjust TDS factor as needed to correct value. Refer to "Calculating TDS Conversion Factor".
DO	Reading is very slow to stabilize	Ensure stirrer motor is on during solution measurement and temperature is stable. If electrode is old, gold cathode may be tarnished—buff with disk or pencil eraser. Replace membrane, electrolyte and recondition

		sensor.
DO	Instrument will not read zero in sodium sulfite solution	Solution contains oxygen—use fresh solution. Replace membrane and recondition sensor.
Temperature	Instrument reads inaccurate temperature	Calibrate using water bath or known accurate thermometer. Faulty thermistor—repair or replace.
ALL	Main digits are faded in measurement mode &/or are faded too often.	When “Stability” is enabled, the digits on the primary reading will be faded when unstable, becoming solid when stable. Disable this feature to keep digits solid at all times or keep this feature enabled while changing the “Stability Criteria” to “Slow”
ALL	I forgot my password	Please send us a written request with your name, contact information, along with the instrument serial number; a temporary password will be provided.
ALL	Memory Full	Often when a timed datalog is used, it runs until the memory is full. To erase the stored data, go to System Setup, CLEAR LOG.
ALL	Reading doesn't change, “AR” is blinking	Auto-Read is active (measurement locks automatically when stable). Press MEAS to resume. Select Auto-Read “DISABLE” if this feature is not desired.
ALL	My problem is not listed here.	Please contact our authorized dealer or email us directly with your feedback: eutech@thermofisher.com

24. Specifications

We reserve the right to make changes, improvements and modifications to the specifications listed here.

pH	pH 2700, ION 2700, PC2700 only
Range	-2.000 to 20.000 pH
Resolution	0.1 / 0.01 / 0.001 pH
Accuracy	±0.002 pH + 1 LSD
Cal. Points	Up to 6 preset or 5 custom
Buffer Sets	USA, NIST, DIN, User1, User2, Custom
Slope Display	Yes (with offset)
Temp Compensation	Automatic or Manual (0 to 100 °C / 32 to 212 °F)
Temp Range (Meter)	0.0 to 100.0 °C / 32.0 to 212.0 °F
Inputs	BNC, ATC, Reference (Half-cell)

mV	pH 2700, ION 2700, PC2700 only
Range	±2000.0 mV
Rel. mV Range	±2000.0 mV
Resolution	0.1 mV
Accuracy	±0.2 mV
Offset Adjustment	Up to ±150 mV

Ion	ION 2700, PC2700 only
Range	0.001 to 19999 ppm (±2000 mV)
Resolution	2 or 3 digits
Accuracy	0.5% full scale (monovalent) 1% full scale (divalent)
Cal Points	2 to 8 points; 0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000
Slope Range	15 to 90 mV/decade

Temperature	ALL MODELS
Resolution	0.1 °C / 0.1 °F
Accuracy	±0.3 °C / ±0.5 °F
Calibration	Offset in 0.1 ° increments; Offset range: ± 5 °C / 9 °F

Conductivity	CON 2700, PC 2700 only
Range	0.050 μ S to 500.0 mS
Resolution	0.01 / 0.1 μ S; 0.001 / 0.01 / 0.1mS
Accuracy	\pm 1% full scale
Cal. Points	Automatic (4 points); Maximum 1 per range Manual (5 points); Maximum 1 per range
Cell Constant	0.010 to 10.000
Coefficient (Per $^{\circ}$ C)	Linear & Pure; 0.000 to 10.000%
Normalization	15.0 to 30.0 $^{\circ}$ C / 59.0 to 86.0 $^{\circ}$ F
Compensation	Automatic with supplied cell or Manual
Temp Compensation	0.0 to 100 $^{\circ}$ C / 32.0 to 212.0 $^{\circ}$ F (0.0 to 80 $^{\circ}$ C / 32.0 to 176.0 $^{\circ}$ F with supplied cell)

TDS	CON 2700, PC 2700 only
Range	0.050 ppm to 500 ppt (@ TDS factor 1.00)
Resolution	0.01 / 0.1 ppm; 0.001 / 0.01 / 0.1 ppt
Accuracy	\pm 1% full scale
Cal. Points	Up to 5
TDS factor	0.400 to 1.000

Salinity	CON 2700, PC 2700 only
Range	0 to 80.0 ppt
Resolution	0.01 / 0.1 ppm; 0.001 / 0.01 / 0.1 ppt
Accuracy	\pm 1% full scale

Resistivity	CON 2700, PC 2700 only
Range	2.000 Ω to 20.0 M Ω
Resolution	0.01 / 0.1 Ω ; 0.001 / 0.1 k Ω ; 0.01 M Ω
Accuracy	\pm 1% full scale

Dissolved Oxygen	DO2700
Range	0 to 50.00 mg/L
Resolution	0.01 mg/L
Accuracy	±0.5% full scale
Offset Adjustment	±10.0%
Cal. Points (%)	2 points; 0%, 100%
Cal. Points (conc)	1 point; ± 50% from the factory default value. Minimum reading allowed is 2.00.
Salinity Correction	0 to 50.0 ppt (manual input)
Barometric Pressure Correction	450 to 825 mmHg (automatic with built in sensor); adjustable ±150 mmHg
Temperature	0.0 to 50.0 °C / 32.0 to 122.0 °F

Other	ALL MODELS
Backlight	Yes
Memory	500 data sets
Cal Due Alarm	user selectable from 1-31 days
High / Low Alarms	user selectable, visual & audible
Power	9 V DC adapter, 1.3 A (100 / 240 VAC, SMPS)
Dimensions (mm)	meter only = 175 (L) x 155 (W) x 69 (H)

25. Replacements and Accessories

Item Description	Part number Ordering Code	
	Eutech Instruments	Oakton Instruments
pH 2700 meter with pH electrode (ECFG7370101B), ATC probe (PH5TEMB01P), integral electrode holder, 100/240 VAC adapter & pH electrode refill solution	ECPH270042GS 01X543902	35420-20
pH 2700 meter with integral electrode holder & 100/240 VAC adapter	ECPH270040S 01X543901	35420-22
ION 2700 meter with pH electrode (ECFG7370101B), ATC probe (PH5TEMB01P), integral electrode holder, 100/240 VAC adapter & pH electrode refill solution	ECION27004GS 01X543904	35421-00
ION 2700 meter with integral electrode holder & 100/240 VAC adapter	ECION270040S 01X543903	35421-02
CON 2700 meter with 4-cell conductivity/ATC probe (CONSEN9201D), integral electrode holder & 100/240 VAC adapter	ECCON270043S 01X543905	35412-00
DO 2700 meter with self-stirring dissolved oxygen / BOD / ATC electrode (EC620SSP), RS232C cable & 100/240 VAC adapter	ECDO270042 01X543907	35416-00
PC 2700 meter with pH electrode (ECFG7370101B), conductivity/ATC electrode (01X244730), integral electrode holder, 100/240 VAC adapter & pH electrode refill solution	ECPC270043S 01X543906	35414-00
PC 2700 meter with integral electrode holder & 100/240 VAC adapter	—	35414-20
pH electrode, glass, refillable, double-junction	ECFG7370101B	35805-04
pH electrode, plastic, gel-filled, double-junction, 3 m cable	ECFC7252203B	35816-77
pH electrode, plastic, gel-filled, double-junction, 1 m cable	ECFC7252201B	35641-51
ORP electrode, plastic, platinum, double-junction	ECFC79602R01B	59001-77
Conductivity/ATC electrode, 4-Cell Graphite With Epoxy-Body, Cell Constant K=0.530, 120 x 12 mm	CONSEN9201D 01X244730	35412-10
Conductivity/ATC electrode, 2-cell epoxy/platinum, k = 0.1	—	35608-72
Conductivity/ATC electrode, 2-cell glass/platinum, k = 1.0	—	35608-76
Conductivity/ATC electrode, 2-cell Ultem/stainless steel, k = 1.0	CONSEN9501D 01X466601	35608-74
Conductivity/ATC electrode, 2-cell epoxy/platinum, k = 10.0	—	35608-78
ATC Probe, Stainless Steel, 117 x 3 mm	PH5TEMB01P 01X210303	35613-13
Dissolved Oxygen/BOD/ATC self-stirring electrode	EC620SSP 01X295704	35420-82
pH 1.68 buffer solution, 480 mL bottle	ECBU1BT	00654-01
pH 4.01 buffer solution, 480 mL bottle	ECBU4BT	00654-00

pH 6.86 buffer solution, 480 mL bottle	ECBU686BT	00654-03
pH 7.00 buffer solution, 480 mL bottle	ECBU7BT	00654-04
pH 9.18 buffer solution, 480 mL bottle	ECBU918BT	00654-07
pH 10.01 buffer solution, 480 mL bottle	ECBU10BT	00654-08
pH 12.45 buffer solution, 480 mL bottle	ECBU12BT	00654-12
pH 4.01, 7.00, & 10.01 buffer solution pack, 480 mL bottles	—	05942-10
Zero oxygen solution (500 mL)	—	00653-00
pH electrode storage solution	ECRE005	00653-04
Double-junction pH electrode refilling solution, saturated KCl	01X211297 60 mL	35803-74 125 mL
10 μ S, (20) x 20 mL sachets	ECCON10BS	35653-09
84 μ S, 480 mL bottle*	ECCON84BT	00653-16
447 μ S, 480 mL bottle	ECCON447BS	00653-47
500 μ S, 480 mL bottle	ECCON500BT	—
1413 μ S, 480 mL bottle*	ECCON1413BT	00653-18
1413 μ S, (20) x 20mL sachets*	ECCON1413BS	35653-11
2764 μ S, 480 mL bottle	ECCON2764BT	00653-20
2764 μ S, (20) x 20mL sachets	ECCON2764BS	35653-12
5.0 mS, 480 mL bottle	ECCON5000BT	—
12.88 mS, 480 mL bottle*	ECCON1288BT	00606-10
15 mS, (20) x 20mL sachets	ECCON15000BS	35653-13
111.8 mS, 480 mL bottle*	ECCON1118BT	—
100/240 VAC, SMPS, 9V, 6W power adapter, USA/UK/EUR Plug	60X426401	35420-72
RS232 cable for connecting 2700 meter to PC or printer, phono plug to RS232 9-pin (F), 1.5 m cable	30X427301	35420-01
Electrode arm and bracket	01X321801	35420-54
Thermal printer. Includes 100-240 VAC power supply with plug adapters for UK, US, EU, and Australia. 01X594101 cable & roll of paper included	01X594301	35420-50
Replacement paper for thermal printer, 2 rolls	01X594401	35420-51
DO electrode maintenance kit; includes (6) membrane caps, polishing disk and electrolyte	EC637DOM	—
RS232 to USB adapter cable; use with 30X427301 / 35420-01 cable to connect 2700 to USB port of your computer	30X544601	22050-58

**Automatic Calibration Standard Value at 25 °C*

26. Warranty

This meter is supplied with a warranty against significant deviations in material and workmanship for a period of THREE years from date of purchase whereas probe with a SIX month warranty.

If repair or adjustment is necessary and has not been the result of abuse or misuse within the designated period, please return – freight prepaid – and correction will be made without charge. Eutech Instruments/Oakton Instruments will determine if the product problem is due to deviations or customer misuse.

Out of warranty products will be repaired on a charged basis.

The warranty on your instrument shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer
- Unauthorized modification or misuse
- Operation outside of the environment specifications of the products

27. Return of Items

Authorization must be obtained from our Customer Service Department or authorized distributor before returning items for any reason. A “Return Material Authorization” (RMA) form is available through our authorized distributor. Please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Eutech Instruments will not be responsible for damage resulting from careless or insufficient packing. A restocking charge will be made on all unauthorized returns.

NOTE: Eutech Instruments Pte Ltd /Oakton Instruments reserve the right to make improvements in design, construction, and appearance of products without notice.

