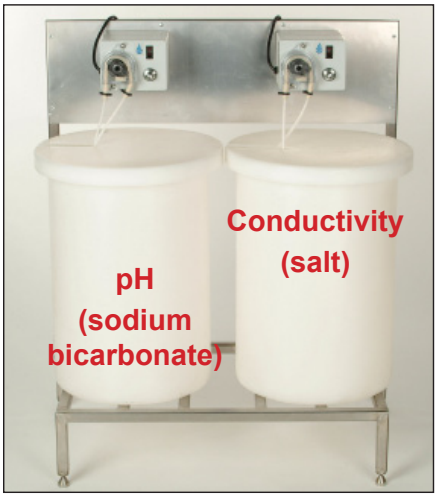
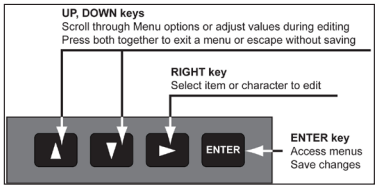
pH Dosing System

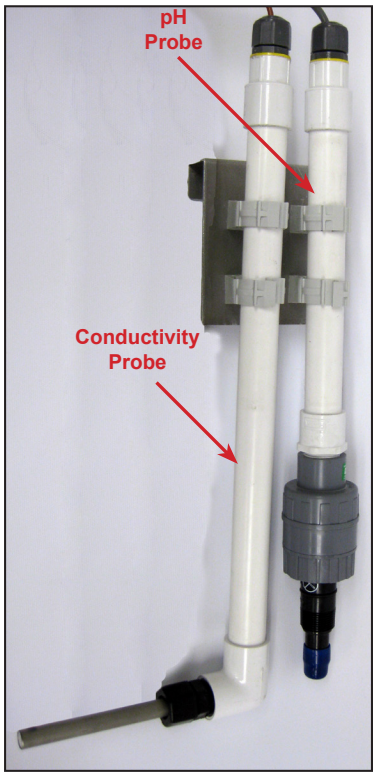


Dosing Barrels and Pumps

pH Transmitter



Menu Navigation Keys



Dosing Probes

⚠ *pH Electrode Handling Instructions and Warnings* ⚠

Due to the sensitive and fragile nature of the pH electrode, certain instructions must be followed when handling the electrode.

- The glass electrode surface is very thin and fragile and must always be kept hydrated:
  - **SAVE THE BLUE PROTECTIVE CAP to protect the glass surface whenever the electrode is not submerged in water.**
  - **Fill the blue protective cap with pH buffer 4 solution and place on electrode to prevent the tip from drying out.**
- Always use caution when handling the electrode to prevent accidental breakage.
- Never scrape or sand the glass electrode surface.
- Never expose electrode to temperatures below 0°C or allow it to dehydrate. These conditions will damage the electrode.
- High temperatures, strong acids or caustics will elevate electrochemical reactions and speed electrode aging.
- Coatings on the glass or junction surfaces (i.e. proteins) cause extended response time and inaccurate measurement.
- Never store the electrode tip in deionized (DI) water or reverse osmosis (RO) water.
- Install pH electrode before placing in water. Refer to the following instructions for installation instructions.
- Placing preamp in water without electrode will void warranty.
- Refer to the following instructions for calibration and maintenance instructions.

Calibrating the pH Electrode

EASY CAL Procedure

Calibrate as often as needed depending on your application and tolerance for drift. Aquaneering suggests every two weeks.

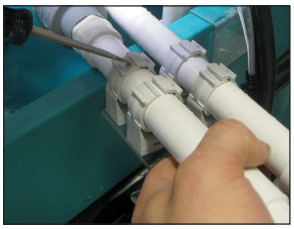
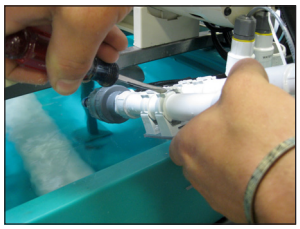



Figure 1

NOTE: To prevent unnecessary dosing, we suggest turning off the dosing pumps until all readings after calibration are consistent. Turn off the switch located on the front of the pumps.

1. Make a note of the mV reading before calibrating to set a baseline measurement. You can use the log at the end of the *pH Dosing System* section or create your own.
2. Clean the electrode prior to calibration. See *Maintenance: Cleaning the Electrode* for instructions.

Figure 2

Figure 3

3. You will need a flathead screwdriver, pH 7 and 4 buffer solutions, and two cups or other containers.

   NOTE: You can purchase pH 7 and 4 buffer solutions from Aquaneering.
4. Use a flathead screwdriver to gently release the clics that secure the pH probe to the sump and remove the probe from the sump water (Figure 1).
5. Rinse the probe with RO water. Shake dry.

   IMPORTANT: Be sure the electrode is completely dry. Any water left on the probe after rinsing will affect the calibration.

Figure 4

6. On the transmitter, press and hold the ENTER button for three seconds.
7. Use the RIGHT ARROW ►button (if necessary) to select the CAL (calibrate) menu. Press ENTER (Figure 2).
8. Press the ▼ (DOWN) button until you reach the EASY CAL screen (Figure 3). Press ► (RIGHT ARROW) and then enter the key code ▲-▲-▲-▼(UP-UP-UP-DOWN) to enter the EASY CAL menu (indicated by a flashing star) (Figure 4).

Figure 5

9. When prompted, place the electrode in a container with pH 7 buffer solution (Figures 5 - 6).

   IMPORTANT: Electrodes should be suspended during calibration to ensure tip contact with the solution.
10. Press ENTER.
11. Wait for the reading to stabilize: pH 7.0 buffer solution = 0 mV (+/- 50) (Figure 7).

    NOTE: If the mV reading is outside the range listed above, you will need to replace the electrode.

Figure 6

Figure 7

12. Record the pH and the mV readings displayed on the screen in your log.
13. Press ENTER to accept first buffer calibration.
14. Rinse the probe with RO water. Shake dry. Be sure the electrode is completely dry before proceeding.
15. The display will prompt you to put the electrode in the second buffer solution (Figure 8). Place the electrode in a container with pH 4 buffer solution. Make sure the electrode is suspended in solution.
16. Press ENTER.

Figure 8

17. Wait for the reading to stabilize:
    pH 4.0 buffer solution = 177 mV (+/- 50)
    NOTE: If the mV reading is outside the range listed above, you will need to replace the electrode.
18. Record the pH and the mV readings displayed on the screen in your log.
19. Press ENTER.
20. Scroll DOWN ▼ to LAST CAL and press the RIGHT ARROW ► key to enter the menu (Figure 9)

Figure 9

21. Enter today's date. (This date can be used to track scheduled maintenance.)
22. Press ENTER to save and exit the menu.
23. Press the UP ▲ and DOWN ▼ keys simultaneously two times to return to normal operation mode.
24. Rinse probe with DI or RO water.
25. Return probe to sump. Gently press probe into the clamp holder and fasten clics.

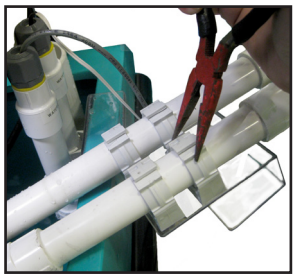


Figure 10

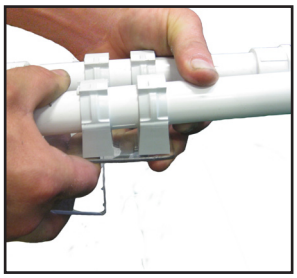


Figure 11

26. Two methods to fasten clics:
    a. Press the edges of the clic together using pliers (Figure 10).
    b. Push on the back of the probe bracket until the edges of the clic snap together (Figure 11).
27. Turn dosing pumps back on.

First-Time Calibration (New or Replacement Electrodes)

NOTE: To prevent unnecessary dosing, we suggest turning the dosing pumps off until all readings after calibration are consistent. Turn off the switch located on the front of the pumps.

NOTE: New electrodes may need to be calibrated two to three times before stabilizing.

1. You will need pH 7 and 4 buffer solutions, two cups or other containers, and a thermometer for temperature calibration.
2. Reset is recommended each time an electrode is replaced (not intial installation or regular calibration):
    a. On the transmitter, press and hold the ENTER button for three seconds.
    b. Use the RIGHT ARROW ►button (if necessary) to select the CAL (calibrate) menu. Press ENTER (Figure 2).
    c. Press the ▼ (DOWN) button until you reach the RESET pH CAL screen (Figure 12). Press ► (RIGHT ARROW) and then enter the key code ▲-▲-▲-▼(UP-UP-UP-DOWN) to enter the RESET pH/CAL menu.

Figure 12

d. Use the UP or DOWN arrow button to choose YES. Press ENTER.
e. Scroll down to RESET TEMPCAL (Figure 13). Enter the menu and choose YES. Press ENTER to save.

Figure 13

3. Remove blue cap before calibrating.
4. Rinse the probe with RO water. Shake dry.
   IMPORTANT: Be sure the electrode is completely dry. Any water left on the probe after rinsing will affect the calibration.
5. Place the electrode and a hand-held thermometer in a container with pH buffer 7 solution. Allow sufficient time for reading to stabilize.
   IMPORTANT: Electrodes should be suspended during calibration to ensure tip contact with the solution.
6. Record the temperature of the calibration solution. You will need to input this value later.
7. If necessary, on the transmitter, press and hold the ENTER button for three seconds to enter menus.
8. If necessary, use the RIGHT ARROW ►button to select the CAL (calibrate) menu. Press ENTER (Figure 4).

Figure 14

9. The first two settings are programmed at the factory. You may skip these steps unless you wish to verify the settings:
   a. Verify CAL: AT INSTRUMENT is displayed (Figure 14). If it is not, press the RIGHT ARROW ►key to enter the menu. You will be prompted to enter the access code (Figure 15).
   b. Enter the access code: press ▲-▲-▲-▼(UP-UP-UP-DOWN).
   c. Use the UP ▲ and DOWN ▼ buttons to select "AT INSTRUMENT". Press ENTER to save.
   d. Scroll DOWN ▼. Verify NO HOLD OUTPUTS is displayed (Figure 16). If it is not, enter menu and select NO HOLD OUTPUTS using UP ▲ and DOWN ▼ buttons. Press ENTER to save.

Figure 15

Figure 16

10. Scroll DOWN ▼ to SET TEMPERATURE menu (Figure 17).
11. Enter the temperature of the thermometer in the pH solution and save.

Figure 17

Figure 18

12. Follow the EASY CAL procedure.
13. Scroll DOWN ▼ to LAST CAL (Figure 20).
14. Enter today's date. (This date can be used to track scheduled maintenance.) Save.
15. Press the UP ▲ and DOWN ▼ keys simultaneously two times to return to normal operation mode.
16. Rinse probe with DI or RO water.
17. Return probe to sump. Gently press probe into the clamp holder and fasten clics.

18. Two methods to fasten clics:
    a. Press the edges of the clic together using pliers (Figure 10).
    b. Push on the back of the probe bracket until the edges of the clic snap together (Figure 11).
19. Turn dosing pumps back on.

Figure 19

Figure 20

Programming the pH Transmitter

NOTE: The pH transmitter is programmed at the factory. If you need to adjust the settings, follow the instructions below.

1. Calibrate the pH electrode by following the instructions in the section *Easy CAL Procedure*.
2. Press and hold ENTER.
3. Press the UP ▲ and DOWN ▼ arrows simultaneously to return to the main menu. Use the RIGHT ARROW ► button to select the INPUT menu. Press ENTER (Figure 21).
4. Scroll DOWN ▼ to AVERAGE.
5. Enter code: UP ▲ UP ▲ UP ▲ DOWN (Figure 22).
6. Set AVERAGE to OFF and save (Figure 23).
7. Scroll DOWN ▼ to MEAS TYPE. Set type to pH and save (Figure 24).
8. Press the UP ▲ and DOWN ▼ arrows to return to the main menu.
9. Use the RIGHT ARROW ►button to select the LOOP menu. Press ENTER.
10. Scroll DOWN ▼ to L1 4mA SETPT. Set the setpoint to 0.00 and save (Figure 25).
11. Scroll DOWN ▼ to L1 20mA SETPT. Set the setpoint to 14.00 and save (Figure 26).
12. Scroll down to L1 ERR VALUE (error value). Verify it is set to 22 (Figure 27).
13. Press the UP ▲ and DOWN ▼ arrows simultaneously to return to the main menu.
14. Use the RIGHT ARROW ►button to select the RELAY menu. Press ENTER.
15. R1 (Relay 1) is not used. Use DOWN ▼ button to:
    a. Verify R1 SOURCE is set to pH.
    b. Verify MODE is OPEN.

Figure 21

Figure 22

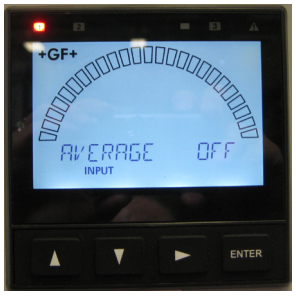


Figure 23

Figure 24

Figure 25

Figure 26

Figure 27

16. Scroll DOWN ▼ to R2 (Relay 2).
    a. Set the R2 (Relay 2) SOURCE to pH and save (Figure 28).
    b. Set R2 MODE to LOW and save. (Figure 29)
    c. Set the R2 SET LOW setpoint to 7.20 and save (Figure 30).
    d. Set R2 HYSTERESIS to 0.10 and save (Figure 31).
    e. Set R2 ON DELAY to 0 and save.
17. Scroll DOWN ▼ to R3 (Relay 3) MODE. Verify it is set to OFF (Figure 32).
18. Press the UP ▲ and DOWN ▼ arrows simultaneously to return to the main menu.
19. Use the RIGHT ARROW ►button to select the OPTIONS menu. Press ENTER.
20. Under the OPTIONS menu, you can set:
    - screen contrast
    - backlight intensity
    - bar graph
    - pH decimal places
    - temperature decimal places
    - password
    - write memos

Figure 28

Figure 29

Figure 30

Maintenance

Cleaning the Electrode

- Every two weeks, inspect for biofilm; clean if needed.
- Always clean before calibrating the electrode.
- Clean electrodes with a very soft toothbrush and warm water.
- For extreme fouling of the electrode, you may gently clean with a very soft toothbrush and Dawn dish soap. Be sure to thoroughly rinse the electrode after cleaning.
- Electrodes are considered consumable and are expected to be replaced yearly.

Figure 31

Figure 32

Installation and Replacement

1. If replacing the probe: unscrew the retaining nut on pH pre-amp and pull out the old electrode.
2. Apply a light coat of food-grade silicone lubricant to the O-ring. This will also ease installation (Figure 34).
3. Insert new electrode into the pre-amp and turn until the keyed contacts are seated. You may have to give the electrode a push to firmly connect it (Figures 34 - 35).

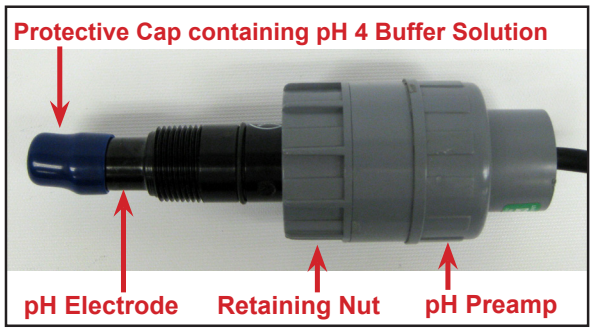


Figure 33

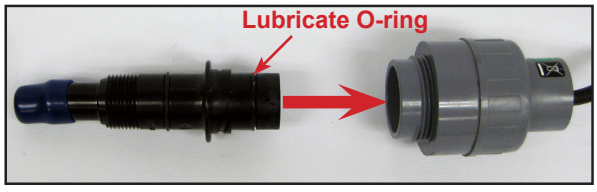


Figure 34

4. Thread retaining nut over electrode and hand-tighten onto the pH pre-amp (Figure 36). Hand-tighten nut and then give one more half-turn to ensure it is water-tight.

CAUTION

- Do not use tools to tighten the retaining nut or it may be damaged.
- However, hand-tighten securely to ensure it is water-tight. If water gets into the pre-amp, it may damage the electrode.

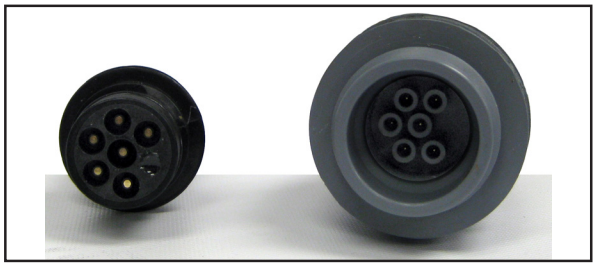


Figure 35: Keyed Contacts

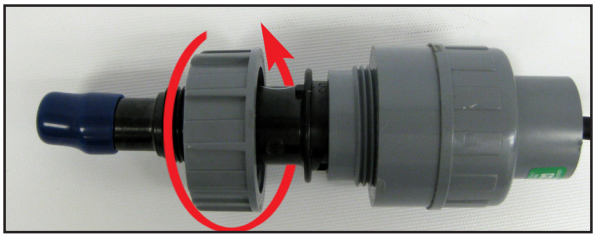


Figure 36

5. Reset both phCAL and TEMPCAL. See instructions in section *First-Time Calibration (New or Replacement Electrodes).*
6. Calibrate the electrode. See section *First-Time Calibration (New or Replacement Electrodes).*

Storage

CAUTION

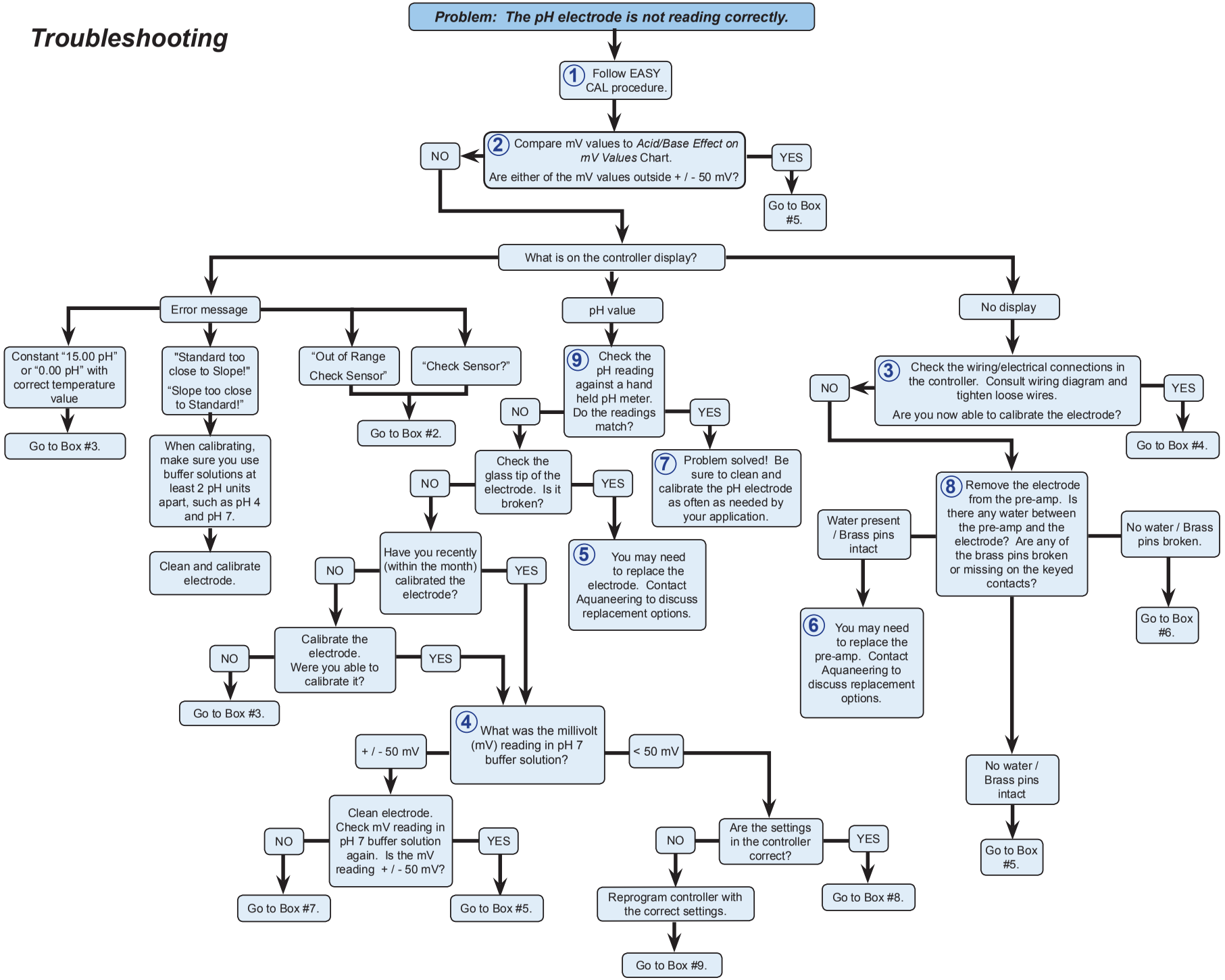
- Do not store the pH electrode in deionized (DI) or reverse osmosis (RO) water.
- Never expose electrode to temperatures below 0°C or allow to dehydrate.

- Fill the blue cap with pH buffer 4 solution and place on electrode (Figure 33).
- When storing boxed electrode, lay the electrode flat.
- Store electrode at a stable room temperature.

Shipping

- pH electrodes should be shipped in the original box if possible.
- Fill the blue cap with pH buffer 4 solution and place on electrode (Figure 33).
- The electrode should be securely packaged in the box with packaging filler material to prevent the electrode from moving around during shipping.
- Failure to follow the above guidelines may result in damage which will void the electrode warranty. Aquaneering will be unable to assist in the repair or replacement of an electrode with a voided manufacturer warranty.

Troubleshooting



pH Electrode Calibration Log					
		Buffer 7 Solution		Buffer 4 Solution	
Date	mV Reading (Before Calibration)	pH	mV	pH	mV

pH Electrode Calibration Log

Dates: _____ to _____

Quick Reference Charts

Chemical Dosing Chart NOTE: Mix sodium bicarbonate into solution.							
		Number of Racks					
Dosing Tank Size		**1**	**2 - 5**	**6 - 12**	**12 - 24**	**24 - 36**	**36 or more**
	3 Gallon	Bicarb ¼ lb	Bicarb ½ lb				
	5 Gallon	Bicarb ½ lb	Bicarb 1 lb	Bicarb 1 lb			
	10 Gallon	Bicarb 1 lb	Bicarb 1 lb	Bicarb 2 lb	Bicarb 2 lb		
	15 Gallon	Bicarb 1 lb	Bicarb 2 lb	Bicarb 2 lb	Bicarb 3 lb	Bicarb 3 lb	
	30 Gallon		Bicarb 2 lb	Bicarb 3 lb	Bicarb 3 lb	Bicarb 3 lb	Bicarb 5 lb
	50 Gallon			Bicarb 3 lb	Bicarb 3 lb	Bicarb 5 lb	Bicarb 5 lb

Acid/Base Effect on mV Values

	Acids							Neutral	Bases						
pH	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
mV	**+414**	**+355**	**+296**	**+237**	**+177**	**+118**	**+59**	**00**	**-59**	**-118**	**-177**	**-237**	**-296**	**-355**	**-414**

Transmitter Quick Reference Guide

- Press the RIGHT ARROW ►key to enter the menu.
- Use the UP ▲ and DOWN ▼ keys to change the value of the selected number character.
- Use the RIGHT ARROW ►key to move between characters.
- When the value is correct, press ENTER to save and exit the menu.
- **Made an Error?** Press the UP ▲ and DOWN ▼ keys simultaneously while any element is flashing. This will recall the last saved value of the item being edited and return you to the main menu.
- **Finished Editing?** Press the UP ▲ and DOWN ▼ keys simultaneously two times after saving the last setting to return to normal operation mode.