

AQT-390

POWERFLO SERIES



AQUATROL™
CONTROL VALVES


SERVICE MANUAL

TABLE OF CONTENTS

General Residential Installation	4
AQT-390 Timer Start-up Setting Procedures	5
AQT-390 Timer Delay Start-up Setting Procedures	6
Regeneration Cycle Program Setting Procedures	7
Water Conditioner Flow Diagrams	8
Dimensional Drawings	11
Body Valve Assembly	12
Body Valve Assembly Parts List	13
DLFC Assembly	14
DLFC Assembly Parts List	15
Upper Control Drive Assembly	16
Upper Control Drive Assembly Parts List	17
Lower Control Drive Assembly	18
Lower Control Drive Assembly Parts List	19
180 Brine System Assembly	20
180 Brine System Assembly Parts List	21
Troubleshooting	22
Wiring Diagram	24
Notes	25



Water Pressure	Minimum 25 PSI
Electrical Supply	Uninterrupted AC. Check voltage compatibility
Existing	Free of any deposits or build-ups inside pipes
Softener	Locate close to drain and connect according to plumbing codes
Bypass Valves	Always provide for bypass valve if unit is not equipped with one

CAUTION	
	Do not exceed 120 PSI water pressure
	Do not exceed 110°F water temperature
	Do not subject unit to freezing conditions

Installation Instructions

1. Place the softener tank where you want to install the unit making sure the unit is level and on a firm base.
(Maximum 7 feet apart for twin units.)
2. All plumbing should be done in accordance with local plumbing codes. The pipe size for the drain line should be the same size as the drain line flow control female connection. Water meters are to be installed on soft water outlets. Twin units with (1) one meter shall be installed on common soft water outlets of units.
3. Solder joints near the drain must be done prior to connecting the Drain Line Flow Control fitting. Leave at least 6" between the DLFC and solder joints when soldering when the pipes are connected on the DLFC. Failure to do this could cause interior damage to the DLFC.
4. Teflon tape is the only sealant to be used on the drain fitting. The drain from twin units may be run through a common line.
5. Make sure that the floor is clean beneath the salt storage tank and that it is level
6. Place approximately 1" of water above the grid plate (if used) in your salt tank. Salt may be place in the unit at this time.
7. On units with by-pass, place in by-pass position. Turn on main water supply. Open a cold soft water tap nearby and let run a few minutes or until the system is free from foreign material (usually solder) that may have resulted from the installation.
8. Place the by-pass in service position.
9. Manually index the softener control into "service" position and let water flow into the mineral tank. When water flow stops, open a cold water tap nearby and let run until air pressure is relieved.
10. Electrical: All electrical connections must be connected according to codes. Use electrical conduit if applicable. Remote meter system wiring diagrams are on page 26.
11. Plug into power supply

How To Set Days On Which Water Conditioner Is To Regenerate:

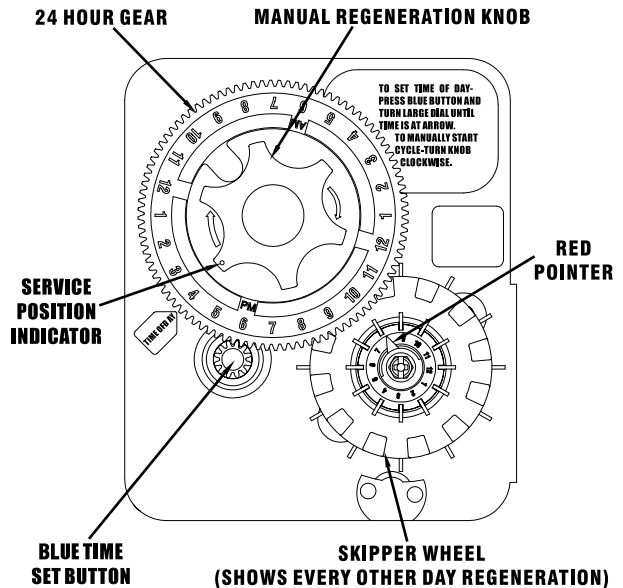
Rotate the skipper wheel until the number "1" is at the red pointer.
Set the days that regeneration is to occur by sliding tabs on the skipper wheel outward to expose trip fingers.
Each tab is one day. Finger at red pointer is tonight.
Moving clockwise from the red pointer, extend or retract fingers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

How To Set The Time Of Day:

Press and hold the blue button in to disengage the drive gear.
Turn the large gear until the actual time of day is at the time of day pointer.
Release the blue button to again engage the drive gear.

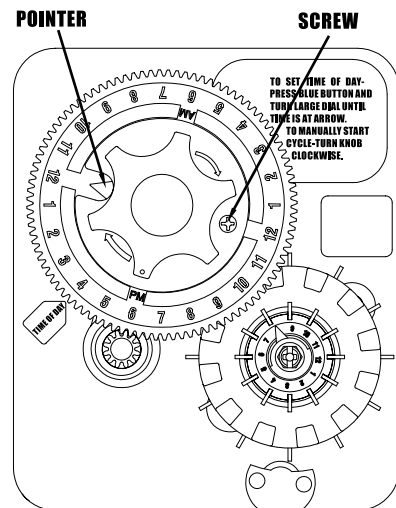
How To Manually Regenerate Your Water Conditioner At Any Time:

Turn the manual regeneration knob clockwise.
This slight movement of the manual regeneration knob engages the program wheel and starts the regeneration program.
The black center knob will make one revolution in the following approximately three hours and stop in the position shown in the drawing.
Even though it takes three hours for this center knob to complete one revolution, the regeneration cycle of your unit might be set only one half of this time.
In any event, conditioned water may be drawn after rinse water stops flowing from the water conditioner drain line.



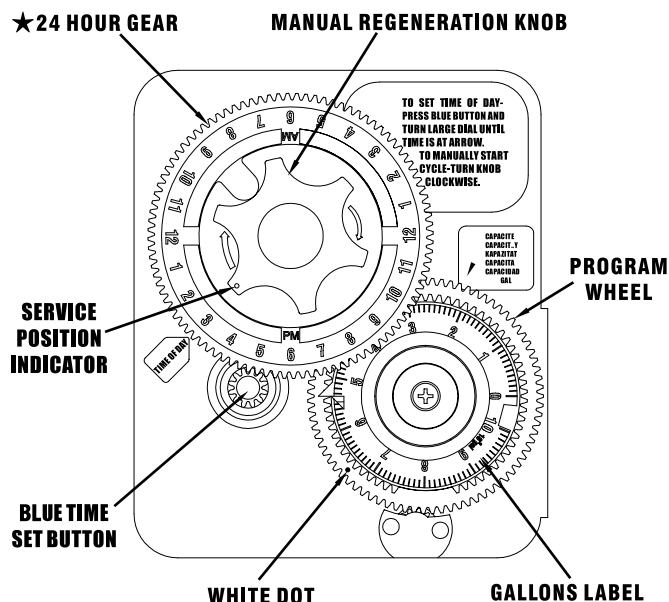
How To Adjust Regeneration Time:

1. Disconnect the power source.
2. Locate the three screws behind the manual regeneration knob by pushing the blue 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 plate so the desired regeneration time aligns next to the raised arrow.
6. Push the blue button in and rotate the 24 hour dial. Tighten each of the three screws.
7. Push the blue 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.



AQT-390 Timer Delay

Start-up Setting Procedures



NOTE:

To set meter capacity rotate manual knob 1-360° revolution to set the gallons.

Typical Programming Procedure

Calculate the gallon capacity of the system, subtract the necessary reserve requirement and set the appropriate gallons available opposite the small white dot on the program wheel. Note, drawing shows 10,000 gallon setting. The capacity (gallons) arrow denotes remaining gallons exclusive of the calculated reserve.

Note: To set meter capacity at initial start-up, either:

1. Rotate the manual regeneration knob one full revolution.
 - or
 2. Rotate the program wheel manual clockwise and align white dot with capacity arrow.
- This procedure must be followed any time the program wheel setting is changed.

How To Set The Time Of Day:

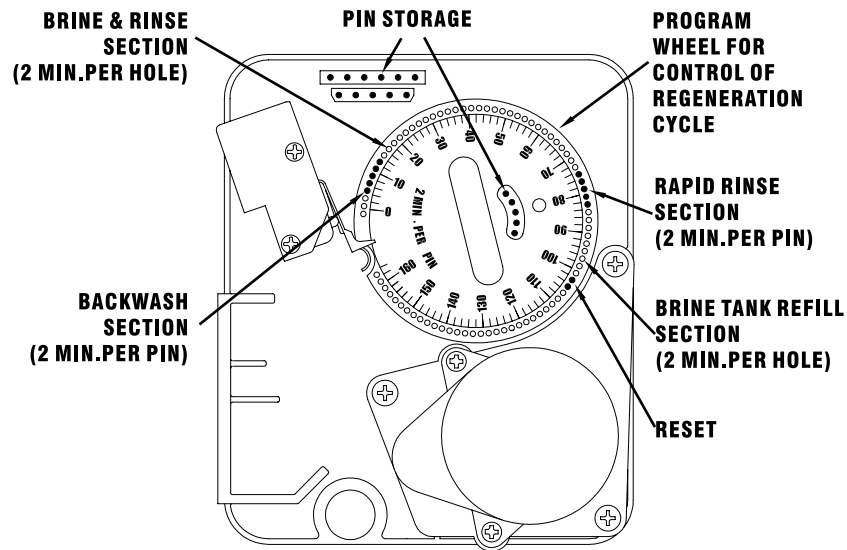
Press and hold the white button in to disengage the drive gear.
Turn the large gear until the actual time of day is opposite of the time of day pointer.
Release the white button to again engage the drive gear.

How To Manually Regenerate Your Water Conditioner At Any Time:

Turn the manual regeneration knob clockwise one "click".
This slight movement of the manual regeneration knob engages the program wheel and starts the regeneration program.
The black center knob will make one revolution in the following approximately three hours and stop in the position shown in the drawing.
Even though it takes three hours for this center knob to complete one revolution, the regeneration cycle of your unit might be set for only on half of this time.
In any event, conditioned water may be drawn after rinse water stops flowing from the water conditioner drain line.

Immediate Regeneration Times:

These timers do not have a 24 hour gear. Setting the gallons on the program wheel and manual regeneration procedure are the same as previous instructions.



How To Set The Regeneration Cycle Program:

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

Timer Setting Procedure:

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 your unit will backwash.

For example: If there are six pins in this section, the time of backwash will be 12 min. (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 Brine And Rinse Time:

The group of holes between the last pin in the backwash section and the second group of pins determines the length of time that your unit will brine and rinse (2 min. per hole).

To change the length of brine and rinse time, move the rapid rinse group of pins to give more or fewer holes in the brine and rinse section. Number of holes times two equals brine and rinse time in minutes.

How To Change The Length Of Rapid Rinse:

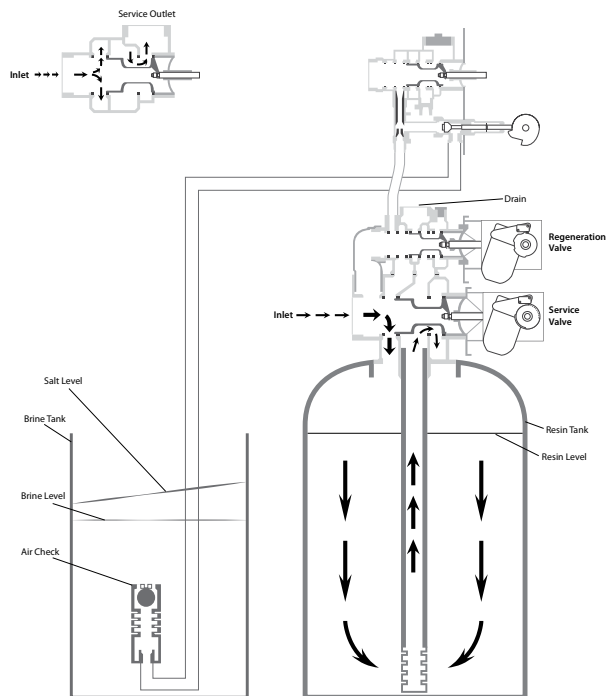
The second group of pins on the program wheel determines the length of time that your water conditioner will rapid rinse (2 min. per pin). To change the length of rapid time, add or remove pins at the higher numbered end of this section as required. The number of pins times two equals the rapid rinse time in minutes.

How To Change The Length Of Brine Tank Refill Time:

The second group of holes in the program wheel determines the length of time that your water conditioner will refill the brine tank (2 min. per hole).

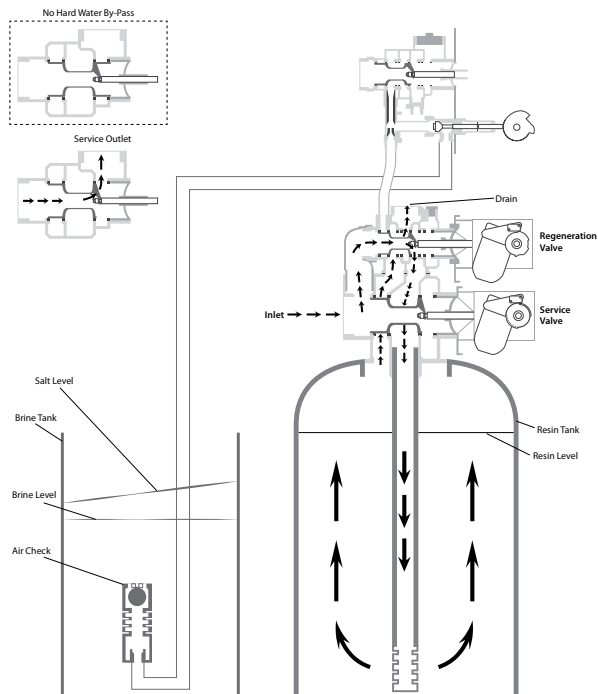
To change the length of refill time, move the two pins at the end of the second group of holes as required.

The regeneration cycle is complete when the outer micro-switch is tripped by the two pin set at the end of the brine tank refill section. The program wheel, however, will continue to rotate until the inner micro-switch drops into the notch on the program wheel.



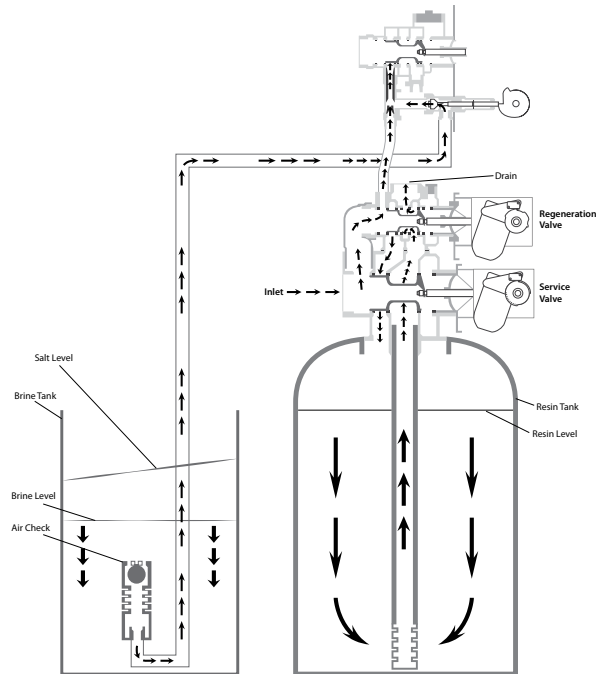
1) Service Position

Hard water enters unit at valve inlet and flows down through the mineral to the bottom. Conditioned water flows up through the distributor tube, around the piston and out the outlet.



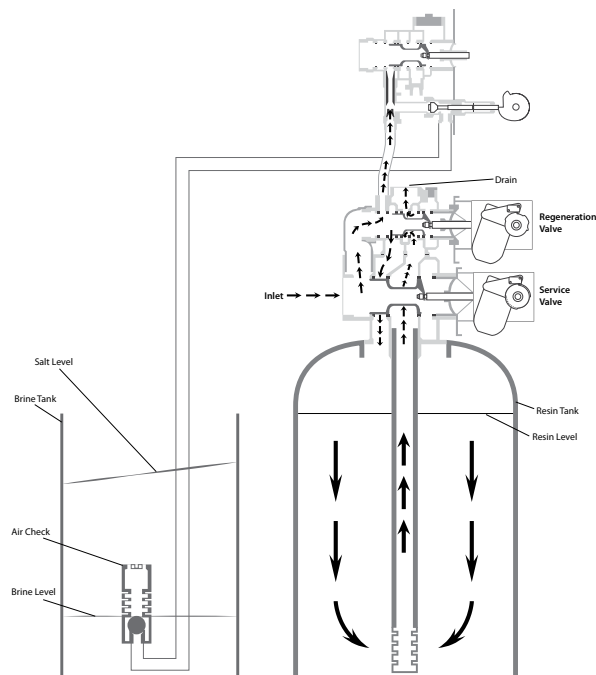
2) Backwash Position

Hard water enters unit at valve inlet and flows through the service adapter piston for by-pass, and up through the coupling to regenerate valve inlet. Flow continues through the regeneration valve piston - down the distributor tube - through the bottom distributor and up through the mineral - around the piston and out the drain. If optional no hard water by-pass piston is used, water flow to service outlet is prevented by an extension on the service outlet until the end of the rapid rinse cycle or brine tank refill cycle, depending on option chosen.



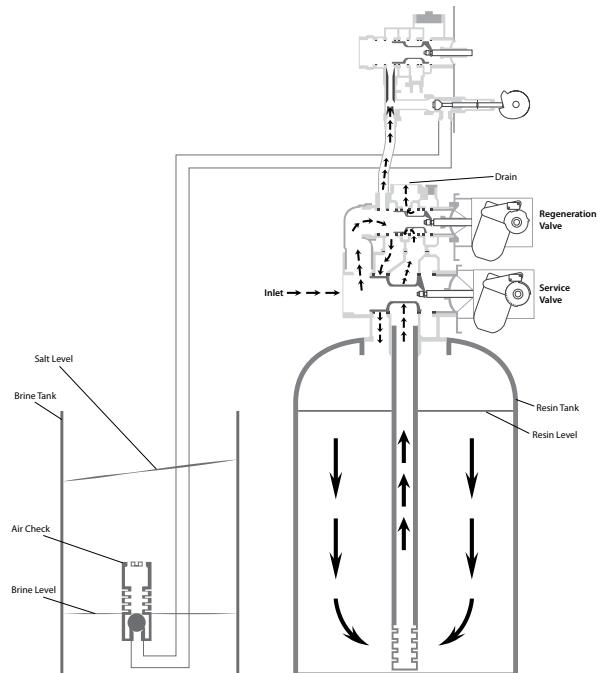
3) Brine Position

Hard water enters unit at valve inlet - flows through injector nozzle and throat to draw brine from the brine tank. Brine flows down through the mineral and into the bottom distributor - up the distributor tube, around the piston and out the drain.



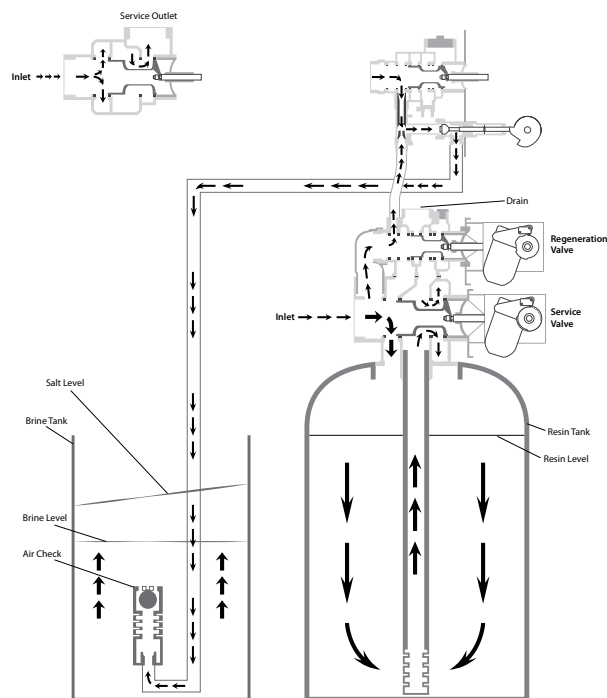
4) Slow Rinse Position

Hard water enters unit at valve inlet - flows through injector nozzle and throat - down through the mineral - into the bottom distributor - up the distributor tube - around the piston and out through the drain line.



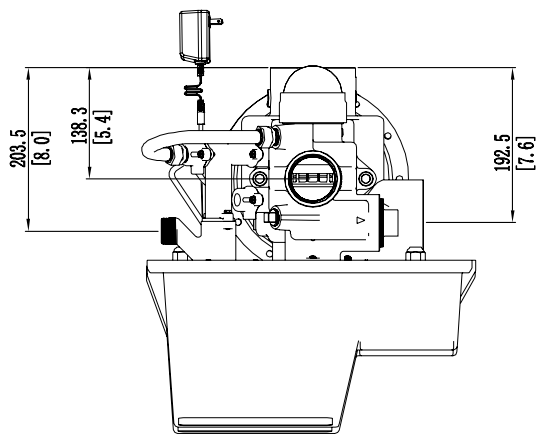
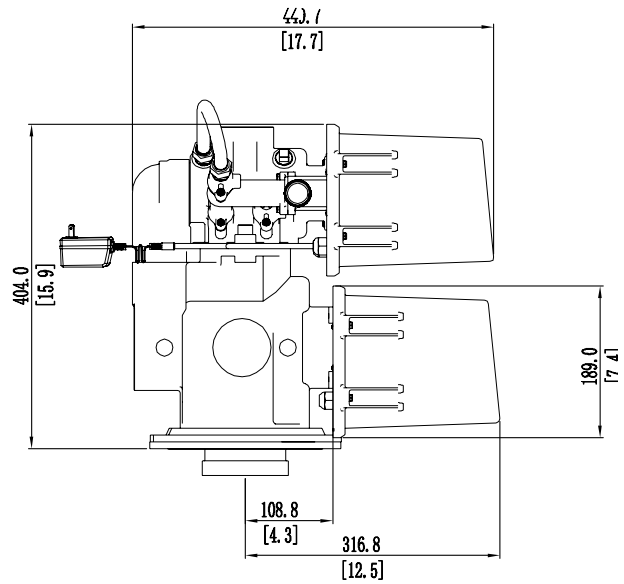
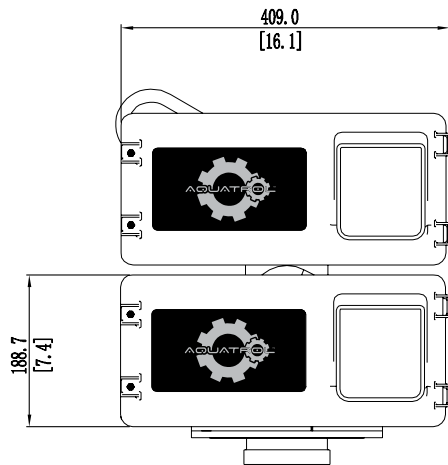
5) Rapid Rinse

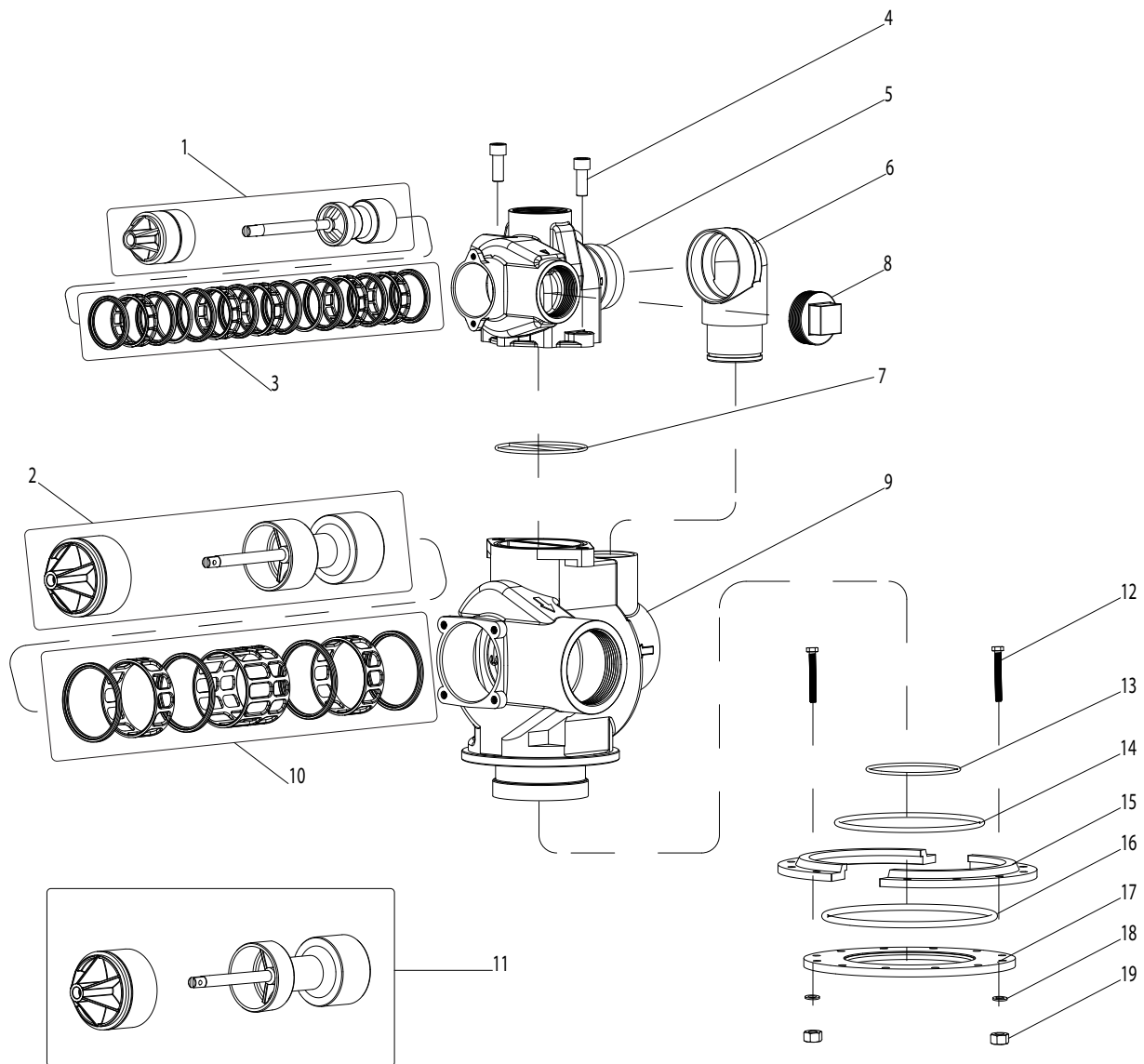
Hard water enters unit at inlet valve - flows through the regeneration valve directly down through the mineral into the bottom distributor and up through the center tube - around the piston and out the drain.



6) Brine Tank Fill Position

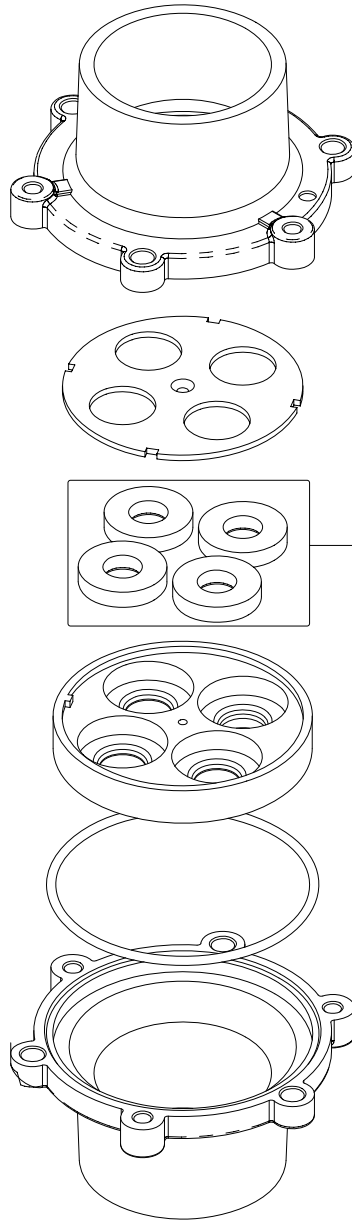
Hard water enters unit at valve inlet - flows through nozzle and through throat to brine valve to refill the brine tank. Inlet flows also continues down through mineral to the bottom distributor. Conditioned water flows up through the distributor tube, around the piston and out the outlet. Note: An option is available to keep service valve in by-pass position until the end of brine tank refill cycle.





Item No.	Quantity	Part No.	Description
1	1	A-60106-00	Piston HW, AQT-315, AQT-390 Upper
2	1	A-60107-00	Piston HW, AQT-390 Lower
3	1	A-60131	Seals & Spacers, AQT-315, AQT-390 Upper
4	2	A-40118	Screw, Body
5	1	A-15114	Body, Valve, AQT-390 Upper
6	1	A-16074	Coupling Assembly
7	1	A-15112	Seal, Valve Body-Adapter
8	1	A-16088	Plug, 2" NPT
9	1	A-16067-02	Valve Body, Lower, 3"
10	1	A-60132	Seals & Spacers, AQT-390 Lower
11	1	A-60107-10	Piston NHW, AQT-390 Lower
12	12	A-16517	Hex Bolt, Flange
13	1	A-16800	O-Ring
14	1	A-16345	O-Ring
15	1	A-16482	Flange Segment, (2 pcs)
16	1	A-16484	O-Ring
17	1	A-16483	Flange Ring
18	12	A-18619	Washer
19	12	A-16346	Nut

A-60711
DLFC, 2" NPT



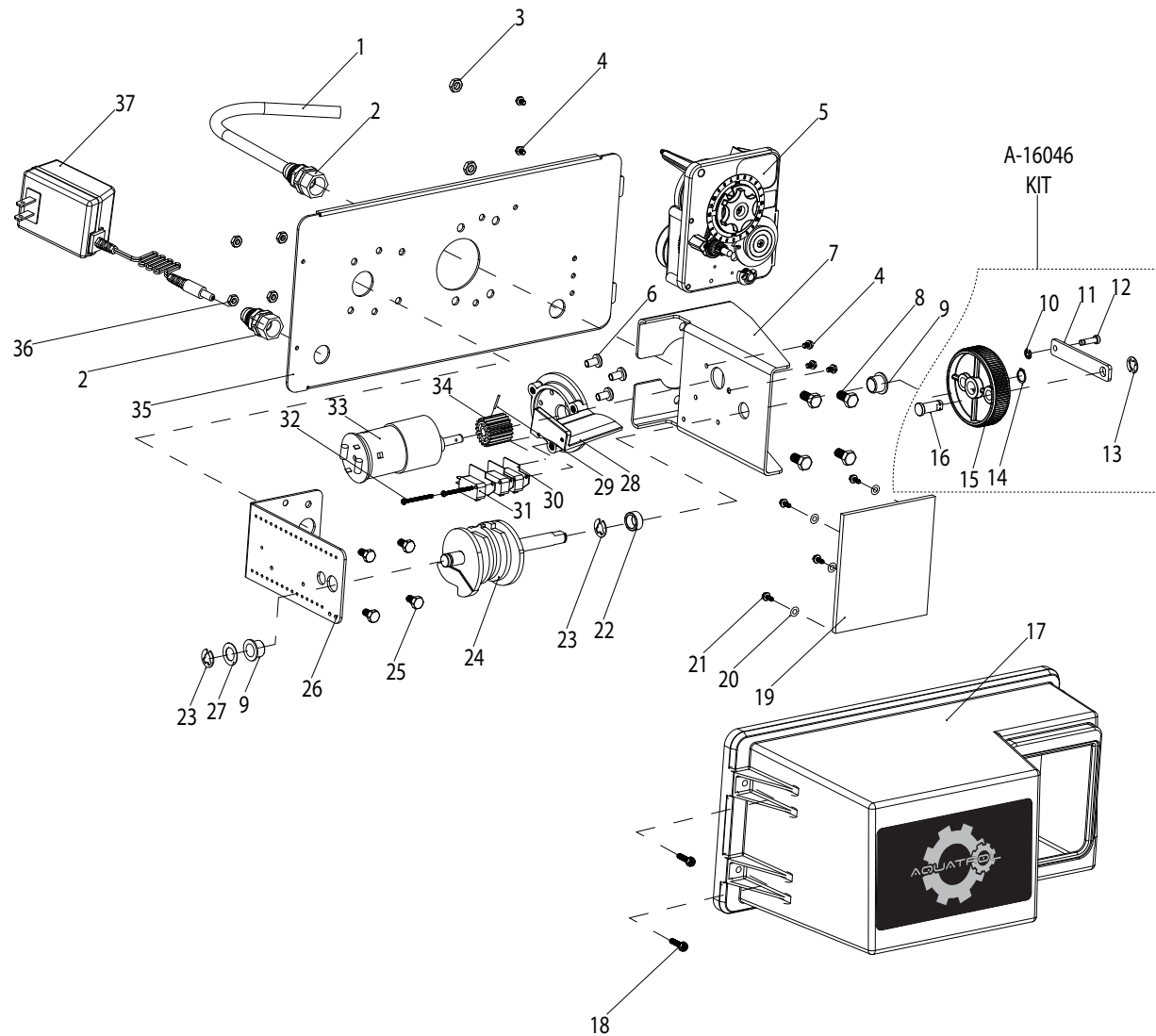
DLFC Buttons
(4 X DLFC)



* DLFC Button / Washer Options (x 4, can be mixed)	
A-17942	DLFC Washer, 5 gpm
A-17943	DLFC Washer, 8 gpm
A-17944	DLFC Washer, 9 gpm
A-16529	DLFC Washer, 10 gpm
A-16735	DLFC Washer, 12 gpm
A-16736	DLFC Washer, 15 gpm
A-16528	DLFC Washer, 20 gpm
A-16737	DLFC Washer, 25 gpm

Upper Control Drive

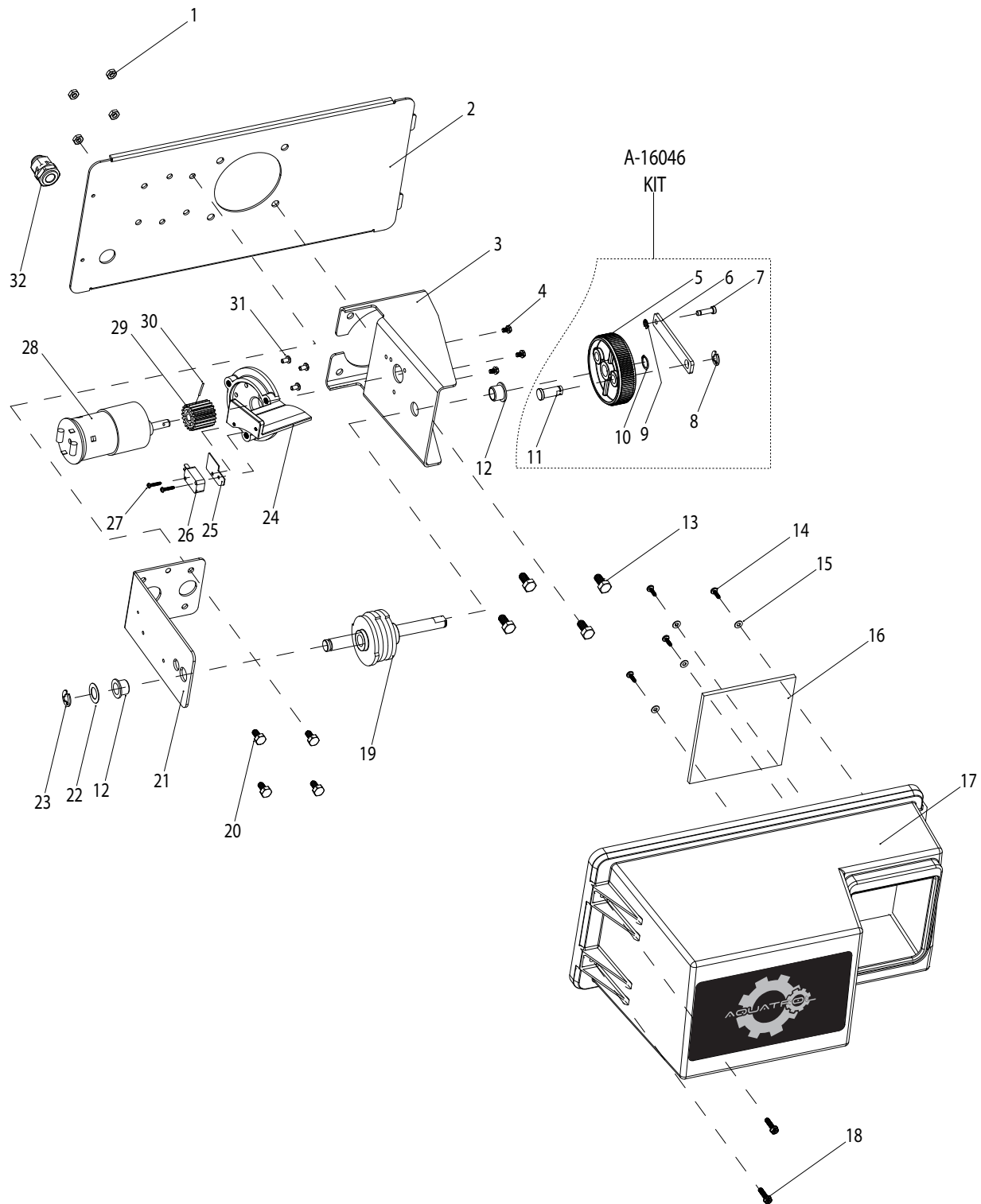
Assembly



Item No.	Quantity	Part No.	Description
1	1	A-17470	Cable Guide, Meter
2	1	A-17470-00	Screw Cap
3	2	A-16346	Nut, Timer
4	5	A-11225	Screw
5*	1		Timer, Mechanical
6	3	A-10016S	Screw, Motor Mounting
7	1	A-15120-01	Motor, Bracket
8	4	A-11224	Hex Bolt, Motor Bracket
9	2	A-16052	Bushing
10	1	A-11898	Retainer
11	1	A-16047	Connecting Link
12	1	A-11709	Pin-drive Link
13	1	A-11774	Retaining Ring
14	1	A-16050	Retaining Ring
15	1	A-16046	Drive Gear, Kit (includes #10 - #16), 315/390
16	1	A-16048	Drive Bearing
17	1	A-60240	Valve Cover
18	1	A-60240	Screw, Cover
19	1	A-60240	Transparent Panel
20	1	A-60240	Washer
21	1	A-60240	Screw
22	1	A-16052-1	Bushing, Cam
23	2	A-16051	Retaining Ring
24	1	A-16494-03	Cam
25	4	A-10231	Hex Bolt, Bracket, Brine Valve
26	1	A-16053	Bracket, Brine Valve
27	1	A-16059	Washer, SS
28	1	A-17797	Bracket, Switch Mounting 315/390
29	1	A-11381	Roll Pin
30	3	A-10302	Insulator, Switch
31	3	A-10218	Switch
32	2	A-40080	Screw, Switch
33	1	A-30018F	Motor 24V, AQT-275, 285, 290 Up, 315, 390 Up & Low
34	1	A-16045-3G	Drive Pinion, Motor 3rd Gen.
35	1	A-19304	Back Plate
36	4	A-11235	Nut
37	1	A-07190F	Transformer, 24V, 60Hz, for Mechanical and NX

Lower Control Drive

Assembly



Item No.	Quantity	Part No.	Description
1	4	A-11235	Nut
2	1	A-19305	Back Plate, 390 Lower
3	1	A-16086	Motor, Bracket, 390 Lower
4	3	A-11225	Screw
5	1	A-11898	Retainer
6	1	A-16047	Connecting Link
7	1	A-11709	Pin-drive Link
8	1	A-11774	Retaining Ring
9	1	A-16050	Retaining Ring
10	1	A-16046	Drive Gear, Kit (includes #10 - #16), 315/390
11	1	A-16048	Drive Bearing
12	2	A-16052	Bushing
13	4	A-11224	Hex Bolt, Motor Bracket
14	1	A-60240	Valve Cover
15	1	A-60240	Screw, Cover
16	1	A-60240	Transparent Panel
17	1	A-60240	Washer
18	1	A-60240	Screw
19	1	A-16494-03	Cam
20	4	A-10231	Hex Bolt, Bracket, Brine Valve
21	1	A-16053	Bracket, Brine Valve
22	1	A-16059	Washer, SS
23	1	A-16051	Retaining Ring
24	1	A-17797	Bracket, Switch Mounting 315/390
25	1	A-10302	Insulator, Switch
26	1	A-10218	Switch
27	2	A-11805	Screw, Switch
28	1	A-30018F	Motor 24V, AQT-275, 285, 290 Up, 315, 390 Up & Low
29	1	A-16045-3G	Drive Pinion, Motor 3rd Gen.
30	1	A-11381	Roll Pin
31	3	A-10016S	Screw, Motor Mounting
32	1	A-18691	Connector, Back Plate, Lower 390

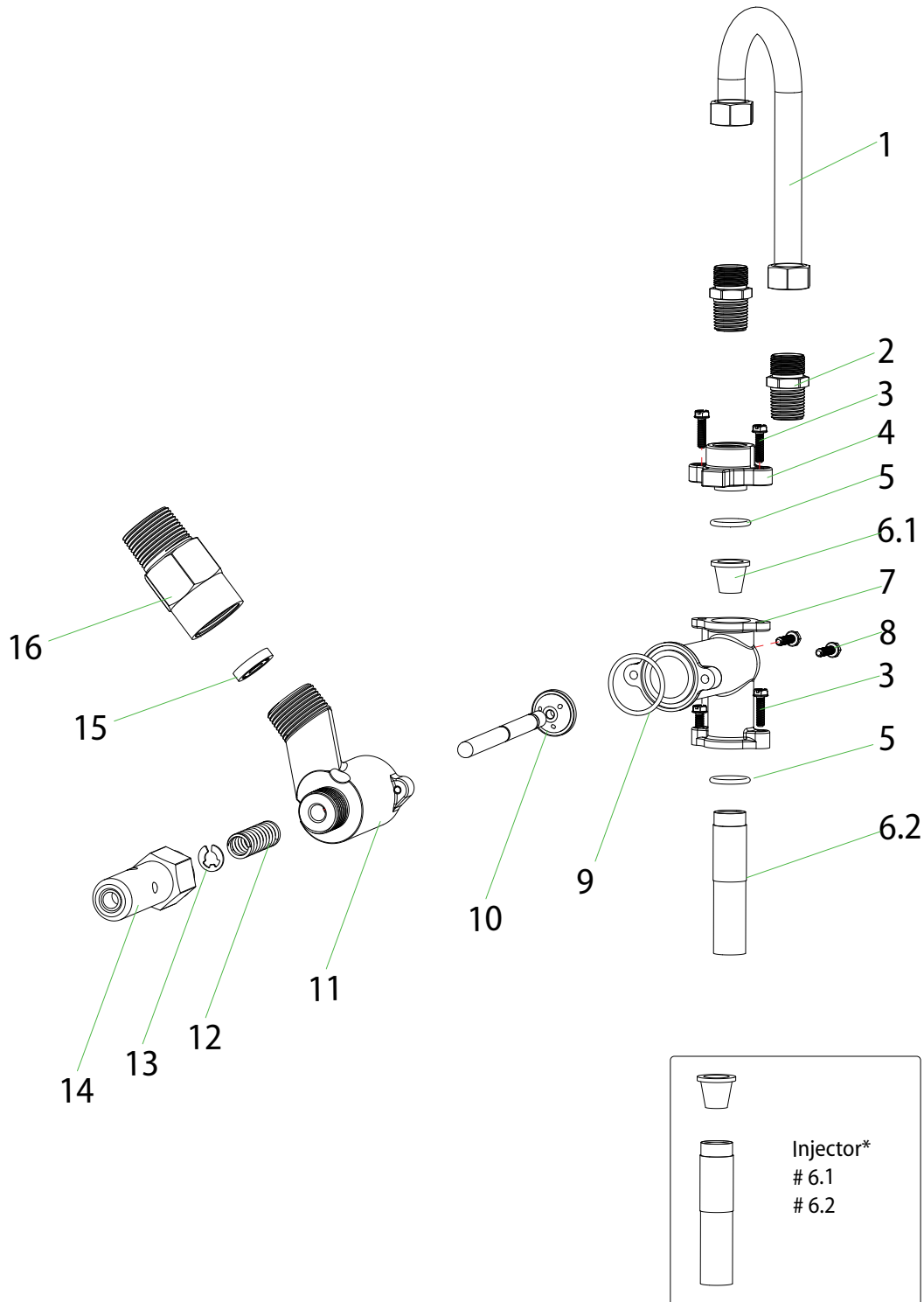
180 Brine System

Assembly



PN 1 - 14 ----- A-60277 --- Brine Valve, Short Stem, Less BLFC, 1" for AQT-315 & AQT-390

PN 10 - 14 ----- A-60036 --- Injector Body, 1" for AQT-315 & AQT-390



Item No.	Quantity	Part No.	Description
1	1	A-18703	Brine Tube
2	2	A-18702	Tube Fitting
3	6	A-12473	Screw
4	1	A-16341-01	Cap, Injector, BV-180
5	2	A-15246	O-Ring, Cap, Injector, BV-180
6.1*	1		Injector Nozzle
6.2*	1		Injector Throat
7	1	A-16340	Injector Body
8	2	A-12473	Screw
9	1	A-19054	O-Ring
10	1	A-16497-01	Brine Stem Assembly
11	1	A-18713	Brine Valve Body, BV-180
12	1	A-11772	Spring, BV-180
13	1	A-11774	Retaining Ring
14	1	A-16498-01	Stem Guide Assembly
15**	1		BLFC, Button
16	1	A-60710	BLFC, Brine Fitting, BV-180

* BLFC Button / Washer Options	
A-17942	BLFC Washer, 5 gpm
A-17943	BLFC Washer, 8 gpm
A-17944	BLFC Washer, 9 gpm
A-16529	BLFC Washer, 10 gpm
A-16735	BLFC Washer, 12 gpm
A-16736	BLFC Washer, 15 gpm
A-16528	BLFC Washer, 20 gpm
A-16737	BLFC Washer, 25 gpm

Troubleshooting

Problems, Cause & Corrections



Problem	Cause	Correction
1) Softener fails to regenerate.	A) Electrical service to unit has been interrupted.	A) Assure permanent electrical service (check fuse, plug, pull chain or switch).
	B) Timer is defective.	B) Replace timer.
	C) Power failure.	C) Reset time of day.
2) Hard water.	A) By-pass valve is open.	A) Close by-pass valve.
	B) No salt in brine tank.	B) Add salt to brine tank and maintain salt level above water level.
	C) Injector screen plugged.	C) Clean injector screen.
	D) Insufficient water flowing into brine tank.	D) Check brine tank fill time and clean brine line flow control if plugged.
	E) Hot water tank hardness.	E) Repeated flushing of the hot water tanks required.
	F) Leak at distributor tube.	F) Make sure distributor tube is not cracked. Check O-ring and tube pilot.
	G) Internal Valve Leak.	G) Replace seals and spacers and/or piston.
	H) Service Adapter did not return to service.	H) Check drive motor and switch.
3) Unit used too much salt.	A) Improper salt setting.	A) Check salt usage and salt setting.
	B) Excessive water in brine tank.	B) See problem No. 7.
4) Loss of water pressure.	A) Iron buildup in line to water conditioner.	A) Clean line to water.
	B) Iron buildup in water conditioner.	B) Clean control and add mineral cleaner to mineral bed. Increase frequency of regeneration.
	C) Inlet of control plugged due to foreign material broken loose from pipes by recent work done on plumbing system.	C) Remove piston and clean control.
5) Loss of mineral through drain line.	A) Air in water system.	B) Assure that well system has proper air eliminator control. Check for dry well conditions.
	B) improper size drain line flow control.	B) Check for proper drain rate.
6) Iron in conditioned water.	A) Fouled mineral bed.	A) Check backwash, brine draw and brine tank fill. Increase frequency of regeneration. Increase backwash time.
7) Excessive water in brine tank.	A) Plugged drain line flow control.	A) Clean flow control.
	B) Plugged injector system.	B) Clean injector and screen.
	C) Timer not cycling.	C) Replace timer.
	D) Foreign material in brine valve.	D) Replace brine valve seat and clean valve.
	E) Foreign material in brine line flow control.	E) Clean brine line flow control.

Problem	Cause	Correction
8) Softener fails to draw brine.	A) Drain line flow control is plugged.	A) Clean drain line flow control.
	B) Injector is plugged.	B) Clean injector.
	C) Injector screen plugged.	C) Clean screen.
	D) Line pressure is too low.	D) Increase line pressure to 20 P.S.I.
	E) Internal control leak.	E) Change seals, spacers and piston assembly
	F) Service adapter did not cycle.	F) Check drive motor and switches.
9) Control cycle continuously.	A) Misadjusted, broken or shorted switch.	A) Determine if switch or timer is faulty and replace it or replace complete power head.
10) Drain flows continuously.	A) Valve is not programming correctly.	A) Check timer program and positioning of control. Replace power head assembly if not positioned properly.
	B) Foreign material in control.	B) Remove power head assembly and inspect bore. Remove foreign material and check control in various regeneration positions.
	C) Internal control leak	C) Replace seals and piston assembly.

General Service Hints for Meter Control

Problem: Softener delivers hard water

Reason: Reserve capacity has been exceeded.

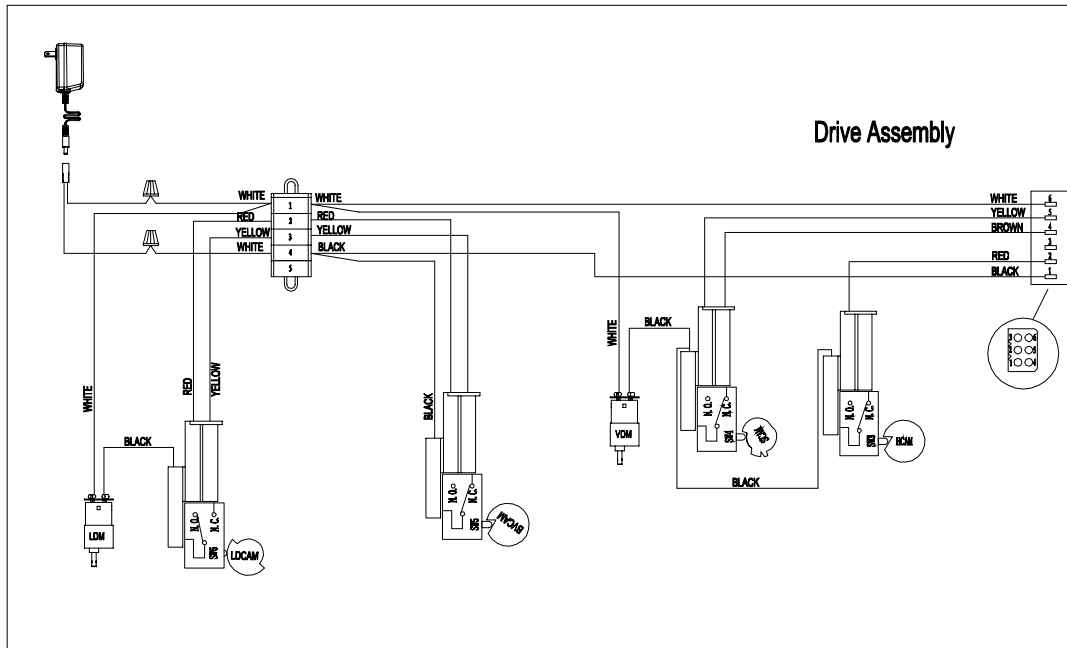
Correction: Check salt dosage requirements and reset program wheel to provide additional reserve.

Reason: Program wheel is not rotating with meter output.

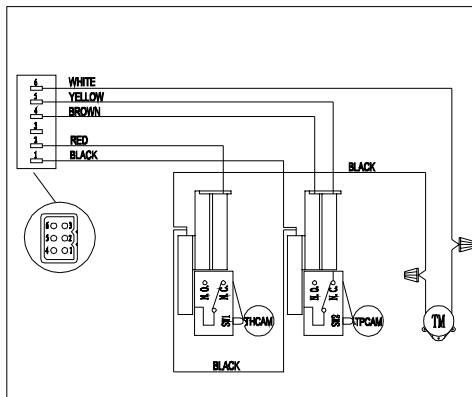
Correction: Pull cable out of meter cover and rotate manually. Program wheel must move without binding and clutch must give positive clicks when program wheel strikes regeneration stop. If it does not, replace timer.

Reason: Meter is not measuring flow.

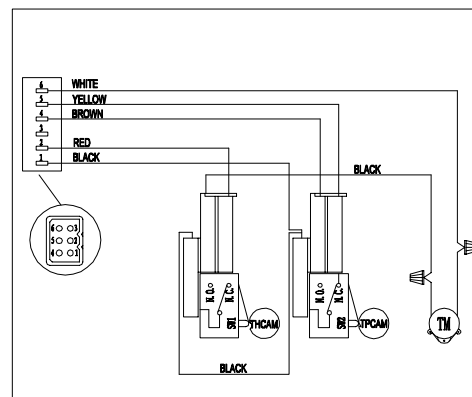
Correction: Check meter with meter checker.



Timer, Meter-timer Control Valve

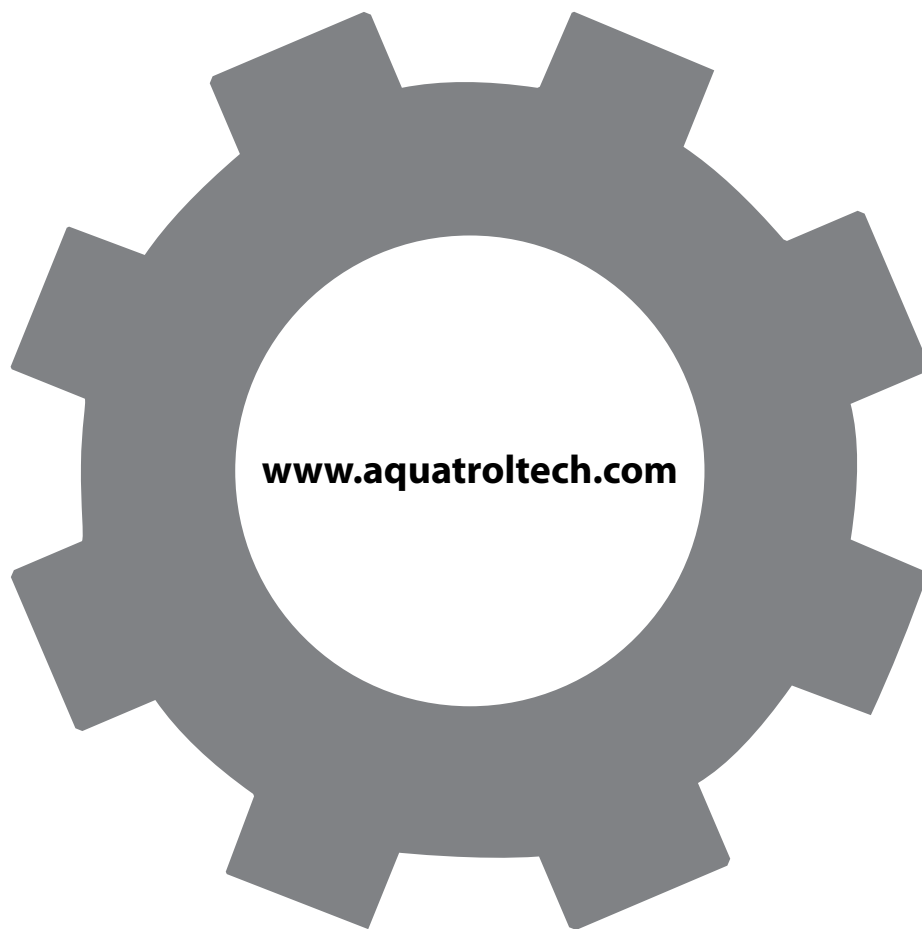


Meter Control Valve



- TM** Time Motor
- VDM** Valve Drive Motor
- LDM** Lower Drive Motor
- SW1** Timer Homing Switch
- SW2** Timer Program Switch
- SW3** Valve Homing Switch
- SW4** Valve Step Switch
- SW5** Brine Cam Switch
- SW6** Lower Drive Switch
- THCAM** Timer Homing Cam
- TPCAM** Timer Program Cam
- HCAM** Valve Homing Cam
- SCAM** Valve Step Cam
- BVCAM** Brine Valve Cam

This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal black lines running across the width of the page, providing a guide for handwriting or typing. The background is a solid off-white color.



AQUATROL | P.O. Box 2235 Chino Hills, CA 91709 • USA