

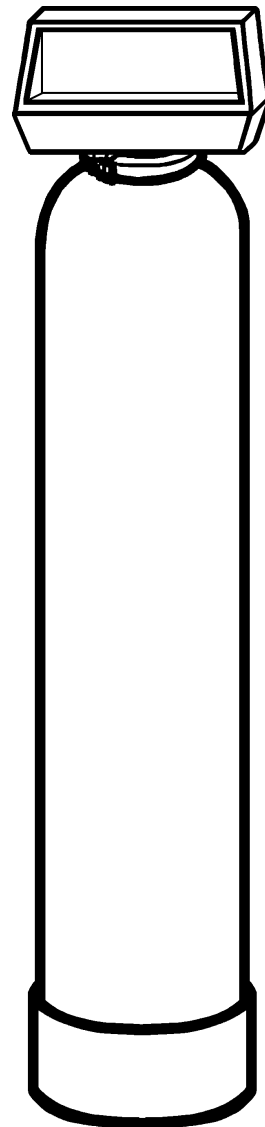


INSTALLATION AND OPERATING INSTRUCTIONS

SUL-X FILTER
SULFUR REMOVAL SYSTEM

MODELS:

SX1000
SX1001
SX2000
SX2001
SX3001



Manufactured and Sold under U.S. Patent No. 3,649,532 by

Cuno Water Treatment

12628 U.S. 33 North, Churubusco, IN 46723
Water Treatment Division of



IN102G (03-058)

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SECTION 1: GENERAL INFORMATION

Congratulations on your purchase of a SUL-X Sulfur Removal System! The SUL-X Filter System operates on new technology for the removal of hydrogen sulfide (sulfur) from your water supply. Contrary to conventional methods, your SUL-X Filter System requires NO retention tank, or chemical regenerant. The unique process is patented.

When properly installed, the SUL-X Filter System will provide many years of trouble-free service. Read this manual carefully and follow the installation steps in the proper order.

DESCRIPTION AND OPERATION OF THE SYSTEM:

The SUL-X Filter System consists of two major components:

- 1) An automatic backwashing type filter containing a special media that removes the precipitated sulfur from the water and functions on the principal of depth filtration rather than surface filtration. The media DOES NOT require a chemical regenerant (such as potassium permanganate) for oxygen enrichment, as is necessary for a greensand filter system. Periodically the filter tank backwashes automatically for a few minutes (generally 10 minutes) which flushes the precipitated sulfur to the drain.

- 2) The second component consists of an electric feeder pump and solution tank for feeding a proprietary chemical solution (SUL-X™ Solution) into the water supply line. When the SUL-X solution comes into contact with the hydrogen sulfide, it causes the hydrogen sulfide to immediately form a precipitate. The precipitate is then collected in the filter tank as described above. The SUL-X solution contains no chlorine, and therefore requires no holding tank or activated carbon posttreatment filtration.

NOTE: If this installation has a very HIGH sulfur concentration and/or HIGH daily water consumption (such as in a large family), it may be more economical to install an aerator ahead of the SUL-X System. The aerator pretreatment will reduce the sulfur concentration by as much as 50 to 75%, thus reducing the consumption of SUL-X chemical solution by a like amount. If the result of multiplying the number of people in the family by the sulfur concentration (in ppm) exceeds 50 (Example: 6 people x 12 ppm = 72), an aerator MAY be recommended. Contact your dealer for more information.

SECTION 2: BEFORE INSTALLATION

INSPECTING AND HANDLING YOUR SUL-X FILTER:

Inspect the equipment for shipping damage. If damaged, notify the transportation company and request a damage inspection. Because your filter system is shipped in more than one carton, refer to the following chart to determine the total number of cartons you should have for your particular model.

COMPONENT	SX1001	SX2001	SX3001
Filter Tank	-	1	1
Media	-	2	3
Feeder Pump	-	1	1
Solution Tank & Parts	-	1	1
TOTAL CARTONS	1	5	6

NOTE: SUL-X Concentrate (generally a case of 4 one gallon bottles) is not included as an integral part of the system, but is sold as a separate item by the manufacturer.

After unpacking, handle the filter unit with care. Damage can result if dropped or if set on sharp, uneven projections on the floor. Do not turn the filter unit upside down.

MAKE SURE YOUR WATER HAS BEEN THOROUGHLY TESTED

An analysis of your water should be made prior to the selection of your water conditioning equipment. Your dealer will generally perform this service for you, and may send a sample to the factory for analysis and recommendations. Enter your analysis below for a permanent record.

NOTE: Hydrogen sulfide (H₂S) must be tested for at the well site. For accuracy, the sample must be drawn with the pump RUNNING, and the test be completed within ONE minute after the sample is drawn.

ANALYSIS OF YOUR WATER

Iron (Fe)	_____ ppm
Manganese (Mn)	_____ ppm
pH	_____
Tannins (Humic Acid)	_____ ppm
Hydrogen Sulfide (H ₂ S)	_____ ppm
Hardness	_____ gpg
Other _____	_____
Other _____	_____

CHECK YOUR PUMPING RATE AND WATER PRESSURE:

Two water system conditions must be checked carefully to avoid unsatisfactory operation or equipment damage:

MINIMUM water pressure required at the filter inlet is 20 psi. **IF PRESSURE IS OVER 100 PSI, A PRESSURE REDUCING VALVE MUST BE INSTALLED IN THE WATER SUPPLY LINE AHEAD OF THE SUL-X SOLUTION INJECTION POINT.**

NOTE: If you have a municipal or a community water supply and daytime water pressure is 85 psi or more, nighttime pressure may exceed 100 psi. Call your local water department or plant operator to obtain pressure readings. If you have a private well, the gauge on the pressure tank will indicate the high and low system pressure. Record your water pressure data below:

WATER PRESSURE

Low _____ psi High _____ psi

The pumping rate of your well must be sufficient for satisfactory operation and BACKWASHING of the FILTER (See SPECIFICATIONS AND OPERATING DATA, Section 7).

HOW TO MEASURE THE PUMPING RATE OF PUMP:

- 1) Make certain no water is being draw. Open spigot nearest pressure tank. When pump starts, close spigot and measure time (in seconds) to refill pressure tank (when pump shuts off). This figure represents CYCLE TIME.
- 2) With the pressure tank full, draw water into a container of known volume, measure the number of gallons drawn until the pump starts again. This is DRAWDOWN. Divide this figure by CYCLE TIME and multiply the result by 60 to arrive at the PUMPING RATE in gallons per minute (gpm). To aid in your calculation, insert the data in the following formula:

$$\text{Draw-Down} \frac{\text{_____}}{\text{(gals.)}} \div \text{Cycle Time} \frac{\text{_____}}{\text{(secs.)}} \times 60$$

$$= \text{Pumping Rate} \frac{\text{_____}}{\text{(gpm)}}$$

EXAMPLE: CYCLE TIME is 63 secs; DRAWDOWN is 8 gals; then, PUMPING RATE equals:

$$8 \text{ gals.} \div 63 \text{ secs.} \times 60 = 7.6 \text{ gpm}$$

LOCATE WATER CONDITIONING EQUIPMENT CORRECTLY:

Select the location of your SUL-X Filter System with care. Various conditions which contribute to proper location are as follows:

- (1) Locate as close as possible to water supply source.
- (2) Locate as close as possible to a floor or laundry tub drain.
- (3) Locate in correct relationship to other water conditioning equipment (Figure 1, 2 or 3 in Section 3).
- (4) Locate the filter in the supply line BEFORE the water heater. Temperatures above 100°F (38°C) will damage the filter and void the factory warranty.
- (5) Do NOT install the filter in a location where freezing temperatures occur. Freezing may cause permanent damage and will also void the factory warranty.
- (6) Allow sufficient space around the installation for easy servicing.
- (7) Provide a non-switched, 110/120V, 60Hz power source for the control valve (not feeder pump).

FACTS TO REMEMBER WHILE PLANNING YOUR INSTALLATION:

- (1) All installation procedures MUST conform to local and state codes.
- (2) If lawn sprinkling, a swimming pool, geothermal heating/cooling or water for other similar devices is required, a split-stream type installation must be employed (Figure 2 or 3). SUL-X Filters are not designed to handle the high flow rates required for such applications. The pumping

Rate of the well pump must be sufficient to accommodate these items plus the backwashing requirement of the SUL-X Filter. Consult your dealer for alternative instructions if the pumping rate is insufficient.

- (3) Remember that the SUL-X filter **INLET** is attached to the pipe that supplies water (i.e., runs to the pump), and the **OUTLET** is the pipe that runs toward the water heater.
- (4) The injection point for feeding SUL-X Solution **MUST** be located between the well pump and the pressure tank. The injection fitting **MUST** enter the bottom of the supply line rather than side or top entry (Figure 7).
- (5) The solution tank should be located in as close proximity to the injection point as possible.
- (6) Before commencing the installation it is advisable to study the existing piping system and to determine the size, number and type of fittings required.

NOTE: If the plumbing system is used as the ground leg of the electrical supply, continuity should be maintained by installing ground straps around any nonconductive plastic piping used in installation.

- (7) It is also advisable to sweep the floor to eliminate foreign objects that could pierce the solution tank, causing it to leak.
- (8) Hydrogen Sulfide can be very corrosive to copper and galvanized pipe, therefore installation should be performed using PVC or other approved plastic. The pressure tank should be a captive-air type rather than a galvanized air-water type for this reason.
- (9) **IMPORTANT:** Always use thread tape on threaded plastic fittings. NEVER use pipe dope, as it will deteriorate the plastic fittings.

SECTION 3: INSTALLATION

PROPER INSTALLATION SEQUENCE OF WATER CONDITIONING EQUIPMENT IS VERY IMPORTANT. REFER TO THE DIAGRAM (Figure 1, 2 or 3) FOR YOUR PARTICULAR WATER SUPPLY. IT IS RECOMMENDED THAT ALL PIPING PRIOR TO THE SUL-X FILTER BE PVC OR OTHER APPROVED PLASTIC (THE CORROSIVENESS OF HYDROGEN SULFIDE ATTACKS AND DESTROYS COPPER OR GALVANIZED PIPE AND PRESSURE TANKS).

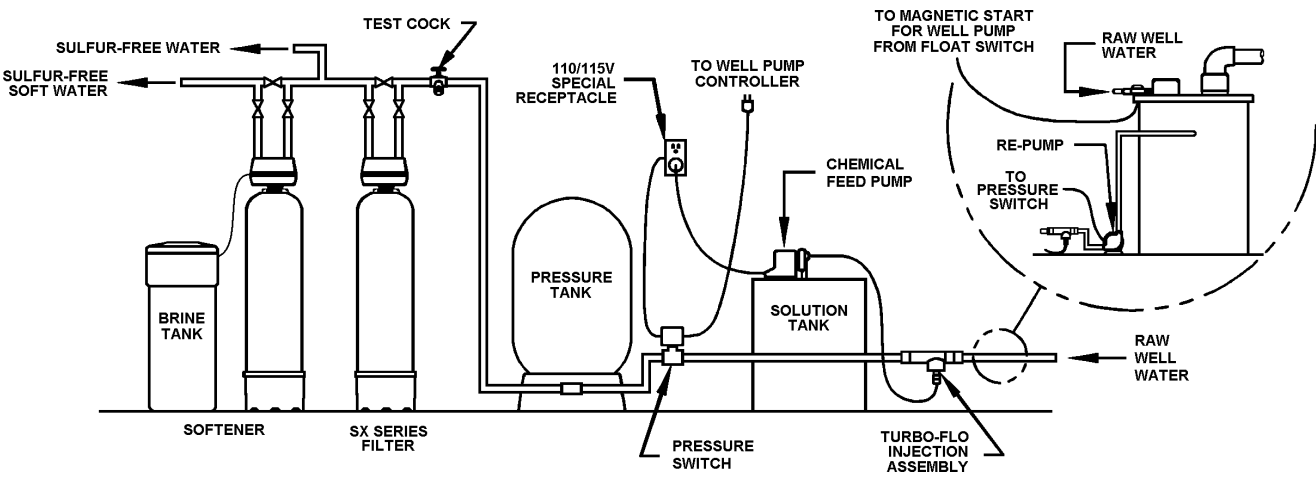


Figure 1. STANDARD INSTALLATION

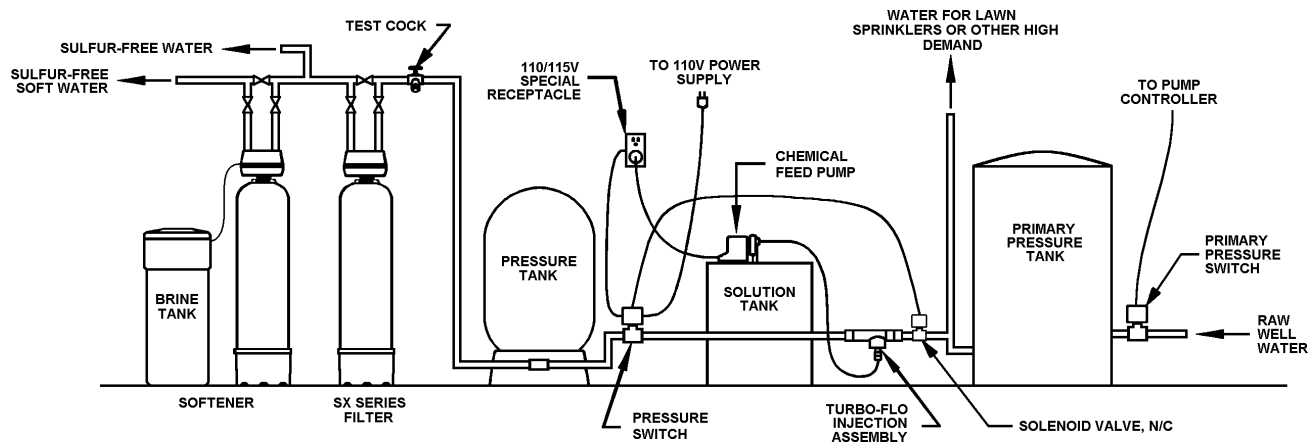


Figure 2. SPLIT-STREAM INSTALLATION

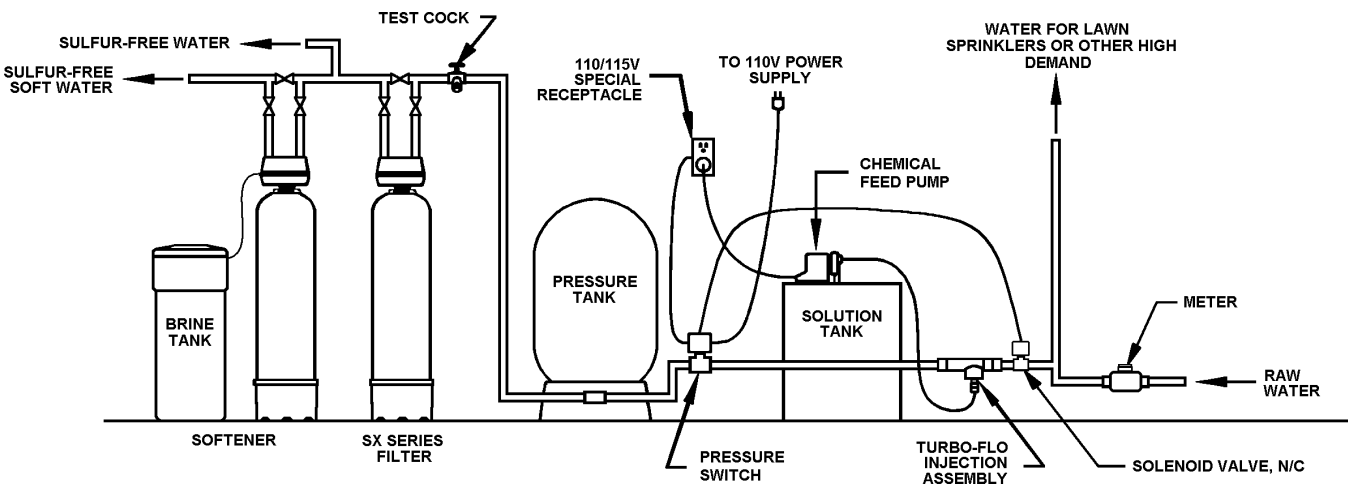


Figure 3. PUBLIC WATER SUPPLY INSTALLATION

Step 1 a) Remove the CONTROL VALVE by removing the latch and then the clamp around the adaptor base (Figure 5). Before loading the MEDIA into the tank, the distributor must be all the way to the bottom of the tank. It is therefore recommended that the distributor be removed and the gravel dumped out and saved. The distributor tube should then be replaced in the empty tank making sure it rests on the bottom. Use the centering tool provided to hold the riser tube in center and prevent MEDIA from entering the distributor. Material lodged in the distributor tube can enter the CONTROL VALVE, thus damaging it. First pour the gravel removed earlier back into the MEDIA TANK, followed by the MEDIA.

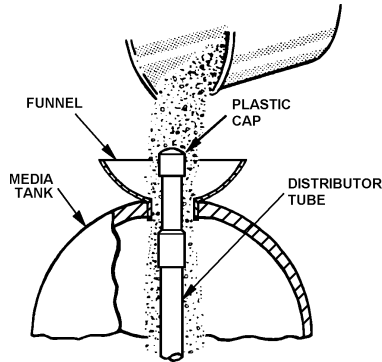


Figure 4. FILLING MEDIA TANK

b) Lubricate the o-ring on the adapter base with silicone grease. Reinstall the CONTROL VALVE making sure the riser tube fits into the valve body tube adaptor protruding from the bottom of valve body and being careful not to pinch the o-ring. Arrows on clamp should align (see below).

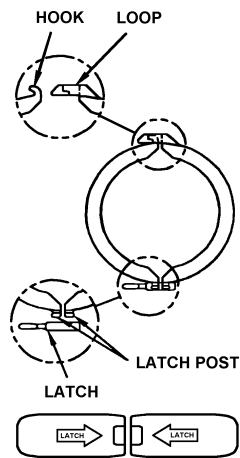


Figure 5. CLAMP ASSEMBLY

(c) If not factory pre-installed, attach BYPASS VALVE and/or YOKE ASSEMBLY using ADAPTER COUPLINGS, CLIPS and SCREWS to CONTROL VALVE (Figure 6).

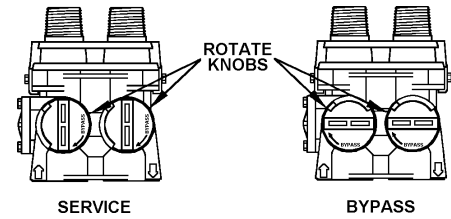
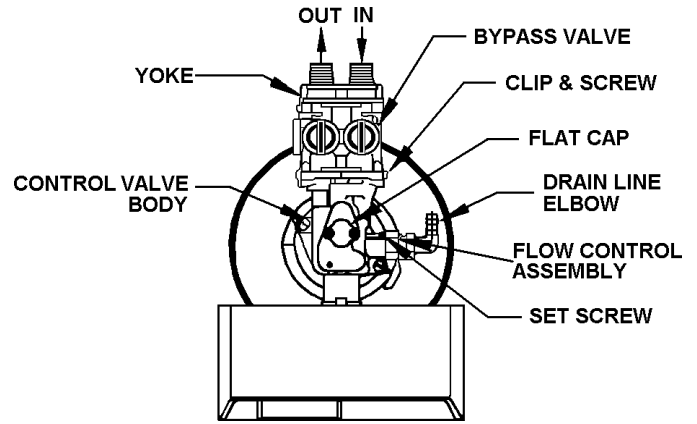


Figure 6. FILTER ASSEMBLY TOP VIEW

Step 2. Shut off all water at main supply. On a PRIVATE WELL SYSTEM, turn off power to pump and drain pressure tank. Make certain pressure is relieved from complete system by opening nearest faucet to drain system. **SHUT OFF FUEL SUPPLY TO HOT WATER HEATER.**

Step 3. The feed pump and solution tank require assembly prior to use (Figure 7).

- a) Unpackage feed pump.
- b) Install Turbo-flo injection fitting in water supply line prior to pressure tank and pressure switch.
- c) Attach bleed valve to top of feed pump head. The white nut on discharge (top) of feed pump must be removed. The bleed valve can now be attached, make sure to use o-ring provided.
- d) Feed pre-cut suction line (clear tube with strainer/foot valve pre-installed) up through proper hole in top of solution tank and attach to suction fitting on bottom of pump head.
- e) Mount feed pump to top of solution tank using nuts and bolts provided.
- f) Attach bleed return line (Short white tubing) to connection on side of bleed valve and feed down into solution tank through predrilled hole.
- g) Attach discharge line (remaining long white tubing) to connection on top of bleed valve. Cut and attach this line to the injector installed in Step 3b.

h) Electrical power to the feeder pump must be provided through a properly grounded 110V special receptacle which is controlled by the pressure switch (see "WARNING" notice and Figure 7 for wiring instructions). **NOTICE: CUTTING OF FEEDER PUMP POWER CORD VOIDS MANUFACTURER'S WARRANTY.** Refer to instruction manual enclosed in feeder pump carton for more information.

WARNING: CHEMICAL FEED PUMP 110V/60 Hz MOTOR. MUST BE CONNECTED TO PRESSURE SWITCH OF SAME RATING OR TO ONE LEG OF 220V PRESSURE SWITCH (DO NOT CUT PUMP'S POWER CORD).

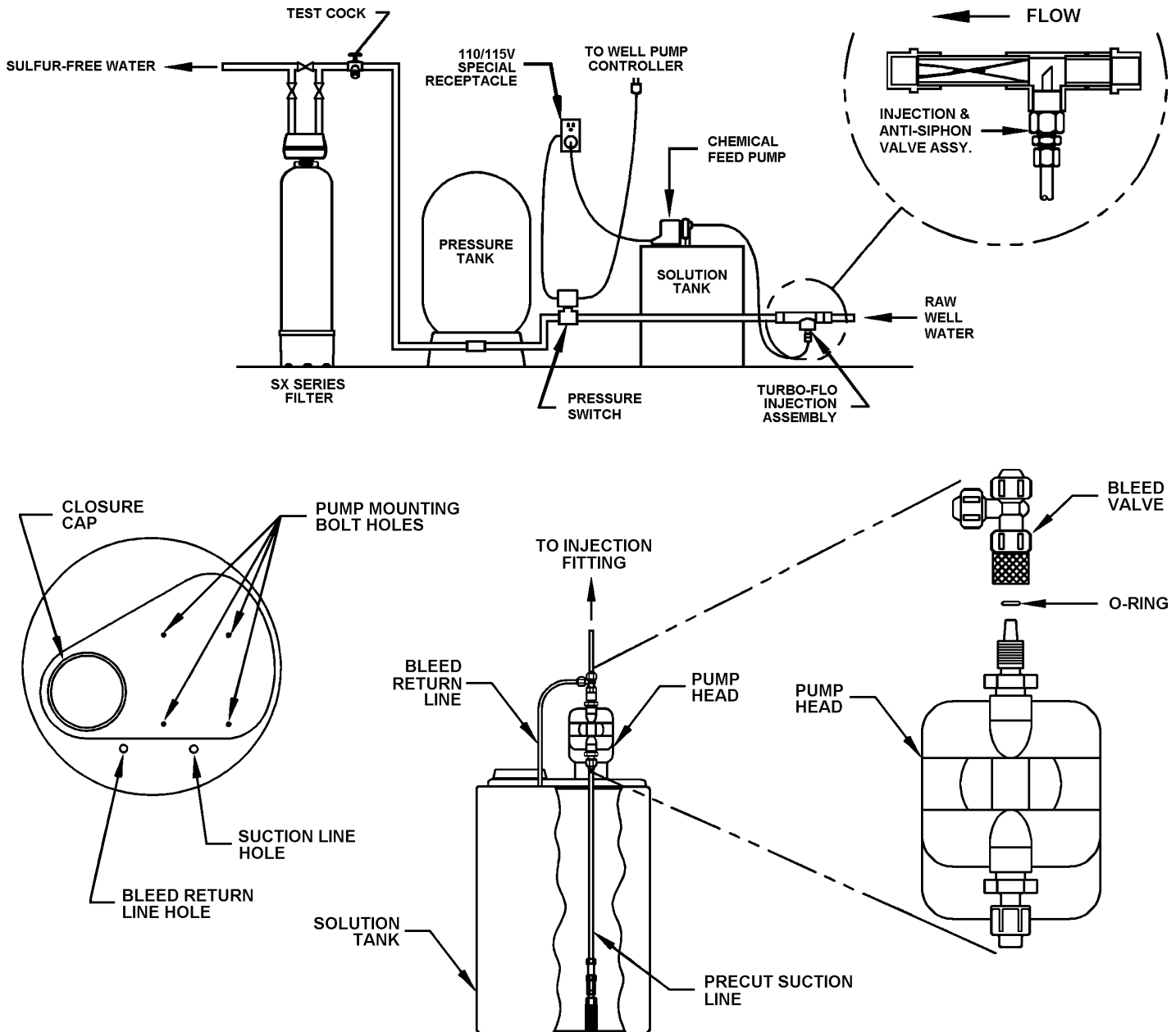


Figure 7. FEEDER SYSTEM SCHEMATIC

- Step 4. Cut main supply line as required to fit plumbing to INLET and OUTLET of BYPASS VALVE or yoke.
- Step 5. Attach plumbing. **DO NOT** apply heat to any fittings connected to BYPASS or CONTROL VALVE, as damage may result to internal parts or connecting adapters. **MAKE CERTAIN WATER FLOW ENTERS THROUGH INLET AND DISCHARGES THROUGH OUTLET.**

NOTE: If installation is to be SPLIT-STREAMED or PUBLIC WATER SUPPLY prior to MEDIA TANK (Figure 2 or 3) refer to special instructions following STEP 14.

- Step 6. Loosen SET-SCREW and pull out DRAIN LINE FLOW CONTROL (DLFC) assembly from VALVE BODY (Figure 6). Unscrew DRAIN LINE ELBOW from DLFC. Apply thread tape to threads. Reassemble to VALVE BODY, making certain DLFC assembly is FULLY inserted into VALVE BODY before tightening SET-SCREW.

CAUTION: SET-SCREW requires only finger-tightening to hold plastic DLFC in place. Overtightening SET-SCREW may crack fitting.

- Step 7. Attach DRAIN LINE to DRAIN LINE ELBOW. To prevent back pressure from reducing flow rate below minimum required for backwash, DRAIN LINE **MUST** be sized according to run length and relative height. Be careful not to bend flexible drain tubing sharply enough to cause "kinking" (if kinking occurs DRAIN LINE **MUST** be replaced!).

Typical examples of proper DRAIN LINE diameters are:

- (1) 1/2 in. ID up to 15 ft. when discharge is lower than inlet.
- (2) 5/8 in. ID up to 15 ft. when discharge is slightly higher than inlet.
- (3) 3/4 in. ID when drain is 15 ft. away and/or drain is installed overhead.

Some areas prohibit the use of flexible drain lines. Check with local code officials prior to installation.

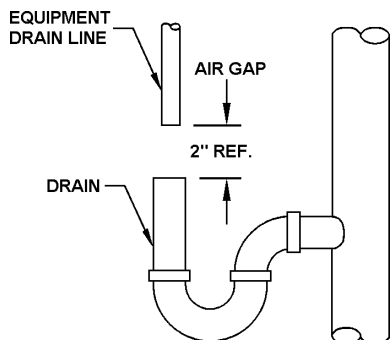


Figure 8. DRAIN

- Step 8. Position DRAIN LINE over drain and secure firmly. To prevent back-siphoning of sewer water, provide an air-gap of at least 2 in. or 2 pipe diameters between end of drain hose and drain (Figure 8). Do not raise DRAIN LINE more than 10 ft. above floor.

- Step 9. Pour 2 gallons of SUL-X concentrate into the solution tank. Under most operating conditions SUL-X concentrate should be diluted with an equal amount of SULFUR-FREE (preferably soft) water. In some situations, however, where a high sulfur concentration and/or a high pumping rate exists, the SUL-X Concentrate must be used in undiluted form in order to provide a high enough SUL-X feed rate to precipitate all the sulfur. To determine if the SUL-X Concentrate should be diluted or undiluted, multiply the pumping rate of your well pump by the sulfur concentration:

$$\text{Pumping Rate} \frac{\text{_____}}{\text{(gpm)}} \times \text{Sulfur} \frac{\text{_____}}{\text{(ppm)}} = \frac{\text{_____}}{\text{(Number)}}$$

* Refer to HOW TO MEASURE PUMPING RATE OF PUMP, Section 2 for proper method of determining pumping rate.

If the resulting number is LESS than 90, DILUTE the SUL-X Concentrate with an equal amount of water. If the number is 90 or above, DO NOT DILUTE the SUL-X Concentrate. (EXAMPLE: 8 gpm pumping rate x 8 ppm sulfur = 64. 64 is LESS than 90 - therefore, dilute the SUL-X Concentrate with an equal amount of water. This is the starting point for setting the correct SUL-X feed rate).

- Step 10. Normally the feed pump operates only when the well pump runs; however, to facilitate calibrating the feed pump, remove the feed pump power cord from the special receptacle controlled by the pressure switch and plug it into any 110/115V power source. To prime pump, turn knob on bleed valve to "BLEED" position and allow pump to run until solution appears in bleed return line. Turn knob on bleed valve to "PUMP" position and continue running feed pump until discharge tube fills to Turbo-flo injector assembly, plug feed pump power cord into special receptacle controlled by pressure switch.

- Step 11. Set feed pump stroke length to 50%. Make certain that filter BYPASS VALVE is in BYPASS POSITION (Figure 6). Turn on power to well pump. Allow water system to repressurize. After system has pressurized check for leaks in plumbing.

Step 12. Open a cold water faucet, so that well pump continues to run at 1/2 pressure; i.e., 30 psi if system operates at 20/40 psi. Continue to draw sample of water from test cock. Adjust feed pump rate just enough to eliminate sulfur odor in water coming from test cock. (Dark brown color of precipitated sulfur and will be removed by the SUL-X Filter). Refer to special Section 4 on dilution procedures to fine tune SUL-X feed rate and concentration (dilution) for most efficient and economical setting. Close cold water faucet.

NOTE: Should a sulfur odor persist even when the dial setting is at its maximum, reread STEP 9. Also, check to determine if the odor is in the hot water only, and, if it is, the hot water heater may need to be drained and cleaned.

Step 13. a) Make certain BYPASS VALVE INLET and OUTLET KNOBS are in "BYPASS" position (Figure 6). Plug timer into a 110/120V, 60 Hz non-switched power source. Manually stage CONTROL VALVE to BACKWASH POSITION by turning "MANUAL REGENERATION KNOB", Page 6-1, clockwise to "BACKWASH" position. Open BYPASS VALVE INLET KNOB approximately 1/4 of the way to full open (SERVICE POSITION) allowing the unit to fill slowly. This will purge any entrapped air in the bed. Once water is flowing to drain, open both the BYPASS VALVE INLET and OUTLET KNOBS completely.

b) Check for leaks. Leave unit in BACKWASH for at least 10 minutes or until drain line water runs clear, whichever is longer. This procedure will "reclassify" media that may have been disturbed during shipping and handling. After this preliminary backwash, stage CONTROL VALVE to SERVICE position. Manually initiate a complete "regeneration" process, allowing the unit to automatically proceed through a backwash and rapid rinse, see "HOW TO MANUALLY BACKWASH YOUR FILTER AT ANY TIME", Page 6-1.

Step 14. Set the TIME-OF-DAY (see HOW TO SET TIME CONTROL). The BACKWASH frequency is factory preset for every other day. This frequency need not be adjusted unless the sulfur removal is great enough to require daily backwashing. Refer to HOW TO SET BACKWASH CYCLE PROGRAM if change is required.

NOTE: Should you experience a water system pressure loss or bleed-through of the precipitant prior to a scheduled backwash, put the system into a manual backwash and increase the frequency of regeneration.

IMPORTANT INSTRUCTIONS: IF WATER IS SUPPLIED BY A PUBLIC OR COMMUNITY SOURCE, OR WATER LINE IS SPLIT-STREAMED ANYWHERE AHEAD OF THE FILTER TANK (See Figure 2):

When water is supplied from a public water system, (Figure 3) or it is split-streamed prior to the filter tank (Figure 2) note the placement of the solenoid valve. The HIGH setting of the pressure control switch (which controls the opening and closing of solenoid valve) must be set a minimum of 2 to 3 lbs. LOWER than the normal LOW pressure encountered on the supply system. FAILURE TO DO THIS WILL NOT ALLOW PROPER CLOSING OF THE SOLENOID VALVE DURING PERIODS OF LOW SYSTEM PRESSURE.

SPECIAL SERVICE INSTRUCTIONS:

During normal operation removal of control valve should never be required. Pressure should be relieved before attempting any disassembly. However, if it must be removed, it can be done by disassembling the quick release clamp, by removing latch. Upon reassembly, all o-rings should be lubricated with silicone grease. Reassemble clamp as shown in Figure 9. MAKE SURE ARROWS ON LATCH SIDE OF CLAMP ARE ALIGNED.

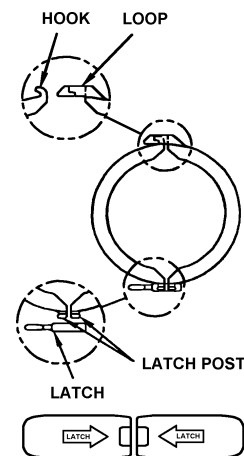


Figure 9. CLAMP ASSEMBLY

SECTION 4: PLUMBING SYSTEM CLEANUP

THE FOLLOWING PROCEDURES ARE GUIDELINES ONLY BUT HAVE PROVEN SUCCESSFUL IN MOST INSTANCES. UNDER NO CIRCUMSTANCES SHOULD ANY PROCEDURE OUTLINED BELOW BE FOLLOWED IF CONTRARY TO THE APPLIANCE MANUFACTURER'S INSTRUCTIONS. SHOULD THERE BE ANY QUESTIONS CONCERNING THE ADVISABILITY OF PERFORMING A PROCEDURE, IT IS STRONGLY RECOMMENDED THE MANUFACTURER'S AUTHORIZED SERVICE OUTLET BE CONSULTED PRIOR TO PERFORMING THE PROCEDURE.

The plumbing system and water using appliances that have been exposed, even for a short time, to untreated water need to be cleaned or they will continue to be a problem.

Select from the following procedures those that apply to the type system and appliances that need cleaned.

SOFTENER

It is not uncommon that the softener was installed in an effort to remove ferrous ("clear water") iron from the water supply. Typically, a softener will remove some ferrous iron until the resin bed becomes fouled to the extent that it will lose both hardness removal capacity and the limited capacity for iron removal. This is the condition to expect the softener to be in when planning a system clean-up.

Prior to closing main supply valve or turning power off to a private well system and preparatory to installing the SUL-X Filter System, do the following:

- (1) Disconnect brine draw line from brine cabinet and place the loose end into a five gallon plastic pail filled with a solution of hot water and 10 ozs. of resin mineral cleaner (IRON-X™).
- (2) Manually advance control timer to BRINE DRAW position (refer to instructions provided with your softener), and allow all hot mineral cleaner solution to be drawn into mineral bed. Then IMMEDIATELY:
- (3) Close main water supply valve or turn power off to pump and proceed with filter installation. During time required to install filter system, iron-fouled softener resin will be chemically cleaned.
- (4) After filter installation is completed and final adjustments made with water turned on and brine draw tube reconnected, manually reposition timer on softener to BACKWASH position. Allow timer to perform an automatic, complete backwash and regeneration cycle. During backwashing of softener, all iron cleaned from the resin will be washed down drain. It is advisable after chemically cleaning softener to regenerate system twice to fully restore capacity lost due to iron-fouling.

HOT WATER HEATER

If the water heater has been exposed to untreated water for a long period of time, replacement of the heater tank may be the only practical solution to prevent continued staining originating from this source.

After completing the installation of the SUL-X Filter System, clean the water heater by following these instructions:

- (1) Shut off fuel supply to water heater and close heater inlet water valve.
- (2) Drain hot water tank completely. Open inlet water valve allowing heater tank to be refilled with treated water. Continue flushing until water runs clear to drain.
- (3) If after approximately 30 minutes flushing, water does NOT clear, terminate flushing operation. Refill water heater with water and pour approximately 1/2 gallon of household bleach into top of heater tank. Allow bleach solution to stand in tank for 20 to 30 minutes. Flush tank again until water is clear at drain. Turn fuel supply on.

NOTE: If water does not clear in approximately 10 minutes, water heater probably should be replaced.

DISH WASHER

Consult owner's handbook and follow manufacturer's instructions.

TOILET FLUSH TANKS

Prior to commencing installation of the SUL-X Filter System, pour 4 to 6 ounces of resin mineral cleaner (IRON-X) or inhibited muriatic acid into flush tanks and bowls and let stand. When installation is completed, flush toilets several times with treated water. If stains remain, repeat procedure until clear.

SECTION 5: FINE TUNING THE SUL-X SYSTEM

In order to make the installation and operation of your SUL-X Sulfur Removal System the most economical, a brief discussion of the concept of dilution must be undertaken. Dilution is defined as the reduction of concentration of a particular constituent by the addition of another. In the case of SUL-X concentrate, the dilution is performed with the addition of sulfur-free water. The idea of dilution rate and ratio may be best demonstrated by several examples.

EXAMPLE 1

Initial concentration: 1 Gallon of SUL-X Concentrate
 If we add: 1 Gallon of Water

Total solution: 2 Gallons of mixture

In the final 2 gallons of mixture, 1/2 (1 gallon out of 2 gallons) is SUL-X concentrate. This can be stated two different ways. First, the dilution ratio is 1:1 (1 gallon SUL-X/1 gallon water) or secondly, by saying a 50% dilution was performed (1/2, i.e. 50%, of the final mixture is SUL-X Concentrate).

EXAMPLE 2

Initial concentration: 1 Gallon of SUL-X
 If we add: 3 Gallons of water

Total Solution: 4 Gallons of mixture

In this example, we end up with 1 gallon of SUL-X in 4 gallons of mixture, therefore 1/4 or 25% of the final mixture is SUL-X Concentrate. Again this can be stated two different ways, first, the dilution ratio is 1:3 (1 gallon SUL-X/3 gallons water) and secondly by saying a 25% dilution was performed (1/4, i.e. 25%, of the final mixture is SUL-X Concentrate).

EXAMPLE 3

Suppose we have performed a 1:1 (50%) dilution by mixing 1 gallon of concentrate with 1 gallon of water. We now have a total of 2 gallons of mixture. After performing the dilution, we decide the mixture is not concentrated enough, so we add 1 gallon of concentrate to the 2 gallon mixture. The ratio of SUL-X to water is now 2:1 (2 gallons of concentrate/1 gallon of water) and the total amount of mixture is now 3 gallons. The SUL-X Concentrate is now diluted 2/3, 66.7% (2 gallons SUL-X/3 gallons mixture).

Two important things to remember:

- 1) A ratio relates the different components of a mixture, when they all have the same units of measure, i.e. gallons of SUL-X to gallons of water, ounces of SUL-X to ounces of water, pounds of SUL-X to pounds of water, etc. In the examples above the ratios were expressed as 1:1, 1:3 and 2:1.

The final amounts of SUL-X concentrate and water mixed together in your installation should be recorded below.

	Mixture Ratio
_____ gallons SUL-X	_____ 1.0 _____
_____ gallons water	_____

These two numbers can be used to determine the **mixture ratio**. By dividing the gallons of water by the gallons of SUL-X an easy to remember ratio can be found (see following example).

EXAMPLE 4

Suppose a final mixture contains 2 gallons of SUL-X and 4 gallons of water:

$$\text{Ratio} = 2:4 \text{ then Mixture Ratio} = 2/2:4/2 = 1.0:2.0$$

Suppose we now wish to make up 12 gallons of solution, we would mix 4 gallons of concentrate with 8 gallons of water. This mixture contains 1 gallon of SUL-X for every 2 gallons of water, therefore our ratio of 1:2 is maintained.

Any amount of solution can be mixed using the following formulas.

$$\frac{\text{Desired Gallons of Solution}}{\text{Mixture Ratio of SUL-X} + \text{Mixture Ratio of WATER}} = \text{Gallons of SUL-X Required}$$

Desired gallons of solution - gallons of SUL-X = gallons of water

Using the above example:

Desired gallons of solution = 12
 Mixture ratio of SUL-X = 1.0
 Mixture ratio of water = 2.0

$$\frac{12}{1.0 + 2.0} = \frac{12}{3.0} = 4 \text{ gallons of SUL-X required}$$

$$12 - 4 = 8 \text{ gallons of water required}$$

EXAMPLE 5

Desired gallons of solution = 10
 Mixture ratio of SUL-X = 1.0

MIXTURE RATIO OF WATER = 2.0

$$\frac{10}{1.0 + 2.0} = \frac{10}{3.0} = 3.33 \text{ gallons of SUL-X required}$$

$$10 - 3.33 = 6.67 \text{ gallons of water required}$$

2) A dilution rate relates one component to the total mixture.

EXAMPLE 6

A ratio of 1:1 exists and we have 1 gallon of SUL-X and 1 gallon of water for a total of 2 gallons of mixture, the dilution rate of SUL-X is $1/2$ or 50%, since there is 1 gallon of concentrate in 2 gallons of mixture.

A ratio of 1:3 gives 4 gallons of mixture, so the dilution rate of SUL-X is $1/4$ or 25%.

A ratio of 2:1 gives 3 gallons of mixture, so the dilution rate of SUL-X is $2/3$ or 66.7%.

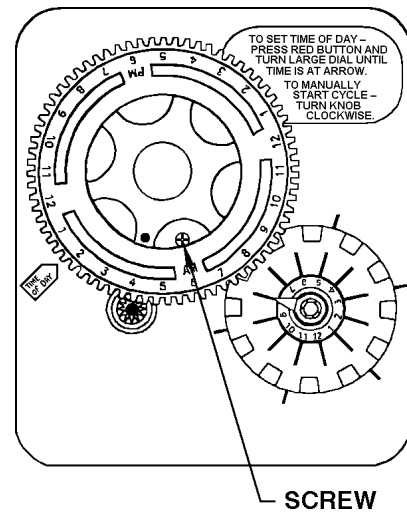
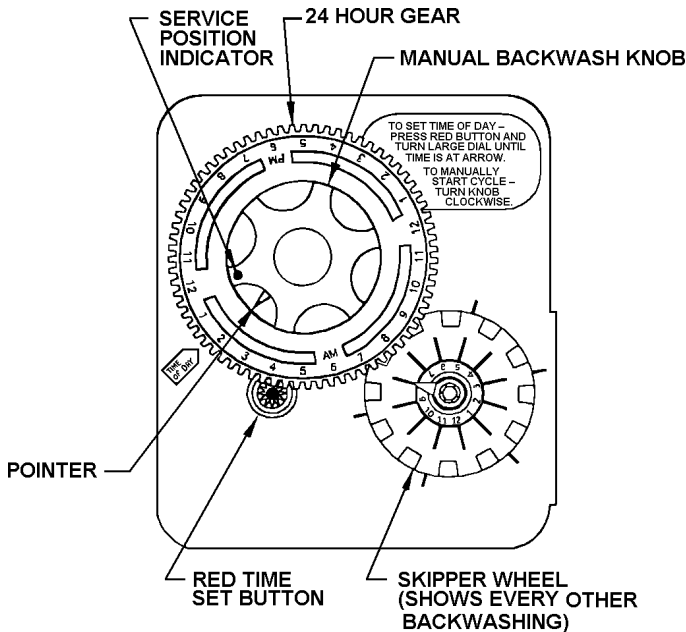
It should be noted that the dilution is stated as: 1 gallon of SUL-X is diluted with 1 gallon of water (1:1 ratio), 1 gallon of SUL-X is diluted with 3 gallons of water (1:3 ratio) or 2 gallons of SUL-X is diluted with 1 gallon of water (2:1 ratio). It would be just as correct to state: 3 gallons of water is diluted with 1 gallon of SUL-X, but the ratio should now be changed from 1:3 to 3:1. The dilution rate can be stated for any component in a mixture, but care should be taken when it is referred to in the ratio form.

Now that we have discussed the ideas of dilution rate and ratio, we can discuss the fine-tuning of the SUL-X system to the most economical operating condition. The basic, underlying idea of the fine-tuning process is to have the highest feed pump stroke frequency at the highest dilution rate of the solution. The decision whether or not to dilute can be based roughly on the stroke frequency percentage at the point where the sulfur odor disappears. If the percentage is 50% or less, the solution can be diluted 50%. After the dilution, the feed pump should once again be adjusted to the point where the smell disappears. This adjustment process should be repeated until the feed rate exceeds 75%. There is no need to adjust the feed pump to a precise setting each time. Since the hydrogen sulfide concentration will vary from day-to-day, the best, most precise setting today may not be tomorrow. The feed pump should be adjusted until it is set above 75%.

If upon initial installation you find the feed rate is above 75% and you are feeding undiluted SUL-X Concentrate, it may be more economical to include an aerator in the treatment system. An aerator will reduce the sulfur concentration 50 - 75%, depending on its efficiency and could reduce the cost of operation for the SUL-X system substantially.

Although we have discussed the concepts of dilution in specific relation to the SUL-X system, the same ideas hold true in other instances where dilutions may be necessary. These situations could include chlorination, soda ash addition for pH adjustment or even when conducting tests on water samples.

SECTION 6: TIMER & BACKWASHING INSTRUCTIONS



HOW TO SET DAYS ON WHICH FILTER IS TO BACKWASH:

Rotate the skipper wheel until the number "1" is at the red pointer. Set the days that backwash is to occur by sliding tabs on the skipper wheel outward to expose trip fingers. Each tab is one day. Finger at red pointer is tonight. Moving clockwise from the red pointer, extend or retract fingers to obtain the desired backwashing schedule.

HOW TO SET THE TIME OF DAY:

- 1) Press and hold the red button in to disengage the drive gear.
- 2) Turn the large gear until the actual time of day is opposite the time of day pointer. Unit will now start backwashing at 1:00 a.m. (See following to adjust this time.)
- 3) Release the red button to again engage the drive gear.

HOW TO MANUALLY BACKWASH YOUR FILTER AT ANY TIME:

Turn the manual backwash knob clockwise until the knob engages the program wheel. This slight movement of the knob will start the backwash program.

The backwash knob will make one revolution in approximately three hours and stop in the position shown in the drawing. Even though it takes three hours for the knob to complete one revolution, the backwash cycle of your unit might be only 12 to 20 minutes in duration.

In any event, filtered water may be drawn after rinse water stops flowing from the filter drain line.

How to Adjust Regeneration Time:

1. Disconnect the power source.
2. Locate the three screws behind the manual regeneration knob by pushing the red button in and rotating the 24 hour dial until each screw appears in the cut out portion of the manual regeneration knob.
3. Loosen each screw slightly to release the pressure on the time plate from the 24 hour gear.
4. Locate the regeneration time pointer on the inside of the 24 hour dial in the cut out.
5. Turn the time plate so the desired regeneration time aligns next to the raised pointer.
6. Push the red button in and rotate the 24 hour dial. Tighten each of the three screws. Do not overtighten.
7. Push the red button and locate the pointer one more time to ensure the desired regeneration time is correct.
8. Reset the time of day and restore power to the unit.

HOW TO SET REGENERATION CYCLE PROGRAM

HOW TO SET THE REGENERATION CYCLE PROGRAM:

The regeneration cycle program on your filter has been factory preset. However, portions of the cycle or program may be lengthened or shortened in time to suit local conditions.

To expose cycle program wheel, grasp timer in upper left-hand corner and pull, releasing snap retainer and swinging timer to the right.

To change the regeneration cycle program, the program wheel must be removed. Grasp program wheel and squeeze protruding lugs towards center, lift program wheel off timer. (Switch arms may require movement to facilitate removal.)

Return timer to closed position engaging snap retainer in back plate. Make certain all electrical wires locate above snap retainer post.

HOW TO CHANGE THE LENGTH OF THE BACKWASH TIME:

The program wheel as shown in the drawing is in the service position. As you look at the numbered side of the program wheel, the group of pins starting at zero determines the length of time that your unit will backwash.

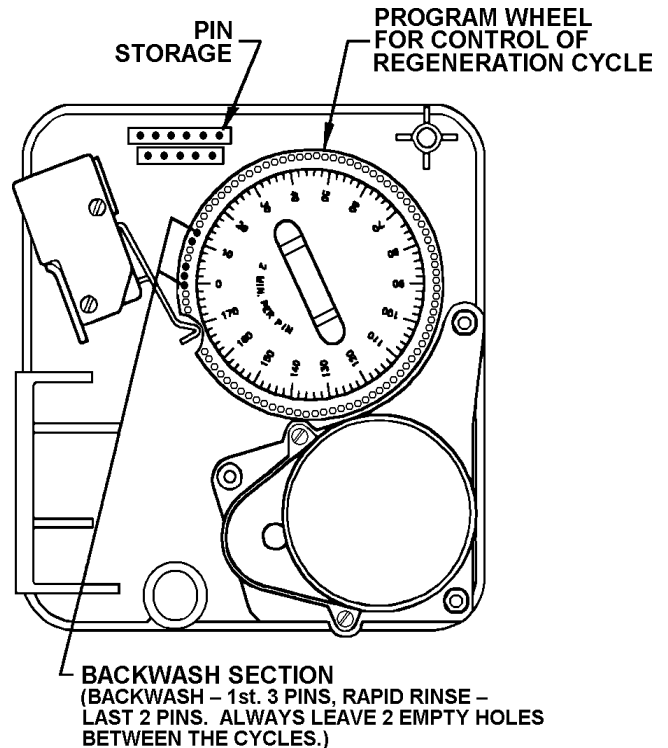
FOR EXAMPLE: If there are three pins in this section, the time of backwash will be six minutes (2 min. per pin). To change the length of backwash time, add or remove pins as required. The number of pins times two equals the backwash time in minutes.

HOW TO CHANGE THE LENGTH OF RAPID RINSE TIME:

The second group of pins on the program wheel determines the length of time that your filter will rapid rinse (2 min. per pin.)

To change the length of rapid rinse, add or remove pins at the higher numbered end of this cycle as required (See note below). The number of pins times two equals the rapid rinse time in minutes.

The regeneration cycle is complete when the outer micro-switch drops off the last pin in the rapid rinse group of pins. The program wheel, however, will continue to rotate until the inner micro-switch drops into the notch on the program wheel.



NOTE: Always leave two empty holes between BACKWASH and RAPID RINSE cycles. This is required for proper cycle staging.

HOW TO MANUALLY CYCLE PROGRAM:

Manually cycling control is useful when it is desirable to check control functions. Depress red button on front of timer. While depressing button, slowly rotate PROGRAMMING WHEEL counter clockwise until valve drive motor engages. Release PROGRAMMING WHEEL until motor STOPS. Control will be in BACKWASH cycle. Continue rotating wheel repeating above procedure and motor will drive piston to the second (intermediate) position. Repeating procedure will cause motor to drive piston to RAPID RINSE position. Control may be returned to SERVICE by rotating PROGRAMMING WHEEL to HOME POSITION (Micro-switch lever will drop into notch on PROGRAMMING WHEEL).

SECTION 7: SPECIFICATION & OPERATING DATA

ITEM	SX1000 SX1001	SX2000 SX2001	SX3001
Media Volume, cu. ft.	1.0	2.0	3.0
Gravel Underbed, (lbs.)	18	22	25
Operating Flow Rate, (gpm) (Note 1):			
Continuous (no duration limit)	3	4	5
Service (intermittent)	6	9	12
Peak (10 minutes max. duration)	10	13	16
Pressure Loss @ Flow Rates (psi)			
Continuous	2	2	2
Service	5	8	10
Peak	13	14	20
Backwash Flow Rate, (gpm) (Note 2)	5	7	10
Service Pipe Size, (in.)	3/4 or 1	3/4 or 1	3/4 or 1
Filter Tank Diameter x Height, (in.)	10 x 44	12 x 54	14 x 65
Minimum Space Required, (in.):			
Width	30	32	34
Depth (w/Bypass)	18	18	18
Height	56	66	78
Approximate Shipping Weight, (lbs.)	163	271	396

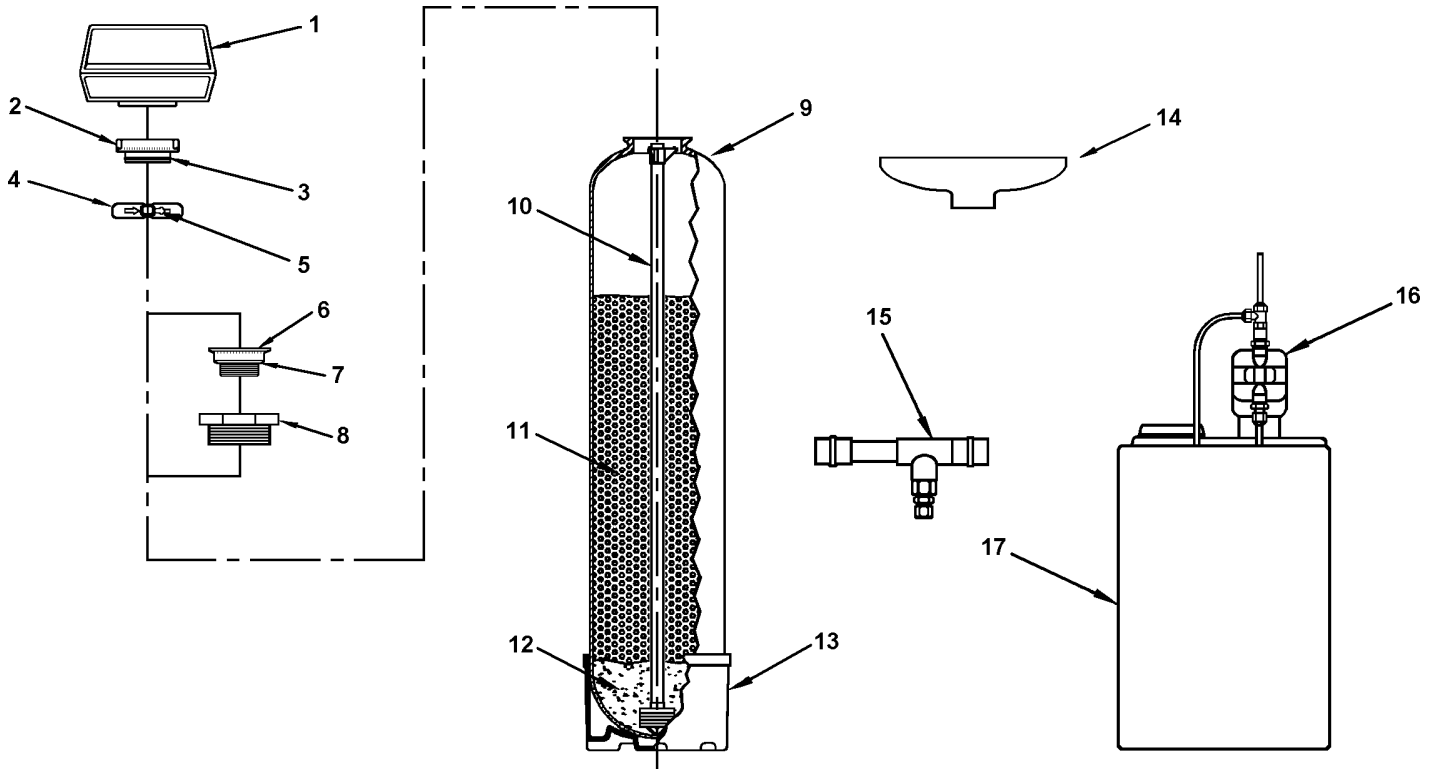
Maximum Operating Temperature 100° F (38° C); Electrical requirements 110V/60Hz; Operating Pressure 20 - 100 psi. Specifications are subject to change without notice.

NOTES:

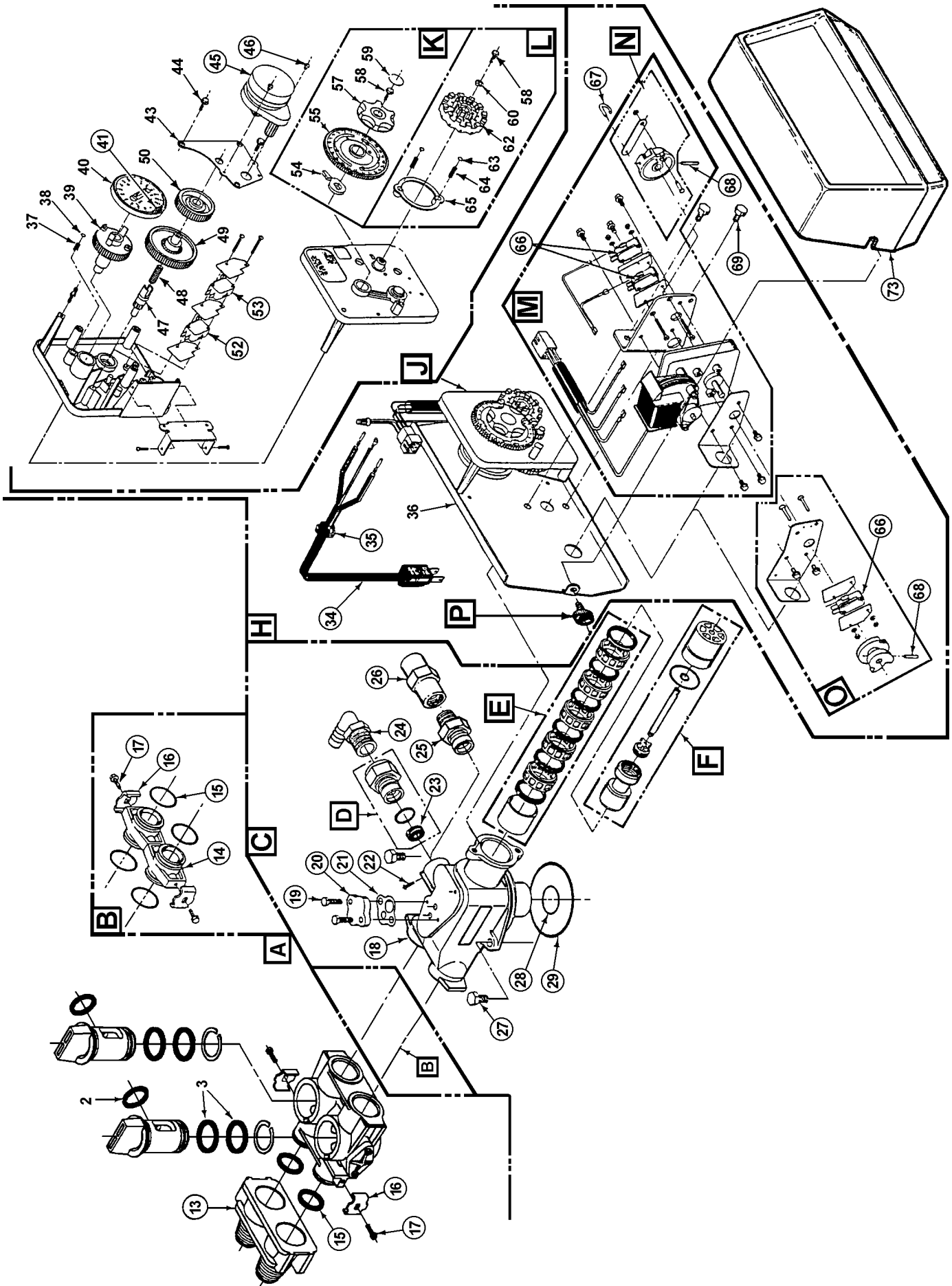
- (1) For satisfactory performance, indicated durations should not be exceeded. Flow rates specified are adequate for normal residential application. Do not use Service Flow Rates when sizing commercial applications or if treated water is to supply a geothermal heat pump, swimming pool, etc.
- (2) Indicated pressure loss is for new systems, these losses will increase as the filter is used and the longer the duration since last regeneration.

COMPONENTS PARTS LIST

REF NO.	DESCRIPTION	SX1000 SX1001	SX2000 SX2001	SX3001
1	Control Valve Complete w/Cover less Bypass	C210500-003	C210700-003	C210000-003
2	Adapter Assy. (Incl. Ref. 3)	FA45CX	FA45CX	FA45CX
3	O-Ring	ORG-234	ORG-234	ORG-234
4	Clamp Assy. (Incl. Ref. 5)	FC45XX	FC45XX	FC45XX
5	Latch, Clamp	FC45C	FC45C	FC45C
6	Adapter Assy., Thread-Flange (Incl. Ref. 7)	---	---	FA45RX
7	O-ring	---	---	10381
8	Bushing, 2-1/2 - 8 X 4-8	---	---	2752-2
9	Mineral Tank w/Base	MTP1044FB	MTP1254FB	MTP1465B
10	Distributor	C37S-16-44	C37S-16-54	T37S-16-65
11	Filter Media	SX-10P	SX-10P (x2)	SX-10P (x3)
12	Gravel Underbed	QC-18	QC-22	QC-25
13	Tank Base	T06-10P	T06A-12P	T06A-14P
14	Funnel	U1006	U1006	U1006
15	Turbo-flo Injector, Complete	TBF1-401	TBF1-401	TBF1-401
16	Feeder Pump	LA30P	LA30P	LA30P
17	Solution Tank	ST15	ST15	ST15



CEC1000 SERIES BACKWASH CONTROL



CEC1000 SERIES BACKWASH CONTROL

**ONLY THOSE PARTS CIRCLED IN DRAWING AND/OR LISTED BELOW ARE STOCK ITEMS.
ALL OTHERS ARE SPECIAL ORDER, NONRETURNABLE.**

REF.	PART NO.	DESCRIPTION
A	60049/18706X	1" Bypass Valve Assy. (Incl. Ref. Items 2, 3, 13, 15, 16 & 17)
	60049/18706-02X	3/4" Bypass Valve Assy. (Incl. Ref. Items 2, 3, 13, 15, 16 & 17) (Optional)
B	10090X	Adapter Coupling Assy. (Incl. Ref. Items 14 - 17)
C	10070	Control Valve Body Assy. (Incl. Ref. Items 18 - 29, E & F) (Specify Model)
D	60705	Drain Line Flow Control Assy. (Specify Size)
E	60121C	Seal Kit
F	60090	Piston Kit
H	60407-BW	Powerhead Assy., I/Cover (Incl. Ref. Items 34 - 69 & F)
J	60304B-13	Timer Assy. (1:00 a.m. Init.) (Incl. Ref. Items 37 - 65)
K	13007-XB	24-Hour Gear Assy. (Incl. Ref. Items 54 - 59)
L	14381X	Skipper Wheel Assy. (Incl. Ref. Items 58 & 60 - 65)
M	60050	Drive Motor Assy., Complete (Specify Model) (Incl. Ref. Items 66 & N)
N	60160-00	Drive Cam Assy. - White
O	10025X	FAS Auxiliary Switch Assy. (Optional) (Incl. Ref. Items 66 & 68)
P	19367	Cover Mounting Screw
13	18706-02	3/4" NPT Adapter Yoke
	18706	1" NPT Adapter Yoke
14	13709	Adapter Coupling
15	1305	Coupling O-ring
16	13255	Adapter Clip
17	13314	Screw - Adapter Coupling
18	15058	Control Valve Body - CEC1000
19	12112	Hex Head Machine Screw
20	11893	Injector Flat Cap - CEC1000
21	11475	Injector Body Gasket
22	11180	Flow Control Retainer Screw
23		DLFC Button
	12092	5.0 GPM
	12408	7.0 GPM
24	12338	Drain Ftg. Elbow (1/2 in. Thread to Hose)
25	11912	Drain Line Flow Control Ftg. (Not Applicable)
26	60700-09	Flow Control 9.0 GPM (Not Applicable)
27	BLT0015	Hex Head Cap Screw
28	11710	Inside Tube O-ring
29	11208	Seal O-ring
34	11838	Powercord, 7 ft.
35	13547	Strain Relief - Flat Cord
41	15493	Roll Pin
45	18743	Timer Motor, 110V/60Hz
46	13278	Screw - Motor Mounting
52	10896	Micro Switch
53	15320	Micro Switch
66	10218	Micro Switch
67	10909	Connecting Rod Pin
68	10338	Drive Roll Pin
69	10231	Box Mounting Screw
73	14479-5P	Control Cover (Specify Model)

WIRING DIAGRAM FOR VALVE DRIVE MOTOR AND TIMER

