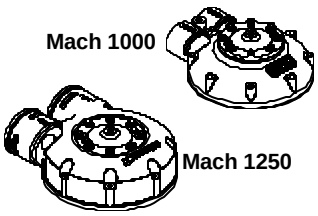
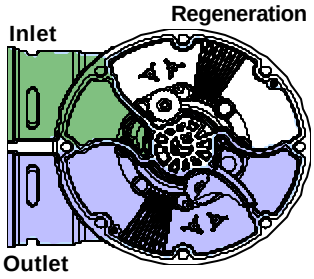
Kinetico's Mach™ Valve



Kinetico Water Conditioners use a twin tank design to assure that treated water is always available. When one tank regenerates, the other supplies treated water. The Kinetico Valve controls when each tank is in service, when each tank must be regenerated and the regeneration of each tank. Two sizes of valves are available: the Mach 1000 and Mach 1250 valves.



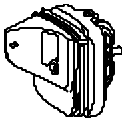
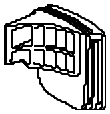
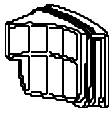
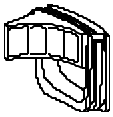
Level One Operation

Level One assembly consists of three chambers: inlet, outlet and regeneration chambers.

Hard water enters the inlet chamber and travels to the media tank where it is treated. Treated water moves from the media tank to the outlet chamber. Contained in the outlet chamber is a water meter turbine, which turns only when water is used. Gears connect the water meter turbine to the water meter disc. The system's meter gearing is defined as the volume of processed water needed to turn the water meter disc 360º.

Flow Nozzle

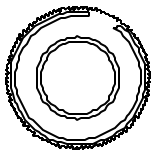
Accuracy and range of the flow meter will depend on the nozzle used with the system. Most units incorporate the half louver nozzle. This nozzle gives a highly accurate and wide range of flow metering capability. If an alternative nozzle is used, a different meter volume per 360º on the water meter will result. To estimate this new volume, use the Meter Ratio Multiplier to determine new volume.

				
	Micro	**Half Louver**	**Full Louver**	**Open Louver**
Part Number	10880	11018	11019	11188
Minimum Flow Range	0.05 gpm	0.4 gpm	0.75 gpm	1.10 gpm
Maximum Flow Range	5.00 gpm	25.00 gpm	40.00 gpm	50.00 gpm
Meter Ratio Multiplier	<0.5 : 0.105 >0.5 : 0.428	1	2.22	3.78

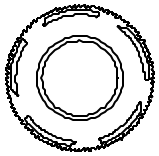
Meter Gearing

Depending on the gear stack used, the volume of water per 360º on the water meter will change. Some of the common gear stacks used are listed.

Gearing	Micro	Half Louver	Full Louver	Open Louver
2-2-2-3	144	342	759	1,293
2-2-1-P5	160	381	846	1,440
2-2-7-P6	245	583	1,303	2,213
2-2-3-P4	276	657	1,470	2,497
2-1-5-P4	307	732	1,689	2,785
2-7-6-P4	470	1,119	2,520	4,280
2-3-4-P4	526	1,253	2,843	4,829
1-5-4-P4	591	1,408	3,171	5,322
7-23-23-P6	720	1,715	3,829	6,483
7-6-4-P4	911	2,168	4,873	8,195
3-4-4-P4	1,021	2,431	5,498	9,189
P2-P20-P14-P14-P14-P17	1,517	3,612	8,019	13,653
P2-P20-P14-P14-P13-P12	1,688	4,019	8,922	15,192
P2-P20-P14-P14-P15-P16	2,595	6,178	13,715	23,353
P2-P20-P14-P14-P17-P11	2,927	6,970	15,473	26,347
P2-P20-P14-P14-P13-P11	3,265	7,774	17,258	29,386
P2-P20-P14-P15-P16-P11	5,018	11,948	26,525	45,163
P2-P20-P14-P17-P11-P11	5,675	13,513	29,999	51,079
P2-P20-P13-P12-P11-P11	6,315	15,035	33,378	56,832
P2-P20-P15-P16-P11-P11	9,705	23,108	51,300	87,348



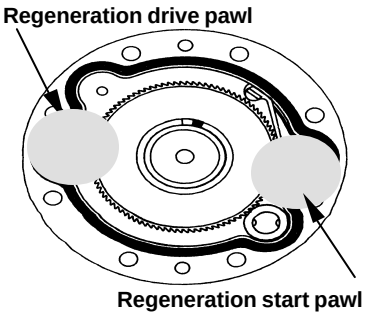
Meter Disc 1



Meter Disc 5

Water Meter Disc

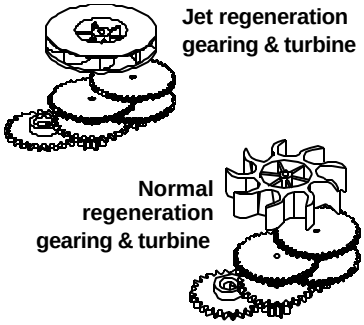
The frequency of regeneration can be adjusted without re-gearing the system. The use of the water meter disc provides for multiple regenerations per 360º cycle on the water meter. Each regeneration notch on a water meter disc will initiate a regeneration when the regeneration start pawl drops into one of these segments and engages with the teeth of the control disc. The number of regenerations within the 360º cycle is indicated by the number of the water meter disc.



Regeneration Pawls

It is important to realize that there are two regeneration pawls: the regeneration start pawl and the regeneration drive pawl. The regeneration start pawl advances the control disc enough to open the regeneration control valve. The water meter and control disc advance together until the control disc uncovers one of the holes in the ceramic disc located directly beneath the control disc. This opens the regeneration control valve, which starts regeneration. Once the valve has opened, the regeneration drive pawl continues to advance the control disc through the regeneration cycle.

When open, the regeneration control valve allows water to pass through a nozzle where it is directed to the regeneration turbine in the regeneration chamber. As the regeneration turbine spins, it drives the regeneration drive pawl, which advances the control disc.



Jet Regeneration

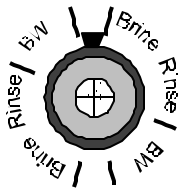
During the regeneration, water is used by the valve to control the sequence. For units equipped with *Jet Regeneration*, a 0.2 gpm regeneration flow control is used to limit the amount of water used. In addition to this small flow control, the regeneration nozzle in the level 2, and the regeneration turbine in the level one are also modified to accept these lower flow rates.

In non-Jet systems, a 0.4 gpm flow control, standard regeneration nozzle and an open regeneration turbine are used.

Control Disc

All internal valve positions are controlled by the Control Disc. As the control disc turns, it covers and uncovers holes in the ceramic disc (located directly below the control disc), sending pressure signals to open and close all internal valves. The sequence of regeneration and service configuration (alternating or Overdrive) is based on the type of control disc installed.

	White	Gray	Black	Orange	Tan	Purple
PN	4689	7931	4700	8637	5565	8635
Service Flow	Alternating	Alternating	Alternating	Overdrive	Overdrive	Overdrive
Regeneration Sequence:						
Backwash	--	--	--	12%	--	--
Brine • Slow Rinse	75%	89%	60%	57%	76%	--
Backwash	25%	11%	40%	12%	24%	65%
Purge	--	--	--	7%	--	25%

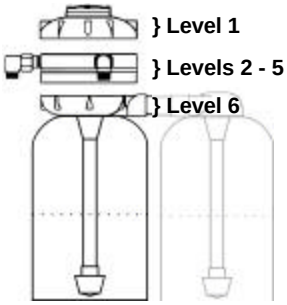


Control Disc Indicator

A visual indicator on top of the control disc (black dot) shows the state of the system at any time. The control disc rotates clockwise. When the indicator dot is at the 12 o'clock position, the Remote Tank is in service. When it is between the 12 o'clock and 6 o'clock positions, the Remote Tank is in regeneration. When the indicator dot is at the 6 o'clock position, the Main Tank is in service. When it is between the 6 o'clock and 12 o'clock positions, the Main Tank is in regeneration.

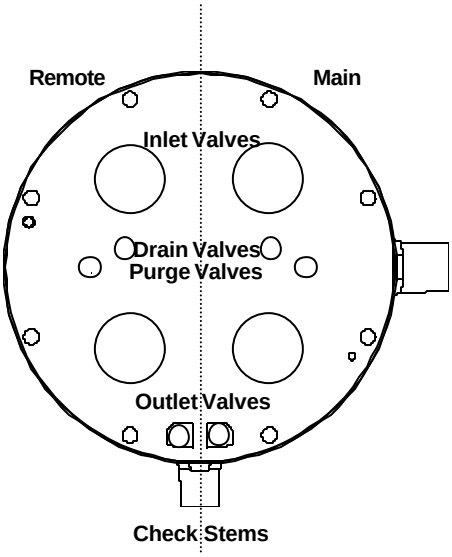
Lower Valving Section

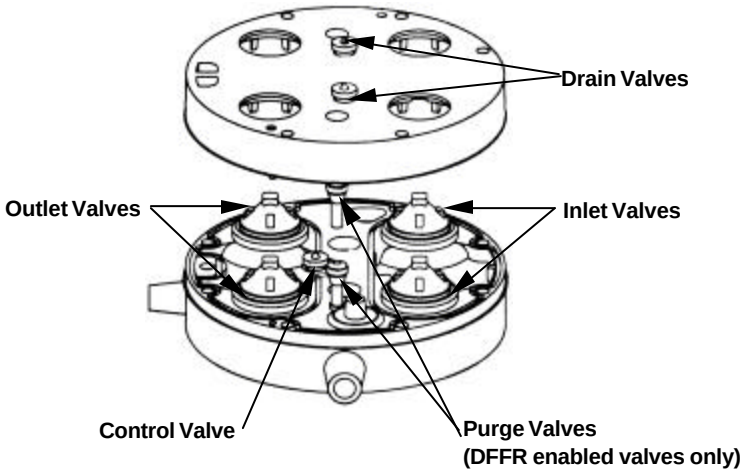
The lower valving section consists of Level Two, Level Three, Level Four and Level Five assemblies.



In the center, there is one regeneration control valve. This valve opens after 4 teeth on the control disc have engaged. This valve then opens and powers the regeneration cycle.

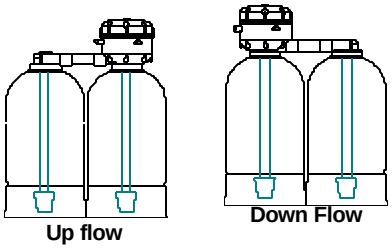
All of the other valves are pairs: one set for the Remote Tank and one set for the Main Tank. For each media tank, there is an Inlet, Outlet, Drain and Check Stem valve (also a down flow rinse valve on DFFR enabled systems.) The Inlet, Outlet and Drain valves are all servo valves controlled by the control disc. The Check Stems are simple one-way valves (check valves). Together, these valves control the flow of water into and out of each media tank during service and regeneration.





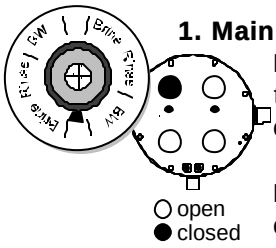
Level 6

The final level of the valve is used to direct the normal service path of the water. This can be either down-flow or up-flow. Since all regenerations are counter-current, choosing the service direction also specifies the regeneration direction. Down-flow service is used with standard, non-packed tank systems. For high efficiency, packed tank systems, up-flow service is specified.



Control Disc: White
Down flow Models: Mach 2030s, Mach 2060s, Mach 2100s, and Mach 2175s
Up Flow Models: Mach 2020c

Control Disc: Gray
Down Flow Models: Mach 2025s

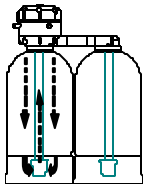


1. Main Tank in Service - Remote Tank in Standby

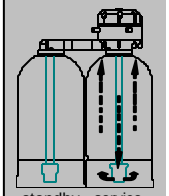
Both Main Tank Inlet and Outlet valves are open. Water passes through Inlet valve, through the resin, through the distributor and out to service through the Main Tank Outlet valve.

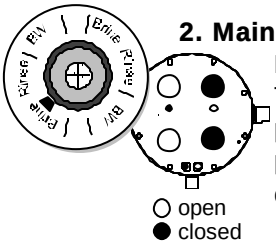
Remote Tank Inlet valve is closed, preventing any water from entering and keeping the Remote Tank in standby.

Down Flow Service



Up Flow Service

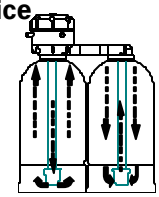


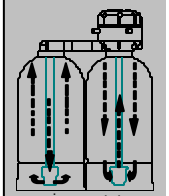


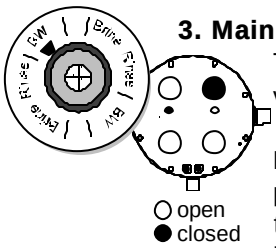
2. Main Tank Regenerating (Brine - Rinse) - Remote Tank in Service

Both the Main Tank Inlet and Outlet valves are closed. The Main Tank Drain valve is open. Soft water from the Remote Tank passes through the venturi, which causes brine to be drawn in past the Check Stem, in to the distributor, through the resin and out through the Drain valve.

The unit will continue to draw until the brine valve closes and prevents brine from entering the Main Tank, thus starting the rinse cycle. The system will continue to rinse until the backwash cycle starts.



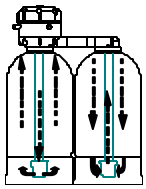


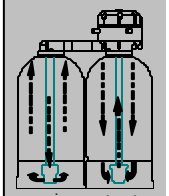


3. Main Tank Regenerating (Backwash) - Remote Tank in Service

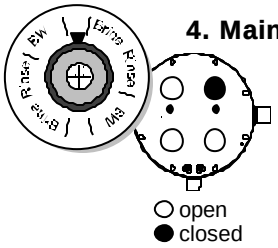
The Main Tank Inlet valve is closed. Both the Main Tank Outlet valve and Main Tank Drain valve are open.

Both Check Stems are closed. Soft water from the Remote Tank passes through the Remote Tank Outlet valve, over and through the Main Tank Outlet valve and then through the distributor. This high flow of water provides thorough cleaning of the hardness ions, iron and excess brine not rinsed during the rinse cycle.





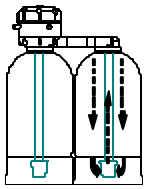
Down Flow Service | **Up Flow Service**

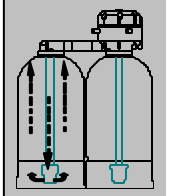


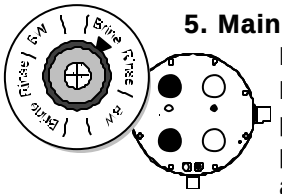
open
closed

4. Main Tank on Standby - Remote Tank in Service

Remote Tank Inlet and Outlet valves are open. Main Tank Inlet valve is closed, preventing any water from entering and keeping Main Tank in standby.



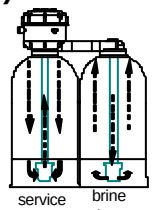


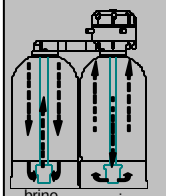


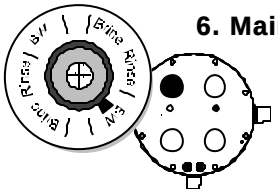
open
closed

5. Main Tank in Service - Remote Tank Regenerating (Brine-Rinse)

Both the Remote Tank Inlet and Outlet valves are closed. The Remote Tank Drain valve is open. Soft water from the Main Tank passes through the venturi, which causes brine to be drawn in past the Check Stem, through the distributor, through the resin, and out through the Drain valve. The unit will continue to draw until the brine valve closes and prevents brine from entering the Remote Tank, thus starting the rinse cycle. The system will continue to slow rinse until the backwash cycle starts.



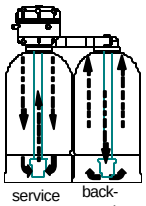


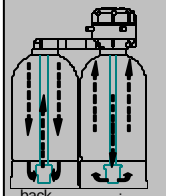


open
closed

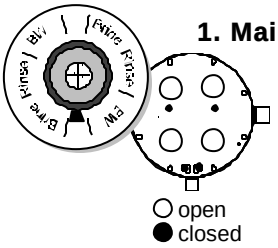
6. Main Tank in Service - Remote Tank Regenerating (Backwash)

The Remote Tank Inlet valve is closed. Both the Remote Tank Outlet valve and Remote Tank Drain valve are open. Both Check Stems are closed. Soft water from the Main Tank passes through the Main Tank Outlet valve, over and through the Remote Tank Outlet valve, and through the distributor. This high flow of water provides thorough cleaning of the hardness ions, iron, and excess brine not rinsed during the rinse cycle.



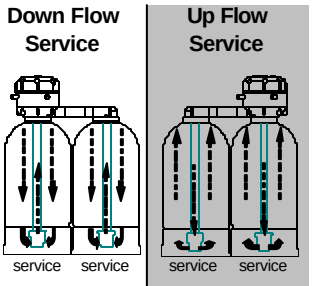


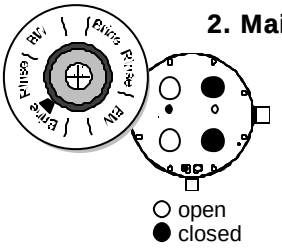
Control Disc: Tan
Down Flow Models: Mach 2060s OD, Mach 2100s OD
Up Flow Models: Mach 2040s OD, Mach 4040s OD



1. Main Tank in Service - Remote Tank in Service

Main Tank and Remote Tank Inlet and Outlet valves are open. Water passes through Inlet valves, through both resin beds, through the distributors, up and then through the Outlet valves.

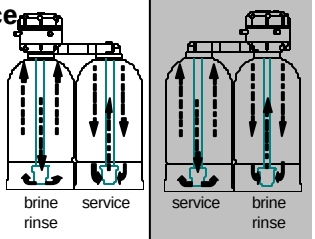


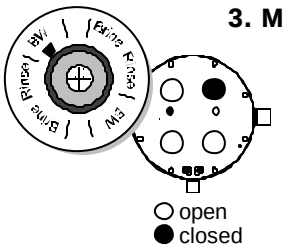


2. Main Tank Regenerating (Brine - Rinse) - Remote Tank in Service

Both the Main Tank Inlet and Outlet valves are closed. The Main Tank Drain valve is open. Soft water from the Remote Tank passes through the venturi, which causes brine to be drawn in past the Check Stem, through the distributor, through the resin and out through the Drain valve.

The unit will continue to draw until the brine valve closes and prevents brine from entering the Main Tank, thus starting the rinse cycle. The system will continue to rinse until the backwash cycle starts.

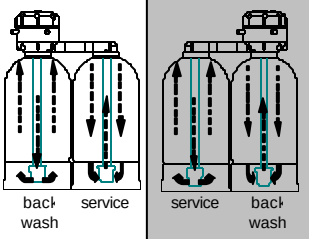


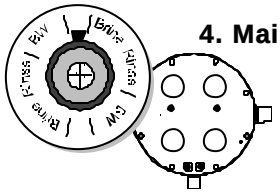


3. Main Tank Regenerating (Backwash) - Remote Tank in Service

The Main Tank Inlet valve is closed. Both the Main Tank Outlet valve and Main Tank Drain valve are open.

Both Check Stems are closed. Soft water from the Remote Tank passes through the Remote Tank Outlet valve, over and through the Main Tank Outlet valve, through the distributor. This high flow of water provides thorough cleaning of the hardness ions, iron and excess brine not rinsed during the rinse cycle.

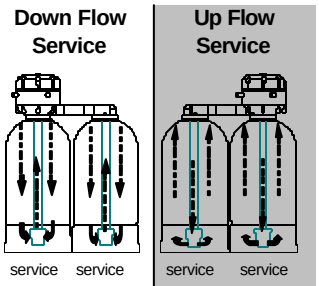


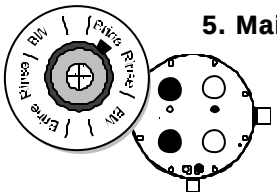


○ open
● closed

4. Main Tank in Service - Remote Tank in Service

Remote and Main Tank Inlet and Outlet valves are open. Both tanks are in service with water flowing through the Inlet valves, through the resin beds, through the distributors, then out the Outlet valves.

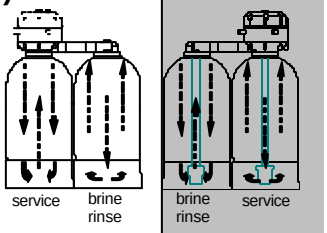


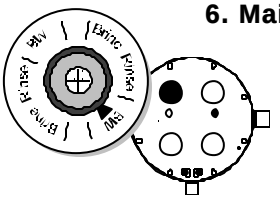


○ open
● closed

5. Main Tank in Service - Remote Tank Regenerating (Brine-Rinse)

Both the Remote Tank Inlet and Outlet valves are closed. The Remote Tank Drain valve is open. Soft water from the Main Tank passes through the venturi, which causes brine to be drawn in past the Check Stem, through the distributor, through the resin, and out through the Drain valve. The unit will continue to draw until the brine valve closes and prevents brine from entering the Remote Tank, thus starting the rinse cycle. The system will continue to slow rinse until the backwash cycle starts.

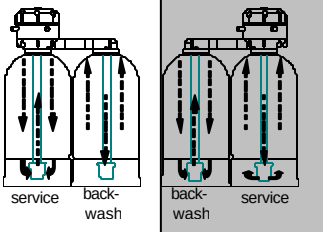




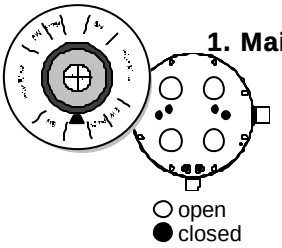
○ open
● closed

6. Main Tank in Service - Remote Tank Regenerating (Backwash)

The Remote Tank Inlet valve is closed. Both the Remote Tank Outlet valve and Remote Tank Drain valve are open. Both Check Stems are closed. Soft water from the Main Tank passes through the Main Tank Outlet valve, over and through the Remote Tank Outlet valve, and through the distributor. This high flow of water provides thorough cleaning of the hardness ions, iron, and excess brine not rinsed during the rinse cycle.

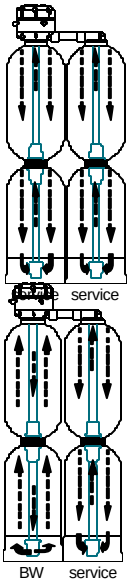


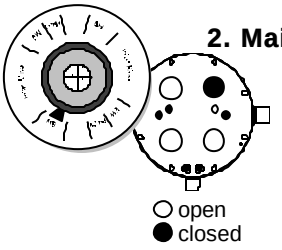
Control Disc: Orange
Down Flow Models: Mach 4060s OD, Mach 4060s OD, 2060f OD Sulfur Guard



1. Main Tank in Service - Remote Tank in Service

Remote and Main Tank Inlet and Outlet valves are open. Water passes through Inlet valves, down through the media/resin, into the distributor tube at the bottom of the second tank, up through the distributor tube and out to service through the Main Tank Outlet valves.

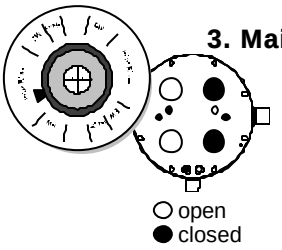




2. Main Tank in Prebackwash – Remote Tank in Service

The Main Tank Inlet valve is closed. Both the Main Tank Outlet valve and Main Tank Drain valve are open.

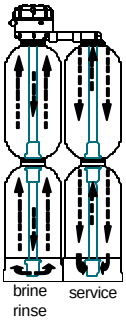
Both Check Stems are closed. Soft water from the Remote Tank passes through the Remote Tank Outlet valve, over and through the Main Tank Outlet valve, through the distributor. This high flow of water provides a backwash to the filter media in the system.

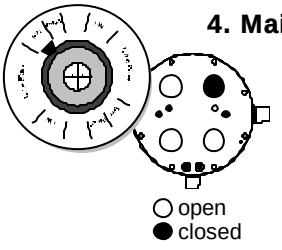


3. Main Tank Regenerating (Brine-Rinse) – Remote Tank in Service

Both the Main Tank Inlet and Outlet valves are closed. The Main Tank Drain valve is open. Soft water from the Remote Tank passes through the venturi, which causes brine to be drawn in past the Check Stem, down through the distributor, up through the resin and out through the Drain valve.

The unit will continue to draw until the brine valve closes and prevents brine from entering the Main Tank, thus starting the rinse cycle. The system will continue to rinse until the backwash cycle starts.

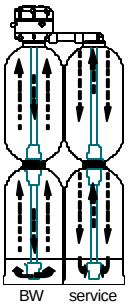


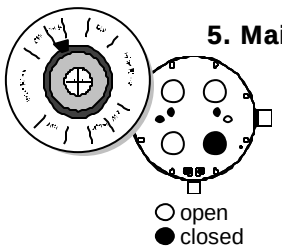


4. Main Tank Regenerating (Backwash) - Remote Tank in Service

The Main Tank Inlet valve is closed. Both the Main Tank Outlet valve and Main Tank Drain valve are open.

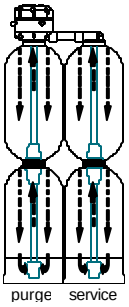
Both Check Stems are closed. Soft water from the Remote Tank passes through the Remote Tank Outlet valve, over and through the Main Tank Outlet valve, through the distributor. This high flow of water provides a backwash to the filter media in the system.

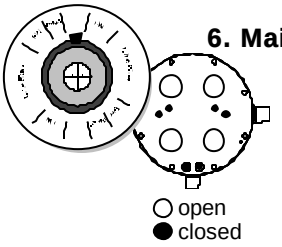




5. Main Tank in Purge – Remote Tank in Service

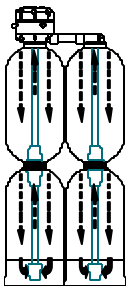
The Main Tank Outlet Valve is closed. The Main Tank Inlet Valve is open. The Drain Valves are closed. The Main Tank Purge Valve is open. The Remote Tank Inlet and Outlet Valves are open, providing water to service. Water flows through the Main Tank Inlet and down through the media. The Main Tank Purge Valve is open allowing water to pass to the drain. This removes any remaining turbidity and repacks the media for the next service cycle.

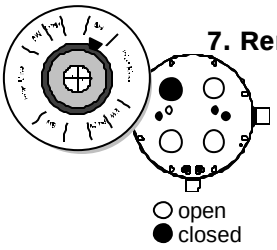




6. Main Tank in Service - Remote Tank in Service

Remote and Main Tank Inlet and Outlet valves are open. Water passes through Inlet valves, down through the media/resin, into the distributor tube at the bottom of the second tank, up through the distributor tube and out to service through the Main Tank Outlet valves.

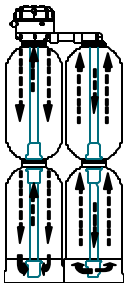


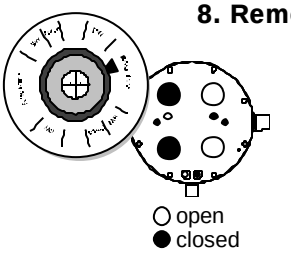


7. Remote Tank in Pre-backwash – Main Tank in Service

The Remote Tank Inlet valve is closed. Both the Remote Tank Outlet valve and Remote Tank Drain valve are open.

Both Check Stems are closed. Soft water from the Main Tank passes through the Main Tank Outlet valve, over and through the Remote Tank Outlet valve, through the distributor. This high flow of water provides a backwash to the filter media in the system.

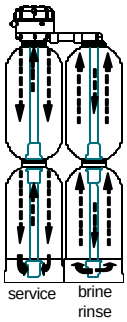


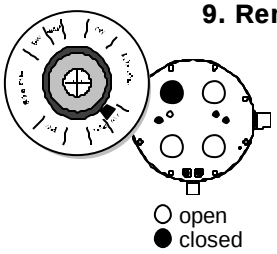


8. Remote Tank Regenerating (Brine-Rinse) – Main Tank in Service

Both the Remote Tank Inlet and Outlet valves are closed. The Remote Tank Drain valve is open. Soft water from the Main Tank passes through the venturi, which causes brine to be drawn in past the Check Stem, down through the distributor, up through the resin and out through the Drain valve.

The unit will continue to draw until the brine valve closes and prevents brine from entering the Remote Tank, thus starting the rinse cycle. The system will continue to rinse until the backwash cycle starts.

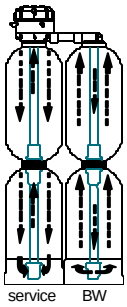


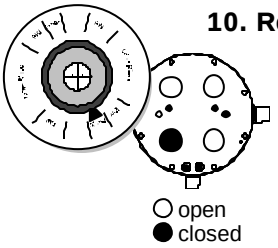


9. Remote Tank Regenerating (Backwash) - Main Tank in Service

The Remote Tank Inlet valve is closed. Both the Remote Tank Outlet valve and Remote Tank Drain valve are open.

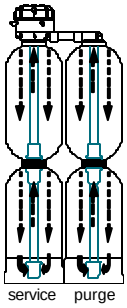
Both Check Stems are closed. Soft water from the Main Tank passes through the Main Tank Outlet valve, over and through the Remote Tank Outlet valve, through the distributor. This high flow of water provides a backwash to the filter media in the system.



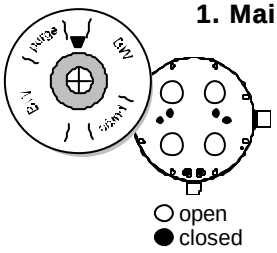


10. Remote Tank in Purge – Main Tank in Service

The Remote Tank Outlet valve is closed. The Remote Tank Inlet valve is open. The Drain valves are closed. The Remote Tank Purge valve is Open, The Main Tank Inlet and Outlet valves are open, providing water to service. Water flows through the Remote Tank Inlet and down through the media. The Remote Tank Purge valve is open allowing water to pass to the drain. This removes any remaining turbidity and repacks the media for the next service cycle.

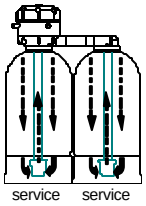


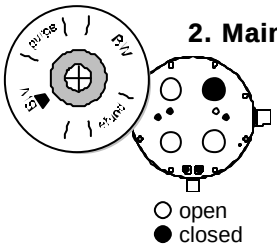
Control Disc: Purple
Down flow Models: Mach 2060f OD, Mach 2100f OD, Mach 4060f OD



1. Main Tank in Service - Remote Tank in Service

Both Main and Remote Tank Inlet and Outlet valves are open. Water passes through Inlet valve, down through the media, into the distributor tube at the bottom, up and out to service through the Main and Remote Tank Outlet valves.

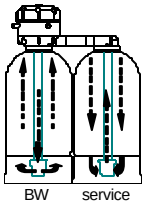


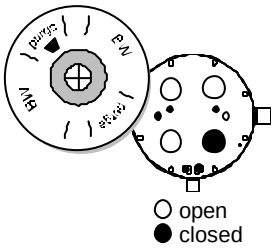


2. Main Tank in Backwash - Remote Tank in Service

The Main Tank Inlet valve is closed. Both the Main Tank Outlet valve and Main Tank Drain valve are open.

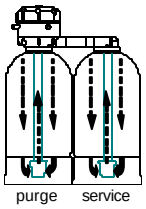
Filtered water from the Remote Tank passes through the Remote Tank Outlet valve, over and through the Main Tank Outlet valve, through the distributor. This high flow of water provides a backwash to the filter media in the system.

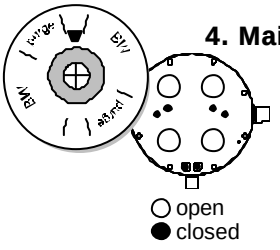




3. Main Tank in Purge - Remote Tank in Service

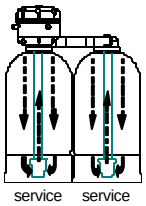
The Main Tank Outlet valve is closed. The Main Tank Inlet valve is open. The Drain valves are closed. The Main Tank Purge valve is open. The Remote Tank Inlet and Outlet valves are open, providing water to service. Water flows through the Main Tank Inlet and down through the media. The Main Tank Purge valve is open allowing water to pass to the drain. This removes any remaining turbidity and repacks the media for the next service cycle.

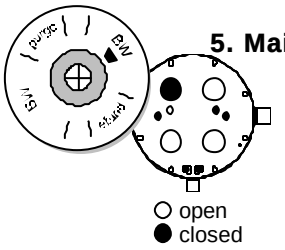




4. Main Tank in Service - Remote Tank in Service

Both Main and Remote Tank Inlet and Outlet valves are open. Water passes through Inlet valves, down through the media, into the distributor tube at the bottom, up and out to service through the Main and Remote Tank Outlet valves.

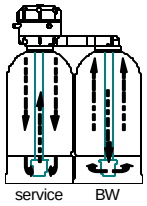


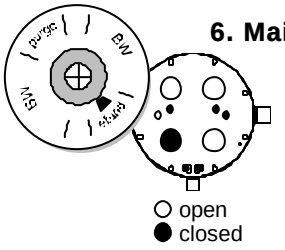


5. Main Tank in Service - Remote Tank in Backwash

The Remote Tank Inlet valve is closed. Both the Remote Tank Outlet valve and Remote Tank Drain valve are open.

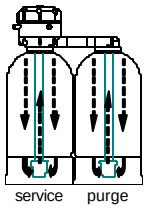
Soft water from the Main Tank passes through the Main Tank Outlet valve, over and through the Remote Tank Outlet valve, through the distributor. This high flow of water provides a backwash to the filter media in the system.



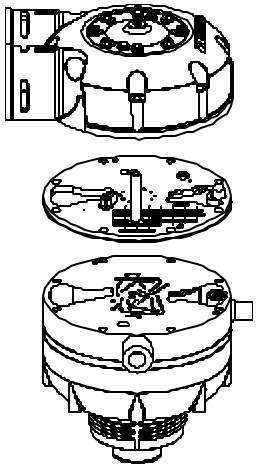
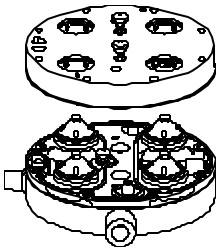
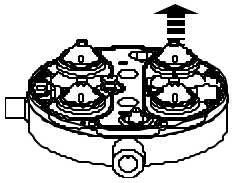
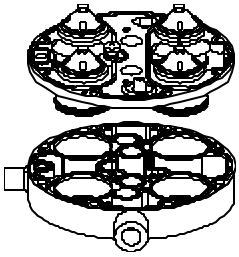


6. Main Tank in Service - Remote Tank in Purge

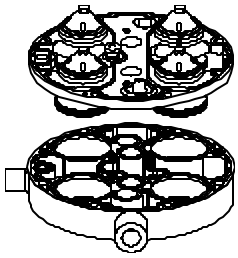
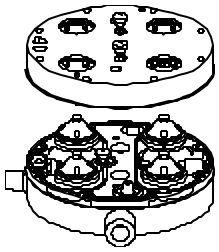
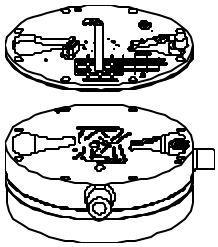
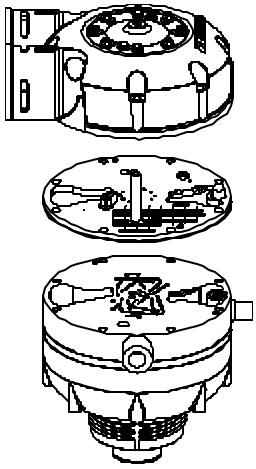
The Remote Tank Outlet valve is closed. The Remote Tank Inlet valve is open. The Drain valves are closed. The Remote Tank Purge valve is open. The Main Tank Inlet and Outlet valves are open, providing water to service. Water flows through the Remote Tank Inlet and down through the media. The Remote Tank Purge valve is open allowing water to pass to the drain. This removes any remaining turbidity and repacks the media for the next service cycle.



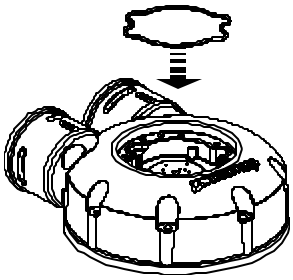
Valve Disassembly

Step 1	Step 2	Step 3	Step 4
			
Holding Levels One through Five in both hands, remove Level One Assembly from the Lower Valving Section. Level Two will remain connected to either Level One or Level Three. It may now be removed.	Separate Level Five from Levels Three, Four.	Using pliers, pull up all four main valve seats.	Separate Level Three from Level Four.

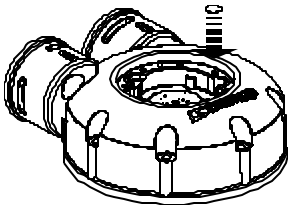
Valve Assembly

Step 1	Step 2	Step 3	Step 4
			
When reassembling, lay Level Four over Level Three. Begin by inserting the control valve and purge valves (on DFFR units) into their respective cylinders on Level Three. Gently turn the Main valve seats and pistons into the Level Three chambers. **Note**: Make sure level seals are securely in seal groove.	Place Level Five over Level Four. Insert the two drain valves into their cylinders in Level Three, while ensuring the purge valve heads (on DFFR units) are aligned into their respective cylinders on Level Five. Make sure the interlock is in place on the post. **Note**: Make sure level seals are securely in seal groove.	Lay Level Two on top of Level Three using the two locating pins on bottom of Level Two as a guide to line up the levels. **Note:** For all units with a Level One drain, the vent tube hole in Level Three is plugged. **Note**: Make sure level seals are securely in seal groove.	When putting Level One Assembly on the Lower Valving Section, note the two locating pins on top of Level Two. These must line up with the holes in Level One as shown. **Note:** Be sure all level seals are in place. Make sure level seals are securely in seal groove.

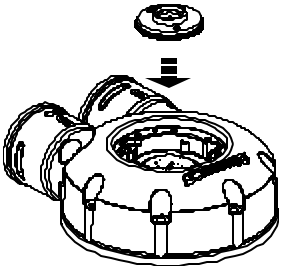
Control Disc, Screen and Seal



Place Cap Seal in groove.



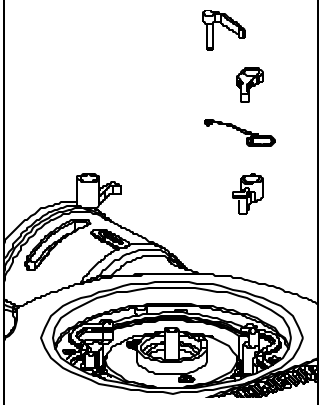
Insert Level One Screen into the hole at 5 o'clock position



Set the Control Disc onto the ceramic disc, flat side down. The Support Pin goes through the hole in the center of the Control Disc.

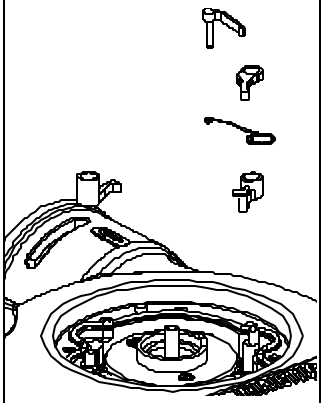
Pawls

Step 1



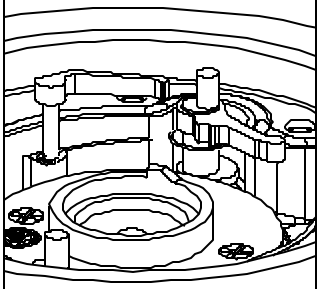
Place the Regeneration Drive Pawl onto the eccentric pin in the 10 o'clock position with the spring wire against the wall.

Step 2



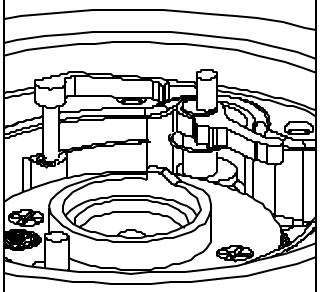
Place the Regeneration Start Pawl onto the eccentric pin in the 4 o'clock position with the spring wire against the wall.

Step 3



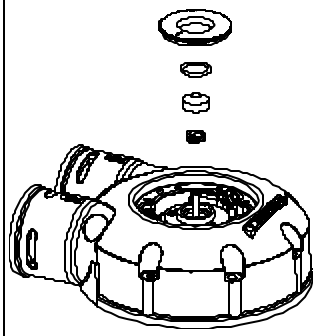
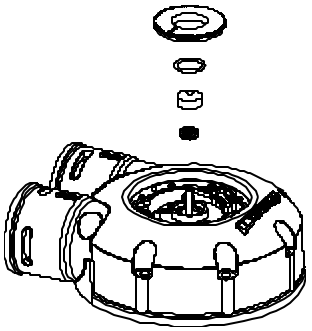
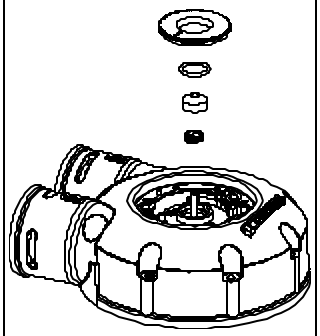
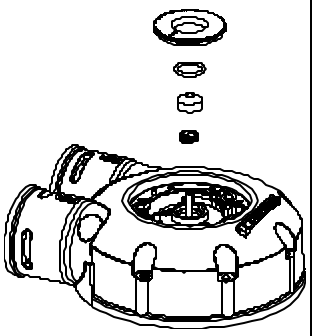
Drop the No-back Pawl leg into the small loop at one end of the Meter Drive Pawl Spring making sure that the vertical arm of the Meter Drive Spring is sticking up. Place the No-back Pawl leg into the small hole at the 2 o'clock position. Drop the large loop of the Meter Drive Spring over the eccentric pin at the 4 o'clock position.

Step 4

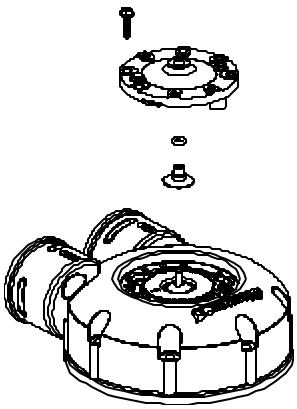
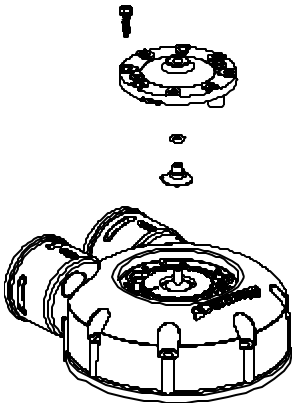
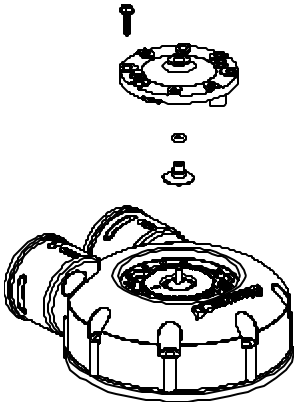
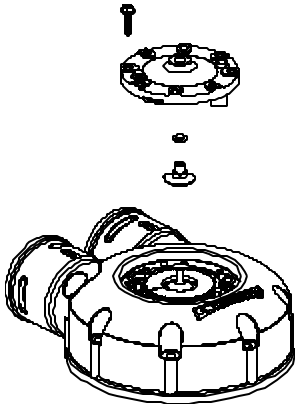


Place the Meter Drive Pawl on top of the Regeneration Start Pawl, making sure that the Meter Drive Spring vertical arm is placed in the notch on the Meter Drive Pawl as shown in the detail above.

Meter Disc and Balance Piston

Step 1	Step 2	Step 3	Step 4
			
Force the Meter Drive Pawl against the side of Level One. While holding the Meter Drive Pawl against Level One side, place the Meter Disc on top of the Control Disc with number facing up. Make sure the meter disc lies flat against the control disc.	Place the Balance Piston O-ring in the groove on the Control Disc.	Set the Balance Piston Spring in the center of the cup on the Control Disc.	Place the Balance Piston on top of the Balance Piston Spring.

Cap

Step 1	Step 2	Step 3	Step 4
			
Slide the Actuator O-ring down onto the Actuator.	Place the Actuator into the hole in the D.O. cap. There is enough friction that the Actuator will stay in the D.O. cap.	Place the D.O. cap on top of the Level One Assembly, making sure that the leg on the Cap goes over the Level One Screen at the 5 o'clock position.	Secure the D.O. cap with 8 cap screws.