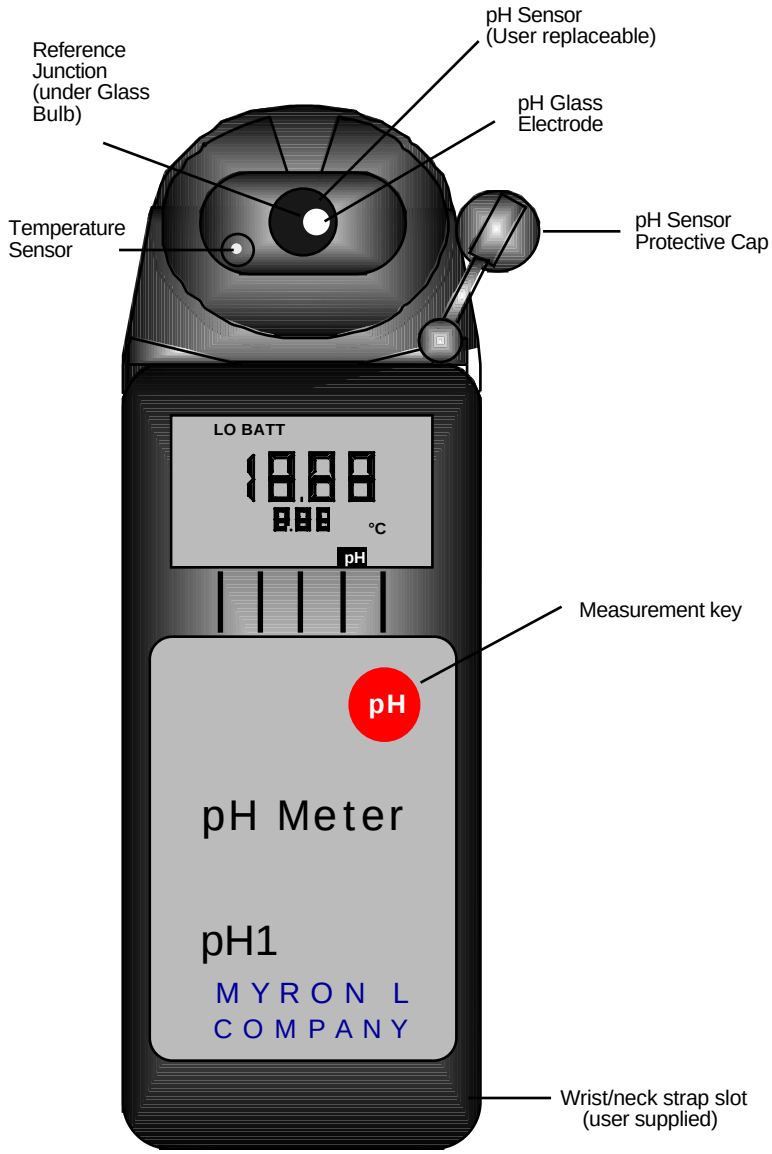
TechPro™ Operation Manual

Model pH1

MYRON L
COMPANY

10-02 (WEB) EG

Instrument Illustration



For detailed explanations, see Table of Contents

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FEATURES and SPECIFICATIONS

A. Features

- Superior resolution 3 1/2 digit LCD
- Accuracy of ± .05 pH units
- All electrodes are internal for maximum protection
- Latest sensor technology
- Water resistant
- Easy calibration
- Temperature Accuracy of ±1° C/F

B. General Specifications

Display	3 1/2 Digit LCD
Dimensions (LxWxH)	7.7x2.7x2.5 in. 196x68x64 mm
Weight	10.8oz./310g
Case Material	ABS
pH Sensor Well Capacity	0.04 oz./1.2 ml
Power	9V Alkaline Battery
Battery Life	>100 Hours/5000 Readings
Operating/Storage Temperature	32-132°F/0-55°C
Protection Ratings	IP64/NEMA 3

C. Specification Chart

pH1	pH	Temperature
Range	0-14 pH	0-71° C 32-160° F
Resolution	.01 pH	0.1° C/F
Accuracy	±.05 pH	±1.0° C/F
Auto Temperature Compensation	0-71° C 32 - 160° F	

D. Warranty/Service

The pH1, has a 2 year warranty excluding the pH sensor which has a limited 6 month warranty. If an instrument fails to operate properly, see Troubleshooting Chart, pg. 12. The battery and pH sensor are user-replaceable For other service, return the instrument prepaid to the Myron L Company.

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If, in the opinion of the factory, failure was due to materials or workmanship, repair or replacement will be made without charge. A reasonable service charge will be made for diagnosis or repairs due to normal wear, abuse or tampering. This warranty is limited to the repair or replacement of the pH1 only. The Myron L Company assumes no other responsibility or liability.

E. TechPro™ Series Models

TechPro Series Models	pH1	AR1	ARH1
Parameters	pH & Temperature	Conductivity or TDS, & Temperature	Conductivity or TDS, pH & Temperature

Additional information available on our web site at:
www.myronl.com

CE

TABLE OF CONTENTS

I. INTRODUCTION

Thank you for selecting the TechPro™ Series, Model pH1, one of the Myron L Company's latest in a new line of digital instruments utilizing advanced circuitry. This circuitry makes it very accurate and easy to use (see pages 2 & 3 for Features and Specifications on this and other models). For your convenience, on the bottom side of your pH1 is a brief set of instructions.

II. RULES of OPERATION

Using the instrument is simple:

- Rinse the pH sensor well with test solution 3 times.
- Refill and Press the RED pH key.
- Note the value displayed. It's that simple!

Your pH1 is designed to provide quick, easy, accurate measurements by simply pressing one key.

Measurements are made on solution held in the pH sensor well (ref. pH Measuring, pg. 13). The protective cap is removed, and the sensor well is filled and rinsed with sample enough times to completely replace the storage solution. After use, the pH sensor well must be refilled with Myron L Storage Solution, and the protective cap reinstalled securely (ref. Cleaning Sensor, pg. 10).

A press of **pH** displays pH readings. No units are displayed.

III. AFTER USING the pH1

Rinse out the cell cup with clean water. Do not scrub the sensor. For oily films, squirt in a foaming non-abrasive cleaner and rinse.
The sensor well must be kept wet with a solution. Before replacing the rubber cap, rinse and fill the sensor well with (in order of preference): Myron L Storage Solution, an almost saturated KCl solution, pH 4 buffer, (ref. Buffer Solutions, pg. 13) or at least a strong table salt solution. Not distilled water.

IV. THE SPECIFIC RECOMMENDED MEASURING PROCEDURES

1. Remove protective cap by squeezing its sides and pulling up.

2. Rinse sensor well 3 times with sample to be measured. Shake out each sample to remove any residual liquid.

3. Refill sensor well with sample.

4. Press **pH** .

5. Take reading.

6. **IMPORTANT**: After use, fill pH sensor well with Myron L Storage Solution, a strong KCl solution or pH 4 buffer, and replace protective cap. Do not allow pH sensor to dry out.

NOTE: If a storage solution, KCl or pH 4 solution is unavailable, use a saturated solution of table salt and water (ref. Cleaning Sensor, pg. 10).

In the first four sections, you have learned all you need to make accurate measurements. The following sections contain calibration and technical information.

V. CALIBRATION

A. Calibration Intervals

Depending on frequency of use and type of solutions tested, generally, calibration is recommended about twice per month.

B. Rules for Calibration in the pH1

1. Calibration Steps

Both Zero and Gain calibrations are accomplished by Calibration Controls located under their respective cap plugs located on the bottom of the instrument, one for Zero, and one for Gain.
After pressing the pH key, the reading is changed/adjusted to match the known buffer value.

2. Calibration Limits

In pH, the inability to calibrate may indicate improper or contaminated buffer solution or a damaged pH Sensor.

C. Calibration Procedures

IMPORTANT: Always "zero" your pH1 with a pH 7 buffer solution before adjusting the gain with acid or base buffers, i.e. 4 and/or 10, etc.

1. pH Zero Calibration

1. Remove protective cap.

2. Rinse sensor well 3 times with 7 buffer solution.

3. Refill sensor well with 7 buffer solution.

4. Press **pH** to verify the pH calibration. (If the display reads 7.00, skip the pH Zero Calibration and proceed to section b. pH Gain Calibration. If reading is not acceptable, continue.

5. Remove cap plug labeled ZERO CAL on bottom of Instrument.

NOTE: If the pH reading displayed will not adjust to the proper reading, the sensor well needs additional rinsing or fresh buffer solution, or the pH sensor is bad and needs to be replaced. (ref. Troubleshooting Chart, pg. 12)

6. Refill sensor well again with 7 buffer solution.

7. While pressing the **pH** key, adjust ZERO CAL Control with finger until the display reads 7.0.

8. Replace bottom cap plug securely to maintain water resistance.

The pH **ZERO** Calibration procedure is now complete. You may continue with pH Gain Calibration or stop and replace with storage solution & pH cap.

b. pH Gain Calibration

IMPORTANT: Always calibrate or verify your pH1 with a pH 7 buffer solution before adjusting the gain with acid or base buffers, i.e., 4 and/or 10, etc. The pH gain calibration is performed in the same manner as the ZERO. For maximum accuracy use a buffer value closest to instrument's normal area of use, i.e., if you normally measure acidic solutions, use "4" buffer.

1. Rinse the sensor well 3 times with acid or base buffer solution.

2. Refill sensor well again with same buffer solution.

3. Press **pH** key. If reading is acceptable, end procedure. If not, continue.

4. Remove cap plug labeled GAIN CAL on bottom of Instrument.

5. Refill sensor well again with same buffer solution.

6. While pressing the **pH**, adjust GAIN CAL Control with finger until reading agrees with buffer solution.

7. If the instrument will be used to read both acids and bases, repeat steps 1 and 6 using opposite buffer solution.

8. If reading is different by more than is acceptable, split the difference with the previous setting. (If it is not possible to adjust Gain, it is an indication of bad buffers or a deteriorating or damaged pH sensor).

9. Replace bottom cap plug securely to maintain water resistance. The pH **GAIN** Calibration procedure is now complete.

VI. CALIBRATION INTERVALS

There is no simple answer as to how often one should calibrate an instrument. The pH1 is designed to not require frequent recalibration. The most common sources of error were eliminated in the design, and there are simple electromechanical adjustments. Still, to ensure specified accuracy, any instrument has to be checked against chemical standards occasionally.

A. Suggested Intervals

On the average, calibration should be checked every 2 weeks to ensure accuracy. Measuring some solutions will require more frequent intervals.

B. Calibration Tracking Records

To minimize your calibration effort, keep records. If adjustments you are making are minimal for your application, you can check less often. Changes in pH calibration are best recorded in pH units. Calibration is purposely limited in the pH1 to approximately ±1 pH unit because more than that indicates the end of the sensor lifetime, and it should be replaced.

C. Practices to Maintain Calibration.

1. Keep the sensor wet with pH storage solution.

2. Rinse away caustic solutions immediately after use.

VII. CHANGING from CENTIGRADE to FAHRENHEIT

(Note: °F to °C is the reverse)

1. **Dry Instrument THOROUGHLY**.

2. Remove the 4 bottom screws and carefully open Instrument.

3. Locate dip switch labeled “TEMP COMP” on the right side of the circuit board. Note: Factory setting is degrees “C”.

4. Set switch number **4** to the down position.

5. Carefully turn instrument over and press the (pH) key. The displayed reading will be in Fahrenheit “°F”.

6. Replace bottom, ensuring the sealing gasket is installed in the groove of the top half of case. Tighten screws securely.

VIII. CARE and MAINTENANCE

The pH1 should be rinsed with clean water after each use. Solvents should be avoided. Shock damage from a fall may cause instrument failure.

A. Temperature Extremes

Solutions in excess of 160°F/71°C should not be placed in the cell cup area; this may cause damage. The pH sensor may fracture if the pH1 temperature is allowed to go below -10°C (14°F). Care should be exercised not to exceed rated operating temperature. Leaving the pH1 in a vehicle or storage shed on a hot day can easily subject the instrument to over 150°F. This will void the warranty.

B. Battery Replacement (LO BATT)

Dry Instrument THOROUGHLY. Remove the 4 bottom screws. Open instrument. Carefully detach battery from circuit board. Replace with 9 volt alkaline battery. Replace bottom, ensuring the sealing gasket is installed in the groove of the top half of case. Tighten screws evenly and securely.

C. pH Sensor Replacement

Order model RPG. When ordering, be sure to include the model and serial number of your instrument to ensure receiving the proper type. Complete installation instructions are provided with each replacement sensor.

D. Cleaning Sensor

The cell cup should be kept as clean as possible. Flushing with clean water following use will prevent buildup on sensor. However, if very dirty samples — particularly scaling types — are allowed to dry in the cell cup, a film will form. This film reduces accuracy. When there are visible films of

oil, dirt, or scale in the cell cup or on the sensor, use a foaming non-abrasive household cleaner. Rinse out the cleaner, and your pH1 is ready for accurate measurements.

The unique pH sensor in your pH1 is a nonrefillable combination type which features a porous liquid junction. It should not be allowed to dry out. If it does, the sensor can sometimes be rejuvenated by first cleaning the sensor well with a liquid spray cleaner such as Windex™ or Fantastic™ and rinsing well. Do not scrub or wipe the pH sensor.

Then use one of the following methods:

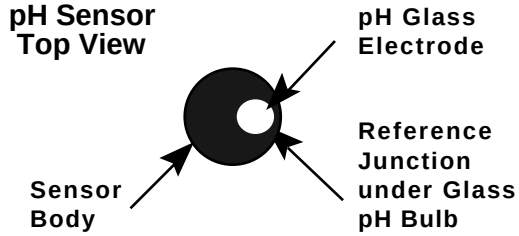
1. Pour a HOT salt solution ~60°C (140°F), preferably potassium chloride (KCl) solution — HOT tap water with table salt (NaCl) will work fine — in the sensor well and allow to cool. Retest.

Or

2. Pour DI water in the sensor well and allow to stand for no more than 4 hours (longer can deplete the reference solution and damage the glass bulb). Retest.

If neither method is successful, sensor must be replaced.

"Drifting" can be caused by a film on the pH sensor bulb. Spray a liquid cleaner such as Windex™ or Fantastic™ into the sensor well to clean it. The sensor bulb is very thin and delicate. Do not scrub or wipe the pH sensor.



Leaving high pH (alkaline) solutions in contact with the pH sensor for long periods of time can damage it. Rinsing such liquids from the pH sensor well and refilling well with Myron L Storage Solution, a saturated KCl solution, pH 4 buffer, or a salty tap water, will extend the useful life.

Samples containing chlorine, sulfur, or ammonia can "poison" any pH electrode. If it is necessary to measure the pH of any such sample, thoroughly rinse the pH sensor well with clean water immediately after taking the measurement. Any sample element which will reduce (add an electron to) silver, such as cyanide, will attack the reference electrode.

Replacement pH sensors are available only from the Myron L Company or our authorized distributors.

IX. TROUBLESHOOTING CHART

Symptom	Possible Cause	Corrective Action
No **display**, even though measurement key pressed.	Battery weak or not connected.	Check connections or replace battery. (ref. Battery Replacement, pg. 10).
Inaccurate **pH** readings	1. pH calibration needed. (ref. Calibration Procedure, pg. 7) 2. Cross-contamination from residual pH buffers or samples in sensor well. 3. Calibration with expired pH buffers.	1. Recalibrate instrument. 2. Thoroughly rinse sensor well. 3. Recalibrate using fresh buffers. (ref. Buffer Solutions, pg. 13)
No response to **pH** changes	Sensor bulb is cracked or an electro-mechanical short caused by an internal crack.	Replace pH sensor (ref. Sensor Replacement, pg. 10)
Will not adjust down to **pH** 7.	pH sensor has lost KCl.	Clean and rejuvenate sensor (ref. Cleaning Sensor, pg. 10) and recalibrate. If no improvement, replace pH sensor (ref. Sensor Replacement, pg. 10).
pH readings drift or respond slowly to changes in buffers/samples.	1. Temporary condition due to "memory" of solution in pH sensor well for long periods. 2. Bulb dirty or dried out. 3. Reference junction clogged or coated.	Clean and rejuvenate sensor (ref. Cleaning Sensor, pg. 10) and recalibrate. If no improvement, replace pH sensor (ref. Sensor Replacement, pg. 10).

X. ACCESSORIES

A. Buffer Solutions

pH buffers are available in pH values of 4, 7 and 10. Myron L Company buffer solutions are traceable to NIST certified pH references and are color-coded for instant identification. They are also mold inhibited and accurate to within ±0.01 pH units @ 25°C. Order 4, 7 or 10 buffer.

B. pH Sensor Storage Solution

Myron L Storage Solution prolongs the life of the pH sensor. It is available in quarts and gallons. Order SSQ or SSG.

C. Soft Protective Case

Padded Cordura® Nylon carrying case features a belt clip for hands-free mobility. Order Model: UCC

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D. Replacement pH Sensor

Model RPG is gel filled and features a unique porous liquid junction. It is user-replaceable and comes with easy to follow instructions.

E. Conductivity/TDS Standard Solutions

For your other Myron L instruments, our NIST standard solutions are available in a variety of salts and concentrations to fit your needs. Call or write for information.

XI. pH MEASURING

A. pH as an Indicator

pH is the measurement of Acidity or Alkalinity of an aqueous solution. It is also stated as the Hydrogen Ion activity of a solution. pH measures the effective, not the total, acidity of a solution.

A 4% solution of acetic acid (pH 4, vinegar) can be quite palatable, but a 4% solution of sulfuric acid (pH 0) is a violent poison. pH provides the needed quantitative information by expressing the degree of activity of an acid or base.

In a solution of one known component, pH will indicate concentration indirectly. However, very dilute solutions may be very slow reading, just because the very few ions take time to accumulate.

B. pH Units

The acidity or alkalinity of a solution is a measurement of the relative availabilities of hydrogen (H^+) and hydroxide ($0H^-$) ions. An increase in

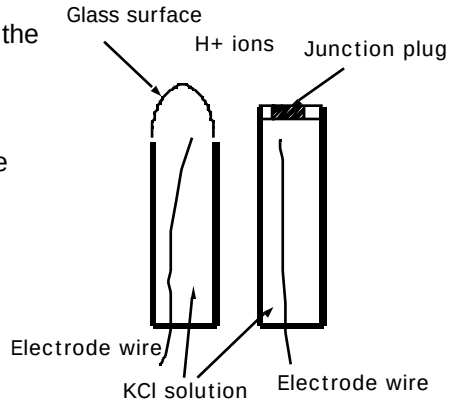
(H^+) ions will increase acidity, while an increase in (OH^-) ions will increase alkalinity. The total concentration of ions is fixed as a characteristic of water, and balance would be 10^{-7} mol/liter (H^+) and (OH^-) ions in a neutral solution (where pH sensors give 0 voltage).

pH is defined as the negative logarithm of hydrogen ion concentration. Where (H^+) concentration falls below 10^{-7}, solutions are less acidic than neutral, and therefore are alkaline. A concentration of 10^{-9} mol/liter of (H^+) would have 100 times less (H^+) ions than (OH^-) ions and be called an alkaline solution of pH 9.

C. The pH Sensor

The active part of the pH sensor is a thin glass surface which is selectively receptive to hydrogen ions. Available hydrogen ions in a solution will accumulate on this surface and a charge will build up across the glass interface. The voltage can be measured with a very high impedance voltmeter circuit; the trick is to connect the voltmeter to solution on each side.

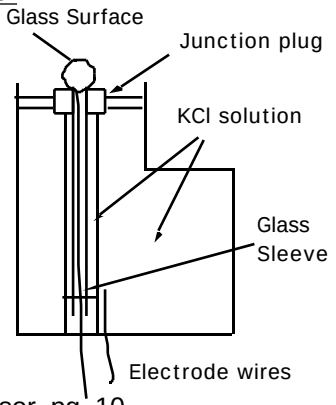
The glass surface encloses a captured solution of potassium chloride holding an electrode of silver coated with silver chloride. This is as inert a connection as can be made from metal to an electrolyte. It still can produce an offset voltage, but using the same materials to connect to the solution on the other side of the membrane allows the 2 equal offsets to cancel.



The problem is... the other side of the membrane is some test solution, not potassium chloride. The outside electrode, also called the Reference Junction, is of the same construction with a porous plug in place of a glass barrier to allow the junction fluid to contact the test solution without significant migration of liquids through the plug material. The figure to the right shows a typical 2 component pair. Migration does occur, and this limits the lifetime of a pH junction from depletion of solution inside the reference junction or from contamination. The junction is damaged by drying out because insoluble crystals may form in a layer, obstructing contact with test solutions. See Cleaning Sensor, pg. 10.

D. The Myron L Integral pH Sensor

The sensor in the pH1 (figure at right) is a single construction in an easily replaceable package. The sensor body holds an oversize solution supply for long life. The reference junction "wick" is porous to provide a very stable, low permeability interface. It is formed in a ring around the pH sensing electrode. The construction combines all the best features of any pH sensor known.



E. Sources of Error

The basics are presented in Cleaning Sensor, pg. 10.

1. Reference Junction

The most common sensor problem will be a clogged junction because a cell was allowed to dry out. The symptom is a drift in the "zero" setting at 7 pH. This is why the pH1 does not allow more than 1 pH unit of offset during calibration. At that point the junction is unreliable.

2. Sensitivity Problems

Sensitivity is the receptiveness of the glass surface, which can be diminished by a film on the surface, or a crack in the glass. These problems also cause long response time.

3. Temperature Compensation

pH sensor glass changes its sensitivity slightly with temperature, so the further from pH 7 one is, the more effect will be seen. A pH of 11 at 40 °C would be off by 0.2 units. The pH1 senses the sensor temperature and compensates the reading.

XII. GLOSSARY

NOTES

Logarithm - An arithmetic function. See pH Units, pg. 13.

For details on specific areas of interest refer to Table of Contents.