

AC40 & AC40B Automatic Water Softener

Operation and Recharging

Hard water is any water that contains minerals such as calcium, magnesium and iron. Approximately 3/4 of the United States has water that is considered hard. When heated, the minerals in hard water come out of solution and are deposited inside fittings, check valves, strainers, heat exchangers, valves, jets and hoses. These minerals build up and cause inefficiency in solution heating, cause component malfunction, premature wear and damage to equipment. Damages resulting from hard water deposits are considered abuse or neglect and such repairs are not covered under equipment warranties. These minerals can also make cleaning chemicals less effective, increasing chemical use and costs. Use of a water softener can save much more time and money than the cost of the water softener.

To remove these minerals, the Hydro Force water softeners operate on the principle of ion exchange. Ions are atoms or groups of atoms that have an electrical charge. During the ion exchange softening process, positively charged cations are attracted to the negatively charged resin beads in the water softener. The resin beads initially hold sodium ions (Na⁺) which are exchanged for the calcium ions (Ca⁺), magnesium ions (Mg⁺) and other cations in the hard water.

The ion exchange resin inside the softener tank consists of highly porous, amber colored polystyrene-divinylbenzene beads loaded with exchange sites. At the beginning of the softening cycle, sodium ions occupy the resin's exchange sites. As the water passes through the resin, the resins stronger attraction for the hardness ions (calcium and magnesium ions) causes it to take on the hardness ions and give up the sodium ions. Iron, lead or other metals in solution may also be removed by ion exchange; but only portions that exist in solution as cations (Positively charged ions). Non-ionic particulates or anions (Negatively charged ions) will not be removed. Ion exchange will not remove suspended matter or chemicals.

The sodium ions added to the softened water are added at an inconsequential rate. The amount of sodium contained in the discharged softened water will not affect the cleaning solution or residual content on the cleaned surface in any measurable or noticeable way.

As the hard water flows downward through the resin bed, the resin at the top of the bed is the first to exchange the sodium ions for the hardness ions. The exchange is not instantaneous and occurs in an area called the reaction zone. The depth of the reaction zone depends on the water hardness, water flow rate, and water temperature. As the resin takes on more hardness the reaction zone moves down in the tank. When the reaction zone reaches the bottom of the tank and hard water passes through the tank the resin has become exhausted and must be recharged.

The size of the tank, the amount of resin and the hardness of the water will affect the amount of water that can be softened before recharging is required. Our softener has a rated capacity of 32,000 grains. Hardness is rated in grains per gallon. The rated capacity divided by the grains per gallon of your water supply will give you the estimated amount of water that can be softened before recharging is required. For example, if your local water is rated at 15 grains per gallon the AC40 can soften approximately 2,100 gallons before recharging is required.

Compaction and channeling of the resin bed or loss of resin can greatly reduce the softening capacity.

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Water hardness test strips can be used to test the water flow out of the water softener to determine if the softener needs to be recharged. Recharging is recommended when the test strips indicate the output water flow has reached 5 grains per gallon.

The recharging or regeneration process should begin with a 10 minute back flush to loosen the resin bed and flush out suspended particles.

(This is automatically performed during the softener re-charging process when the timer is running.)

The regeneration occurs when a salt or brine solution is passed downward through the resin bed. When the salt (sodium chloride) is dissolved in water to make the brine solution, it splits into sodium (Na^+) cations and chloride (Cl^-) anions. When the brine solution flows through the softener, the resin beads are surrounded by overwhelming numbers of sodium ions, some of the sodium ions will attach to the resin bead exchange sites, thereby kicking off the hardness ions that previously occupied these sites. The hardness ions are then flushed from the tank along with the excess brine. The chloride ions merely pass through during the recharging process or bond with the hardness ions and are discharged as calcium chloride and magnesium chloride.

The negative electrical charge is permanently infused in the structural chemistry of the resin beads. This negative charge will always seek balance by attracting a counteracting positive charge of the cations in the hard water such as the calcium or magnesium ions or the sodium cations in the brine solution. The bead charge is permanent and cannot be destroyed. However the exchange sites of the resin beads can be fouled or blocked if the beads become coated with iron hydroxide or oil. Oxidants such as chlorine can destroy the structure of the polystyrene-divinylbenzene causing the beads to physically disintegrate. Even so, water softening resin beads typically have a life of 10 to 20 years.

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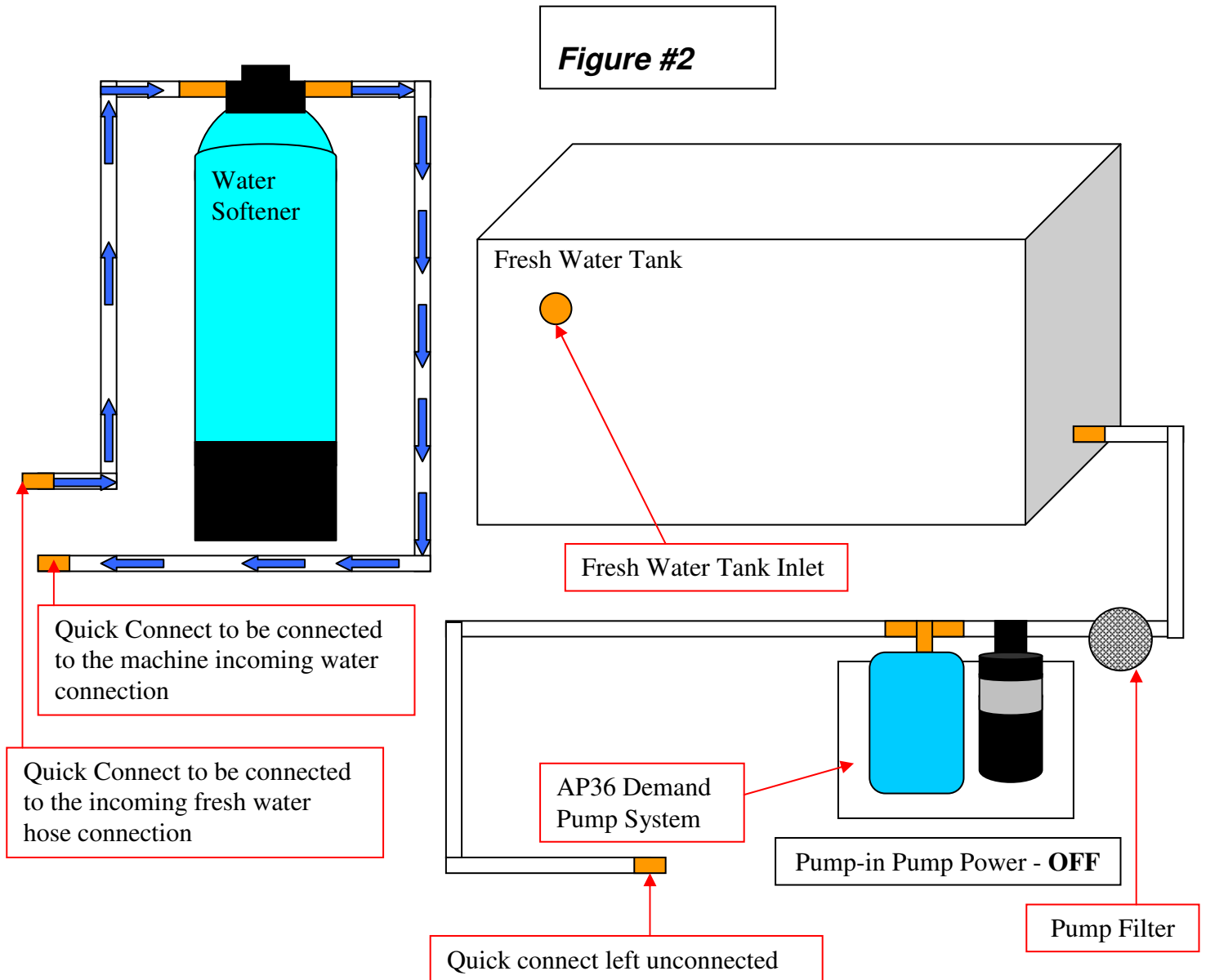
RECHARGING PROCEDURE

1. Fill the brine tank 1/2 to 3/4 full with rock salt.
2. Remove the C-clip and plug from the brine port top of the timer head. Connect the brine hose to the softener head and secure the hose by replacing the C-clip.
3. The recharging drain hose remains connected to the barb on the Timer Head and the hose is closed with a garden hose cap. To recharge softener, remove the cap and direct the hose to a drain.
4. The flow of water from the outlet side of the water softener head must be blocked during the recharging process. This can be accomplished by closing a valve if so equipped, disconnecting the quick connect from the machine or water tank or disconnecting the hose and putting a plug in the outlet fitting.
5. Connect a hose from a water faucet to the inlet side of the water softener head. Turn on the water and wait 10-15 minutes to allow the brine tank to fill with water. The water will dissolve the salt and create the brine solution needed for recharging the water softener. At least 25psi of water pressure is required for recharging the water softener.
6. Turn the control valve timer clockwise to the 1 HR setting. (Recharging will take approximately 60 minutes.) This will start the recharging process. Water will immediately start flowing out of the drain hose. As the water flows through the water softener and out of the drain hose the brine solution will be siphoned from the brine tank and flushed through the softener resin bed.
7. Once the timer shuts off the recharging process is complete. Turn the water supply off.
8. Re-cap the drain hose.
9. Remove the C-clip and disconnect the brine hose from the softener head. Re-install the plug and replace the C-clip.
10. Reconnect the hose or quick connect or open the valve to restore the water flow connection between the outlet side of the softener and the fresh water tank or machine.
11. The water softener is now ready to return to normal water softening operation.

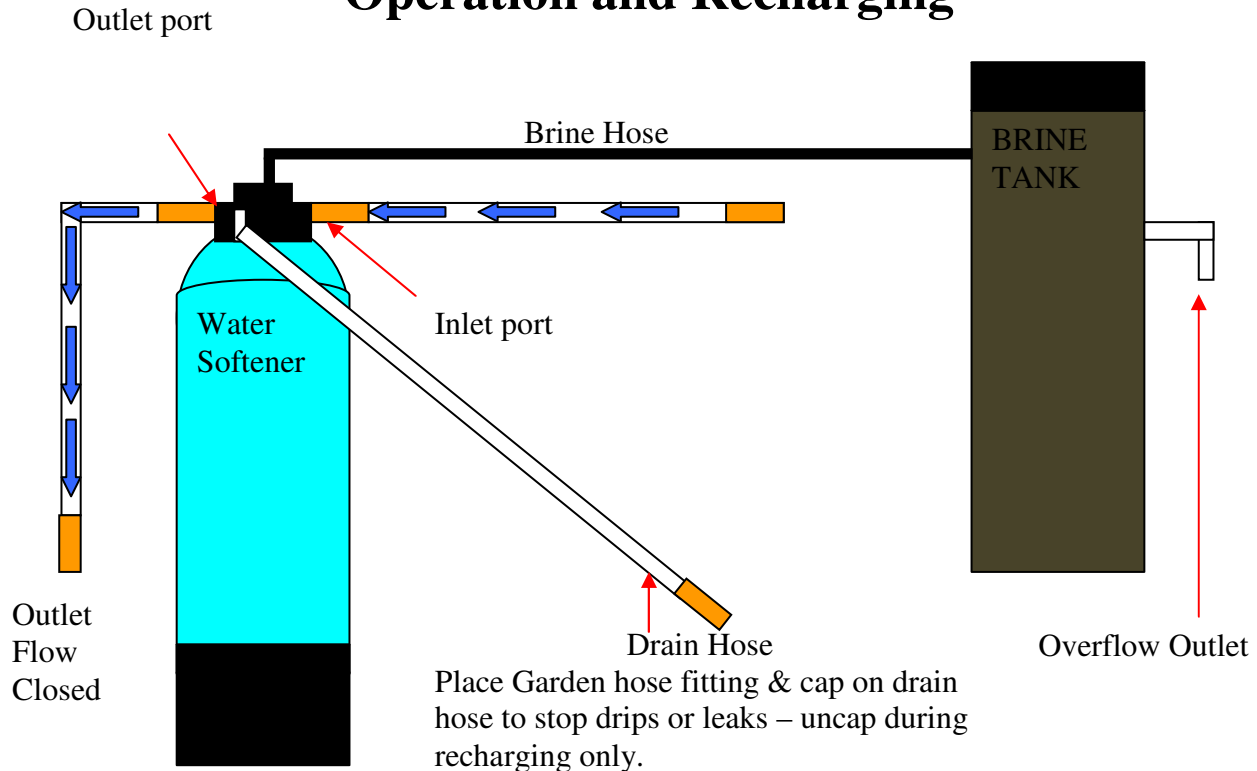
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The same size and style quick connect used as the incoming water connection on the machine should also be used on the fresh water tank inlet. If the hose from the softener to the tank is made long enough it can be connected to the incoming water connection on the machine when the pump-in pump and fresh water tank are not needed or malfunctioning. This is the same water softener plumbing route used on machines without a fresh water tank or pump-in system. (See **Figure #2**)



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RECHARGING

1. Remove clip and plug from brine port on softener timer head. Connect brine hose and secure with clip.
2. Uncap drain hose connected to drain barb on water softener timer head.
3. During recharging, incoming water is connected to the Inlet port.
4. The water flow from the Outlet port the outlet port should be stopped by disconnecting the quick connect from the tank or machine or by closing a valve if so equipped.
5. With the timer off, the water will flow from the softener timer head through the brine hose to fill brine tank with water. When the tank is full, float valve will shut off the flow or water will start to flow out of the overflow outlet.
6. When the timer is turned on, water will start to flow out of the drain hose. Brine will be drawn from the brine tank, flushed through the resin bed and discharged out of the drain hose.
7. When time has expired and the timer is off, the flow from the drain hose will stop. Water will again flow to the brine tank. When the tank is full, float valve will shut off the flow or water will start to flow out of the overflow outlet.
8. When recharging is complete, disconnect the brine hose from the softener timer head. Install plug & clip in brine hose port on timer head. Cap drain hose. Reconnect outlet flow hose to tank or machine and open valve if so equipped.

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