



# CON 5 Meter Manual



**The LaMotte 5 Series**

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# What is Conductivity?

Conductivity is defined as the ability of a solution to conduct an electrical current, or the reciprocal of the solution's ability to resist the current. This current is conducted by electrically charged particles called ions, which are present in almost all solutions. Different solutions have different kinds and amounts of ions. Distilled water has very few ions, and therefore a low conductivity, while sea water has a large number of ions, and a high conductivity.

Although a conductivity reading provides an overall measurement of the ionic content of a solution, it is not possible to distinguish the specific amounts of individual ions. For this reason, conductivity is often used to measure the total dissolved solids (TDS) of a solution. TDS is defined as the amount of solids which will pass through a 45 micron filter. Rather than filtering a solution, the TDS can be estimated by multiplying the conductivity measurement by a predetermined factor. This factor, which is determined gravimetrically, will fall between 0.55 and 0.9. A commonly used factor is 0.7.

Conductivity is measured in microsiemens per centimeter ( $\mu\text{siemens/cm}$ ). Siemens are also called mhos. In waters of higher conductivity,  $\mu\text{siemens/cm}$  may be multiplied by 1000, giving results as millisiemens per centimeter ( $\text{msiemens/cm}$ ). Total dissolved solids are measured in parts per million. Therefore, using the information discussed above:

$$\mu\text{siemens/cm} \times 0.7 = \text{ppm TDS}$$

Because it is a quick, reliable, and inexpensive way of monitoring the ionic content of a solution, conductivity measurements are widely used in many areas of water testing, from environmental monitoring to municipal water supplies to many industrial applications.

## The CON 5 Meter

Conductivity is measured using a probe which contains two electrodes, separated by a fixed distance. When a voltage is applied from the meter across the electrodes, the ions in solution conduct a current, which flows between the electrodes. The greater the concentration of ions in the solution, the larger the current generated and the higher the conductivity. Likewise, the smaller the concentration of ions, the lower the conductivity. The meter converts the current measured to a conductivity reading. Over time the electrodes may become dirty or fouled with contaminants from the sample. For specific probe cleaning instructions for the CON 5, see Probe Care on page 14.

Conductivity measurements are very dependent on temperature. The ability of the ions to move through the solution, and conduct the current, is related to the temperature of the solution. As the temperature rises, the ions move more quickly through the solution, increasing the conductivity. As the temperature decreases the ions move more slowly and the conductivity decreases. Since the conductivity of the same solution can change by as much as 2 percent per °C, accurate temperature measurements must be made simultaneously to the conductivity reading. The CON 5 includes a temperature sensor within the probe to measure the temperature.

To make conductivity readings taken at different times and places comparable, measurements are often converted to what the conductivity of the solution would be at 25°C. The CON 5 automatically makes this conversion before providing a final reading.

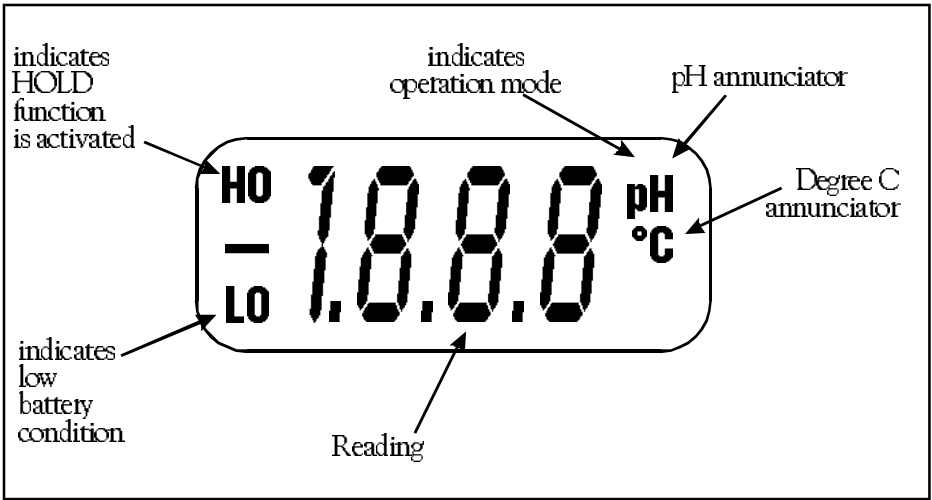
## Meter Specifications

Range:	0.0 to 199.9 $\mu\text{S}$	0.0 to 50°C
	200 to 1999 $\mu\text{S}$	
	2.00 to 19.99 mS	
Auto Ranging Resolution:	0.1 $\mu\text{S}$	0.1°C
	1 $\mu\text{S}$	
	0.01 mS	
Accuracy:	+/- 4 $\mu\text{S}$	+/- 0.5°C
	+/- 40 $\mu\text{S}$	
	+/- 0.4 mS	
	(+/- 2% of full scale)	
Calibration:	Up to 3 points	offset 0.1°C increments
Cell Constant:	1	
Auto Shutoff:	after 17 minutes	
Automatic Temp. Comp.:	0.0 to 50°C	
Reference Temperature:	Factory set at 25°C	
Temperature Coefficient:	Factory set at 2% per °C	
Keys:	ON/OFF, HOLD/ENTER, MODE/INC, CAL, ▲ / ▼	
Power:	4 AAA Alkaline Batteries	
Size:	5.5" X 2.7" X 1.3" (14 X 7 X 3.5 cm)	

## Accessories

<b>Description</b>	<b>Order #</b>
Conductivity/Temperature Probe	5-0042
Conductivity Standard, 74 $\mu\text{mhos/cm}$ , 500 mL	6416-L
Conductivity Standard, 718 $\mu\text{mhos/cm}$ , 500 mL	6417-L
Conductivity Standard, 1413 $\mu\text{mhos/cm}$ , 500 mL	6354-L
Conductivity Standard, 6668 $\mu\text{mhos/cm}$ , 500 mL	6418-L
Protective Rubber Boot	5-0040

# Display and Keypad Functions



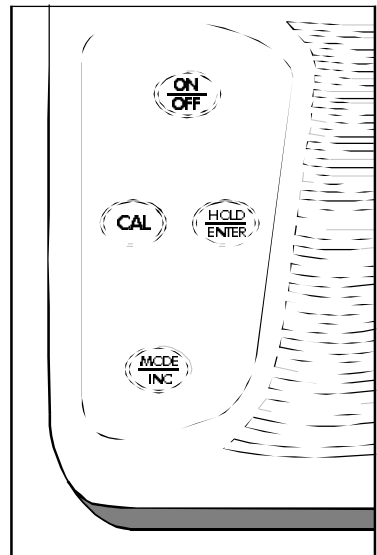
**ON/OFF** :Turns the meter on and off

**HOLD/ENTER**: Freezes the measured reading or confirms the calibration value.

**CAL**: Allows calibration of the meter for conductivity and temperature

**MODE/INC**: Selects the parameter to be measured: conductivity or temperature

**▲ / ▼**: Scrolls display values up or down to select calibration values

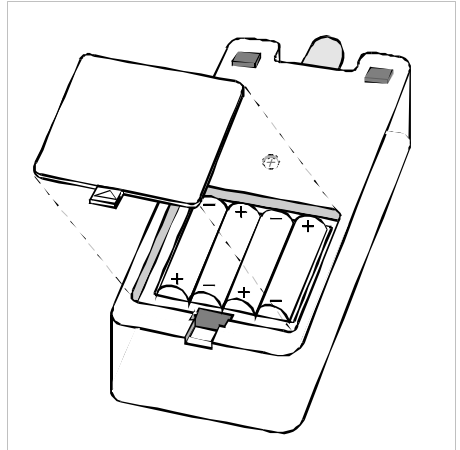


## Meter Set-up

### **Inserting the batteries**

1. Open the battery compartment on the back of the meter.
2. Insert four AAA batteries. Note polarity.
3. Replace cover and press it down until it clicks.

NOTE: A “LO” annunciator in the LCD will indicate when battery power is low. Replace the batteries as soon as possible.

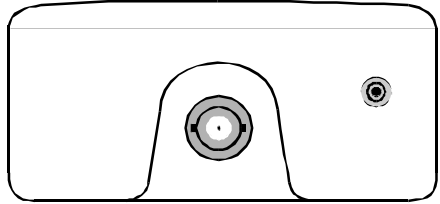


### **Connecting the Combination Conductivity/Temperature Probe**

1. Slide the BNC connector over the receptacle on the meter. Make sure the pin on the meter connector is in the lower end of the slot.
2. Turn the outer ring on the BNC connector until the pin slides to the upper end of the slot.
3. Insert the small plug into the jack on the meter.

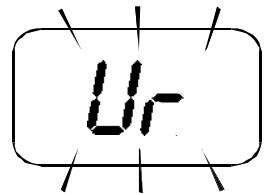
NOTE: If the temperature probe is not connected, the temperature reading (°C) will default to 25 °C.

NOTE: Wet the probe for 10 minutes before performing the calibration procedure or taking readings in order to saturate the probe surface and minimize drift.



### **Turning the meter on**

The ON/OFF key will turn the meter on. All of the LCD segments will be displayed for a few seconds as the meter goes through a self-diagnostic test. The meter will then switch to the conductivity measurement mode.



# Conductivity Calibration

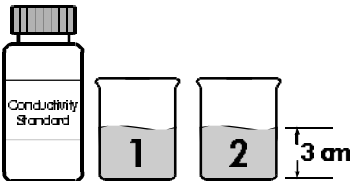
The meter is capable of up to a three-point calibration. Only one calibration is needed for the entire range of the meter but better accuracy will be achieved if each range is calibrated. If a range is not calibrated, the meter will automatically calibrate to the range closest to the sample being tested.

Calibrate the meter at least once a week if solutions with a conductivity of less than 100  $\mu\text{S}$  are being measured in order to get  $\pm 2\%$  full scale accuracy. If solutions are being measured with conductivity in the mid range, and the probe is washed in deionized water and stored dry, the meter need only be calibrated once a month. Calibrate the meter at least once a week if measurements are taken at extreme temperatures.

Select a conductivity standard with a concentration near the sample to be measured. If this is not possible, choose a value that is approximately  $2/3$  of the full scale value of the measurement range. For example, in the 200 to 1999  $\mu\text{S}$  range, the meter should be calibrated with a 1413  $\mu\text{S}$  solution.

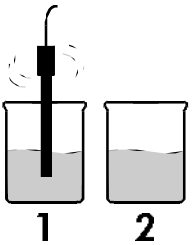
*NOTE: The meter will not accept calibration values less than 40  $\mu\text{S}$ . All new calibrations will automatically override existing calibrations.*

**1.**



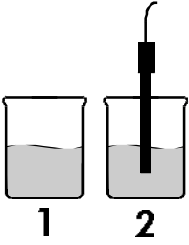
Pour approximately 3 cm of a conductivity standard into two separate containers.

**2.**



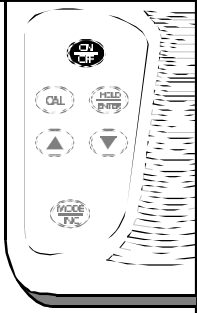
Gently stir the first container of the standard with the probe. This container will be used as the rinse solution to remove contaminants.

**3.**



Immerse the probe in the second container of the standard.

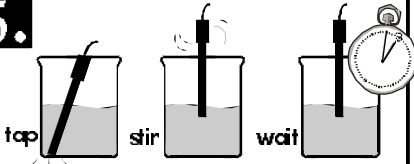
**4.**



Press the ON/OFF key to turn the meter on and to enter the conductivity mode.

# Conductivity Calibration

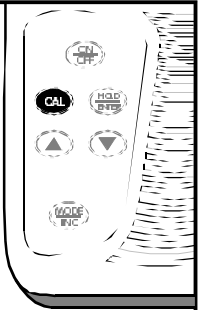
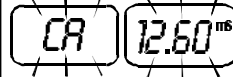
**5.**



Tap the probe on the bottom of the container to remove any air bubbles. Gently stir the standard with the probe. Wait until the probe stabilizes to the temperature of the standard. This should take about 3 minutes at room temperature.

**6.**

Press the CAL key. The display will blink and show the factory calibrated value.



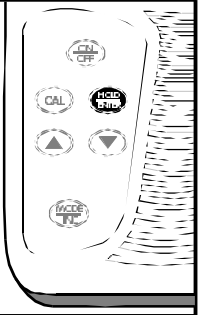
**7.**

Press the ▲ or ▼ keys until the displayed value matches the value of the standard.



**8.**

Press the HOLD/ENTER key to confirm calibration. The meter will exit the calibration mode and return to the measurement mode.



# Temperature Calibration

The temperature probe is factory calibrated. Over time, the temperature calibration may drift and require recalibration. The temperature should be recalibrated prior to conductivity calibration if the probe has been replaced.

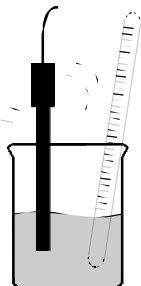
**1.**

Press the MODE/INC key until "°C" appears on the LCD.



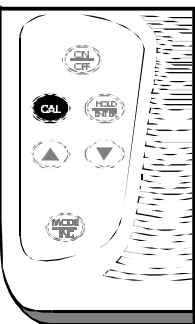
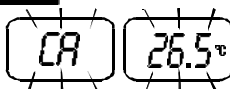
**2.**

While gently stirring the sample with the probe, compare the value to a NIST certified thermometer or other accurate thermometer. For the best accuracy, place the thermometer and temperature probe in a constant temperature bath.



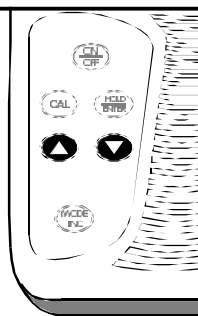
**3.**

Press the CAL key. The LCD will show "CA" and the display will flash.



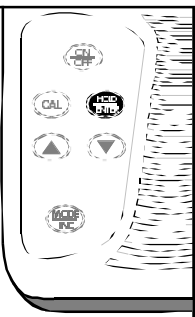
**4.**

Press the ▲ or ▼ keys until the displayed value matches the correct temperature. The maximum adjustment of  $\pm 5^{\circ}\text{C}$  from the factory default.



**5.**

Press the ENTER key to confirm the calibration. The LCD will display "CO" and the meter will revert to the measurement mode.

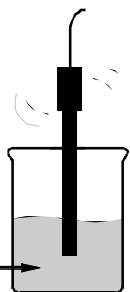


# Measuring Conductivity

1.

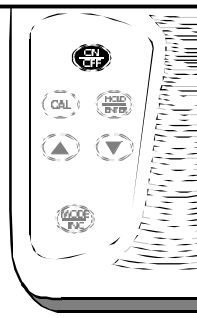
Rinse the probe with distilled or deionized water to remove impurities.

distilled H<sub>2</sub>O



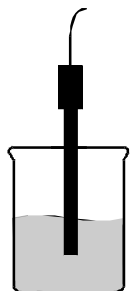
2.

Press the ON/OFF key to turn the meter on.



3.

Immerse the probe in the sample. Make sure the tip of the probe is completely immersed.



4.

Stir the sample with the probe to create a homogeneous solution.



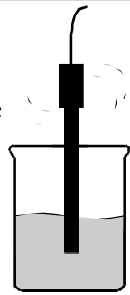
5.

Tap the probe on the bottom of the container to remove any air bubbles.



6.

Gently stir the sample with the probe. Read the conductivity value of the sample from the display.



NOTE: Press the HOLD key once to freeze the reading. The LCD will show "HO" to indicate that the HOLD function is activated. Press the HOLD key again to deactivate the HOLD function and to return to the measurement mode.

**HO** 72.80 mS

# Measuring Temperature

1.

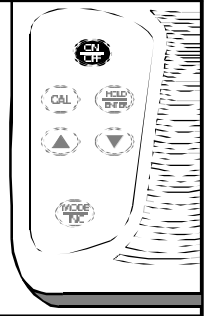
Rinse the probe with distilled or deionized water.

distilled H<sub>2</sub>O



2.

Press the ON/OFF button to turn the meter on.



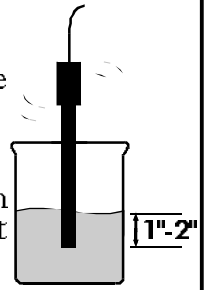
3.

Press the MODE/INC key to select <sup>HO</sup>C°.



4.

Immerse the probe approximately 1" to 2" in the sample. Stir the sample gently with the probe and wait for the display to stabilize. Record the reading as °C.



NOTE: Press the HOLD key once to freeze the reading. The LCD will show "HO" to indicate that the HOLD function is activated. Press the HOLD key again to deactivate the HOLD function and to return to the measurement mode.

<sup>HO</sup> 26.5 °C

## Probe Care

A dry probe should be soaked for at least 10 minutes before use.

Never scratch the stainless steel portions with a hard surface.

Do not strike the probe against hard surfaces.

Keep the conductivity probe clean. Rinse the probe with deionized water or tap water before storing it. The probe may be cleaned by swishing it in a mild detergent bath and then wiping it with soft tissue paper. The probe should then be rinsed with tap water and then rinsed in deionized water. Clean the probe with alcohol to remove oils, films or oxidation. Recalibrate the meter after cleaning the probe.

## Error Messages

<b>Error Message</b>	<b>Indicates</b>	<b>Solution</b>
E 2	Microprocessor Error	Recalibrate instrument
E 3	Microprocessor Error	Turn meter off and then on again. Contact LaMotte for return authorization
Ur	Temperature under range Faulty sensor	Warm sample Contact LaMotte for return authorization
Or	Conductivity over range Temperature over range Faulty temperature sensor	Dilute sample Cool sample Contact LaMotte for return authorization

# Troubleshooting

<b>Problem</b>	<b>Check</b>	<b>Action</b>
LO Message	Batteries	Replace
Power on but no display	Batteries	Insert batteries
	Batteries	Verify correct polarity
	Batteries	Replace
Unstable reading	Probe	Immerse probe more deeply in sample
	Probe	Replace probe
	Interference from nearby motor	Remove or switch off
	Probe	Clean probe
Slow response	Probe	Clean probe
Display locked	Electrical discharge near meter	Switch meter off and then on again. Remove batteries and reinsert.
Unable to calibrate	Probe	Clean probe
	Calibration standard	Select standard within range

# Warranty Information

## **Repairs**

If it is necessary to return the instrument for repair, contact LaMotte Company at 1-800-344-3100 for a return authorization number.

## **Instrument Guarantee**

This instrument, excluding the probe, is guaranteed to be free of defects in material and workmanship for two years from date of original purchase. If in that time it is found to be defective, it will be repaired or replaced without charge, except for transportation expenses. This guarantee does not cover the batteries.

This guarantee is void under the following circumstances:

- ◆ Operator's negligence
- ◆ Improper application
- ◆ Unauthorized servicing

## **Limits of Liability**

Under no circumstances shall LaMotte company be liable for loss of life, profits, or other damages incurred through the use or misuse of their products.

## **Packaging and Delivery**

Experienced packaging personnel at LaMotte Company assure adequate protection against normal hazards encountered during shipping. After the product leaves the manufacturer, all responsibility for its safe delivery is assured by the transporter. Damage claims must be filed immediately with the transporter to receive compensation for damaged goods.



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