

# Technical Note #106

## Erratic or Incorrect PH Readings

### Symptoms

pH readings are unstable, jumping around, or slowly drifting higher over time. The readings may become worse at certain times of the day, or be correct for a few hours a day then become unstable again.

### Causes

- Electrode contamination or probe at end of useful life.
- Stray voltages in the tank.
- EMI/RF Electrical interference.
- Ground Loop.
- Defective Probe Module.

### Troubleshooting Procedure

1. If multiple pH probes are being used and the problem is only on one of the probes, then the probe itself may be contaminated or at the end of its useful life. Swap the two pH probes at the BNC connector, leaving the Probe Modules in place. If the problem transfers to the other Module, then the probe tip should be cleaned followed by recalibration. If calibration fails or takes a very long time to complete, then the pH probe may have exhausted its electrolyte and requires replacing. If swapping the probes had no effect, turn off power to the Lighthouse Pro and swap the Probe Modules at the connectors on the back of the unit. If the problem transfers to the other probe, then one of the Probe Modules may be defective. NOTE: swapping probes or probe modules will result in different readings because calibration stays with the port. Watch for changes in erratic behavior but ignore absolute pH value changes.
2. If all probes are affected or this is a single probe system, fill a drinking glass with some tank water. Remove all probes from the tank and place in the glass. If the readings appear correct or are no longer erratic, then the problem is caused by stray voltages , EMI/RF interference, or ground loops.
3. Stray voltages can be caused by plugging aquarium equipment into outlets where the ground terminal is not connected. Check all wall outlets for correct grounding by purchase an inexpensive plug-in outlet tester at the hardware store. Do not use two-prong adapters on any equipment as they prevent the equipment from being properly grounded. Adding a ground probe to the tank water will eliminate most stray voltage problems.
4. EMI/RF interference is usually caused by magnetic fields (typically generated by ballasts and water pumps) that create voltages and radio high frequency noise in the tank water. A ground probe will eliminate most problems. If that doesn't work or works partially, physically move the probes to another location in the tank. Do not tie or bundle probe cables, AC cords, etc. together- this will result in electrical interference from one cable to another. Try moving the Lighthouse Pro console away from motors, pumps, and ballasts. Non-aquarium equipment such as computers and laptops can create radio interference as well, so keep these devices away from the controller and probes. If the erratic probe readings occur at certain times of the day, there may be some other equipment (such as air

conditioners, halogen lighting) that are inducing noise on the AC line or through the air as radio noise. These problems may be fixed by using a computer-style UPS/surge suppressor on the Lighthouse Pro. In severe situations, stand-alone plug-in surge suppressors may be required on lighting, pumps, and powerheads.

5. Ground Loops are more difficult to solve. The problem occurs when the common or ground connection at various electrical equipment has a few volts difference between the ground points. This voltage difference is injected into pH and ORP electrodes and causes skewed and erratic readings. In some cases, the readings are stable but climb slowly up or down over time. The best way to track down ground loops is to unplug each aquarium appliance one at a time and watch for changes in the pH readings. Do not simply turn off aquarium equipment at its switch- you must physically pull the plug out of the socket to break the ground. In almost all cases, there is one piece of equipment that causes this problem. Keep pulling plugs until everything is unplugged. When the offending equipment is found, the pH readings will stabilize and the readings will look correct. Fixing this sort of problem is an experimental process. You may need to add (or remove) a ground probe in the tank. Try plugging the offending equipment into a different outlet or circuit, or use a two wire adapter to isolate the equipment's ground. Any metal contact in the water from titanium heaters or chiller coils may also be a source of the ground loop.