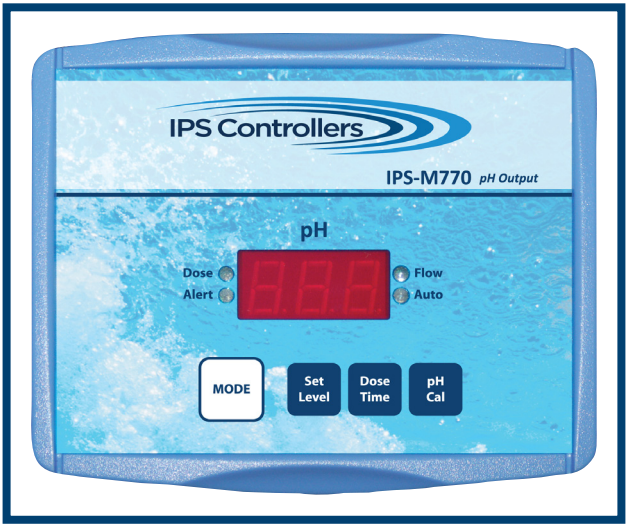
M770 pH Controller



Owner's Manual

IPS Controllers

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.

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.

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 coloured 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.

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 M770 pH Controller

   a. Allows automatic monitoring of pH balance through a simple, user-friendly interface, resulting in easier management of water balance in swimming pools, spas, or circulating water environments.

   b. Easily installed into your existing pool environment and equipment, or can be customized to your needs.

   c. Monitors and displays the pH level using LEDs and a digital readout on the front panel.

   In addition, four separate function buttons allow simple push-button control of these individual parameters:

   1) Mode - Auto or Stand-by (programming),
   2) Set Level - pH level to be maintained,
   3) Dose Timer - Timed or Continuous feed modes,
   4) pH Cal - pH calibration for variation in pH sensors.

   d. If the pH level falls below the preset set level, then the controller will activate the chemical feeder until the preset set level is reached.

2. Flow Cell with Switch

   a. An injection-molded flow cell with integrated flow switch houses the pH sensor, and partners with the M770 controller to monitor the pH level 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 Sensor - pH Glass Sensor (Use only IPS Controllers part # SXPH to maintain NSF Certification)

4. Fittings – for tapping installation of flow cell input/output

5. In-line Filter - installed prior to flow cell to protect switch and sensor

6. Tubing – 25 feet of 3/8" for providing filtered water to and from the flow cell

7. Feeder – peristaltic pump or CO_2 for controlling pH (purchased separately)

8. Mounting Board – ABS plastic with mounting inserts and stainless hardware (16" x 12" standard)

9. Check Valve/Injector – qty. 1 (for use with optional peristaltic pump)

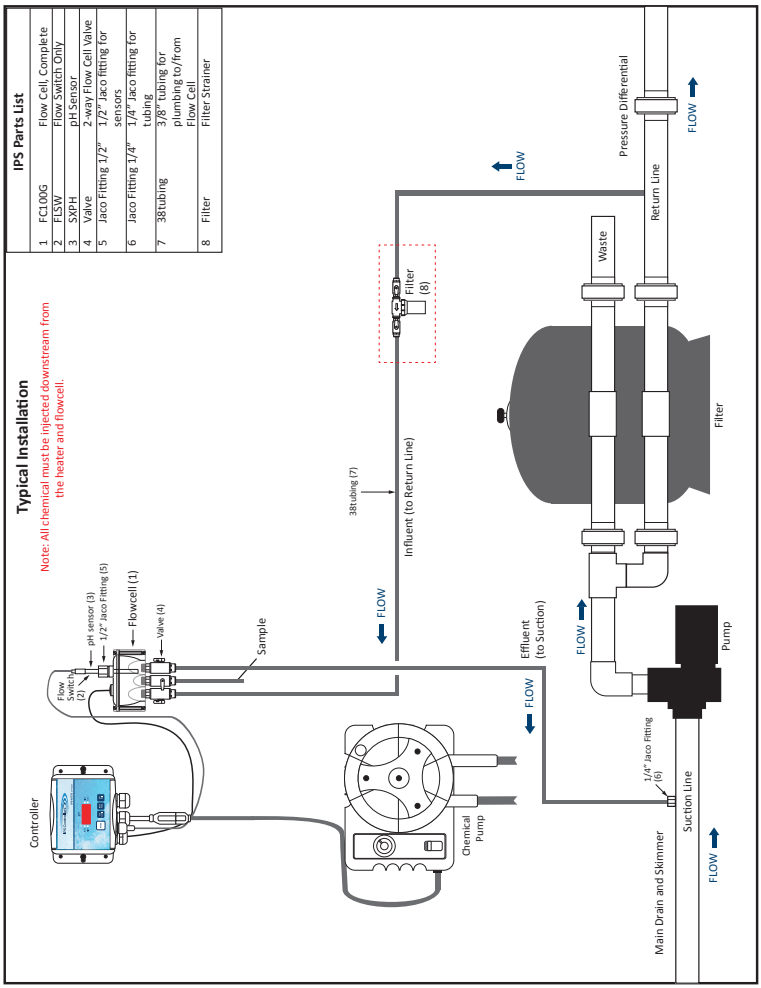

Figure 1: This is a typical installation using IPS' system package, which consists of an M770 pH Controller and a flow cell with switch.

D. Specifications

Enclosure: 7"L x 4.5"W x 2.75"D (**Note:** Mounting board dimensions are 16"L x 12"W x 1/4"D.)

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

pH Set Level: 7.0 to 8.0

Dose Timer: Off, Continuous, or Timed cycle

Overfeed Timer: 30 timed cycles, or 120 continuous minutes

High Alert: Factory set at 8.0

Low Alert: Factory set at 7.0

Readout: Function LED and numerical digital displays

Alarm: Red alert LEDs

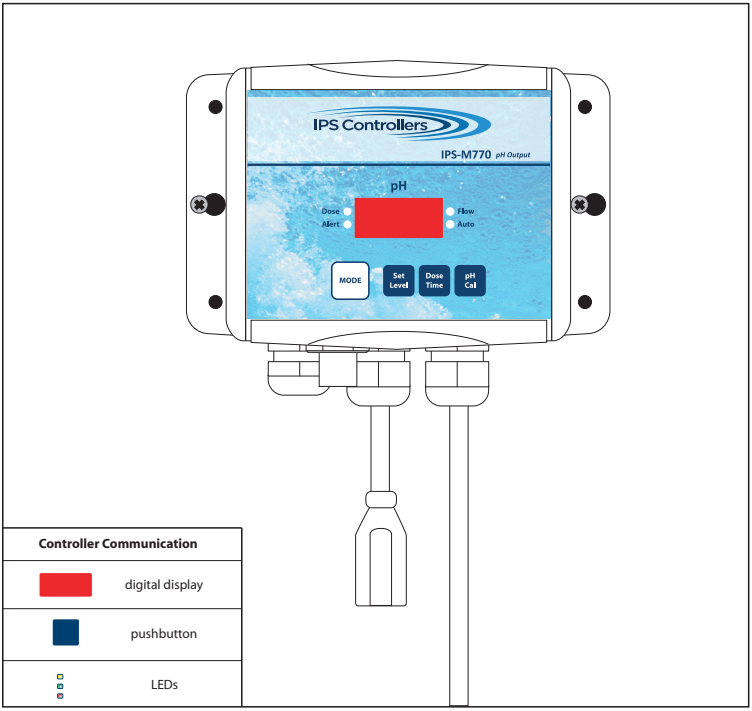

Figure 2: M770 Controller Components Connections

E. Controller Panel Descriptions

1. Digital displays and Function LEDs
   a. Alert - red LED
   b. Dose - green LED

2. Mode - pushbutton adjustments
   a. Auto - red LED
   b. pH standby - no LED
   c. OFF mode - In standby, press and hold Mode button for 3 seconds to turn controller off.

3. Flow - green LED

4. Set Level – pushbutton adjustments

5. Dose Timer – pushbutton adjustments

6. pH Cal – pushbutton adjustments

7. Electrical Connections (peripherals)
   a. pH output - max. 5 amps @ 120 VAC
   b. AC power - 120 VAC, 50-60 Hz
   c. Flow - from flow cell
   d. pH sensor - BNC connection

F. Electrical Descriptions

1. Power
   a. 120 VAC, 50-60 Hz, 3-wire grounded NEMA 5 power cord. GFCI source required.

II. Installation

A. Setup

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. Masonry drill bit and anchors, or other appropriate fasteners
5. 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. Securely mount ABS mounting board with M770 controller and flow cell on wall (vertical installation).
   b. If applicable, securely attach the peristaltic pump with the provided hardware.
   c. Drill a 7/16" hole and and tap a 1/4" NPT port to a location directly downstream from the filter and upstream from any

chemical introduction points. Install a tubing connector (included) and flex tubing to be connected to the left side flow cell port containing the flow switch. Install an in-line filter between tubing connector and flow cell in an area that is easily accessible for filter cleaning.

d. Drill a 7/16" hole and tap a 1/4" NPT port to a location that is subject to vacuum or reduced pressure. Install a tubing connector (included) and flex tubing to be connected to the right side flow cell port. **Note: This tubing connector can also be installed into the drain hole on the suction side of the pump for best performance.**

e. Cut a 3" - 6" length of flex tubing and insert into the flow cell's sample stream port (center).

3. pH Sensor
   a. Verify that the M770 controller power is OFF.

   b. Carefully remove the plastic protective bottle and o-ring from the sensor and store in a separate location for future reuse.

   c. Slide the glass end of the sensor into the loosened compression fitting located at the top of the flow cell. Ensure that the tip is submerged to within 1/2" from the bottom of the flow cell. Hand tighten the nut on the compression fitting.

4. Electrical Connections
   a. Verify that the M770 controller power is OFF.

   b. Connect the pH feeder connection to the peristaltic pump or other device.

   c. Connect the AC power cord to a GFCI power source. For outdoor installations, ensure the use of a watertight outlet cover.

d. Connect the flow switch to the screw terminals inside the controller (labeled Flow). Wire jumper should be removed and stored for later use during trouble-shooting.

e. Connect the pH sensor connector to the corresponding port at the bottom of the controller.

III. Operation

A. Startup and Shutdown

1. Startup

   a. Plug M770 power cord into power outlet. For outdoor installations, ensure the use of a watertight outlet cover.

   b. Turn on the filter pump, open the left flow valve (pressure) and right flow cell valve (suction), and verify the water flow through the flow cell by opening the sample port valve (center) and observing a steady stream of water. **Note: Water should pass over the pH sensor for a minimum of 5 minutes to allow for accurate reading of pH levels from the pool or spa.**

   c. Check for leaks and repair if necessary.

   d. Manually adjust and balance the pool or spa water to acceptable ranges using a test kit.

   e. Verify that the green Flow LED is illuminated. The pH dose output is disabled if there is no water flow.

   f. Press the Mode pushbutton momentarily to place the controller into the pH Standby mode. Select the desired pH set level and dose time (continuous or timed).

   g. While still in the pH Standby mode, press the pH Cal pushbutton to calibrate the reading to the value observed through the manual testing of the water. **Note: Always calibrate using water from the sample port of the flow cell.**

   h. Press the Mode pushbutton once to place the controller into Auto mode (red LED is illuminated).

2. Shutdown

Note: Each time the Mode pushbutton is momentarily pressed, the mode will cycle from Auto to pH Standby, and then return to Auto mode.

a. Press the Mode pushbutton momentarily to place the controller in pH Standby mode.

b. Press and hold the Mode pushbutton for 2 seconds until the pH digital display reads OFF.

c. Release the Mode pushbutton. The M770 controller will turn off, and the digital display and function LEDs will go blank. The green Flow LED will be illuminated if water is flowing through the flow cell.

B. Modes and Adjustments

1. Auto
   a. This is the normal operational mode of the M770 controller.
   b. The controller allows full operation and monitoring of the pH levels.
   c. No function pushbuttons are operational in this mode.
   d. The red function LED next to Auto is illuminated.
   e. The pH digital display monitors the sensor input levels.
2. pH Standby

Note: While in this mode, the pH digital display will show dashes, and all Auto functions will be disabled. When a function pushbutton is pressed, the digital display will show the function.

   a. Set Level
      1. Default: 7.4 pH
      2. Selectable range: 7.0 – 8.0 pH (in 0.1 increments)
   b. Dose Timer
      1. Default: Timed dose of 7.2 second pH feed relay energized and 5 minutes pH feed relay de-energized. In the timed dose cycle mode, the Dose LED will flash while dosing and illuminate steadily during the delay portion of the timed cycle. In continuous dose mode, the Dose LED will flash while dosing.

2. Selectable range: OFF, CON (continuous), and Timed (0.6 – 900 seconds ON and 5 minutes OFF)

c. Over Timer

1. Preset: 30 timed cycles or 120 minutes in continuous dosing. The over feed timer does not automatically reset. It must be reset by turning the controller off, then on.

2. The Overfeed timer is interlocked with the Dose Timer selection.

i. If the Dose Timer is set to a timed cycle, the Over Timer will count timed feed cycles. When the preset cycle is reached, the pH digital display will flash and the pH output relay will de-energize.

- Preset: 30 cycles

ii. If the Dose Timer is set to a continuous feed mode, the Over Timer will count in minutes.

- Preset: 120 minutes

3. When the Dose Timer is changed from either timed or continuous feed, the Over Timer is reset to Default.

d. High Alert

1. Preset: 8.0 pH

2. Selectable range: OFF, 7.5 pH to 8.4 pH (acid feed). A high alert will occur if the pH level remains above the High Alert level for 10 continuous minutes, and will automatically turn off the High Alert when the pH level falls below the high alert level for 1 continuous minute. During High Alert, the pH dose output will be disabled.

3. Changing High Alert setting

i. Press Mode button to enter pH standby

ii. Press and hold Mode button and then press Set Level button (red pH alert LED will come on)

release both buttons. You are now in Set Alerts mode.

iii. Use Set Level button to increase/decrease pH High Alert

iiii. When finished, press Mode button to continue

e. Low Alert

1. Preset: 7.0 pH

2. Selectable range: OFF, 6.8 pH to 7.4 pH (acid feed). A low alert will occur if the pH level remains below the Low Alert level for 10 continuous minutes, and will automatical¬ly turn off the Low Alert when the pH level rises above the low alert level for 1 continuous minute. During Low Alert, the pH dose output will be disabled.

3. Changing Low Alert setting

i. Press Mode button to enter pH standby

ii. Press and hold Mode button and then press Set Level button (red pH alert LED will come on) release both buttons. You are now in Set Alerts mode.

iii. Use Dose Time button to increase/decrease pH Low Alert

iiii. When finished, press Mode button to continue

f. pH Cal

1. Default: 0 volt sensor input, displays 7.0 pH

2. Selectable range: With a 0 volt sensor input, the display is adjustable from 6.1 pH to 7.9 pH.

3. Factory defaults

To return the controller to the factory defaults, place the controller in pH Standby mode by pressing the Mode pushbutton. Turn off the controller by holding down the Mode pushbutton for 2 sec-

onds. Press and hold both the Set Level and pH Cal pushbuttons, and then press the Mode pushbutton. The pH display will show "Ld", and the controller will be returned to the factory default functions and be placed in the test mode. Return the controller to full operation by turning off the controller with the Mode pushbutton as described earlier. Turn the controller on again by pressing the Mode pushbutton. **Note: Failure to complete this action will leave the controller in the test mode.**

C. Maintenance

1. Winterizing (extended shutdowns or colder climates)

   a. Turn off the M770 controller and shut off main power to controller.

   b. Gently remove the ph sensor from the flow cell. Fill the provided protective bottle (removed during installation) with water and re-install onto the sensor, and store in a warm, secure location.

   c. Drain the water from the flow cell.

2. Cleaning the sensor tip

Note: It is important to keep the sensor tip clean in order to ensure accurate readings.

   a. The sensor tip should be cleaned every 1 to 4 weeks for commercial pools and spas, and every 1 to 6 months for residential pools and spas. Determine the necessary frequency by comparing the readings before and after the cleaning. Identical readings mean that the cleaning time can be extended.

   b. Turn off the M770 controller.

   c. Close the right and left valves at the bottom of the flow cell.

   d. Loosen the nut fitting on the sensor and gently remove it from the flow cell.

e. Swirl the sensor tip for 5 seconds in Muriatic acid or white vinegar and rinse with water. **Note: Do not touch or brush the sensor tip.**

f. *For commercial pools and spas:* For every 3rd cleaning, swirl the sensor tip in a liquid soap and water solution. Rinse with water.

g. Gently re-insert the sensor into the flow cell and hand tighten the nut fitting.

h. Turn on the M770 controller.

i. Open the flow cell valves and wait for a few minutes for the system to stabilize and get an accurate reading. Adjust the Set Level if necessary.

j. If the sensor does not show the indicated readings, then it must be replaced.

IV. Troubleshooting

A. pH level too low

1. *Set level is too low:* Check pH level with test kit and adjust as necessary.
2. *Chemical feed rate too high:* Lower feed rate.
3. *Chemical feeder is empty (base):* Refill the feeder.
4. *Sensor malfunction:* Replace sensor.

B. pH level too high

1. *Sensor tip is dirty:* Clean according to maintenance instructions.
2. *Improper pH sensor calibration:* Adjust pH calibration.
3. *Chemical feeder is empty (base):* Refill the feeder.
4. *Feed pump malfunction:* Repair the feed pump.
5. *Chemical feed rate too low:* Increase feed rate.

C. pH alert LED on

1. *Problem with acid supply:* Verify that the acid tank is not empty.
2. *Controller undershooting set level:* Increase dosing time if using a timed feed cycle, or switch to continuous feed.
3. *Manual addition:* Verify that the acid was not manually added.
4. *Controller overshooting set level:* 1) Dilute acid with water, or 2) Lower dosing time, or switch from continuous feed to timed feed.

D. Display and LEDs off

1. *No power supply:* Check circuit breaker.

E. Feeder not operating

1. *Inadequate Flow*: Check flow through flow cell and controller.
2. *Bad fuse:* Replace fuse.

F. Flow LED off

1. Verify that all appropriate valves are open.
2. Verify that there is sufficient pressure in the line. Close right side valve slightly if necessary.
3. Verify that the flow switch is securely connected to the controller terminals.
4. The pH output is disabled if the green Flow LED is not illuminated.

V. Warranty

IPS-M770 pH Controllers

IPS Controllers warrants the IPS-M770 controller to be free of defects in materials and workmanship for a period of five (5) years from the date of installation. This warranty is limited to the repair or replacement of defective components (at our discretion) when returned to the factory within the five (5) year warranty period.

Other Components

IPS Controllers warrants all other components including flow cells and flow switches for a period of one (1) year from the date of installation. Sensors will be under warranty for a period of one (1) year from the date of factory purchase. This warranty is limited to the repair or replacement of defective components (at our discretion) when returned to the factory within the one (1) year warranty period.

Limitation of Liability

This Limited Warranty excludes liability for any damage during transportation, consequential damages of any kind, damages due to improper installation or improper operation, improper handling of chemicals, and the use of this product in applications for which it was not designed.

Claims

All warranty claims should be directed to IPS Controllers at the contact point listed below. After receiving a Returned Merchandise Authorization (RMA) number, all product must be returned (shipping prepaid) to the factory for evaluation.

Simply intelligent water care.

Factory Contact:
30826 Wealth Street, Murrieta, CA 92563 toll-free
phone. 877-693-6903, fax. 951-693-3224 web.
www.ipscontrollers.com

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