



**INSTALLATION, OPERATION,
and SERVICE INSTRUCTIONS
with Parts Lists**

**Aquasential™
Smart
High Efficiency
Water Conditioners**

Models from 2021



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Installation, Operation, and Service Instructions with Parts Lists

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Introduction

Read this Manual First

Before you operate the Culligan® Aquasential™ Smart High Efficiency Water Conditioner systems, read this manual to become familiar with the device and its capabilities. This product is designed to meet the needs of applications for high quality water. This manual contains important information about the unit, including information needed for installation, operating, and maintenance procedures. A troubleshooting section provides a guide for quick and accurate problem solving.

In order for the water treatment system to continue to provide high quality water, you must develop a thorough understanding of the system and its operation. Review this manual before making any attempt to install, operate, or service the system. Installation or maintenance done on this system by an untrained service person can cause major damage to equipment or property damage.

Licensed plumbers know that standard industry procedures include only to hand tighten or use strap wrenches on plastic parts. Plastic piping systems must be installed, operated and maintained in accordance with accepted standards and procedures. Not adhering to the recommended service/maintenance can cause damage to equipment or property damage.

This manual is based on information available at the time it was finalized, approved, and published. Continuing design refinement could cause changes that may not be included in this publication.

Your local independently operated Culligan dealer employs trained service and maintenance personnel who are experienced in the installation, function and repair of Culligan equipment. This publication is written specifically for these individuals and is intended for their use.

We encourage Culligan users to learn about Culligan products, but we believe that product knowledge is best obtained by consulting with your Culligan dealer. Untrained individuals who use this manual assume the risk of any resulting property damage or personal injury.

The Aquasential Smart High Efficiency Water Softeners have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 44 for the effective reduction of hardness (calcium and magnesium), barium, and radium 226/228 as verified and substantiated by test data. Certified models: 9", 9" Outdoor, 10", 10" Outdoor, 12", 12" Outdoor, 14", 14" Outdoor.



The Aquasential Smart High Efficiency Municipal Water Softeners have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 44 for the effective reduction of hardness (calcium and magnesium), barium, and radium 226/228, and NSF/ANSI Standard 42 for the effective reduction of Chlorine Taste and Odor as verified and substantiated by test data. Certified models: Municipal 9", Municipal 9" Outdoor, Municipal 10", Municipal 10" Outdoor, Municipal 12", Municipal 12" Outdoor, Municipal 14", Municipal 14" Outdoor.

The Aquasential Smart High Efficiency Upflow Water Softeners have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 44 for the effective reduction of hardness (calcium and magnesium), barium, and radium 226/228 as verified and substantiated by test data. Certified models: 9" Upflow, 9" Upflow Outdoor, 10" Upflow, 10" Upflow Outdoor.

The Aquasential Smart High Efficiency Softener-Clear water softeners and Aquasential Smart High Efficiency Softener-Clear Plus water softeners have been tested and certified by WQA against CSA B483.1, NSF/ANSI Standard 372, NSF/ANSI Standard 44 for the effective reduction of hardness (calcium and magnesium), barium, and radium, and NSF/ANSI 42 for the effective Iron Reduction up to 11ppm, as verified and substantiated by test data. Certified models: 9" Softener-Clear, 10" Softener-Clear, 12" Softener-Clear, 14" Softener-Clear, 9" Softener-Clear Plus, 9" Softener-Clear Plus Outdoor, 10" Softener-Clear Plus, 12" Softener-Clear Plus, 14" Softener-Clear Plus.

The Aquasential Smart High Efficiency 1" Twin Water Softeners have been tested and certified by the WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 44 for the effective reduction of hardness (calcium and magnesium), barium, and radium 226/228, as verified and substantiated by test data. Certified models: Twin 9", Twin 9" Outdoor, Twin 10", Twin 10" Outdoor, Twin 12", Twin 12" Outdoor, Twin 14", Twin 14" Outdoor.

The Aquasential Smart High Efficiency 1" Twin Upflow Water Softeners have been tested and certified by the WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 44 for the effective reduction of hardness (calcium and magnesium), barium, and radium 226/228, as verified and substantiated by test data. Certified models: Twin Upflow 9", Twin Upflow 10".

The Aquasential Smart High Efficiency 1.25 water softeners have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 44 for the effective reduction of hardness (calcium and magnesium), barium, and radium 226/228, as verified and substantiated by test data. Certified models: HE-1.25-10, HE-1.25-12, HE-1.25-14, HE-1.25-16.

The Aquasential Smart High Efficiency 1.25 Water Softener Controller Enclosure comply with the UL 50/50E standards for an IP45 Rating.

The Aquasential Smart High Efficiency Water Softener Outdoor and Aquasential Smart High Efficiency Twin Outdoor Controller Enclosures comply with the UL 50/50E standards for an IP45 Rating.

Contains FCC ID: 2AC7Z-ESPWROOM32D and IC: 21098-ESPWROOM32D..

This device complies with part 15 of the FCC Rules subject to the following two conditions: (1) This device may not cause harmful interference (2) This device must accept all interference received including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil n' doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This device complies with Health Canada's Safety Code. The installer of this device should ensure that RF radiation is not emitted in excess of the Health Canada's requirement.

Cet appareil est conforme avec Santé Canada Code de sécurité 6. Le programme d'installation de cet appareil doit s'assurer que les rayonnements RF n'est pas émis au-delà de l'exigence de Santé Canada.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Les changements ou modifications non expressément approuvés par la partie responsable de la conformité pourraient annuler l'autorité de l'utilisateur à utiliser cet équipement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Innovation, Science and Economic Development Canada's licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This Class B digital apparatus complies with Innovation, Science and Economic Development Canada ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Innovation, Sciences et Développement économique Canada.

NOTE! An Owners Guide is available online; it contains answers to most questions, system operation information, suggested maintenance, and a trouble shooting section.
www.culligan.com/support/product-information/product-manuals

Safety Instructions and Safety Definitions

Throughout this manual there are paragraphs set off by special headings.

Note

NOTE! “Note!” is used to emphasize installation, operation or maintenance information which is important, but does not present any hazard.

Caution



CAUTION!

“Caution” is used when failure to follow directions could result in damage to equipment or property.

Warning



WARNING!

“Warning” is used to indicate a hazard which could cause injury or death if ignored.

The **CAUTION** and **WARNING** paragraphs are not meant to cover all possible conditions and situations that may occur. It must be understood that common sense, caution, and careful attention are conditions which cannot be built into the equipment. These **MUST** be supplied by the personnel installing, operating, or maintaining the system.

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Attention Service Technician:

This publication is written specifically for, and is intended to be used by, trained service and maintenance personnel who are experienced in the installation, function and repair of Culligan equipment. Untrained individuals who use this manual assume the risk of any resulting property damage and/or personal injury.

NOTE! Please send any suggestions for improving this manual to productmanuals@culligan.com

Be sure to check and follow the applicable plumbing codes and ordinances when installing this equipment.



WARNING!

Electrical shock hazard! Prior to servicing equipment, disconnect power supply to prevent electrical shock.

WARNING!

If incorrectly installed, operated, or maintained, this product can cause severe injury. Those who install, operate, or maintain this product should be trained in its proper use, warned of its dangers, and should read the entire manual before attempting to install, operate, or maintain this product. Failure to comply with any warning or caution that results in any damage will void the warranty.

WARNING!

Use protective clothing and proper face or eye protection equipment when handling chemicals or power tools.



CAUTION!

This product is not to be used by children or persons with reduced physical, sensory or mental capabilities, or lack of experience or knowledge, unless they have been given supervision or instruction. Children should be instructed not to play with this appliance.

CAUTION!

If the power cord from the power supply to the unit looks or becomes damaged, the cord and power supply should be replaced by a Culligan Service Agent or similarly qualified person in order to avoid a hazard.

CAUTION!

To reduce the risk of fire, use only No. 26 AWG or larger telecommunications line cord.

NOTE! This system is not intended for use with water that is microbiologically unsafe or of unknown quality without adequate disinfection either before or after the system.

Check your applicable local plumbing and sanitation codes. Follow local codes if they differ from the standards used in this manual. To ensure proper and efficient operation of this Culligan product to your full satisfaction, carefully follow the instructions in this manual.

Specifications

Culligan Aquasential Smart High Efficiency (HE) Water Conditioners

Culligan Aquasential Smart HE Softener—Downflow Regeneration

Model	9" 9" Outdoor	10" 10" Outdoor	12" 12" Outdoor	14" 14" Outdoor
Control Valve Type	1" Reinforced Thermoplastic with GBX Circuit Board	1" Reinforced Thermoplastic with GBX Circuit Board	1" Reinforced Thermoplastic with GBX Circuit Board	1" Reinforced Thermoplastic with GBX Circuit Board
Installation Environment ¹	Indoor / Outdoor	Indoor / Outdoor	Indoor / Outdoor	Indoor / Outdoor
Overall Conditioner Ht (Softener height w/ control valve)	56 in / 1397 mm	62 in / 1575 mm	60 in / 1524 mm	73 in / 1854 mm
Media Tank Type	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™
Media Tank Dimensions (Dia x Ht)	9 x 48 in 229 x 1219 mm	10 x 54 in 254 x 1372 mm	12 x 52 in 305 x 1321 mm	14 x 65 in 356 x 1651 mm
Salt Storage Tank Dimensions (Dia x Ht)	11 x 11 in / 160 lb 280 x 280 mm / 73 kg 16 x 43 in / 250 lb 407 x 1093 mm / 113.4 kg 18 x 43 in / 375 lb 458 x 1093 mm / 170 kg	16 x 43 in / 250 lb 407 x 1093 mm / 113.4 kg 18 x 43 in / 375 lb 458 x 1093 mm / 170 kg	18 x 43 in / 375 lb 458 x 1321 mm / 170 kg	24 x 42 in / 650 lb 607 x 1067 mm / 295 kg
Cation Resin, Type and Quantity	Cullex® 8% Resin, 1.0 ft³ or Cullex® 10% Resin, 1.0 ft³	Cullex® 8% Resin, 1.5 ft³	Cullex® 8% Resin, 2.0 ft³	Cullex® 8% Resin, 3.0 ft³
Underbedding, Type and Quantity	Cullsian® - 12 lb	Cullsian® - 15 lb	Cullsian® - 20 lb	Cullsian® - 25 lb
Grains Exchange Capacity @ Salt Dosage Per Regeneration ²	19,003 gr @ 4 lb	30,439 gr @ 6 lb	28,365 gr @ 7 lb	42,548 gr @ 10.5 lb
	25,823 gr @ 8 lb	45,609 gr @ 12 lb	44,764 gr @ 16 lb	67,146 gr @ 24 lb
	29,622 gr @ 12 lb	48,623 gr @ 18 lb	58,658 gr @ 24 lb	87,987 gr @ 36 lb
Efficiency at rated dosage ³	4,751 gr/lb @ 4 lb salt dosage	5,073 gr/lb @ 6 lb salt dosage	4,052 gr/lb @ 7 lb salt dosage	4,052 gr/lb @ 10.5 lb salt dosage
Freeboard to Media ⁴	14.5 in / 368 mm	14.5 in / 368 mm	16 in / 406 mm	25 in / 635 mm
Freeboard to Underbedding ⁵	44.5 in / 1130 mm	47.5 in / 1207 mm	46 in / 1168 mm	59 in / 1499 mm
Rated Service Flow @ Pressure Drop	9.0 gpm @ 11 psi 34 Lpm @ 77.2 kPa	9.4 gpm @ 12 psi 35.6 Lpm @ 82.7 kPa	10.0 gpm @ 11 psi 37.9 Lpm @ 75.8 kPa	10.6 gpm @ 11 psi 40.1 Lpm @ 75.8 kPa
Peak Service Flow @ Pressure Drop	10.9 gpm @ 15 psi 41.3 Lpm @ 103.4 kPa	11.0 gpm @ 15 psi 41.6 Lpm @ 103.4 kPa	12.6 gpm @ 15 psi 47.7 Lpm @ 103.4 kPa	12.8 gpm @ 15 psi 48.5 Lpm @ 103.4 kPa
Total Hardness, Maximum	75 gpg	99 gpg	99 gpg	99 gpg
Total Iron, Maximum (dissolved) ⁷	5 ppm	5 ppm	5 ppm	5 ppm
Operating Pressure	20-125 psi / 140–860 kPa	20-125 psi / 140–860 kPa	20-125 psi / 140–860 kPa	20-125 psi / 140–860 kPa
Operating Pressure (Canada)	20-90 psi / 140–620 kPa	20-90 psi / 140–620 kPa	20-90 psi / 140–620 kPa	20-90 psi / 140–620 kPa
Operating Temperature	33-120°F / 1-50°C	33-120°F / 1-50°C	33-120°F / 1-50°C	33-120°F / 1-50°C
Electrical Requirements	28VDC / 60 Hz	28VDC / 60 Hz	28VDC / 60 Hz	28VDC / 60 Hz
Electrical Power Consumption, Min/Max	3 watts / 35 watts	3 watts / 35 watts	3 watts / 35 watts	3 watts / 35 watts
Drain Flow, Maximum ⁶	2.38 gpm / 9 Lpm	2 gpm / 7.57 Lpm	2.86 gpm / 10.56 Lpm	5.28 gpm / 19.99 Lpm
Recharge Time, Average	59 min	77 min	78 min	77 min
Recharge Water Consumption	56 gal / 212 L	82 gal / 310 L	102 gal / 386 L	167 gal / 685 L

¹ Unit must have Outdoor certification/rating label to be used in an Outdoor installation and requires Culligan Outdoor rated power supply.

² Capacities and corresponding salt dosages pertain to low hardness waters. Capacities listed are per regeneration.

³ Efficiency rated according to NSF/ANSI Standard 44.

⁴ Measured from top of resin bed to top surface of tank threads.

⁵ Measured from the top of underbedding to top surface of tank threads.

⁶ Backwash at 120 psi (830 kPa).

⁷ Iron removal claims have not been verified by the Water Quality Association.

Culligan Aquasential Smart HE Softener—Upflow Regeneration

Model	9" Upflow 9" Upflow Outdoor	10" Upflow 10" Upflow Outdoor
Control Valve	1" Reinforced Thermoplastic with HE Circuit Board	1" Reinforced Thermoplastic with HE Circuit Board
Overall Conditioner Height	56 in	62 in
Media Tank Design	Quadra-Hull™	Quadra-Hull™
Media Tank Dimensions (Dia x Ht)	9 x 48 in	10 x 54 in
Salt Storage Tank Dimensions (Dia x Ht)	16" x 43" or 18" x 43"	16" x 43" or 18" x 43"
Exchange Media, Type and Quantity	Cullex® Media, 1.0 ft³	Cullex Media, 1.5 ft³
Underbedding, Type and Quantity	Cullsan® Underbedding, 12 lb	Cullsan Underbedding, 15 lb
Exchange Capacity @ Salt Dosage Per Recharge	10,209 gr @ 2.0 lb	15,314 gr @ 3.0 lb
	16,666 gr @ 4.0 lb	24,999 gr @ 6.0 lb
	25,116 gr @ 8.0 lb	37,674 gr @ 12.0 lb
Efficiency rated dosage ¹	5,105 gr/lb @ 2 lb salt dosage	5,105 gr/lb @ 3 lb salt dosage
Proportional Brining Efficiency Rating ²	5,760 gr/lb @ 2 lb salt dosage	5,898 gr/lb @ 6 lb salt dosage
Freeboard to Media ³	14.5 in	14.5 in
Freeboard to Underbedding ⁴	44.5 in	47.5 in
Salt Storage Capacity	250 lb or 375 lb	250 lb or 375 lb
Rated Service Flow @ Pressure Drop	9.0 gpm @ 11 psi	9.4 gpm @ 12 psi
Auxiliary Flow Rate ⁵	10.8 gpm @ 15 psi	11.0 gpm @ 15 psi
Total Hardness, Maximum	30 gpg	30 gpg
Total Iron, Maximum	2 ppm	2 ppm
Hardness to Iron Ratio, minimum	8 gpg to 1 ppm	8 gpg to 1 ppm
Operating Pressure	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)
Operating Pressure (Canada)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)
Operating Temperature	33-120°F (0–49°C)	33-120°F (0–49°C)
Electrical Requirements	28VDC / 60 Hz	28VDC / 60 Hz
Electrical Power Consumption, Min/Max	3 watts / 35 watts	3 watts / 35 watts
Drain Flow, Maximum ⁶	1.98 gpm	1.98 gpm
Recharge Time, Average ⁷ Recharge Water	47 minutes	68 minutes
Consumption, Average ⁷	25 gallons	20 gallons

¹ The efficiency rated dosage is only valid at the stated salt dosage and 2-minute backwash. It is efficiency rated according to NSF/ANSI 44.

² The Proportional Brining Efficiency Rating assumes a 20 percent reserve capacity at the time of regeneration that is typical of what the manufacturer expects under real-world operation. Proportional brining is not measured by NSF/ANSI 44, and so this claim is not, and can not, be rated to NSF/ANSI 44.

³ Measured from top of media to top surface of tank threads. (backwashed and drained).

⁴ Measured from top of underbedding to top surface of tank threads.

⁵ Auxiliary flow rates do not represent the maximum service flow rate used for determining the conditioner's rated capacity and efficiency and that continuous operation at these flow rates greater than the maximum service flow rate may affect capacity and efficiency performances.

⁶ Backwash at 35 psi (830 kPa).

⁷ 2 minute backwash, 2 lb 9" model, 3 lb 10" model.

Culligan Aquasential Smart HE Softener—Municipal

Model	Municipal 9" Municipal 9" Outdoor	Municipal 10" Municipal 10" Outdoor	Municipal 12" Municipal 12" Outdoor	Municipal 14" Municipal 14" Outdoor
Control Valve	1", 5-cycle Reinforced Thermoplastic with Global Electronic (GBE) Circuit Board	1", 5-cycle Reinforced Thermoplastic with Global Electronic (GBE) Circuit Board	1", 5-cycle Reinforced Thermoplastic with Global Electronic (GBE) Circuit Board	1", 5-cycle Reinforced Thermoplastic with Global Electronic (GBE) Circuit Board
Overall Conditioner Height	54 in	60 in	58 in	71 in
Media Tank Design	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™
Media Tank Dimensions (Dia x Ht)	9 x 48 in	10 x 54 in	12 x 52 in	14 x 65 in
Salt Storage Tank Dimensions (Dia x Ht)	11 x 11 in or 16 x 43 in or 18 x 43 in	16 x 43 in or 18 x 43 in	18 x 43 in	24 x 42 in
Exchange Media, Type and Quantity	Cullex® Media, 0.8 ft³	Cullex® Media, 1.0 ft³	Cullex® Media, 1.5 ft³	Cullex® Media, 2.3 ft³
Carbon Media, Quantity	6 lb	8 lb	12 lb	18 lb
Underbedding, Type and Quantity	Cullsán® Underbedding, 12 lb	Cullsán® Underbedding, 15 lb	Cullsán® Underbedding, 20 lb	Cullsán® Underbedding, 25 lb
Exchange Capacity @ Salt Dosage Per Recharge	16,789 gr @ 4.0 lb	20,986 gr @ 5.0 lb	28,045 gr @ 7.0 lb	42,943 gr @ 10.7 lb
	22,827 gr @ 8.0 lb	28,534 gr @ 10.0 lb	42,953 gr @ 18.0 lb	54,597 gr @ 18.0 lb
	25,989 gr @ 12.0 lb	32,486 gr @ 15.0 lb	48,620 gr @ 30.0 lb	66,230 gr @ 28.0 lb
Efficiency rated dosage ¹	4,198 gr/lb @ 4 lb salt dosage	4,197 gr/lb @ 5 lb salt dosage	4,006 gr/lb @ 7 lb salt dosage	4,013 gr/lb @ 10.7 lb salt dosage
Chlorine Taste and Odor Capacity	300,000 gallons	339,000 gallons	621,000 gallons	931,500 gallons
Freeboard to Media ²	15.75 in	19.5 in	17.31 in	25.89 in
Freeboard to Underbedding ³	44.5 in	47.5 in	46 in	59 in
Salt Storage Capacity	160 lb or 250 lb or 375 lb	250 lb or 375 lb	375 lb	650 lb
Rated Service Flow @ Pressure Drop	9.0 gpm @ 11 psi	9.4 gpm @ 11 psi	10.0 gpm @ 11 psi	10.6 gpm @ 11 psi
Total Hardness, Maximum	15 gpg	15 gpg	15 gpg	15 gpg
Total Iron, Maximum	0 ppm	0 ppm	0 ppm	0 ppm
Color	Less Than 1	Less Than 1	Less Than 1	Less Than 1
Turbidity	Less Than 5 NTU	Less Than 5 NTU	Less Than 5 NTU	Less Than 5 NTU
TOC	Less Than 0.5 PPM	Less Than 0.5 PPM	Less Than 0.5 PPM	Less Than 0.5 PPM
Operating Pressure	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)
Operating Pressure (Canada)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)
Operating Temperature	33-120°F (0–49°C)	33-120°F (0–49°C)	33-120°F (0–49°C)	33-120°F (0–49°C)
Electrical Requirements	28VDC/60 Hz	28VDC/60 Hz	28VDC/60 Hz	28VDC/60 Hz
Electrical Power Consumption, Min/Max	3 watts / 35 watts	3 watts / 35 watts	3 watts / 35 watts	3 watts / 35 watts
Drain Flow, Maximum ⁴	2.6 gpm	2.6 gpm	3.2 gpm	6.2 gpm
Recharge Time, Average ⁵ Recharge Water	83 min	83 min	68 min	73 min
Consumption, Average ⁵	63 gal	63 gal	98 gal	170 gal

¹The efficiency rated dosage is only valid at the stated salt dosage and is efficiency rated according to NSF/ANSI 44.

²Measured from top of media to top surface of tank threads. (backwashed and drained).

³Measured from top of underbedding to top surface of tank threads.

⁴Backwash at 120 psi (830 kPa).

⁵10 minute backwash, 4 lb 9" model, 5 lb 10" model, 7 lb 12" model, or 10.7 lb 14" model.

Culligan Aquasential Smart HE Softener—Softener-Cleer

Model	9" Softener-Cleer	10" Softener-Cleer	12" Softener-Cleer	14" Softener-Cleer
Control Valve	1" Reinforced Thermoplastic w/ HE Circuit Board	1" Reinforced Thermoplastic w/ HE Circuit Board	1" Reinforced Thermoplastic w/ HE Circuit Board	1" Reinforced Thermoplastic w/ HE Circuit Board
Overall Conditioner Ht	56 in	62 in	60 in	73 in
Media Tank Design	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™
Media Tank Dimensions (Dia x Ht)	9 x 48 in	10 x 54 in	12 x 52 in	14 x 65 in
Salt Storage Tank Dimensions (Dia x Ht)	16 x 43 in or 18 x 43 in	16 x 43 in or 18 x 43 in	18 x 43 in	24 x 42 in
Exchange Media, Type and Quantity	Cullex® Media, 1.0 ft³	Cullex Media, 1.5 ft³	Cullex Media, 2.0 ft³	Cullex Media, 3.0 ft³
Underbedding, Type and Quantity	Cullsans® Underbedding, 12 lb	Cullsans Underbedding, 15 lb	Cullsans Underbedding, 20 lb	Cullsans Underbedding, 25 lb
Exchange Capacity @ Salt Dosage Per Recharge	19,003 gr @ 4.0 lb	28,391 gr @ 6.0 lb	28,365 gr @ 7.0 lb	42,548 gr @ 10.5 lb
	25,823 gr @ 8.0 lb	43,262 gr @ 12.0 lb	44,764 gr @ 16.0 lb	61,746 gr @ 24 lb
	29,622 gr @ 12.0 lb	48,129 gr @ 18.0 lb	58,658 gr @ 24.0 lb	87,987 gr @ 36 lb
Efficiency rated dosage¹	4,751 gr/lb @ 4 lb salt dosage	4,732 gr/lb @ 6 lb salt dosage	4,052 gr/lb @ 7 lb salt dosage	4,052 gr/lb @ 10.5 lb salt dosage
Freeboard to Media²	14.5 in	14.5 in	16 in	25 in
Freeboard to Underbedding³	44.5 in	47.5 in	46 in	59 in
Salt Storage Capacity	375 lb	375 lb	375 lb	650 lb
Rated Service Flow @ Pressure Drop	9.0 gpm @ 12 psi	9.4 gpm @ 13 psi	10.0 gpm @ 11 psi	10.6 gpm @ 11 psi
Auxiliary Flow Rate⁴	10.8 gpm @ 15 psi	11.0 gpm @ 15 psi	12.6 gpm @ 15 psi	12.8 gpm @ 15 psi
Total Hardness, Max.	50 gpg	75 gpg	75 gpg	75 gpg
Total Dissolved Iron, Max 10 ppm⁵	2000 gal	3000 gal	4000 gal	6000 gal
Flow Rate for Iron Reduction⁶	9.0 gpm	9.4 gpm	10.0 gpm	10.6 gpm
Iron and Sulfur Reducing Bacteria⁸	Trace Amounts	Trace Amounts	Trace Amounts	Trace Amounts
pH	6.5–8.5	6.5–8.5	6.5–8.5	6.5–8.5
Tannins	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm
Total Organic Carbon	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm
Free Chlorine Level	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm
Dissolved Oxygen	3.0 ppm or below	3.0 ppm or below	3.0 ppm or below	3.0 ppm or below
Polyphosphate	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm
Operating Pressure	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)
Operating Pressure (Canada)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)
Operating Temperature	33-120°F (0–49°C)	33-120°F (0–49°C)	33-120°F (0–49°C)	33-120°F (0–49°C)
Electrical Requirements	28VDC/60 Hz	28VDC/60 Hz	28VDC/60 Hz	28VDC/60 Hz
Electrical Power Consumption, Min/Max	3 watts/35 watts	3 watts/35 watts	3 watts/35 watts	3 watts/35 watts
Drain Flow, Maximum⁹	2.34 gpm	2.5 gpm	3.5 gpm	5.28 gpm
Recharge Time, Average⁷ Recharge Water	59 minutes	72 minutes	74 minutes	71 minutes
Consumption, Average⁷	53 gallons	65 gallons	108 gallons	167 gallons

¹ The efficiency rated dosage is only valid at the stated salt dosage and is efficiency rated according to NSF/ANSI 44. Water consumption determined in accordance with 7.1.1 of NSF/ANSI 44.

² Measured from top of media to top surface of tank threads. (backwashed and drained).

³ Measured from top of underbedding to top surface of tank threads.

⁴ Auxiliary flow rates do not represent the maximum service flow rate used for determining the softener's rated capacity and efficiency.

Continuous operation at these flow rates greater than the maximum service flow rate might affect capacity and efficiency performances.

⁵ Performance testing on these models was performed at the flow rates specified. When a higher flow rate occurs upon installation, a flow control, restrictor, or other method of flow reduction should be used in order to mimic these performance results.

⁶ Backwash at 120 psi (830 kPa).

⁷ 10 minute backwash, 4 lb 9" model, 6 lb 10" model, 7 lb 10.5" model or 12 lb 14" model salt dosage.

⁸ The Iron and Sulfur reducing bacteria performance is a manufacturer claim and has not been evaluated or certified by WQA.

Culligan Aquasential Smart HE Softener—Softener-Cleer Plus

Model	9" Softener-Cleer Plus 9" Softener-Cleer Plus Outdoor	10" Softener-Cleer Plus	12" Softener-Cleer Plus	14" Softener-Cleer Plus
Control Valve	1" Reinforced Thermoplastic w/ HE Circuit Board			
Overall Conditioner Ht	56 in	62 in	60 in	73 in
Media Tank Design	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™
Media Tank Dimensions (Dia x Ht)	9 x 48 in	10 x 54 in	12 x 52 in	14 x 65 in
Salt Storage Tank Dimensions (Dia x Ht)	16 x 43 in or 18 x 43 in	16 x 43 in or 18 x 43 in	18 x 43 in	24 x 42 in
Exchange Media, Type and Quantity	Cullex® Media, 1.0 ft³	Cullex Media, 1.5 ft³	Cullex Media, 2.0 ft³	Cullex Media, 3.0 ft³
Underbedding, Type and Quantity	Cullsan® Underbedding, 12 lb	Cullsan Underbedding, 15 lb	Cullsan Underbedding, 20 lb	Cullsan Underbedding, 25 lb
Media, KDF-85	13.5 lb	13.5 lb	27.0 lb	40.5 lb
Exchange Capacity @ Salt Dosage Per Recharge	18,927 gr @ 4.0 lb	28,391 gr @ 6.0 lb	28,365 gr @ 7.0 lb	42,548 gr @ 10.5 lb
	28,841 gr @ 8.0 lb	43,262 gr @ 12.0 lb	44,764 gr @ 16.0 lb	67,146 gr @ 24 lb
	32,086 gr @ 12.0 lb	48,129 gr @ 18.0 lb	58,658 gr @ 24.0 lb	87,987 gr @ 36 lb
Efficiency rated dosage ⁷	4,732 gr/lb @ 4 lb salt dosage	4,732 gr/lb @ 6 lb salt dosage	4,052 gr/lb @ 7 lb salt dosage	4,052 gr/lb @ 10.5 lb salt dosage
Freeboard to Media ²	12 in	12 in	13.5 in	22.5 in
Freeboard to Underbedding ³	44.5 in	47.5 in	46 in	59 in
Salt Storage Capacity	375 lb	375 lb	375 lb	650 lb
Service Flow @ Pressure Drop	8.0 gpm @ 9 psi	9.9 gpm @ 14 psi	8.5 gpm @ 8 psi	11.0 gpm @ 12 psi
Auxiliary Flow Rate ⁸	10.7 gpm @ 15 psi	10.9 gpm @ 15 psi	11.7 gpm @ 15psi	11.0 gpm @ 15 psi
Total Hardness, Max.	50 gpg	75 gpg	75 gpg	75 gpg
Total Dissolved Iron, Max 10ppm ⁶	2000 gal	3000 gal	4000 gal	6000 gal
Flow Rate for Iron Reduction ⁶	4 gpm	5.9 gpm	8.5 gpm	11.0 gpm
Hydrogen Sulfide ¹	2 ppm	2 ppm	2 ppm	2 ppm
Iron and Sulfur Reducing Bacteria ¹	Trace Amounts	Trace Amounts	Trace Amounts	Trace Amounts
pH	6.5–8.5	6.5–8.5	6.5–8.5	6.5–8.5
Tannins	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm
Total Organic Carbon	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm
Free Chlorine Level	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm
Dissolved Oxygen	3.0 ppm or below	3.0 ppm or below	3.0 ppm or below	3.0 ppm or below
Polyphosphate	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm
Operating Pressure	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)
Operating Pressure (Canada)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)
Operating Temperature	33-120°F (0–49°C)	33-120°F (0–49°C)	33-120°F (0–49°C)	33-120°F (0–49°C)
Electrical Requirements	28VDC/60 Hz	28VDC/60 Hz	28VDC/60 Hz	28VDC/60 Hz
Electrical Power Consumption, Min/Max	3 watts/35 watts	3 watts/35 watts	3 watts/35 watts	3 watts/35 watts
Drain Flow, Maximum ⁴	2.34 gpm	2.5 gpm	3.5 gpm	5.9 gpm
Recharge Time, Average ⁵ Recharge Water	62 minutes	72 minutes	74 minutes	71 minutes
Consumption, Average ⁵	58 gallons	65 gallons	108 gallons	176 gallons

¹ The Hydrogen Sulfide and Iron and Sulfur reducing bacteria performance are manufacturer claims and have not been evaluated or certified by WQA.

² Measured from top of media to top surface of tank threads. (backwashed and drained).

³ Measured from top of underbedding to top surface of tank threads.

⁴ Backwash at 120 psi (830 kPa).

⁵ 10 minute backwash, 4 lb 9" model, 6 lb 10" model, 7 lb 12" model or 10.5 lb 14" model salt dosage.

⁶ Performance testing on these models was performed at the flow rates specified. When a higher flow rate occurs upon installation, a flow control, restrictor, or other method of flow reduction should be used in order to mimic these performance results.

⁷ The efficiency rated dosage is only valid at the stated salt dosage and is efficiency rated according to NSF/ANSI 44.

⁸ Auxiliary flow rates do not represent the maximum service flow rate used for determining the softener's rated capacity and efficiency.

Continuous operation at these flow rates greater than the maximum service flow rate might affect capacity and efficiency performances.

Culligan Aquasential Smart HE—Twin Water Conditioners—Downflow Regeneration

Model	Twin 9" Twin 9" Outdoor	Twin 10" Twin 10" Outdoor	Twin 12" Twin 12" Outdoor	Twin 14" Twin 14" Outdoor
Control Valve	1" Reinforced Thermoplastic w/ HE Circuit Boards			
Overall Conditioner Ht	56 in	62 in	60 in	73 in
Media Tank Design	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™
Media Tank Dimensions (Dia x Ht)	9 x 48 in	10 x 54 in	12 x 52 in	14 x 65 in
Salt Storage Tank Dimensions (Dia x Ht)	18 x 43 in	18 x 43 in	18 x 43 in	24 x 42 in
Exchange Media, Type and Quantity	Cullex® Media, 1.0 ft³	Cullex Media, 1.5 ft³	Cullex Media, 2.0 ft³	Cullex Media, 3.0 ft³
Underbedding, Type and Quantity	Cullsán® Underbedding, 12 lb	Cullsán Underbedding, 15 lb	Cullsán Underbedding, 20 lb	Cullsán Underbedding, 25 lb
Exchange Capacity @ Salt Dosage Per Recharge (per tank)	19,003 gr @ 4.0 lb	30,439 gr @ 6.0 lb	28,365 gr @ 7.0 lb	42,548 gr @ 10.5 lb
	25,823 gr @ 8.0 lb	45,609 gr @ 12.0 lb	44,764 gr @ 16.0 lb	67,146 gr @ 24 lb
	29,622 gr @ 12.0 lb	48,623 gr @ 18.0 lb	58,658 gr @ 24.0 lb	87,987 gr @ 36 lb
Efficiency rated dosage¹ (per tank)	4,751 gr/lb @ 4 lb salt dosage	5,073 gr/lb @ 6 lb salt dosage	4,052 gr/lb @ 7 lb salt dosage	4,052 gr/lb @ 10.5 lb salt dosage
Freeboard to Media²	14.5 in	14.5 in	16 in	25 in
Freeboard to Underbedding³	44.5 in	47.5 in	46 in	59 in
Salt Storage Capacity	375 lb	375 lb	375 lb	650 lb
Rated Service Flow @ Pressure Drop	9.0 gpm @ 11 psi	9.4 gpm @ 12 psi	10.0 gpm @ 11 psi	10.6 gpm @ 11 psi
Auxiliary Flow Rate⁴	10.8 gpm @ 15 psi	11.0 gpm @ 15 psi	12.6 gpm @ 15 psi	12.8 gpm @ 15 psi
Total Hardness, Maximum	75 gpg	99 gpg	99 gpg	99 gpg
Total Iron, Maximum	5 ppm	5 ppm	5 ppm	5 ppm
Hardness to Iron Ratio, Minimum	8 gpg to 1 ppm	8 gpg to 1 ppm	8 gpg to 1 ppm	8 gpg to 1 ppm
Operating Pressure	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)
Operating Pressure (Canada)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)
Operating Temperature	33-120°F (0–49°C)	33-120°F (0–49°C)	33-120°F (0–49°C)	33-120°F (0–49°C)
Electrical Requirements	28VDC/60 Hz	28VDC/60 Hz	28VDC/60 Hz	28VDC/60 Hz
Electrical Power Consumption, Min/Max	3 watts/35 watts	3 watts/35 watts	3 watts/35 watts	3 watts/35 watts
Drain Flow, Maximum⁵	1.98 gpm	2 gpm	2.86 gpm	5.28 gpm
Recharge Time, Average⁶ Recharge Water	59 minutes	77 minutes	78 minutes	77 minutes
Consumption, Average⁶	46 gallons	82 gallons	102 gallons	181 gallons

¹ The efficiency rated dosage is only valid at the stated salt dosage and is efficiency rated according to NSF/ANSI Standard 44.

² Measured from top of media to top surface of tank threads (backwashed and drained).

³ Measured from top of underbedding to top surface of tank threads.

⁴ Auxiliary flow rates do not represent the maximum service flow rate used for determining the softener's rated capacity and efficiency and that continuous operation at these flow rates greater than the maximum service flow rate may affect capacity and efficiency performances.

⁵ Backwash at 120 psi.

⁶ 10 minute backwash, 4 lb 9" model, 6 lb 10" model, 7 lb 12" model, or 10.5 lb 14" model salt dosage.

Culligan Aquasential Smart HE—Twin Softener—Upflow Regeneration

Model	Twin Upflow 9"	Twin Upflow 10"
Control Valve	1" Reinforced Thermoplastic with HE Circuit Board	
Overall Conditioner Height	56 in	62 in
Media Tank Design	Quadra-Hull™	Quadra-Hull™
Media Tank Dimensions (Dia x Ht)	9 x 48 in	10 x 54 in
Salt Storage Tank Dimensions (Dia x Ht)	18 x 43 in	18 x 43 in
Exchange Media, Type and Quantity	Cullex® Media, 1.0 ft ³	Cullex Media, 1.5 ft ³
Underbedding, Type and Quantity	Cullsan® Underbedding, 12 lb	Cullsan Underbedding, 15 lb
Exchange Capacity @ Salt Dosage Per Recharge (per tank)	10,209 gr @ 2.0 lb	15,314 gr @ 3.0 lb
	16,666 gr @ 4.0 lb	24,999 gr @ 6.0 lb
	25,116 gr @ 8.0 lb	37,674 gr @ 12.0 lb
Efficiency Rated Dosage (per tank) ¹	5,105 gr/lb @ 2 lb salt dosage	5,105 gr/lb @ 3 lb salt dosage
Proportional Brining Efficiency Rating (per tank) ²	5,760 gr/lb @ 2 lb salt dosage	5,898 gr/lb @ 6 lb salt dosage
Freeboard to Media ³	14.5 in	14.5 in
Freeboard to Underbedding ⁴	44.5 in	47.5 in
Salt Storage Capacity	375 lb	375 lb
Rated Service Flow @ Pressure Drop	9.0 gpm @ 15 psi	9.1 gpm @ 15 psi
Auxiliary Flow Rate ⁵	10.8 gpm @ 15 psi	11.0 gpm @ 15 psi
Total Hardness, Maximum	30 gpg	30 gpg
Total Iron, Maximum	2 ppm	2 ppm
Hardness to Iron Ratio, Minimum	8 gpg to 1 ppm	8 gpg to 1 ppm
Operating Pressure	20-125 psi (138–862 kPa)	20-125 psi (138–862 kPa)
Operating Pressure (Canada)	20-90 psi (138–621 kPa)	20-90 psi (138–621 kPa)
Operating Temperature	33-120°F (0–49°C)	33-120°F (0–49°C)
Electrical Requirements	28VDC/60 Hz	28VDC/60 Hz
Electrical Power Consumption, Min/Max	3 watts/35 watts	3 watts/35 watts
Drain Flow, Maximum ⁶	1.98 gpm	1.98 gpm
Recharge Time, Average ⁸ Recharge Water	47 minutes	68 minutes
Consumption, Average ⁷ (Evaluated by WQA)	33 gallons	35 gallons
Consumption, Average ⁸	25 gallons	30 gallons

¹ The efficiency rated dosage is only valid at the stated salt dosage and 2-minute backwash. It is efficiency rated according to NSF/ANSI 44.

² The Proportional Brining Efficiency Rating assumes a 20 percent reserve capacity at the time of regeneration that is typical of what the manufacturer expects under real-world operation. Proportional brining is not measured by NSF/ANSI 44, and so this claim is not, and can not, be rated to NSF/ANSI 44.

³ Measured from top of media to top surface of tank threads. (backwashed and drained).

⁴ Measured from top of underbedding to top surface of tank threads.

⁵ Auxiliary flow rates do not represent the maximum service flow rate used for determining the softener's rated capacity and efficiency and that continuous operation at these flow rates greater than the maximum service flow rate may affect capacity and efficiency performances.

⁶ Backwash at 120 psi (830 kPa).

⁷ Connected the first water consumption line..

⁸ 2-minute backwash, 2 lb 9" model, 3 lb 10" model salt dosage.

Culligan Aquasential Smart HE Softener—1.25”

Model	HE-1.25-10	HE-1.25-12	HE-1.25-14	HE-1.25-16
Control Valve	1¼" Reinforced Thermoplastic with GBE Circuit Board			
Overall Conditioner Height	62 in	60 in	73 in	73 in
Media Tank Design	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™	Quadra-Hull™
Media Tank Dimensions (Dia x Ht)	10 x 54 in	12 x 52 in	14 x 65 in	16 x 65 in
Salt Storage Tank Dimensions (Dia x Ht)	18 x 43 in	18 x 43 in	24 x 40 in	24 x 40 in
Exchange Media, Type and Quantity	Cullex® Media, 1.5 ft ³	Cullex® Media, 2.0 ft ³	Cullex® Media, 3.0 ft ³	Cullex® Media, 4.0 ft ³
Underbedding, Type and Quantity	Cullsan® Underbedding, 15 lb	Cullsan® Underbedding, 20 lb	Cullsan® Underbedding, 30 lb	Cullsan® Underbedding, 40 lb
Exchange Capacity @ Salt Dosage Per Recharge	29,764 gr @ 6.0 lb 43,505 gr @ 12.0 lb 51,353 gr @ 18.0 lb	35,027 gr @ 8.0 lb 52,874 gr @ 16.0 lb 61,235 gr @ 24.0 lb	52,541 gr @ 12.0 lb 79,311 gr @ 24.0 lb 91,853 gr @ 36.0 lb	70,054 gr @ 16.0 lb 105,748 gr @ 32.0 lb 122,470 gr @ 48.0 lb
Efficiency Rated Dosage ¹	4,961 gr/lb @ 6 lb salt dosage	4,378 gr/lb @ 8 lb salt dosage	4,378 gr/lb @ 12 lb salt dosage	4,378 gr/lb @ 16 lb salt dosage
Freeboard to Media ²	14.5 in	16 in	25 in	25 in
Freeboard to Underbedding ³	47.5 in	46 in	59 in	59 in
Salt Storage Capacity	375 lb	375 lb	650 lb	650 lb
Rated Service Flow @ Pressure Drop	14.9 gpm @ 14 psi	17.9 gpm @ 15 psi	19.3 gpm @ 15 psi	21.0 gpm @ 15 psi
Total Hardness, Maximum	99 gpg	99 gpg	99 gpg	99 gpg
Total Iron, Maximum	5 ppm	5 ppm	5 ppm	5 ppm
Hardness to Iron Ratio, Minimum	8 gpg to 1 ppm	8 gpg to 1 ppm	8 gpg to 1 ppm	8 gpg to 1 ppm
Operating Pressure	20-125 psi	20-125 psi	20-125 psi	20-125 psi
Operating Pressure (Canada)	20-90 psi	20-90 psi	20-90 psi	20-90 psi
Operating Temperature	33-120°F	33-120°F	33-120°F	33-120°F
Electrical Requirements	28VDC/60Hz	28VDC/60Hz	28VDC/60Hz	28VDC/60Hz
Electrical Power Consumption, Min/Max	3 watts/35 watts	3 watts/35 watts	3 watts/35 watts	3 watts/35 watts
Drain Flow, Maximum ⁴	2.38 gpm	3.88 gpm	5.5 gpm	5.5 gpm
Recharge Time, Average ⁵	155 min	124 min	113 min	117 min
Recharge Water Consumption, Average ⁵	82 gal	121 gal	184 gal	250 gal

¹The efficiency rated dosage is only valid at the stated salt dosage and is efficiency rated according to NSF/ANSI 44.

²Measured from top of media to top surface of tank threads. (backwashed and drained).

³Measured from top of underbedding to top surface of tank threads.

⁴Backwash at 120 psi (830 kPa).

⁵10 minute backwash, 6 lb 10" model, 8 lb 12" model, 12 lb 14" model or 16 lb 16" model salt dosage.

Installation

Using This Manual

This installation manual covers several different models and versions of Aquasential Smart HE Water Conditioners. All models share the main Aquasential Smart HE system components and a similar installation process. Refer to the specific Appendix for additional instructions and details for the individual unit's setup. For a list of Appendices, see ["Contents" on page 2.](#)

Materials

NOTE! Important! Read this section entirely before starting the installation.

System should be supplied with cold water only.

With the exception of media containers, open the remaining containers, remove all the components, and inspect them before starting installation.

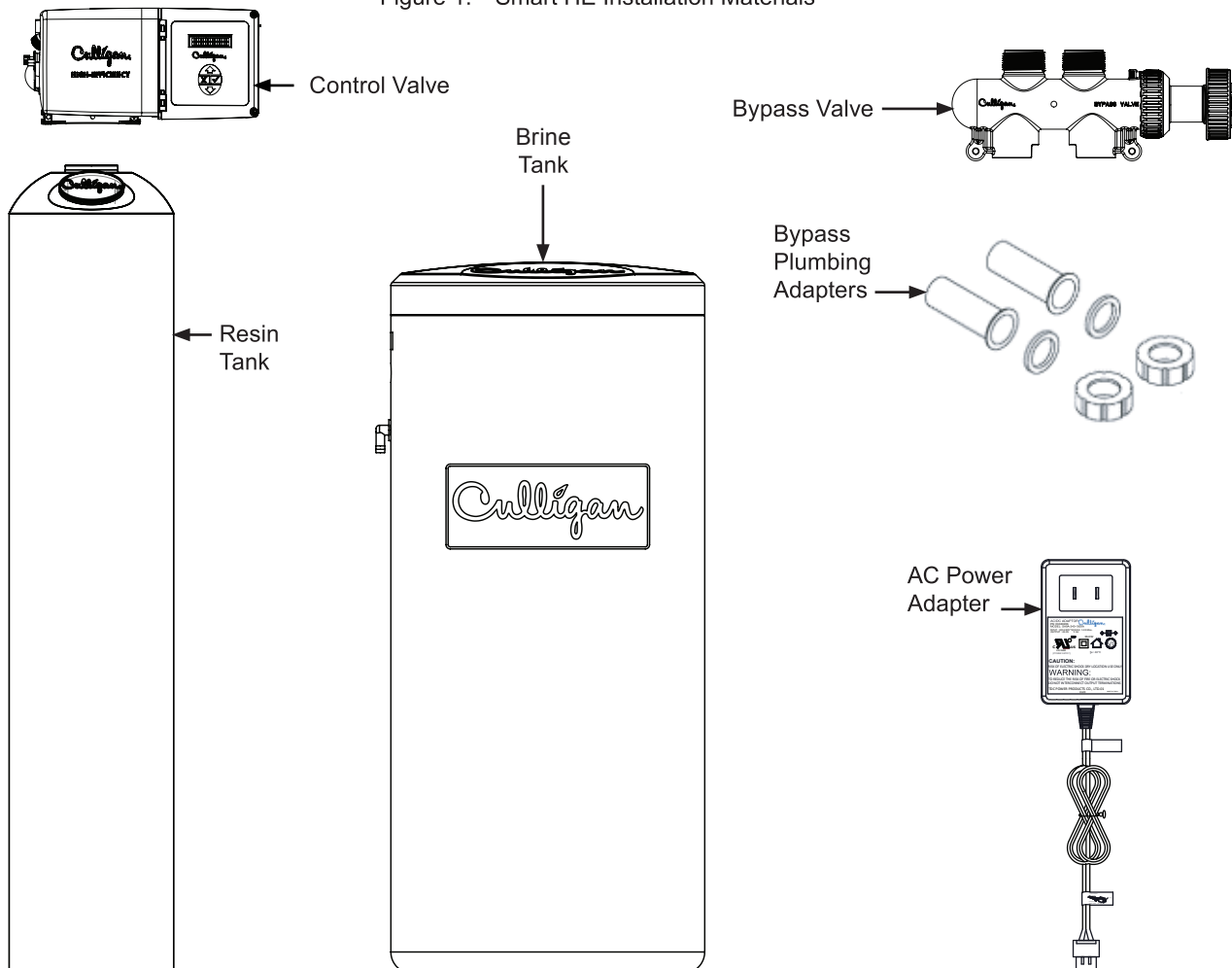
The following are necessary components for installation:

Materials

- Brine line, 3/8" (P/N 01009819 or equivalent) for 8" and 10" tanks or 1/2" (P/N 00901800 or equivalent) for 12" tanks.
- Drain line, 1/2" (P/N 00303082, gray, semi-flexible; or P/N 00331946, black, semi-rigid; or equivalent)
- Thread sealing tape
- Pressure reducing valve (if pressure exceeds 125 psi [860 kPa])
- Pipe and fittings suited to the type of installation

Water softener salt (rock, solar or pellet salt formulated specifically for water softeners) With the exception of media containers, open the remaining boxes, remove all the components, and inspect them before starting installation.

Figure 1. Smart HE Installation Materials



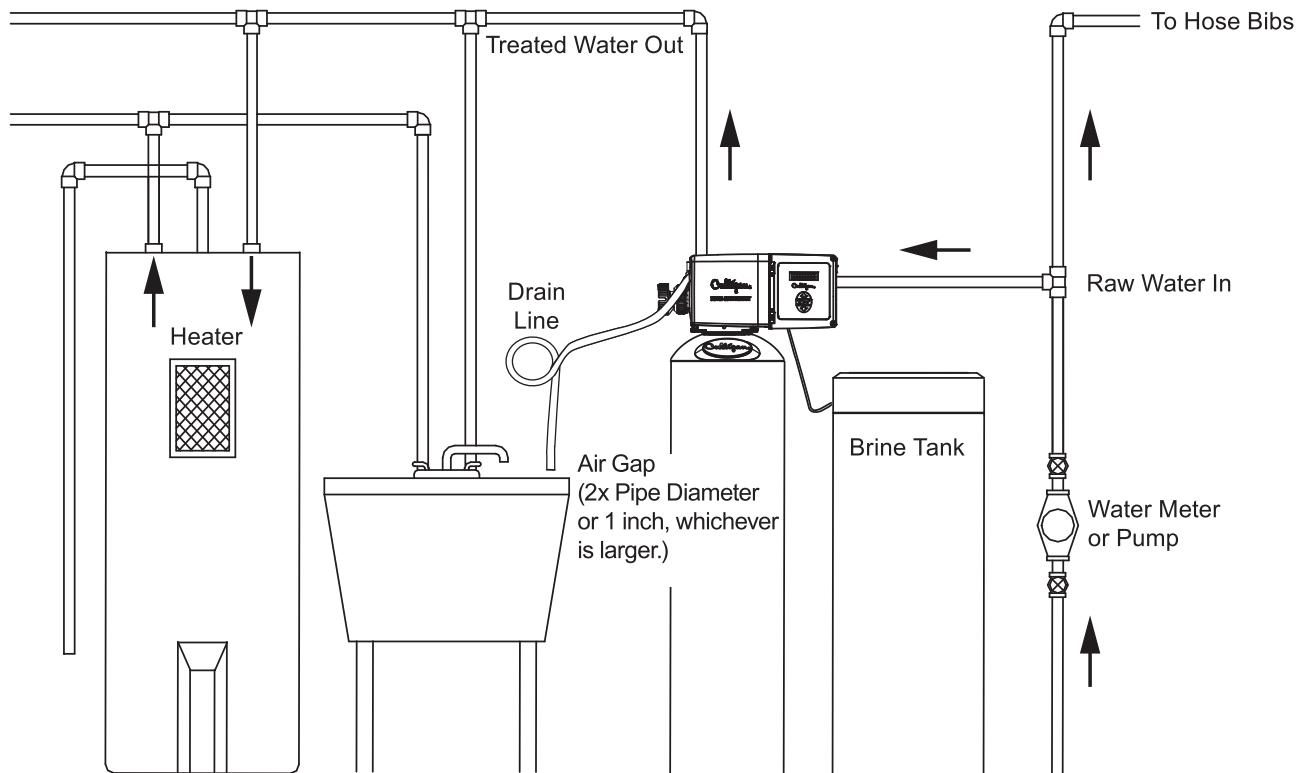
Location

Determine the installation location and position the media tank prior to plumbing. Do not install the unit within 3 feet of an electrical panel or within 5 feet of water heater or furnace. It may be difficult to move the tank after media is loaded. Set the media tank in the location where it will be installed.

Placement

Refer to Placement Figure for system placement.

Figure 2. Smart HE System Placement



Space Requirements

Allow 6-12 inches (15-30 cm) behind the unit for plumbing and drain lines and 4 feet (1.3 meters) above for service access.

Floor Surface

Choose an area with solid, level floor, free of bumps or irregularities.

Drain Facilities

Choose a nearby drain that can handle the rated drain flow (floor drain, sink or stand pipe). Refer to Drain Length Table for maximum drain line length.

NOTE! Most codes require an anti-siphon device or air gap for the drain line. Observe all local plumbing codes and drain restrictions. The system and installation must comply with all state and local laws and regulations.

Loading the Resin



CAUTION!

Once the tank is full do not lay it down as this will disrupt the layers of gravel underbedding and result in poor performance.

CAUTION!

Keep the outlet manifold centered in the tank when loading the media. The manifold must remain vertical to ensure a good seal at the o-ring. Rap the tank near the bottom with a rubber mallet to level the Cullsan.

9" and 10" tanks are filled with media at the factory.

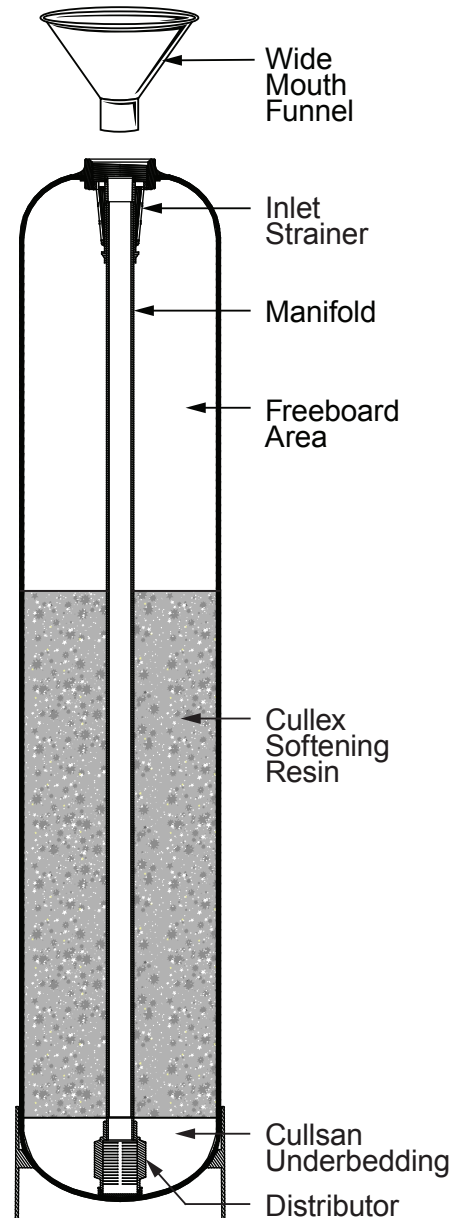
Table 1. Loading quantities.

Size	Cullex (Ft ³)	Cullsan (lb)	Freeboard (inches)
12" Downflow	2	20	16
14" Downflow	3	25	25

NOTE! Only the 12" and 14" tank will require loading.

1. Position the tank for loading. The Culligan® logo should be facing towards the front.
2. Remove the inlet strainer.
3. Position the outlet manifold in the tank.
4. Cover the top of the manifold with a clean rag.
5. Using a wide-mouth funnel, load the Culligan Cullsan underbedding through the top of the tank. See "[Table 1. Loading quantities.](#)"
6. Load the tank with the Cullex® ion exchange resin. Leveling is not required.
7. For Municipal units, load the carbon media per the amount in "[Table 1. Loading quantities.](#)" Leveling is not required.
8. Remove the funnel and rinse any media from the tank threads.
9. Install the inlet strainer, ensuring to thread the strainer until it bottoms out on the tank thread. Failure to install the strainer correctly may cause the control to leak.

Figure 3. Media Tank Cross Section

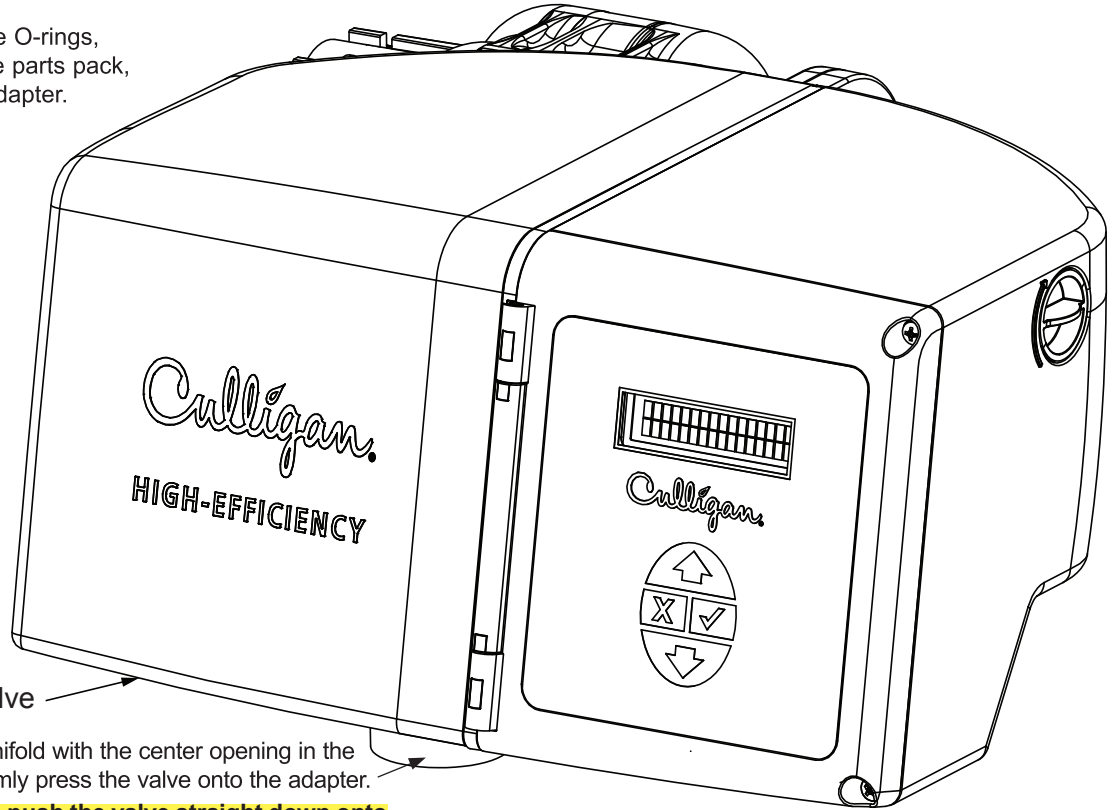


Mount the Control Valve

See [Figure 4](#) for an illustration on mounting the control valve to the tank.

Figure 4. Mounting the Control Valve

1. Assemble the O-rings, located in the parts pack, to the tank adapter.



Control Valve

5. Align the manifold with the center opening in the valve, and firmly press the valve onto the adapter.

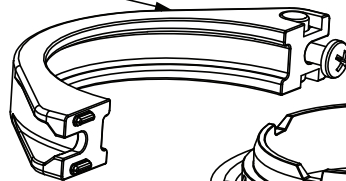
Make sure to push the valve straight down onto the manifold. If the valve is cocked, it may cause the O-ring to slip off the manifold.

Valve Adapter O-ring (Large O-ring)

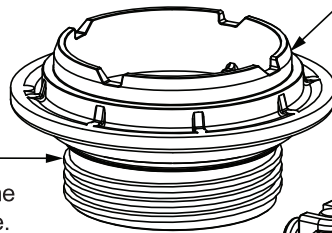
2. The larger of the two O-rings in the parts pack should be positioned between the adapter and the valve. Do not stretch the smaller O-ring onto the top of the tank adapter. Lubricate with silicone lubricant.

U-Clamp

Do not try to rotate control valve if the clamp is tightened otherwise you may cut the o-ring.



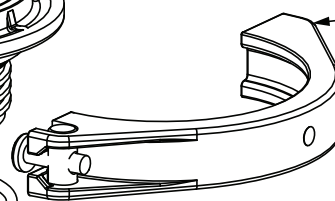
The valve adapter O-ring rests on the first step on the adapter.



Adapter

4. Screw the adapter into the tank until the adapter bottoms out on the tank flange.

The adapter only needs to be tightened hand-tight to the tank flange.



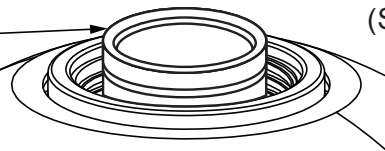
U-Clamp

6. Assemble the tank clamp to the control and tighten the clamp screws.

The clamp and valve will be able to rotate on the tank until water pressure is applied.

Outlet Manifold

3. Lubricate the outlet manifold O-ring with silicone lubricant.



Tank Adapter O-ring (Smaller O-ring)

DO NOT lubricate this ring!

Do not push the top O-Ring down to the flange surface on the adapter.

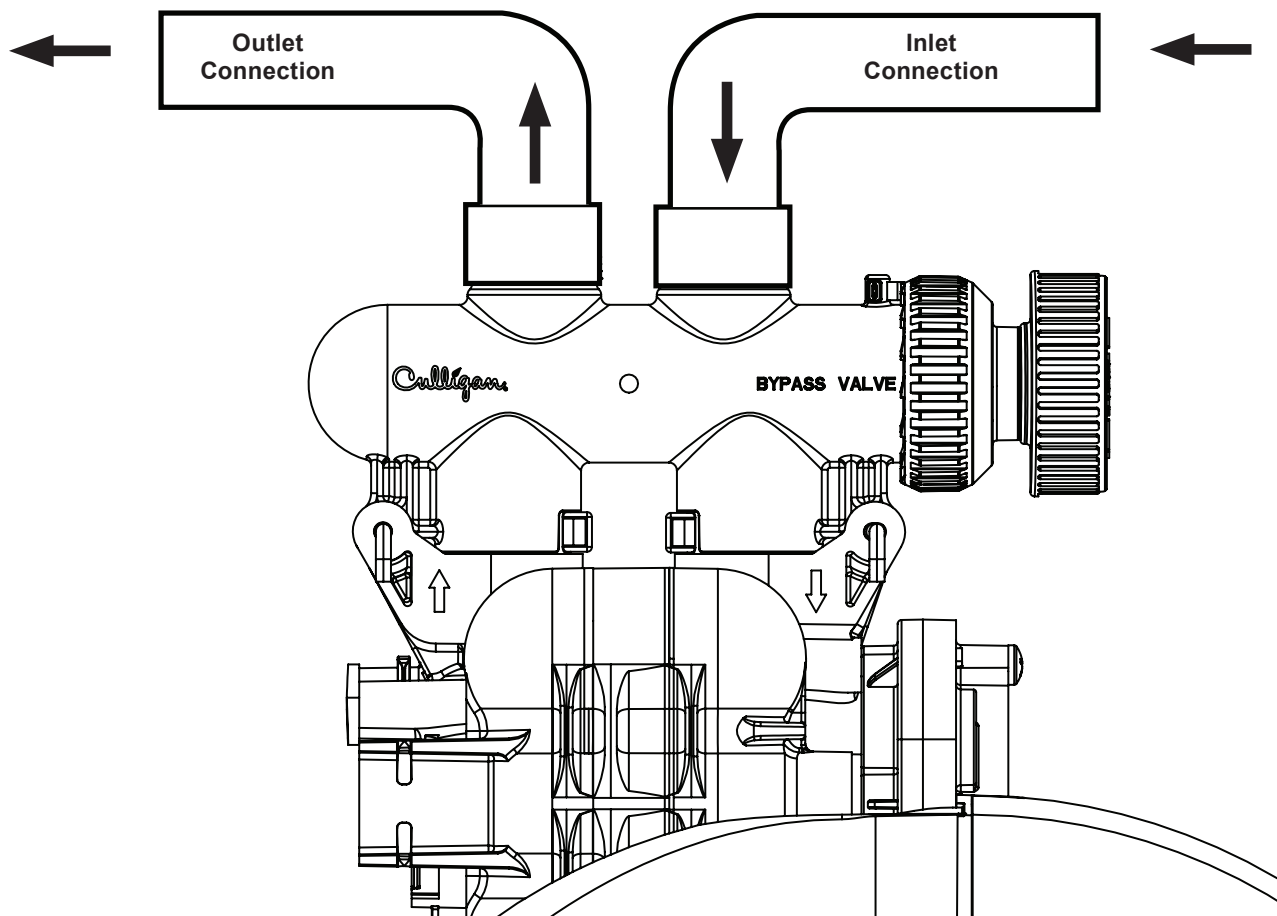
Plumbing Connections

General Instructions

- Take the time to perform a clean installation. Foreign objects, if allowed to enter the piping, can enter the control valve and cause operational problems.
- Once you have completed the plumbing connections to the bypass, the main water supply line may then be reopened so that hard water will be available to the household throughout the remainder of the installation process. Set the Cul-Flo-Valve Bypass in the bypass position by screwing the stem all the way in against the body.

NOTE! The bypass valve can be attached to the control valve with the blue knob on the left side or right side without affecting the direction of water flow.

Figure 5. Plumbing Connection – Top View



NOTE! In all cases where metal pipe was originally used and is later interrupted by the bypass valve to maintain proper metallic pipe bonding, an approved ground clamp c/w not less than #6 copper conductor must be used for continuity. Check your local electrical code for the correct clamp and cable size.



CAUTION!

Close the inlet supply line and relieve system pressure before cutting into the plumbing or flooding could result!

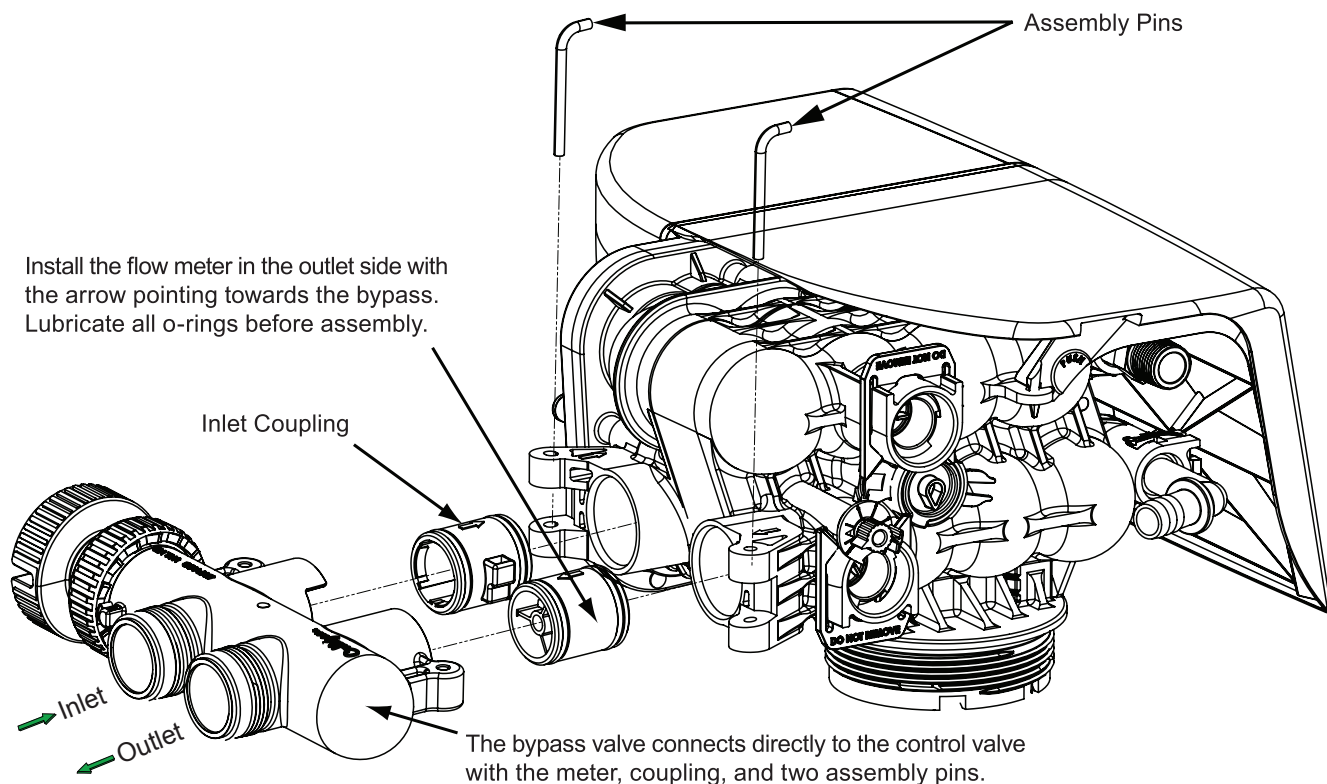
CAUTION!

When making sweat connections, remove all plastic and rubber components which contact brass or copper. Applying heat to these components may result in damage.

Bypass Valve Installation

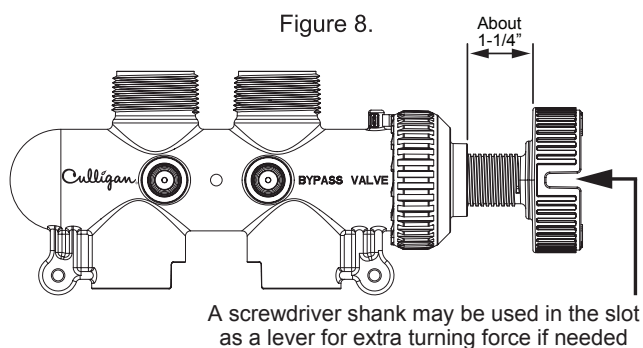
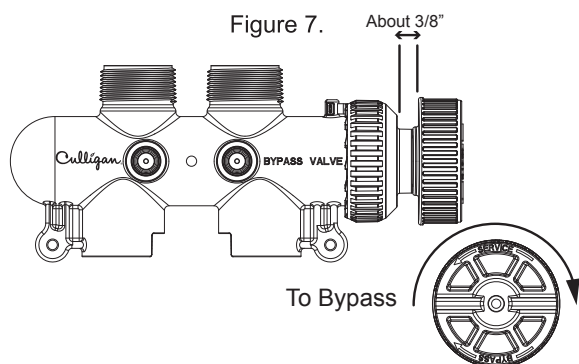
Refer to [Figure 6](#) and the instructions below to connect the flow meter, bypass valve, and plumbing.

Figure 6. Bypass Valve Assembly



NOTE! The mounting ear on the inlet side of the control valve is slotted to aid in making the pin connection with the bypass. The pin should be inserted into the outlet side of the control valve first, then ensure that the inlet side is properly aligned and the slot is not obstructed prior to inserting the pin. The pin should never be forced into position.

To bypass, turn the blue knob clockwise (see directional arrow on end of knob) until the knob stops as shown. ("Figure 7.") DO NOT OVERTIGHTEN! To return to service, turn the blue knob counter-clockwise until the knob stops as shown. ("Figure 8.") (See directional arrow on the end of knob) DO NOT OVERTIGHTEN!



Bypass Plumbing Connections

Table 2. Bypass Adapters - Smart HE

P/N	Pipe Size	Fitting Type	Description	Qty	Image
01016564	3/4"	Copper Tube	Straight	1 Set	
01016565	3/4"	Copper Tube	90° Elbow	1 Set	
01010783	1"	Copper Tube	Straight	1 Set	
P1009856	3/4" and 1"	Copper Plumbing Adapters	Gasket	25 ea	
P1018758	1"	Plastic - PVC Threaded MNPT	Straight	5 Sets (Multipak)	
P1018757	1"	Plastic - PVC Threaded MNPT	Elbow	5 Sets (Multipak)	
MS030226	1"	John Guest - CTS	Straight	1 Fitting	
MS030227	3/4"	John Guest - CTS	Straight	1 Fitting	
MS030223	3/4"	John Guest - CTS	90° Elbow	1 Fitting	
MS030225	1"	John Guest - CTS	90° Elbow	1 Fitting	
MS030224	3/4"	John Guest - CTS	90° Elbow	1 Fitting	
MS030450	3/4"	Boshart - Brass to PEX	Straight	1 Fitting	
MS030451	1"	Boshart - Brass to PEX	Straight	1 Fitting	
MS030448	3/4"	Boshart - Brass to PEX	Straight	1 Fitting	
MS030449	1"	Boshart - Brass to PEX	Straight	1 Fitting	

Removal & Reinstallation of the Vanity Cover

Figure 9. Vanity Cover Removal Steps.

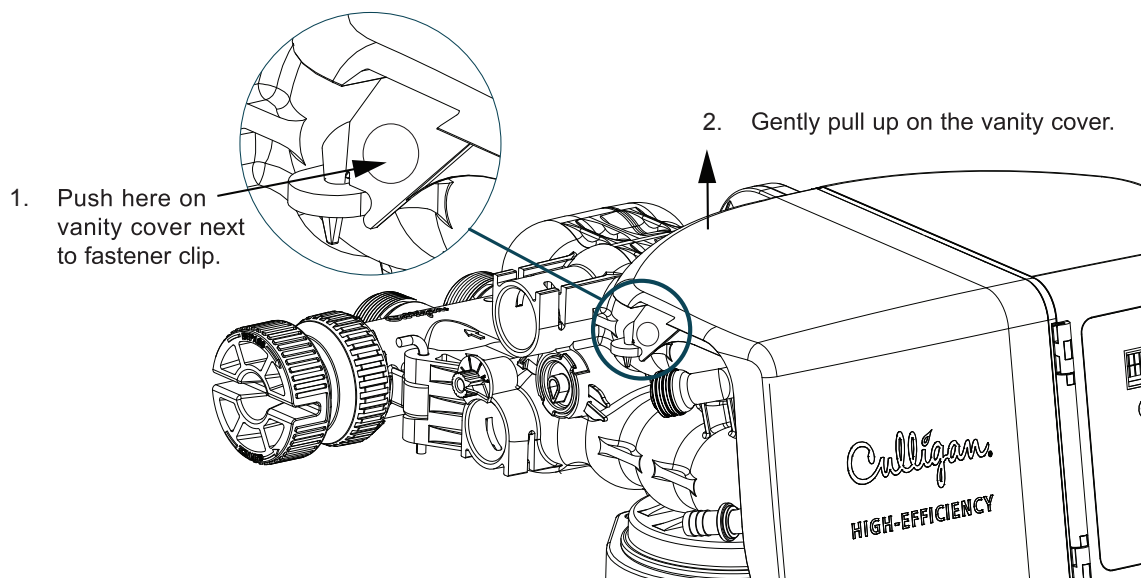


Figure 10. Reattaching the Cover Fastener.

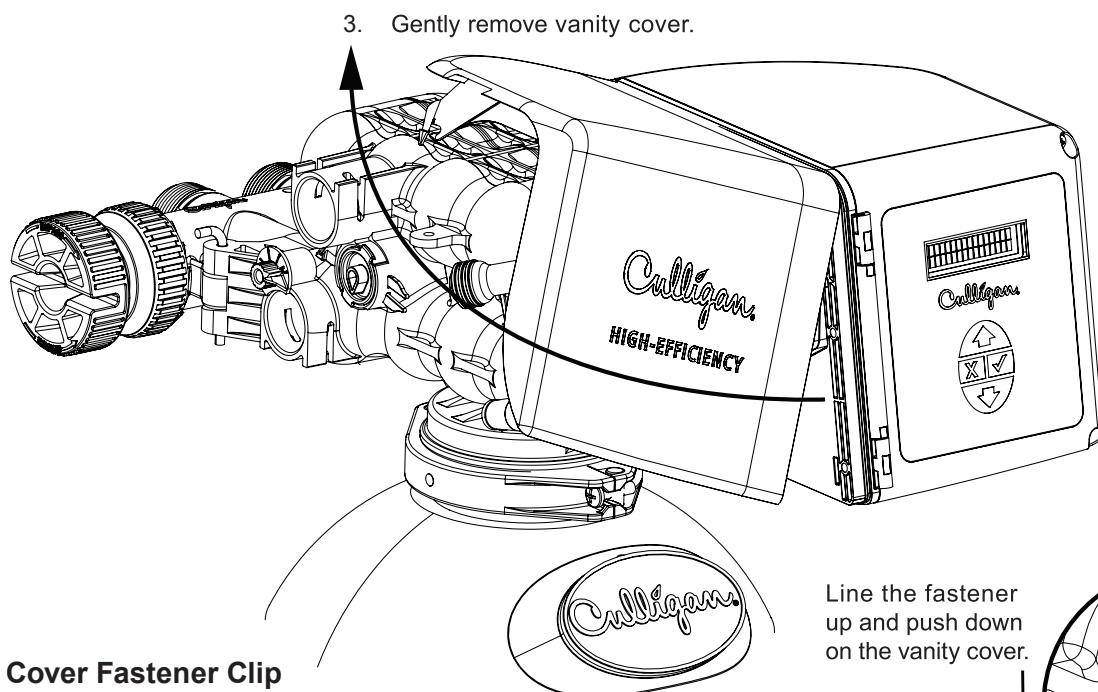
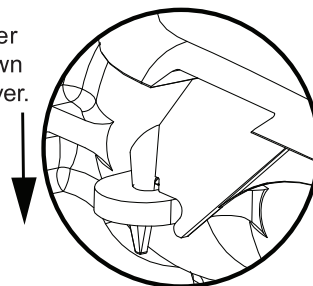


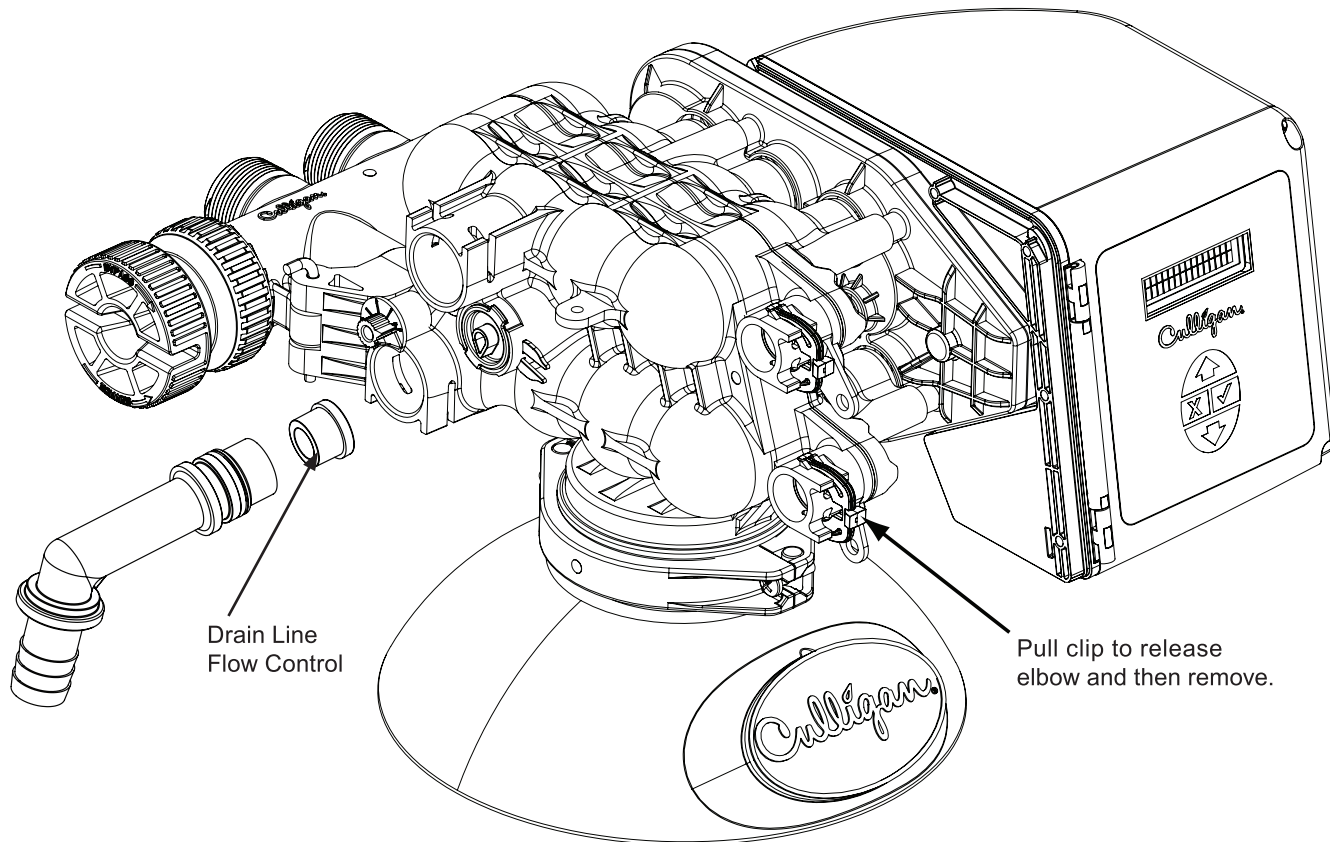
Figure 11.

Line the fastener up and push down on the vanity cover.



Drain Line Flow Control Replacement

Figure 12. Removing the drain elbow and brine elbow.



Drain Line Flow Control Parts

Figure 13. Drain Line Flow Control

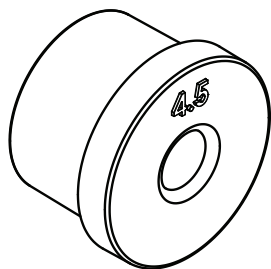


Table 3. Drain Line Flow Control parts

P/N (10 pk)	Color	Flow Rate
P1040210	Black	1.2 gpm
P1040211	Brown	2.0 gpm
P1040212	Green	3.5 gpm
P1040213	Red	4.5 gpm
P1040214	Black	5.5 gpm

Drain Line Connection

Refer to [Table 4](#) for drain line length and height limitations.

1. Fasten the drain line to the elbow with the hose clamp.
2. Secure the drain line to prevent its movement during regeneration. When discharging into a sink, or open floor drain, a loop in the end of the drain line will keep it filled with water and will reduce splashing at the beginning of a regeneration.

NOTE! Waste connections or drain outlets shall be designed and constructed to provide for connection to the sanitary waste system through an air gap as required by the local plumbing code. The system and installation must comply with state and local laws and regulations.

Figure 14. Drain Line Connections

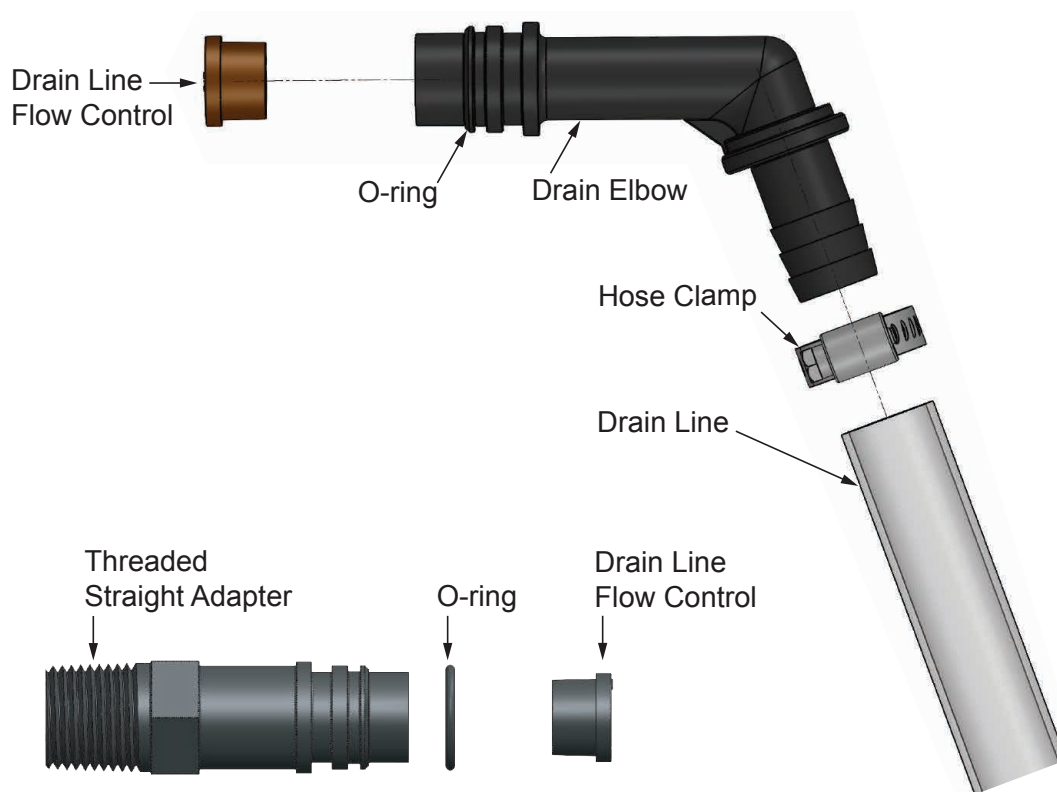


Table 4. Maximum Allowable Drain Line Length

Height of Discharge Above Floor Level Operating						
Operating Pressure	0 ft (0 m)	2 ft (0.6 m)	4 ft (1.2 m)	6 ft (1.8 m)	8 ft (2.4 m)	10 ft (3 m)
30 psi (210 kPa)	60 ft (18 m)	50 ft (15 m)	30 ft (9 m)	15 ft (5 m)	Not allowable	Not allowable
40 psi (279 kPa)	100 ft (30 m)	90 ft (27 m)	70 ft (21 m)	50 ft (15 m)	30 ft (9 m)	12 ft (4 m)
50 psi (349 kPa)	145 ft (41 m)	115 ft (35 m)	80 ft (24 m)	80 ft (24 m)	60 ft (18 m)	40 ft (12 m)
60 psi (419 kPa)	Normal installation		100 ft (30 m)	100 ft (30 m)	85 ft (26 m)	60 ft (18 m)
80 psi (559 kPa)	Should not require more than				140 ft (43 m)	120 ft (37 m)
100 psi (699 kPa)	100 ft (30 m) of drain line					150 ft (46 m)

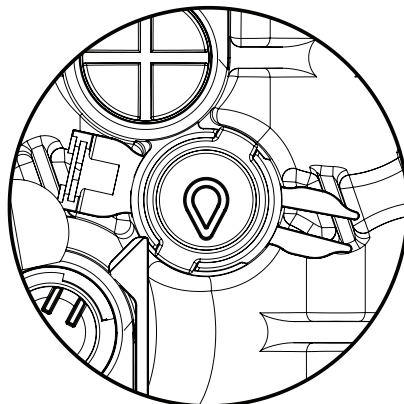
Removal of the Eductor Cap

The very small o-ring on the post inside the eductor cap on all Smart HE valves is crucial for the proper brine draw function of the control. The eductor cap's up or down orientation indicates upflow or downflow brining through the resin tank. Improper removal of the eductor cap may result in damage to this o-ring, negatively impacting brine draw.

To remove the eductor cap without damage, use needle nose pliers, grasp the large waterdrop-shaped boss in the center of the cap, and pull straight out. To avoid damage DO NOT pry or rock the cap back and forth during removal.

NOTE! Care should still be taken when removing the cap using needle nose pliers by the large waterdrop-shaped boss because the post can still be broken if not pulled straight out.

Figure 15.
Eductor cap featuring large boss
(Shown in Downflow position)



Changing the Eductor Throat & Nozzle

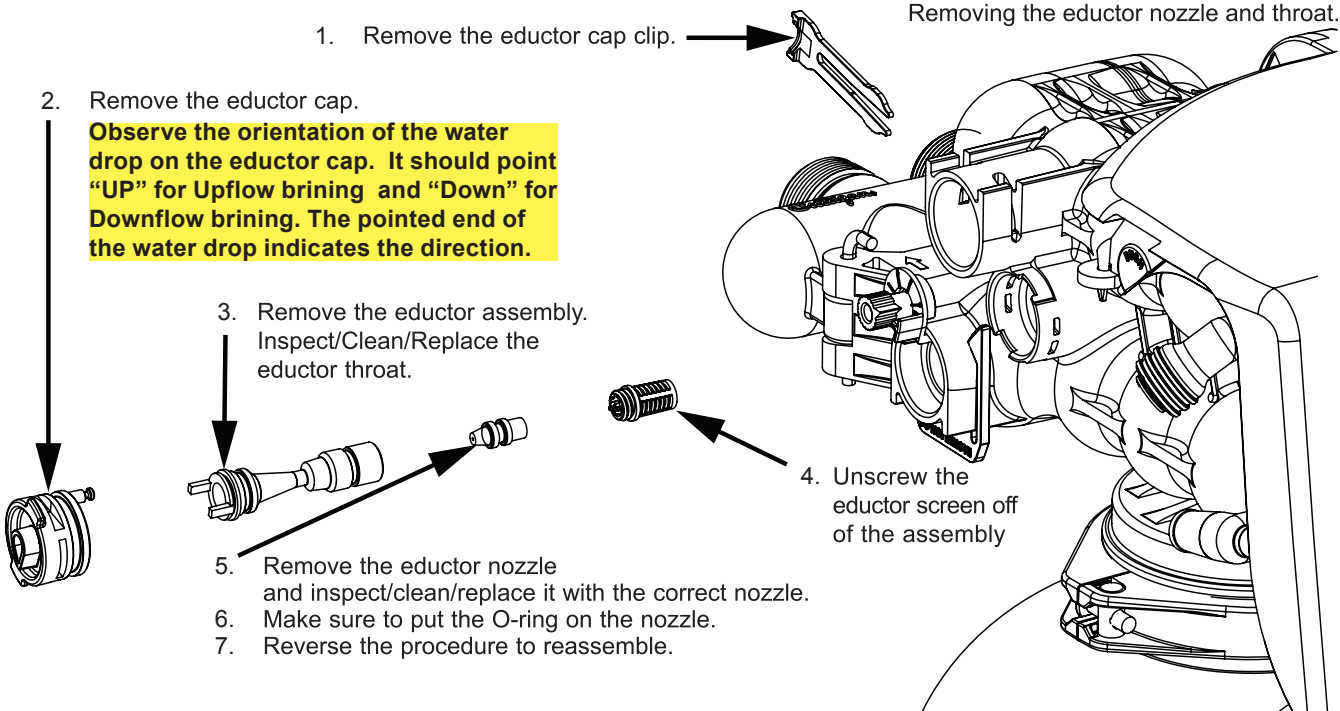


Figure 16.
Removing the eductor nozzle and throat.

Table 5.

Smart HE Softener Eductor Nozzle, Throat and Drain Line Flow Controls - Standard Systems
(See Appendix pages for Softener-Clear, Municipal and Nitrate Reduction Conditioners)

Unit	Throat	Nozzle	Backwash/Fast Rinse* - Flow Control Color	Brine Draw	Slow Rinse	Brine Refill
9" Upflow	Gray	Blue	2.5 gpm - Brown	0.42 gpm	0.26 gpm	0.45 gpm
10" Upflow	White	Blue	2.5 gpm - Brown	0.42 gpm	0.26 gpm	0.45 gpm
9" Downflow	Gray	White	2.5 gpm - Brown	0.28 gpm	0.21 gpm	0.45 gpm
10" Downflow	Beige	Beige	2.5 gpm - Brown	0.98 gpm	0.78 gpm	0.45 gpm
12" Downflow	Beige	Beige	3.5 gpm - Green	0.93 gpm	0.81 gpm	0.8 gpm
14" Downflow	Blue	Green	5.5 gpm - Black	1.86 gpm	1.37 gpm	0.8 gpm

* Flow Rate represents text molded onto flow control. For actual flow rate see "Drain Flow, Maximum" on the Specifications page.

Eductor Upflow Spring & Bullet

Smart HE Upflow systems incorporate an eductor check valve. This bullet type check valve is designed to seal from the outside edge of the eductor throat with the small spring inside the bullet, pressing against the eductor cap.

Figure 17. Eductor cap with Bullet Check

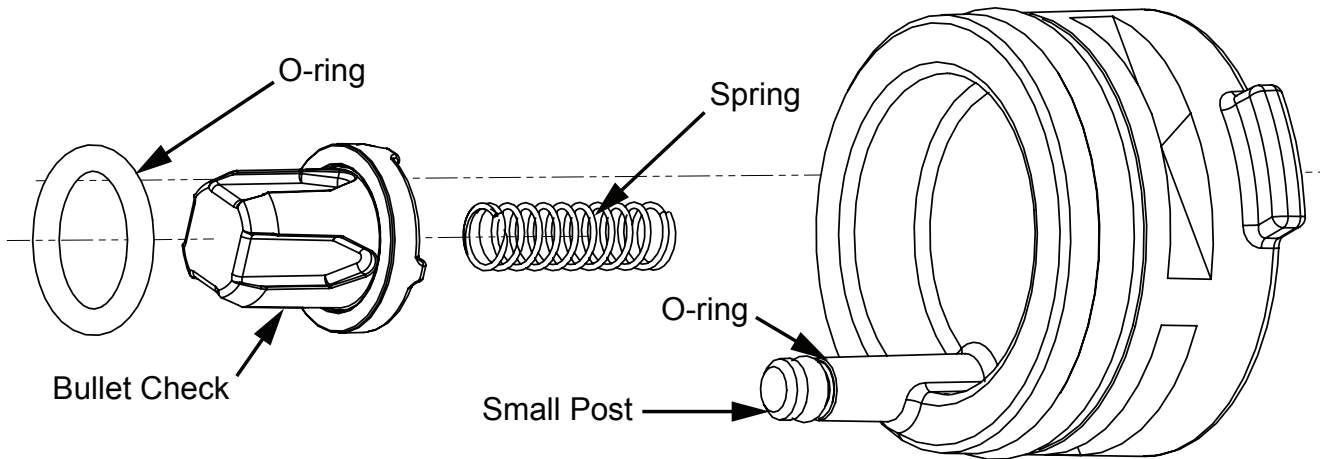
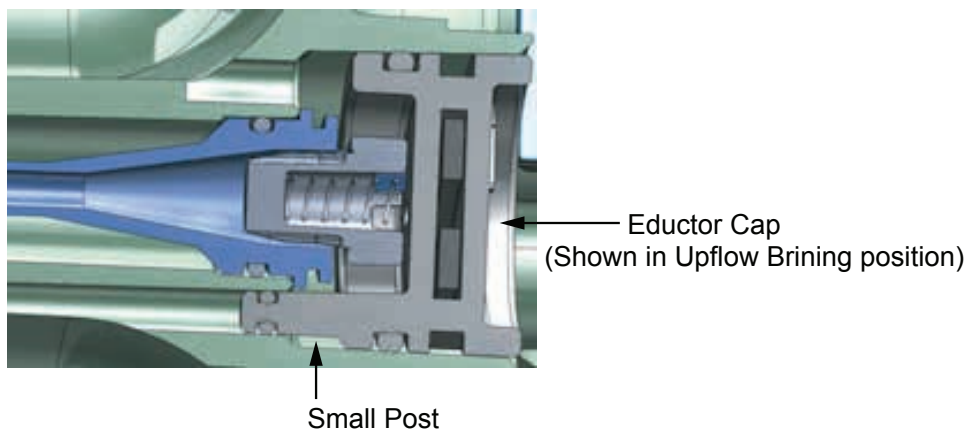


Figure 18. Smart HE Upflow Eductor Assembly - Cross Sectional View



Brine System Installation

Figure 19. Brine Tank

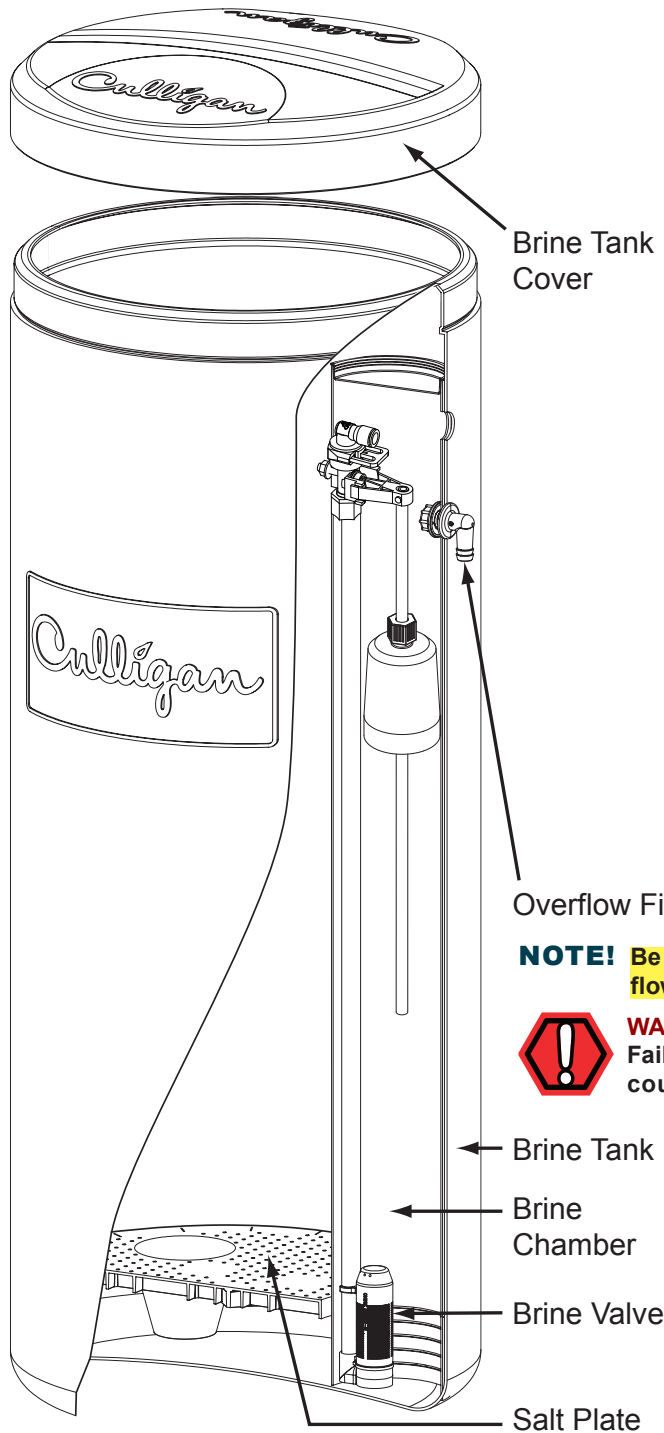
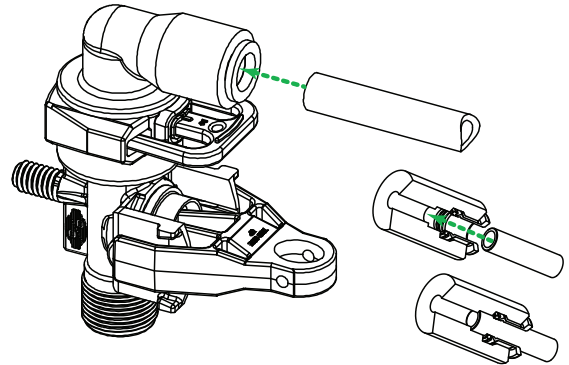


Figure 20. Insert Brine Line Tubing into Brine Fitting



1. Measure a length of 3/8" brine line sufficient to reach from the brine tank to the brine fitting. Cut both ends of the brine line squarely and cleanly.
2. Check the push-to-connect fitting opening to be sure it is clean and free of debris.
3. Insert the tubing until it bottoms into the fitting. Pull on the tubing to verify it is fully inserted.
4. To disassemble, push the collar toward the fitting and hold while pulling the tubing straight out of the fitting.

Overflow Fitting

NOTE! Be sure to run tubing from the overflow fitting to a suitable floor drain.



WARNING! Failure to have overflow protection could result in property damage!

Brine Tank

Brine Chamber

Brine Valve

Salt Plate

Fill The Salt Storage Container

Fill the salt storage container with water until the level reaches about one (1) inch above the salt support plate. Pour salt into the container. Fill with salt to within a few inches of the top.

Electrical

Controller Electrical Connections

The 28VDC power supply and flow meter wire harness is already connected to the circuit board. If no other circuit board connections are required proceed to the First Time Setup. Refer to the instructions below and [Figure 21](#) - [Figure 22](#) for connecting the Aqua-Sensor probe wire harness to the circuit board.

Figure 21. Insert Wire with Bushing.

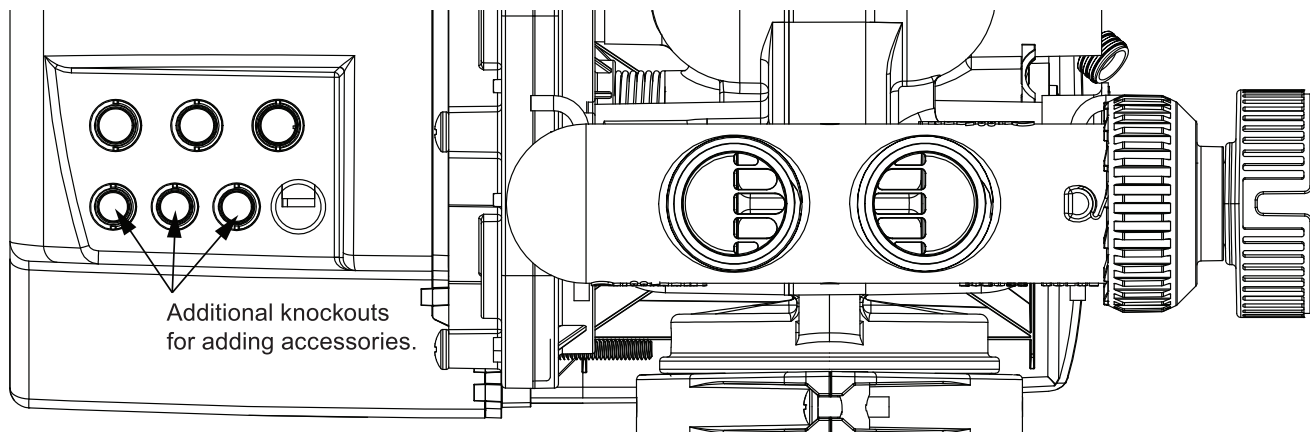
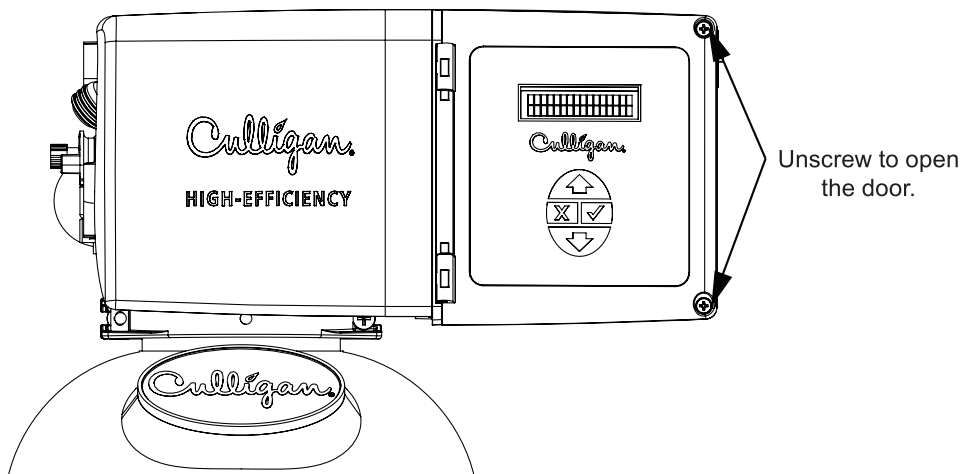


Figure 22. Opening the Smart HE Enclosure Door



Power Supply

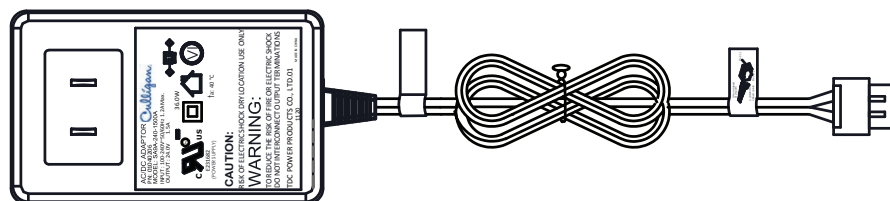
A wall mount plug-in power supply with a 20-foot cord is provided. The customer should provide an electrical outlet that is not controlled by a switch that can be turned off accidentally. Observe local electrical codes.

NOTE! The softener works on 24 volt - 60 Hz electrical power only.

P/N 01040206 20 ft plug-in power supply is rated for indoor installations only.

P/N 01040207 30 ft optional power cord for longer runs to an indoor outlet.

Figure 23. 20-foot Power Supply



GBX Circuit Board - Main

Figure 24. Back of GBX Circuit Board

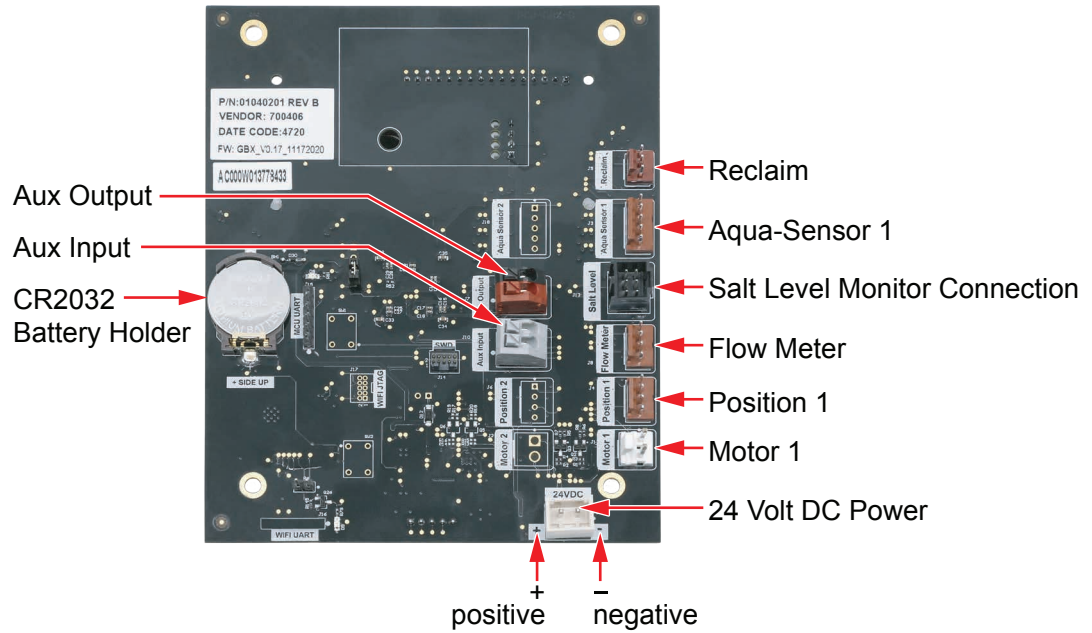
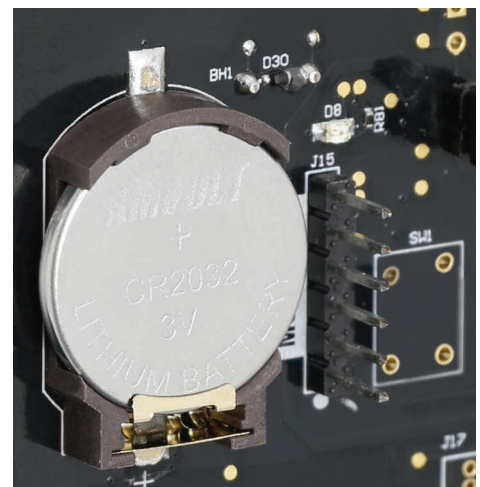


Figure 25. GBX Circuit Board Battery Replacement



Insert CR2032 coin battery, positive side of the battery pointing out, in the empty battery slot on the GBX Circuit Board.



Installing Accessories

Aqua-Sensor® (Indoor P/N 01040293, Outdoor P/N 01040295)

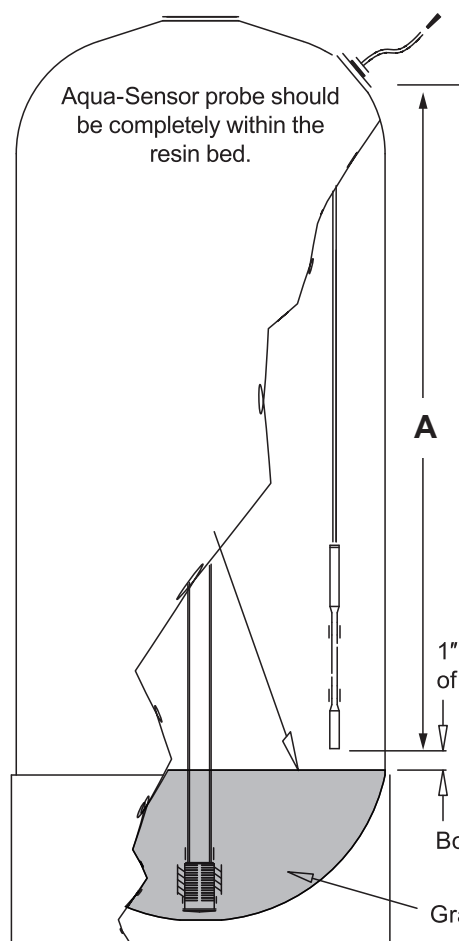
Aqua-Sensor® probe detects and initializes a regeneration based on exhaustion of the resin bed, which is monitored by electrical conductivity. The conductivity is also monitored in the resin bed during regeneration to determine the brining process has been complete and to optimize the slow rinse times, potentially saving water.



WARNING!

For best results, do not subject the Aqua-Sensor® to conditions outside the operating parameters of the water softening system. See [“Specifications” on page 7.](#)

NOTE! The wire connectors must be connected to the circuit board properly. Failure to properly connect any of the connectors will result in a malfunction of the circuit board operation.



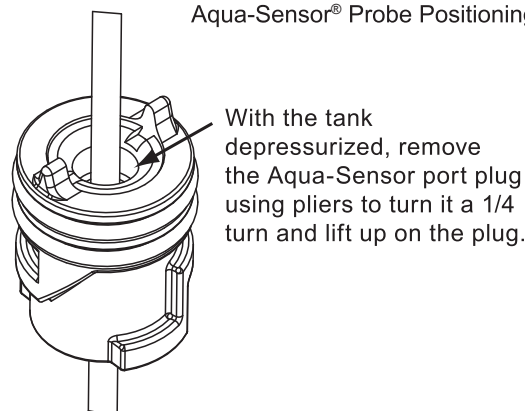
Locate the Aqua-Sensor probe from the kit and adjust the cable to the proper length for the HE's tank size ([Table 6](#)). The small center plug can be loosened to allow cable movement and then re-tightened with pliers to prevent leaks.

Lube the o-ring of the Aqua-Sensor probe before inserting it into the port.

Table 6. Aqua-Sensor Probe Lengths

Softener Model	9	10	12	14
Recommended "A"	40"	44"	42"	52"
NOTE! Measurement to the bottom of the probe allows for a 30% reserve capacity.				
If used in a multiple tank configuration, lower the probes to be just above the underbedding.				

Figure 26. Aqua-Sensor® Probe Positioning.



NOTE! For the Aqua-Sensor system to work correctly the tank will need to be backwashed for additional amount of time to drop the probe to its operating depth. Then the system will need to complete a full regeneration to record the conductivity in the tank.

Leak Detector

Attach the two wires from the leak sensor to the Aux In terminals on the GBX board. Circuit board has the default for Aux In at Leak so no programming is required after wiring.

Figure 27. Leak Sensor - Top View

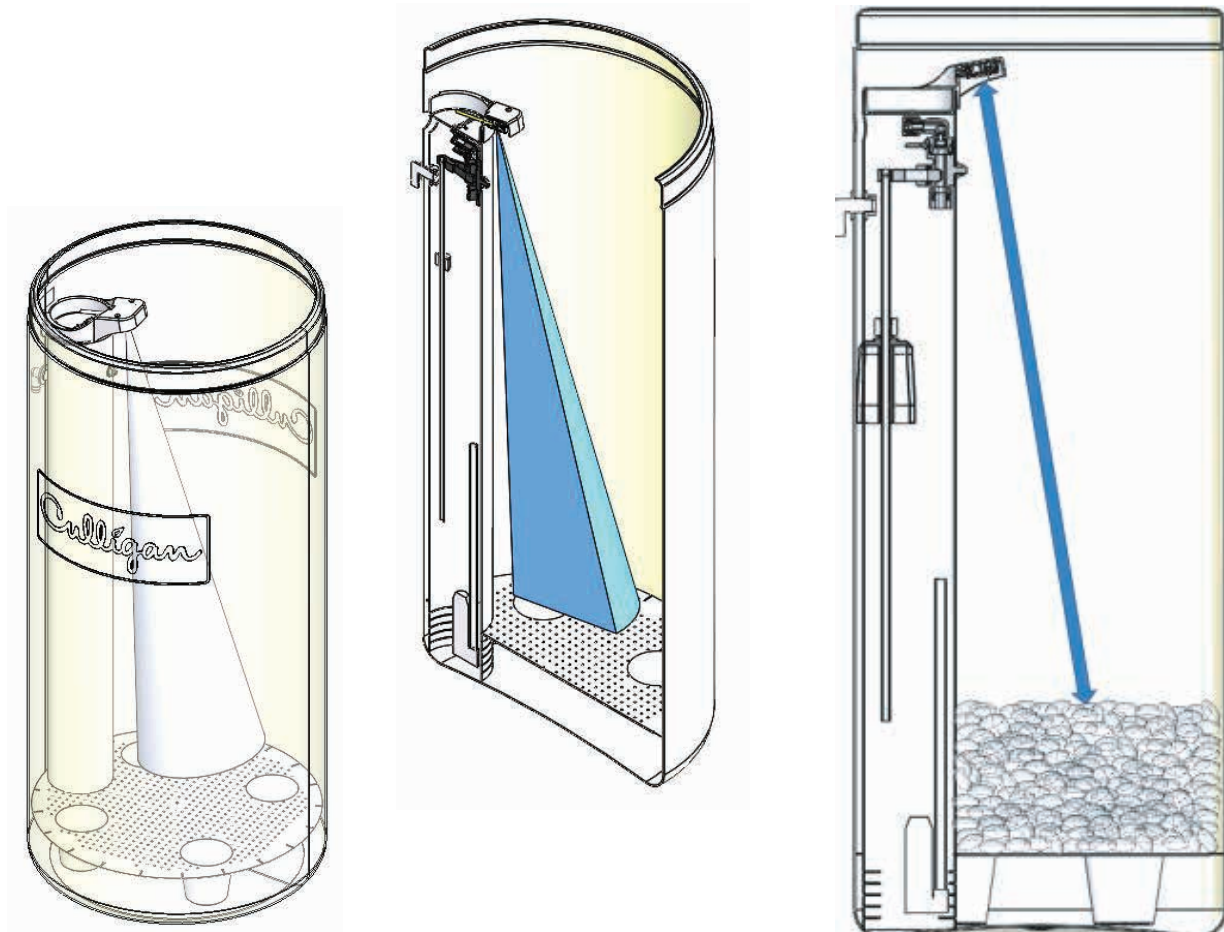
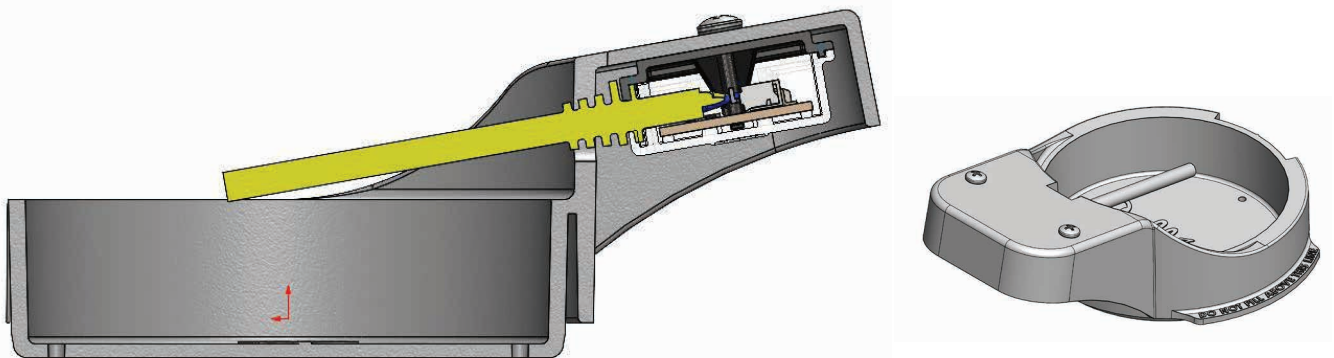


Figure 28. Leak Sensor - Bottom View



Salt Level Monitor (Indoor P/N 01040297)

1. Attach the Salt Level Monitor by pressing the cap down onto the brine well.
2. Drill a 1/2" hole just below the height of the cap and off to the side of the brine well.
3. After feeding the cable through the opening, insert the split grommet around the cable and into the opening of the brine tank wall.
4. Plug the 6-pin connector into the GBX circuit board location labeled "Salt Level".

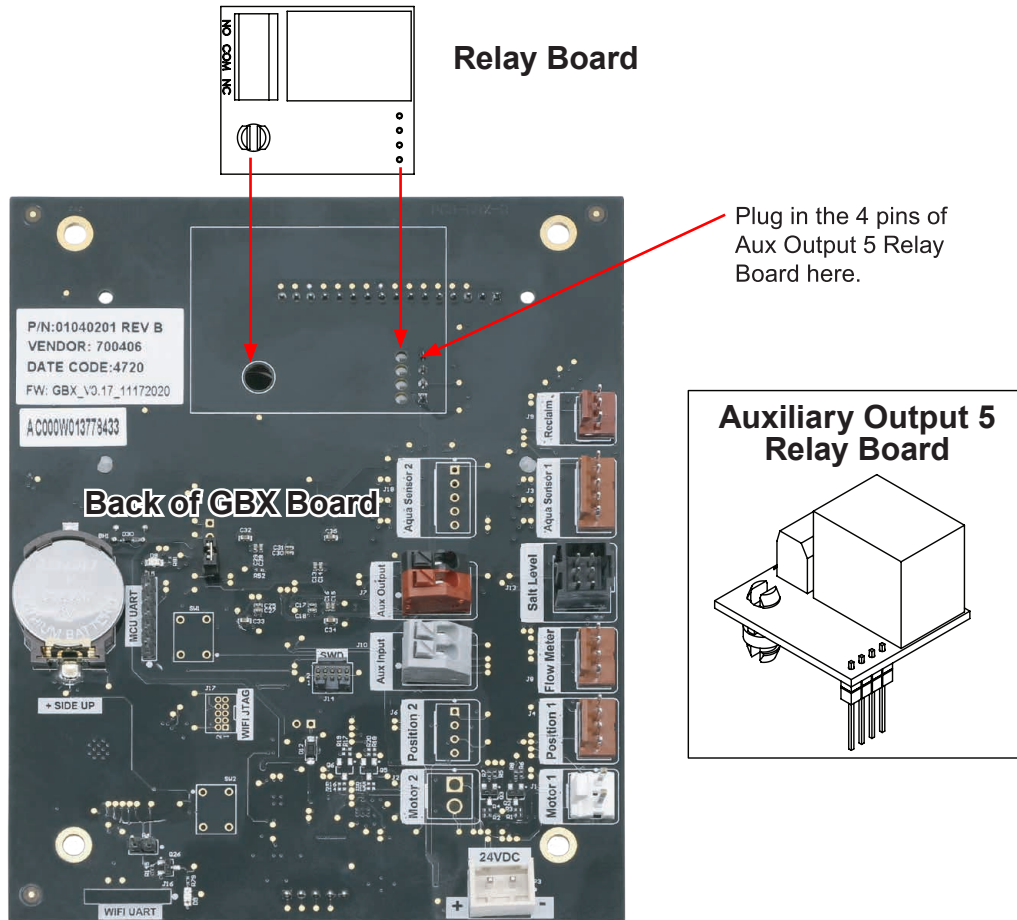


Auxiliary Output 5 Relay Board (P/N 01022238)

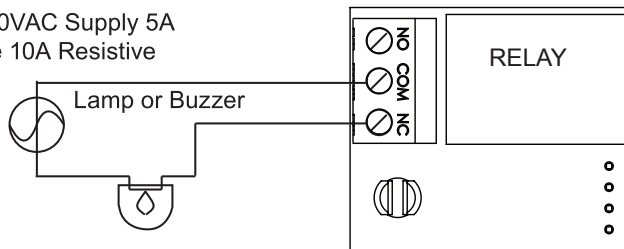
The GBX board offers support for the Auxiliary Output 5 Relay board (P/N 01022238). To use the relay board, install it onto the back of the GBX board.

Refer to GBX Programming for Residential Softeners and Filters Manual (P/N 01040743) for programming information. This manual can be obtained on CPort (www.cport.culligan.com) under the [Technical Service Tab](#) or on the Service Tech App.

Figure 29. Example of Wiring to the GBX Alarm Signal Output.



Up to 250VAC Supply 5A
Inductive 10A Resistive



In this example, the circuit is wired to the Common (Com) Terminal and Normally Closed (NC) Terminal, which means that when the lamp or buzzer is ON an error has occurred, and when the light is OFF the circuit is operating normally.

NOTE! Aux Output 5 Relay Board is also used to control HE Accessory Chemical Feed Pumps.

This mode of operation occurs when the relay board is plugged into the GBX board Aux 5 Output Relay socket. When Error Status is selected on the display, this relay is energized holding the normally closed contact open, and when the GBX board has power AND there are no errors present the relay is energized. ("Problem Found" is not showing on the Home screen). The relay is in the de-energized state when the GBX is either powered OFF or when there is an error present on the GBX board.

Settings

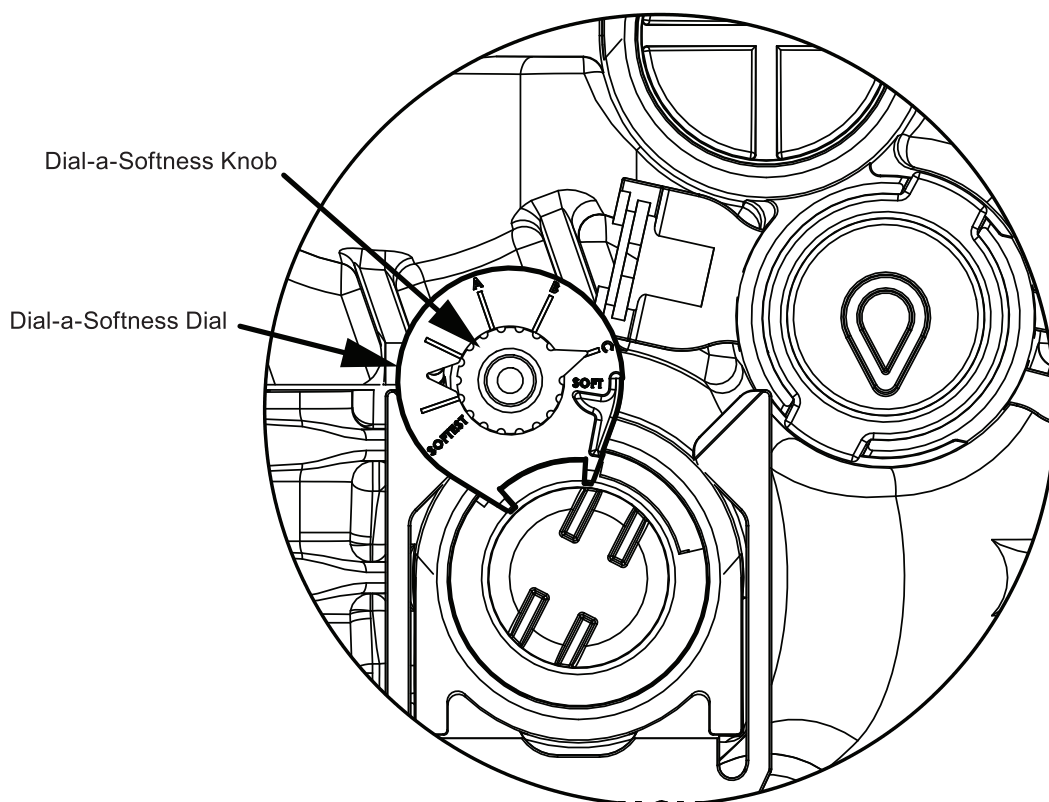
Dial-a-Softness

Dial-a-Softness is a manual adjustment built into the control valve that allows for variable hardness levels to bypass the resin tank into the softened water. The hard water bypass can be adjusted to produce 1–3 gpg hardness bleed. Shipped from the factory the Dial-a-Softness knob is set to the “SOFTTEST” position (no hard water bypass). See [Figure 30](#).

To set the Dial-a-Softness:

1. Locate the Dial-a-Softness knob on the control valve.
2. Set the Dial-a-Softness knob to position A, B, or C as outlined in the table below, based on raw water hardness; this should produce a 1–3 gpg hardness bleed.

Figure 30. Dial-a-Softness Knob.



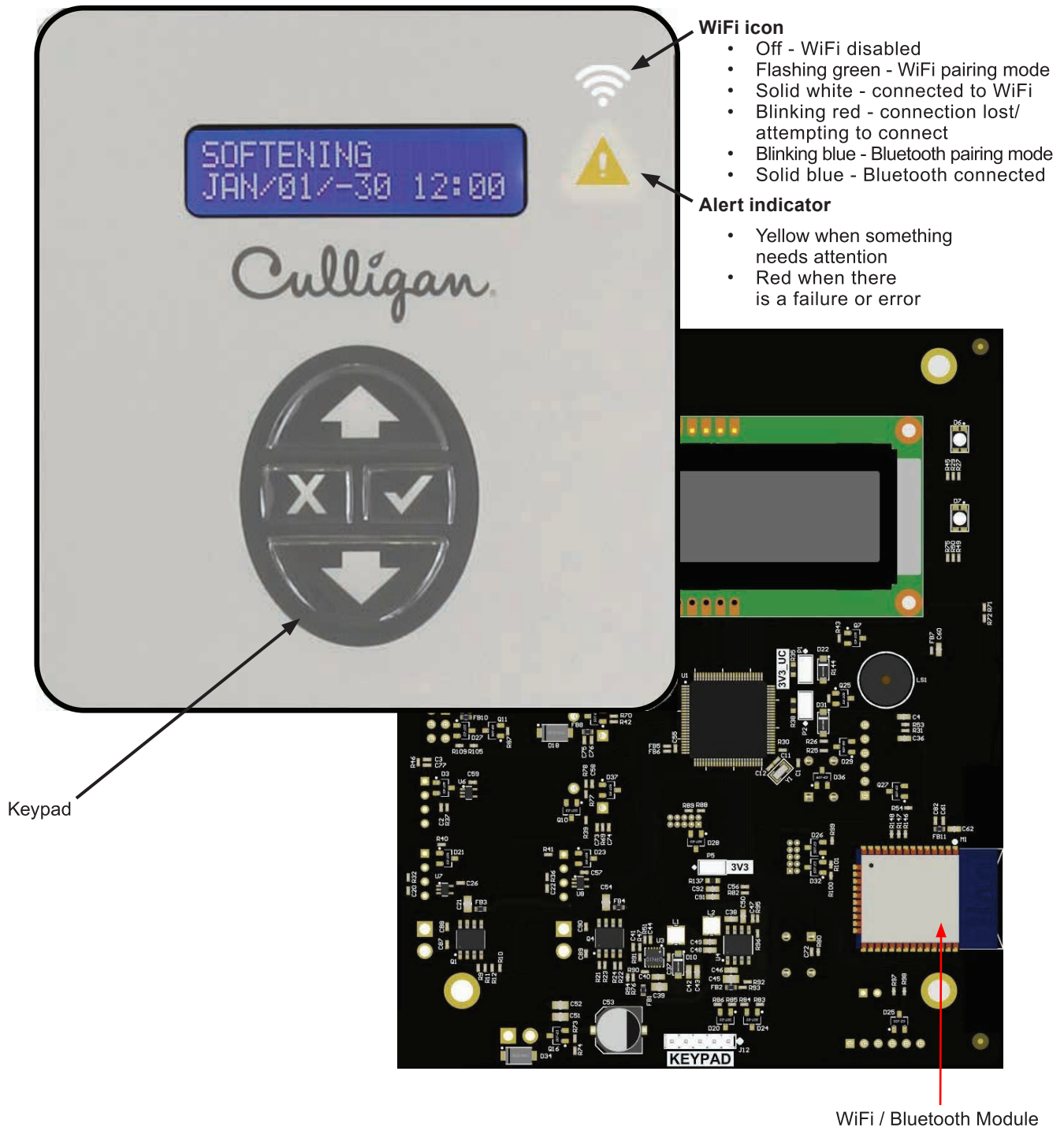
Letter on Dial-a-Softness Knob	1–3 gpg Hardness Bleed
SOFTTEST	0
A	Greater than 20 gpg
B	Between 10–20 gpg
C	Less than 10 gpg

NOTE! The Smart HE must take into account the adjusted capacity if the Dial-a-Softness was changed. See GBX Programming for Residential Softeners and Filters Manual (P/N 01040743) to update the Dial-a-Softness setting.

Controller Features

Keypad Overview

Figure 31. Front of GBX Board



Startup

Recommended Start-Up Procedure

1. Close the main water supply valve.
2. Set the bypass valve to the bypass position.
3. Ensure that all faucets at the installation site are closed.
4. Direct the drain line discharge into a bucket where flow can be observed.
5. Plug the power supply into a 120 Volt, 60 Hz, single-phase receptacle. The screen displays LANGUAGE (Refer to the GBX Programming for Residential Softeners & Filters Manual, P/N 01040743, for instructions).
6. Complete the First Time Setup.
7. Open the main supply valve.
8. Using motor control in diagnostics, move to backwash position
9. Initiate an immediate regeneration to move the control into the BACKWASH position.
10. When in the BACKWASH position, slowly rotate the bypass to the soft water position until water flows.
11. Allow the tank to fill slowly until water flows from the drain line.
12. When flow to drain is established, open the bypass fully. Watch the drain line discharge for signs of resin. If signs of resin particles appear, reduce the flow. Increase the flow again when resin no longer appears in the discharge.
13. After the BACKWASH runs clear, Fill the brine tank with water until the level reaches about 1" above the salt plate.
14. Step the control to the refill position to fill the brine tank and purge air from the brine line.
15. Complete the installation and cleanup.
16. Sanitize the unit as you leave the installation site (See "[Sanitizing Procedure](#)").
17. Set to regenerate that night or set to regenerate at the preset time.

Serial Numbers

The unit has a serial number located on the back of the control valve enclosure and on the top surface of the media tank. Do not destroy these serial number labels.

The bottom portion of the label can be removed, placed on the IQR form, and recorded online.



The tank serial number label needs to be attached at the time of installation on a clean dry location on the outside of the tank.

NOTE! Do not remove or destroy the serial number; it is referenced on request for warranty repair or replacement.

Sanitizing Procedure

A water softener in daily use on a potable water supply generally requires no special attention other than keeping the salt tank filled. Occasionally, however, a unit may require sanitization under one of the following conditions:

- At start-up time.
- After standing idle for a week or more.
- On private supplies, the appearance of off-tastes and odors, particularly if musty or “rotten egg” (caused by harmless sulfate-reducing bacteria).

NOTE! If the water supply contains iron, regenerate the softener before sanitizing to remove iron from the resin.



CAUTION!

Hazard from toxic fumes! Chlorine bleach and common iron control chemicals may generate toxic fumes when mixed. If the unit uses Culligan Softner-Gard® or other compounds containing sodium hydrosulfite, sodium bisulfite, or any other reducing agent, disconnect the device feeding the chemical(s) and manually regenerate the unit before sanitizing.

1. Remove the brine tank cover.
2. Pour directly into the brine chamber 1/3 to 1/2 cup of unscented household bleach (6% sodium hypochlorite) for each cubic foot of resin in the tank.
3. Manually start recharge. Allow the unit to complete the recharge cycle automatically.

Before Leaving The Installation Site

1. Sanitize the water softener.
2. The water heater may hold hard water for several days. Advise the customer that the existing water volume in the tank will need to be used before the hot water is soft. If soft hot water is required immediately, open hot water valve at a tub faucet and run water until it tests soft. With on-demand water heaters the water will never get cold.
3. Explain the operation of the softener to the customer. Make sure the customer knows that there will be new sounds associated with the recharging of the unit. Advise the customer to periodically check and replenish the salt supply.
4. Attach the appropriate data plate label located in the Parts Pack onto the back of the control.
5. Clean up the unit and installation site, removing any soldering, or pipe threading, residues from the equipment and surrounding area with a damp towel.

Use of Bypass Valve

Depending on where the unit was installed, the outside sill cocks may or may not be supplied with softened water. If possible, all lines not requiring soft water should be taken off upstream of the softener and reconnected to the untreated water supply. This is not always possible, however, due to the difficulty or expense of rearranging the piping. Before making any plumbing changes, check local and state plumbing codes.

Bypass the softener if:

1. If the outside lines are treated by the water softener and the water is to be used for lawn sprinkling or other outside uses (use softener internal or external softener bypass valve).
2. Water is not used for several days (use softener internal or external bypass valve).
3. You wish to inspect or work on the valve or brine system (use softener external bypass valve).
4. A water leak from the valve is evident (use softener external bypass valve).

Three-Valve Bypass

To bypass, close the inlet and outlet valves, and open the middle valve. Reverse the process to return to softened water. Be sure to close the bypass valve completely to avoid mixing hard water with soft water.



CAUTION!

If the media tank is to remain attached to the control valve, close only the inlet valve, then open the bypass valve. This will prevent pressure from increasing in the media tank due to warming. If the softener is leaking or continuously running to the drain, turn the outlet valve off as well.

Care and Cleaning

Protect the operation and appearance of the water conditioner by following these precautions:

1. Do not place heavy objects on top of the conditioner cover.
2. Use only mild soap and warm water to clean the exterior of the unit. Never use harsh abrasive cleaners or compounds which contain acid or bleach. Culligan recommends Simple Green or an equivalent cleaner.
3. Protect the conditioner and drain line from freezing temperatures.

Manual Control Cycling

Refer to the GBX Programming for Residential Softeners and Filters Manual, P/N 01040743, for instructions.

Preventative Maintenance

NOTE! Refer to the **GBX Programming for Residential Softeners and Filters Manual (P/N 01040743)** for diagnostic procedures using the Smart (GBX) Controller.

Preventive Maintenance Inspection Schedule

The Culligan Smart HE water Conditioner has been designed to provide long service life. Routinely inspecting the system may help avoid potentially costly breakdowns related to circumstances outside of the control of the dealer and/or user.

Table 7. Recommended preventive maintenance inspection schedule.

Component	Suggested Inspection Frequency	Reason for Maintenance
Entire System	At Start-up, after infrequent use (idle for one week or more) or every 3–6 months if on a private water supply.	On private supplies, the appearance of off-tastes and odors, particularly if musty or “rotten egg” (caused by harmless sulfate-reducing bacteria) may indicate a need for the system to be sanitized. See “Sanitizing Procedure” on page 38 .
Backwash Flow Controller	Every 12 months or every time service is performed on the system.	Build up of sediment, iron and/or other foreign materials (found in some water supplies but not necessarily all) could negatively affect system performance. Monitor item for normal or unexpected wear.
Brine eductor nozzle and throat	Every 12 months or every time service is performed on the system.	Build up of sediment, iron and/or other foreign materials (found in some water supplies but not necessarily all) could negatively affect system performance. Monitor item for normal or unexpected wear.
Softening Media	Every 2–3 years	Chlorinated water supplies can breakdown and destroy softening resin. Softening resin may also perform poorly if subjected to other materials (sediment, iron, alum, etc.) found in some water supplies (but not necessarily all).

Application Problems

Many service problems are not due to equipment malfunction, but rather to misapplication or environmental conditions.

The Operation & Performance Specifications

See [“Specifications” on page 7](#). Provides the recommended limits of water characteristics for the Culligan High Efficiency water Conditioners. If the water characteristics fall outside these limits, programming modifications or additional water treatment equipment may be required, or the water characteristics should be brought inside the limits. The system flow rates and exchange capacities are also listed.

Smart HE Flow Rates

When troubleshooting a softener, measure the actual flow rates and compare these measured values to those listed in the [“Specifications” on page 7](#), and [Table 5 on page 26](#).

Some variations from the values in this table are normal and to be expected. The backwash, brine fill, and slow-rinse flow rates should be expected to be within +/-15% of the values in [Table 5 on page 26](#). The brine draw rate should be within 5% of the value shown in [Table 5 on page 26](#).

If there are no apparent general problems or environmental problems, refer to [“Troubleshooting Guide” on page 47](#).

Service

Analyzing the System

Analyzing the system involves three basic steps:

1. Check the system in all cycle positions.
2. Compare the data to normal operating data.
3. Determine which component may cause the problem (troubleshooting).

If steps 1-3 did not reveal the problem, initiate a regeneration cycle and manually cycle the valve to brine draw (brine draw is the #2 position on up flow units and position #3 on down flow). Allow the unit to complete the brine draw cycle and observe how the system reacts.

Although it may be possible to solve a specific problem simply by changing a component, analyzing the entire system can reveal additional problems which would otherwise require extra service calls. "Parts changing" is not the same as service.

Checking the System

The following tools are needed to collect data:

1. Hardness, iron and chlorine test kits
2. Pressure gauge, 0-120 psi
3. 5-Gallon bucket and time keeping device; i.e., clock app on mobile phone
4. Calculator

The customer may be able to provide details relating to problems with the system. By collecting data prior to a service call, a "first guess" about the cause of the problem can be made and the need for any special parts can be determined. If the problem is as simple as lack of salt in the brine tank, a service call may not be needed at all.

Familiarize yourself with the replacement procedures and component parts thoroughly before attempting any repair.



WARNING!

**Disconnect all electrical power to the unit before servicing.
Bypass the unit and relieve system pressure before attempting repair.**

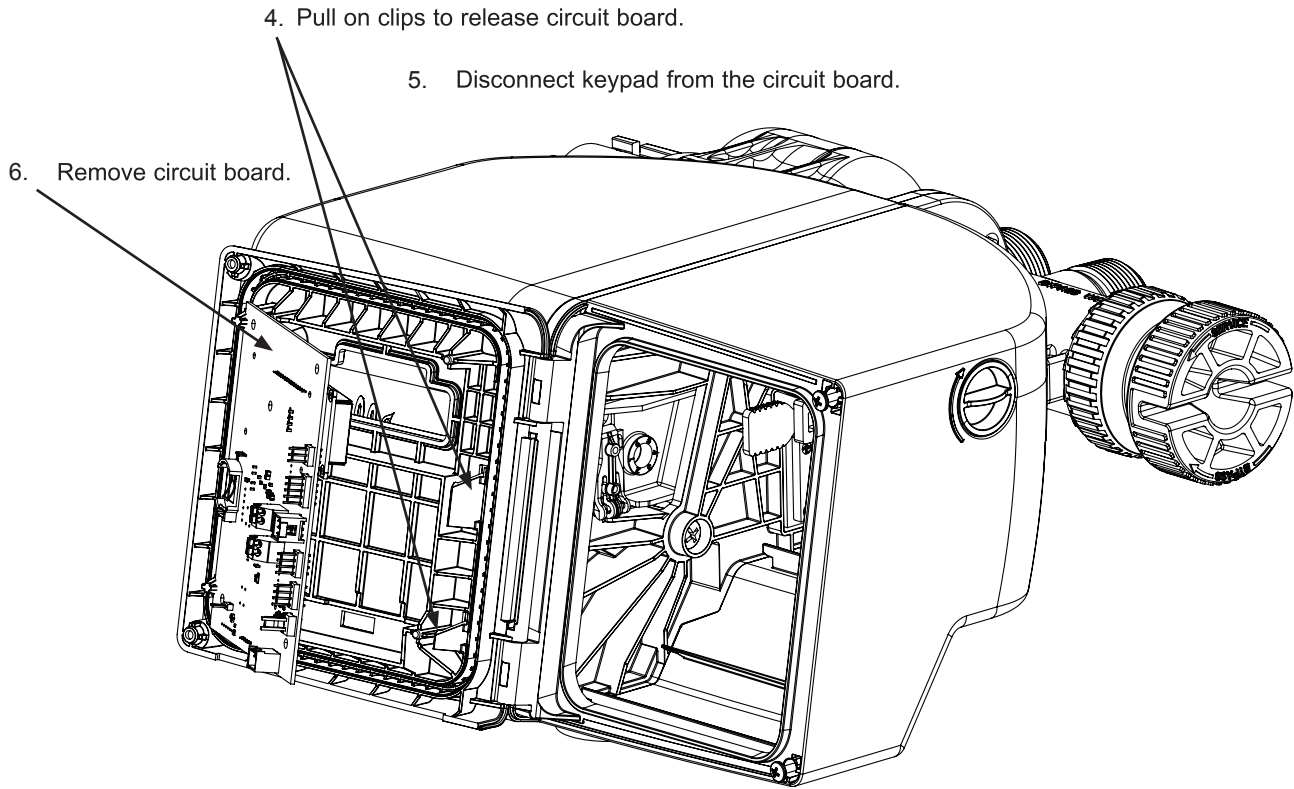
Replace the Circuit Board

1. Turn the power off.

NOTE! Make sure that all of the settings are written down before the replacing the circuit board. Settings will need to be reprogrammed after the new circuit board is installed.

2. Open the door on the enclosure. See [Figure 22 on page 29](#).
3. Disconnect all the connections, such as the power supply and position sensor, from the circuit board.

Figure 32. Removing the Circuit Board



7. Reverse steps 4-6 to insert the new circuit board.
8. Reconnect all the connections, such as the power supply and position sensor, from the circuit board. See [“Electrical” on page 29](#).
9. Close the door on the enclosure and re-tighten the screws.
10. Turn on power. Reprogram the Smart HE Softener.

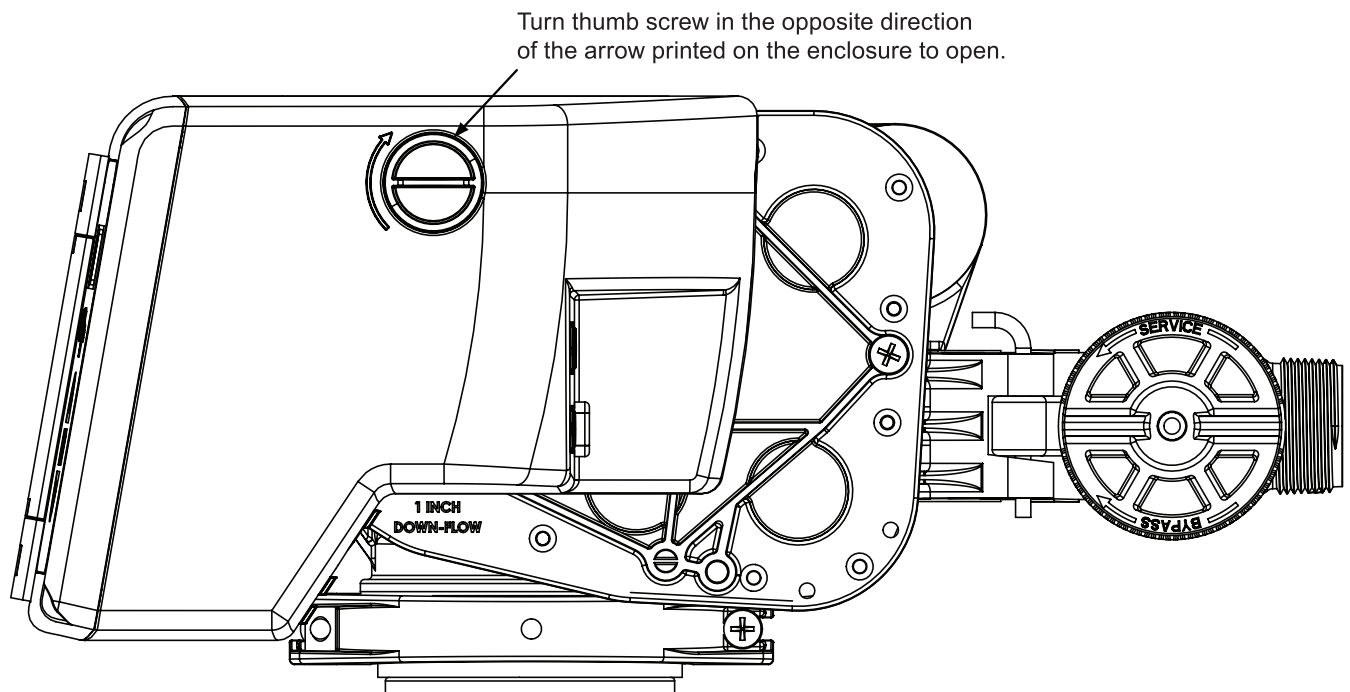


CAUTION!

Do not touch any surfaces of the circuit board. Electrical static discharges may cause damage to the board. Handle the circuit board by holding only the edges of the circuit board. Keep replacement boards in their special anti-static bags until ready for use. Mishandling of the circuit board will void the warranty.

Removing the Electrical Enclosure

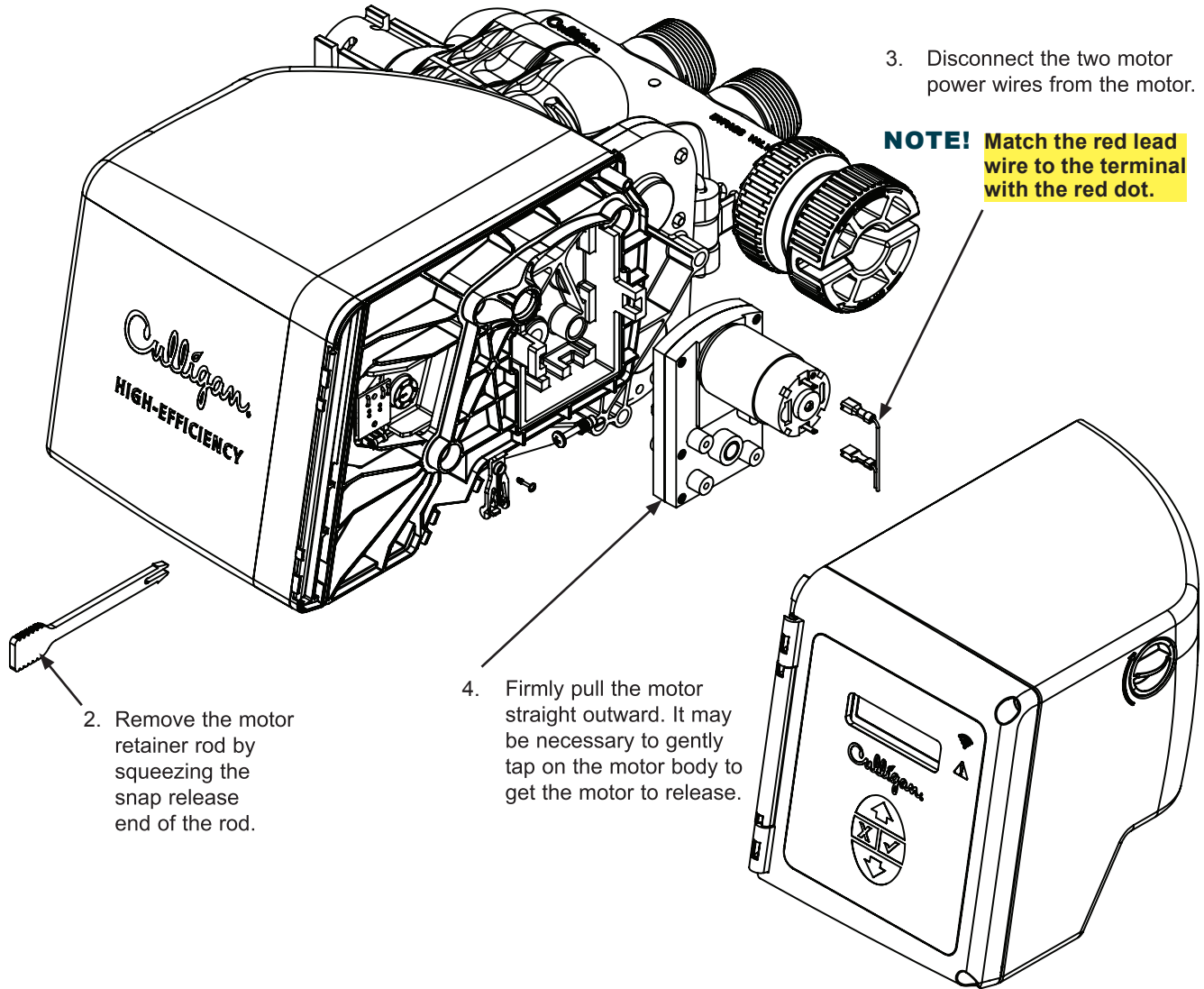
Figure 33. Removing the Electrical Enclosure



Replace the Gear Motor

1. Remove the Smart HE electrical enclosure. See the [“Removing the Electrical Enclosure”](#) section.

Figure 34. Replace Motor

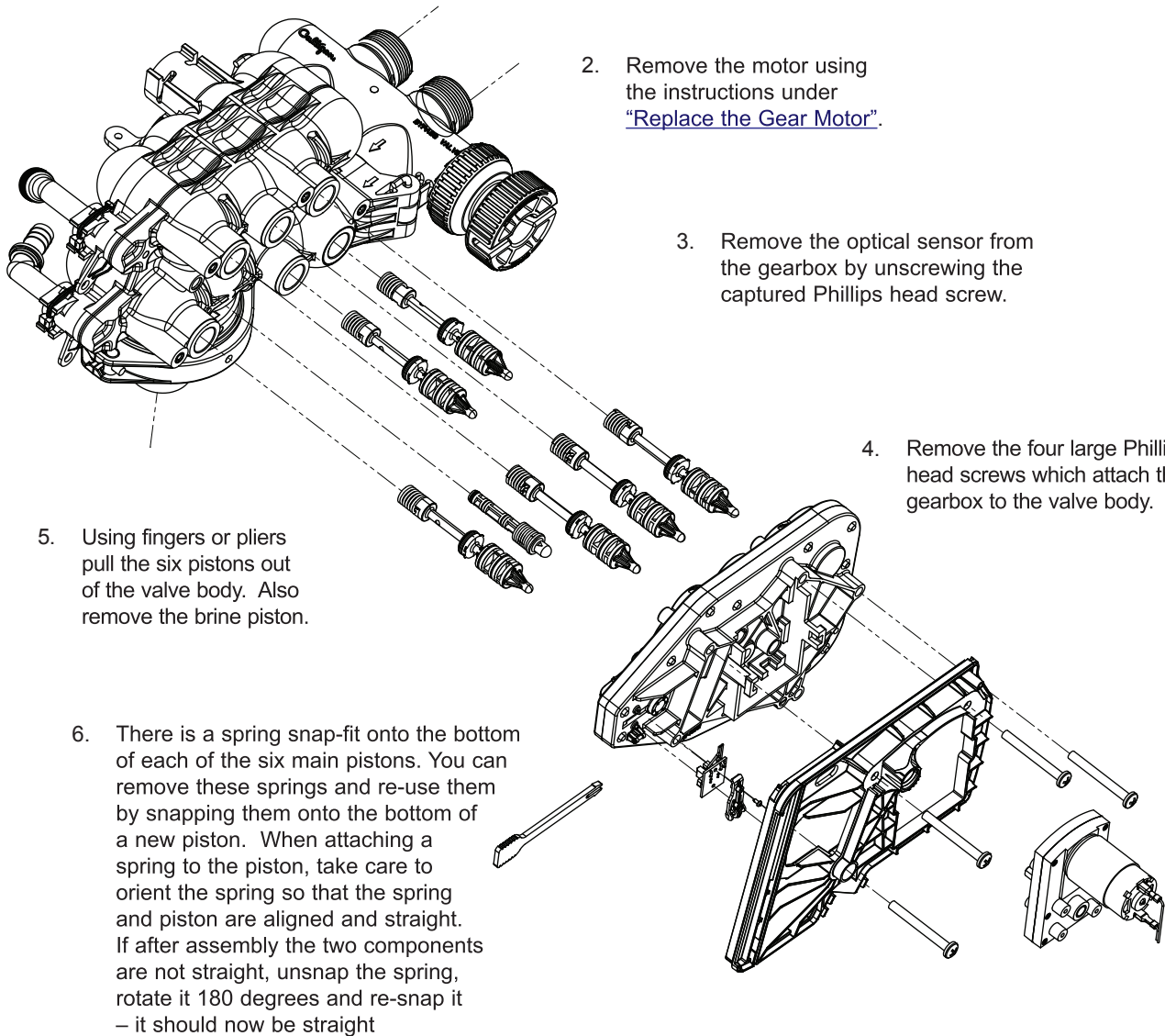


5. In order to insert the new motor into the gearbox, it is necessary to get the “flat” on the motor shaft to line up with the “flat” in the gearbox drive-gear. The easiest way to do this is to hold the motor in position, attempting to push it into the drive gear, while causing the motor shaft to turn by using the Advanced Setup\Diagnostics\Manual Motor Control menu. (Alternatively, if you remove water pressure from the valve, and/or remove the gearbox from the valve body, you can insert a large screw driver into the drive gear and use the screwdriver to rotate the drive gear so that the flat on the drive gear lines up with the flat on the motor shaft.)
6. Once the motor is fully inserted, re-install the motor retainer rod and motor wire harness.
7. Reattach the electrical enclosure.

Replace the Gearbox and Pistons

1. See the [“Removing the Electrical Enclosure”](#) section.

Figure 35. Replace the Gearbox and Piston



2. Remove the motor using the instructions under [“Replace the Gear Motor”](#).

3. Remove the optical sensor from the gearbox by unscrewing the captured Phillips head screw.

4. Remove the four large Phillips head screws which attach the gearbox to the valve body.

5. Using fingers or pliers pull the six pistons out of the valve body. Also remove the brine piston.

6. There is a spring snap-fit onto the bottom of each of the six main pistons. You can remove these springs and re-use them by snapping them onto the bottom of a new piston. When attaching a spring to the piston, take care to orient the spring so that the spring and piston are aligned and straight. If after assembly the two components are not straight, unsnap the spring, rotate it 180 degrees and re-snap it – it should now be straight

7. Install the new gearbox and/or pistons by reversing the directions listed above. Take care to make sure that the four large Phillips screws are fully inserted and tight.

Remove/Inspect/Replace the Dial-a-Softness Knob

Figure 36. Dial-a-Softness

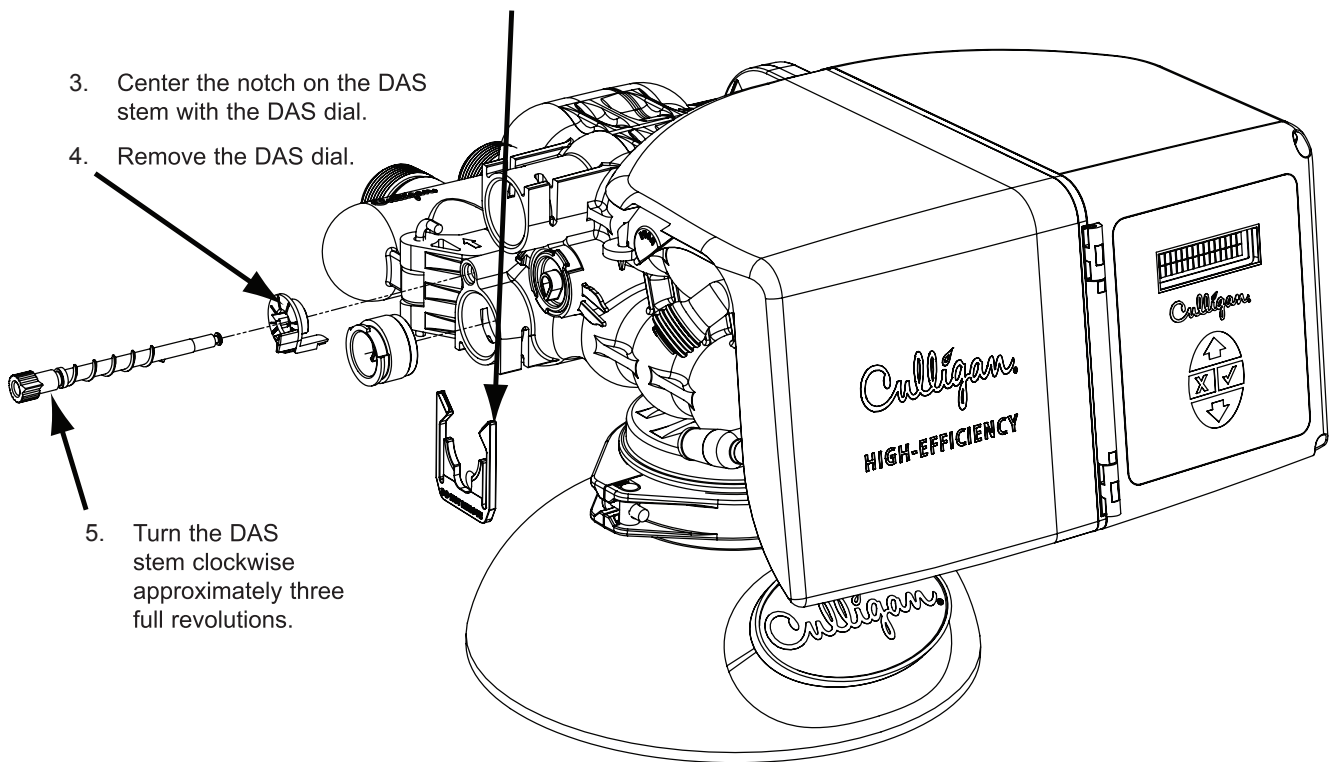
1. Relieve water pressure from the valve.

2. Remove the DAS clip.

3. Center the notch on the DAS stem with the DAS dial.

4. Remove the DAS dial.

5. Turn the DAS stem clockwise approximately three full revolutions.



To reinstall the DAS, reverse the above instructions.

Troubleshooting Guide

Brine System Analysis

1. WATER LEVEL in the brine tank
 - a. Empty
 - b. Below level of safety valve
 - c. At level of safety valve float
2. SAFETY VALVE in brine tank
 - a. Float rod travels up and down freely (approximately 1/2")
 - b. Float rod is rigid

If the brine system is functioning properly, there will be water in the brine tank, but the level should be below the safety valve float and the float rod should travel freely. If these conditions do not exist, one of the following conditions will indicate the nature of the problem:

1. NO WATER IN BRINE TANK—ROD TRAVELS FREELY. The flow control is plugged. Remove refill flow control. Clean or replace.
2. NO WATER IN BRINE TANK—ROD IS RIGID. Air or water slammed the safety valve closed before water could enter the tank. Make sure that the check seat assy. below the brine elbow is clean and moves freely. Check for possible air leaks in the brining system.
3. WATER IN BRINE TANK UP TO SAFETY VALVE FLOAT—ROD IS RIGID. There are possible causes:
 - a. Brine piston is not in service position when control is in service or brine piston seals are defective. Remove brine line while in service. There should be no flow to brine tank.

Refill flow rate is too high or refill time length is too long. Check refill flow rate and compare to specification in [Table 5 on page 26](#).

Problem	Cause	Solution
1. Unit has blank display.	Unit has no power.	Verify that unit is connected to a constant power source (Not an outlet on a switch).
	Defective plug-in transformer.	Replace plug-in power supply.
2. Softener fails to automatically initiate a regeneration.	Electrical service to the unit has been disrupted.	Verify that unit is connected to a constant power source (Not an outlet on a switch).
	Soft-Minder® meter not properly recording total gallons used. The flow meter connection and operation can be verified using the test mode setting on the circuit board.	Verify that meter cable is plugged into circuit board. Verify that meter cable is snapped into flow meter housing. Verify that flow meter has not become plugged with debris.
	Aqua-Sensor® probe not sensing hardness front. The Aqua-Sensor connection and operation can be verified using the Aqua-Sensor Troubleshooting steps on page 50 .	Verify that Aqua-Sensor connector is properly connected to circuit board. Verify that Aqua-Sensor probe is working. Clean probe if necessary.
	Incorrect programming.	Refer to and verify all settings in the GBX Programming for Residential Softeners & Filters Manual, P/N 01040743.
3. Regeneration occurs at incorrect time.	Timer setting incorrect.	Reset timer.
	Incorrect programming.	Refer to and verify all settings in the GBX Programming for Residential Softeners & Filters Manual, P/N 01040743.

Problem	Cause	Solution
4. Error message is displayed.	Refer to Error and Alert Messages section in the GBX Programming for Residential Softeners & Filters Manual, P/N 01040743.	
5. Hard water to service. The root cause of hard water to service may also lead to problems such as Iron or Hardness bleed in softeners.	Salt or chemical storage tank is empty.	Add salt or chemical to storage tank and verify that proper level of salt or chemical is maintained.
	Eductor screen or nozzle plugged.	Clean or replace eductor nozzle and/or screen.
	Incorrect programming. (Salt dosage too low for influent hardness)	Refer to and verify all settings in the GBX Programming for Residential Softeners & Filters Manual, P/N 01040743.
	Insufficient water flowing to salt storage tank.	Verify that refill settings are correct and clean the refill flow restrictor.
	Internal seal leak.	Replace pistons.
	Excessive water usage.	Verify that programming is correct.
	Unconditioned water in water heater tank.	Flush water heater to fill tank with conditioned water. Follow water heater manufacturer's recommendation.
	Salt bridge.	Break up salt bridge in brine tank. Do not try to break the salt bridge by pounding on the outside of the brine tank.
6. Loss of water pressure.	Control and/or resin bed plugged with debris or iron build-up.	Clean control and increase frequency of regenerations or length of backwash. Plant recondition if necessary.
	Top strainer plugged.	Remove control from tank and clean top strainer. Check if eductor screen/nozzle is also plugged.
	Control plugged with foreign material broken loose from recent plumbing work.	Clean control.
7. Loss of resin to drain.	Improper drain line flow control.	Ensure that the control has the proper drain line flow control. (See Table 3 on page 24)
	Air in water system.	Ensure that system has proper air eliminator control.
8. Resin to service.	Plumbing connected to control backwards.	Verify unit is plumbed correctly.
	Defective outlet manifold.	Replace outlet manifold.
9. Water in storage tank up to float.	Plugged drain line flow control (unit will not draw brine).	Clean or replace drain line flow control.
	Plugged eductor system (unit will not draw brine).	Clean or replace eductor screen and nozzle.
	Slow leak to brine line. Faulty eductor piston.	Replace brine piston.
	Power outage while control was in refill position.	Verify that first 3 rows of "Water in storage tank up to float" Problem are not the cause for the extra water in the storage tank.

Problem	Cause	Solution
10. Excessive water in salt storage tank (water above brine valve float).	Faulty brine valve; float shut-off failure. When the brine valve is faulty, one of the items listed under “Water in storage tank up to float” Problem is also required in order to produce excessive water in the storage tank.	Clean brine valve, replace stem seat, or replace brine valve.
11. Unit fails to refill storage tank.	Refill restrictor plugged.	Clean or replace refill restrictor.
	Air in brine line causes float to slam shut (Float rod is rigid).	Verify that all tubing connections are properly assembled.
12. Unit fails to draw brine or chemical.	Drain line flow control is plugged.	Clean or replace drain line flow control.
	Plugged eductor system.	Clean or replace eductor screen and nozzle.
	Line pressure too low.	Increase line pressure to a minimum of 20 psi (140 kPa).
	Internal control leak.	Replace pistons and/or brine piston.
	Drain line too long or restricted.	Verify proper drain line length. See “Table 4. Maximum Allowable Drain Line Length” on page 25.
	Eductor is drawing air into system.	Verify that all tubing connections are properly assembled. Verify air eliminator ball seating.
13. Unit uses an excessive amount of salt or chemical.	Incorrect programming.	Refer to and verify all settings in the GBX Programming for Residential Softeners & Filters Manual, P/N 01040743.
	Excessive water in storage tank.	Refer to problems 9 & 10.
14. Continuous flow to drain.	Internal seal leak.	Replace pistons.
	Piston or brine piston jammed in position.	Replace pistons or brine pistons.
	Power failure while unit was in regeneration.	Restore power to unit. Verify that unit is connected to a constant power source.
15. Salt water to service	Inadequate Brine/Rinse setting for desired salt dosage.	Refer to and verify all settings in the GBX Programming for Residential Softeners & Filters Manual, P/N 01040743.
	Low water pressure lengthens brine draw time.	Increase line pressure to a minimum of 20 psi (140 kPa).
	Too much brine in the storage tank.	Refer to Problems 9 & 10.

Aqua-Sensor® Troubleshooting

The following procedure will help you diagnose problems in units equipped with Aqua-Sensor® sensing device. Because many sensor problems are actually regeneration problems, it contains a combination of sensor diagnostics and routine control valve and brine system checks.

Recording Important Information

Record the following information from the GBX diagnostic menu screens to use in analyzing the Aqua-Sensor's performance.

Select: Main Menu > Diagnostics > Advanced Stats > Regen Stats

Last Regen Trigger: _____

If it shows Aqua-Sensor, the probe and circuits are working correctly to detect resin exhaust. If you see Manual, Flow Meter, etc., the Aqua-Sensor may not be reading correctly or programming could be favoring another trigger to regenerate. Gallons or Reserve could be higher than needed for the probe to signal exhaustion. Be sure your reserve is less than 5% in the Regen Setup.

Last Brine Draw Slow Rinse: _____

If it shows a number of minutes less than the programmed Slow Rinse Time, found in Advanced Setup > Cycle Times > Slow Rinse, then the patented rinse-out feature of the Aqua-Sensor is operating based on the probe sensing the removal of brine and hardness during regeneration. If the number is the same as the Slow Rinse Time, the setting could be too short for the salt dosage and eduction rate or the probe may not be sensing the rinse-out. Lengthening the cycle time greater than 75 minutes can often insure it isn't the first possibility. In general, the time you read should be 8-15 minutes less than the cycle time.

Select: Main Menu > Diagnostics > Check Sensors.

With water flowing through the tank record Z-ratio: _____

This is a reading from the sensing probe while you have water flowing passed it. Unless the tank has just finished a full regeneration, this reading should be increasing slightly or at least be a number higher than the Z-minimum recording. The exact number is not important as you might see something near 1078 or higher. What is critical is the number is increasing, since it determines the need to regenerate.

Z-minimum: _____

If this number remains at 0000 the tank has not yet regenerated successfully sending brine thru the resin bed or there is no 2.5VAC power to operate the probe; preventing it form recording a number; or the probe is not installed correctly inside the tank and into the circuit board; which would also affect the Z-ratio reading. Z-minimum should always be a number lower than Z-ratio, since it is the starting point for monitoring conductivity in the resin. Also it might change slightly after each successful regeneration.

Z-increase %: _____

This number represents a difference, an increase in Z-ratio over the Z-minimum. As this percentage reaches 7.5% for longer than 6 minutes, the circuit board will get ready to regenerate. The percentage can be seen higher than 7.5%, but it has no bearing on the need to regenerate.

By understanding each of these indicators in the programming, technicians should be able to see if the Aqua-Sensor is functioning properly. Remember that it is only a trigger to regenerate based on reading the hardness level in the resin bed. If the Conditioner does not fully operate mechanically through a proper regeneration, the sensor cannot perform its functions correctly either.

If the power supply, programmed settings and regeneration are all correct, and the unit fails to trigger a regeneration from the sensor, replace the Aqua-Sensor probe.

If all of these factors are correct and the unit seems to be continually regenerating, consider the quality of the resin and a proper regeneration before deciding to replace the Aqua-Sensor probe.

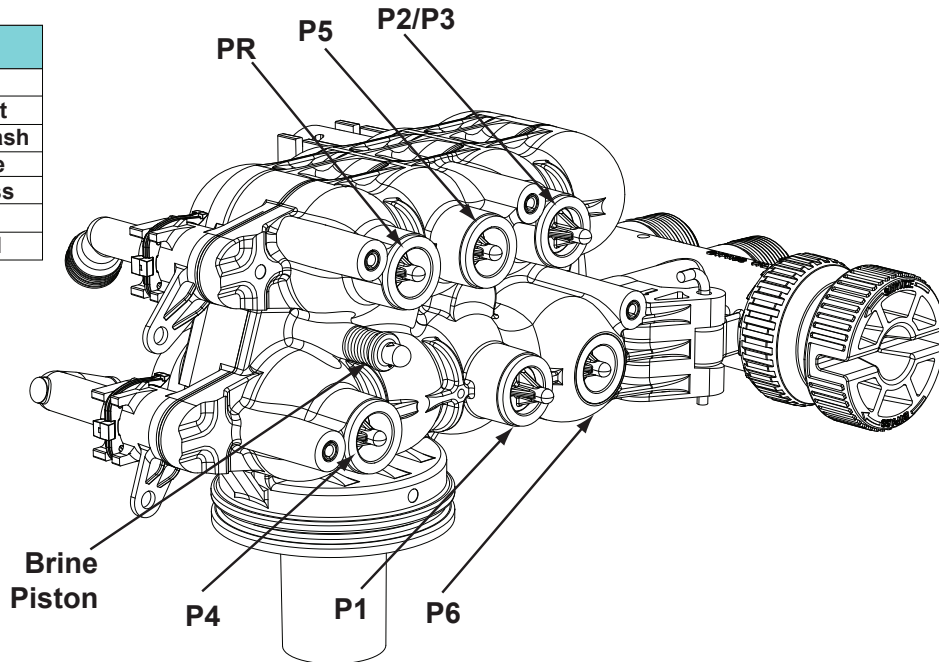
Flow Diagrams

Control Valve Piston Locations

The control valve controls the movement of untreated and treated product during downflow and upflow regeneration cycles. Identify each piston as installed. In this cycle (downflow service), the P1 and P2/P3 valves are open; the P4, P5, P6, and PR valves and the Brine Piston are closed.

Figure 37. Valve piston locations

Pistons	
P1	Inlet
P2/P3	Outlet
P4	Backwash
P5	Rinse
P6	Bypass
Brine	—
PR	Refill



The cycle sequence is different for downflow regeneration than for upflow regeneration. Note the regeneration cycle sequence for downflow and upflow regeneration.

Downflow Regeneration Cycle Sequence

1. Service
2. Backwash
3. Brine Draw/Slow Rinse
4. Fast Rinse
5. Refill (Brine)
6. Bypass

See [page 52](#) through [page 58](#) for Downflow Regeneration flow diagrams.

Upflow Regeneration Cycle Sequence

1. Service
2. Brine Draw/Slow Rinse
3. Backwash
4. Fast Rinse
5. Refill (Brine)
6. Bypass

See [page 59](#) through [page 65](#) for Upflow Regeneration flow diagrams.

Down Flow Regeneration—Service

Raw water is allowed in the inlet to the top of the tank. The water is run through the resin up the manifold to the outlet. The water to the outlet should be soft if the system is operating properly.

Figure 38. Down flow regeneration—service.

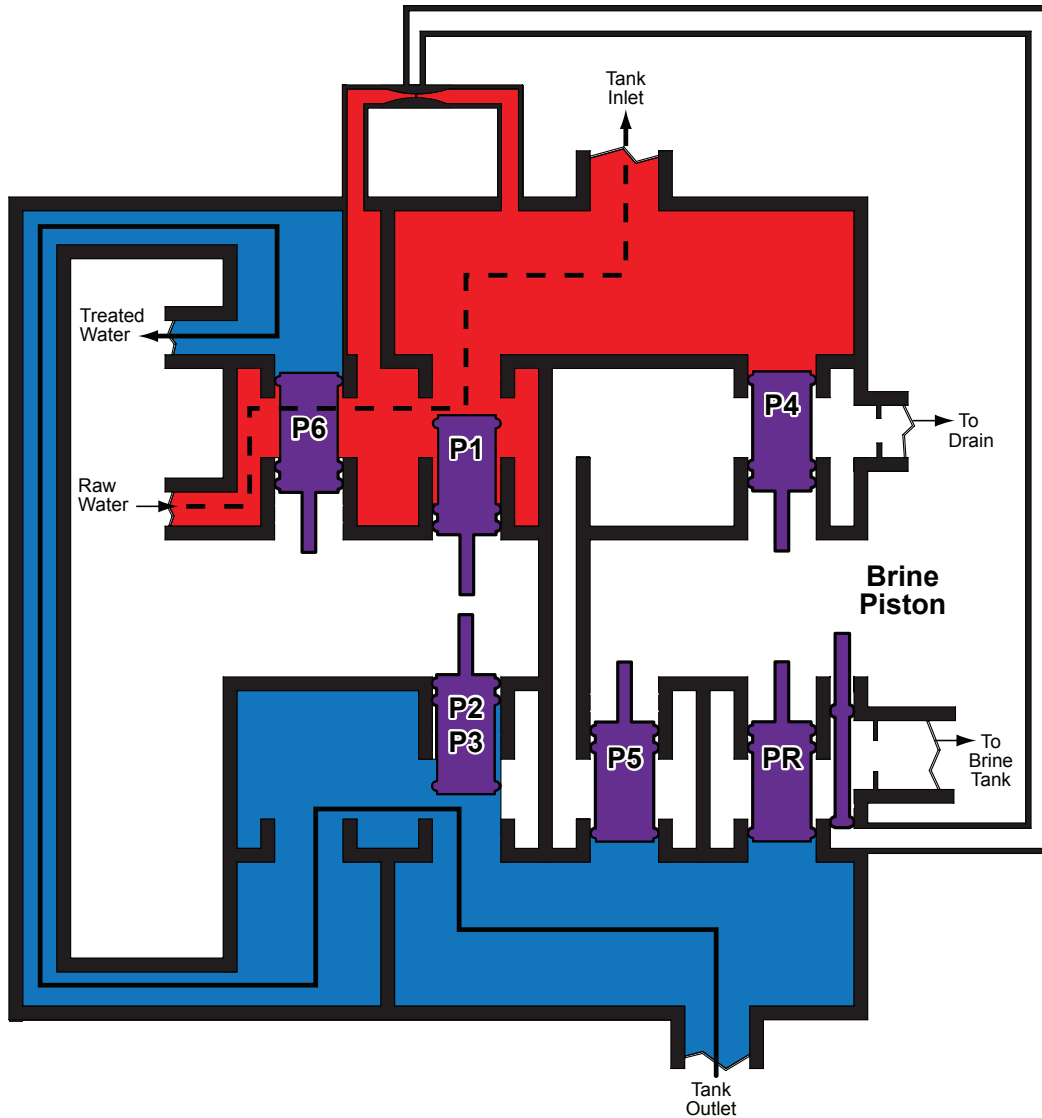


Table 8. Down Flow Regeneration—Service

Service		
Piston		Position
P1	Inlet	Open
P2/3	Outlet	Open
P4	Backwash	Closed
P5	Rinse	Closed
P6	Bypass	Closed
Brine Piston	Brine	Closed
PR	Refill	Closed

COLOR KEY	
■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Down Flow Regeneration—Backwash

Raw water is directed down the center of the manifold, up through the resin, out the top of the tank to drain. The water to drain should be hard.

Figure 39. Down flow regeneration—backwash.

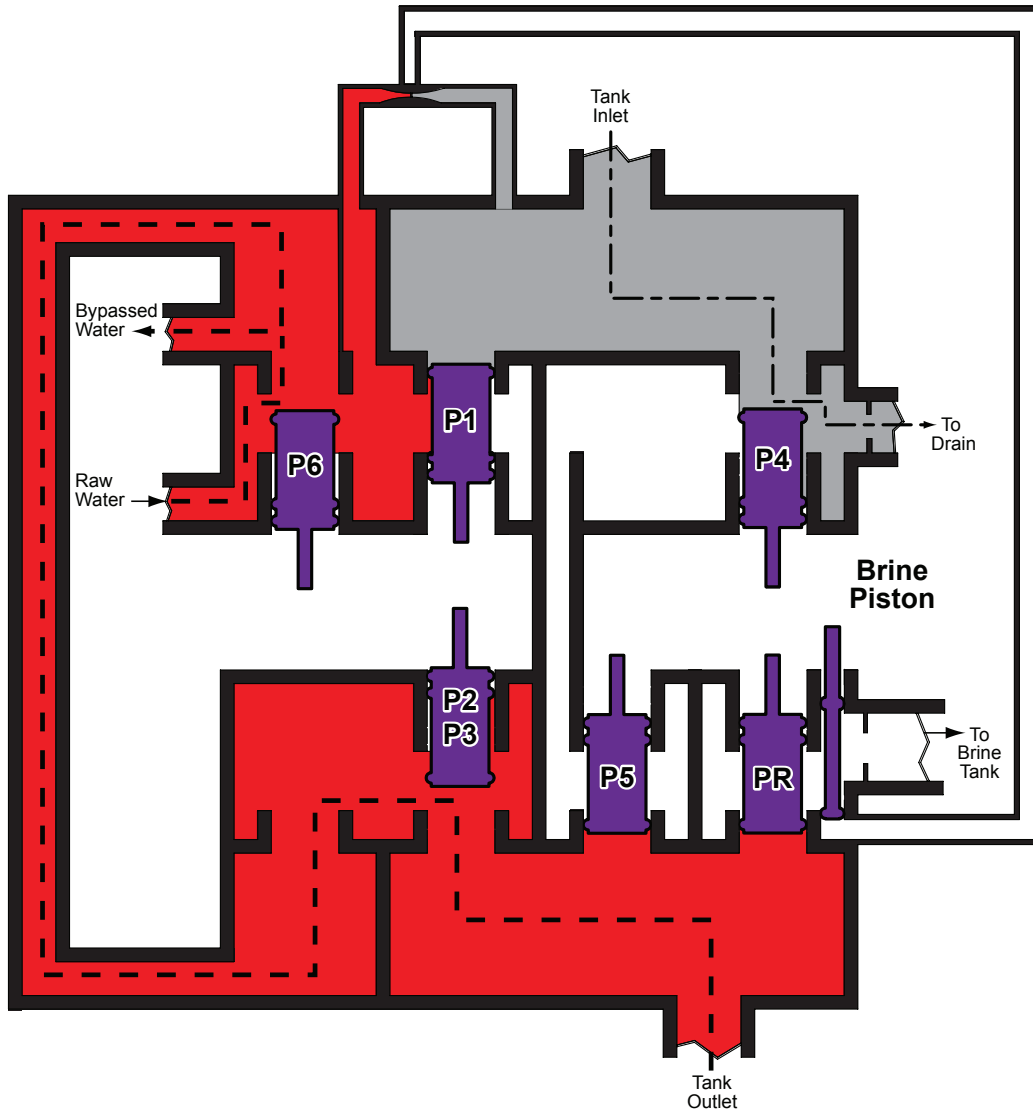


Table 9. Down flow regeneration—backwash

Backwash		
Piston		Position
P1	Inlet	Closed
P2/3	Outlet	Open
P4	Backwash	Open
P5	Rinse	Closed
P6	Bypass	Open
Brine Piston	Brine	Closed
PR	Refill	Closed

COLOR KEY

RED	RED = Raw Water
ORANGE	ORANGE = Diluted Brine
YELLOW	YELLOW = Concentrated Brine
GRAY	GRAY = Water To Drain
BLUE	BLUE = Treated Water
PURPLE	PURPLE = Piston

Down Flow Regeneration—Brine Draw

Raw water is directed from the inlet through the nozzle and into the throat. A vacuum is created and concentrated brine is educted (drawn). The raw water and concentrated brine combine, enter the mineral tank, and pass through the resin, up the manifold and to the drain. Once all of the brine has been educted and the brine valve seats, the unit goes into slow rinse. Hard water is allowed to service during regeneration.

Figure 40. Down flow regeneration—brine draw.

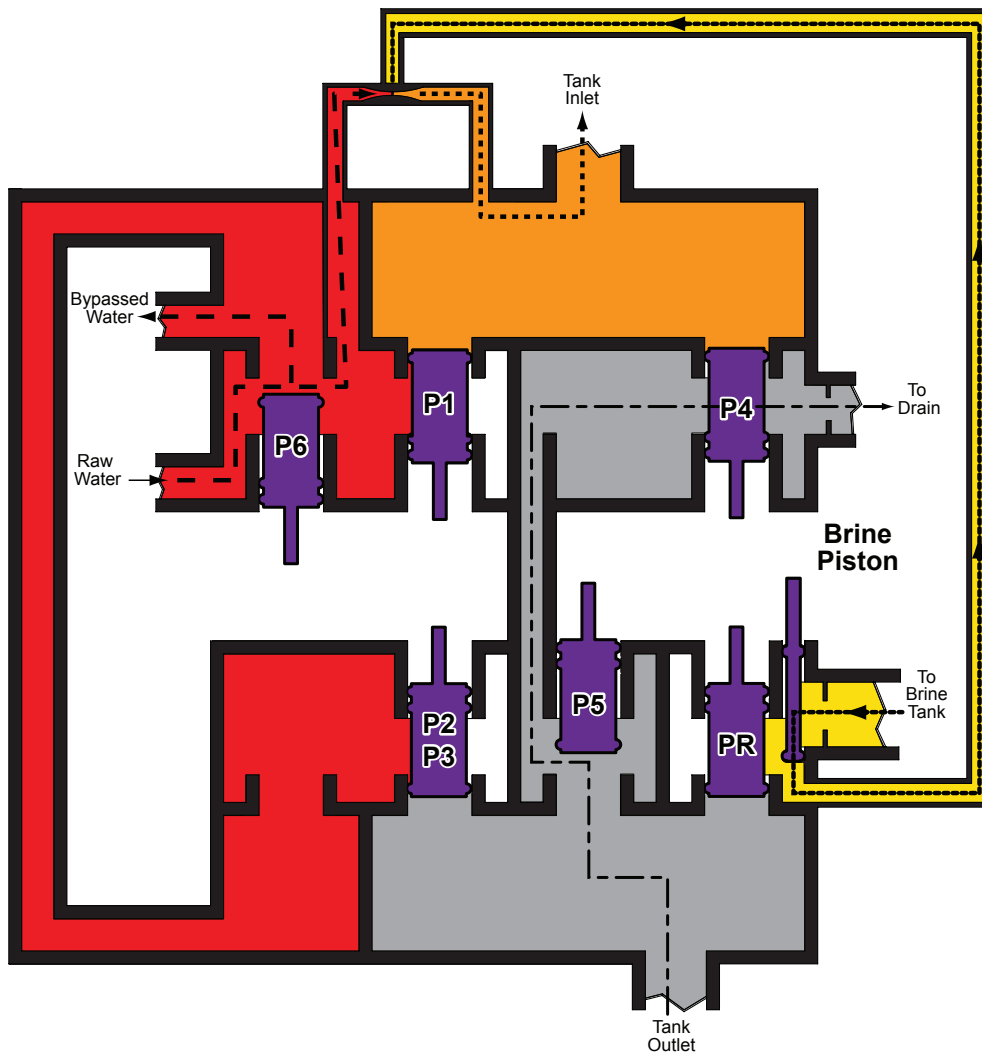


Table 10. Down Flow Regeneration—Brine Draw

Brine Draw		
Piston		Position
P1	Inlet	Closed
P2/3	Outlet	Closed
P4	Backwash	Closed
P5	Rinse	Open
P6	Bypass	Open
Brine Piston	Brine	Open
PR	Refill	Closed

COLOR KEY	
■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Down Flow Regeneration—Slow Rinse

Raw water is directed from the inlet through the nozzle and into the throat. A vacuum is created but the brine valve has seated, so no brine is educted. The raw water enters the mineral tank, passes through the resin, up the manifold and to the drain. Hard water is allowed to service during regeneration.

Figure 41. Down flow regeneration—slow rinse.

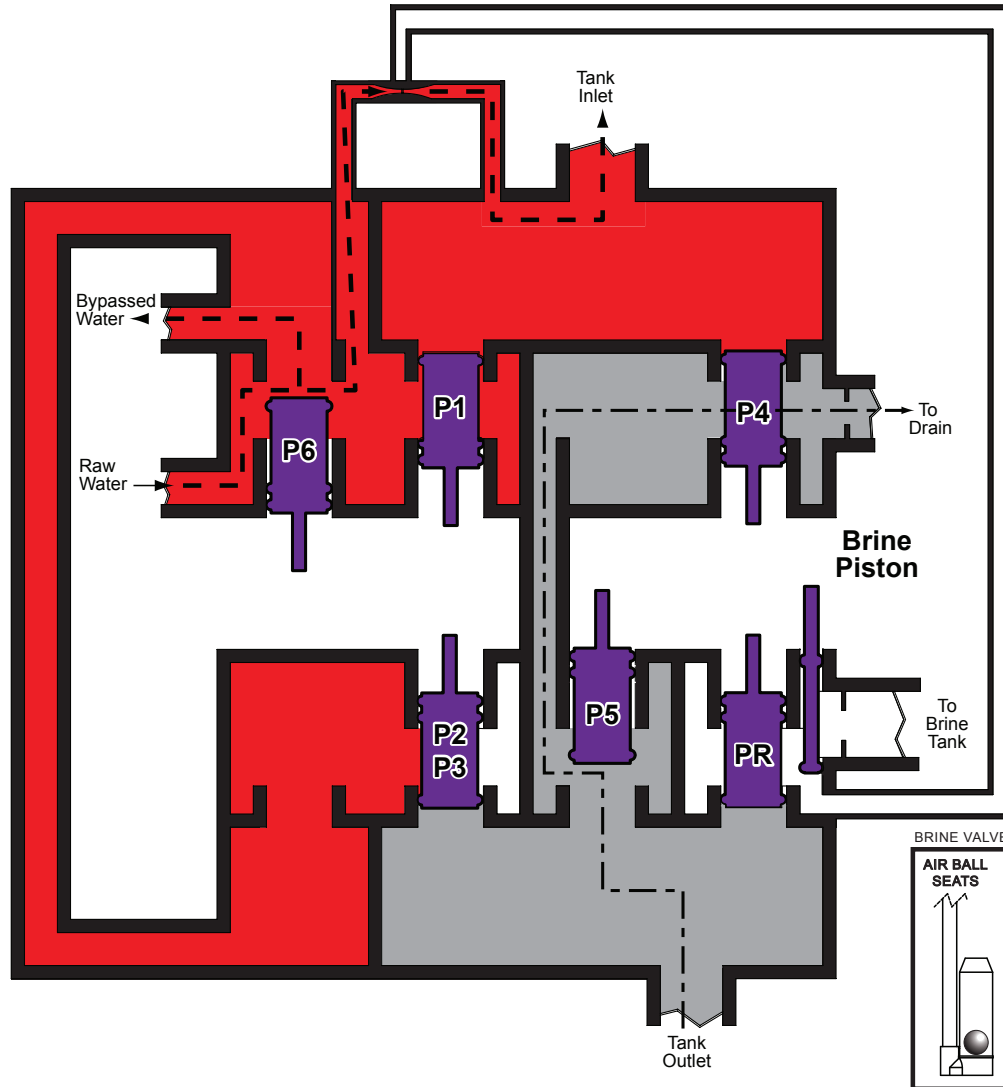


Table 11. Down Flow Regeneration—Slow Rinse

Slow Rinse		
Piston		Position
P1	Inlet	Closed
P2/3	Outlet	Closed
P4	Backwash	Closed
P5	Rinse	Open
P6	Bypass	Open
Brine Piston	Brine	Open
PR	Refill	Closed

COLOR KEY	
■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Down Flow Regeneration—Fast Rinse

Raw water is directed from the inlet to the top of the tank, down the resin, up the manifold, and out to drain. Hard water is allowed to Service during regeneration. The water to drain should be soft.

Figure 42. Down flow regeneration—fast rinse.

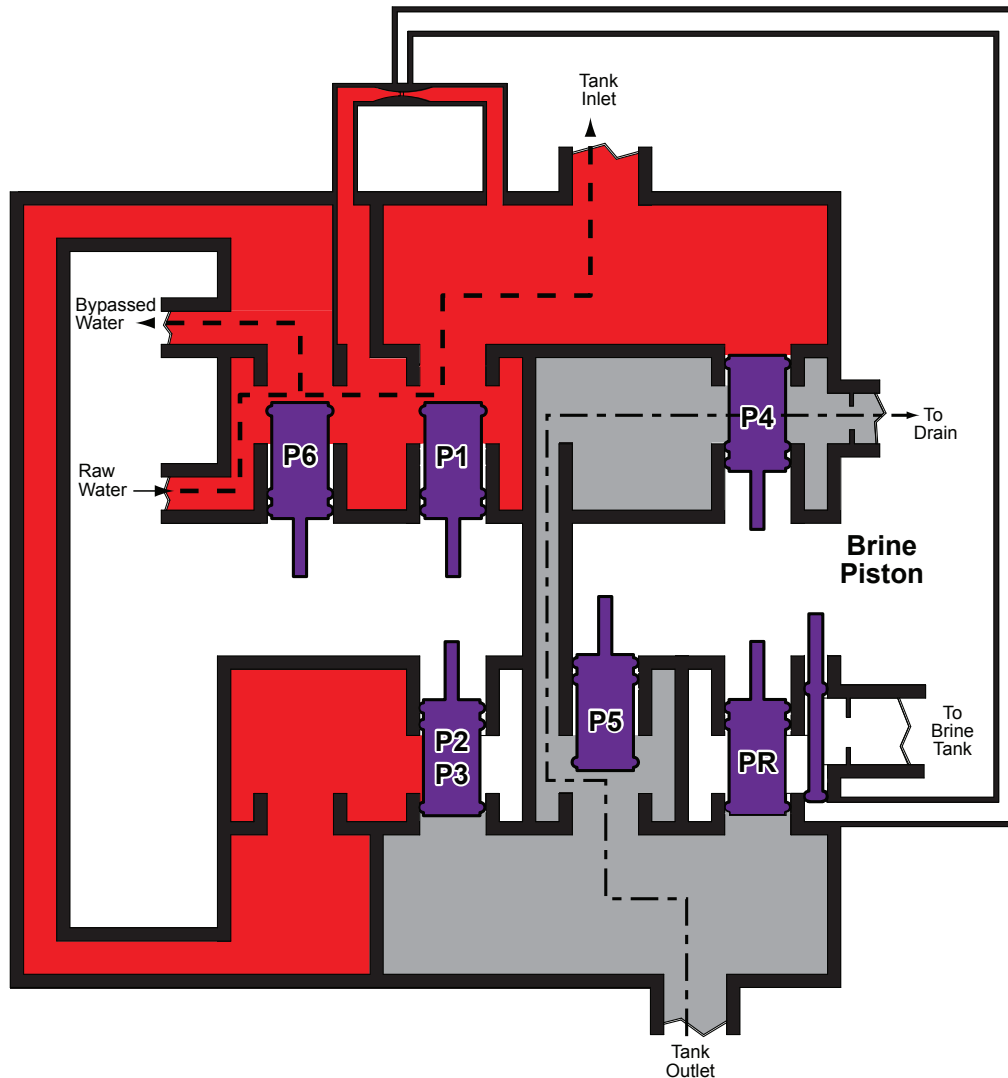


Table 12. Down Flow Regeneration—Fast Rinse

Fast Rinse		
Piston		Position
P1	Inlet	Open
P2/3	Outlet	Closed
P4	Backwash	Closed
P5	Rinse	Open
P6	Bypass	Open
Brine Piston	Brine	Closed
PR	Refill	Closed

COLOR KEY	
■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Down Flow Regeneration—Refill

To make the brine, water flows into the salt storage area during the fill stage. Fill cycle length depends on the salt dosage. Use soft water for refill.

Figure 43. Down flow regeneration—refill.

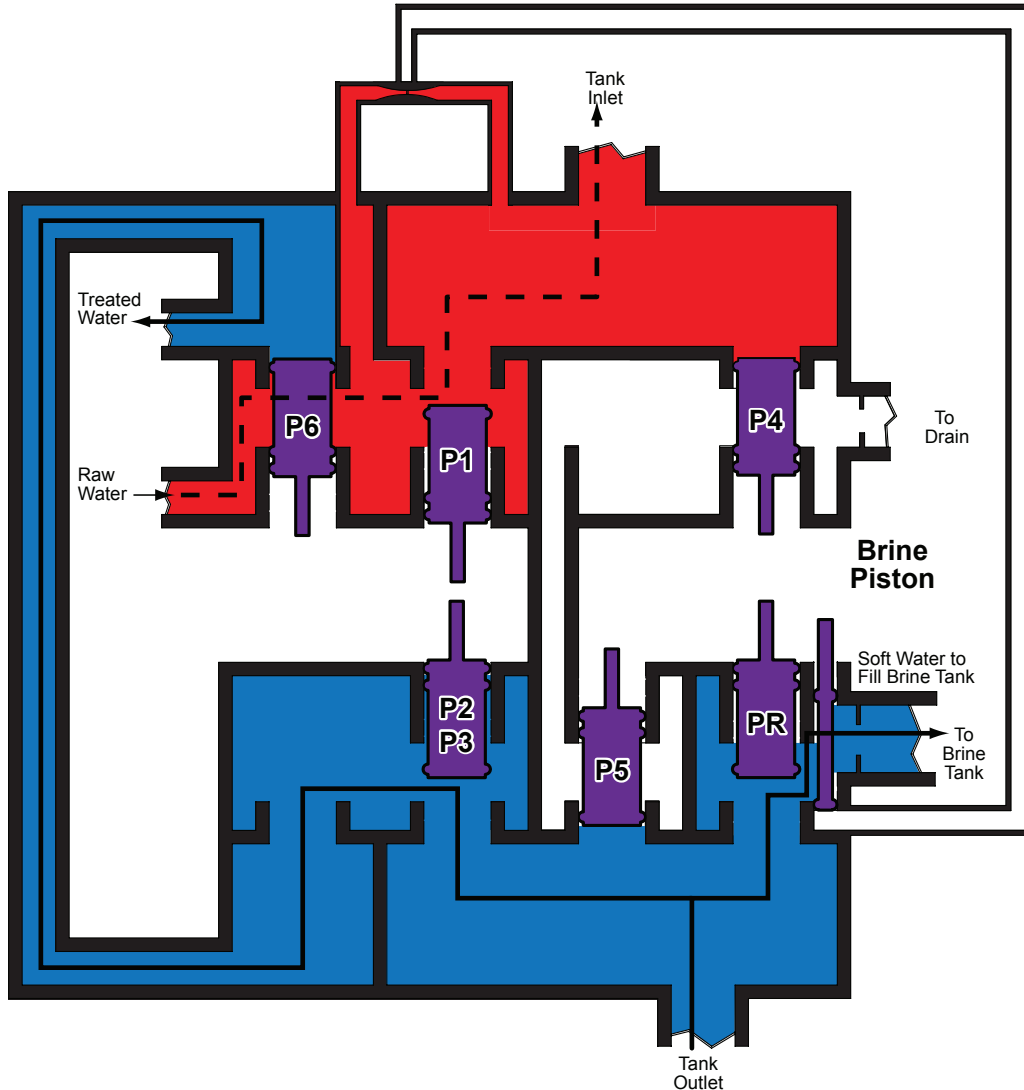


Table 13. Down Flow Regeneration—Refill

Refill		
Piston	Position	Position
P1	Inlet	Open
P2/3	Outlet	Open
P4	Backwash	Closed
P5	Rinse	Closed
P6	Bypass	Closed
Brine Piston	Brine	Closed
PR	Refill	Open

COLOR KEY	
■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Down Flow Regeneration—Bypass

The Smart HE control can be bypassed for a preset time duration. Raw water is allowed in the inlet of the control and internally bypassed to the outlet of the control (hard water is allowed to service).

Figure 44. Down flow regeneration—bypass.

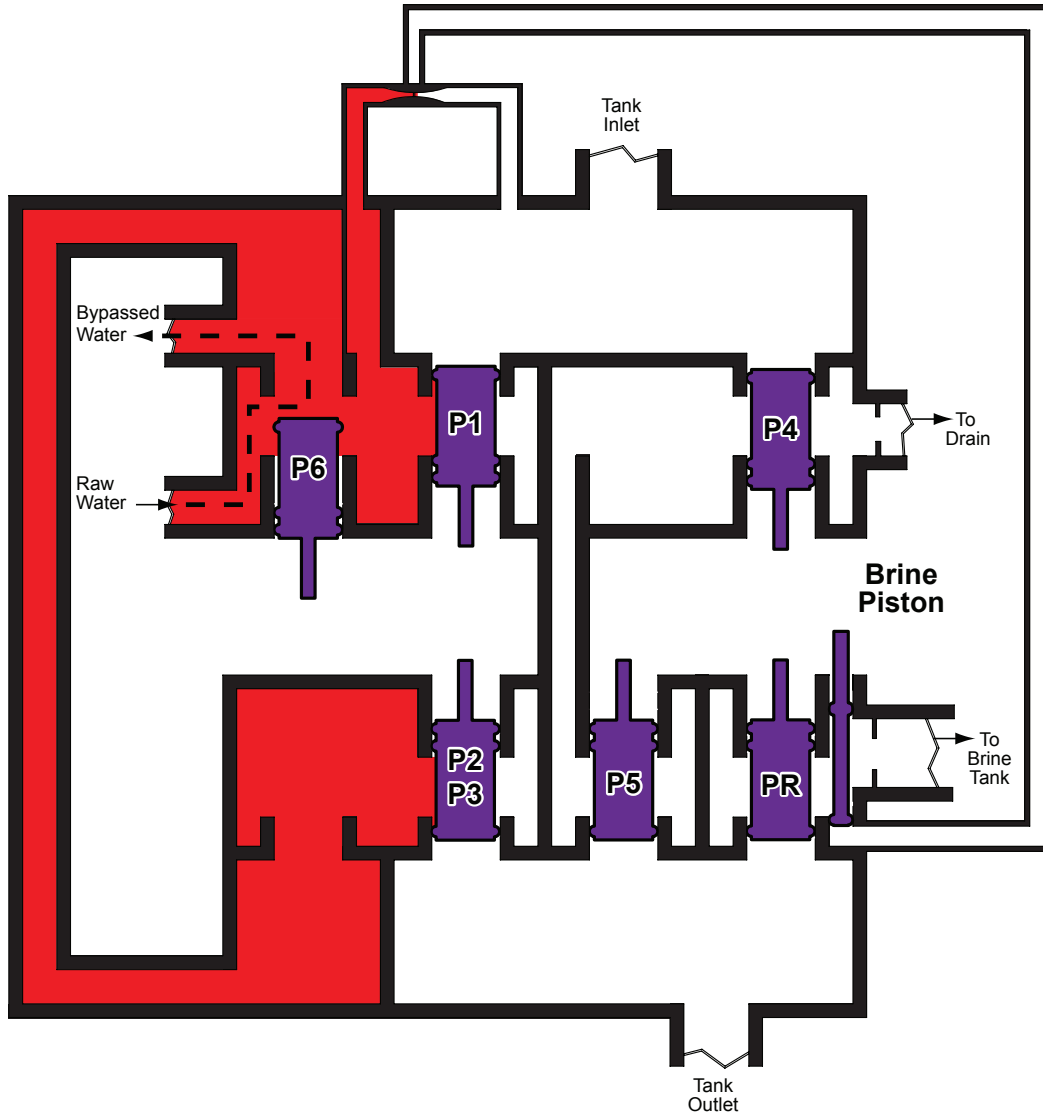


Table 14. Down flow regeneration—bypass

Bypass		
Piston		Position
P1	Inlet	Closed
P2/3	Outlet	Closed
P4	Backwash	Closed
P5	Rinse	Closed
P6	Bypass	Open
Brine Piston	Brine	Closed
PR	Refill	Closed

COLOR KEY

■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Up Flow Regeneration—Service

Raw water is allowed in the inlet to the top of the tank. The water is run through the resin up the manifold to the outlet. The water to the outlet should be soft if the system is operating properly.

Figure 45. Up flow regeneration—service.

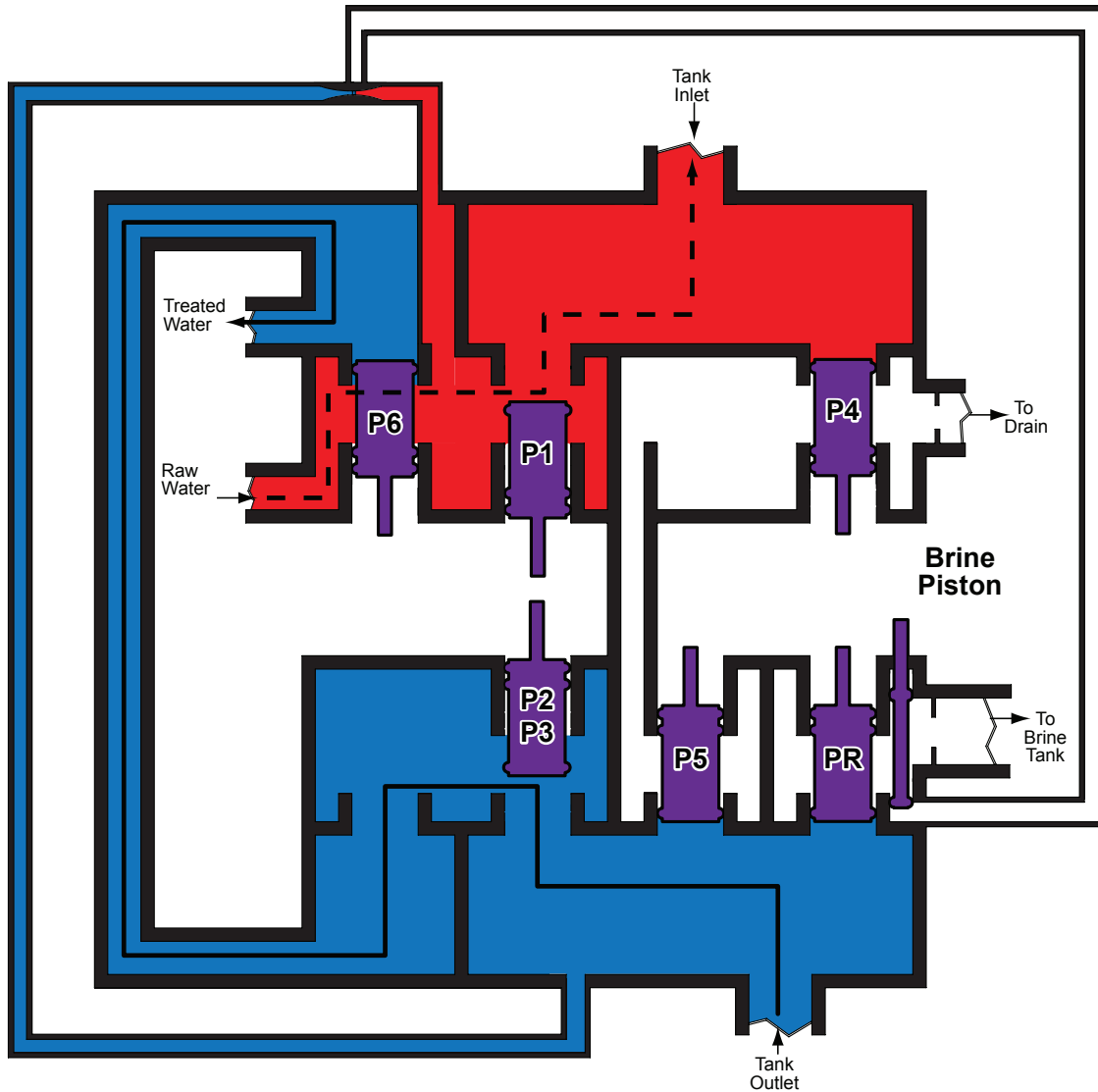


Table 15. Up Flow Regeneration—Service

Service		
Piston		Position
P1	Inlet	Open
P2/3	Outlet	Open
P4	Backwash	Closed
P5	Rinse	Closed
P6	Bypass	Closed
Brine Piston	Brine	Closed
PR	Refill	Closed

COLOR KEY

■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Up Flow Regeneration—Brine Draw

Raw water is directed from the inlet through the nozzle and into the throat. A vacuum is created and concentrated brine is educted (drawn). The raw water and concentrated brine combine, enter the mineral tank, and pass through the resin, up the manifold and to the drain. Once all of the brine has been educted and the brine valve seats, the unit goes into slow rinse. Hard water is allowed to service during regeneration.

Figure 46. Up flow regeneration—brine draw.

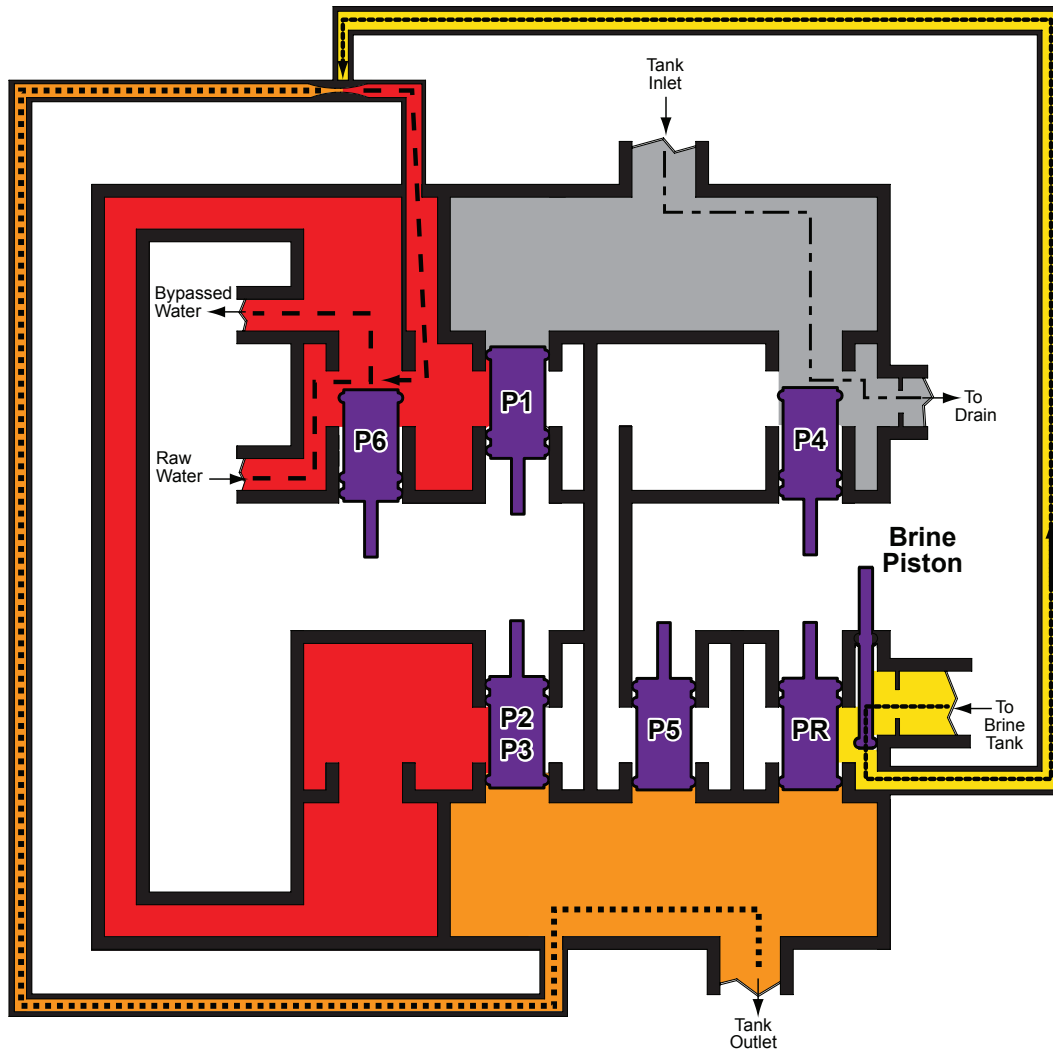


Table 16. Up Flow Regeneration—Brine Draw

Brine Draw		
Piston		Position
P1	Inlet	Closed
P2/3	Outlet	Closed
P4	Backwash	Open
P5	Rinse	Closed
P6	Bypass	Open
Brine Piston	Brine	Open
PR	Refill	Closed

COLOR KEY	
■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Up Flow Regeneration—Slow Rinse

Raw water is directed from the inlet through the nozzle and into the throat. A vacuum is created but the brine valve has seated, so no brine is educted. The raw water enters the mineral tank, passes through the resin, up the manifold and to the drain. Hard water is allowed to service during regeneration.

Figure 47. Up flow regeneration—slow rinse.

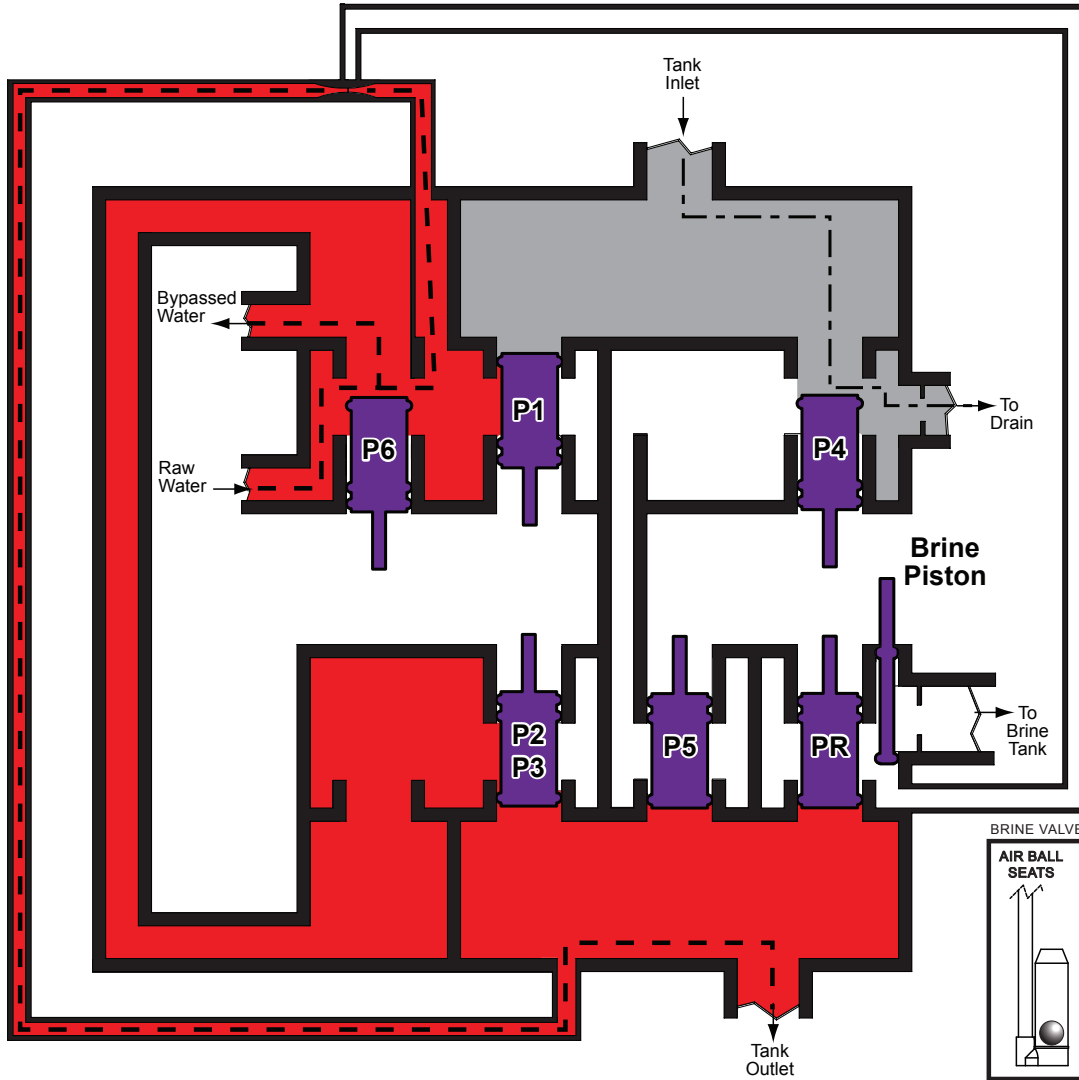


Table 17. Up Flow Regeneration—Slow Rinse

Slow Rinse		
Piston		Position
P1	Inlet	Closed
P2/3	Outlet	Closed
P4	Backwash	Open
P5	Rinse	Closed
P6	Bypass	Open
Brine Piston	Brine	Open
PR	Refill	Closed

COLOR KEY	
■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Up Flow Regeneration—Backwash

Raw water is directed down the center of the manifold, up through the resin, out the top of the tank to drain. The water to drain should be hard.

Figure 48. Up flow regeneration—backwash.

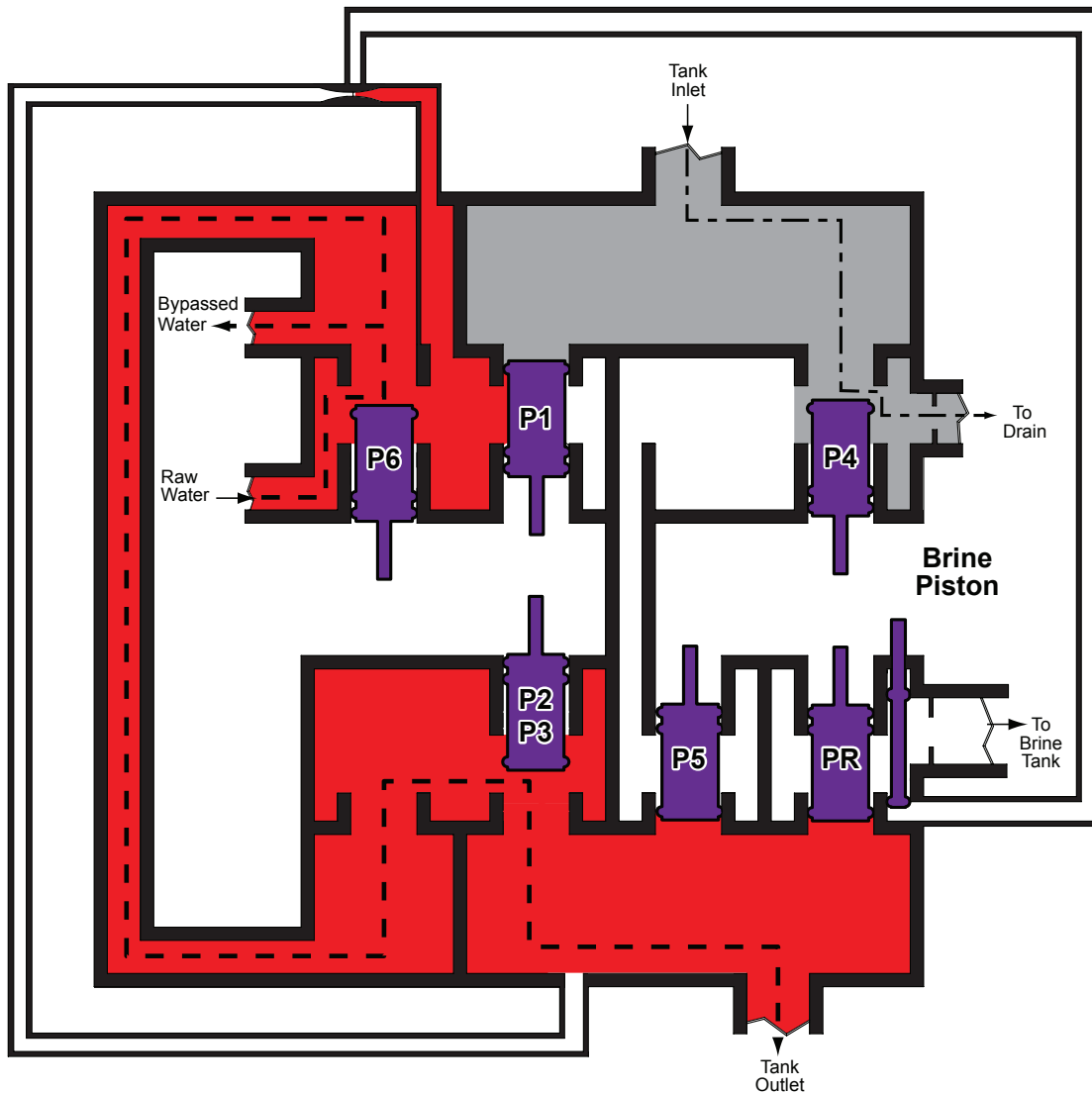


Table 18. Up flow regeneration—backwash

Backwash		
Piston		Position
P1	Inlet	Closed
P2/3	Outlet	Open
P4	Backwash	Open
P5	Rinse	Closed
P6	Bypass	Open
Brine Piston	Brine	Closed
PR	Refill	Closed

COLOR KEY	
■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Up Flow Regeneration—Fast Rinse

Backwash is followed by a fast flow of water down through the resin tank. The fast flow packs the resin bed and gets it ready for return to service.

Figure 49. Up flow regeneration—fast rinse.

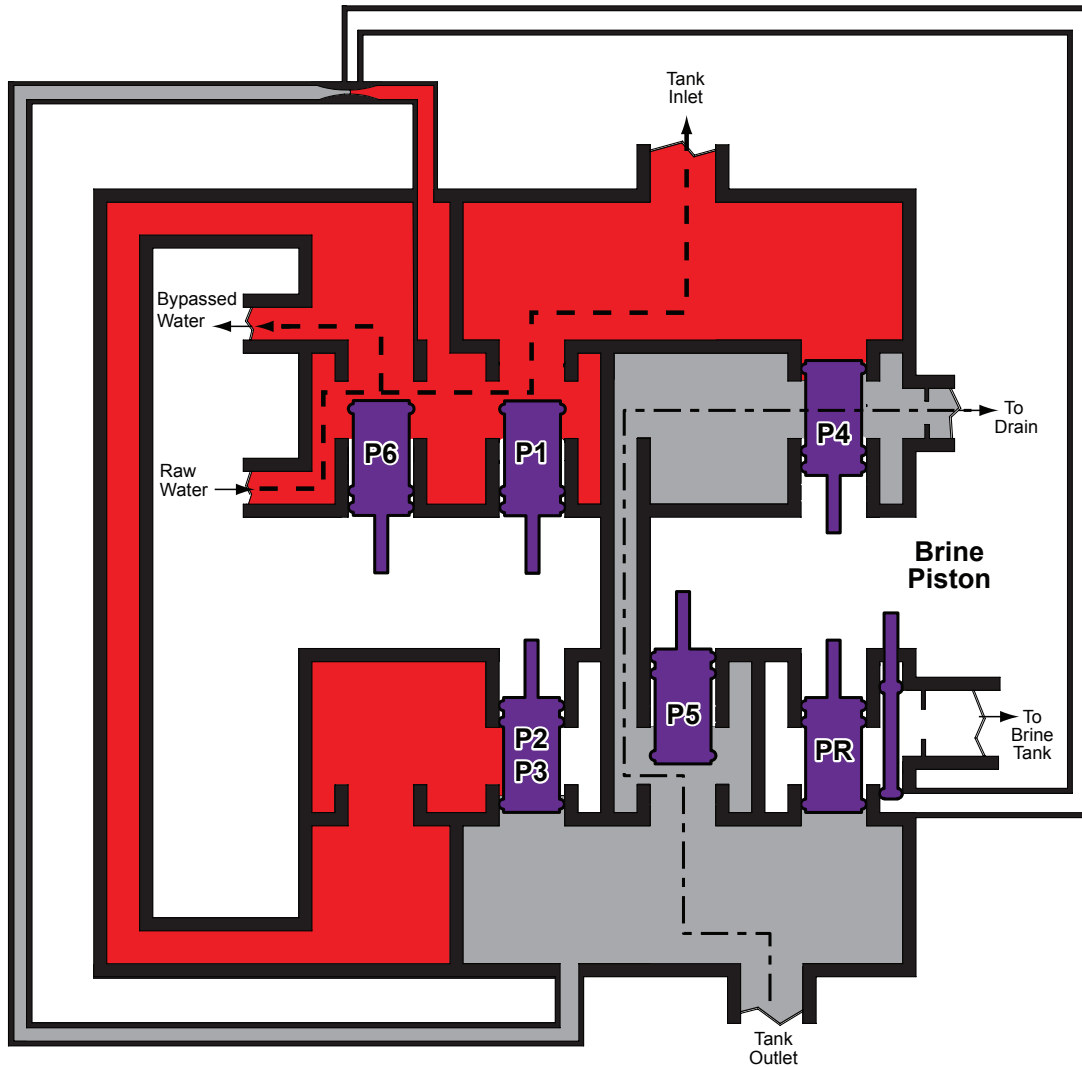


Table 19. Up flow regeneration—fast rinse.

Fast Rinse		
Piston		Position
P1	Inlet	Open
P2/3	Outlet	Closed
P4	Backwash	Closed
P5	Rinse	Open
P6	Bypass	Open
Brine Piston	Brine	Closed
PR	Refill	Closed

COLOR KEY	
■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Up Flow Regeneration—Refill

To make the brine, water flows into the salt storage area during the fill stage to make brine for the next regeneration sequence. Use soft water for refill. Fill cycle length depends on the salt dosage. There is an approximately two-hour pause while the unit is making brine. The unit will continue to be in the service position and will continue to soften water.

Figure 50. Up flow regeneration—refill.

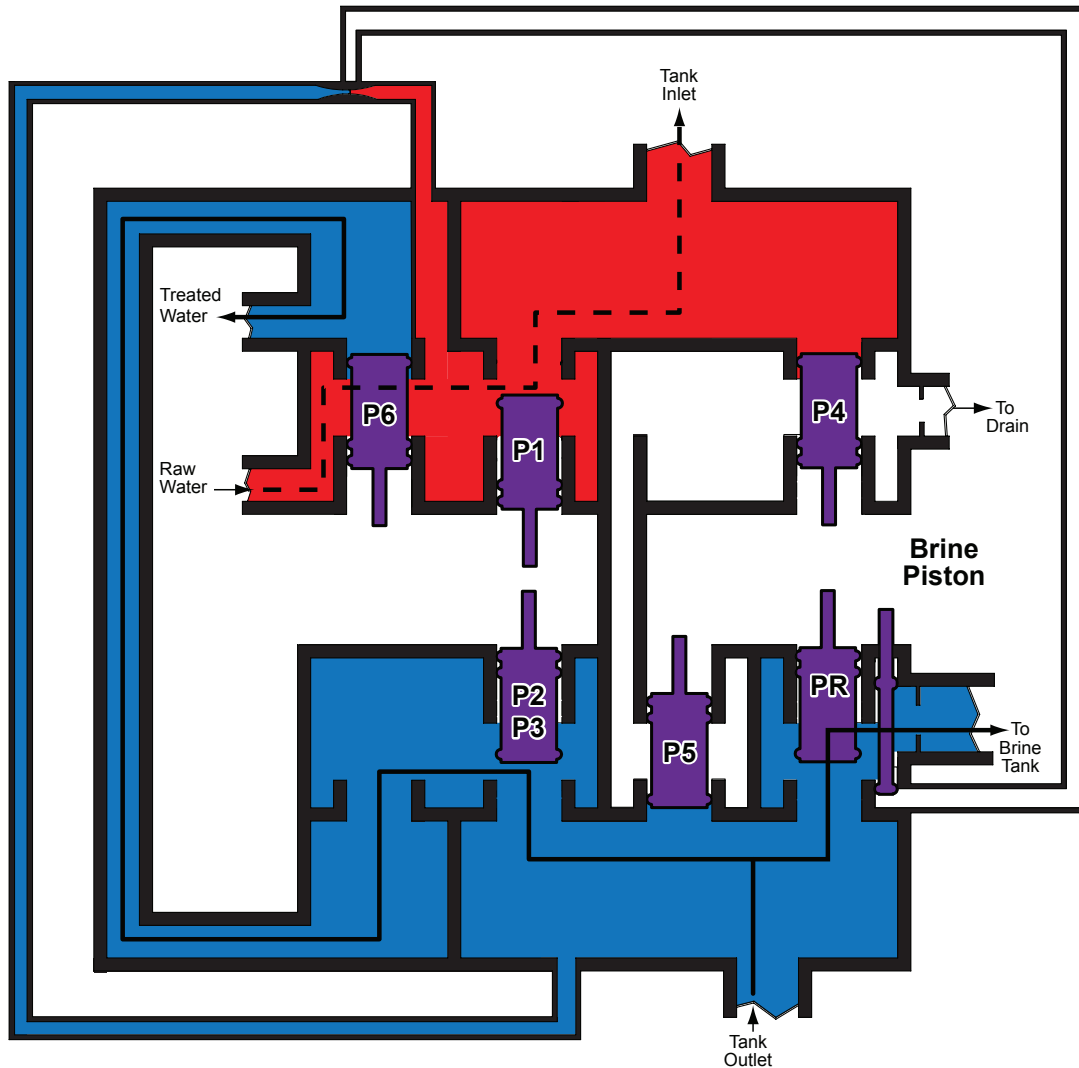


Table 20. Up flow regeneration—refill

Refill		
Piston		Position
P1	Inlet	Open
P2/3	Outlet	Open
P4	Backwash	Closed
P5	Rinse	Closed
P6	Bypass	Closed
Brine Piston	Brine	Closed
PR	Refill	Open

COLOR KEY

■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Up Flow Regeneration—Bypass

The Smart HE control can be bypassed for a preset time duration. Raw water is allowed in the inlet of the control and internally bypassed to the outlet of the control (hard water is allowed to service).

Figure 51. Up flow regeneration—bypass.

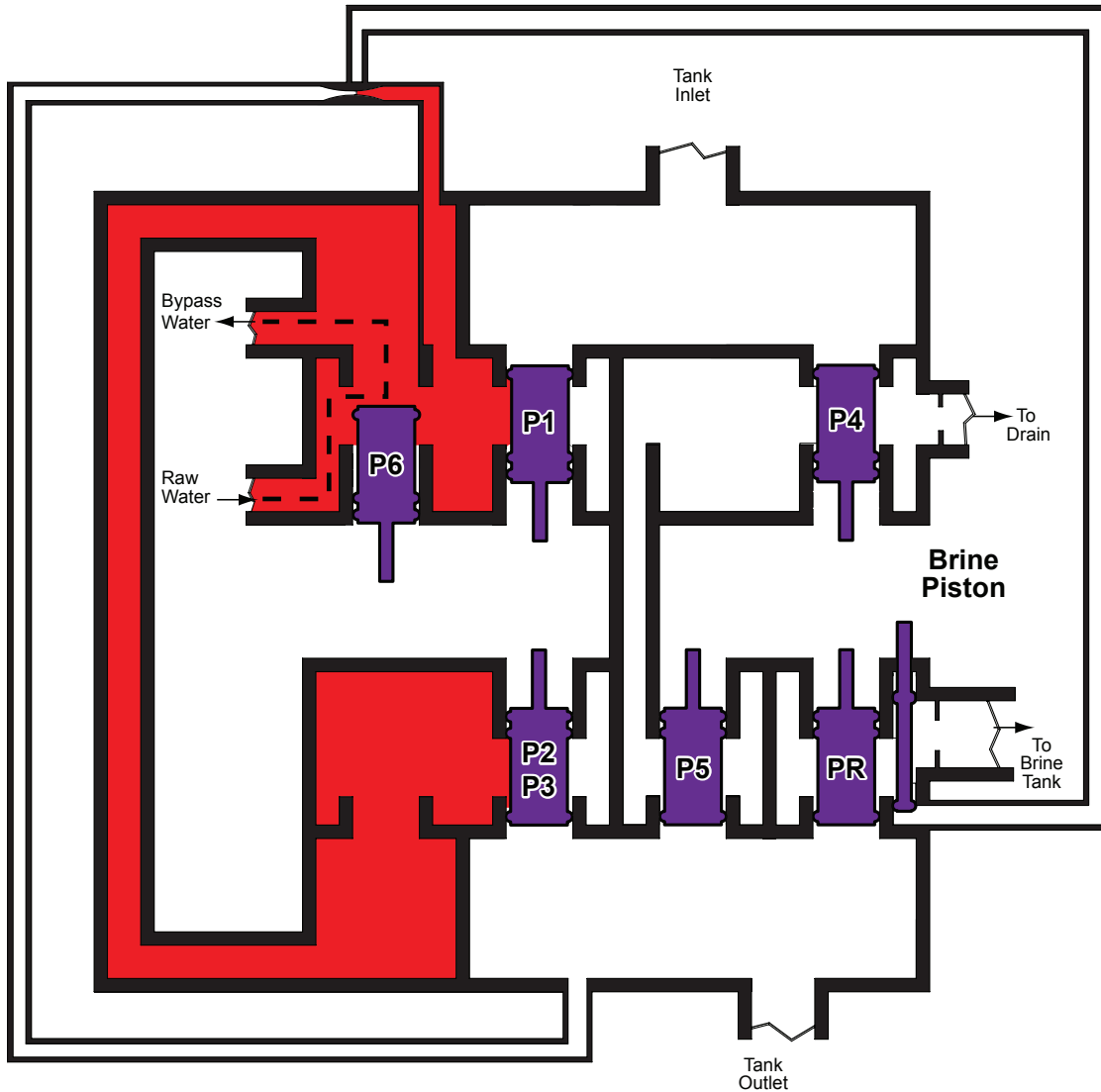


Table 21. Up flow regeneration—bypass

Bypass		
Piston		Position
P1	Inlet	Closed
P2/3	Outlet	Closed
P4	Backwash	Closed
P5	Rinse	Closed
P6	Bypass	Open
Brine Piston	Brine	Closed
PR	Refill	Closed

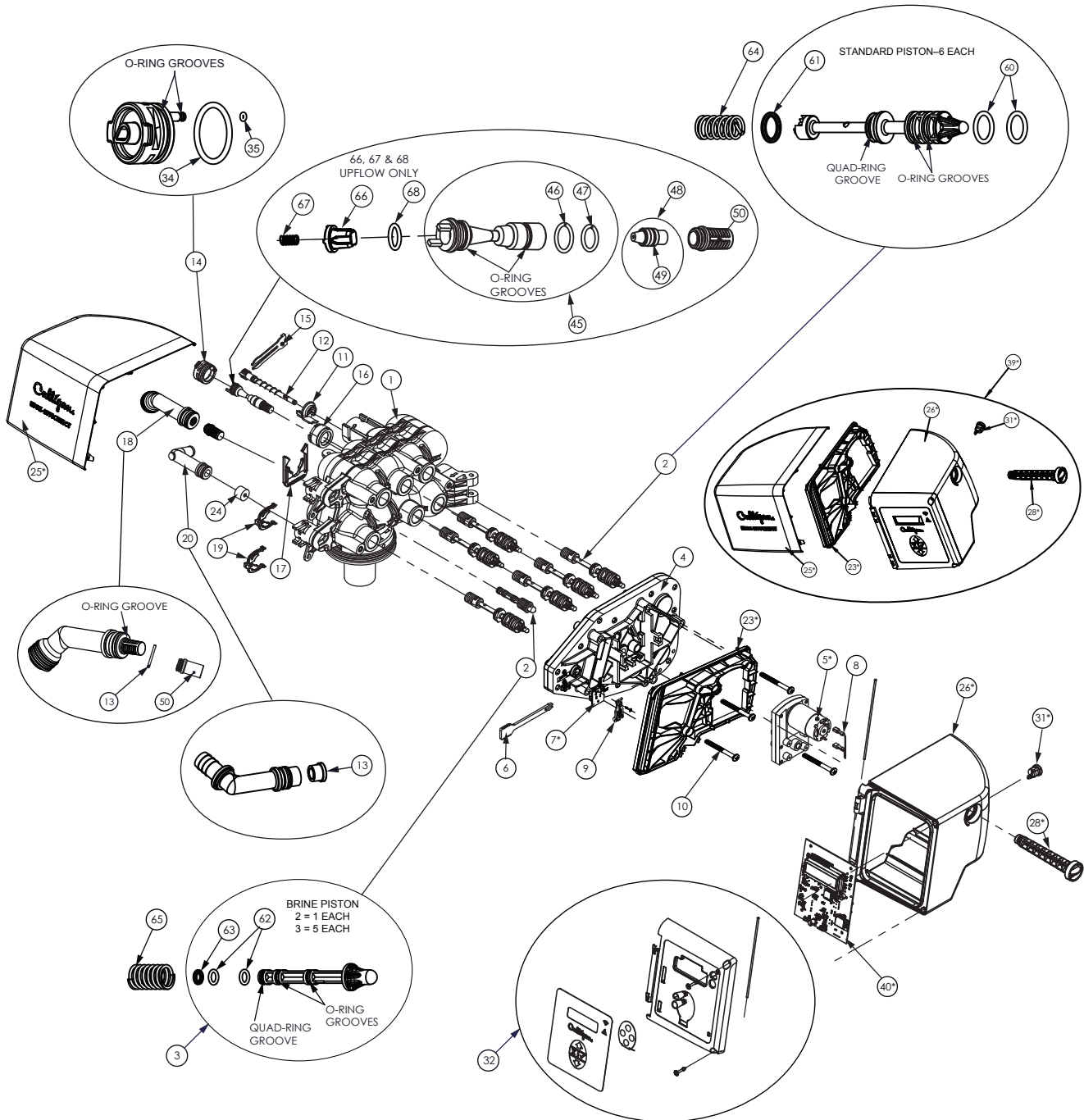
COLOR KEY

■	RED = Raw Water
■	ORANGE = Diluted Brine
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Parts List

Smart HE Water Softener Control Valve Assembly (Indoor/Outdoor)

NOTE! See Appendix F on page 96 for parts specific to Outdoor Smart HE Controls



Smart HE Water Softener Control Valve Assembly Parts List

Item	P/N	Description	Item	P/N	Description
	01040350	Smart HE Indoor Control Valve, Downflow, Complete	20	P1040222	Drain Elbow Assembly, Barbed, 10ea
	01040351	Smart HE Indoor Control Valve, Upflow, Complete	***	P1040220	Drain fitting, straight w/O-ring, 1/2" NPT, 10 pk
1	01023020	Valve Body	23	01038230	Enclosure Frame, Indoor
2	01025267	Piston Rebuild Kit, Includes 6ea Standard Piston assemblies and 1ea Brine Piston Assembly	24	P1040211	Backwash Flow Control, 2.0 gpm, Brown, 10ea
3	P1022786	Brine Piston w/80 Duro Quad Seal, HE 1", 5ea		P1040212	Backwash Flow Control, 3.5 gpm, Green, 10ea
4	01040224	Gear Box Assembly, Downflow, Smart HE		P1040214	Backwash Flow Control, 5.5 gpm, Black, 10ea
	01040225	Gear Box Assembly, Upflow, Smart HE	25	01038223	Cover, HE Control, Indoor, Gray
5	01020240	Gearmotor, Indoor	26	—	Hood, HE Control, Indoor (only available in item 39 kit), Gray
6	P1020415	Retainer, Gearmotor, 4ea	28	P1038220	Enclosure Thumb Screw, 10ea
7	01020420	Wire Harness w/ Position Sensor, Indoor	31	P1000372	Strain Relief Fitting, Indoor 25ea
8	01022735	Wire Harness, Motor	32	01041869	Enclosure Door Kit, Indoor, Gray. (Includes all door components with hinge - no circuit board)
9	P1041775	Kit, Position Sensor Latch w/Screw, 10 PK	34	P1021162	O-ring, Eductor Plug Assembly, Large, 10ea
10	P1020517	Gear Box Assembly Screw, 10ea	35	P1020424	O-ring, Eductor Plug Assembly, Small, 10ea
11	P1020289	Dial-a-Softness Knob, 10ea	39	01041797	Electronics Enclosure Kit less Circuit Board, Indoor
12	P1020427	Dial-a-Softness Assembly w/ O-Rings, 10ea	40	01041776	Replacement Circuit Board
13	P0440268	O-Ring & Drain Elbow, 10ea	45	P1022796	Eductor Throat with O-rings, Downflow, Beige, 10ea
14	P1020487	Eductor Plug Assembly w/ O-Rings, 10ea		P1022723	Eductor Throat with O-rings, Downflow, Blue, 10ea
15	P1020290	Eductor Plug Retainer, 10ea		P1023712	Eductor Throat with O-rings, Upflow, Gray, 10ea
16	P1023051	Dial-a-Softness Locking Plug, 10ea		P1023713	Eductor Throat with O-rings, Upflow, White, 10ea
17	P1020291	Dial-a-Softness Locking Plug Retainer, 10ea	46	P1020603	Eductor Throat O-ring, Large, 10ea
18	P1034563	Brine Elbow Assy, HE, Push-To-Connect, 10ea	47	P1020428	Eductor Throat O-ring, Small, 10ea
19	P1030127	Retainer, Brine & Drain Elbow, 10ea	48	P1013894	Eductor Nozzle w/ O-ring, Blue, 10ea

Item	P/N	Description
	P1013895	Eductor Nozzle w/ O-ring, Beige, 10ea
	P1024333	Eductor Nozzle w/ O-ring, Green, 10ea
	P1040291	Eductor Nozzle w/ O-ring, White, 10ea
49	P0308438	O-ring, Eductor Nozzle, 10ea
50	P1029422	Filter Screen, Eductor, Threaded, 10pk
60	P1020431	Main Piston O-ring, 25ea
61	P1025199	Main Piston Quad Ring, 25ea
62	P1020426	Brine Piston O-ring 25ea
63	—	Brine Piston Quad Ring (not available for sale - use item #3)
64	P1020252	Main Piston Spring, 10ea
65	P1020286	Brine Piston Spring 10ea
66	P1030149	Bullet, Check Valve, Upflow, 10ea
67	P1030150	Spring, Upflow, 10ea (for upflow models only)
68	P0447986	O-ring, Bullet Check, 25 pk
***	P1030511	UF Bullet Kit, 10ea (incl items #66, #67, #68)
***	P1030504	UF Eductor Kit, 9", 10 Pack
***	P1030505	UF Eductor Kit, 10" & 12", 10 Pack
***	P1030506	UF Eductor Kit, 14" & 16", 10 Pack
***	P1030507	UF Eductor Kit, 18", 10 Pack
***	P1041578	Hose Clamp, Drain, 25ea
***	01040206	Power Supply, Indoor, 24VDC, 20'
***	01040207	Power Supply, Indoor, 24VDC, 30' (optional)
***	P1006498	Plug, Dome, Enclosure, .562", Indoor, 10ea

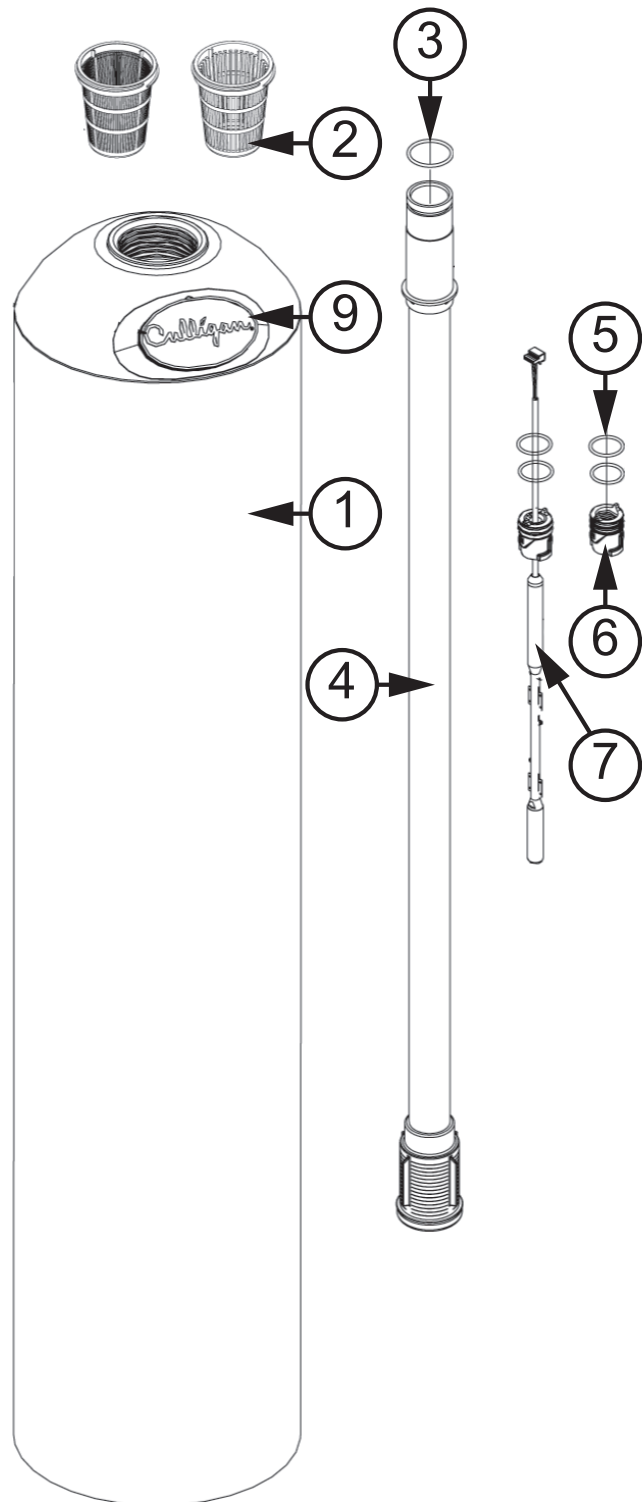
*** Not shown

Media Tank Assembly

Item	P/N	Description	Qty
1	01040426	Tank Assembly, 9" w/ Fillport, gray, Complete, 8% crosslink cation resin	
	01040411	Tank Assembly, 9" w/ Fillport, gray, Complete, 10% crosslink cation resin	
	01040430	Tank Assembly, 10" w/ Fillport, gray, Complete 8% crosslink cation resin	
	01036074	Tank Assembly, 12" w/ Fillport, gray, Complete, Less Media	
	01040402	Tank Assembly, 14" w/ Fillport, gray, Complete, Less Media	
	01040449	Tank Replacement, 9", w/ Fillport, gray, Empty	
	01040404	Tank Replacement, 10", w/ Fillport, gray, Empty	
2	P1009847	Top Strainer - Fine Slot, 10ea	
	P1011195	Top Strainer - Wide Slot, 10 ea	1
3	P1009099	O-Ring, Manifold, 50 ea	1
4	01016176	Outlet Manifold - 9"	1
	01014539	Outlet Manifold - 10"	1
	01018846	Outlet Manifold - 12"	1
	01016429	Outlet Manifold - 14"	1
5	P1017434	O-Ring, Plug and Sensor, 10ea	2
6	01015122	Plug, Tank Porthole	1
7	01040293	Aqua-Sensor probe, Indoor, GBX	1
	01040295	Aqua-Sensor probe, Outdoor, GBX	1
9	01030412	Culligan Emblem, Gray	1
—	MS018169	Cation Resin, 10% Crosslink, 1 cubic Foot	*
—	00156001	Cullex Resin, 8%, 1 Cubic Foot	*
—	00160702	Cullsan, 20 lb bag	*

*Refer to "[Specifications](#)" on [page 7](#) for the amount of Cullex and Cullsan needed for the unit's tank.

Figure 52. Tank assembly.



Brine Tanks, Lids and Salt Plates

Figure 53. 16" and 18" brine system.

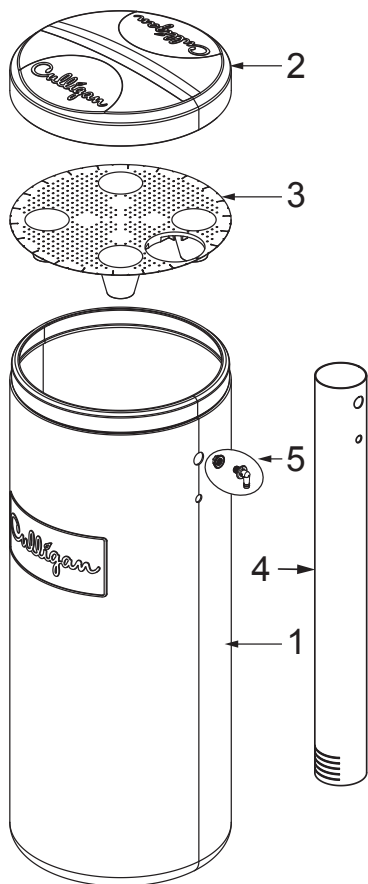


Figure 54. 11" Brine System

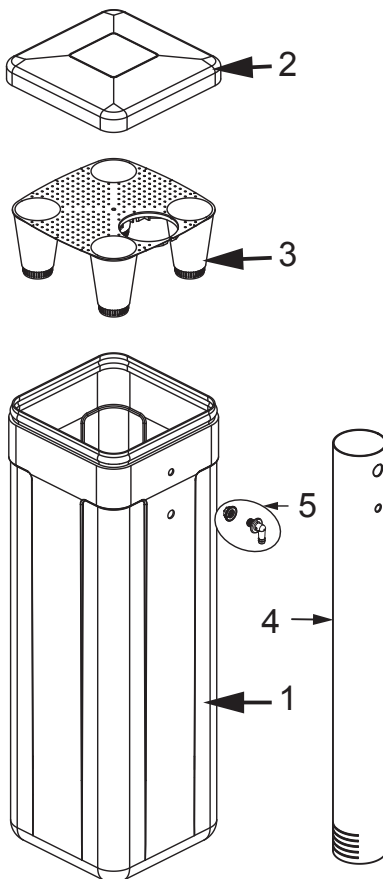
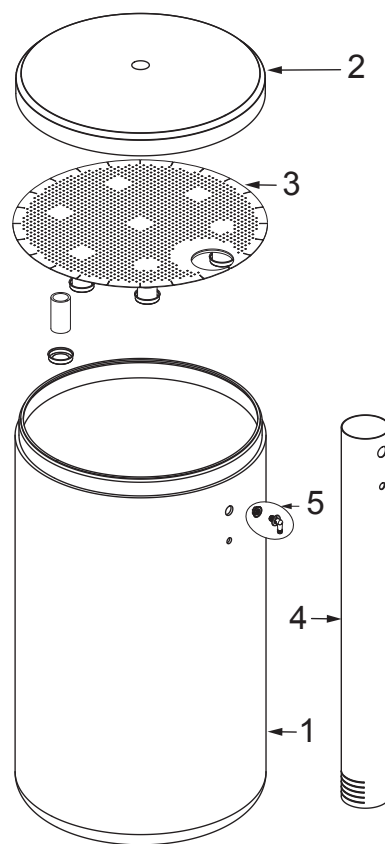


Figure 55. 24" Brine System



NOTE! For Brine Valve Assembly, Tank Adapter, and Bypass Valve Parts List, see page 71.

16" and 18" Brine System

Item	P/N	Description
—	01036062	Brine System, 250 lb, Gray
—	01036063	Brine System, 375 lb, Gray
1	01038212	Replacement Tank, 250 lb, Gray
	01038214	Replacement Tank, 375 lb, Gray
2	—	Cover, 250 lb, Gray (not available for sale)
	01038215	Cover, 375 lb, Gray
3	01018707	Salt Plate, 250 lb
	01018713	Salt Plate, 375 lb
4	01018708	Brine Chamber, 250 lb & 375 lb
5	P1020190	Overflow Fitting w/ Nut - 24 Pack

11" Brine System

Item	P/N	Description
—	01040391	Brine System, 160 lb, Gray
1	01040397	Replacement Tank, 160 lb, Gray
2	—	Cover, 160 lb, Gray
3	01018764	Salt Plate, 160 lb
—	—	Brine Chamber, 160 lb
4	01018768	Brine Chamber
5	P1020190	Overflow Fitting w/ Nut - 24 Pack

24" Brine System

Item	P/N.	Description
—	01036064	Brine System, 650 lb, Gray
1	01038215	Replacement Tank, 650 lb, Gray
2	01036064	Cover, 650 lb, Gray
3	01018714	Salt Plate, 650 lb
4	01018708	Brine Chamber
5	P1020190	Overflow Fitting w/ Nut - 24 Pack

Figure 56. Brine Valve Assembly - All

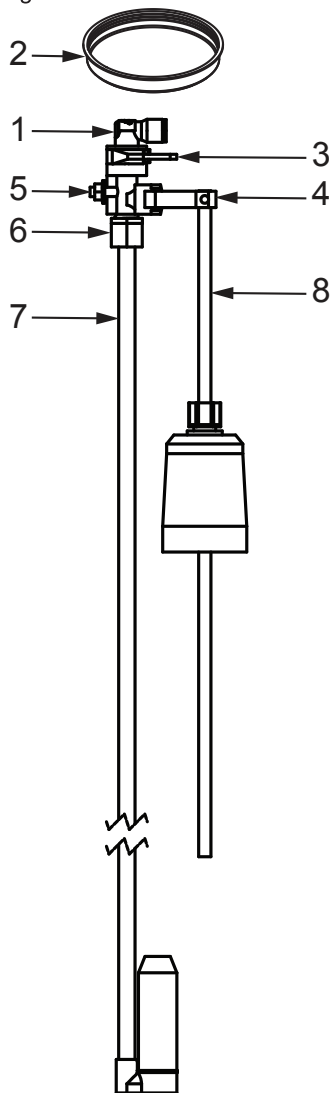


Figure 57. 1" Tank Adapter

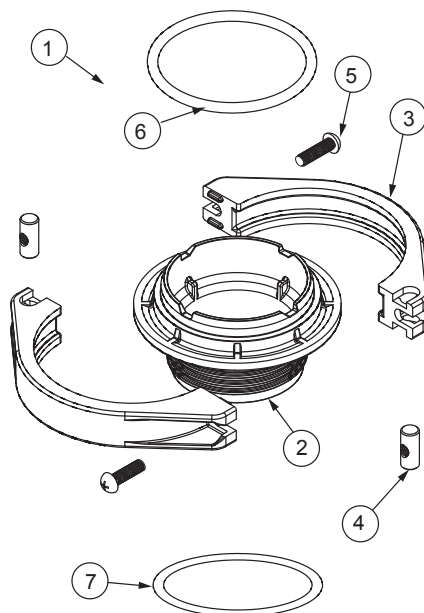
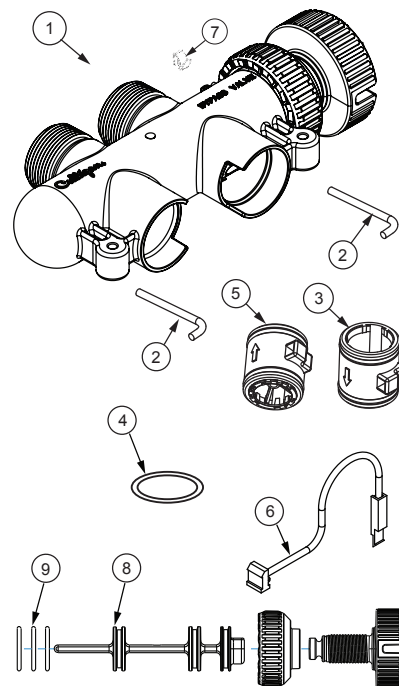


Figure 58. 1" Bypass Valve



Tank Adapter

Item	P/N	Description
1	01014153	Adapter Assy, 1" Valve to tank - less o-rings (Includes 2,3,4,5)
2	01013958	Tank Adapter, 1" Valve
3	P1013959	Tank Clamp, 1" Valve
4	P1013669	Tank Clamp Pin, 1" Valve, 10ea
5	P0318383	Tank Clamp Screw, 1" Valve, 10 ea
6	P1014848	O-Ring, Large, 1" Valve to Tank Adapter, 25 ea
7	P0440052	O-Ring, 1" Valve Adapter to ACME Tank, 25 ea

Brine Valve Assembly

Item	P/N	Description
—	01035282	Brine Valve - PTC
1	01035204	BLFC Elbow - 3/8" - PTC - 0.45 gpm
	01018711	BLFC Elbow - 1/2" - Jaco - 0.8 gpm
2	P1020194	Brine Well Cap - 24 Pack
3	P1020191	Retaining Clip - 24 Pack
4	P1020192	Pin - 24 Pack
5	P1020193	5/16" Nut, Retaining - 24 Pack
6	P1020195	3/8" Nut - 24 Pack
7	P1020198	Air Check/Pick-Up Assy - 24 Pack
8	P1020197	Float - 24 Pack

Bypass Valve

Item	P/N	Description
1	01018760	Bypass Valve, Rotary
2	P1009075	Retaining Pin, 1" Bypass Valve, 10 ea
3	01014033	Coupling Kit, for 1" Bypass includes 2 couplings w/4 o-rings and two pins (item #2)
4	P1009099	O-Ring, Couplings/Meters, 12 ea
5	01026849	Flow Meter Assy, HE 1", LF, includes 28" outdoor cable (item #6)
6	01025282	Wire Harness, Flow Meter, 28" outdoor cable
7	P1018422	Spring Clip, 1 1/4" Bypass Valve, 10pk
8	01018755	Rebuild Kit - 1" 1/4" Rotary Bypass
9	P1016467	Replacement O-Ring for Bypass Valve Stem, 50ea/Kit

Appendix A - Smart HE Softener-Cleer/Softener-Cleer Plus

Softener-Cleer Water Softener Operation

Culligan Softener-Cleer/Softener-Cleer Plus water softener systems and accessories are designed for well water. The systems utilizes Cullex ion exchange resin, a chlorine generator, mineral reactivator (a phosphoric acid solution), and a layer of KDF (Softener-Cleer Plus models only) to reduce:

- Hardness
- Dissolved iron up to 10 ppm
- Trace amounts of Iron-Related, Slime Forming and Sulfate Reducing Bacteria from colonizing the resin bed.
- Hydrogen sulfide up to 2 ppm (Softener-Cleer Plus models only)

Mineral Reactivator

A small amount of Mineral Reactivator is educted at the beginning of the Brine Draw cycle. The mild acid is designed to clean the Cullex resin pores of iron, manganese, silt, and organic compounds that can cause resin fouling and a loss of ion-exchange capacity.

Order the Mineral Reactivator in Quart or Gallon Bottles from::

Pro Products

Website: www.proproducts.com

Chlorine Generator

After the eduction of the Mineral Reactivator the Chlorine Generator in the Brine Elbow Assy. generates a chlorine solution from the salt brine. The chlorine solution reduces trace levels of Iron-Related, Slime Forming and Sulfate Reducing bacteria that may have colonized in the resin bed..

KDF (Softener-Cleer Plus Models Only)

KDF media is high-purity copper-zinc granules that use redox (the exchange of electrons) to reduce hydrogen sulfide from water. The KDF reacts with hydrogen sulfide to form insoluble sulfide that can be backwashed.

Softener-Cleer Regeneration Sequence

See [the figure below](#) for an overview of the Softener-Cleer regeneration sequence.

Figure 59. Mineral Reactivator



Figure 60. Chlorine Generator

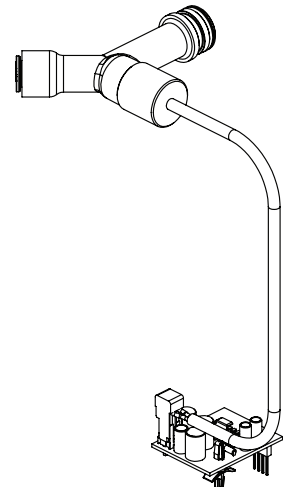
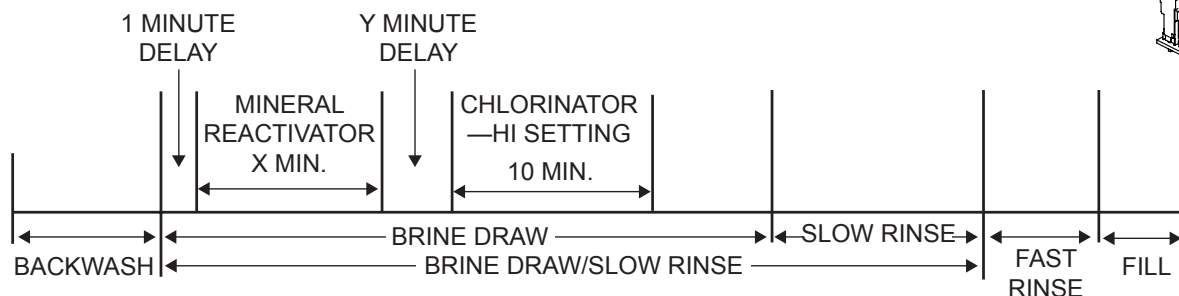


Figure 61. Softener-Cleer regeneration sequence.



Installation

Follow the standard installation procedure for the Smart HE softener as outlined in this manual. Other modifications are covered in the sections to follow in this Appendix.

Adding KDF to the Softener-Clear Plus

Follow the procedure below to add KDF to 9" and 10" media tanks.



CAUTION!

Follow these instructions to prevent resin and/or KDF from discharging to the drain during initial start up.

Backwash the Softener-Clear prior to adding the KDF to remove resin fines and remove air pockets.

This process could also be completed using an In-plant Backwash Funnel system at the dealership.

1. Depressurize the Softener-Clear unit, disconnect electrical power and remove the control valve.

NOTE! For 12" and 14" tanks, add the KDF before adding the Cullex resin.

You can also add the KDF without removing the control valve by using the fillport on the tank.

2. Remove the inlet strainer.
3. Cover the top of the manifold with a clean rag.
4. Pour the KDF into the tank. [Table 22](#) displays the quantities of KDF required for each tank.

Table 22. KDF quantities for Softener-Clear.

	9" Tank	10" Tank	12" Tank	14" Tank
Quantity of KDF, lb	13.5	13.5	27	40.5
Number of Containers	1	1	2	3

5. Re-install the inlet strainer, making sure to thread the strainer until it bottoms out on the tank thread. Failure to install the strainer correctly can cause the tank adapter to leak.
6. Install the control valve, pressurize the unit, connect electrical power, and backwash the Softener-Clear. Slowly rotate the bypass valve to the "Soft Water" position until water flows.

Softener-Cleer - Drain Line Flow Control, Eductor Nozzle—Throat

Use the recommended drain line flow control, eductor nozzle, and eductor throat for various size tanks. See [Table 23](#).

Refer to [Figure 12](#) and instructions below for changing the drain line flow control, eductor nozzle, and eductor throat.

Table 23. Softener-Cleer Eductor Nozzle, Throat and Drain Line Flow Controls.

Unit	Throat	Nozzle	Backwash/Fast Rinse* - Flow Control Color	Brine Draw	Slow Rinse	Brine Refill
9" Softener-Cleer	Gray	White	2.5 gpm - Brown	0.28 gpm	0.13 gpm	0.45 gpm
10" Softener-Cleer	Beige	Beige	2.5 gpm - Brown	0.92 gpm	0.26 gpm	0.45 gpm
12" Softener-Cleer	Beige	Beige	3.5 gpm - Green	0.93 gpm	0.70 gpm	0.80 gpm
14" Softener-Cleer	Blue	Green	5.5 gpm - Black	1.86 gpm	1.37 gpm	0.80 gpm
9" Softener-Cleer Plus	Beige	Blue	2.5 gpm - Brown	0.35 gpm	0.26 gpm	0.45 gpm
10" Softener-Cleer Plus	Beige	Beige	2.5 gpm - Brown	0.93 gpm	0.26 gpm	0.45 gpm
12" Softener-Cleer Plus	Beige	Beige	3.5 gpm - Green	0.93 gpm	0.70 gpm	0.80 gpm
14" Softener-Cleer Plus	Blue	Green	5.5 gpm - Black	1.86 gpm	1.37 gpm	0.80 gpm

*Flow Rate represents text molded onto flow control. For actual flow rate see "Drain Flow, Maximum" on the Specifications page.

Refer to [NOTE](#) below and the instructions on "[Changing the Eductor Throat & Nozzle](#)" on [page 26](#) when changing the eductor nozzle and throat.

NOTE! Observe the orientation of the arrow on the eductor cap. It should point "Down" for Downflow brining.



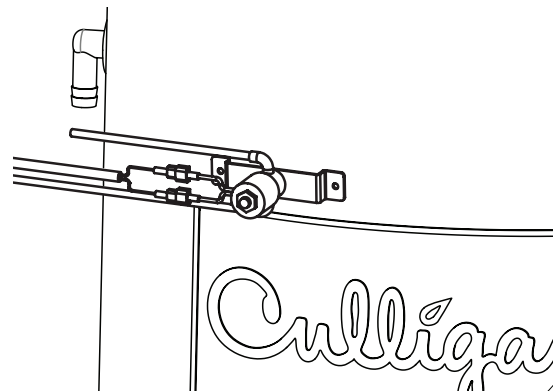
CAUTION!

DO NOT make a direct connection to the drain. Provide an air gap of at least four times the diameter of the drain pipe or conform to local sanitation codes and to permit the observation of drain flow.

Mounting the Chemical and Solenoid Bracket

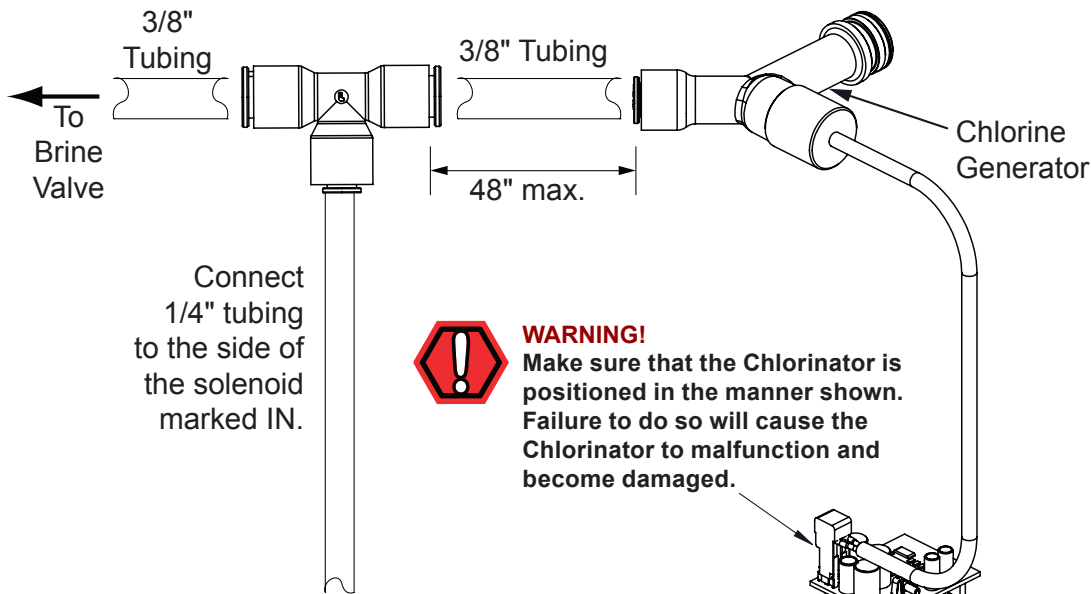
1. Mark the holes for the bracket position it so top left hole approximately 8" from top of tank and 8" to the side of the overflow elbow.
2. Drill holes into the brine tank aligning with the top two holes on the template using a 1/4" drill bit.
3. Next, mount the Chemical Solution Bracket on the inside of the brine tank and the solenoid valve bracket on the outside of the brine tank using the provided push pins making certain that the fit to the tank is tight.
4. Insert the solution bottle into the bracket.
5. Replace the cap of the mineral reactivator with the cap assembly in the Softener-Cleer parts pack. Three additional tapping screws have been provided to secure the brine tank cover.

Figure 62. Softener-Cleer and solenoid brackets attached to brine tank



Installing the Chlorine Generator

Figure 63. Softener-Cleer interconnecting tubing



Fit these into the grooves of the Chlorine Generator's connector.

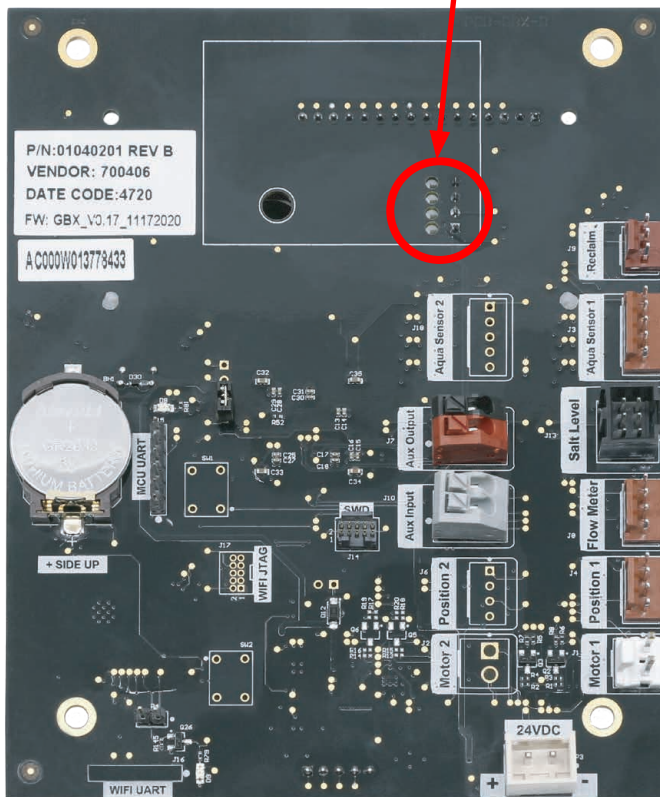
Figure 64. Chlorinator Circuit Board Installation - GBX



WARNING! Make sure that the Chlorine Generator is positioned with the board's connectors fitting into the grooves on the Chlorine Generator's connector. Failure to do so will cause the Chlorine Generator to malfunction and be damaged.



CAUTION! All electrical components should be the same DC current; this includes the power supply, Aux Board, and Solenoid.



Interconnecting Tubing

1. Insert and fully seat 3/8" tubing from Chlorine Generator to the 3/8" Tee.
2. Insert and fully seat 3/8" tubing from the 3/8" tee assembly to the brine valve.
3. Drill a 1/4" hole in the brine tank wall for tubing from the bottom of the solenoid.
4. Connect 1/4" tubing to the 1/4" elbow located at the top of the solenoid.
5. Insert the 1/4" tubing from the top of the solenoid through the brine tank wall and connect it to the cap assembly on the solution bottle..

NOTE! Make sure all nuts are fastened securely to prevent leaks.

6. Slide the solenoid assembly cover over the top of the solenoid assembly until it snaps into place.

NOTE! Verify that the red flow restrictor is inserted in the dip tube inside the mineral reactivator bottle.

Figure 65.
Mineral reactivator bottle tubing connections.

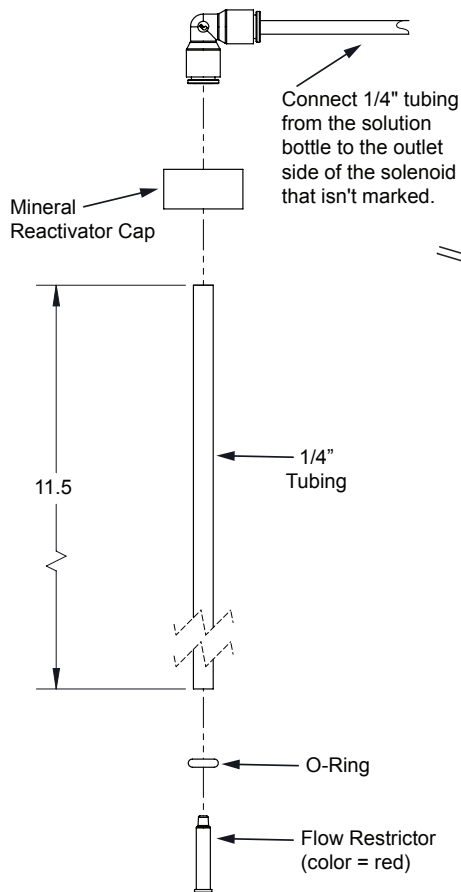


Figure 66.
Brine well tubing.

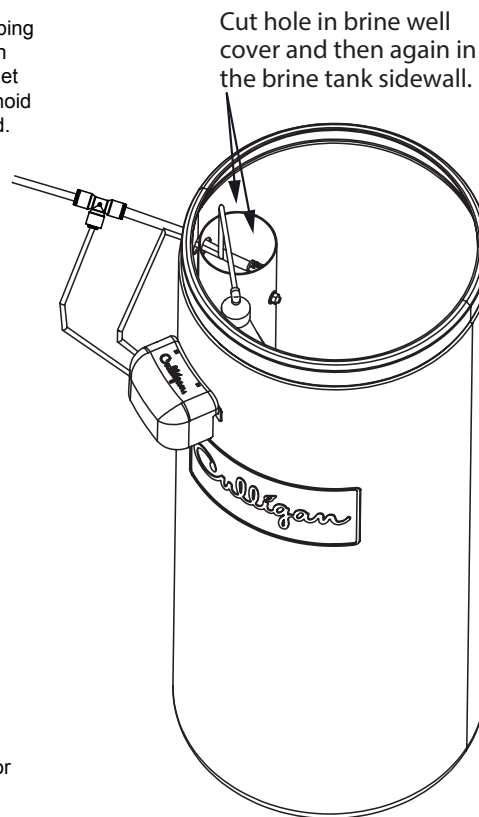
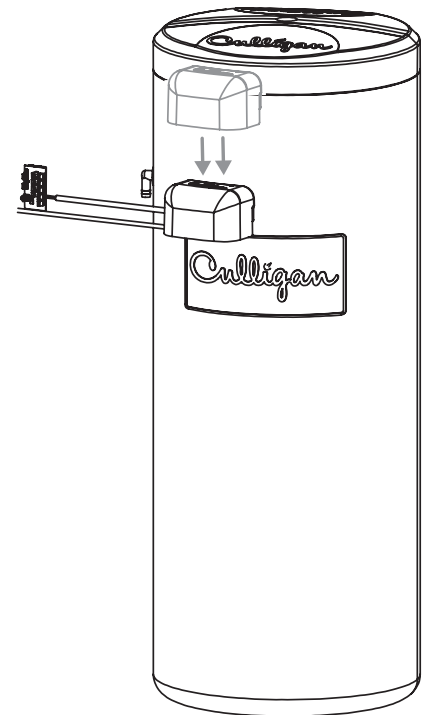


Figure 67.
Cover



Softener-Clear Settings

The Softener-Clear is designed to perform efficiently on a wide range of water supplies. Before the unit can be regenerated and put into service, several settings must be made. See the recommended salt dosages and reserve capacities.

NOTE! This table is for reference purposes and should be used as a starting point. You can reduce salt dosages based on historical operating conditions and applications.

Table 24. Softener-Clear salt dosage and reserve capacity.

Unit	0–3 ppm of Iron		4–6 ppm of Iron		7–10 ppm of Iron	
	Salt Dosage, lb	Reserve Capacity	Salt Dosage, lb	Reserve Capacity	Salt Dosage, lb	Reserve Capacity
9"	8	30%	13	40%	15	50%
10"	12		19		23	
12"	16		25		30	
14"	24		38		45	

NOTE! Change the salt dosage using the HE Controller: ADV. SETUP > REGEN SETUP > SALT DOSAGE.

Change the reserve capacity using the HE Controller: ADV. SETUP > REGEN SETUP > RESERVE CAPACITY.

Regeneration Frequency

Culligan recommends that REGEN INTERVAL (Time Clock Backup) should be used even if a meter is used to initiate regeneration. Culligan suggests that REGEN INTERVAL (Time Clock Backup) should be initially set to three days; you can increase this setting at a later date based on historical operating conditions and applications.

NOTE! Change the REGEN INTERVAL (Time Clock Backup) using the HE Controller: ADV. SETUP > REGEN TRIGGER > REGEN INTERVAL

Setting Alarm to Refill Mineral Reactivator

You can set an alarm on the HE Controller to alert the customer to add another bottle of Mineral Reactivator. See [Table 25](#).

Table 25. Softener-Clear maintenance schedule.

Unit	Ounces/Regeneration	Will Last X Regenerations	Container Change Frequency (days)
9"	0.5	64	192
10"	0.75	42	126
12"	1	32	96
14"	1.5	21	63

NOTE! Table 25 is based on 32 ounce container of Mineral Reactivator and regenerating every third day.

Set the Mineral Reactivator Alarm (External Filter Alarm) using the HE Controller: ACCESSORIES > EXT. FILTER.

Example

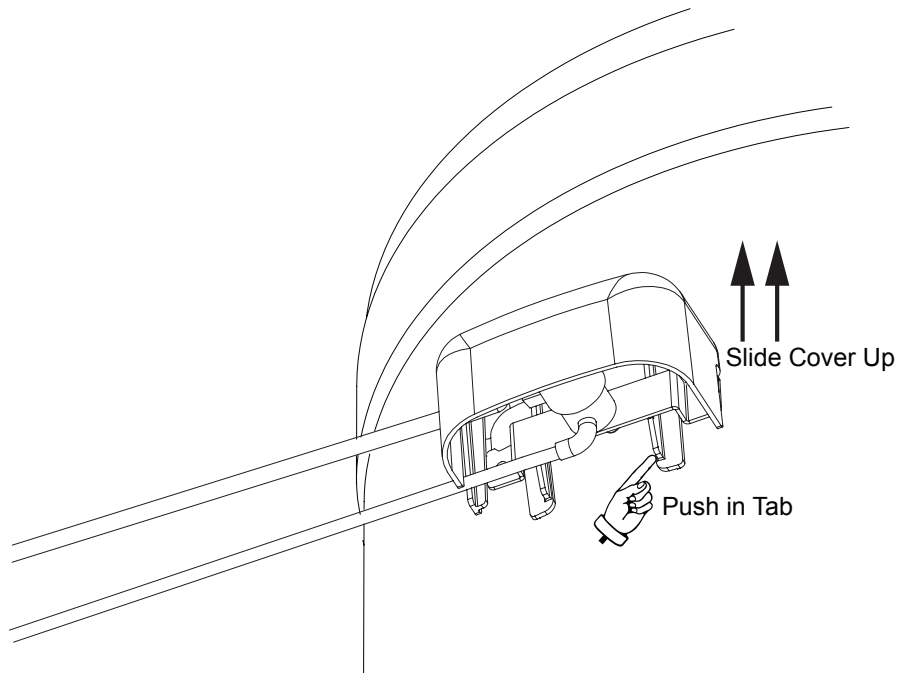
For the 10" unit a new container will be needed approximately every 126 days. When setting the External Filter Alarm choose time base and enter 126 days.

Service & Maintenance

Removing the Solenoid Assembly Cover

1. Push in one of the snap tabs on the solenoid assembly cover to disengage the cover from the solenoid mounting bracket. See [Figure 68](#).
2. Slide the cover up and away from the mounting bracket to remove it from the assembly.

Figure 68. Removing the solenoid assembly cover.



Solenoid Troubleshooting

An empty bottle of Mineral Reactivator doesn't immediately point to failed solenoid:

- Check the AUX OUT programming to be NORMALLY OFF, active in BRINE/SRINSE, DELAY for 1 min and be ACTIVE for 3-6 minutes depending on the tank size.
- Check for proper tubing connections from the bottle to the IN on the solenoid. If it is connected otherwise, pressure during refill of the brine tank could also fill the solution bottle. This allows chemical to be drawn out of the bottle by eduction but closes tightly at the center-point of the diaphragm when the brine tank is being refilled. If it is mistakenly reversed, chemical draw occurs all the time through the solenoid during brine draw.
- Disassemble and check the solenoid condition, clean as needed, properly reassembling the parts.

Test the solenoid's ability to function correctly using the following steps:

1. Remove the tubing at the bottle cap and reverse the tubing connected to the solenoid.
2. Using Motor Control move the HE valve to the Refill (position 5) and seat the brine valve by lifting the float stem. If water dribbles from the outlet of the solenoid, the diaphragm isn't seating properly.
3. Activate the solenoid by going to AUX OUT TEST, pushing the until it displays AUX 1 ON, water should flow freely from the solenoid outlet and when you push the again, the flow should stop completely.
4. Replace the solenoid if it fails to operate correctly as described in this test.

Smart HE Softener-Cleer Parts

Figure 69. Solenoid Assembly

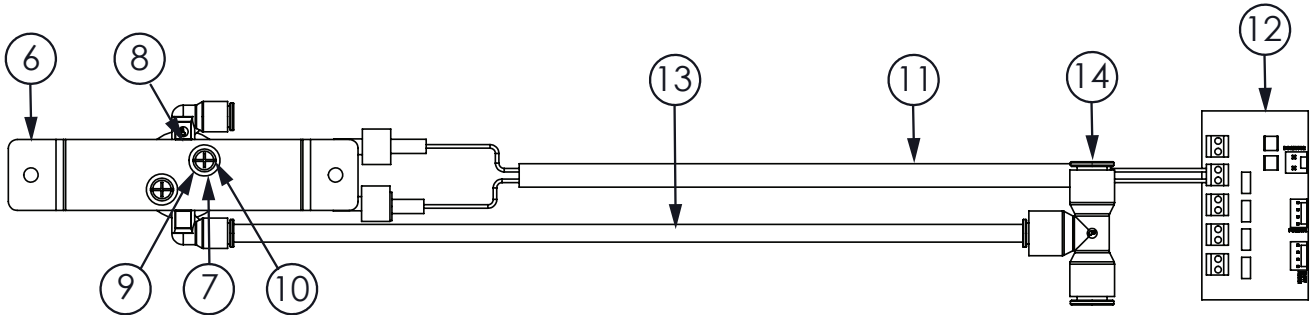


Figure 70. Mineral Reactivator Suction Assy.

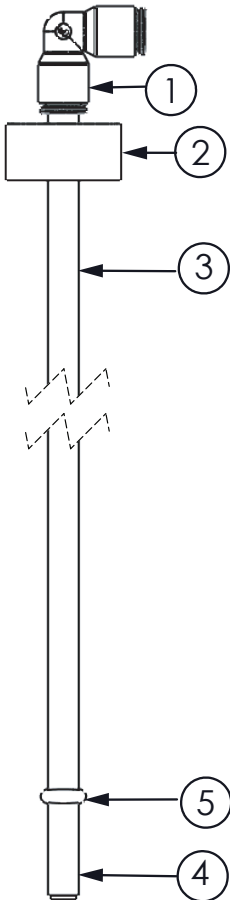
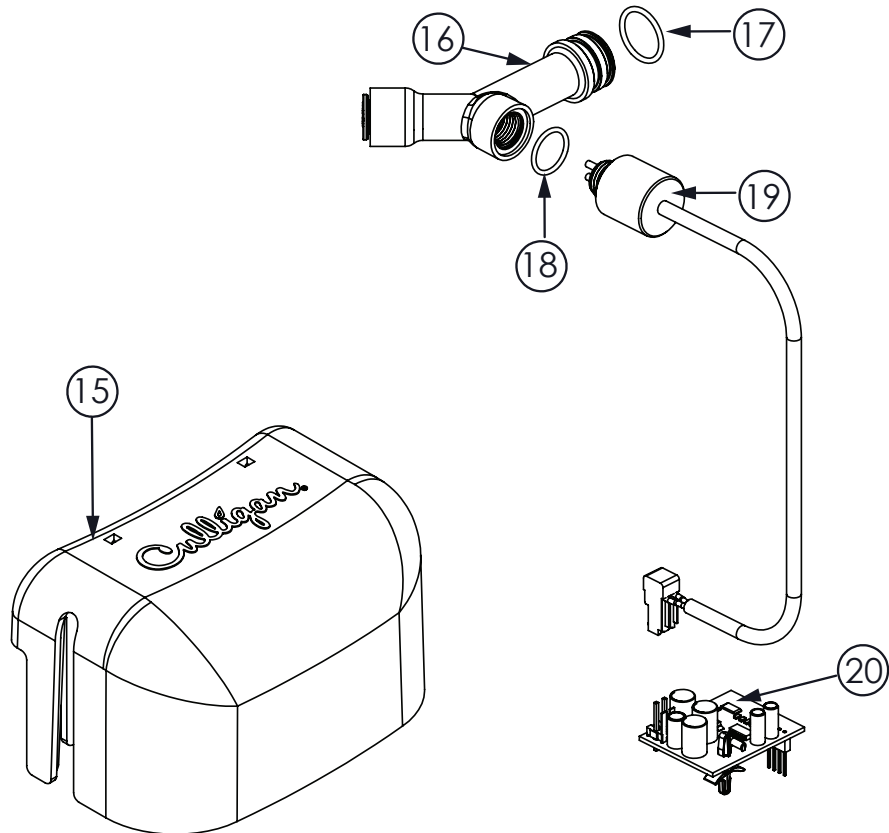


Figure 71. Chlorine Generator



Smart HE Softener-Cleer Parts List

Item	Part No.	Description	Qty.
–	01040303	Kit, Softener-Cleer and Softener-Cleer Plus: the components listed below are included in the Softener-Cleer and Softener-Cleer Plus kit.	
	P1024690	Assembly, Mineral Reactivator Cap, 10 ea	
	01041599	Bottle Holder Bracket - Gray	
	—	Assembly, Solenoid Bracket	
	01041596	Cover, Solenoid Softener-Cleer	
	01034566	Tee, 3/8" x 3/8" x 1/4" Tube, 10 ea	
	—	Softener-Cleer Chlorinator Kit	
1	P1034569	Union, Elbow, 1/4" Tube, OD, 10 ea	
2	P1024690	Cap, Polypro, 16 oz., White, with hole, 10 ea	
3	00402184	Tubing, 1/4", PE, Blue	
4	P1020521	Flow Control Assembly, 10 ea	
5	P1025023	O-Ring, 10 ea	
6	01041598	Bracket, Solenoid	1 EA
7	—	Washer	2 EA
8	01035748	Solenoid, N/C, 1/8 NPT, Polypro, 24VDC	1 EA
9	—	Washer	2 EA
10	—	Screw	2 EA
11	01024693	Cable, 2 Conductor	1 EA
12	01033456	Auxiliary Board, DC	1 EA
13	00402184	Tubing, 1/4", PE, Blue	—
14	P1034566	Tee, 3/8" x 3/8" x 1/4" Tube, 10 ea	1 EA
15	01041596	Cover, Solenoid Assembly, Softener-Cleer	1
*	01024891	Media, KDF-85, 13.5 lb, (Softener-Cleer Plus models only) Qty needed for 9"=1, 10"=1, 12"=2, 14"=3	
16	P1034574	Elbow, Chlorinator Adapter	10 Pack
***	P1024681	Standoff Board	10 Pack
17	P0440268	O-ring, chlorinator elbow	10 Pack
18	P0308462	O-ring, Chlorine Generator	10 Pack
19	01007335	Electrode Assy, Chlorine Generator	1 EA
20	01025091	Circuit Board, Chlorine Generator	1 EA

*** part not shown

Appendix B - Smart HE Municipal

Loading the Media Tank with Gravel, Resin, and Activated Carbon



CAUTION!

Once the tank is full do not lay it down as this will disrupt the layers of gravel underbedding, resin, and activated carbon, resulting in poor performance.

CAUTION!

DO NOT allow the outlet manifold to move when loading the media. The manifold must remain vertical to ensure a good seal at the o-ring. Rap the tank near the bottom with a rubber mallet to level the sand.

9" and 10" tanks are filled with media at the factory.

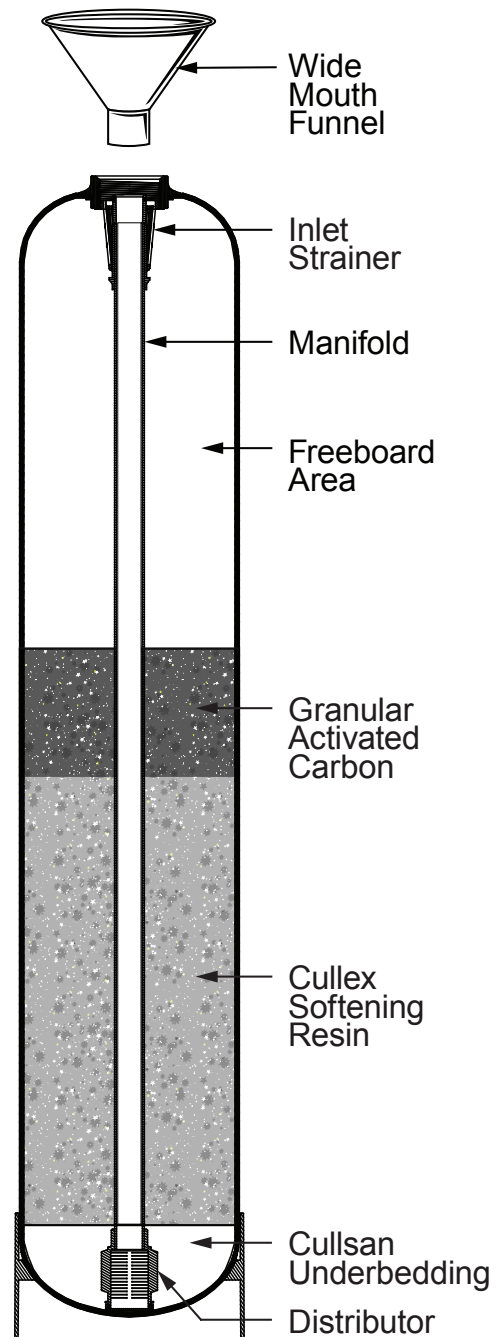
Table 26. Loading quantities.

Size	Cullex (cu. ft.)	Cullsan (lb)	Carbon (lb)	Freeboard (inches)
Municipal 9"	.83	6	6	15.75
Municipal 10"	1.04	1525	8	19.50
Municipal 12"	1.5	20	12	17.31
Municipal 14"	2.3	25	18	25.89

NOTE! Only the 12" and 14" tank will require loading.

1. Position the tank for loading. The Culligan® logo should be facing towards the front.
2. Remove the inlet strainer.
3. Position the outlet manifold in the tank.
4. Cover the tops of the manifold with a clean rag.
5. Using a wide-mouth funnel, load the Culligan Cullsan underbedding through the top of the tank. See "Table 26. Loading quantities."
6. Load the tank with the Cullex® ion exchange resin. Leveling is not required. See "Table 26. Loading quantities."
7. Load the activated carbon per the amount in "Table 26. Loading quantities." Leveling is not required.
8. Remove the funnel and clean tanks threads of any media.
9. Install the inlet strainer, ensuring to thread the strainer until it bottoms out on the tank thread. Failure to install the strainer correctly may cause a leak between the tank and tank adapter.
10. Proceed to "Mount the Control Valve" on page 19.

Figure 72. Media Tank Cross Section



Municipal - Drain Line Flow Control, Eductor Nozzle—Throat

Use the recommended drain line flow control, eductor nozzle, and eductor throat for various size tanks. See [Table 27](#).

Refer to [Figure 12](#) and instructions below for changing the drain line flow control, eductor nozzle, and eductor throat.

Table 27. Municipal - Eductor Nozzle, Throat and Drain Line Flow Controls.

Unit	Throat	Nozzle	Backwash/Fast Rinse* - Flow Control Color	Brine Draw	Slow Rinse	Brine Refill
Municipal 9"	Beige	Blue	2.5 gpm - Brown	0.42 gpm	0.28 gpm	0.45 gpm
Municipal 10"	Beige	Beige	2.5 gpm - Brown	0.42 gpm	0.26 gpm	0.45 gpm
Municipal 12"	Beige	Beige	3.5 gpm - Green	0.94 gpm	0.76 gpm	0.8 gpm
Municipal 14"	Blue	Green	5.5 gpm - Black	1.85 gpm	0.76 gpm	0.8 gpm

*Flow Rate represents text molded onto flow control. For actual flow rate see "Drain Flow, Maximum" on the Specifications page.

Refer to [NOTE](#) below and the instructions on "[Changing the Eductor Throat & Nozzle](#)" on page 26 when changing the eductor nozzle and throat

NOTE! Observe the orientation of the arrow on the eductor cap. It should point "Down" for Downflow brining.



CAUTION!

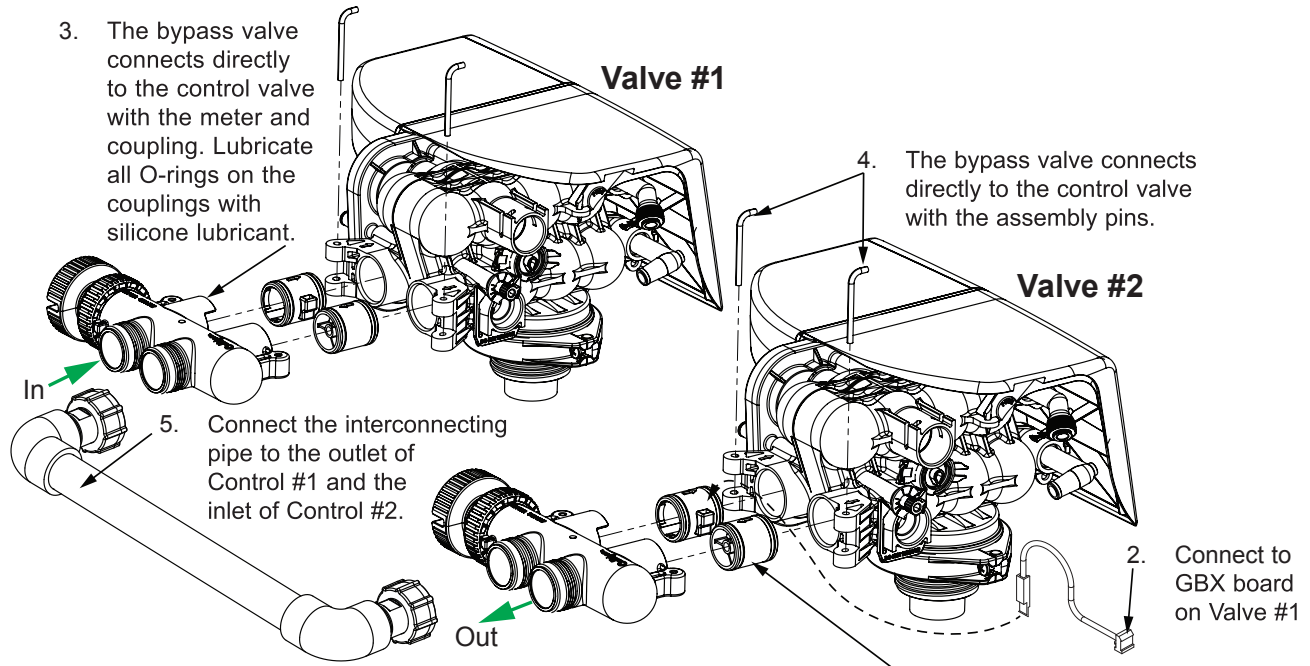
DO NOT make a direct connection to the drain. Provide an air gap of at least four times the diameter of the drain pipe or conform to local sanitation codes and to permit the observation of drain flow.

Appendix C - Smart HE Twin

Bypass Valve Installation

Refer to the instructions below to connect the meter, bypass valve, and interconnecting pipe.

Figure 73. Bypass valve assembly



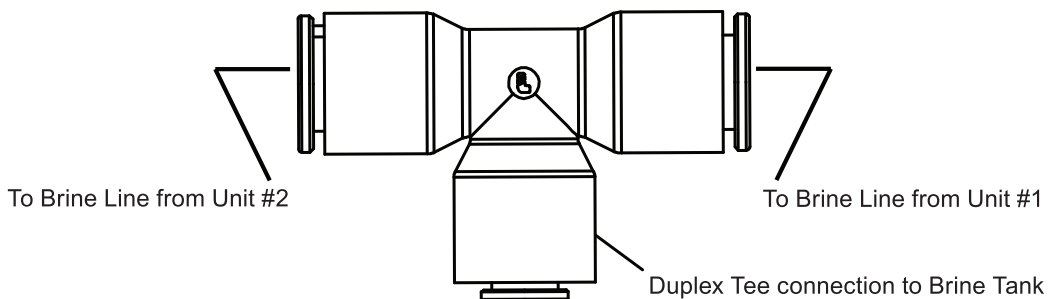
1. All HE units are equipped with a Soft-Minder® meter. The meter is installed on the outlet side of the control valve #2 (the meter is located in control valve #1 small parts kit). The meter body fits in the same space as the coupling between the control valve and the bypass. Make sure the arrow on the flow meter is pointing in the direction of the flow. Lubricate all O-rings on the meter with silicone lubricant. Connect the HE Twin meter wire harness to the meter (the meter wire harness is located in control valve #2 small parts kit).

NOTE! The Low Flow Meter has a white dot on the connection for the wire harness.

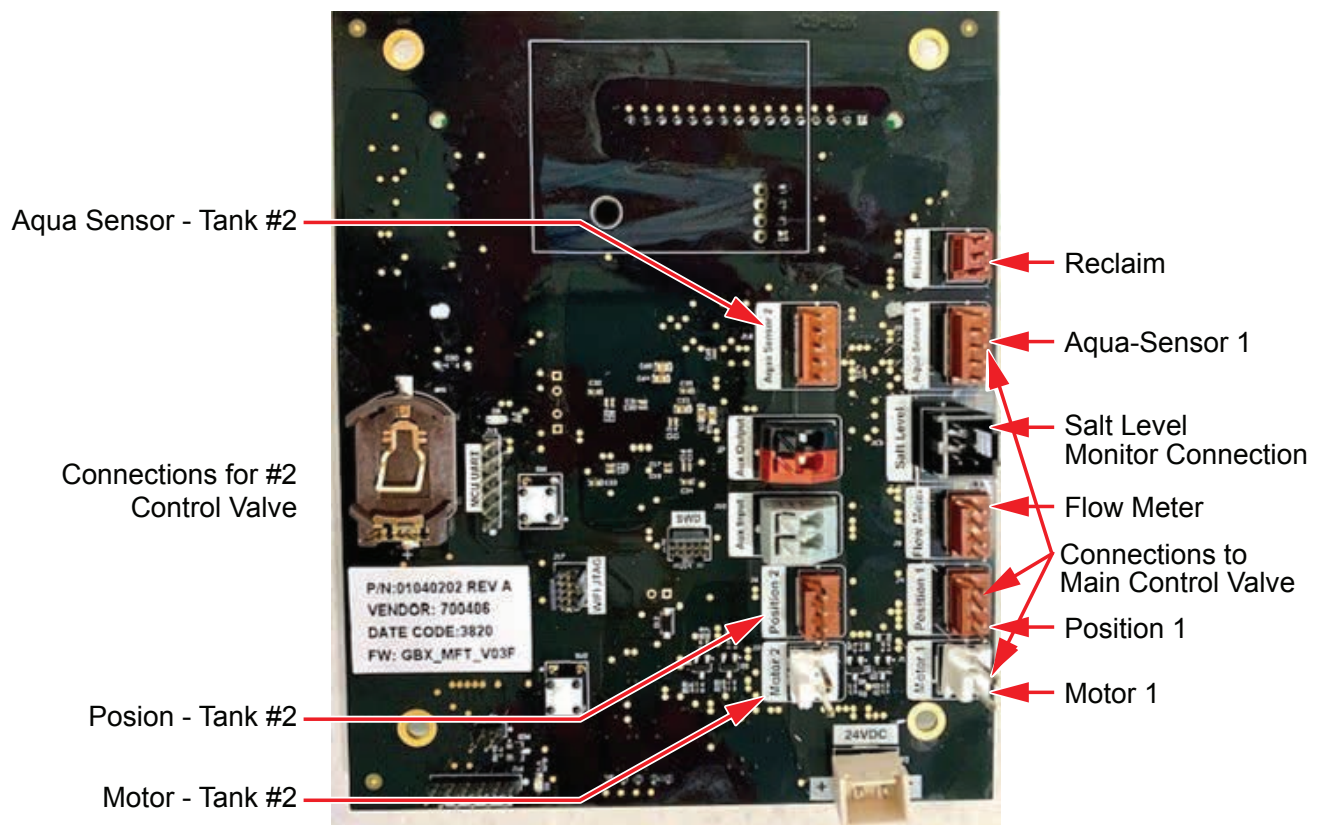
In all cases where metal pipe was originally used and is later interrupted by the bypass valve to maintain proper metallic pipe bonding, an approved ground clamp c/w not less than #6 copper conductor must be used for continuity. Check your local electrical code for the correct clamp and cable size.

Brine Connection Tubing

Figure 74. Installing a Brine System



GBX Circuit Board - Smart HE Twin Control Valve #2



Smart HE Twin Control Valve Assembly #2 (Indoor/Outdoor)

Figure 75.

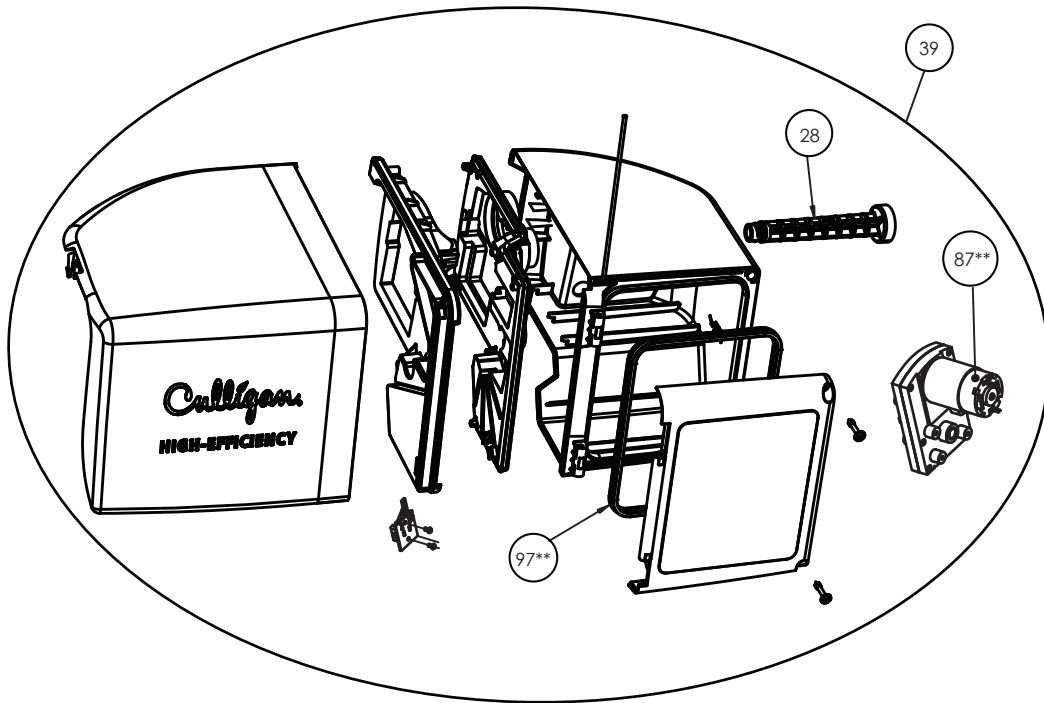
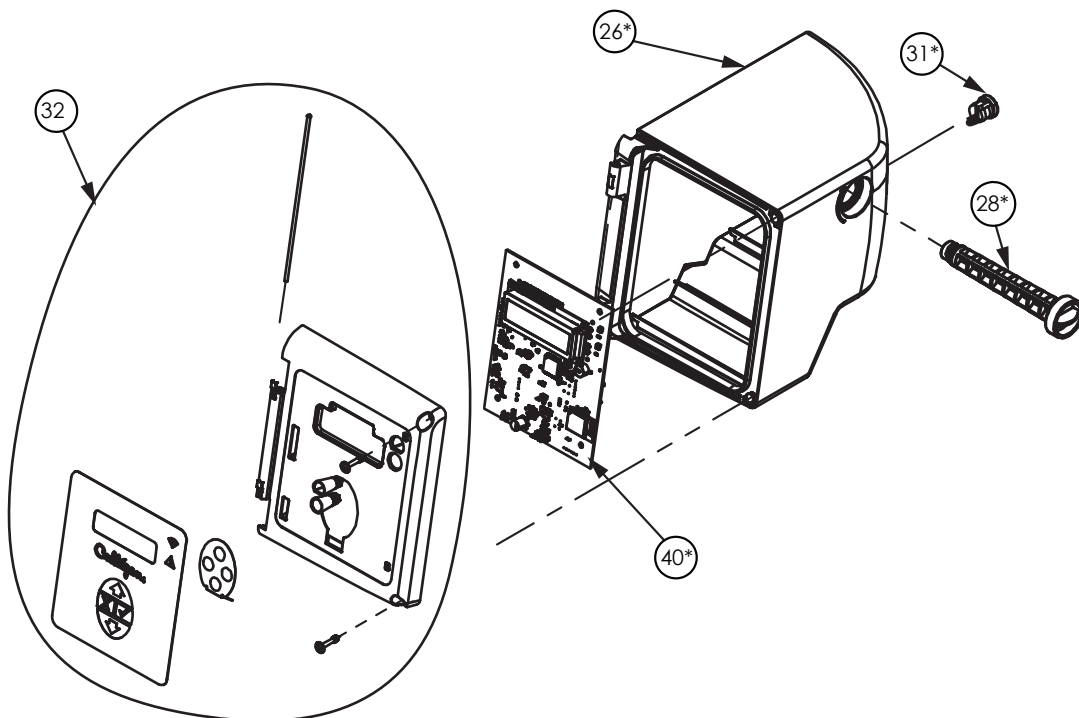


Figure 76.



Smart HE Twin Parts List - Unique Parts Only

NOTE! Only parts unique to Smart HE Twin are listed below.
Please see the main manual "Parts List" on page 66 for others.

Item	P/N	Description
–	01040347	Smart HE Twin Control Valve #1, Downflow, Complete
–	01040348	Smart HE Twin Control Valve #1, Upflow, Complete
–	01040354	Smart HE Twin Control Valve #2, Downflow, Complete
–	01040355	Smart HE Twin Control Valve #2, Upflow, Complete
7	01022751	Wire Harness w/ Position Sensor, Control #2, Extended, Indoor
8	01022752	Wire Harness, Motor, Control #2, Extended, Indoor
40	01041777	Replacement Circuit Board, HE Twin, GBX, Indoor/Outdoor
87	01033061	Gearmotor, Outdoor, Kit
32	01041848	Door Kit, Smart HE Twin #2, Indoor
97	P1033068	Door Seal, Outdoor, 10ea/Kit
***	01021077	Interconnecting Pipe & Fittings, Copper
***	01023290	Interconnecting Pipe & Fittings, Plastic
***	P1034568	Tee, 3/8" Tube, 10pk
Outdoor Part Numbers		
–	01040349	Outdoor Smart HE Twin Control #1, Downflow - Complete
–	01040356	Outdoor Smart HE Twin Control #2, Downflow - Complete
7	01025266	Wire Harness w/ Position Sensor, Control #2, Extended, Outdoor
8	01025493	Wire Harness, Motor, Control #2, Extended, Outdoor
32	01041849	Door Kit, Smart HE Twin #2, Outdoor
39	01041798	Electronics Enclosure Kit without Circuit Board, Twin Control #2, Outdoor
***	01025282	Harness, Meter, 28" Long (Outdoor), Twin #2

*** part not shown

Appendix D - Smart HE-1.25"

Installation of the Smart HE-1.25" Control Valve

Figure 77. Removing the drain elbow and brine elbow (Smart HE-1.25")

1. To begin removing the drain elbow and brine elbow, pull clips to release elbows.



CAUTION!
Clip was designed to stay attached to the valve. Do NOT try to detach.

4. To begin mounting the control valve, assemble the O-rings, located in the parts pack, to the tank adapter.

Brine Connector

2. Pull the drain elbow straight off.

3. Install the correct drain line flow control.

5. Lubricate the outlet manifold O-ring with silicone lubricant.

6. Align the manifold with the center opening in the valve, and firmly press the valve onto the manifold.

7. Screw the control valve into the tank until the control valve bottoms out on the tank flange.

NOTE! Do not re-install the cover until the drain line tubing is connected.

In all cases where metal pipe was originally used and is later interrupted by the bypass valve to maintain proper metallic pipe bonding, an approved ground clamp c/w not less than #6 copper conductor must be used for continuity. Check your local electrical code for the correct clamp and cable size.

Drain Line Flow Control, Eductor Nozzle—Throat

Use the recommended drain line flow control, eductor nozzle, and eductor throat for various size tanks. See [Table 28](#).

Refer to [Figure 12](#) and instructions below for changing the drain line flow control, eductor nozzle, and eductor throat.

Table 28. Smart HE 1.25 Eductor Nozzle, Throat and Drain Line Flow Controls.

Size	Backwash/ Fast Rinse**	Nozzle	Throat	Brine Draw	Slow Rinse	Brine Refill
10"	2.0 gpm (Brown)*	Beige*	Beige*	0.93 gpm	0.72 gpm	0.45 gpm
12"	3.5 gpm (Green)	Beige	Beige	0.93 gpm	0.75 gpm	0.80 gpm
14"	5.5 gpm (Black)	Beige	Beige	0.93 gpm	0.75 gpm	0.80 gpm
16"	5.5 gpm (Black)	Blue	Green	1.38 gpm	1.28 gpm	0.80 gpm

* Shipped assembled inside the control standard from factory

** Flow Rate represents text molded onto flow control. For actual flow rate see "Drain Flow, Maximum" on the Specifications page.

Refer to [NOTE](#) below and the instructions on "[Changing the Eductor Throat & Nozzle](#)" on [page 26](#) when changing the eductor nozzle and throat

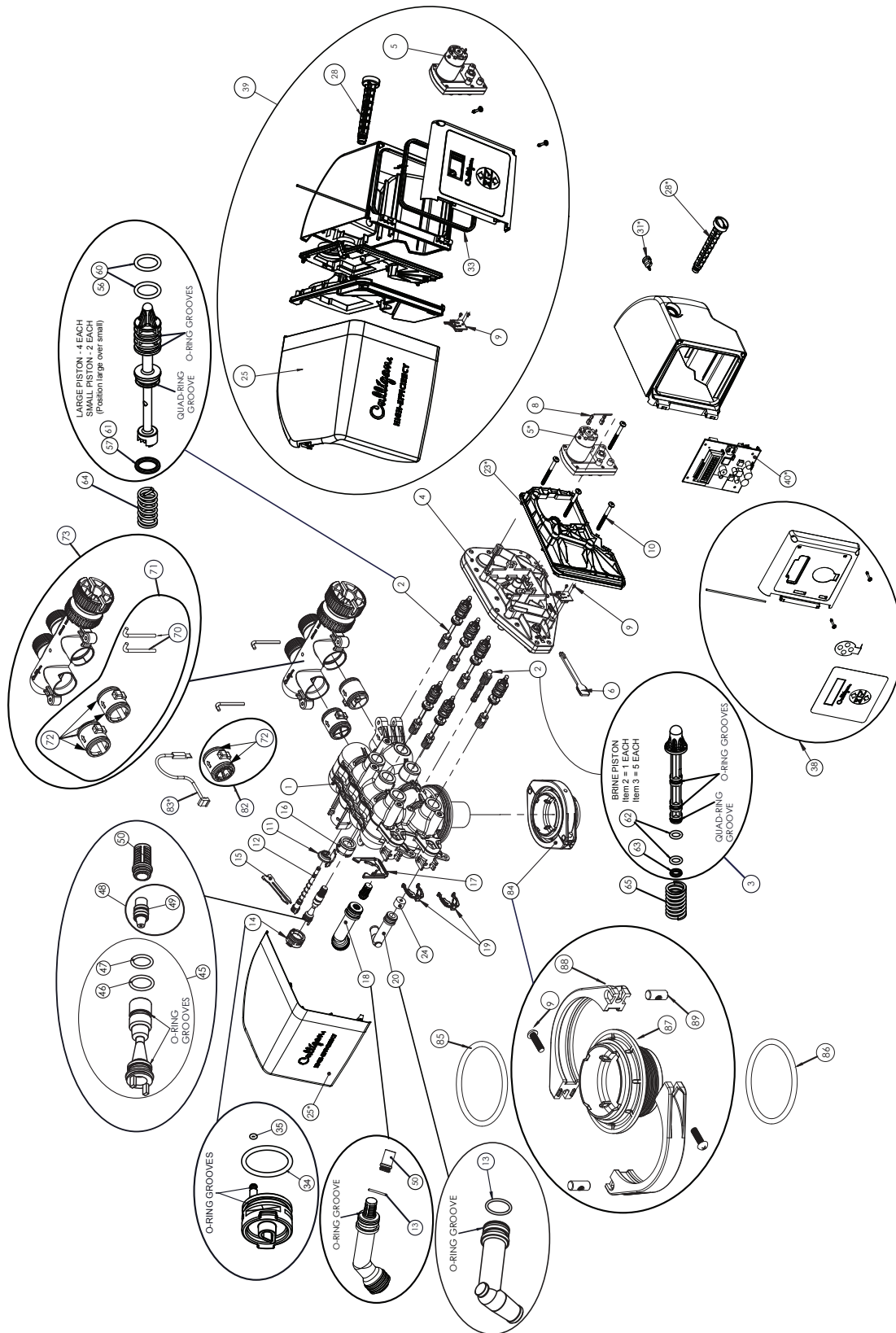
NOTE! Observe the orientation of the water-shaped boss on the eductor cap. It should point "Down" for Downflow brining.



CAUTION!

DO NOT make a direct connection to the drain. Provide an air gap of at least four times the diameter of the drain pipe or conform to local sanitation codes and to permit the observation of drain flow.

Smart HE 1.25 Control Valve Assembly



Item	Part No.	Description
	01040357	Smart HE 1.25" Control Valve, Downflow, Complete
1	01031629	Valve Body
2	01031428	Piston Rebuild Kit, includes 4ea Large Piston Assemblies, 2ea Standard Piston Assemblies, and 1 ea Brine Piston Assembly
3	P1025242	Brine Piston w/80 Duro Quad Seal, HE 1.25" - 1.5", 5ea
4	01041585	Gear Box Assembly
5	01033143	Gearmotor, Kit
6	P1020415	Retainer, Gearmotor, 10ea
7	01034555	Compartment Plate & Wire Harness w/Position Sensor, Kit
8	01022735	Wire Harness, Motor
9	P1041775	Position Sensor Latch & Screw, 10 pk
10	P1020517	Gear Box Assembly Screw, 10ea
11	P1020289	Dial-a-Softness Knob, 10ea
12	P1022185	Dial-a-Softness Assembly w/ O-Rings, 10ea
13	P0440268	O-Ring, Brine & Drain Elbow, 10ea/Kit
14	P1020487	Eductor Plug Assembly w/ O-Rings, 10ea
15	P1020290	Eductor Plug Retainer, 10ea
16	P1023051	Dial-a-Softness Locking Plug, 10ea
17	P1020291	Dial-a-Softness Locking Plug Retainer, 10ea
18	01034563	Brine Elbow Assy, HE, Push-To-Connect, 10ea
19	P1030127	Retainer, Brine & Drain Elbow, 10ea
20	P1040222	Angled Drain Fitting, w/ O-ring, 5/8 ID Hose, 10 pk
23	01040249	HE Control Enclosure Frame, Outdoor, Gray, Kit
24	P1040211	Flow Control, Drain, 2.0 GPM, Brown, 10 pk
	P1040212	Flow Control, Drain, 3.5 GPM, Green, 10 pk
	P1040214	Flow Control, Drain, 5.5 GPM, Black, 10 pk
25	01040247	HE Cover 1 1/2" Control, Outdoor, Gray
28	01040248	Thumb Screw, Enclosure, HE Control, Outdoor, Gray, Kit
31	P1025274	Strain Relief Fitting, 10ea
33	P1033068	Enclosure Door Seal, 10ea/Kit
34	P1021162	O-ring, Eductor Plug Assembly, Large, 10ea/Kit

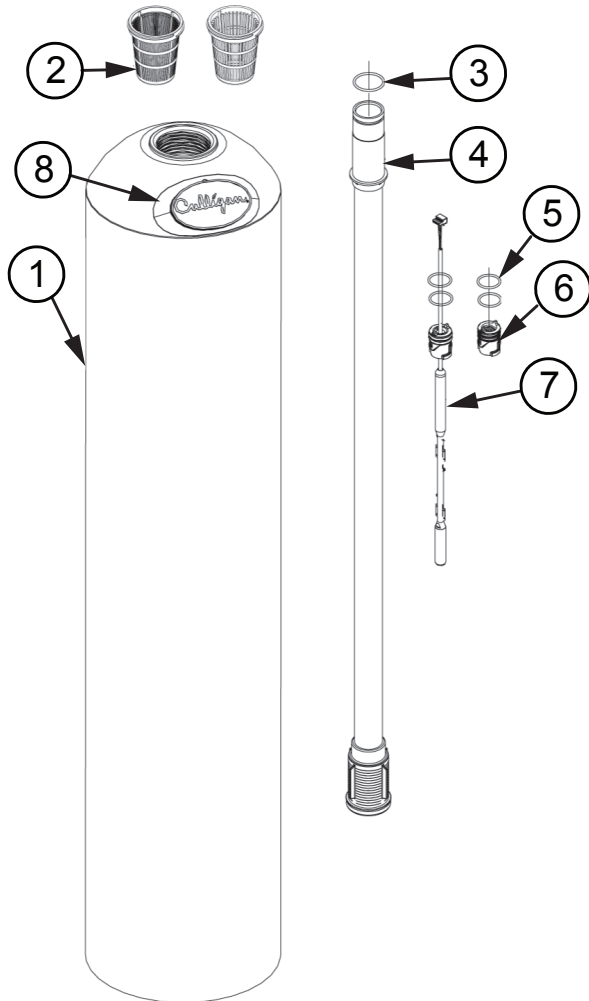
Item	Part No.	Description
35	P1020424	O-ring, Eductor Plug Assembly, Small, 10ea/Kit
38	01041785	Smart HE Door, Outdoor, Gray, Kit
39	01041884	Electronics Enclosure Kit less Circuit Board
40	01020745	Replacement Circuit Board
45	P1022796	Eductor Throat with O-rings, Down-flow, Tan, 10ea
	P1022723	Eductor Throat with O-rings, Down-flow, Blue, 10ea
46	P1020603	Eductor Throat O-ring, Large, 10ea/Kit
47	P1020428	Eductor Throat O-ring, Small, 10ea/Kit
48	P1013895	Eductor Nozzle w/ O-ring, Beige, 10ea
	P1024333	Eductor Nozzle w/ O-ring, Green, 10ea
49	P0308438	O-ring, Eductor Nozzle, 10ea/Kit
50	P1029422	Screen, 10ea
56	P1024364	Large Piston, O-ring, 25ea/Kit
57	P1025239	Large Piston Quad Ring, 25ea/Kit
60	P1020431	Small Piston, O-ring, 25ea/Kit
61	P1025199	Small Piston Quad Ring, 25ea/Kit
62	P1020426	Brine Piston O-ring 25ea/Kit
63	—	Brine Piston Quad Ring (not available for sale - use Item 2 or 3), Kit
64	P1020252	Large & Small Main Piston Spring, 10ea
65	P1020286	Brine Piston Spring 10ea
70	P1009075	Retaining Pin, 10ea/Kit
71	01014033	Coupling Kit
72	P1009099	O-ring, Couplings/Meters, 50ea/Kit
73	01024348	Bypass Valve, Standard, No Port, 1 1/4"
74	01024348	1 1/4" Straight-Through Connector
82	01026849	Meter Kit Assembly, HE 1", LF
83	01025282	Wire Harness, Meter, 28" length
84	01014153	Adapter Assy, 1" Valve to Tank - less O-rings (Includes: 87,88,89,90)
***	01041578	Clamp, Hose, 5/16" W, 0.708" ID, SS
***	01031826	Transformer, Single Output, 20'
***	01031921	Transformer, Single Output 40' (optional)
***	01025281	Bypass Rebuild Kit for HE 1.25/1.5

Item	Part No.	Description
***	01033456	Auxiliary Board, DC (optional)
***	01022238	Alarm Relay Board (optional)
85	P1014848	O-Ring, Large, 1" Valve to Tank Adapter, 25 ea
86	P0440052	O-Ring, 1" Valve Adapter to ACME Tank, 25 ea
87	01013958	Tank Adapter, 1" Valve
88	P1013959	Tank Clamp, 1" Valve
89	P1013669	Tank Clamp Pin, 1" Valve, 10 ea
90	P0318383	Tank Clamp Screw, 1" Valve, 10 ea

*** part not illustrated

Tank Assembly

Figure 78. Tank assembly.



Item	Part No.	Description	Qty
1	01040430	Quadra Hull Tank, 10x54, ACME, 1" Manifold, Port, 1.5 CF, Gray	
	01036074	Quadra Hull Tank, 12x52, ACME, 1" Manifold, Port	
	01040402	Quadra Hull Tank, 14x65, ACME, 1" Manifold, Port	
	01040403	Quadra Hull Tank, 16x65, ACME, 1" Manifold, Port	
	01040404	Quadra Hull Tank, 10x54, ACME, Port	
2	P1009847	Top Strainer - Fine Slot	10ea/pk
	P1011195	Top Strainer - Wide Slot	10ea/pk
3	P1009099	O-Ring, Manifold	50ea/pk
4	01014539	Outlet Manifold - 10"	1
	01018846	Outlet Manifold - 12"	1
	01016429	Outlet Manifold - 14" and 16"	1
5	P1017434	O-Ring, Plug and Sensor	2
6	01015122	Plug	1
7	01040295	Aqua-Sensor, Outdoor, GBX	1
8	01016174	Culligan Emblem	1

Appendix F - Smart HE Outdoor Models - Installation

Outdoor Smart HE Enclosure

The outdoor rated Smart HE has a water tight enclosure made of UV stabilized material to protect the electrical and mechanical components. Proper assembly of the enclosure and placement of the compartment plate are crucial for protection from weather.

Item	Part No.	Description
	01040352	HE Outdoor Control Valve, Downflow, Complete
	01040353	HE Outdoor Control Valve, Upflow, Complete
87	01033061	Gearmotor, Outdoor, Kit
89	01040268	Cover, Smart HE Control, Outdoor, Grey
93	01041785	Enclosure Door Kit, Outdoor, (includes: door, decal, keypad, hinge, gasket and screws)
94	01033331	Electronics Enclosure Kit less Circuit Board, Outdoor
97 ***	P1033068	Door Seal, Outdoor, 10ea/Kit
98 ***	P1040248	Thumb Screw, HE Control, Outdoor, Gray, 10ea
***	01041776	PCB, GBX LCD Soft/Filt, Repl, Single
***	01041777	PCB, GBX LCD Soft/Filt, Repl, Twin
***	01025282	Wire Harness, Meter, 28" Long, Outdoor
***	01040208	Power Supply, Outdoor, 24VDC, 20 ft.
***	01040209	Extension Cable, DC Power Supply, Outdoor, 20 ft.

Figure 79. Smart HE Outdoor Enclosure

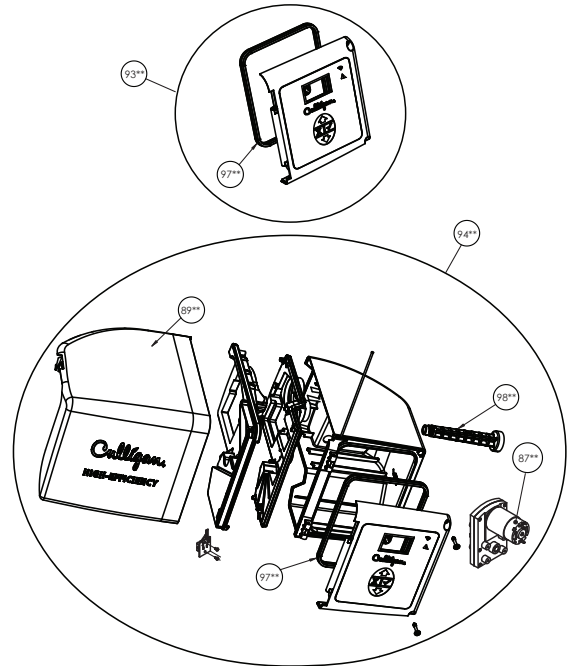
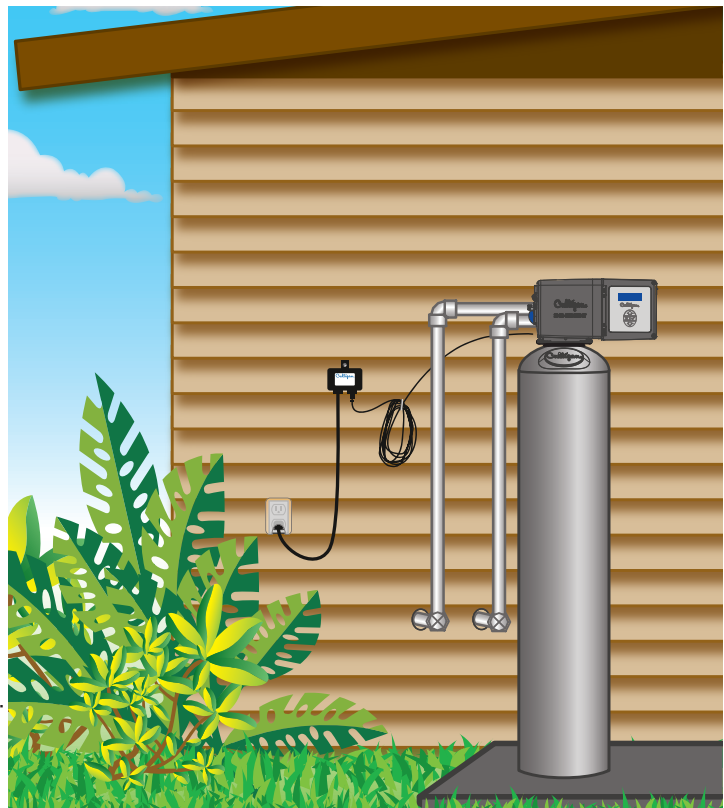


Figure 80. Outdoor System Placement

Placement

Refer to [Figure 80](#) for system placement outdoors.

- Set the Media tank on a solid, level surface near plumbing, drain, and electrical connections. Media tank and plumbing should be secured so the system can't be knocked over.
- The customer should provide a GFCI electrical outlet suitable for outdoor use that is NOT controlled by a switch that can be turned off accidentally.
- For outdoor installation, only use an outdoor rated power supply.
- **Power supply MUST be mounted on the wall at least 1 foot above ground level.** (See [Figure 80](#))
- Properly ground to conform with all governing codes and ordinances.
- Observe all state and local electrical codes.
- P/N 01040206 plug-in power supply is rated for indoor installations only, do not use for outdoor installation.
- P/N 01040208 plug-in 20-foot power supply is included and rated for outdoor installations.
- P/N 01040209 optional 20-foot extension power supply is rated for outdoor installations (not included).
- For Outdoor use with a UL Listed Class 2 Direct Plug-in Power Unit only.



Drain Connection

Observing all local plumbing codes and drain restrictions, connect the system drain line to drain connection that is capable of handling the rate flow, complying with all state and local regulations. Refer to [“Table 4. Maximum Allowable Drain Line Length” on page 25](#) for maximum drain line length.

Electrical Connection

Outdoor rated systems are supplied with a 24 volt – 60Hz power supply.

The customer should provide a GFCI electrical outlet suitable for outdoor use that is not controlled by a switch for powering the unit. The location of that receptacle will determine the proper power supply to select to complete the installation.

Figure 81. Insert Wire with Bushing

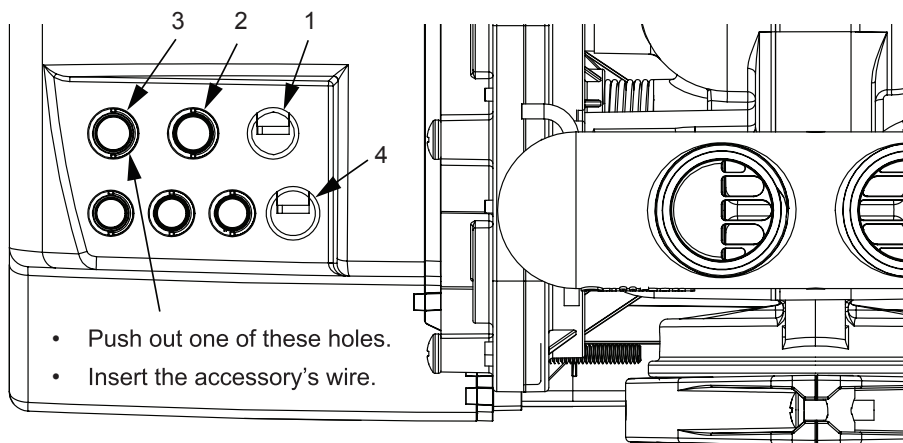


Figure 82. Connectors

(Optional)

Table 32. Accessory connectors and possible connections.

Part No.	Description	Location(s)	Connection
P1025274	Cord Grip, Liquid Tight, with two holes, 10 PK	1	24V Power (pre-installed)
P1025264	Cord Grip, Liquid Tight, 10 PK	1, 2, 3	Aqua-Sensor
P1025277	Liquid Tight Hole Plug, 10 PK	1, 2, 3,	—
—	Cord Grip, Liquid Tight	4	Flow Meter (pre-installed)

- Connect accessories to the GBX board.
- Pull any excess wire out of the enclosure.
- Attach the strain relief fitting to the accessory's cord and insert into the enclosure.

Power Supply

Figure 83. Wall Mounted Outdoor Transformer 01040208

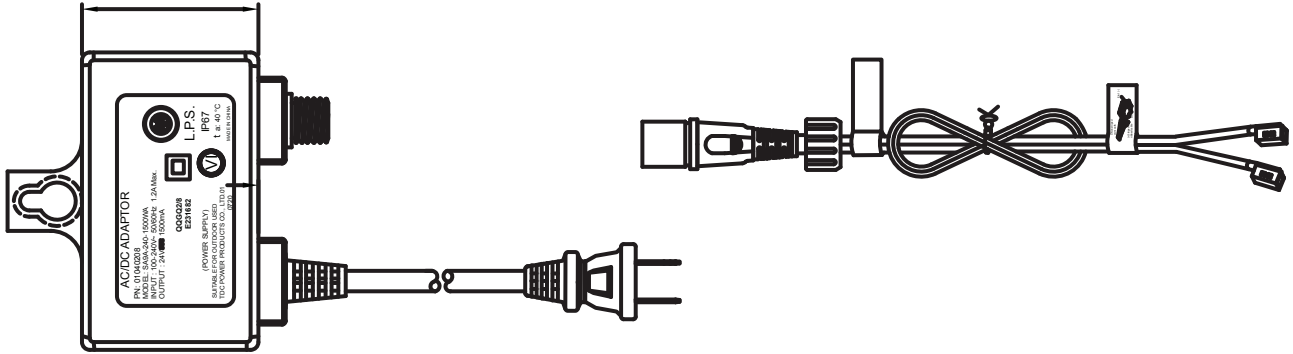
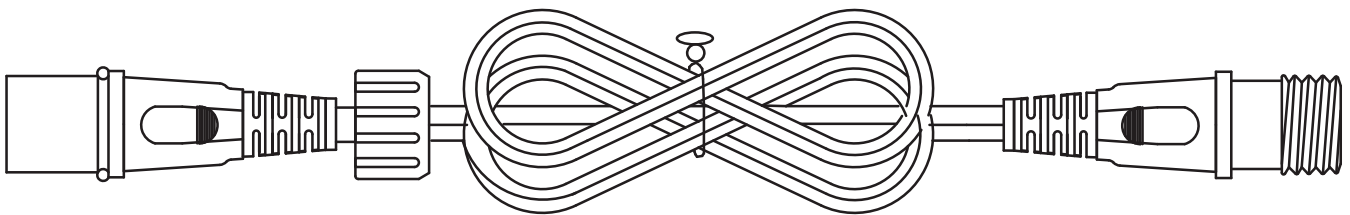


Figure 84. 20 foot DC Power Cable Extension - 01040209



Appendix G - Principles of Operation

What Is Hard Water?

Water is said to be hard when it carries too high a concentration of calcium and magnesium. Acceptable water hardness levels will vary depending on the application.

How Does It Work?

The components of dissolved minerals are called ions. They carry either a positive or negative charge. Hardness ions of minerals dissolved in water carry a positive charge. These positively charged ions (cations) are attracted to a synthetic softening material called ion exchange resin.

The heart of the softening system, therefore, is a deep bed of resin which draws calcium and magnesium ions, as well as ferrous iron, from the water as it passes through the resin bed.

Can The Resin Draw Out Hardness Ions Indefinitely?

No. During normal operation, the resin becomes saturated with positive ions and functions less efficiently. When hardness leakage occurs, the resin should be regenerated to restore its efficiency.

How Do You Regenerate Resin?

Regenerate a resin bed by removing the mineral ions through a process called "ion exchange". This regeneration process occurs in four steps and takes approximately 50 to 70 minutes.

Backwash

During the backwash step, raw water flows rapidly upward (in reverse direction to the service flow) through the resin bed to expand the bed and flush out accumulated dirt, sediment and other sources of turbidity.

Brine Draw

The brine solution consisting of water and salt is drawn from a brine storage tank and allowed to flow slowly down through the resin bed. The brine solution removes the calcium and magnesium ions from the resin.

Slow Rinse

Brine draw is then followed by a raw water slow rinse. This rinse step will slowly remove most of the remaining brine, exchanged calcium and magnesium ions from the resin.

Fast Rinse

Slow rinse is followed by a raw water flush, a very rapid down flow of raw water which removes the last traces of brine, and settles the resin bed.

How Often Must You Regenerate?

Frequency must be determined for each installation based on the amount of water usage, its degree of hardness and the amount of resin through which it flows. In some cases it is necessary to utilize a resin cleaner when the raw water contains iron. Contact your local Culligan dealer for more information.

How Do You Control The Regeneration Process?

The regeneration process for the softener is controlled automatically either on a predetermined time, or volume through the use of the Culligan Accusoft controller with flow sensor. The regeneration process can also be initiated manually by the operator as required.

Appendix H - Applications Requiring Iron Reduction

Types of Iron – Identification and Characteristics

Iron can exist in different forms in a water supply and should be identified to determine a successful application. Iron may be present in any combination of the following four types:

1. **Dissolved Iron** – Also known as ferrous, soluble or clear water iron. Dissolved iron is soluble in water and is detected by taking a sample of the water to be treated in a clear glass or white Styrofoam cup. The water is initially clear, but on exposure to the air it may gradually turn cloudy or colored as the iron oxidizes. Up to 5 ppm of this type of iron can be removed from the water by the same ion exchange principles that remove the hardness elements of calcium and magnesium. Dissolved iron is the only type of iron a water softener will reliably remove.
2. **Particulate Iron** - Also known as ferric iron or, rust. This type of iron is an undissolved particle of iron. A softener will trap some of the larger particles of iron, but many will not be flushed out of the resin bed during the regeneration cycle. This will eventually lead to an accumulation of particulate iron in the resin bed and to service and foul the ion exchange resin. A pre-filter will be required to remove this type of iron prior to the water softener.
3. **Organic Bound and Colloidal Iron** – Organically bound iron is strongly attached to organic matter in the water. The ion exchange process alone cannot break this attachment and the softener will not reduce it. Colloidal particles will also not exchange onto softening resin are too small to be removed by conventional filtration.
4. **Bacterial Iron** - This type of iron is protected inside a bacteria cell. Like the organic bound iron, it is not removed by a water softener.

Operational Considerations for Iron Removal

The Culligan Smart HE softeners are manufacturer rated to remove up to 5 ppm of dissolved iron. It is important to understand the following conditions and limitations to successfully use ion exchange softening systems for iron reduction.

1. Iron must be in the ferrous, clear water form to be removed by any type Cullex softening resin.
2. Other types of iron removal will require additional types of pre-filtration.
3. Regeneration cycles must occur more frequently to prevent iron from oxidizing into resin beads.
4. The maximum resin capacity used between regenerations should be limited to 60% of total.
5. Higher salt dosages are recommended to maintain iron-free treated water quality.
6. Treated water capacity must be adjusted based on “Compensated Hardness” calculations. See [“Appendix I - Capacity Settings for Iron Reduction”](#).
7. The Day Interval setting must be used and set to no more than 3 to 4-day intervals.
8. The preventative use of resin cleaning products such as Culligan Iron Eater and Culligan Mineral Reactivator will aid in keeping the resin bed free of iron build up.
9. If water tests zero soft and iron is present in treated water the iron is most likely not ferrous.
10. If hardness is present in the treated water, it is likely iron is also present.
11. Iron removal claims have not been verified by the Water Quality Association, Underwriters Laboratories or IAPMO R&T except for Softener-Cleer and Softener-Cleer Plus models. Softener-Cleer and Softener-Cleer Plus models have been certified by WQA for iron reduction.

Appendix I - Capacity Settings for Iron Reduction

Capacity Settings for Iron Removal (except Softener-Cleer models)

When using the softener for ferrous iron reduction, the ion-exchange and regeneration process work the same as for hardness reduction. To ensure consistent iron removal, it is necessary to adjust the treated water capacity based on the ratio of hardness and iron levels.

Although iron occupies a relatively small percentage of exchange sites on the resin compared to hardness, it is necessary to reduce the treated water capacity; this is done by using a compensated hardness level. The reason for the compensated hardness level is that hardness exchanged onto the resin will displace iron and manganese and move these ions deeper into the resin bed. As hardness minerals are removed, they occupy more resin capacity.

During the service cycle iron and manganese can be displaced from the resin by hardness under higher flow rates as the resin capacity is exhausted. A Compensated Hardness level provides a safety factor to prevent this from occurring. Capacity adjustments can be easily calculated by using the “Compensated Hardness” formula below.

Calculating the Compensated Hardness Level

To calculate the compensation factor for iron, locate the water hardness level in the chart below and the corresponding Iron Multiplier listed below the hardness level.

Table 33.

Hardness Range	1 – 20 GPG	21 – 40 GPG	41 – 60 GPG	61 – 100 GPG
Iron Multiplier	x 2 GPG	x 3 GPG	x 4 GPG	x 5 GPG

Multiply the iron level in the water by the Iron Multiplier to arrive at the compensated iron level in GPG and add it to the hardness level to determine the Compensated Hardness level.

EXAMPLE: Hardness level is 25 GPG and Iron level is 3 mg/l.

Hardness Level	25 GPG	Determined by water analysis
Iron Level - 3 mg/l x 3 GPG Iron Multiplier = 9	+ 9 GPG	Calculated from iron level and “ Table 33. ”
Compensated Hardness Level	<u>34 GPG</u>	Use for determining Gallons Capacity

Use 34 GPG as the Compensated Hardness level to determine treated gallons capacity in this iron reduction application.

NOTE! The Culligan Aquasential Smart High Efficiency Series are not certified by WQA for Iron reduction, except for Softener-Cleer and Softener-Cleer Plus models.

For Softener-Cleer systems’ capacity settings, please refer to the Softener-Cleer Section - [Table 23.](#)

Appendix J - Brine Reclaim Kit Installation

Connect the Brine Line

1. Measure a length of brine line sufficient to reach from the brine tank to the brine fitting, with no sharp bends.
2. Cut both ends of the brine line squarely and cleanly.
3. Slip the white nut over one end of the tubing and press the plastic insert into the end of the tubing ([Figure 85](#)). Connect to the brine connection on the valve and tighten nut.
4. Install 3/8" tubing between the brine reclaim fitting and the brine tank. See [Figure 86](#).

Figure 85. Brine valve tubing.

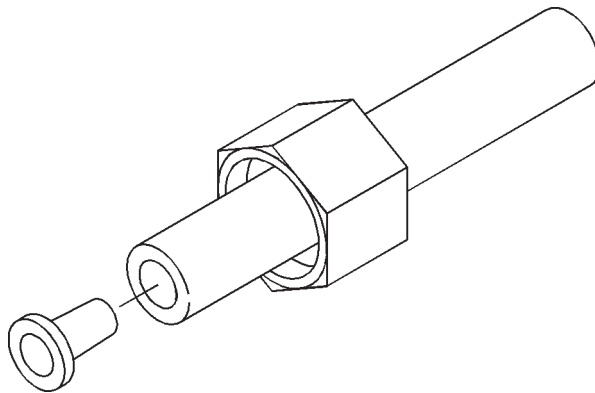
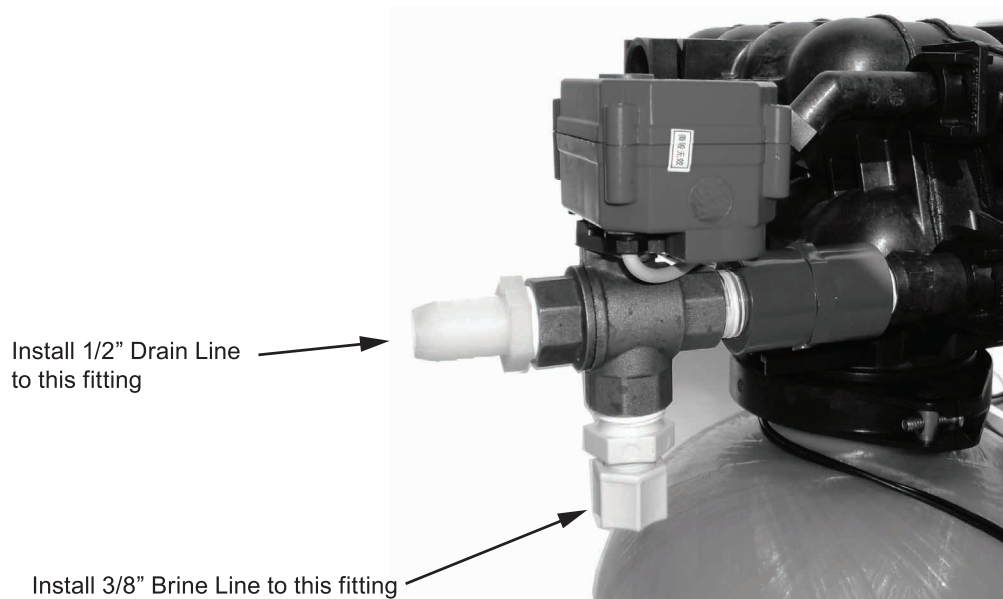


Figure 86. Drain and brine line locations.



Modify the Brine Tank



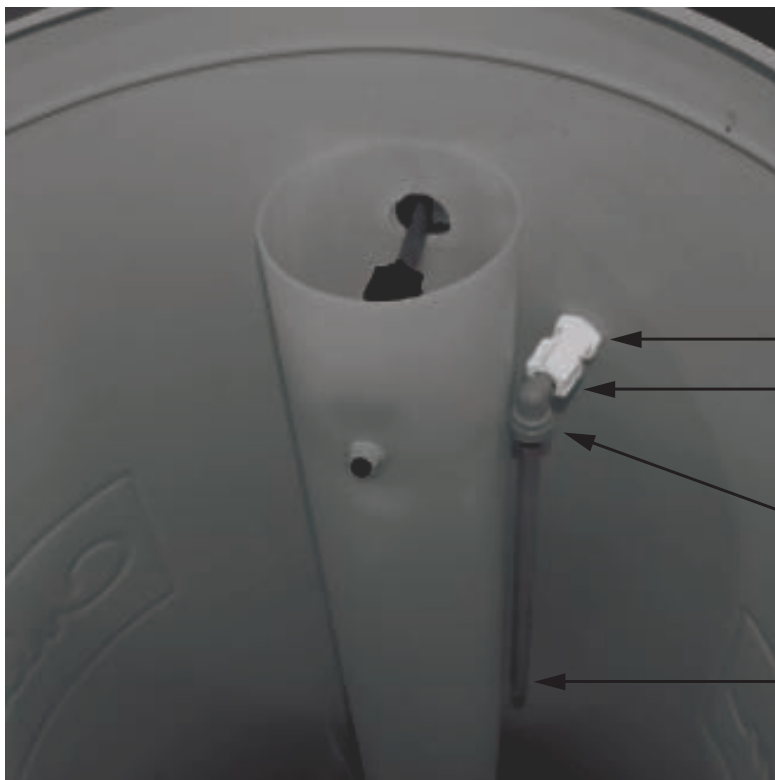
CAUTION!

THE BRINE TANK OVER FLOW MUST BE CONNECTED TO A SUITABLE DRAIN. It is very possible that a malfunction will cause the brine tank to overflow, so this connection needs to be done to help prevent damage to the customer's home.

Figure 87. Brine line fitting location.

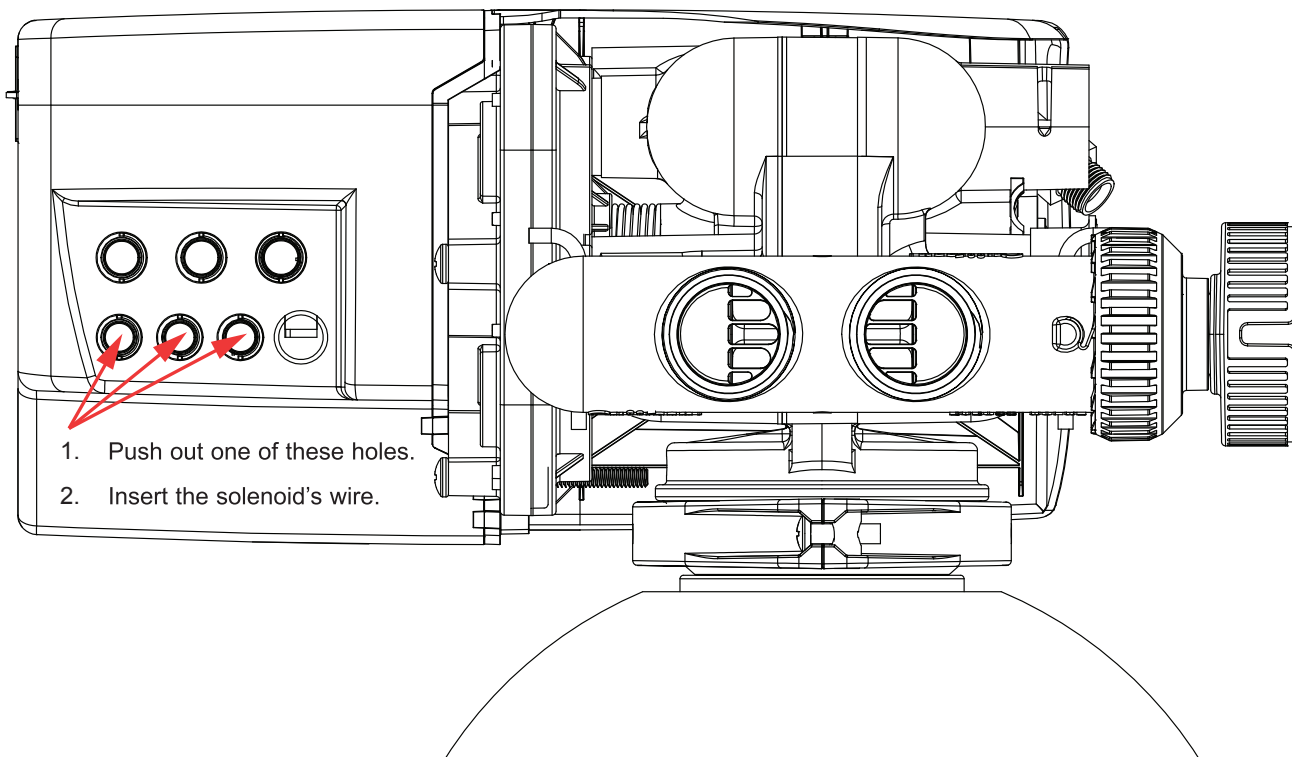


Figure 88. Brine valve float height.



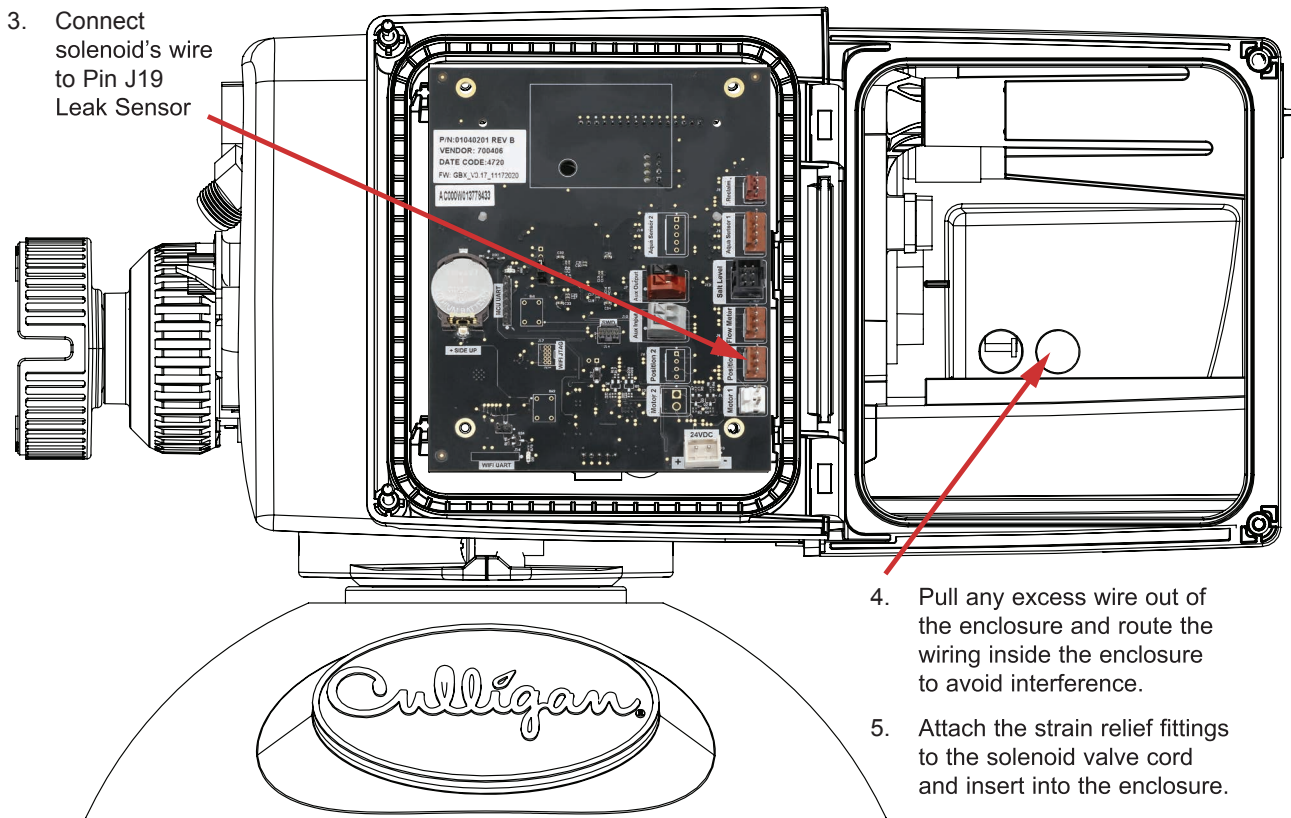
3. Screw the nut on the bulkhead fitting to secure the fitting to the brine tank.
2. Install a bulkhead fitting (included in the brine reclaim small parts kit)
5. Insert the stem of the John Guest elbow into the bulkhead fitting and tighten.
4. Insert a 3/8" x 10-1/2" tubing (included in the brine reclaim small parts kit) onto a 3/8" John Guest elbow (included in the brine reclaim small parts kit).

Figure 89. Insert Wire with Bushing.



1. Push out one of these holes.
2. Insert the solenoid's wire.

Figure 90. Connect Solenoid's Wire to GBX Board



3. Connect solenoid's wire to Pin J19 Leak Sensor

4. Pull any excess wire out of the enclosure and route the wiring inside the enclosure to avoid interference.
5. Attach the strain relief fittings to the solenoid valve cord and insert into the enclosure.

Appendix K - Brine Reclaim Duplex Installation

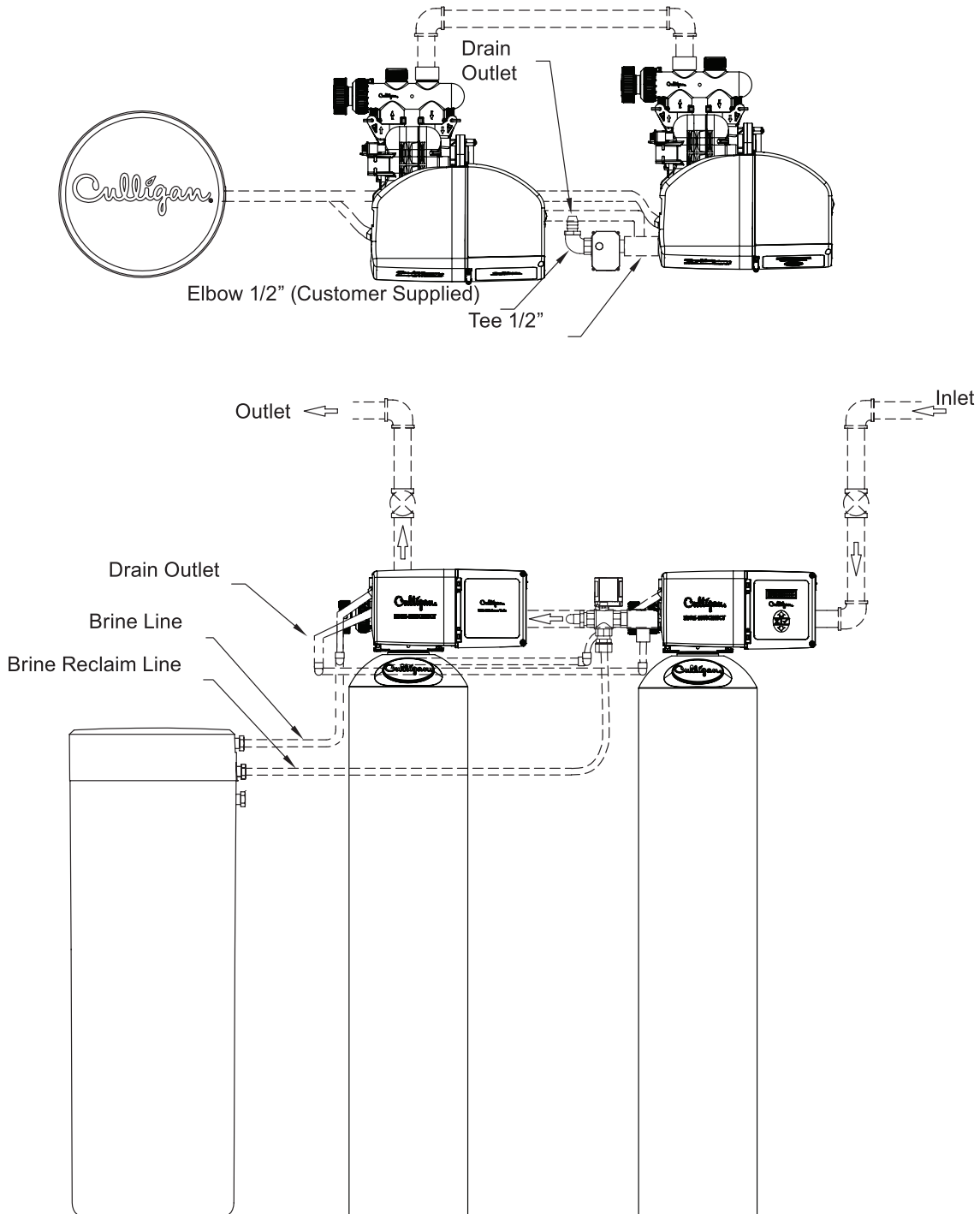
Brine Reclaim Twin Alternating Installation

NOTE! To use brine reclaim on a progressive flow system, install a brine reclaim kit on each softener.

All plumbing connections are supplied by the customer.

Remove 1/2" coupling and replace with customer-supplied 1/2" tee.

Figure 91. Brine reclaim installation on twin alternating softener.



Appendix L - Brine Reclaim Troubleshooting

Troubleshooting

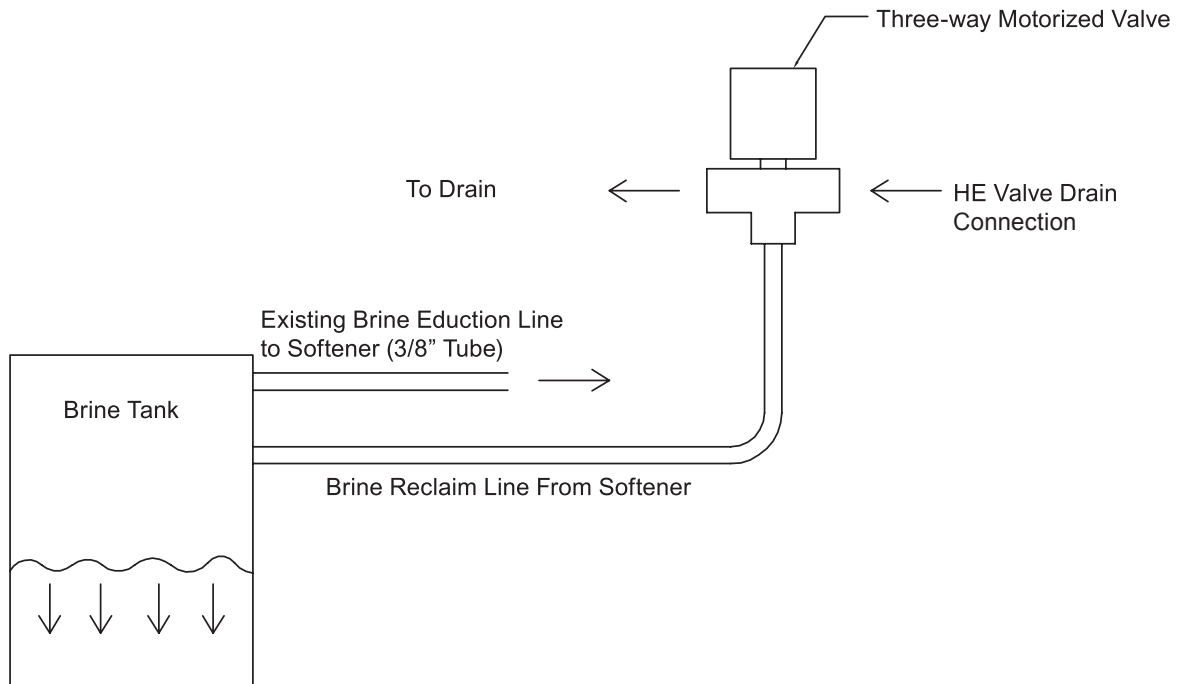
Problem	Possible Cause/Solution
After installing and programming the HE Brine Reclaim Kit, the system fails to divert brine flow from the drain line to the brine reclaim line.	<p>Verify that wiring is correctly configured. See Figure 90 on page 104.</p> <p>Inspect the reclaim valve and replace if malfunctioning.</p>
The brine level in the tank is higher than normal.	<p>Verify that the refill time is set to ZERO (0) in the custom cycle time settings.</p> <p>See the GBX Programming Guide (P/N 01040743).</p> <p>Verify that the system inlet pressure matches the pressure setting.</p> <p>See the GBX Programming Guide (P/N 01040743).</p>
Brine reclaim valve fails to return from the brine reclaim position to the drain position.	<p>The reclaim valve was not powered for a long enough duration prior to disconnecting power to the valve. Verify that the valve is powered for a minimum of 1–2 minutes prior to disconnecting power during the Aux 5 test. Verify that the reclaim valve timing is set properly.</p> <p>See the GBX Programming Guide (P/N 01040743).</p>

Appendix M - Brine Reclaim System Flow

Brine Rinse Step A

1. Brine is drawn from the brine tank.
2. Brine flows through the softener tank and to the drain until the brine valve seats, preventing air from entering. See [Figure 92](#).

Figure 92. HE Brine Reclaim, Step A.

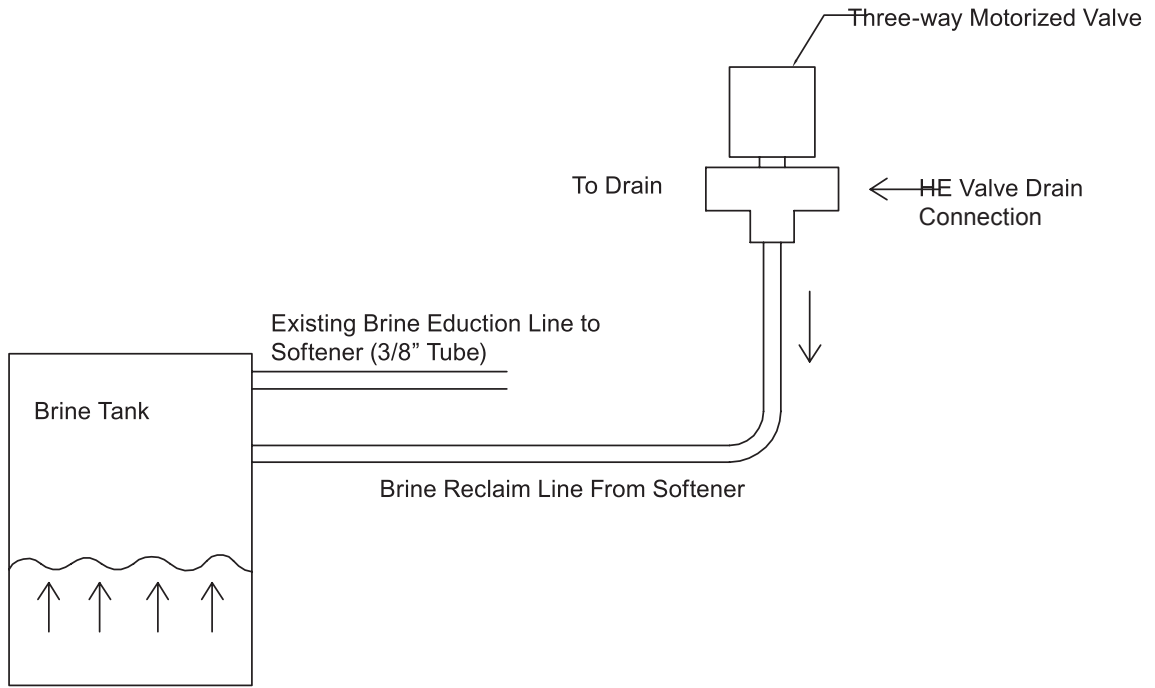


Brine Reclaim

Brine Rinse Step B

1. AUX6 state changes to ON when the AUX6 OUT DELAY duration expires (brine cycle).
2. The HE Brine Reclaim Valve changes position.
3. Brine/rinse water exiting the HE Brine Reclaim Valve is diverted to the reclaim line to refill the brine tank.
4. The HE Brine Reclaim Valve stays in this position for the duration specified in the AUX6 OUT ACTIVE setting. See [Figure 93](#).

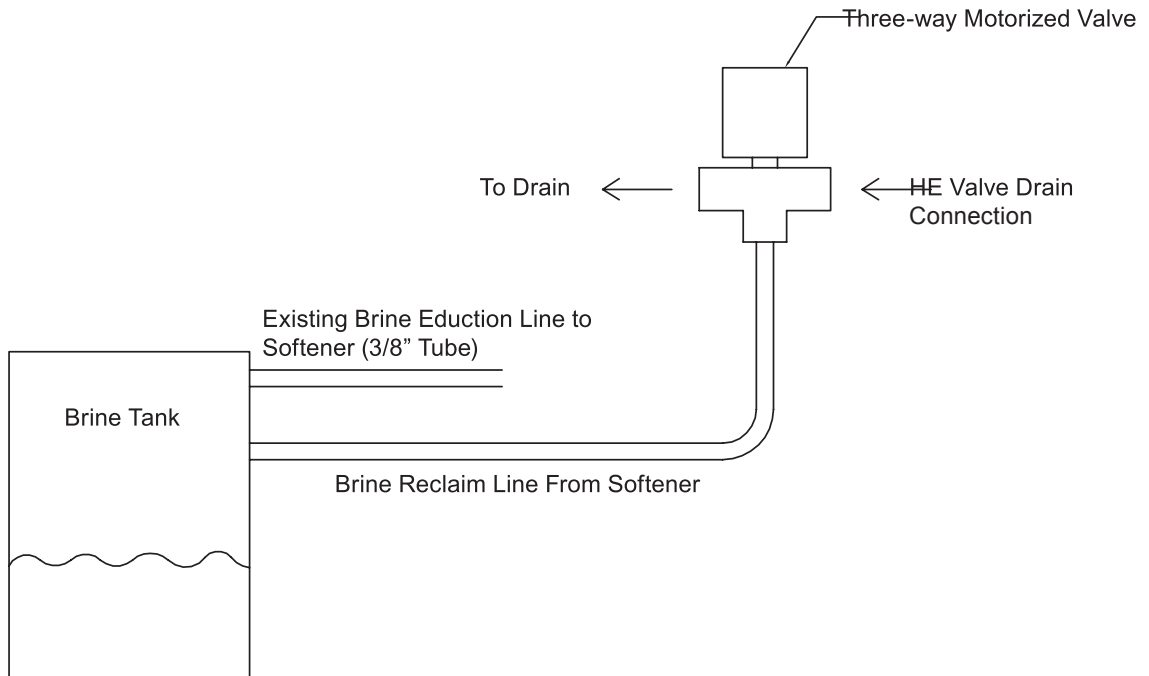
Figure 93. HE Brine Reclaim, Step B.



Brine Rinse Step C

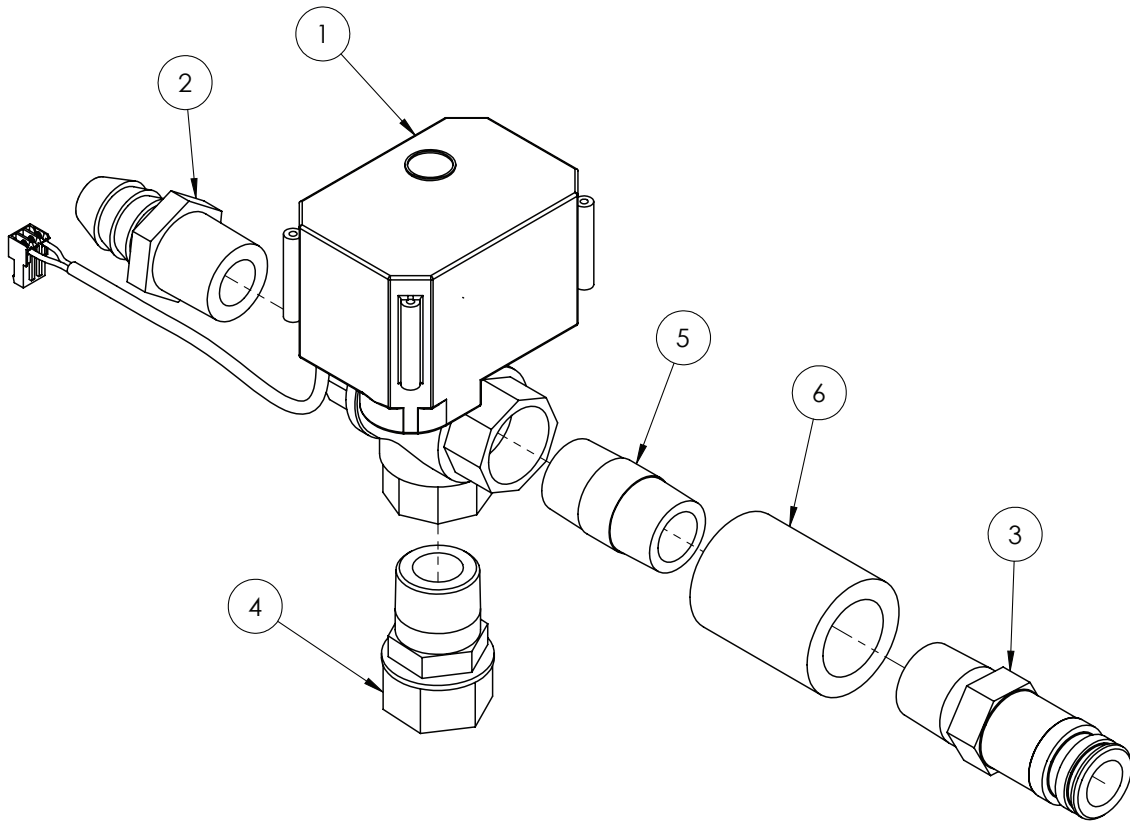
1. AUX6 state changes to OFF when the AUX6 OUT ACTIVE duration expires.
2. The HE Brine Reclaim Valve returns to its original position.
3. The HE Brine Reclaim Valve diverts flow to the drain for the remainder of the brine/rinse duration.

Figure 94. HE Brine Reclaim, Step C.



Appendix N - Brine Reclaim Kit Parts

HE Brine Reclaim Kit Assembly



Item	Part Number	Description	Qty
—	01025672	Kit, Brine Reclaim, 1/2" (includes items 1-6)	
1	01025671	Valve, Ball, 1/2", 3Way, 5VDC	1
2	—	Fitting, 1/2MNPT, 5/8 Barb	1
3	P1024022	Kit, Straight Fitting Assembly, 5ea	1
4	—	Fitting, 1/2MNPTx3/8Comp	1
5	—	Nipple, 1/2x1-1/2, PVC Sch.80, TBE	1
6	—	Coupling, 1/2", FNPT, SS, 304	1

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Este producto está sujeto a cambios sin previo aviso.
Por favor, conserve este manual.

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