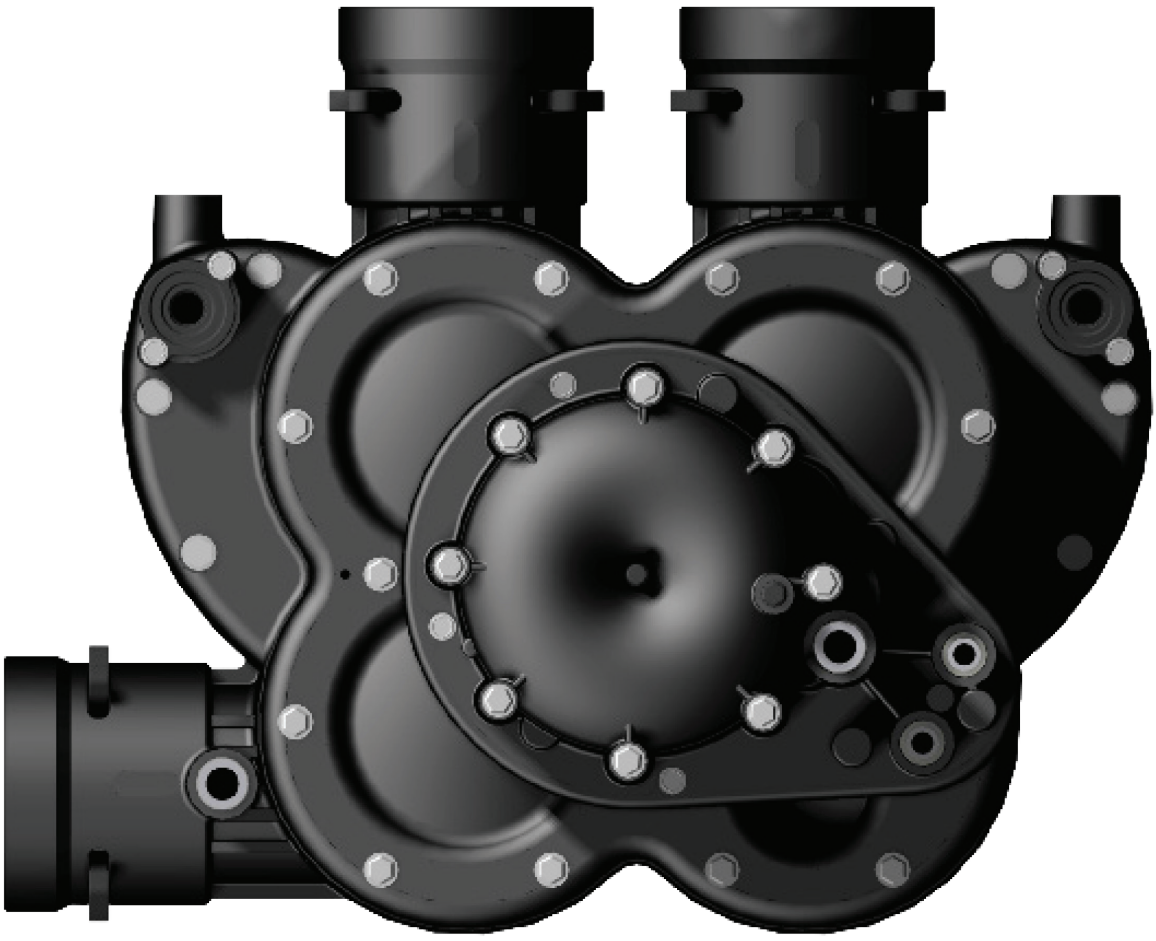
KineticoPRO®
Total Water Care

HYDRUS®

# Owner's Manual

## Hydrus® Commercial Softening Systems



### Models:

| | | | | |
|---|---|---|---|---|
| HS 116s | HS 116s OD | HS 216s OD | HS 316s OD | HS 416s OD |
| HS 118s | HS 118s OD | HS 218s OD | HS 318s OD | HS 418s OD |
| HS 121s | HS 121s OD | HS 221s OD | HS 321s OD | HS 421s OD |
| HS 124s | HS 124s OD | HS 224s OD | HS 324s OD | HS 424s OD |
| HS 130s | HS 130s OD | HS 230s OD | HS 330s OD | HS 430s OD |
| HS 136s | HS 136s OD | HS 236s OD | HS 336s OD | HS 436s OD |
| HS 142s | HS 142s OD | HS 242s OD | HS 342s OD | HS 442s OD |

# Table of Contents

## Troubleshooting



## Parts

# The Hydrus Series Commercial Softeners

**The benefits of softened water are many:**

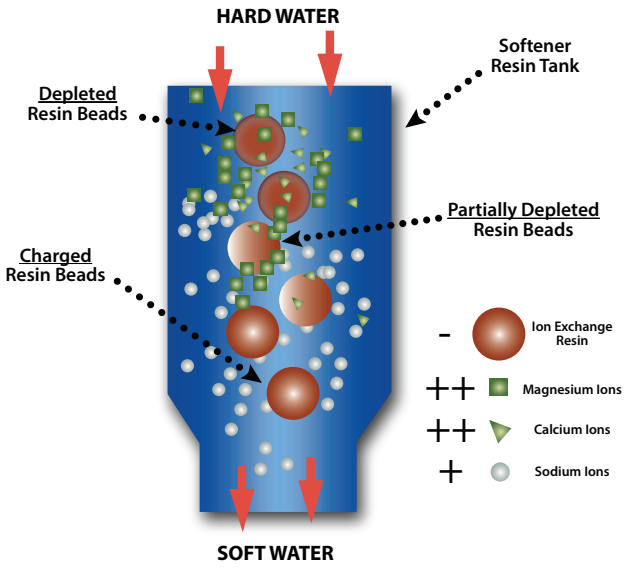
- Savings in soap products and cleaners
- Reduction or elimination of fabric softeners in laundering facilities
- Reduction of boiler chemical costs
- Reduction in rinse aids that prevent water spotting
- Elimination of scale, which inhibits heat transfer

However, the benefits gained by softening in a commercial environment far exceed chemical savings. Commercial facilities invest in high-quality equipment to carry out the daily tasks of operating that business, which is often very expensive. Dishwashers, boilers, laundering equipment and the entire plumbing system is at risk of hardness fouling that can severely limit the equipment's useful life and can be the cause of costly repairs.

## How a Water Softener Works

Hard water contains calcium and magnesium ions. KineticoPRO® softeners contain resin beads, which hold sodium ions. When hard water passes through the resin beads, the calcium and magnesium ions are exchanged for the sodium ions held by the resin. Following this ion exchange process, the water leaving is soft.

Once the resin bed is loaded with calcium and magnesium ions, it must be cleansed, or regenerated, so that it can continue to soften water. The salt in the brine tank mixes with water to provide a source of saturated brine solution for regeneration of the resin beads. The brine solution loosens the hardness minerals from the resin, which have built up. Lastly, the system fast rinses to drain, flushing the hardness minerals away. The regenerated resin beads hold sodium ions, making them ready for a new cycle of exchanging sodium ions for more calcium and magnesium ions.




Unlike other softeners, the KineticoPRO multiplex Hydrus systems regenerate with soft water. The multiplex systems also regenerate countercurrent to the service flow. Just as there are differences in cleaning with soft water, there are differences in regenerating with soft water. The system uses only clean, soft water to carry out the regeneration and to make the saturated brine solution in the salt storage tank. This decreases the loading on the resin in general and preserves the virtually unloaded resin portion of the bed at the bottom of the tank. This is one of the ways countercurrent regenerating softening systems provide the softest water in the industry.

## Hydrus Softener Design Features

**There are two Hydrus softener series:**

The HS 1xxs are simplex softeners. The xx indicates the tank diameter in inches. The simplex softeners regenerate cocurrently using hard water, and by-pass hard water during regeneration.

The HS 1xxs OD, HS 2xxs OD, HS 3xxs OD and the HS 4xxs OD are all multiplex softeners. The multiplex softeners regenerate countercurrent to the service flow, using soft water. Soft water for regeneration comes from the softener tanks still in service. Multiplex systems do not by-pass hard water.

# Automatic Operation

Once the Hydrus Softening System has been installed and set up, operation is completely automatic. The standard, most efficient configuration is to have a flow meter in line that monitors the total amount of water that is softened. Once the set volume of water has been softened, it signals a control device called the Smart Start™ Controller. The controller in turn signals the Hydrus Valve to regenerate. The Hydrus Valve automatically carries out all of the regeneration operations.

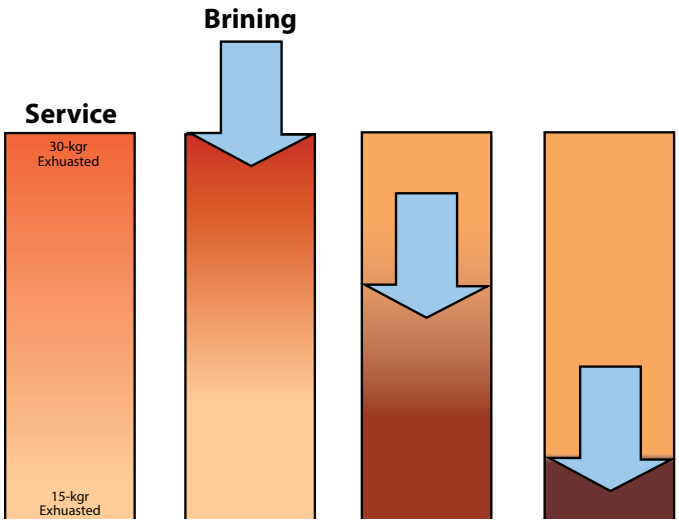
# Countercurrent Regeneration

Understanding the value of countercurrent regeneration starts with an understanding of the process by which an ion exchange media is exhausted. Following the service flow through the media bed, the greatest concentration of exchanged ions is at the entry point of the media bed. As the flow path is followed through the depth of the media bed, a concentration gradient is formed.

The concentration gradient works in favor of countercurrent regeneration. By reversing the flow through the exhausted bed, regenerating from lowest to highest concentration, it allows regenerant chemicals to be introduced first to the media that is least exhausted and then, gradually, to the completely exhausted media at the service entry to the tank.

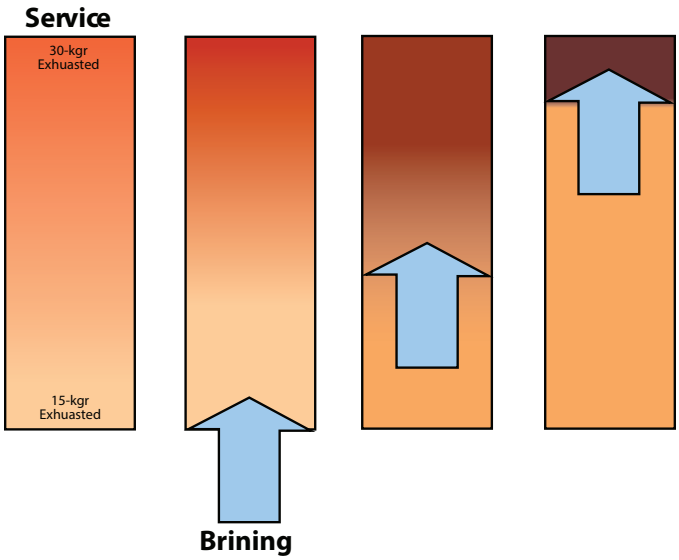
The benefits of this type of regeneration include enhanced efficiencies as well as improved product quality. The overall salt consumption of a countercurrent system can be 40-50% less than a similar cocurrent system.

## Cocurrent Regeneration




During **cocurrent** regeneration, hardness ions are pushed from the area of highest concentration through the area of least concentration, like sweeping a pile of dirt over a swept part of the floor. To achieve complete regeneration, a high dosage of salt is required, increasing costs.

## Countercurrent Regeneration




Regeneration is most efficient when carried out in the **countercurrent** direction. First, the least contaminated part of the bed, followed by the most. In this way, the bottom part of the bed maintains a high quality standard, providing a polishing step just prior to the water leaving the bed. Salt is conserved, and higher quality water is the result.

## Low Leakage

Leakage is a term used to describe the amount of hardness that passes through the softener and leaves as hardness in the effluent to the system. The use of countercurrent regeneration drastically reduces leakage. If required, Hydrus softeners can be configured to provide hardness less than 1.0 mg/L, as calcium carbonate.

## High Flow Rates

KineticoPRO's Hydrus Softening Systems are designed to accommodate the high flows demanded by today's growing businesses. Despite its compact size, the system provides softened water when needed, on demand.

Flow rates through a system and pressure drops are closely related. As the flow rate increases through a softening system, the pressure drop increases. KineticoPRO Hydrus Softening Systems are designed specifically to minimize pressure drop while maximizing flow rate.

**The following features are built into every Hydrus Softening System:**

- High flow distributors - provide minimal pressure loss through system.
- Dual layer underbedding, where beneficial - improves water distribution through system, increases salt and water efficiency and reduces pressure loss.

## High Capacity

Some manufactures rely upon high salt dosing to maximize capacity, but this practice leads to higher salt usage and diminished efficiency. KineticoPRO combines the latest technologies with solid engineering practices to provide the most efficient softening system possible. With KineticoPRO softening systems, most applications require salt dosing of only 5 lb/ft$^3$ of resin, compared to 15 lb/ft$^3$ and even 25 lb/ft$^3$ in competing systems.

In addition to the use of countercurrent regeneration to extend times between regenerations, high-capacity media is used. This media is a premium grade gel cation exchange resin, which meets the performance requirements of commercial water treatment.

Flow dynamics have an effect on capacity as well. The distribution system, the width versus the height of the media tank, flow rate and retention time all play a factor in the capacity of the resin. A balance is struck between all of these factors to provide the leading softening system in the industry.

Alternative brining configurations, electing capacity over efficiency, are easily set on Hydrus systems. KineticoPRO professionals are trained to know which is best for each installation.

## Low Maintenance Requirements

There are relatively few periodic maintenance requirements of a Hydrus Softening System. The brine tanks require periodic filling. The state, local or building code may require daily inspection to check for leaks and verify system operation.

On a less frequent basis, the performance of the system can be verified for hardness removal. Initially, this test should be run more often in order to optimize brine settings.

Over the system's lifetime, the resin may begin to lose capacity, and the regeneration frequency may have to be stepped up. Indication of aging resin will show up in periodic hardness testing. Under general usage, the media is expected to last 5 to 10 years. Deterioration is due primarily to attack by chlorine. If chlorine levels are regularly above 0.2 mg/L, thought should be given to the addition of carbon pretreatment to the Hydrus Softening System. Generally any amount of strong oxidant in the water will reduce the life of the resin.

# System Sizing

The system has been sized around the specific demands to be placed upon it in terms of peak flow rate, average flow rate and hardness. If the softener is intended for a more seasonal application, consideration is given to ensure the most efficient flow of soft water.

The peak flow rate, expressed in gallons per minute (gpm), is the maximum flow rate that is required for the operation of a facility running at a substantial percentage of its maximum effective water demand. Equipment selection, carried out by factory-trained KineticoPRO professionals, is made by fixture counts, data obtained from equipment manuals and incoming pipe sizes.

The average flow rate, expressed in gallons per day (gpd) or per month, can be used to measure the normalized flow demand. A monthly flow rate represents a 30-day cycle of daily flow, which tends to be a more accurate estimation of average flow. These values are obtained from water meter readings and water bills.

The remaining factor used in properly sizing a KineticoPRO Hydrus system is the hardness of the water to be treated. Hardness is a measure of the calcium and magnesium salts dissolved in the water. The positively-charged portions of these salts, or cations, constitute the loading on the system used to soften the water. Some contaminants, such as iron and manganese, also exchange and contribute to the "compensated" hardness of the water.

| | HS 116s | HS 118s | HS 121s | HS 124s | HS 130s | HS 136s | HS 142s |
|---|---|---|---|---|---|---|---|
| Tanks | (1) 16" x 65" | (1) 18" x 65" | (1) 21" x 65" | (1) 24" x 65" | (1) 30" x 72" | (1) 36" x 72" | (1) 42" x 72" |
| Resin Volume Per Tank | 4 $ft^3$ | 5 $ft^3$ | 6 $ft^3$ | 8 $ft^3$ | 12 $ft^3$ | 18 $ft^3$ | 26 $ft^3$ |
| Service Flow | 35 gpm | 45 gpm | 55 gpm | 65 gpm | 72 gpm | 78 gpm | 81 gpm |
| Service Flow in Regeneration | By-pass | By-pass | By-pass | By-pass | By-pass | By-pass | By-pass |
| Regeneration | Cocurrent | Cocurrent | Cocurrent | Cocurrent | Cocurrent | Cocurrent | Cocurrent |

| | HS 216s OD | HS 218s OD | HS 221s OD | HS 224s OD | HS 230s OD | HS 236s OD | HS 242s OD |
|---|---|---|---|---|---|---|---|
| Tanks | (2) 16" x 65" | (2) 18" x 65" | (2) 21" x 65" | (2) 24" x 65" | (2) 30" x 72" | (2) 36" x 72" | (2) 42" x 72" |
| Resin Volume Per Tank | 4 $ft^3$ | 5 $ft^3$ | 6 $ft^3$ | 8 $ft^3$ | 12 $ft^3$ | 18 $ft^3$ | 26 $ft^3$ |
| Service Flow | 70 gpm | 90 gpm | 110 gpm | 130 gpm | 144 gpm | 156 gpm | 162 gpm |
| Service Flow in Regeneration | 27 gpm | 37 gpm | 45 gpm | 50 gpm | 52 gpm | 48 gpm | 41 gpm |
| Regeneration | Countercurrent | Countercurrent | Countercurrent | Countercurrent | Countercurrent | Countercurrent | Countercurrent |

| | HS 316s OD | HS 318s OD | HS 321s OD | HS 324s OD | HS 330s OD | HS 336s OD | HS 342s OD |
|---|---|---|---|---|---|---|---|
| Tanks | (3) 16" x 65" | (3) 18" x 65" | (3) 21" x 65" | (3) 24" x 65" | (3) 30" x 72" | (3) 36" x 72" | (3) 42" x 72" |
| Resin Volume Per Tank | 4 $ft^3$ | 5 $ft^3$ | 6 $ft^3$ | 8 $ft^3$ | 12 $ft^3$ | 18 $ft^3$ | 26 $ft^3$ |
| Service Flow | 105 gpm | 135 gpm | 165 gpm | 195 gpm | 216 gpm | 234 gpm | 243 gpm |
| Service Flow in Regeneration | 62 gpm | 82 gpm | 100 gpm | 115 gpm | 124 gpm | 126 gpm | 122 gpm |
| Regeneration | Countercurrent | Countercurrent | Countercurrent | Countercurrent | Countercurrent | Countercurrent | Countercurrent |

| | HS 416s OD | HS 418s OD | HS 421s OD | HS 424s OD | HS 430s OD | HS 436s OD | HS 442s OD |
|---|---|---|---|---|---|---|---|
| Tanks | (4) 16" x 65" | (4) 18" x 65" | (4) 21" x 65" | (4) 24" x 65" | (4) 30" x 72" | (4) 36" x 72" | (4) 42" x 72" |
| Resin Volume Per Tank | 4 $ft^3$ | 5 $ft^3$ | 6 $ft^3$ | 8 $ft^3$ | 12 $ft^3$ | 18 $ft^3$ | 26 $ft^3$ |
| Service Flow | 140 gpm | 180 gpm | 220 gpm | 260 gpm | 288 gpm | 312 gpm | 324 gpm |
| Service Flow in Regeneration | 97 gpm | 127 gpm | 155 gpm | 180 gpm | 196 gpm | 204 gpm | 203 gpm |
| Regeneration | Countercurrent | Countercurrent | Countercurrent | Countercurrent | Countercurrent | Countercurrent | Countercurrent |

# Operation

This section is provided to instruct on the operation of tanks, controls and bringing systems. KineticoPRO's Hydrus Softening Systems are an assembly of five major sub-assemblies: media tank, remote meter, Smart Start Controller, the brining system and the Hydrus Valve itself. Together, they provide softened water efficiently, reliably and continuously. The KineticoPRO professional, when enlisted, has inspected the installation and has made all of the proper adjustments to the system to ensure proper installation, startup and operation.

## Concepts

KineticoPRO's Hydrus Valve is designed to control commercial, industrial and municipal water treatment equipment. The valve controls all service and regeneration functions for a single tank. A separate valve is required for each tank.

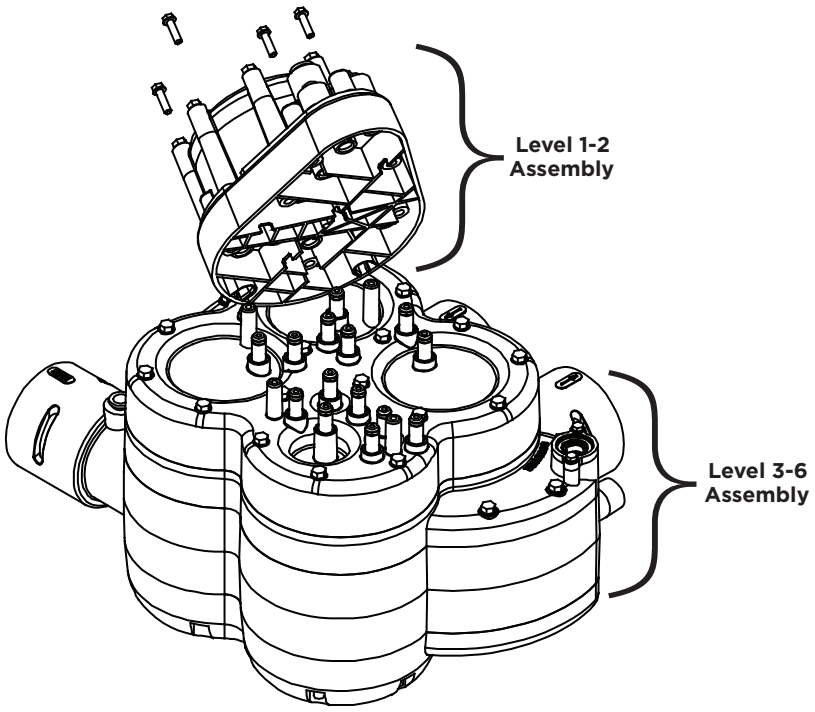
### Level 1-2 Assembly

The level 1-2 assembly controls the service and regeneration cycles for the entire valve.

### Starting Regeneration

External water flow to the "Start Port," as shown on page 27, starts the regeneration. This water can come from opening a hand valve, a solenoid valve or some similar device. The regeneration start requires a flow of about 0.5 gpm. This flow is regulated internal to the valve, so the supply must be able to meet or exceed this flow rate. The length of time to start the cycle is dependent on the length of the overall cycle. Times can range from 5 to 20 minutes.

The regeneration start water enters the level 1-2 assembly by means of a ¼" tubing connection. It spins a turbine, which advances the control disc. As this disc advances, the regeneration control valve opens. This allows flow back up to the level 1-2 assembly, passing the regeneration flow control and the regeneration nozzle. Once the regeneration control valve opens, the external water flow through the ¼" tubing can stop. The nozzle directs the flow past the regeneration turbine, keeping the control disc advancing through the regeneration cycle and driving the regeneration gear stack.




### Regeneration Gear Stack

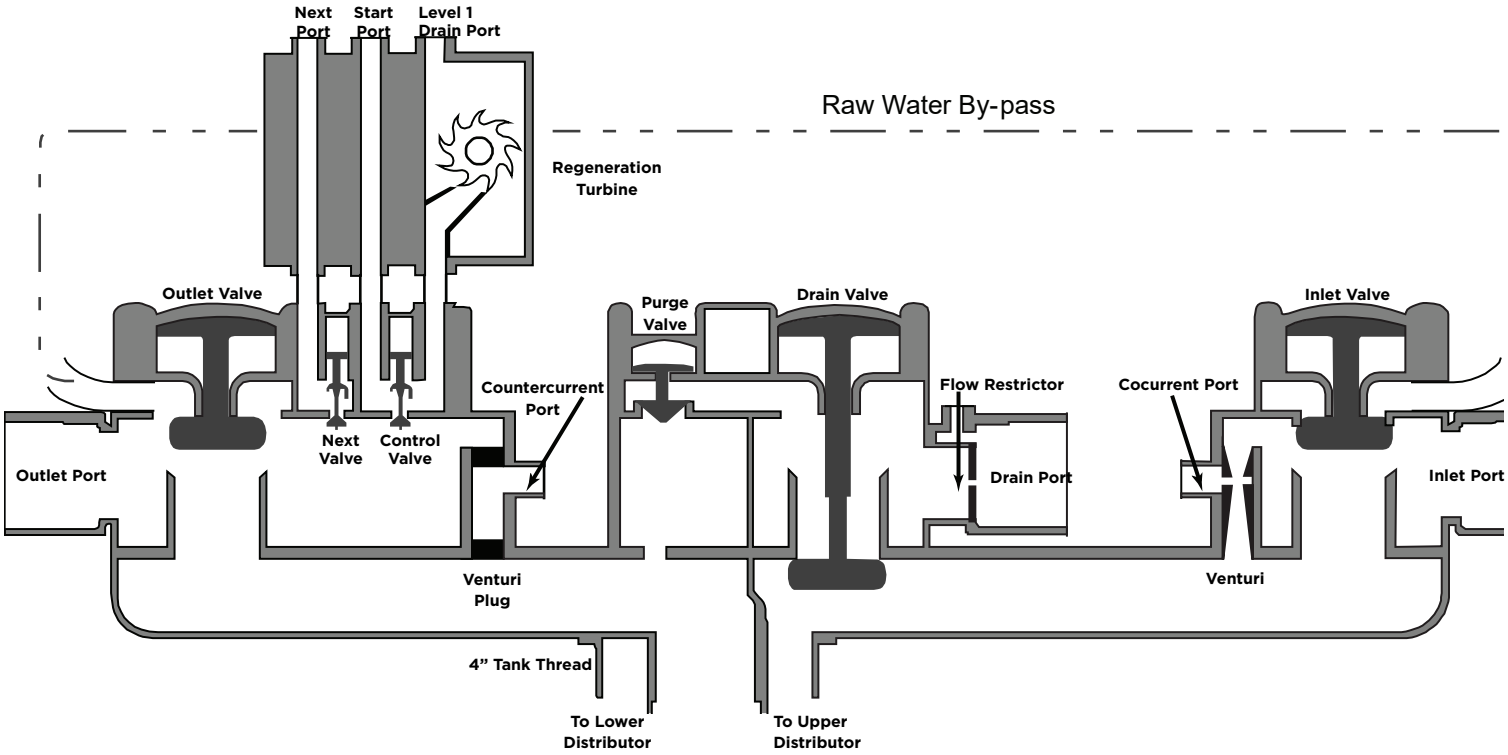
The regeneration gear stack controls the length of regeneration. Depending on the gearing used, a regeneration can take between 20 minutes and 210 minutes. The regeneration gear stack drives the regeneration drive pawl, which drives the control disc.

### Control Disc

The control disc pressurizes or vents signal holes in the ceramic disc. These ceramic disc holes are connected to servo valves located in the level 3-6 assembly. Level 2 assists in routing the pressure signals from the ceramic disc holes to the proper location on the level 3-6 assembly. The control disc determines what function the module takes. There is a different control disc for each valve configuration: simplex, multiplex, softener and filter. The control disc is selected based on the tank's function.

## Level 3-6 Assembly

The level 3-6 assembly holds the servo valve, valve seats, venturi and backwash flow control. Also included within this assembly is the capability of a raw water by-pass. This is located on level 5A. The raw water by-pass is used in simplex systems, allowing untreated water to be diverted to service during a regeneration. There are six valves: inlet valve, outlet valve, drain valve, purge valve, regeneration control valve and start next valve. The following graphic shows the general scheme and operation of the remarkable valve.




## Simplex Systems

The KineticoPRO Hydrus System has two basic configurations: simplex and multiplex. The simplex configuration is straightforward in its operation. As a single tank, the regeneration occurs without affecting any other tanks or sub-systems that may be present. Raw water is by-passed around the treatment system during a regeneration. Raw, untreated water is also used for the regeneration process and to refill the brine drum.

## Multiplex Systems' Regeneration Sequence

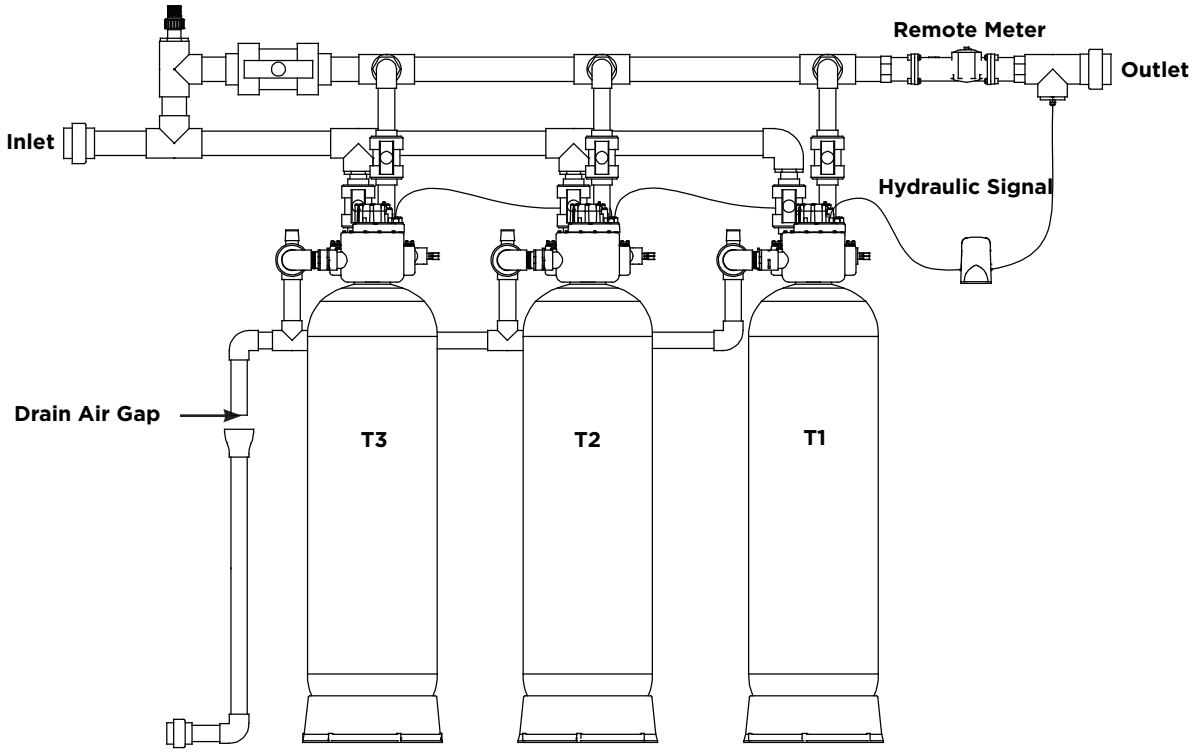
The multiplex systems' configuration differs from simplex systems primarily during regeneration. When sizing the multiplex systems, KineticoPRO professionals consider these differences in order to meet the treatment goals. In general, multiplex systems are used for applications that are more critical, where a continuous supply of soft water is required, where high flow is required or where softened water specifications require countercurrent regeneration with soft water.

During service, all of the tanks are operating at equal flow rates in parallel. The softening media removes hardness and eventually approaches exhaustion. Taking several factors into account, a regeneration is initiated based upon time and service, day and time, or volume of processed water, depending on whether or not the unit is equipped with a flow meter.

To provide the most efficient, productive regeneration, Hydrus multiplex systems use softened water for all four stages of the regeneration and to refill the brine tank. For a better understanding, a triplex Hydrus system is used in the following example.

**The following steps describe the regeneration sequence of this three-tank system: T1, T2 and T3.**

1. The remote meter measures the volume of water processed and closes a dry contact to activate the Smart Start controller, which produces a hydraulic signal.
2. The lead tank receives the hydraulic signal from the Smart Start Controller at the Start Port, which spins a turbine and advances the control disc to start the regeneration.




3. T1 shuts down, and a regeneration on this tank begins. The two remaining tanks continue to soften water for distribution and also supply the softened water required for the regeneration of T1. The tanks are sized so that the water system demand and the water used for regeneration can be met by the two tanks in service. The inlet valve closes, but the outlet valve remains open. This allows soft water from T2 and T3 to be used for regeneration in a countercurrent fashion.
4. After T1 is regenerated, the Start-Next valve opens and sends a hydraulic signal to T2. At that point, T2 shuts down and a regeneration on it begins. T1 and T3 supply water for distribution and also supply the softened water required for the regeneration of T2.
5. The process continues until all tanks in the train have regenerated. The Start-Next port in T3 is plugged and not used.

# Plumbing[1]

It's important that the Hydrus system be plumbed with isolation and by-pass valves and approved materials using approved methods. It's implicit that the system is installed with proper fittings and is provided with isolation and expansion capabilities. Plumbing specification is outside the scope of this manual and subject to local code.

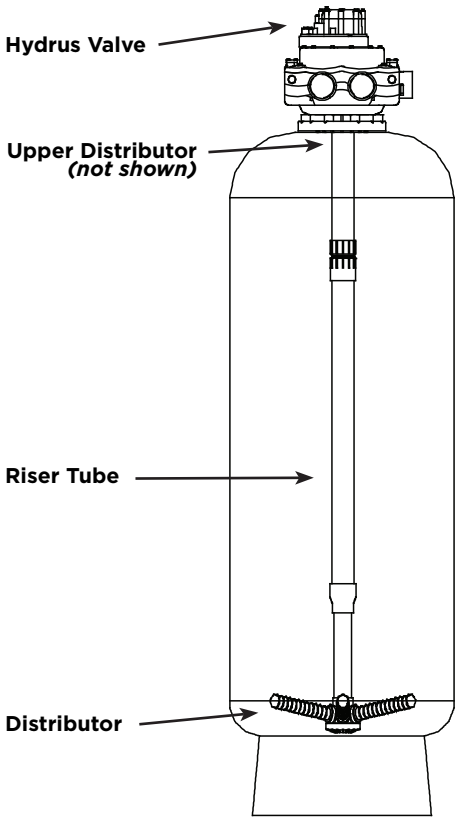
[1] See installation manual for Hydrus - specific plumbing requirements, p/n 12190M

# Media Tanks

The media tanks are made up of several components: the tank itself, upper distributor, media, underbedding, lower distributor and riser. The raw water flows into the valve and through the upper distributor at the top of the tank just beneath the valve. It flows through the media where the ion exchange process takes place. The water is now softened. At the bottom of the media bed, there are one or two different grades of underbedding. The water flows through the underbedding and into the distributors. Lastly, the water flows up the riser tube and out the valve to service.

## Upper Distributor

The upper distributor prevents channeling of the inlet stream into the top of the resin bed. A plastic molded distributor is attached to the bottom of the Hydrus Valve.




## Media[1]

High capacity, non-solvent resin is used in Hydrus softeners.

## Underbedding[1]

In order to ensure proper distribution, minimal pressure drop and to protect the distributors from fouling, two different grades of underbedding may be used. Only fine grade gravel is required for small tanks.

## Lower Distributor

The lower distributors are of a hub and slotted lateral design. This provides excellent flow distribution through the resin bed. The high surface area of the laterals minimizes pressure loss through the system. On some laterals, there may be blocked off slots, or slots not opened fully. This design assures proper flow and even distribution of the water through the resin bed. The polypropylene construction of the distributor assembly gives it excellent durability.

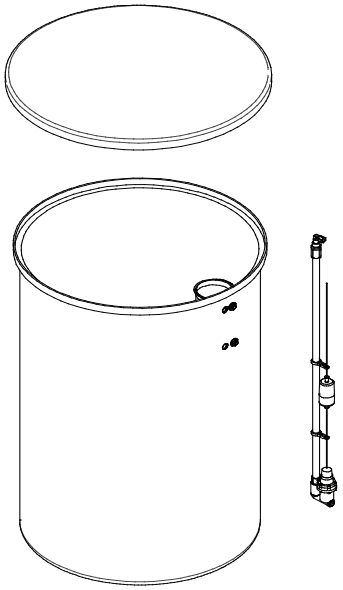
## Riser Tube

A riser tube is used to connect the lower distributor to the control valve. The riser tube is 2.0" in diameter and cut in length, depending upon the tank size.

## Brining System

The brining system supplies the saturated brine required to regenerate the softening resin. It is made up of the tank, brine valve and connective plumbing. Conventional Hydrus softening systems employ a separate brine tank for each softener.

The tanks come in various sizes, typically sized based upon the volume of the media to be regenerated. Larger tanks paired with smaller softeners can extend the time between required maintenance. The tanks are designed to ease the loading of softener grade salt. They are automatically filled with water to dissolve the solid salt into a saturated liquid form. All brine tanks include an overflow connection to drain an accidental tank overflow.



**Brine Tank**

[1] See installation manual for Hydrus - specific plumbing requirements, p/n 12190M

Each brine tank includes a brine valve to adjust the volume of brine to be used each regeneration. Each tank and salt setting combination has its own required setting. The setting is made during installation and should not require any operational maintenance. Should the brine tank or softener have to be moved or modified in any way, or if the hardness of the influent water changes, an adjustment may be required. A table is on page 18 of this manual that provides instruction on the adjustment of brine valves.

Hydrus softeners are generally set up for two different salt dosages. They are set up for either high efficiency or for high capacity. Further, the salt dosage is based upon the configuration of the system, whether simplex or multiplex.

Multiplex systems, which all regenerate countercurrently with soft water, are the most efficient. This holds regardless of setting. Efficiencies are easily compared by considering the grains of hardness exchanged versus the number of pounds of salt used per regeneration. The values run from as low as 2,000 grains/pound of salt on a simplex unit adjusted for high capacity to as high as 4,330 grains/pound of salt for a multiplex system adjusted for high efficiency.

| | lb/ft³ | 16x65 | 18x65 | 21x62 | 24x65 | 30x72 | 36x72 | 42x72 |
|---|---|---|---|---|---|---|---|---|
| Multiplex Softener | 5.0 | 4,100 | 4,330 | 4,005 | 4,103 | 4,304 | 4,304 | 4,304 |
| Multiplex Softener | 7.5 | 3,333 | 3,467 | 3,200 | 3,283 | 3,444 | 3,444 | 3,444 |
| Simplex Softener | 10 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 |
| Simplex Softener | 15 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |

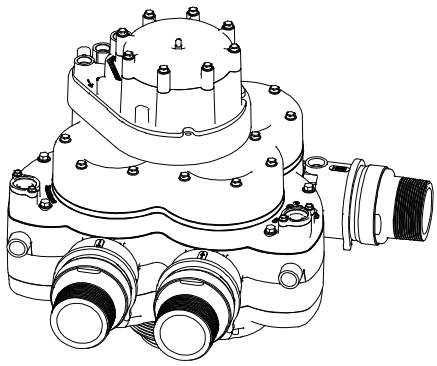
Efficiency, grains/pound of salt

## Central Brining

Central brining, a less efficient option, is available on Hydrus systems. Election to central brining is typically based on space considerations. More brine tanks take up more space, and larger systems require more salt. A brine tank for each softener can take up a considerable amount of floor space. Equipment and instructions for central brine tanks are available separately from Kinetico Incorporated.

## The Hydrus Valve

The Hydrus Valve is at the heart of KineticoPRO's commercial high-flow systems. It's a multi-port valve that controls system flow through a single tank. It is designed to link to other Hydrus valves, making expansion to multi-tank configurations uncomplicated. The Hydrus Valve is a revolutionary design that allows enormous flexibility in system configuration.



The Hydrus uses water pressure to move its internal pistons through service and regeneration cycles. It doesn't use electrical components; therefore, it is ideally suited for installation in the harshest environments. All regeneration sequences and timing are managed via an on-board hydraulic control disc.

The Hydrus uses a hydraulic start signal to initiate a regeneration. The Hydrus control valve controls the following functions: service, regeneration, brine tank filling and kick-next in the case of multiplex systems. If central brining is employed, the brine tank filling is done by way of pressurized feed. Regeneration sequences differ between the countercurrent regenerating multiplex systems and cocurrent regenerating simplex systems. The service cycles are the same.

# System Configuration

**The following installation guidelines must be followed:**

- The system must be complete and parameters set to factory-specified values
- The system and installation must comply with federal, state and local laws
- The system is not intended to be used for treating water that is microbiologically unsafe or of unknown quality without disinfection before or after the system
- The procedure for sanitizing the softener found on page 23 must be followed after installation or service
- The system is intended to be operated within the specified parameters given in this section, including the following:
    - The system is intended to be installed indoors, on a level surface where the temperature is controlled between 35° and 120°F and operated at an effluent pressure of at least 35 psi and an influent pressure not exceeding 125 psi.
    - Provisions for an anti-siphon air gap should be part of the installation to prevent a cross connection between the water system and the waste system.
    - Waste connections or drain outlets shall be designed and constructed to provide for the connection to the sanitary water system through an air gap of 2 pipe diameters or 1 inch (25 mm) whichever is larger.
    - Flexible connections between the tanks and plumbing are required to allow for tank expansion under pressure.
    - A vacuum breaker is required at the highest point in the plumbing.

**Failure to follow the instructions in this manual and to follow proper installation procedures may void the warranty, cause bodily harm, cause the system to operate improperly or not at all and/or cause damage to the system. Compliance must also be achieved in a modification of the original installation. Consult a KineticoPRO professional or the appropriate technical documentation if a modification or an alteration is planned or carried out.**

# Sizing

A proper salt setting is dependent upon two factors: the hardness and iron concentration in the feed water, and the desired water softness. There are two different salt settings: the high capacity setting and the high efficiency setting.

## General guidelines for a multi-tank system:

- The high capacity salt setting should be used if the feed water iron is higher than 1 mg/L.
- The high capacity salt setting should be used if the softened water hardness needs to be less than 4 mg/L.
- The high efficiency salt setting is used when the soft water can have 4-10 mg/L hardness as calcium carbonate, if the feed hardness is 15 grain/gal or less.
- The high efficiency salt setting is used when the soft water can have up to 20 mg/L as $CaCO_3$ when the feed water hardness is up to 40 grain/gal.

## General guidelines for a single tank softener:

- It should not be used to provide soft water with less than 1 mg/L hardness.
- The high capacity salt setting is used to provide soft water with 2-9 mg/L.
- The high capacity setting should be used when the feed water iron is above 1 mg/L.
- The high efficiency setting is used when the desired soft water hardness can be greater than 10 mg/L.

As discussed, resin capacity is subject to several factors: the life of the media, additional cation loading not including iron and manganese, and others. Caution can be applied by including a margin of safety to ensure a constant supply of soft water for critical applications. A table is given on page 17.

## Compensated Hardness Equation:

$$\frac{\text{mg/L Hardness, as } CaCO_3}{17.1} + 3\ \text{mg/L iron} + 5\ \text{mg/L manganese} = \text{Compensated Hardness, grain/gal as } CaCO_3$$

The equation above is used to determine the compensated hardness. It provides a method for converting iron and manganese into an equivalent hardness.

The following tables provide the maximum gallons set point of each system available versus the grains per gallon (gpg):

## Simplex Systems (maximum capacity in thousands of gallons)

| | HIGH EFFICIENCY Brine Dose (10 lb/ft³ Salt Setting) | | | | | | | HIGH CAPACITY Brine Dose (15 lb/ft³ Salt Setting) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GPG** | **HS 116s** | **HS 118s** | **HS 121s** | **HS 124s** | **HS 130s** | **HS 136s** | **HS 142s** | **HS 116s** | **HS 118s** | **HS 121s** | **HS 124s** | **HS 130s** | **HS 136s** | **HS 142s** |
| **50** | 2.0 | 2.5 | 3.0 | 4.0 | 6.0 | 9.0 | 13.0 | 2.4 | 3.0 | 3.6 | 4.8 | 7.2 | 10.8 | 15.6 |
| **45** | 2.2 | 2.8 | 3.3 | 4.4 | 6.7 | 10.0 | 14.4 | 2.7 | 3.3 | 4.0 | 5.3 | 8.0 | 12.0 | 17.3 |
| **40** | 2.5 | 3.1 | 3.8 | 5.0 | 7.5 | 11.3 | 16.3 | 3.0 | 3.8 | 4.5 | 6.0 | 9.0 | 13.5 | 19.5 |
| **35** | 2.9 | 3.6 | 4.3 | 5.7 | 8.6 | 12.9 | 18.6 | 3.4 | 4.3 | 5.1 | 6.9 | 10.3 | 15.4 | 22.3 |
| **30** | 3.3 | 4.2 | 5.0 | 6.7 | 10.0 | 15.0 | 21.7 | 4.0 | 5.0 | 6.0 | 8.0 | 12.0 | 18.0 | 26.0 |
| **25** | 4.0 | 5.0 | 6.0 | 8.0 | 12.0 | 18.0 | 26.0 | 4.8 | 6.0 | 7.2 | 9.6 | 14.4 | 21.6 | 31.2 |
| **20** | 5.0 | 6.3 | 7.5 | 10.0 | 15.0 | 22.5 | 32.5 | 6.0 | 7.5 | 9.0 | 12.0 | 18.0 | 27.0 | 39.0 |
| **19** | 5.3 | 6.6 | 7.9 | 10.5 | 15.8 | 23.7 | 34.2 | 6.3 | 7.9 | 9.5 | 12.6 | 18.9 | 28.4 | 41.1 |
| **18** | 5.6 | 6.9 | 8.3 | 11.1 | 16.7 | 25.0 | 36.1 | 6.7 | 8.3 | 10.0 | 13.3 | 20.0 | 30.0 | 43.3 |
| **17** | 5.9 | 7.4 | 8.8 | 11.8 | 17.6 | 26.5 | 38.2 | 7.1 | 8.8 | 10.6 | 14.1 | 21.2 | 31.8 | 45.9 |
| **16** | 6.3 | 7.8 | 9.4 | 12.5 | 18.8 | 28.1 | 40.6 | 7.5 | 9.4 | 11.3 | 15.0 | 22.5 | 33.8 | 48.8 |
| **15** | 6.7 | 8.3 | 10.0 | 13.3 | 20.0 | 30.0 | 43.3 | 8.0 | 10.0 | 12.0 | 16.0 | 24.0 | 36.0 | 52.0 |
| **14** | 7.1 | 8.9 | 10.7 | 14.3 | 21.4 | 32.1 | 46.4 | 8.6 | 10.7 | 12.9 | 17.1 | 25.7 | 38.6 | 55.7 |
| **13** | 7.7 | 9.6 | 11.5 | 15.4 | 23.1 | 34.6 | 50.0 | 9.2 | 11.5 | 13.8 | 18.5 | 27.7 | 41.5 | 60.0 |
| **12** | 8.3 | 10.4 | 12.5 | 16.7 | 25.0 | 37.5 | 54.2 | 10.0 | 12.5 | 15.0 | 20.0 | 30.0 | 45.0 | 65.0 |
| **11** | 9.1 | 11.4 | 13.6 | 18.2 | 27.3 | 40.9 | 59.1 | 10.9 | 13.6 | 16.4 | 21.8 | 32.7 | 49.1 | 70.9 |
| **10** | 10.0 | 12.5 | 15.0 | 20.0 | 30.0 | 45.0 | 65.0 | 12.0 | 15.0 | 18.0 | 24.0 | 36.0 | 54.0 | 78.0 |
| **9** | 11.1 | 13.9 | 16.7 | 22.2 | 33.3 | 50.0 | 72.2 | 13.3 | 16.7 | 20.0 | 26.7 | 40.0 | 60.0 | 86.7 |
| **8** | 12.5 | 15.6 | 18.8 | 25.0 | 37.5 | 56.3 | 81.3 | 15.0 | 18.8 | 22.5 | 30.0 | 45.0 | 67.5 | 97.5 |
| **7** | 14.3 | 17.9 | 21.4 | 28.6 | 42.9 | 64.3 | 92.9 | 17.1 | 21.4 | 25.7 | 34.3 | 51.4 | 77.1 | 111.4 |
| **6** | 16.7 | 20.8 | 25.0 | 33.3 | 50.0 | 75.0 | 108.3 | 20.0 | 25.0 | 30.0 | 40.0 | 60.0 | 90.0 | 130.0 |
| **5** | 20.0 | 25.0 | 30.0 | 40.0 | 60.0 | 90.0 | 130.0 | 24.0 | 30.0 | 36.0 | 48.0 | 72.0 | 108.0 | 156.0 |
| **4** | 25.0 | 31.3 | 37.5 | 50.0 | 75.0 | 112.5 | 162.5 | 30.0 | 37.5 | 45.0 | 60.0 | 90.0 | 135.0 | 195.0 |
| **3** | 33.3 | 41.7 | 50.0 | 66.7 | 100.0 | 150.0 | 216.7 | 40.0 | 50.0 | 60.0 | 80.0 | 120.0 | 180.0 | 260.0 |
| **2** | 50.0 | 62.5 | 75.0 | 100.0 | 150.0 | 225.0 | 325.0 | 60.0 | 75.0 | 90.0 | 120.0 | 180.0 | 270.0 | 390.0 |
| **1** | 100.0 | 125.0 | 150.0 | 200.0 | 300.0 | 450.0 | 650.0 | 120.0 | 150.0 | 180.0 | 240.0 | 360.0 | 540.0 | 780.0 |

# Two Tank Systems (maximum capacity in thousands of gallons)

| | HIGH EFFICIENCY Brine Dose (5 lb/ft³ Salt Setting) | | | | | | | HIGH CAPACITY Brine Dose (7.5 lb/ft³ Salt Setting) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GPG | HS 216s OD | HS 218s OD | HS 221s OD | HS 224s OD | HS 230s OD | HS 236s OD | HS 242s OD | HS 216s OD | HS 218s OD | HS 221s OD | HS 224s OD | HS 230s OD | HS 236s OD | HS 242s OD |
| **50** | 2.6 | 3.7 | 4.1 | 5.7 | 8.7 | 13.1 | 19.1 | 3.4 | 4.6 | 5.1 | 7.0 | 10.8 | 16.2 | 23.6 |
| **45** | 3.0 | 4.2 | 4.6 | 6.4 | 9.9 | 14.8 | 21.6 | 3.8 | 5.2 | 5.7 | 7.8 | 12.2 | 18.3 | 26.6 |
| **40** | 3.4 | 4.8 | 5.3 | 7.3 | 11.3 | 17.0 | 24.7 | 4.4 | 5.9 | 6.5 | 8.9 | 13.9 | 20.9 | 30.3 |
| **35** | 4.0 | 5.6 | 6.2 | 8.5 | 13.1 | 19.8 | 28.7 | 5.1 | 6.8 | 7.5 | 10.4 | 16.1 | 24.2 | 35.1 |
| **30** | 4.7 | 6.6 | 7.3 | 10.0 | 15.6 | 23.5 | 34.0 | 6.1 | 8.1 | 8.9 | 12.2 | 19.1 | 28.6 | 41.5 |
| **25** | 5.8 | 8.1 | 8.9 | 12.2 | 19.0 | 28.6 | 41.5 | 7.4 | 9.8 | 10.8 | 14.9 | 23.2 | 34.8 | 50.4 |
| **20** | 7.4 | 10.2 | 11.3 | 15.5 | 24.2 | 36.4 | 52.7 | 9.4 | 12.4 | 13.7 | 18.8 | 29.4 | 44.1 | 63.9 |
| **19** | 7.8 | 10.8 | 12.0 | 16.4 | 25.6 | 38.4 | 55.6 | 9.9 | 13.1 | 14.5 | 19.8 | 31.0 | 46.6 | 67.4 |
| **18** | 8.3 | 11.4 | 12.7 | 17.3 | 27.1 | 40.7 | 58.9 | 10.5 | 13.8 | 15.3 | 21.0 | 32.8 | 49.3 | 71.3 |
| **17** | 8.8 | 12.1 | 13.4 | 18.4 | 28.8 | 43.2 | 62.5 | 11.2 | 14.7 | 16.2 | 22.3 | 34.9 | 52.3 | 75.7 |
| **16** | 9.4 | 12.9 | 14.3 | 19.6 | 30.7 | 46.0 | 66.7 | 11.9 | 15.6 | 17.3 | 23.7 | 37.1 | 55.7 | 80.7 |
| **15** | 10.1 | 13.8 | 15.3 | 21.0 | 32.8 | 49.3 | 71.3 | 12.7 | 16.7 | 18.5 | 25.4 | 39.7 | 59.6 | 86.3 |
| **14** | 10.8 | 14.9 | 16.5 | 22.5 | 35.3 | 53.0 | 76.7 | 13.7 | 18.0 | 19.9 | 27.2 | 42.7 | 64.0 | 92.7 |
| **13** | 11.7 | 16.0 | 17.8 | 24.3 | 38.1 | 57.2 | 82.8 | 14.8 | 19.4 | 21.5 | 29.4 | 46.1 | 69.2 | 100.0 |
| **12** | 12.7 | 17.4 | 19.3 | 26.4 | 41.4 | 62.2 | 90.0 | 16.1 | 21.1 | 23.3 | 31.9 | 50.0 | 75.1 | 108.7 |
| **11** | 13.9 | 19.1 | 21.2 | 28.9 | 45.3 | 68.1 | 98.5 | 17.6 | 23.0 | 25.5 | 34.9 | 54.7 | 82.2 | 118.8 |
| **10** | 15.4 | 21.0 | 23.3 | 31.9 | 50.0 | 75.1 | 108.6 | 19.4 | 25.4 | 28.1 | 38.5 | 60.4 | 90.6 | 131.0 |
| **9** | 17.2 | 23.4 | 26.0 | 35.6 | 55.8 | 83.7 | 121.1 | 21.6 | 28.3 | 31.3 | 42.9 | 67.3 | 100.9 | 146.0 |
| **8** | 19.4 | 26.5 | 29.3 | 40.1 | 62.9 | 94.5 | 136.6 | 24.4 | 31.9 | 35.3 | 48.3 | 75.9 | 113.9 | 164.6 |
| **7** | 22.3 | 30.3 | 33.6 | 46.0 | 72.2 | 108.3 | 156.6 | 28.0 | 36.5 | 40.4 | 55.4 | 86.9 | 130.5 | 188.6 |
| **6** | 26.1 | 35.5 | 39.4 | 53.8 | 84.5 | 126.7 | 183.2 | 32.7 | 42.7 | 47.3 | 64.8 | 101.7 | 152.6 | 220.6 |
| **5** | 31.4 | 42.7 | 47.4 | 64.7 | 101.7 | 152.6 | 220.5 | 39.4 | 51.4 | 56.9 | 77.9 | 122.4 | 183.6 | 265.4 |
| **4** | 39.4 | 53.5 | 59.4 | 81.2 | 127.5 | 191.3 | 276.5 | 49.4 | 64.4 | 71.3 | 97.6 | 153.4 | 230.1 | 332.5 |
| **3** | 52.7 | 71.6 | 79.4 | 108.5 | 170.5 | 255.9 | 369.7 | 66.1 | 86.1 | 95.3 | 130.4 | 205.0 | 307.6 | 444.4 |
| **2** | 79.4 | 107.6 | 119.5 | 163.2 | 256.6 | 385.0 | 556.2 | 99.4 | 129.4 | 143.3 | 196.1 | 308.3 | 462.6 | 668.3 |
| **1** | 159.4 | 215.9 | 239.6 | 327.3 | 514.9 | 772.3 | 1115.8 | 199.4 | 259.4 | 287.3 | 393.1 | 618.3 | 927.5 | 1339.9 |

# Three Tank Systems (maximum capacity in thousands of gallons)

| | HIGH EFFICIENCY Brine Dose (5 lb/ft³ Salt Setting) | | | | | | | HIGH CAPACITY Brine Dose (7.5 lb/ft³ Salt Setting) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GPG** | **HS 316s OD** | **HS 318s OD** | **HS 321s OD** | **HS 324s OD** | **HS 330s OD** | **HS 336s OD** | **HS 342s OD** | **HS 316s OD** | **HS 318s OD** | **HS 321s OD** | **HS 324s OD** | **HS 330s OD** | **HS 336s OD** | **HS 342s OD** |
| **50** | 3.9 | 5.6 | 6.2 | 8.5 | 13.1 | 19.7 | 28.7 | 5.1 | 6.9 | 7.6 | 10.5 | 16.2 | 24.3 | 35.4 |
| **45** | 4.4 | 6.3 | 7.0 | 9.6 | 14.8 | 22.3 | 32.4 | 5.8 | 7.8 | 8.6 | 11.8 | 18.2 | 27.4 | 39.9 |
| **40** | 5.1 | 7.2 | 8.0 | 11.0 | 16.9 | 25.5 | 37.0 | 6.6 | 8.8 | 9.8 | 13.4 | 20.8 | 31.3 | 45.4 |
| **35** | 6.0 | 8.4 | 9.3 | 12.7 | 19.7 | 29.6 | 43.0 | 7.7 | 10.2 | 11.3 | 15.5 | 24.1 | 36.3 | 52.6 |
| **30** | 7.1 | 9.9 | 11.0 | 15.1 | 23.4 | 35.2 | 51.0 | 9.1 | 12.1 | 13.4 | 18.3 | 28.6 | 42.9 | 62.2 |
| **25** | 8.7 | 12.1 | 13.4 | 18.3 | 28.6 | 42.9 | 62.2 | 11.1 | 14.7 | 16.2 | 22.3 | 34.8 | 52.2 | 75.7 |
| **20** | 11.1 | 15.3 | 17.0 | 23.3 | 36.3 | 54.5 | 79.0 | 14.1 | 18.6 | 20.6 | 28.2 | 44.1 | 66.2 | 95.8 |
| **19** | 11.7 | 16.2 | 17.9 | 24.6 | 38.4 | 57.6 | 83.4 | 14.9 | 19.6 | 21.7 | 29.7 | 46.5 | 69.9 | 101.1 |
| **18** | 12.4 | 17.1 | 19.0 | 26.0 | 40.6 | 61.0 | 88.3 | 15.8 | 20.8 | 23.0 | 31.5 | 49.2 | 73.9 | 107.0 |
| **17** | 13.2 | 18.2 | 20.2 | 27.6 | 43.2 | 64.8 | 93.8 | 16.7 | 22.0 | 24.4 | 33.4 | 52.3 | 78.5 | 113.6 |
| **16** | 14.1 | 19.4 | 21.5 | 29.4 | 46.0 | 69.1 | 100.0 | 17.9 | 23.5 | 26.0 | 35.6 | 55.7 | 83.6 | 121.0 |
| **15** | 15.1 | 20.7 | 23.0 | 31.5 | 49.2 | 73.9 | 107.0 | 19.1 | 25.1 | 27.8 | 38.0 | 59.6 | 89.4 | 129.4 |
| **14** | 16.2 | 22.3 | 24.7 | 33.8 | 52.9 | 79.4 | 115.0 | 20.5 | 26.9 | 29.8 | 40.9 | 64.0 | 96.1 | 139.0 |
| **13** | 17.6 | 24.1 | 26.7 | 36.5 | 57.2 | 85.8 | 124.2 | 22.2 | 29.1 | 32.2 | 44.1 | 69.1 | 103.7 | 150.1 |
| **12** | 19.1 | 26.2 | 29.0 | 39.7 | 62.1 | 93.3 | 135.0 | 24.1 | 31.6 | 35.0 | 47.9 | 75.1 | 112.7 | 163.0 |
| **11** | 20.9 | 28.6 | 31.7 | 43.4 | 68.0 | 102.1 | 147.7 | 26.4 | 34.5 | 38.2 | 52.4 | 82.1 | 123.2 | 178.2 |
| **10** | 23.1 | 31.6 | 35.0 | 47.9 | 75.1 | 112.6 | 162.9 | 29.1 | 38.1 | 42.2 | 57.7 | 90.6 | 135.9 | 196.6 |
| **9** | 25.8 | 35.2 | 39.0 | 53.3 | 83.7 | 125.6 | 181.6 | 32.4 | 42.4 | 47.0 | 64.3 | 100.9 | 151.4 | 218.9 |
| **8** | 29.1 | 39.7 | 44.0 | 60.2 | 94.4 | 141.7 | 204.9 | 36.6 | 47.8 | 53.0 | 72.5 | 113.8 | 170.8 | 246.9 |
| **7** | 33.4 | 45.5 | 50.5 | 69.0 | 108.3 | 162.5 | 234.9 | 42.0 | 54.8 | 60.7 | 83.1 | 130.4 | 195.7 | 282.9 |
| **6** | 39.1 | 53.2 | 59.0 | 80.7 | 126.7 | 190.1 | 274.8 | 49.1 | 64.1 | 71.0 | 97.1 | 152.6 | 228.9 | 330.9 |
| **5** | 47.1 | 64.0 | 71.0 | 97.1 | 152.5 | 228.9 | 330.8 | 59.1 | 77.1 | 85.4 | 116.8 | 183.6 | 275.4 | 398.0 |
| **4** | 59.1 | 80.3 | 89.1 | 121.7 | 191.3 | 287.0 | 414.7 | 74.1 | 96.6 | 107.0 | 146.4 | 230.0 | 345.1 | 498.8 |
| **3** | 79.1 | 107.3 | 119.1 | 162.8 | 255.8 | 383.8 | 554.6 | 99.1 | 129.1 | 143.0 | 195.6 | 307.5 | 461.4 | 666.7 |
| **2** | 119.1 | 161.5 | 179.2 | 244.8 | 384.9 | 577.5 | 834.4 | 149.1 | 194.1 | 215.0 | 294.1 | 462.5 | 693.8 | 1002.5 |
| **1** | 239.1 | 323.8 | 359.4 | 491.0 | 722.3 | 1158.5 | 1673.6 | 299.1 | 389.1 | 431.0 | 589.6 | 927.5 | 1391.3 | 2009.8 |

## Four Tank Systems (maximum capacity in thousands of gallons)

| | HIGH EFFICIENCY Brine Dose (5 lb/ft³ Salt Setting) | | | | | | | HIGH CAPACITY Brine Dose (7.5 lb/ft³ Salt Setting) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GPG | HS 416s OD | HS 418s OD | HS 421s OD | HS 424s OD | HS 430s OD | HS 436s OD | HS 442s OD | HS 416s OD | HS 418s OD | HS 421s OD | HS 424s OD | HS 430s OD | HS 436s OD | HS 442s OD |
| **50** | 5.2 | 7.4 | 8.2 | 11.3 | 17.4 | 26.2 | 38.2 | 7.1 | 9.2 | 10.1 | 13.9 | 21.6 | 32.4 | 47.2 |
| **45** | 5.9 | 8.4 | 9.3 | 12.8 | 19.7 | 29.7 | 43.2 | 8.0 | 10.3 | 11.4 | 15.7 | 24.3 | 36.6 | 53.1 |
| **40** | 6.8 | 9.6 | 10.6 | 14.6 | 22.6 | 34.0 | 49.4 | 9.1 | 11.8 | 13.0 | 17.9 | 27.8 | 41.7 | 60.6 |
| **35** | 7.9 | 11.2 | 12.3 | 16.9 | 26.3 | 39.5 | 57.4 | 10.5 | 13.6 | 15.1 | 20.7 | 32.2 | 48.4 | 70.2 |
| **30** | 9.5 | 13.2 | 14.6 | 20.1 | 31.2 | 46.9 | 68.0 | 12.4 | 16.1 | 17.8 | 24.5 | 38.1 | 57.2 | 83.0 |
| **25** | 11.6 | 16.1 | 17.8 | 24.4 | 38.1 | 57.2 | 83.0 | 15.1 | 19.6 | 21.7 | 29.7 | 46.4 | 69.6 | 100.9 |
| **20** | 14.8 | 20.4 | 22.6 | 31.0 | 48.4 | 72.7 | 105.3 | 19.1 | 24.8 | 27.4 | 37.6 | 58.8 | 88.2 | 127.8 |
| **19** | 15.6 | 21.6 | 23.9 | 32.7 | 51.1 | 76.8 | 111.2 | 20.2 | 26.2 | 28.9 | 39.7 | 62.0 | 93.1 | 134.8 |
| **18** | 16.6 | 22.8 | 25.3 | 34.7 | 54.2 | 81.3 | 117.8 | 21.3 | 27.7 | 30.6 | 42.0 | 65.7 | 98.6 | 142.7 |
| **17** | 17.6 | 24.3 | 26.9 | 36.8 | 57.5 | 86.4 | 125.1 | 22.6 | 29.4 | 32.5 | 44.5 | 69.7 | 104.6 | 151.5 |
| **16** | 18.8 | 25.8 | 28.6 | 39.2 | 61.3 | 92.1 | 133.3 | 24.1 | 31.3 | 34.6 | 47.4 | 74.3 | 111.5 | 161.3 |
| **15** | 20.1 | 27.7 | 30.7 | 42.0 | 65.6 | 98.5 | 142.6 | 25.8 | 33.5 | 37.0 | 50.7 | 79.4 | 119.2 | 172.5 |
| **14** | 21.7 | 29.7 | 32.9 | 45.1 | 70.6 | 105.9 | 153.3 | 27.7 | 35.9 | 39.8 | 54.5 | 85.3 | 128.1 | 185.3 |
| **13** | 23.4 | 32.1 | 35.6 | 48.7 | 76.2 | 114.4 | 165.6 | 29.9 | 38.8 | 42.9 | 58.8 | 92.1 | 138.3 | 200.1 |
| **12** | 25.5 | 34.9 | 38.7 | 52.9 | 82.9 | 124.4 | 179.9 | 32.4 | 42.1 | 46.6 | 63.8 | 100.1 | 150.2 | 217.3 |
| **11** | 27.9 | 38.1 | 42.3 | 57.9 | 90.7 | 136.1 | 196.9 | 35.5 | 46.1 | 51.0 | 69.8 | 109.5 | 164.3 | 237.7 |
| **10** | 30.8 | 42.1 | 46.7 | 63.8 | 100.1 | 150.2 | 217.2 | 39.1 | 50.8 | 56.2 | 77.0 | 120.8 | 181.2 | 262.1 |
| **9** | 34.4 | 46.9 | 52.0 | 71.1 | 111.5 | 167.4 | 242.1 | 43.5 | 56.6 | 62.6 | 85.7 | 134.5 | 201.9 | 291.9 |
| **8** | 38.8 | 52.9 | 58.7 | 80.2 | 125.9 | 188.9 | 273.2 | 49.1 | 63.8 | 70.6 | 96.7 | 151.8 | 227.7 | 329.2 |
| **7** | 44.5 | 60.6 | 67.3 | 92.0 | 144.3 | 216.6 | 313.2 | 56.2 | 73.1 | 80.9 | 110.7 | 173.9 | 260.9 | 377.2 |
| **6** | 52.1 | 71.0 | 78.7 | 107.6 | 168.9 | 253.5 | 366.5 | 65.8 | 85.5 | 94.9 | 129.5 | 203.4 | 305.2 | 441.2 |
| **5** | 62.8 | 85.4 | 94.7 | 129.5 | 203.4 | 305.1 | 441.1 | 79.1 | 102.8 | 113.8 | 155.8 | 244.7 | 367.2 | 530.7 |
| **4** | 78.8 | 107.0 | 118.8 | 162.3 | 255.0 | 382.6 | 553.0 | 99.1 | 128.8 | 142.6 | 195.2 | 306.7 | 460.2 | 665.0 |
| **3** | 105.5 | 143.1 | 158.8 | 217.0 | 341.1 | 511.7 | 739.5 | 132.4 | 172.1 | 190.6 | 260.8 | 410.1 | 615.2 | 888.9 |
| **2** | 158.8 | 215.3 | 238.9 | 326.4 | 513.3 | 770.0 | 1112.5 | 199.1 | 258.8 | 286.6 | 392.1 | 616.7 | 925.1 | 1336.6 |
| **1** | 318.8 | 431.8 | 479.2 | 654.7 | 1029.7 | 1544.7 | 2231.5 | 399.1 | 518.8 | 574.6 | 786.1 | 1236.6 | 1855.0 | 2679.8 |

**Note:** The multiplex softeners are efficiency rated according to NSF/ANSI 44 as shown in the proceeding four tables, given that the salt dosages are as stated in the table heading.

### Gallons Set Point

The gallons set point tables represent the maximum capacity of the Hydrus softeners. The simplex table is based on typical resin capacity. The multiplex tables are based on demonstrated capacity in the softener NSF/ANSI STD 44 testing, which is to a 1.0 gpg leakage point.

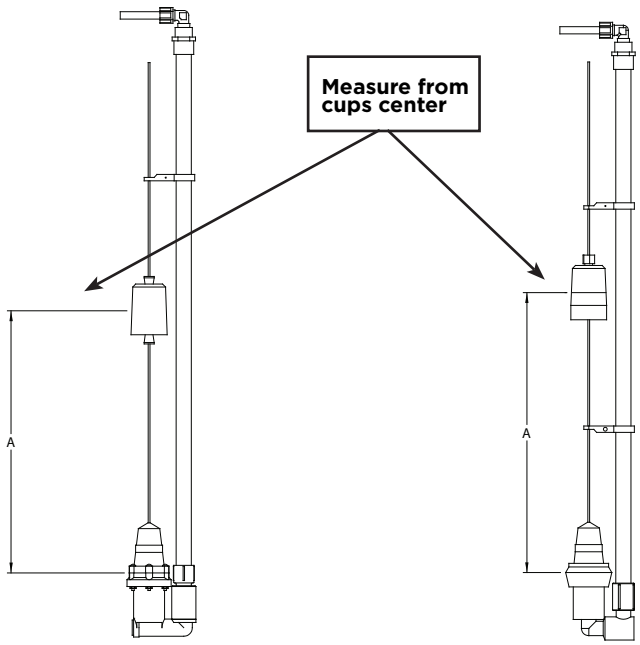
The gallons between regeneration tables are the maximum volume, accounting for the regeneration volume. For "Real World" applications, a safety factor should be applied. The following table suggests safety factors, based on application and desired water hardness.

| Desired Hardness, mg/L $CaCO_3$ | Safety Factor Multiplier | |
|---|---|---|
| | Intermittent Service | Continuous Service |
| <1 | 0.75 | 0.60 |
| 1 — 3 | 0.80 | 0.70 |
| 4 — 9 | 0.85 | 0.75 |
| 10 — 20 | 0.90 | 0.80 |
| > 20 | 0.95 | 0.85 |

# Brining System

Following the chart below, set the brine valve by raising or lowering the float cup:

| Float Setting (A) | | | | |
|---|---|---|---|---|
| Salt Dose, in lb | Brine Drum Size | | | |
| | 24 x 50 | 30 x 48 | 39 x 60 | 50 x 60 |
| 20 | 8.1" | | | |
| 25 | 10.1" | 6.6" | | |
| 30 | 12.1" | 8.0" | | |
| 38 | 15.3' | 10.1" | 6.0" | |
| 40 | 16.1" | 10.6" | 6.3" | |
| 45 | 18.1" | 11.9" | 7.1" | |
| 50 | 20.1" | 13.3" | 7.8" | |
| 60 | 24.2" | 15.9' | 9.4" | 6.0" |
| 75 | 30.2' | 19.9" | 11.8" | 7.5" |
| 80 | | 21.2" | 12.5" | 8.0" |
| 90 | | 23.9" | 14.1" | 9.0" |
| 120 | | 31.8' | 18.8" | 12.1" |
| 135 | | | 21.2" | 13.6" |
| 180 | | | 28.2" | 18.1" |
| 270 | | | | 27.1" |
| 390 | | | | 39" * |



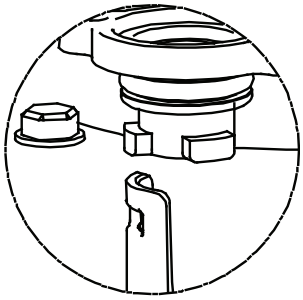

**** Not recommended***

The following chart provides a guide to the required salt settings for a given tank size. Obtain the number pounds required from the table required from the table below and then to set the height of the float cup.

| Salt Dose in lbs (Per Tank) | | | | | |
|---|---|---|---|---|---|
| Tank Size | $Ft^3$ of resin | Simplex System | | Multi-tank System | |
| | | 10 lb/$ft^3$ | 15 lb/$ft^3$ | 5 lb/$ft^3$ | 7.5 lb/$ft^3$ |
| 16 x 65 | 4 | 40 lb | 60 lb | 20 lb | 30 lb |
| 18 x 65 | 5 | 50 lb | 75 lb | 25 lb | 38 lb |
| 21 x 62 | 6 | 60 lb | 90 lb | 30 lb | 45 lb |
| 24 x 65 | 8 | 80 lb | 120 lb | 40 lb | 60 lb |
| 30 x 72 | 12 | 120 lb | 180 lb | 60 lb | 90 lb |
| 36 x 72 | 18 | 180 lb | 270 lb | 90 lb | 135 lb |
| 42 x 72 | 26 | 260 lb | 390 lb | 130 lb | 195 lb |

## Venturi Installation

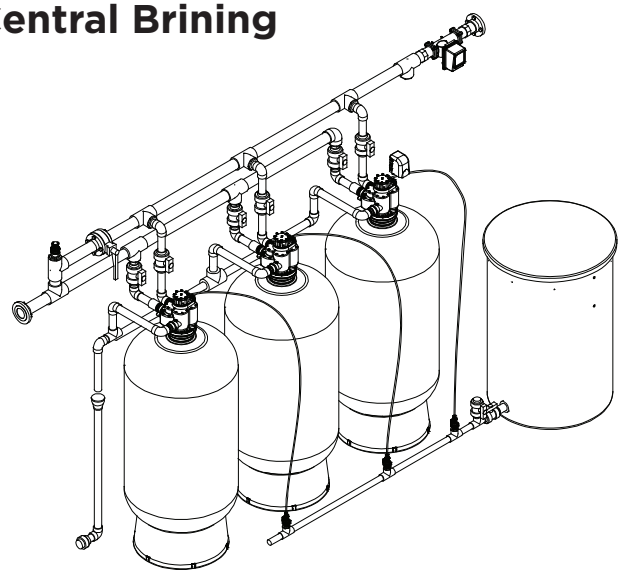
1. Identify the valve body style. The valve body is either a countercurrent or a cocurrent style. An arrow, next to the inlet-side venturi, points to a part number. Part number 10906B is the countercurrent valve body and number 10905B is the cocurrent valve body.
2. Locate the proper venturi cavity for installation. The ports are marked "CO" for simplex systems and "COUNTER" for multi-tank systems.
3. Remove the two screws holding the venturi cover in place. Install the venturi into the venturi cap. Insert venturi & venturi cap into the Level 5A. Make sure the opening of the venturi is in line with the brine port.



The following table identifies which venturi to use in each valve, depending upon tank size whether it's a simplex or a multiplex system:

| Tank Size | Simplex, Cocurrent Regeneration | Multiplex, Countercurrent Regeneration |
|---|---|---|
| 16 x 65 | Brown | Orange |
| 18 x 25 | Brown | Orange |
| 21 x 62 | Brown | Orange |
| 24 x 65 | Brown | Orange |
| 30 x 72 | Brown | Blue |
| 36 x 72 | Yellow | Red |
| 42 x 72 | Yellow | Gold |

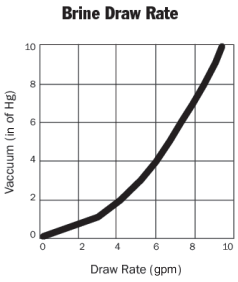
## Central Brining

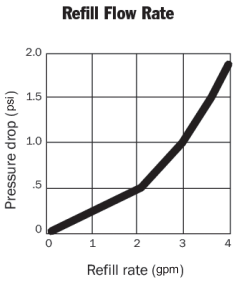


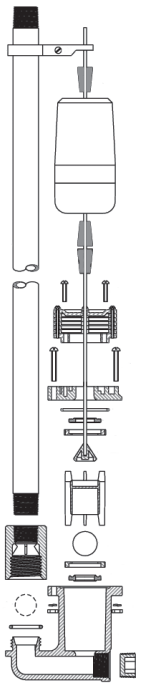
Multiple tank Hydrus softeners can be set up to drain from a central brine drum. This central drum can contain salt and brine, or just brine from a separate salt saturator. Equipment and instructions for Hydrus softeners using central brine tanks are available separately from KineticoPRO Incorporated.

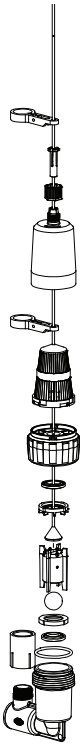
## 454 High Flow Brine Valve

Today's larger commercial brine valves demand higher brine draw and refill rates. Building upon the original 454's design, the 454 High Flow has improved flow characteristics allowing brine draw up to 10 gal/min and refill rates up to four 4 gal/min. A flow diffuser and heavier float prevent premature checking. 36" and 54" Float Rods are available.



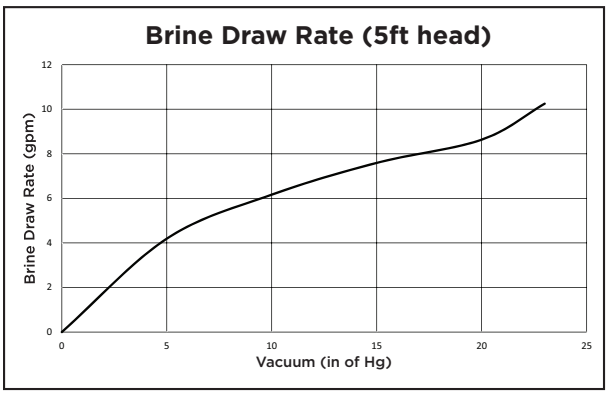



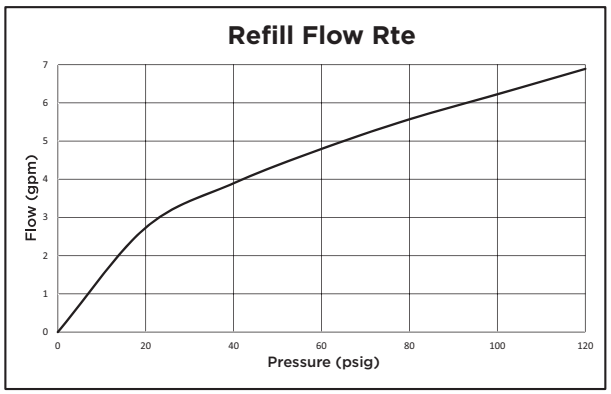





## 484¾" Commercial Brine Valve

Today's larger commercial brine valves demand higher brine draw and refill rates. Building upon the original 454's design, the 454 High Flow has improved flow characteristics allowing brine draw up to 10 gal/min and refill rates up to 4 gal/min. A flow diffuser and heavier float prevent premature checking. 36" and 54" Float Rods are available.



# Backwash Flow Control

For all control valves, one backwash flow control per valve is required. Supplied with each valve is a backwash flow plate. Based on the desired backwash flow rate, this plate is drilled out to provide this flow.

| Target Flow Rate (gpm) | Drill Size (inches) Based on Inlet Pressure | | |
|---|---|---|---|
| | 30-45 psi | 45-60 psi | >60 psi |
| 8 | 0.250 (1/4) | 0.234 (15/64) | 0.218 (7/32) |
| 10 | 0.281 (9/32) | 0.265 (17/64) | 0.234 (15/64) |
| 15 | 0.375 (3/8) | 0.328 (21/64) | 0.296 (19/64) |
| 20 | 0.406 (13/32) | 0.390 (25/64) | 0.359 (23/64) |
| 30 | 0.515 (33/64) | 0.453 (29/64) | 0.437 (7/16) |
| 40 | 0.609 (39/64) | 0.531 (17/32) | 0.468 (15/32) |
| 55 | 0.718 (23/32) | 0.625 (5/8) | 0.546 (35/64) |
| 75 | 0.750 (3/4) | 0.734 (47/64) | 0.718 (23/32) |

**Note:** Pressure at 60°F (15.5°C) water temperature.

# Remote Meter

The remote meter monitors the soft water service flow at the control outlet with the meter impeller being the only in-stream moving part. As the turbine turns, feedback is sent to the controller that will trigger regeneration immediately or on a delayed basis depending on its programming.

KineticoPRO offers two (2) Smart Start controller models:

- Base Smart Start: uses mechanical actuation to measure water usage and initiate regeneration. KineticoPRO modifies the mechanical meter from its original configuration to allow it to interface with the Base Smart Start controller.

# System Maintenance

KineticoPRO has engineered the Hydrus system to provide quality water without requiring extensive maintenance. Minor, routine maintenance is recommended to keep the softener working properly.

No special tools are required for system repairs or maintenance. If the system is completely cut off from power, whether hydraulic or electrical, the system does not require resetting. It picks up where it left off. These are some of the many benefits built into all Hydrus Softening Systems to ensure trouble-free ownership.

Not only is the unit easy to maintain, it's built tough and has been extensively tested. The multiplex systems conform to NSF/ANSI[1] Standard 44 for specific performance claims as verified and substantiated by test data.

## The battery of third-party testing includes:

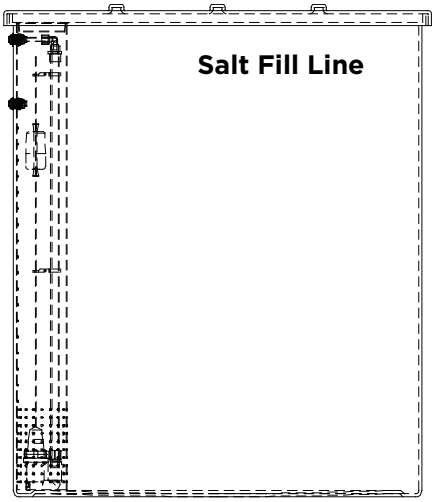
- **Materials of construction** - verifying they are non-leaching and able to maintain surface integrity in operation
- **Structural performance** - verifying working pressure, burst testing, cycle testing, non-hazardous, electrical safety, waste segregation and verification of chemical and mechanical performance and operation
- **Mandatory testing of elective claims** - verifying efficiency, water use, required operating pressures and exchange capacity
- **Materials** - verification of manufacturers promotional materials and the inclusion of specific information in operational and maintenance instructions

# Adding Regenerant

Prior to installation of the Hydrus softener, an estimated salt usage calculation should be carried out. Based upon this calculation and other factors, the system has been set up to run at high efficiency or high capacity. These operational parameters can be fine-tuned after installation.

It's important to select the right salt for regeneration to keep the system operating optimally. Only high quality, softener grade salt should be used. A minimum purity of 99.8% salt is recommended. Manufacturers of softener salt have particular formulations to ensure trouble-free softening.

[1] NSF/ANSI 44 - 2004, "Residential Cation Exchange Water Softeners", NSF International Standard/American National Standard




**Some features and benefits:**

- Uniquely shaped for extra hardness removal
- Virtually 100% water soluble, minimizing brine tank clean out
- Helps prevent mushing, bridging and channeling
- Designed to keep softeners clean and trouble-free

The frequency of salt replenishment is based upon usage and size brine tank in use. Simply fill the brine tank with salt until the level reaches just below the structure that houses the float assembly.

The following table shows the capacities of each available brine drum, along with other information. If a softening system is to be reconfigured, careful consideration must be given to brine drum capacities. A larger, expanded system may require additional brine storage capacity in order to operate properly.

| | 24" x 50" | 30" x 48" | 39" x 60" | 50" x 60" |
|---|---|---|---|---|
| **Tank Composition** | Polyethylene | Polyethylene | Polyethylene | Polyethylene |
| **Brine Valve Material** | Polyethylene | Polyethylene | Polyethylene | Polyethylene |
| **Brine Well Size** | 6" | 6" | 6" | 6" |
| **Overflow Protection** | ½" | ½" | ½" | ½" |
| **Brine Valve Connections** | ½" | ½" | ½" | ½" |
| **Salt Capacity** | 850 lb | 1,350 lb | 1,500 lb | 4,500 lb |
| **Volume Capacity** | 80 gal | 147 gal | 260 gal | 425 gal |
| **Maximum Brine Dosing** | 75 lb | 136 lb | 180 lb | 270 lb |
| **Empty Weight** | 45 lb | 80 lb | 80 lb | 110 lb |

| Maximum Brine Dosing | | | | |
|---|---|---|---|---|
| **5 lb/ft³** | 15 ft³ | 27 ft³ | 36 ft³ | 54 ft³ |
| **7.5 lb/ft³** | 10 ft³ | 18 ft³ | 24 ft³ | 36 ft³ |
| **10 lb/ft³** | 8 ft³ | 14 ft³ | 18 ft³ | 27 ft³ |
| **15 lb/ft³** | 5 ft³ | 9 ft³ | 12 ft³ | 18 ft³ |

**Brine Tank Specifications**

**IMPORTANT:** Never use rock salt in the system as it contains impurities that can interfere with performance.

# Brine Drums

A combination salt storage and brine production tank, this unit is manufactured of corrosion-resistant, rigid polyethylene. The brine tank has an internal brine well chamber to house the brine valve assembly. The brine float assembly allows for adjustable salt settings and provides for a shut-off to the brine refill. The brine tank includes an overflow connection to be plumbed to a suitable drain.

In most cases, one brine tank is required for each media tank. This is because multiplexed systems regenerate sequentially. Once the first tank completes a regeneration, the regeneration of the second tank immediately follows. This brings two challenges to a brining system. One, the system must have sufficient capacity to provide saturated brine to each of the tanks in the sequence. Two, the brining system must retain a constant concentration of brine.

Since the previous tank in the sequence replenishes the brine tank, it changes the concentration of the brine. Although a brine tank may have sufficient capacity to brine several tanks, since the concentration of the brine solution in that tank changes, each media tank requires its own brine tank.

Due to these challenges, a change in configuration is required if brining is to be carried out centrally, and the existing Hydrus system is configured with each media tank paired to a brine tank. Likewise, a change in configuration is required if brining is to be carried out by pairing, and the existing Hydrus system is configured for central brining.

# Remote Meter

A remote meter is installed to measure the volume of processed water. Once the set volume is reached, a signal is interpreted by the Smart Start controller, which in turn sends a hydraulic signal to the lead tank to initiate a regeneration. A remote meter can be used with both simplex and multiplex systems. For multiplex systems, the meter is located on the combined system outlet.

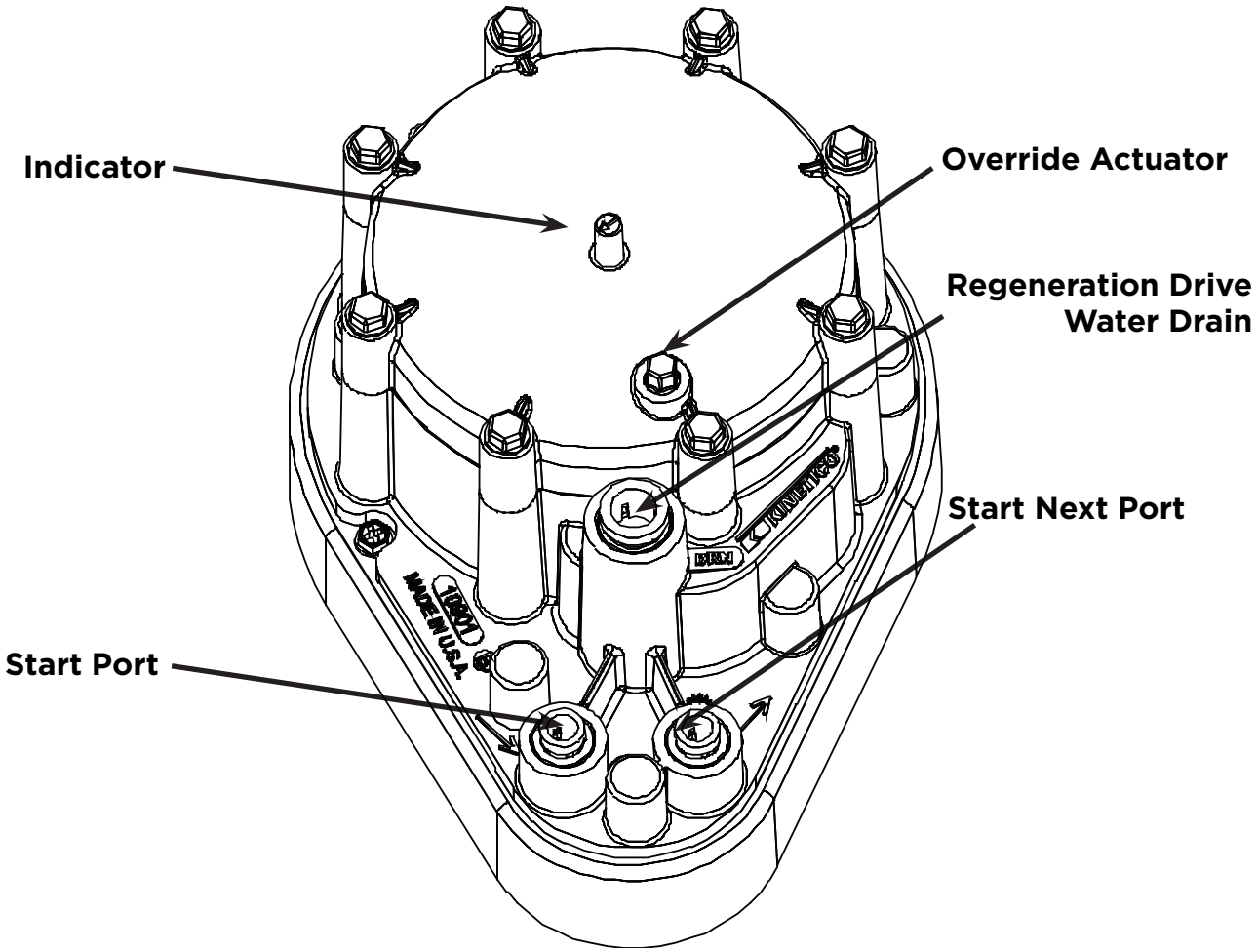
## Manual Regeneration

If the salt storage tank runs out of salt, a manual regeneration of the unit is required after adding salt. An automatic regeneration will eventually occur, but hard water will enter the water system until a regeneration occurs.

**There are several ways to force the Hydrus valve to regenerate:**

1. If using a Base Smart Start controller (refer to its specific Owner's Manual):
   a. Advance the Remote Meter
   b. A regeneration can also be forced by following the procedure described in controller manual. The procedure manually opens the solenoid valve, which in turn directs a flow of water to the Start Port of the Hydrus Valve.
2. Directly on the Hydrus valve with any controller: Manually advance Level 1-2 of the Hydrus valve, as shown below and described:

   To manually regenerate the system, use a ¼" nut driver to turn the small, hex-shaped "Override Actuator." Slowly turn counter-clockwise until the actuator has advanced the "Indicator" arrow to the "BRINE" position, about 10°. At this point, the flow of water will be audible. This indicates a successful regeneration initiation has occurred. If water flow is not heard, contact a KineticoPRO professional .



# Battery Replacement

Insert the battery pack into the mid-wall section to hold the batteries. Plug the keyed battery connector into the two-terminal port on the inside of the circuit board labeled "BAT+POWER."

## Battery Pack

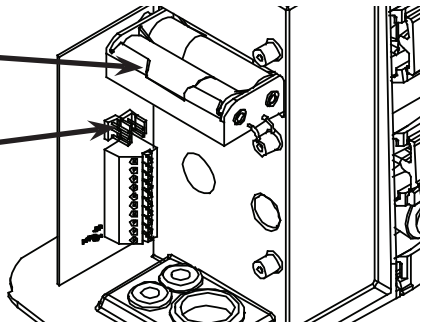
Press into mid-wall section.

**Note:** The fit is tight to keep the battery in place.

## Battery Connection Terminal

Red positive wire is on top of connector, and the connector is keyed.

**Note:** Only use Kinetico battery pack, part number 12106.



# Softener Sanitation Procedure

It's necessary to sanitize the system prior to its first use. It may also become necessary during the lifetime of the softener to disinfect the system. This procedure should be carried out when new resin is installed, any time a significant break in the system occurs and a contaminant may have entered the system, or if the water supply has been in some way temporarily contaminated.

1. Regenerate both tanks of the water conditioning unit with sodium chloride (salt). Use a clean grade of salt appropriate for use with water treatment equipment. **Do NOT use rock salt.**
2. Mix one fluid ounce of unscented household bleach per four gallons of clean/soft water. This should make a 100 ppm solution. A table is provided below, which gives the gallons of disinfectant required for each system.

| Tank Size | 16" x 65" | 18" x 65" | 21" x 62" | 24" x 65" | 30" x 72" | 36" x 72" | 42" x 72" |
|---|---|---|---|---|---|---|---|
| **Tank Volume, $ft^3$** | **6.6** | **8.3** | **11** | **13.4** | **25** | **35.3** | **46.1** |
| **Solution Required per tank, gallons** | 3.6 | 4.5 | 6.0 | 7.3 | 13.6 | 19.2 | 25.1 |
| **5.25% Sodium Hypochlorite Required, ounces** | .9 | 1.1 | 1.5 | 1.8 | 3.3 | 4.7 | 6.1 |

3. Disconnect the brine line, and put the ½" tube into the container holding the bleach mixture from the step above.
4. Put the unit into brine draw on one tank.
5. Draw the mixture until a strong bleach odor is detected (smelled or tested) in the drain line. This procedure should produce approximately 20 ppm in the mixed solution.
6. Make sure the system is isolated from service. Advance the control disc to the service position, and allow the unit to stand for 30-60 minutes. The colder the water, the longer the stand time should be.
7. Reconnect the brine line (½" tube) to the brine tank, and backwash each tank of the softener two times.

# Troubleshooting

KineticoPRO has identified 11 problems familiar to softening systems. This troubleshooting guide is intended to serve as a useful diagnostic tool in solving more common, easy to determine problems. If the problem is not shown below, a call to the local KineticoPRO professional should be helpful. KineticoPRO will try to assist over the phone and may send out a service professional.

Beginning with "Frequent Regeneration", possible reasons for the complaint and the corresponding solutions.

## Frequent Regeneration

| Problem | Reason | Solution |
|---|---|---|
| **1. The customer is not familiar with Hydrus unit operation** | ☐ If customer previously owned an electric unit with timer based regeneration, they may not realize that Hydrus units can regenerate at any time of the day or night | ■ Explain to the customer how the Hydrus softener works<br>■ Emphasize that regeneration is controlled by the measurement of water use rather than on an arbitrary timed basis |
| **2. High water usage** | ☐ The customer may be using more water than he realizes | ■ Obtain a water-bill (if customer is on a city water system) and determine how much water should be used |

## Hard Water

| Problem | Reason | Solution |
|---|---|---|
| **1. Water meter not working** | ☐ No water meter signal | ■ Replace meter<br>■ Check cable running from meter to timer |
| | ☐ Hydraulic signal being interrupted from starter control box | ■ Troubleshoot control box |
| | ☐ Minimum flow rate for 2" meter is 3 gpm and 7 gpm for a 3" meter | ■ Identify cause of low flow rate. Reduce capacity set-point to compensate for non-metered low flow |
| | ☐ Meter wiring not correct to Smart Start | ■ Check wiring and continuity between meter and smart start control box |
| **2. The unit will not go into automatic regeneration** | ☐ Meter or timer not properly programmed | ■ See setup and troubleshooting for these devices |
| | ☐ Start solenoid malfunctioning | ■ Repair or replace solenoid |
| | ☐ Smart Start pre-filter clogged | ■ Clean or replace pre-filter cartridge |
| | ☐ Lock out time engaged | ■ Controller requires 5 hours between regenerations |
| | ☐ Wrong mode of Operation on Smart Start | ■ Check first DIP switch if using Base Smart Start: Left for DAY mode and right for COUNTDOWN mode |
| **3. No vacuum in brine position** | ☐ Plugged venturi | ■ Clean |
| | ☐ Incorrect control disc | ■ Match control disc to regeneration type:<br>White - Multiplex systems<br>Tan - Simplex systems |
| | ☐ Plugged backwash flow control | ■ Clean out backwash flow control |
| | ☐ Plugged drain line | ■ Clean out drain line |
| | ☐ Broken venturi | ■ Replace |
| **4. Short salting** | ☐ Plugged venturi - brine tank not refilling properly | ■ Clean venturi |
| | ☐ Brine Valve not set properly | ■ Refer to manual for correct brine valve settings |
| | ☐ Salt mushed | ■ Clean salt drum |
| **5. Bridged salt in the brine drum** | ☐ Salt has solidified in the drum | ■ Carefully move the salt around to break up the mass of solidified salt<br>■ Use salt with Dextrin binder |

## Hard Water Continued...

| Problem | Reason | Solution |
|---|---|---|
| **6. The by-pass is open** | ☐ An open by-pass allows water to flow around the system without any treatment at all | ■ Close the by-pass |
| | ☐ All simplex units incorporate an internal by-pass | ■ Sample during service for a simplex system, not regeneration |
| | ☐ While the unit is in regeneration, this by-pass is open | |
| | ☐ Do not sample for quality while a simplex unit is in regeneration | |
| **7. The by-pass is leaking** | ☐ This can be determined by testing the water at a soft water tap | ■ Repair or replace the by-pass |
| | ☐ Shut off unit, disconnect the brine line, add a shut-off valve, turn unit on and test water at fitting | |
| | ☐ Water that tests soft at the brine fitting and hard at the tap indicates a by-pass is leaking | |
| **8. Raw Water** | ☐ Raw water statistics have changed | ■ Retest raw water and reprogram meter or timer as needed |
| **9. Distributor Tube O-ring** | ☐ Distributor tube O-ring rolled or cut | ■ Replace O-ring |
| **10. Brine drum does not refill or overfills** | ☐ The brine valve is set incorrectly | ■ Set the brine valve according to instructions on the brine valve installation sheet in the owner's pack or tech manual |
| | ☐ The brine valve is non-conforming | ■ Replace the brine valve |
| | ☐ The brine drum is dirty | ■ Clean out the brine drum |
| | ☐ The venturi nozzle is plugged | ■ Clean out venturi |
| **11. Fouled Resin** | ☐ Obtain sample for analysis | ■ Determine proper cleaning procedure |
| **12. Wrong venturi** | ☐ Verify venturi section | ■ Replace with proper venturi |

## High Salt Consumption

| Problem | Reason | Solution |
|---|---|---|
| **1. Regenerates too often** | ☐ See the section entitled "Frequent Regeneration" | ■ See the section entitled "Frequent Regeneration" |
| | ☐ Wrong venturi for central brine option | ■ See central brine instructions |
| **2. Water level in the brine drum is too high** | ☐ The brine valve is set wrong or non-conforming | ■ Verify the brine valve setting. Replace non-conforming brine valve |
| | ☐ The brine valve or the brine drum is dirty | ■ Clean brine valve and drum |
| | ☐ The brine valve leaks | ■ Tighten the connectors on the brine valve |

## Iron Bleed Through

| Problem | Reason | Solution |
|---|---|---|
| **1. Customer plumbing** | ☐ Previous iron buildup inside existing plumbing after the water softener | ■ Verify that customer plumbing is the problem by testing the water quality at the brine fitting with water running |
| **2. The salt setting is not set properly for current raw water conditions** | ☐ The composition of raw water can change with time | ■ Check the hardness and iron content of raw water<br>■ Set the brine valve for current raw water conditions |
| **3. The iron may be ferric iron** | ☐ Ferric iron is not removable by ion exchange | ■ Verify by using the demo softener to determine if iron is removable by ion exchange<br>■ Add additional equipment if needed |
| **4. The customer's plumbing may include a galvanized pressure tank** | ☐ A galvanized pressure tank will create oxidized iron | ■ Replace the galvanized pressure tank with a bladder-style pressure tank |

## Leaks

| Problem | Reason | Solution |
|---|---|---|
| **1. Water leaks from any of the assembly levels** | ☐ Valve screws are not tightened | ■ Depressurize the unit and tighten screws<br>• Main Valve Screws: 70 inch lb<br>• Level 5A screws: 50 inch lb<br>• Cap Screws: 50 inch lb |
| | ☐ One of the seals between assembly levels is pinched or missing | ■ Replace the non-conforming seal |
| | ☐ One of the screw holes is stripped or cracked | ■ Replace the level |
| | ☐ There is a crack on the seal area near a screw hole | ■ Replace the level |
| **2. Water feed pressure is too high (125 psi maximum)** | ☐ The pressure regulator is broken | ■ Replace pressure regulator |
| **3. Water leaks at the base** | ☐ The base is not tightened properly | ■ Tighten base |
| | ☐ The O-ring on the base is pinched or missing | ■ Replace base O-ring |

## No Water to Service

| Problem | Reason | Solution |
|---|---|---|
| **Multi-tank system with overlapping unit regeneration** | ☐ For a duplex, overridden regeneration start signal while one tank is still in regeneration | ■ Open system by-pass to allow water to outlet side of valves<br>■ Manually advance valve to service position<br>■ This will allow valves to reset<br>■ One valve can then be manually advanced to original regeneration stage, if desired |
| | ☐ Multiple regenerations prior to completion of regeneration lock-out | ■ Open by-pass to allow unit to cycle |
| | ☐ Manual regeneration override while another unit was regenerating | ■ Open by-pass to allow unit to cycle |
| | ☐ Stuck regeneration signal | ■ Check for debris in solenoid valve |

## Pressure Loss

| Problem | Reason | Solution |
|---|---|---|
| **1. Reduced pressure entering the unit** | ☐ The pre-filter is clogged | ■ Replace the clogged prefilter |
| **2. The upper and/or lower distributors are plugged** | ☐ Foreign matter from the input lines is accumulating in the distributors | ■ Clean the distributors<br>■ Add a prefilter to eliminate the foreign matter before it enters the unit |

## Salty Treated Water

| Problem | Reason | Solution |
|---|---|---|
| **1. Restricted drain line** | ☐ The drain is kinked or clogged | ■ Clear any obstructions<br>■ Make sure that the drain line flows smoothly and unrestricted |
| **2. Low water pressure** | ☐ The unit should not see water pressure drop below 30 psi on the outlet at any time<br>☐ During the backwash portion of the regeneration cycle, it must hold at least 30 psi or the brine may not rinse out completely | ■ Test the outlet pressure with the unit in backwash and one faucet at high flow<br>■ Measure the pressure by placing a gauge on the brine fitting<br>■ Raise pressure if below 30 psi |
| **3. The backwash flow control is plugged** | ☐ Without enough backwash flow to the drain, the unit cannot wash all the salt from the media tanks | ■ Clean the backwash flow control<br>■ Check hole size |
| **4. The drain is extremely long or placed higher than 8 feet above the Hydrus valve** | ☐ Such drain runs can put back-pressure on the unit and restrict the drain flow<br>☐ This causes the same result as number 3 above | ■ Locate a closer drain or use a larger diameter drain line |
| **5. The upper distributors are plugged** | ☐ Foreign material that finds its way into the media tanks may be collected around the upper distributors during backwash, clogging them | ■ Clean upper distributors<br>■ Install a prefilter |
| **6. Water level in the brine drum is too high** | ☐ The brine valve is set wrong or non-conforming | ■ Verify the brine valve setting<br>■ Replace non-conforming brine valve |

## Taste, Color and/or Odor

| Problem | Reason | Solution |
|---|---|---|
| **1. Treated water has a metallic or iron taste** | ☐ See the section entitled "Iron Bleed Through" | ■ See the section entitled "Iron Bleed Through" |
| **2. Treated water has chlorine odor and/or taste** | ☐ This is due to heavily chlorinated raw city water | ■ Install a carbon filter |
| **3. Treated water has a yellow tint** | ☐ The raw water may have traces of tannins present<br>☐ See the section entitled "Iron Bleed Through"<br>☐ Color throw from new resin | ■ Contact Technical Support<br>■ See the section entitled "Iron Bleed Through"<br>■ Temporary problem, it will go away after 2 to 3 bed volumes of flushing |
| **4. Treated water has an odor (hot water only)** | ☐ The magnesium rod in hot water tanks can cause a reaction that gives off an odor of rotten eggs | ■ Remove this rod from the hot water heater<br>■ An alternative rod may be installed |

## Unit Sticks in Cycle

| Problem | Reason | Solution |
|---|---|---|
| **The unit sticks in regeneration or backwash cycle** | ☐ The regeneration flow path is plugged at the regeneration nozzle or flow control | ■ Clean the regeneration flow path |
| | ☐ The regeneration drive pawl and/or spring is weak or broken | ■ Replace the regeneration drive pawl |
| | ☐ There is a damaged tooth on the control disc | ■ Replace the control disc |
| | ☐ The eccentric pinion is worn | ■ Replace the eccentric pinion (snap fit) |
| | ☐ Drain line from L1 restricted | ■ Clean drain line |
| | ☐ Poor outlet pressure (<30 psi) | ■ Increase pressure to system, or further reduce flow rate of system by the use of a flow control at the outlet of the system |
| | ☐ Solenoid valve of Smart Start controller stuck in open position | ■ Clean solenoid valve or replace |

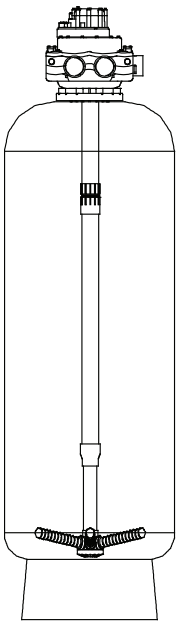
## Water Running to Drain

Verify that the leak is in fact coming from the L1 Level or the main drain by removing the line from the L1 Level drain. If no leak detected, go to "Valve not sealing - drain purge control."

| Problem | Reason | Solution |
|---|---|---|
| 1. **The balance piston O-ring is not seated properly** | ☐ Water will leak past an improperly seated balance piston O-ring and out the drain | ■ Replace worn or non-conforming O-ring |
| 2. **Bad control disc** | ☐ A scored control disc will allow a fast drip to a pencil sized stream to flow through the drain | ■ Replace the control disc |
| 3. **Valve, Drain, Purge or Control not sealing** | ☐ Foreign matter under the seals will not allow them to seat properly | ■ Disassemble and remove the foreign matter from seals |
| | ☐ Chlorine damage to seal | ■ Replace seal (and valve if it is an over molded seal) |
| 4. **Stem or piston quad rings not sealing** | ☐ Foreign matter under the seals will not allow them to seat properly | ■ Disassemble and remove the foreign matter from seals |
| | ☐ Chlorine damage to seal | ■ Replace seal (and valve if it is an over molded seal) |
| 5. **Low water pressure** | ☐ If the water pressure is less than 30 psi at the brine fitting, the system may not operate properly | ■ Increase water pressure |
| 6. **Plugged Level 1** | ☐ Check Level 1 drain is free from obstructions | ■ Clean Level 1 |

# Parts

## Complete Systems, Tanks, Risers and Distribution

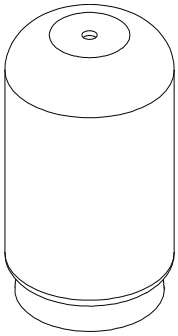


### Complete Softener Tank Assemblies

**Includes:**

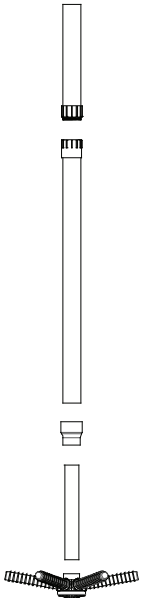
- Tank
- Distributor
- Valve
- Resin
- Underbedding
- Manual
- Diffuser

| Tank Size | Simplex | Multiplex |
|---|---|---|
| 16" x 65" | H15873 | H15874 |
| 18" x 65" | H12239 | H12245 |
| 21" x 62" | H12240 | H12246 |
| 24" x 65" | H12241 | H12247 |
| 30" x 72" | H12242 | H12248 |
| 36" x 72" | H12243 | H12249 |



### Tanks

| | |
|---|---|
| 16" x 65" | 11174B |
| 18" x 65" | 10999 |
| 21" x 62" | 68015 |
| 24" x 65" | 68016 |
| 30" x 72" | 71047A |
| 36" x 72" | 68021 |
| 42" x 72" | 68022 |



### Distribution

**Riser Tube Kit (#12226)**

**Includes:**

- Pipe, 1½" x 15"
- Pipe, 2" x 72" (requires cutting)
- Reducer Fitting, 1½" x 2"
- Adapter, 2" FNPT
- Adapter, 2" MNPT

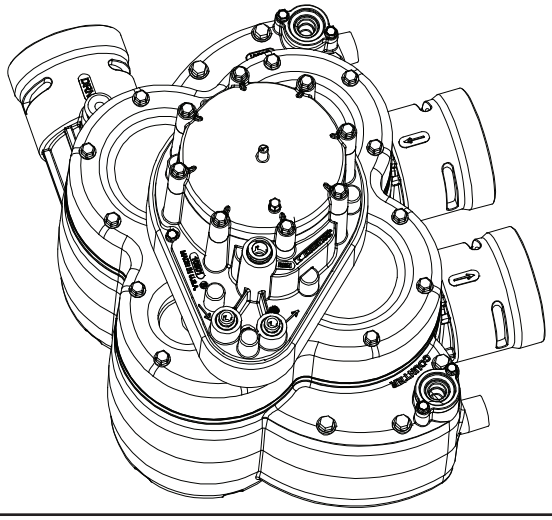
**Distributor Assembly**

**Includes:**

- Hub, 1½" x Six Lateral Sockets
- Six Laterals

| | |
|---|---|
| 16" x 65" | 62805 |
| 18" x 65" | 10996 |
| 21" x 62" | 68363 |
| 24" x 65" | 68363 |
| 30" x 72" | 10997 |
| 36" x 72" | 68364 |
| 42" x 72" | 68364 |

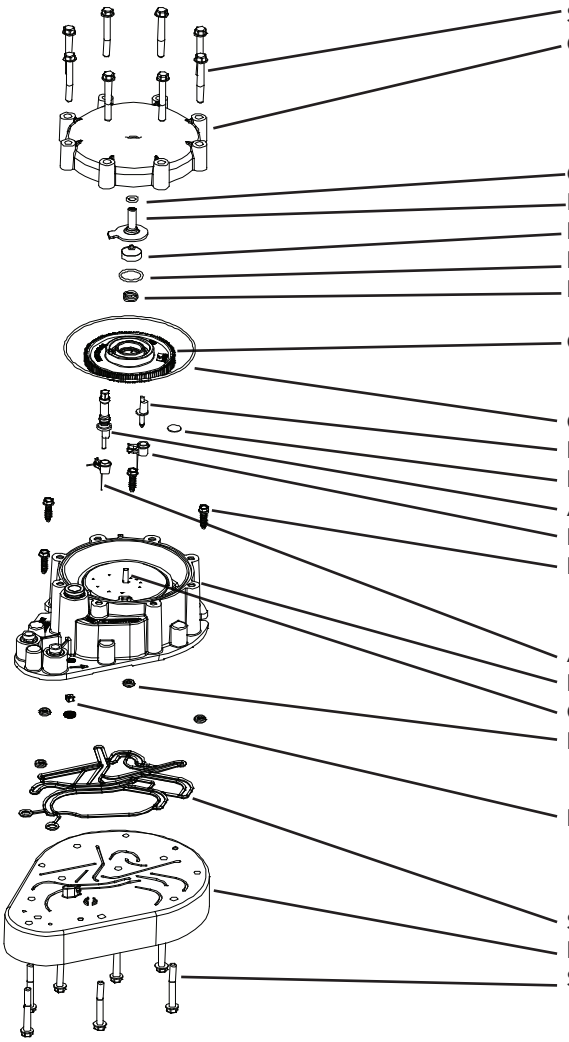
## Complete Valves



Hydrus, Softener, Multi-tank, 18-24 ..... H12194
Hydrus, Softener, Multi-tank, 30-42 ..... H12189
Hydrus, Softener, Simplex, 18-24 ..... H12198
Hydrus, Softener, Simplex, 30-42 ..... H12202

**Includes Valve Manual**

## Level 1 / 2



Screws (#10x1.5") (QTY 8 for Cap) ..... 10734
Cap
***Filter, Single or Multi-tank ..... 12216A***
***Softener, Multi-tank, Countercurrent ..... 12217A***
***Softener, Simplex, Cocurrent ..... 12218A***

O-ring Indicator ..... 1460
Indicator ..... 10927A
Balance Piston ..... 14927
Balance Piston O-ring 121 ..... 1070
Balance Piston Spring ..... 5448

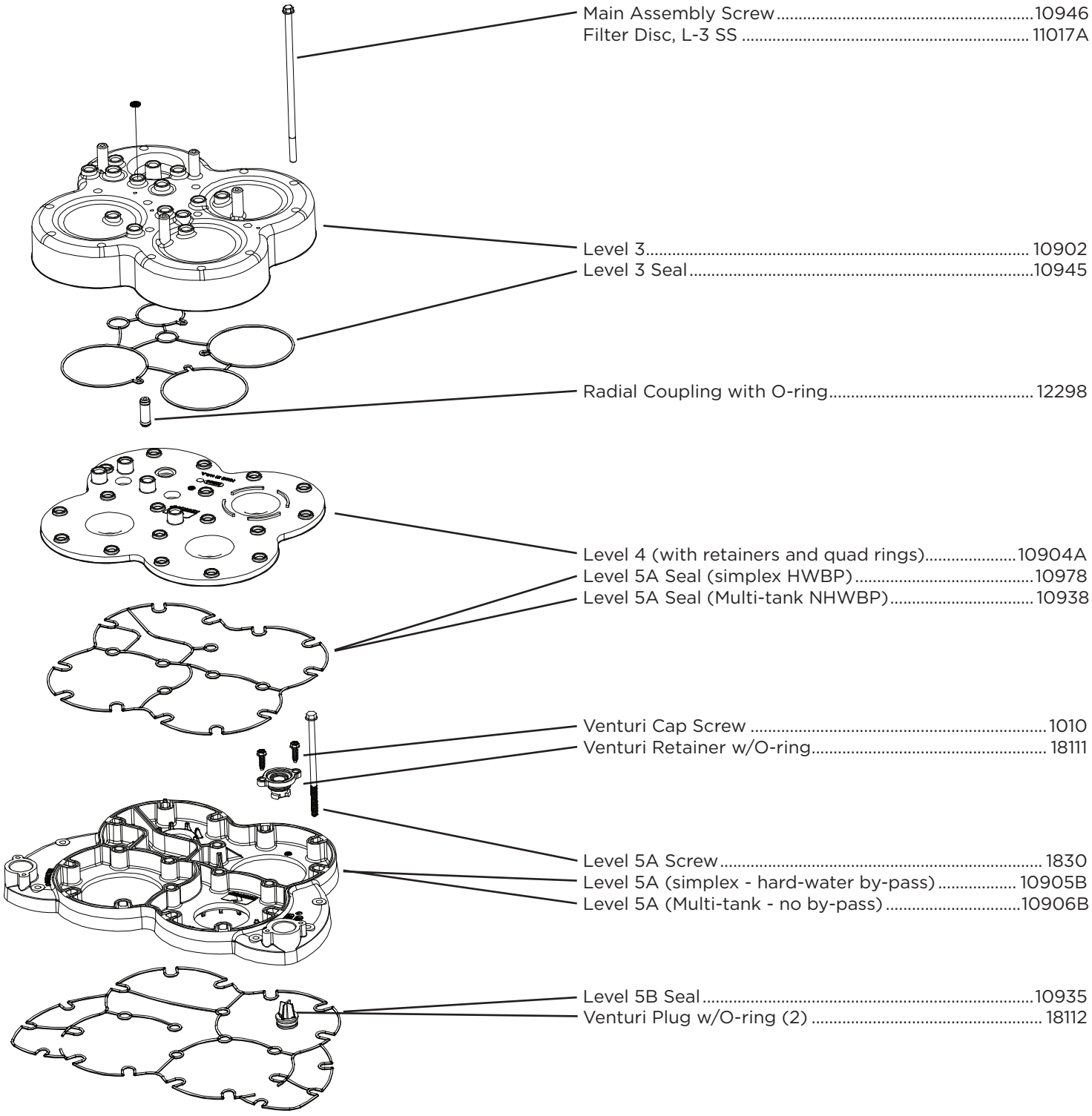
Control Disc
***Multi-tank Softener (WHITE) ..... 10910B***
***Single Tank Softener (TAN) ..... 10912C***
Cap O-ring 045 ..... 10928
Regen Eccentric Pin ..... 10949
Filter Disc L1 SS ..... 10781
Actuator ..... 12303
Regeneration Drive Pawl Assembly ..... 10980A
Level 1 Screw (QTY 4 for Level 1) ..... 1010

Actuator Drive Assembly ..... 10980A
Level 1 (w/inserts), Ceramic, Stem Gears ..... 10901A
Control Disc Pin ..... 1023
Level 1 Screw Quad Ring ..... 10981

Flow Control (0.4 gpm)
***All 120 minute valves and filter valves ..... 12314***
***All 150 minute valves ..... 8188A***

Seal Level 1 ..... 10923A
Level 2 ..... 10903A
Screw (Level 2 to Level 1) (QTY 8) ..... 10734

# Level 3 - 5A



Main Assembly Screw ..... 10946
Filter Disc, L-3 SS ..... 11017A

Level 3 ..... 10902
Level 3 Seal ..... 10945

Radial Coupling with O-ring ..... 12298

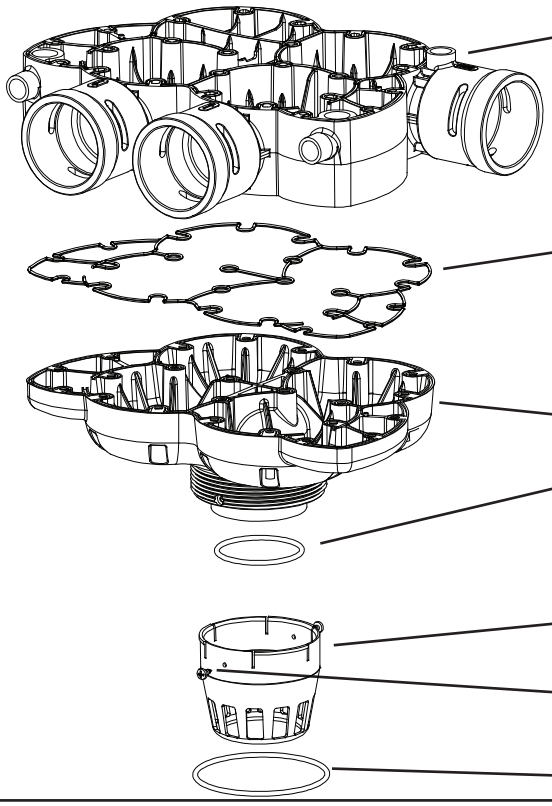
Level 4 (with retainers and quad rings) ..... 10904A
Level 5A Seal (simplex HWBP) ..... 10978
Level 5A Seal (Multi-tank NHWBP) ..... 10938

Venturi Cap Screw ..... 1010
Venturi Retainer w/O-ring ..... 18111

Level 5A Screw ..... 1830
Level 5A (simplex - hard-water by-pass) ..... 10905B
Level 5A (Multi-tank - no by-pass) ..... 10906B

Level 5B Seal ..... 10935
Venturi Plug w/O-ring (2) ..... 18112

## Level 5B - Base



Level 5B (with inserts) ..... 12294A

Base Seal ..... 10932

Base (includes retainers and O-ring) ..... 10908A

Riser Tube O-ring ..... 10930

Upper Distributor

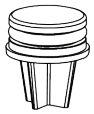
***Diffuser (used with filters) ..... 10977***

***Distributor (used with softeners) ..... 10968***

Upper Distributor Screw ..... 1774

Base O-ring ..... 10947

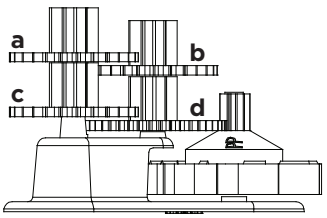
## Venturi Accessories



Venturi Plug w/O-ring ..... 18112

## Gearing

### Regeneration Gearing



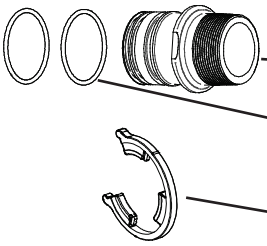

***Unit (time) ..... Short hand (a-b-c-d)***
***Standard Filter (20 min.) ..... 2-2-2-2-#10 Jet***
***Special Filter (40 min.) ..... 2-2-2-3-#8 Jet***
***Special Softener (90 min.) ..... 2-1-5-4-#8 Jet***
***16-24 Softener (120 min.) ..... 2-2-7-6-#8***
***30-36 Softener (150 min.) ..... 2-3-4-4-#8 Jet***

Gearing Retainer Clip ..... 10985A

### Turbines

#8 ..... 9272A
#8 Jet ..... 11011A
#10 Jet ..... 8781F

## Inlet / Outlet Adapters



2" MNPT Adapter ..... 10920
1.5" MNPT Adapter ..... 12309
2" BSP Adapter ..... 13019A

Adapter O-ring (2) ..... 10965



Adapter E-clip ..... 10921A

## Gears

### Gears

1 ..... 1522
2 ..... 1523
3 ..... 1524
4 ..... 1525
5 ..... 1526
6 ..... 1527
7 ..... 1528

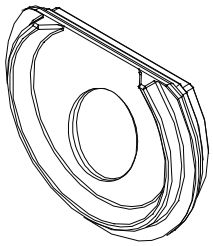
## Miscellaneous

1.00 cc Lube Packet ***(MED 420)***.....11319

Hydrus System Service Kit.....12316A

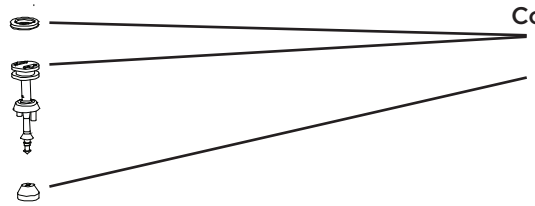
Owners Manual.....12223N

## Drain Flow Control

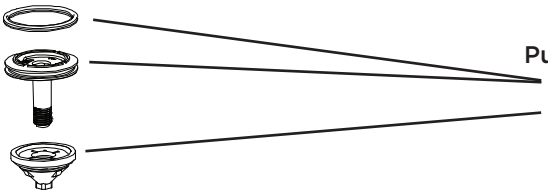


Backwash Flow Control (universal).....10919
O-ring (BWFC).....10967

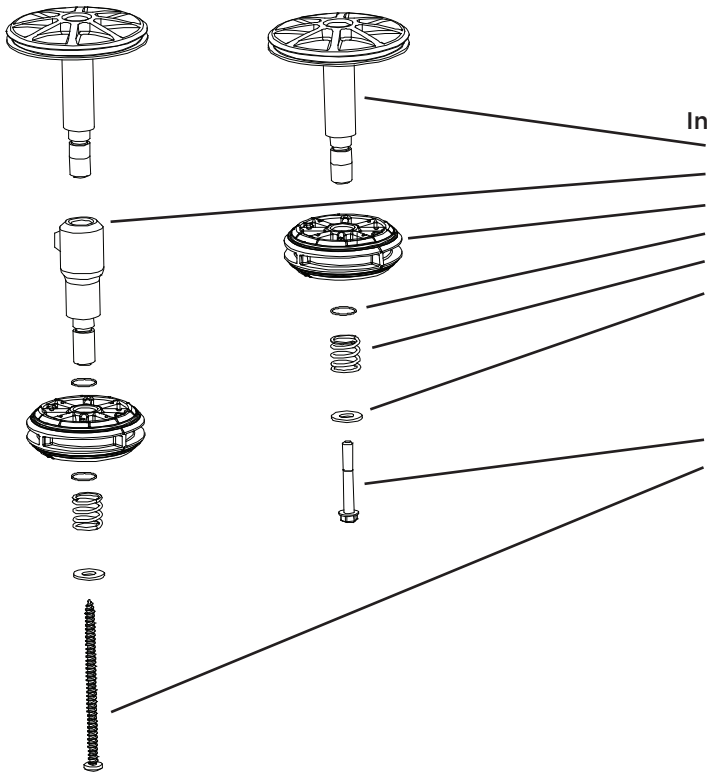
## Internal Valves



**Control Valve and Start Next Valve**
Valve Piston (with quad ring).....7872A
Seal.....8193A

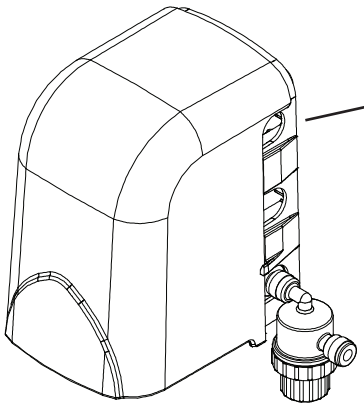


**Purge Valve**
Piston (with quad ring).....17398
Seat (with glued seal).....10984A



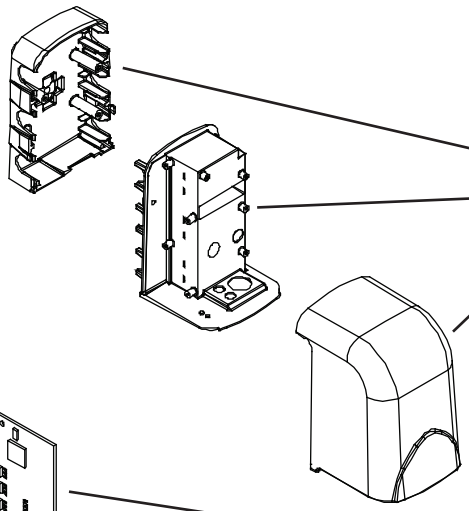
**Inlet/Outlet/Drain Valve**
Piston (with quad ring).....10943
Valve Extension.....12305
Seat (with over molded seal).....10942A
Piston O-ring, 011.....10634
Piston Spring.....10964
Piston Washer.....10971
Piston Screw.....10734
Piston Screw (long).....12306

# Base Smart Start Controller



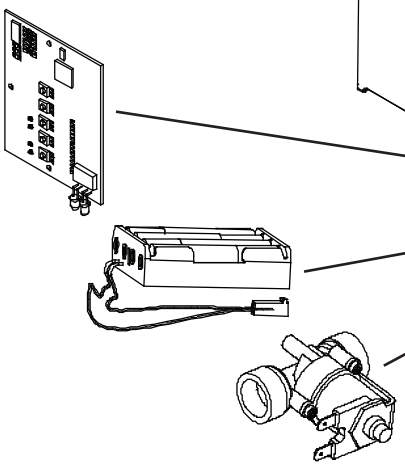
**Complete Smart Start Controllers**

Smart Start Controller, No Box ..... 12137



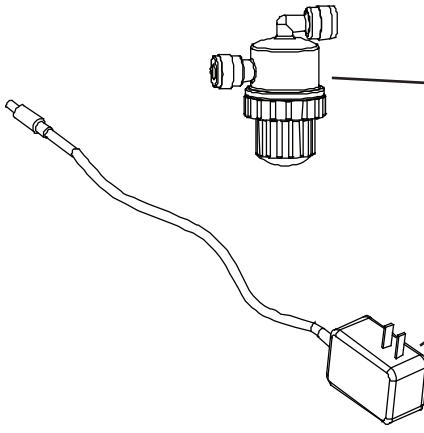
**Enclosure**

Back Mounting Plate Enclosure ..... 12100
Midwall Enclosure ..... 12101
Front Cover Enclosure ..... 12102



**Electrical**

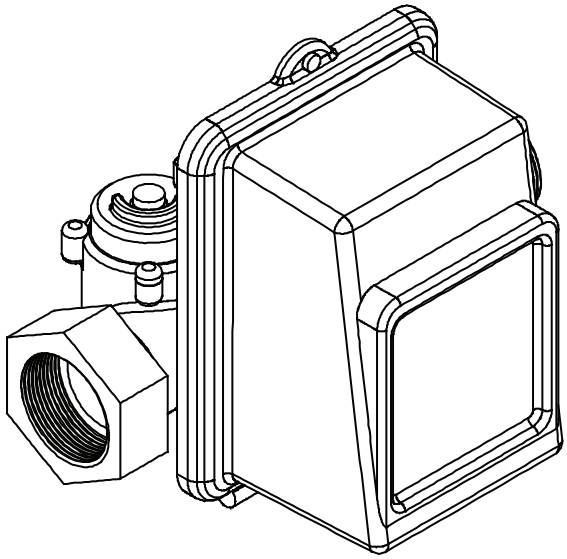
Timer Circuit with Coating (SS Base) ..... 12142
Two-Terminal Battery Pack ..... 12106
Bi-Stable Solenoid, including fittings ..... 17309



**Miscellaneous**

Inline Filter, ¼" Tube ..... 12144
External Power Supply, US Version ..... 12128

## Meters - Remote Reset



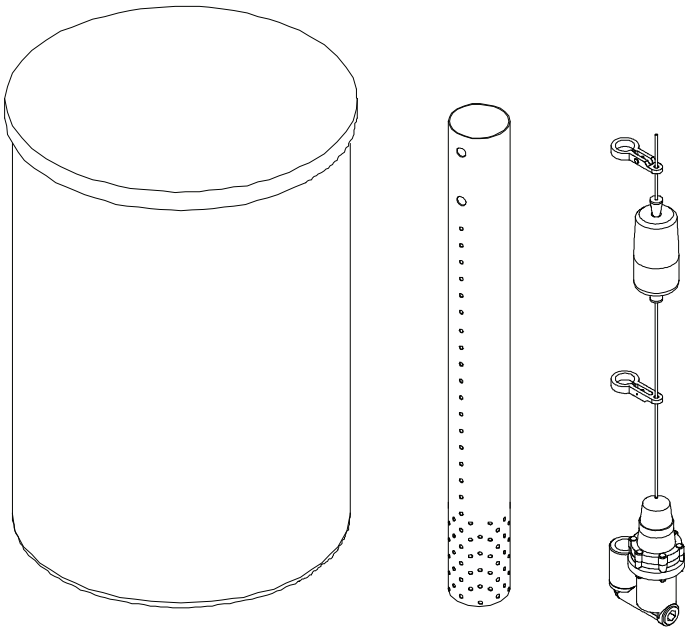
**Immediate Regeneration, 120 VAC**

2" Meter, Plastic, 120V 50/60HZ, 3-150 gpm, 6,250-106,250 gallon range ..... 16714

3" Meter, Stainless Steel, 120V 50/60HZ, STD, 7-300 gpm, 3,750-63,750 gallon range ..... 16712

3" Meter, Stainless Steel, 120V 50/60HZ, EXT, 7-300 gpm, 18,750-318,750 gallon range ..... 16713

## Brining System



**Complete Brine Systems**

24" x 50" ..... 68370D
30" x 48" ..... 68373D
39" x 60" ..... 12295B
50" x 60" ..... 68371D

**Wells[1]**

24" x 50" ..... 12317
30" x 48" ..... 12317
39" x 60" ..... 12300
50" x 60" ..... 12300

**Valves[2]**

24" x 50" ..... 74160A
30" x 48" ..... 74160A
39" x 60" ..... 74160A
50" x 60" ..... 74160A

**For Central Brine**

Central Brine Drum Internals ..... 4781
Check Valve (one per Hydrus) ..... 62238

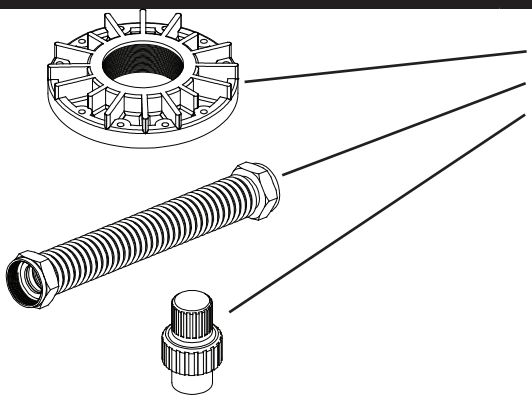
**Tanks**

24" x 50" ..... 4724A
39" x 60" ..... 4726A
50" x 60" ..... 4728A

[1] Well may require cutting to size and drilling.

[2] Valve is not assembled.

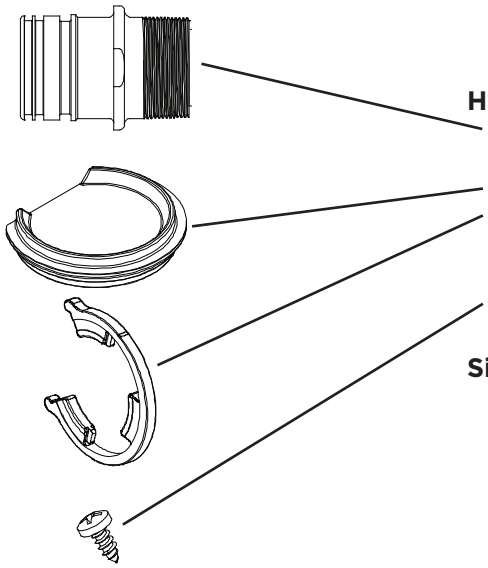
## Miscellaneous Components



Adapter Flange, 6" to 4" (required on 36" and 42" tanks) ... 72868
2" Flex Hose Connector ... 13096
Vacuum Breaker 1" ... 58547

Coarse Gravel ... 1226A
Fine Gravel ... 57580

## Installation Kits



**Master Installation Kit**

| Includes: | Quantity |
|---|---|
| Venturi Kit (shown below) | 1 |

**Hydrus Softener Installation Kit**

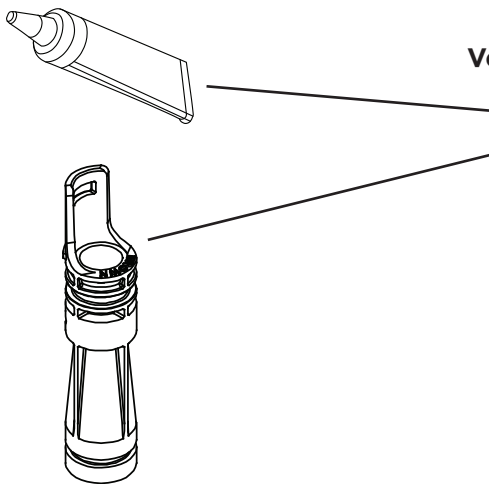
2" MNPT Adapters ... 3
O-ring, 028 ... 1
Flow Control ... 1
E-clips ... 3
O-rings, 228 ... 6
Silicone Packets, 2.00mL ... 3
Distributor Screws ... 2
***(NOTE: 21" tank systems also include an additional 343 O-ring for tank seal).***

**Simplex**

16" x 65" ... H12227A
18" x 65" ... H12227A
21" x 62" ... H12228B
24" x 65" ... H12229A
30" x 72" ... H12230A
36" x 72" ... H12231A
42" x 72" ... H12232A

**Multiplex**

16" x 65" ... H12233A
18" x 65" ... H12233A
21" x 62" ... H12234B
24" x 65" ... H12235A
30" x 72" ... H12236A
36" x 72" ... H12237A
42" x 72" ... H12238A



**Venturi Kits**

**Includes:**
Lubricant Packet
Venturi
Installation Instructions
O-rings

Brown ... 12204A
Yellow ... 12205A
Black ... 12206
Orange ... 12207A
Silver ... 12208
Blue ... 12209A
Red ... 12210A
Gold ... 12211A
Green ... 12212

# Notes:

# Owner's Manual

## Hydrus Commercial Softening Systems



Corporate Headquarters
10845 Kinsman Road
Newbury, Ohio 44065

www.KineticoPRO.com

**Product No. 12223N**

**Rev. 06.30.2023**