MiniWarden

Automated Pool & Spa Chemical Controller And Data Recorder

ORP pH Tf Flow
678 7.3 69 ON
OFF
Rly ↓_ c▯

ETL LISTED
C US
Intertek

Installation
&
Operation

NSF
Certified to
NSF/ANSI Standard 50

Version: 110/220 VAC Web Server

Contents

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. With the MiniWarden on and operating, push the test button on the GFCI and the MiniWarden should turn off. Now push the reset button on the GFCI and the MiniWarden 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 MiniWarden.**

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 MiniWarden 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 MiniWarden prior to any service including the main AC power. Never apply power when MiniWarden service door is unlocked or in the open position. Only qualified and licensed technicians should perform any service or repair.*

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

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

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

   11.1 <u>Never mix sodium hypochlorite and muratic acid!</u>

   11.2 <u>When mixing acid and water, always add acid to the water, never add water to the acid.</u>

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**

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

15   **ATTENTION***: LIRE LA NOTICE TECHNIQUE*

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

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

MiniWarden OVERVIEW

ControlOMatic, with over 20 years of technological leadership in Pool & Spa Chemical Control Systems congratulates you on your selection of the MiniWarden Chemical Controller. MiniWarden is a water chemistry control system with capabilities to control the pH and sanitizer on a pool, spa, fountain or any other similar body of water. 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 MiniWarden will control chemical feed equipment using relays to keep the pool or spa water in balance. Water measurements are taken continuously while MiniWarden's internal relay programing determines if chemical adjustments are needed. MiniWarden also contains a selection for the sanitizer relay to be dry-contact which can be used for salt water chlorine generators and solenoid valves that are controlled with a different voltage or a simple switch.

SYSTEM COMPONENTS

♦ Simple and Advanced operating modes: SIMPLE: Cycle time control makes the MiniWarden very easy to operate and only a few settings required for operation. ADVANCED: The original operating modes allowing for very detailed and precise control.

♦ CONTROLLER: MiniWarden is a microprocessor based, modular automation system that is capable of continuous monitoring locally onsite or remotely offsite.

♦ INTERFACE: MiniWarden 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: MiniWarden 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: MiniWarden includes 2 output relays for the control of pH and sanitizer.

♦ SENSORS: ORP Sensor, pH Sensor, Temperature Sensor and Flow Sensor.

♦ VOLTAGE: MiniWarden requires 120/220 VAC Input Voltage to operate.

♦ SECURITY: MiniWarden 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 with 10 passwords.

♦ COMMUNICATION: MiniWarden can connect to the Internet for direct monitoring, setup, and data interface via an Ethernet option (a WIFI bridge can be added for wireless).

♦ DATA: MiniWarden will record up to 8192 lines of data with the built in internal memory.

♦ OVERFEED PROTECTION: MiniWarden is designed with overfeed protection. Standard Overfeed limits the amount of time a relay can turn on feed equipment in a 24-Hour period. Also includes a setpoint overfeed limit that can be used to prevent chemicals from being fed onto the floor of the equipment room by damaged feed tubes.

♦ PROPORTIONAL FEED: Proportionally reduces the on-time as the measurement gets closer to the set-point to prevent overshoot.

Maximum Electrical Specifications

ITEM	DESCRIPTION	LIMIT
Input Voltage	Maximum input AC voltage	120/240 VAC
Input Current	Maximum input current	5.0 A
Relay Voltage	Maximum relay voltage	240 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
MiniWarden	Controller Only with no sensors or flow cell.
MiniWarden FC	Controller including flow cell and sensors.
MiniWarden MTD	Controller including flow cell, sensors and pre-mounted on back board.
PW-Lan	Manage controller remotely using the Ethernet (LAN) Option.
TrueDPD	Adds free chlorine measurement using the DPD colorimetric method.
Pigtail Option	Option: Two foot extension cable to connect to feed equipment.
Tube Fittings	Option: 3/8 and 1/2" Tube fittings, requires 4

Certifications

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

Certified to NSF/ANSI Standard 50

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&

Mounting MiniWarden

Turn off any heaters, pool or spa circulation systems, chemical feed pumps or any related shut-off valves or equipment and relieve pressure from the filtration system. Find a suitable mounting location near a 120/240 VAC power source that meets the following criteria:

- Facilitates a combined (influent & effluent) maximum tubing run of 30'.
- Do not mount controller above electrical sources or electrical equipment.
- At least 10' away from any pool, spa or body of water and not accessible to the public.
- Away from corrosive materials and physical hazards.
- Not in direct sunlight or directly above or near any heat source.
- For 220 VAC, ability to hard wire with GFCI (ground fault circuit interrupter) protection.

Securely mount controller or the optional controller backboard vertically on the wall using supplied screws or appropriate fasteners for the wall construction. Never mount MiniWarden horizontally.

## Flow Cell To Circulation Plumbing

There are many ways to connect the flow cell tubing to the circulation plumbing. Successful flow cell installation requires a pressure differential.   One way to install is to make sure the input source to the flow cell is well upstream from any chemical injection point (C Below). The Flow cell input and output points before and after the filter provide the greatest pressure differential (see below). MiniWarden is equipped with a strainer to filter out any debris from the unfiltered water. Periodically check and clean the strainer. However, the flow cell input and output can also be installed before and after the heater if enough pressure differential is available to create adequate flow through the flow cell.

- Flow Cell Input: Drill & tap a connection point in the circulation system at a location just up-stream from the filter (A - Below). Install tubing connector and run tubing to the input side of the flow cell.
- Flow Cell Output: Drill & tap a connection point in the circulation system at a location with reduced pressure just after the filter (B - Below). Install tubing connector and run tubing to the output side of the flow cell.

CAUTION: Maximum pressure across the sensors should be 10 PSI (pressure gauge may be required). Always expose the sensors to positive pressure. Prevent exposing the sensors to negative pressure or a vacuum by connecting the flow cell output tubing to the suction side of the pump as the vacuum may suck the sensor gel from the sensors rendering the sensors inoperable in a very short period of time.
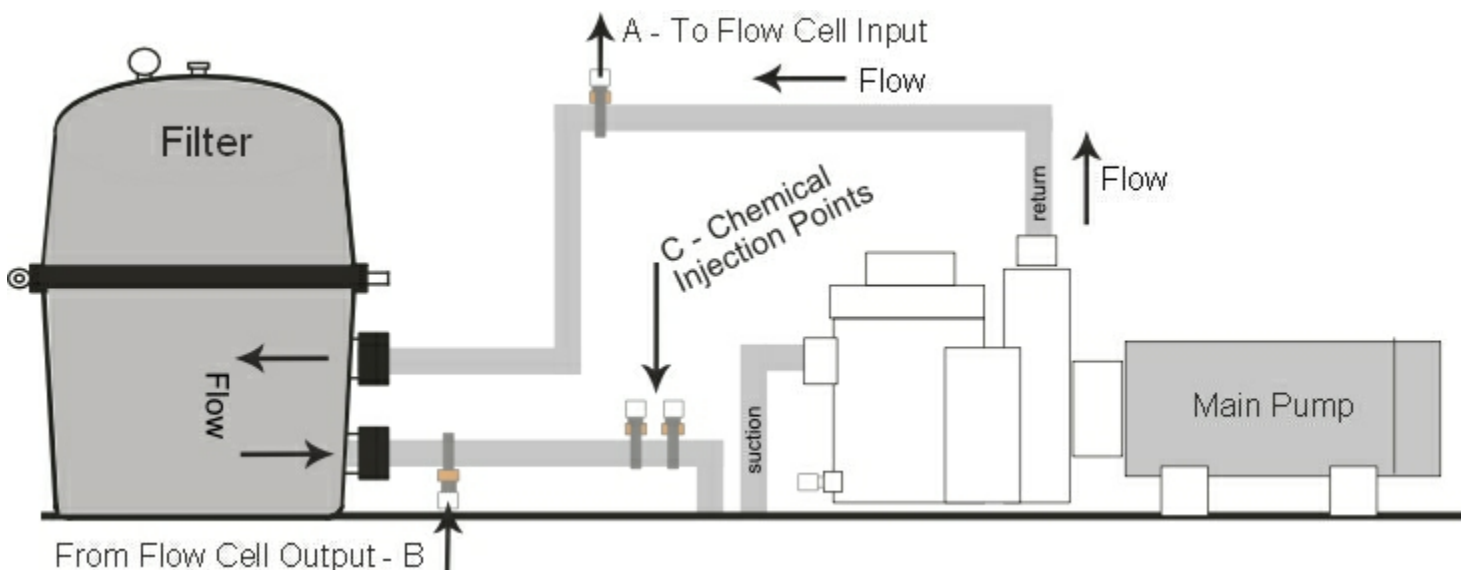
♦ If not pre-mounted, find a suitable location to mount the acrylic flow cell within 3 feet of the controller. Mount and assemble flow cell parts according to Picture 2.

♦ There is a small magnet in the flow cell that is held in place with a piece of tape. Remove the tape and make sure the magnet remains in the hole above the filter / strainer.

♦ Remove pH (Blue) and ORP (Red) sensors from the boxes. Use Teflon tape on sensor threads and all other flow cell parts to ensure water tight connection and fasten accordingly.

♦ Install the appropriate 1/2" or 3/8" hard vinyl input and output tubing from the pools circulation system connection points to the "In" and "Out" connection points on the flow cell according to Picture 2.

♦ Once connected, turn circulating pump back on, test for leaks at all connection points, and make sure all air evacuates form the tubing.
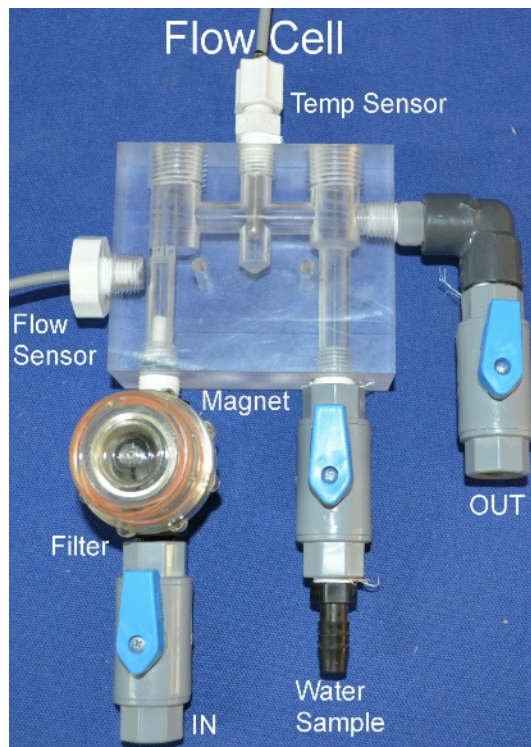
IMPORTANT NOTE: There needs to be just enough water flow through the flow cell to raise the flow magnet inside the flow cell to make contact with the flow sensor. To test this, turn the "input" shut-off valve to the off position and watch the flow magnet drop from the flow sensor. Next, turn the input shut-off valve back on and watch the flow magnet raise to the flow sensor. If the flow magnet raises abruptly and pings/knocks the flow cell acrylic then there is too much flow pressure. To reduce pressure, perform the same exercise, but now open the shut-off valve slowly and stop when you see the magnet "slowly" raise to make connection with the flow sensor. Leave the shut-off valve in that position.

Sensor Wire Connection

If not pre-mounted, route the pH (Blue Sensor Wire), ORP (Red Sensor Wire), gray flow switch and the gray temperature sensor wire through the small cable grip on the right side on the bottom part of the controller and connect as labeled inside MiniWarden or as indicated below in PICTURE 3. **Please Note: Black wires are always negative (-) and the Clear or Red wires are always positive (+).**

- Flow Sensor Connection: Connect flow the sensor to Flow1 on the display board on the lid.
- Temperature Sensor Connection: Connect the sensor to the Temp connection on the display board on the lid.
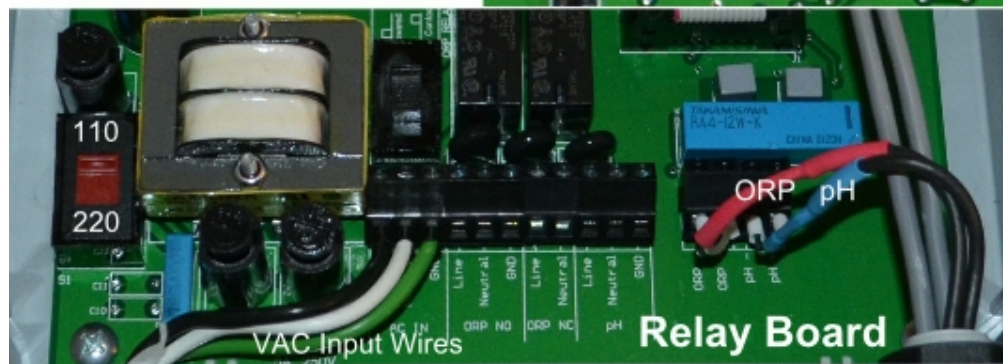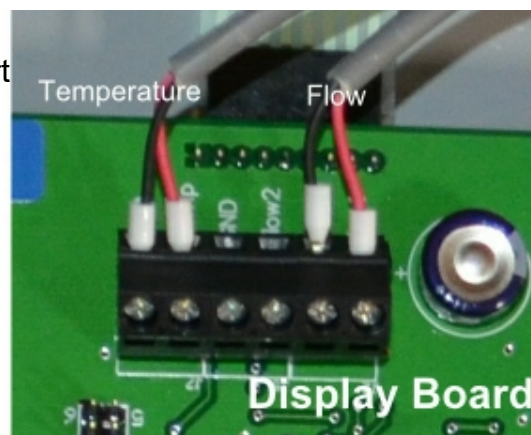
Supply 110/220 Vac Input Selection

The MiniWarden supports both 110 VAC and 220 VAC. For 110 VAC the power cord includes a GFCI on the end of the cord that plugs in. For 220 VAC the cord should be removed and the MiniWarden should be hardwired to a circuit breaker with a GFCi by a licensed electrician. The cord can be returned to ControlOMatic for a credit.

- **VAC Selector:** The red switch on the left of the bottom circuit board must have the switch notch up for 110 VAC, and down for 220 VAC. Incorrect selection will damage the MiniWarden.
- A good solid earth ground is required for MiniWarden to work properly.
- The ORP and pH relay are directly connected to the input VAC. If you have the MiniWarden set for 220 VAC then the loads must also be 220 VAC.
- For 220 VAC operation, the neutral line will be connected to the Red 220 VAC wire and the Line connection will be to the Black 220 VAC wire. The Neutral connection for pH and ORP relays switches the Neutral input VAC wire. The relays are double through and break both lines.

Load / Equipment Connection & Installation

ORP & pH RELAYS: The chemical feed relays for pH and ORP are internally connected to the input VAC main input which is located on the left side connector on the circuit board through 5 AMP fuses F1 and F2. No voltage is being supplied to the load / equipment when the relay is off, hence, voltage is being supplied to the load / equipment when the relay is on. Any standard chemical feed pump or solenoid valve can be hard wired directly into the appropriate ORP and pH connection terminals as shown below in PICTURE 4 so long as their voltage matches the input VAC connected to the MiniWarden.

Relay Board Acronyms for ORP & pH 120 VAC Relays:

- ❏**Line**: Normally Open Black. When the ORP & pH relay is off the terminal will have no voltage. Hence, when the relay is on the terminal will have voltage.
- ❏Neutral: For 110 VAC - This is connected to the input white neutral wire when the relay is on. For 220 VAC - This is connected to the neutral connection on the VAC input terminal which is connected to the 220 VAC red wire.
- ❏**GND**: The ground connection for the ORP and pH chemical feeders.
- ❏**ORP NO**: The connection to the relay that is normally open. When the relay is off there is no supplied voltage, only when the relay is on.
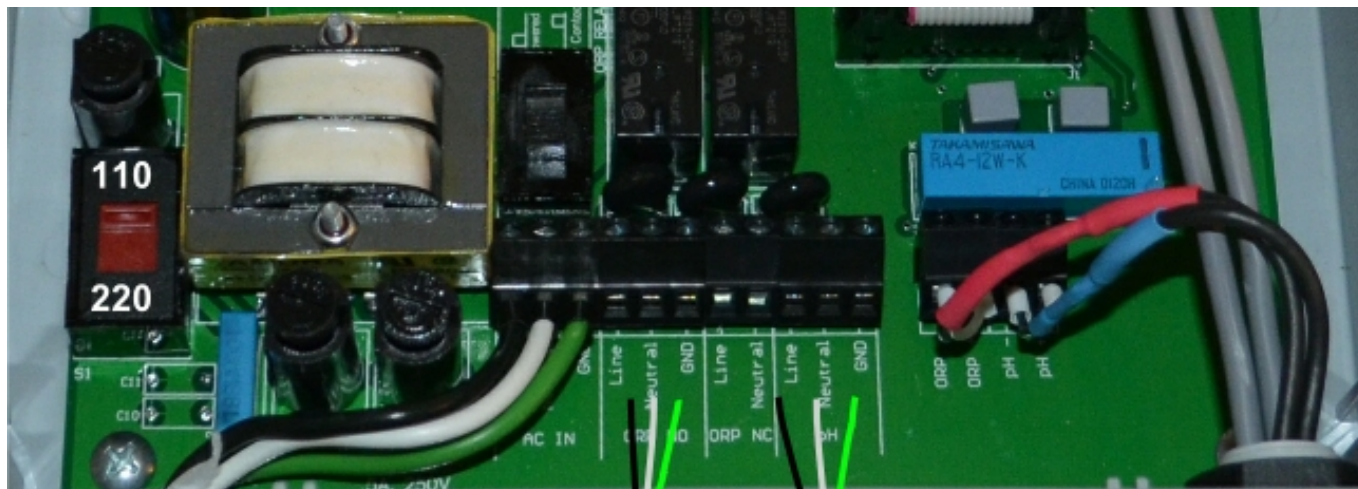
❑**ORP NC**: The connection to the relay that has voltage when the relay is off. When the relay is on there is no voltage.

ORP DRY CONTACT RELAY

A dry contact relay is not connected to any voltage and acts as a switch. To supply power to a load / equipment (such as a chemical pump) through a dry contact relay, the voltage must be supplied using a jumper to the appropriate voltage. To change the ORP relay to dry contact the Dry Contact Switch must be switched to the upper position. In this case, when the relay is on the Line connection will be connected to the Neutral connection when the relay is on. For the control of a saltwater chlorine generator the dry contact can be used as a switch with no voltage.

Relay Board Acronyms for the ORP Dry Contact Relay:
❑Line: One side of the dry contact relay.
❑Neutral: Other side of the dry contact relay
❑ORP NO: Line is connected to Neutral when the relay is on.
❑ORP NC: Line is connected to Neutral when the relay is off.

Supported Auxiliary Dry Contact Loads / Equipment:

♦ Chlorine Generators: A high power chlorine generator should not be powered using MiniWarden's internal VAC power as it may exceed the input 2.5 AMP relay rating. One way is to break the chlorine generator flow switch line (B) as shown in PICTURE 5. When MiniWarden's relay turns on while the flow switch is on then the chlorine generator will turn on. When the relay is turned off it makes the chlorine generator think there is no flow and the chlorine generator will turn off.

♦ Loads / Equipment Using External 24 VAC (Erosion Feeders & Suction Side Cal Hypo): Solenoids are used to control water flow through a chlorine erosion feeders and suction side cal hypo systems and may use 24 VAC. Install a 24 VAC Transformer external to the MiniWarden and connect one of the output leads to the Line connection of the ORP relay and connect the Neutral connection of the ORP relay to the solenoid as shown in PICTURE 5. Connect the other 24 VAC Transformer wire to the remaining solenoid wire (C). If the 24 VAC Transformer has an output ground wire then connect it to one of the GND terminals on the relay board.
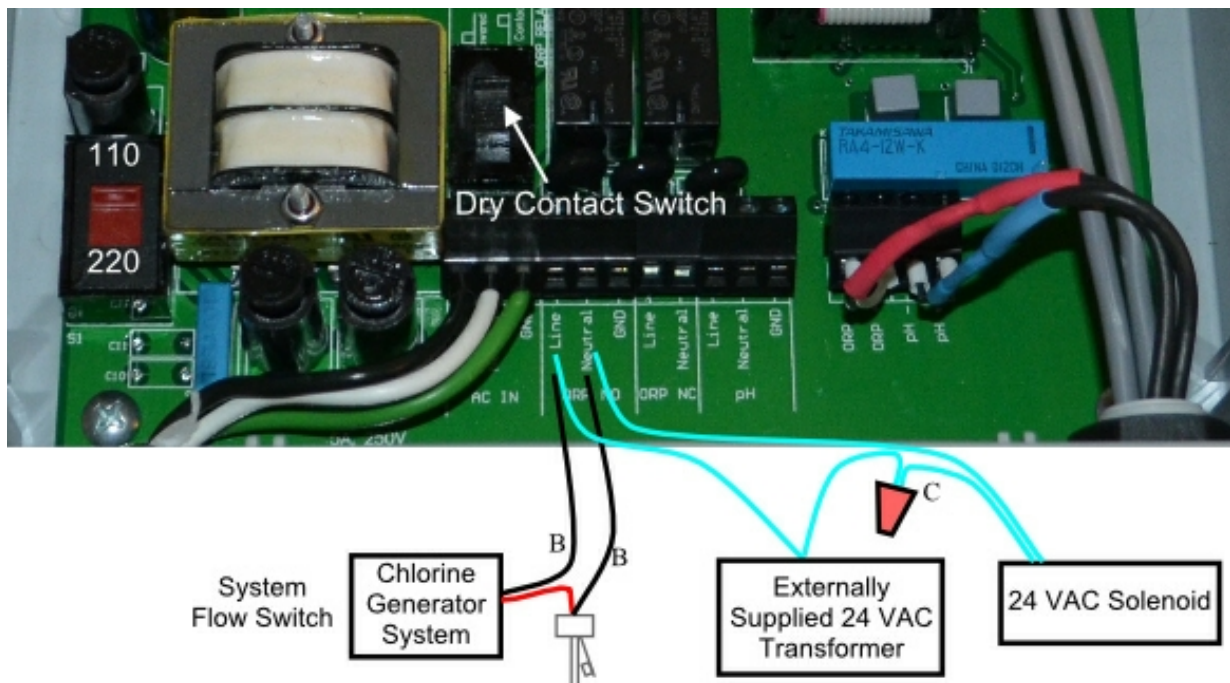
MiniWarden Operation

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

♦ **Back:** From the main readings display the **Back** button provides access to the main menu where all of the configurations are. If MiniWarden 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 MiniWarden and allows you to accept or save an entry.

♦ **Number & Text Keys:** The number and text keys allow you to change numerical values and text in many menus.

❑ Number Keys: "0 through 9" change numerical values.
❑ Text Keys: Some menus allow for entering or changing text. The first press of a number key will display the number. The next press will display the first Lower-Case letter below the number and so on. Continuing to press the key will display Upper-Case letters.
❑ When the cursor is in the first position, pressing the left arrow key will toggle between upper and lower case.

♦ **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.

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 MiniWarden are accessed through the Default Readings Screen .

Default Readings Screen			
ORP͜ pH	Tf	Flow	
681 7.7	75	ON	a
Relay ↑↓			🔒

Please review definitions of all Row & Column information and symbols below.

◆ **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 is 7.7. When the MiniWarden 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):** The current real time measurements and alarm status. Example above: ORP=681, pH=7.7, Temperature (Tf) = 75 degrees Fahrenheit, Flow = ON. The "a" on the far right indicates that the alarm is on.

◆ **Row 3 (Flow switch 2):** The current status of Flow Switch 2 (advanced mode).

◆ **Row 4 (Relay Status):** Row 4 displays the current status of both relays in the following order with symbols that are defined below:

❑ **Rly:** ORP pH1
❑ _ : 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 (advanced mode).
❑ 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.**
❑ p In the ORP position indicates pH lockout and is on and sanitizer feed is disabled..

◆ **Other Symbols Defined:**

❑ The letter "a" on the right will display when the Pool alarm is on.
❑ "p" In the last 4 characters of the display screen, indicates a user PIN code has been entered, this will clear when it is sent to the server (advanced mode).
❑ "N" or "c" is displayed in the lower right indicates communication status with remote networks (advanced mode).

❑ The LOCK symbol in the lower right indicates security is enabled.

Selecting Simple/Advanced Mode

To change modes, press the Back button to access the Main Menu. While in the Main Menu press the Right and Left arrow at the same time. WARNING: All settings will be reset to factory defaults. Press 9 to make the change, any other button to exit without making any changes.

Mode Selection
Operating Mode
Resets all defaults
Current Mode-Simple
9=Change to Advanced

Handy Menu

MiniWarden has 2 Menus (Handy and the Main Menu) that are all accessible directly from the Default Readings Screen. Only the Handy is NOT password protected.

♦ **Handy Menu:** Press **Down Arrow** or **Enter** from the default readings screen to access the handy menu.

- ❑**Enter Password**: Allows for the entry of a password if MiniWarden has been security enabled.
- ❑**Last 7 Days Data:** Cycle through the last 7 day noon-time data measurements.
- ❑**Enter Service Pin (Advanced mode)**: Service Technician can be assigned a Pin Code to enter when servicing the pool. This feature only applies when MiniWarden is Communication Enabled.
- ❑**Enter Measurements**: The following real pool measurements (PPM, pH, ALK, Hard and CYA) can be manually entered. If MiniWarden is communication enabled then the data will be sent / stored at www.poolwarden.com. Entering these manual measurements will also enable the Langlier Index Adjustment in the System Menu in advanced mode. See Langlier pH in the System Menu for more information.
- ❑**Relay Information:** Displays relay type, Length of time on for day and month, Number of times relay has been turned on for the day. Enter 0 to clear the timers for the selected relay. Press the right and left arrow to cycle through the relays.

♦ **Startup Screen:** Press the **Up Arrow** from the readings screen to access the startup screen that shows the software version and serial number on the fourth line and the current time and date on the third line..

♦ **Alarm Menu / Screen:** Press the **Right Arrow** from the readings screen to access the alarm menu. The alarm screen shows all pending alarms even if OFF. The alarm conditions are set up in the Relay Setup Menu.

- ❑**Langlier Index (Advanced mode):** Press the **Right Arrow** from the "Alarm Menu" to display the Langlier index. This screen only displays if the ALK, Hard and CYA have been entered in the "Handy Menu". The calculation uses the three manually entered measurements and the current measurement for pH and temperature.

♦ **Set Point Screen:** Pressing **9** from the readings screen will show current set-points.

TrueDPD Operation (Advanced mode): Pressing **6** from the readings screen will show the last measurement cycle information from the TrueDPD if it is enabled in the "System Menu".

Non-Password Protected Menus and Screens
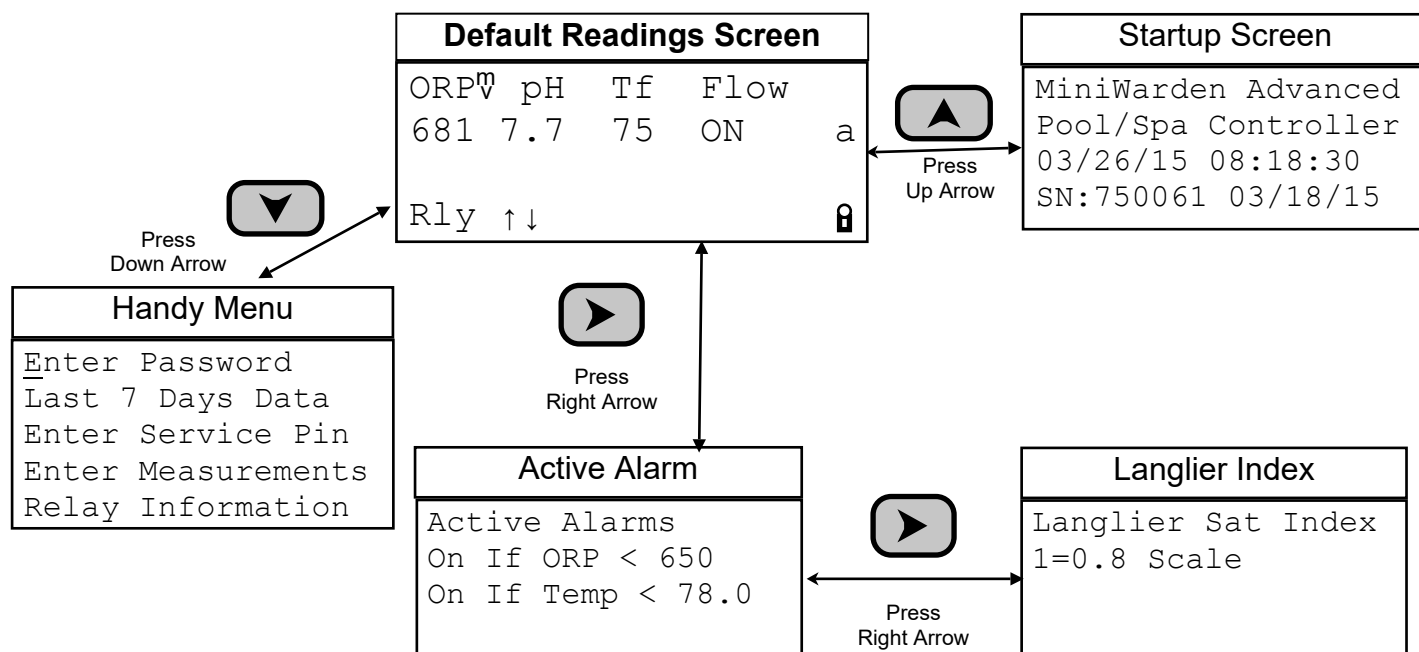
MiniWarden Simple Mode

When switching between simple and advanced mode all settings are reset to factory defaults. Some of the features that are not supported in simple mode include:

1. Communication: Simple mode will not send data to the data server and the Ethernet module isn't supported.
2. TrueDPD: Simple mode will not interface with the TrueDPD free chlorine sensor.
3. Flow Switch 2: Is not used in simple mode.
4. Daily Overfeed: The 24 hour overfeed timers are not used in simple mode.

Simple Mode Features

1. Cycle time control, select either 30 or 60 seconds.
2. ORP and pH spread based control instead of a proportional percentage.
3. Setpoints easy to set from the main menu.
4. Alarm menu includes values for pH and ORP only.
5. Adjustable ORP and pH spread,including 0.
6. PH Support for acid or base.
7. PH Lockout on ORP control.
8. Adjustable setpoint overfeed from 1 to 6 hours.

MiniWarden Simple Mode Menus
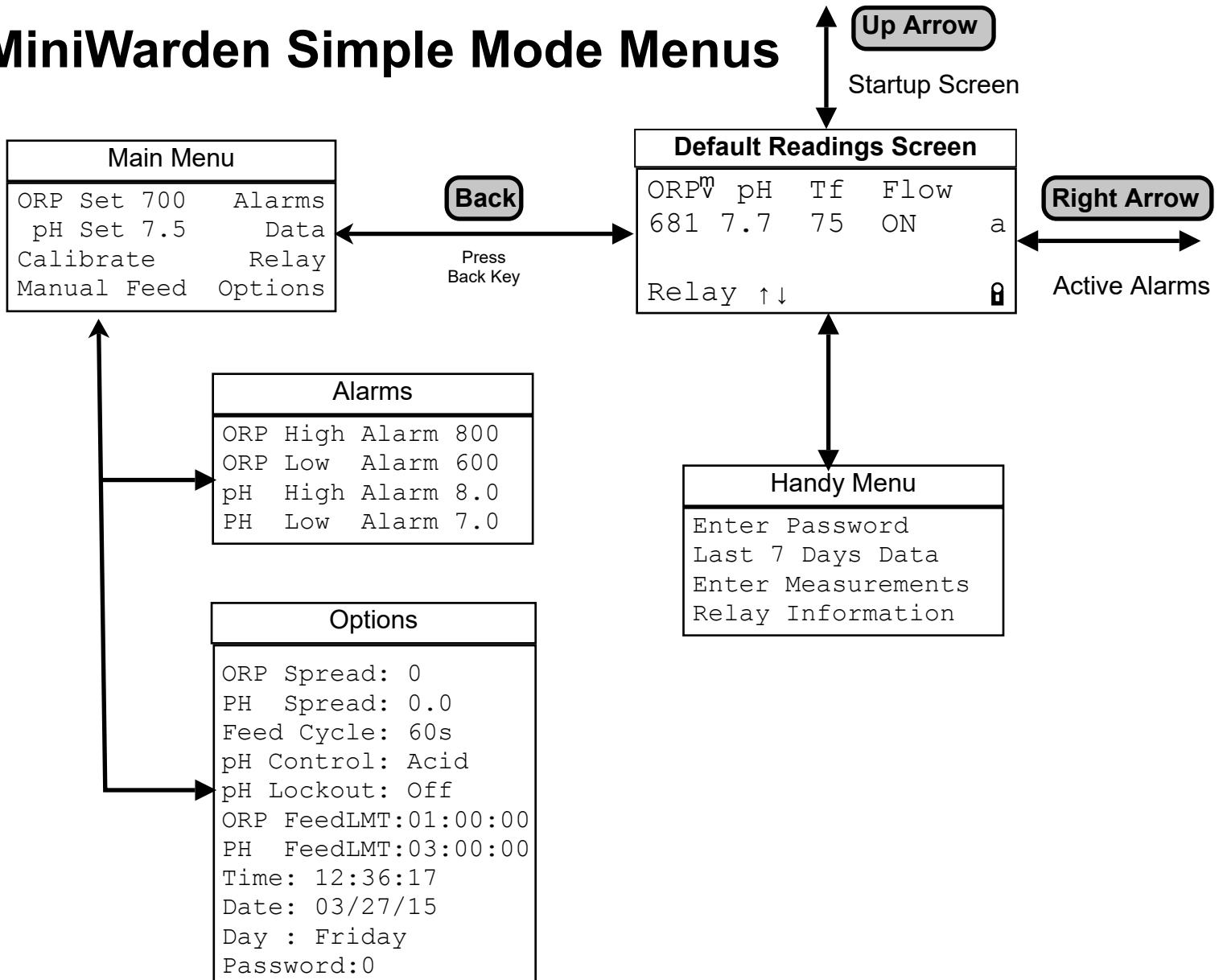
Simple Mode Main Menu

ORP Setpoint: Select to change the ORP set point. The range is 600 to 900 mV. If the current ORP measurement is below the set point the relay will be in a feed cycle if there is flow and the feed limit hasn't been reached.

pH Setpoint: Select to change the pH set point. The range is 6.0 to 9.0. If the current pH measurement is above the set point for acid control the relay will be in a feed cycle if there is flow and the feed limit hasn't been reached. If the current pH measurement is below the set point for base control the relay will be in a feed cycle if there is flow and the feed limit hasn't been reached.

Calibration: 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 ORP 650   -16%
Cal pH  7.7   -5%
Cal Temp 78   +12%
Clear Cal ORP
Clear Cal pH
Clear Cal Temp
```

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.

There are selections for clearing the calibration on each sensor.

Manual Feed: 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. There are three states that the relay can be in when in manual control:

If the relay is currently ON, it will turn off for the amount of manual relay time in the relay setup. Once this time is finished the relay will go back to auto.

If the relay is OFF, and not in manual OFF mode, it will turn ON for the manual relay time and return to auto.

If the relay is OFF, and not manual mode, it will go back to auto.

Alarms: Select this menu to set the high and low alarms for ORP and pH.

1. When the pH or ORP is outside of the limits, there is a fixed 1 minute delay before the alarm red LED will turn on. If this is the only alarm condition, the LED will be on solid.
2. If the feed limit has been reached, there will be an "s" for the Relay status the the alarm LED will be flashing.

Data: See the description in the advanced mode section. Data recording is the same except the interval is fixed at 1 minute in simple mode.

RLY: This is the advanced relay configuration and can be used to change values outside of the simple mode method. - This menu choice will be removed.

Options Menu:

ORP and pH Spread:

Time Proportional Control:

With Time Proportional Control (TPC) the relay will cycle ON for part of the cycle time (either 30 or 60 seconds) depending on the deviation from the set point. The smaller the deviation, the less time the relay will be on. TPC helps to minimize overshoot and provide a stable approach of the chemical values to reach the set point.

The spread sets the distance from the set point that TPC will be in control before the relay is strictly on or off. Increasing the spread will help to reduce overshoot and if it takes too long to reach the setpoint then decrease the spread.

ORP and pH Spread - ON/OFF Control:

```
                    Options

ORP Spread: 0
PH  Spread: 0.0
Feed Cycle: 60s
pH Control: Acid
pH Lockout: Off
ORP FeedLMT:01:00:00
PH  FeedLMT:03:00:00
Time: 12:36:17
Date: 03/27/15
Day : Friday
Password:0
```

Setting the spread to 0 disables TPC and the relay will on when the setpoint needs to be reached and off when the measurement equals or has passed the set point. On/Off control is typically used when the feeders are slow or under sized such as erosion feeders and salt systems or if the volume of the water is large.

Feed Cycle: The feed time is the total of the on and off times added together and remains the same. When the cycle time is reached it will just start over. There are two cycle times to select from and 30 seconds is typically for spas and 60 is for pools.

pH Control: Select either Acid or Base. For Acid, the pH relay will be in a feed cycle when the pH is higher than the set point. For Base, the pH relay will be in a feed cycle when the pH is lower than the set point.

pH Lockout: A protection setting for sanitizer control. If set to Off pH Lockout is disabled. The selections are Off, 7.8, 7.9 and 8.0. If enabled and the pH is greater than the value, the ORP relay will not turn on.

ORP and pH Feed Limit: Feed limit is a time limit for the set point to be reached. Some of the common failures of a chemical feed system are running out of the chemicals, chemical feed system failure and even broken chemical feed tubes. If the relay is on for the selected time without the set point being reached the relay will be disabled until the condition is corrected or the feed limit timer cleared. Use one of the following methods to clear the timer:

1. Manually adjust the water to get the measurement at the setpoint. This can also be accomplished via calibration or changing the setpoint.
2. Cycle power on the MiniWarden
3. Go to the Relay Information menu in the Handy Menu and press the number 0 on the appropriate relay to clear all the timers.

Time and Date: Enter the current time and date that will be used to time stamp the data.

Password: Simple mode allows for 1 password. If the password is 0 the feature is disabled. When there is a password, it will be required to access the main menu. After entered, it will clear and need to be re-entered when the back light turns of which is 2 minutes with no buttons pressed.

MiniWarden Advanced Mode

The Main Menu

Simply press **Back** from the Default Readings Screen to gain access to the "Main Menu". From the "Main Menu" simply use the Up & Down arrow keys to navigate to each sub menu item and press **Enter** to go to that sub menu. Accessing the Main Menu can be password protected and can be dependent on a security level if MiniWarden is security enabled in the "Security Setup" menu which will be discussed later.

Main Menu

Default Readings Screen

```
ORP^mv  pH   Tf   Flow
681 7.7   75   ON      a


Rly ↑↓                    🔒
```

Back

Press Back Key

Main Menu

```
Service    LAN
Data       Security
Relays     Relay Type
System
```

Service

```
Relay Manual
Calibration
Disable Relays
Clear Overfeed
```

Data

```
Go To Data
Interval
Clear Data
Used
```

Relays

```
pH
ORP
Alarm
```

System

```
Time: 12:36:17
Date: 03/27/15
Day : Friday
Units: English
Daylight Savings No
Langlier pH +/-0.2
TrueDPD Free Cl OFF
TrueDPD Cycle:10 min
ORP Cal: Enabled
Service QuickJmp On
Display Type: LCD
Factory Defaults
```

LAN

```
Data Server Setup
Network Setup
Information
Client IP Security
```

Security Setup

```
0Admin
1Tech
2Tech
3-9Service
Clear All Passwords
```

Relay Type

```
PH
ORP
Alarm
Name:
```

Main Menu (previous version)

```
Service
Data Recording
Relay Setup
System
Communication Setup
Security Setup
Relay Control Type
```

PROGRAMMING - GETTING STARTED

The menu tree below represents the "Getting Started" menus that are necessary to get MiniWarden setup. The remaining menus represent more advanced features that will be covered in later sections. Become very familiar with the 4 menus below surrounding the Main Menu as they will be utilized most of the time. Any menu utilizing the **Back** button for access can be password protected.

Default Readings Screen

```
ORPᵐᵥ pH   Tf   Flow
681  7.7   75   ON    a
                 OFF
Rly ↑↓
```

GETTING STARTED PROGRAMMING

Back
Press Back Key

Service
```
Relay Manual
Calibration
Disable Relays
Clear Overfeed
```

Security
```
0Admin
1Tech
2Tech
3-9Service
```

Main Menu
```
Service    LAN
Data       Security
Relays     Relay Type
System     TrueDPD
```

Relays
```
pH   Acid(pH-)
ORP  Liquid(ORP+)
Alarm Standard
```

Relay Type
```
PH   Acid(pH-)
ORP  Liquid(ORP+)
Alarm Standard
Name: Pool1
```

Step 1 - System Menu

The first step is to set the Date, Time and Day of the Week in the System Menu. Press the **Back** button to access the "Main Menu" and scroll down to the "System Menu" and set the correct Date, Time and Day of the week and then proceed to Step 2 below. Much more will be covered on the "System Menu" in the Advanced section of this manual.

Step 2 - Security Setup Menu

The next step is to set up and assign passwords to the various personnel who will be working with or servicing MiniWarden. Menus that are accessed from the "Default Readings Screen" using the **Back** button can be password protected. The Handy Menu, Flow Menu and Alarm Menu are not Password Protected - anyone can access them. From the "Default Readings Screen", simply press the **Back** button to access the "Main Menu" and use the **Down Arrow** to scroll to "Security Setup". 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.

- **1 Admin Password:** Access to all menus within MiniWarden including ability to add, delete, or change passwords. If the Admin Password has been lost, please read the troubleshooting section at the end of this manual.
- **2 Technician Passwords:** Access only to the Service, Data Recording and Relay Setup menus.
- **7 Service Passwords:** Access only to the Service and Data Recording Menus.

Step 3 - Relay Control Type Menu

The Relay Control Type Menu is the next step in programming MiniWarden and getting started. The Relay Control Type Menu sets each relay to the control type the relay will use. For Example: Will the ORP Relay use Liquid Chlorine, an Erosion Feeder or a Salt System? This is where the MiniWarden relays are set up to the appropriate way to control the installed equipment. From the Default Readings screen press the **Back** button to scroll down and select Relay Control Type and scroll down to the relay that needs to be changed and press the Enter key to select that relay. When changing a relays control type the Arrow buttons perform the following actions which is also indicated on the screen.
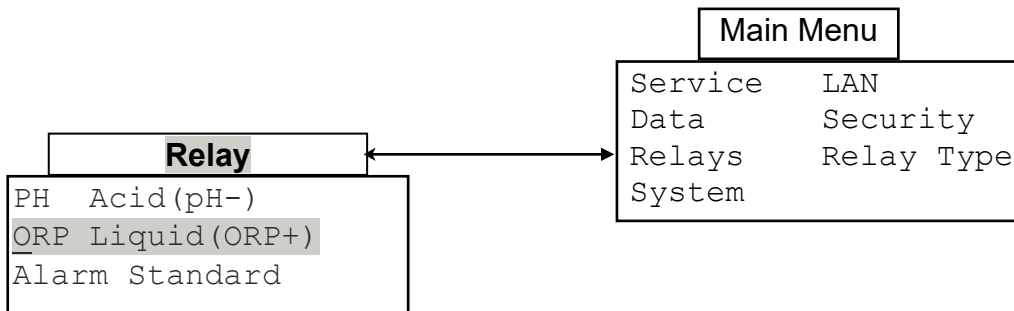
♦ Press the ► **Right Arrow** to cycle through all the control types for the current relay.

♦ Press the ◄ **Left Arrow** to save and update the new control type within MiniWarden. Note: The **Back** button will cancel the change, only the **Left Arrow** will change the control type. Note: To reset a single relay back to factory default values select that relay in this menu and the press the **Left Arrow**.

♦ Press the **Back** button to cancel and exit without making any changes.

♦ **Relay Control Types**: MiniWarden includes control types for sanitizer and pH. The ORP relays can only use a sanitizer control type and the pH relays can only use a base or acid control type.

Relay Control Type List

ORP	pH	Alarm
Liquid(ORP+)	Acid(pH-)	Not Used
Feeder(ORP+)	Base(pH+)	Standard
Cal Hypo(ORP+)		ORP %
Salt System(ORP+)		

Step 4 - Relays: Configuring the relays

The next step in getting started is to program all the set-points for the pH & ORP relays and the Alarm limits. From the Default Readings Screen press the **Back** button to access the Main Menu and scroll 3 rows down to "Relays" and press **Enter**. Scroll up or down to change the settings for the desired relay or alarm.

```
                                    Main Menu
                            Service    LAN
                            Data       Security
        Relay         ◄──►  Relays     Relay Type
  PH   Acid(pH-)            System
  ORP  Liquid(ORP+)
  Alarm Standard
```
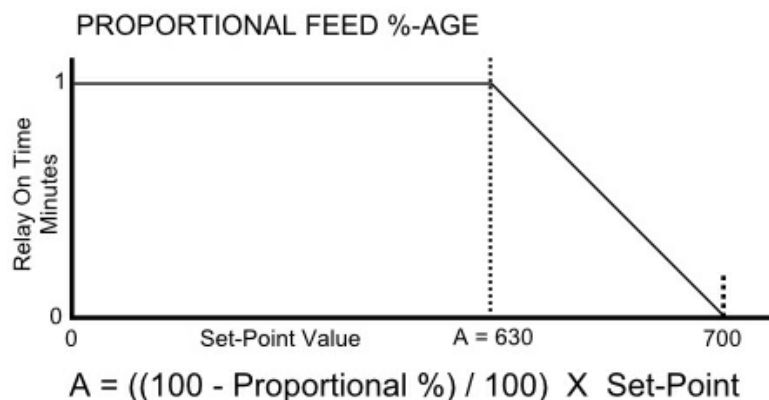
ORP Relay:

In the Relay Setup Menu scroll down to the ORP relay and press enter. The following reviews each command within an ORP Relay selection that is setup as Liquid Chlorine (the control type can be changed in the Relay Control Types Menu) . The other less common control types such as Cal Hypo, Salt Systems, etc follow a very similar relay programming and command structure as Liquid Chlorine. Please use the following as a guide for those less common control types.

♦ **Manual Time 00:02:00:** Is the amount of time you can set a relay to turn on manually (Default Setting 2 Minutes). To turn the relay on manually you have to do so in the service menu which will be covered in the next section. 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, simply enter the new time and press **Enter** to save.

♦ **Proportional 10%:** The Proportional %-Age (Default Setting 10%) means that as the measured ORP reading gets to within 10% (630 in this case) of the ORP setpoint (700 in this case), the amount of relay on-time will proportionally decrease as the reading gets closer and closer to the setpoint. Proportional feed helps to prevent chemical overshoot. To change the %-Age, simply press **Enter**, change the value and press **Enter** to save. To disable, set the %-Age to zero "0" and press **Enter** to save.

PROPORTIONAL FEED %-AGE

Relay On Time Minutes

Set-Point Value   A = 630   700

$$A = ((100 - \text{Proportional \%}) / 100) \times \text{Set-Point}$$

♦ **On If ORP < 700:** This is the ORP setpoint 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. The relay will turn on for the programmed on time, in this case for 1 minute as set in the "On Time 00:01:00" command or less than 1 minute if the measured reading is within the proportional feed %-age of 10%.

♦ **Off If pH > 0.00:** This is the 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 is already an ample amount of sanitizer in the pool. The pH Lockout feature 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. The default setting is 0.0 or disabled.

♦ **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 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 00:01:00" in this case 1 minute. To change the on delay time, simply press **Enter** and change the time and press **Enter** again to save the new setting. Enter 00:00:00 to disable.

♦ **On Time 00:01:00:** This is the total amount of time the relay will be ON if the "On If ORP < 700" condition has been satisfied. The default setting is 1 minute. 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.

♦ **MinTimeOff 00:07:00:** This is the total amount the relay will be OFF if the "On if ORP < 700" 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. 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 between none and pH.

♦ **Off if Flow Off - 1:** The ORP Relay will be turned off if "No Flow" is detected in Flow Switch Input 1. **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.

  ❑ When in Setpoint Overfeed, there are only 2 ways to reset it: 1) cycle power on the MiniWarden and 2) Manually fix the chemical imbalance so that the setpoint is approached within 5%.
  ❑ When feeding sanitizer the ORP measurement will rise as sanitizer is being added. When the ORP is within 5% of the setpoint the Setpoint Overfeed timer will clear.
  ❑ 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.

pH Relay

In the Relay Setup Menu scroll down to pH and press **Enter**. The following reviews each command within a pH Relay selection that is set up as acid (change to base in the Relay control Types Menu).
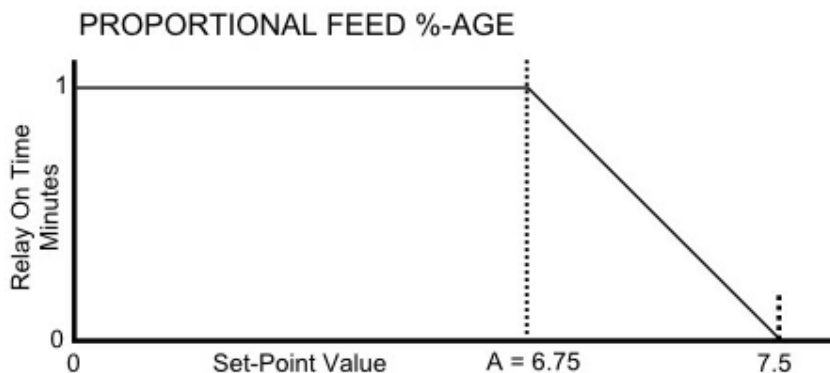
♦ **Manual Time 00:02:00:** Is the amount of time you can set a relay to turn on manually (Default Setting 2 Minutes). To turn the relay on manually you have to do so in the service menu which will be covered in the next section. When you turn on the relay manually in the service menu, the relay will be on for 2 minutes in this case. To change the time, simply enter the new time and press **Enter** to save.

♦ **Proportional 10%:** The Proportional %-Age (Default Setting 10%) means that as the measured pH reading gets to within 10% (6.75 in this case) of the pH setpoint of 7.5, the amount of relay on-time will proportionally decrease as the reading gets closer and closer to the setpoint. Proportional feed helps to prevent chemical overshoot. To change the %-Age, simply press **Enter**, change the value and press **Enter** to save the new setting. To deactivate this feature set the %-Age to zero "0" and press **Enter** to save setting.

PROPORTIONAL FEED %-AGE

Relay On Time Minutes

Set-Point Value   A = 6.75   7.5

$$A = ((100 - \text{Proportional \%}) / 100) \times \text{Set-Point}$$

♦ **On If pH > 7.5:** This is the pH set-point 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. The relay will turn on for the programmed on time, in this case for 1 minute as set in the "On Time 00:01:00" command or less than 1 minute if the measured reading is within the proportional feed %-age of 10%. When feeding base, this command is the only difference and will be **On if pH < 7.5**.

♦ **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 - then the relay will turn on for the programmed "On Time 00:01:00" in this case 1 minute. 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.

♦ **On Time 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. The default setting is 1 minute. 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.

♦ **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. 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 pH Relay will be Off if the ORP relay is On. 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 between ORP and none.

♦ **Off if Flow Off - 1:** The pH Relay will be turned off if "No Flow" is detected in Flow Switch Input 1. **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.

   ❑ When in Setpoint Overfeed, there are only 2 ways to reset it: 1) cycle power on the MiniWarden and 2) Manually fix the chemical imbalance so that the setpoint is approached within 5%.
   ❑ When feeding acid the pH measurement will lower as acid is being added. When the pH is within 5% of the setpoint the Setpoint Overfeed timer will clear.

♦ **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.

   ❑ Calculate the total amount of chemical the pool would ever need in a 24 hour period. (Example: 1 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 hour period. **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.

Alarm Programming

In the "Relay Setup" menu are also the configuration settings for the alarm light on the MiniWarden enclosure lid. In the Relay Setup Menu simply scroll down to the Alarm and press **Enter**. The following reviews each command within an Alarm Menu Selection.

Alarm Selected
| ```
On If ORP > 800
On If ORP < 600
On If pH > 8.0
On If pH < 7.0
On If Temp > 0
On If Temp < 0
On If Flow Off - none
On If Flow Off - none
On If Overfeed - YES
On Delay        00:10:00
MinTime On      00:00:10
MinTimeOff      00:00:10
Off If Time <   00:00:00
Off If Time >   00:00:00
``` |

♦ **On If ORP > 800:** The factory default setting is 800. The alarm will turn on if this condition is satisfied. To change the condition simply press **Enter** to change the limit and press **Enter** again to save, enter "0" zero to disable.

♦ **On if ORP < 600:** The factory default setting is 600. The alarm will turn on if this condition is satisfied. To change the condition simply press **Enter** to change the value and press **Enter** again to save, enter "0" zero to disable.

♦ **On If pH > 8.0:** The factory default setting is 8.0. The alarm will turn on if this condition is satisfied. To change the condition simply press **Enter** to change the value and press **Enter** again to save, enter "0.0" to disable..

♦ **On If pH < 7.0:** The factory default setting is 7.0. The alarm will turn on if this condition is satisfied. To change the condition simply press **Enter** to change the value and press **Enter** again to save, enter "0.0" to disable.

♦ **On If Temp > 0:** The factory default setting is "0" zero or disabled. The alarm will turn on if this condition is satisfied. To change the condition simply press **Enter** to change the value and press **Enter** again to save, enter "0" zero to disable.

♦ **On If Temp < 0:** The factory default setting is "0" zero or disabled. The alarm will turn on if this condition is satisfied. To change the condition simply press **Enter** to change the value and press **Enter** again to save, enter "0" zero to disable.

♦ **On If Flow Off - none:** The factory default setting is "none" or disabled. The alarm will turn on if no flow is detected. To turn the alarm status on if no flow is detected press **Enter** to change the value from "none" to 1 for Flow Switch Input 1 or 2 for Flow Switch Input 2. This command is included two times so you can turn the alarm on for both flow switches, one is for water flow in the flow cell and the second can be for detecting low chemical storage.

♦ **On If Overfeed - YES:** The factory default setting is "YES". The alarm will turn on if this condition is satisfied. To change the condition simply press **Enter** to change to NO.

♦ **On Delay 00:10:00:**   The factory default setting is 10 Minutes. The alarm will only turn on if this condition is satisfied for at least 10 Minutes. This command prevents multiple alarms if a sensor reading is fluctuating back and forth. To change the command press **Enter** to change the value and press **Enter** again to save, enter "00:00:00" to disable.

♦ **Off If Time < 00:00:00:** This is a time of day command. The factory default setting is "0" zero or disabled. 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.

♦ **Off If Time > 00:00:00:** This is a time of day command. The factory default setting is "00:00:00" or disabled. If not 00:00:00, the alarm will be OFF for the indicated time until midnight.

Alarm control types:

❑**Standard**: This is listed above and uses ORP values to set the alarm. Use this control type for the alarms if ORP Calibration is enabled in the "System Menu".

❑**ORP %:** When the ORP Calibration is disabled the sanitizer levels are changed by changing the ORP setpoint. If the ORP setpoint is changed then the alarm values for ORP may also need to be changed to reflect this. Using the ORP % for the alarm control type uses a percentage of the setpoint rather than specific values so if the ORP setpoint is changed that is automatically reflected in the ORP part of the alarms. The default value is 10%, if the ORP setpoint is 700, then the alarm values would be 630 and 770 mv.

Step 5 - Service Menu

The Service Menu includes all items that a service technician needs to service a pool and is a critical next step in setting up MiniWarden. From the Default Readings Screen simply press the **Back** button to access the main menu and select the first line "Service" and press the **Enter** button to access the Service Menu. From here you will be able to manually turn on and off all relays, calibrate pH and ORP sensors, disable the relays for servicing and clear all the overfeed timers.

Service Menu

```
Relay Manual Mode
Calibration
Disable Relays
Clear Overfeed Timers
```

- ♦ **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. There are three states that the relay can be in when in manual control:

Relay Manual

```
pH  00:00:00 OFF
ORP 00:00:00 OFF
```

  - ❑ If the relay is currently ON, it will turn off for the amount of manual relay time in the relay setup. Once this time is finished the relay will go back to auto.
  - ❑ If the relay is OFF, and not in manual OFF mode, it will turn ON for the manual relay time and return to auto.
  - ❑ If the relay is OFF, and not manual mode, it will go back to auto.

- ♦ **Calibration:** 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 ORP 650   -16%
Cal pH   7.7  -5%
Cal Temp 78   +12%
Clear Cal ORP
Clear Cal pH
Clear Cal Temp
```

  - ❑ 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.

- ♦ **Disable Relays:** To make sure the chemical feeders do not turn on while servicing a pool. Press **Enter** up to 4 times to disable from 15 minutes to 60 minutes. Press the **Enter** key again to put the relays back to auto.

- ♦ **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 MiniWarden will not clear the overfeed timers.
  - ❑ The Setpoint Overfeed timers are not cleared when selecting the Clear Overfeed Times.

COMMUNICATION - GETTING STARTED: LAN / ETHERNET

MiniWarden will support communication with a data server utilizing an optional Ethernet / LAN communication module to connect to a pool facilities network. The following section describes how a LAN Communication module is set up in MiniWarden in order to connect to a network with all the configuration steps necessary to successfully establish communication. If WIFI is required an Ethernet to WIFI bridge can be purchased to enable WIFI. If there isn't an Ethernet cable already in the pump room an Ethernet over powerline approach may provide the lowest cost connection. **NOTE:** If the Ethernet cable is plugged in when the MiniWarden is already on it will not try to establish the connection. Always cycle power on the MiniWarden as the connection process only occurs at startup.

Network Setup

```
Data Server Setup
Network Setup
Information
Client IP Security
```

Step 1 - The Communication Module
When the MiniWarden turns on it will automatically detect the PW-LAN if installed. The MiniWarden will first obtain the IP address of the data server and during this process displays an "N" (not connected) in the lower right corner of the display screen. Once the IP address is obtained the "N" will change to a "c" (connected) in the lower right corner..

Step 2 - Network Setup Menu
If only the data server feature will be used no changes are required, leave DHCP enabled. If the direct connection feature is also needed then DHCP may need to be disabled to configure the MiniWarden with a local static IP address.

DHCP: Stands for "Dynamic Host Configuration Protocol". The default setting is "Enabled".   When DHCP is enabled the network located at the pool facility will automatically assign an IP address to the communication module within PoolWarden. When enabled, there is nothing else to configure. This is also a convenient way to find an available local IP address. Once assigned by the local network it can then be switched to a static IP address with the came value that can be observed in the Communication / Information screen.

DHCP Disabled: When disabled the following items must be correctly entered and will be provided by the IP department at the facility.

❑ Static IP Address: Used for connecting to MiniWarden remotely.
❑ Gateway IP Address: Used for connecting to MiniWarden remotely.
❑ Subnet Mask: Default is 255.255.255.0 and does not need to be changed.

DHCP Enabled

```
DHCP:   Enabled
Automatic connection
with dynamic IP
Address assignment
```

DHCP Disabled

```
DHCP:   disabled
Static IP Address
   192.168.0.199
Gateway IP Address
   192.168.0.1
Subnet Mask
   255.255.255.0
Primary DNS
   8.8.8.8
```

Step 3 - Client IP Security
You can enter up to 10 IP addresses which provide enhanced security for remote connections to the MiniWarden. When IP addresses are added, remote connections will only be allowed if the client IP address is in this list. This works for both remote and local IP addresses. You can also allow a range by using 255 as a mask. For example:

192.168.0.255 will allow all access from 192.168.0.(0 to 255).

If not using direct connect enter 1.1.1.1 as the first IP address for Client IP Security, this will disable any unexpected communication with MiniWarden. When not on the list the connection is rejected and it will appear that it isn't even there.

Step 4 - DATA SERVER SETUP

Set the interval that the PoolWarden will send a data packet to the server. If the interval is 00:00:00 data will not be sent. Select Send Data Packet to immediately send a data packet. To disable sending data packets at night set a start and end hour.

Data Server Setup

```
Send Data Packet
Interval: 00:00:00
Start Hour: 0
End   Hour: 0
On Alarm: No
```

Step 5 - INFORMATION

The information screen contains the IP address that the PoolWarden is using and the gateway IP address. The Mac value is also provided and the IT configuration may want to setup the routing using the Mac address. If they ask for this information it is available on this screen as well as on a sticker on the bottom of the PW-LAN card.
The Ver (software version) of the PW-LAN card is also displayed.

Information

```
Pkts:82  Ver 12
IP  198.168.0.200
GIP 198.168.0.1
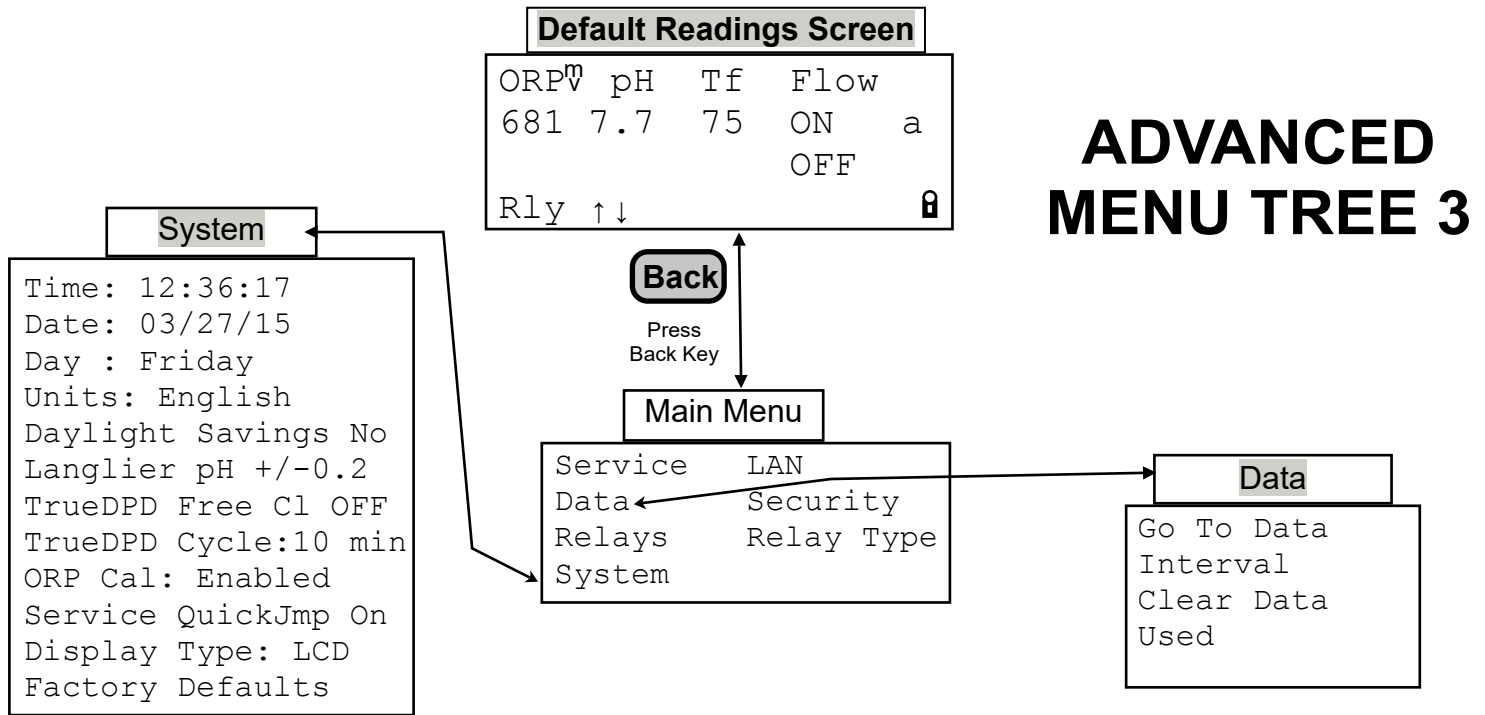Mac00:12:34:56:78:9A
```

COMMUNICATION: REMOTE CONNECTION

The PoolWarden is a web server and can be connected to any web browser which can be a computer, laptop, smart phone or any device with

an Internet connection and a browser. To make the connection to the PoolWarden the router at the facility will need to be setup appropriately to route outside connections to the appropriate PoolWarden.

ADVANCED FEATURES

The rest of this manual will be dedicated to all of the Advanced Menus & Features which make MiniWarden one of the most versatile chemical controllers in the world. Please review each section carefully to understand how each menu item may help your organization. Simply press the **Back** button from the Default Readings Screen to gain access to the "Main Menu". From the "Main Menu" simply use the **Up & Down Arrows** 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 can be dependent on a security level if PoolWarden is security enabled in the "Security Setup" menu which was covered in the "PROGRAMMING - GETTING STARTED" section of this manual.

ADVANCED MENU TREE 3

Default Readings Screen

```
ORP  pH   Tf   Flow
681  7.7  75   ON    a
                OFF
Rly ↑↓               🔒
```

Back

Press Back Key

System

```
Time: 12:36:17
Date: 03/27/15
Day : Friday
Units: English
Daylight Savings No
Langlier pH +/-0.2
TrueDPD Free Cl OFF
TrueDPD Cycle:10 min
ORP Cal: Enabled
Service QuickJmp On
Display Type: LCD
Factory Defaults
```

Main Menu

```
Service    LAN
Data       Security
Relays     Relay Type
System
```

Data

```
Go To Data
Interval
Clear Data
Used
```

Data Menu

This menu provides access to MiniWarden'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. The internal memory has the ability to record 8,192 rows of data. Once the maximum memory has been reached, any new data will record over the oldest data. To access "Data Recording" simply press the **Back** button from the default readings screen and scroll down to "Data Recording" and press **Enter** and select "Go To Data".

Data

```
Go To Data
Interval: 00:01:00
Clear Data:
Used: 0/8192   o
```

Go To Data

```
Data Help        ↑+big
0 Toggle line4 > +1
#*10 Big Jump  < -1
Back -> Quit    ↓-big
```

- ♦ **Go To Data**: Before entering the actual Data a "Data Help" screen is displayed that provides a brief summary of the tips on how to scroll through the rows of recorded data.

  - ❑0 Toggle line4: Pressing the Zero **0** button toggles line 4 on the display screen between the relay status for each reading and the Date, Time & Data Record Number.
  - ❑#*10 Big Jump: This is the "Big Jump" by a factor of 10. If you press any number 1 through 9 and then the **Up or Down Arrow** it will jump through the data by a factor of 10 times that number. Example: If you press 8 then the up arrow it will jump forward through 80 rows (8 x 10 = 80) of data. If you press 7 then the down arrow it will jump backward through 70 rows (7 x 10 = 70).
  - ❑**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.

◆ **Interval 00:00:00**: Set the data recording time interval. The default setting is 00:00:00 or disabled. Simply press **Enter** to scroll through the following data recording intervals. Each interval will fill the internal memory as shown below. Once the memory is full then the new data will overwrite the oldest data first.

- ❑ 00:00:00: Disabled, No Data Recording
- ❑ 00:01:00: Data will record in 1 minute intervals. Internal Memory will be full in 5.5 Days.
- ❑ 00:05:00: Data will record in 5 minute intervals. Internal Memory will be full in 5.5 Days.
- ❑ 00:15:00: Data will record in 15 minute intervals. Internal Memory will be full in 85 Days.
- ❑ 00:30:00: Data will record in 30 minute intervals. Internal Memory will be full in 170 Days.
- ❑ 01:00:00: Data will record in 1 hour intervals. Internal Memory will be full in 341 Days.

◆ **Clear Data:** Simply scroll down to "Clear Data" and press **Enter** and the internal memory will reset to 0/8192.

◆ **Used 0 / 8192:** This shows how much internal memory is currently being used. If a number like 3150/8192 is seen in this screen, then that means 3150 rows of data have been recorded out of the available 8192 rows. Press **Enter** to immediately record data. If there is a lower case "o" on the fourth line then the data is in overflow mode and any new recorded data is erasing the oldest recorded data.

System Menu

The System Menu is where many of the main operating system components are turned on or off. Please review and set each item according to the needs of MiniWarden and the client being served. To access the System Menu press **Back** from the "Default Readings Screen" and scroll down the Main Menu to System and press **Enter**.

```
         System
Time: 12:36:17
Date: 03/27/15
Day : Friday
Units: English
Daylight Savings No
Langlier pH +/-0.2
TrueDPD Free Cl OFF
TrueDPD Cycle:10 min
ORP Cal: Enabled
Service QuickJmp On
Display Type: LCD
Factory Defaults
```

◆ **Time**: The time clock in PoolWarden is based on 00:00:00 military time. Simply press **Enter** and set the correct time and press **Enter** again to save the new time.

◆ **Date**: Simply press **Enter** and set the correct date and press the **Enter** key again to save the new date.

◆ **Day**: Press the Enter key to toggle through to the appropriate day of the week and press the Back key to save the new day of the week.

◆ **Units:** Press **Enter** to toggle between the English or Metric System.

◆ **Daylight Savings:** Press **Enter** to toggle between YES to enable daylight savings time or NO to disable daylight savings. The default setting is set to YES which means that MiniWarden will automatically adjust for daylight savings time each year.

◆ **Langlier pH +/- 0.0**: When the Langlier Index falls outside of the balanced range of -0.5 to +0.5, the pH set-point within MiniWarden will be adjusted by this pre-set factor to help keep the Langlier Index within the range of -0.5 to +0.5 (Balanced). To change the Langlier pH adjustment factor, simply press **Enter** to toggle through +/- 0.0, +/- 0.1, +/- 0.2 or +/- 0.3. The set-point within MiniWarden will be adjusted by this Langlier Index Adjustment Factor once the pH sensor reading has reached the existing set-point. To view the Langlier Index simply press the **Right Arrow** twice from the "Default Readings Screen". To perform a quick view of the current set-points simply press the **9** button when at the "Default Readings Screen". Langlier is enabled after manual measurements have been entered in the "Handy Menu".

♦ **TrueDPD:** This menu item is not used unless the TrueDPD sensor is installed. TrueDPD is an optional external sensor to PoolWarden that measures free chlorine using the DPD colorimetric method. Please refer to the TrueDPD Operation Manual to use this System Menu item.

♦ **TrueDPD Cycle:** This menu item is not used unless TrueDPD is installed. The is the cycle time between measurements and can be set to 10, 20, 30 and 60 minutes.

♦ **ORP Cal**: Press **Enter** to Enable or Disable ORP Calibration. The default setting is Enabled. If disabled the ORP will not be able to be calibrated and any changed in sanitizer level require changing the setpoint.

♦ **Display Type: LCD**: Press **Enter** to cycle between VFD and LCD. The default display is the LCD type.

♦ **Service Quickjmp**: When set to ON, pressing the **Left Arrow** from the 'Default Readings Screen" will jump to the "Service" menu without requiring a password even if security is enabled. Pressing **Back** will return to the "Default Readings Screen" and not the "Main Menu".

❑ Press **1** to disable the relays, a number will appear in the upper right corner that will count down. When it reaches 0 the MiniWarden will go back to normal operation. Press **1** again to immediately set the time to 0 and put MiniWarden back in auto mode.
❑ Press **4** to jump to ORP calibration, or ORP setpoint if ORP calibration is disabled.
❑ Press **5** to jump to pH calibration.
❑ Press **7** to jump to manual relay control.

♦ **Factory Defaults:** Warning, selecting this will completely restore all settings to the original factory defaults conditions including relay control types, relay programming and calibrations. When selected, a Warning screen will display and you must press **9** to proceed or any other button to exit without resetting everything.

Advanced Relay Types

The relay types supported for pH are Acid and Base. There are 4 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.

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

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.

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.

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	2360-010-02	Circuit Board	MiniWarden motherboard
12	2360-020-07	Circuit Board	MiniWarden relay board
13	PWLAN	Circuit Board	Ethernet communication module
14	2370-040-10	Cable	Motherboard to relay board interconnect cable
15	1020-080-01	Cable	Cable grip, 1/2" NPT (.23-.47"), GRAY, bottom row
15	1020-070-01	Cable	Cable grip, 3/8" NPT (.20-.39"), GRAY, top row

Maintenance

MiniWarden 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

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

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.

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.

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 MiniWarden. 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 MiniWarden 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 MiniWarden has it's own unique reset code and one that works on one MiniWarden will not work on another.

Technical Support

Please contact ControlOMatic at 530-205-4520 for sales and support. Send support emails to support@controlomatic.com. There are some training videos at www.mypoolwardentraining.com.

LIMITED WARRANTY

Models: This warranty applies to MiniWarden 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