



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

**Aquasential™
Smart High Efficiency
Water Filters**

**Models from 2021
updated with
GBX2 Circuit Board**



CAT# 01040706 Rev D

DCO# 220111

06/27/23

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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 Filter 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 Culligan Aquasential Smart High Efficiency 9" Cullar, 10" Cullar, 9" Cullar Outdoor and 10" Cullar Outdoor Water Filters have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 42 for the effective reduction of chlorine taste and odor up to 120,000 gallons for the 9" filter and 180,000 gallons for the 10" filter as verified and substantiated by test data.



The Culligan Aquasential Smart High Efficiency 9" Cullneu, 10" Cullneu, 9" Cullneu Outdoor and 10" Cullneu Outdoor Water Filters have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI/CAN Standard 61 for Material Safety requirement only. Not certified for contaminant reduction by WQA.

The Culligan Aquasential Smart High Efficiency 9" Filtr-Clear, 10" Filtr-Clear and 9" Filtr-Clear Outdoor and 10" Filtr-Clear Outdoor Water Filters have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 42 for Class IV ($\geq 15 \mu\text{m}$ to $< 30 \mu\text{m}$) particulate reduction as verified and substantiated by test data.

The Culligan Aquasential Smart High Efficiency 9" Filter Empty, 10" Filter Empty, 9" Filter Empty Outdoor and 10" Filter Empty Outdoor Water Filters have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI/CAN Standard 61 for material safety requirement only. Not certified for contaminant reduction by WQA. No media or underbedding has been qualified with these systems.

The Culligan Aquasential Smart High Efficiency 9" Filter Empty w/FP, 10" Filter Empty w/FP, 9" Filter Empty w/FP Outdoor and 10" Filter Empty w/FP Outdoor have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI/CAN Standard 61 for material safety requirement only. Not certified for contaminant reduction by WQA. No media or underbedding has been qualified with these systems.

The Culligan Aquasential Smart High Efficiency 10" and 12" Iron-Clear® filter have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 42 for the effective reduction of iron up to 1,400 gallons for the 10" filter and 2,000 gallons for the 12" filter as verified and substantiated by test data.

The Culligan Aquasential Smart High Efficiency Sulfur-Clear™ filters with Quadra Hull or Fiberglass tanks have been tested and certified by WQA against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 42 for the effective reduction of iron up to 1,000 gallons and NSF/ANSI Standard 42 for the effective reduction of hydrogen sulfide as verified and substantiated by test data.

The Culligan Aquasential Smart High Efficiency Arsenic 12", 14" and 16" filters and Aquasential Smart High Efficiency Arsenic 12", 14" and 16" Outdoor filters have been certified by IAPMO R&T against NSF/ANSI Standard 372, CSA B483.1, and NSF/ANSI Standard 53 for the effective reduction of total arsenic (pentavalent and trivalent) as verified and substantiated by test data. See Performance Data Sheet and Arsenic Facts section for an explanation of reduction performance.



The Culligan Aquasential High Efficiency Water Filter Outdoor Filter complies with the UL 50/50E standards for an IP45 Rating. Contains FCC ID: 2AC7Z-ESPWROOM32D and IC: 21098-ESPWROOM32D or FCC ID: 2AC7Z-ESP32WROVERE and IC: 21098-ESP32WROVERE.

The specific FCC ID and IC identification label is located on the exterior of the product.

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 nedit 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.

Products manufactured and marketed by Culligan International Company (Culligan) and its affiliates are protected by patents issued or pending in the United States and other countries. Culligan reserves the right to change the specifications referred to in this literature at any time without prior notice. Culligan, Aqua-Sensor, Soft-Minder, Select Plus and Select Filters are trademarks of Culligan International Company or its affiliates.

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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 Filters

Culligan Smart HE Filters	9" 9" Outdoor	10" 10" Outdoor
General		
Control Valve type	1" Reinforced Thermoplastic w/ GBX2 Circuit Board	1" Reinforced Thermoplastic w/ GBX2 Circuit Board
Installation Environment	Indoor / Outdoor	Indoor / Outdoor
Filter Tank Size	9 x 48 in. (229x1,219mm)	10 x 54 in. (254x1,372mm)
Temperature Limits	33-120°F (1-50°C)	33-120°F (1-50°C)
Water Pressure Limits	20-120 psi (140-830kPa)	20-120 psi (140-830kPa)
Water Pressure Limits (Canada)	20-90 psi (140-620kPa)	20-90 psi (140-620kPa)
Electrical Requirements (Control Valve)	24 VDC, 36W	24 VDC, 36 W
Overall Height	54 in. (1,372 mm)	60 in. (1,524 mm)
Filtr-Cleer®		
Rated Service Flow @ Pressure Drop	7.6 gpm @ 15 psi	8.1 gpm @ 15 psi
Minimum Practical Filtration Size	15 microns	15 microns
Maximum Particulate Matter	150 NTU	150 NTU
Maximum Suspended Solids	150 mg/L	150 mg/L
Drain Flow, Maximum ¹	4.5 gpm	7.0 gpm
pH Limitation	6.0 - 9.5	6.0 - 9.5
Recharge Time ²	21 min.	21 min.
Recharge Water Consumption, Av. ³	90 gal.	140 gal.
Freeboard ⁴	20 ± 1.5 inches	19 ± 1.5 inches
Cullar®		
Rated Service Flow @ Pressure Drop	4.0 gpm @ 2.0 psi	5.9 gpm @ 5.0 psi
Drain Flow, Maximum ¹	3.5 gpm	5.5 gpm
pH Limitation	5.0 - 11.0	5.0 - 11.0
Recharge Time ²	21 min.	21 min.
Recharge Water Consumption, Av. ³	40 gal.	110 gal.
Cullar Media Volume	0.73 cu. ft.	1.5 cu. ft.
Cullsan® Underbedding Media Amount	10 lb (.1 ft ³)	20 lb (.2 ft ³)
Freeboard ⁴	22 ± 1.5 inches	24 ± 1.5 inches
Rated Capacity	120,000 gallons	180,000 gallons
Cullneu®		
Rated Service Flow @ Pressure Drop	4.0 gpm @ 2.0 psi	5.9 gpm @ 3.0 psi
Drain Flow, Maximum ¹	3.5 gpm	5.5 gpm
pH Limitation*	5.2 to 6.8	5.2 to 6.8
Recharge Time ²	21 min.	21 min.
Recharge Water Consumption, Av. ³	70 gal.	110 gal.
Cullneu Media Volume ⁵	1.0 cu. ft.	1.5 cu. ft.
Freeboard ⁴	13 ± 1.5 inches	18 ± 1.5 inches

¹ Backwash at 120 psi (830 kPa).

² Factory settings.

³ Factory settings and 120 psi line pressure.

⁴ Measured from top of media to top surface of tank threads. (backwashed and drained).

⁵ Under dynamic conditions, it might be necessary to mix five parts Cullneu with one part Cullneu C to effectively raise the pH.

NOTE! Filtr-Cleer media is pre-measured, boxed, and shipped with each Filtr-Cleer system.

Culligan Smart HE Iron-Clear Filters

	10" Iron-Clear	12" Iron-Clear
Control Valve Type	1" Reinforced Thermoplastic w/ GBX2 Circuit Board	1" Reinforced Thermoplastic w/ GBX2 Circuit Board
Installation Environment	Indoor	Indoor
Overall Conditioner Height	67"	65"
Media Tank Dimensions (D x H)	2 ea. 10" x 54"	2 ea. 12" x 52"
Filter Media Type	1.0 cu. ft. Birm	1.5 cu. ft. Birm
Underbedding		
G-50	35 lb	35 lb
Cullsan U	25 lb	25 lb
Capacity ¹	1400 gallons	2000 gallons
Freeboard ²	21"	18"
Max. Clear Water (Soluble) Iron	10 ppm	10 ppm
Max. Hydrogen Sulfide ³	5.0 ppm	5.0 ppm
Minimum Alkalinity	100 ppm	100 ppm
pH for Iron Removal	7.0 - 8.5	7.0 - 8.5
Service Flow @ Pressure Drop (Clean Bed)		
Normal	4 gpm @ 6 psi	4 gpm @ 4 psi
Maximum ⁴	6 gpm @ 9 psi	9 gpm @ 14 psi
Operating Pressure	20-60 psi	20-60 psi
Operating Temperature	33-120° F (1-48° C)	33-120° F (1-48° C)
Electrical Requirements (Control Valve)	24 VDC, 36 W	24 VDC, 36 W
Electrical Requirements (Compressor)	120VAC/60Hz, 175W/245W (continuous/max)*	120 Volts/60Hz, 175W/245W (continuous/max)*
Drain Flow, Maximum	10 gpm (5.5 gpm minimum required)	10 gpm (8.0 gpm minimum required)
Regeneration Time		
Backwash	5–20 minutes	5–20 minutes
Fast Rinse	5–20 minutes	5–20 minutes

¹ Capacity based on 4 gpm and 10 mg/L of dissolved iron.

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

³ Hydrogen sulfide will be reduced significantly in water containing less than 5 ppm as tested by Culligan.

⁴ Max flow rates and pressure drop characteristics have not been validated by the Water Quality Association or IAPMO R&T.

The maximum specified flow rate at which the system will deliver treated water is defined as service flow.

* When compressor is running periodically, otherwise the power consumption is ~1 watt.

Culligan Smart HE Sulfur-Clear Filters

	10" Fiberglass	10" Quadra-Hull
Control Valve Type	1" Reinforced Thermoplastic with GBX2 Circuit Board	1" Reinforced Thermoplastic with GBX2 Circuit Board
Installation Environment	Indoor	Indoor
Overall Conditioner Height	69"	69"
Media Tank Dimensions (D x H)	10 x 54 in.	10 x 54 in.
Filter Media Type	1.5 cu ft. CIM	1.5 cu ft. CIM
Underbedding	Cullsan, 20 lb	Cullsan, 20 lb
Capacity ¹	1000 gallons	1000 gallons
Freeboard ²	18 in	18 in
Max. Clear Water (Soluble) Iron	10 ppm	10 ppm
Max. Hydrogen Sulfide	8 ppm	8 ppm
Minimum Alkalinity	100 ppm	100 ppm
pH	7.0–8.5	7.0–8.5
Service Flow @ Pressure Drop (Clean Bed) Normal ³	5 gpm @ 4 psi	5 gpm @ 4 psi
Maximum		
Operating Pressure	20–60 psi/138–414 kPa	20–60 psi/138–414 kPa
Operating Temperature	33–120° F/1–49°C	33–120° F/1–49°C
Electrical Requirements (Control Valve)	24 VDC, 36 W	24 VDC, 36 W
Electrical Requirements (Compressor)	120VAC/60Hz, 175W/245W (continuous/max)*	120 Volts/60Hz, 175W/245W (continuous/max)*
Drain Flow, Maximum	5.5 gpm	5.5 gpm
Backwash	5-20 minutes	5-20 minutes
Pause/Draw	Pause = 1 min / Chlorine Draw (if used) = 90 min	Pause = 1 min / Chlorine Draw (if used) = 90 min
Fast Rinse	5-20 minutes	5-20 minutes

¹ Capacity based on 5 gpm (10" unit) and 10 mg/L of dissolved iron.

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

³ Max flow rates and pressure drop characteristics have not been certified by the Water Quality Association.

For the purposes of plumbing sizing, only the service flow rate and corresponding pressure drop should be used.

Culligan Smart HE Arsenic Filters

	12" Arsenic 12" Arsenic Outdoor	14" Arsenic 14" Arsenic Outdoor	16" Arsenic 16" Arsenic Outdoor
General			
Control Valve Type	1" Reinforced Thermoplastic w/GBX2 Circuit Board		
Installation Environment ¹	Indoor / Outdoor		
Overall Conditioner Height	60 in.	73 in.	73 in.
Media Tank Type	Quadra-Hull Tank		
Media Tank Dimensions (Dia x Ht) 12 x 52 in. 14 x 65 in. 16 x 65 in.	12 x 52 in.	14 x 65 in.	16 x 65 in.
Cull-AsX53 Media and Quantity	2.0 cu. ft.	3.0 cu. ft.	4.0 cu. ft.
Underbedding Type and Quantity	Cullsan, 15 lb	Cullsan, 20 lb	Cullsan, 25 lb
Freeboard ²	15"	26"	25"
Media Life - Rated Capacity - Gallons	125,000 Gallons	180,000 Gallons	250,000 Gallons
Rated Service Flow @ Pressure Drop	5 gpm @ 2 psi	7.5 gpm @ 5 psi	10.0 gpm @ 10 psi
Recommended Water Quality Criteria			
pH Range	6.5 - 8.5		
Arsenic - Total (Type III & Type V)	< 100 µg/l		
Iron	< 0.3mg/l (< .1 mg/l recommended)		
Manganese	< 0.01 mg/l (<.1 mg/l recommended)		
Phosphate ³	< 0.40 mg/l (< .01 mg/l recommended)		
Silica ⁴	< 30 mg/l recommended		
Sulfate	< 100 mg/l		
Hydrogen Sulfide	None detectable		
Turbidity	< 5 NTU		
Fluoride	< 1 mg/l		
Hardness	< 300 mg/l		
Nuisance Bacteria ⁵	None detectable - for best performance and media life		
Tannins	None detectable		
Operating Pressure	20–120 psi [138–862 kPa]		
Operating Pressure Canada	20–90 psi [138–621 kPa]		
Operating Temperature	33–120 deg F [1–49°C]		
Electrical Requirements (Control Valve)	24 VDC, 36 W		
Drain Flow, Max ⁶	7.0 gpm	10.0 gpm	11.5 gpm
Reconditioning Time			
Backwash	15 Minutes		
Fast Rinse	5 Minutes		

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

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

³ Increased Phosphate levels will reduce rated media life.

⁴ Increased Silica levels will reduce rated media life.

⁵ Nuisance Bacteria includes Iron Related, Slime Forming and Sulfate Reducing Bacteria.

⁶ Backwash at 60 psi

Preparation

The success of the installation will depend to a great extent on advance planning and preparation. Careful attention to the unit's location, accessibility to electrical and drain facilities, and the availability of the proper tools will ensure a professional looking installation. Of utmost importance is the assurance that the filter has been properly applied and meets all specifications.

Pressure

The filter is designed to operate within a pressure range of 20 to 120 psi. Pressures below 20 psi may cause the unit to perform and recharge inefficiently, while pressures above 120 psi can cause damage and noisy operation of the control valve.

Low pressure is generally not a problem with municipal water supplies, although some adjustments of the well pump system may be required on private supplies. Although uncommon, some municipal supplies may exceed the high-pressure limit. A pressure reducing valve should be installed if such pressures are encountered. Keep in mind, also, that some municipal supplies have higher pressure during nighttime hours.

Check the available water pressure with a gauge assembly to determine what adjustments, if any, are necessary (Figure 1). Place the gauge on a raw water line and open a nearby faucet. Adjust the faucet until the flow is about 5 gallons per minute and check the pressure. In the case of a private well system, allow water to run until the pump cuts in. If the pressure is less than 20 psi at this point, adjust the pump pressure switch as required to raise the cut-in pressure above 20 psi.

Figure 1.



Pressure Drop

Whenever water is flowing, a certain amount of pressure is lost due to resistance from pipe, fittings, and appliances connected to the water supply. The amount of pressure drop encountered depends on how fast the water is flowing and how much resistance it meets. The amount of pressure available at a tap is also determined by its height above the source of the supply. For example, if water pressure in the basement is 50 psi, it will be about 45 psi on the ground floor, and about 40 psi on the second floor, or a reduction of about 5 psi for every 10 feet of elevation.

Particularly in the case of private water supplies, it may be necessary to increase the pump pressure to overcome pressure drop through the conditioner so that adequate pressure is available at all taps.

As the filter bed becomes loaded with the particulate matter it has removed or pressure drop will increase. The filter must be backwashed prior to the pressure drop reaching unacceptable levels. Filter systems should always be installed prior to the water heater.



CAUTION!

The use of a pressure reducing valve may limit the flow of water in the household.

Temperature

Do not install the unit where it might freeze, or next to a water heater or furnace or in direct sunlight. For Outdoor installations, an Outdoor rated system is required. Outdoor installation of an Indoor rated system is not recommended and voids the warranty. When installing an Outdoor unit in an outside location you must take steps necessary to assure the filter installation plumbing, wiring, etc. are protected from the elements (sunlight, rain, wind, heat, cold), contamination, etc. as when installed indoors.

Installation

Using This Manual

This installation manual covers several different models and versions of Aquasential Smart HE Water Filters. All models share the main Aquasential Smart HE system components and a similar installation process. Refer to the specific system in the 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.

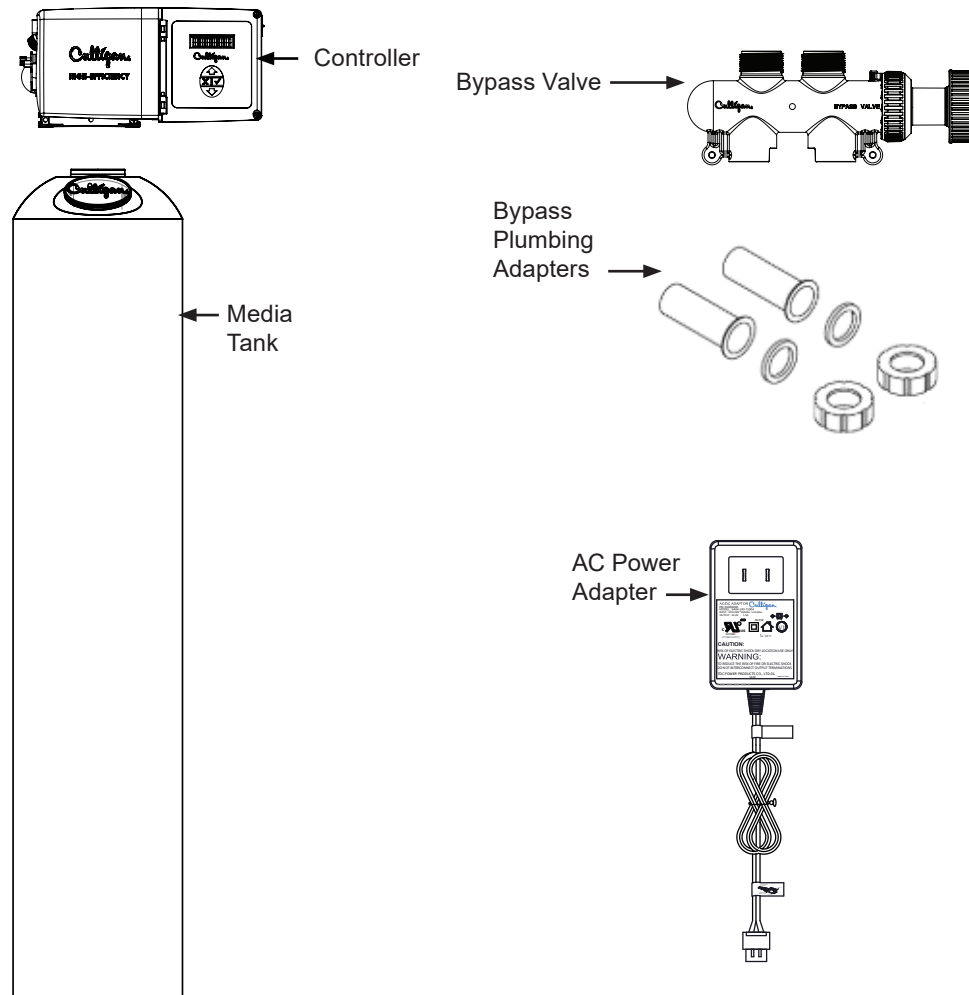
The following are necessary components for installation:

Materials

- 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 120 psi [860 kPa] or 60 psi [414 kPa] for Iron-Cleer and Sulfur-Cleer filter systems)
- Pipe and fittings suited to the type of installation

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

Figure 2. Smart HE Installation Materials



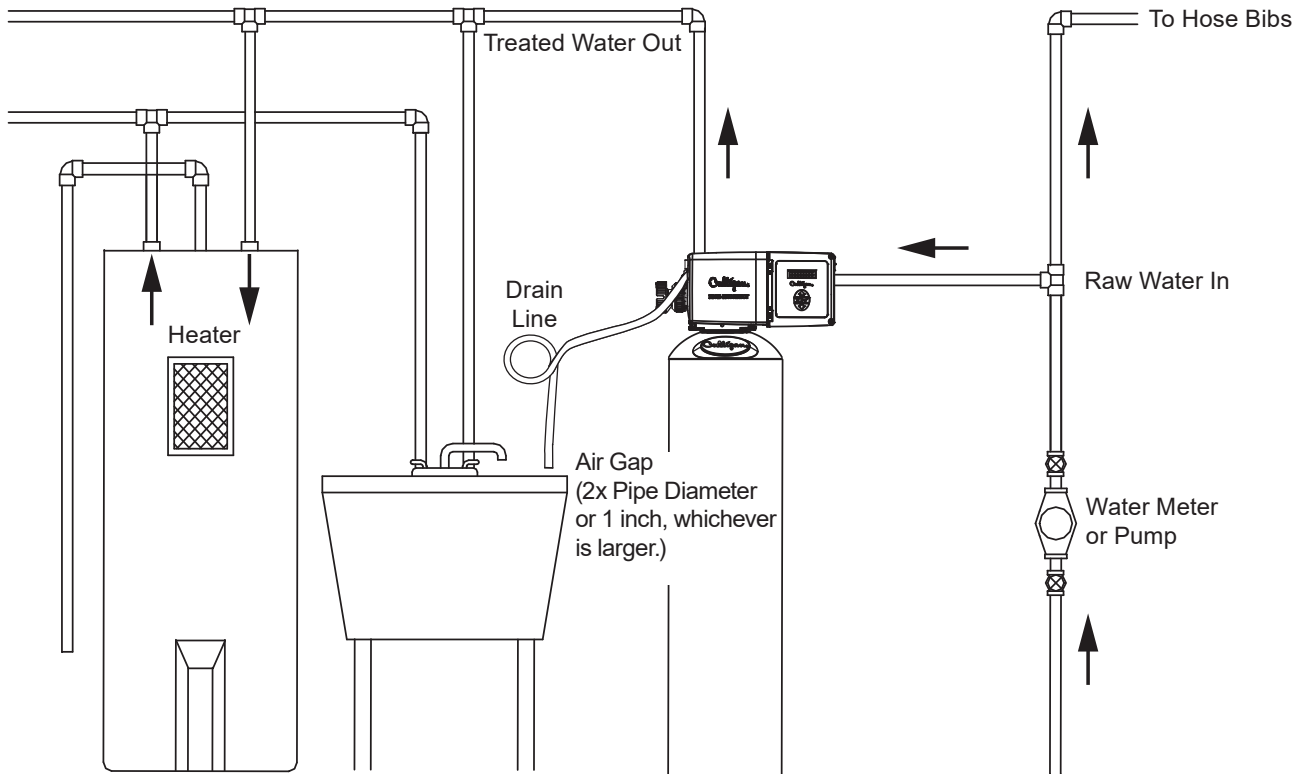
Location

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 3. Smart HE Filter 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.

Filter Media Loading - Cullar Activated Carbon Filters



CAUTION!

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

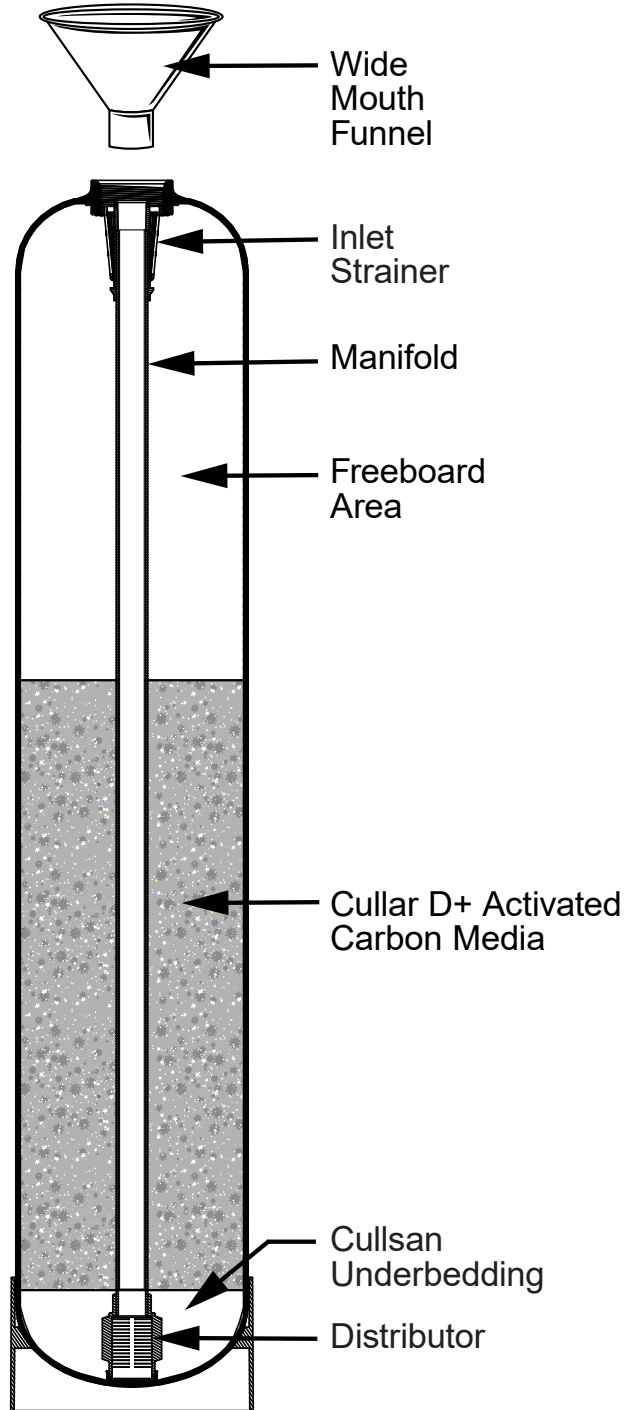
CAUTION!

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.

NOTE! Activated carbon filter media must be soaked in water for 24 to 48 hours to allow for full saturation before being put into service. In-plant preparation is highly recommended.

1. Position the tank for loading.
2. Remove the inlet strainer.
3. Be sure the outlet manifold is positioned properly in the tank.
4. Cover the outlet manifold before inserting the large opening funnel.
5. Pour underbedding into the tank. Level if required.
6. Pour the activated carbon media into the tank. Leveling isn't required.
7. Replace the inlet strainer. Make sure to thread it all the way to the bottom of the tank threads.

Figure 4. Cullar Media Tank Layers Cross Section



Filter Media Loading - Filtr-Clear Water Filters

The 9" Filtr-Clear filters are shipped with one media pack and the 10" Filtr-Clear filters are shipped with two media packs. Verify that the proper number of media packs are on site before loading the tank. Place the manifold inside the tank.

1. Position the tip of the manifold in the recess located in the bottom of the tank.
2. Cover the top of the manifold with a clean rag.
3. Place a wide-mouth funnel in the tank opening.
4. Open the media pack(s) by cutting along the bottom of the carton and lifting up to expose the four individual media packages. See [Figure 5](#).

NOTE! The performance of the filter may be severely affected if the media is not added in the proper sequence shown. Refer to [Figure 6](#) for reference.

5. With no water in the tank, slowly pour the Cullsan® U media into the tank.

NOTE! The 10" filter uses only one bag of Cullsan U media pack. Shake tank to level the media.

6. With no water in the tank, slowly pour the Cullsan G-50 media into the tank and level.

NOTE! The 10" filter requires the Cullsan G-50 from both of the media packs.

7. With no water in the tank, slowly pour the Cullsan A media into the tank and level.

NOTE! The 10" filter requires the Cullsan A from both of the media packs.

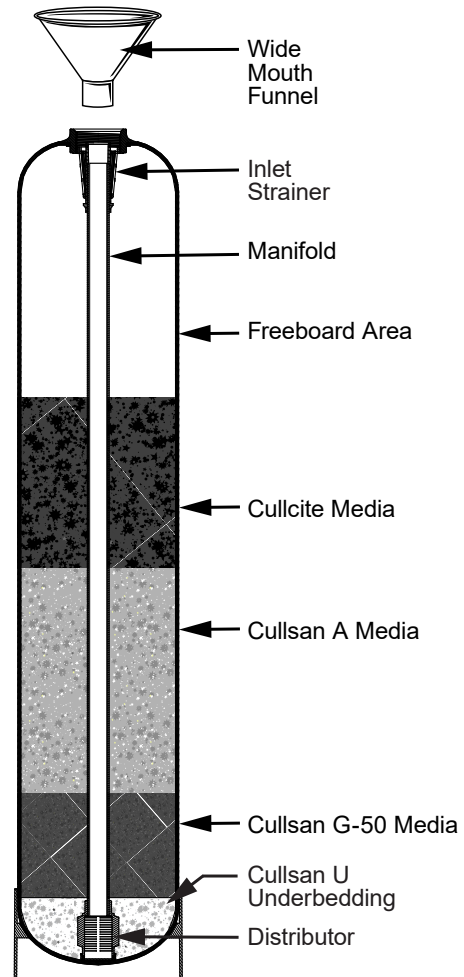
8. With no water in the tank, slowly pour the Cullcite® media into the tank and level.

NOTE! The 10" filter requires the Cullcite from both of the media packs.

Figure 5. Filtr-Clear Media Pack (P/N 01013968)



Figure 6. Filtr-Clear Media Tank Cross Section



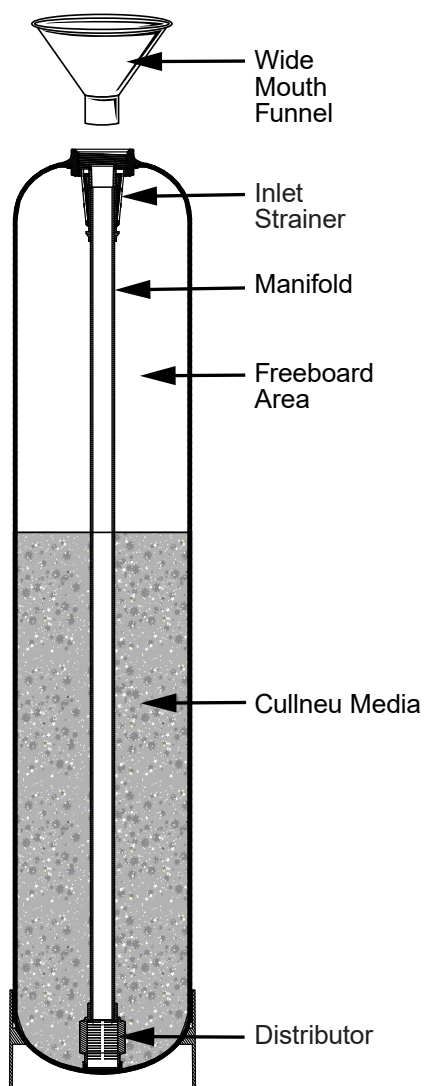
Filter Media Loading - Cullneu® Filters

Cullneu filters are shipped with 2 bags of Cullneu with 9" filters and 3 bags of Cullneu with 10" filters. Verify that the proper amount of media is on site before loading.

1. Place the manifold inside the tank. Position the tip of the manifold in the recess located in the bottom of the tank.
2. Cover the top of the manifold with a clean rag.
3. Place a wide mouth funnel in the tank opening. The Cullneu media should be added with no water in the tank.
4. For 9" Cullneu filters, slowly pour the entire contents of two bags of media into the tank.
5. For 10" Cullneu filters, slowly pour the entire contents of two bags of media and enough media from the third bag to raise the level of media in the tank to within 21" of the top of the tank.

NOTE! DO NOT OVERFILL. Overfilling will result in excess media being lost to drain during backwash, possibly plugging the control valve. Shake the tank to level the media.

Figure 7. Cullneu Filter Media Tank Cross Section

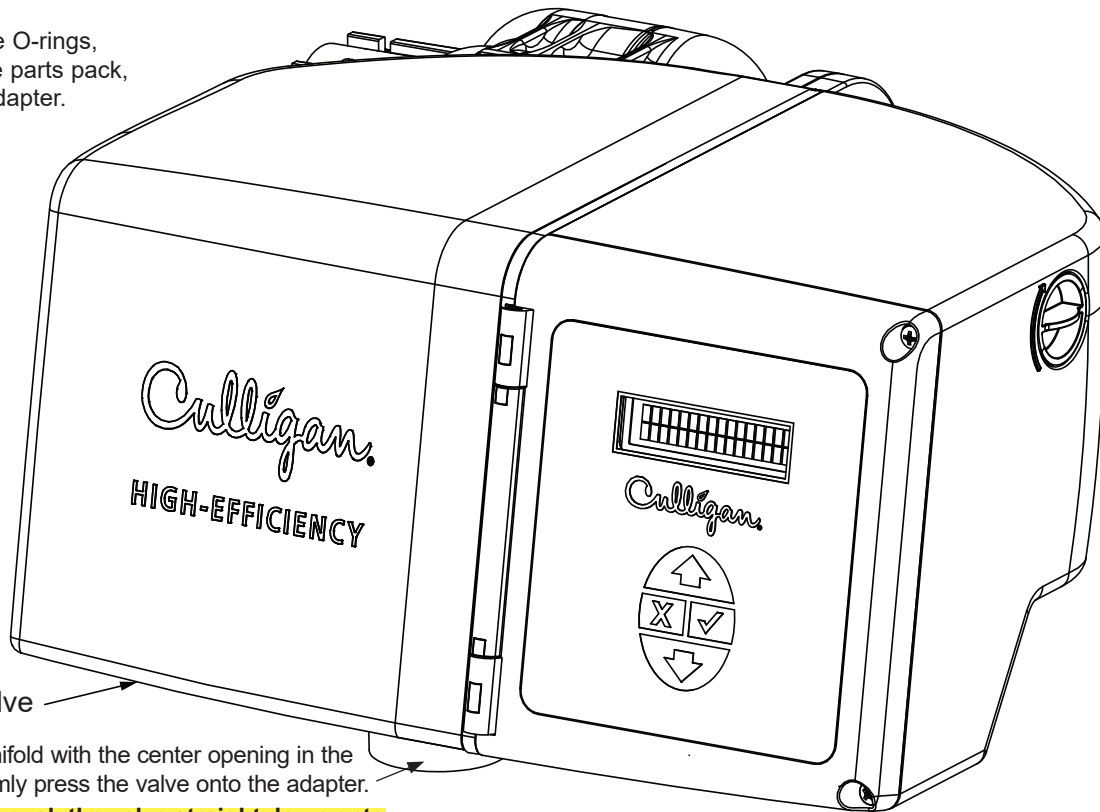


Mount the Control Valve

See [Figure 8](#) for an illustration on mounting the control valve to the tank.

Figure 8. Mounting the Control Valve

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

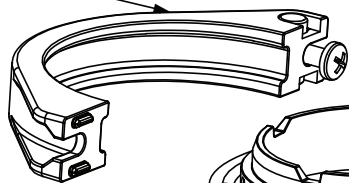


5. Align the manifold with the center opening in the valve, and firmly press the valve onto the adapter.

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.

U-Clamp

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



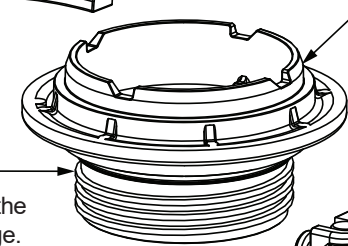
Adapter

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.

Outlet Manifold

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



Valve Adapter O-ring (Large O-ring)

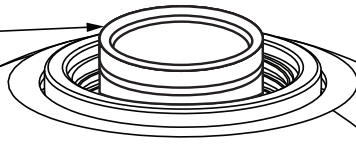
2. The larger of the two O-rings in the parts pack should be positioned between the adapter and the valve. Do not stretch the smaller O-ring onto the top of the tank adapter. Lubricate with silicone lubricant.

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



Tank Adapter O-ring (Smaller O-ring)

DO NOT lubricate this ring!



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.

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

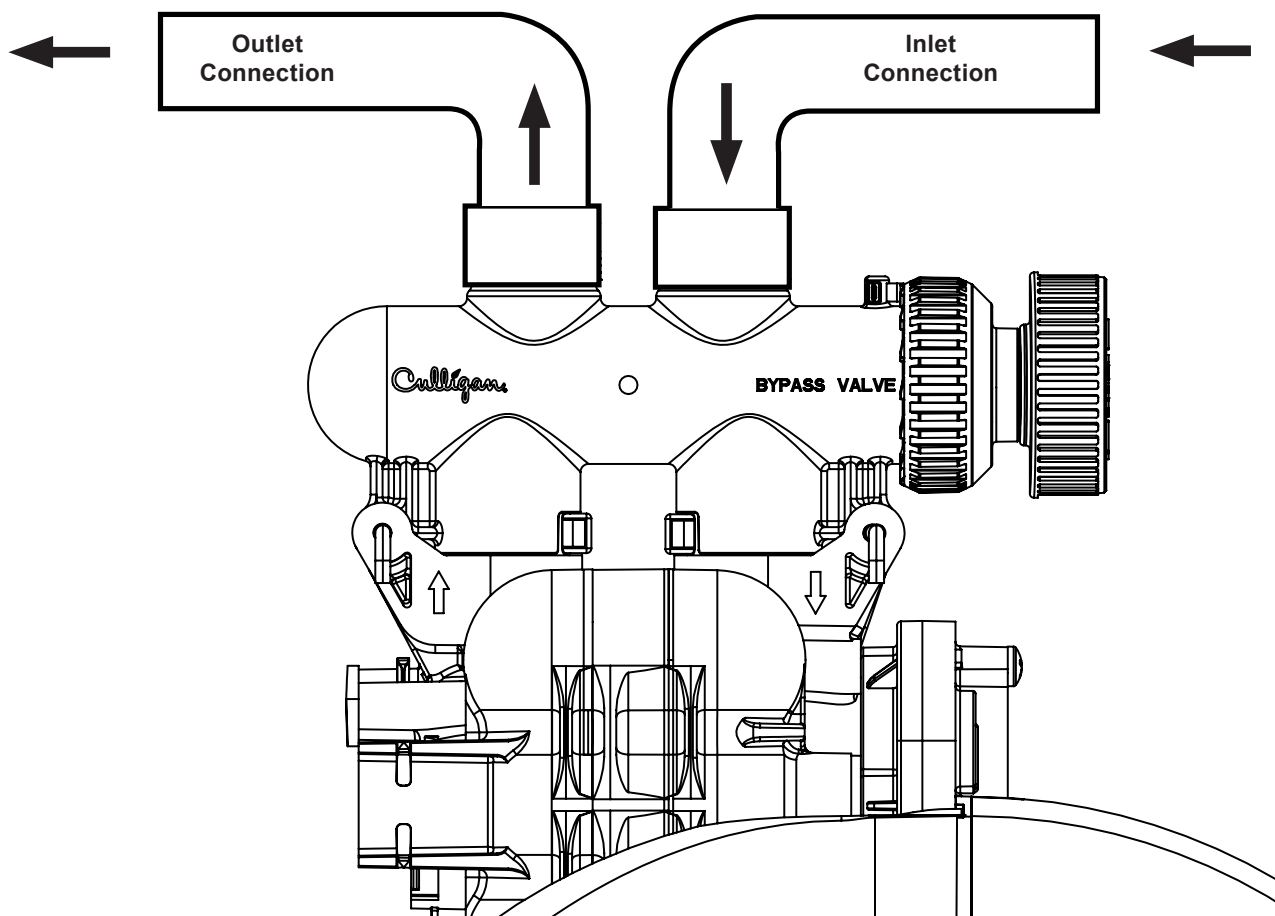
Plumbing Connections

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 9. 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!

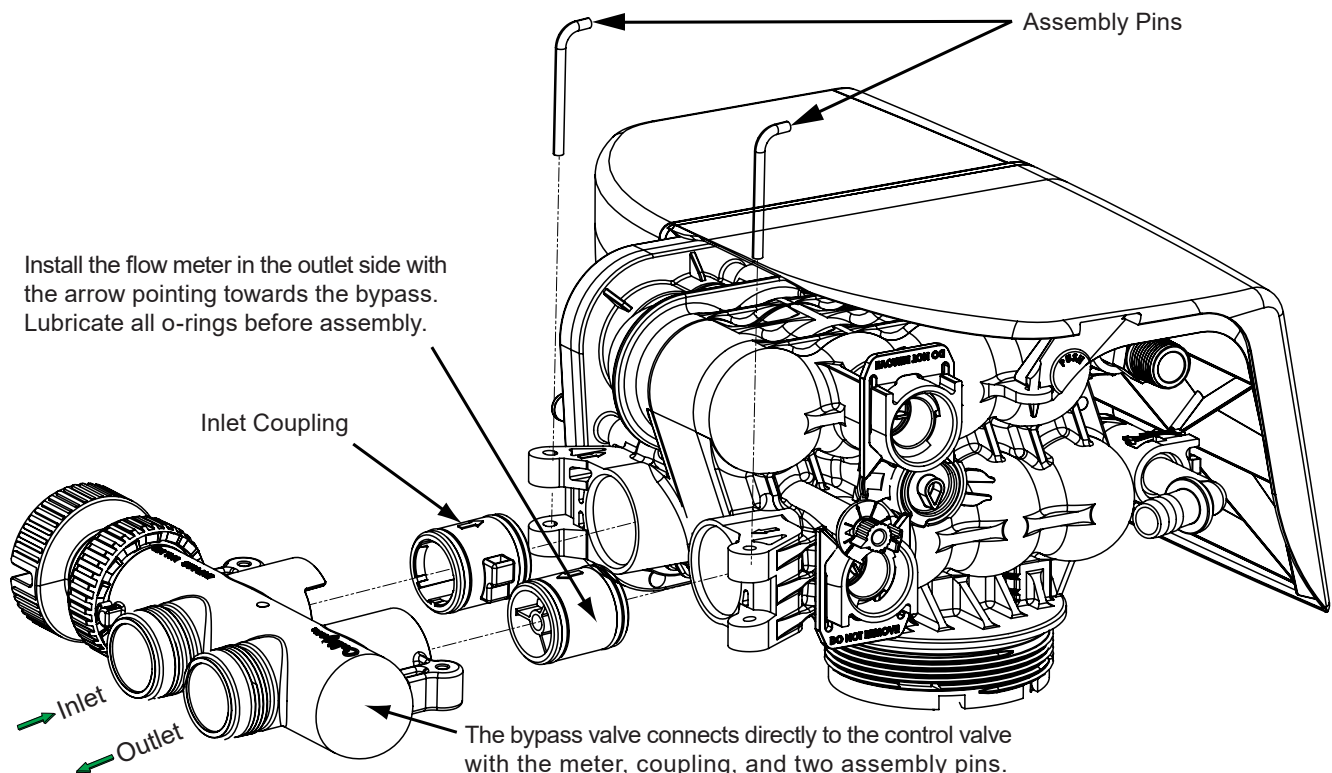
CAUTION!

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 10](#) and the instructions below to connect the flow meter, bypass valve, and plumbing.

Figure 10. Bypass Valve Assembly



Install the flow meter in the outlet side with the arrow pointing towards the bypass. Lubricate all o-rings before assembly.

Inlet Coupling

The bypass valve connects directly to the control valve with the meter, coupling, and two assembly pins.

NOTE! Sulfur-Clear systems include an inlet check valve to be used in place of the inlet coupling.

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 11.") DO NOT OVERTIGHTEN! To return to service, turn the blue knob counter-clockwise until the knob stops as shown. ("Figure 12.") (See directional arrow on the end of knob) DO NOT OVERTIGHTEN!

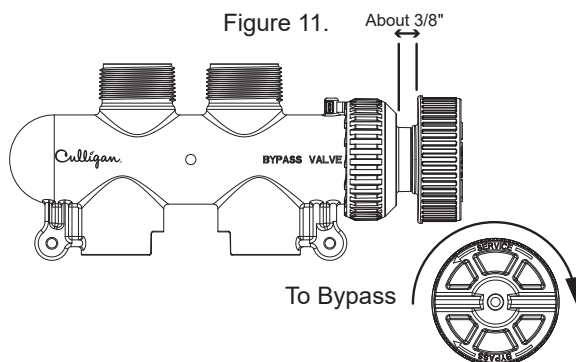


Figure 11.

About 3/8"

To Bypass

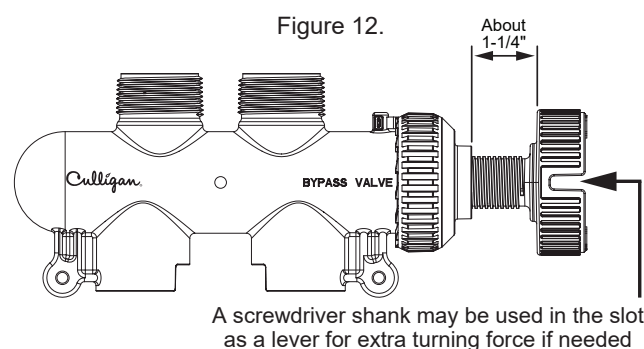


Figure 12.

About 1-1/4"

A screwdriver shank may be used in the slot as a lever for extra turning force if needed

Bypass Plumbing Connections

Table 1. 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 13. Vanity Cover Removal Steps.

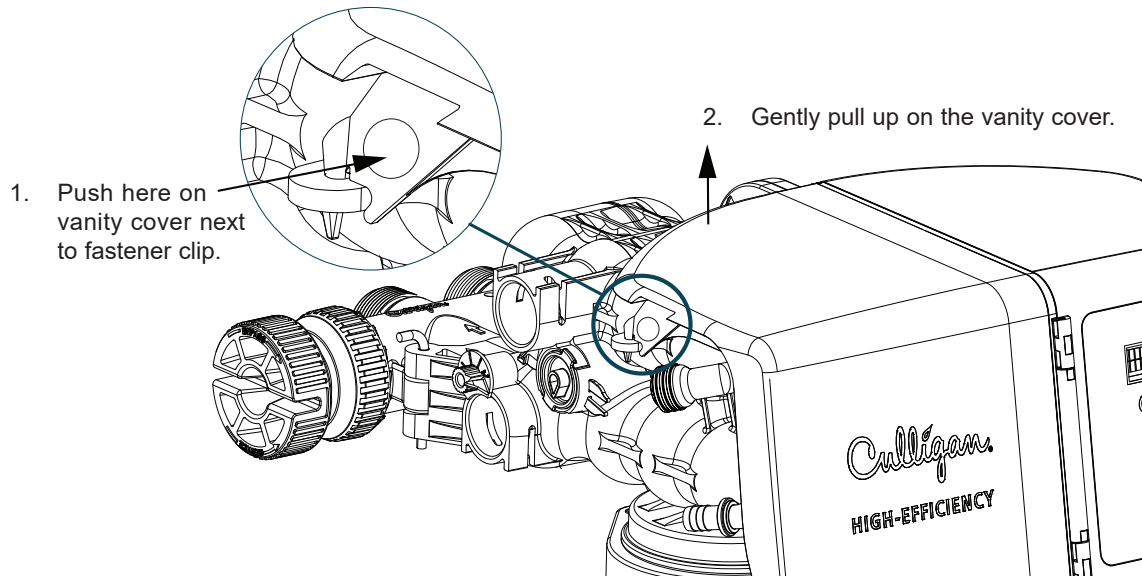


Figure 14. Reattaching the Cover Fastener.

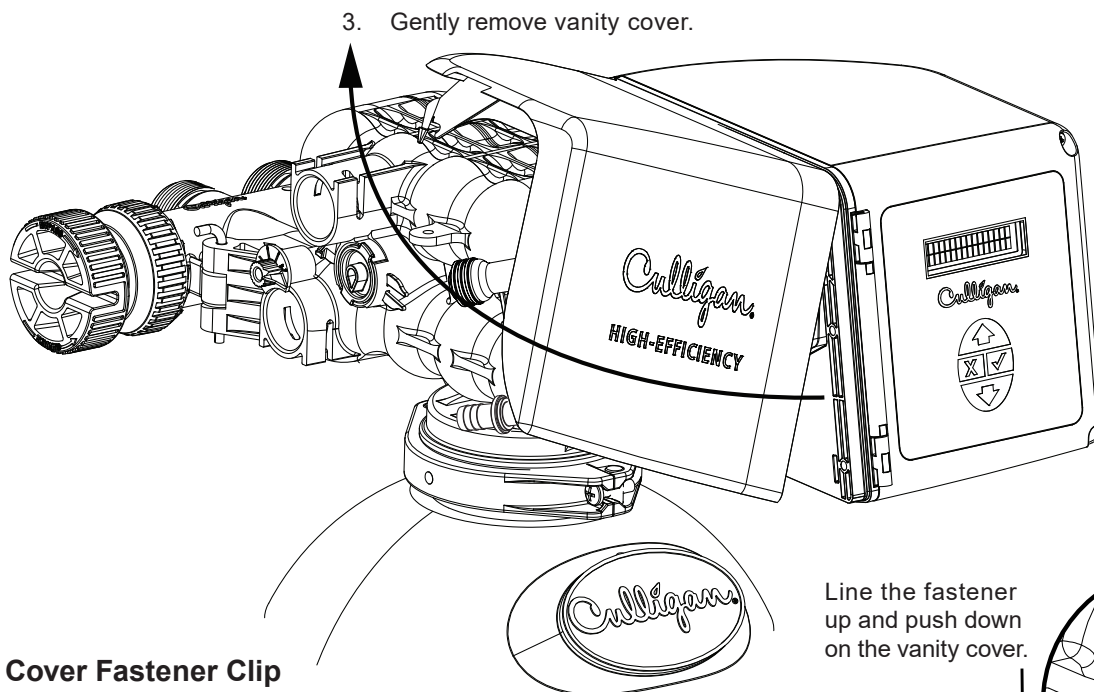


Figure 15.

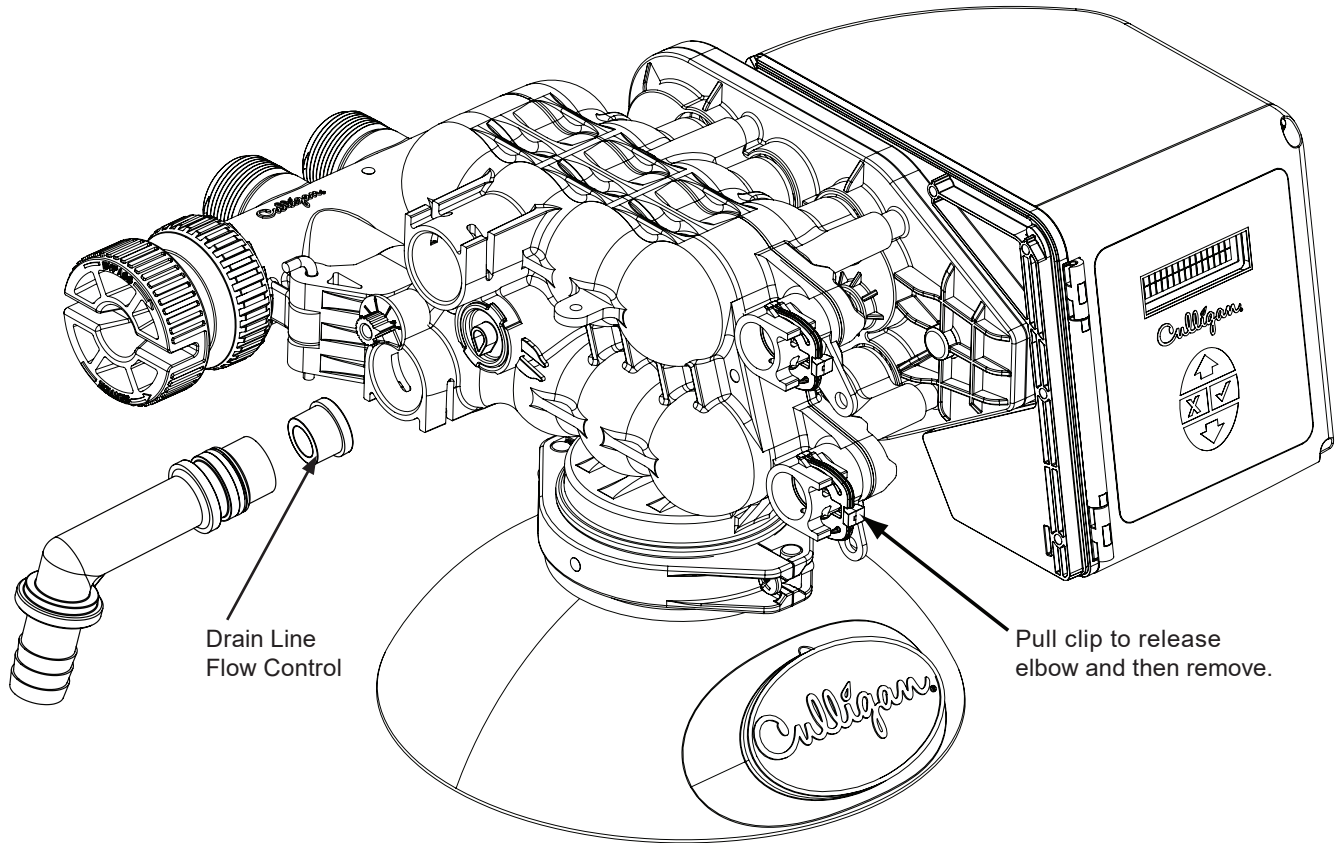
Line the fastener up and push down on the vanity cover.

Cover Fastener Clip

4. Rotate the cover downward inserting the two pins on the side of the cover into the two holes on side of the frame.

Drain Line Flow Control Replacement

Figure 16. Removing the drain elbow and brine elbow.

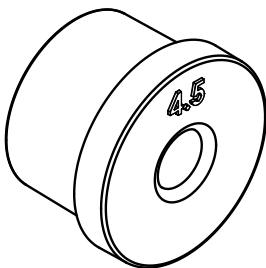


Drain Line Flow Control Parts

Table 2. Smart HE Filters - Drain Line Flow Controls

Filter Type	Drain Line Flow Control - GPM	Color
Cullar 9"	3.5 gpm	Green
Cullar 10"	5.5 gpm	Black
Filtr-Cleer 9"	4.5 gpm	Red
Filtr-Cleer 10"	7.0 gpm	Black
Cullneu 9"	3.5 gpm	Green
Cullneu 10"	5.5 gpm	Black
Iron-Cleer 10"	7.0 gpm / (5.5 gpm Min.)	Black / Black
Iron-Cleer 12"	10.0 gpm / (7.0 gpm Min.)	Black / Black
Sulfur-Cleer 10"	5.5 gpm	Black
Arsenic 12"	7.0 gpm	Black
Arsenic 14"	10.0 gpm	Black
Arsenic 16"	11.5 gpm	Black

Figure 17. Drain Line Flow Control



NOTE! Flow controls have gpm rating molded into face for proper identification.

Drain Line Connection

Refer to [Table 3](#) 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 18. Drain Line Connections

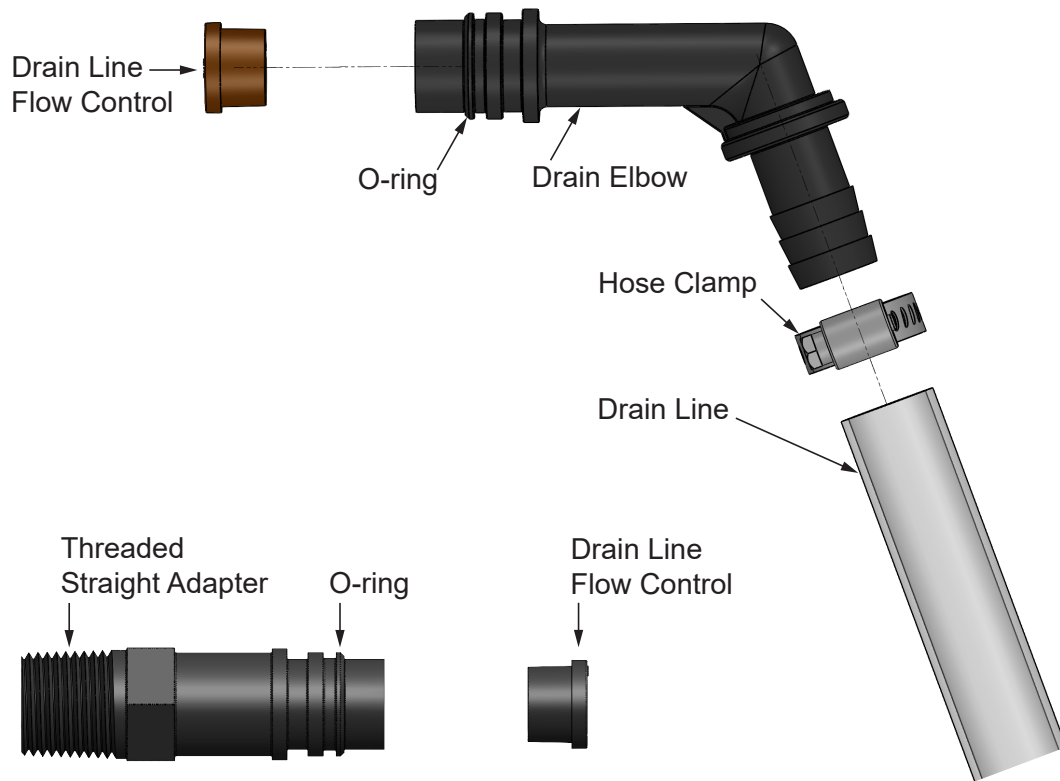


Table 3. Maximum Allowable Drain Line Length

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)

Electrical

Controller Electrical Connections

The 24VDC 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.

Figure 19. Insert Wire with Bushing.

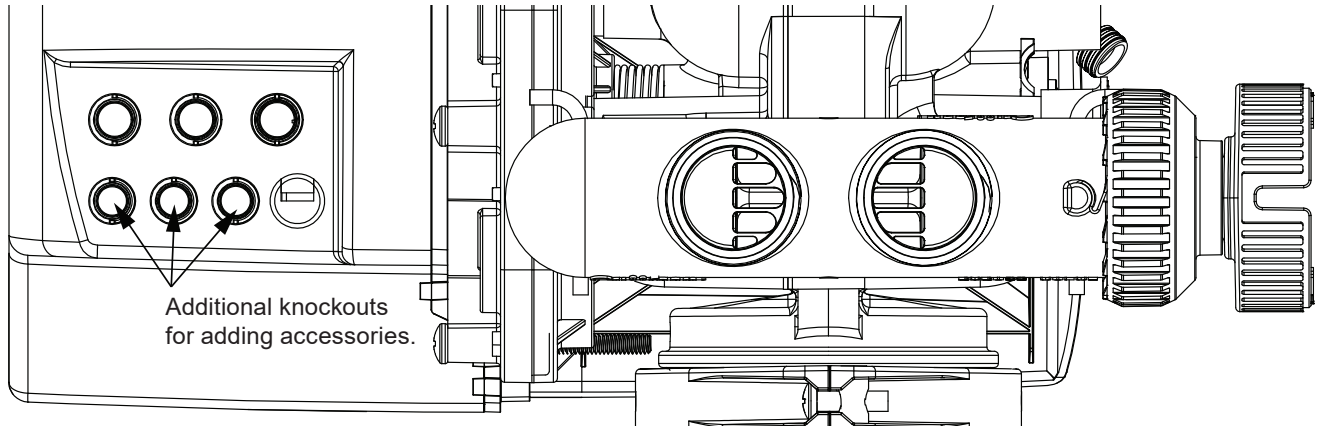
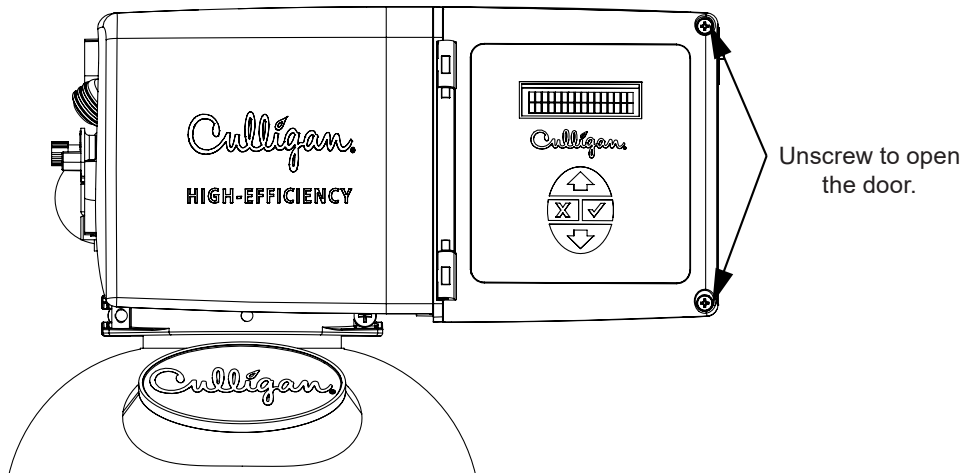


Figure 20. Opening the Smart HE Enclosure Door



Power Supply

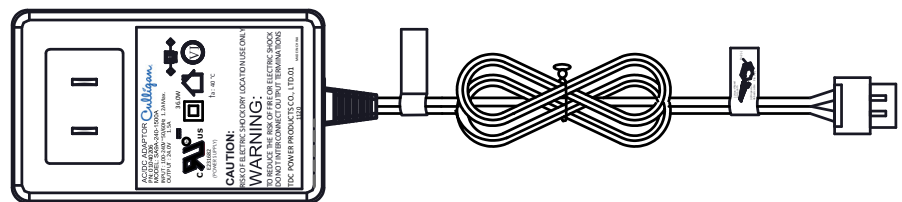
A wall mount plug-in power supply with a 20-foot cord is provided. The customer should provide an electrical outlet that is not controlled by a switch that can be turned off accidentally. Observe local electrical codes.

NOTE! The filter 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 21. 20-foot Power Supply



GBX2 Circuit Board - Main

Figure 22. Back of GBX2 Circuit Board

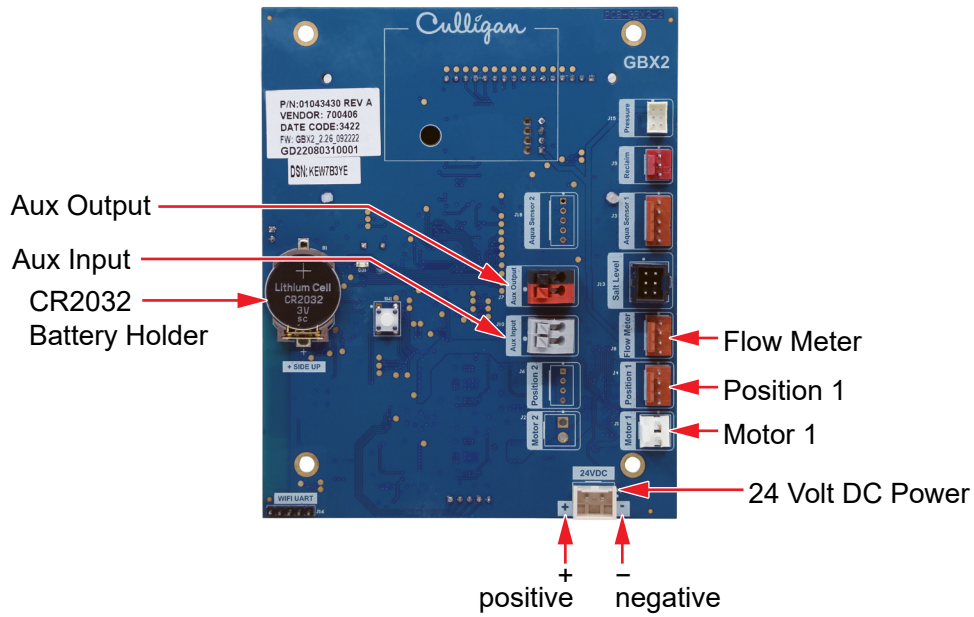
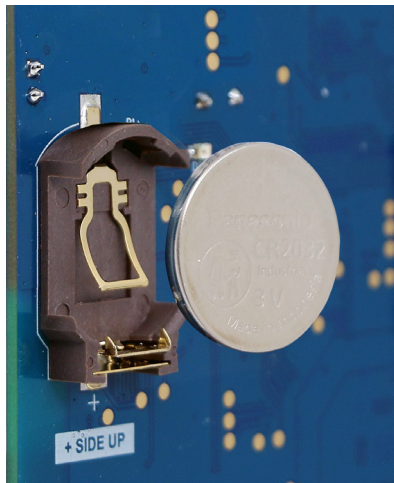


Figure 23. GBX2 Circuit Board Battery Replacement



Insert CR2032 coin battery, positive side of the battery pointing out, in the empty battery slot on the GBX2 Circuit Board.



Installing Accessories

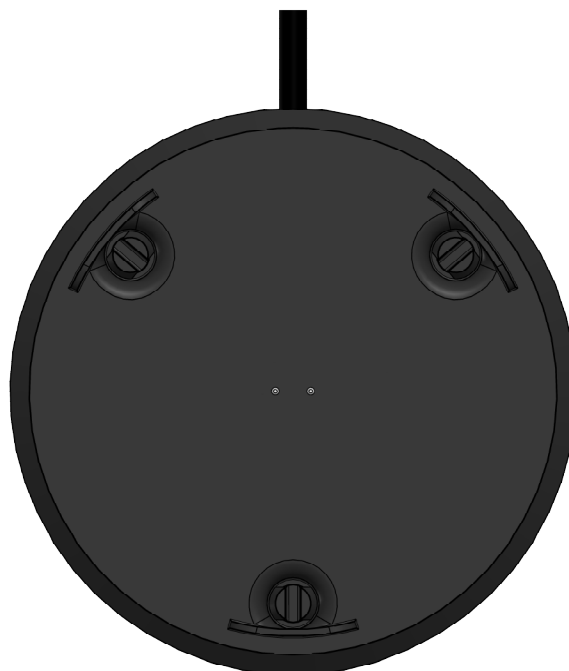
Leak Sensor (P/N 01040317)

Attach the two wires from the leak sensor to the Aux In terminals on the GBX2 board. Circuit board has the default for Aux In at Leak so no programming is required after wiring.

Figure 24. Leak Sensor - Top View



Figure 25. Leak Sensor - Bottom View



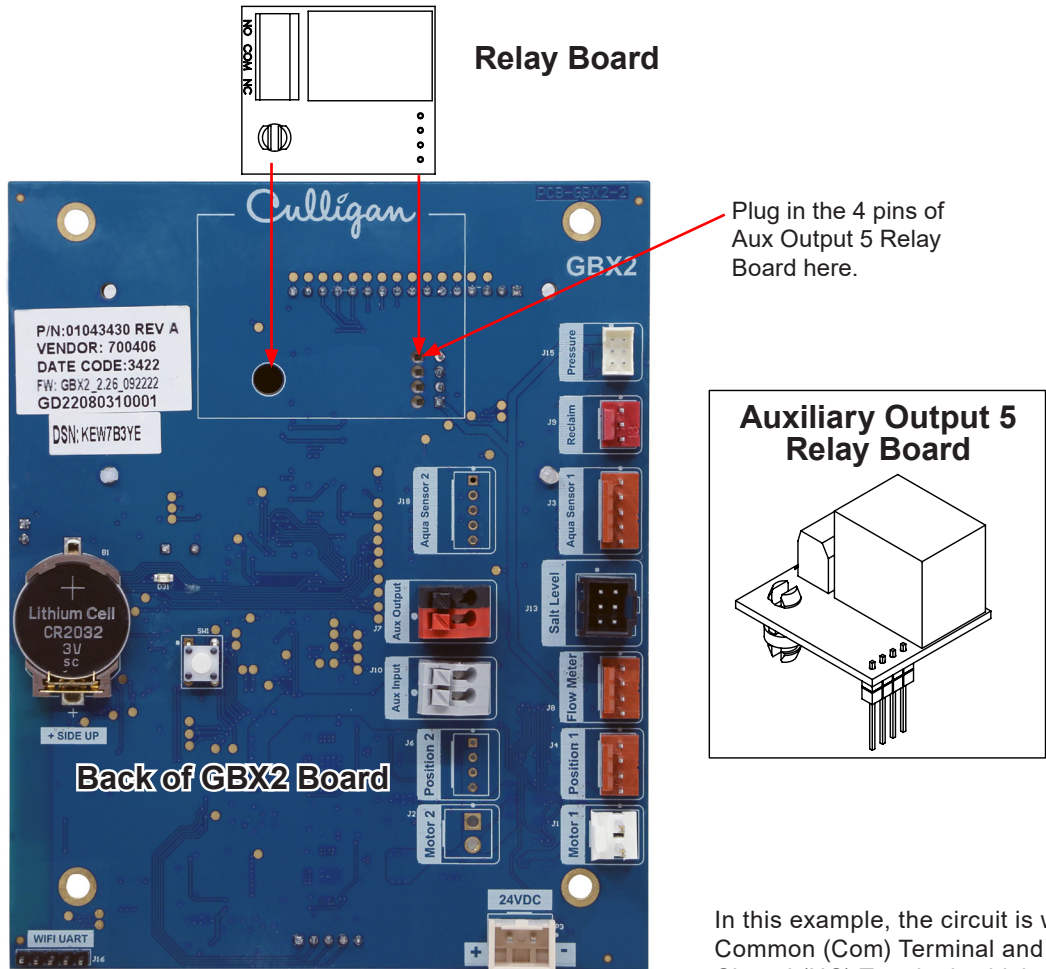
Auxiliary Output 5 Relay Board (P/N 01022238)

The GBX2 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 GBX2 board.

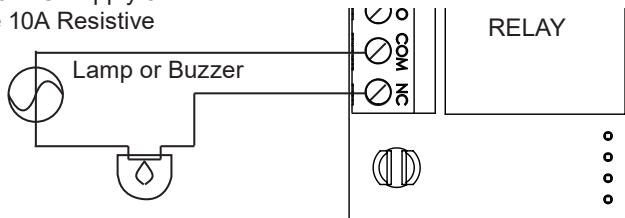
Refer to GBX2 Programming Guide (P/N 01040743) for programming information.

This manual can be obtained on CPort (www.cport.culligan.com) under the [Technical Service Tab](#) or on the Service Tech App.

Figure 26. Example of Wiring to the GBX2 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 Sulfur-Clear compressor and HE Accessory Chemical Feed Pumps.

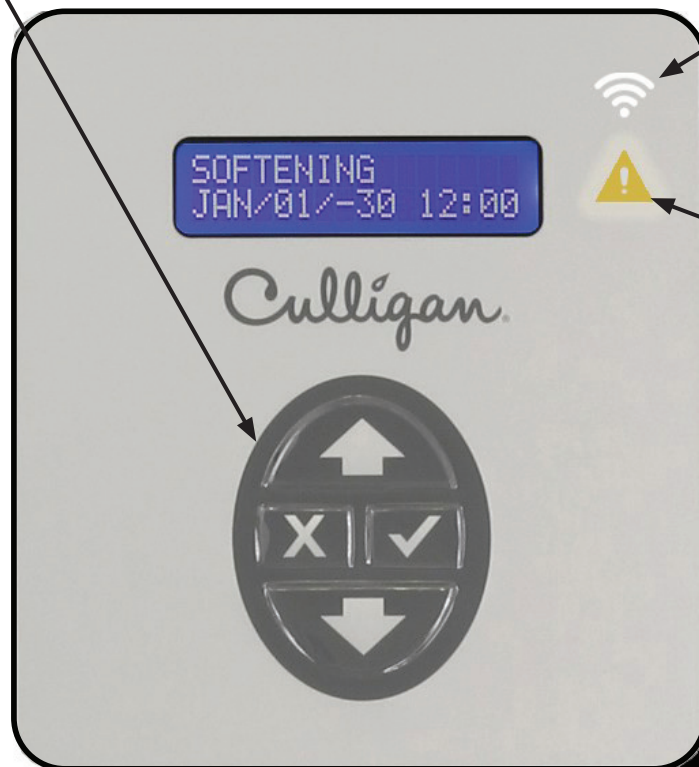
This mode of operation occurs when the relay board is plugged into the GBX2 board Aux 5 Output Relay socket. When Error Status is selected on the display, this relay is energized holding the normally closed contact open, and when the GBX2 board has power AND there are no errors present the relay is energized. ("Problem Found" is not showing on the Home screen). The relay is in the de-energized state when the GBX2 is either powered OFF or when there is an error present on the GBX2 board.

Controller Features

Keypad Overview

Figure 27. Front of GBX2 Board

Keypad

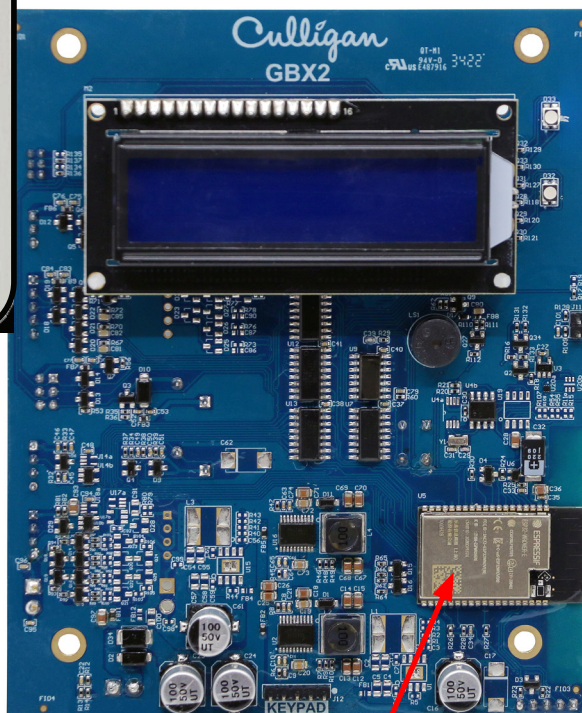


WiFi icon

- Off - WiFi disabled
- Flashing green - WiFi pairing mode
- Solid white - connected to WiFi
- Blinking red - connection lost/ attempting to connect
- Blinking blue - Bluetooth pairing mode
- Solid blue - Bluetooth connected

Alert indicator

- Yellow when something needs attention
- Red when there is a failure or error



WiFi / Bluetooth Module




UP ARROW  button: scrolls up the menu



DOWN ARROW  button: scrolls down the menu



CHECK MARK  button: selects the highlighted option, opens a new screen, or accepts a changed setting




CANCEL or EXIT  button: returns to the previous screen or cancels a changed setting



CAUTION!

When viewing screens, the down arrow should be used. Using the check button can default some programmed settings.

NOTE! Hold down the  or  button to quickly scroll through the setting without repeatedly pressing the button.

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 GBX2 Programming Guide, 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 #2).
10. When in the BACKWASH position, slowly rotate the bypass to the service 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 filter media. If signs of filter media particles appear, reduce the flow. Increase the flow again when media no longer appears in the discharge.
13. After the BACKWASH runs clear, using motor control advance past the PAUSE/DRAW (Position #3) to FAST RINSE (Position #4). When flow to drain is clear advance to SERVICE (Position #1).
14. Complete the installation and cleanup.
15. Sanitize the unit as you leave the installation site.
16. Set to regenerate that night or set to regenerate at the preset time.

Serial Numbers

The serial number label is temporarily taped to the media tank and needs to be permanently attached to the tank during installation. Wipe a location on the tank with an alcohol towelette then affix the label. That location can be near the tank collar, tank base, side shell near the tank base, or under the Culligan emblem of a Quadra-Hull tank. Alternately, the label may also be applied to the dealer copy of the customer sale order documentation.

Use the Service Pro app to record and submit the IQR at the time of installation.



← The label needs to be attached at the time of installation on a clean dry location. The location can be near the tank collar, tank base, side shell near the tank base, or under the Culligan emblem of a Quadra-Hull tank. Alternately, the label may also be applied to the dealer copy of the customer sale order documentation.

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

Before Leaving The Installation Site

1. Sanitize the water filter.
2. The water heater may hold unfiltered 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 completely filtered. If filtered hot water is required immediately, open hot water valve at a tub faucet and run water until it tests show it as filtered. With on-demand water heaters the water will never get cold.
3. Explain the operation of the filter to the customer. Make sure the customer understands that there will be new sounds associated with the filter system during a reconditioning cycle. It is common to hear the sound of water running intermittently when reconditioning occurs.
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 faucets and irrigation system may or may not be supplied with filtered water. If possible, all lines not requiring filtered water should be taken off upstream of the filter 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 filter if:

1. The outside lines are treated by the water filter and the water is to be used for lawn irrigation or other outside uses (use filter internal or external filter bypass valve).
2. Water is not used for several days (use filter internal or external bypass valve).
3. You wish to inspect or work on the control valve (use filter external bypass valve).
4. A water leak from the control valve is evident (use filter 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 filtered water. Be sure to close the bypass valve completely to avoid mixing filtered and unfiltered 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 filter 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 filter by following these precautions:

1. Do not place heavy objects on top of the filter 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 filter and drain line from freezing temperatures.

Manual Control Cycling

Refer to the GBX2 Programming Guide, P/N 01040743, for instructions.

Preventative Maintenance

NOTE! Refer to the GBX2 Programming Guide (P/N 01040743) for diagnostic procedures using the Smart (GBX2) Controller.

Preventive Maintenance Inspection Schedule

The Culligan Smart HE Water Filter 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 4. 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) might indicate a need for the system to be sanitized.
Drain Line Flow Control	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.
Media	As needed.	<p>Cullneu Filter—As water passes through the Cullneu filter, the media slowly dissolves and neutralizes the water. The rate at which the Cullneu media dissolves depends upon a number of factors such as temperature flow rate and pH.</p> <p>Cullar—Replace when taste, odor, or chlorine can no longer be removed.</p> <p>Filtr-Cleer—If pressure loss is excessive and proper flow can not be restored by a reconditioning cycle the media may be fouled with heavy amounts of sediment. Replace media with depth filter media pack.</p>

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](#). for the recommended limits of water characteristics for the Culligan High Efficiency Water Filters. 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 treated water capacities are listed where applicable.

Smart HE Flow Rates

When troubleshooting a filter, measure the actual flow rates and compare these measured values to those listed in the [“Specifications” on page 7](#), and [Table 2 on page 22](#).

Some variations from the values in this table are normal and to be expected. The backwash flow rates should be expected to be within +/-15% of the values in [Table 2 on page 22](#). The brine draw rate should be within 5% of the value shown in [Table 2 on page 22](#).

If there are no apparent general problems or environmental problems, refer to [“Troubleshooting Guide” on page 37](#).

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 reconditioning cycle and manually cycle the valve; observe the flows to drain during each cycle.

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, pH, hydrogen sulfide, and chlorine test depending on the system type
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 anticipated.

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.**

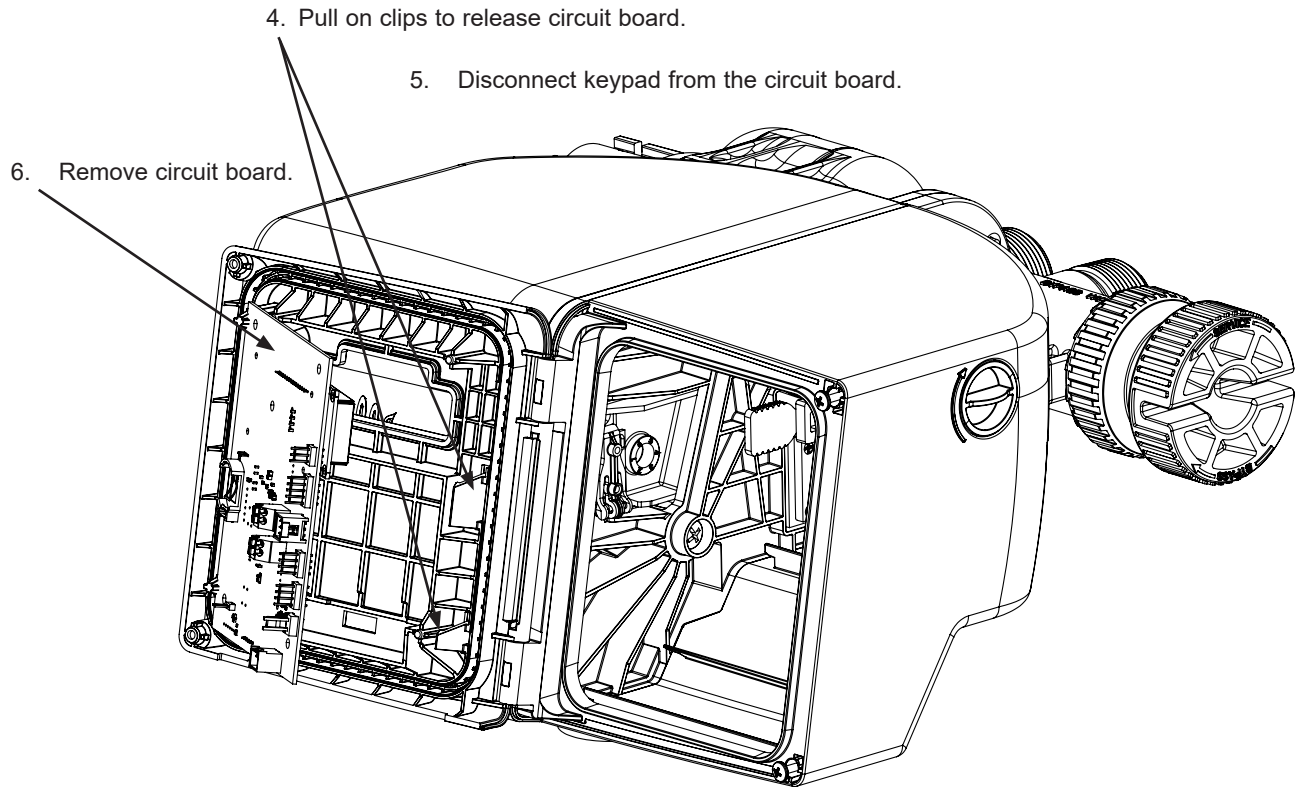
Replace the Circuit Board

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 20 on page 24](#).
3. Disconnect all the connections, such as the power supply and position sensor, from the circuit board.

Figure 28. Removing the Circuit Board



4. Pull on clips to release circuit board.
5. Disconnect keypad from the circuit board.
6. Remove 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 24](#).
9. Close the door on the enclosure and re-tighten the screws.
10. Turn on power. Reprogram the Smart HE Filter.



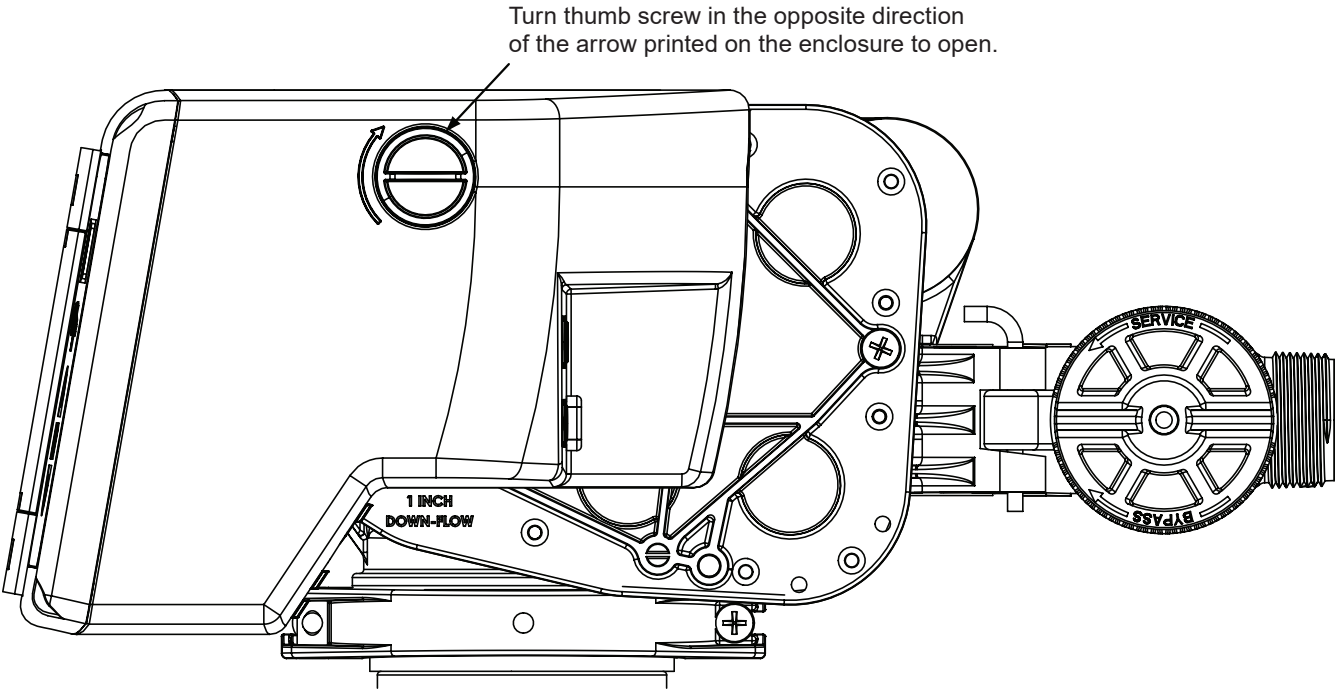
CAUTION!

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

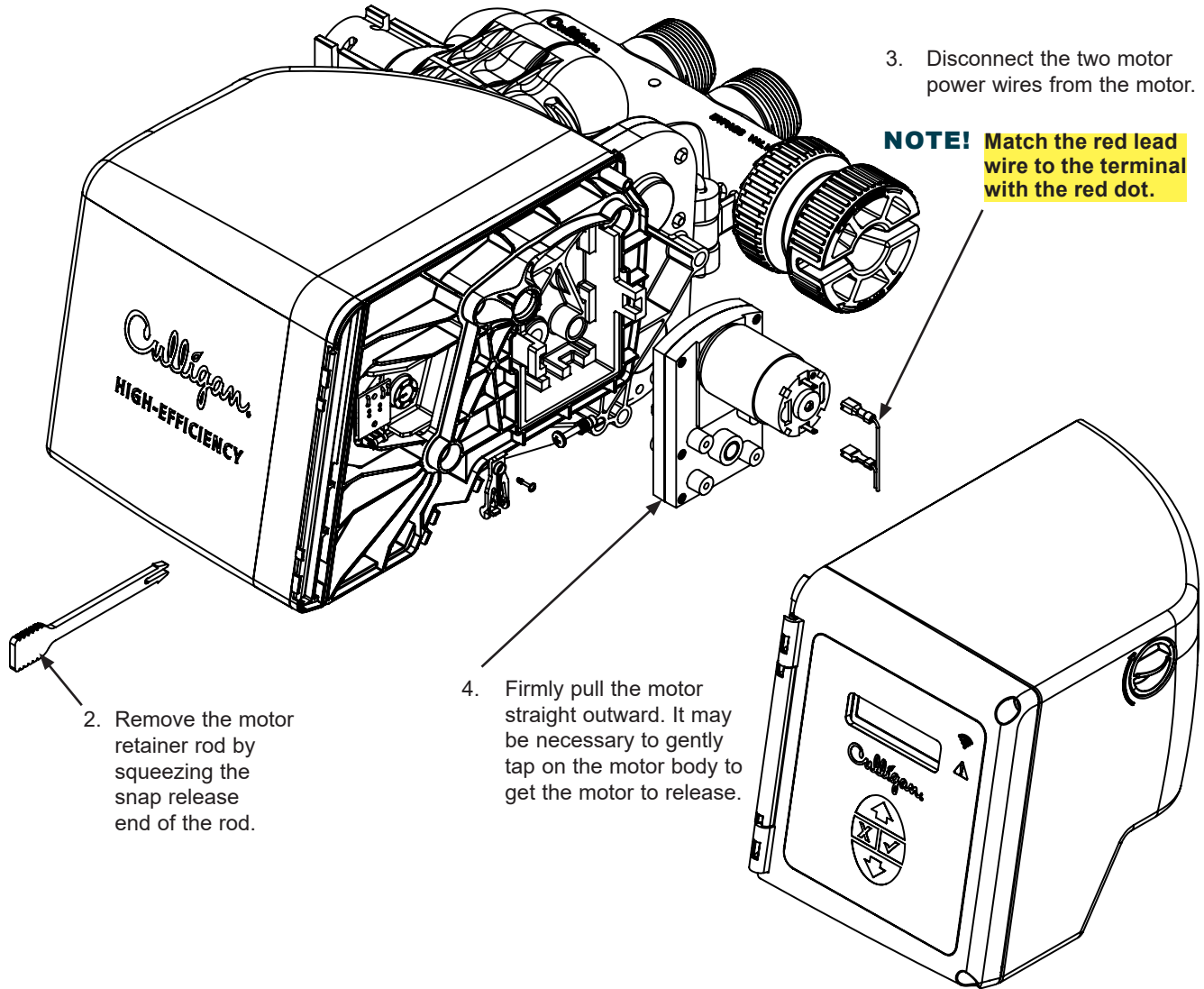
Figure 29. Removing the Electrical Enclosure



Replace the Gear Motor

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

Figure 30. Replace Motor

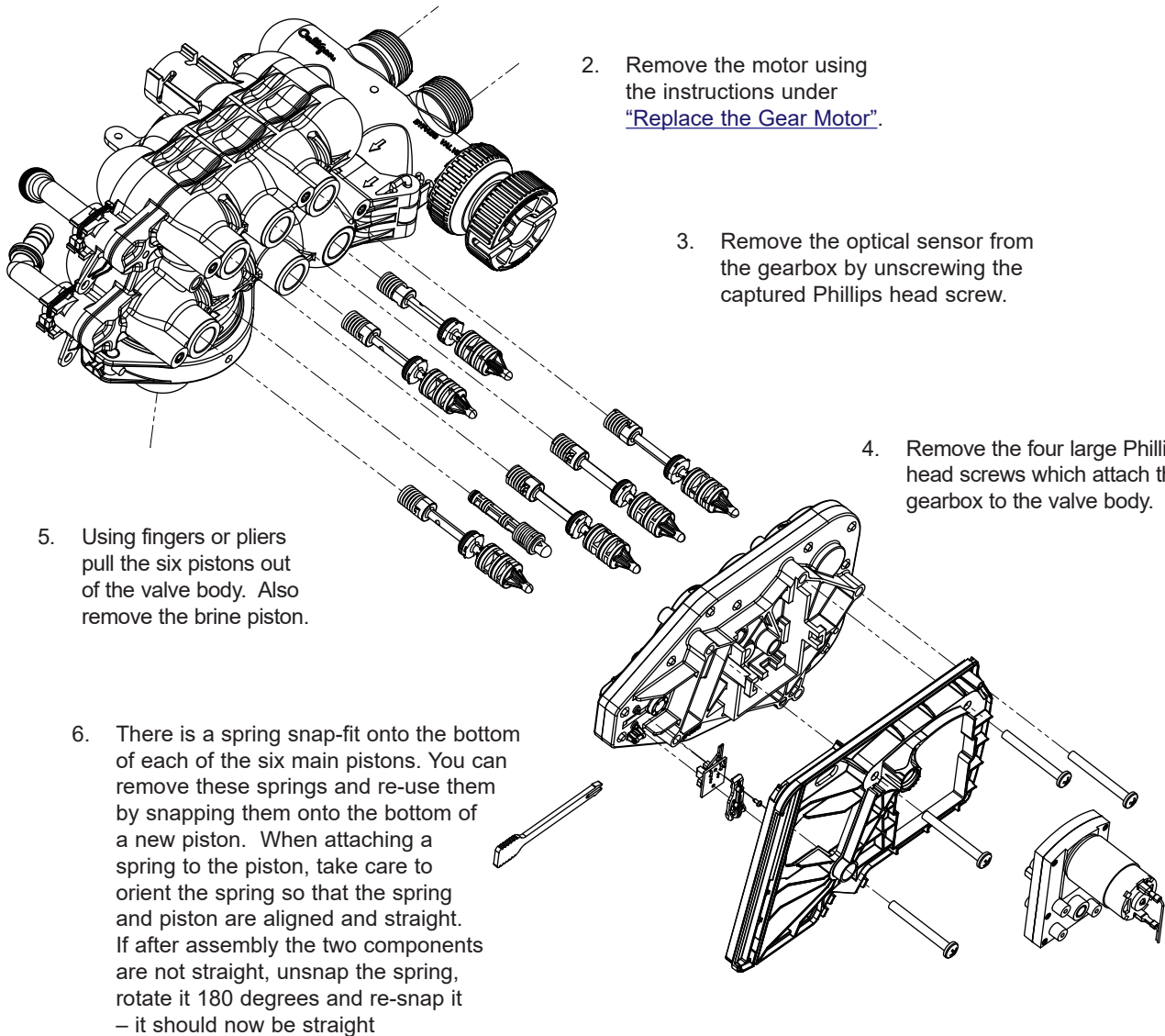


5. In order to insert the new motor into the gearbox, it is necessary to get the “flat” on the motor shaft to line up with the “flat” in the gearbox drive-gear. The easiest way to do this is to hold the motor in position, attempting to push it into the drive gear, while causing the motor shaft to turn 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 31. 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.

Troubleshooting Guide

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 transformer.
2. Filter 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.
	Incorrect programming.	Refer to and verify all settings in the GBX2 Programming Guide, P/N 01040743.
3. Regeneration occurs at incorrect time.	Timer setting incorrect.	Reset timer.
	Timer flashing.	Reset timer and verify that unit is connected to a constant power source.
	Circuit board set to immediate regeneration.	Set circuit board to delayed regeneration.
	Incorrect programming.	Refer to and verify all settings in the GBX2 Programming Guide, P/N 01040743.
4. Error message is displayed.	See the GBX2 Programming Guide, P/N 01040743.	
5. Unfiltered water to service. The root cause of unfiltered water to service may also lead to problems with contaminant reduction.	Incorrect programming.	Refer to and verify all settings in the GBX2 Programming Guide, P/N 01040743.
	Internal seal leak.	Replace pistons.
	Excessive water usage.	Verify that programming is correct. Adjust reconditioning frequency and Day Interval to meet treated water demand.
	Unconditioned water in water heater tank.	Flush water heater to fill tank with filtered water.
6. Loss of water pressure	Control and/or media bed plugged with sediment or iron build-up.	Clean control and increase frequency of reconditioning or length of backwash. Additional filtration may be required.
	Inlet manifold plugged.	Remove control from tank and clean inlet manifold.
	Control plugged with foreign material broken loose from recent plumbing work.	Clean control.
7. Loss of mineral to drain.	Improper drain line flow control.	Ensure that the control has the proper drain line flow control (see Table 2 on page 22).
	Air in water system.	Check water in well pressure tank for the presence of air.
8. Mineral to service.	Inlet and Outlet piping plumbed incorrectly.	Verify inlet and outlet plumbing matches directional arrows molded into control valve.
	Defective outlet manifold.	Replace outlet manifold.
9. Continuous flow to drain	Internal seal leak.	Replace pistons.
	Power failure while unit was in regeneration.	Restore power to unit. Verify that unit is connected to a constant power source.

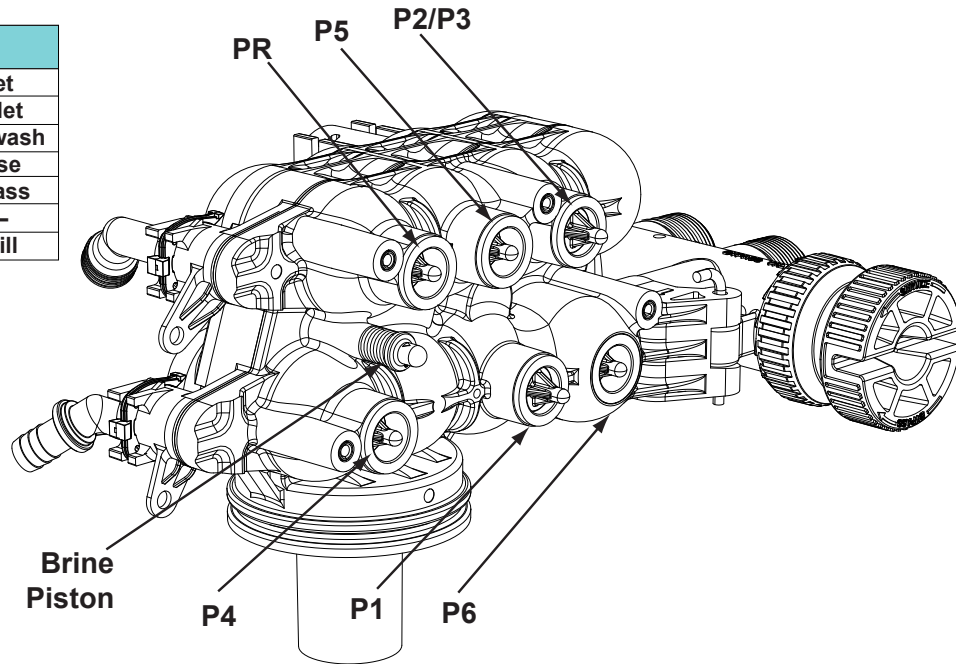
Flow Diagrams

Control Valve Piston Locations

The control valve controls the movement of untreated and treated product during reconditioning 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 32. Valve piston locations

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



Note the reconditioning cycle sequence for downflow regeneration.

Downflow Reconditioning Cycle Sequence

1. Service
2. Backwash
3. Pause/Draw
4. Fast Rinse
5. Pause
6. Bypass

See [page 39](#) through [page 43](#) for Downflow Reconditioning flow diagrams.

Service

Raw water is allowed in the inlet to the top of the tank. The water flows through the filter media up the manifold to the outlet. The water to the outlet should be filtered if the system is operating properly.

Figure 33. Service.

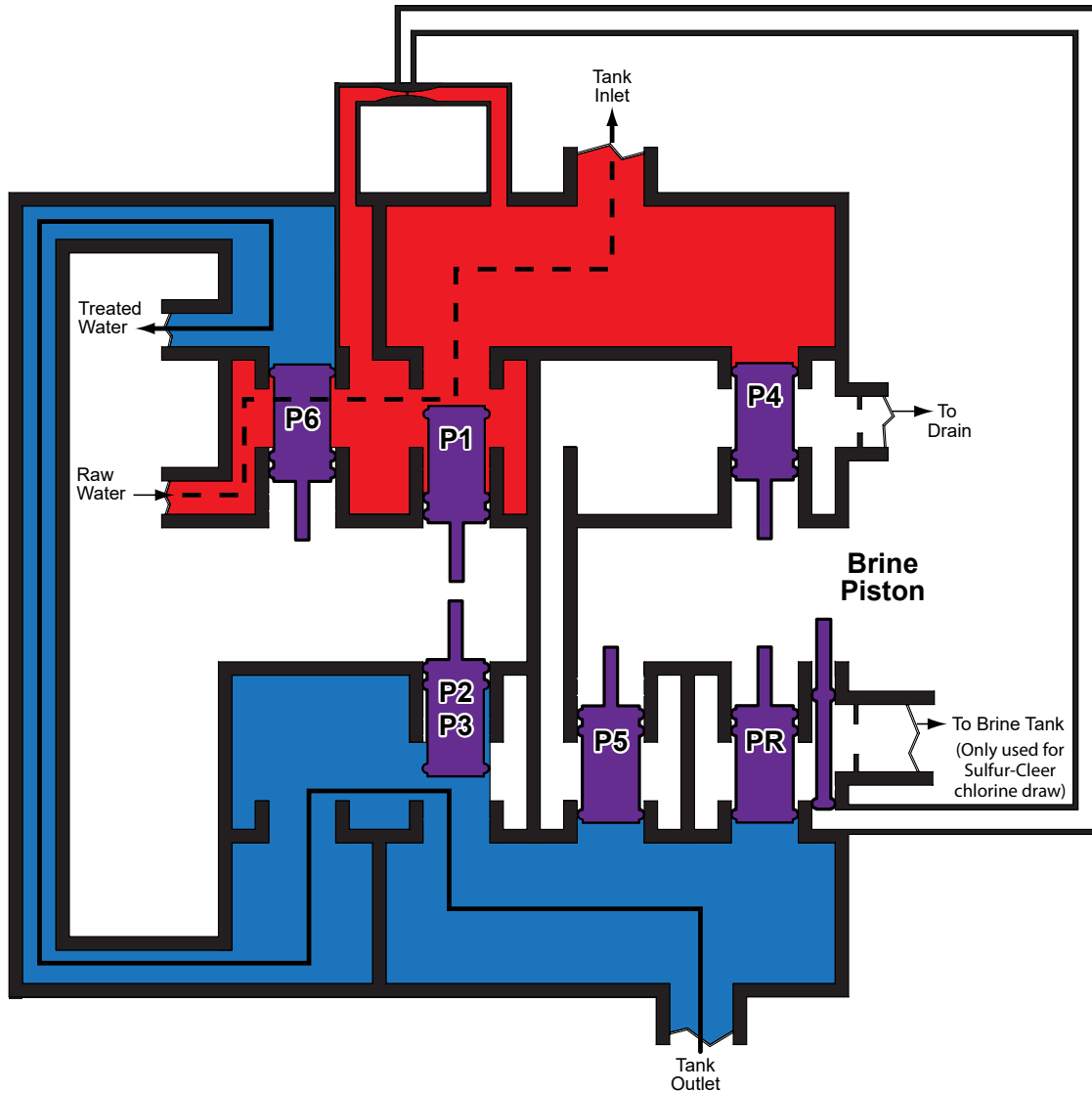


Table 5. Service

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 = Chlorine Solution
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Backwash

Raw water is directed down the center of the manifold, up through the media bed, out the top of the tank to drain.

Figure 34. Backwash.

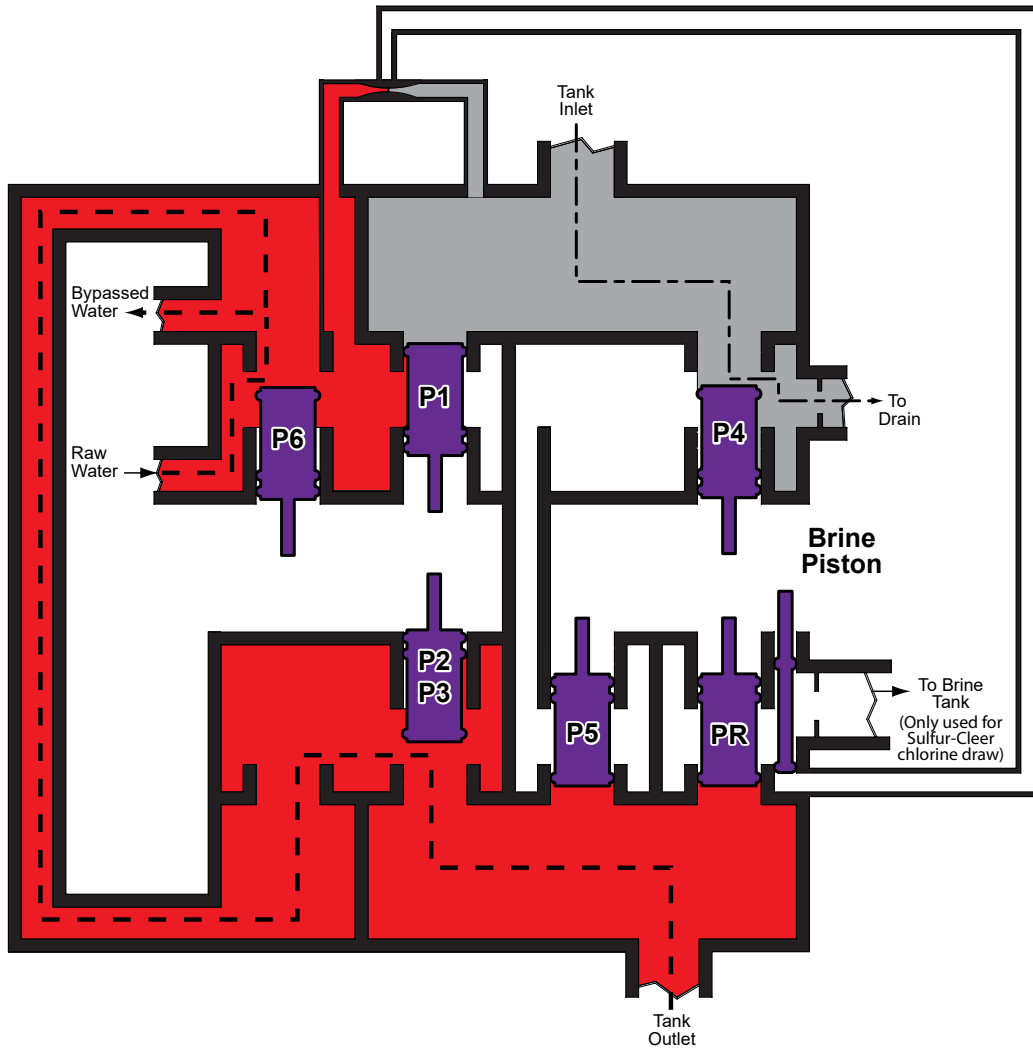


Table 6. Backwash

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 = Chlorine Solution
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Pause / Draw

Because this Automatic Water Filter shares its timer with other water conditioning products, it momentarily stops in a Pause / Draw cycle. This setting is only used for the Sulfur-Clear system for the periodic eduction of chlorine. The Pause / Draw cycle is factory-set at one (1) minute. Refer to the programming section for instructions to adjust the Pause / Draw time.

Figure 35. Pause.

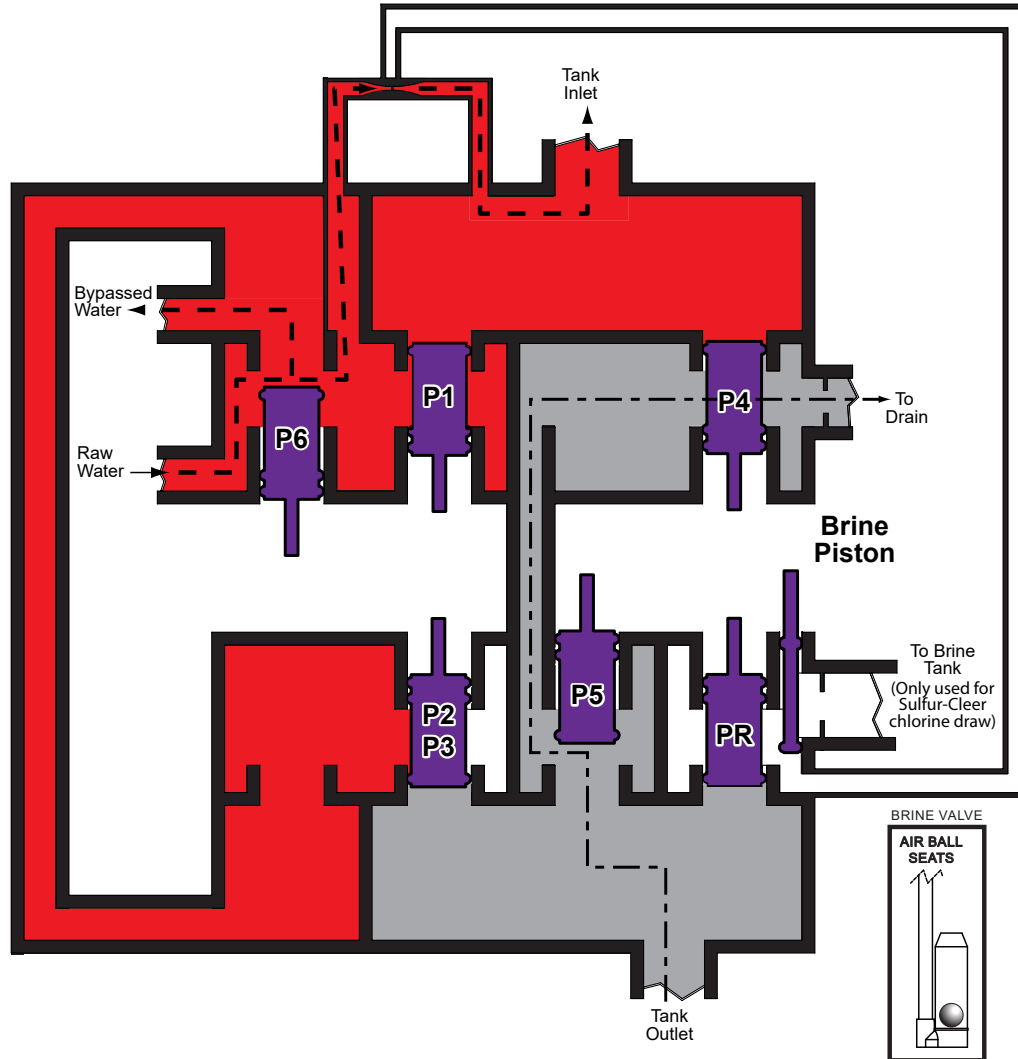


Table 7. Pause

Pause		
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 = Chlorine Solution
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

Fast Rinse

Backwash is followed by a fast flow of water down through the filter tank. The fast flow gets the filter ready for return to service.

Figure 36. Fast Rinse.

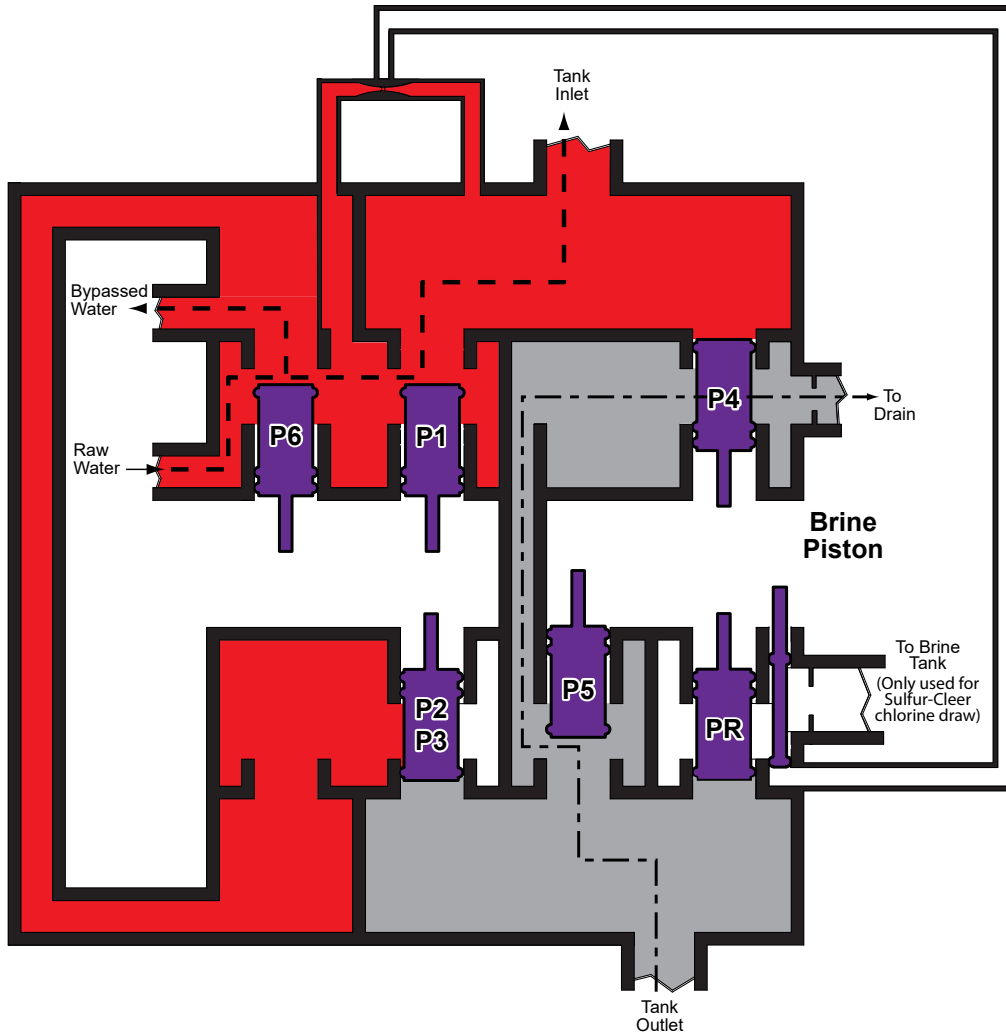


Table 8. Fast Rinse

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 = Chlorine Solution
■	YELLOW = Concentrated Brine
■	GRAY = Water To Drain
■	BLUE = Treated Water
■	PURPLE = Piston

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 (unfiltered water is allowed to service).

Figure 37. Bypass.

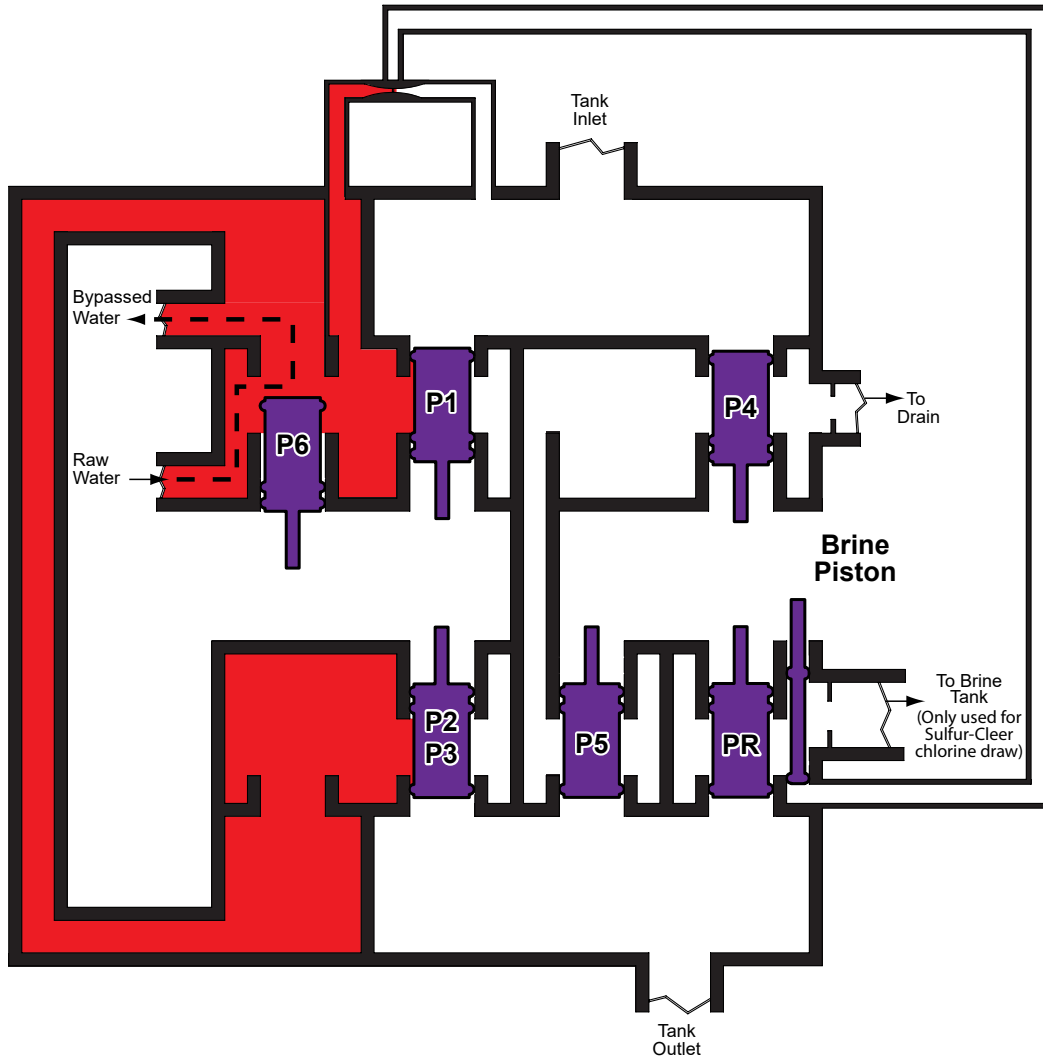


Table 9. Bypass

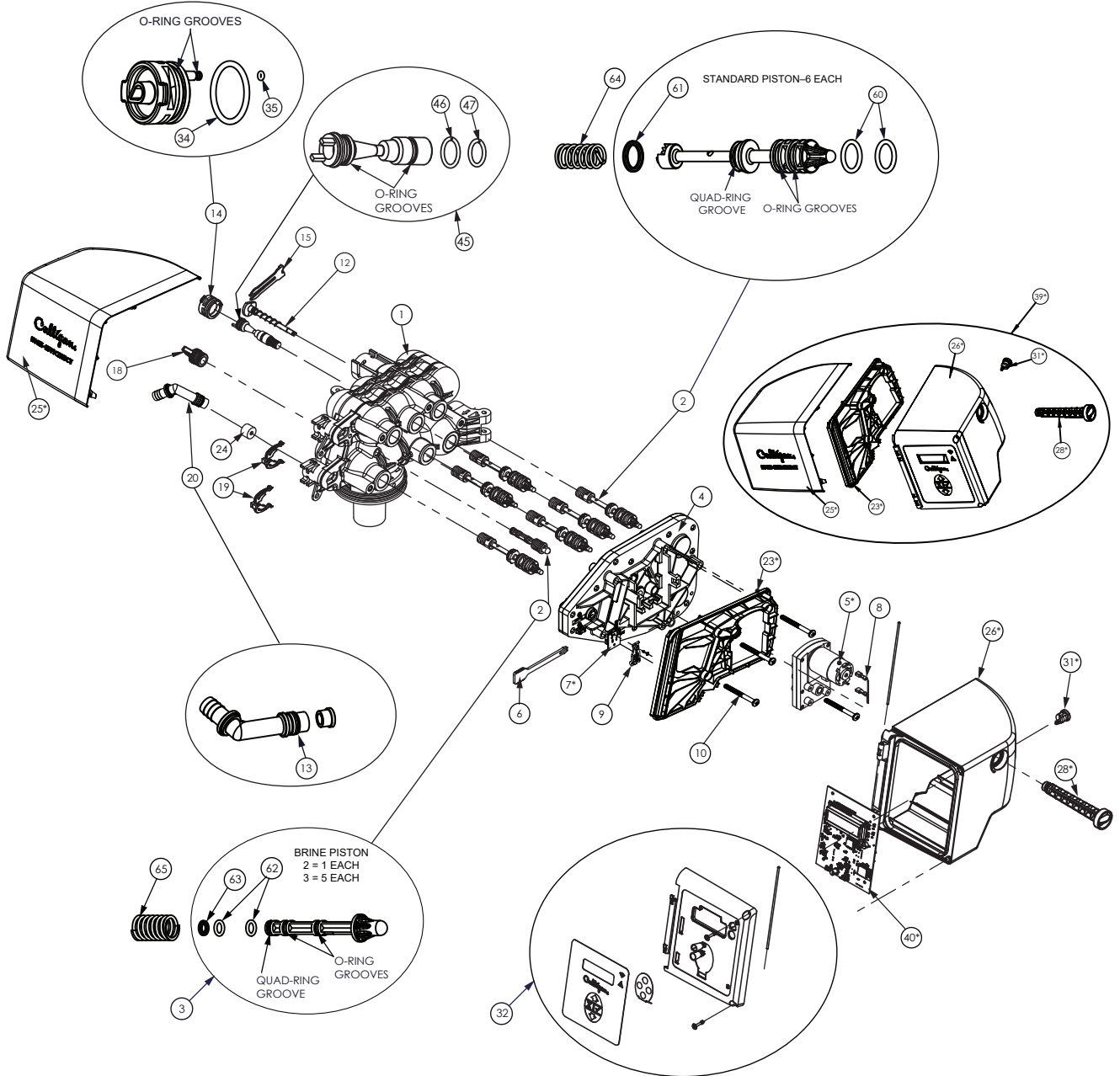
Bypass		
Piston		Position
P1	Inlet	Closed
P2/3	Outlet	Closed
P4	Backwash	Closed
P5	Rinse	Closed
P6	Bypass	Open
Brine Piston	Brine	Closed
PR	Refill	Closed

COLOR KEY

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

Parts List

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



Smart HE Water Filter Control Valve Assembly Parts List

Item	P/N	Description	Item	P/N	Description
	01040340	Smart HE Indoor Control Valve, Filter, Complete		P1040214	Backwash Flow Control, 5.5 gpm, Black, 10ea
	01040341	Smart HE Outdoor Control Valve, Filter, Complete	25	01038223	Cover, HE Control, Indoor, Gray
1	01023020	Valve Body	26	—	Hood, HE Control, Indoor (only available in item 39 kit), Gray
2	01025267‡	Piston Rebuild Kit, Includes 6ea Standard Piston assemblies and 1ea Brine Piston Assembly	28	01038220	Enclosure Thumb Screw (only available in item 39 kit)
3	P1022786	Brine Piston w/80 Duro Quad Seal, HE 1", 5ea	31	P1000372	Strain Relief Fitting, Indoor 25ea
4	01040224	Gear Box Assembly, Downflow, Smart HE	32	01041869	Enclosure Door Kit, Indoor, Gray. (Includes all door components with hinge - no circuit board)
5	01020240	Gearmotor, Indoor	34	P1021162	O-ring, Eductor Plug Assembly, Large, 10ea
6	P1020415	Retainer, Gearmotor, 10 ea	35	P1020424	O-ring, Eductor Plug Assembly, Small, 10ea
7	01020420‡	Position Sensor, Indoor w/Wire Harness	39	01041797	Electronics Enclosure Kit less Circuit Board, Indoor
8	01022735	Wire Harness, Motor	40	01041776‡	Replacement Circuit Board (GBX)
9	P1041775	Kit, Position Sensor Latch w/Screw, 10 PK		01043455	Replacement Circuit Board (GBX2)
10	P1020517	Gear Box Assembly Screw, 4ea	45	P1022242‡	Eductor Assy, Plugged, Kit, 10ea
12	P1020624	Dial-A-Soft Without Knob Assembly, 10ea	46	P1020603	Eductor Throat O-ring, Large, 10ea
13	P0440268	O-Ring & Drain Elbow, 10ea	47	P1020428	Eductor Throat O-ring, Small, 10ea
14	P1020487	Eductor Plug Assembly w/ O-Rings, 10ea	60	P1020431	Main Piston O-ring, 25ea
15	P1020290	Eductor Plug Retainer, 10ea	61	P1025199	Main Piston Quad Ring, 25ea
18	P1044939	Brine Plug with O-ring, HE, Kit, 5 ea.	64	P1020252	Main Piston Spring, 10ea
19	P1030127	Retainer, Brine & Drain Elbow, 10ea	65	P1020286	Brine Piston Spring 10ea
20	P1040222‡	Drain Elbow Assembly, Barbed, 10ea	***	P1041578	Hose Clamp, Drain, 25ea
***	P1040220	Drain fitting, straight w/O-ring, 1/2" NPT, 10 pk	***	01040206	Power Supply, Indoor, 24VDC, 20'
23	01038230	Enclosure Frame, Indoor (only available in item 39 kit)	***	01040207	Power Supply, Indoor, 24VDC, 30' (optional)
24	P1040211‡	Backwash Flow Control, 2.0 gpm, Brown, 10ea	***	P1006498	Plug, Dome, Enclosure, .562", Indoor, 10ea
	P1040212‡	Backwash Flow Control, 3.5 gpm, Green, 10ea	*** Not shown ‡ Recommended Spare Part		

HE Rebuild Kits (Filters)

	9" Filter Rebuild Kit (01044087)	10" Filter Rebuild Kit (01044088)	12" Filter Rebuild Kit (01044089)	14" Filter Rebuild Kit (01044090)
01022242 - Plugged Eductor Housing	1	1	1	1
01040212 - Flow Control,Drain,3.5 GPM,Smart HE & Select/Select Plus	1			
01040213 - Flow Control,Drain,4.5 GPM	1			
01040214 - Flow Control,Drain,5.5 GPM,Smart HE & Select/Select Plus		1		
01040215 - Flow Control,Drain,7.0 GPM,Smart HE & Select/Select Plus		1	1	
01040216 - Flow Control,Drain,10.0 GPM,Smart HE & Select/Select Plus			1	
01040217 - Flow Control,Drain,11.5 GPM,Smart HE & Select/Select Plus				1
01040222 - Fitting Drain w/oring, Angled, 5/8" ID Hose, Smart HE & Select/Select Plus	1	1	1	1
01020487 - Plug Assy,Eductor Housing,HE	1	1	1	1
01041844 - Kit,All Piston Springs,HE	1	1	1	1
01025267 - Piston Rebuild Kit for HE 1"	1	1	1	1
01030127 - Clip Retainer,Drain & Brine,HE	1	1	1	1

Valve Rebuild Kits (Filters)

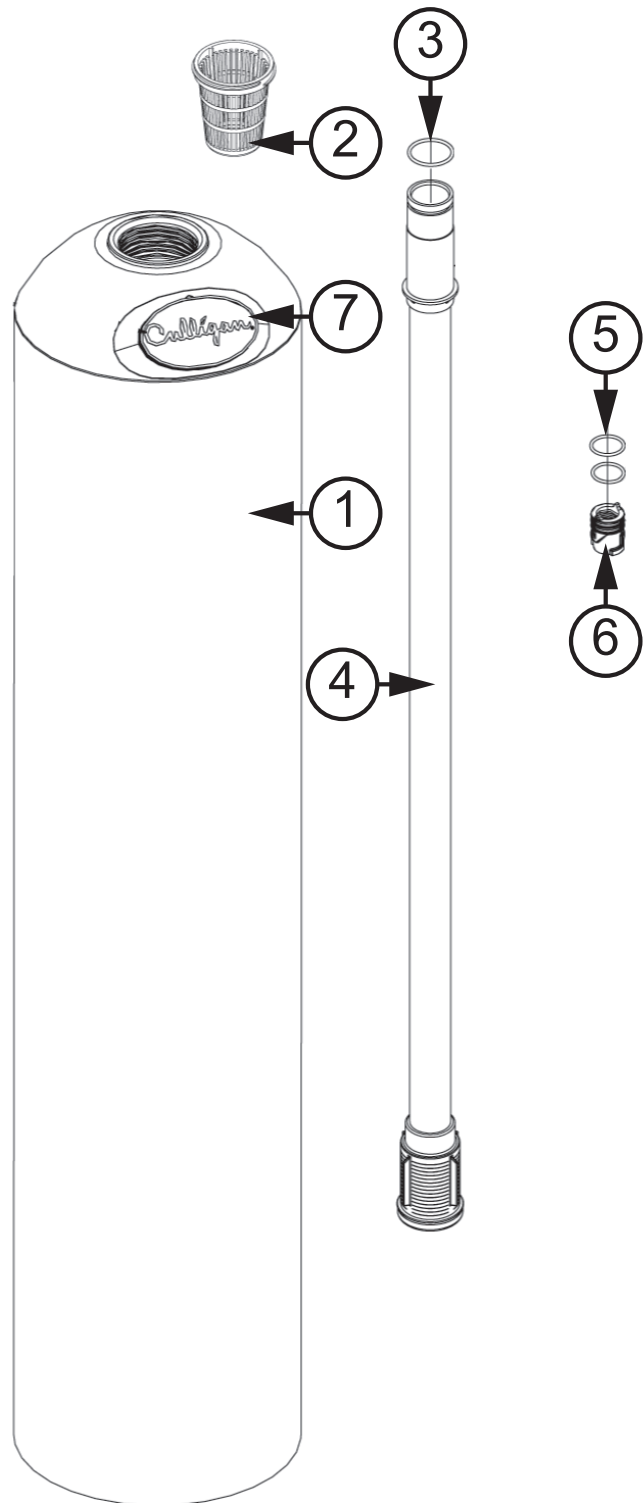
	8" PV 01042516	10" PV 01044301	PV Iron-Cleer 01041905	OX Filter 01041904
01012902 - Seal Pack Assy,Power Valve	1	1	1	1
01013730 - Eductor Sleeve Assy,Filter,White	1	1	1	
00448668 - PLUG FILTER ASSEMBLY EDUCTOR	1	1	1	
01040222 - Fitting Drain w/oring, Angled, 5/8" ID Hose, Smart HE & Select/Select Plus	1	1	1	1
01040211 - Flow Control,Drain,2.0 GPM,Smart HE & Select/Select Plus	1			
01040212 - Flow Control,Drain,3.5 GPM,Smart HE & Select/Select Plus	1			
01040213 - Flow Control,Drain,4.5 GPM,Smart HE & Select/Select Plus	1			
00445797 - Seal,Eductor Port,Power Valve	1	1	1	1
01040214 - Flow Control,Drain,5.5 GPM,Smart HE & Select/Select Plus		1	1	1
01040215 - Flow Control,Drain,7.0 GPM,Black		1	1	
01040216 - Flow Control,Drain,10.0 GPM,Smart HE & Select/Select Plus			1	
01013631 - Brine Piston w/Viton O-Rings (Filters)				1
01013731 - Eductor Sleeve Assy,Sulfur-Cleer,White				1
01024333 - Restrictor Assy,PV,Green				1
01013897 - Restrictor Assy,PV,Blue,Viton				1
00445269 - Eductor Screen				1
01014143 - Eductor Assy,PV,Beige,Viton				1

Media Tank Assembly

Item	P/N	Description	Qty
	01040449	Tank Replacement, 9", w/ Fillport, Gray, QH, Empty	
	01040404	Tank Replacement, 10", w/ Fillport, Gray, QH, Empty	
	01036074	Tank Assembly, 12" w/ Fillport, Gray, QH, Complete, Less Media	
	01040402	Tank Assembly, 14" w/ Fillport, Gray, QH, Complete, Less Media	
2	P1009847	Top Strainer - Fine Slot, 10ea	
	P1011195	Top Strainer - Wide Slot, 10 ea	1
3	P1009099	O-Ring, Manifold, 12 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	01030412	Culligan Emblem, Gray	1
—	00160702	Cullsan, 20 lb bag	*
—	01014632	Cullar D+ , .75 cu.ft. (20 lb)	*
—	00160010	Cullneu, .50 cu.ft. (50 lb)	*
—	01013968	Filtr-Cleer Media Pack - Pre-Measured & Boxed (9" - 1 required / 10" - 2 required)	*

*Refer to "[Specifications](#)" on [page 7](#) for the amount of filter media and underbedding required for each model.

Figure 38. Tank assembly.



Tank Adapter and Bypass Valve

Figure 39. 1" Tank Adapter

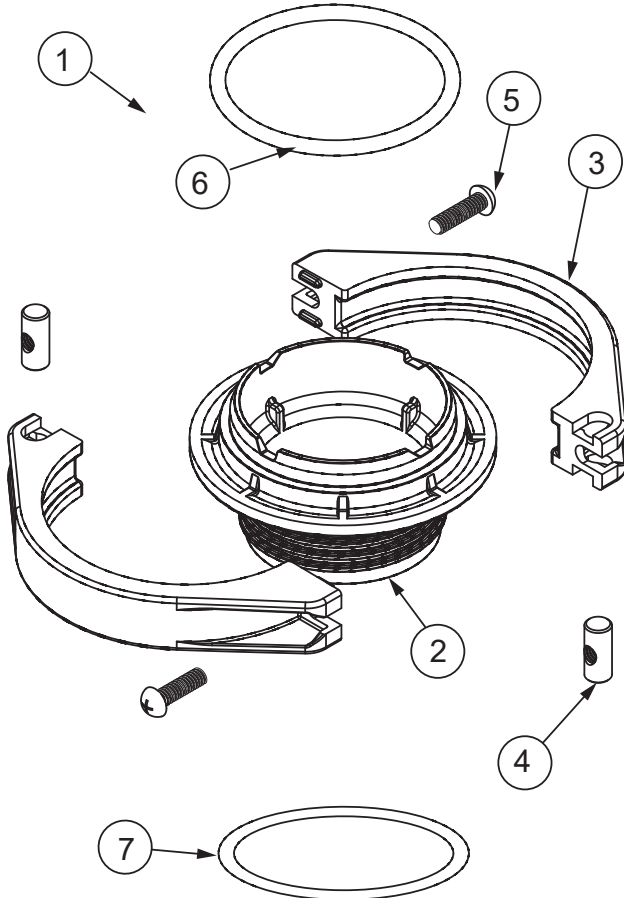
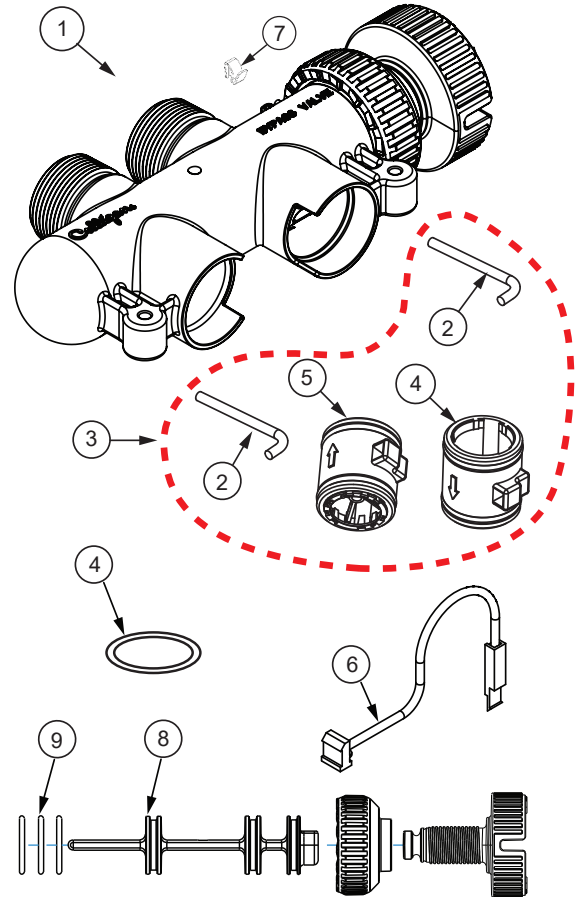


Figure 40. Bypass Valve



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

Bypass Valve

Item	P/N	Description
1	01018760	Bypass Valve, 1.25", 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 1/4" Rotary Bypass (Includes #9)
9	P1016467	Replacement O-Ring for Bypass Valve Stem, 12ea/Kit

‡ Recommended Spare Part

Appendix A - Smart HE Iron-Cleer® Filter

Preparation

Component Description

The water conditioner is shipped from the factory in a minimum of eight cartons (for 10" units; nine cartons for 12" units). Remove all components from their cartons and inspect them before starting installation.

Control Valve Assembly	Includes the High Efficiency control valve, flow meter, and the bypass valve. Small parts packages will contain additional installation hardware.
Media Tank	Includes two tanks complete with manifold.
Filter Media	Includes one package of Birm filter media (10" filters) or two packages (12" filters), one package of G-50, and one package of Cullsan U underbedding.
Aeration Head	Incorporates the compressor and other miscellaneous components.
Pick-up Tube	A long tube that mates with the aeration head inside the tank.

Pre-Installation Check List

- Location of Aeration and Filter Tank: These two tanks should be installed after the pressure tank and as close to each other as practical. If you want to filter outside hose bibs, be sure the filter system is properly sized to handle the flow rates required for extended periods of time, in addition to the normal household demand.
- Drain Line: All drain lines must be a minimum of 1/2" or equal to the size of the drain line connection at the control valve or larger. Avoid overhead drain lines when possible. If used, overhead drain lines are not to exceed a height of five feet above the control valve and should be no more than fifty feet in length.
- Pressure Relief Valve: A pressure relief valve is installed in aeration tank assembly and it is recommended that a separate drain line be extended toward the floor or to a drain receptacle.
- Outdoor installation is not recommended and voids the warranty. If installing in an outside location, you must take the steps necessary to assure the filter, installation plumbing, wiring, etc. are as well protected from the elements (sunlight, rain, wind, heat, cold), contamination as when installed indoors.
- Check Valve: On applications where there is a non-filtered demand for water such as a shared wells (where the filter system is only installed in one of two or more homes), outside hose bibs, farms with outbuildings, yard hydrants, etc. a spring loaded check valve is provided and must be installed ahead of the aeration tank. It is recommended to install the check valve in a vertical up-flow position.
- By-Pass Valves: Two bypass valves are provided with the filter system. One bypass valve is used for the control valve and the other bypass valve is used for the aeration tank.
- Filtered Water: Normally, filtered water is furnished to all household lines; however, outside faucets are typically left on raw water. If filtered water is provided to outside faucets, the filter system must be sized accordingly.
- Treated Water: The filter system should be installed after the pressure tank and before a water softener and water heater.
- Electrical Facilities: A ten(10) foot cord and wall mount plug-in power supply are provided with the filter control. A six(6) foot power cord is provided with the compressor. The customer should provide a receptacle, preferably one not controlled by a switch that can be turned off accidentally. Observe local electrical codes.

Iron-Cleer - Aeration Components and Operation

There are four primary components that control the aeration functions of the Iron-Cleer system. These components are located on the top of the aeration tank and work in unison to provide effective aeration conditions by maintaining the correct air-to-water balance in the aeration tank.

Air Compressor

Supplies and maintains a fresh supply of air in the aeration tank. The air serves to oxidize iron and hydrogen sulfide to a filterable form.

Time Delay Relay

The time delay relay controls the air compressors air recharge cycle and how frequently it occurs. The relay simultaneously energizes the air compressor and the solenoid valve for a 6-minute interval. After a 6-minute fixed run time, the time delay relay turns off the air compressor and de-energizes the solenoid valve. The time delay relay also controls the frequency of the air compressor run cycle which is adjustable from a 1-hour to a 48-hour interval.

Shuttle Valve Operation

The shuttle valve holds air in the aeration tank during the service position and allows air to vent from the tank during compressor operation. In the service position, water pressure holds the shuttle valve piston in the closed position, retaining the airhead in the aeration tank while closing the air recharge inlet port and vent/drain port. During air recharge cycle, air pressure is greater than the water pressure and forces the shuttle valve piston to the open piston allowing air to vent from the aeration tank. The shuttle valve has an internal pressure relief valve that will relieve pressure (greater than 100 psi) in the aeration tank. This safety function protects components from failure due to excessive pressure.

Solenoid Valve Operation

The solenoid valve is a three-way valve with ports that connect to the air compressor, shuttle valve and the atmosphere/drain. In the service cycle, the solenoid valve is de-energized and the port to the air compressor is closed, providing a positive shut-off to the compressor. This prevents water from backing up into the air compressor and causing damage. In the air recharge cycle, the solenoid valve closes the port to the atmosphere/drain and opens the port from the air compressor to the aeration tank allowing replenishment of the airhead.

Operation during Air Recharge Cycle

When energized by the time delay relay, the air compressor sends air through the solenoid valve into one end of the shuttle valve. Once air pressure in the shuttle valve is greater than the water supply pressure at the other end of the shuttle valve, the piston shifts to the open position. In the open position, the bleed-off port discharges excess water and old air to the vent/drain port through a flow restrictor. Simultaneously, the air inlet port opens to provide a direct passage between the air compressor and the top of the aeration tank. The air compressor runs for a fixed 6-minute interval replacing the head of air in the aeration tank with fresh air.

Operation during Air Recharge Shut Off and Service

The time delay relay turns power off to the air pump and the solenoid valve at the end of the recharge cycle. The solenoid valve then closes the port between the air pump and the shuttle valve. The port between the shuttle valve and the atmosphere opens and releases air pressure. This allows water pressure to shift the piston to the closed position. With the piston in the closed position, the air recharge inlet port is closed and passage between the bleed off tube and the drain port is also closed.

Figure 41.
Aeration Service Cycle.

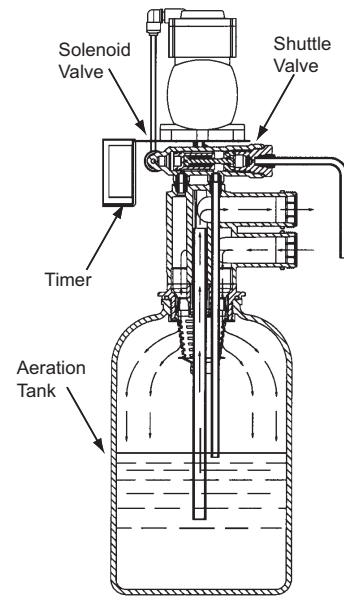
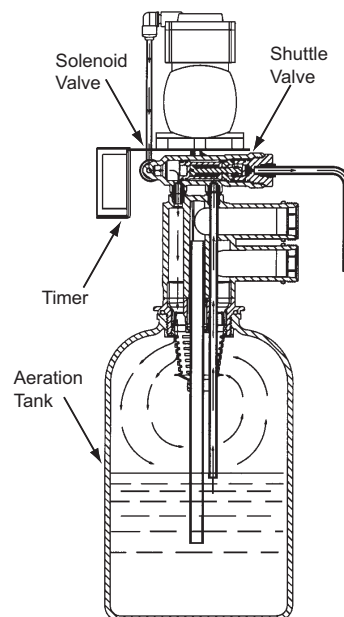


Figure 42.
Air Recharge Cycle.



Installation

NOTE! Read this section entirely before starting the installation. Follow all applicable plumbing and electrical codes.

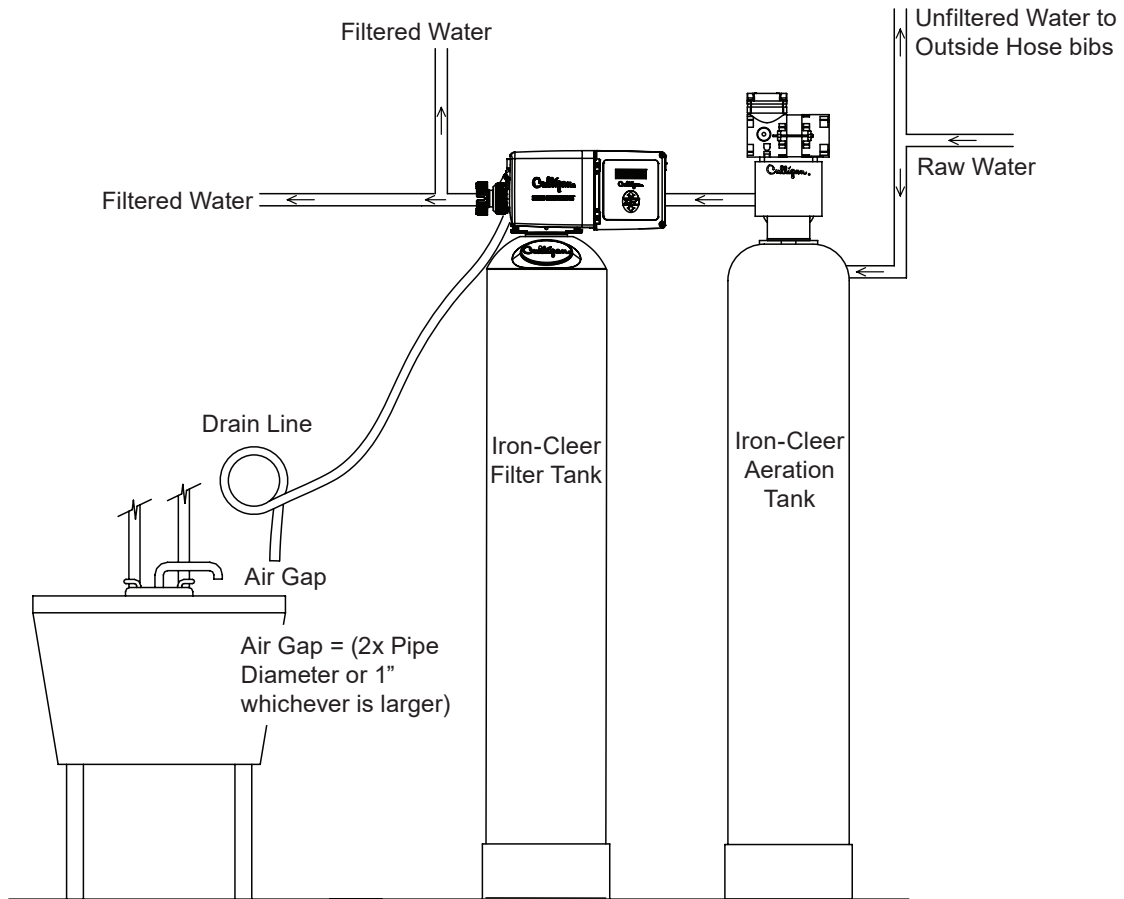
Placement

Refer to [Figure 43](#) for system placement.

Set the media and aeration tanks on a solid, level surface near water, drain and electrical facilities.

NOTE! Waste connections or drain outlets shall be designed and constructed to provide for connection to the sanitary waste system through an air gap of two pipe diameters or 25.4 mm (1 inch), whichever is larger.

Figure 43. Iron-Clear system filter placement.



Filter Media Loading - Iron-Cleer Filters

Table 10. Loading quantities.

Size	Cullsan U (lb)	G-50 (lb)	Birm (Ft ³)	Freeboard (inches)
10" Filter	25	35	1	21
12" Filter	25	35	1.5	18

1. Position the tank in the desired installation location.
2. Remove the inlet strainer by turning it counter-clockwise.
3. Position the outlet manifold in the tank.
4. Cover the top of the manifold with a clean rag to prevent filter media from entering the manifold during filling.
5. Using a large-mouth funnel, load the Culligan Cullsan U underbedding through the top of the tank. See [Table 10](#).
6. Load the G-50 media.
(only 35 lb of the 50 lb bag is used)
Leveling is required. See [Table 10](#).
7. Load the Birm media.
See [Table 10](#).
8. Remove the funnel.
9. Using a hose, top off the tank with water to bring the water level to within a few inches of the top opening and add 2 ounces of 6% liquid chlorine bleach to the tank for sanitization.
10. 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 control to leak.



CAUTION!

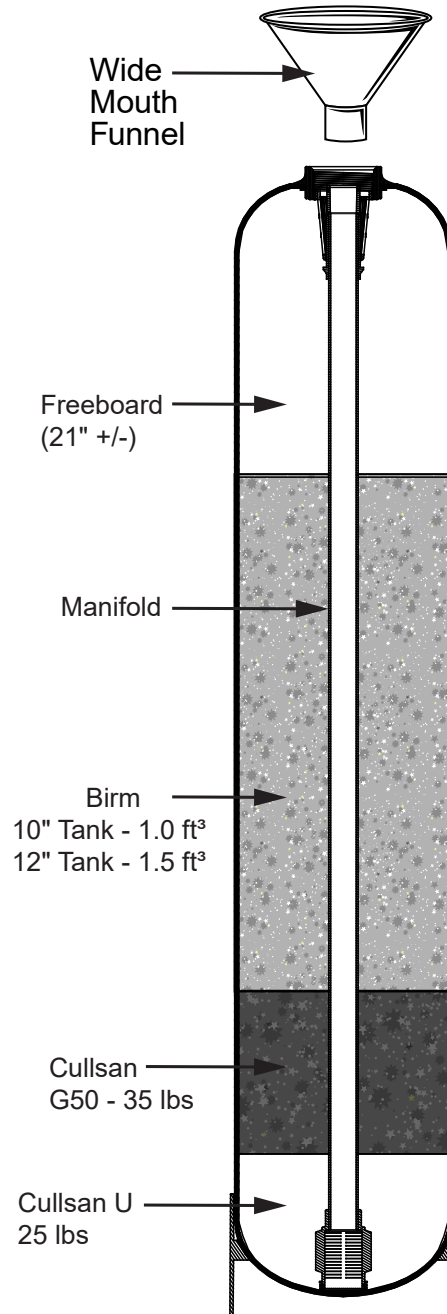
Once the tank is full do not lay it down as this will disrupt the layers of filter media and result in poor performance.



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.

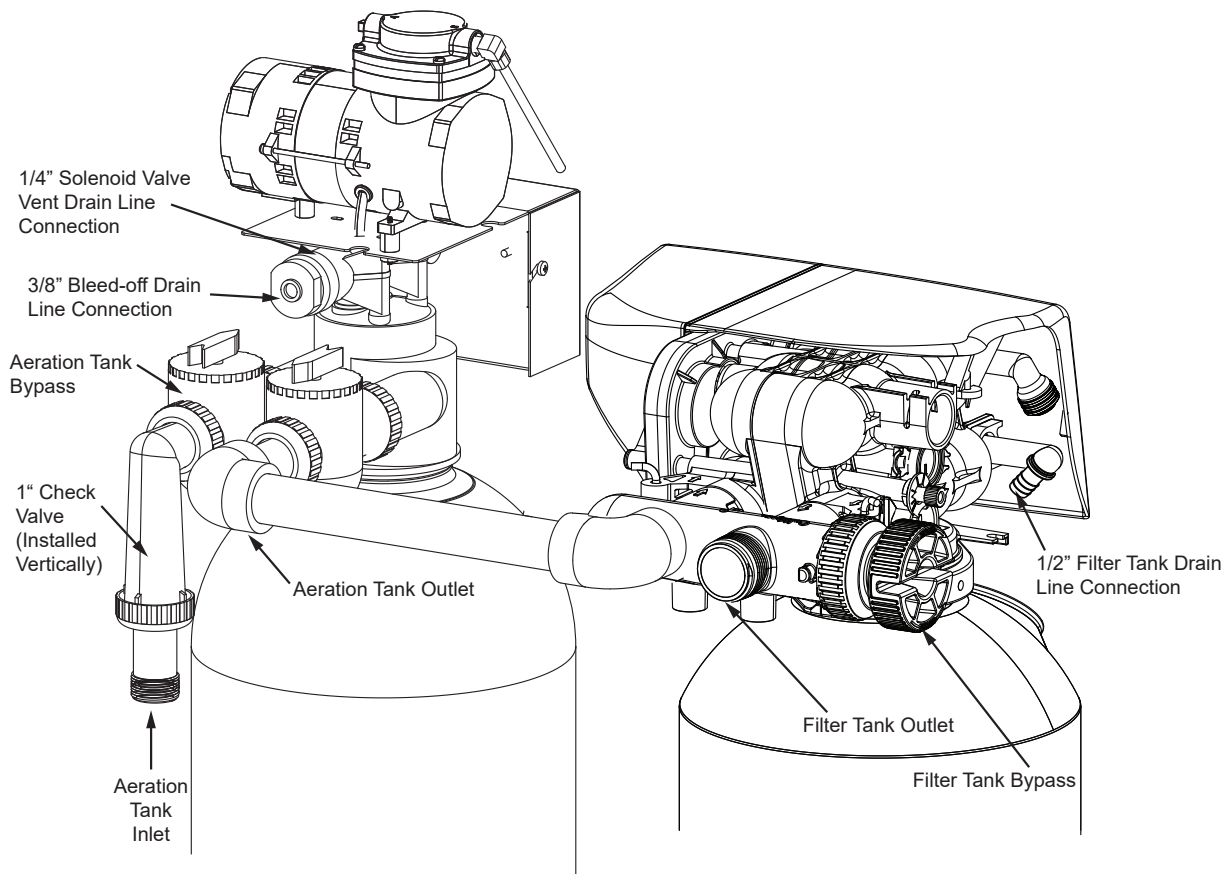
Figure 44. Iron-Cleer Media Tank Cross Section



Drain Lines

1. Filter Tank Drain Line
 - a. Locate the hose clamp in the small parts pack and a length of 1/2" drain line tubing (not supplied).
 - b. Slide the hose clamp over the end of the drain line tubing.
 - c. Push the end of the drain line tubing over the drain line fitting, move the hose clamp to within 1/4" of the end of the drain line at the drain fitting and tighten the hose clamp with a screwdriver.
2. Aeration Head Bleed Off Drain Line
 - a. Connect 3/8" tubing (not supplied) to the bleed off drain line connection on the aeration head (see [Figure 45](#)).
3. Solenoid Valve Vent Drain Line
 - a. Connect 1/4" tubing (not supplied) to the solenoid vent connection on the aeration head (see [Figure 45](#)). It is recommended that the 3/8" aeration head bleed off drain line and solenoid valve vent drain line not be connected together. Water flowing to drain from the solenoid vent line is a means of troubleshooting; the solenoid will normally expect very little moisture unless an internal seal fails from within the valve body.
 - b. Run the drain lines to a suitable waste outlet, such as a laundry tub, floor drain, or stand pipe and in accordance with local plumbing codes. To prevent back-siphoning of drain contents, an air gap is desirable and is required by law in most states. PROTECT THE DRAIN LINE FROM FREEZING TEMPERATURE!
 - c. DO NOT connect the drain lines together.
 - d. Cut the drain lines to the required length.
 - e. Secure the end of the drain line to an immovable object to prevent its being forced out of place during the drain cycle.

Figure 45. HE Iron-Clear drain lines.



Aeration Tank Installation

Aeration Head Assembly Quick Install

1. Insert the white disperser into the bottom of the aeration head. Twist it clockwise to lock it into position. See [Figure 46](#).
2. Insert the small gray rigid tube into the white disperser and up into the aeration head. **The tube must go into the disperser approximately 8 ¼", until it contacts the stop molded into the aeration head.** Approximately 8 ¼" will remain sticking out of the white disperser. If more than this amount is sticking out of the disperser, the tube is not fully inserted into the aeration head. The tube can be marked with a pencil at 8 ¼" as a visual guide. See [Figure 46](#).
3. Locate the large tube provided and mark it 4 ⅜" from the end. Insert it into the white disperser and aeration head until it contacts the stop molded into the aeration head. Approximately 4 ⅜" of the tube will be in the white disperser when properly seated. Use the mark to verify it is inserted deep enough. See [Figure 46](#).
4. Tighten the screw on the white disperser to secure the two tubes as shown. See [Figure 47](#).
5. Install the assembly onto a tank.
6. Locate the bypass valve, inlet elbow, and 1" threaded adapters.
7. Lightly lubricate the external O-rings on the bypass valve with silicone lubricant. Connect the bypass valve to the inlet and outlet connections on the rear of the aeration head assembly. See [Figure 48](#).
8. Lightly lubricate the O-ring on the plastic elbow check valve with silicone lubricant and then assemble it to the inlet port on the bypass valve as shown. See [Figure 49](#).

NOTE! The small hole in the white disperser must be in the position shown after it is locked into position.

Tighten the plastic nuts by hand only.

The inlet of the plastic elbow check valve must face down when installed.

No extra external check valve is required.

Tighten the plastic nuts by hand only.

Figure 46. Insert small tube.

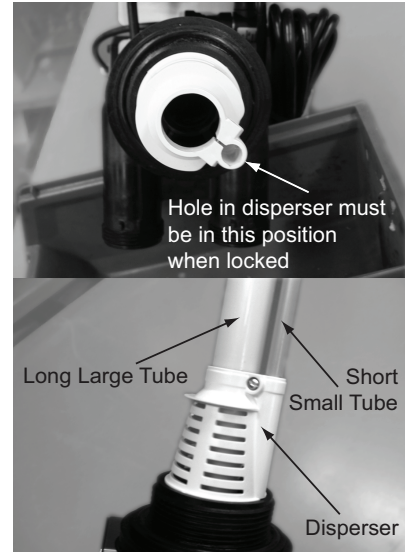


Figure 47. Insert large tube.

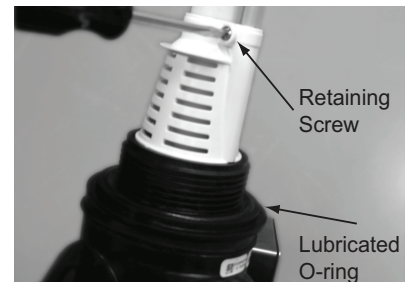


Figure 48. Bypass valve.

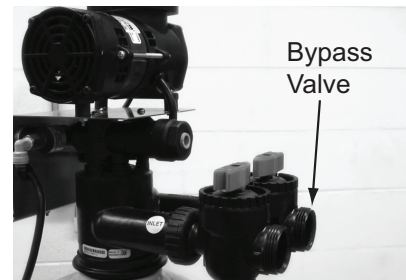
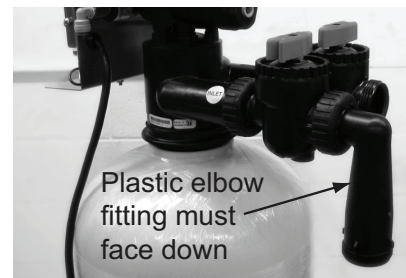


Figure 49. White disperser.



- Assemble the 1" threaded fittings using the fittings, nuts, O-rings, and split rings provided. Follow the illustration that is packed with the fitting kit. Lightly lubricate the o-rings on the threaded fittings with silicone lubricant. Assemble one of these fittings to the inlet of the plastic elbow and assemble the other one to the outlet port on the bypass valve as shown. See [Figure 50](#).

NOTE! Tighten the plastic nuts by hand only.

- Run 1/4" tubing from the solenoid valve exhaust port and 3/8" tubing from the aeration head drain connection to an atmospheric drain separate from the filter drain. Connect the Solenoid Valve Exhaust Port Tube (1/4" connection) to the atmospheric drain, then connect the Aeration Head drain tube (3/8" connection) to the atmospheric drain. See [Figure 51](#).
- The outlet of the aeration tank is then connected to the inlet of the filter tank. One-inch diameter pipe is required.

Figure 50. Fitting Assembly.

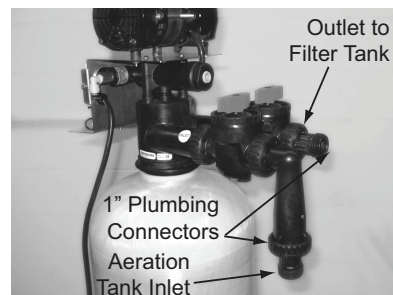


Figure 51. Tube connections

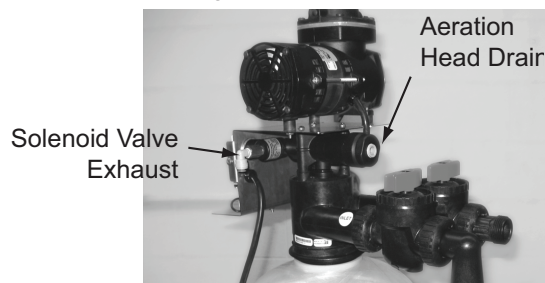
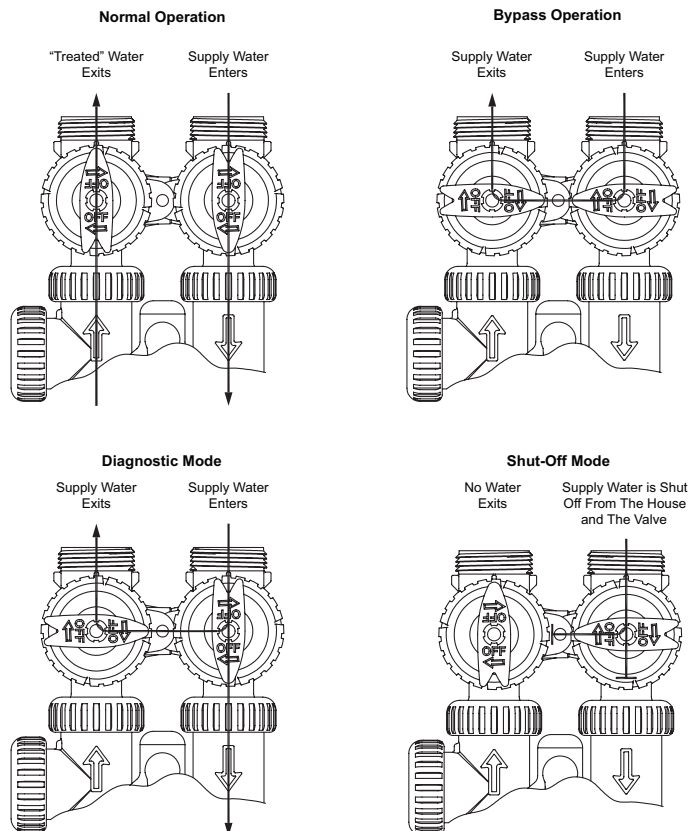


Figure 52. Bypass valve operations.

Aeration Tank – Bypass Valve Operation



Settings

Your Culligan® Iron-Cleer® Water Filter is designed to perform efficiently on a wide range of water supplies. Before the unit can be recharged and put into service, several settings must be made.

Backwash Cycle

Backwash expands and loosens the media bed, and flushes away accumulated particulate matter. The backwash interval is preset at the factory for 10 minutes, which is adequate for most water supplies. It is recommended that backwash last just long enough so that the effluent from the drain line is clear. Backwash too long and water is wasted, not long enough and the tank becomes fouled with sediment. Refer to the GBX2 Programming Guide (01040743) to increase or decrease the backwash interval. This manual can be obtained from your local dealer, CPort (www.cport.culligan.com) under the [Technical Service Tab](#) or on the Service Tech App.

Pause Cycle

The Smart HE Filter Control shares programming with other water conditioning products which would use this period for the education and rinsing of salt, or other regenerant chemical. The pause step duration is one (1) minute.

Fast Rinse Cycle

Fast rinse settles and compacts the media after backwashing and flushes any residual particulate matter from the bottom of the filter bed before returning the filter to service. Fast rinse is set at the factory at 10 minutes. It may be extended, if desired. Refer to the GBX2 Programming Guide (01040743) to increase or decrease the rapid rinse interval. This manual can be obtained from your local dealer, CPort (www.cport.culligan.com) under the [Technical Service Tab](#) or on the Service Tech App.

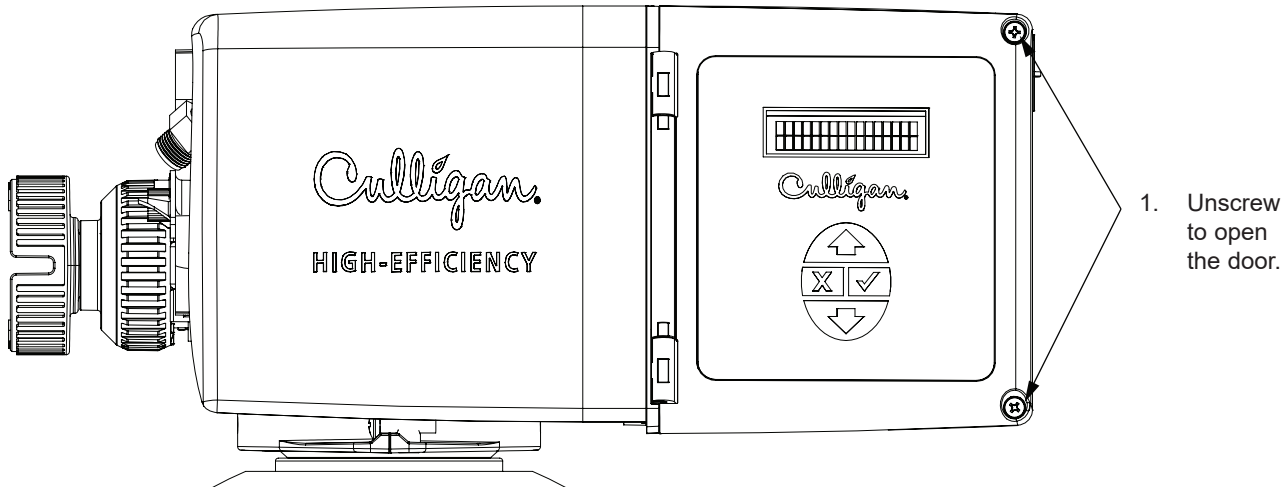
Backwash Frequency

Refer to the GBX2 Programming Guide (01040743). This manual can be obtained from your local dealer, CPort (www.cport.culligan.com) under the [Technical Service Tab](#) or on the Service Tech App.

Circuit Board Connections

The 24 volt power supply and flow meter wire harness is already connected to the circuit board. Refer to the instructions below and [Figure 53](#) to [Figure 55](#) for connecting the aeration controller relay and any accessories to the GBX2 circuit board.

Figure 53. Open HE Enclosure Door



WARNING!

Disconnect all electrical power to the unit before connecting.



CAUTION!

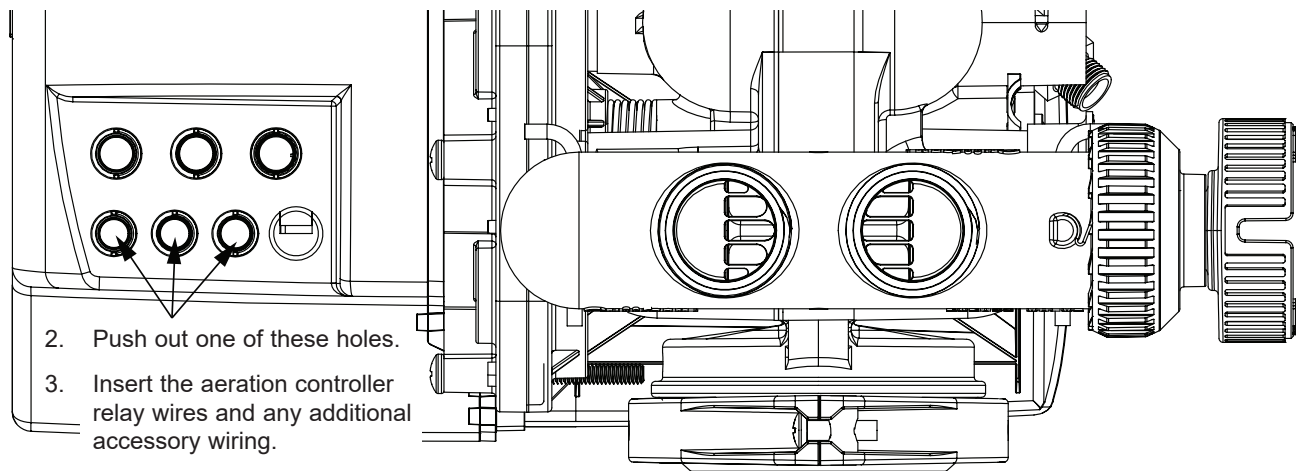
Grip all connections to the circuit board by the connecting terminals for assembly and disassembly. Failure to do so could result in damage to the wire leads or connecting terminals.

CAUTION!

Do not touch any surfaces of the circuit board. Electrical static discharges might cause damage to the board. Handle the circuit board by holding only the edges of the circuit board. Mishandling of the circuit board will void the warranty.

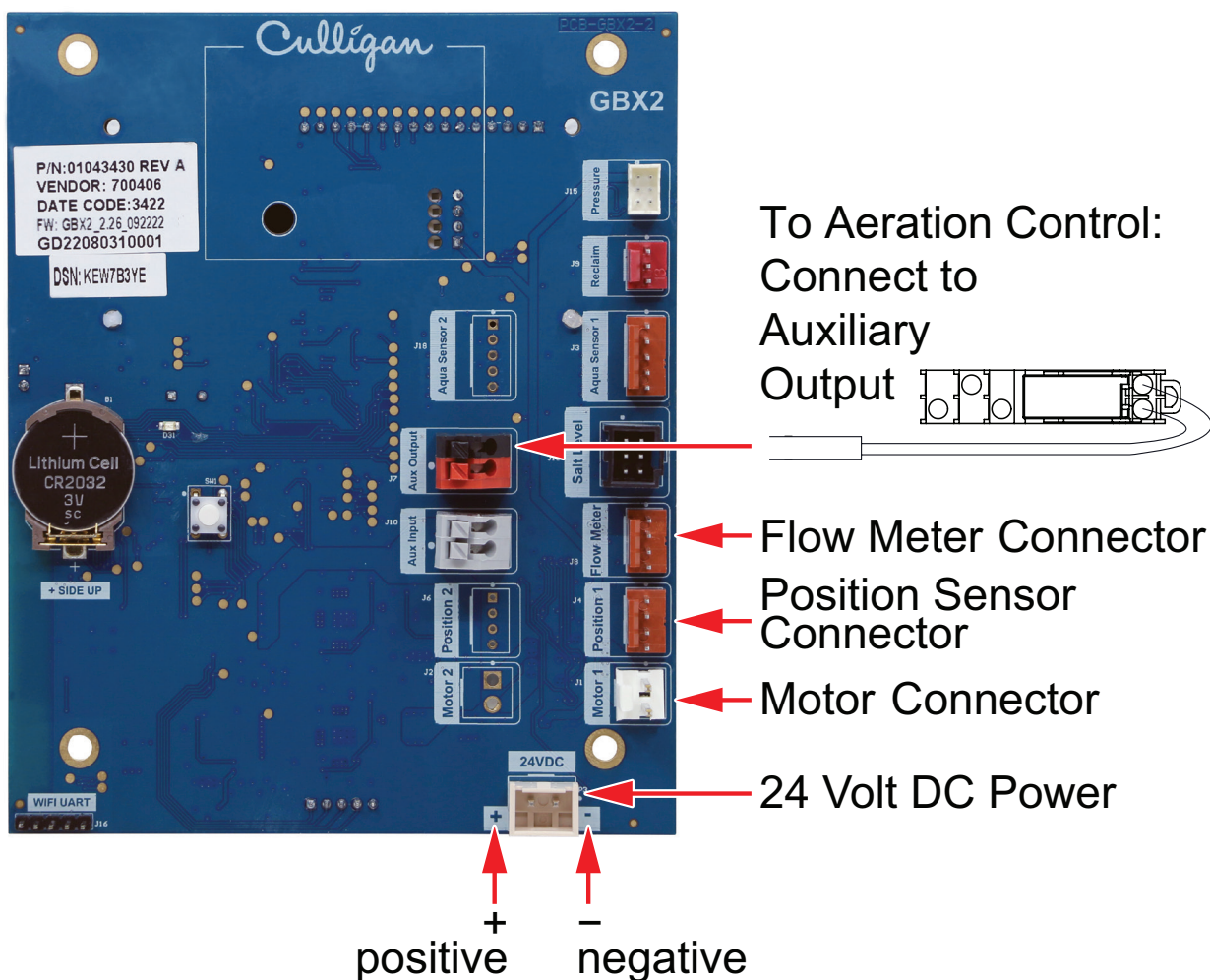
NOTE! Observe all state and local electrical codes.

Figure 54. Insert Wire with Bushing.



4. Connect the two wires from the aeration controller relay to the Aux Output terminal connections as shown and any additional accessories to the GBX2 board.
5. Pull any excess wire out of the enclosure and route the wiring inside the enclosure to avoid interference.
6. Attach the strain relief fitting to the accessory's cord and insert into the enclosure.

Figure 55. Connecting Aeration Controller Relay to GBX2 circuit board

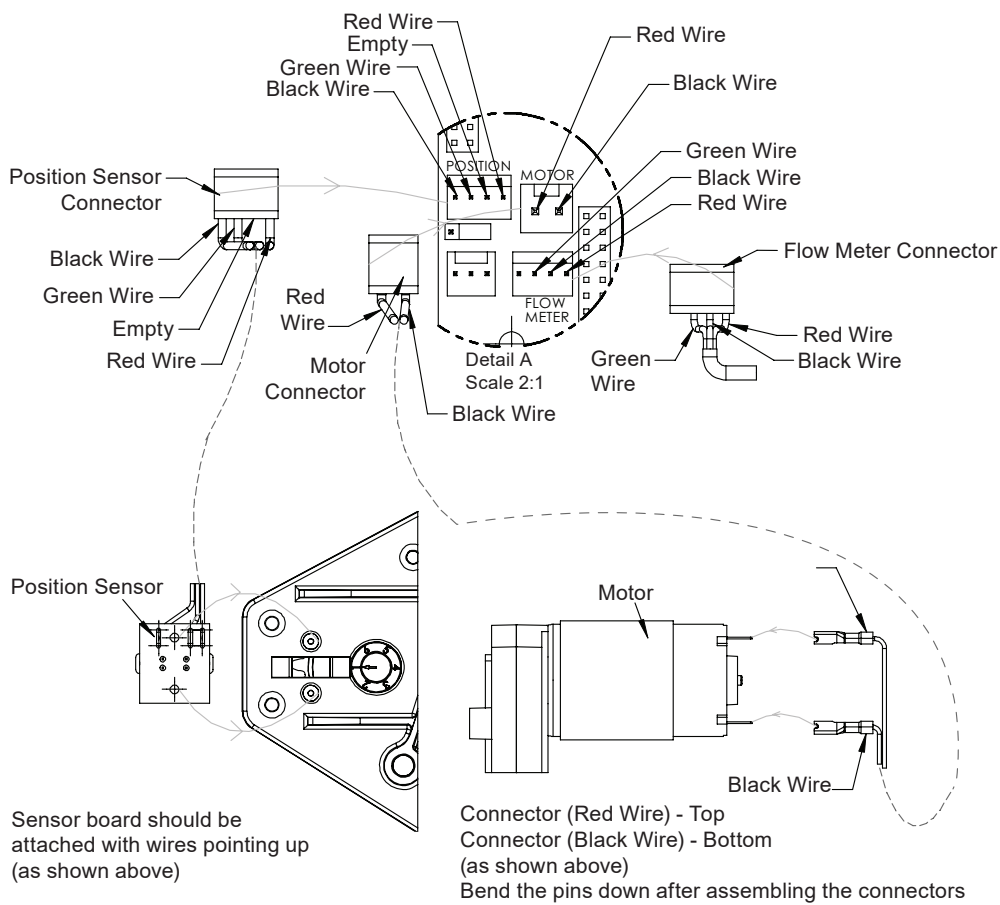


CAUTION!

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.

7. Tighten screws to close the door.

Electrical Schematic



Final Startup

Recommended Start-Up Procedure

Refer to "[Recommended Start-Up Procedure](#)" on page 29.

Before Leaving The Installation Site

1. Sanitize the water filter.
2. The water heater will hold unfiltered 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 filtered. If filtered hot water is required immediately, refer to the water heater owner's manual for the proper method of draining the water heater.
3. Explain the operation of the filter to the customer. Make sure the customer knows that there will be new sounds associated with the reconditioning of the unit.
4. Sign and date the corresponding performance data sheet. Leave the Owner's Guide with the customer.
5. Attach the appropriate data plate label located in the Parts Pack onto the back of the control.
6. 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 particular installation was made, the outside sill cocks may or may not be served by conditioned water. Ideally, all lines not requiring filtered water should be taken off upstream of the filter. This is not always possible, however, due to the difficulty or expense of rearranging the piping.

Bypass the filter if:

1. The outside lines do not bypass the water filter and the water is to be used for lawn irrigation or other outside uses.
2. Water is not used for several days.
3. You wish to inspect or work on the valve.
4. A water leak from the valve is evident.

Three-Valve Bypass

To bypass, close the inlet and outlet valves, and open the bypass valve. Reverse the process to get filtered water once again. Be sure to close the bypass valve completely to avoid mixing non-filtered water with filtered 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 unit is running to drain or leaking, close the outlet valve in addition to the inlet valve.

Care and Cleaning

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

1. Do not place heavy objects on top of the filter 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 filter and drain line from freezing temperatures.
4. Reset the time, if required, after any interruption of electrical power to keep the unit on its normal schedule.

Recommended Preventive Maintenance Maintenance Inspection

This Culligan water filter has been designed to provide a good, consistent service life. Because of the nature of problem water, we recommend that the local Culligan dealer provide regular maintenance/service contracts for the proper operation of your systems. The water filter service begins with a multi point inspection of your water filter system in an effort to uncover any and all problems that may exist. Listed below is a recommended list of maintenance items to be inspected at a minimum of once a year (or more frequently depending on the raw water quality).

Test Water	Feed	Product
Hardness		
Iron		
Hydrogen Sulfide		
Chlorine		
TDS		
Other		
Comments:		
Bypass Valve		
Bypass in Service or Bypass?		
Condition of bypass valve		
Operation OK?		
Control Valve		
Condition of Pistons		
Condition of Solenoid Valve		
Condition of Motor:		
Condition of Flow Control		
Condition of Optical Sensor		
Condition of Check Valve		
Condition of Shuttle Valve		
Condition of Compressor	Output PSI	
Control settings	Before	After
Check /reset Circuit Board		
Check time of regeneration		
Compressor ON time (seconds), OFF time (gallons/minute)		
Backwash step (minutes)		
Pause step (minutes)		
Rapid Rise step (minutes)		
Cycle control	Test Cycle	OK?
Backwash		
Fast rinse		
Media Tank		
Freeboard inches:		
Media Condition		
Iron Cleer: Condition of strainer in Aeration Tank		

Application Problems

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

Operation and Performance Specifications

Provides the limits of water characteristics for the Culligan High Efficiency Series™ water filters. If the water characteristics fall outside these limits, 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.

If there are no apparent general problems or environmental problems, refer to [“Troubleshooting” on page 63](#).

Service and Repair

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. Allow the unit to complete the regeneration 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:

- Iron and Hydrogen Sulfide test kits
- Pressure gauge, 0-120 psi
- 5-Gallon bucket and watch
- Calculator

The customer can provide most data. 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; possibly a service call might 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.

Troubleshooting

General Troubleshooting

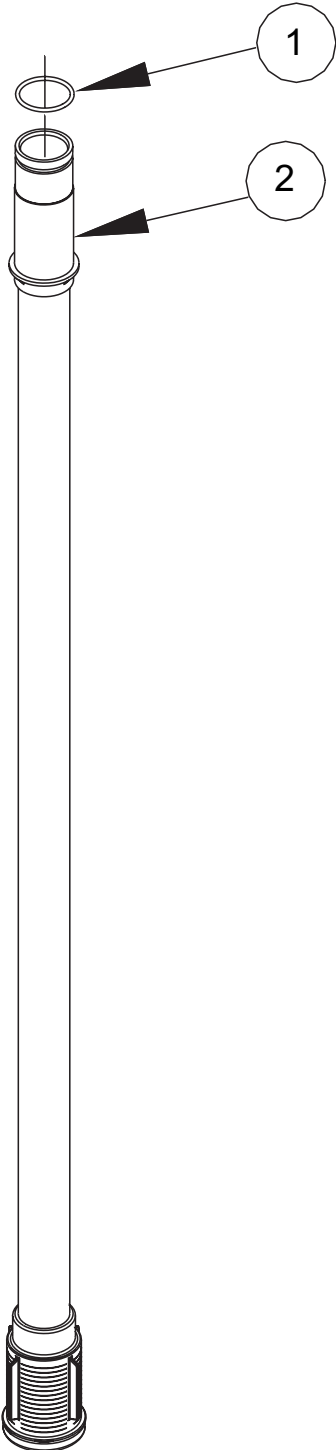
Complaint	Problem	Cause	Solution
Iron bleed-through or staining.	Inadequate backwash of filter	1. Plugged drain line flow control	1. Clean or replace drain line flow control
		2. Insufficient water supply from well.	2. Check for minimum specified flow and pressure requirements of filter system.
		3. Plugged aeration tank inlet diffuser or pick-up tube.	3. (Generally will only plug with the presence of iron bacteria.) Clean aeration assembly and shock treat the water supply with chlorine as needed to control iron bacteria.
		4. Media bed fouled.	4. Rebed filter and correct the cause of fouling.
	Fails to regenerate	1. Interrupted electrical service.	1. Assure continuous electrical supply (check plug, breaker, fuses, etc.).
		2. Faulty circuit board.	2. Replace circuit board.
		3. Faulty drive motor.	3. Replace drive motor.
		4. Circuit board set incorrectly.	4. Reset circuit board.
	Water contaminant levels are greater than limits established by the manufacturer	1. It is not uncommon for local water conditions to change.	1. Consult manufacturer.
	Inadequate aeration	1. Loss of air through inlet check valve.	1a. Check installation position of check valve - Consult Installation and Operation Manual for proper position.
			1b. Check for foreign material in seat of check valve, clean or replace as required.
		2. Loss of air through air leak.	2. Check aeration tank assembly and air recharge line and fittings for any air leaks and repair (Note: soapy water solution works well for locating air leaks)
		3. Faulty aeration pump.	
		a. Electrical failure	a. Assure permanent electrical service (check plug, breaker, fuses, terminal block on control valve, etc.).
		b. Pneumatic failure	b. Check for adequate pressure and volume production from air pump.
c. Damp environment		c. Clean, repair or replace aeration pump, ventilate environment or provide external air source.	
4. Air loss through high demand	4. Increase regeneration frequency of filter.		
Exceeding recommended filter system flow rate.	1. Service flow rate demand is higher than filter system design flow rate.	1a. Install a flow control at filter system outlet equal to or less than the design flow rate of filter system.	
		1b. Install additional filter(s) or a larger single filter system which meets both the service flow demand and backwash flow requirements available.	

Complaint	Problem	Cause	Solution
Iron bleed-through or staining. Cont.	Regeneration during service flow demand.	1. Time of day set incorrectly.	1. Reset timer.
	Raw water bleeding through filter.	1. Internal control valve leak.	1a. Assure all adapter base o-ring seals are in place 1b. Replace seals, spacer and piston assemblies.
Water leaking from relief valve.	Dirt lodged under seat of valve.	1. Pressure has exceeded rating on relief valve and caused valve to open	1. Check pressure on system. Adjust if necessary. Clean or replace relief valve.
	Faulty or defective relief valve		1. Replace valve
Water is effervescent	This can be expected when water is aerated under pressure.	1. Water supply has been naturally aerated under well system pressure. As water is released to the atmosphere, air molecules separate from the water molecules.	1. This natural phenomenon will typically dissipate to the atmosphere in a matter of seconds. If preferred, water can be drawn and stored in an open container prior to use (i.e. fill a pitcher and store in the refrigerator for cool, fresh drinking water).
Loss of pressure	See Cause and Solution for: “Inadequate backwash of filter” and “Fails to regenerate” Under the Complaint column: “Iron bleed-through or staining.” on page 63:		
Air spurting at outside or non-filtered water fixtures.	Inlet check valve not sealing.	1. Improper installation location.	1. See installation and operation manual for proper location of inlet check valve
		2. Foreign material preventing check valve from seating properly.	2. Clean or replace check valve.
		3. Worn or faulty check valve.	3. Replace check valve
Air spurting from filtered water fixtures.	Reduced pressure in distribution system.	1. Service flow demand is greater than water supply available from well pump system.	1. Repair or replace well pump system.
		2. Water flow is restricted by supply piping and/or water treatment equipment.	2a. Eliminate restrictions in supply piping to water treatment equipment such as iron bacteria plugging the upper diffuser assembly, etc. 2b. Install larger water treatment system to provide less pressure drop.
Loss of media through drain line.	New filter backwashed during first 24 hours after installation.	1. New filter media is shipped in a dry condition and must soak for 24 hours to become fully saturated before a backwash cycle.	1. Clean drain line flow control, seals, control valve body, spacers, and piston assemblies
	Air passing through filter during backwash.	1. Excess air accumulated in aeration tank from aeration pump. 2. Excess air accumulated in filter system from water supply or well pump.	1. Bleed-off valve flow control is plugged with foreign material - clean or replace. 2a. Repair well pump system. 2b. If the cause was due to temporary loss of water main pressure; the problem will most likely correct itself with the return of continuous pressure.
Excessive noise during regeneration .	Howling or whistling noise during regeneration cycle.	1. Inadequate drain line size.	1. Increase drain line size
		2. Drain line is vibrating against other pipes, conduits, pipe hangers, heat ducts, floor joists,etc.	2. Insulate drain line, specifically at points of contact with other materials.

Complaint	Problem	Cause	Solution
Water is running to drain continuously.	A. Control valve is stuck in regeneration cycle.	1. Electrical service to control(s) has been interrupted.	1. Assure continuous electrical service is available. (check plug, breaker, fuse, etc.)
		2. Faulty circuit board.	2. Replace circuit board.
		3. Faulty drive motor.	3. Replace drive motor.
		4. Foreign material lodged in piston.	4. Disassemble and clean control valve, replace seals, spacers and piston assemblies.
Blue green staining.	A. Corrosive water condition in copper distribution piping system.	1. Low pH condition of the raw water supply.	1. A Cullneu® filter may be required to elevate the pH - consult factory.
		2. In rare occasions, highly aerated water in combination with a specific water supply can create a slightly corrosive condition.	2. Install a polyphosphate cartridge filter after the Iron-Cleer Filter System to protect the distribution piping.
Compressor doesn't run.		1. Compressor unplugged.	1. Plug it in.
		2. Relay settings incorrect.	2. Set relay correctly.
		3. Bad relay.	3. Replace relay.
Compressor run with excessive noise.		1. Dead head pressure is 65 psi.	1. Consult factory.
		2. Dead head pressure is 65 psi.	2. Rebuild compressor.
Compressor runs continuously.		1. Incorrect relay settings	1. Set relay settings correctly.
		2. Bad relay.	2. Replace relay.

Media Tank Assembly

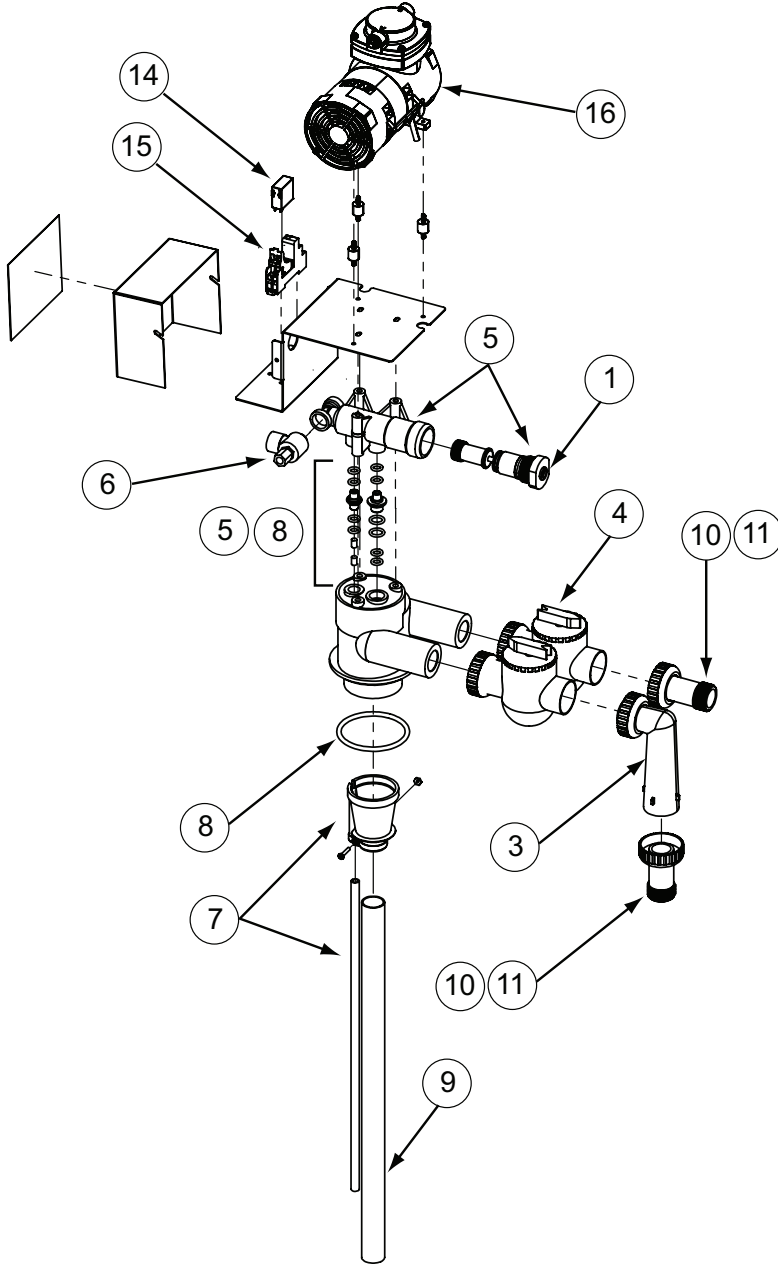
Figure 56.
Conditioner tank.



Item	Part No.	Description
	01040418	Tank Assembly, 10" x 54", FG, Gray w/manifold (Filter Tank)
	01040422	Replacement tank, 10" x 54" FG, Gray w/o manifold (Aeration tank)
	01040424	Tank Assembly, 12" x 52", FG, Gray w/manifold (Filter Tank)
1	P1009099	O-ring outlet manifold (1" control) (12 Pack)
2	01014539	Outlet manifold 10" x 54" (1" control)
	01018846	Outlet manifold 12" x 52" (1" control)
*	P1011195	Strainer, Top, Wide Slot - 10 ea
*	A1025002	Birm, 1 ft3
*	01014575	Birm, 1/2 ft3
*	01001345	Cullsan G50, 50 lb
*	00163813	Cullsan U , 25 lb

Aeration Assembly

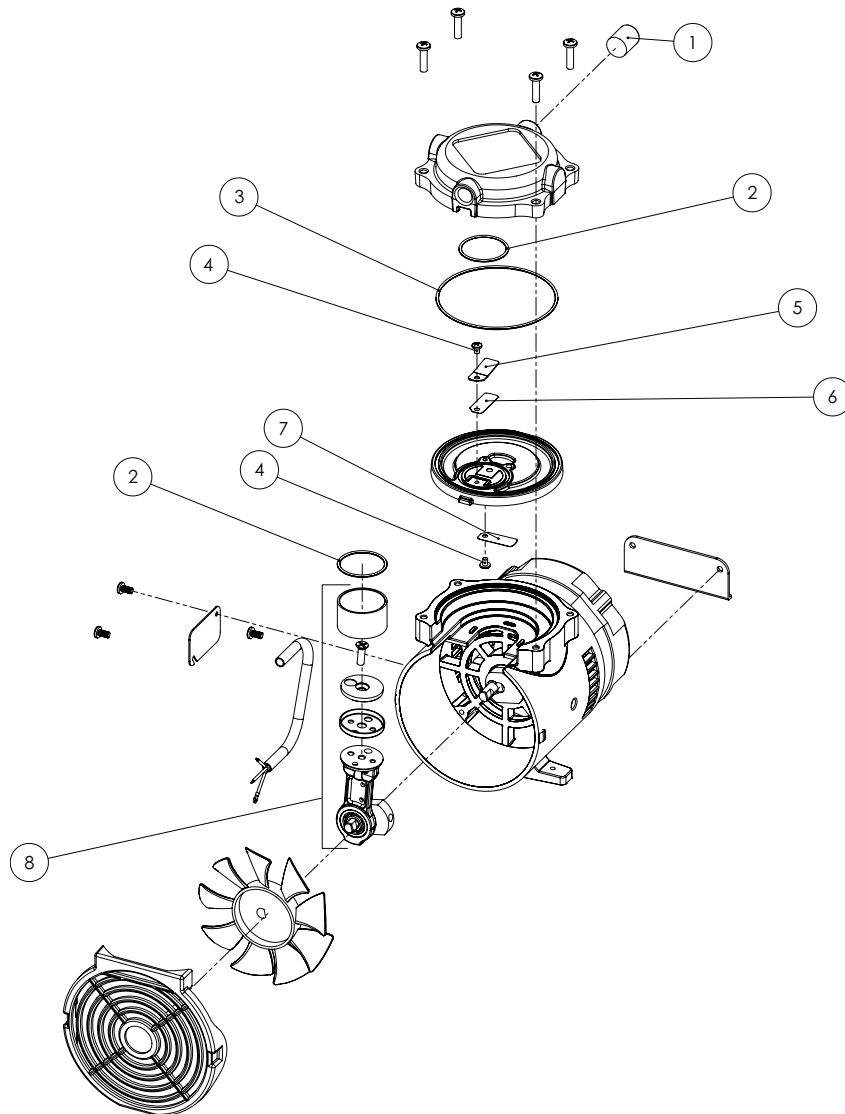
Figure 57. Aeration assembly.



Item	Part No.	Description
1	P1018738	Piston Assembly Kit (5 pack)
3	01018740	Elbow with Check Valve
4	01018741	Bypass Valve
5	01018742	Shuttle Assembly Kit
6	01018743	Solenoid Valve Kit
7	01018744	Disperser and Bleed Tube Kit
8	01018745	Seal Kit
9	01018161	Pickup Tube
10	01018746	Plumbing Connector Kit, 1" Male NPT
11	01018748	Plumbing Connector Kit, 1" Brass Sweat (5-pair)
—	01018921	Tool Kit, Solenoid Valve and Duckbill Check Valve
14	01023645	Relay
15	01023646	Socket for Relay
16	01029378	Compressor, Model LP12-AA38-002

Compressor Assembly - Model LP12-AA38-002

Figure 58. Compressor assembly, Model LP12-AA38-002



Item	Part No.	Description
—	01029378	Compressor, Model LP12-AA38-002
—	01029379	Compressor Rebuild Kit
1	*	Foam Filter
2	*	Cylinder O-Ring
3	*	Head O-Ring
4	*	Valve Screw
5	*	Valve Restraint
6	*	Flat Valve
7	*	Curved Valve
8	*	Rod/Eccentric Bearing Assembly

*Included in Rebuild Kit

Appendix B - Smart HE Sulfur-Clear™ Filter

Preparation

Component Description

The High Efficiency Sulfur-Clear™ is shipped from the factory in six (6) cartons. Remove all components from their cartons and inspect them before starting installation.

Control Valve Assembly	Includes the High Efficiency control valve, meter, and the bypass valve. Small parts packages will contain additional installation hardware and inlet check valve, along with the welcome card.
Media Tank	Includes media tank, manifold and inlet strainer.
Filter Media	Includes one package of catalytic carbon filter media and one package of Cullsan® underbedding.
Aeration Assembly	Incorporates the compressor and other miscellaneous components.

Pre-Installation Check List

- Water Pressure: A minimum of 20 psi at a predetermined flow rate is required to backwash the filter properly, with a maximum of 60 psi to be used. If pressure exceeds 60 psi a pressure reducing valve must be installed ahead of the High Efficiency Sulfur-Clear™ System.
- Actual Influent Flow Rate: (Water, available from well pump, service inlet, etc.) The actual pumping rate must exceed the backwash rate (drain flow) for the model of filter selected at a minimum of 20 psi. See actual backwash rates in the Specifications section.
- Electrical Requirements for Filter Control: A continuous 120VAC is required to cycle the controls and aeration pump. Make certain the electrical supply is always on and cannot be turned off with another switch. The system and installation must comply with all state and local laws and regulations.
- Existing Plumbing: The condition of the existing plumbing should be free from lime and iron build-up. Piping that is heavily built-up with lime and/or iron should be replaced.
- Equipment Location: This system is not rated for outdoor use. Exposure to high humidity and moisture could reduce the service life of the compressor and the warranty coverage.
- Location of Filter Tank: The tank should be installed after the pressure tank. If you want to filter outside hose bibs, be sure the filter system is properly sized to handle the flow rates required for extended periods of time, in addition to the normal household demand.
- Avoid locations where condensation from overhead pipes might drip on the unit.
- Allow adequate ventilation for the compressor.
- Drain Line: All drain lines must be a minimum of 1/2" or equal to the size of the drain line connection at the control valve or larger. Avoid overhead drain lines when possible. If used, overhead drain lines are not to exceed a height of five feet above the control valve and should be no more than fifty feet in length.
- Temperature: Do not install the unit where it might freeze, or next to a water heater or furnace or in direct sunlight. Outdoor installation is not recommended and voids the warranty and UL certification. If installing in an outside location, you must take the steps necessary to assure the filter, installation plumbing, wiring, etc. are as well protected from the elements (sunlight, rain, wind, heat, cold), contamination, vandalism, etc. as when installed indoors.
- Filtered Water: Normally, filtered water is furnished to all household lines; however, outside faucets are typically left on raw water. If filtered water is provided to outside faucets, the filter system must be sized accordingly.
- Treated Water: The filter system should be installed after the pressure tank and before the water softener and water heater.
- Electrical Facilities: A twenty (20) foot cord and wall mount plug-in 28 VDC power supply are provided with the filter control. A six (6) foot power cord is provided with the compressor. The customer should provide a receptacle, preferably one not controlled by a switch that can be turned off accidentally. Observe local electrical codes.



CAUTION!

Use and Handling of Household Bleach! Bleach is a strong oxidizing agent. It can cause severe irritation or damage to eyes and skin. Observe all precautions stated on the bleach container.

- Store bleach in a cool dry place out of reach of children and pets.
- Do not store in an unmarked container.
- Do not store in a container with misleading markings regarding the container content
- Keep the bleach covered and tightly closed when not in use.

Compressor Operation

Step 1

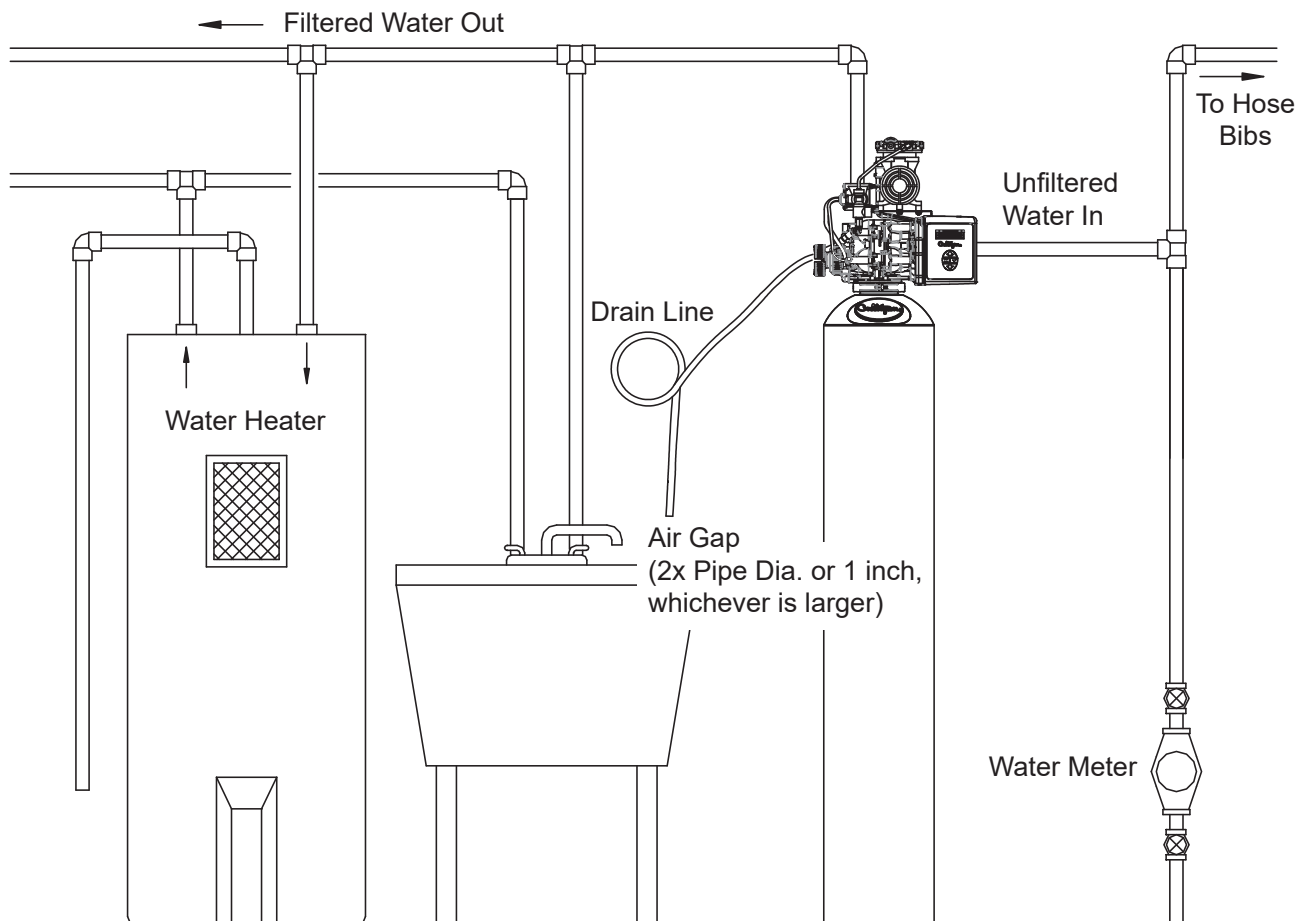
Aeration Operation Service Cycle

In the service cycle, raw water enters the inlet port of the medium tank and is directed through the inlet strainer. The oxidation process begins when the water passes through the inlet strainer and cascades through a head of air. This air/ water contact oxidizes the iron and/or hydrogen sulfide in the water. The water is then filtered through the media. It then passes through the outlet of the aeration tank to the inlet of the filter.

Filter Tank Operation Service Cycle

Upon system demand for filtered water, the water is directed downward through the media toward the lower manifold. Oxidized iron particles are trapped by the filter bed as the water passes through. Filtered water enters the lower manifold and travels up the manifold to the outlet port on the filter valve.

Figure 59. Sulfur-Clear operating configuration.



Step 2

Aeration Operation Air Recharge Cycle

When energized, the air pump sends air through the solenoid valve into one end of the shuttle valve. Once air pressure in the shuttle valve is greater than the water supply pressure at the other end of the shuttle valve, the piston shifts to the open

position. In the open position, the bleed-off port discharges excess water and old air to the drain port through a flow restrictor. Simultaneously, the air inlet port opens to provide a direct connection between the air pump and the top of the aeration tank. The air pump runs for a preset period of time recharging the head of air in the aeration tank.

Air Recharge Shut Off

The timer turns power off to the air pump and the solenoid valve at the end of the recharge cycle. The solenoid valve then closes the port between the air pump and the shuttle valve. The port between the shuttle valve and the atmosphere opens and releases air pressure. This allows water pressure to shift the piston to the closed position. With the piston in the closed position, the air recharge inlet port is closed and direct communication between the bleed off tube and the drain port is also closed.

Timer Operation

A timer controls the air recharge cycle and how frequently it occurs. The timer simultaneously energizes the air pump and the solenoid valve. After a preset amount of time, the timer shuts off the air pump and de-energizes the solenoid valve.

Solenoid Valve Operation

The solenoid valve is a three-way valve having ports that connect to the air pump, shuttle valve and the atmosphere. In the service cycle, the solenoid valve is de-energized and closes the port to the air pump, providing a positive shutoff to the pump. This prevents water from backing up into the air pump and damaging the pump. In the air recharge cycle, the solenoid valve closes the port to the atmosphere and opens the port from the air pump.

Shuttle Valve Operation

In the service position, water pressure holds the shuttle valve piston in the closed position, trapping the airhead in the aeration tank and closes the air recharge inlet port and drain port. During air recharge cycle, air pressure is greater than the water pressure and forces the shuttle valve piston in the open piston. The shuttle valve has an internal pressure relief valve that will relieve pressure (greater than 100 psi) that may build up in the aeration tank. This precautionary function protects components from failure due to excessive pressure.

Step 3

Filter Tank Operation—Backwash Cycle

Reversing the flow of water through the filter bed and backwashing dirty water to the drain cleans the filter bed. Raw water enters the filter control valve through the inlet port and is directed down the distributor tube and out the lower distributor at the bottom of the tank, flowing upward through the multimedia filter bed toward the top of the tank into the control valve. Water is then directed through a specific flow restrictor and out the drain port to be discharged to drain.

Step 4

Filter Tank Operation—Rinse Cycle

The rinse cycle packs the clean filter bed. Raw water enters the control valve through the inlet port and is directed downward through the filter bed into the bottom distributor, up the distributor tube into the control valve. Water is then directed through a specific flow restrictor and out the drain port to be discharged to drain.

Operation Of Aeration Pump

The Sulfur-Cleer™ system introduces air into the aeration tank and bleeds off the old head of air automatically. The exchange of the air into the aeration tank is controlled independently of the recharge frequency of the filter media tank, allowing the air to be exchanged on a more frequent basis. During an air exchange cycle, the air compressor pumps fresh air into the aeration tank and the air eliminator solenoid exhausts the old air.

NOTE! The compressor doesn't operate during a reconditioning cycle.

Filter Media Loading – Sulfur-Clear Filters

Figure 60. Sulfur-Clear Media Tank Layers Cross Section



CAUTION!

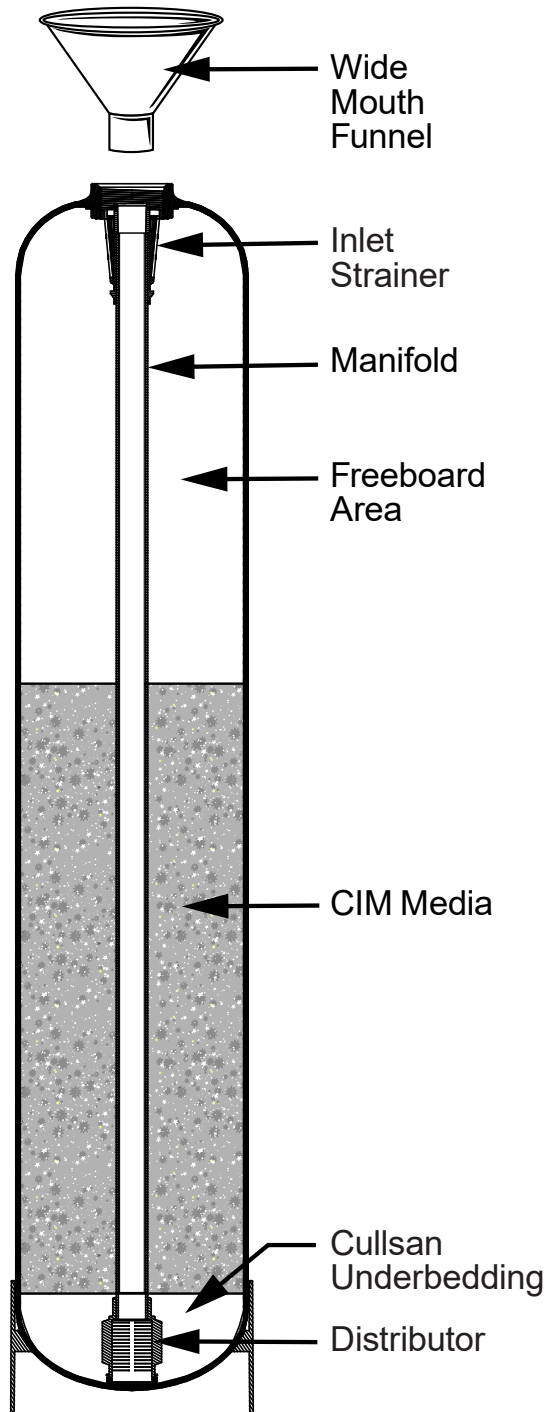
Once the tank is full, do not lay it down as this will disrupt the layer of gravel underbedding and result in poor performance.

CAUTION!

DO NOT allow the outlet manifold to move when loading the CIM 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.

NOTE! CIM Media must be soaked in water for 24 to 48 hours to allow for full saturation before begin put into service. In-plant preparation is highly recommended.

1. Position the tank for loading.
2. Remove the inlet strainer.
3. Be sure the outlet manifold is positioned properly in the tank.
4. Cover the outlet manifold before inserting the large opening funnel.
5. Pour underbedding into the tank. Level if required.
6. Pour the CIM Media into the tank. Leveling is not required.
7. Replace the inlet strainer. Make sure to thread it all the way to the bottom of the tank threads.



Drain Line Flow Control, Eductor Nozzle—Throat

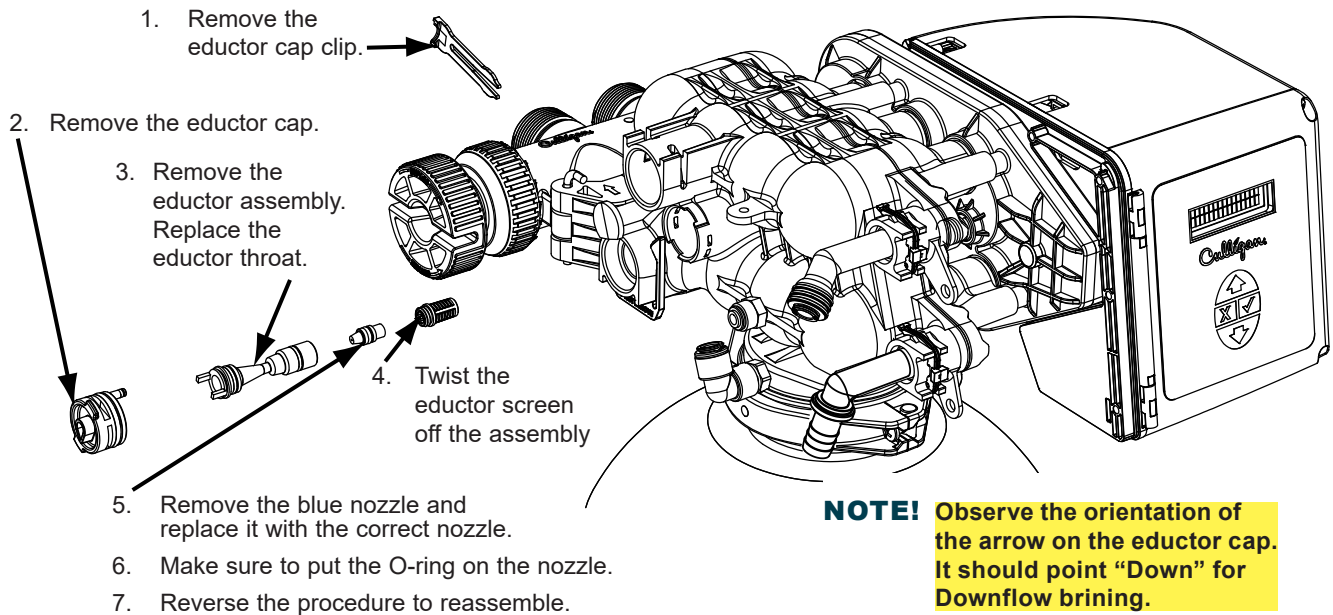
Listed below is the recommended drain line flow control, eductor nozzle, and eductor throat to be used for Sulfur-Cleer systems. Refer to [Figure 61](#), and the instructions below for changing the drain line flow control, eductor nozzle, and eductor throat.

Table 11.Flow Restrictors.

Unit	Drain Line Flow	Nozzle	Throat
10"	5.5 gpm (#2 Brown)	Blue	Beige

Eductor Nozzle and Throat Replacement

Figure 61. Removing the eductor nozzle and throat.



Drain Line Connection

Refer to [Table 3 on page 23](#) for drain line length and height limitations under the applicable tank size.

1. Remove hose clamp from the small parts pack included with the control.
2. Route a length of 1/2" drain line from the drain elbow to the drain.
3. Fasten the drain line to the elbow with the clamp.
4. 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 tube will keep it filled with water and will reduce splashing at the beginning of each 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 of two pipe diameters or 1 inch, whichever is larger.

Observe all plumbing codes. Most codes require an anti-siphon device or air gap at the discharge point. The system and installation must comply with state and local laws and regulations.

Connecting the Solution Tank

1. Cut a length of 3/8" eduction tubing sufficient to reach from the control valve to the solution tank, about six feet. Cut the ends squarely and evenly.
2. Connect the eduction line from the solution tank to the control valve. Tighten finger-tight plus an extra half turn. See [Figure 16](#).

Mounting the Aeration Control to HE Sulfur-Clear Valve

1. Remove HE enclosure. See [Figure 63](#).
2. Remove the top two screws that secure the gearbox to the valve.
3. Remove the screw and nut that is inserted on aeration control bracket.
4. Place the aeration control on top of the valve.
5. Insert the gearbox screws you just removed through the two holes in the aeration control bracket and screw them back into the gearbox.
6. Insert the screw you removed into the hole on the other side of the aeration control bracket and through the hold on the control valve support. Tighten the nut onto the screw.

Figure 62. Solution tank with eduction tubing.

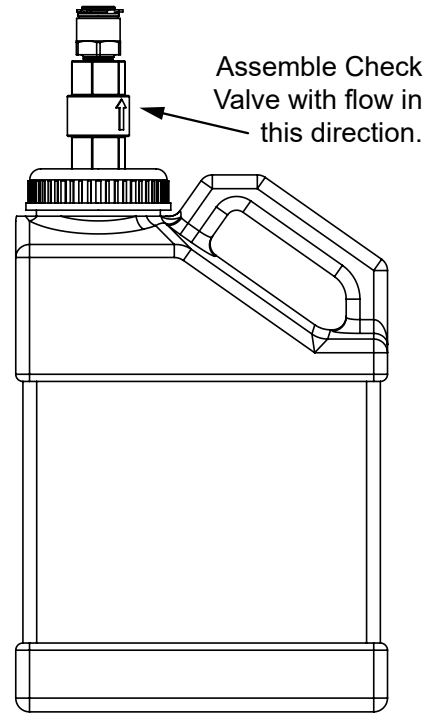
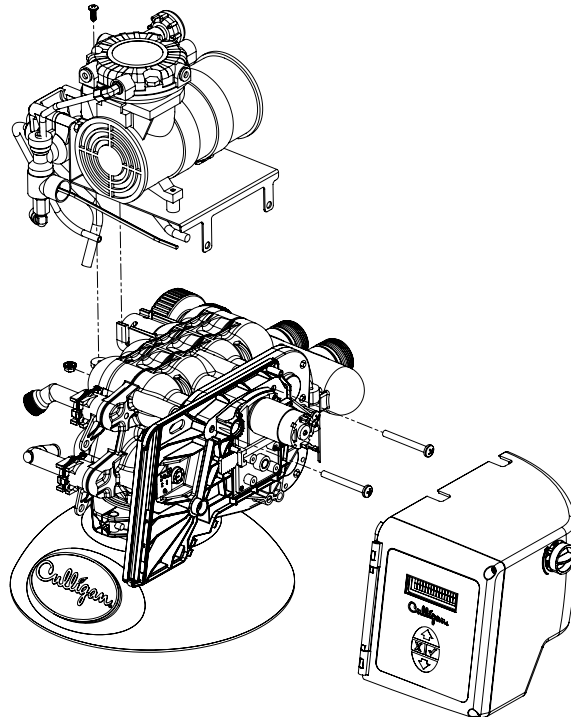


Figure 63. Removing enclosure cover from control valve.



Circuit Board Connections

The 24VDC power supply and flow meter wire harness is already connected to the circuit board. Refer to the instructions below and [“Circuit Board Connections” on page 57](#) for additional connections to the circuit board.



WARNING!

Disconnect all electrical power to the unit before connecting.



CAUTION!

Grip all connections to the circuit board by the connecting terminals for assembly and disassembly. Failure to do so could result in damage to the wire leads or connecting terminals.

CAUTION!

Do not touch any surfaces of the circuit board. Electrical static discharges might cause damage to the board. Handle the circuit board by holding only the edges of the circuit board. Mishandling of the circuit board will void the warranty.

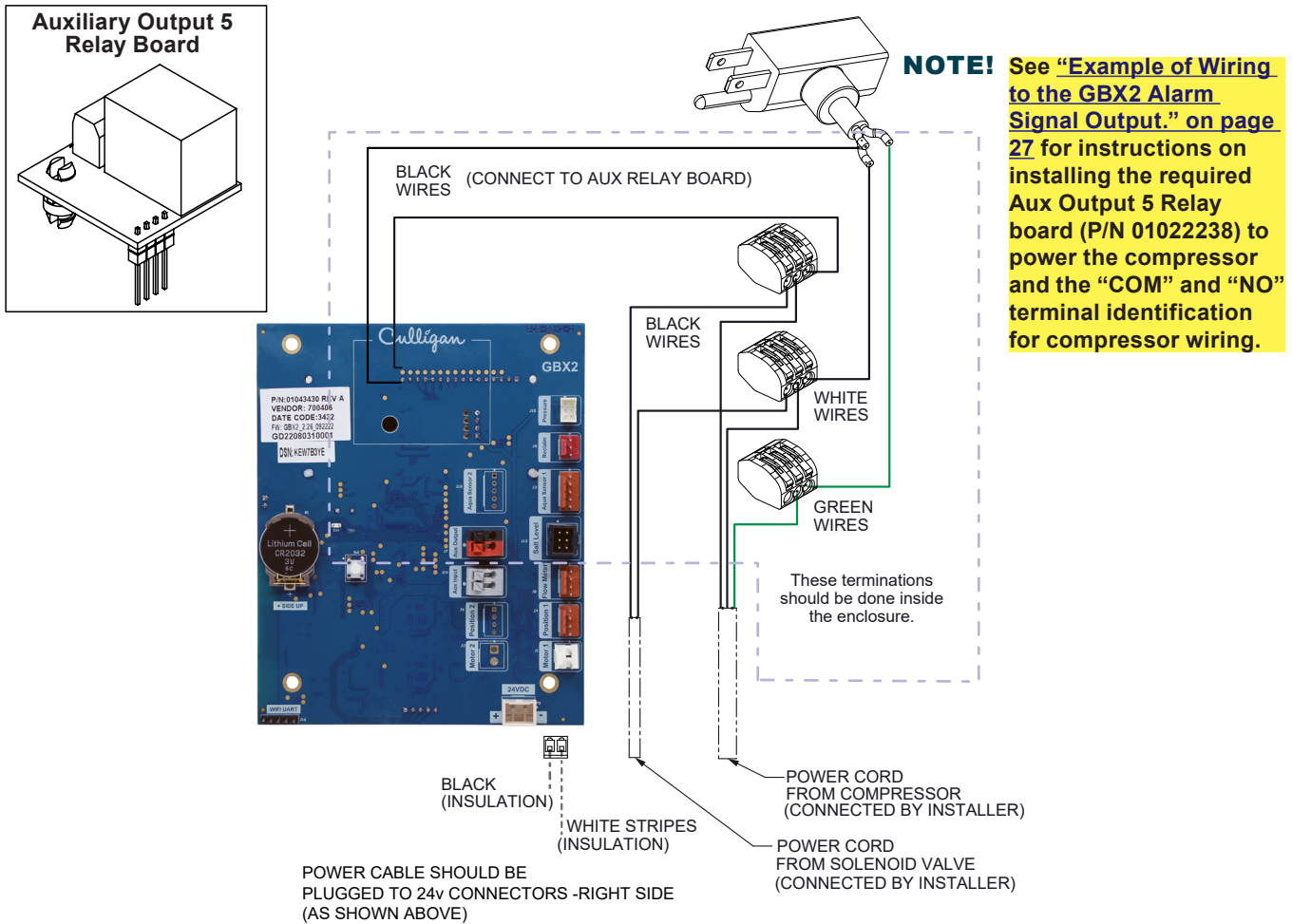
NOTE! Observe all state and local electrical codes.

Connect the Compressor Power Cord

NOTE! Both power cords attached to the enclosure should not be plugged in while making these wiring connections.

1. Loosen (2) screws on the front of the enclosure and open the door to access the GBX2 circuit board and wiring and install the Aux Output Relay board into the GBX2 circuit board. Refer to [“Example of Wiring to the GBX2 Alarm Signal Output.” on page 27](#) for details.
2. Feed the compressor power cord (3 wires) and the solenoid valve wires (2 black wires) through the slotted opening in the backplate and into the enclosure.
3. Cut the ring terminal of the green wire of the compressor power cord and strip the insulation back about 1/4 inch.
4. Loosen the power cord strain relief fitting. This will facilitate removing the circuit board. See [page 57](#).
5. Insert the green wire into the 3 wire terminal connector with the green wire from the 120V power cord inside the enclosure.
6. Insert the white wire from the compressor power cord into the 3-wire terminal connector with the white wire from the 120V power cord.
7. Insert the black wire from the compressor power cord into the 3-wire terminal connector with the black wire connected to the terminal marked “COM” on the relay board.
8. Insert the black wire from the 120V power cord to the terminal marked “NO” on the relay board.

Figure 64. Compressor power cord connection.



9. Insert the green wire from the compressor power cord into the three-wire terminal strip that has the green wire connected from the power cord plug. See [“on page 82.”](#)

NOTE! To insert a wire into the three-wire terminal strip lift the orange lever to open the clamp and insert the wire. The lever clicks as it is lowered, actuating the clamp, for superior connectivity.

10. Insert the white wire from the compressor power cord into three-wire terminal strip that has the black wire connected from the power cord plug.
11. Insert the black wire from the compressor power cord into three-wire terminal strip that has the black wire coming from the relay board.

Connect the Solenoid Power Cord

1. Insert the black wire from the solenoid power cord into three-wire terminal strip that has the white wire connected from the power cord plug and white wire from the compressor power cord.
2. Insert the black wire from the compressor power cord into three-wire terminal strip that has the black wire coming from the relay and black wire from the compressor power cord.

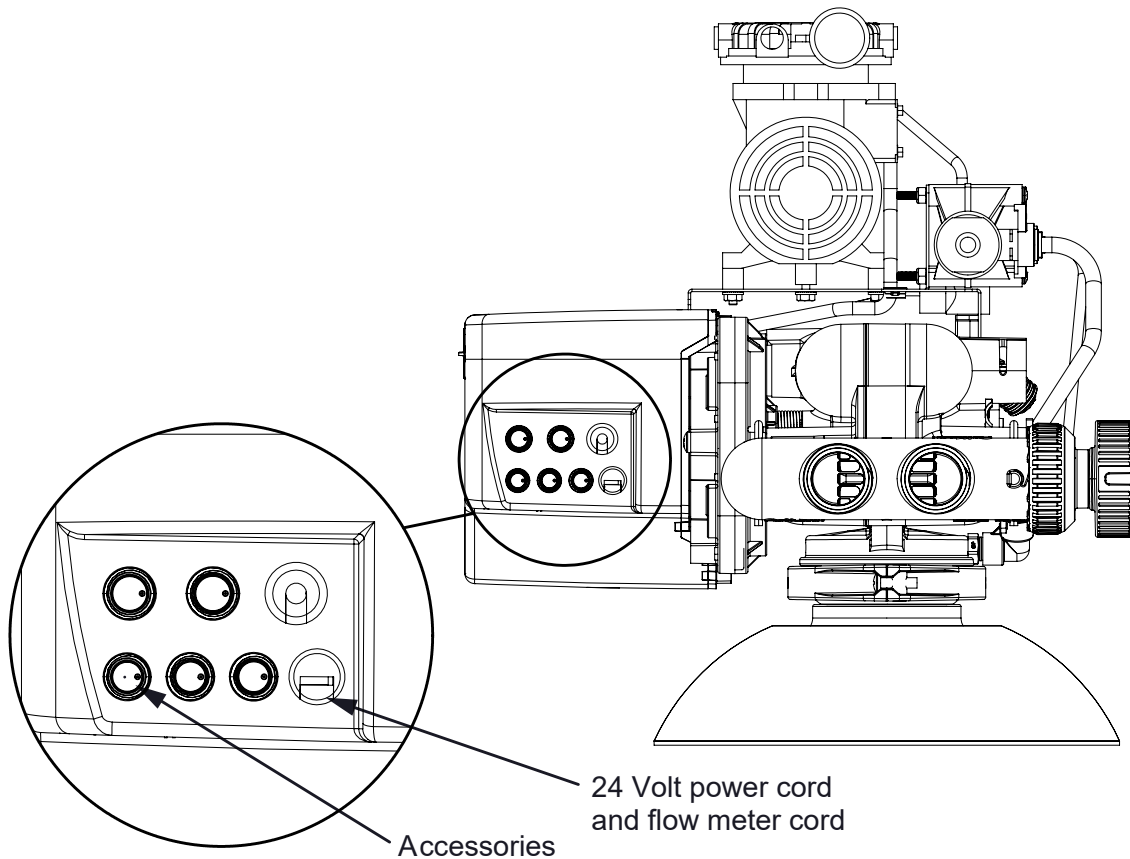
Tie Electrical Wires

1. Use the plastic tie shipped with the aeration control to wrap the electrical wires that are inside the enclosure.
2. Close the enclosure door and tighten the two (2) front screws if no other electrical connections need to be made.

Install Accessories

1. Remove any of the plastic knock outs needed from the enclosure for your accessories.
2. Insert the accessory wire harness through any of the available holes on the enclosure. See [Figure 65](#).
3. Connect the accessory wire harness to the circuit board.

Figure 65. Circuit board connections.



NOTE! Failure to properly connect any of the connectors will result in a malfunction of the circuit board operation.

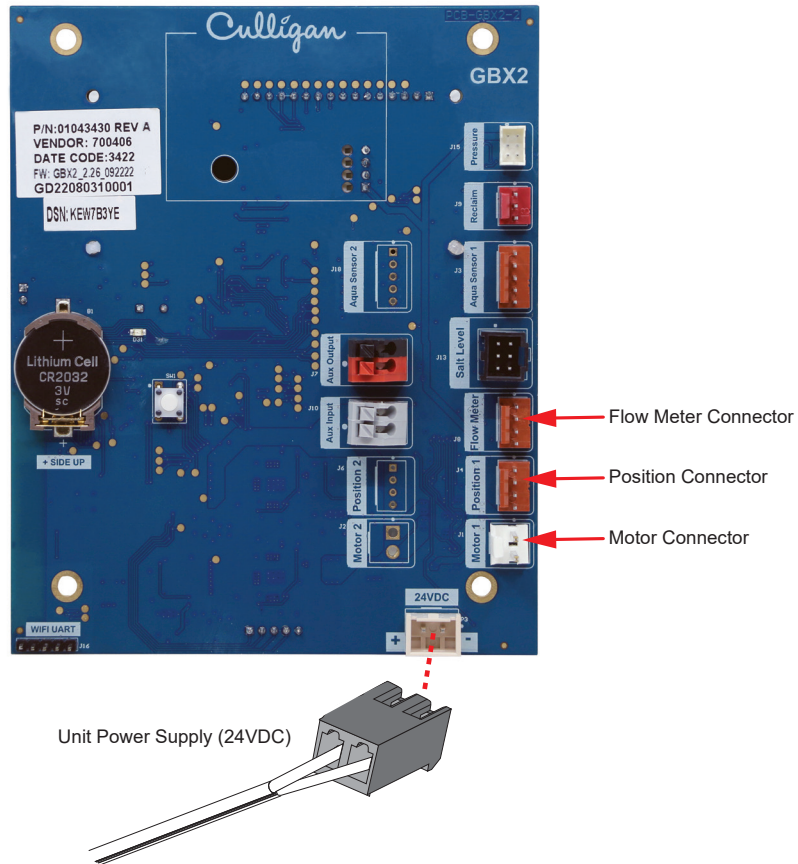
4. Pull any excess cable wire out of the enclosure and route the wiring inside the enclosure to avoid interference.
5. Reattach the 24VDC power supply to the circuit board.
6. Install the Inlet Check Valve assembly (supplied in the small parts kit) in place of the Inlet Bypass Coupling on the inlet side of the control valve where the arrow points toward the control valve. The arrow on the check valve must also point towards the control valve.



CAUTION!

Verify wiring from the terminals to circuit board are correct before applying power to the control.

Figure 66. 24VDC power connection.



7. Shut the enclosure cover and tighten screws.

NOTE! The wall outlet must be a non-switched outlet.

The circuit board controls the compressor-run timing and will turn on once the circuit board is properly programmed.

Grounding Instructions

This appliance must be grounded. In the event of a malfunction or breakdown, grounding will reduce the risk of electric shock by providing a path of least resistance for the electric current. This appliance is equipped with a cord having an appliance-grounding conductor and grounding plug. The plug must be plugged into an appropriate outlet that is installed and grounded in accordance with all local codes and ordinances.



WARNING!

Improper connection of the appliance-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or service representative if you are in doubt whether the appliance is properly grounded.

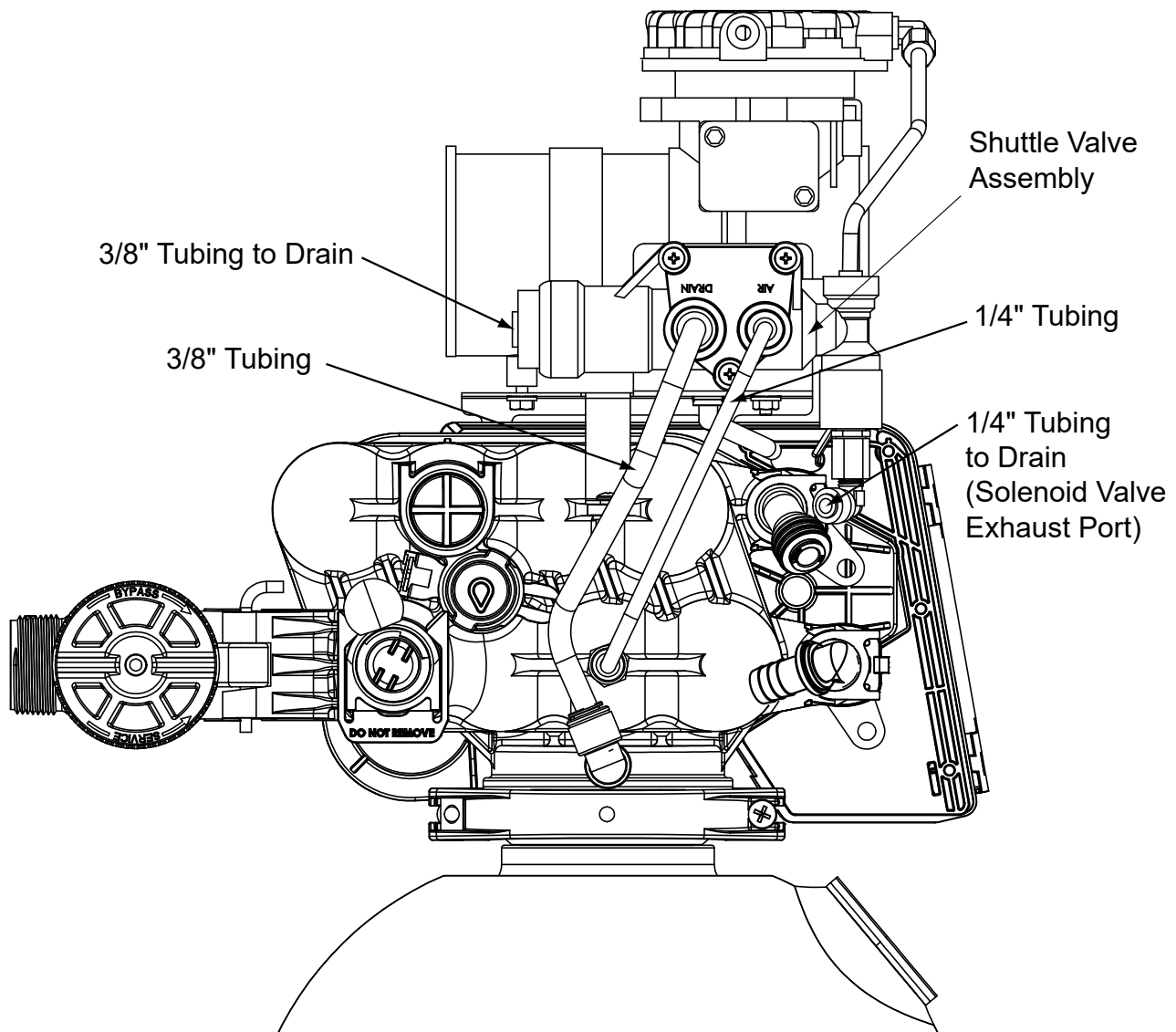
WARNING!

Do not modify the plug provided with the appliance; if it will not fit in the outlet, have a proper outlet installed by a qualified technician.

Interconnecting Tubing

1. Insert the 1/4" black tubing (shipped with the aeration control) from the fitting marked "AIR" on the shuttle valve to the 1/4" fitting inserted in the control valve. See [Figure 67](#).
2. Insert the 3/8" black tubing (shipped with the aeration control) from the fitting marked "DRAIN" on the shuttle valve to the 3/8" elbow inserted in the control valve.
3. Run 1/4" tubing from the solenoid valve exhaust port and 3/8" tubing from the shuttle valve drain connection to an atmospheric drain separate from the filter drain.

Figure 67. Sulfur-Cleer interconnecting tubing.



4. Refer to the GBX2 Programming (P/N 01040743) for instructions on how to program the Culligan® HE Sulfur-Cleer. This manual can be obtained from your local dealer, on CPort (www.cport.culligan.com) under the [Technical Service Tab](#) or on the iPad Technical Service App.

Settings

The Culligan® Sulfur-Cleer™ Water Filter can be applied to reduce both clear water iron and hydrogen sulfide. The Sulfur-Cleer™ filter relies on the action of air delivered by the compressor and the special Culligan® Catalytic carbon filter media to efficiently reduce iron and hydrogen sulfide.

The frequency of regeneration is based on water usage and the amount of iron and/or hydrogen sulfide present. [Table 12](#) shows the approximate number of gallons that can be treated between regenerations. Users generally can expect the media to last 2-3 years on installations with low to moderate levels of iron and hydrogen sulfide. Installations with high challenge levels may reduce media life to 1 year or less. Your Culligan® dealer can help you determine when the filter media will need to be replaced.

Table 12. Sulfur-Cleer regeneration frequency.

Iron (ppm)	Volume (gallons)
1–2	12,000
3–4	6,000
5–6	3,000
7–8	2,000
9–10	1,000

Iron and Trace Hydrogen Sulfide

When applying the filter on water sources with only iron present or with levels of hydrogen sulfide less than 1 ppm, only backwashing will be needed to regenerate the filter. In some applications, odors may develop over time and the media bed may need to be sanitized. In these cases, use the following procedures during the next regeneration. In general, bleach will not be required more than once per month and users generally find that it is needed no more than once every four to six months, if at all.

Iron

The Culligan Sulfur-Cleer for iron reduction requires no chemical regenerant and only periodic backwashing to flush accumulated oxidized iron out of the media bed to drain. The frequency of backwash is based upon the expected water usage and the iron content of the untreated water. Frequency of backwash is based on experience with your water. Recommended initial backwash frequency is twice a week when any iron is present.

In some applications, odors may develop over time and the media bed may need to be sanitized. In these cases, up to one half gallon of non-scented household bleach may be educted into the filter during the next regeneration. In general, bleach will not be required more than once per month and users generally find that it is needed no more than once every four to six months, if at all.

Discharge of a strong oxidizing agent, such as chlorine bleach into a private on site wastewater treatment system (POWTS) can affect the performance of the POWTS. Proper operation of the Sulfur-Cleer system will not result in the discharge of chlorine into the POWTS. Please consult with your technical service representative if you have questions or concerns.

Backwash

Backwash is factory set at 10 minutes and adjustable from 1 to 99 minutes. Ideally, the backwash time should only last long enough for the water at the drain to run clear.

Hydrogen Sulfide—Over 1 PPM

When applying the filter on water sources with hydrogen sulfide levels of 1–5 ppm, backwashing every three days and eduction of diluted non-scented bleach on occasion may be needed. Regeneration with bleach is only necessary when hydrogen sulfide is present in the product water. Although the air compressor provides much of the action needed to reduce hydrogen sulfide, the bleach will “super oxygenate” the Culligan catalytic carbon filter media to enhance effectiveness. Overdosing with bleach will cause a faster breakdown of the media. Therefore, any chlorine dosing scheme involves a compromise between media life and hydrogen sulfide reduction

NOTE! The Culligan® Sulfur-Cleer™ is not recommended if the filter will be regenerating with bleach more than two times per month and the waste will be discharged into a septic tank or similar system.



CAUTION!
DO NOT USE BLEACH WITH EVERY REGENERATION

The overuse of chlorine will cause a faster breakdown of the catalytic carbon filter media. Any chlorine dosing scheme therefore involves a compromise between hydrogen sulfide reduction and media life. Due to a multitude of factors impacting the capacity of the media (water chemistry, flow rates, natural dissolved oxygen present, age of the media, temperature, pressure, etc), predicting the exact capacity is difficult. Chlorine bleach regeneration is only necessary when hydrogen sulfide is present in the product water. However the user must be willing to accept occasional rotten egg odors a few times until a historical capacity pattern and a definite regeneration period can be established to follow for that installation.

Regeneration Procedure With Bleach



CAUTION!
Use and Handling of Household Bleach!

Bleach is a strong oxidizing agent. It can cause severe irritation or damage to eyes and skin. Observe all precautions stated on the bleach container.

- Store bleach in a cool dry place out of reach of children and pets.
- Do not store in an unmarked container.
- Do not store in a container with misleading markings regarding the container content
- Keep the bleach covered and tightly closed when not in use.

NOTE! When bleach is used to regenerate the Sulfur-Cleer™, Culligan strongly recommends the dealer set-up a service contract with the customer to initiate the regeneration when required.

If a service contract is not practical, then Culligan recommends the dealer and the customer strictly abide by the following procedure when regenerating with bleach:

The dealer must instruct the customer on the handling of chlorine and review the DANGER statements on the bleach bottle with the customer.

The dealer must review the first aid instructions on the bleach bottle with the customer.

The dealer must be present with the customer during the first regeneration.

Protective eye wear and gloves are required.

When regenerating a Sulfur-Cleer™ system with a diluted bleach solution, the brine draw rinse cycle time should be changed to 90 minutes.

1. Add 32 oz. (1/4 gallon) of 5.25% or 6% non-scented bleach to a clean one gallon container and dilute to one full gallon with water (soft water is preferred). Locate this container on the floor next to the Sulfur-Cleer™ system. Tightly replace the cover on the bleach bottle.



CAUTION!
Never place the bottle on a table or above floor level.

2. Initiate an immediate regeneration.

- Carefully insert the eduction valve into the container from step 1.



CAUTION!
The valve must be secured or held during the eduction cycle.

CAUTION!
Do not leave the bleach unattended during the eduction cycle.

- Allow the Sulfur-Cleer™ to educt the diluted bleach from step 1. The eduction cycle takes about 5–10 minutes after the backwash cycle.



CAUTION!
There will still be concentrated bleach in and on the valve.

- After the bleach has been educted, there will still be time left in the eduction cycle. Carefully remove the eduction valve to avoid dripping or spillage.



CAUTION!
Store the bleach in a cool, dry place out of reach of children and pets.

- Immediately place the eduction valve in a bucket or bottle of plain water. The continued eduction will pull fresh water to rinse the inside of the valve. The fresh water in the bucket will rinse the outside of the valve.
- Refer to the GBX2 Programming Guide (P/N 01040743) for instructions on how to program the setting for the Culligan® HE Sulfur-Cleer. This manual can be obtained from your local dealer, on CPort (www.cport.culligan.com) under the [Technical Service Tab](#) or on the iPad Technical Service App.

Final Startup

Recommended Start-Up Procedure

Refer to [“Recommended Start-Up Procedure” on page 29](#).

Before Leaving The Installation Site

1. Sanitize the water filter.
2. The water heater may hold unfiltered 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 filtered. If filtered hot water is required immediately, refer to the water heater owner’s manual for the proper method of draining the water heater.
3. Explain the operation of the filter to the customer. Make sure the customer knows that there will be new sounds associated with the reconditioning of the unit.
4. Sign and date the corresponding performance data sheet.
5. Attach the appropriate data plate label located in the Parts Pack onto the back of the control.
6. Clean up the unit and installation site, removing any soldering, or pipe threading, residues from the equipment and surrounding area with a damp towel.

Recommended Preventive Maintenance

NOTE! Refer to the GBX2 Programming Guide (P/N 01040743) for diagnostic procedures using the Smart (GBX2) Controller. This manual can be obtained from your local dealer, on CPort (www.cport.culligan.com) under the [Technical Service Tab](#) or on the [Service Tech App](#).

Because of the water quality where the Sulfur-Cleer™ water filters are used, routine maintenance is essential.

- Inspect monthly the tube connecting the compressor and the injection fitting. Water laying in the lowest part of the tube may indicate check valve failure.
- Inspect monthly the rubber compressor mounts for signs of cracking or wear.
- The customer may perform this inspection but should be instructed to call the dealer for service. Refer to the [“Service” on page 32](#) for service procedures.
- Inspect the 1/4” drain tube from the remote aeration controller. A constant drip from this drain tube may indicate a worn seal in the shuttle valve.

Application Problems

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

Operation and Performance Specifications

See [“Culligan Smart HE Sulfur-Cleer Filters” on page 9](#). Provides the limits of water characteristics for the Culligan High Efficiency Series™ water filters. If the water characteristics fall outside these limits, additional water treatment equipment may be required, or the water characteristics should be brought inside the limits. The system flow rates and reduction capabilities are also listed.

If there are no apparent general problems or environmental problems, refer to [“Troubleshooting” on page 88](#).

Maintenance Inspection

This Culligan Sulfur-Cleer™ water filter has been designed to provide a good, consistent service life. Because of the nature of problem water, we recommend that the local Culligan dealer provide regular maintenance/service contracts for the proper operation of your systems. The water filter service begins with a multi point inspection of your water filter system in an effort to uncover any and all problems that may exist. Listed below is a recommended list of maintenance items to be inspected at a minimum of once a year (or more frequently depending on the raw water quality).

Test Water	Feed	Product
Hardness		
Iron		
Hydrogen Sulfide		
pH Level		
TDS		
Other		
Comments:		
Bypass Valve		
Bypass in Service or Bypass?		
Condition of bypass valve		
Operation OK?		
Control Valve		
Condition of Eductor (Sulfur-Cleer)		
Condition of Solution Valve (Sulfur-Cleer)		
Condition of Pistons		
Condition of Solenoid Valve		
Condition of Motor:		
Condition of Flow Control		
Condition of Optical Sensor:		
Condition of Check Valve		
Condition of Compressor	Output PSI	
Control settings	Before	After
Check/Reset Time of Day		
Check Time of Regeneration		
Setting "On Time" in seconds		
Setting "Off Time" in minutes or gallons		
Backwash (minutes)		
Chemical Draw/Slow Rinse (minutes)		
Fast Rinse (minutes)		
Cycle control	Test Cycle	OK?
	Backwash	
	Chemical Draw	
	Slow Rinse	
	Fast rinse	
Media Tank		
Freeboard inches:		
Media Condition		

Maintenance

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. Allow the unit to complete the regeneration 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:

- Iron and Hydrogen Sulfide test kits
- Pressure gauge, 0-120 psi
- 5-Gallon bucket and watch
- Calculator

The customer can provide most data. 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; possibly a service call might 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.**

The Sulfur-Cleer filters rely on the action of air and the filter media to efficiently remove iron and hydrogen sulfide as tested by Culligan. A failure in the air delivery and venting system will cause a general failure of the filter. Refer to ["Troubleshooting" on page 88](#) and the following service procedures.

Air Compressor

The compressor may need replacement if it:

- Fails to deliver air to the media tank or
- Makes excessive noise.

To test the compressor:

1. Remove the tubing from the outlet side of the compressor.
2. Screw in an elbow (P/N 00441613) and pressure gauge (P/N 00448621).
3. Start the compressor by pressing the "Statistics" key on the keypad once and then pressing the "-" key until the "COMPRN" is displayed. Press the "Regen" key and the compressor will turn on.

Pressure should be at least 60 psi when the compressor is working properly. If the pressure is lower, rebuild the compressor.

Inspect/Clean/Replace the Eductor

Figure 68. Removing the eductor nozzle and throat.

1. Remove water pressure from the valve.

2. Remove the eductor cap clip.

3. Remove the eductor cap.

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

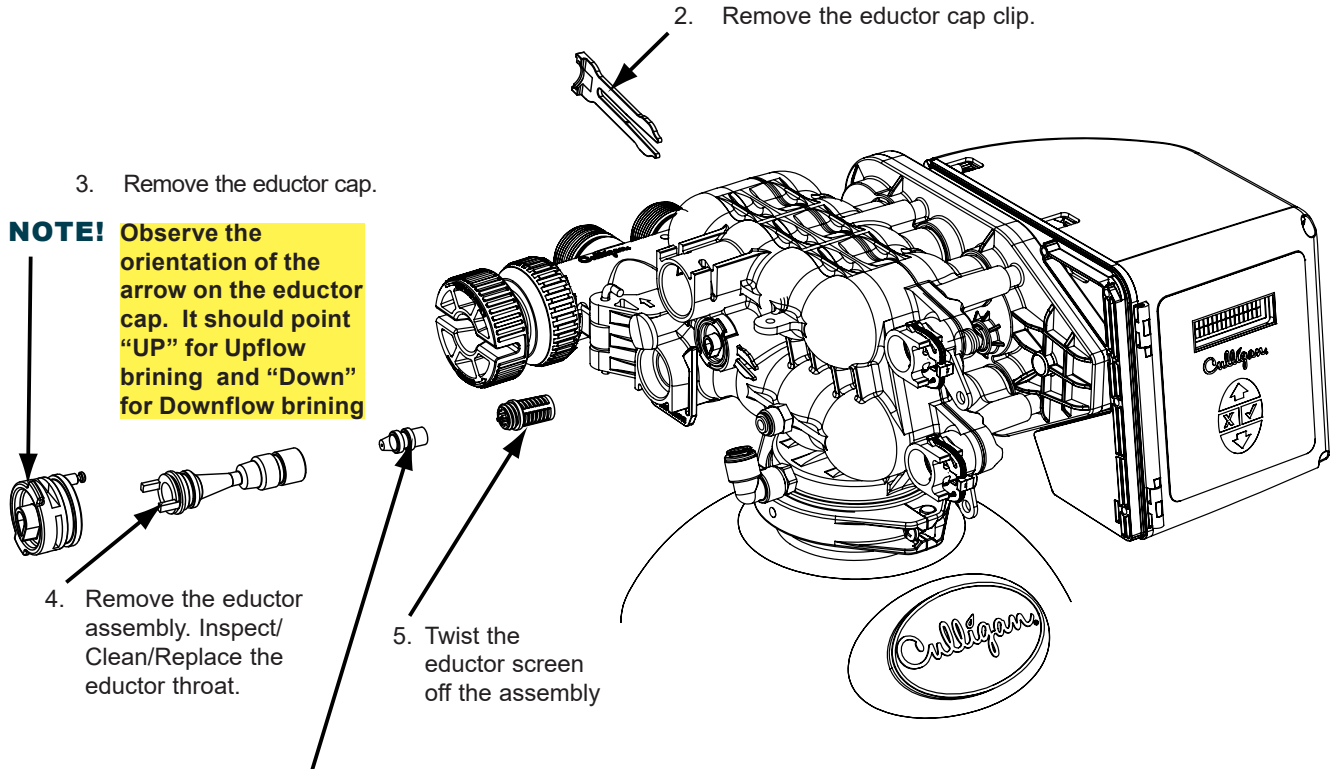
4. Remove the eductor assembly. Inspect/Clean/Replace the eductor throat.

5. Twist the eductor screen off the assembly

6. Remove the blue nozzle and inspect/clean/replace it with the correct nozzle.

7. Make sure to put the O-ring on the nozzle.

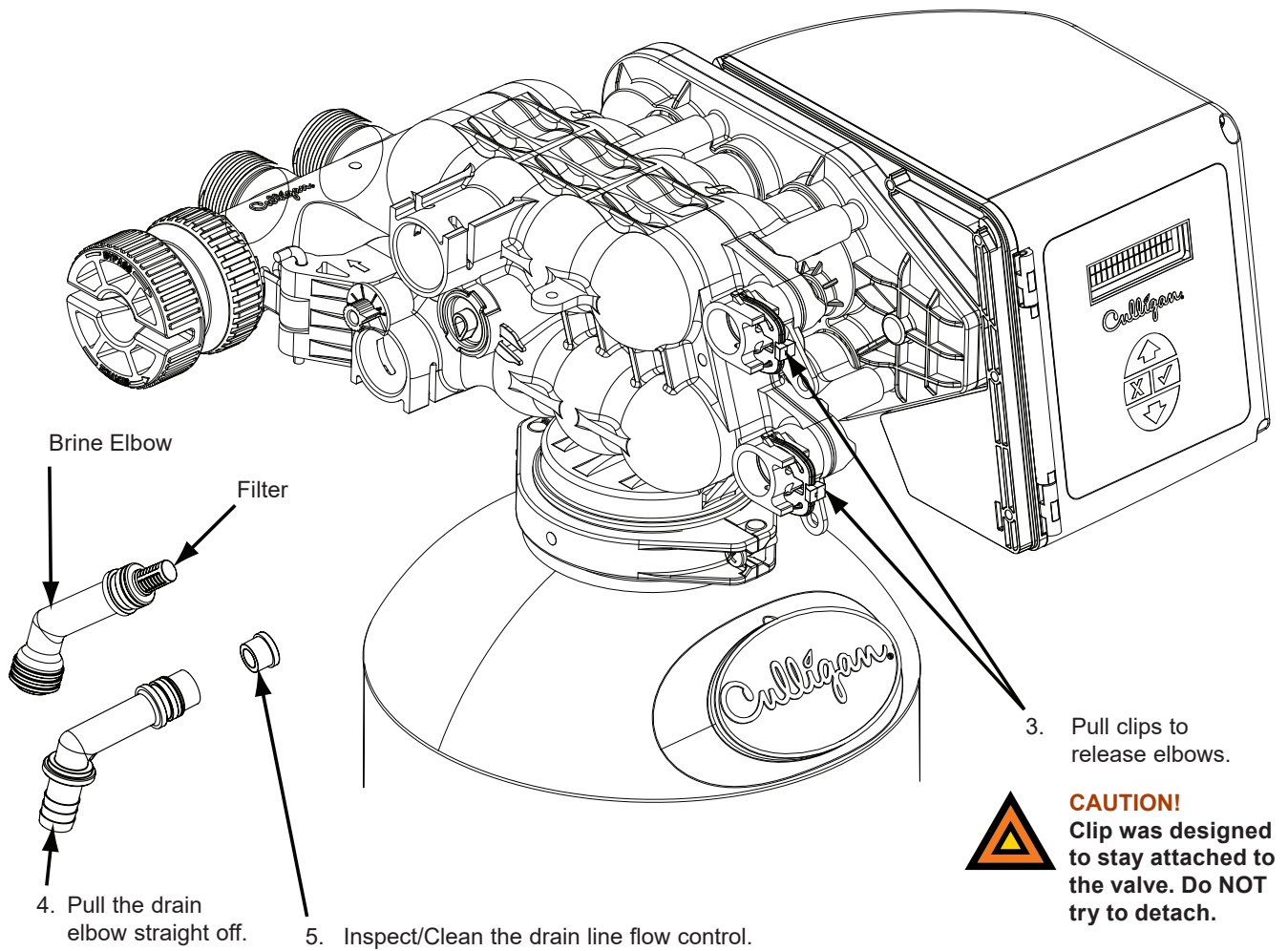
8. Reverse the procedure to reassemble.



Inspect/Clean the Brine Line and Drain Line Flow Control

1. Relieve water pressure from the valve.
2. Remove the cover by releasing the cover fastener from the control.

Figure 69. Removing the drain elbow and brine elbow.



6. Reverse the procedure to reassemble.

NOTE! The number on the flow control should face into the valve body.
Do not re-install the cover until the drain line tubing is connected.

Troubleshooting

Problem or Symptom	Cause	Solution
1. Unit has blank display.	A. Unit has no power.	A. Verify that unit is connected to a constant power source (Not an outlet on a switch).
	B. Defective plug-in power supply.	B. Replace plug-in power supply.
2. Filter fails to automatically initiate a regeneration.	A. Electrical service to the unit has been disrupted.	A. Verify that unit is connected to a constant power source (Not an outlet on a switch).
	B. 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.	B. 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.
	C. Incorrect programming.	C. Refer to the 'Programming' section and verify all settings.
3. Regeneration occurs at incorrect time.	A. Timer setting incorrect.	A. Reset timer.
	B. Timer flashing.	B. Reset timer and verify that unit is connected to a constant power source.
	C. Circuit board set to immediate regeneration.	C. Set circuit board to delayed regeneration.
	D. Incorrect programming.	D. Refer to the 'Programming' section and verify all settings.
4. Error message is displayed.	See the GBX2 Programming Guide (P/N 01040743).	
5. Unfiltered water to service. The root cause of unfiltered water to service may also lead to problems such as Iron bleed.	A. Salt or Chemical storage tank is empty.	A. Add salt or chemical to storage tank and verify that proper level of salt or chemical is maintained.
	B. Incorrect programming.	B. Refer to the 'Programming' section and verify that settings are correct.
	C. Internal seal leak.	C. Replace pistons.
	D. Excessive water usage.	D. Verify that programming is correct. For Time Clock units increase regeneration frequency.
	E. Unconditioned water in water heater tank.	E. Flush water heater to fill tank with conditioned water.
6. Loss of water pressure	A. Control and/or media bed plugged with debris or iron build-up.	A. Clean control and increase frequency of regenerations or length of backwash. Plant recondition if necessary.
	B. Inlet manifold plugged.	B. Remove control from tank and clean inlet manifold. Check if eductor screen/nozzle are also plugged.
	C. Control plugged with foreign material broken loose from recent plumbing work.	C. Clean control.
7. Loss of mineral to drain.	A. Improper drain line flow control.	A. Ensure that the control has the proper drain line flow control (see Figure 50 on page 55).
	B. Air in water system.	
8. Mineral to service.	A. Control connected to tank backwards.	A. Verify that control is properly mounted to the tank.
	B. Defective outlet manifold.	B. Replace outlet manifold.
9. Continuous flow to drain	A. Internal seal leak.	A. Replace pistons.
	B. Piston or brine piston jammed in position.	B. Replace Piston or brine piston.
	C. Power failure while unit was in regeneration.	C. Restore power to unit. Verify that unit is connected to a constant power source.

Smart HE Sulfur-Cleer® Replacement Parts

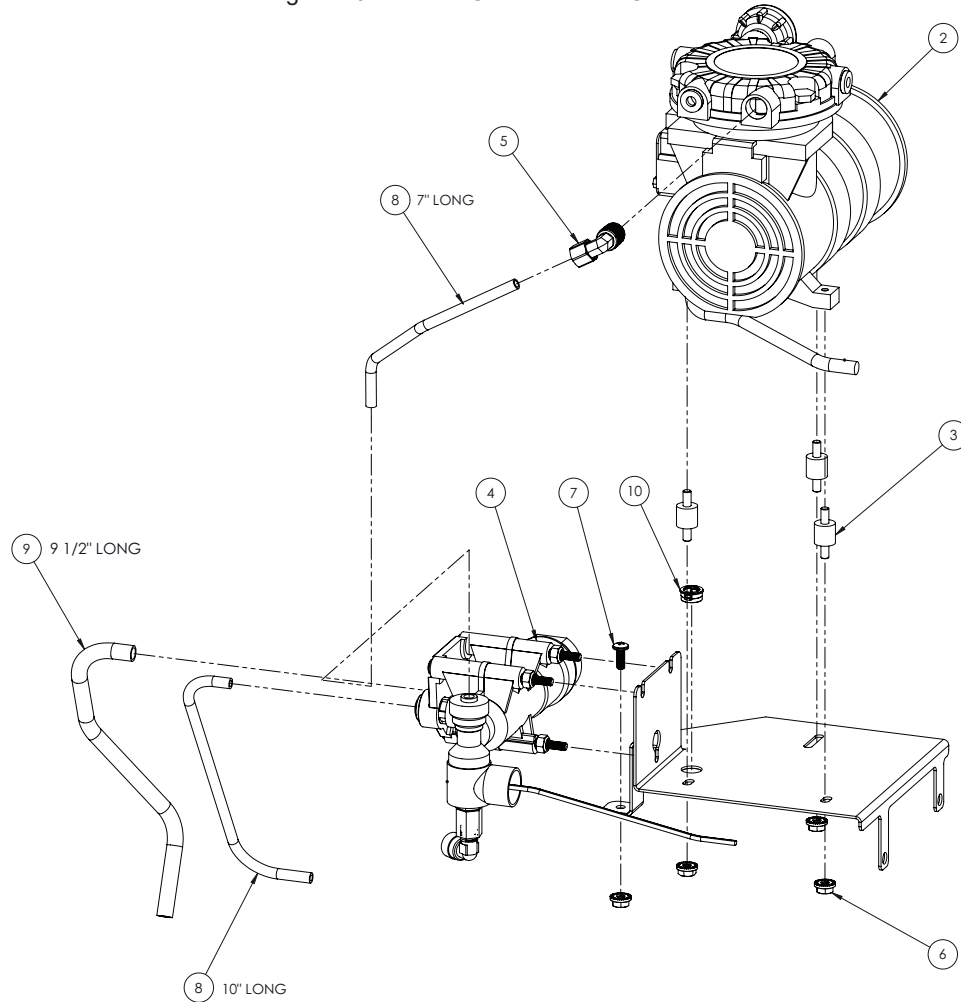
NOTE! Part listed here are unique to the Smart HE Sulfur-Cleer control valve. See exploded parts view on “Parts List” on page 44 for reference.

Item	Part Number	Description
*	01040343	Smart HE Sulfur-Cleer Control, Complete
1	01023196	Valve Body
4	01040224	Gear Box Assembly, Downflow
12	P0440268	O-ring, Brine & Drain Elbow, 10ea/kit
18	01037287	Brine Elbow Assembly, Push-To-Connect
24	P1040214	Backwash Flow Control, Black (5.5 gpm), 10ea
23	01040256	Enclosure Frame, Sulfur-Cleer
*	01022238	Aux Out Relay, Circuit Board
45	P1001257	Eductor Sleeve, Sulfur-Cleer, 10 PCS (includes items 46 and 47)
46	00332354	Eductor Throat O-ring, Large, Viton
47	P0308454	Eductor Throat O-ring, Small, Viton, 10ea/Kit
48	01013897	Eductor Nozzle w/O-ring, Blue
49	P0308455	O-ring, Eductor Nozzle, Viton, 10 ea/Kit
*	P1014170	Adapter, 1/8" NPTE x 1/4" Stem, 10ea
*	P1005648	Elbow Adapter, 1/4" x 3/8", 10ea
*	P1010259	Adapter, 1/4" Tube x 1/8" NPTE, 10ea
*	01034517	Assy, Inlet Check Valve
*	00401734	Mineral, CIM, 1.5 cu.ft drum

* Not shown

Aeration Controller

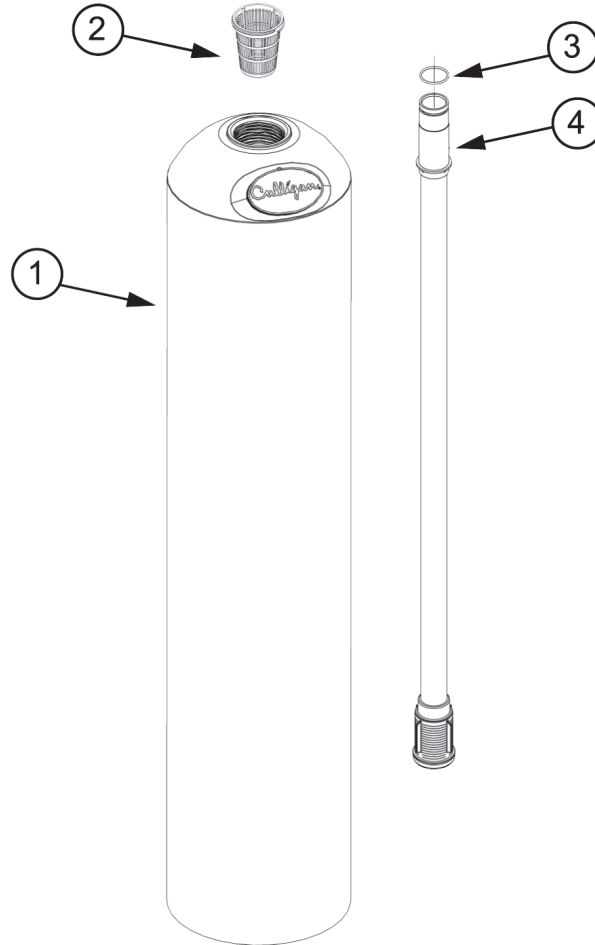
Figure 70. Sulfur-Cleer Aeration Controller.



Item	Part No.	Description	Qty.
—	01023494	Aeration Controller, Complete	1
2	01029378	Compressor, Model LP12-AA38-002	1
3	P1023536	Rubber Mount, 1/2"x1/2", #10-32 Thd, 10ea	3
4	01023201	Shuttle Assembly, Complete	1
5	—	Elbow, Tube Fitting, 1/4T x 1/4"NPT, 10ea	1
6	—	Nut, #10-32, Hex, Lock	4
7	—	Screw, Mach, #10-32x1/2, Hex Hd Phil	1
8	00303177	Tubing, 1/4", PE, Black	
9	01009819	Tubing, 3/8", PE, Black	
10	—	Bushing, Short, 1/2" O.D.x3/8" I.D.	1
11	P1000372	Bushing, Strain Relief, 25ea	1
12	—	Bushing, Strain Relief	1
	01041681	Compressor Valve Plate	
	01041682	Internal Solenoid Repair Kit	
	01041683	Shuttle End Cap	
	01041684	Remote Panel Shuttle Valve Assembly with Solenoid	
	01041685	HE IC Complete Solenoid Kit	

Tank Assembly

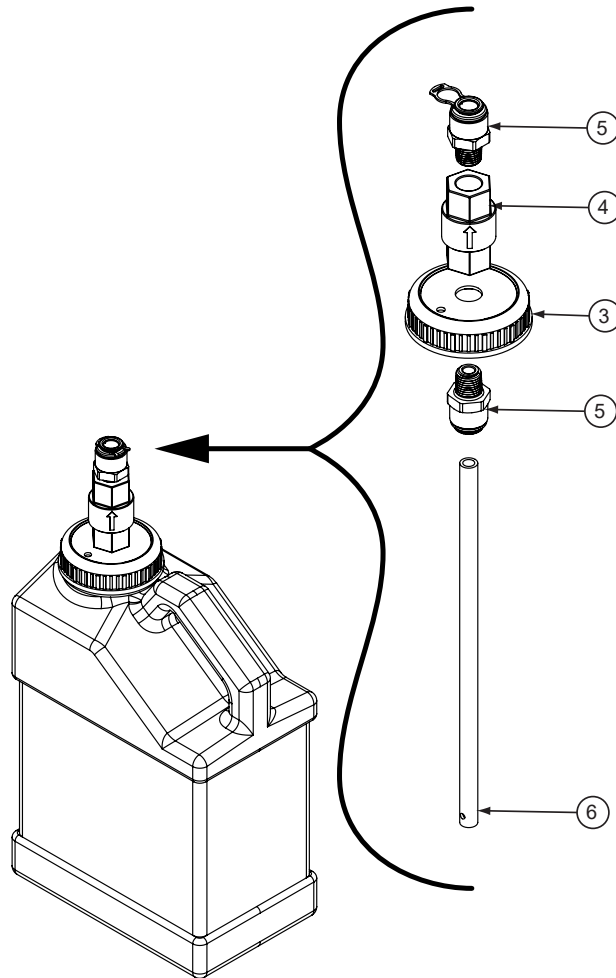
Figure 71. Sulfur-Clear tank assembly.



Item	Part No.	Description	Qty.
1	01040431	QH Tank Replacement, Gray, 10" x 54", w/ Manifold (includes items 2-4)	
	01040418	FRP Tank Replacement, Gray, 10" x 54", w/ Manifold (includes items 2-4)	
2	P1011195	Top Strainer - Wide Slot, 10 ea	1
3	P1009099	O-Ring, Manifold, 12 ea	1
4	01014539	Outlet Manifold - 10"	1
—	00401734	Culligan CIM Catalytic Media, 1.5 cu.ft	1
—	00160702	Cullsian Underbedding, 20 lb	

Solution Tank

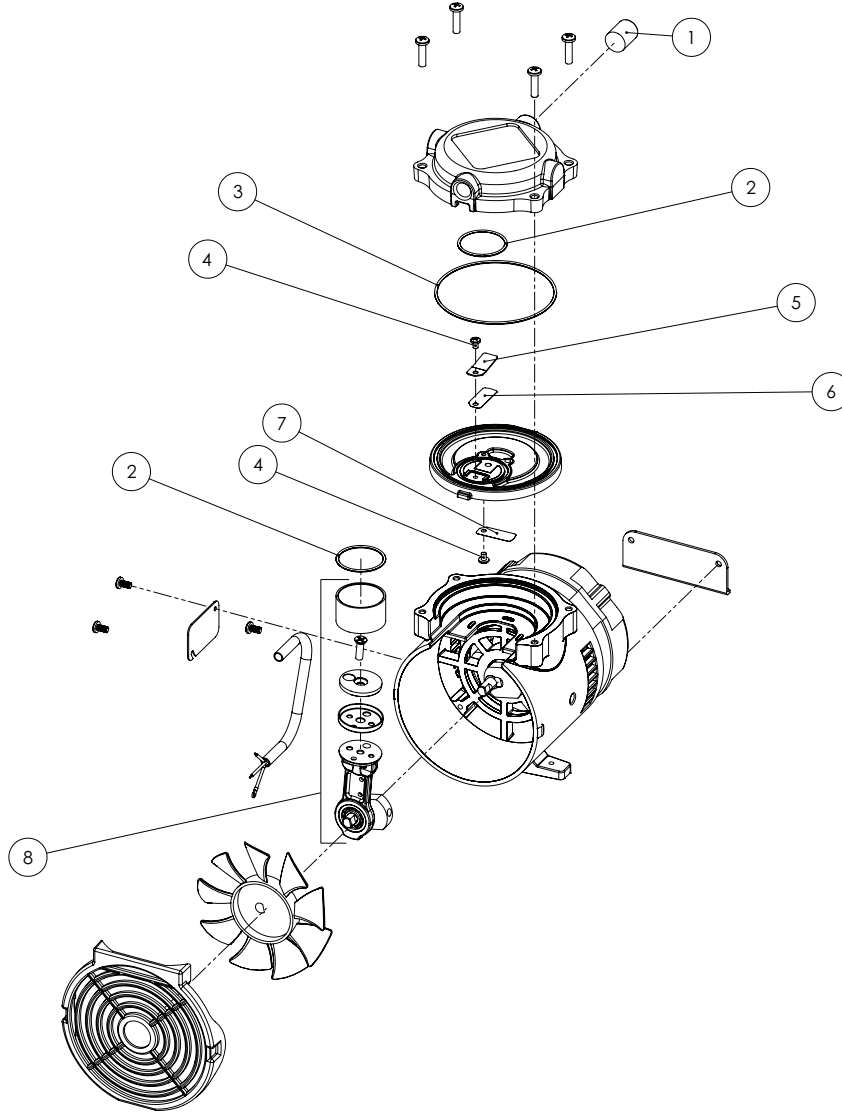
Figure 72. Sulfur-Cleer conditioner tank.



Item	Part No.	Description	Qty.
—	01028893	Solution tank, complete (includes items 3-6)	
3	—	Cap with holes	1
4	P1020214	Check valve, 1/4", 10ea/kit	1
5	—	Adapter, 3/8" tube x 1/4" NPTE	1
6	—	3/8" tube	1

Compressor Assembly - Model LP12-AA38-002

Figure 73. Compressor assembly, Model LP12-AA38-002



Item	Part No.	Description
—	01029378	Compressor, Model LP12-AA38-002
—	01029379	Compressor Rebuild Kit
1	*	Foam Filter
2	*	Cylinder O-Ring
3	*	Head O-Ring
4	*	Valve Screw
5	*	Valve Restraint
6	*	Flat Valve
7	*	Curved Valve
8	*	Rod/Eccentric Bearing Assembly

*Included in Rebuild Kit

Appendix C - Iron-Cleer/Sulfur-Cleer Compressor Service Kit

Sulfur-Cleer Compressor Service Kit (01029379)

Service Kit Installation



WARNING!

Unplug the compressor before beginning disassembly.

NOTE!

Please read this manual completely before installing and using this pump. Save this manual for future reference and keep in the vicinity of the pump.

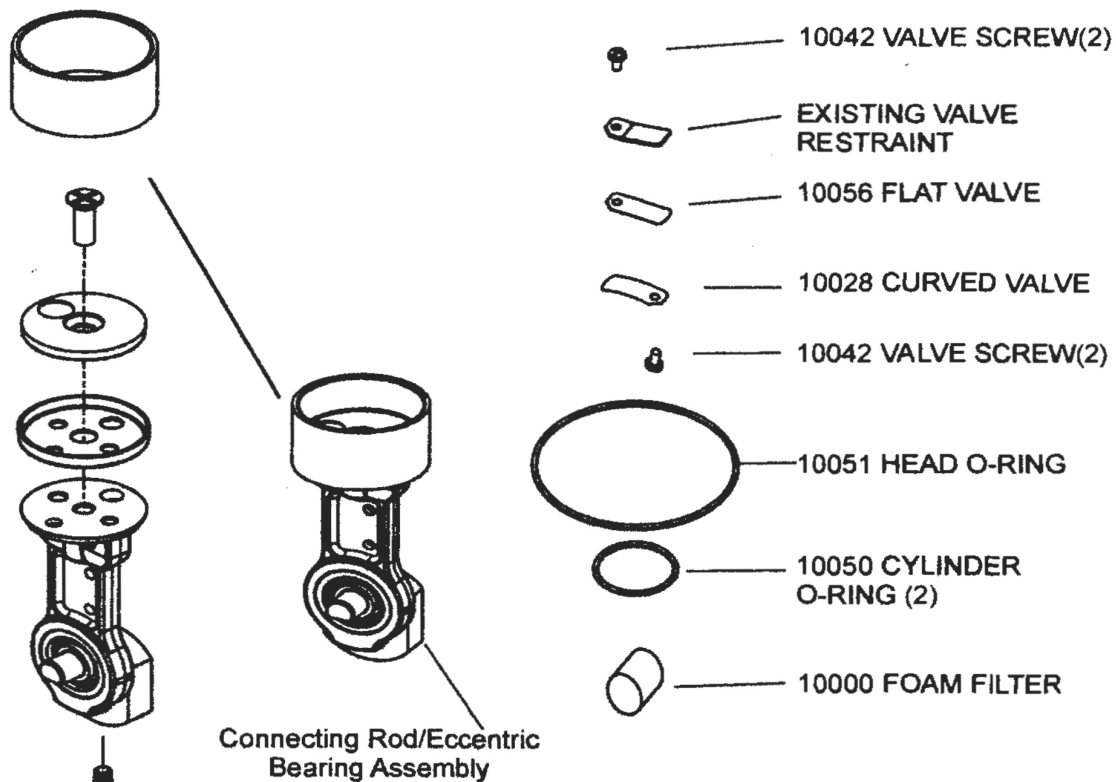


CAUTION!

Improper assembly or use of damaged parts may lead to premature failure. To avoid frequent repairs follow the recommended assembly procedures.

Parts Included

- 10042 Valve Screw (2)
- Existing Valve Restraint
- 10056 Flat Valve
- 10028 Curved Valve
- 10042 Valve Screw (2)
- 10051 Head O-Ring
- 10050 Cylinder O-Ring (2)
- 10000 Foam Filter



Tools Required

- #2 Phillips bit for torque wrench (head screws, valve screws)
- 5/16" Allen wrench bit for torque wrench (eccentric screw)
- Torque wrench (18-55 inch pounds)
- Clean cloths

Disassembly

You can reduce system leaks by keeping accessories such as relief valves, gauges, crossover tubes, etc. in place at the ports while you remove the head.

1. Clean external surfaces of compressor.
2. Loosen and remove the 4 head screws (1) and compressor head (2). See [Figure 41](#).
3. Carefully separate valve plate (5) from head.
4. Remove head O-Ring (4) and discard. Carefully remove and discard exhaust cavity (3) O-Ring from topside of valve plate.
5. Remove and discard screw and valve flapper from top of valve plate, keep the valve flapper restraint (5). Clean restraint.
6. Remove and discard cylinder O-Ring, screw and intake valve flapper from underside of valve plate.
7. Remove front cover (A). Remove fan (B) from eccentric bearing assembly (C). See [Figure 10](#).
8. Rotate eccentric bearing assembly to align set screw with eccentric screw access hole. Loosen set screw with 5/16" Allen wrench. Slide connecting rod assembly off shaft. Remove from housing and discard.

Figure 75.

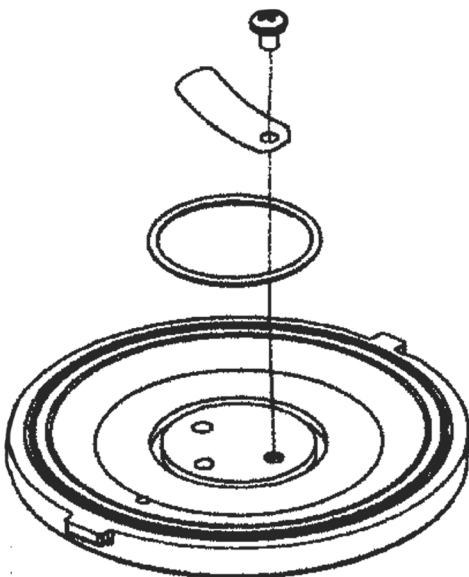


Figure 74.

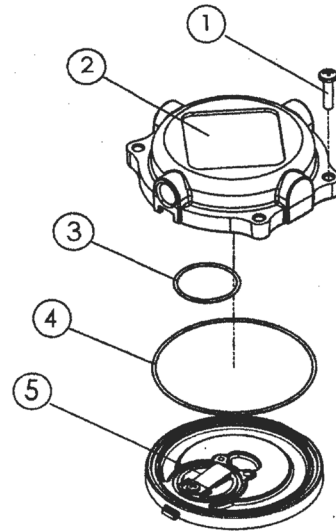
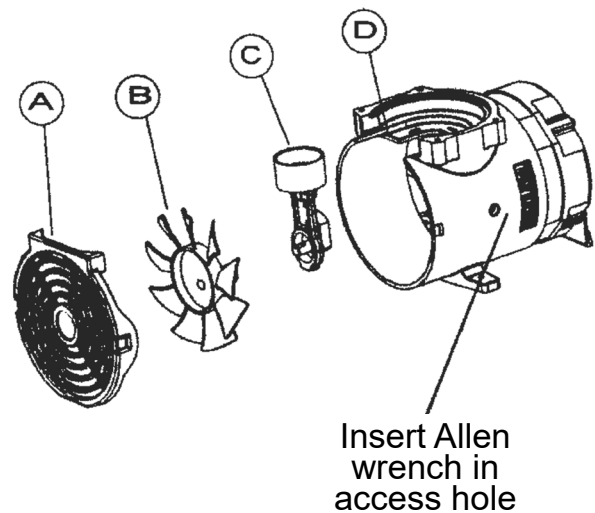


Figure 76.



Reassemble Valve Plate

1. Clean bottom of valve plate with a clean, soft cloth.
See ["Electrical" on page 24.](#)
2. Install intake valve flapper with curve up covering intake port.
3. Install valve flapper screw and torque to 18 inch pounds keeping flapper secure and properly aligned over intake port.
4. Carefully install cylinder O-Ring into O-Ring groove.
5. Clean top of valve plate with a clean, soft cloth. See [Figure 5.](#)
6. Install exhaust valve flapper with notch to the right.
7. Place restraint on top of flapper screw and torque to 18 inch pounds keeping flapper and restraint properly aligned over exhaust port.

Figure 77.

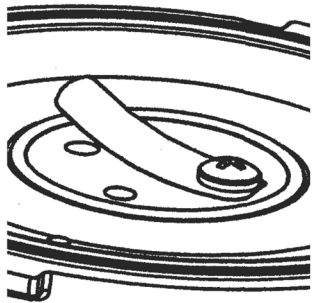
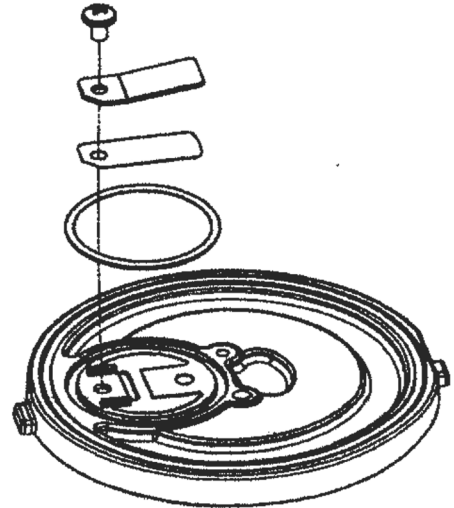


Figure 78.



Assembly and Head

1. Insert new rod assembly through opening in the housing.
Align eccentric set screw with the flat of the shaft.
Push assembly onto shaft until eccentric contacts housing bearing.
2. Torque eccentric set screw to 55 inch pounds.
3. With exhaust valve facing the front, place the valve plate assembly on the compressor housing so the lip of the cylinder fits into O-ring groove on valve plate assembly, ensure cylinder O-ring remains properly seated. See [Figure 6.](#)
4. Carefully install head O-ring and exhaust cavity O-ring, seated firmly into grooves.
5. Place head on top of valve plate aligning the tabs on the valve plate with the slots on the head and exhaust cavity towards the front.
6. Insert and tighten 4 head screws to 40 inch pounds in a criss crossed pattern.

Reassemble Rod, Valve Plate

Figure 79.

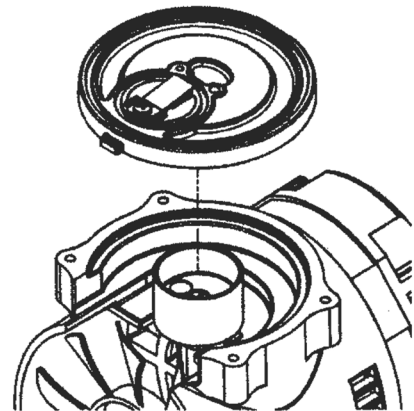
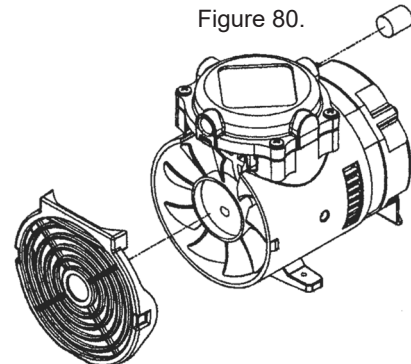


Figure 80.

Reassemble Fan and Front Cover

1. Remove and discard foam filter from intake port of head.
Replace with new foam filter. See [Figure 44.](#)
2. Assemble fan onto nib of the connecting rod assembly ensuring that the flat on the nib aligns with the flat of the fan hub. Press firmly until fan touches connecting rod bearing
3. Assemble front cover to housing by snapping slots on side of front cover onto tabs on side of the housing.



Maintenance



WARNING!

The head and motor surface(s) can become very hot during operation. Do not touch these parts until the pump has been turned off and allowed to cool.

Intake filters and mufflers require periodic inspection and replacement. Initial inspection is suggested at 500 hours; the user should determine the frequency thereafter. Prevent most problems by keeping filters and mufflers clean. Dirty filters and mufflers decrease pump performance and can decrease pump life.

Some filter element(s) are held together by a snap fit. Remove the cover to replace the felt and then reassemble.

Troubleshooting

Low Pressure	High Pressure	Low Vacuum	Excessive Noise	Over Heating	Won't Start	Reason
•				•		Dirty Filter
		•		•	•	Dirty Muffler
•		•				Dirty Valves
•		•	•		•	Damaged Valves
•		•				Worn/Damaged Cup
•	•	•	•	•	•	Improper Cylinder Shimming
•		•				Leaky Hose
•		•				Leaky Check Valve
•	•	•		•	•	Plugged Vacuum or Pressure Line
•		•		•	•	Low Voltage
•		•				Leaky Relief Valve

Appendix D - Sulfur-Clear Shuttle Valve Operation

The purpose of this Appendix is to provide an overview of the shuttle valve of the Iron-Clear and Sulfur-Clear aeration controls and to answer a couple frequently-asked questions.

FAQ No. 1 – Can I join the three drain lines in to a single tube?

A: There is no reason not to join the filter drain and the shuttle valve drain into a single line if you wish. They are used at different times so neither will interfere with the other. The shuttle vent is open only when the compressor is running, so there may be a mixture of air and water passing to drain at that time. The control valve drain carries water only during the regeneration step, although some air may discharge at the beginning of backwash.

The third drain line, a section of ¼" OD tubing, is actually an air vent line. It serves two purposes: primarily it vents air pressure from the air side of the shuttle when the compressor stops, allowing the shuttle to return to its resting position. That stops the flow of air and water to drain. Under normal operation there should not be any water coming from that line.

Its second function is to act as a telltale. Should the shuttle fail to return to rest and the duckbill check fail to hold, water will flow back toward the compressor. The three-way solenoid valve protects the compressor by diverting backflow to drain. The presence of water from the vent line is a sign that service is needed on the shuttle assembly. The bottom line is that you must be able to detect the presence of water in the vent line.

- If you use clear or translucent tubing for the vent line you may join it with the other drain lines.
- If you use opaque tubing, the vent tube end must remain separate from the drain lines with the end in plain sight.

In either case, a shuttle or duck bill check leak will cause water flow from the solenoid vent line so it must be routed to a drain to prevent potential water damage. As always, your drains must be constructed and routed in a manner that fully complies with all applicable plumbing codes, including a proper air gap where the drains discharge to the waste pipe.

FAQ No. 2 – Why don't you include a strainer or screen on the line running from the control valve to the shuttle drain?

A: The simple answer is that it shouldn't be necessary if the media is soaked and backwashed as instructed before the unit is put into service. A strainer is available under P/N 01014429 if you elect to use one. It's the same one used on the original Super S filter.

Most of the remaining common questions can be answered with the illustrations that follow. They show the shuttle valve internal structure in detail along with descriptions of what happens during each operating step.

Figure 81. Compressor Idle.

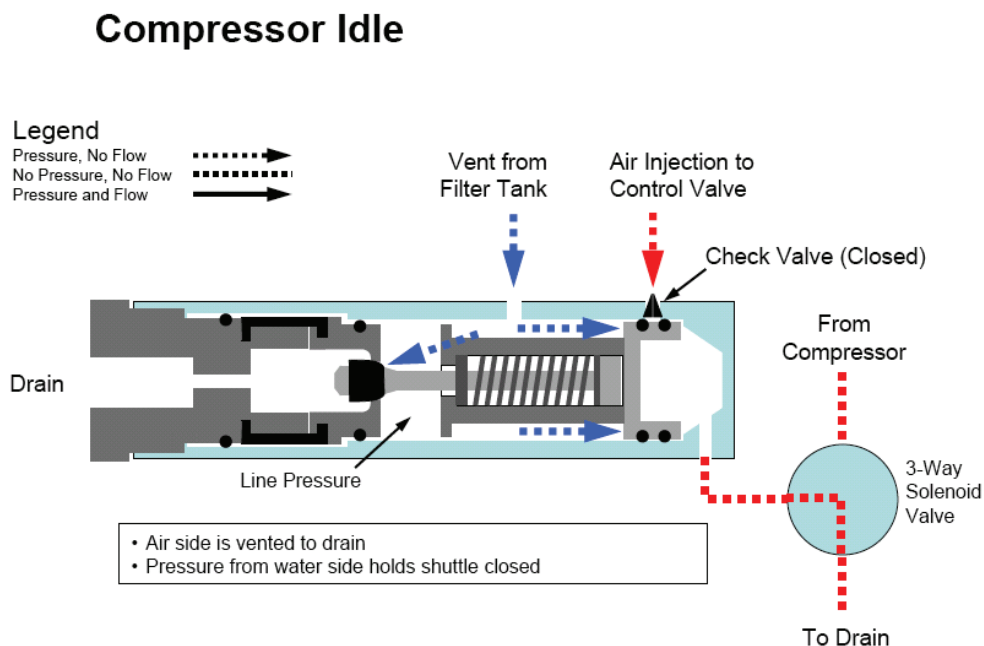


Figure 82. Compressor Running.

Compressor Running

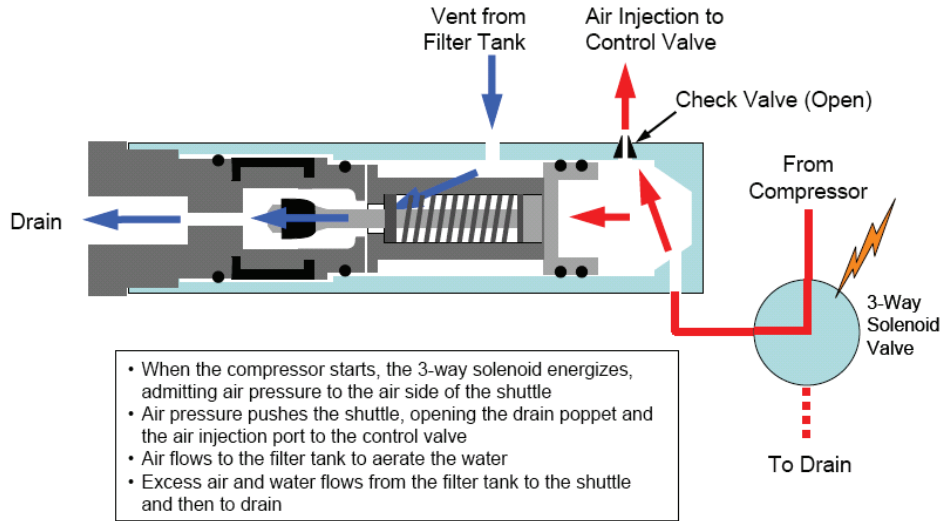


Figure 83. Compressor Stopped.

Compressor Stopped

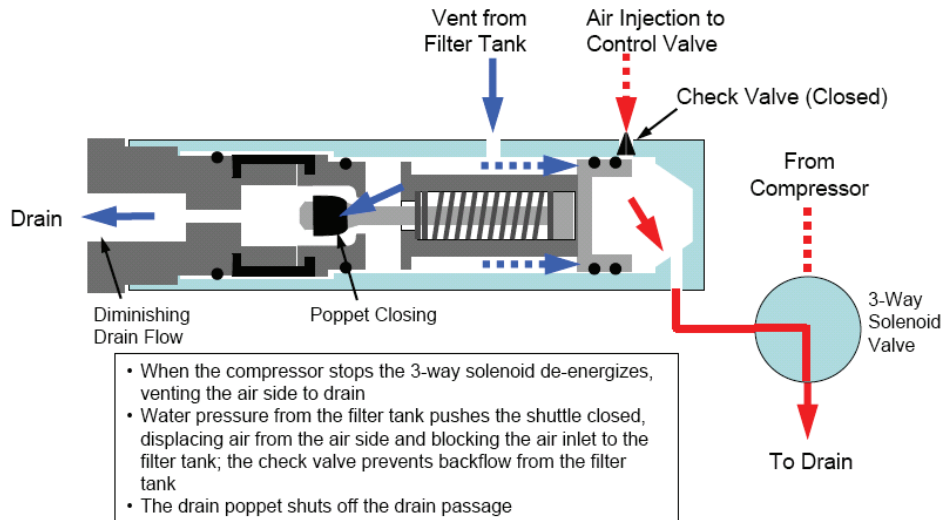


Figure 84. Pressure Safety Relief.

Pressure Safety Relief

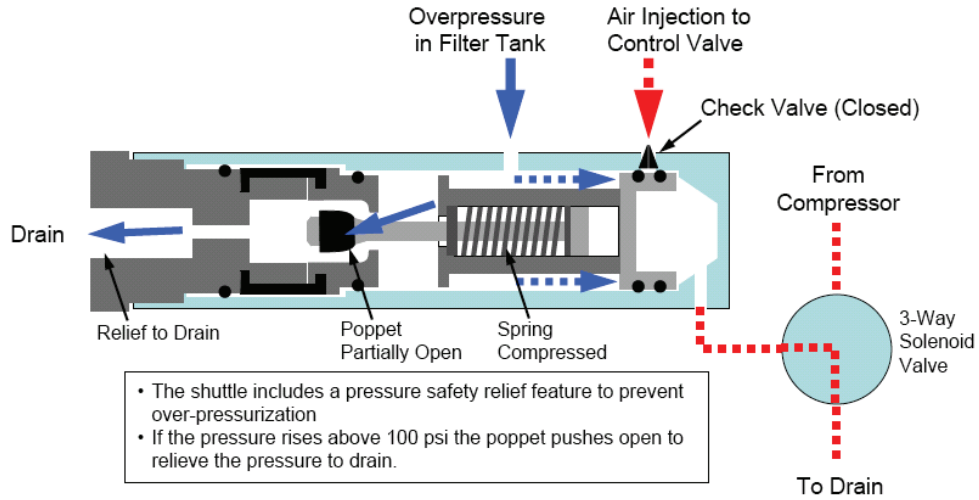
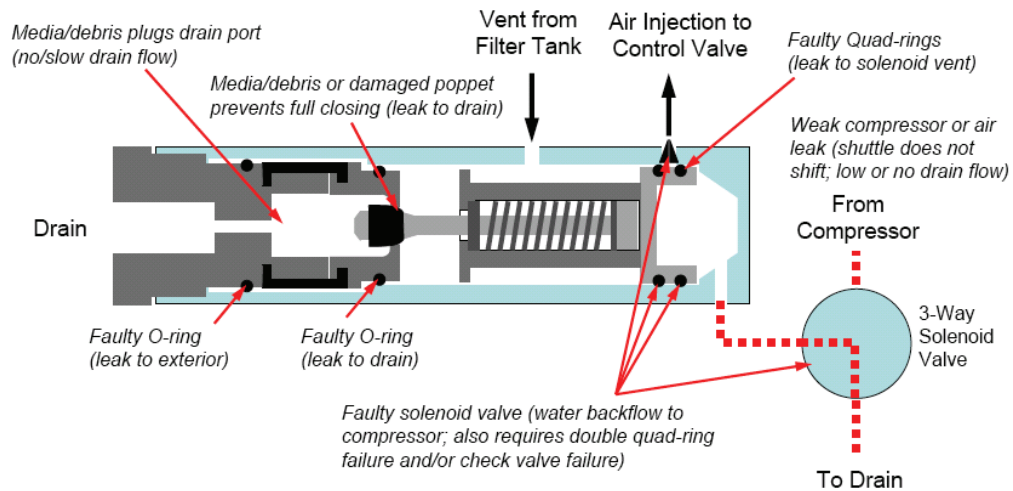


Figure 85. Compressor Potential Failure Points.

Potential Failure Points



Appendix E - Smart HE Arsenic Filter

Filter Media Loading - Arsenic Reduction Filter



CAUTION!

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

NOTE! Cull-AsX53 filter media must be soaked in water for 24 hours to allow for full saturation before begin put into service. In-plant preparation is highly recommended.

1. Position the tank for loading.
2. Remove the inlet strainer.
3. Be sure the outlet manifold is positioned properly in the tank.
4. Cover the outlet manifold before inserting the large opening funnel.
5. Pour underbedding into the tank. Level if required.
6. Add water to fill the tank to approximately 1/3 full.
7. Pour the Cull-AsX53 media into the tank. Leveling isn't required.
8. Replace the inlet strainer. Make sure to thread it all the way to the bottom of the tank threads.

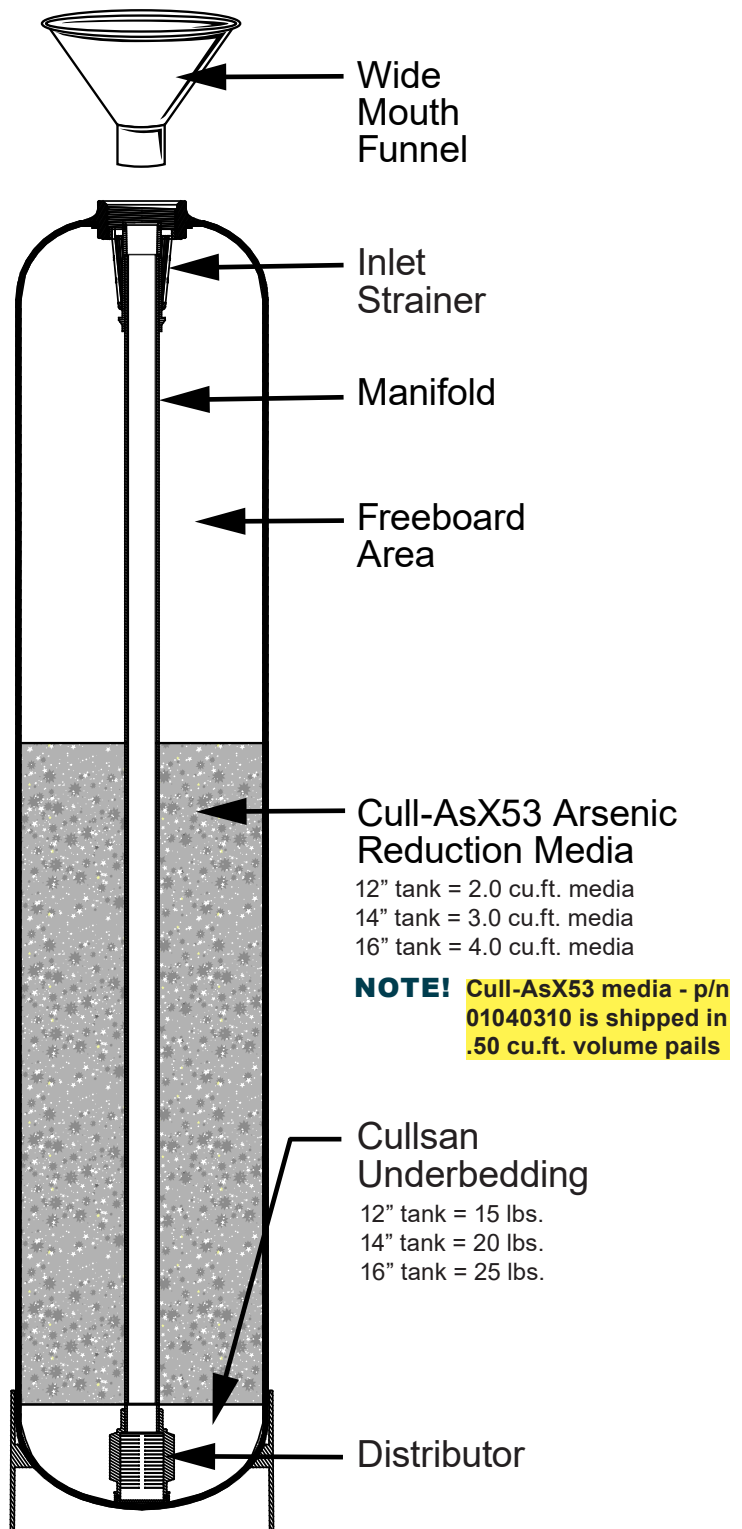
NOTE! While adding Cull-AsX53 media to the tank water should always be visible above the media level in the tank. If water is not visible add more until media level is submerged.

Change Backwash Flow Control

Prior to start-up, the installed drain line flow control, shipped with the control valve, must be replaced with the appropriate sized backwash flow control for the tank size being installed.

- 12" tank - 7.0 - Black
- 14" tank - 10.0 - Black
- 16" tank - 11.5 - Black

Figure 86. Media Tank Cross Section















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 GBX2 Programming Guide, P/N 01040743, for instructions).
6. Complete the First Time Setup as a “Filter”
7. Open the main supply valve.
8. Using motor control in diagnostics, cycle control to BACKWASH (Position #2)
9. When in the BACKWASH position, slowly rotate the bypass to the service position until water flows.
10. Allow the tank to fill slowly until water flows from the drain line.
11. When flow to drain is established, open the bypass fully. Watch the drain line discharge for signs of filter media. If signs of filter media particles appear, reduce the flow. Increase the flow again when media no longer appears in the discharge.
12. After the BACKWASH runs clear, using motor control advance past the PAUSE/DRAW (Position #3) to FAST RINSE (Position #4). When flow to drain is clear advance to SERVICE (Position #1).
NOTE! Flush for 90 minutes or until the effluent is free of media fines and color.
13. Complete the installation and clean-up.
14. Program the Smart HE Filter GBX2 Controller as outlined in the following section.

Programming Total Capacity and Media Life Functions

The Culligan Arsenic Filter system uses the included flow meter as a Performance Indicator Device (PID) to monitor the quantity of water treated in relation to the systems rated treated water capacity for arsenic reduction. When the programmed MEDIA LIFE capacity has reached “zero” gallons the GBX2 controller will activate the YELLOW alert indicator on the front panel and REPLACE MEDIA will show on the display screen. The REPLACE MEDIA alert will also be activated in the Culligan Connect App if used. When the MEDIA LIFE alarm is activated the Cull-AsX53 filter media must be replaced to ensure the continued reduction of arsenic from the influent water supply. Refer to the GBX2 programming Guide (P/N 01040743) for additional programming information.

To program the TOTAL CAPACITY and MEDIA LIFE functions for the Smart HE GBX2 control:

1. From the Home Screen press  until 4) ADV SET-UP is displayed and press  to select.
2. Press  repeatedly until 2) REGEN SET-UP is displayed and press  to select.
3. Press  once to advance to TOTAL CAPACITY and press  to select.
4. Use  to increase the TOTAL CAPACITY gallons setting to 4,000 gallons and press  to accept.
NOTE! This setting ONLY controls the frequency of the automatic reconditioning cycle.
5. MEDIA LIFE is now displayed, press  to select.
6. Use  to increase the MEDIA LIFE gallons capacity to the value listed below based on the tank size.
 - 12” tank with 2.0 cu. ft. Cull-AsX53 media = 125,000 gallons
 - 14” tank with 3.0 cu. ft. Cull-AsX53 media = 180,000 gallons
 - 16” tank with 4.0 cu. ft. Cull-AsX53 media = 250,000 gallons
7. Press  to accept and then press  repeatedly to return to the FILTERING home screen.

NOTE! The MEDIA LIFE REMAINING in gallons can be checked at any time from the GBX2 Control Information Screen.

Appendix F - Smart HE Outdoor Models

Outdoor Smart HE Enclosure

The outdoor rated Smart HE control 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.



WARNING!

Do not use an extension cord. Connect only to suitably marked, covered GFCI receptacle for wet locations.

Item	Part No.	Description
	01040341	Smart HE Control Valve, Filter, Outdoor
87	01033061	Gearmotor, Outdoor, Kit
89	01040268	Cover, Smart HE Control, Outdoor, Grey
93	01041785	Enclosure Door Kit, Outdoor, (includes: door, keypad, hinge, gasket and screws)
94	01033331	Electronics Enclosure Kit less Circuit Board, Outdoor
97 ***	P1033068	Door Seal, Outdoor, 10ea/Kit
98 ***	01040248	Thumb Screw, HE Control, Outdoor, Gray
***	01025282	Wire Harness, Meter, 28" Long, Outdoor
***	01040208	Power Supply, Outdoor, 24VDC, 20 ft.
***	01040209	Extension Cable, DC Power Supply, Outdoor, 20 ft.

Figure 87. Smart HE Outdoor Enclosure

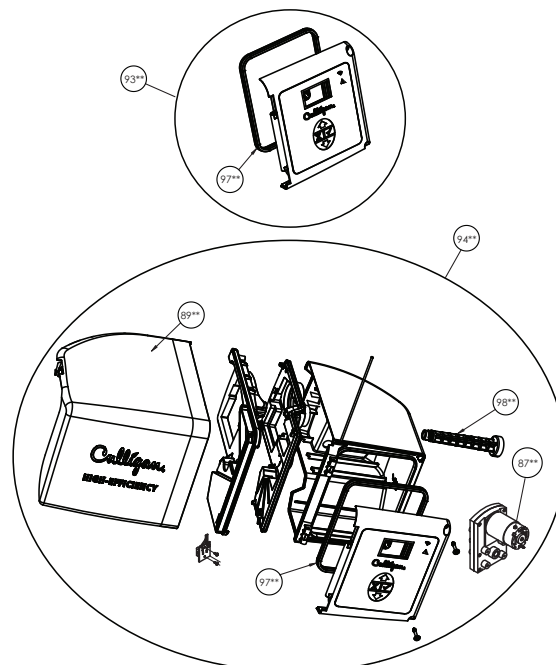


Figure 88. Outdoor System Placement

Placement

Refer to [Figure 47](#) 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 88](#))
- 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 3. Maximum Allowable Drain Line Length” on page 23](#) 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 89. Insert Wire with Bushing

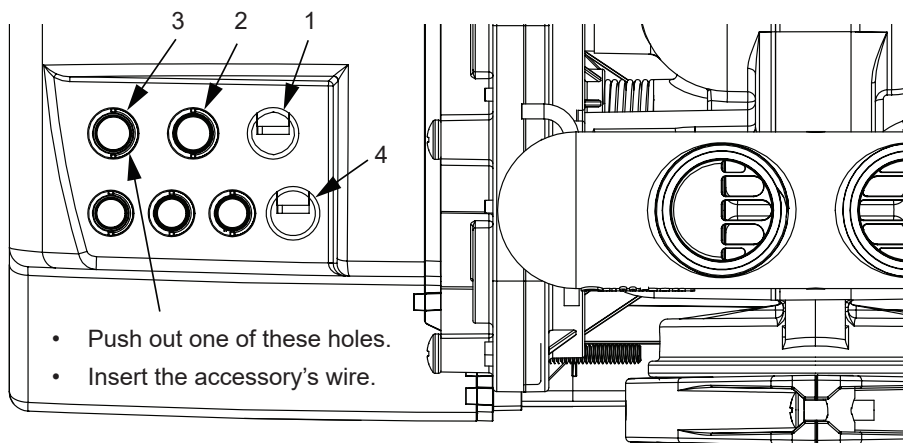


Figure 90. Connectors

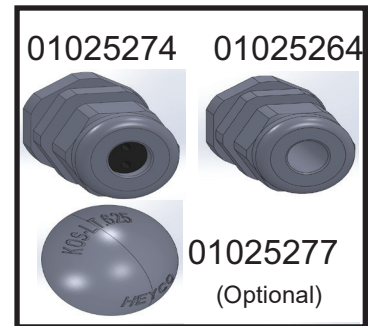


Table 13. Accessory connectors and possible connections.

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

- Connect accessories to the GBX2 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 91. Wall Mounted Outdoor Transformer 01040208

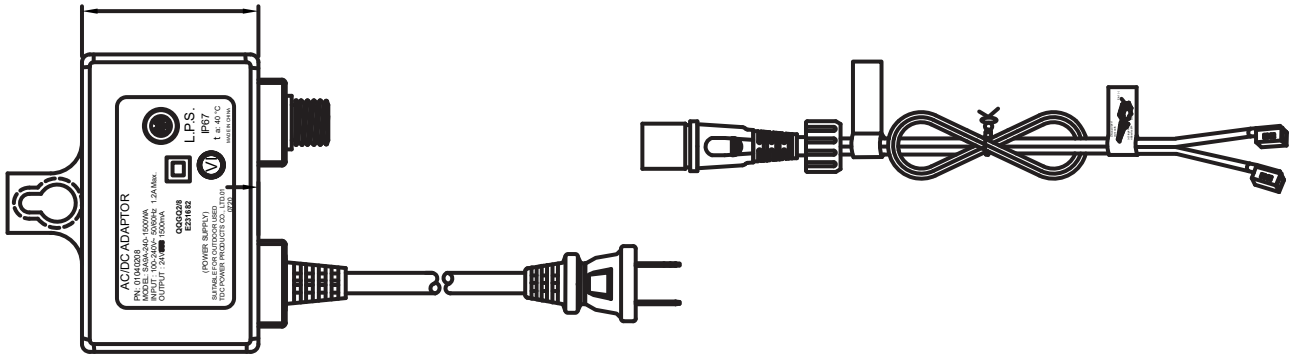
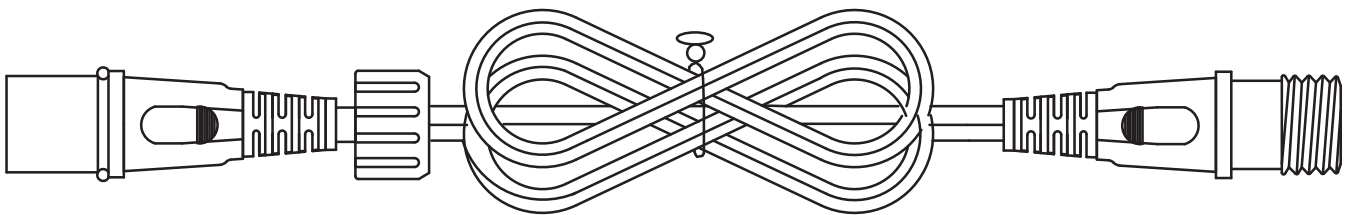


Figure 92. 20 foot DC Power Cable Extension - 01040209



Appendix G - Application

It is important to understand how your Culligan® Water Filter functions and know its capabilities and limitations for a successful application. Proper application will maximize system performance and extend the life expectancy of the filtration system. Following the guidelines and recommendations in this section of the manual will help to ensure the filter system is applied correctly.

Cullar® Filter

Smart HE Filters with Cullar D+ activated carbon media can reduce chlorine and associated tastes and odors. Some other common tastes and odors associated with naturally occurring organics may also be removed. Cullar D+ media can temporarily reduce hydrogen sulfide levels but if hydrogen sulfide is constantly present in the water an odor reduction system specifically designed for hydrogen sulfide reduction must be selected. Whenever the cause of an objectionable taste or odor has not been identified further water testing is required. Cullar D+ media should not be used with water that is of unknown microbiologically quality, is unsafe or contains nuisance bacteria without adequate chemical disinfection with chlorine prior to the Cullar filter system. Cullar D+ media can last for several years in many cases but will eventually need replacement when it loses its ability to satisfactorily reduce chlorine levels.

Filtr-Cleer®

Smart HE Filtr-Cleer Water Filters use a multi-layered media capable of reducing particulate matter down to 30-microns in particle size. The stratified layers of progressively finer filter media allow filtration through the entire depth of media bed. This method of filtration minimizes the pressure loss associated with filters that use only one grade of filter media. The Filtr-Cleer will not effectively remove colloidal matter and turbidity below the micron rating or color caused by organics. Common applications follow:

- Reduction of suspended matter in the water.
- Reduction of particulate matter, such as clay, mud, and fine sediment.
- Prefiltration of oxidized iron prior to a water softening system.
- Reduction of light sand and sediments.
- After a retention tank when a Cul-Cleer® system with chemical feed is used for oxidation, coagulation, or flocculation.

NOTE! NOTE If sand and sediment particles are too large to be flushed from the Filtr-Cleer media and tank during the backwash cycle a sand trap should be installed prior to any filtration.

The volume of filtered water between reconditioning cycles will depend upon the amount, type, and size of the particulate matter being removed by the filter. The reconditioning interval should be a balance between avoiding excessive pressure drop as accumulated sediments are removed by the filter media and water conservation related to frequent reconditioning cycles. It is important for successful well water applications that the well pump system can provide the required backwash and rinse flow rate for the selected system.

The Culligan Analytical laboratory offers a “Depth Filter” analysis to aid in determining the effectiveness of Culligan Filtr-Cleer systems. A water sample representative of the water to be treated (4 oz) should be sent to the lab for analysis. Include the “Request for Analysis” form available on Cport and specify “Depth Filter” analysis on the form.

The Depth Filter analysis includes the following tests:

- Total Suspended Solids – mg/l
- Suspended Solids > 10 microns – mg/l (greater than 10-microns)
- Suspended Solids > .45 microns – mg/l (greater than .45-microns)
- Turbidity – NTU (Nephelometric Turbidity Units)
- Turbidity After 11-micron Filtration - NTU (Nephelometric Turbidity Units)

If the Turbidity test result of the untreated water exceeds 150 NTU, Suspended Solids exceeds 150 mg/L or the Turbidity After Filtration is of unacceptable quality a Filtr-Cleer filter may not be applicable. Filtr-Cleer media is inert and durable providing a long service life. Inadequate backwashing can shorten media life so it is important that well water systems can supply the required backwash and rinse flow rates for the selected system. The U.S. Public Health Drinking Water standards state the turbidity level for a private well should not exceed 5 NTU.

Cullneu® Filter

Smart HE Water Filters with Cullneu Media can neutralize acidic water caused by low pH levels. Smart HE Filters can be used on waters with a pH level from 5.2 to 6.8. Low pH levels are primarily caused by carbon dioxide in the water which forms carbonic acid. Carbonic acid can corrode copper piping resulting in blue/green staining, pipe damage and pin-hole leaks. Other metals in the plumbing system can also be corroded and dissolved including brass, lead, and iron. Cullneu media is a high-purity form of calcium carbonate that reacts with carbonic acid in the water to convert it to bicarbonate alkalinity. This increases the pH and alkalinity level of the water and reduces the potential for corrosion. If the pH level is between 5.0 and 6.0 then one part of Cullneu C media (magnesium oxide) should be mixed with 5 parts of Cullneu media to provide additional neutralizing capability. Cullneu media is a sacrificial mineral and will dissolve into the water over time. During the neutralization process some hardness is also added to the water. Since Cullneu media is consumed in the neutralization process the media level in the filter tank will need to be periodically replenished to maintain system effectiveness. Cullneu filters should be plumbed prior to a water softener if soft water is desired. If the water to be treated has a pH level of less than 5.0 and/or a high level of hardness, then a Cullneu filter may not be applicable. A solution feeder system should be considered for pH levels below 5.0.

A complete analysis of the water is recommended to help in determining the best solution for pH neutralization. At a minimum, an on-site analysis of the water's pH, alkalinity, hardness, and total dissolved solids (TDS) levels should be conducted. A more detailed water analysis can be performed by the Culligan Analytical lab. See Cport for details on test packages.

Iron-Cleer® Filter

Smart HE Iron-Cleer Filters are designed for iron and hydrogen sulfide removal. The two-tank Iron-Cleer system utilizes the process of aeration and oxidation followed by filtration with a catalytic filter media. The aeration process is initiated in the first tank by an integrated air compressor and shuttle valve that maintains and balances an airhead within the aeration tank. Water entering the aeration tank contacts air and starts the oxidation process. Iron begins to convert to the ferric form and hydrogen sulfide converts to sulfate and/or a filterable particle. Water exiting the aeration tank enters the filter tank where it contacts the Birm catalytic filter media to complete the oxidation and filtration process. An additional layer of Culligan G-50 filter media below the Birm offers additional filtration for smaller particles of oxidized iron and hydrogen sulfide.

To achieve the best system performance the following conditions should be met:

- A pH level 7.0 to 8.5 is required for iron reduction.
- An alkalinity level of 100 mg/l (as CaCO₃) or higher to ensure complete oxidation of iron to a filterable particle.
- Iron levels should not exceed 10 mg/l of ferrous (clear water) iron.
- Hydrogen sulfide levels up to 5 mg/l. An on-site hydrogen sulfide test is recommended to quantify the H₂S level.

Other application considerations:

- Organics and Tannins - color in the water caused by organics, including tannin will not be reduced by the Iron-Cleer system and additional treatment will be required.
- Nuisance Bacteria - Iron-Related bacteria and Slime Forming bacteria can adversely affect system operation, performance, and media life. If nuisance bacteria are suspected, it is recommended to test for their presence. The Culligan Analytical lab offers a Nuisance Bacteria test panel including: Iron Related, Slime Forming and Sulfate Reducing bacteria to determine the levels of each bacteria. If high levels of nuisance bacteria are present other treatment options should be considered or increased service will be required.
- Manganese reduction is possible in some applications. The Iron-Cleer system is not rated for manganese reduction since manganese is very soluble and difficult to oxidize and filter. In applications with a pH level above 8.0 and an alkalinity level over 100 mg/l manganese may be reduced. In the presence of higher levels of iron, the manganese may "co-precipitate" with the iron resulting in a reduction of manganese

Sulfur-Cleer® Filter

Smart HE Sulfur-Cleer Filters are designed for hydrogen sulfide and iron removal. The single-tank Sulfur-Cleer system utilizes the process of aeration and oxidation combined with catalytic activated carbon filtration. The aeration process is initiated in the filter tank by an integrated air compressor and shuttle valve that maintains and balances an airhead within the tank. Water entering the tank contacts air and starts the oxidation process. Hydrogen sulfide and iron begin to oxidize to sulfate and/or a filterable particle. Water passes through the filter tank where it contacts the CIM catalytic activated carbon media to complete the oxidation and filtration process. In some hydrogen sulfide applications, odors can develop within the system and an optional chlorine draw cycle can be utilized to periodically sanitize the media bed if necessary.

To achieve the best system performance the following conditions should be met:

- A pH level 7.0 to 8.5 is required for iron reduction.
- An alkalinity level of 100 mg/l (as CaCO₃) or higher to ensure complete oxidation of iron to a filterable particle.
- Hydrogen sulfide levels up to 8 mg/l. An on-site hydrogen sulfide test is recommended to quantify the H₂S level.
- Iron levels should not exceed 10 mg/l of ferrous (clear water) iron.

Other application considerations:

- Organics and Tannins - color in the water caused by organics, including tannin are not intended to be reduced by the Sulfur-Cleer system and additional treatment may be required. The Sulfur-Cleer is not designed to reduce organic bound iron.
- Nuisance Bacteria – Sulfate Reducing, Iron-Related and Slime Forming bacteria can adversely affect system operation, performance, and media life. If nuisance bacteria are suspected and a periodic chlorination does not resolve the problem, it is recommended to test the untreated well water for their presence. The Culligan Analytical lab offers a Nuisance Bacteria test panel including: Sulfate Reducing, Iron Related and Slime Forming bacteria to determine the levels of each bacteria. If high levels of nuisance bacteria are present other treatment options should be considered or increased service will be required.

Arsenic Reduction Filter

Smart HE Arsenic Filters with Cull-AsX53 filter media are designed to reduce total arsenic at levels up to 100 ppb. The system is certified to NSF/ANSI Standard 53 for the reduction of Type III (trivalent) and Type V (pentavalent) arsenic. The system utilizes Cull-AsX53 filter media, a high-capacity granular ferric oxide adsorptive media specifically designed to reduce arsenic. The media only requires a periodic reconditioning cycle without the need for chemical regenerants. The system can be used on municipal water supplies with chlorine and non-chlorinated private well water supplies. When the Cull-AsX53 filter media has reached its usable capacity for arsenic reduction there is no risk of arsenic being released into the treated water or backwash effluent.

For proper application, a complete water analysis by the Culligan Analytical lab is recommended to predict system performance. The lab offers an Arsenic Application test panel that includes 27 parameters. The parameters listed below have the most influence on arsenic reduction efficiency and media life.

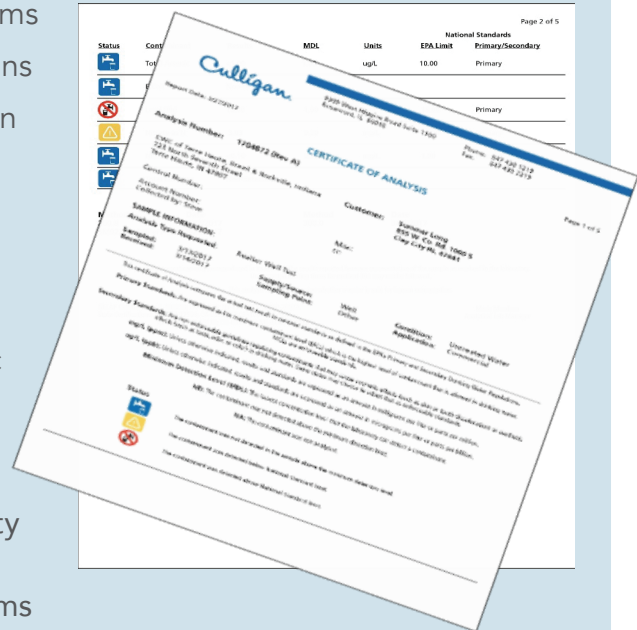
- Arsenic – Total – parts per billion
- Arsenic – individual levels of Type III and Type V – parts per billion
- Silica – mg/l
- Phosphate – mg/l
- pH level
- Iron and Manganese – mg/l

For arsenic reduction on Problem Water applications with iron, manganese, color, odor, or organics in the water a Nuisance Bacteria Panel test is also recommended to ensure that the media bed will not become fouled. Iron Related and Slime Forming bacteria can negatively impact the reduction efficiency and media life of any adsorptive arsenic reduction media. Pre-treatment for the parameters listed above is required for the best results. See Cport for details on Culligan Analytical lab test packages for arsenic applications including post-installation follow-up testing.

Why Water Testing?

The most common reasons to test water!

- Diagnosing problems with existing systems
- Water treatment system recommendations
- Follow-up testing after system installation to confirm performance
- Annual testing of well water as recommended by the EPA
- Real Estate requirement for property purchase and transfer
- Regulatory requirements for small public water systems
- History of local contamination – natural or caused by local types of industry
- Customer health concerns over the safety of their well water
- Investigative testing can identify problems that become a sales opportunity



PROBLEM WATER ANALYSIS - THE BEST TEST VALUE

Problem Water Analysis Includes 40 Test Parameters for Water Treatment

- Standard Analysis including TOC
- Heavy Metals
- Arsenic
- Nuisance Bacteria
 - Iron Related
 - Sulfate Reducing
 - Slime Forming
- Hydrogen Sulfide
- Coliform and E. Coli Bacteria
- Includes overnight shipping - saves you a trip to your local lab
- Best dollar value at just \$7.00 per test parameter



To get started order testing supplies through CPort:

<https://cport.culligan.com/Sales-Marketing/HH-Sales-Tools/Analytical-Lab/Water-Sampling-Supply-Order.aspx>

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