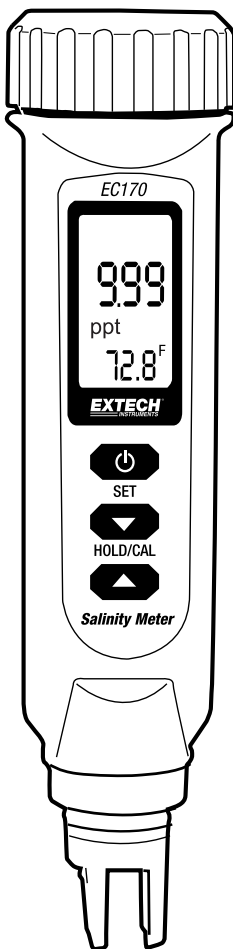# Salinity Meter

Pen Style Water Quality Meter

Model EC170

Introduction

Congratulations on your purchase of the Extech Pen Style Water Quality instrument; the Model EC170 measures Salinity and temperature. The instrument is housed in an IP65 Water-proof enclosure for safety. This meter is shipped fully tested and calibrated and, with proper use, will provide years of reliable service. Please visit our website (www.extech.com) to check for the latest version of this User Guide, Product Updates, and Customer Support.

Features

- IP65 Waterproof housing

- Automatic Ranging and Manual Ranging capability

- Dual Display with ATC (automatic temperature compensation)

- Data hold for freezing displayed readings

- Low battery indicator

- Automatic power-off for maximum battery efficiency

- Switchable temperature units of measure (^{o}C/^{o}F)

- Multi-point and one-touch calibration features

- Pocket sized, powered by four (4) LR44 batteries

Supplied Materials

- EC170 meter

- Four (4) LR44 button batteries

- Operation manual (hard copy, mini-disk, and on-line availability at www.extech.com)

Battery Installation

The meter is shipped with the four (4) LR44 button batteries removed. The user must install the batteries before the meter can be used. Refer to accompanying diagram.

1. Unscrew the battery compartment cover (top of meter) in a counter-clockwise direction. Please do not discard the black washer.

2. Install the four (4) LR44 button batteries, carefully orienting the batteries and observing polarity.

3. Replace the battery compartment cover.

4. Please remove the batteries while the meter is not in use for long periods.
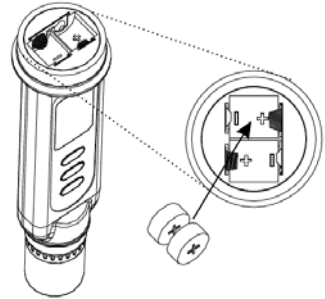
Never dispose of used batteries or rechargeable batteries in household waste. As consumers, users are legally required to take used batteries to appropriate collection sites, the retail store where the batteries were purchased, or wherever batteries are sold.

Disposal: Do not dispose of this instrument in household waste. The user is obligated to take end-of-life devices to a designated collection point for the disposal of electrical and electronic equipment.

Other Battery Safety Reminders
a. Never dispose of batteries in a fire. Batteries may explode or leak.
b. Never mix battery types. Always install new batteries of the same type.
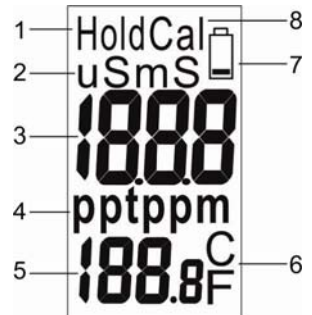
Meter Description

1. Battery Compartment
2. Display
3. Keypad
4. Electrode
5. Electrode protective cap
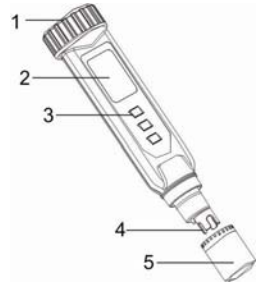
Display Description

1. Data Hold icon
2. Micro- and milli-Siemens units (unused in this meter)
3. Primary measurement reading
4. Parts per thousand salinity units (ppm parts per million are not used in this meter)
5. Temperature reading
6. Temperature units of measure
7. Battery strength indicator
8. Calibration icon

Keypad Description

1. Power ON-OFF and SET button
2. Down Arrow, Data Hold, and Calibration button
3. Up arrow button
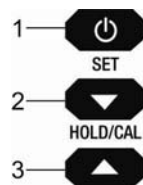
Operation

Getting Started

1. Remove the probe's protective cap (bottom of meter) by pulling the cap firmly downward, away from meter, until it snaps off (see diagram).
2. Press the power button ⏻ to power ON the meter. The meter display will cycle through several icons (representing the current configuration of the meter) before settling on the main display as shown in the display description above.
3. Press the power button momentarily to power OFF the meter.
4. This meter is powered by four (4) LR44 buttons batteries. If the meter will not switch ON please check that fresh batteries are installed.

Automatic and Manual Ranging

There are two ranges available Range 1 (0.00 to 10.00 ppt) and Range 2 (10.1 to 70.0 ppt). The meter defaults to the AUTO Range mode where one of these two ranges is selected automatically to provide the best resolution and accuracy for each given measurement. However, MANUAL Range mode can also be used where range 1 and range 2 can be selected manually.

5. Press and hold the ▲ UP arrow button, the number 1 (range 1) will appear on the lower right of the LCD and 'ran' (range) will appear at the center of the LCD.
6. Release the button and the meter will be forced into range 1.
7. Press and hold the UP arrow button again, the number 2 (range 2) will appear on the lower right of the LCD and 'ran' (range) will appear at the center of the LCD.
8. Release the button and the meter will be forced into range 2.
9. Press and hold the UP arrow button again, 'ATo' will appear on the lower LCD area indicating that the meter is once again in the AUTO Range mode.
10. Release the button to end the range setting session or return to step 1 to repeat this process.

Measurement Preparations, Notes, and Considerations

- Accuracy is given as % full-scale; therefore using the lowest range will yield the best accuracy.
- The meter's display will indicate E02 or E03 if the measured value is below (E02) or above (E03) specified limits of the meter. If this occurs, please select another range as described in the Manual Range discussion in previous paragraph.
- The temperature coefficient is fixed and cannot be adjusted.
- The normalization (reference) temperature is fixed (25°C); the nominal value is correct for most applications.
- Rinse the probe with deionized or distilled water before use to remove impurities that may adhere to the electrode. When the meter has been idle for a long period, soak the electrode for at least 30 minutes before use.
- When dipping the probe into a sample solution, be sure to eliminate air bubbles trapped in the probe's slot. To remove air bubbles, give the probe a gentle stir while submerged in the solution.
- When taking a measurement, stir the probe gently in the sample to create a homogenous sample. Allow a few seconds to elapse for the probe and the sample to reach temperature equilibrium. Ideally, wait 15 minutes to achieve maximum accuracy and best temperature compensation.
- The unit of measure icon will flash on the meter's display while stabilization is taking place in measurement mode. When stabilization is achieved, the meter's icon will stop flashing.
- Press the HOLD button to freeze a displayed reading. Press again to release the display.

Salinity Measurement

1. Read the Measurement Preparation section above before continuing.
2. Insert the electrode into the sample ensuring that the electrodes are completely submersed.
3. Slowly stir the solution with the electrode to remove air bubbles.
4. The meter uses the Auto-range utility to find the proper range and then displays the salinity reading at the center of the LCD with the temperature reading shown on the lower LCD area in smaller digits.

Finishing a Measurement Session

After a measurement session:
- Rinse the electrode in deionized or distilled water and store dry.
- Affix the protective cap over the electrode when storing.
- If the unit is to be left un-unused for long periods, remove and store the batteries separately.

Automatic Power OFF (Sleep mode)

The meter will automatically switch OFF after 20 minutes of inactivity. To disable the Sleep Mode: With the instrument switched off, press and hold the SET and HLD/CAL buttons simultaneously until the 'n' icon appears on the display. Release the buttons and the meter will power up. The meter will now stay switched ON until the user manually switches it OFF. The meter reverts to the 'Sleep Mode active' state each time it is powered down.

Setup Mode

Parameter P1: Temperature Units

1. From the normal operating mode, press and hold the SET button for at least 2 seconds until the '**Px**' icon appears on the bottom of the LCD display (x = setup parameter number).
2. Use the arrow buttons to scroll to the P1.0 icon if necessary.
3. Press the SET button momentarily, the '**C**' or '**F**' icon should now be flashing and the '**t.ut**' icon (abbreviation for temperature units) will be visible above the flashing unit.
4. Use the arrow keys to select the desired unit of measure.
5. Press the SET button momentarily to confirm the selection.
6. The display returns to the P1.0 screen.
7. Press the up arrow button to scroll to the next parameter P3.0 with '**rSt**' displayed (factory default reset mode) and follow the steps in the next section.

Parameter P3: Factory Default Reset

This parameter can be used to restore all settings to their factory default state.

1. If continuing from Parameter P1 skip directly to step 2 below. If starting from the normal operating mode, press and hold the SET button for at least 2 seconds until the '**Px**' icon appears on the meter display (x = setup parameter number) and then use the arrow buttons to scroll to the P3 icon. The '**rSt**' display icon will be visible above the P3 icon.
2. At the P3.0 'rSt' screen press the SET button momentarily; a '**y**' or an '**n**' will be flashing.
3. Use the arrow buttons to select '**y**' for YES RESET or '**n**' for NO RESET.
4. Press the SET button momentarily to confirm the setting.
5. Press and hold the SET button for at least 2 seconds to return to the normal operation mode or press the up arrow button momentarily to move to Parameter P4 (see below).

Parameter P4: Calibration Review for Range 1 and Range 2 Concentrations

1. If continuing from Parameter P3 skip directly to step 2 below. If starting from the normal operating mode, press and hold the SET button for at least 2 seconds until the '**Px**' icon appears on the meter display (x = setup parameter number) and then continue step 2 below.
2. Use the arrow buttons to scroll to the P4.0 icon if necessary. The '**CAL**' display icon will be visible above the P4.0 icon.
3. Press the SET button momentarily to view the current Range 1 Calibration Concentration. The P4.0 icon will change to P4.1. If dashes (- - -) appear on the display this indicates that the meter has not been calibrated thus far.
4. Press the up arrow button to move to the P4.2 display. The displayed value now represents the Range 2 Calibration Concentration. Again, if dashed lines appear, then the meter has not been calibrated up to this point.
5. Press and hold the SET button for at least 2 seconds to return to the P4.0 '**CAL**' screen.
6. Use the arrow keys to select another parameter or press and hold the SET button for at least 2 seconds to return to the normal operation mode.

Calibration

Calibration Preparation and Considerations

The user must first determine:

1. The best calibration schedule for the application at hand.
2. What calibration standard to use.

Calibration Schedule

*   Calibration is necessary and should be performed regularly.
*   If measuring in the mid-ranges calibrate the meter at least once per month and soak the probe deionized or for 15 minutes before each use.
*   If measuring in extreme temperature environments, or at the low end of the measurement range, calibrate the meter at least once per week.

Selecting a Calibration Standard

For best results select a calibration standard closest to the expected sample value. Alternatively, use a calibration solution value that is approximately 2/3 of the expected full scale measurement range. Remember not to re-use calibration solutions; contaminants in the solution will affect the calibration and the accuracy.

Salinity Calibration Procedure

1. Insert the probe into deionized or distilled water for approximately 30 minutes to rinse the probe.
2. Select the Sodium Chloride standard that is closest to the expected measurement range.
3. Fill two separate and clean sample cups with the standardizing solution to a depth of at least 3 cm (1.2") each.
4. Switch the meter ON.
5. Rinse the probe in one of the sample cup solutions, gently stirring the probe. Rinsing could remove contaminants that could affect calibration and cause measurement errors.
6. Dip the rinsed probe into the other sample cup solution. Tap or move the electrode in the sample to dislodge air bubbles. Let the probe stabilize to the solution temperature.
7. Press and hold the **HOLD/CAL** button (approximately 2 seconds) until the salinity value and the '**CAL**' icon begin flashing on the LCD.
8. Use the arrow buttons to adjust the displayed value to match the value of the standard solution. The Salinity reading can be adjusted ±30% from the detected value. Values differing more than ±30% from the detected value indicates that the electrode needs to be cleaned.
9. When the CAL icon stops flashing, press the SET button momentarily to confirm the value. The meter will then return to the normal measurement mode.
10. Note that in cases where the Salinity reading is outside the ±30% window, the meter display may freeze and not allow the user to return to the normal operating mode. In this case, remove one of the batteries to switch the meter OFF and do not use the meter again until the electrode has been cleaned or replaced.

Maintenance

- **Keep the meter's measurement electrode clean**. Between measurements, rinse the electrode with deionized or distilled water. If the electrode has been exposed to a solvent immiscible in water, clean it with a solvent miscible in water, e.g. Ethanol, and then rinse carefully with water.
- **Store the electrode carefully.** Before storing, rinse carefully in deionized or distilled water and store dry.

Troubleshooting

Power ON is attempted but there is no display

- Be sure to press the ON-OFF button for at least 100mS to switch the meter ON.
- Check that batteries are positioned correctly, making good contact, and correct polarity.
- Replace the batteries if necessary.
- Remove and replace the existing batteries.

Display switches OFF

- This is normal when Auto Power OFF is activated.
- Replace the batteries if necessary.

Air Bubbles adhered to Electrode

- Stir the electrode completely and be sure to dip the electrode into a solution at an oblique angle. Vertical dipping can cause many air bubbles to adhere.
- Gently tap the bottom of the solution container while stirring the electrode in the solution.
- Air can be blown across the electrode before dipping it into the solution.

Error Codes

- Refer to the Table below for details on Error Codes displayed by the meter.

Code	Description	Suggestions
SALINITY ERRORS		
-----	Measurement outside of range	In Manual Range mode, press and hold the up arrow for 2 seconds to change range or use the Auto Range mode
E03	Salinity is over-range	Check against a standard buffer solution. If problem persists, repair meter
E04	Temperature error	Repair meter
TEMPERATURE ERRORS		
E01	Temperature circuit damaged	Repair meter
E02	Temperature value is below allowable range or Temperature circuit damage	Check again at room temperature. If error persists, repair meter
E03	Temperature value is above allowable range or Temperature circuit damage	Check again at room temperature. If error persists, repair meter

Factory Default Settings

Type	Parameter	Default	Notes
P1.0	Select °C/°F	°C	Temperature units
P3.0	Revert to Factory Default settings	NO	Select YES to revert to default settings
P4.1	Review previous Calibration data	-----	Calibration Data for Range 1
P4.2		-----	Calibration Data for Range 2

Specifications

Measurement ranges	Range 1:	0.00 to 10.00 ppt Salinity
	Range 2:	10.1 to 70.0 ppt Salinity
	ppt = parts per thousand	1ppt = 1 g/L

Salinity Accuracy	Range 1:	1% Full Scale ±1digit or 2% Full Scale
	Range 2:	±1digit
Salinity Resolution	Range 1:	0.01ppt
	Range 2:	0.1ppt

Temperature Accuracy	±0.5°C (0.9°F)
Temperature Resolution	0.1°C/°F

TDS Factor	Built-in NaCl conductivity to TDS conversion factor
Calibration	One point calibration per range
Auto Power OFF	After 20 minutes of inactivity
Data Hold	Freezes displayed reading
Automatic Temperature Compensation (ATC): 0 to 50°C (32 to 122°F)	
Waterproof	IP65 rated
Temperature Coefficient	Built-in NaCl temperature coefficient
Operating Conditions	Temperature: 0 to 50°C (32 to 122°F); <80%RH
Storage Conditions	Temperature: 0 to 60°C (32 to 140°F); <90%RH
Normalization Temperature	Fixed at 25°C (77°F)
Basic status indicators	Out-of-range (----) and low battery
Power Supply	Four (4) LR44 'button' batteries
Dimensions	Meter: 165 x 35 x 32mm (6.5 x 1.4 x 1.3")
	LCD: 30 x 18mm (1.2 x 0.7")
Weight	115g (4 oz.)