EXTECH®

USER MANUAL

6–in–1 Water Quality Meter with 3 Probes

MODEL EC700

1 Introduction

Thank you for selecting the Extech EC700 6–in-1 Water Quality Meter. The EC700 measures pH, EC (Conductivity), TDS (Total Dissolved Solids), Salinity, DO (Dissolved Oxygen), and Temperature.

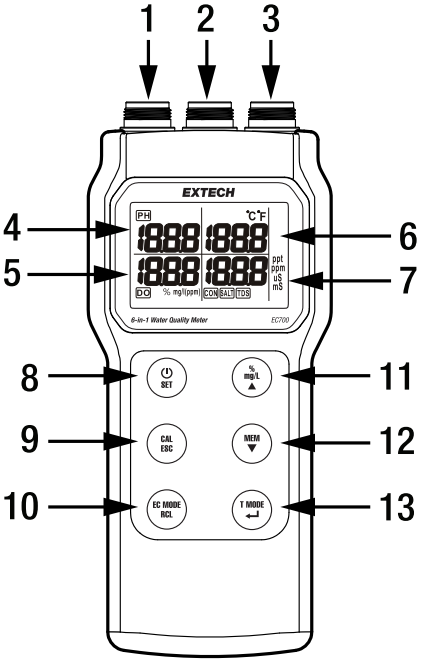
The EC700 is easy to operate and offers a large LCD for displaying multiple readings simultaneously. Optical DO probe offers reduced maintenance, zero oxygen consumption, low drift, no minimum inflow, and does not require a polarization voltage.

Other features are listed below:

- Optical DO probe measures DO in luminescent and fluorometric environments.
- Compensation for temperature, pressure, and salinity.
- Temperature units selection.
- Multiple point calibration.
- Rugged and waterproof (IP 67 rated).
- Storage for 99 readings. Easy recall for trend analysis.
- Auto Power OFF (APO) after one hour.
- Includes pH probe with buffers, conductivity probe and buffer, DO probe, protective probe caps, cable organizer clips, batteries, and carrying case.

2 Product Description

2.1 Meter



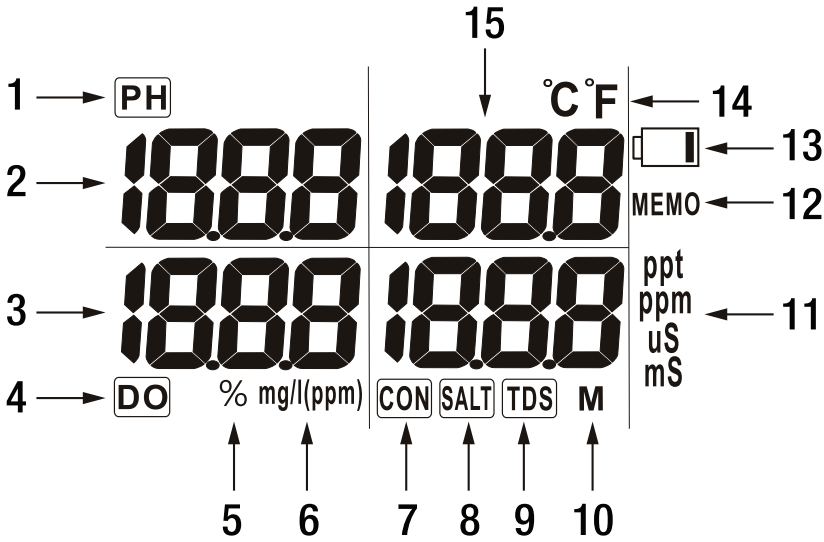
1. pH probe connection
2. Conductivity (EC) probe connection
3. Dissolved Oxygen (DO) probe connection
4. pH measurement reading
5. Dissolved oxygen measurement reading
6. Temperature measurement reading
7. Conductivity, Salinity, or TDS reading
8. Power and SET (setup) button (see Control Buttons section, below)
9. CAL (calibration) and ESC (escape) button
10. EC MODE and RCL (recall memory) button
11. Units selection and UP navigation button
12. MEM (memory) and DOWN navigation button
13. T Mode (temperature mode) and ↵ (confirm) button

NOTE: Battery compartment on back of meter.

2.2 Control Buttons

	Power button: Short press to switch meter ON or OFF SET: Long press in normal mode to access the SETUP mode
	CAL: Long press to toggle ‘normal’ and ‘calibration’ modes ESC: Press to return to normal mode from the calibration, setup, or recall mode
	EC MODE: Press to select Conductivity (µS/mS), Salinity (ppt), or TDS (ppm/ppt) mode RCL: Long press to recall stored readings
	% mg/L: Press to toggle DO % and DO mg/L (ppm) units Up arrow: Press to increase a setting value in SETUP mode
	MEM: Press to save current reading to memory Down arrow: Press to decrease a setting value in SETUP mode
	T MODE: Press to select the probe whose temperature will be displayed ↵: In the setup mode, press to prepare a setting for adjustment and then press to confirm the setting after adjustment.

2.3 Display



1. pH probe active
2. pH reading
3. DO reading
4. DO probe active
5. DO % units
6. DO mg/l (ppm) units
7. Conductivity probe active
8. Salinity mode selected
9. TDS mode selected
10. Appears when a reading is compensated
11. Conductivity/Salinity/TDS units of measure
12. Appears when stored readings are recalled
13. Low battery icon
14. Temperature units
15. Temperature measurement display

3 Quick Start

3.1 STEP 1: Inspect the Probes

- Inspect the pH probe. The probe glass should be intact and moist, and the junction fibre should be clean.
- Inspect the conductivity (EC) probe. The probe should be intact and dry.
- Inspect the DO probe. The probe sensing surface should be free of scratches.

3.2 STEP 2: Connect the Probes

- Ensure that all probe plugs and meter sockets are clean, and that all pins are straight.
- Connect the probes firmly to the meter, observing the keyed alignment guides. Once inserted, turn the probe plug to lock the probe in place.

3.3 STEP 3: Power the Meter

- Install four (4) AAA batteries in the rear compartment.
- Press the power button to switch ON the meter.

4 Meter Power

The meter is powered by four (4) AAA batteries, installed in the rear compartment. Connect the probes to the meter before powering. Short press the power button to switch the meter ON or OFF. If the low battery icon appears, replace the batteries as explained in the Maintenance section.

The meter automatically powers down after one hour of inactivity.

5 Operation

5.1 Dissolved Oxygen DO Probe Preparation

1. Before first use and after storage, hydrate the DO sensing surface for two hours by filling the distilled water reservoir.
2. Squeeze out excess water from the sponge so that it remains moist but does not drip.
3. Ensure that the probe surface is dry. Moisture on the probe surface will affect accuracy.
4. Affix the probe storage cap and let the probe stand vertically on a level surface.
5. With the meter OFF, wait for at least one hour to create a 100% water vapor-saturated condition between the sponge and sensing surface. If the meter is ON, there is the risk of heat interference.
6. After one hour, power the meter. Wait one minute and check that the DO reading is between 95.0 and 105.0%.

5.2 pH and Conductivity (EC) Probes Preparation

1. If the pH electrode is dehydrated, soak it for at least four hours in a KCl solution before taking readings.
2. If the EC probe has been stored for a while, soak it in clean water for at least 30 minutes before use.
3. Calibrate the pH and EC probes, as instructed in Section 8.

5.3 Additional Probe Considerations

⚠ **CAUTION**
Use probes in aqueous solutions only. DO NOT place the probes in viscous, organic liquids, such as heavy oils, glycerin (glycerol), ethylene glycol, or alcohols. DO NOT place probes in acetone or nonpolar solvents, such as pentane or hexane.

- If salt or mineral deposits are observed on a probe, rinse with distilled or deionized water. Keep the sensing surface clean and free of scratches.
- Place the protective cap on the probes to protect the sensing surface.
- When a probe is placed in a new environment, allow 5 minutes for the probe to stabilize to the new ambient conditions.
- Stir solutions for 60 seconds before noting the reading, and ensure that the probe is covered by at least 2 in. (5 cm) of solution.

5.4 Connecting Probes to the Meter

The probe sockets on the meter are keyed so that probes can only be inserted in one orientation. Use care when plugging probes into the meter, do not force the probe if resistance is detected. Ensure that the keys on the probe and meter are aligned before applying pressure.

After a probe is connected, rotate the probe plug to lock the connection.

5.5 Switching DO Modes

In the normal or recall modes, press the **% mg/L** button to toggle between DO concentration (mg/L) and DO saturation (%).

5.6 Selecting TDS and Salinity Modes

From the EC mode, press the **EC/MODE** button to switch to the TDS or Salinity mode (as indicated by the display symbols).

This device features an automatic seawater compensation function, no manual adjustment is required. For any other solution, set the TDS conversion factor, manually, in the Setup mode (parameter P.50). When a reading is compensated, the display shows the **M** icon.

If air bubbles adhere to the EC probe, remove them by gently immersing and withdrawing the probe from the water several times.

5.7 Changing the Temperature Display Mode

The temperature display column shows the temperature measured by the probe whose icon is blinking. For example, when the DO icon is blinking, the temperature reading represents the temperature measured by the DO probe.

To select a probe whose temperature will be displayed, press the **T MODE** button from the normal mode, and stop when the blinking icon represents the desired probe.

6 Storing and Recalling Readings

In the normal mode, press the **MEM** button to store the current reading. Up to 99 readings can be stored. When a reading is stored, the display will flash **MEMO** and the memory location number will appear in the upper right corner of the display.

When the memory is full, the display will show **FUL** when you attempt to store a reading. Clear all readings in the Setup mode.

To recall readings from the normal mode, long press the **RCL** button, the display icon **MEMO** will flash. Use the up and down arrow buttons to scroll through the stored readings.

Note that DO units cannot be changed while in the recall mode.

Short press the **ESC** button to exit the recall mode.

7 Setup Mode

The Setup mode offers a variety of configuration, verification, and functional parameters as listed in the table, below.

- Long press the **SET** button from the normal mode, to access the setup mode.
- Use the up and down arrow buttons to step through the setup parameters.
- Press ↵ to prepare a parameter for editing.
- Use the up and down arrow buttons to adjust settings.
- To save an entry, press the ↵ button.
- To exit the menu, press the **ESC** button.

Table 7.1 Setup mode parameters

Parameter	Description	Options and adjustment ranges
P. 10 (Clr)	Clear memory	YES/NO
P. 20 (ELE)	pH probe slope	For review only
P. 30 (CAL)	EC calibration check	For review only
P. 40 (CEL)	Cell constant	For review only
P. 50 (tdF)	TDS factor	0.30 to 1.00 (default 0.5)
P. 60 (COE)	DO compensation	0.0 to 42 ppt (When a reading is compensated, the display shows the **M** icon).
P. 62	Salinity setting	0.0 to 42 ppt
P. 63	Altitude setting	0 to 3500 meters
P. 70 (unt)	Temperature units	℃/℉ (default ℃)
P. 80 (rSt)	Factory default reset	n/a

NOTE: Parameters P. 62 and P. 63 are accessible only when editing parameter P. 60.

8 Calibration

8.1 Dissolved Oxygen (DO) Calibration

Calibrate the probe after a chemical cleaning or if a quick check in air shows readings outside the range of 105.0 to 95.0%. A monthly accuracy check is recommended.

Two calibrations are explained below, 100% and 0% calibrations.

8.1.1 100% DO Verification and Calibration

8.1.1.1 100% DO Calibration in Water Vapor-Saturated Air

Keep the probe dry; drops of water on the probe membrane can affect accuracy. The air pressure and temperature must remain constant during the calibration. Perform the calibration away from wind and direct sunlight.

1. Completely saturate the sponge with distilled water but squeeze out excess water so there is no dripping.
2. Keep the probe surface dry and stand the probe on a level surface.
3. Switch OFF the meter (to minimize heat interference) and wait for one hour to create a 100% water vapor-saturated condition between the sponge and sensing surface.
4. After one hour, power the meter. Wait one minute and check that the DO reading is between 95.0 to 105.0%.
5. If the reading is out of range, continue with this 100% water-saturated air calibration. If the reading is more than 10% out of range, perform both a 0% and 100% calibration.
6. Use the **T MODE** ↵ button to select the DO mode.
7. Long press the **CAL** button to start the calibration.
8. Use the up/down arrow buttons to select 100% or 0% and then press ↵.
9. Select **YES** or **NO** and then press ↵ to continue, or press **ESC** to abort the calibration. If **YES** is selected, the meter will perform a 400 second calibration and then automatically return to the normal mode.

8.1.2 0% DO Calibration in Water Vapor-Saturated Air

IMPORTANT! Since the probe can be damaged by harsh chemicals, the probe must not stay in contact with a sodium sulfite zero oxygen solution for more than one hour.

This calibration is only necessary for applications where high accuracy is required at low DO levels (< 1 ppm).

Always perform a 100% water-saturated air calibration before performing a zero oxygen calibration.

1. Prepare a sodium sulfite solution by dissolving approximately 10 g of NA_2-SO_3 in approximately 10 ml of distilled water. Transfer the solution to a BOD bottle or flask.
   NOTE: A small amount of cobalt salt can be added to the solution. This will cause the solution to change color when it no longer has a zero oxygen content.
2. Immerse the probe in a water-sulfite solution, to determine the zero point (0% saturation). Stir the probe in the solution to quickly decrease oxygen saturation.
3. Add a stir bar to the bottle or flask and immerse the probe into the bottle or flask. Seal the bottle or flask for the best results.
4. Place the bottle or flask on a magnetic stir plate and gently stir the solution.
5. Wait at least 5 minutes for the probe to come to equilibrium.
6. If the measured value is > 5.0%, execute steps 6 through 9 in Section 8.1.1.1 for the zero point calibration and then continue with the steps below.
7. Thoroughly rinse the probe with clean water and blot dry with a lint-free cloth.
8. If the probe responds slowly or yields inaccurate readings after the calibration, there may be residual solution on the probe. A thorough thirty-minute soaking and rinsing with distilled water may be required.

8.2 pH Probe Calibration

Perform a calibration monthly, and use the specific calibration buffer that best matches the pH of the liquid to be measured.

With the protective cap removed, rinse the probe in distilled water.

1. Power the meter.
2. Pour the pH buffer into a clean container and place the electrode in the buffer solution. We recommend starting with a pH buffer of 7.01.
3. Ensure that the electrode is completely immersed in the buffer and stir for one minute to create a homogenous solution free of bubbles.
4. Press the **T MODE** ↵ button to select the pH mode.
5. Long press the **CAL** button to start the calibration.
6. When the meter recognizes the buffer value, the **CAL** icon will flash on the display.
7. If the flashing value does not match the buffer solution value, use the up/down arrow buttons to adjust. The adjustable range is 3.5 to 4.5, 6.5 to 7.5, and 9.5 to 10.5.
8. Wait 30 seconds for the meter to automatically display the **SA** icon. Alternatively, press the ↵ button to show the **SA** icon immediately.
9. Repeat steps 1 through 8 for 4.01 and 10.01 calibrations.
10. Always clean the calibration materials with clean water before immersing into a new buffer solution.
11. Affix the protective cap when finished and before storage, ensuring that there is sufficient buffer in the cap.

8.3 Conductivity (EC) Probe Calibration

For applications where measurements are typically < 100 µS or in extreme temperatures, calibrate once per week. For mid-range measurements, calibrate monthly. Clean the electrode with a soft brush before immersing in a buffer solution. The protective cap does not need to be removed before calibration.

An EC buffer can be used to calibrate Conductivity, TDS, or Salinity. Select a standard buffer that best matches the conductivity of the liquid to be measured. Typically, calibrate at 2/3 the full range. See the table below for reference. Always use a fresh solution when calibrating.

Table 8.1 Selecting the appropriate buffer

Measurement range	Suggested buffer	Typical commercial buffers
0 to 199.9 µS	60.0 to 170.0 µS	84 µS
0 to 1999 µS	600 to 1700 µS	1413 µS
0 to 19.99 mS	6.00 to 17.00 mS	12.88 mS
0 to 150.0 mS	60.0 to 128.0 mS	111.8 mS

EC probes require only a single-point calibration. The previous calibration data will be replaced after re-calibration. For example, if the meter was calibrated using a 1413 µS solution (in the 0 to 1999 µS range), the previous 1413 µS calibration data will be replaced. However, the meter will retain the calibration for the other ranges, which have not been re-calibrated.

1. Place the probe in demineralized or distilled water for 30 minutes.
2. Select the appropriate calibration solution.
3. Pour the solution into a clean container.
4. Power the meter and press the **T MODE** ↵ button to select the EC mode.
5. Dip the probe into the buffer solution and stir for five minutes and then tap the probe to remove air bubbles in the sensing area.
6. Long press the **CAL** button to enter the calibration mode. The conductivity value will be automatically detected and the value will flash on the display. Use the arrow buttons to adjust the displayed value, if necessary, to match the solution value.
7. Press the ↵ button, the **SA** icon will appear. The display will stop flashing and the meter will automatically switch to the normal mode when the calibration has completed. To quit, without saving the calibration data, press the **ESC** button.

8. Repeat steps 1 through 7 to calibrate other ranges.
9. Always rinse the probe with clean water when switching to a new buffer solution.

9 Maintenance

9.1 Battery Replacement

The meter is powered by four (4) AAA batteries, installed in the rear compartment. If the low battery icon appears, or if the meter does not switch ON, replace the batteries.

1. Remove the rear battery compartment screw.
2. Remove the compartment cover.
3. Remove the used batteries and replace with new batteries of the same type, observing correct polarity.
4. Replace the compartment cover and secure with the compartment screw.
5. Dispose of the batteries responsibility and in accordance with all applicable regulations.


Do not dispose of used batteries or rechargeable batteries in household waste.

9.2 Probe Care

⚠ **CAUTION**
Use probes in aqueous solutions only.
DO NOT place the probes in viscous, organic liquids, such as heavy oils, glycerin (glycerol), ethylene glycol, or alcohols.
DO NOT place probes in acetone or nonpolar solvents, such as pentane or hexane.

9.2.1 DO (Dissolved Oxygen) Probe Care

- **Do not twist the sensing tip**. The fluorometric DO sensing tip is not replaceable.
- **Avoid touching the sensing tip surface (black)**. Dirt or scratches will affect accuracy.
- **Hydrate before use**. The probe is shipped moist but can become dry over time. Hydrate the sensing tip by soaking in clean distilled water for two hours.
- **Calibration**. The DO probe is factory calibrated and only requires calibration after a chemical cleaning, or if inaccurate readings are observed.
- **Keep the probe clean** (especially around the optical sensing surface). Parafilm on the sensing surface can cause measurement errors.
- **Rinse before storing** and place a moist sponge in the storage tube.

- **Interfering substances**. See list below.

Table 9.1 Interfering substances

Alcohol > 5%
Hydrogen peroxide (H_2O_2) > 3%
Sodium hypochlorite or commercial bleach (NaClO) > 3%
Gaseous sulfur dioxide (SO_2) and gaseous chlorine (Cl_2)
Cross sensitivity with organic solvents, such as acetone, toluene, chloroform, methylene chloride, and chlorine gas.
No cross sensitivity with CO_2, H_2S, SO_2, ammonia (NH_3), pH, or any ionic species such as sulfide (S_2), sulfate (SO_4), chloride (Cl), and hydrogen sulfide (HS).

9.2.2 EC (Conductivity) Probe Care

- Rinse with distilled water after each use and clean with a mild detergent, if necessary.
- Store dry.
- Calibrate regularly with standard solutions.
- Prevent residue buildup and check for damage after each use.

9.2.3 pH Probe Care

- Always store with a buffer moistened sponge over the probe's glass bulb. DO NOT use distilled water for storage.
- Rinse the electrode with distilled water before use.
- Do not touch or rub the glass bulb.
- Rinse with distilled water after each use and clean with a mild detergent, if necessary.
- Calibrate often with standard solutions.
- Prevent residue buildup and check for damage after each use.

9.3 Troubleshooting

When troubleshooting, isolate the system components, checking each in turn. The components include the meter, probes, and buffer solutions. Water ingress and measurement techniques should also be considered.

- Meter. The meter is the easiest component to eliminate as a possible cause of error. If the meter responds abnormally, check that the batteries are fresh. Service the meter if abnormal behavior continues.

- Probe. If thorough cleaning and rinsing does not solve an issue, and if there are no scratches or discoloration on the sensing surface, replace the probe.
- If a probe works properly in a standard solution but not in a sample, check for interference or substances in the sample that could damage or alter the probe response. Refer to the table below for a list of chemicals that could damage the probes.
- Water ingress. The IP67 rating allows you to operate the meter and clean the probes without worry, but the probes are not designed to operate under water, even though they can be submerged in an aquatic environment for brief periods.
- Measurement techniques. The behavior of the meter and the probes can be unpredictable or abnormal if the published instructions are not followed carefully.

Problem	Recommendation
Unable to calibrate a probe	• Ensure that the calibration steps are carefully followed. • Ensure no water droplets on the surface of the DO probe when performing a 100% water vapor-saturated air check. • Thoroughly clean and rinse probe and try again. Soak the probe if necessary.
DO measurements are unstable	• Allow the probe to achieve equilibrium, especially if the liquid is not at room temperature or if the temperature is fluctuating. • Clean and rinse the DO probe. • An interfering substance may be present in the sample.
DO measurement is low	• Salt may be present. Set the salinity factor as instructed earlier. • Clean and rinse the DO probe. • There may be residual sodium sulfite on the probe. Thoroughly soak and rinse the probe in distilled water.
Incorrect temperature reading	• Ensure that the probe is immersed to at least 2 in. (5 cm) in the sample.

Ineffective zero point DO calibration appears	• DO probe must be in an oxygen free solution for at least 5 minutes. • Ensure that the bottle or flask is sealed with the probe using Parafilm.
Inaccurate readings after zero point DO calibration	• Soak the DO probe in distilled water for 30 minutes. Use a wash bottle to thoroughly rinse the probe with distilled water, and then soak for another 30 minutes in fresh distilled water.

10 Specifications

10.1 Measurement Ranges, Resolution, and Accuracy

pH range (resolution)	2.00 to 12.00 (0.01)
pH accuracy	± 0.1
Conductivity ranges (resolution)	0 to 199.9 µS/cm (0.1) 0 to 1999 µS/cm (1) 0 to 19.99 mS/cm (0.01) 0 to 150.0 mS/cm (0.1)
Conductivity accuracy	± (1% full scale + 1 digit)
TDS range (resolution)	0 to 199.9 ppm (0.1) multiplied by TDS factor 0 to 1999 ppm (1) multiplied by TDS factor 0 to 19.99 ppt (0.01) multiplied by TDS factor 0 to 150.0 ppt (0.1) multiplied by TDS factor
TDS accuracy	± (1% full scale + 1 digit)
TDS factor	0.30 to 1.00
Salinity range (resolution)	0 to 10.00 ppt (0.01) 10.0 to 42.0 ppt (0.1) seawater
Salinity accuracy	± (1% full scale + 1 digit)
Dissolved Oxygen range (resolution)	0.0 to 199.9% (0.1) 0.0 to 20.0 mg/L (0.1)
Dissolved Oxygen accuracy	± 3% full scale
Temperature range	23.0 to 140.0°F (-5.0 to 60.0°C) DO probe only: 23.0 to 122.0°F (-5.0 to 50.0°C)
Temperature accuracy	± 1.0°F (0.5°C)

10.2 Meter Specifications

Display	LCD type, 1.3 x 2.1 in. (32.5 x 54.0 mm)
Response time	< 30 seconds for dissolved oxygen < 90 seconds for all others
Battery power	Four (4) AAA batteries
Automatic Power OFF (APO)	After one hour of inactivity

IP rating	IP67
Operating temperature	32 to 122°F (0 to 50°C)
Operating humidity	< 80 % RH
Storage temperature	32 to 140°F (0 to 60°C)
Storage humidity	< 90 % RH
Dimensions (L x W x H)	6.7 x 3.1 x 1.7 in. (169 x 78.3 x 43.4 mm)
Weight	7.1 oz. (200 g)

10.3 General Specifications

Sensor life	Typically one year for DO; 6 months for pH, with proper care
Included probes	pH probe with 4, 7, and 10 buffers Conductivity probe with 1413 µS buffer Dissolved oxygen probe
Included accessories	Batteries, cable organizer clips, documentation
Optional accessories	9.9 ft. (3 m) DO probe extension cable

11 Customer Support

Customer Support Local Telephone List:

https://support.flir.com/contact

Returns (RMA):

https://customer.flir.com/Home

12 Warranty

Teledyne FLIR warrants this Extech brand instrument to be free of defects in parts and workmanship for two years from date of shipment. To view the full warranty text, please visit the support site, link below.

https://www.flir.com/support-center/warranty/

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