

M920 pH/Dual ORP Controller



Owner's Manual



Simply intelligent water care.

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Certified to
NSF/ANSI Standard 50

I. Introduction

A. Water Chemistry

Water chemistry is a complex science that contains many variables. These variables not only affect the water environment itself, but they can have adverse effects on your equipment as well as your health. These are only some of the factors which we follow closely to ensure the most healthy water interactions:

pH is the measurement of the acidity or basicity in an aqueous solution. A measurement below 7 is considered acid, while a measurement above 7 is base or alkaline. It is a significant factor in determining the water quality as it affects sanitizer levels, water color, and human reaction to the water.


ORP (Oxidation Reduction Potential) is the measurement of the oxidizing capacity present in water. ORP cannot be fooled by the effects of pH, total dissolved solids (TDS), stabilizers, and non-chlorine oxidizers. A typical ORP sensor measures Hypochlorous Acid (HOCl), which is the more effective component of free chlorine. A higher ORP reading equates to the sanitizer working more effectively.

Water balance is comprised of pH, calcium hardness, total alkalinity, temperature, and TDS. When water is balanced, the Langelier saturation index is 0. Values above +0.3 lead to scaling and cloudy water, while values below -0.3 can cause corrosion of pool equipment and surfaces. If the water balance is not fixed in a timely manner, secondary effects can lead to rapidly declining water conditions that can affect the health of the water occupants.

pH and ORP work conversely to one another, and are affected by other factors such as temperature, Cyanuric Acid, and TDS that can increase the negative impacts of unbalanced water.

B. IMPORTANT SAFETY INSTRUCTIONS

1. READ AND FOLLOW ALL INSTRUCTIONS.

2. **Risk of electric shock:** Connect the controller to a dedicated ground-fault circuit interrupter (GFCI) circuit breaker.
 - a. A green colored terminal or a terminal marked G, GR, Ground, Grounding, or the  symbol* is located inside the supply terminal box or compartment. To reduce the risk of electrical shock, this terminal must be connected to the grounding means provided in the electrical supply service panel with a continuous copper wire equivalent in size to the circuit conductors supplying this equipment.
**IEC Publication 417, Symbol 5019.*
3. Disconnect power before servicing the controller.
4. Inspect all power cords frequently. Any damaged cords should be replaced immediately to reduce the risk of injury by shock.
5. Always maintain a record of manual water chemistry readings using an accurate test kit. Automated controllers are not a substitute for this Health Department requirement.
6. **WARNING** – To reduce the risk of injury, do not permit children to use this product unless they are closely supervised at all times.
7. **Danger** – Risk of injury.
 - a. Replace damaged cord immediately.
 - b. Do not bury cord.
 - c. Connect to a grounded, grounding type receptacle only.
8. **WARNING** – Risk of electric shock. Install at least 5 feet (1.5m) from inside wall of water enclosure using non-metallic plumbing.
9. Operation of this controller without a functioning flow-switch will void the NSF Certification.
10. **WARNING** – Do not install this controller where it is accessible to the public.
11. **SAVE THESE INSTRUCTIONS.**

C. System Components

1. IPS M920 pH/Dual ORP Controller
 - a. It allows automatic monitoring of water sanitization and pH balance through a simple, user-friendly interface, resulting in easier management of water balance in swimming pools, spas, or circulating water environments.
 - b. It can be easily installed into your existing pool environment and equipment, or can be customized to your needs.
 - c. It monitors and displays the pH and ORP levels using LEDs and digital readouts on the front panel. If the temperature sensor is installed, the M920 will monitor temperature and display on the front panel when in Temp mode.
 - d. It monitors up to two chemical tanks equipped with level switches and displays status using LEDs on the front panel.

In addition, six separate function buttons allow simple pushbutton control of these individual parameters:

- 1) Set Level – ORP or pH level to be maintained,
 - 2) Dose Timer – Timed or continuous feed modes,
 - 3) Delay Timer – Delay time between feed cycles,
 - 4) Over Timer – Maximum feed cycles or time allowed,
 - 5) High Alert – Maximum level of ORP or pH allowed,
 - 6) Low Alert – Minimum level of ORP or pH allowed,
 - 7) pH Cal – pH calibration for variation in pH sensors.
- e. If the ORP (sanitizer) levels fall below a preset set level, then the controller will activate the chemical feeder until the preset set level is reached. The pH is similarly maintained.
2. Flow Cell with Flow Switch
 - a. An injection-molded flow cell with integrated flow switch houses the pH and ORP sensors, and partners with the M920 controller to monitor the pH and ORP levels in the water.

- b. The flow switch verifies that water is flowing during a feed cycle, and sends the controller instructions to deactivate the feed if water is not flowing.
 - c. Operation of this controller without a functioning flow-switch will void the NSF Certification.
3. pH and ORP Sensors
- a. pH Sensor – standard (Use only IPS Controllers part # SXPH to maintain NSF Certification)
 - b. ORP Platinum Sensor – standard (Use only IPS Controllers part # SXORP to maintain NSF Certification)
 - c. ORP Gold Sensor – for use with Salt Chlorine systems (Use only IPS Controllers part # SXORP-G to maintain NSF Certification)
4. Fittings – tubing connectors (2) for tapping installation of flow cell input/output
5. In-line Filter with 2-way valves
6. Tubing – 25 feet of 3/8"
7. Chemical Pump – Peristaltic pump, choice of sizes and brands (optional)
8. Mounting Board – ABS plastic with mounting holes and stainless hardware (16" x 12" standard, 24" x 19" optional)
9. Temperature Sensor – Senses the current water temperature and displays the temperature in the display when in Temp mode.
10. Remote Monitoring – When connected to the Internet through the Internal Ethernet connection, the controller will send data to a central website. Users can monitor controller activity remotely and report on activity for a date range. **Note:** A sign-up fee applies.

D. Specifications

Enclosure: 7.95”L x 5.98”W x 3.54”D

Electrical Input/Output: 120 VAC, 50 - 60 Hz

ORP Set Level: 400 mV to 900 mV

pH Set Level: 7.0 to 8.0

Dose Timer: Off, Continuous, or Timed cycle

Delay Time: 1 - 99 minutes

Overfeed Timer: Off, 20-100 timed cycles, or 20-180 continuous minutes, default of 60

High Alert: pH default of 8.0, ORP default of 900

Low Alert: pH default of 7.0, ORP default of 100

Readout: Function LED and numerical digital displays

Alarm: Red alert LEDs with optional external audible/visible alarm

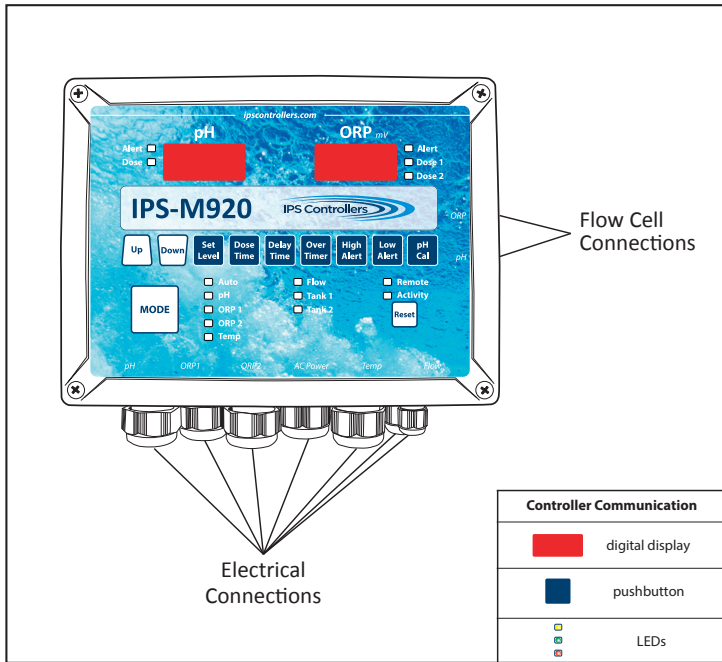


Figure 2: M920 Controller Components Connections

E. Controller Panel Descriptions

1. Digital Displays and Function LEDs
 - a. pH
 1. Alert - red LED
 2. Dose - green LED
 - b. ORP
 1. Alert - red LED
 2. Dose 1 - yellow LED
 3. Dose 2 - yellow LED

2. Mode - pushbutton adjustments
 - a. Auto - red LED
 - b. pH standby - green LED
 - c. ORP1 standby - yellow LED
 - d. ORP2 standby - yellow LED
 - e. Temp display & calibrate - green LED
 - f. OFF mode - In standby, press and hold Mode button for 3 seconds to turn controller off.
3. Arrows - pushbutton adjustments
 - a. Up - For increasing feature values
 - b. Down - For decreasing features values
4. Set Level – pushbutton adjustments
5. Dose Timer – pushbutton adjustments
6. Delay Time - pushbutton adjustments
7. Over Timer – pushbutton adjustments
8. High Alert – pushbutton adjustments
9. Low Alert – pushbutton adjustments
10. pH Cal – pushbutton adjustments
11. Flow - green LED
12. Tank 1 - red LED
13. Tank 2 - red LED
14. Remote (Power) - green LED
15. Activity (Remote) - yellow LED
16. Electrical Connections (peripherals)
 - a. pH output (left receptacle) - max. 3.15 amps @ 120 VAC
max, 1.6 amps@240 VAC

- b. ORP1 output (center receptacle)- max. 3.15 amps @ 120 VAC max, 1.6 amps@240 VAC
- c. ORP2 output (right receptacle) - max. 3.15 amps @ 120 VAC max, 1.6 amps@240 VAC
- d. AC power - 120 VAC, 50-60 Hz
- e. Flow - from flow cell
- f. Tank 1 - from tank level switch (optional)
- g. Tank 2 - from tank level switch (optional)
- h. External audible/visible alarm (optional)
- i. pH sensor - BNC connection
- j. ORP sensor - BNC connection
- k. Optional dry contact ORP1 output (contact factory for instructions)

F. Electrical Descriptions

- 1. Power
 - a. 120 VAC, 50-60 Hz, 3-wire grounded NEMA 5 power cord. GFCI source required. **Note: There is an option to convert to 240 VAC input/output.**
- 2. Dip Switches (1-4)
 - a. 1: pH/ORP interlock (default: **OFF**)
No ORP1 or ORP2 feed if pH is feeding (ON).
 - b. 2: pH/ORP alert interlock (default: **ON**)
No ORP1 or ORP2 if pH is in alert mode (ON).
 - c. 3: Acid/Base default acid (default: **OFF**)
 - 1. Feed base chemical when pH level falls below set point. (ON)
 - 2. Feed acid chemical when pH above set point. (OFF)
 - d. 4: Not in use.

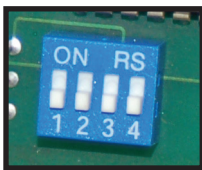


Figure 3: Dipswitches

II. Installation

A. Setup (Installation video available at ipscontrollers.com)

1. Turn off all peripheral equipment such as heaters, chemical feeders, and pumps.
2. Relieve pressure from the filtration system.

B. Tools

1. Cordless drill
2. 1/4" NPT Tap
3. 7/16" drill bit
4. 1/4" or 3/8" drill bit for Temp Sensor
5. Masonry drill bit and anchors, or other appropriate fasteners
6. 13/16" wrench or channel-lock pliers

C. Procedure

1. Location
 - a. Wall area with easy access
 - b. Within 8 feet of feeder
 - c. At least 10 feet from water edge
 - d. Close proximity to time clock
 - e. Within 6 feet of GFCI power source
2. Mounting
 - a. Controller and flow cell are factory-mounted to ABS board for your convenience.
 - b. Securely mount ABS mounting board with M920 controller and flow cell on wall (vertical installation).

- c. If applicable, securely attach the peristaltic pumps to the optional larger ABS mounting board with the provided hardware.
- d. Drill a 7/16" hole and tap a 1/4" NPT port to a location downstream from the filter and upstream from the heater and any chemical introduction points. Install a tubing connector and flex tubing to be connected to the left side flow cell port containing the flow switch. The in-line filter will also be installed in this line and mounted to a horizontal pipe with band clamps (included). **Note: Verify that the filter is installed with directional arrows pointing in the direction of the flow.**
- e. Drill a 7/16" hole and tap a 1/4" NPT port to a location that is subject to vacuum or reduced pressure (after heater). Install a tubing connector and flex tubing to be connected to the right side flow cell port. **Note: We recommend that this tubing connector be installed into the drain hole on the suction side of the pump for best performance.**
- f. Cut a 3" - 6" length of flex tubing and insert into the flow cell's sample stream port (center).

3. pH and ORP Sensors

Note: Carefully unpack the pH and ORP sensors and set aside in a clear area until ready to install into the flow cell.

- a. Verify that the M920 controller power is OFF.
 - b. Remove the plastic protective caps from the sensors and store in a separate location for future re-use.
 - c. Slide the glass end of each sensor (pH and ORP) into one of the compression fittings located at the top of the flow cell. Ensure that the tip is submerged into the water to within 1/2" from the bottom of the flow cell. Hand tighten each nut fitting.
- ### 4. Temperature Sensor
- a. Drill a 1/4" or 3/8" inch hole (depending on the sensor size) after the filter and before the heater.

- b. Insert the temperature sensor into the hole and secure with a band clamp (included).
 - c. Run the sensor cable into the controller through the strain relief marked “temp” and connect to the terminal block on the front circuit board marked “Temp”.
5. Remote Monitoring Ethernet Connection
 - a. Run the Ethernet cable with connector into the M920 through the largest strain relief connector on the bottom or the enclosure.
 - b. Connect to the Ethernet connector on the front circuit board.
 - c. When a valid connection is made, the green “Remote” LED will light up and the orange “Activity” LED will blink intermittently.
6. Electrical Connections
 - a. Verify that the M920 controller power is OFF.
 - b. Connect the pH feeder connection to the appropriate peristaltic pump or other device.
 - c. Connect the ORP feeder connection to the appropriate peristaltic pump or other device. **Note: There is another connection port for ORP2.**
 - d. Method 1 (recommended): Connect the AC power cord to the load-side of the circulation pump circuit. This will only provide power to the M920 when the circulation pump is running.
 - e. Method 2: Connect the AC power cord to a GFCI power source.
 - f. Connect the pH sensor connector to the corresponding lower port (labeled pH) at the right edge of the controller.
 - g. Connect the ORP sensor connector to the corresponding upper port (labeled ORP) at the right edge of the controller.
7. Optional connection to a Salt Chlorine Generator (SCG)

The M920 controller is capable of controlling (turning on/off) a SCG depending on the current ORP reading. This action can be accomplished through the use of a 120V or 240V relay, or by connecting the SCG to the “normally open” dry contact relay (ORP1) included with the M920 controller. Contact the factory for more information.

8. Converting from Cord to Permanent Connection

- a. Remove cover.
- b. Loosen strain relief gland from AC cord.
- c. Using a 3/32” (2.44mm) slot screw driver, carefully loosen terminals that attach the AC cord to the controller box.
- d. Remove the AC cord.
- e. Replace the AC cord with a minimum jacketed cord of 18/3 AWG SW 105° 900 V, then carefully hand tighten the terminals on the strain relief gland. **Note:** For liquid tight installation connections, replace the strain relief gland with a liquid tight connector and use a minimum stranded wire gauge of 18 AWG 105° 600 V (**do not use solid conductor**) for each conductor: Black (hot), White (common), and Green (ground).

Important:

The minimum allowable conductor size is 18 AWG with an ampacity of 10 AMPS, and a ground fault interrupt circuit breaker of 15-20 AMPS.

Use stranded copper wire only.