



## ***pH 5 Meter Manual***



**The LaMotte 5 Series**

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## What is pH?

pH is one of the most common analyses in soil and water testing. An indication of the sample's acidity, pH is actually a measurement of the activity of hydrogen ions in the sample.

pH measurements run on a scale from 0-14, with 7.0 considered neutral. Those solutions with a pH below 7.0 are considered acids, and those above 7.0 are designated bases. The pH scale is logarithmic, so a one unit change in pH actually reflects a ten-fold change in the acidity. For instance, orange juice (pH 4) is ten times more acidic than cottage cheese, which has a pH of 5.

Many industries rely heavily on pH for their processes to work properly, or to maintain expensive equipment. Breweries maintain the pH between 4.2 and 4.6 to keep infectious bacteria from breeding during the fermentation process. In many industrial applications, if the pH is too low the water may corrode metal equipment, but if it is too high scaling may result.

pH can be measured visually or electronically. Visual comparisons use a pH indicator whose color change reflects the pH, which is then matched to a color standard. pH meters, such as the pH 5, simplify the pH test. A probe is placed in the sample, and the pH is read directly from the meter.

While the meter is very easy to use, the electronics within the meter are more complex. After the pH probe measures the millivolts of potential between the reference electrode and the pH electrode, the meter converts this reading to pH units using the Nernst Equation:

$$E = E_x + \frac{2.3 RT_k}{nF} \log(a_i)$$

where  $E_x$  = constant depending upon reference electrode

$R$  = constant

$T_k$  = absolute temperature

$n$  = charge of the ion (including sign)

$F$  = constant

$a_i$  = activity of the ion

## **The pH 5 Meter**

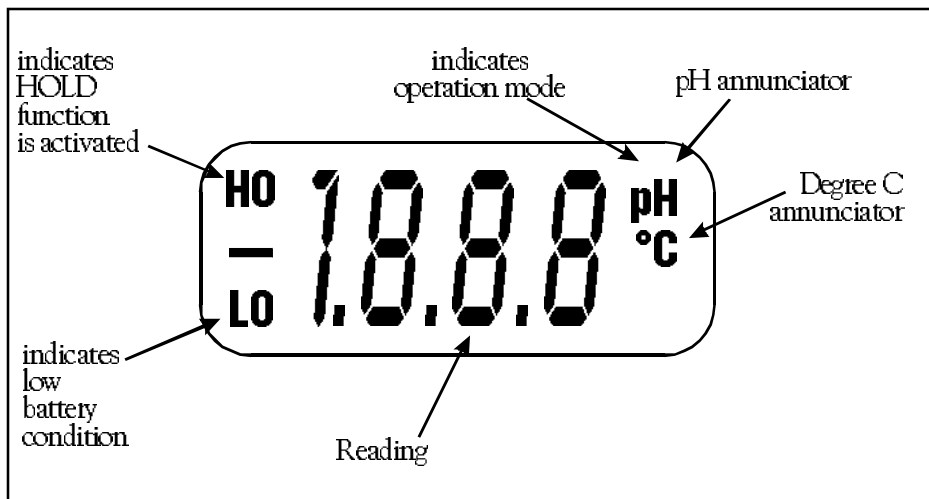
The pH 5 meter consists of three major components: the pH probe, the temperature probe and the meter.

The pH probe consists of a glass, hydrogen-ion selective electrode, and a reference electrode, combined into a single unit. The glass electrode is specially treated to measure only hydrogen ions, while the reference electrode is silver surrounded by silver chloride. It provides a “zero” or reference point for the measurement. This “zero” point means any change in potential measured at the glass electrode is attributed to hydrogen ions, and therefore is expressed as pH.

When the temperature and pH probes are immersed in the sample, the meter measures the difference in potential between the glass electrode and the reference electrode. This electronic measurement is converted from millivolts to pH units, and the result appears on the display.

If, for some reason, the temperature probe can not be used during the pH measurement, the meter will assume a temperature of 25°C.

## Display and Keypad Functions

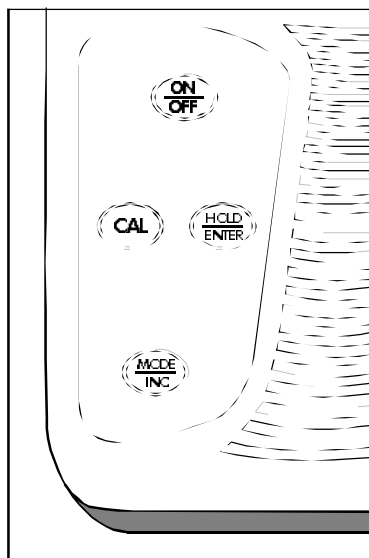


**ON/OFF** :Turns the meter on and off

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

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

**MODE/INC**: Selects the parameter to be measured: pH or temperature. Adjusts display during temperature calibration.



## **Meter Specifications**

|                          |  |
|--------------------------|--|
| Range:                   | 0.00 to 14.00 pH, 0.0 to 100°C             |
| Resolution:              | 0.01 pH, 0.1°C                             |
| Accuracy:                | +/- 0.01pH, +/-0.5°C                       |
| Calibration:             | Up to 3 points, offset 0.1°C               |
| pH Slope Range:          | 80% to 120%                                |
| Auto Buffer Recognition: | pH 4.01, 7.00, 10.00                       |
| Auto Shutoff:            | after 17 minutes                           |
| Automatic Temp. Comp.:   | 0.0 to 50°C                                |
| Operating Temperature:   | 0 to 50°C                                  |
| Keys:                    | ON/OFF, HOLD/ENTER, MODE/INC, CAL          |
| Probe:                   | Combination gel-filled epoxy body, Ag/AgCl |
| 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> |
|--|----------------|
| pH probe                               | 1904           |
| Temperature probe                      | 5-0041         |
| pH Electrode in soaker bottle          | 1904           |
| pH Buffer, 4.00, 120 mL                | 2807-J         |
| pH Buffer, 7.00, 120 mL                | 2881-J         |
| pH Buffer, 10.00, 120 mL               | 2896-J         |
| Mini Buffer Tablets, pH 4, 50 tablets  | 3983-H         |
| Mini Buffer Tablets, pH 7, 50 tablets  | 3984-H         |
| Mini Buffer Tablets, pH 10, 50 tablets | 3985-H         |
| Beaker, plastic, mL                    | 0944           |
| Protective Rubber Boot                 | 5-0040         |

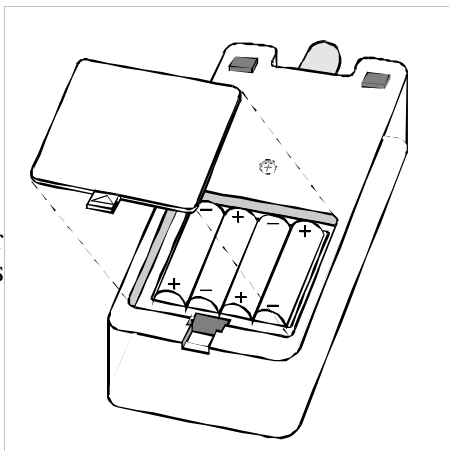
## Meter Set-up

### Inserting the Batteries

The battery compartment is found at the back of the instrument. To open the battery compartment, push the lid up. See figure.

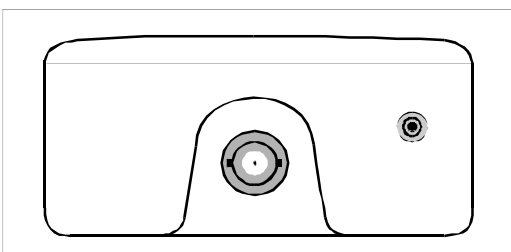
Note the polarity of each battery before inserting the batteries into position. After replacement, place the cover back into its position and press down until it locks tightly.

A “LO” annunciator in the LCD alerts you when battery power is running low. Replace batteries with a fresh set as soon as possible.



### Connecting the Electrode

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.



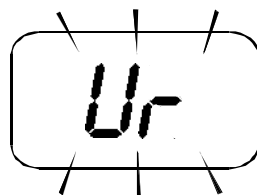
### Connecting the Temperature Probe

1. Slide the connector pin into the small hole on the end of the meter.

### 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 pH measurement mode.

If the LCD then displays “Ur”, the electrode is faulty, the temperature sensor is faulty, or there is an open circuit.



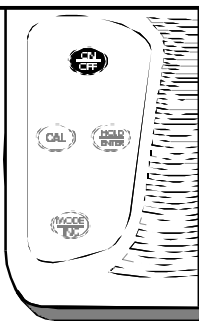
## pH Calibration

The meter is capable of up to a three-point calibration. The calibration must be performed with pH 4.01, 7.00 and 10.00 buffers. It is recommended that at least a 2-point calibration be performed at room temperature using buffers that bracket the expected pH of the sample (one above and one below). If a one-point calibration is performed, the pH of the buffer must be close to the pH of the sample that is being measured. If the temperature probe is not connected, the meter will default to 25°C.

*All new calibrations will over-ride existing data.*

**1.**

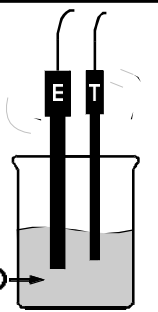
Press the ON/OFF key to turn the meter on. The meter will enter the pH mode.



**2.**

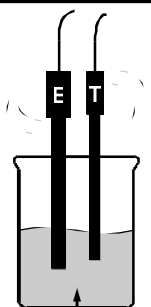
Remove the electrode from the soaker bottle. Rinse the electrode and temperature probe with distilled water.

distilled H<sub>2</sub>O



**3.**

Immerse both the electrode and temperature probe in pH 7.0 buffer solution. The glass bulb of the electrode must be completely covered. Stir gently and wait for meter to stabilize (approximately 40 seconds).



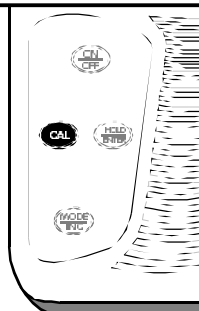
7.0 buffer solution

**4.**

Press the CAL key to enter the calibration mode.

The display will momentarily flash "CA" to indicate that the meter is in the calibration mode. The display will then show a non-calibrated reading while blinking.

CA 7.03<sup>m</sup>



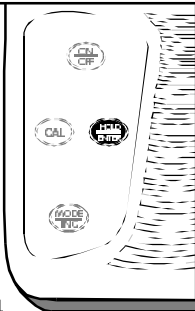
## pH Calibration

**5.**

Allow the reading to stabilize (The meter will only recognize 7.00, 4.01 and 10.00 buffers).

**6.**

Press the HOLD/ENTER key once to confirm the calibration. The LCD will display "CO" to confirm that the calibration point has been saved. The meter will exit the calibration mode and return to the measurement mode.



**7.**

Repeat the calibration procedure with pH buffers 4.01 and/or 10.00 for best accuracy.

NOTE: The meter has automatic buffer recognition which will identify the correct pH buffer values during calibration. If buffers other than 4.01, 7.00 and 10.00 are used, or the electrode is not functioning properly, the LCD will flash "ER1".

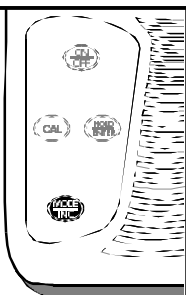


## Temperature Calibration

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

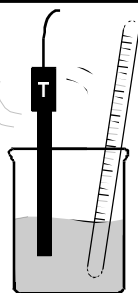
1.

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

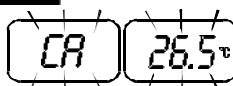


2.

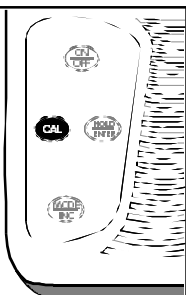
While gently stirring the sample with the temperature probe, compare the displayed value to a NIST certified thermometer or other accurate thermometer. For the best accuracy, place the thermometer & temperature probe in a constant temperature bath.



3.

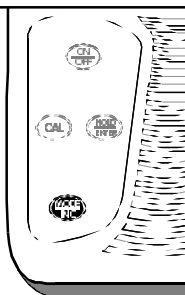


Press the CAL key. The LCD will show "CA" and the display will flash.



4.

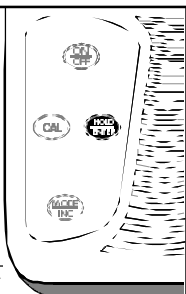
Press the MODE/INC key until the display shows the correct temperature. (The MODE/INC key will scroll to the maximum allowable value, and then loop back to the minimum allowable value. The maximum adjustment is  $\pm 0.5$  from the displayed reading.)



5.



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

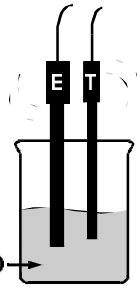


# Measuring pH

1.

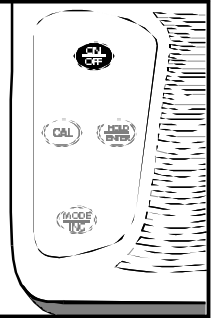
Rinse the electrode and temperature probe with distilled or deionized water.

distilled H<sub>2</sub>O



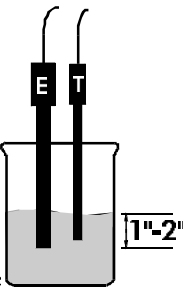
2.

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



3.

Immerse the electrode and temperature probe approximately 1"-2" in the sample. Stir gently and wait for the display to stabilize. Record the reading as pH.



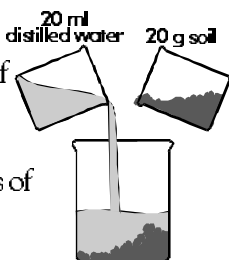
NOTE: Press the HOLD/ENTER key once to freeze the reading. The LCD will show "HO" to indicate that the HOLD function is activated. Press the HOLD/ENTER key again to deactivate the HOLD function and to return to the measurement mode.



# Measuring pH of Soil

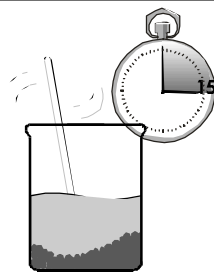
**1.**

Place a 1:1 ratio of soil and distilled water in a small beaker. For most analyses, 20 grams of soil and 20 mL of distilled water are sufficient.



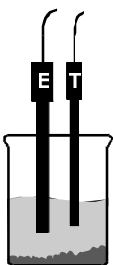
**2.**

Wait 15 minutes. Stir occasionally with a stirring rod.



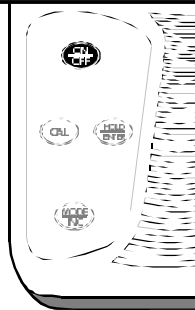
**3.**

Stir the sample. Immediately place the pH electrode and the temperature probe in the sample.



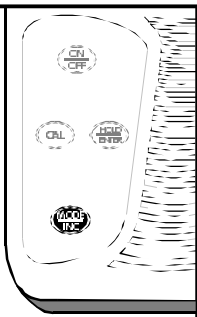
**4.**

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



**5.**

Wait until the display stabilizes. Record the reading as pH.



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

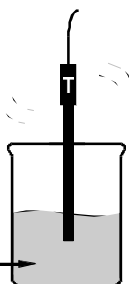
**HO** 3.28 <sup>pH</sup>

# Measuring Temperature

1.

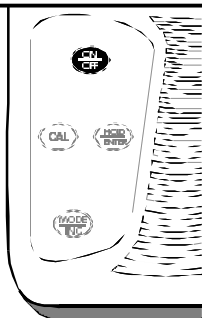
Rinse the temperature probe with distilled or deionized water.

distilled H<sub>2</sub>O



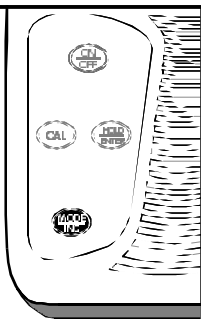
2.

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



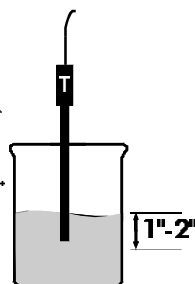
3.

Press the MODE/INC key to select "°C".



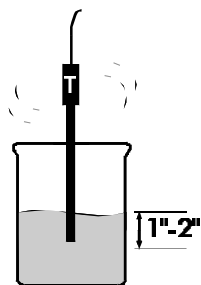
4.

Immerse the temperature sensor approximately 1" to 2" in the sample.

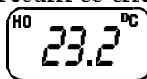


5.

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.



## **Troubleshooting**

| <b>Problem</b>          | <b>Check</b>                   | <b>Action</b>                           |
|-------------------------|--------------------------------|---|
| Er message              | Buffers                        | Use fresh 4.01, 7.00 or 10.00 buffer    |
|                         | Electrode                      | Replace                                 |
| Ur or Or Message        | pH of sample                   | Must be within range                    |
|                         | Temperature of sample          | Must be within range                    |
|                         | Electrode                      | Replace                                 |
|                         | Temperature probe              | Replace                                 |
| LO Message              | Batteries                      | Replace                                 |
| Power on but no display | Batteries                      | Insert batteries                        |
|                         | Batteries                      | Verify correct polarity                 |
|                         | Batteries                      | Replace                                 |
| Unstable reading        | Electrode                      | Immerse electrode more deeply in sample |
|                         | Electrode                      | Replace                                 |
|                         | Interference from nearby motor | Remove or switch off interfering motor  |
| Slow response           | Electrode                      | Replace                                 |

## ***Storage***

The pH electrode should always be stored in the soaker bottle. The cap should be tightened to prevent leaks. The soaker bottle contains a dilute solution of potassium chloride.

## ***After Measuring***

Rinse the electrode and reference junction in deionized water. Store the electrode as recommended in “Storage” or as recommended by the manufacturer.

## ***Electrode Cleaning***

Because your pH electrode is susceptible to dirt and contamination, clean it every one to three months depending on extent and condition of use.

Clean the electrode in a mild detergent solution. Wipe the probe with a soft tissue paper. Avoid touching the glass membrane with your fingers. Rinse thoroughly in tap water and then in distilled water. Recalibrate your meter after cleaning the electrode.

## ***Special Cleaning Tips***

**Salt deposit:** dissolve the deposit by immersing the electrode in tap water for ten to fifteen minutes. Then thoroughly rinse with distilled water.

**Oil/grease film:** wash electrode pH bulb gently in detergent solution. Rinse electrode tip with distilled water.

**Clogged reference junction:** heat a diluted KC1 solution to 60-80°C. Place the sensing part of the electrode into the heated solution for about 10 minutes. Allow the electrode to cool in some unheated KC1 solution.

**Protein deposits:** prepare a 1% pepsin solution in 0.1M of HC1. Place the electrode in the solution for five to ten minutes. Rinse the electrode with distilled water.

## **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 probes, 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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