PoolWarden Plus

Automated Pool & Spa Chemical Controller
And Data Recorder

Intertek

Operation

Manual

Version: Cloud

Certified to NSF/ANSI Standard 50

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IMPORTANT WARNING AND SAFETY INSTRUCTIONS

1 READ AND FOLLOW ALL INSTRUCTIONS

2 SAVE THESE INSTRUCTIONS

3 WARNING – To reduce the risk of injury, do not permit children to use this product

4 DANGER – Risk of injury

4.1 Replace damaged cord immediately.

4.2 Do not bury cord.

4.3 Connect to a grounded, grounding type receptacle only.

4.4 Do not use an extension cord.

5 WARNING – This product is provided with a ground-fault circuit-interrupter at the end of the power cord. The GFCI must be tested before each use. Turn the PoolWarden off by placing the ON/OFF switch to the OFF position. Next, push the test button on the GFCI and place the ON/OFF switch to the ON position. The PoolWarden should not operate. Now push the reset button on the GFCI and the PoolWarden should now operate normally. When the product fails to operate in this manner, there is a ground current flowing indicating the possibility of an electric shock. Disconnect the power until the fault has been identified and corrected.

6 It is very important to follow the safety guidelines in this manual to ensure safe installation and programming. Upon installation, it is important to properly train all personnel basic water quality management techniques, proper operation and programming to anyone who operates or services PoolWarden.

7 All applicable local installation codes and ordinances must also be adhered to. Improper installation will create an electrical hazard which could result in death or serious injury to pool users, installers or others due to electrical shock, and may also cause damage to property. The PoolWarden must be installed by a licensed or certified electrician or a qualified pool professional:

7.1 United States: National Electrical Code (NEC), NFPA 70

7.2 Canada: Canadian Electrical Code (CEC), CSA C22.1.

8 WARNING – Disconnect all power to PoolWarden prior to any service including the main AC power and any other AC sources that may be connected to the AUX relays. Never apply power when PoolWarden

service door is unlocked or in the open position. Only qualified and licensed technicians should perform any service or repair.

9 ***WARNING – Always mount PoolWarden in safe and dry area. Never mount PoolWarden above any other electrical equipment.***

10 ***WARNING – Install PoolWarden in a location that is not accessible to the public.***

11 ***WARNING – Pool and Spa Chemical Safety***

11.1 Never mix sodium hypochlorite and muratic acid!

11.2 When mixing acid and water, always add acid to the water, never add water to the acid.

12 **CAUTION – TEST THE GROUND FAULT CIRCUIT INTERRUPTER BEFORE EACH USE OF THE POOL/SPA**

13 **CAUTION – CONNECT ONLY TO A CIRCUIT PROTECTED BY A CLASS A GROUND FAULT CIRCUIT INTERRUPTER**

1 ***ATTENTION: TOUJOURS VÉRIFIER L'EFFICACITÉ DU DISJONCTEUR DIFFÉRENTIEL AVANT D'UTILISER LE BAIN***

2 ***ATTENTION: LIRE LA NOTICE TECHNIQUE***

3 ***AVERTISSEMENT: DÉCONNECTER DU CIRCUIT D'ALIMENTATION ÉLECTRIQUE AVANT L'ENTRETIEN***

4 ***ATTENTION: CONNECTER UNIQUEMENT À UN CIRCUIT PROTÉGÉ PAR UN DISJONCTEUR DIFFÉRENTIEL DE CLASSE A***

POOLWARDEN OVERVIEW

ControlOMatic, with over 20 years of technological leadership in Pool & Spa Chemical Control Systems, congratulates you on your selection of the PoolWarden Chemical Controller. PoolWarden measures pH, sanitizer and temperature on up to two bodies of water and will control the appropriate feed equipment to keep the measurements within a preprogrammed range. Using ORP (oxidation reduction potential) technology the control of sanitizer takes into account the effects of pH, and a pH lockout feature is also included for high pH values. Supporting both 110 and 220 VAC, the PoolWarden will control chemical feed equipment using relays to keep the pool or spa water in balance. Water measurements are taken continuously while PoolWarden's internal relay programing determines if chemical adjustments are needed. PoolWarden then communicates the adjustment signals through relays which control the chemical feed equipment. PoolWarden also contains additional dry-contact auxiliary relays that can be used to control heaters, pumps, chlorine backup and external alarm notifications.

SYSTEM COMPONENTS

- **CONTROLLER:** PoolWarden is a microprocessor based, modular automation system that is capable of continuous monitoring locally onsite or remotely offsite.
- **INTERFACE:** PoolWarden uses a 16-button built in keypad, and an easy to read 80 character liquid crystal display. The display's internal back-light provides controller viewing in pool rooms with low light conditions. Back-light illumination time can be adjusted to suit the operator.
- **MEMORY:** PoolWarden is designed with nonvolatile memory which preserves all internal programming in case of power loss. Internal memory is preserved for up to 10 years without having power applied.
- **RELAYS:** PoolWarden S (single pool) includes 4 relays (2 of which are dry contact relays). PoolWarden D (two pools) includes 8 relays. Four of the 8 relays are dry contact relays (2 for each body of water).
- **SENSORS:** ORP Sensor, pH Sensor, Temperature Sensor and Flow Sensor.
- **VOLTAGE:** PoolWarden is designed with an ON/OFF switch and requires 120 VAC Input Voltage to operate.
- **SECURITY:** PoolWarden is designed with a lockable enclosure and provides up to four levels of password security protection (Admin, Tech, Service and Guest) for both local onsite and remote offsite interaction with the controller.
- **COMMUNICATION:** PoolWarden can connect to the Internet for direct monitoring, setup, and data interface via a WIFI or Ethernet option.
- **DATA:** PoolWarden will record up to 8192 lines of data with the built in internal memory.
- **HEATERS:** Auxiliary relays can control pool heaters with up to two set-points for each day to facilitate energy management.
- **PUMP CONTROL:** Auxiliary relays can be setup as a simple timer for controlling the on/off state of main pumps.
- **OVERFEED PROTECTION:** PoolWarden is designed with overfeed protection. Standard Overfeed limits the amount of time a relay can turn on feed equipment in a 24-Hour period.
- **PROPORTIONAL FEED:** Proportionally reduces the on-time as the measurement gets closer to the set-point to prevent overshoot.
- **E-MAIL ALERTS:** PoolWarden provides support for 4 email addresses. Alarm alerts can be sent directly from the controller for real-time management.
- **DIGITAL FLOW SENSORS:** PoolWarden can track flow rate and flow volume.
- **AUXILIARY RELAYS:** Auxiliary relays can control additional / backup sanitizer or acid feed pumps.

Maximum Electrical Specifications

ITEM	DESCRIPTION	LIMIT
Input Voltage	Maximum input AC voltage	220 VAC, 50-60 Hz
Input Current	Maximum input current	10 A
Relay Voltage	Maximum relay voltage	220 VAC
Relay Current	Maximum Relay Current	2.5 A
Temperature	Minimum/Maximum Operating Temperature	30/110 °F
Standby Current	Maximum operating current	0.1 A Max
pH	Measurement of pH	4.22 to 9.98
ORP	Oxidation Reduction Potential	0 to 999 mV
Temperature	Water temperature measurement.	32 to 122 °F

Models and Options

ITEM	DESCRIPTION
PW-XFC	PoolWarden controller with flow cell and sensors
PW-XFC-P	Add 2 pigtails per pool for easy connection of external feeders
PW-XFC-PE	Add 2 pigtails per pool and Ethernet communication
PW-XFC-E	Add Ethernet communication
PW-XMTD	PoolWarden controller with flow cell and sensors pre mounted on white back panel
PW-XMTD-P	Add 2 pigtails per pool for easy connection of external feeders
PW-XMTD-PE	Add 2 pigtails per pool and Ethernet communication
PW-XMTD-E	Add Ethernet communication
TrueDPD	Adds free chlorine measurement using the DPD colorimetric method. This is available as a single and dual sensor.
X	In the above model numbers, replace the x for S (Single pool) or D (Dual Pool)

Certifications

4010758
Conforms to
UL STD 1563
Certified to CSA STD
C22.2 No. 218.1

NSF/ANSI 50 - Equipment for Swimming Pools, Spas, Hot Tubs and Other Recreational Water Facilities
http://info.nsf.org/Certified/Pools/Listings.asp?Company=C0214550&Standard=050&

Version Plus

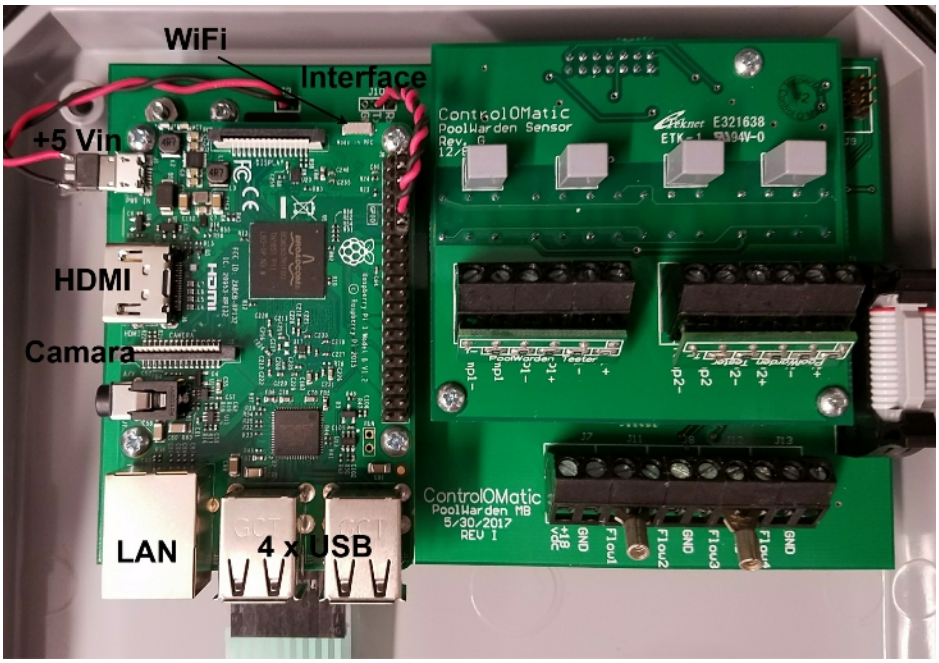
The PoolWarden Plus uses an advanced communication module that controls the operation of the system and requires an Internet connection. A Linux based operating system provides significant functionality advances including the ability to connect a computer monitor, keyboard and mouse.

Attach the communication module using 4 screws. Connect the +5 power connector and the Interface connector. When updating an existing PoolWarden the original software must be updated to interface with the communication module. The module will take over control of the display, overlay buttons, sensor card and all aspects of the pool control.

The Poolwarden Plus is very easy to update, simply go to the Internet screen and select check for updates. If there are any you will be able to update with the push of a button.

Features

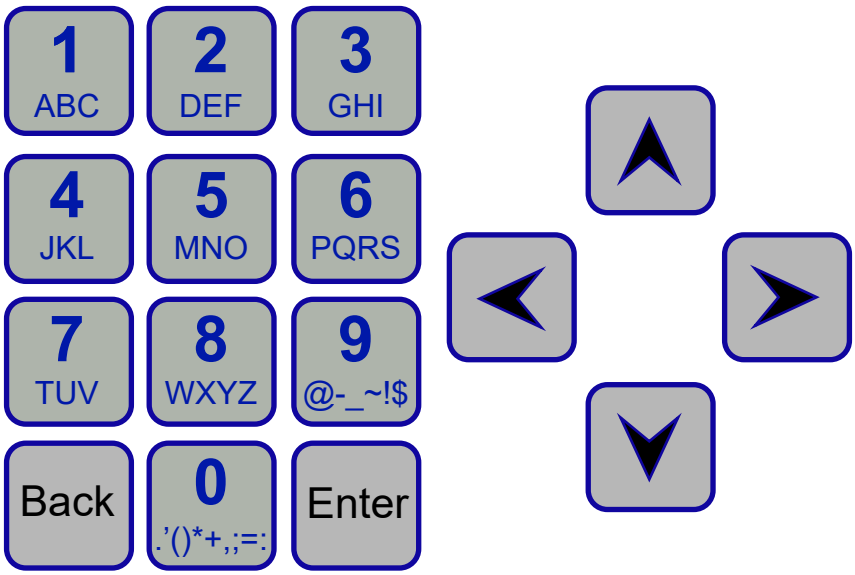
- ♦ 64bit ARMv7 Quad Core Processor
- ♦ 1GB Ram
- ♦ Built in WiFi
- ♦ Built in Bluetooth
- ♦ Built in Ethernet
- ♦ 4 x USB 2 ports
- ♦ Full size HDMI for external monitor, 1920x1200
- ♦ CSI camera port
- ♦ Micro SD port hard drive, 8GB
- ♦ Internet connection required for time, date and data. There is no setting for time, date and daylight savings - it is automatic from the Internet.
- ♦ Easy software updating
- ♦ Run Firefox
- ♦ Unlimited data recording
- ♦ Data saved in SQLite3 database, easy to retrieve
- ♦ Built in data server for direct connect
- ♦ Supports both mixing time or cycle time relay control
- ♦ PH and ORP Control span simplifies proportional control
- ♦ Daily data reporting
- ♦ Control Types: Mixing or Cycle



PoolWarden Plus OPERATION

This section reviews all the navigation features associated with PoolWarden's keyboard.

- **Back:** From the main readings display the **Back** button provides access to the main menu where all of the configurations are. If PoolWarden is password protected then you will need to enter the password to access the main menu. The **Back** button will also go back one menu from almost any screen and pressing it enough times will get back to the readings display.
- **Enter:** The **Enter** button provides access to most menus and sub menus within PoolWarden and allows you to accept or save an entry.
- **Number & Text Keys:** The number and text keys allow you to change numerical values only. Text from the front panel isn't supported in the Pi version.
- **Arrow Keys:** The arrow buttons (**Up, Down, Left & Right)**, allow navigation within each menu. All menus are fully rotational which means if you use the **Up** arrow to scroll to the top of a menu and press it one more time - you will be at the bottom of that same menu and vise-versa.



- ❑**Up Arrow**: Moves the cursor up one selection in a menu.
- ❑**Down Arrow:** Moves the cursor Down one selection in a menu. Also used to cancel changing a value.
- ❑**Left Arrow**: Moves back to the previous menu just like the **Back** button.
- ❑**Right Arrow**: Selects the item the cursor is currently on just like the **Enter** button.

Warning - Settings that reset to defaults

There are two settings that will reset all parameters to factory defaults and these should be set before any other values are changed. Both are discussed in the Main Menu - Setup section. These selections change the structure of the relay control.

- PH/ORP Ctrl: Mixing or Cycle
- TrueDPD: Enabled or Disabled

Default Readings Screen

The Default Readings Screen is displayed after power up and when a button isn't pressed for a period of time. It is the most critical screen as it will display the current pH & ORP sensor readings, flow status, relay status, alarm status and various symbols that are defined below. Menus within PoolWarden are accessed through the Default Readings Screen . Please review definitions of all Row & Column information and symbols below.

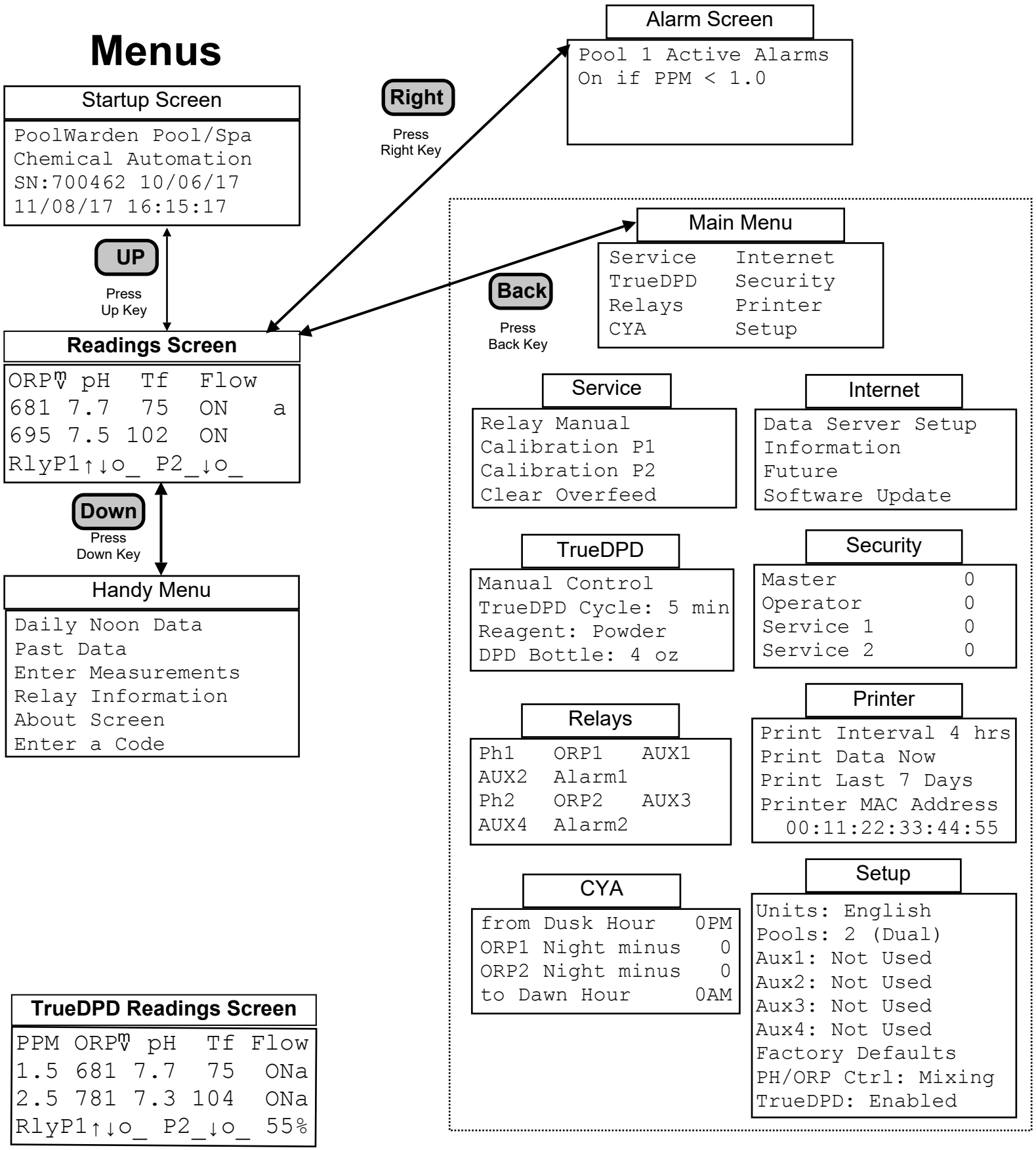
Default Readings Screen

```
ORP  pH  Tf  Flow
681 7.7  75  ON    a
695 7.5 102  ON
RlyP1↑↓o_ P2_↓o_  N
```

- **Row 1 (Column Header):** The first row is a column header and defines what you find below that particular column header. Example above: The "pH" Column Header on the first row means that the current pH readings for Pool 1 (7.7) and Pool 2 (7.5) are just below. When the PoolWarden is turned on a number will display on this line to the right which is a delay before the relays will operate, the turn on delay gives time for accurate reading prior to controlling the relays.
- **Row 2 (Current Measurements Pool1):** The current real time measurements and status for Pool 1. Example above for Pool 1: ORP=681, pH=7.7, Temperature (Tf) = 75 degrees Fahrenheit, Flow = ON. The "a" on the far right indicates that Pool1 is in alarm.
- **Row 3 (Current Measurements Pool2):** The current real time measurements and status for Pool 2. Example above for Pool 1: ORP=695, pH=7.5, Temperature (Tf) = 102 degrees Fahrenheit, Flow = ON and the alarm is not on for Pool2.
- **Row 4 (Relay Status):** Row 4 displays the current status of all the relays in the following order with symbols that are defined below (**RlyP1** = Pool1 and **P2** = Pool 2);
  - **RlyP1:** ORP1, pH1, Aux1, Aux2 **P2:** ORP2, pH2, Aux3, Aux4
  - _ : An underline indicates the relay is OFF and not in an active feed cycle.
  - ↑ : An Up arrow indicates the relay is ON and in an active feed cycle.
  - ↓ : A Down arrow indicates the relay is OFF and in the OFF part of an active cycle.
  - o : An "o" indicates the relay has reached the on time limit (overfeed limit) for the day and will not turn on again until the overfeed limit clears automatically each night at midnight or when PoolWarden's power is cycled.
  - s : An "s" indicates the relay has reached the setpoint overfeed limit and will not turn on again until the setpoint is achieved by other means (manually adding the required chemicals). The only other way to clear this is to cycle power. **NOTE: The setpoint overfeed will not clear when the Clear Overfeed menu item is selected in the service menu or at midnight like the daily overfeed.**
  - The letter 'b' next to an ORP reading indicates ORP is in pH lockout and ORP backup is on.
  - The letter 'p' next to an ORP reading indicates ORP is in pH lockout and is off.
- **Other Symbols Defined:**
  - The letter "a" on the right will display when the Pool alarm is on.
- **Flow Status:** The flow will either be ON or OFF with the standard flow sensor. Flow status for Pool 1 uses Flow 1 input for the sensor connection and Pool 2 uses Flow 3 input for the sensor connection on the sensor circuit board. This cannot be changed.

PoolWarden Plus MENU STRUCTURE

Simply press the **Back** button from the Readings Screen to gain access to the "Main Menu". From the "Main Menu" use the Up & Down arrow keys to navigate to each sub menu item and press Enter to go to that sub menu or selection. Accessing the Main Menu can be password protected and the available selections will be dependent on the security level of the password.



TrueDPD Readings Screen

```
PPM ORP mV pH  Tf Flow
1.5 681 7.7  75  ONa
2.5 781 7.3 104  ONa
RlyP1↑↓o_ P2_↓o_ 55%
```

Information Menus

PoolWarden has 4 information only screens (handy, alarm, startup and setpoint) which are all accessible directly from the Readings Screen. The information screens are NOT password protected.

Handy Menu

Press ▼ **Down Arrow** or **Enter** from the default readings screen.

- ❑**Daily Noon Data:** Allows scrolling through the noon time readings beginning with the last recording.
- ❑**Past Data:** This menu provides access to PoolWarden's internally recorded data. The data can be displayed visually on screen. Please note that this screen will only display readings, pH, ORP, Temp, Flow Status and Alarm Status.
  - ❑**Back** - > Quit: Exit the Data and bring you back to the Data Recording screen.
  - ❑↑+big: Pressing the **Up Arrow** will jump forward 30 rows of data. The up arrow also works in conjunction with the #*10Big Jump above. If any number between 1 through 9 is pressed followed by the up arrow then it will jump the data by a factor of 10 times that number.
  - ❑> +1: Pressing the **Right Arrow** will move forward one "1" data row at a time.
  - ❑< - 1: Pressing the **Left Arrow** will move backward one "1" data row at a time.
  - ❑↓-big: Pressing the Down Arrow will jump forward 30 rows of data. The up arrow also works in conjunction with the #*10Big Jump above. If any number between 1 through 9 is pressed followed by the down arrow key then it will jump the data by a factor of 10 times that number.
- ❑**Enter Measurements**: The following manually taken pool measurements: PPM, pH, ALK, Hard and CYA can be entered here. If PoolWarden is communication enabled then the data will be sent / stored at www.PoolWarden.com.
- ❑**Relay Information:** Displays current information about the relay including length of time on for day and month, Number of times relay has been turned on for the day. Press the right and left arrows to switch relays.
- ❑**About Screen:** List the total hours the unit has been on, total number of power up cycles, data packets sent and other information.
- ❑**Enter Password**: Allows for the entry of a password if PoolWarden has been security enabled.

Alarm Screen

Press ► **Right Arrow** from the readings screen to access the alarm menu. The alarm screen shows all alarms even if the current alarm is OFF. There are many conditions that can turn the alarm light on. Those conditions are set up for each pool in the Relay Setup Menu. The alarm screen lists the condition that have already turned the alarm on, or will turn the alarm on after the delay.

Startup Screen

Press the **Up Arrow** from the readings screen to access the startup screen. This is the screen that displays for a few seconds when the system is turned on. The serial number, software date, and current date and time are displayed.

Setpoints

Pressing the 9 key from the readings screen will show current set-points.

Reports

If there is anything to report there will be a "4" in the lower right corner of the readings screen. Press the 4 button to see the information.

- ♦ If the ORP is being reduced from the cyanuric acid that will display
- ♦ If unable to connect to the Internet

TrueDPD Information

Press the 6 key from the readings screen to access the TrueDPD information screen.

TrueDPD Information			
CLRv	DPDv	PPM	P1
4.30	2.45	3.6	c55
4.31	3.45	1.6	v3.98
Err	purg	meas	99%

- **CLRv:** The clear voltage, must be greater than 3.50 for operation.
- **DPDv:** The voltage after the DPD reagent has been added, must be less than the clear voltage for operation.
- **P1 / 2:** The current pool being measured.
- **C##:** The current seconds count in the measurement cycle. A full cycle takes about 82 seconds.
- **V#.##:** The current measured voltage
- **Err:** Displays if there has been any errors in the measurement, press 1 or 7 to view.
- **Purg:** After replacing the DPD reagent, select "purg" by pressing 2 or 8 to turn the DPD pump on for about 4 seconds which will purge the tubes with fresh reagent. It is also a good idea before replacing the reagent to run the DPD pump with fresh water for a couple minutes to keep the tubes clean.
- **Meas:** Press 3 or 9 to start a measurement cycle. A very good idea to do after a purg.
- 55%: The percentage of DPD reagent left. Press the up arrow to set to change the value in 10% increments.

Main Menu

The main menu is password protected and where all the configurations take place. Press the **Back** button from the readings screen.

Main Menu	
Service	Internet
TrueDPD	Security
Relays	Printer
CYA	Setup

Main Menu - Service

The Service Menu includes all items that a service technician needs to service a pool including manually feeding chemicals and calibration.

Relay Manual		
PH1	00:00:00	Off
ORP1	00:00:00	Off
Aux1	00:00:00	Off
Aux2	00:00:00	Off
PH2	00:00:00	Off
ORP2	00:00:00	Off
Aux3	00:00:00	Off
Aux4	00:00:00	Off

- **Relay Manual Mode:** Use the up and down arrow keys to scroll next to the relay that needs to be put into manual mode. Press the **Enter** button or the **Right Arrow** to put the selected relay into manual mode.
  - ❑ If the relay is currently ON, it will turn off and put back into auto control.
  - ❑ If the relay is OFF, it will turn ON for the manual relay time and return to auto.
- **Calibration Pool1 and Pool2:** Select the desired pool to calibrate and scroll to the item to calibrate. Manual Pool Measurements must be taken to calibrate each sensor. For best results the pool should be at the desired values when calibrating. The percentage to the right of the current reading is the amount of calibration and if it is at 99% that sensor is at the maximum calibration and may need to be replaced.

Calibration		
Cal ORP1	650	-16%
Cal pH1	7.7	-5%
Cal Temp1	78	+12%
Clear Cal ORP1		
Clear Cal pH1		
Clear Cal Temp1		
Cal PPM1	3.4	-6%
Clear Cal PPM1		

  - ❑ pH: Enter the manually measured pH value. A pH sensor can be calibrated +/- 2 pH units.
  - ❑ ORP: If the sanitizer level is higher than desired and the pH is at the setpoint then raise the ORP calibration slightly. If the sanitizer level is lower than desired and the pH is at the setpoint then lower the ORP calibration slightly. The ORP sensor can be calibrated +/- 200 mV. ORP sensors are affected by cyanuric acid, pH and other factors and it may take a few days to get it adjusted.
  - ❑ Temperature: Enter the manually measured temperature. A temperature sensor can be calibrated +/- 25 degrees Fahrenheit.

- ❑PPM: If the TrueDPD is connected there will be a selection for calibrating the free chlorine. When it is calibrated, the calibration is calculated on the next measurement cycle, if the PoolWarden power is cycled before that happens the calibration will be lost.

♦ **Clear Overfeed Times:** If an overfeed timer has been reached it will only clear/reset at midnight. There are times when servicing a pool that you may want to clear the overfeed timers to stop an alarm from tripping or to have the relay turn back on.

- ❑The only way to clear the overfeed timers is to select Clear Overfeed in the "Service" menu or to wait till midnight when they automatically clear. Note: Cycling power on the PoolWarden will not clear the overfeed timers.
- ❑The Setpoint Overfeed timers are also cleared when selecting the Clear Overfeed Times.

Main Menu - TrueDPD

The TrueDPD is a free chlorine sensor using the DPD testing method. It is an optional piece of equipment and can be enabled in the Setup menu.

TrueDPD Menu

```
Manual Control
TrueDPD Cycle: 5 min
Reagent: Powder
DPD Bottle: 4 oz
```

♦ **Manual Control:** Allows for manually controlling all of the functions of the TrueDPD which is useful to make sure everything is working properly and purging the DPD.

♦ **TrueDPD Cycle:** The cycle time between measurements and can be set to 5 min, 15 min, 30 min, 1 Hour or 6 Hour.

♦ **Reagent:** Liquid/Powder - The TrueDPD supports two different reagents for making the measurement. The standard powder mix is low cost, accurate but darkens over time at higher temperatures. The Liquid DPD that is made from Lamotte doesn't require mixing with water and doesn't darken over time.

♦ **DPD Bottle**: 4oz, 8oz or 16oz. A 4 oz bottle has enough reagent for about 1800 measurements.

Main Menu - Relays

The Aux relays are covered in the Setup section and Appendix A. From the Readings Screen press the Back button to access the Main Menu and select Relays. The relays are controlled with commands that can be enabled or disabled. Any command that has a value of 0 is disabled. The values listed is the default. When using the Cycle control type, please see the appendix for more information.

pH1 and pH2 Control Relays

In the Relay Menu scroll to pH1 or pH2 and press **Enter**. The following reviews each command within a pH Relay.

♦ **Manual Time 00:02:00:** Is the amount of time you can set a relay to turn on manually. To change the time, simply enter the new time and press **Enter** to save.

♦ **PH Control Span:** Select 0.0, 0.2, 0.3 or 0.4. When the measurement is greater than the span away from the setpoint the on time will be the full on time. When the measurement is between the setpoint and the span away from the setpoint the on time will be decreased to reduce overshooting the setpoint. When set to 0.0 the on time will not be adjusted. Press **Enter or the right arrow** to cycle the values.

♦ **On If pH > 7.5:** This is the pH set-point for ACID control and the factory default setting is 7.5. The relay will turn the chemical feed pump on if the measured pH reading is greater than 7.5.

♦ **On If pH < 0.0:** This is the pH set-point for BASE control and the factory default setting is 0.0 (disabled). When set, the relay will turn the chemical feed pump on if the measured pH reading is less than the value. Note: One of the two setpoints must be 0.0.

♦ **On Delay 00:00:20:** The on delay, in this case 20 seconds, is necessary to prevent the relay and, hence the chemical feed pump, from turning on and off frequently if the sensor measurement fluctuates back and forth from 7.5 and 7.6. It means that the relay will not turn on unless the condition of "On If pH > 7.5" is satisfied for at least 20 seconds. To change the on delay time, press **Enter** and change the time, press **Enter** to save the new setting. The value 00:00:00 disables the on delay.

♦ **Max Time On 00:01:00:** This is the total amount of time the relay will be ON if the "On If pH > 7.5" condition has been satisfied. This command works in conjunction with the MinTimeOff Command below. If

the pH reading is not being maintained then more or less on time may be needed. This is the maximum time the relay will be on and depending on the Span setting it may be on less.

- **MinTimeOff 00:05:00:** This is the total amount of time the relay will be OFF if the "On if pH > 7.5" condition has been satisfied. This is the amount of time allowed for chemical mixing in the pool and works in conjunction with the "On Time" Command above.
- **Off If RLY On -none:** The default setting is none or disabled. This feature prevents 2 relays being on at the same time. This is useful in cases where the chemical injection points are very close together and prevents the pH relay injecting at the same time the ORP relay is injecting. Simply press **Enter** to toggle through to the choices.
- **Off if Flow Off - 1 or 3:** The pH Relay will be turned off if "No Flow" is detected in Flow Switch Input 1 for Pool1 and if "No Flow" is detected in Flow Switch Input 3 for Pool2. **Note**: This setting can't be changed as it relates to safety, pressing the **Right Arrow** to change has no effect.
- **SetOvrfeed 00:00:00**: This type of overfeed requires the measurement to approach the setpoint. If a feed tube is broken and the chemicals are going on the floor this type of overfeed protection will detect that and shut down the relay sooner than the daily overfeed. Calculate how much feed time is required for the setpoint to be reached when the pH is a full point off. When the Setpoint Overfeed is reached the relay status will display an "s". The default value is 00:00:00 which is disabled, in order to use this feature calculate the amount of time required and enter that time.
  - ❑ Setpoint Overfeed can be cleared by 1) cycle power on the PoolWarden and 2) Manually fixing the chemical imbalance or clearing the overfeed timers in the Service menu.
- **Overfeed 06:00:00:** The Overfeed time represents the maximum amount of time a chemical relay will feed in a day from midnight to midnight. This must be set up properly to reduce the chance of feeding large amounts of chemicals in the event something goes wrong. The default time will most likely need to be adjusted. Please follow the calculation below.
  - ❑ Calculate the total amount of chemical the pool would ever need in a 24 hour period. (Example: 10 Gallons would be the MOST chemical a pool would need on any given day).
  - ❑ Calculate the amount of time it would take the feed-pump to inject that total amount of chemical in a 24 hours. **Example**: Limit to 1 gallon with a 10 Gallon Per Day (GPD) Fixed Rate Peristaltic Pump. 1 Gallons / 10 Gallons * 24 Hours = 2.4 hours or 02:24:00. You will need to adjust for variable pumps depending on the variable pump setting. Most variable pumps use a scale of 10 to 0. So if the pump is set on 8 then use 80% of the total GDP rate, in this case .80 x 10 GPD = 8 GPD.
  - ❑ Calculate the overfeed time with the following equation using the following example…..
    Overfeed Time = (Daily Gallon Need) / (Pump GPD Rate) times (24 Hours)
    Round up and set the overfeed time. It can be set for minutes and seconds for finer control.

ORP1 and ORP2 Relay Configuration

In the Relay Setup Menu scroll to the ORP1 or ORP2 relay and press enter. The following lists all of the commands and what they do. Note: If the TrueDPD isn't enabled the PPM commands will not be listed.

- **Manual Time 00:02:00:** Is the amount of time you can set a relay to turn on manually (Default Setting 2 Minutes). To change the time, simply enter the new time and hit the Enter Key to save.
- **LockOn Time 00:00:00:** This setting is only located in the ORP Relay menu. The factory default setting is zero "0". This is a setting for when the the ORP relay is in pH Lockout. It allows for some chlorine to feed into the pool for the programmed time instead of none at all while the relay is in pH Lockout. pH Lockout will be discussed in the Off If pH > 0.00 section. The "LockOffTime" below must be set as well to make sure there is a period of off time during the day. You would have to calculate how many gallons the pool would need in a day and then calculate how long the feed pumps need to be On and Off during the day to feed that amount.
- **LockOffTime 00:00:00:** This is a setting for the off time of the cycle when the the ORP relay is in pH Lockout. Both LockOn and LockOff allows for some chlorine to feed instead of none at all while the relay is in pH Lockout.

- **ORP Control Span:** Press Enter to cycle between 0, 10, 20, 30, 40 and 50 mv. If the measurement is less than the span below the setpoint then the relay will be on for the full on time and if in between the setpoint and the span the on time will be proportionately decreased. If the measurement is greater than the setpoint the relay will be off. Span control helps to prevent chemical overshoot.
- **PPM Control Span:** Press Enter to cycle between 0, 0.5, 1.0, 1.5 and 2.0 ppm. If the measurement is less than the span below the setpoint then the relay will be on for the full on time and if in between the setpoint and the span the on time will be proportionately decreased. If the measurement is greater than the setpoint the relay will be off. Span control helps to prevent chemical overshoot. If both PPM and ORP spans are used, the higher calculated on time will be used.
- **On If ORP < 700:** This is the ORP set-point and the factory default setting is 700. The relay will turn the chemical feed pump on if the measured ORP reading is less than 700.
- **Off If pH > 0.0:** pH Lockout Command. The default setting is zero "0" or disabled. ORP is highly dependant on pH. In other words, a high pH reduces the killing effectiveness of the sanitizer and has a direct effect on lowering the ORP reading even though there may be an ample amount of sanitizer in the water. pH Lockout helps to prevent chlorine overfeed. A typical pH Lockout setting is 8.0 and will lockout the ORP relay when pH reaches 8.0 or higher. This command doesn't effect the PPM setpoint.
- **On If PPM < 2.0:** This is the PPM set-point and the factory default setting is 2.0. The relay will turn the chemical feed pump on if the measured PPM reading is less than 2.0.
- **And if PPM> 0.0:** The TrueDPD sensor will read a 0.0 level if out of DPD reagent. Set this command to Yes if that is a possibility to not allow feeding with a 0.0 PPM measurement.
- **On Delay 00:00:20:** The on delay prevents the relay and hence the chemical feed pump from turning on and off frequently if the sensor measurement fluctuates back and forth from 699 and 700. It means that the relay will not turn on unless the condition of "On If ORP < 700" is satisfied for at least 20 seconds - then the relay will turn on for the programmed on time. Press **Enter** and change the time and press **Enter** again to save the new setting. Enter 00:00:00 to disable.
- **Max Time On 00:01:00:** This is the total amount of time the relay will be ON if the measurement is below the setpoint. This command works in conjunction with the MinTimeOff Command below. If the ORP reading is not being maintained then more or less on time may be needed. Setting both Max Time On and Min Time On isn't allowed.
- **Min Time On 00:01:00:** This is the minimum amount of time the relay will be ON if the measurement is below the setpoint. This command works in conjunction with the MinTimeOff Command below. Use this command for salt water chlorine generators and chlorinators. Setting both Max Time On and Min Time On isn't allowed. With this type of on time, when the relay turns on it will be on until the setpoint is reached and for at least the on time specified.
- **MinTimeOff 00:07:00:** This is the total amount the relay will be OFF in the off part of the cycle and is part of the mixint time. Do not set to 00:00:00 if the On Time is not also set to 00:00:00 as they work together.
- **Off If RLY On -none:** The default setting is none or disabled. This feature prevents 2 relays being on at the same time. It means this ORP Relay will be Off if the pH relay is On. This is useful in cases where the chemical injection points are very close together and prevents the ORP relay injecting at the same time the pH relay is injecting. Simply press **Enter** to toggle through the selections.
- **Off If ORP > 0:** The default setting is 0mV or disabled. This feature prevents feeding sanitizer if the ORP reading reaches a high value. When using the TrueDPD and free chlorine as the main control, if the DPD reagent runs out the PPM reading will be low which can result in over-feeding. Set the Off if ORP value appropriately to protect against that condition.
- **Off if Flow Off - 1 or 3:** The ORP Relay will be turned off if "No Flow" is detected in Flow Switch Input 1 for Pool1 and if "No Flow" is detected in Flow Switch Input 3 for Pool2. **Note**: This setting can't be changed as it relates to safety, pressing the **Right Arrow** to change has no effect.
- **SetOvrfeed 00:00:00**: This type of overfeed requires the measurement to approach the setpoint. If a feed tube is broken and the chemicals are going on the floor this type of overfeed protection will detect that and

shut down the relay sooner than the daily overfeed. Calculate how much feed time is required for the setpoint to be reached when the sanitizer is at 0. When the Setpoint Overfeed is reached the relay status will display an “s”. The default value is 00:00:00 which is disabled, in order to use this feature calculate the amount of time required and enter that time.

- ❑ Setpoint Overfeed is cleared by: 1) cycle power on the PoolWarden and 2) Manually fix the chemical imbalance so that the setpoint is achieved or 3) clear the overfeet timers in the service menu.
- ❑ If it would take 2 gallons of liquid chlorine to raise the chlorine level from 0 to the desired value, calculate how much time that would be, and enter the time. This time should be quite a bit lower than the 24 hour Overfeed timer.

♦ **Overfeed 06:00:00:** All chemical feed relays include this overfeed feature. The Overfeed time represents the maximum amount of time a chemical relay will feed in a day from midnight to midnight. This must be set up properly to reduce the chance of feeding large amounts of chemicals in the event something goes wrong. The default time will most likely not be correct. Please follow the calculation below. The minimum value for Overfeed time is 1 minute, it can’t be disabled.

- ❑ Calculate the total amount of chemical the pool would ever need in a 24 hour period. (Example: 10 Gallons would be the MOST liquid chlorine a pool would need on any given day).
- ❑ Calculate the amount of time it would take the feed-pump to inject that total amount of liquid chlorine in a 24 hour period. **Example**: Limit to 10 gallons with a 50 Gallon Per Day (GPD) Fixed Rate Peristaltic Pump. 10 Gallons / 50 Gallons * 24 Hours = 4.8 hours or 04:48:00. You will need to adjust for variable pumps depending on the variable pump setting. Most variable pumps use a scale of 10 to 0. So if the pump is set on 8 then use 80% of the total GDP rate, in this case .80 x 50 GPD = 40 GPD.
- ❑ Calculate the overfeed time with the following equation using the following example…..
  Overfeed Time = (Daily Gallon Maximum) / (Pump GPD Rate) times (24 Hours)
  Round up and set the overfeed time. It can be set for minutes and seconds for finer control.

Alarm 1 and 2 Setup

In the Relay menu are also the configuration settings for the alarm light on the PoolWarden enclosure lid. Scroll to the Alarm1 or Alarm2 and press **Enter**. The following reviews each command within the Alarm Menu.

♦ **On If ORP > 800:** The alarm will turn on if the ORP is greater than the value.

♦ **On if ORP < 600:** The alarm will turn on if the ORP is less than the value.

♦ **On If PPM > 7.0:** The alarm will turn on if the PPM is greater than the value.

♦ **On if PPM < 1.0:** The alarm will turn on if the PPM is less than the value

♦ **On If pH > 8.0:** The alarm will turn on if the pH is greater than the value.

♦ **On If pH < 7.0:** The alarm will turn on if the pH is less than the value

♦ **On If Temp > 0:** The alarm will turn on if the temperature is greater than the value

♦ **On If Temp < 0:** The alarm will turn on if the temperature is less than the value

♦ **On If Flow Off - none:** The alarm will turn on if no flow is detected. Pool1 uses Flow Switch Input 1 and Pool2 uses Flow Switch Input 3. To turn the alarm status on if no flow is detected for Pool1 simply hit the Enter Key to change the value from “none” to 1 (Flow Switch Input 1). To turn the alarm status on if no flow is detected for Pool2 simply hit the Enter Key 3 times to change the value from “none” to 3 (Flow Switch Input 3).

♦ **On If Overfeed - YES:** The alarm will turn on if the daily overfeed or setpoint overfeed has been reached for the indicated pool including the pH, ORP and Aux relays.

♦ **Off If Flow Off - none:** The PoolWarden will not send alarm notification if no flow is detected. If the main pump is off then you may not want to get alarm nitofications.

♦ **On Delay 00:10:00:** The alarm will only turn on if this condition is satisfied for at least 10 Minutes. This command prevents multiple alarms if the sensor readings are fluctuating back and forth.

♦ **Min Time On 00:00:10:** The alarm will be on at least this long giving time for notifications to be sent out.

♦ **Min Time Off 00:00:10:** When the alarm turns off, it will be off at least this long.

- **Off If Time < 00:00:00:** This is a time of day command. All alarm conditions will be OFF for the entire time of day until the time of day condition is met. If not 00:00:00, the alarm will be off from midnight until the time in this command. Use this command if you don't want notifications at night.
- **Off If Time > 00:00:00:** This is a time of day command. If not 00:00:00, the alarm will be OFF for the indicated time until midnight. Use this command if you don't want notifications at night.

Main Menu - CYA

ORP Is effected by cyanuric acid and during the day the ORP measurement will drop and at night it will go up for the same chlorine and pH level if there is cyanuric acid in the water. The higher the concentration the larger the ORP change. What usually happens in this case is at night the ORP rises and PoolWarden will not feed any more sanitizer until the sun comes up the next day, but during the night the actual chlorine dropped so in the morning the chlorine level may be low. Lowering the ORP value at night will allow for sanitizer to still be fed even in the presence of cyanuric acid.

The PoolWarden allows for the ORP to be reduced during night time hours to adjust for the natural ORP increase during the evening hours if Cyanuric Acid is being used in the Pool.

- **from Dusk Hour 0PM:** Drop the ORP from this hour on at night
- **ORP1 Night minus 0:** Drop the ORP for pool 1 by this amount
- **ORP2 Night minus 0:** Drop the ORP for pool 2 by this amount
- **to Dawn Hour 0AM:** Continue in the morning until this hour

In order to set this value observe the ORP reading at noon and midnight with the same sanitizer level, if the cyanuric acid had no impact the ORP values would be the same. Subtract the midnight ORP reading from the noon ORP reading and this is the value that can be entered.

When the ORP is being reduced, the status will be indicated in the report screen, press 4 from the readings screen.

Main Menu - Internet

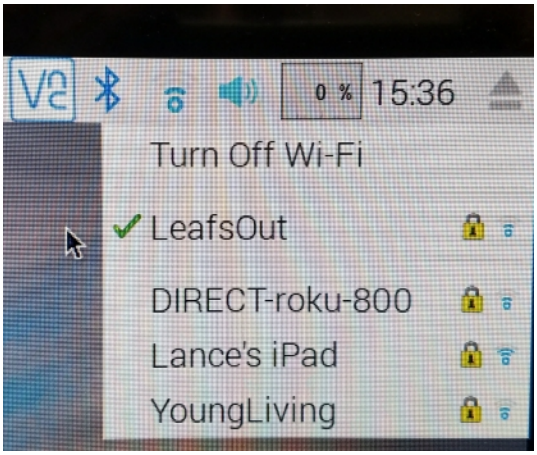
The PoolWarden Pi includes built in WiFi, Ethernet and Bluetooth support. There is no support in the PoolWarden part of the software for connecting to the Internet. Connecting to the Internet is similar to connecting any home computer to the Internet. If it doesn't connect automatically the following will be required:

- Mouse and Keyboard
- Computer monitor with HDMI cable

You will most likely need to connect to the operating system when using the WiFi network, for setting a static IP address, when using a 4G hotspot and when using USB tethering. Connect the mouse, keyboard and monitor to the communication card. Once this is complete there should be no further need for the monitor and keyboard.

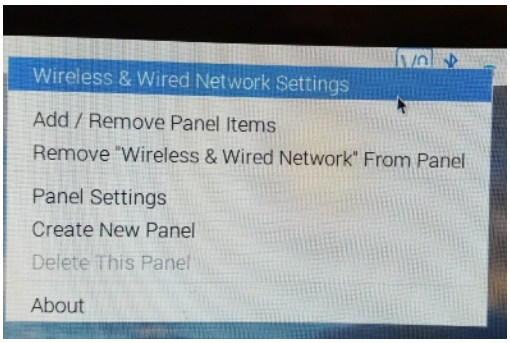
Connecting with WiFi

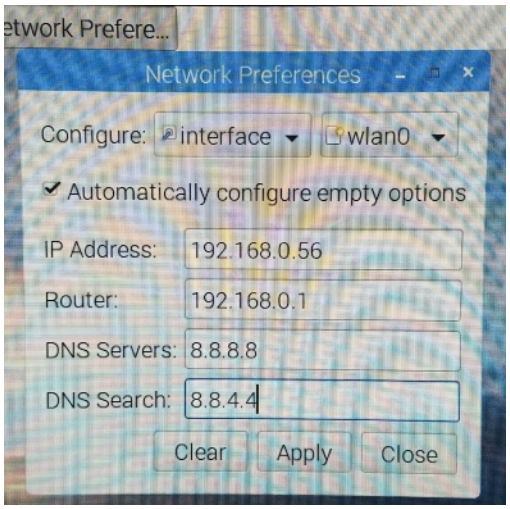
- With the mouse, left click the WiFi icon to display all of the wireless networks and make sure the WiFi is on
- Select the desired network and a Pre Shared Key box will open to enter the WiFi password.
- After entering the password the WiFi icon in the upper right corner should show the signal strength. The higher the strength the better. There is no antenna to move and the WiFi may not work if far from the router or in a concrete room.



Static IP Address

This is only required if you want to connect to the PoolWarden Plus directly. The IP address can change from time to time and when set to static it will always be the same. The static IP address is usually assigned by the IT department.





- Right click on the WiFi / Network icon in the upper right corner of the screen.
- Select “Wireless & Wired Network Settings” from the menu.
- In the right select next to configure select eth0 for Ethernet and wlan0 for WiFi. There may be other choices as well.
- Enter the static IP address, the router’s IP address and the DNS addresses
- Select Apply and that is it.

Hotspot or Tethering

If there is no Internet or the locations Internet is too difficult to use a hotspot is a relatively low cost alternative to make the connection. You can purchase a hotspot from Verizon for $20 to 100 with a $10 per month charge and a $40 activation fee with a 2 year contract. There may be a limit of how many you can have.

- **HotSpot**
- Enable the WiFi on the hotspot device and make sure it has a good 4G signal. Make sure you have a secure location for it.
- Setup a password in the hotspot to make sure no one will be able to use it.
- Follow the WiFi instruction above to connect the PoolWarden to the hotspot.
- **Tethering**
- You can typically use Bluetooth or USB. For USB make sure the device is charged if it is a notepad or cell phone.
- Turn WiFi off on the hotspot device
- Left click on the WiFi / network icon in the upper right corner of the monitor and turn off WiFi on the PoolWarden
- Connect the devices USB charging cable into the device and the USB connector in the PoolWarden
- In the device settings, turn on USB tethering. You may have to Google it if not obvious

Data Server Setup

Data Server Setup

```
Send Data Packet
Interval 15 minutes
Start Hour: 0
End   Hour: 0
On Alarm: No
```

- **Send Data Packet:** Send data to the server to make sure it is working. On a new install contact ControlOMatic before hand and they can look at the server to verify the arrival of the packet.
- **Interval 15 minutes:** Set the interval to send data. 0 is no data, then 15, 30, 60, 120 and 240 minutes. Note: Data will be sent to the data server at the specified interval in line with the actual time and stored into the internal database in the PoolWarden. Data recording in the PoolWarden is based on this interval in the Internet setup. Note: The daily data reporting feature of the server will send all of the data between two times. If you want hourly measurements set this value to 60 minutes.
- **Start Hour:** Enter the hour to start sending data. Use this feature if you don’t want to send data at night.
- **End Hour:** Enter the hour to stop sending data
- **On Alarm:** Send a data packet if the alarm turns on

INFORMATION

- **Lan and WiFi MAC address:** Some routers use the MAC address to grant access. This information is also available by opening up a terminal in the operating system and entering the Linux command “ifconfig”.
- Land and WiFi IP address: The assigned IP address for both are listed.

Future

Will be used at a later date.

Software Update

The PoolWarden supports software updating in the field with an Internet connection. Other methods include replacing the micro sim hard drive or a memory stick in a USB port.

- **Select Check for Updates:** Press the Enter button.
- **Update To:** If there is a new version the selection to update will be displayed and press the Enter button to update.
- If there are no updates that will also be displayed.
- After the update, the PoolWarden will reboot the operating system.

Check for Updates

```
PoolWarden Ver 1.46
Date 11/08/17
_Check for Updates
```

Check for Updates

```
PoolWarden Ver 1.46
Date 11/08/17
_Update To :   1.47
```

Main Menu - Security

Assign up to 4 passwords to the various personnel who will be working with or servicing PoolWarden. The main menu is protected and the Handy Menu, alarm screen and setpoints are not Password Protected - anyone can access them. There are 3 levels of access that are defined below. Scroll to the level and assign up to a 10 digit password (numbers only) and press “Enter” to save the password. Entering zero “0” will disable a password and the maximum value for any password is 4294967295.

- **Master:** Access to all menus within PoolWarden including ability to add, delete, or change passwords. If the password has been lost, please read the troubleshooting section at the end of this manual.
- **Operator:** Access to all menus except the Security menu.
- **Service:** Access only to the Service Menu.

Main Menu - Printer

The PoolWarden Plus supports a Bluetooth printer and it must be first discovered. This happens in the PoolWarden menus and no need to access the operating system. If the “Look for Printer” displays press the 9 button to proceed. Note: Multiple PoolWardens can share the same printer, if there are multiple in the room and you do not want to use a specific printer turn off the other printers first.

Look for Printer

```
 Look for Bluetooth
      Printer
Press 9 to Proceed
Allow a few minutes
```

Once a day a header line will print with the name of the PoolWarden (setup in the System Menu) and the serial number. Then at the appropriate intervals the current measurements will be printed.

Printer

```
Print Interval 4 hrs
Print Data Now
Print Last 7 Days
Printer MAC Address
  00:11:22:33:44:55
```

- **Print Interval:** Press Enter to cycle through Off, 30 min, 60 min, 4 hrs and Noon.
- **Print Data Now:** Print the current measurements now.
- **Print Last 7 days:** Prints the last 7 noontime measurements. There may be less than 7 if the measurements haven’t been made yet or if the PoolWarden was turned off at NOON on some of the days.
- **Printer MAC address:** For future use

Main Menu - Setup

The Setup Menu is where many of the main operating system features are turned on or off. Please review and set each item according to your needs.

Setup
Units: English Pools: 2 (Dual) Aux1: Not Used Aux2: Not Used Aux3: Not Used Aux4: Not Used Factory Defaults PH/ORP Ctrl: Mixing TrueDPD: Enabled

- **Units:** Press **Enter** to toggle between the English or Metric System. This is for the display of temperature only.
- **Pools:** This setting is normally entered by the factory when PoolWarden is purchased. However, there may be a need to set PoolWarden to Single Pool Controller or Dual Pool Controller.
- **Aux1-4:** The pH and ORP relays are fixed in what they can control and the Aux relays have many types of equipment that can be controller. See appendix A for more information and the control types.
- **Factory Defaults:** Reset all settings back to factory defaults. There is no “undo” so take care when selecting this option.
- **PH/ORP Ctrl:** Mixing or Cycle. WARNING: Changing the control type resets all settings to factory default. See the appendix for more information on cycle control.
- **TrueDPD:** Enabled or Disabled. Only enable if the TrueDPD external sensor box is installed and connected to flow switch input 4. WARNING: Changing this resets all settings to factory default.

LIMITED WARRANTY

Models: This warranty applies to PoolWarden referenced here as “Controller”. ControlOMatic, Inc. Warrants the controller to to be free from defects in manufacturing and workmanship for a period of Five (5) Years from the date of manufacture for the electronic main circuit board. All sensors and flow cells have a One (1) Year warranty. All other supporting equipment to the controller are individually covered by the specific equipment manufacturers warranty. Liability under this warranty is limited to the repair or replacement of any device or component which is returned to ControlOMatic within the warranty period by the original purchaser and found to be defective upon examination.

This warranty does not cover: (a) the purchaser’s labor or any servicing fees related to replacement of the defective product; (b) damage resulting from the use of this product in a manner inconsistent with normal use and the owners manual; (c) damage as a result of misuse, accident or neglect; (d) damage from improper testing, operation, or installation; (e) damage resulting from not operating the controller on a dedicated circuit or under conditions other than those recommended or at voltages or amperages other than those indicated on the controller and in the owners manual; (f) acts of mother nature (lightning, floods, earthquakes, etc); (g) modification of the controller in any way.

Defective parts should be returned to the local ControlOMatic Dealer. Any parts returned directly to ControlOMatic require a Return Material Authorization (RMA) code issued by a ControlOMatic Technician.

ControlOMatic makes no warranties, either expressed or implied, other than those stated above. No representative has the authority to change or modify this warranty in any way. Warranty Registration can be done at www.miniwarden.com or call 530-205-4520.

Any warranty claims should be directed to the following address:
ControlOMatic, Inc.
12659 Arbor ln
Grass Valley, CA 95949
530-205-4520

Appendix A

Aux Relays: CHANGING RELAY TYPE

The two dry contact Auxiliary Relays per pool are a standard feature in PoolWarden. Please review this section to understand how to configure the programming within PoolWarden to control many of the pools additional equipment such as Heaters, Circulation Pumps, Water Levelers, Back Up Sanitizers, etc. Please note that both Auxiliary Relays can also manage the same standard pH and ORP control types that the main pH and ORP relays can manage. From the Main Menu select "Relay Type", then select Pool1 or Pool2 and scroll down and select the Aux1 or Aux2 which are the auxiliary relays for Pool1. If Pool2 is selected then the

Aux3 and Aux4 would be the auxiliary relays for Pool2. Once one of the Auxiliary Relays is selected the following "Change Control Type" menu will appear.

- **Change:** Press the **Right Arrow** ">" to scroll through the control types.
- **Save:** Press the **Left Arrow** "<" to save the selection.
- **Back**: Press the **Back** key to cancel out of this menu.

Once saved the relay settings can be changed in the "Relay Setup" menu. Use the "Relay Type" menu to set pH control from Acid to Base, to select the type of sanitizer that is being used or to select from a number of choices for the AUX relays.

Heater Control Type

- **Manual Time 00:02:00:** Is the amount of time you can set a relay to turn on manually (Default Setting 2 Minutes). When you turn on the relay manually in the service menu, the relay will be on for 2 minutes in this case. To change the time press **Enter** and edit the time and press **Enter** to save.

- **On If Temp < 0:** This is the Main Temperature set-point and the factory default setting is zero "0" or disabled. The relay will turn the Heater on if the Temperature falls below the set point and will turn off once the set point is achieved.
- **Night Temp < 0:** This is the Secondary Temperature set-point and the factory default setting is zero "0" or disabled. This secondary set point works in conjunction with the Advanced Menu. The relay will turn the Heater on if the Night Temperature falls below the set point and will turn off once the set point is achieved.

Aux1 Heater Relay Selected

```
ManualTime  00:02:00
On If Temp < 0
Night Temp < 0
On Delay    00:01:00
MinTimeOn   00:02:00
MinTimeOff  00:02:00
Off if Flow Off - 1
Overfeed    10:00:00
```

- **On Delay 00:01:00:** The on delay, in this case 1:00 minute, is necessary to prevent the relay and hence the heater from turning on and off frequently if the temperature fluctuates back and forth from from the set-point. The relay will not turn on unless the setpoint condition is satisfied for at least 1:00 Minute - then the relay will turn on for at least the programmed "On Time 00:02:00" in this case 2 minutes.
- **MinTimeOn 00:02:00:** This is the total amount of time the relay will be ON if the Temperature dips below the setpoint. The default setting is 2 Minutes. This command works in conjunction with the MinTimeOff Command. This prevents the heater from kicking on and off frequently if the temperature is fluctuating around the set-point.
- **MinTimeOff 00:02:00:** This is the total amount of time the relay will be OFF if the Temperature reaches the set-point and the relay has been on at least the MinTimeOn. The default setting is 2 Minutes. This command works in conjunction with the MinTimeOn Command above. This prevents the heater from

kicking on and off frequently if the temperature is fluctuating around the set-point. Never set this time to 00:00:00, that will keep the timers from properly resetting.

- **Off if Flow Off - 1:** This Aux1 Relay will be turned off if "No Flow" is detected in Flow Switch Input 1. Pool1 uses Flow Switch Input 1 and Pool2 uses Flow Switch Input 3. Never allow the heater to turn on if there is no flow. The heater will have it's only flow detection which will also keep that from happening.
- **Overfeed 10:00:00:** The Overfeed time represents the maximum amount of time a Heater can be on in a 24-Hour period from midnight to midnight. Calculate the maximum amount of total time the heater would be on in a 24-Hour period and enter the time here. The default time of 10:00:00 will most likely not be correct. This will prevent the Heater from continuously running if something goes wrong with the temperature sensor.

Feed Daily Control Type

Feed Daily can be used to turn on a piece of equipment at the same time every day of the week that or specific days. It can be used to perform the following:

- ❑Turn on at a specific time and off at a specific time
- ❑Can be enabled for any or all days of the week
- ❑When it is on, it can also cycle on and off
- ❑Can be disabled based on a flow switch being off

Aux1 Feed Daily Selected

```
ManualTime  00:02:00
Day of Week  smtWtfs
Off If Time <  10:00:00
Off If Time >  12:00:00
On Time        00:30:00
MinTimeOff     00:30:00
Off if Flow Off - 1
```

- **Manual Time 00:02:00**: The manual time for any relay can be set up to 23:59:58.
- **Day Of Week smtwtfs**: This is the ON Command for this control type, if all letters for the days of the week are left lower case, the relay will not turn on. To enable the relay to turn on select the Day of Week command and press **Enter**, then select numbers 1 through 7 representing Sunday through Saturday and toggle between the lower case and uppercase letter of the week. Lower case is disabled and uppercase means the relay will be enabled or turned on on that day of the week.
- **Off If Time < 00:00:00**: This is a modifying command to the Day Of Week Setting and is where the relay will be off if the time of day is less than the configured time setting. The default setting is zero "00:00:00" or disabled. Enter the time based on 24-Hour Military Time and press **Enter** to save.
- **Off If Time > 00:00:00**: This is a modifying command to the Day Of Week Setting and is where the relay will be off if the time of day is greater than the configured time setting. The default setting is zero "00:00:00" or disabled. Enter the time based on 24-Hour Military Time and press **Enter** to save.
- **On Time 00:00:00**: This command is used to cycle the relay on and off continuously. Enter the desired on time for the cycle (such as 2 Hours or 02:00:00) and press **Enter** to save the setting.
- **MinTimeOff 00:00:00**: When the relay is going to cycle on and off during the on portion of the day this command controls how long it will be off. Once this off time has been reached the relay will turn back on for the On Time. If this cycling feature is going to be used do not leave either the On Time or the MinTimeOff at 0, they are used together for proper operation.
- **Off if Flow Off - 1**: The relay will be turned OFF if "No Flow" is detected in Flow Switch Input 1. Press Enter to cycle between Flow Switch 1, 2, 3, 4 and none.

Example: The commands listed in the above box for this section will have Aux1 cycling on for 30 minutes, and off for 30 minutes on Wednesday between 10AM and noon.

Alarm Out Control Type

Alarm Out is where an external alarm can be connected to an Auxiliary Relay and configured in this menu. This may be needed in cases where a more pronounced sound or light is needed.

Alarm Out

```
On if Alarm On - Yes
Off if Flow Off - 1
```

- **On if Alarm On - Yes:** When set to Yes the Aux relay will be on if the alarm light is on.
- **Off if Flow Off - 1**: The relay will be turned OFF if “No Flow” is detected in Flow Switch Input 1. Press Enter to cycle between Flow Switch 1, 2, 3, 4 and none. If the circulation pump turns off at night you may not want this additional alarm output to be on which can be detected by no flow.

Superchlorination

Use this relay control type to feed an increased amount of sanitizer once a week or a couple times a week. This relay control type is the same as the Feed Daily and only the new additional commands are discussed here.

Superchlorination

```
ManualTime  00:02:00
Day of Week  smtwtfS
Off If Time <  22:00:00
Off If Time >  23:00:00
On Time        00:15:00
MinTimeOff     00:15:00
Off If ORP>700
Off If pH > 7.9
Off if Flow Off - 1
```

- **Manual Time 00:02:00**: The manual time can be used to test the sanitizer feed for superchlorination to make sure it is connected properly..
- **Day Of Week smtwtfs**: Set the days of the week to perform superchlorination.
- **Off If Time < 00:00:00**: Set the time to start the superchlorination.
- **Off If Time > 00:00:00**: Set the time to end the superchlorination.
- **On Time 00:00:00 and MinTimeOff 00:00:00**: The mixing times may not be needed, but for a smaller body of water you may want to feed sanitizer for 15 minutes and let it mix for another 15 with the relay OFF to give the sanitizer time to mix.
- **Off If ORP>700:** The setpoint for a superchlorination cycle is to turn off if the ORP is higher than an ORP setpoint. The feed cycle will continue until enough sanitizer has been added to reach this setpoint of the Off If Time value has been reached. If you are going to feed a set amount of chlorine based on time only set this value to 0 to skip it.
- **Off If pH> 7.9:** ORP is affected by pH and as the pH goes up the ORP value goes down. If when starting the superchlorination cycle the acid storage tank is empty the pH may be at a higher then desired value causing the ORP to be lower which could lead to feeding more sanitizer than desired. If you are going to feed a set amount of chlorine based on time and not using the ORP setpoint then set this value to 0 to skip it.
- **Off if Flow Off - 1**: The relay will be turned OFF if “No Flow” is detected in Flow Switch Input 1. Press Enter to cycle between Flow Switch 1, 2, 3, 4 and none.

Water Level Control Type

Water Level is where an external pool water level feed can be connected to an Auxiliary Relay and configured in this menu. If a water level switch is used it should be connected to Flow 2 for Pool1 and Flow 4 for Pool2. When the water is below the switch level then water should be added. The flow switch can be either on when the water is low or off when the water is low depending on the type of switch, read the following carefully to make sure you select the correct turn on condition.

- **Manual Time 00:02:00**: Is the amount of time you can set a relay to turn on manually (Default Setting 2 Minutes). To change the time, enter the new time and press **Enter** to save.
- **On if Flow On - none**: The Aux Water Level Relay will be turned on if “Flow” is detected in a Flow Switch Input. Set this command to the appropriate flow switch input if the switch is ON when the water is low. Note: If setting the On if Flow On to a switch value, leave On if Flow Off set to none.
- **On if Flow Off - none**: The Aux Water Level Relay will be turned on if “Flow” is detected in a Flow Switch Input. Set this command to the appropriate flow switch input if the switch is OFF when the water is low. Note: If setting the On if Flow Off to a switch value, leave On if Flow On set to none.

Aux1 Water Level

```
ManualTime  00:02:00
On if  Flow On -none
On if  Flow Off-none
Off If Time <  00:00:00
Off If Time >  00:00:00
Off if Flow Off-none
Overfeed   00:00:00
```

- **Off If Time < 00:00:00**: This command will keep the relay off if the time of day is less than the configured time setting. The default setting is zero "00:00:00" or disabled. Enter the time based on 24-Hour Military Time and press **Enter** to save. Leave this at 00:00:00 if it doesn't matter the time of day to add water.
- **Off If Time > 00:00:00:** This command will keep the relay off if the time of day is greater than the configured time setting. The default setting is zero "00:00:00" or disabled. Enter the time based on 24-Hour Military Time and press **Enter** to save. Leave this at 00:00:00 if it doesn't matter the time of day to add water.
- **Off if Flow Off - none:** The Aux Water Level Relay will be turned off if "No Flow" is detected in the Flow Switch Input indicated.
- **Overfeed 00:00:00**: The Overfeed time represents the maximum amount of time a Water Leveler can be on in a 24-Hour period from midnight to midnight. Calculate the maximum amount of total time the Water Leveler would be on in a 24-Hour period and enter the time here. The default time of 00:00:00 or disabled. This will prevent the possible overflow situations.

Time Based Water Level: If not using the flow input for water level but a time base such as 15 minutes a day, then set the On if Flow On - 1 or 3 to use the flow switch in the flow cell which will turn this relay on, and then use the time of day commands to set the amount of minutes to add water per day. You could also use the Feed Daily relay control type for more control such as selecting the days of the week to add water.

ORP Control Types

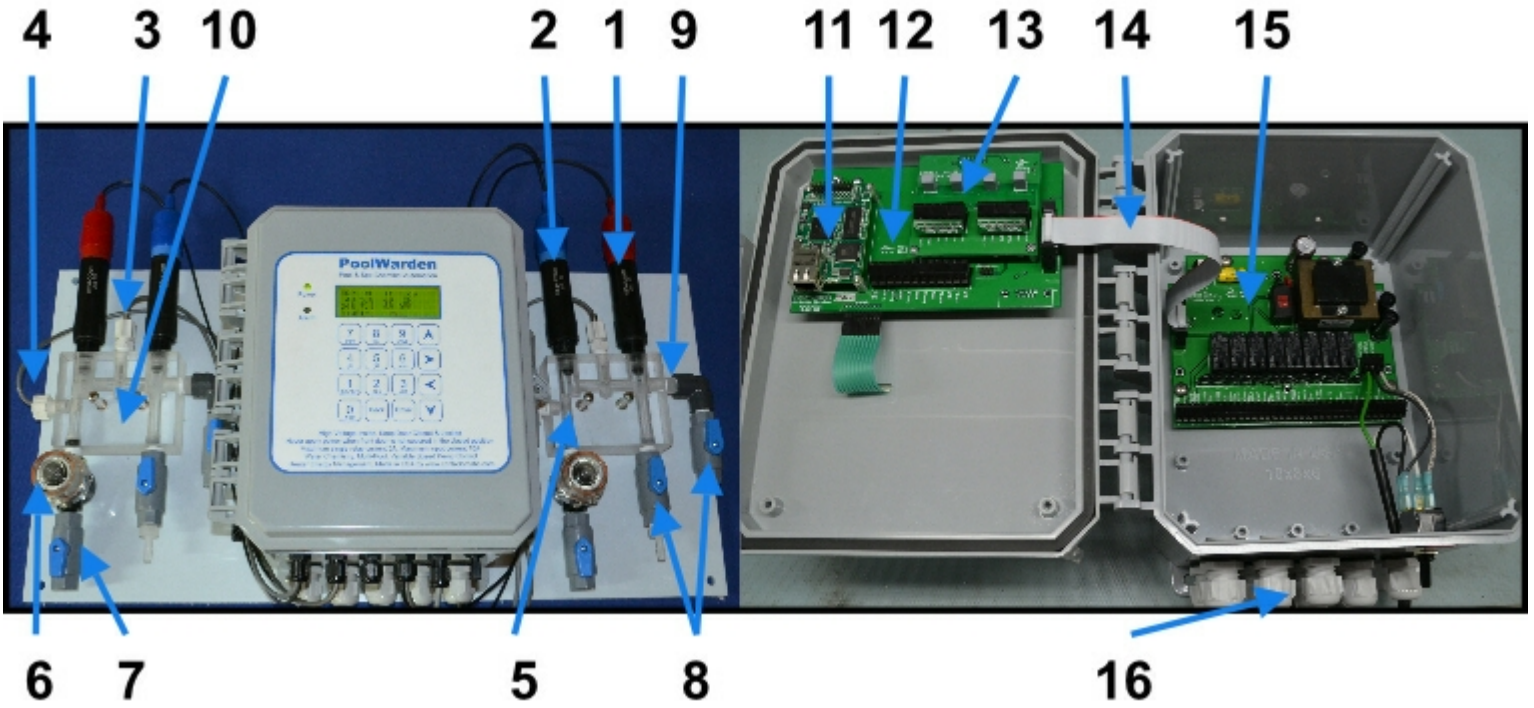
There are 4 control type selections for ORP: Liquid, Feeder, Cal Hypo and Salt System. Liquid and Cal Hypo have the exact same relay programming, and Feeder and Salt System have the exact same relay programming.

Proportional and ORP Over Run: For a feeder, proportional control isn't needed because the relay will stay on until the setpoint is achieved. ORP Over Run allows for 0, 5, 10 or 15mv to be added to the setpoint, it will turn on at the setpoint, and off at the setpoint plus this value.

Liquid and Cal Hypo	Feeder and Salt System	
ManualTime	Same	Manual feed time
Proportional	ORP Over Run	
On If ORP<700	Same	ORP Setpoint
On Delay	Same	Turn on delay
On Time	MinTime On	
MinTimeOff	Same	When turning off, stay off at least this long
Off If pH	Same	PH Lockout
Off if RLY On	Same	Keep off if currently in a pH feed cycle
Off if Flow Off	Same	Only allow feeding if there is flow
SetOvrfeed	Same	Feed limit based on the setpoint being achieved
Overfeed	Same	Daily feed limit

On Time and MinTimeOn: For liquid, the On Time is part of the cycle, it will be on for the programmed On Time or less and then the MinTimeOff will start which allows the added chemicals to mix. For the Feeder, the MinTime On is the minimum amount of time the relay will be on, even if the setpoint is achieved. Note that the relay may be on longer than this time if the setpoint isn't achieved within the programmed time.

Appendix B: Replacement Parts



Item	Part Number	Type	Description
1	ORP-COMP	Sensor	ORP Sensor, platinum band, red sensor body
1	ORP-COMG	Sensor	ORP Sensor, gold disk for salt water chlorinators
2	PH-COM1	Sensor	PH Sensor, blue sensor body
3	PW-T10K-3ft	Sensor	Temperature sensor, 3 foot cable
4	PW-Flow3	Sensor	Flow sensor detector, 3 foot cable
5	PW-FlowCell-MAG	Sensor	Flow sensor magnet
6	PW-Strainer	Flow Cell	Inlet water strainer with stainless steel screen
6	PW-Strainer-Screen	Flow Cell	Stainless steel screen for inlet water strainer
7	1250-070-01	Flow Cell	1/4" FNPTxFNTP, SMC 2-Way Ball Valves
8	1250-080-01	Flow Cell	1/4" Ball Valve FNPT x MNPT, SMC
9	1250-100-01	Flow Cell	1/4" NPT, PP Threaded Nipple
10	2070-010-01	Flow Cell	Machined PoolWarden flow cell acrylic block
11	PWLANC	Circuit Board	Ethernet communication module
12	2370-020-07	Circuit Board	PoolWarden motherboard
13	2370-130-06	Circuit Board	PoolWarden sensor card dual pool
13	2370-050-06	Circuit Board	PoolWarden sensor card single pool
14	2570-080-01	Cable	Motherboard to relay board interconnect cable
15	2370-120-10	Circuit Board	PoolWarden dual pool relay board (8 relays)
15	2370-040-10	Circuit Board	PoolWarden single pool relay board (4 relays)
16	1020-080-01	Cable	Cable grip, 1/2" NPT (.23-.47"), GRAY, bottom row
16	1020-070-01	Cable	Cable grip, 3/8" NPT (.20-.39"), GRAY, top row

Appendix C: Maintenance

PoolWarden Enclosure

The enclosure can be cleaned with a soft cloth that is moist with water. Take extra care when cleaning the clear display window. To clean the display window make sure the cloth hasn't been used to clean anything else or it may have grit which may scratch the clear screen.
The PoolWarden includes cable grips on the bottom side of the box. If any are not used make sure to fill them so that the opening is closed. If a cable grip is left open bugs may enter the inside and leave droppings and nests which should be removed.

Sensor Maintenance

The sensors must be clean to operate properly. The strainer in front of the flow cell will catch most debris but oils and chemical deposits will get through. Slow response, increased need to calibrate and inconsistent readings are indicators that the sensors need to be cleaned or replaced.

To clean the sensors, turn off both valves to the flow cell and carefully remove the pH and ORP sensors from the flow cell. The small white dots on the bottom of the sensor should be flush with the black sensor body and clearly visible. Use a soft brush and a mild detergent to remove any oil and contamination from the glass bulb and the small white dots. Do not let the sensors dry out as that may damage the sensor, after cleaning apply Teflon tape to the threads and reinstall the sensors.

ORP and pH Sensor Replacement

The PoolWarden ORP and pH sensors have a warranty to last at least 1 year and will most likely last from 1.5 to 3 years or longer. An indication that it is time to replace a sensor is the percentage listed on the calibration screen in the PoolWarden service menu. If the percentage is 99% then the sensor is not able to be properly calibrated and should be replaced. There is a date code on the sensor body that can also aid in determining if the sensor needs to be replaced. If one sensor needs to be replaced and both the ORP and pH sensor have the same date code it is recommended to replace them both.

Part Number	Type	Description
ORP-COMP	Sensor	ORP Sensor, platinum band, red sensor body
ORP-COMG	Sensor	ORP Sensor, gold disk for salt water chlorinators
PH-COM1	Sensor	PH Sensor, blue sensor body

Sensor Storage

During the installation of the PoolWarden make sure to the sensor caps. To store the sensors turn off both valves to the flow cell and remove the sensors. Add a little water to the sensor cap and hand tighten the sensor to the cap. The cap should have a small sponge that only needs to be moistened.

Cold Temperatures

The ORP and pH sensors should not be exposed to freezing conditions. If the outside temperature is below freezing this may damage the sensors and they should be removed to protect them. Always store them with their protective caps.

Always drain the water from the flow cell, strainer and tubing to to flow cell to prevent damage in freezing conditions.

Technical Support

Please contact ControlOMatic at 530-762-1627 for sales and support. Send support emails to support@controlomatic.com. The dedicated PoolWarden website with videos, tips, documents and more is:

www.poolwardentraining.com

Appendix D: Troubleshooting

Flow not registering even though the magnet is up

- Make sure the flow sensor detector wire is connected to the correct switch input. Pool 1 uses Flow 1 and Pool 2 uses Flow 3. On the readings display, the flow indication for Pool 1 is Flow input 1 and for Pool 2 is Flow input 3, this can't be changed. If you moved the Pool 1 flow sensor to Flow input 2 the display will still show the status of Flow input 1.
- Rotate the flow sensor ¼ turn. There is a polarity between the magnet and the flow sensor and rotating the sensor slightly may help.

Alarm light is on, but the readings are OK

- There are many factors that affect the alarm status. From the readings screen press the right arrow to enter the alarm conditions screen. This will list all of the factors from the alarm settings that are causing the alarm light to be on.

ORP and pH readings are way off

- If the ORP and pH sensors wires are swapped this will cause readings that are way off. The ORP sensor will read near 0 and the pH sensor will be maxed out. Check the wire connections.
- Check the circuit boards and make sure they are all properly seated in their connectors.
- Clean the sensors and check the date code.

ORP and pH readings are drifting

- The most common cause of sensor drifting is a poor earth ground connection to the PoolWarden. A good way to test the earth ground connection is to measure with a digital voltmeter one of the ground terminals on the main board in the lid to a piece of metal in the pump room.

Chemical feeders are not turning on

- The first test is to make sure they can turn on. Go to the service menu and select Manual Relay Mode and turn on the feeder to test. If if doesn't turn on then there may be a problem with the feeder, the wiring or even the relay.
- Try plugging the feeder into an alternate power source to make sure it can turn on.
- The setting for the relay control require a flow switch to be on and an overfeed timer to not be reached.

ORP varies from day to night with the same pH and free chlorine

The presence of cyanuric acid in pool water is a challenge for ORP sensors as they detect the waters ability to oxidize which cyanuric acid has an impact on and is dependant on the amount of sunlight hitting the water. The PoolWarden has an advanced feature allowing for an automatic decrease in the ORP value at night to help compensate for this effect (go to the advanced menu for more information). If there is cyanuric acid in the water then the following guidelines may help:

- Only calibrate the ORP sensor at the brightest time of the day. If you calibrate the sensor at night when the chlorine is all available that will then lead to an overfeed condition on the next day when the sun is out and the ORP drops.

Forgot Your Password

If you enabled the security feature and forgot your password all is not lost. Contact ControlOMatic with the serial number and proof of ownership and a password reset code will be provided that will clear all of the security passwords. Each PoolWarden has it's own unique reset code and one that works on one PoolWarden will not work on another.