



EVAPORCOOL

Evaporcool® Solutions, LLC

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Congratulations on your purchase of a new Evaporcool® system!

Historical records show that evaporative cooling techniques date back to the ancient Egyptians. The Roman Empire integrated evaporative cooling in the construction of many of their dwellings that still exist today. More recently, textile mills in 1800's New England were outfitted with evaporative cooling devices to comfort textile workers. Evaporcool® Systems, LLP patented system has incorporated 21st century computer technology to design a state-of-the-art evaporative cooling system that makes efficient use of water to help your rooftop HVAC equipment operate at its most efficient levels.

With care, your Evaporcool® system will extend the life of your air conditioning equipment, while reducing electrical consumption and HVAC equipment maintenance for many years to come. Although there are just a few parts that need regular care, it is important that you follow the instructions herein to maintain optimum performance, and to protect your warranty.

Should you encounter any problems with your Evaporcool® system, please contact the installing contractor or your HVAC service maintenance provider immediately. In the event they are not available, please call us at (901) 382-7809, and our service staff will be glad to help you.

Thank you again for your Evaporcool® purchase.

Sheldon Smith
Chairman

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Introduction

This manual describes the various parts that make up the Evaporcool® System on your building. The Evaporcool® System always includes the following maintainable items:

- “Big Blue” in line particulate water filter and water pressure gauges
- SmartSpray™ control boxes
- Solenoid valves
- EZ-Frame™ assemblies with Evaporblue™ media
- Spray nozzles located inside EZ-Frame™ assemblies
- Transformers, fuses and fuse holders
- Flexible water lines and water line connectors
- Temperature sensors and humidity sensors

The Evaporcool® System may also include the following maintainable items:

- Salt water softener system with backwash device
- RF water softener system
- Booster pump
- Expansion tanks
- Water meter

Routine Maintenance Checklist

In most cases, routine maintenance of your Evaporcool system will take just a few minutes to complete. On some occasions, the filter media will also need to be cleaned, which will add some time to your routine maintenance.

General

- Check all water connections.
- Check filters for debris.
- Check RF water conditioning device to be certain that it is plugged in.

Spring, Summer and Fall

- Perform “general” tasks.
- Check filters and filter frames for debris and evaporates. Clean as necessary.
- In the beginning of the hot weather, put the controller in “test” mode. Conduct a 2-minute spray test. Check sprayers for pattern and water line connectors for leaks.
- Check water spray pattern for irregularities. Clean spray heads if necessary.
- For systems equipped with HydroFlow™ radio frequency type water conditioner, check to see that function light is on. Check to see that plugs are inserted securely.
- Check valves and water connections.
- Check “Big Blue” in-line filter gauges.

Winterization

- Shut off all incoming water supply valves.
- Drain supply water lines to each air conditioning unit.
- Toggle controller to “off” mode.

Systems with Salt Water Softeners

- With salt water softening systems, check brine tank for salt. Add pellet type solar salt as necessary. (Do NOT let brine tank run out of salt. This will adversely affect the operation of the water softener, and could lead to damage of Evaporcool® filter media). Do Not use rock salt. Use solar salt pellets designed for water softener systems.
- Follow manufacturer’s detailed maintenance guide for salt water softeners.

Other – Some Systems May Be Equipped With the Following:

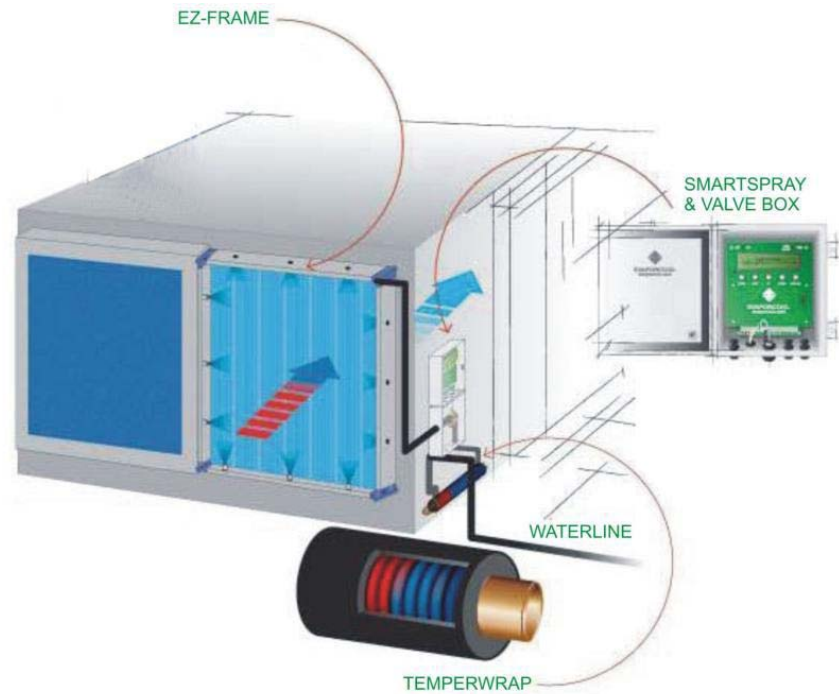
- Check booster pump operation (if applicable).
- Check expansion (bladder) tank (if applicable).
- Check water meter (if applicable).

What is the Evaporcool® System?

The Evaporcool® System is a proprietary evaporative cooling system that works with virtually any existing air-cooled condensing unit.

At the air conditioning unit, the Evaporcool® System is made up of the following components:

EZ-Frame™;
 SmartSpray™;
 Valve Box; and
 Temperwrap™



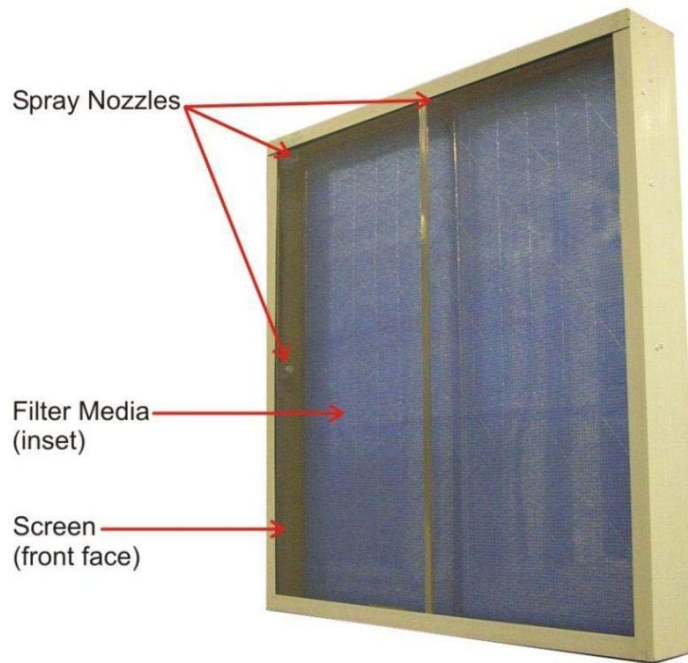
The Evaporcool System

EZ-Frame™: The EZ-Frame™ framing system (patent-pending) provides a unique mechanism for protecting condensing coils, and creates a cool, moist micro-environment in which air temperature is lowered as it enters the air conditioning unit. This unique design consists of an inner and an outer filter separated by several inches of interior air space. Small spray nozzles are strategically placed within each frame to maximize coverage.

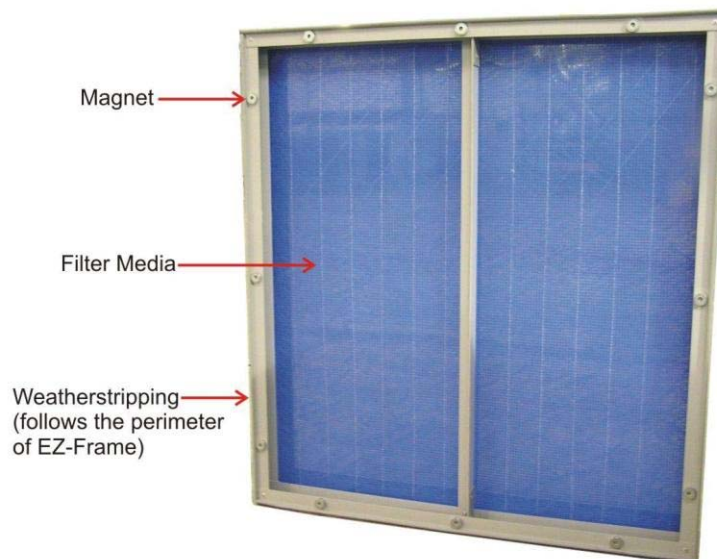
EZ-Frames™ are magnetically attached around the condenser coils of an air conditioning unit. The frames contain small nozzles that spray water into the air before the air is drawn into the condenser coil area. This cools the air used to remove heat from the condenser coil.

By cooling the air before it reaches the condenser coils, the Evaporcool® System makes the air conditioning unit perform as though the external air temperature is cooler than it actually is.

Further, the EZ-Frame™ and filter media protect the coil from dirt and debris. As a result, the coils stay clean much longer. This helps in extending the life of the HVAC equipment and also reduces the energy consumption of the compressors.

EZ-Frame™

Components of the EZ-Frame™ (Front).



Components of the EZ-Frame™ (Rear).

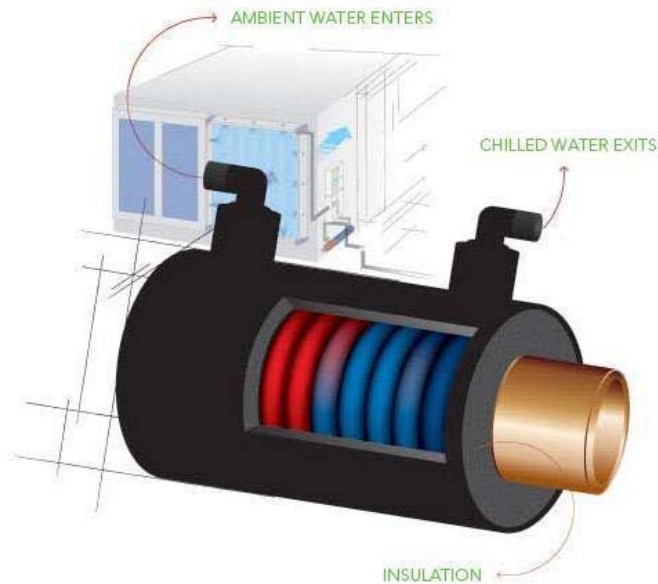
SmartSpray™ and Temperwrap™

SmartSpray™ controller

The SmartSpray™ control box is the brain of the Evaporcool® System. It monitors the external environment and the HVAC equipment in order to determine spray quantity and spray intervals to provide optimal amount of water to evaporate into the air.

Temperwrap™:

Temperwrap™ is the Evaporcool® System's patented process, which chills water by bringing it into contact with the cold suction line of the HVAC equipment before the water is released through the EZ Frames. (Cold water cools the air more effectively than water at ambient air temperatures).



In-Line Water Filter Maintenance

Checking the “Big Blue” In-Line Filter:

Put all Evaporcool® systems on the rooftop in the 120-second spray test mode, or open the bleed valve nearest the in-line filter (on the discharge side). Just prior to and just after the in-line filter you will find water pressure gauges. Check both water gauges. If the leaving water gauge is 15 psi less than the entering water gauge, shut off water lines and check the Big Blue filter compartment. The 5 micron filter cartridge is located inside the filter housing. This filter is designed to capture larger particulate matter within the water line. Maintenance of the in-line filter is as follows:

Remove the Big Blue filter cartridge from the housing as shown below.

Rinse out casing.

Check filter for wear and debris. If the filter supplied is reusable, clean with high pressure water and reinstall. If the filter is not reusable and visibly worn, replace with new. Make note of filter model number for future replacements.

**FS10B-1
10” Single Filter**



**FS20B-1
20” Single Filter**



Big Blue Filter Cartridges.



Bourdon Tube Pressure Gauge

In-line filter system shown to the right



In-Line Water Filter Maintenance



Examine the in-line filter pressure gauges. If the pressure differential is less than 15 psi, no action is needed.

If the pressure differential is more than 15 psi, remove the filter housing and replace the interior cartridge filter (see images below).



Remove the Big Blue filter housing. If it is too tight to remove by hand, remove with a filter wrench or a strap wrench. In addition to replacing the cartridge filter, check the O ring on the filter cap. If this is worn or shows evidence of water leaks, replace the O ring as you replace the filter cartridge. Note both the filter cartridge model and O ring size for future replacements.

Hydro Care™ RF Water Conditioner System Maintenance

Your Evaporcool™ system may be equipped with a HydroCare™ water conditioner system. The HydroCare™ water conditioner system uses a patented frequency of random radio wave signals. These signals travel the length of the plumbing system (at the point of installation), and work whether the water is running or not. This device will dissolve and remove lime scale naturally, without using salts or chemicals. Although this device is relatively maintenance free, there are some things you should check on a regular basis. These are listed below:

- Check plug to be certain it is plugged into 120V outlet.
- Check plug (pin) into RF device to be certain that it is fully inserted and seated.
- Check light on RF device. If light is not illuminated, after checking above conditions, contact your installing contractor or HVAC maintenance provider.
- If you notice scale build up on the Evaporcool[®] filter media that does not come off easily with water, call your installing contractor to perform an oscilloscope test to your water piping leading to the Evaporcool[®] system to show whether the RF device is sending a strong enough signal.



Routine Cleaning of Evaporcool Filter Media

Under normal conditions routine cleaning of the Evaporblue™ media can be performed while the EZ-Frame™ is attached to the unit. Pressure washing is NOT recommended. Lightly rinse the media with water. Beginning from the top of the EZ-Frame™, use your garden hose and apply water to EZ-Frame™ with a side to side motion at a 45 degree angle through the screen and onto the Evaporblue™ filter media (figure 1). Once the pad has been rinsed thoroughly make sure the soiled water at the bottom of the EZ-Frame™ drains clear through the drain holes. Move on to the next EZ-Frame™.

In extreme conditions, the EZ-Frame™ may need to be pulled from the unit, the top removed and the screen removed. Starting on the back side of the EZ-Frame™, lightly rinse using a side to side motion at a 45 degree angle toward the bottom of the assembly (figure 2). Turn the EZ-Frame™ around and repeat the rinse from the front side making sure the soiled water drains clear through the drain holes at the bottom of the assembly. Replace the screen making sure the notched corners are at the top and the spline on the aluminum frame faces out, and then re-attach the top and the place back on the unit. Move on to the next EZ-Frame™.

The above procedure needs to be done in regular intervals during the hotter months. The frequency is dependent upon how much pollen, dust and evaporated debris has accumulated on the pads. Typically, during the summer, you must rinse the filter material once per month. Do not let material build up on the filter pads, as it is harder to remove if allowed to accumulate.



Figure 1



Figure 2

Preparation for Disassembly and Reassembly of EZ-Frames™

Occasionally it may become necessary to repair or replace nozzles. To perform this maintenance, you will need to know how to disassemble and reassemble your EZ-Frames™ and how to properly remove the screen and access the sprayers. Before removing EZ-Frames™ for repair, you will need to shut down the Smartspray controller.

Start by opening the SmartSpray™ controller. In the upper left corner you will see an ON/OFF toggle switch. Flip the switch to the OFF position. The screen will go blank.



Shut off the water supply at the air conditioning unit.

Decouple the flexible water line that leads to the filter you are servicing. Do this by pushing the releasing collar on the fitting on top of the EZ-Frame™ and then pull the hose from the fitting.

Remove the EZ-Frame™ by grabbing one corner and pulling the magnets free from the HVAC/R unit. Once you have removed the EZ-Frame™ from the HVAC/R unit you can begin disassembly.

Disassembly and Reassembly of EZ-Frames

To repair or replace nozzles you will need to know how to disassemble and reassemble your EZ-Frames.

Tools Needed: 5/16" Nut Driver



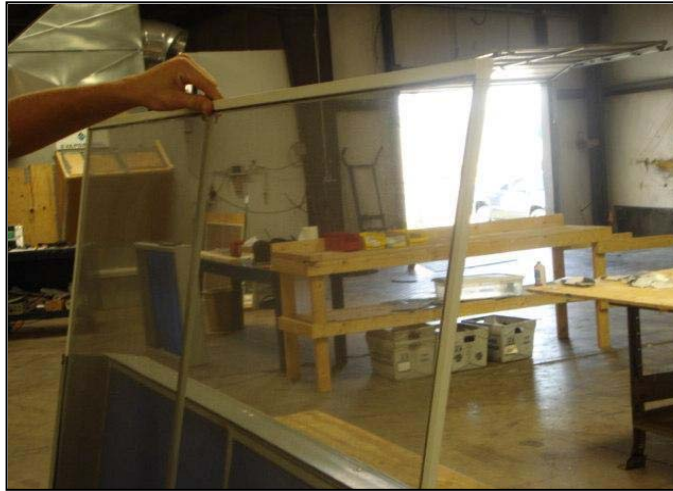
Remove screws across the top of the EZ-Frame™ system using the 5/16" nut driver.



Carefully remove the top from the rest of the EZ-Frame™ system.



Slide the front screen out from the top of the EZ-Frame™. Removal of the front screen will provide access to the spray nozzles and interior frame.



This will allow you access to the sprayers and inner filter media. You may need access to the sprayers if you have a sprayer that is not spraying properly, so you can remove it and clear any debris that may be causing it to spray improperly.

The sprayer assembly consists of three parts; (1) sprayer body, (2) flutter valve and (3) sprayer (figure 1). Figure 2 shows the flutter valve placed in the sprayer before insertion into the sprayer body (figure 3). The sprayer fits into the sprayer body with a 90 degree turn.



Figure 1



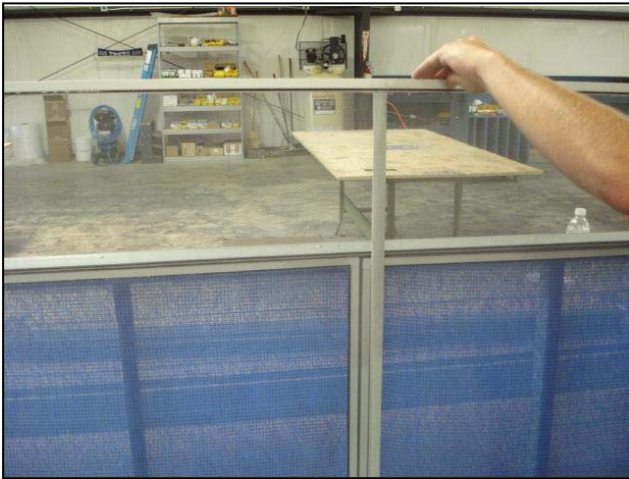
Figure 2



Figure 3

Reinstalling the Outer Screens

Place the screen(s) back into the EZ-Frame™ with the spline facing towards you and the notched corners toward the top.



Replacing the EZ-Frame™ Sprayer Top

Replace the EZ-Frame™ sprayer top by setting the top in place and reinstalling the screws.



Restart the SmartSpray™ Controller

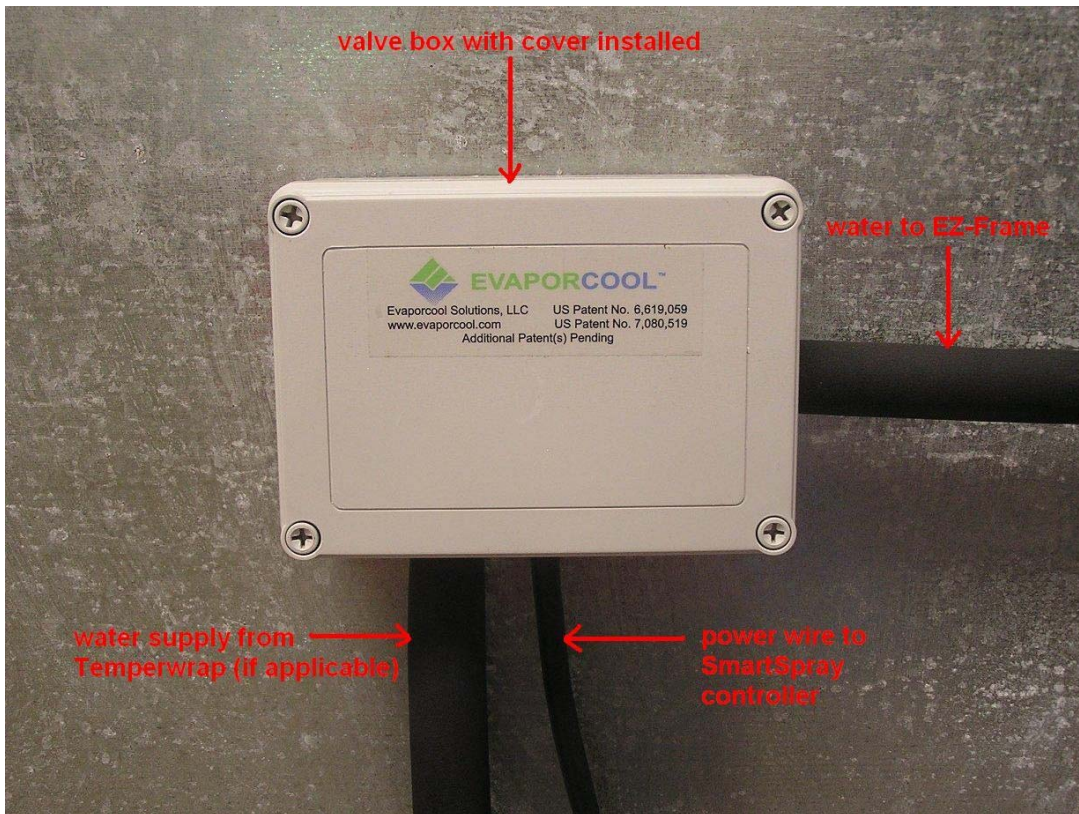
Open the SmartSpray™ control box and flip the toggle switch in the top left corner of the box to the “On” position.



Solenoid Valve Maintenance

Valve Box:

The valve box contains an all brass, 24v, continuous duty, normally closed solenoid valve. Water connections can be made through either side or the bottom of the box (inlet and outlet), as specified on survey sheets. Each solenoid valve box is secured to the AC unit via magnets mounted to the back of the box at the factory. NEMA enclosure may vary.



Solenoid Valves:

Each solenoid valve should be checked periodically for leaks and wire connections.

In areas where freezing temperatures are common, your Evaporcool system will need to be winterized. When winterizing, the drain plug should be removed, water allowed to drain and then reinstalled. Refer to page 5 of this guide.

Model 522 Spray Controller

Operators Manual

Version 3.0

October 2011



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Description

The Model 522 Spray Controller monitors various input temperature conditions and sends periodic electric pulses to external water valve solenoids for the purpose of keeping air intake filters moist.

The 522 controller is fully programmable through five key switches and displays system information on a 2 line x 20 character LCD module with back light.

Hardware inputs to the 522 controller include an ambient air temperature sensor, 2 channel input temperature sensors, 2 compressor current sensors and a relative humidity sensor.

Two switches on the board include an on/off control and a run/test switch to run all output sprays for visual inspection.

There are two output spray channels. Each output channel can drive a 2 amp load of spray solenoids as long as the 24 volt AC transformer can source the current.

All external connections are made through lever controlled spring action terminals for quick and secure connections.

All program memory is held in non-volatile flash memory. Program parameter information is held in non-volatile EEPROM memory. These memories will remain when power is lost.

Watch-Dog Circuit – A new feature on the 522 processor board is a separate circuit that continuously monitors the main processor circuit. The red blinking LED on the processor board is used for the timing of all spray related operations. If this LED stops blinking, so will the spraying. After about 90 seconds without blinking, the Watch-Dog circuit will turn power off to the entire unit. After 3 seconds, power will be restored as if someone were there to turn the power switch off and back on. This ‘hard boot’ will help insure that a locked unit is corrected quickly and automatically.

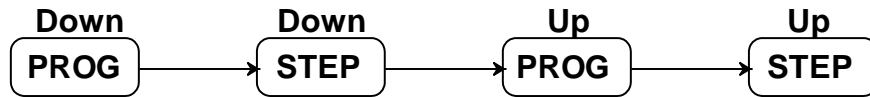
Programming the 522

During normal operation, the LCD screen will display “Evaporcool Solutions” on the first line and the current temperature and humidity on the second.



Evaporcool Solutions
Temp-079°F RH-36%

An LED on the main board will blink once per second showing that the system is operational but keystrokes will not cause the display to change unless the unit is properly logged into. The login sequence is to push and hold the PROG key followed by pushing and holding the STEP key. Then let the PROG key go followed by the STEP key. The following illustration shows this sequence.



Once the 522 is logged on, the LCD screen will display the Welcome screen. This is the main screen inside the program and all operations start and end here.

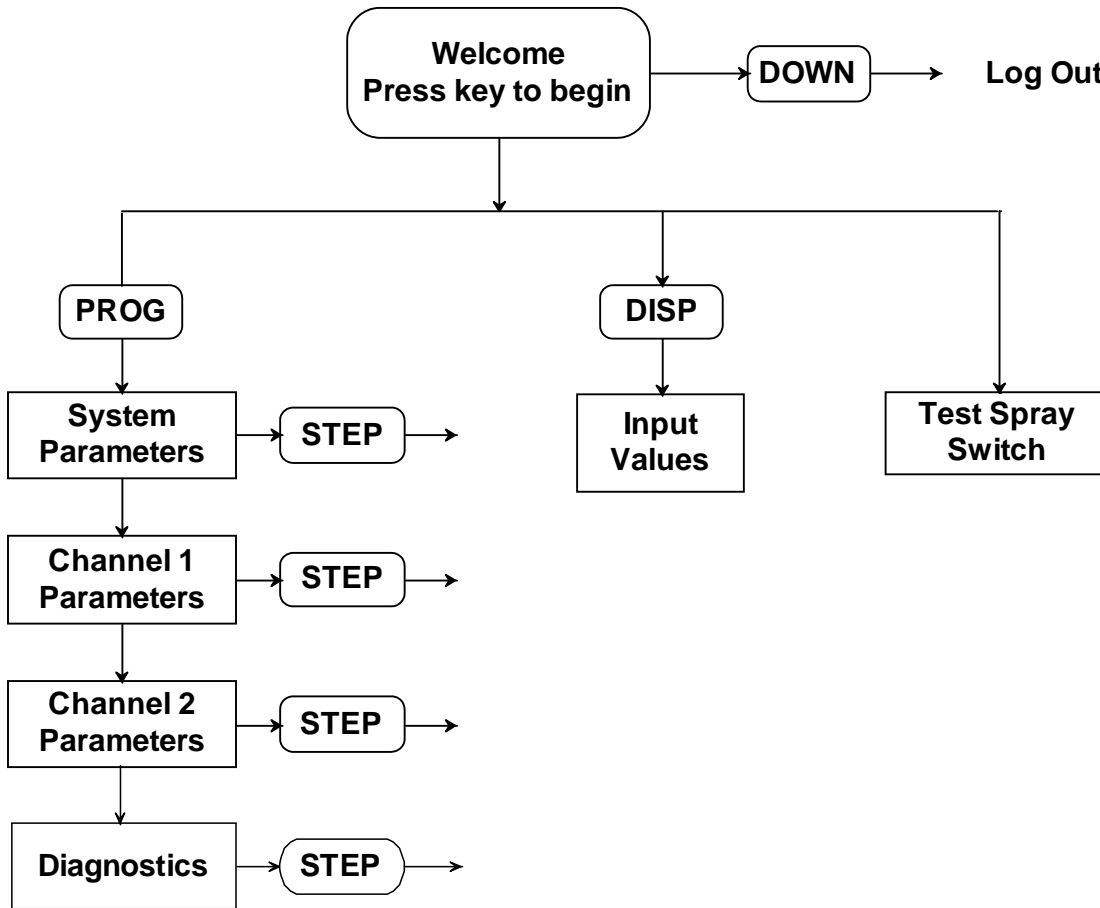
Welcome
Press key to begin

Backup LOGIN method: new in Version 3.0

If the operator has trouble logging in using the method above, a second method can be used. Press the UP key for about 3 seconds until the 'E' in Evaporcool changes to an asterisk '*'. Within one second, release the UP key and press the STEP key.

Once the system is logged into, all sprays and system monitoring stops. Spraying will continue as soon as the operator logs out. This can be done in two ways. From the Welcome screen, press the DOWN key to log out instantly or the system will log itself out automatically after being idle for five minutes (no keystrokes).

Following is a chart showing the various functions that can be performed from the Welcome screen.



Pressing the PROG key enters the program area. There are three separate categories to enter parameter information into and one for diagnostics. They are:

System Parameters – pertaining to the entire system.

Channel 1 Parameters – unique to channel one Channel 2

Parameters – unique to channel two Diagnostics – test and restore default parameters (ver 3.0)

Use the STEP key to save and advance to the next parameter.

The DISP key can be used to save and step backwards

The PROG key will exit any parameter without saving changes to that parameter.

System parameters- the following parameters affect the overall performance of the 522.

1. Lowest air temperature to spray.

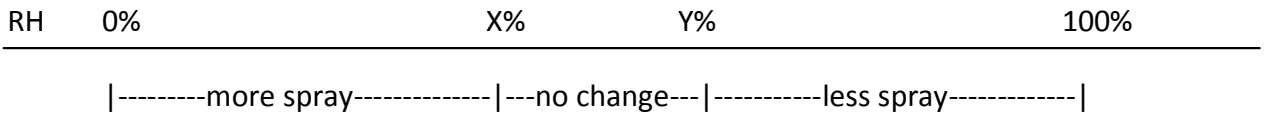


Enter any value between 50 and 110 degrees. No spraying will occur at all if the air temperature falls below this point.

- 2. Maximum test spray in seconds – from 1 to 120 seconds.
The run/test switch will turn on all sprays when the switch is in the test mode and will shut off automatically when the max time is reached.

To operate the Test Spray, the system must be logged on and displaying the Welcome screen. A switch transition from RUN to TEST must happen. This means if the switch is already in the TEST position, it must first be switched to RUN and then back to TEST. Once started, the spray may be ended by turning the switch back to RUN or by letting the maximum time expire. To run the test again, the switch must be toggled off and back on. If the spray is left on accidentally, the spray will stop when the max time is reached and the system will log off and begin normal operation after five minutes.

- 3. Relative Humidity sensor – Enabled or Disabled
If ‘Disabled’ is selected, then any parameters relating to Relative Humidity will be skipped. If ‘Enabled’ is selected, the program continues through four more parameters that describe the effect that RH will have on the spray frequencies.
- 4. X% - Low end of “Normal Range”. The RH “normal range” is where no action is taken on the GAP length. (the time between spray pulses). Enter a value between 1 and 70%.



- 5. Y% - High end of “Normal Range”. Enter a value between 30 and 99%.
- 6. RH – Below normal
This parameter describes the action taken when the relative humidity is very low (dry). The evaporation rate is high. For each % below the normal range, the time between spray pulses (GAP) will be reduced by ___%. Enter a value between 1 and 9.
- 7. RH – Above normal
This describes the action taken when the relative humidity is high (humid), where the evaporation rate is slower. For each % above the normal range, the GAP will be increased by ___%. Enter a value between 1 and 9.



8. Water Freeze Monitor – Enabled or Disabled
New in version 2.5 is the ability of the system to drain the water automatically when the temperature drops to near freezing. This operation assumes that a model 510 water controller is in the system to disconnect the water source and connect compressed air prior to the 522 freeze flush. If the model 510 water controller is not present, disabling this parameter will prevent any water flushing and also cause other freeze related parameters to be skipped.
9. Freeze – temperature to empty water lines
Nearing freezing, this is the point at which water should be drained from the lines. This setting should be several degrees lower than the low setting in the 510 water controller to insure that air is being supplied, otherwise water will replace water. Enter a temperature value between 30 and 45 degrees.
10. Freeze – how many seconds needed to drain the water
Use the ‘drain test’ procedure in the DISPLAY mode to measure the time needed to drain the lines. Enter here in seconds, from 5 to 999.
11. Freeze – temperature to refill the lines with water
The 522 requires this temperature to be at least 5 degrees higher than the temperature to drain the lines. Enter a value between 35 and 55 degrees. Again, this temperature needs to be several degrees higher than the 510 ‘high’ set point so that water and not air is available when refilling occurs.
12. Freeze – how many seconds needed to refill the water
Use the ‘refill test’ procedure in the DISPLAY mode to measure the time needed to refill the lines. Enter here in seconds, from 5 to 999.

Once the system parameters are finished, the program returns to the Welcome screen.

Channel 1 and Channel 2 parameters – Each channel has an identical set of parameters that defines that channel’s operation. There are ten in each. The parameters below need to be entered for each channel used.

1. Channel operation – Enabled or Disabled.
If Enabled is selected, then the operator can proceed to the remaining parameters. If Disabled is selected, then the program skips that channel.
2. Input Source – Condenser temperature or Ambient temperature



Condenser temperature uses a remote sensor, which is laid against the Freon line at the output of the condenser. If ambient temperature is selected, that channel's temperature input will not be used, eliminating the need for that remote sensor. Instead, the systems ambient temperature sensor will be used.

3. Lowest temperature (condenser or ambient) to allow spraying.
For condenser (attached to the condenser output), an input temperature of about 90 degrees would be used. For ambient, use the same setting as in System Parameter 1. If a different temp is used for ambient, the higher of the two will be used to affect this channel's operation.
4. Length of spray pulse – 1 to 99 seconds.
How long it takes to wet the filter without having water draining at the bottom. The taller the filter, the longer the pulse.
5. Gap between spray pulses – 5 to 999 seconds
On an average day with average sunlight, average temperature and average humidity for this region, how long until the filter is drying and in need of another spray pulse. Other parameters will increase or decrease this value automatically, according to the changing temperature and humidity.
6. For each degree over the input temperature, reduce the gap (time between Sprays) by ____%. Select between 1 and 20 %.

Example1: If condenser input is used, the condenser temp is set to 90°, the gap setting is 100 seconds and this parameter is set to 7%.

Let's say an input reading from the condenser output is 94°. That's 4 degrees over the input setting.

$$4^{\circ} \times 7\% = 28\%$$

$$100 - 28\% = 72 \text{ seconds.}$$

The spray gap would be reduced from 100 to 72 seconds.

A larger % setting for condenser inputs might be better.

Example2: If ambient input is used, the lowest ambient temp is set to 70°, the gap setting is 100 seconds and this parameter is set to 2%.

Here, an input reading from the ambient sensor is 85°. That's 15 degrees over the input setting.

$$15^{\circ} \times 2\% = 30\%$$

$$100 - 30\% = 70 \text{ seconds.}$$

The spray gap would be reduced from 100 to 70 seconds.

A smaller % setting for ambient inputs might be better.



7. Secondary spray output – Select the other channel or none. Ch1 can use Ch2 for secondary and Ch2 can use Ch1. If one channel's compressor is running and the other is not, the one not running may still receive a partial spray pulse if desired. Select the secondary channel in this parameter and the partial % in the next. If 'none' is selected here, the next parameter is skipped.
8. Partial Spray – Secondary Spray % - from 5 to 95%. Each channel's partial spray length is based on its own spray pulse length, not the primary channel it is secondary to.
9. Overspray length – in parameter 4, the length of a spray pulse is defined. More than one pulse chained together is an overspray. Select 1 – 5.
10. New overspray if GAP > X minutes. After a long period of no spraying, the screen may be totally dry and need extra spraying (an overspray) to thoroughly wet the surface. Define here that length of time. Select 5 – 240 minutes.

After each channel's parameters have been stepped through, the program returns to the Welcome screen.

Diagnostic Screen

Pressing STEP in the diagnostic screen will cause a short test to be run on the integrity of each parameter value. Each parameter has limits, such as 0 to 9, 5 to 120 or just ON or OFF. If this test finds a value that is outside of the allowed range, the error is reported. Errors may be corrected by simply stepping through the parameters, or by toggling parameter values or by reloading the default values.

Pressing STEP at the end of this test enters a screen that asks if the operator wants to reload all default values. Answer 'yes' to reload or 'no' to return to the Welcome screen.

Display Mode

From the Welcome screen, pressing the DISP key enters the display mode. Use the STEP key to advance through the display screens. Nothing can be entered here.

1. Model number and software version information.

**Base Model 522
Version 3.0**

2. Ambient temperature and relative humidity (if enabled).

**Ambient Temp - 086°F
Rel Humidity -----%**

3. Ch1 and Ch2 input temperatures. If either channel is disabled or if it's input is set to ambient instead of condenser, its value is not displayed.

**Ch1 Temp – 091°F
Ch2 Temp -- Off**

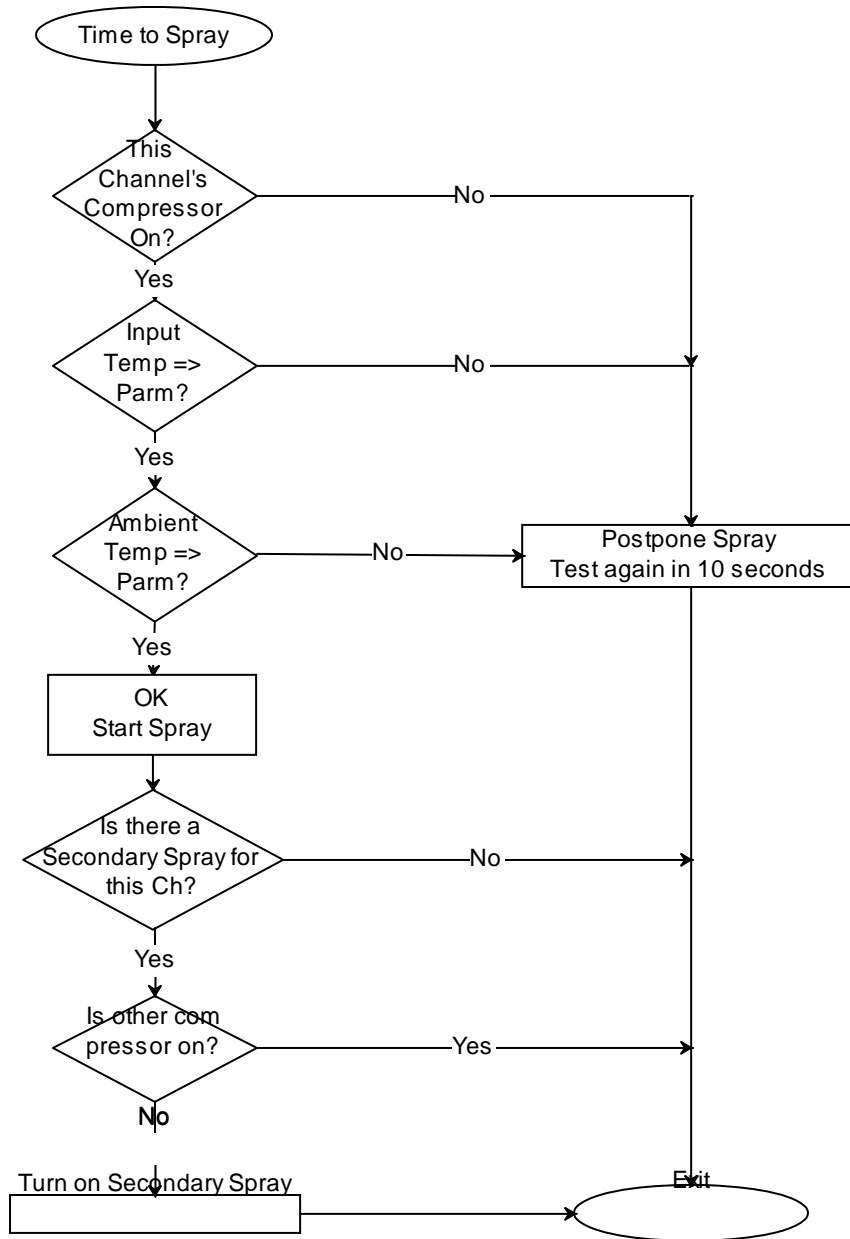
4. Compressor status

**Compressor #1 - ON
Compressor #2 - OFF**

5. Freeze Test – ‘drain’ – Freeze monitor must be enabled in System Parameters.
When this screen is displaying, the time setting for draining the water can be tested. To start the test, the RUN/TEST switch must be moved from the RUN position to the TEST position. If already in the TEST position, simply move to the RUN position and then back to TEST. To stop the test, move the switch back to the RUN position.
6. Freeze Test – ‘refill’ – Freeze monitor must be enabled in System Parameters.
When this screen is displaying, the time setting for refilling the water can be tested. To start the test, use the same procedure as that used in the ‘drain’ test.
5. System Display Clock – the clock in the Model 522 only counts seconds. Each second is numbered. It does not recognize hours, minutes or days. All operations in this unit, including starting and stopping pulses in each channel, LCD back light, auto log off, test spray and partial sprays all use this clock for proper operation. The blinking LED on the main board flashes each time the system clock is incremented.

**Display Mode
System Clock - 06728**

When the system clock indicates that it is time for a channel to spray, several qualifying tests are first performed. Any test that fails will disqualify and postpone the spray for 10 seconds when the tests will be repeated. The following flowchart illustrates this process.



See Note 1

Note 1 – Partial sprays are only applied to a channel during times when its compressor is turned off. If its compressor is on, it will not receive a partial spray from this channel but will receive its own primary spray pulses according to its own time schedule.

Relative Humidity Module

The relative humidity sensor is connected to the 3 pin R/H connector.

The 3 wires are connected as follows:

		Belden 8723 extension
Blue	V+	Red
Yellow	Signal	Green
White	GND	White

No calibration is necessary. To view the relative humidity in the DISPLAY mode, it must be enabled in the system parameters. In version 1.3 or lower, the relative humidity is displayed, but not used in calculations to vary the spray frequency.

Starting in Version 2.0, four system parameters were added to allow the relative humidity to influence the spray frequencies. Two parameters define a normal range where no action on the GAP length are taken. When the RH is below this normal range (very dry), the GAP between sprays is reduced, causing the spray to happen more often. A parameter defines how aggressive this GAP reduction should be. When the RH is above the normal range (very humid), the GAP is increased, causing water to spray less often. Another parameter defines this increase.

Current Sensors

Current sensors are clamped around one main compressor cable and sense when current is passing through that cable, indicating the on/off status of the compressor. Each current sensor has a 'trigger point' or 'threshold' that is adjustable by turning the potentiometer screw on the side of the sensor. When the current going through the sensor is above the threshold point, the sensor output indicates "ON" and when the current is less than the threshold point, the sensor output is "OFF". This threshold point is adjustable from 0 to 5 amps. The following steps illustrate how to adjust the sensor to between 3 – 3 ½ amps.

1. Connect the sensor to one of the 522 controller current sensor inputs.
2. Enter the 'display' mode and monitor the Compressor On/Off status.
3. With no cable going through the sensor, wind its potentiometer counter-clockwise until the display falsely shows that the compressor is "ON".
4. Now, slowly wind the pot in a clockwise direction just until the compressor indication goes back to "OFF".
5. From this point, wind the pot clockwise for five full turns and stop.

At this setting, the sensor is set to trigger at some point between 3 and 3 ½ amps. Additional clockwise turns will increase the threshold by about ½ amp per full turn. Counter-clockwise turns will decrease the threshold by about ½ amp per full turn.

Version History

Version 3.0 changes

1. Alternative LOGIN method – New feature
If the normal login method is difficult because of bounciness or corroded switch contacts, an alternative method is now available.
2. Display temperature and relative humidity readings stabilized. The display is now updated once instead of 10+ times per second.
3. Diagnostic Screen – New feature
This feature allows testing for parameter errors and the ability to restore all parameter default settings.

Version 2.5A changes

1. Brown-out auto restart feature added –
An internal processor setting will restart itself any time the 5 volt operating voltage falls below 4.5 volts. Previously this setting was at 2 volts. This may help reduce the possibility of processor lock ups causing spraying to stop.

Version 2.5 changes – begin model 522

1. Freeze Monitor – New feature
This feature gives the model 522 the ability to sense the temperature nearing the freezing point, and take action to drain the water lines to prevent freezing and damage to the system. If a model 510 water controller is present in the system, turn this feature on. The temperature to drain, length of drain, temperature to refill and length of refill are now programmable parameters. The DISPLAY mode also gives the ability to test these procedures on a warm day.

Version 2.3 changes

1. Display fix – The LCD display would sometimes show a dark top line only, usually caused by plugging or unplugging the program connector in, but sometimes for no apparent reason at all. Functions other than the LCD display continued to function normally. Before, the only remedy was to reinitialize the LCD display by cycling power. In version 2.3, a software routine was added to periodically reinitialize the display



without having to cycle power. Now, if the display scrambles for any reason, it will self-correct within about 15 seconds.

Version 2.2 changes

1. Changed display name to “Evaporcool Solutions”
2. Overspray programming added – an overspray is a long spray pulse made up of several normal spray pulses (2 to 5). This overspray is executed each time the 522 is powered on, when the program mode is exited, or after a long period of no spray activity. The length of the overspray and the ‘dry time’ necessary to qualify for one are defined in parameters 9 and 10 of each channel. Overspray’s for each channel are independent of each other.
3. Auto-Scroll feature added – some parameters allow wide variations. Pushing and holding the ‘UP’ or ‘DOWN’ key for 1 second will cause the display to change rapidly. Release and then press, press, press to single step.
4. Model number and firmware version number are now briefly displayed when the unit is first powered on.

Version 2.1 changes

1. Fixed a problem with units turning on when any temperature was over 100 degrees. Temperature would display 000° until temperature dropped below 100°.

Version 2.0 changes

1. Changed software to make keys more responsive.
2. Changed Title Display to now show “Chilling Filter Co” on the first line and the current Temperature and Relative Humidity on the second.
3. Changed configuration settings in CPU to prohibit program from being read.
4. Relative Humidity module is now fully operational. (see section on R/H Module).

Version 1.3 changes

1. Changed the minimum GAP between spray pulses from 15 seconds to 5 seconds.
2. For each degree over the channel temp, decrease the GAP by XX%.
XX now ranges from 1 to 20%
3. Improved the GAP reduction software
4. Removed the calibration and linear adjustment software routines. (not needed with thermistor probes)

Version 1.2 changes

1. Parameter for spray pulse duration changed from 9 second max to 99 seconds.
2. Error code reporting. If an internal reset occurs, the display will briefly display an error code. Used for diagnostic purposes.
3. Temperature sensors are changed from RTD type to thermistor probes. No calibration is necessary and they are more stable and accurate.
4. Operation Display – During normal operating mode (not logged in), the display will show real-time system information. If the Run/Test switch is in the Run position, the display will indicate when spray 1 or 2 is on and also when a partial spray is on. If the Run/Test switch is in the Test position, the display will give reasons why a channel is NOT spraying. If the channel is enabled but doesn't spray, it is for one of three reasons.
 - A. Ambient temperature too low. Display will show the current temperature and how far that is below the parameter setting.
 - B. Condenser temperature too low. Display will show the current temperature and how far that is below that parameter setting.
 - C. That channel's compressor not running.

These display indicators will aid in the setup and operation of the Spray Controller.

Version 1.1 changes

1. Changed spray pulse duration from 1-9 seconds to 1-99 seconds.

Version 1.0

Original prototype for testing.. Program Version 1.0.

Parts List

Electrical Equipment:

Smart Spray Controller and Components

Smart Spray™ Controller	Model 521 Rev.3
Tron Time Delay Fuse	11/32" x 1-1/2" Midget 500 V, .5 Amps
Tron In-line Fuse Holder	Single pole for 13/32" x 1 1/2" fuse, HEB Series
PHENIX AC Current Sensor	Model 9642 open core adjustable trip
Humirel Rel. Hum. Module	HM 1500
Base Electronics Temp Probe	Model 521- TMPASSY
MARS Control Transformer	Part Number 50232 (T1000C/B)
Belden 8723 060	Special purpose 22 AWG 2 pair 2 conductor shielded communication cable
Portable Power Cord	SJO 16-3 AWG 300 Volt rating insulation
Amazing Magnets	CUPH1000 Rare Earth magnets (NdFeB)

Valve Box Assembly and Components

Vynckier Box	Part number VES#266668-03 (RH)
Connector Clamp	Type KO, Size 1/2" Non-metallic PN NC301
Solenoid Valve	Horton 32038B/24
Legris Fitting	Male elbow 1/2" tube to 3/8" MPT Legris
Fitting	Male connector 1/2" tube to 3/8" MPT
Portable Power Cord	SJO 16-3 AWG 300 Volt rating insulation
Buchanan	PN 57133508202 disconnect, female, fully insulated
Buchanan	PN 57183229-41 connector, U clip type insulated

Valve Box Assembly and Components – c ont' d

Machine Screws	Round head slotted 10x32x1/2" lg NF thd SS PN 2BA27
Nylock nuts	10x32 NF NM Nylock ZP PN IFA33
Amazing Magnets	CUPH1000 Rare Earth magnets (NdFeB)

Filtration Equipment and Components**Water Filtration Equipment Standard Flow**

Pentek Filter Housing	PN 150070; ¾ Blue 20" standard filter housing
Filter Mounting Bracket	PN 150578; MC-1A Blue mounting bracket
Filter Media	PN ECP5-20; pleated cellulose polypropylene cartridge

Water Filtration Equipment High Flow

Pentek Filter Housing	PN 150236; 1 ¼" Big Blue 20" filter housing
Filter Mounting Bracket	PN 150061; Big Blue mounting bracket
Filter Media	PN ECP5-20BB; pleated cellulose polypropylene cartridge

Miscellaneous Water Filtration Equipment

Wika Gauge	PN 4352241 Wika 213.53 2.5 0-100 psi, ¼" NPT LM
Chem Cock	PN A45CCV; test valve

Tubing, Insulation and Quick Disconnect Fittings

Tubing

Parker Nylon Tubing	PN NB-8-062; ½" OD x ⅜" ID; .062 wall thk; 250 psi wk pressure; 1000 psi burst pressure. Parker Cat # 4660
Parker Nylon Tubing	PN NB-4-035; ¼" OD x .180" ID; .035 wall thk; 250 psi wk pressure; 1000 psi burst pressure. Parker Cat # 4660

Insulation

AeroCell Insulation	PN CT 1414; ¼" ID x ¼" wall
AeroCell Insulation	PN CT 1214; ½" ID x ¼" wall

Fittings

Legris Fitting	PN 3008-56-11; ¼-⅛ female tube-to-tube Inlet
Legris Fitting	PN 3009-56-11; ¼ -⅛ female elbow connector
Legris Fitting	PN 3102-56-00; ¼ - 90° union elbow
Legris Fitting	PN 3106-62-00; ½ - ½ straight union tube-to-tube
Legris Fitting	PN 3014-56-11; ¼ - ⅛ female straight inlet
Legris Fitting	PN 3140-56-00; ¼ - Y coupling
Legris Fitting	PN 3102-62-00; ½ - 90° Elbow tube-to-tube
Legris Fitting	PN 3104-56-00; ¼ - ¼ equal T connector
Legris Fitting	PN 3104-62-00; ½ - ½ equal tube T
Legris Fitting	PN 3104-62-56; ½ - ½ - ¼ unequal tube tee
Legris Fitting	PN 3106-56-00; ¼ straight union tube-to-tube
Legris Fitting	PN3166-56-62; ½ - ¼ tube reducer
Legris Fitting	PN 3175-62/18; Female ½" threaded M quick release
Legris Fitting	PN 3109-62-18; ½" – ⅜" male elbow
Legris Fitting	PN 3104-60-00; ⅜" equal tube T
Legris Fittings	PN 3102-60-00 ⅜" 90° Elbow

Legris Fittings

PN 3008-60-14 $\frac{3}{8}$ " - $\frac{1}{4}$ " NPT to tube T

Tubing, Insulation and Quick Disconnect Fittings c o nt' **d**

Legris Fitting

PN 3009-60-14 $\frac{3}{8}$ " - $\frac{1}{4}$ " NPT to tube 90° Elbow

TemperWrap Assembly Kit

Watts Nylo-Braided Hose

PN 4027595; 5/8" OD x 3/8" ID line

Watts Connector

PN A290; 3/8" x 3/8" barb splicer

Ideal Hose Clamps

PN 2AP57; Worm Gear screw hose clamps

Nomoco Insulation

PN IMC138CT; NOMOLOCK Insulation, 1 3/8" x 1/2" x 72"

Magnet Strap Assemblies

Amazing Magnets

CUPH1000 Rare Earth magnets (NdFeB)

Nylok Nut

PN 1FA33; 10/32 NPT

Machine Screws

Round head slotted 10x32x1/2" lg NF thd SS PN 2BA27 or 13607

Water Line Strap

PN TS102; Conduit strap, $\frac{3}{4}$ " 1 hole

Miscellaneous Items

Miscellaneous

U Nuts

PN 10066; # 10 screw size - spring Type U Nut

Grommet

PN 561-MP15018; ID 1.125 x HD 1.5

Grommet

PN 561-MP10012;

Grommet

PN 561-MP5006; ID .375 x HD .500



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