Atlas Scientific™
Environmental Robotics

V 2.5
Revised 7/23

Gen 2

Micro pH Probe

Half-cell – silver / silver chloride
with EXR Glass

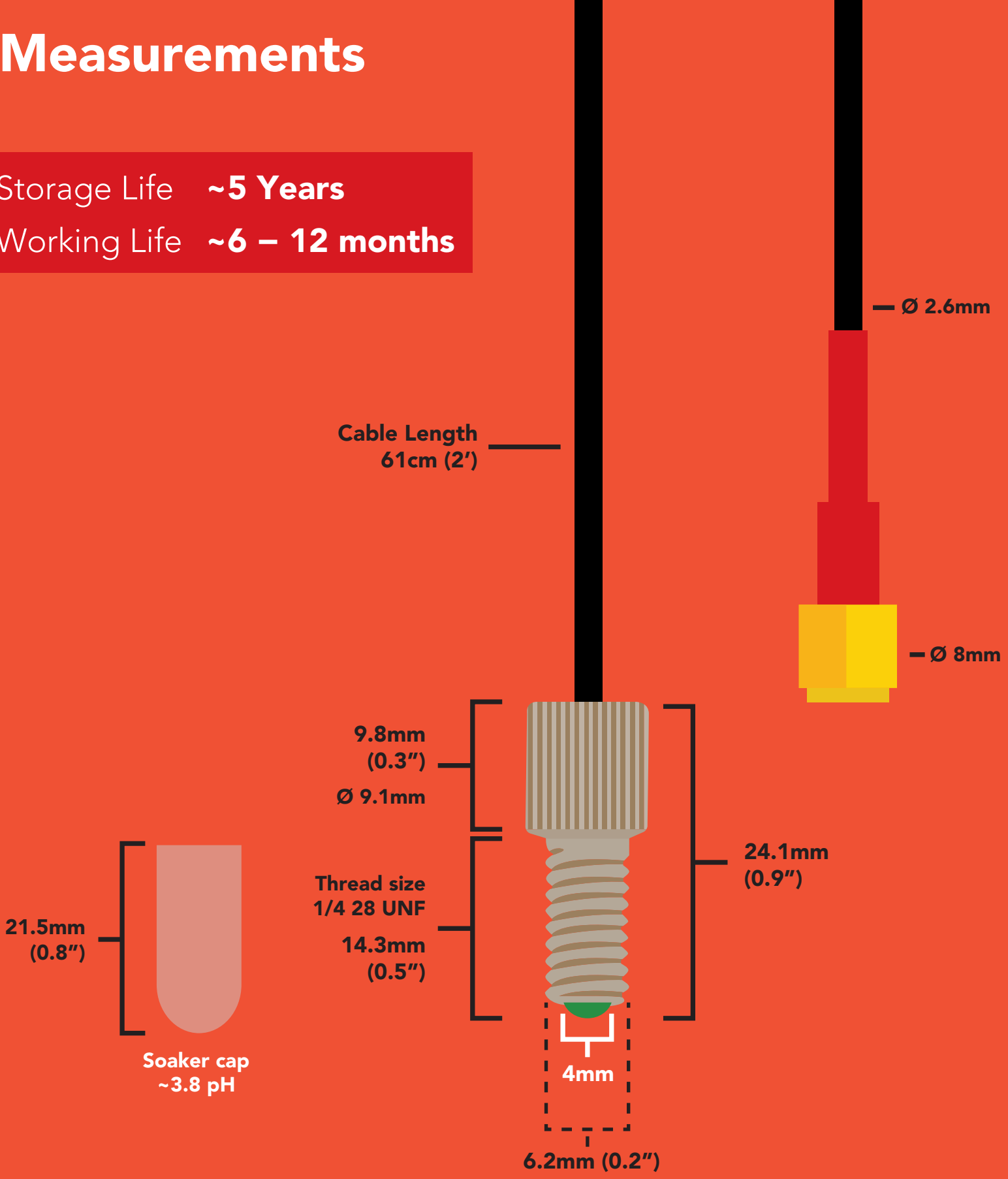
Reads	**pH**
Range	**0 – 14**
Resolution	**+/- 0.01**
Accuracy	**+/– 0.02**
Response time	**95% in 5s**
Temperature range °C	**-5 – 90 °C**
Max pressure	**150 PSI**
Max depth	**60m (197 ft)**
Connector	**Male SMA**
Cable length	**61cm (2')**
Internal temperature sensor	**No**
Time before recalibration	**~1 month**
Life expectancy	**~6 – 12 months**

RoHS COMPLIANT

Measurements

Storage Life **~5 Years**

Working Life **~6 – 12 months**



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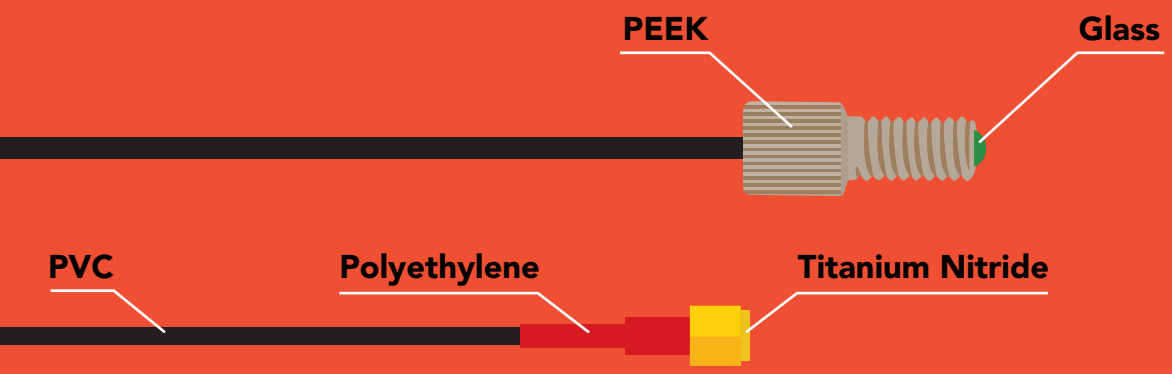
Specifications

Reference electrode	**Silver / silver chloride**
Max depth	**60m (197 ft)**
Cable length	**61cm (2')**
Weight	**29 grams**
Speed of response	**95% in 1 second**
Isopotential point	**pH 7.00 (0 mV)**
Dimensions	**6.2mm x 24.1mm (0.2" x 0.9")**
SMA connector	**Male**
Sterilization	**Chemical only**
Food Safe	**Yes**

Materials



The Micro pH probe can be *fully submerged* in fresh or salt water, up to the SMA connector *indefinitely*.

Typical applications

- Microfluidics

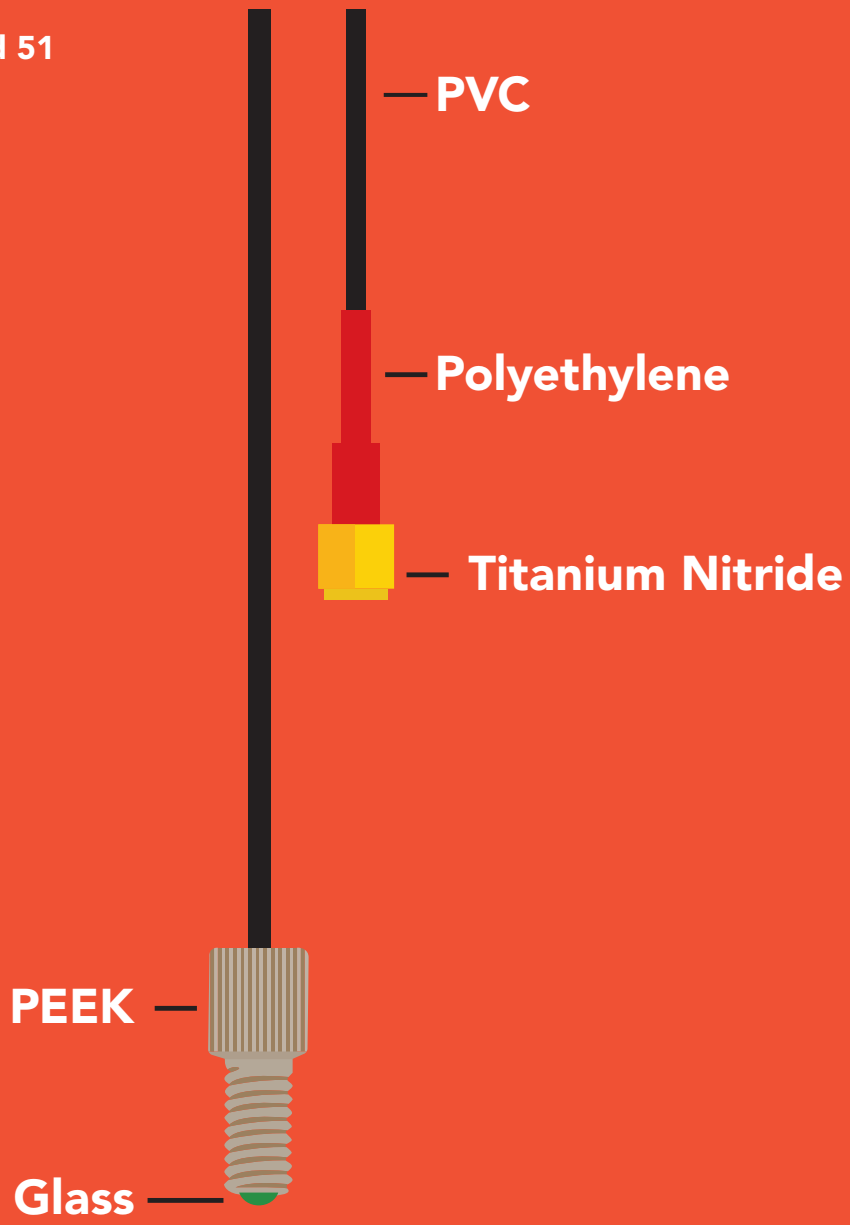
NSF/ANSI 51 Compliant

Food Safe

Atlas Scientific LLC, hereby certifies that,

Micro pH Probe
Part # ENV-10-pH

Complies with NSF/ANSI Standard 51



- **PVC**
  NSF/ANSI 51 Compliant
- **Glass**
  NSF/ANSI 51 Compliant
- **PEEK**
  NSF/ANSI 51 Compliant
- **Polyethylene**
  NSF/ANSI 51 Compliant
- **Titanium Nitride**
  NSF/ANSI 51 Compliant

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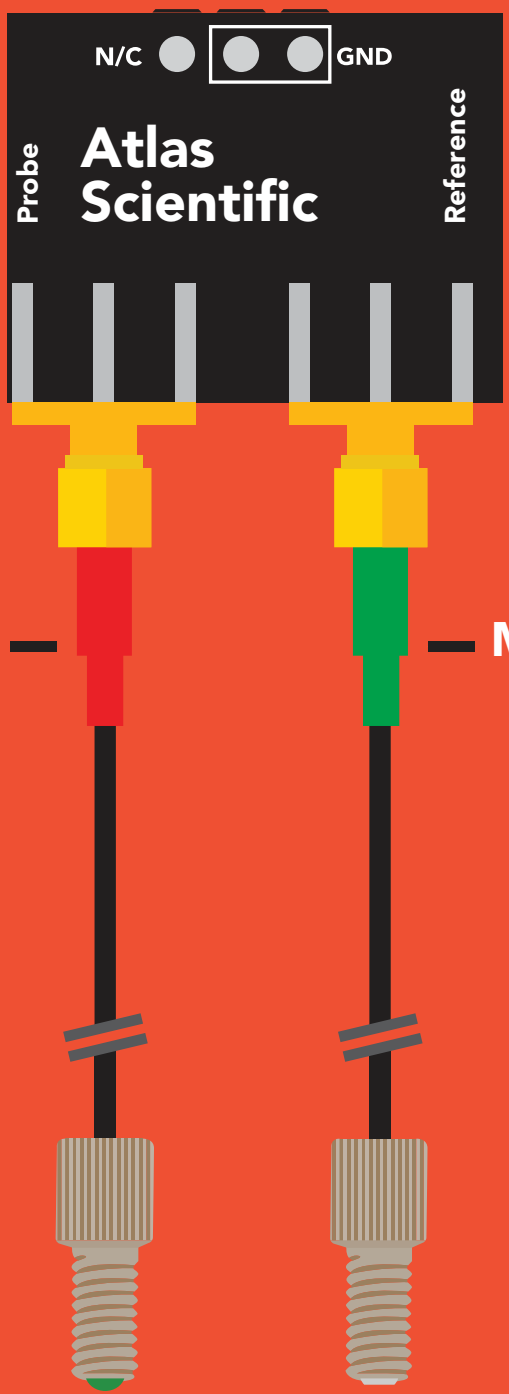
Attention

This is a half-cell pH probe. It *MUST* be connected to a reference probe before it will work.



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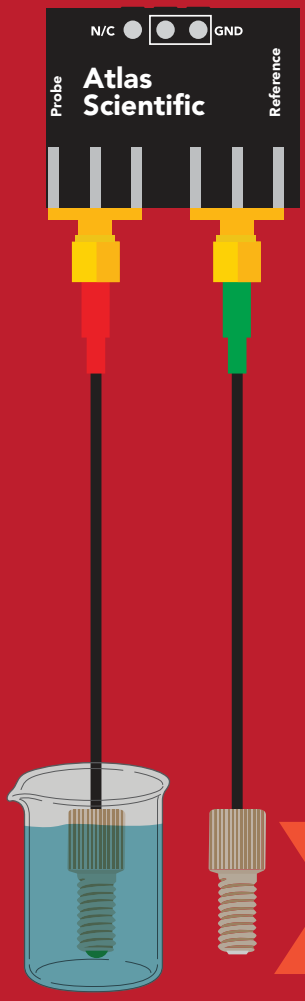
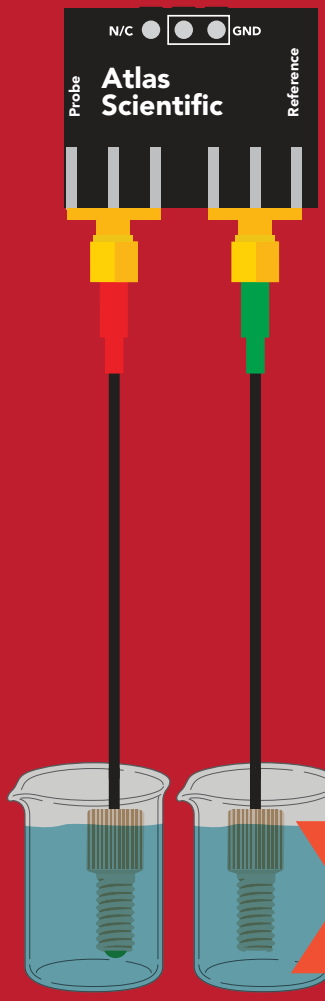


Unpredictable results, not a valid reading



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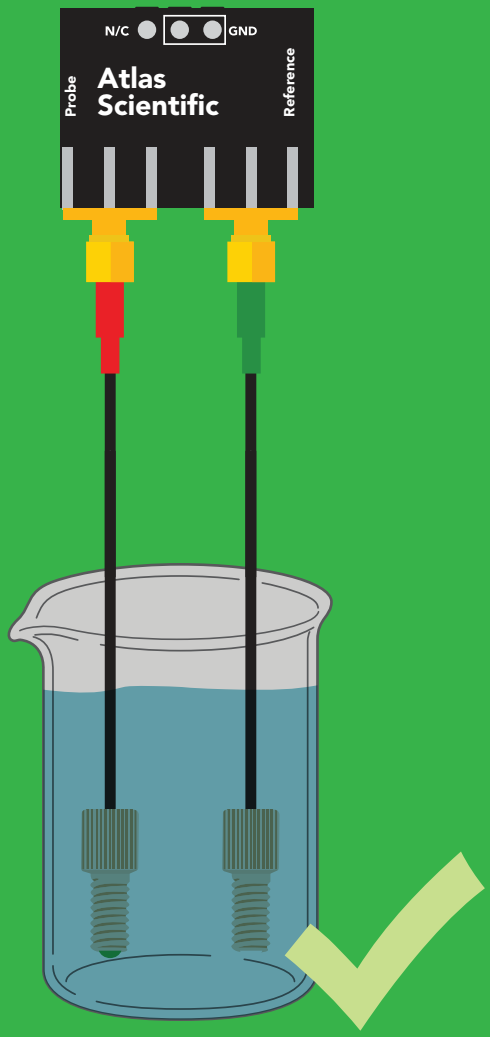
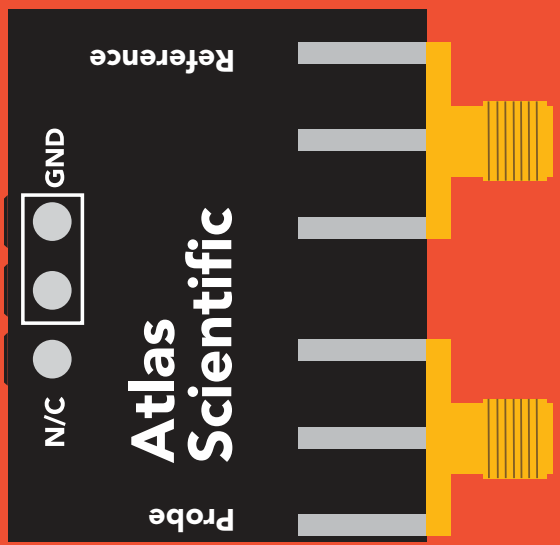


Correct

In order to take accurate readings, both the pH and Reference micro probes must be placed within the same sample of liquid.



Half-cell SMA breakout boards create a single output, just like a normal probe.

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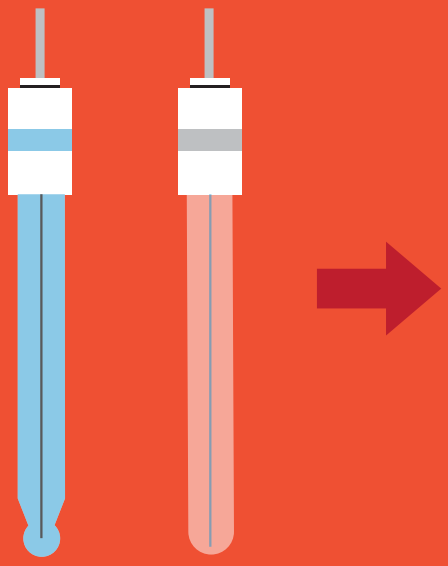
Half-cell operating principle

Back in the day, pH probes would come with a separate reference probe, which is crucial for accurate readings. Modern day pH probes have the reference built in, creating an all in one package. In order for Atlas Scientific to get the size of our Micro pH probe down to 6.2mm, we had to separate the reference into its own micro probe.

Both pH and reference micro probes are needed in order to take accurate readings.

1940's pH probes

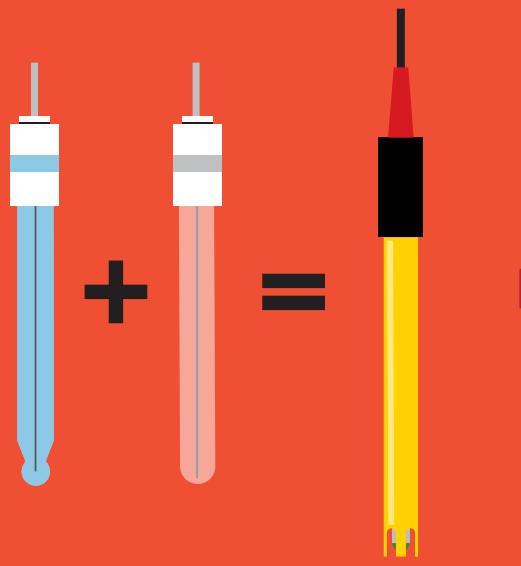
(Half-cell pH & Reference)



pH **Reference**

Modern probes

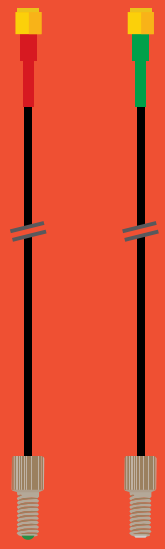
(Half-cell pH & Reference merged into one)



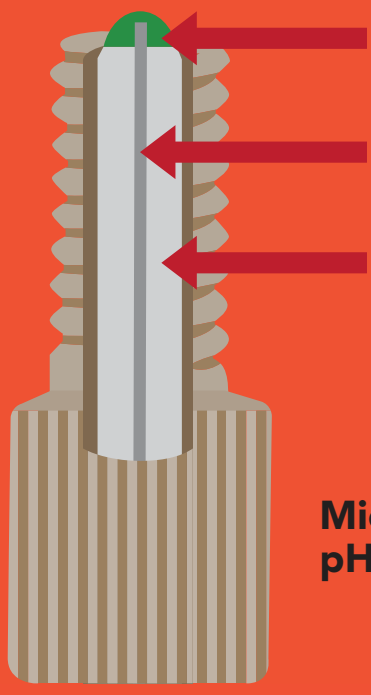
Combination probe

New Micro probes

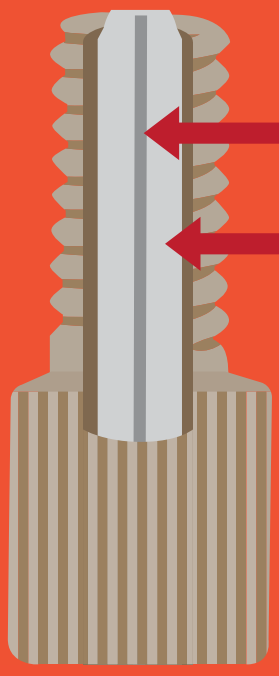
(Half-cell pH & Reference)



These probes are too small to be a combination probe.



Micro pH probe



Micro reference probe

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Unique behavior

Atlas Scientific's microprobe technology has some unusual properties.

Unusual calibration slope

After calibrating a micro pH probe, the slope of the pH probe can be < 70%. This is what you would expect to see on an older pH probe that's at the end of its life. However, the probe behaves normally and shows no loss of sensing capabilities. The exact resonating for this phenomenon remains unknown to us.

Unaffected by drying

pH probes need to be kept wet at all times. If a pH probe is allowed to dry out, the probe could be permanently damaged.

Atlas Scientific's micro probes seem to be unaffected by drying. We have found that if a micro pH or micro reference probe is allowed to dry, the probe still works normally when it's put back into water. We have seen that the probes can be stored dry for many months without any change in performance.

We believe this is related to the unusually small amount of glass used at the tip of the probe.

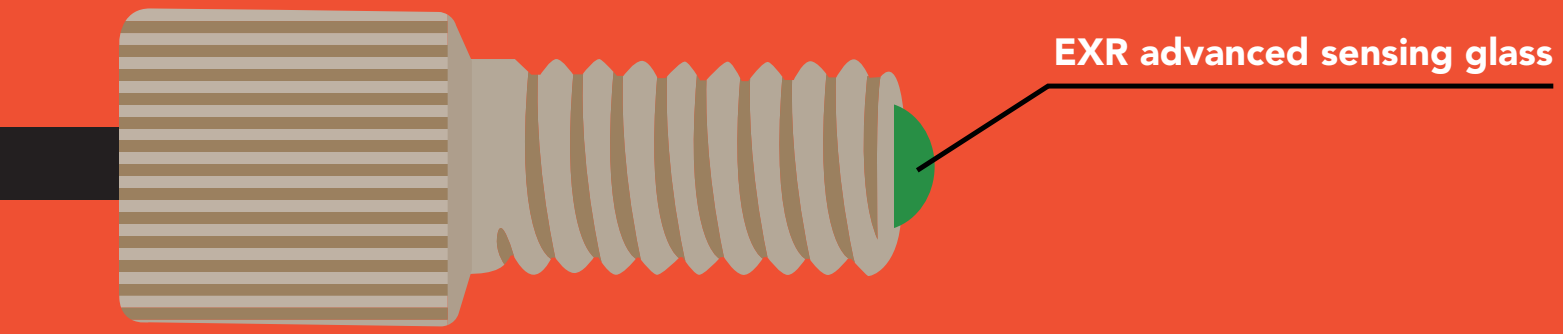
***Atlas Scientific does not recommend storing the probes dry.**

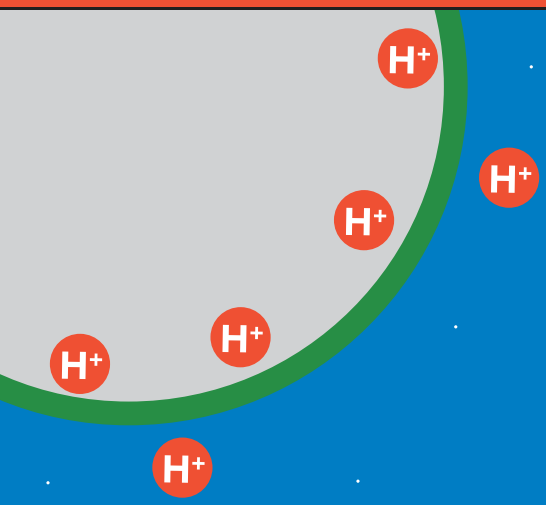
Reactivation of a dried probe

If your Atlas Scientific micro pH or reference probe have been allowed to dry out for an extended period of time, it can be reactivated by placing the probe in a small amount pH storage solution. Let the micro probe sit for 1 hour.

EXR advanced sensing glass

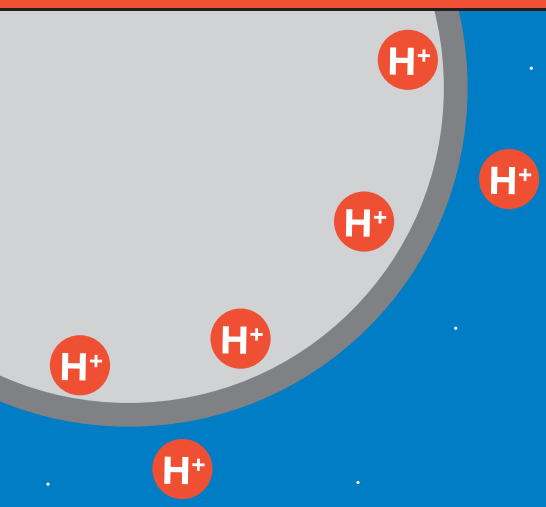
Our newest Micro pH probes have EXR advanced sensing glass. The EXR advanced sensing glass has been specially formulated; allowing for faster reactions and more accurate readings in low ionic solutions.





EXR advanced sensing glass
in low ionic solution

✓ **pH 10**



Normal sensing glass
in low ionic solution

X **Undetectable**

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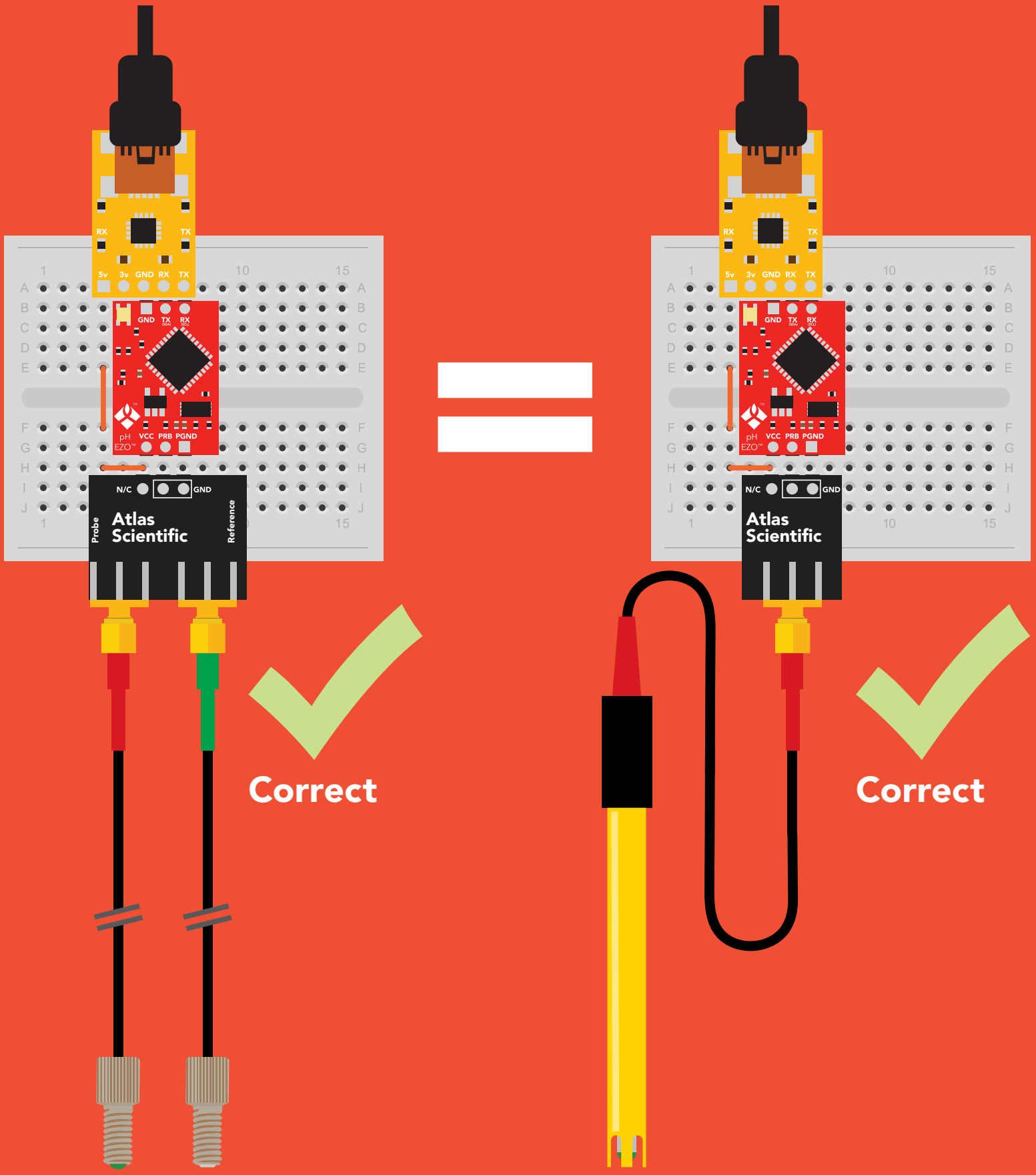
Example setup



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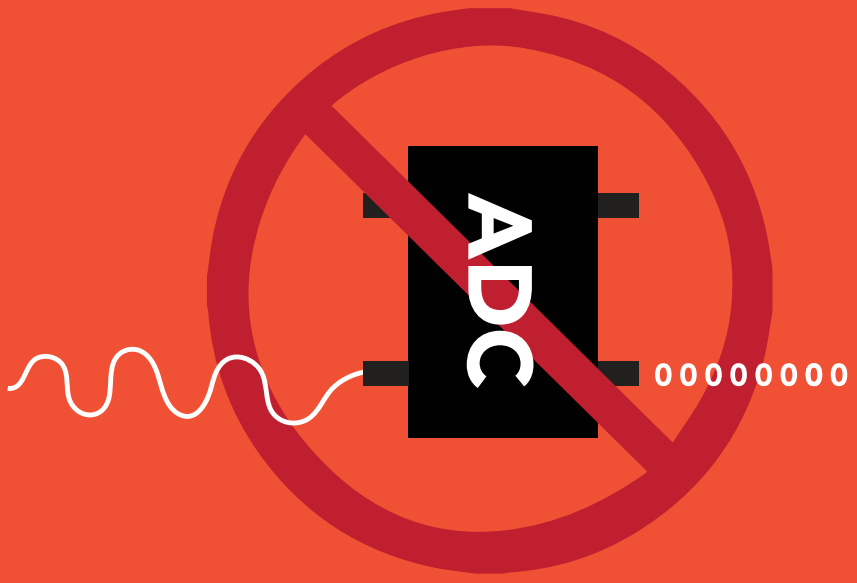
A pH electrode is a passive device that detects a current generated from hydrogen ion activity. This current *(which can be positive or negative)* is *very weak and cannot be detected with a multimeter, or an analog to digital converter.* This weak electrical signal can easily be disrupted and care should be taken to only use proper connectors and cables.

Result will ***always*** read zero.



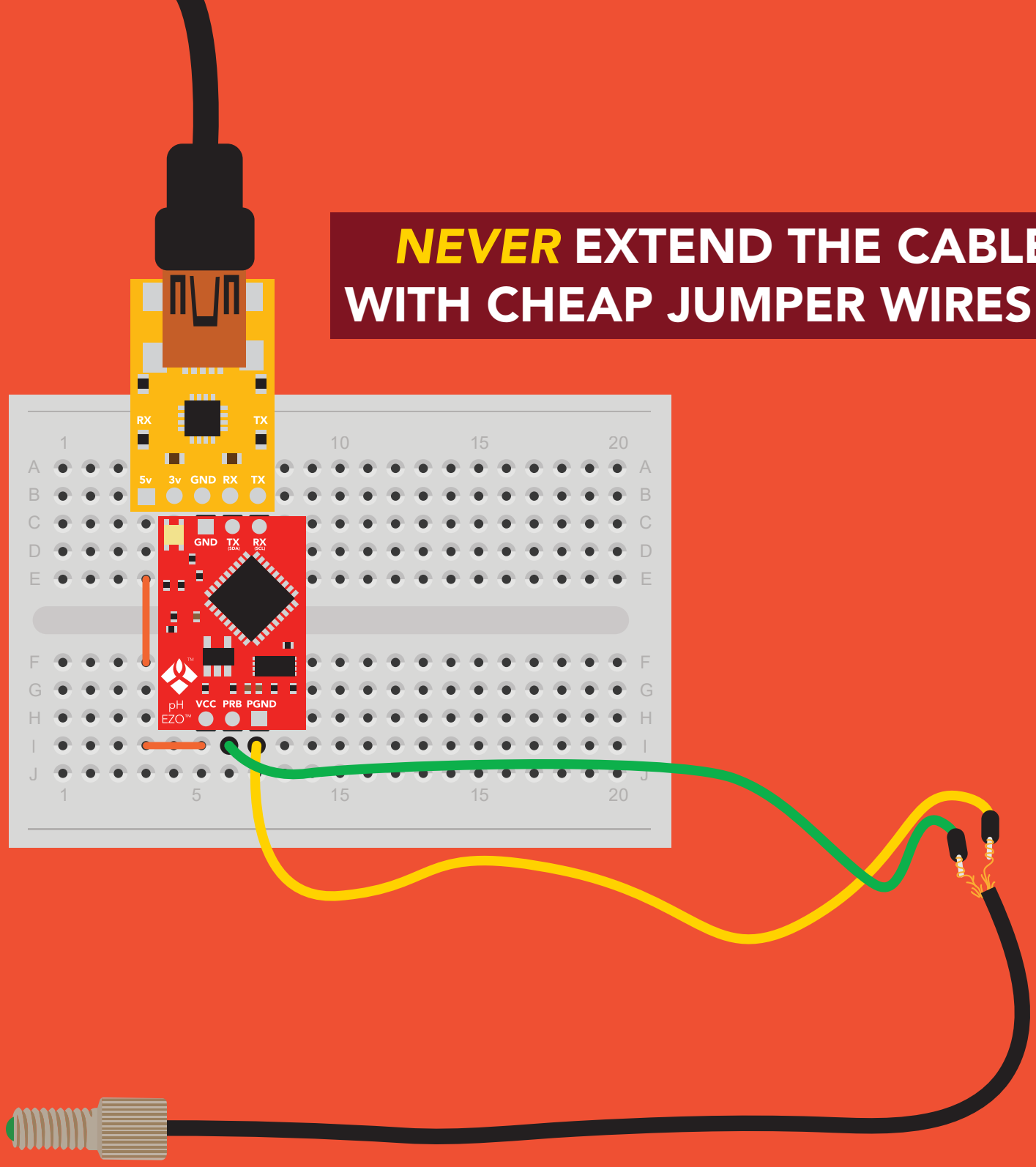
Result will ***always*** read zero.

The current that is generated from the hydrogen ion activity is the reciprocal of that activity and can be predicted using this equation:

$$E = E^0 + \frac{RT}{F}\ln(\alpha_{H+}) = E^0 - \frac{2.303RT}{F}pH$$

Where **R** is the ideal gas constant.
T is the temperature in Kelvin.
F is the Faraday constant.

Because a pH probe is a passive device it can pick up voltages that are transmitted through the solution being measured. This will result in incorrect readings and will slowly damage the pH probe over time. In this instance, proper isolation is required.



NEVER EXTEND THE CABLE WITH CHEAP JUMPER WIRES!

DO NOT CUT THE PROBE CABLE WITHOUT REFERRING TO *THIS DOCUMENT!*

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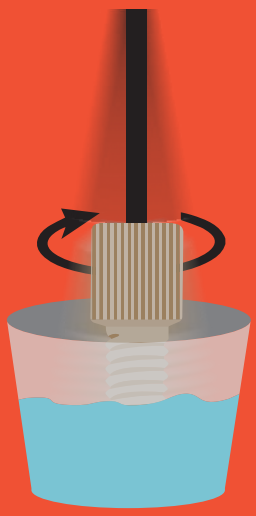
Improve response time

Vigorously stir the probe in the sample, calibration solution, or rinse solution. This action will bring solution to the probes surface quicker and improve the speed of response.



Response time

Probe cleaning

Coating of the pH bulb can lead to erroneous readings including shortened span (slope). The type of coating will determine the cleaning technique. Soft coatings can be removed by vigorous stirring or by the use of a squirt bottle. Organic chemical, or hard coatings, should be chemically removed using a light bleach solution. If cleaning does not restore performance, reconditioning may be tried. ***Do not use a brush or abrasive materials on the pH probe.***