

Bioreactor Accessories pH, ORP / Redox & pO₂ Probe Simulator

PROBE SIMULATOR MANUAL

Phone: 610-363-2650 Fax: 610-363-2583 Email: vicmail@valley-instrument.com



VALLEY INSTRUMENT COMPANY
491 Clover Mill Road Exton, PA 19341

pH, ORP / Redox & pO₂ Probe Simulator

Table of Contents

Specifications	3
Component Description	4
Operation.....	5
Ordering Information and Accessories	7
Warranty	8

pH, ORP / Redox & pO2 Probe Simulator

Specifications



Fig. 1 Front view of simulator



Fig. 2 Rear view of simulator

pH

Output @ 25°C: 4pH = (+) 177.0mV \pm 0.5mV
7pH = 0.0mV \pm 0.1mV
10pH = (-) 177.0mV \pm 0.5mV
Output @ 10°C: 4pH = (+) 168.2mV \pm 1.0mV
7pH = 0.0mV \pm 0.1mV
10pH = (-) 168.2mV \pm 1.0mV
Output @ 40°C: 4pH = (+) 185.9mV \pm 1.0mV
7pH = 0.0mV \pm 0.1mV
10pH = (-) 185.9mV \pm 1.0mV

Impedance: Low = 10 Meg Ω \pm 1%
High = 110 Meg Ω \pm 1%

pH solution ground (white jack) = 50K \pm 1% to pH reference

Redox/Orp

Output: (+) 500mV \pm 0.5mV
0mV \pm 0.1mV
(-) 500mV \pm 0.5mV

Impedance: Low = 10 Meg Ω \pm 1%
High = 110 Meg Ω \pm 1%

pO2 Polarographic DO

Output: Nitrogen N2 (>1.000 Meg Ω)
50% Air (10 Meg Ω \pm 1%)
100% Air (20 Meg Ω \pm 1%)
Ratio Accuracy = \pm 0.1%

RTD: 22.1K \pm 1%

Power Indicator

Red LED goes out to indicate bad battery at 7.0 V \pm 0.5V

Battery

Type: Standard 9V
Location: Slide open compartment on bottom

pH, ORP / Redox & pO₂ Probe Simulator

Component Description

A: pH Impedance Test Switch

LOW - Normal simulator operating position
HIGH - Test the operation of pH instrument and cable under high impedance conditions such as low temperature or aging probes.

B: pH & ORP/Redox Output Connector

C: pH Solution Ground Jack

D: pO₂ Polarographic DO Output Connector

E: pO₂ Polarographic DO Signal Selector

Nitrogen N₂ (>1.000 Meg Ω)
50% Air (10 Meg $\Omega \pm 1\%$)
100% Air (20 Meg $\Omega \pm 1\%$)

F: pH/ORP/Redox Signal Selector

4pH - simulates probe in 4pH buffer solution
7pH - simulates probe in 7pH buffer solution
10pH - simulates probe in 10pH buffer solution

0mV - simulates probe at 0mV
(+) 500mV - simulates probe at +500mV
(-) 500mV - simulates probe at -500mV

Note: This is a locking switch. To operate, pull the switch out and toggle to the desired position

G: pH/ORP/Redox Selector Switch

pH - pH testing
ORP/REDOX - mV Orp/Redox testing

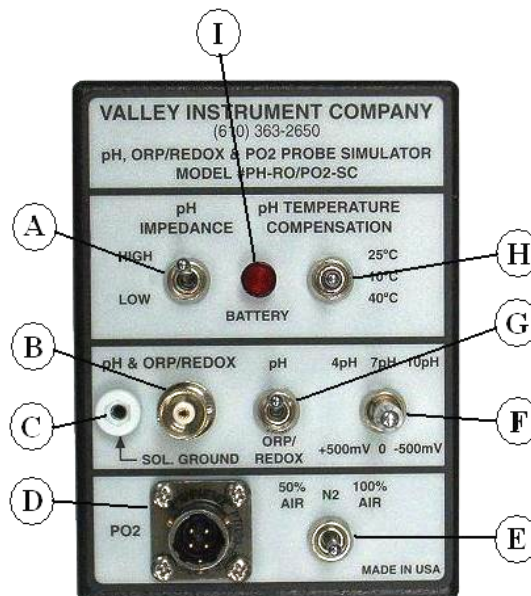
H: pH Temperature Compensation Switch

25°C - normal operating position
10°C - simulates 10°C operating temperature
40°C - simulates 40°C operating temperature

I: Power/Battery Indicator (LED)

Illuminated - unit is On and battery is okay
Off - unit is off or battery is bad

Note: when simulating 7pH or 0mV, no battery power is required and indicator will not be illuminated



Battery Replacement

1. When switch [F] is in the 4pH (+500mV) or 10pH (-500mV) position and the battery LED [I] is not illuminated, the battery needs replacement.
2. Remove battery cover from rear of unit as seen in Fig 2.
3. Remove and discard old battery and replace with a new 9V battery.

pH, ORP / Redox & pO₂ Probe Simulator

Operation

Polarographic DO Testing

1. To verify or test a pO₂ polarographic system, disconnect the cable at the probe and plug the cable into the DO output connector [D].
2. Set the DO signal selector switch [E] to the N₂ position and adjust the pO₂ amplifier/controller zero calibration adjustment until the instrument reads zero.
3. Set the DO signal selector switch [E] to the 100% air position and adjust the pO₂ amplifier/controller span calibration adjustment until the instrument reads 100%.
4. Set the DO signal selector switch [E] to the 50% air position and check that the instrument reads $50.0 \pm 0.2\%$ to verify linearity.
5. You have now verified your amplifier and your cable. Disconnect the cable from the simulator and plug it back on your pO₂ probe.
6. If your probe is in air and was calibrated in the Air setting, it should read $\approx 100\% \pm 50\%$. There is a wide variability based on probe manufacturer specifications, amplifier bias (excitation), electrolyte, membrane or overall probe condition.
7. You have now verified your entire pO₂ system and are ready to calibrate your probe.

pH Testing

1. To verify or test a pH system, disconnect the cable at the probe and plug the cable into the pH output connector [B]. If you have a detachable probe cable that is not a BNC input, see the optional cable adapters on page 7. If your cable is not detachable at the probe or you do not have the proper adapter, use the BNC to BNC cable provided to connect the simulator directly to your pH amplifier/controller. If you have a pH amplifier/controller that is not a Valley instrument or it does not have a BNC input, see the optional amplifier/controller adapters on page (x).
2. If you have a pH probe system with solution ground, connect the instrument pin plug into the solution ground jack [C]. To test the pH system, unplug the pin plug and verify the system indicates a reference fault.
3. Set the pH/ORP/Redox selector switch [G] to the pH position.
4. Verify the pH impedance switch [A] is in the Low position and the Temperature Compensation switch [H] is in the 25°C position.
5. Set the pH/ORP/Redox Signal Selector switch [F] to the 7pH position and adjust the pH amplifier/controller standardize (zero) calibration adjustment until the instrument reads 7pH.
Note: This is a locking switch. To operate, pull the switch out and toggle to the desired position
6. Set the pH/ORP/Redox Signal Selector switch [F] to the 4pH position and adjust the pH amplifier/controller slope (span) calibration adjustment until the instrument reads 4pH.

7. Set the pH/ORP/Redox Signal Selector switch [F] to the 10pH position and verify the instrument reads $10\text{pH} \pm 0.01 \text{ pH}$. If it is out of spec, repeat steps 5 and 6 until instrument is within desired range.

8. Set the pH/ORP/Redox Signal Selector switch [F] to the 7pH position and simulate a high impedance condition by setting the pH Impedance test switch [A] to the High position. Verify the instrument reads $7\text{pH} \pm 0.02 \text{ pH}$. Set the pH Impedance Test switch back to the Low position.

Note: Some instruments will go into probe fault with impedance > 100 Meg Ω .

9. Set the pH/ORP/Redox Signal Selector switch [F] to the 4pH position and simulate a high impedance condition by setting the pH Impedance test switch [A] to the High position. Verify the instrument reads $4\text{pH} \pm 0.02 \text{ pH}$. Set the pH Impedance Test switch back to the Low position.

10. Set the pH/ORP/Redox Signal Selector switch [F] to the 10pH position and simulate a high impedance condition by setting the pH Impedance test switch [A] to the High position. Verify the instrument reads $10\text{pH} \pm 0.02 \text{ pH}$. Set the pH Impedance Test switch back to the Low position.

Note: If your amplifier system shows excessive error in high impedance position, your amplifier or input cable is defective.

11. If your controller has a temperature compensation adjustment, place the pH/ORP/Redox Signal Selector switch [F] to the 4pH position and verify your controller reads 4.00 pH.

12. Set the pH Temperature Compensation switch [H] to the 10°C position and turn your controller temperature compensation On. Adjust your controller temperature compensation to 10°C and verify the instrument reads $4\text{pH} \pm 0.03 \text{ pH}$.

13. Set the pH/ORP/Redox Signal Selector switch [F] to the 10pH position and verify your controller reads 10.00pH.

14. Set the pH Temperature Compensation switch [H] to the 40°C position and turn your controller temperature compensation On. Adjust your controller temperature compensation to 40°C and verify the instrument reads $10\text{pH} \pm 0.03 \text{ pH}$. Set the pH Temperature Compensation switch back to the 25°C position.

Note: At 7pH, temperature compensation should have no affect on the process value

15. If you are using a standard pH probe with no solution ground, you can test your instrument isolation by connecting the solution ground jack [C] to your instrument ground. Set the pH Impedance test switch [A] to the Low position and toggle the pH/ORP/Redox Signal Selector switch [F] to the 7pH, 4pH and 10pH positions. If the instrument readings are altered after setting down, your instrument is in question.

16. If you are working with a pH probe with a detachable cable, you have now verified your amplifier and cable. Disconnect the cable from the simulator and plug it back on your pH probe.

pH, ORP / Redox & pO₂ Probe Simulator

Operation

17. If you are working with a pH probe with an attached cable, you have now verified your amplifier. Disconnect the test cable from the amplifier and plug the probe cable back into your amplifier/controller.

18. You have now verified your pH system and are ready to calibrate your probe.

11. You have now verified your Redox/ORP system and are ready to calibrate your probe.

ORP/Redox Testing

1. To verify or test a Redox or ORP system, disconnect the cable at the probe and plug the cable into the pH output connector [B]. If you have a detachable probe cable that is not a BNC input, see the optional cable adapters on page 7. If your cable is not detachable at the probe or you do not have the proper adapter, use the BNC to BNC cable provided to connect the simulator directly to your Redox/ORP amplifier/controller. If you have a Redox/ORP amplifier/controller that is not a Valley instrument or it does not have a BNC input, see the optional amplifier/controller adapters on page (x).

2. Set the pH/ORP/Redox selector switch [G] to the ORP/Redox position.

3. Set the pH impedance switch [A] to the Low position.

4. Set the pH/ORP/Redox Signal Selector switch [F] to the zero position and adjust the Redox/pH amplifier/controller standardize (zero) calibration adjustment until the instrument reads 0.

5. Set the pH/ORP/Redox Signal Selector switch [F] to the (+) 500mV position and adjust the Redox/pH amplifier/controller slope (span) calibration adjustment until the instrument reads +500mV.

6. Set the pH/ORP/Redox Signal Selector switch [F] to the (-) 500mV position and verify the instrument reads -500mV ± 1 mV.

7. With the pH/ORP/Redox Signal Selector switch [F] in the (-) 500mV position, set the pH impedance switch [A] to the High position. Verify the instrument reading does not change by more than ± 1 mV.

8. Set the pH/ORP/Redox Signal Selector switch [F] to the zero position, switch the pH impedance switch [A] from the High to Low position. Verify the instrument zero does not change by more than ± 1 mV.

Note: If your instrument shows excessive error in high impedance position at 0 or 500mV, your amplifier or input cable impedance is defective.

9. If you are working with a Redox/ORP probe with a detachable cable, you have now verified your instrument and cable. Disconnect the cable from the simulator and plug it back on your Redox/ORP probe.

10. If you are working with a Redox/ORP probe with an attached cable, you have now verified your amplifier. Disconnect the test cable from the amplifier and plug the probe cable back into your amplifier/controller.

pH, ORP / Redox & pO2 Probe Simulator

Ordering Information and Accessories

Part #: PH-RO/PO2-SC

Includes: Simulator
10' coaxial cable #VC-BB
9V battery

Part #: PH-RO/PO2-SC-KIT

Includes: Simulator
10' coaxial cable #VC-BB
TNC cable adapter #VP-BT
S7 or S8 cable adapter #VP-B7
K9 or K8S cable adapter #VP-B9
9V battery

Options

Part #: PH-RO/PO2-CERT

NIST traceable calibration certificate with data

It is recommended the simulator is returned to our Exton, PA plant for re-calibration.

Accessories

pH Cable Adapters



VP-BT - Adapts a TNC probe cable to the simulator



VP-B7 - Adapts a S7 or S8 probe cable to the simulator



VP-B9 - Adapts a K9 or K8S probe cable to the simulator



VP-BIC - Adapts a 962 pH cable to TNC

pO2 Cable Adapters



VP-VP - Adapts a Vario-Pin pO2 probe cable to the simulator

Cables



VC-BB - 10' Coaxial Cable
BNC probe to BNC instrument
(1 supplied with simulator)

pH, ORP / Redox & pO₂ Probe Simulator

Warranty

The simulator is guaranteed for three (3) years from date of shipment. This warranty includes all parts and labor necessary to repair or replace defective simulator returned to our Exton, PA plant freight prepaid. This warranty excludes batteries or unusual wear and tear. Valley Instrument Company is not liable for any costs or damages other than the specific warranties enclosed herein. We are not liable for damages to equipment or loss of production time due to malfunction of this warranty device. Warranty is void if simulator has been tampered with in any way.