



# CAT 3500<sup>®</sup>

## Water Quality Controller

### Owner's Manual

 <p>The image shows the Hayward CAT 3500 Water Quality Controller. It is a white rectangular unit with a digital display and several ports. To its left are three blue test tubes in a holder. Below the unit is a circular NSF logo.</p>	<h4>Contents</h4> <p>Introduction.....2</p> <p>Installation.....4</p> <p>Pool Chemistry .....7</p> <p>Configuration.....7</p> <p>System Maintenance.....25</p> <p>Troubleshooting.....26</p> <p>Warranty.....30</p>
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CAT-3500

**REGISTER  
NOW**  
*to extend your*  
**WARRANTY**

*see back of manual for details*

Hayward Pool Products  
620 Division Street, Elizabeth NJ 07207  
[www.hayward.com](http://www.hayward.com)



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## IMPORTANT SAFETY INSTRUCTIONS

When using this electrical equipment, basic safety precautions should always be followed, including the following:

- READ AND FOLLOW ALL INSTRUCTIONS
- **WARNING:** Risk of Electric Shock. Connect controller only to a grounding type receptacle protected by a ground-fault circuit interrupter (GFI). CAT Controllers recommends installation to a dedicated GFI circuit breaker performed by a licensed electrician.
- **WARNING:** Disconnect power before servicing. Other than the fuses, there are no user serviceable parts inside the controller.
- **WARNING:** All power cords should be inspected frequently. Any damaged power cords must be replaced immediately to reduce the risk of electric shock. Never operate a controller without functional flow protection.
- **WARNING:** Installation requires a properly located GFI protected receptacle. Never use an extension cord for electrical connections to the controller.
- **WARNING:** Always mount controller in a safe area not subject to damage by moving objects. Never bury controller power cords.
- **WARNING:** Any person using, adjusting, or monitoring the controller must be at least 18 years of age and be familiar with these instructions and the contents of this manual.
- **WARNING:** Always take and record manual water chemistry readings in conformance with Health Department requirements. Although automated controllers are a great aid in maintaining healthy water quality, controllers are not a substitute for manual water testing with an accurate test kit.
- **WARNING:** Always read and become familiar with Material Safety Data Sheets (MSDS) and safe handling instructions for all chemicals used with the controller.
- **Caution:** The automatic controller should not be installed where it is accessible to the public.
- Overfeed Timers prevent potentially dangerous, unintentional dispensing of chemicals. CAT Controllers recommends always having the "Over Feed Timeout" functions enabled as a precautionary measure. By disabling the "Overfeed Timeout" the overfeeding of chemicals could occur and create unsafe water chemistry conditions. Overfeeding chemicals is dangerous and could potentially harm patrons.

**Certification - NSF 50 Certified for pH/ORP Display and Output only**

### SAVE THESE INSTRUCTIONS



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## Introduction

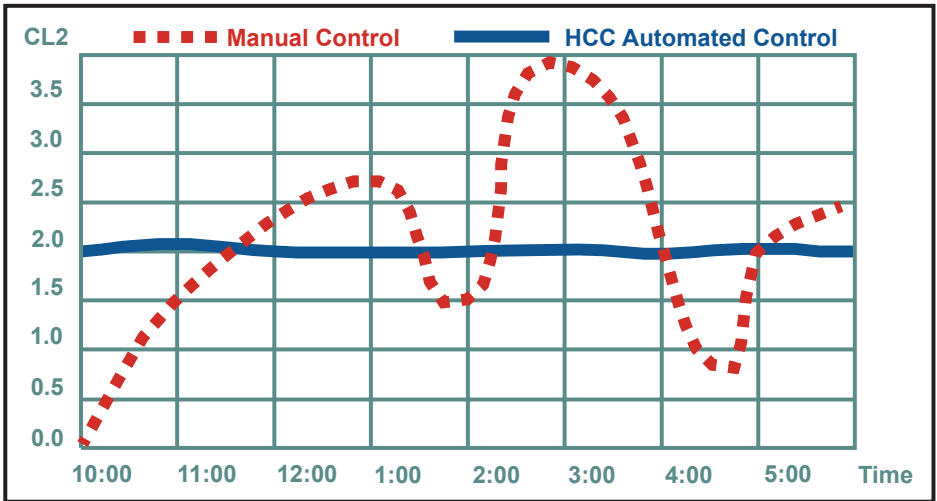
### Description

The CAT 3500 revolutionizes the manner in which water quality can be monitored and maintained. A pool operator typically checks, records and adjusts pool or spa water chemistry hourly at best. The CAT 3500 continuously samples pH and sanitizer activity, adjusting the feeding of chemicals on a basis proportional to the demand.

Optional digital flow and level sensors are available to monitor flow rate, chemical storage tank levels, and even automate water level control.

The results include elimination of “human error”, accurate and reliable maintenance of chemical levels twenty-four hours a day, compliance with Health Department operating standards, reduced burden on operating staff, and a reduction of chemical usage and costs.

The following graph compares typical chlorine levels when chemistry is adjusted manually versus automatically with the CAT 3500 controller:





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## What's Included

### Description

The following is a description of the components incorporated in a typical CAT 3500 water quality control system:

*The Professional-Series pH Sensor* samples water from the filtration system and sends signals to the controller indicating the acidity of the water. The ideal pH range for pools and spas is 7.4 - 7.6. The CAT 3500 controller is preset from the factory to maintain pH 7.5. If pH is maintained below 7.4 (too acidic), eye irritation, corrosion of equipment, and damage to the pool or spa surface can occur. If pH is maintained above 7.6 (too alkaline), sanitizer activity is reduced, water may become cloudy, and eye irritation may result.

*The Professional-Series ORP Sensor* samples water from the filtration system and sends signals to the controller indicating the oxidation-reduction potential (redox) of the water. ORP is an actual measure of sanitizer activity (chlorine, bromine, ozone, etc.) and bacteriological water quality rather than an expression of chemical residual levels. The CAT 3500 controller is preset from the factory to maintain ORP at 650 millivolts.

*The Flow Sensor* monitors the rate of flow across the pH and ORP sensors and signals the controller to disable automated chemical feeding during periods when the filtration system is off or low recirculation flow is detected.

*The Flow Cell* provides a convenient location for mounting the pH, ORP and Flow sensors while ensuring ideal hydraulic conditions to maximize sensor performance and life.

*The CAT 3500 Controller* scans and interprets the signals from the pH, ORP, flow, and optional digital flow-rate and level sensors, displays water quality readings and alarms in alphanumeric format, and activates chemical feeders in proportion to demand to maintain pH and ORP setpoint levels.

The controller incorporates audible and visual safeguard alarms for out of range conditions and menu-driven control of setpoints, alarms, and a host of advanced features.

*The Level Sensors* (optional) provide signals to the controller indicating low pH chemical tank level, low ORP tank level, and low water level.

*The Digital Flow Sensor* (optional) provides a flow rate to be displayed by the controller and an alarm indication when filter maintenance is required.

### Package Contents:

- (1) CAT 3500 Water Quality Controller
- (1) PVC Backboard with Mounting Holes and Stainless Hardware
- (1) Professional Series pH Sensor with 24" Cable and BNC Connector
- (1) Professional Series ORP Sensor with 24" Cable and BNC Connector
- (2) Sensor Storage Containers
- (1) Injection Molded Flow Cell
- (3) 1/4" NPT x 3/8" Tubing True-Seal Ball Valve
- (1) Flow Switch with 24" Cable and Specialty Connector
- (1) Temperature Sensor with 10' Cable and Specialty Connector



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- (2) BNC Connector Protective Covers (Remove to Connect Sensors)
- (1) 30' Roll, Blue Poly Installation Tubing (3/8" OD)
- (2) 1/4" NPT x 3/8" Tubing True-Seal Connectors

*NOTE: Before commencing installation, please confirm that items listed above have been included. Please report any shortages immediately to the factory.*

## What You Will Need

The following tools are recommended for installation:

- Drill (Cordless preferred)
- 3/8" Drill Bit
- 1/4" NPT (National Pipe Tapered) Tap
- Masonry Drill Bit & Anchors (if required)
- 13/16" Wrench or Channel-Lock Pliers.

# Installation

## Installation Procedure

The key to a successful flow cell installation is in the plumbing. A pressure differential is required to allow clean, untreated water to pass through the cell and across the sensors. We recommend using the enclosed tubing and fittings to create a pressure-suction "loop" line.

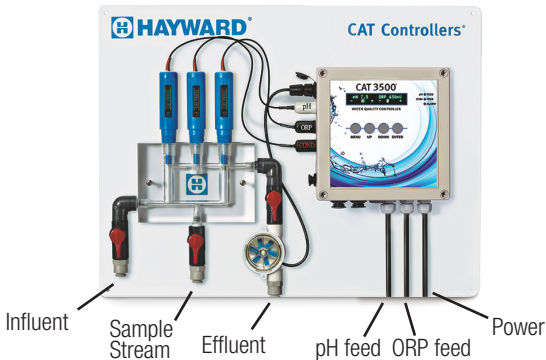
Follow the directions below for installation and refer to the Installation Diagram on page 6.

1. Turn off heater, chemical feeders, pump, and any other related equipment. Relieve pressure from filtration system.
2. Select a convenient mounting location for the controller unit which will meet the following criteria:
  - a. Facilitates a combined (influent and effluent) maximum tubing run of 30'.
  - b. Located a minimum of ten feet from pool or spa.
  - c. GFI protected power source available.
  - d. Easily accessible to pool or spa operator.
  - e. Away from corrosive materials and physical hazards.
3. Securely mount PVC Backboard on vertical wall.
4. Drill and tap a 1/4" NPT port at a location just downstream of the filter, but upstream from any chemical injection point. Install a tubing connector, and run flex tubing to the influent flow cell port.
5. Drill and tap a 1/4" NPT port at a location subject to vacuum or reduced pressure. Install the remaining tubing connector and run flex tubing to the effluent flow cell port.
6. Cut a 3" length of flex tubing and insert into the sample stream port.

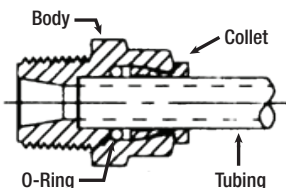


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7. Remove pH and ORP sensors from the plastic storage bottles and save bottles and storage fluid for future use. Thread sensors into flow cell.
8. Remove BNC protective covers from left side of controller unit and store for future use. These covers protect the controller unit from electrostatic discharge (ESD) and should be used whenever handling or transporting the controller unit.
9. Connect the pH, ORP and Flow sensor cables to the controller unit as labeled. Sensor cables are constructed from a specialized material - never cut or splice.
10. Drill and tap a 1/4" NPT port at the location from which temperature measurement is desired (upstream from heater). Insert temperature sensor and connect to controller.
11. If new or additional chemical feeders are to be used with the controller, install according to manufacturer's instructions at this time.
12. Connect chemical feeders to the controller as labeled (See diagram below).
13. Check all electrical and mechanical connections. Resume filtration system operation and check for any leaks.



Working with Tru-Seal Fluid Connections for a Fast, Professional Installation (See diagram below).



### Prepare Tubing:

Cut tubing squarely and remove any burrs. Mark tubing 3/4" from end. This is the insertion mark.

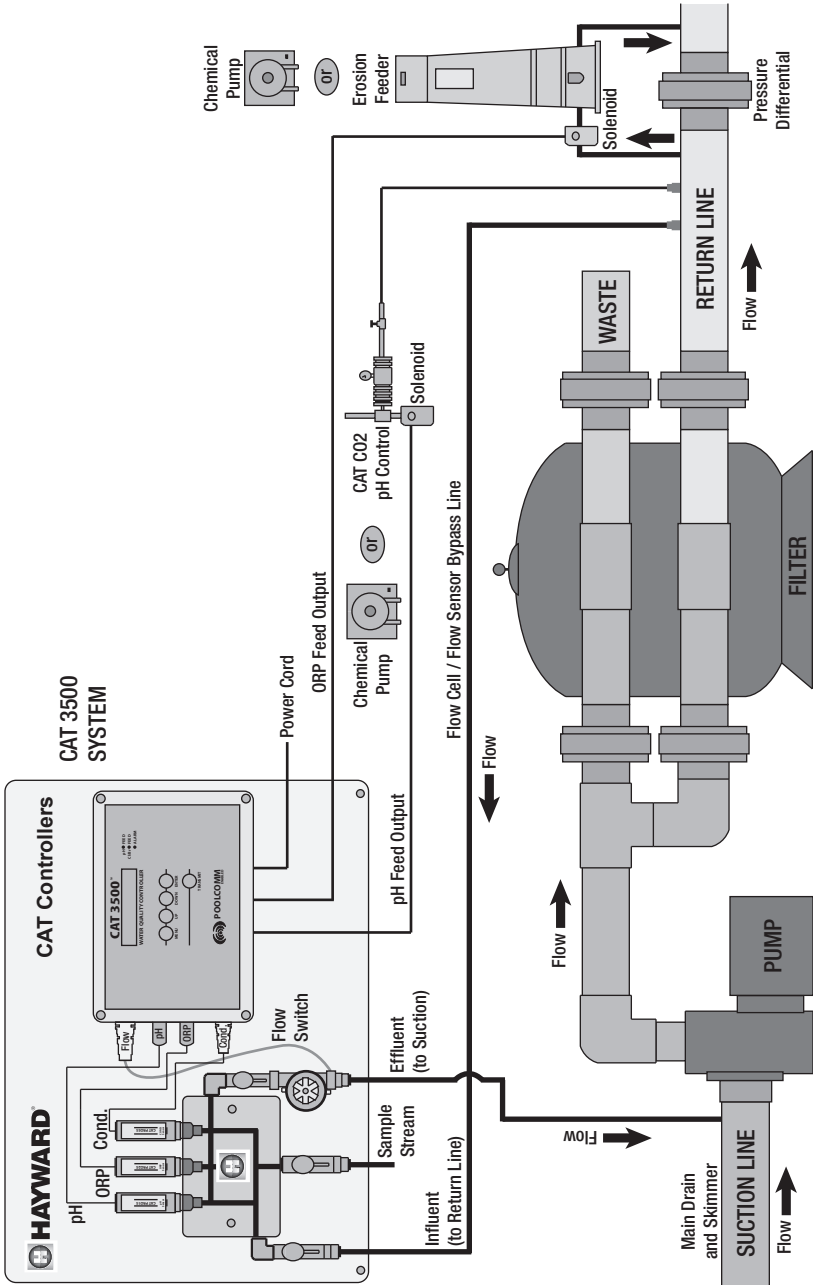
### Insert Tubing

Insert tubing straight into fitting until it bottoms out and insertion mark is no longer visible.

### To Release Tubing:

Push collet toward fitting body and pull on tubing to release. Repeat steps 1 and 2 to reuse fitting.

# Typical CAT 3500 Installation Diagram





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## Pool Chemistry

Now that your new controller has been physically installed, water chemistry should be tested and adjusted prior to initiating automated control of the pool or spa. Confirm that your pool or spa water conforms to the following ranges before powering on and setting up the CAT 3500.

The table below indicates generally accepted guidelines. Always maintain water chemistry according to standards set by your local or State Health Department.

Test	Minimum	Ideal	Maximum
pH	7.2	7.5	7.8
Free Chlorine (PPM)	1	2	3
Bromine (PPM)	2	3	4
Cyanuric Acid (PPM)	0	-	100
ORP (mV)	650	-	-
Total Alkalinity	80	-	120
Calcium Hardness	200	-	400

All CAT water quality controllers maintain sanitizer levels (chlorine, bromine, ozone, etc.) based on ORP. Although ORP is a superior index of water quality compared to part per million sanitizer residual levels, factors such as pH, cyanuric acid concentration and total dissolved solids can affect sanitizer residual readings relative to ORP.

CAT Controllers recommends establishing desired pH, sanitizer residual, calcium hardness, total alkalinity, temperature and cyanuric acid levels prior to initiating automated control of the pool or spa. The ORP setpoint will need to be changed periodically as described later in this section if the goal is to provide consistent sanitizer residual levels rather than consistent control of ORP.

## Configuration

### Overview

The CAT 3500 features a bright, menu-driven vacuum-fluorescent display which makes setup and programming simple in any lighting conditions. The menu structure is divided into two sections; the Operating Menu is intended for the end user to manage settings which are accessed on a frequent basis, while the Configuration Menu is used to set up advanced features which truly customize the controller to meet the individual requirements of the application.

The keypad provides intuitive access to the controller functionality as described on the following page.





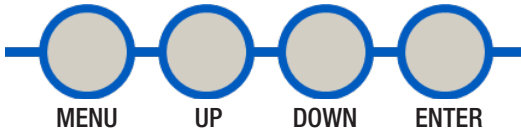
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**MENU:** Used to enter menu mode and to navigate back within the menu structure.

**UP:** Used to increase values and to navigate vertically up within the menu structure.

**DOWN:** Used to decrease values and to navigate down within the menu structure.

**ENTER:** Used to select or confirm a menu item.



## Basic Configuration Options

### Normal Operating Mode:

During normal operating mode, the display will indicate sensed pH, ORP, Flow Rate (with optional digital flow sensor) and a status line which alternates between:

- "System OK" or a list of any alarm conditions
- A graph indicating sensed pH and ORP vs- setpoint values.

The following is a typical display during normal operating mode:

pH 7.5 ORP 650  
System OK

### To Change The Brightness Of The Display:

The display intensity can be changed to accommodate comfortable viewing in a variety of lighting circumstances. While in normal operating mode:

- Press UP to increase display intensity.
- Press DOWN to decrease display intensity.

### To Enter The Operating Menu:

The operating menu contains selections which are likely to be changed on a routine basis, and therefore are easily accessed. While in normal operating mode:



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Press MENU.

The following will be displayed:

**Operating Menu**  
**pH Setpoint**

### To Change The pH Setpoint:

The CAT 3500 is programmed at the factory with a default setpoint of pH 7.5. CAT Controllers considers this to be ideal for pool and spa applications. The following steps enable the selection of a different setpoint. While in normal operating mode:

Press MENU.

Select pH setpoint by pressing ENTER.

The current pH setpoint will be displayed:

**pH Setpoint**  
**7.5 pH**

Press UP or DOWN to select the desired pH.

Press ENTER to save your selection.

The controller will automatically return to normal operating mode in 10 seconds.

### To Calibrate pH:

The CAT 3500 is far more accurate than most liquid test standards, but pH calibration is necessary to match manual water testing results, compensate for a depleted or unclean pH sensor, and confirm proper operation of the system. While in normal operating mode:

Press MENU.

Press DOWN to find the pH Calibrate menu item.

Press ENTER to select pH Calibrate.

The sensed pH value as currently calibrated will be displayed:

**pH Calibrate**  
**7.5 pH**

Press UP or DOWN to match your known good standard.

Press ENTER to save your selection.

The controller will automatically return to normal operating mode in 10 seconds.

### To Select pH Feed Mode:

The CAT 3500 is programmed at the factory to operate in automatic feed mode as the default setting. Other pH feed mode selections include off (disabled), and manual on for a fixed interval up to 25 minutes after which automatic feed will resume. While in normal operating mode:

Press MENU.

Press DOWN to find the pH Feed Mode menu item.

Press ENTER to select pH Feed Mode.

The current pH Feed Mode will be displayed:



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## pH Feed Mode Automatic Feed

Press UP or DOWN to find the desired selection.  
Press ENTER to save your selection.

The controller will automatically return to normal operating mode in 10 seconds.

The “Off” (disabled) mode is useful when servicing pH feed equipment, or if pH chemical supply has been depleted.

The “Manual On” mode allows constant chemical feed for a fixed interval of up to 25 minutes. This feature is useful when the addition of extra chemicals is desired, as well as during initial balancing of the water.

*NOTE: Always disconnect chemical feeder power cords prior to performing any electrical service.*

### To Change The ORP Setpoint:

The CAT 3500 is programmed at the factory to maintain ORP at 650 mV by default. This is the generally accepted world standard for safe drinking water. In order to maintain a given chlorine or bromine residual in conformance with Health Department standards for a particular body of water, perform the following:

Check and balance pH, calcium hardness and total alkalinity. Manually feed chlorine or bromine to desired ppm residual. Note the displayed ORP value. This will be used as the setpoint. While in normal operating mode:

Press MENU.  
Press DOWN to find the ORP Setpoint menu item.  
Press ENTER to select ORP Setpoint.  
The current ORP setpoint will be displayed:

## ORP Setpoint 650 mV

Press UP or DOWN to select the setpoint noted above.  
Press ENTER to save your selection.

The controller will automatically return to normal operating mode in 10 seconds.

### To Select ORP Feed Mode:

The CAT 3500 is programmed at the factory to operate in automatic feed mode as the default setting. Other ORP feed mode selections include off (disabled), and manual on for a fixed interval up to 25 minutes after which automatic feed will resume. While in normal operating mode:

Press MENU.  
Press DOWN to find the ORP Feed Mode menu item.  
Press ENTER to select ORP Feed Mode.  
The current ORP Feed Mode will be displayed:



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## ORP Feed Mode Automatic Feed

Press UP or DOWN to find the desired selection.  
Press ENTER to save your selection.

The controller will automatically return to normal operating mode in 10 seconds.

The “Off” (disabled) mode is useful when servicing ORP feed equipment, or if sanitizer chemical supply has been depleted.

The “Manual On” mode allows constant chemical feed for a fixed interval of up to 25 minutes, useful when the addition of extra chemicals is desired, as well as initial balancing of the water.

## Advanced Configuration Options

### To Enter The Configuration Setup Menu:

The configuration setup menu contains features which enable the CAT 3500 to be customized to the unique characteristics of the application. Optional accessories such as the digital flow meter are also activated through this menu. While in normal operating mode:

Press MENU.  
Press DOWN to find the Configuration Setup menu item.  
Press ENTER to select Configuration Setup.  
The Configuration Setup Menu will be displayed:

## Configuration Setup pH Control Mode

Press DOWN to scroll through menu items.  
Press ENTER to make a selection.  
Press MENU to return to the Operating Menu.

The controller will automatically return to normal operating mode in 10 seconds.

### Salt High Alarm:

The Salt High Alarm sounds audible and visual alarms, and sends a message to the Poolcomm website during a high salt condition. It does not inhibit chemical feed. From the Configuration Setup Menu:

Press DOWN to find the Salt High Alarm Menu item.  
Press ENTER to select Salt High Alarm.  
The current Salt High Alarm setting will be displayed:

## Salt High Alarm 5500 ppm

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.  
Press MENU to return to Operating Menu.



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## **Salt Low Alarm:**

The Salt Low Alarm sounds audible and visual alarms, and sends a message to the Poolcomm website during a low salt condition. It does not inhibit chemical feed. From the Configuration Setup Menu:

Press DOWN to find the Salt Low Alarm Menu item.  
Press ENTER to select Salt Low Alarm.  
The current Salt Low Alarm setting will be displayed:

**Salt Low Alarm**  
**4500 ppm**

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.  
Press MENU to return to Operating Menu.

## **TDS High Alarm:**

The TDS High Alarm sounds audible and visual alarms, and sends a message to the Poolcomm website during a high TDS condition. It does not inhibit chemical feed. From the Configuration Setup Menu:

Press DOWN to find the TDS High Alarm Menu item.  
Press ENTER to select TDS High Alarm.  
The current TDS High Alarm setting will be displayed:

**TDS High Alarm**  
**6600 ppm**

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.  
Press MENU to return to Operating Menu.

## **TDS Calibration.:**

Used to calibrate TDS to manual test readings The default value is 0. Please adjust the displayed value up or down until it matches the accurate manually tested reference reading. From the Configuration Setup Menu:

Press DOWN to find the TDS Calibration from Std Menu item.  
Press ENTER to select TDS Calibration from Std.  
The current TDS Calibration setting will be displayed:

**TDS Calibration**  
**0.00 ppm/ $\mu$ S (0)**

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.  
Press MENU to return to Operating Menu.



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## Salinity Calibrate:

Used to calibrate Salinity Calibrate to manual test readings. The default value is 0.98. The TDS Calibration must be completed prior to adjusting this setting. Please then adjust the displayed value up or down until it matches the accurate manually tested reference reading. From the Configuration Setup Menu:

Press DOWN to find the Salinity Calibrate Menu item.  
Press ENTER to select Salinity Calibrate.  
The current Salinity Calibrate setting will be displayed:

**Salinity Calibrate**  
**0.98 1/ppm (5978)**

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.  
Press MENU to return to Operating Menu.

## To Change The pH Control Mode:

The CAT 3500 is programmed at the factory to operate in the acid feed mode by default (when pH exceeds setpoint, the pH chemical feeder is activated). If the sanitizer or other factors of the application cause the pH to decrease, base feed mode must be selected. From the Configuration Setup Menu:

Press DOWN to find the pH Control Mode menu item.  
Press ENTER to select pH Control Mode.  
The current pH Control Mode will be displayed:

**pH Control Mode**  
**Acid Feed**

Press UP or DOWN to select acid feed or base feed.  
Press ENTER to save your selection.  
Press MENU to return to the Operating Menu.

The controller will automatically return to normal operating mode in 10 seconds.

*NOTE: In certain unusual applications, pH correction may be required in both acid feed and base feed modes. The third relay can be programmed as described later in this manual to accommodate this requirement.*

## pH Priority:

The CAT 3500 features a pH Priority setting which will inhibit ORP feed whenever pH is greater than .2 pH from the setpoint. This feature provides an important safeguard when sanitizers with a high pH (such as liquid chlorine) are used. From the Configuration Setup Menu:

Press DOWN to find the pH Priority menu item.  
Press ENTER to select pH Priority.  
The current pH Priority Mode will be displayed:



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## pH Priority Off

Press UP or DOWN to enable or disable pH Priority.  
Press ENTER to save your selection.  
Press MENU to return to the Operating Menu.

The controller will automatically return to normal operating mode in 10 seconds.

### **PH Interlock:**

When this option is enabled or “On”, ORP Feed is disabled if pH is in a high alarm condition. From the Configuration Set Up Menu:

Press DOWN to find the PH Interlock Menu item.  
Press ENTER to select PH Interlock.  
The current PH Interlock setting will be displayed:

## pH Interlock On

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

### **pH Feed:**

The CAT 3500 by default uses a time-based proportional feed algorithm which enables the control of virtually any body of water without under-feeding or overshooting the setpoint. With some types of chemical feeders, however, it is beneficial to disable proportional feed and feed on a fixed basis. From the Configuration Setup Menu:

Press DOWN to find the pH Feed menu item.  
Press ENTER to select pH Feed.  
The current pH Feed setting will be displayed:

## pH Feed Proportional

Press UP or DOWN to select Proportional or Fixed feed.  
Press ENTER to save your selection.  
Press MENU to return to the Operating Menu.

The controller will automatically return to normal operating mode in 10 seconds.

### **pH Low Alarm:**

The pH Low Alarm inhibits pH feed, sounds audible and visual alarms, and sends a message to the POOLCOMM website during a low pH condition. From the Configuration Setup Menu:

Press DOWN to find the pH Low Alarm menu item.  
Press ENTER to select pH Low Alarm.  
The current pH Low Alarm Setting will be displayed:



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## pH Low Alarm 7.0 pH

Press UP or DOWN to scroll to the desired setting.  
Press ENTER to save your selection.  
Press MENU to return to the Operating Menu.

### **pH High Alarm:**

The pH High Alarm inhibits pH feed, sounds audible and visual alarms, and sends a message to the POOLCOMM website during a high pH condition. From the Configuration Setup Menu:

Press DOWN to find the pH High Alarm menu item.  
Press ENTER to select pH High Alarm.  
The current pH High Alarm Setting will be displayed:

## pH High Alarm 7.0 pH

Press UP or DOWN to scroll to the desired setting.  
Press ENTER to save your selection.  
Press MENU to return to the Operating Menu.

### **pH Overfeed Timeout:**

The pH Overfeed Timeout inhibits pH feed, sounds audible and visual alarms, and sends a message to the POOLCOMM website when the pH setpoint is not reached after feeding continuously for a selectable period of time. From the Configuration Setup Menu:

Press DOWN to find the pH Overfeed Timeout menu item.  
Press ENTER to select pH Overfeed Timeout.  
The current pH Overfeed Timeout Setting will be displayed:

## pH Overfeed Timeout Off

Press UP or DOWN to scroll to the desired setting.  
Press ENTER to save your selection.  
Press MENU to return to the Operating Menu

*NOTE: Overfeed Timers prevent potentially dangerous, unintentional dispensing of chemicals. CAT Controllers recommends always having the "Overfeed Timeout" functions enabled as a precautionary measure. By disabling the "Overfeed Timeout" the overfeeding of chemicals could occur and create unsafe water chemistry conditions. Overfeeding chemicals is dangerous and could potentially harm patrons.*

### **ORP Feed:**

The CAT 3500 by default uses a time-based proportional feed algorithm which enables the precise control of virtually any body of water. With some types of chemical feeders, however, it is beneficial to disable proportional feed and dispense chemicals on a fixed basis. From the Configuration





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## Setup Menu:

Press DOWN to find the ORP Feed menu item.  
Press ENTER to select ORP Feed.  
The current ORP Feed setting will be displayed:

**ORP Feed  
Proportional**

Press UP or DOWN to select Proportional or Fixed feed.  
Press ENTER to save your selection.

## ORP Mixing Time On:

This feature prevents the controller from receiving inaccurate readings due to chemicals passing directly through the flow cell and over the sensors before being injected into the return line. Typically this would occur when the sanitizer is fed on the “suction side” of the primary circulation/filter pump. To program the amount of time you would like the controller to feed during its cycle please follow the steps below. From the Configuration Set Up Menu:

Press DOWN to find the ORP Mixing Time On item.  
Press ENTER to select ORP Mixing Time On.  
The current ORP Mixing Time On setting will be displayed:

**Mixing Time On Time  
30 seconds**

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

## ORP Mixing Time Off:

This feature prevents the controller from receiving inaccurate readings due to chemicals passing directly through the flow cell and over the sensors before being injected into the return line. Typically this would occur when the sanitizer is fed on the “suction side” of the primary circulation/filter pump. To program the amount of time you would like the controller to stop feed and ignore readings after its feed cycle please follow the steps below. From the Configuration Set Up Menu:

Press DOWN to find the ORP Mixing Time Off Menu item.  
Press ENTER to select ORP Mixing Time Off.  
The current ORP Mixing Time Off setting will be displayed:

**Mixing Time Off Time  
30 seconds**

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

## ORP Low Alarm:

The ORP Low Alarm inhibits ORP feed, sounds audible and visual alarms, and sends a message to the POOLCOMM website during a low ORP condition. From the Configuration Setup Menu:



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Press DOWN to find the ORP Low Alarm menu item.  
Press ENTER to select ORP Low Alarm.  
The current ORP Low Alarm Setting will be displayed:

**ORP Low Alarm**  
**525 mV**

Press UP or DOWN to scroll to the desired setting.  
Press ENTER to save your selection.

### **ORP High Alarm:**

The ORP High Alarm inhibits ORP feed, sounds audible and visual alarms, and sends a message to the POOLCOMM website during a high ORP condition. From the Configuration Setup Menu:

Press DOWN to find the ORP High Alarm menu item.  
Press ENTER to select ORP High Alarm.  
The current ORP High Alarm Setting will be displayed:

**ORP High Alarm**  
**900 mV**

Press UP or DOWN to scroll to the desired setting.  
Press ENTER to save your selection.

### **ORP Overfeed Timeout:**

The ORP Overfeed Timeout inhibits ORP feed, activates audible and visual alarms, and sends a message to the POOLCOMM website when the ORP setpoint is not reached after feeding continuously for a selectable period of time. From the Configuration Setup Menu:

Press DOWN to find the ORP Overfeed Timeout menu item.  
Press ENTER to select ORP Overfeed Timeout.  
The current ORP Overfeed Timeout Setting will be displayed:

**ORP Overfeed Timeout**  
**Off**

Press UP or DOWN to scroll to the desired setting.  
Press ENTER to save your selection.

*NOTE: Overfeed Timers prevent potentially dangerous, unintentional, dispensing of chemicals. CAT Controllers recommends always having the "Overfeed Timeout" functions enabled as a precautionary measure. By disabling the "Overfeed Timeout" the overfeeding of chemicals could occur and create unsafe water chemistry conditions. Overfeeding chemicals is dangerous and could potentially harm patrons.*

### **Auxiliary pH Setpoint:**

The auxiliary relay can be programmed to provide acid or base feed pH correction, or to support supplemental pH control with a second setpoint. Once the setpoint is entered, go to Auxiliary Output Setup to assign the relay to the desired function. From the Configuration Setup Menu:



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Press DOWN to find the Auxiliary pH Setpoint menu item.  
Press ENTER to select Auxiliary pH Setpoint.  
The current Auxiliary pH Setpoint will be displayed:

**AUX pH Setpoint**  
**7.5 pH**

Press UP or DOWN to scroll to the desired setting.  
Press ENTER to save your selection.

### **Auxiliary ORP Setpoint:**

The auxiliary relay can be programmed to support supplemental ORP control with a second setpoint, or dechlorination. Once the setpoint is entered, go to Auxiliary Output Setup to assign the relay to the desired function. From the Configuration Setup Menu:

Press DOWN to find the Auxiliary ORP Setpoint menu item.  
Press ENTER to select Auxiliary ORP Setpoint.  
The current Auxiliary ORP Setpoint will be displayed:

**AUX ORP Setpoint**  
**650 mV**

Press UP or DOWN to scroll to the desired setting.  
Press ENTER to save your selection.

### **Alarm Setup:**

The Alarm Setup allows the audible alarm to be disabled without interfering with any other safeguards or alerts to the POOLCOMM website. From the Configuration Setup Menu:

Press DOWN to find the Alarm Setup menu item.  
Press ENTER to select Alarm Setup.  
The current Alarm Setup option will be displayed:

**Alarm Setup**  
**Audible and Visual**

Press UP or DOWN to scroll to the desired setting.  
Press ENTER to save your selection

### **Feed On Alarm:**

This feature allows the controller to override the pH High Alarm and ORP Low Alarm. If the controller is displaying a pH High Alarm or ORP Low Alarm the controller will feed the desired chemical while continuing to display the alarm, in an attempt to adjust the chemicals appropriately. The default setting is "No", and is the recommended setting. From the Configuration Set Up Menu:

Press DOWN to find the Feed On Alarm Menu item.  
Press ENTER to select Feed On Alarm.  
The current Feed On Alarm setting will be displayed:



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**Feed on Alarm**  
**No**

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

### **Auxiliary Output Setup:**

The auxiliary relay can be programmed to provide any one of the following functions:

- Remote Alarm
- pH Base Feed
- pH Acid Feed
- ORP Feed Up
- ORP Feed Down
- Level / Flow Sensor #1, #2 or #3
- Primary ORP Relay
- Temperature Up
- Temperature Down
- Timer On for Selectable Interval

From the Configuration Setup Menu:

Press DOWN to find the Auxiliary Output Setup menu item.  
Press ENTER to select Auxiliary Output Setup.  
The current Auxiliary Output selection will be displayed:

**AUX Output Setup**  
**Disabled**

Press UP or DOWN to scroll to the desired setting.  
Press ENTER to save your selection.

### **Level/Flow Sensor Input # 3 Setup:**

The third Level/Flow Sensor input is provided to facilitate, digital flow monitoring water level control, other features using optional sensors. From the Configuration Setup Menu:

Press DOWN to find the Input 3 Setup menu item.  
Press ENTER to select Input 3 Setup.  
Press DOWN to view the following options:

- Disabled
- Digital Flow (ENTER to select pipe size).
- Level Sensor

Press ENTER to confirm the selection.

After 10 seconds, the controller will revert to the Configuration Setup Menu.



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## Digital Flow Pipe Size:

The Digital Flow Pipe Size is used to select the pipe size and schedule to ensure proper flow rate is displayed. From the Configuration Set Up Menu:

Press DOWN to find the Digital Flow Pipe Size item.  
Press ENTER to select Digital Flow Pipe Size.  
The current Digital Flow Pipe Size setting will be displayed:

Digital Flow Pipe Size  
1.5 Saddle Sch 40

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

## Digital Flow Sensor Type:

The Digital Flow Sensor Type is used to select the digital flow being used. Options available are Blue-White and Signet. From the Configuration Set Up Menu:

Press DOWN to find the Digital Flow Sensor Type item.  
Press ENTER to select Digital Flow Sensor Type.  
The current Digital Flow Sensor Type setting will be displayed:

Digital Flow Sensor Type  
Blue-White

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

## Digital Flow Alarm:

The Digital Flow Alarm sounds audible and visual alarms, and sends a message to Poolcomm website during a Low Flow alarm condition. This will inhibit chemical feed. From the Configuration Set Up Menu:

Press DOWN to find the Digital Flow Alarm item.  
Press ENTER to select Digital Flow Alarm.  
The current Digital Flow Alarm setting will be displayed:

Digital Flow Alarm  
0

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

## Temperature Format:

This feature allows you to switch the temperature display between Fahrenheit and Celcius. From the Configuration Set Up Menu:



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Press DOWN to find the Temperature Format item.  
Press ENTER to select Temperature Format.  
The current Temperature Format setting will be displayed:

Temperature Format  
Celcius

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

### Temperature Setpoint:

This feature is programmed at the factory to maintain 75 degrees Fahrenheit by default. It can be adjusted to desired level. From the Configuration Set Up Menu:

Press DOWN to find the Temperature Setpoint item.  
Press ENTER to select Temperature Setpoint.  
The current Temperature Setpoint setting will be displayed:

Temperature Setpoint  
75°F

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

### Temperature Calibrate:

Used to calibrate temperature against manual test readings. The default value is 0. Please adjust the displayed value up or down until it matches the accurate manually tested reference reading. TDS and Salinity readings are affected by temperature so if calibrating, start with temperature first, then TDS and Salinity.

Press DOWN to find the Temperature Calibrate Menu item.  
Press ENTER to select Temperature Calibrate.  
The current Temperature Calibrate setting will be displayed:

Temperature Calibrate  
+0 (077.0 °F)

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.  
Press MENU to return to Operating Menu.

### Temperature Low Alarm:

The Temperature Low Alarm inhibits temperature control, sounds audible and visual alarms, and sends a message to Poolcomm website during a low alarm condition. From the Configuration Set Up Menu:

Press DOWN to find the Temperature Low Alarm item.  
Press ENTER to select Temperature Low Alarm.



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The current Temperature Low Alarm setting will be displayed:

**Temperature Low Alarm**  
**20°F**

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

### Temperature High Alarm:

The Temperature High Alarm inhibits temperature control, sounds audible and visual alarms, and sends a message to Poolcomm website during a high alarm condition. From the Configuration Set Up Menu:

Press DOWN to find the Temperature High Alarm item.  
Press ENTER to select Temperature High Alarm.  
The current Temperature High Alarm setting will be displayed:

**Temperature High Alarm**  
**104°F**

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

### Display System Information:

The Display System Info function is used to view firmware revision number and the system date/time. From the Configuration Setup Menu:

Press DOWN to find the Display System Info menu item.  
Press ENTER to select Display System Info.  
Press ENTER at the prompt to confirm the selection.  
The System Information will be displayed:

**firmware version 1.8**  
**07-12-05 13:22 (UTC)**

After 10 seconds, the controller will revert to the Configuration Setup Menu.

### Update FW via BL:

This feature is used to update firmware on the controller. Please contact Hayward Commercial at 301-838-4001 if you have firmware issues with your controller. From the Configuration Setup Menu:

Press DOWN to find the Update FW via BL Menu item.

**Configuration Setup**  
**Update FW via BL**



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## Restore Factory Defaults:

The Restore Factory Defaults function erases all user-modified settings from memory and restores all factory default settings and values. From the Configuration Setup Menu:

Press DOWN to find the Restore Factory Def. menu item.  
Press ENTER to select Restore Factory Def.  
Press ENTER again at the following prompt:

Restore Factory Def.  
ENTER to Restore...

The display will go blank, and all default settings will be restored.

After 10 seconds, the controller will revert to the Normal Operating Mode.

**Caution:** all user modified settings including acid/base feed mode, alarms, setpoints, etc. must now be configured as described earlier in this manual.

## Demonstration Mode:

The Demo Mode enables the CAT 3500 to be used as a demonstration, training, or sales aid. All functions, menus, and settings of the controller are active except that pH is simulated at 7.5 and ORP is simulated at 650 mV. Therefore, no sensors are required when working with the controller in Demo Mode. From the Configuration Setup Menu:

Press DOWN to find the Demo menu item.  
Press ENTER to select Demo.  
The current status of Demo Mode will be displayed:

Demo  
Off

Press UP or DOWN to make a selection.  
Press ENTER to save your selection.  
The controller will revert to the Configuration Setup Menu.

As a reminder that the controller is in Demonstration Mode, the following screen will be alternately displayed when in Normal Operating Mode:

CAT 3500  
Demo Mode

**Caution:** Demonstration Mode must never be used when the CAT 3500 is connected to active chemical feeders or otherwise in use as a water quality controller. The CAT 3500 is simulating pH and ORP values, and therefore is not sampling the sensors or monitoring water quality.





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## Password Protect:

When this feature is enabled, it restricts access to the Menu features unless a Dealer or Operator passcode is entered. Dealer Passcode provides access to all menu options, and Operator Passcode provides access to only Operating Menu options. From the Configuration Set Up Menu:

Press DOWN to find the Password Protect item.  
Press ENTER to select Password Protect Format.  
The current Password Protect Format setting will be displayed:

Password Protect  
Off

Press UP or Down to scroll to desired setting.  
Press ENTER to save your selection.

## Operator Password:

This feature allows the programming of an Operator passcode, which can be used to access only the controller's Operating Menu options, PH/ORP Setpoint, PH Calibrate, & PH/ORP Feed Mode. From the Configuration Set Up Menu:

Press DOWN to find the Operator Password item.  
Press ENTER to select Operator Password Format.  
The current Operator Password Format setting will be displayed:

Operator Password  
0000 ↵

Press UP or Down to scroll to between numbers, use the Menu and Enter buttons to change digits up and down.

Press scroll to the ↵ symbol and press ENTER to save your selection.

## Dealer Password:

This feature allows the programming of a Dealer passcode, which can be used to access the controller's full range of menu options. From the Configuration Set Up Menu:

Press DOWN to find the Dealer Password item.  
Press ENTER to select Dealer Password Format.  
The current Dealer Password Format setting will be displayed:

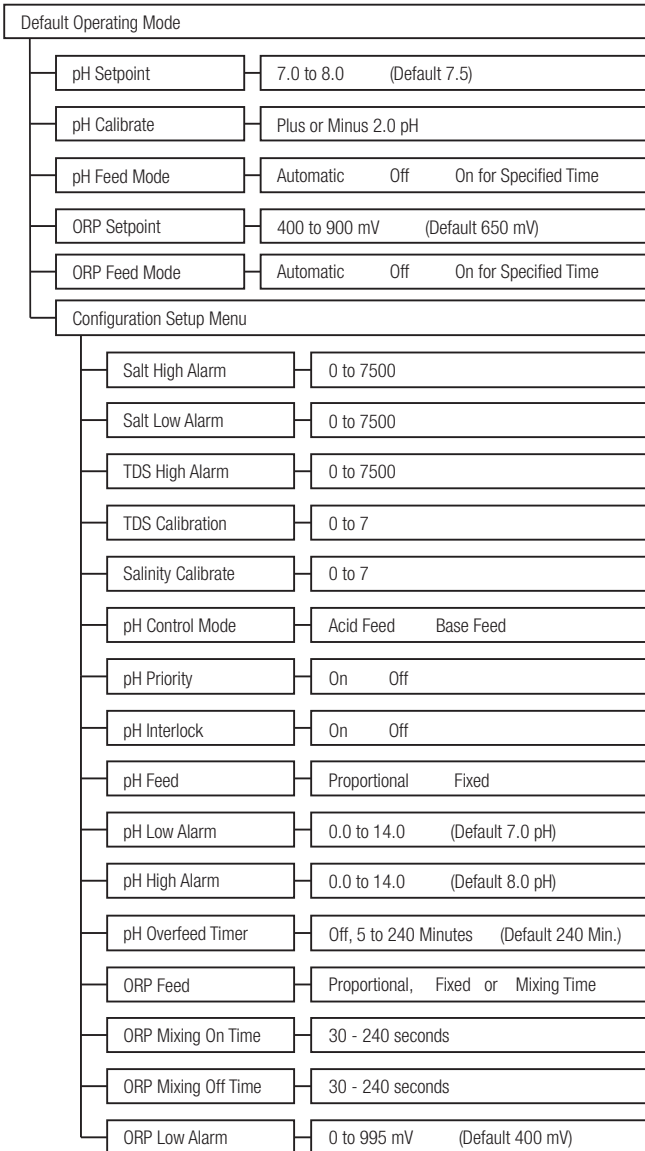
Dealer Password  
0000 ↵

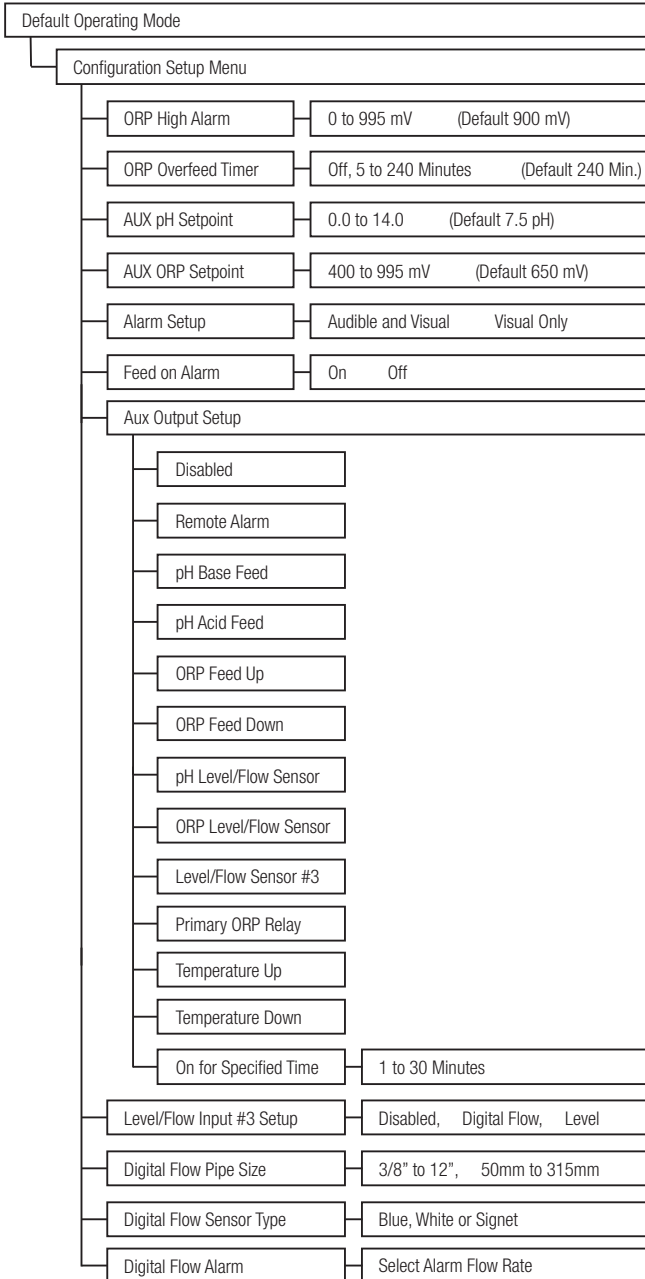
Press UP or Down to scroll to between numbers, use the Menu and Enter buttons to change digits up and down.

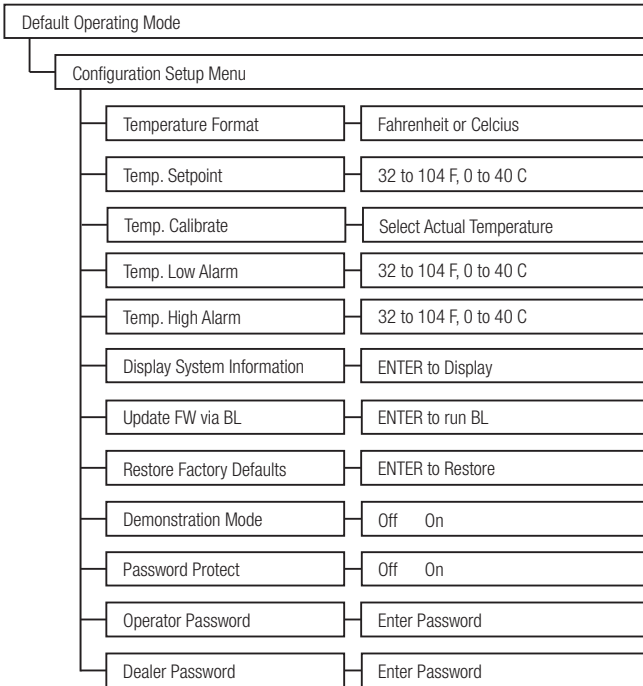
Press scroll to the ↵ symbol and press ENTER to save your selection.



## CAT 3500 Menu Tree









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## System Maintenance

### CAT 3500 Controller Package

The CAT 3500 controller unit is virtually maintenance free. Cleaning of the enclosure, front panel and flow cell can be performed using a clean, soft cloth moistened with mild soap and water solution or glass cleaner. Use of abrasives or harsh chemicals may damage the enclosure and membrane switch panel.

### Water Maintenance

Always test and record water chemistry readings in compliance with Health Department requirements using a quality manual test kit. Calibrate pH periodically as described earlier in this manual.

It is important to note that changes in pH, cyanuric acid concentration, total dissolved solids, and use of additional or alternative sanitizers will all affect the primary sanitizer residual level relative to ORP. It is important to maintain total alkalinity on a regular basis to ensure pH stability. To maintain a consistent sanitizer residual in parts-per-million (ppm), periodically adjust the ORP setpoint.

### Precision Calibration

The CAT 3500 controller provides instrument-grade accuracy which exceeds that of most liquid-standard water testing kits. Therefore, it may be preferable to calibrate pH using commercially available reference solutions.

### Sensor Maintenance

The sensors must be clean and free from oil, chemical deposits and contamination to function properly. After saturation in pool or spa water, the sensors may need to be cleaned on a weekly or monthly basis depending on bather load and other facility-specific characteristics. Slow response, increased need to calibrate pH, and inconsistent readings are indications that the sensors are in need of cleaning.

To clean the sensors, disconnect from the controller and carefully remove them from the flow cell. Clean the reference junction (the white teflon ring at the bottom of sensor body) with a soft tooth brush and regular tooth paste. A household liquid dishwashing detergent may also be used to remove any oil. Rinse with fresh water, replace teflon thread-seal tape, and reinstall sensors.

### Sensor Replacement

CAT Professional Series pH and ORP sensors are engineered to provide the highest performance and longest possible functional service life. If properly cleaned, sensors provide unstable readings or require excessive calibration, the pair of sensors should be replaced. For optimum controller performance, replace with genuine CAT Professional Series sensors PRO15-2 and PRO25-2.

### Sensor Storage

Exposure to atmospheric conditions will cause the sensor tips to dry out. Always remove and properly store sensors in the soaking caps provided if sensors are to be removed or stored for one hour or longer. Although CAT Professional Series sensors are freeze-resistant, they must be protected from freezing temperatures when not in use.



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Store sensors in the soaking caps provided, making sure that each container is filled with the original storage solution or clean water. If the storage containers have been misplaced, store sensors individually in small glass or plastic containers with clean water covering sensor tips.

## Controller Storage

The controller unit is subject to damage by electro-static discharge (ESD) when the sensor cables are disconnected. Always reinstall the BNC protective covers prior to storing or transporting the CAT 3500 controller unit.

## Winterization

The sensors should be prepared for storage as outlined above and protected from freezing temperatures. Although the CAT 3500 controller is designed to withstand a broad temperature range, winter storage in a secure location may be desirable.

The flow cell and poly tubing must be drained prior to exposure to freezing temperatures. Either purge all water using compressed air or thoroughly drain through the valve ports and tubing connections.

# Troubleshooting

## pH Out Of Range

pH is measured on a scale ranging from 0 to 14, with pH 7.0 considered neutral. pH below 7.0 is considered acidic and above 7.0 is alkaline. pH is a significant variable in determining water quality as it affects sanitizer activity, color, and human compatibility with the water. The proper pH range for swimming pools and spas is between 7.2 and 7.8.

## pH Low

A pH below 7.2 will cause corrosive water resulting in possible damage to the filtration components and pool surface as well as bather discomfort. First, test the pool/spa water with a phenol red pH test kit. If the pH on the test kit agrees with the controller and the pH is below 7.2, check the pH correction chemical level. If the manual test does not agree with the controller clean the sensor.

## pH High

A pH above 7.8 will cause scaling on the pool surface, plumbing, and filtration equipment as well as cloudy water, inefficient use of sanitizer and bather discomfort. First, test the pool/spa water with a phenol red pH test kit. If the pH on the test kit agrees with the controller and the pH is above 7.8, check the pH correction chemical level. If the manual test does not agree with the controller clean the sensor.

## pH Overfeed

The pH Overfeed timeout occurs when the CAT 3500 has been feeding chemicals for a time greater than the selected maximum feed time and has not reached its setpoint. A properly selected Overfeed timeout prevents the unit from continuing to feed chemicals when the chemical supply has been diminished or a chemical feeder has become clogged or broken. First, check the chemical supply and chemical feeder. If both are in order, check the Overfeed timeout setting as it may need to be increased to keep up with chemical demand.



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## pH Tank Low

The pH Tank Low alarm will sound when the chemical being fed falls below the optional optical level sensor in the tank. First check the chemical level. If the level is above the sensor, check the sensor for obstruction or scaling.

## ORP Out Of Range

Oxidation Reduction Potential is a measure of the oxidizing capacity present in water. Unlike a DPD chlorine reading, which can only differentiate between free available chlorine and the less effective combined chlorine, ORP provides an accurate measure of water quality regardless of pH, TDS, cyanuric acid, or non-chlorine oxidizers. The proper ORP range for swimming pools and spas is between 650 and 800 mV, with any value above 650 resulting in healthy water quality.

## ORP Overfeed

The ORP Overfeed timeout occurs when the CAT 3500 has been feeding chemicals for a time greater than the selected maximum feed time and has not reached its set point. A properly selected Overfeed timeout prevents the unit from continuing to feed chemicals when the chemical supply has been diminished or a chemical feeder has become clogged or broken. First, check the chemical supply and chemical feeder. If both are in order check the Overfeed timer setting as it may need to be increased to keep up with chemical demand.

## ORP Tank Low

The ORP Tank Low alarm will sound when the chemical being fed falls below the chemical level in the tank. First check the chemical level. If the level is above the sensor, check the sensor for obstruction or calcification.

## No Flow

The CAT 3500 is equipped with a flow sensor to prevent the controller from feeding chemicals in the absence of proper recirculation. First check the filtration system to ensure that it is running and that water is moving through the flow cell. If water is flowing and the alarm is still sounding check flow sensor for obstruction.

When using the optional Digital Flow Sensor, the digital flow alarm setting can be entered in gallons-per-minute to send a No Flow alarm when the filters require cleaning or backwashing.

## Technical Specifications

Enclosure Type	7" x 7" x 2.3" Glass Filled Polycarbonate
Enclosure Properties	NEMA Type 1, 4, 4X, 6, 12, 13
Flame Resistance	UL94-5V (UL 746 C 5)
Display	2 x 20 Character Vacuum Fluorescent
Front Panel	UV Protected Lexan Membrane Switch
Key Type	Embossed with Stainless Tactile Domes



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Flow Cell	Injection Molded with Integral Baffles
Flow Sensor	Magnetic with Embedded Reed Switch
Backboard	CNC Machined & Beveled PVC
Inputs	CAT Professional Series pH Sensor CAT Professional Series ORP Sensor CAT Magnetic Flow Sensor CAT Rotary Flow Sensor Optical pH Tank Level Sensor Optical ORP Tank Level Sensor Optical Water Level Sensor Digital Flow Meter
Outputs	pH Feed, 4 Amp, 115 VAC ORP Feed 4 Amp, 115 VAC Dry Contact, 1 Amp Max
Auxiliary Output	User Programmable Remote Alarm pH Acid Feed pH Base Feed ORP Primary Feed ORP Supplemental Feed Dechlorination Control Level/Flow Sensor # 1 Level/Flow Sensor # 2 Level/Flow Sensor # 3 Time-based Activation
Safety Systems	pH Low and High Alarms ORP Low and High Alarms pH Priority Feed pH Overfeed Timeout ORP Overfeed Timeout Supplemental Feed Modes
Optional Equipment	Optical Level Sensors Digital Flow Rate Sensor Rotary Flow Sensor
Sensor Output Signal Requirements	0-14 pH, 0-1000mV ORP





## Addendum for UL Listed Models

### CAT 3500 - Revision I Terminal Block Wiring Instructions

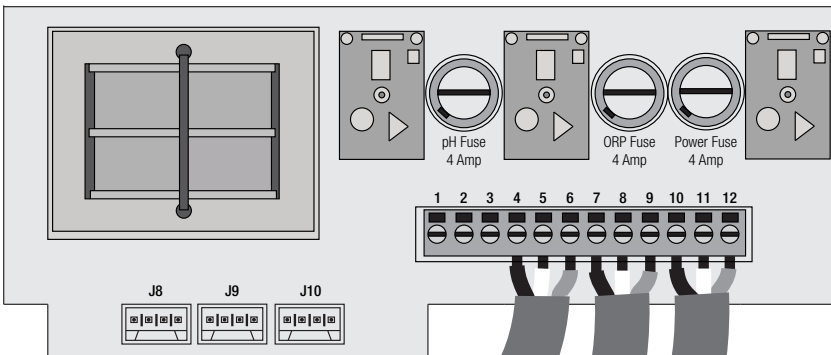
The CAT 3500 UL listed controller must be installed in conformance with local and national electrical codes using hard-wired electrical connections. Please refer to the instructions below:

1. Disconnect power at circuit breaker.
2. Unscrew and remove the CAT 3500 cover to access the wiring terminal block.
3. Install UL listed ½”conduit and liquid-tight connectors for line, powered pH feed, and powered CL/BR feed.
4. Connect the CAT 3500 controller and powered outputs as shown in the wiring diagram on page 29, using 18 gauge solid copper wire.
5. Reinstall the CAT 3500 cover, power on the controller, and test for proper operation of powered output devices.

*Note: CAT Controllers recommends connecting the CAT 3500 controller to a dedicated 15 Amp circuit breaker.*

### Terminal Block Wiring Diagram

Refer to the diagram below for wiring and fuse locations.



#### Terminal Block Designations:

**AUX 1 Dry Contact**  
 1 = Normally Open  
 2 = Normally Closed  
 3 = Common

**pH Line (120V)**  
 4 = Live  
 5 = Neutral  
 6 = Ground

**ORP Line (120V)**  
 7 = Live  
 8 = Neutral  
 9 = Ground

**Power Line (120V)**  
 10 = Live  
 11 = Neutral  
 12 = Ground

**Input 1 (J8)**  
 - pH Tank Level  
 - Disabled  
 - Level Sensor (Dry)  
 - Level Sensor (Wet)

**Input 2 (J9)**  
 - ORP Tank Level  
 - Disabled  
 - Level Sensor (Dry)  
 - Level Sensor (Wet)

**Input 3 (J10)**  
 - Disabled  
 - Digital Flow  
 - Level Sensor (Dry)  
 - Level Sensor (Wet)



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## WARRANTY

Hayward® warrants the CAT 3500 automated controller to be free of defects in material and workmanship for a period of five years from date of shipment from our factory or authorized distributor. Liability under this warranty is limited to the repair or replacement of any device or component which is returned to the factory within five years of delivery to original purchaser, shipping prepaid, and which is found to be defective upon examination.

Hayward® warrants all sensors, flow switches, fittings and accessories to be free of defects in material and workmanship for a period of one year from date of shipment from our factory or authorized distributor. Liability under this warranty is limited to the repair or replacement of any device or component which is returned to the factory within one year of delivery to original purchaser, shipping prepaid, and which is found to be defective upon examination.

Hayward® disclaims all liability for damage during transportation, for consequential damage of whatever nature, for damage due to handling, improper installation or operation, and for determining suitability for the use intended by the purchaser.

Hayward® makes no warranties, either expressed or implied, other than those stated above. No representative has authority to change or modify this warranty in any respect. After obtaining a Return Merchandise Authorization form, any warranty claims should be directed to the following address:

Hayward Commercial Pool Products  
10101 Molecular Drive Suite 200  
Rockville, MD 20850 (USA)  
800-657-2287  
301-838-4001



# 90 DAY EXTENDED WARRANTY\* REGISTER WITH YOUR SMARTPHONE

— PROTECT YOUR INVESTMENT IN 2 EASY STEPS —

## 1. TAKE A PHOTO

Take a photo of the camera icon



## 2. SEND IT IN

Send it in using **one** of the methods below



### SMARTPHONE

Text a photo of the camera icon to **71403**

OR



### ONLINE

Visit [Hayward.com/Warranty](http://Hayward.com/Warranty)

OR



### MESSENGER

Send photo to **photoregister**

\*Extended warranty is in addition to applicable product warranty and is for parts only, labor not included.  
**Need help?** Visit [photoregister.com/help](http://photoregister.com/help) or text HELP to 71403.

For further information or consumer  
technical support, visit our website at  
[www.hayward.com](http://www.hayward.com)



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