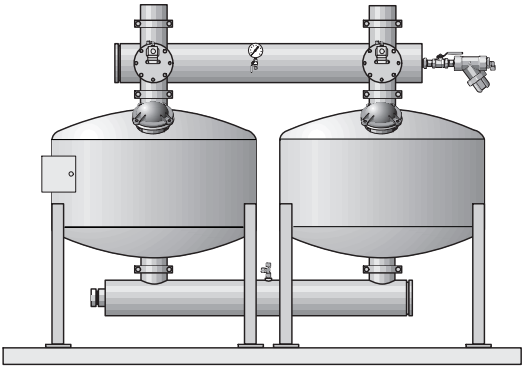
FLOW-GUARD

Filtration Products

VERTICAL SAND MEDIA FILTERS

INSTALLATION and OPERATION Manual



FRESNO

Valves & Castings, Inc.

Thank you for selecting Flow-Guard Sand Media Filters!

With a minimal amount of periodic maintenance you can expect to preserve an excellent degree of filtration for many years to come. We encourage you to familiarize yourself and your irrigation team with the simple operation and maintenance techniques described in this manual to insure many years of trouble-free performance from your Flow-Guard Filters.

FLOW-GUARD
Filtration Products

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IMPORTANT NOTES:

This manual provides information essential to the successful installation, operation and maintenance of your filters.

Please read the entire manual before undertaking installation and/or operation.

Be sure that your irrigation team is clear on the operation and maintenance functions they will be performing.

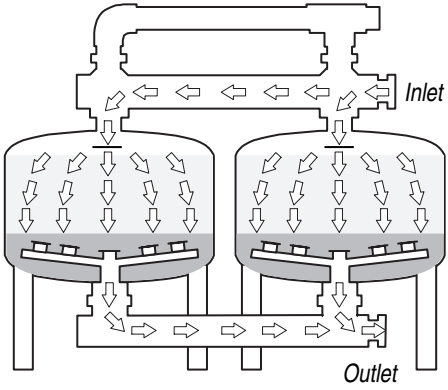
Keep this manual at the filtration site for easy reference.

Table of Contents

Principals of Operation

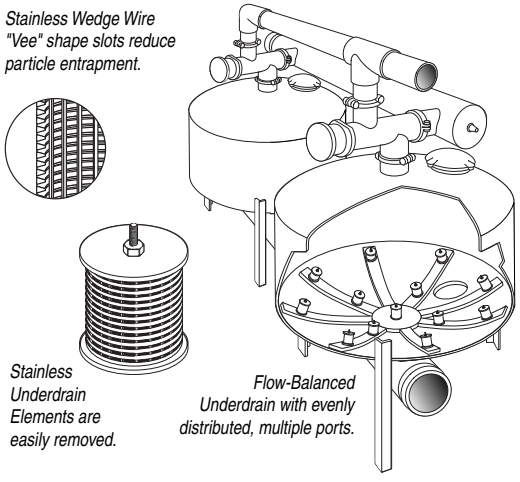
The principal of sand media filtration is quite straightforward. The irrigation source water is pressurized and introduced into the top of the media tanks. A diffusion plate in the top throat of the tank serves to reduce water velocity and distribute the water evenly across the top of the media bed. The media bed is a layer of size-graded crushed silica sand about 16" in depth. The contaminates in the water are captured in the media bed and filtered water passes into the discharge manifold at the bottom of the tanks.

Filtration Mode



Sand media filters are effective at filtering both organic and inorganic contaminants. The large size and three-dimensional nature of a media bed provides more surface area and has greater holding capacity than many other types of filters. **Determining filter capacity and understanding the backwash function (cleaning) of your system are among the most important aspects of successful filtration.** These operations and more will be covered in the following pages.

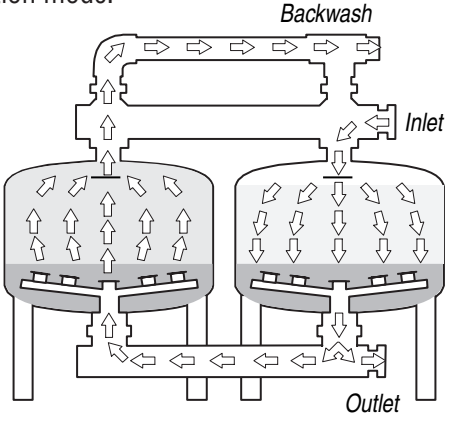
The key to superior media filtration is the effective removal of the captured contaminates from the media bed, commonly referred to as **"backwashing"**. Located in the bottom of every Flow-Guard Media Filter is a highly engineered underdrain system that is designed to perform two functions. **First** it allows filtered water to pass without allowing any media sand to pass through the filters and into the irrigation system. **Second**, during the backwash operation it must allow the flush-water to be evenly distributed throughout the entire media bed, with no pockets or dead spots. This insures that the media is lifted and uniformly rinsed free of contaminants in an efficient manner.



The Flow-Guard underdrain is made up of a series of stainless steel wedgewire **"elements"** attached to a stainless steel spoke system that covers the entire bottom of the tank. The large spoke system allows for a better distribution of the backwash water to the individual wedgewire elements. The wedgewire is effective in preventing media from entering the irrigation system and by design does not get obstructed with media. Covering the wedgewire elements is a layer of gravel. The purpose of the gravel is to deflect the high-velocity backwash water and create a very uniform flow, capable of gently lifting the media in the most efficient manner possible. Efficient backwashing results in cleaner media sand and shorter backwash cycles.

How the Backwash is Accomplished

The backwash operation is accomplished by sequentially flushing each tank in a series of two or more filters. To backwash a tank, the small **3-way control valve** on the backwash valve is either manually or automatically turned to the ON position. This allows pressurized water from the hydraulic command system to fill the actuator diaphragm and push the piston into the backwash valve. Connected to this piston is a two-sided valve plunger. In the non-actuated position, the spring-loaded valve is seated between the tank inlet and the backwash discharge manifold. This prevents water from escaping into the backwash system during the filtration mode.

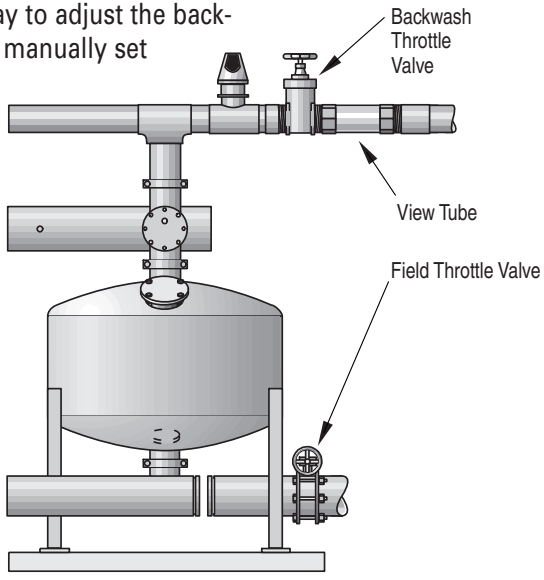


When actuated, the **piston and valve seal** move across the inlet port of the tank and seat against the intake manifold, (where unfiltered water enters the tank). This single motion prevents unfiltered water from entering the tank and allows pressurized filtered water in the irrigation system to escape backwards through the tank and out the backwash manifold. Because the backwash flow is dependent upon a source of filtered water from the irrigation system, all media filter systems require at least two tanks, one to supply filtered water for the other tank that is backwashing. **It is important to keep in mind that only one tank should be backwashed at a time.**

The Backwash throttle valve is placed on the backwash discharge manifold to control the volume of water that can escape during backwash.

Obtaining the proper flow rate of the backwash water is critical for effective flushing. Too high a flow rate will flush all of the media out of the tank. Too low a flow rate will not allow the media to gently lift, fluidize and flush the contamination from the sand. The proper flow rate is dependent upon tank diameter, as shown in the accompanying table.

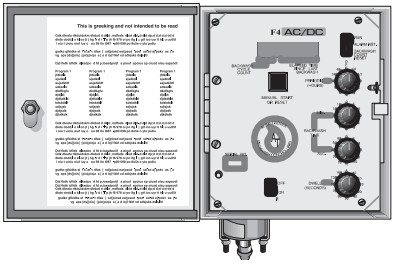
Backwash Flow Requirements	
Tank Size	**Flow/GPM**
15"	21
18"	26
24"	48
30"	83
36"	105
45"	188
48"	200



The most common way to adjust the backwash throttle valve is to manually set one filter to backwash with the throttle valve fully closed. Slowly open the throttle valve until a trace of media is evident in the backwash discharge. **Place a nylon stocking or fine mesh screen over the discharge pipe to check for the presence of media**. If this is not possible, a sight tube can be used as an alternative. **It is desirable to have a slight amount of media discharged during the backwash.** You will lose two or three inches of sand per season (100-200 lb. per 48" tank).

Important:

Although the media bed is about 16" deep, it is important to keep the contamination in the top couple of inches. This allows you to quickly rinse the sand during a backwash sequence. If the lower depths of media becomes contaminated, it will take much longer to rinse the sand and you run the risk contaminating the underdrain. In order to prevent contamination from reaching the lower depths of the media bed, proper backwash frequency and duration must be determined.



The backwash frequency is dependent upon the characteristics of the contaminants present in the source water. Although the automated backwash controller is equipped with a logic circuit to initiate a backwash when the pressure differential across the filters reaches a given level, (typically 4-6 psi higher than when the tanks are clean), it is often times required to initiate a backwash sooner than this. In many installations the water quality changes during the season, and the irrigator must increase the backwash frequency to the current conditions.

Be Aware:

Very fine silts, for example, are able to migrate deeply into the media bed before an appreciable pressure differential is reached, and they become difficult to remove. Algae and other organic matter tend to harden and cake with time, cementing the media together if not flushed on a daily basis. Therefore, it is a good idea to set the controller clock or manually flush the filters once daily, as a minimum. For heavier loads of contaminants, perhaps every two to four hours.

The backwash duration is dependent upon the characteristics of the contaminants and the backwash frequency. A 90-second flush duration should be adequate if the captured contaminants are large particles such as flakes of rust, weed seeds and leaves, which will be laid out upon the surface of the media bed. If the contaminates are fine silts that migrate into the media bed, the backwash duration becomes more a factor of how deep they have migrated, which is directly related to how often the filters are flushed.

Note:

It is important for the irrigator to periodically observe a backwash sequence and confirm that the duration is of sufficient length to remove all of the contaminants. Backwash water will be clear until valve seats (15-20 seconds) then dirty water will be apparent through view tube or at discharge. The backwash water should again run clear for 15-20 seconds before the valve is signaled to close.

The operational speed of the backwash valves is a critical factor in determining the backwash duration. When the valve is signaled to open and the actuator diaphragm is filling and pushing the valve piston back, unfiltered water is able to pass underneath the valve seals and escape into the backwash manifold. To the irrigator it may appear that the filter is flushing, although it is not. **Backwashing does not begin until the piston and valve are fully seated against the intake port, closing off that high-pressure unfiltered water**. Only then can the lower-pressure filtered water from the bottom of the filter escape through the backwash manifold, carrying with it the filter contaminants. A new backwash valve operating with good system pressure (20-70 psi) will fully open in 15-20 seconds. Older valves operating in corrosive or dusty environments can take longer to open because of wear and tear on the piston, bushing and O-rings. The filter for the hydraulic control system needs to be cleaned periodically to insure that the valve pistons are receiving clean high-pressure water to operate the valves. It is not uncommon to find one or two filters in a multi-tank system that have

slow-acting backwash valves and these tanks are never properly flushed. Careful observation of an entire backwash sequence and periodic inspection of the media will alert the irrigation team to these potential problems.

The dwell time setting on the automatic controller allows you to select the amount of time the controller waits for one valve to close before signaling the next valve to open. This enables you to adjust for slow-acting valves or allows the irrigation system to rebuild its pressure between flushes. **If the system pressure drops to a point where it is affecting the filtration backwash capacity, it may be necessary to place a pressure-sustaining valve on the discharge side of the filter station.** This valve will automatically partially close off the flow to the field, allowing the pressure of the filter tanks to be sustained at a pre-set level.

It is important to periodically inspect the media. Begin by draining the filters and opening the manway ports. The sand should be level and up to the fill line (the top weld). Dig down through the sand, looking for clay lenses or mud balls that indicate improper backwashing dynamics. If there is evidence of contaminates reaching the bottom of the media bed, it may be necessary to adjust the backwash frequency or duration.

In cases of severe contamination, it may be necessary to remove all of the gravel and media from the filter and replace it with new material. (Periodic inspection will catch most situations before they become this severe.)

It is advisable to check the media monthly during the first season, and thereafter once or twice per season. Before replacing the manway covers remember to top off the tanks with your selected media.

Review:

1. The key to superior media filtration is the effective removal of the captured contaminates from the media bed, commonly referred to as backwashing. (See page 5.)

2. It is important to keep in mind that only one tank should be flushed at a time. (See page 6.)

3. Obtaining the proper flow rate of the backwash water is critical for effective flushing. (See page 7.)

4. In order to prevent contamination from reaching the lower depths of the media bed, proper backwash frequency and duration must be determined. (See page 8.)

5. It is important for the irrigator to periodically observe a backwash sequence and confirm that the duration is of sufficient length to remove all of the contaminants. (See page 9.)

6. In cases of severe contamination, it may be necessary to remove all of the gravel and media from the filter and replace it with new material. (See page 10.)

System Components and Accessories

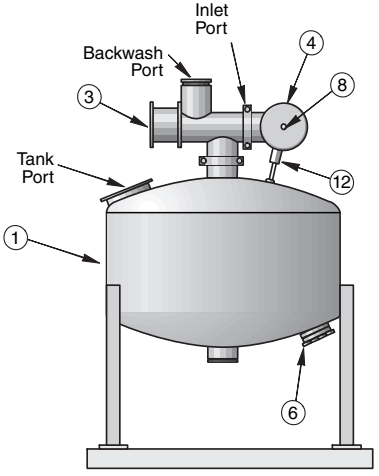
System components are divided into two categories: Components; items included with your filter purchase and Accessories; recommended items that are not included with your filter. The diagram on page 13 identifies Components with numbers and Accessories with letters. See charts below for item descriptions.

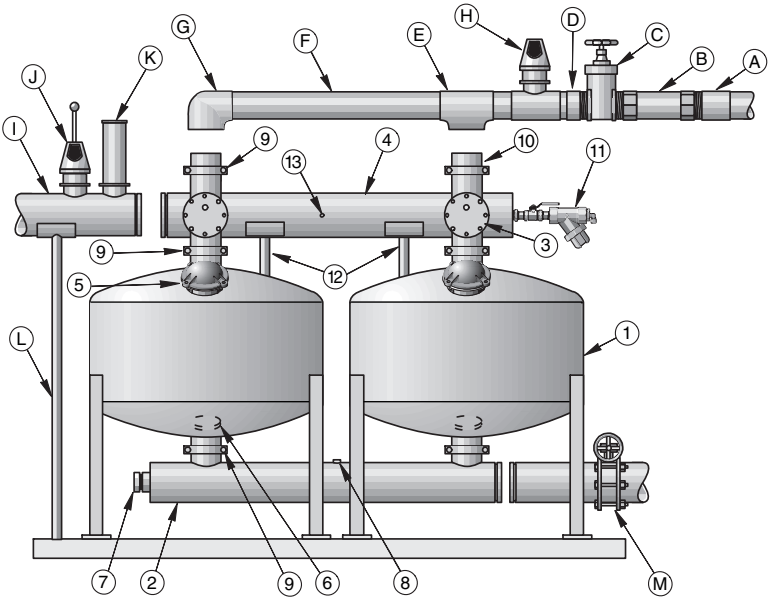
Components

1. *Media Tank*
2. *Outlet Manifold*
3. *Backwash Valve*
4. *Inlet Manifold*
5. *Manway (Fill port)*
6. *Drain Port*
7. *Clean Water Access Port*
8. *1/2" Access Port*
9. *Groove Coupling*
10. *PVC Groove Adapter*
11. *Hydraulic Charging Assembly*
12. *Manifold Support (48" models only)*
13. *1/4" Access Port*

Accessories - *see details on page 14*

- *A. PVC Female Adapter*
- *B. View Tube*
- *C. Backwash Throttle Valve*
- *D. PVC Male Adapter*
- *E. PVC "Tee"*
- *F. PVC Piping (SCD. 40)*
- *G. PVC 90˚ Elbow*
- *H. Air & Vacuum Vent*
- *I. Supply System Piping*
- *J. Continuous Acting Air Vent*
- *K. Pressure Relief Valve*
- *L. Support*
- *M. On / Off Valve*


Inlet Port
Backwash Port
Tank Port
4
8
3
12
1
6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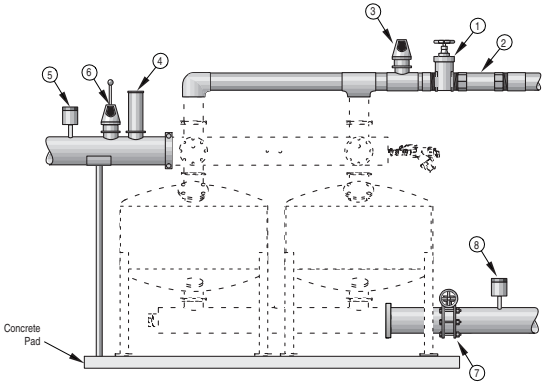
Accessories



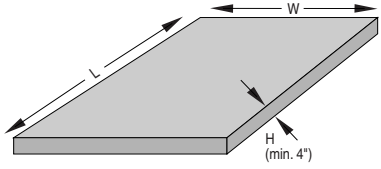
1. **Backwash Throttle Valve:** To assure correct backwash flow from the media tanks, it is necessary to install a gate valve to throttle flow on the backwash manifold outlet.
2. **View Tube:** Enables visual inspection of the backwash water.
3. **Backwash Manifold Air Vent:** Facilitates draining and prevents vacuum from developing in the backwash piping.
4. **Pressure Relief Valve:** Installed in the supply system pipe within 3' of the inlet manifold connection to protect the filters from over-pressurization.
5. **Pressure Shut Down Switch:** Preset to shut down system in case of over pressurization. (Supplied by others.)
6. **Continuous Acting Air Vent:** Evacuates air during initial system charging and during operation.
7. **Field Throttle Valve:** Installed at the discharge of the outlet manifold for two (2) reasons. First, the valve facilitates backwash of the media upon initial start-up. Second, it permits throttling of the outlet flow to increase backwash and allow occasional deep cleaning cycles.
8. **Flow Meter:** A flow meter is helpful in determining the quantity of irrigation water applied and in monitoring pump performance. A flow meter may also be used to more precisely determine the proper duration of the backwash cycle.

Site Location

Select a site which is readily accessible for installation and servicing of the filter. Other factors to consider are: location of power source for automation control, provision for backwash water disposal, and safety and security of equipment and operators.

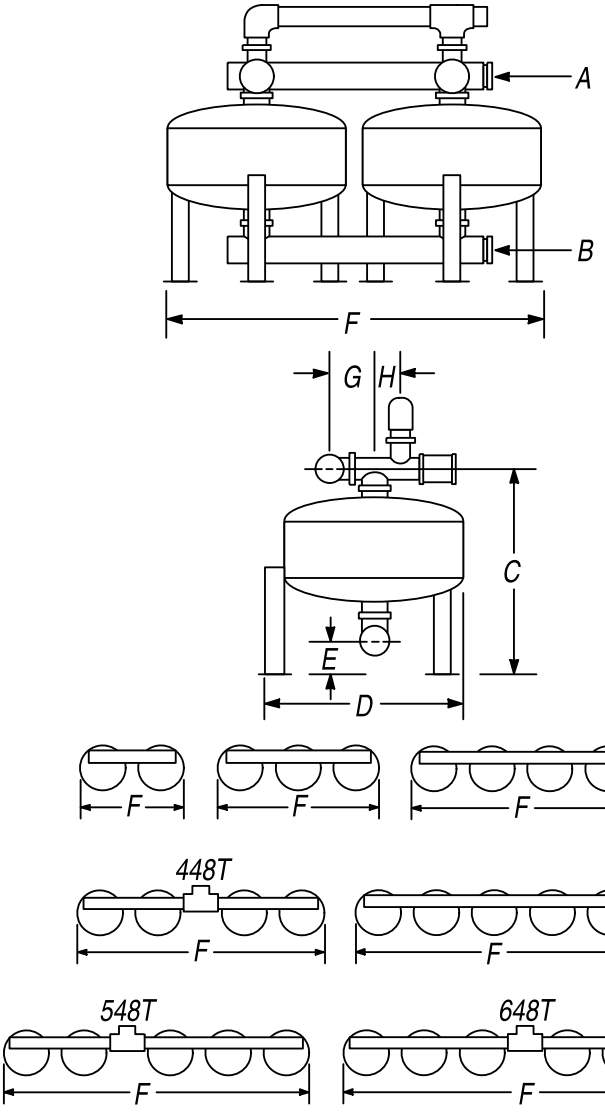
Concrete Pad Requirements

The concrete pad supporting the filter unit must be level and relatively smooth. The pad should be level within 1/8" from end to end. Foundation grade commercial 5 -sack Redi-Mix concrete provides service adequate to support the filter unit weight. The pad should be at least 4" thick with 6" x 6" footings on the perimeter. Allow sufficient curing time. The chart below provides minimum pad dimensions for filters only.



Model Number	LENGTH		WIDTH	
	Inches	Meters	Inches	Meters
218	48	1.2	30	0.8
318	60	1.5	30	0.8
224	60	1.5	36	0.9
324	90	2.3	36	1.0
230	80	2.0	40	1.0
330	120	3.0	40	1.0
236	96	2.4	54	1.4
336	126	3.2	54	1.4
248	114	2.9	60	1.5
348	160	4.1	60	1.5
448	220	5.6	60	1.5
548	300	7.6	60	1.5
648	350	8.9	60	1.5

Dimensions and Specifications



Models and Sizes

Model No.	A Inlet Diameter	B Outlet Diameter	C	D	E	F	G	H
215	2	2	42.75	18	6	33	6 3/4	2 1/4
218	3	3	43.75	21	6	39	7 1/4	2 1/4
318	3	3	43.75	21	6	51	7 1/4	2 1/4
224	3	3	44.75	27	6	51	8 1/4	2 3/8
324	4	4	44.75	27	6	78	8 3/4	2 3/8
230	4	4	52.13	33	9.75	70	8 3/4	2 3/8
330	6	6	52.13	33	8.75	110	9 7/8	2 3/8
236	4	4	53.75	39	10.75	76	8 3/4	2 3/8
336	6	6	53.75	39	9.75	116	9 7/8	2 3/8
245	6	6	53.75	48	10.5	97	10 1/8	3 1/4
345	6	6	53.75	48	10.5	149	10 1/8	3 1/4
445	8	8	53.75	48	9.5	201	11 1/8	3 1/4
445T	10	10	53.75	48	10.5	208	10 1/8	3 1/4
545	10	10	53.75	48	8.5	253	12 1/4	3 1/4
545T	10	10	53.75	48	10.5	260	10 1/8	3 1/4
645T	10	10	53.75	48	10.5	312	10 1/8	3 1/4
248	6	6	58.75	51	10.5	100	10 1/8	3 1/4
348	6	6	58.75	51	10.5	152	10 1/8	3 1/4
448	8	8	58.75	51	9.5	204	10 1/8	3 1/4
448T	10	10	58.75	51	10.5	211	10 1/8	3 1/4
548	10	10	58.75	51	8.5	256	12 1/4	3 1/4
548T	10	10	58.75	51	10.5	263	10 1/8	3 1/4
648T	10	10	58.75	51	10.5	315	10 1/8	3 1/4

Notes: Dimensions are in inches (± 1/2").
Inlet and outlet sizes are nominal pipe sizes.

Model No.	Flow Rate - Standard		Flow Rate - Metric		Filtration Area Ft²	Shipping Wt lbs
	25 GPM/FT²	17 GPM/FT²	17 L/S/M²	11.5 L/S/M²		
215	62	42	3.9	2.6	2.5	136
218	88	60	5.6	3.8	3.5	160
318	132	90	8.4	5.7	5.3	240
224	157	107	9.9	6.7	6.3	220
324	235	160	14.8	10.1	9.5	330
230	244	167	15.4	10.5	9.8	315
330	368	250	23.2	15.8	14.7	430
236	353	240	22.3	15.1	14.1	525
336	530	360	33.4	22.7	21.2	770
245	555	377	35.0	23.8	22.2	690
345	832	566	52.5	35.7	33.3	1075
445	1110	754	70.0	47.6	44.4	1490
545	1387	943	87.5	59.5	55.5	1850
645	1665	1132	105.0	71.4	66.6	2200
248	625	425	39.4	26.8	25.0	720
348	937	637	59.1	40.2	37.5	1105
448	1250	850	78.9	53.6	50.0	1520
548	1562	1062	98.5	67.0	62.5	1880
648	1875	1275	118.3	80.4	75.0	2230

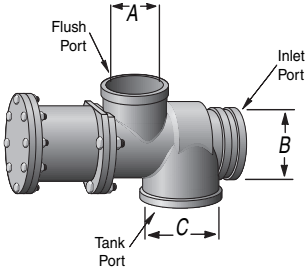
Installation Procedure

Install Outlet Manifold

Couple outlet manifold to tank bottom ports (see #2, page 13). Do not fully tighten groove couplings (see Groove Coupling Assembly instructions at right).

Install Backwash Valves

Couple backwash valves to media tanks. Do not install backwash valve upside-down. Ports may be the same size on some models *(see diagram below for details).*



Tank Size	Part No.	A	B	C
15"	F011-S21	2.0"	2.0"	2.0"
18"	F011-S21	2.0"	2.0"	2.0"
24"	F011-S26	2.5"	3.0"	4.0"
30"	F011-S26	2.5"	3.0"	4.0"
36"	F011-S26	2.5"	3.0"	4.0"
45"	F011-S51	4.0"	4.0"	5.0"
48"	F011-S51	4.0"	4.0"	5.0"

Port Dimensions are Nominal Pipe Size

Install Inlet Manifold

Couple the inlet manifold to the backwash valve inlet ports. Install at least two manifold support jacks (45" and 48" tanks only) for each inlet manifold (see #12, page 13).

Install PVC Grooved Adapters

PVC Groove Adapters are installed atop the backwash valves (see #10, page 13).

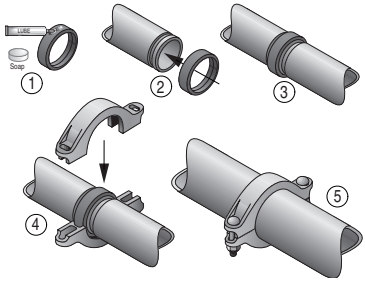
Install Backwash Manifold Assembly

The backwash manifold assembly is made up of PVC accessories (see A, D, E, F & G, page 13) that are not provided with the filter. It is necessary to install a throttle valve (C) for proper backwash flow regulation. The optional view tube will facilitate proper adjustment of the throttle valve and aid in adjusting the length of the backwash cycle.

Always install an air-vacuum relief valve on the backwash manifold (see H, page 13).

Tighten all groove couplings when above steps are completed.

Groove Coupling Assembly

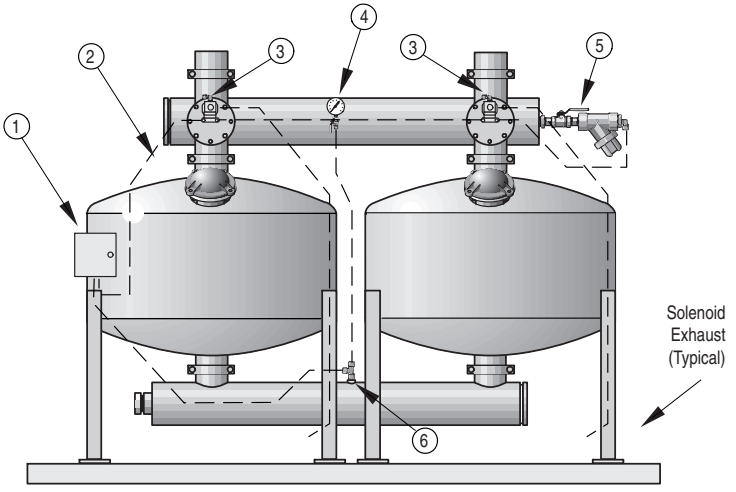


Check gasket for defects. Apply a thin coat of lubricant to the gasket lips and outside of gasket. Place gasket over pipe end, ***being sure it doesn't overhang the pipe lip.*** *Align and bring the two pipe ends together and slide the gasket into position centered between the grooves on each pipe.* ***No portion of the gasket should extend into the grooves.*** *Place clamp over the gasket, being sure it engages the grooves. Insert bolts and tighten nuts alternately and equally until housing bolt pads are firmly together metal to metal. Excessive nut tightening is not necessary.*

Caution:

Uneven tightening may cause gasket to pinch.

Automation Assembly Guide

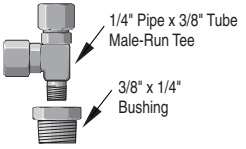


Automation Components

1. *Controller Assembly*
2. *3/8" Tubing*
3. *Solenoid Valve Assembly*
4. *Pressure Gauge Assembly*
5. *Hydraulic Charging Assembly*
6. *Low Pressure Supply Assembly*

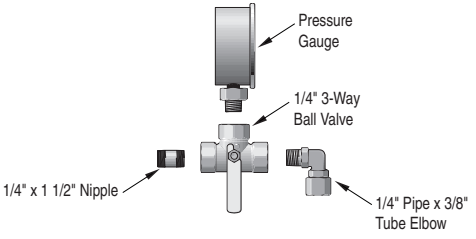
Install Low Pressure Supply Assembly

When installing the Low Pressure Supply Assembly use teflon tape thread sealant (see diagram at right & #6 above).



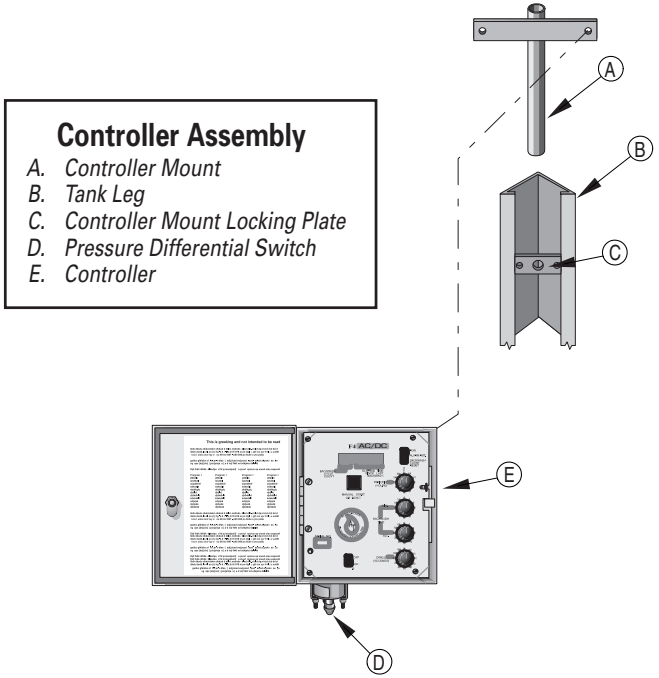
Install Pressure Gauge Assembly

When installing Pressure Gauge Assembly use teflon tape thread sealant (see diagram at right & #4 above).



Install Controller Assembly

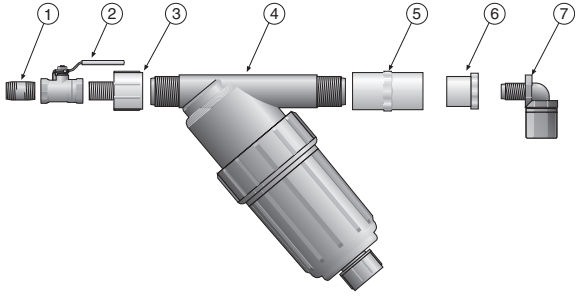
Locate the controller on the opposite end of the charging assembly (see #1, page 20). Slide the Controller Mount Locking Plate down the inside of the tank leg selected for mounting the Controller. Hold the Controller Mount (A) in the desired position, then tighten the set screw against the Controller Mount Pipe. Controller wiring diagram is packaged with the controller.



Install Hydraulic Charging Assembly

See diagram below. Use only teflon tape as a thread sealant.

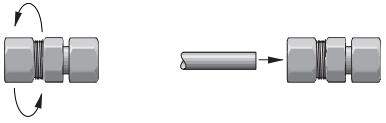
Hydraulic Charging Assembly



1. *Nipple, 1/2" x Close PVC*
2. *1/2" Ball Valve*
3. *IPT Adapter, 1/2" x 3/4"*
4. *Y Strainer, Plastic, 80 Mesh*
5. *Female Adapter, PVC*
6. *Reducer Bushing, PVC 3/4" x 1/4"*
7. *Tubing Elbow, #P6ME4*

Install Tubing

Cut tube squarely and remove any burrs. Loosen nut on fitting until three (3) threads are visible. Moisten end of tube with water. Push tube straight into fitting until it meets the fitting's shoulder. Tighten nut by hand, additional tightening should not be necessary. Do not over tighten.



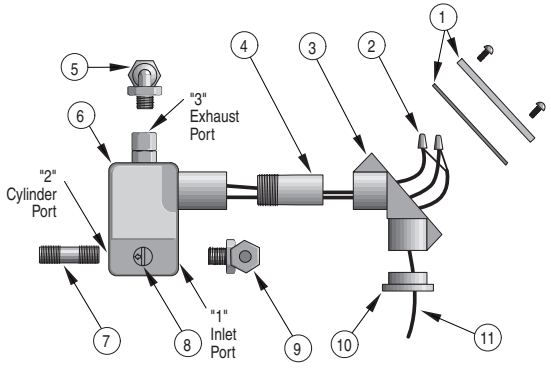
Note:

A length of tubing should be attached to the exhaust port of each solenoid valve (see #3, page 20) to channel exhaust water from the actuator to the ground below the filter unit.

Install Solenoid Valves

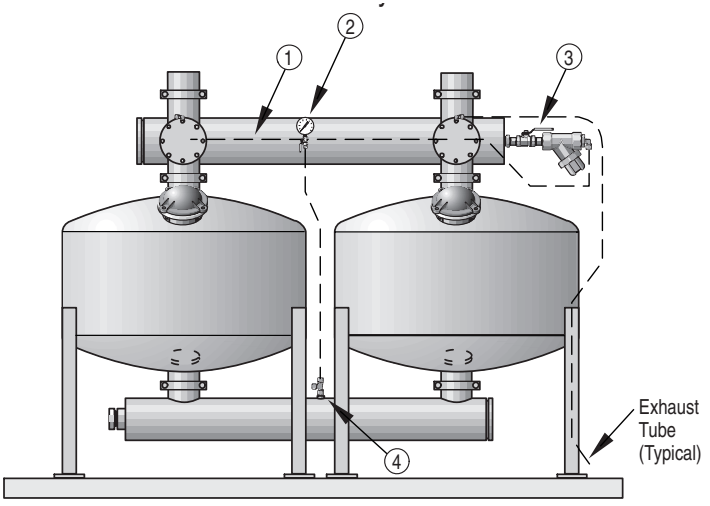
Use only teflon tape as a thread sealant. Solenoid ports are stamped for identification. The port stamped "1" is the Inlet Port and connects to the pressure line from the charging assembly (see #5, page 20). The Cylinder Port stamped "2" is to be connected to the backwash valve actuator via a 1/4" pipe nipple (see #7 below). The port stamped "3" is the Exhaust Port and is vented to the atmosphere.

Solenoid Assembly



1. *Access Elbow Cap & Gasket*
2. *Wire Nuts*
3. *Access Elbow*
4. *1/2" T.O.E. Nipple*
5. *1/4" Pipe x 3/8" Tube Elbow*
6. *Solenoid Valve*
7. *1/4" x 1 1/2" Nipple*
8. *Manual Override Screw*
9. *1/4" Pipe x 3/8" Tube "Tee"*
10. *Snap-In Cap*
11. *Control Wire*

Semi-Automatic Assembly Guide

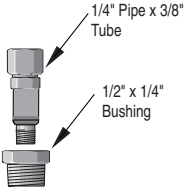


Semi-Automatic Components

1. *3/8″ Tubing*
2. *Pressure Gauge Assembly*
3. *Hydraulic Charging Assembly*
4. *Low Pressure Supply Assembly*

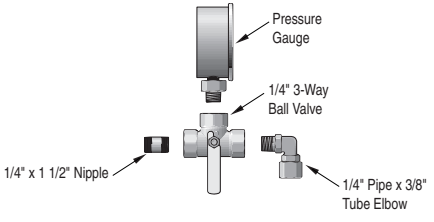
Install Low Pressure Supply Assembly

When installing the Low Pressure Supply Assembly use teflon tape thread sealant (see diagram at right & #4 above).



Install Pressure Gauge Assembly

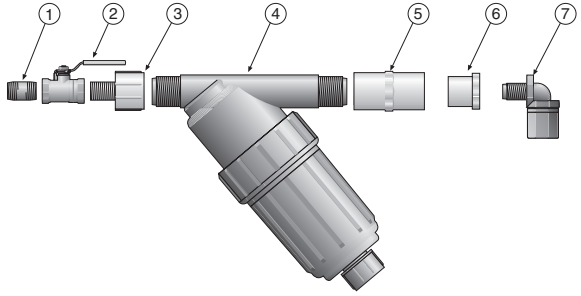
When installing the Pressure Gauge Assembly use teflon tape thread sealant (see diagram at right & #2 above).



Install Hydraulic Charging Assembly

See diagram below. Use only teflon tape as a thread sealant.

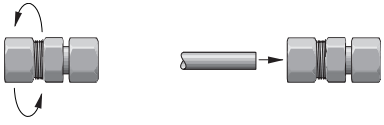
Hydraulic Charging Assembly



1. *Nipple, 1/2" x Close PVC*
2. *1/2" Ball Valve*
3. *IPT Adapter, 1/2" x 3/4"*
4. *Y Strainer, Plastic, 80 Mesh*
5. *Female Adapter, PVC*
6. *Reducer Bushing, PVC 3/4" x 1/4"*
7. *Tubing Elbow, #P6ME4*

Install Tubing

Cut tube squarely and remove any burrs. Loosen nut on fitting until three (3) threads are visible. Moisten end of tube with water. Push tube straight into fitting until it meets the fitting's shoulder. Tighten nut by hand, additional tightening should not be necessary. Do not over tighten.

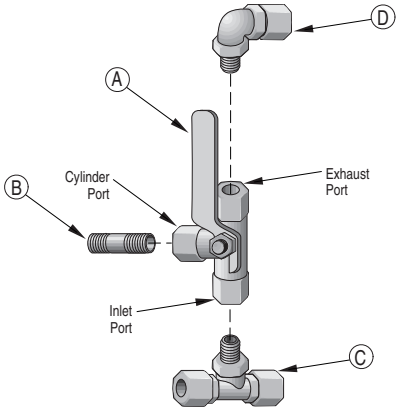


Note:

A length of tubing should be attached to the exhaust port of each 3-way ball valve (see diagram, page 24) to channel exhaust water from the actuator to the ground below the filter unit.

Install 3-Way Ball Valves

Use only teflon tape as a thread sealant. The port below identified as ***"inlet"*** is the supply port and connects to the pressure line from the charging assembly. The port identified ***"cylinder"*** is to be connected to the backwash valve actuator via a 1/4" pipe nipple. The port Identified ***"exhaust"*** is the exhaust port and is vented to the atmosphere.



A. 1/4" 3-Way Ball Valve *B. 1/4" x 1 1/2" Pipe Nipple*
C. 1/4" Pipe x 3/8" Tube Tee *D. 1/4" Pipe x 3/8" Tube Elbow*

Note:

Item "C" in the diagram below will change from Tee to Elbow for the last backwash valve in the series. The 1/4" 3-Way Ball Valve is shown in flush mode. Rotate handle 90° clockwise for operating mode.

Media Loading Instructions

- Remove manway covers and inspect the inside of the tanks for debris. Check element covers to be sure all are secure.
- Load media in accordance with media requirements (see page 27). After media has been loaded, secure manway covers.
- On all 15", 18" and 24" tanks you will notice a raised tab on each of the brackets that holds the nuts that secure the lid to the tank. These tabs are stops for the lid to set against.

WARNING! ***Correct torque on the bolts is reached when, with the gasket in place, the bolts are tightened enough to bring the lid in contact with the tabs. Do not over tighten!***

Having loaded the media, the filter system is ready for the pre-start check list.

Media Requirements

Important:

Washed crushed silica sand is recommended for improved system performance.

Media Material and No.	Mean Effective Media Size	Mean Uniformity Coefficient	Equivalent Mesh Size
#20 Crushed Silica	0.48	1.50	190-250*
#16 Crushed Silica	0.68	1.50	130-180*
#12 Crushed Silica	1.05	1.50	90-130*

*Based on 25 GPM/Ft^2

Model No.	Gravel	Sand
	80 lb / 36 Kg bags	100 lb / 45 Kg bags
215	1	3
218	2	4
224	3	8
324	4	12
230	4	10
330	6	15
236	6	16
336	9	24
245	12	24
345	18	36
445	24	48
545	30	60
645	36	72
248	14	26
348	21	39
448	28	52
548	35	65
648	42	78

PRE START-UP Checklist

☐ 1. Check power to the controller. Be sure voltage is 110VAC, unless using DC operation.

☐ 2. All grooved couplers should be fully tightened.

☐ 3. Check manway covers to be sure gaskets are in place and lids are properly tightened.

☐ 4. Power to the controller should be in the **"OFF"** position.

☐ 5. Open the on/off valve to allow passage of water from filters to field.

☐ 6. Close the backwash manifold throttle valve.

☐ 7. Place one backwash valve in manual backwash mode (manual override screw in the ***"ON"*** position.

WARNING! ***Over-pressurization can cause serious damage to any hydraulic system.*** *Check the maximum pressure capacity of the pump or system supplying water to the filtration unit. Several conditions during start-up and operation can stop water flow, producing a full head of static pressure within the filter unit. Protect against damage by installing a pressure relief valve with capacity sufficient to adequately discharge over-pressurization. In systems where the supply to the filters is elevated, "water hammer" can cause rapid pressure spikes significantly higher than the systems normal operating pressure. Consult the manufacturer for all installations where supply elevations exceed the filter elevation.* ***Over-pressurization can severely damage filter tanks.***

Initial Cleaning of Tanks

Start pump or open valve supplying pressurized water to the filters. The backwash valve previously set in the manual backwash mode (see detail, page 30) will open and begin a backwash cycle. Open the backwash manifold throttle valve until some media is visible in the view tube. Initial flow through the filters may be sluggish for several cycles. To speed up the initial cleaning of the tank, close the outlet valve until a healthy backwash flow appears in the view tube. Wait approximately two minutes then rotate to a second tank by closing the override screw on the first solenoid and opening the second. Repeat this procedure until all filter tanks have been backwashed a minimum of three times.

Adjust backwash throttle valve until only a trace of media is visible in the view tube.

BACKWASH ONLY ONE TANK AT A TIME!

All tanks contain contaminants and fines prior to initial backwash. Flow through the media system will be sluggish until some cleaning occurs. If, after three backwash rotations, the tanks are not yet clean, continue with additional cycles until cleaning occurs.

The backwash valves operate hydraulically and take 15 to 20 seconds to fully open. While the valve is opening, flow through the backwash manifold will be higher than normal. When the valve is fully open the flow will decrease and the backwash water will become dirty in appearance. **Do not attempt to adjust the system until the valve is fully open. Early differential readings are not accurate until the system is fully operational.** After the initial cleaning of the media filter, set regulators and repair any leaks. When the system is operating properly, proceed with final adjustments.

Start-Up Procedure

Automatic

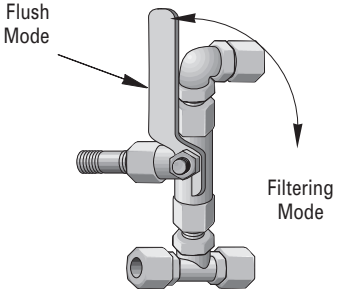
*When the arrow on the manual override screw is pointing to the **Off** position the valve will be in normal filtering mode. To place a backwash valve into the backwash mode, rotate the arrow clockwise to the **On** position. The backwash valve will be open and remain open until the override screw is turned back to the **Off** position. Be sure the controller is in the **Off** position when manually operating solenoid valves.*

Solenoid Valve

Semi-Automatic

When the operating lever is pointing up, as shown, the backwash valve will be in the flush mode. Rotate the lever 90˚ downward to place the backwash valve in filtering mode.

3-Way Ball Valve



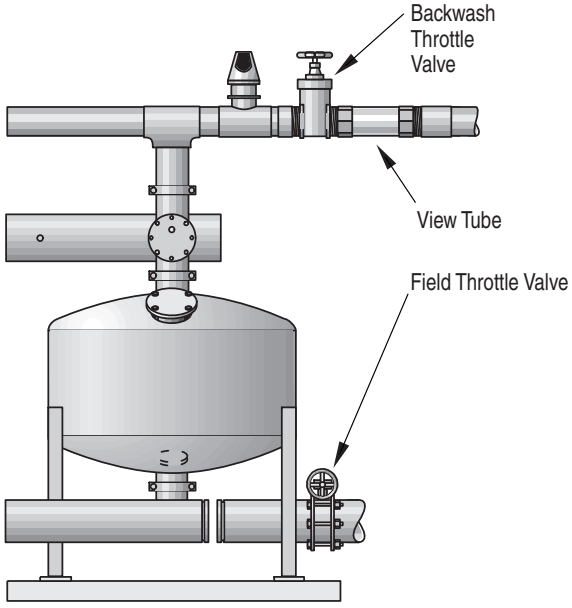
Backwash Throttle Valve Adjustment

Pre-set the controller for a 90 second backwash and a 30 second dwell time. Turn on controller power and initiate a flush cycle (see controller instructions). Adjust the backwash throttle valve as follows:

During the flush cycle, check the backwash water through the view tube, or catch a backwash sample using a fine sieve. Adjust the backwash throttle valve downward until only a trace of media is being lost and the backwash valve is fully open. Partially close the field valve to direct additional flow for backwash.

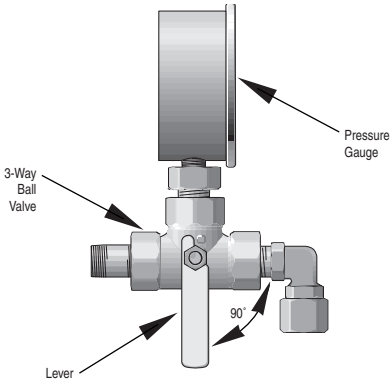
In systems where backwash flow is inadequate, the field valve or pressure sustaining valve must be adjusted in this manner* EACH TIME *a backwash cycle is initiated.

WARNING!
Failure to follow the above procedure may cause differential pressure to build gradually and the frequency of required backwash cycles to increase.



Pressure Gauge Assembly

Because pressure gauges vary in accuracy, a single gauge is utilized to measure both incoming and outgoing pressure. A 3-way ball valve directs distribution of pressure to the gauge from the **top (inlet) manifold** or the **bottom (outlet) manifold.** When the lever is in a down position, (as shown) outlet pressure is being indicated on the gauge. Rotate the lever 90˚ to read the inlet pressure.



Pressure Differential Adjustments

The pressure differential (P.D.) switch, located on the controller, measures the differential pressure between incoming and outgoing pressure. When the difference between the two pressures increase to the P.D. setting, the switch signals the controller to begin a backwash cycle. The P.D. setting can be changed by adjusting the knob on the face of the P.D. switch.

Scheduling Backwash Cycles

Automatic systems are shipped with the P.D. switch preset at 9 lbs. If the desired differential range is not met by this setting, adjust accordingly. The quality of the source water will dictate the backwash frequency required.

Periodic Start Function

The periodic start function is used to set the interval between flush cycles.

Backwash Flush Time

Backwash flush time is adjusted on the face of the controller. Start with a 90 second setting. Observe the water quality at the beginning and end of a backwash cycle through the view tube or at the outlet of the backwash manifold. If the backwash water is still dirty near the end of the cycle, increase the flush time. If the water appears clean several seconds before the end of the cycle, decrease the flush time. In addition to the water quality, check the pressure differential after backwash. If the P.D. has returned to the optimum level, the flush duration is adequate. If not, increase the backwash duration until optimum differential is achieved.

Note:

> ***As the backwash valve open and closes, water from the backwash manifold is mixed with incoming water from the inlet manifold. The first and last 15-20 seconds of flow will be diluted in this manner and is not representative.***

Dwell Time

The dwell between tanks enables the irrigation system pressure to recover before the next tank flushes. This delay provides the system with a full head of pressure with which to initiate flushing of the next tank. To adjust the dwell time, observe the backwash cycle of the last tank in the battery. Calculate the length of time from the end of the cycle until maximum system pressure is regained. This is the time that should be set as dwell time.

Maintenance Schedule

The following maintenance schedule is based upon field observations of typical Flow-Guard installations.

Season Start-Up

Note: *This assumes that the End-of-Season Shutdown procedures were performed. If this assumption is incorrect, please review the End-of-Season Shutdown section.*

1. Inspect all portholes, drains, air vents, pressure relief valves, control filters and hydraulic tubing, ball valves, flow meters and backwash manifolds to insure they are ready for start-up.
2. Start the system and initiate a backwash sequence with very low pressure on the tanks, if possible (20-25 psi). Because the tanks were drained, there is a good likelihood that they contain trapped air. This air has the potential of disrupting the media bed when a backwash is sequenced under high pressures.
3. Initiate a second backwash sequence under normal pressure. Observe each tank's backwash valve opening and closing speeds to check for consistent time from tank to tank.

Monthly

1. Check the filter pressure differential.
2. Check the flow meter.
3. Observe a filter backwash sequence and confirm that there is sufficient time to flush the media in <u>all</u> of the tanks.
4. Check pressure gauge during operation. Be sure gauge returns to "O" when at rest.
5. Check P.D. reading after backwash and adjust flush time if needed.
6. Check manual backwash throttle valve for proper setting. If it has been tampered with, readjust the valve.
7. Check the reservoirs (if applicable) to confirm that the algae control program is appropriate.

Mid Season

1. Remove and clean the hydraulic charging manifold screen at the end of the inlet manifold.
2. Open all of the sand media tanks and inspect the media down to the underdrains to determine if the backwash controllers are appropriately adjusted.
3. Check sand level in tank. Top-off the sand levels as needed.

End of Season

1. Initiate a backwash sequence under normal pressure. Observe each tank's backwash valve opening and closing speeds to check for consistent time from tank to tank.
2. Disconnect power to the controller.
3. Rinse and drain all filters, manifolds, control filters, ball valves, backwash valve actuators, backwash lines, chemigation valves, booster pump volutes...all above ground components that may freeze.
4. Inspect and lubricate all of the filter backwash valves. Replace any leaking porthole gaskets or troublesome bolts & nuts.

Maintenance Considerations

Pressure Gauge

The Pressure gauge is subject to frequent pressure shocks and in time may lose its sensitivity or not return to "0" when the system is depressurized. The gauge is an important diagnostic tool for the entire irrigation system, requiring frequent checks and replacement if erroneous readings are displayed.

Backwash Valves

Lubrication

Backwash valves have a stainless steel operating stem that slides through a PVC guide bushing and a set of o-rings. Lubricate with lithium-based grease. Placing a yearly shot of grease on the stem through the drain hole on the bottom of the valve actuator body should keep it in good shape.

Diaphragm

The backwash valve contains a rolling diaphragm that is subject to wear and may leak after a number of years. Water leaking through the drain hole during backwash is an indication of hydraulic command water passing through the diaphragm. If water drains continually through the drain hole, not just during backwash, it is an indication that the o-ring seals on the piston guide bushing have failed, and unfiltered water is leaking through from the "wet side" of the valve.

Plunger Seal

A common indication the plunger seal not fully seated against the valve is water continually weeping into the backwash discharge manifold, visible through the sight tube. This is usually caused by (1) defective plunger seal (2) chipped epoxy on valve seat or (3) adjustment of the piston on the stainless steel operating stem.

Detaching Backwash valve

Removing the backwash valve form the tank and manifold is simple and requires very little time. Taking off the three grooved couplers will allow easy access for visual inspection and maintenance procedures.

Backwash view glass

The view glass is clear acrylic plastic, requiring protection from sunlight because (1) the acrylic is not UV stable and will darken and stress crack (2) sunlight will promote algae growth, rendering it useless for viewing backwash efficiency.

Protecting the view glass with a suitable shade is a necessity. A short piece of PVC pipe, split lengthwise and slipped over the view tube will provide excellent protection.

Rubber gaskets and grooved coupler seals

May harden with age. If they begin to leak, replace them. Gaskets that continually weep will soon become a worker safety issue as algae growth will make the concrete pad dangerously slick. Because the irrigators will be opening the tank ports to inspect the sand, it is a good idea to have a couple spare port gaskets on hand. Applying anti-seize compound to the bolt threads will also keep the inspections a simple task.

Cast iron components

Will remain shiny in corrosive atmospheres if they are periodically washed with soap and water and given an application of light oil, such as WD-40.

Chemigation and Fertigation

CAUTION: Do not inject corrosive chemicals into or upstream of filters. Chemicals should only be injected downstream of filters, and then a chemigation check valve is required.

Trouble Shooting

The filters will not backwash automatically.

- ✓ Controller switch is ON.
- ✓ Controller switch is in the RUN mode.
- ✓ Controller circuit breaker is engaged.
- ✓ Controller dials are properly adjusted.
- ✓ Periodic Hours is *not* set to OFF.
- ✓ Backwash Time is *not* set to 0 MIN and 0 SEC.
- ✓ Controller Dip Switches, backside of Panel - properly set.
- ✓ There is power to the Controller.
- ✓ The Hydraulic Charging Valve is open and the Filter is clean.
- ✓ Manual Override Screw on all Solenoid Valves is in OFF position.
- ✓ The Backwash Throttle Valve (on the Backwash Discharge Manifold) is at least partially open and the Backwash Discharge is clear of obstructions.

Once you have checked all of the above:

Initiate a backwash sequence by pressing the MANUAL START button.

- ✓ Does the Controller respond by indicating that Station One is active?
  - If not, the Controller circuit board appears to be faulty.
- ✓ As the Controller sequences the various Stations, listen for a corresponding "Click" at each solenoid valve.
- ✓ Check to ensure that the hydraulic charging line is not connected to the outlet (low pressure) side of the filter.
- ✓ Check AC/DC switch on the back panel for correct solenoid polarity. A buzzing sound from the solenoid indicates the switch is in the wrong position.
  - If not, the wiring to the Solenoid Valves is probably faulty, or the manual override knob is in the ON position.
  - If not, the controller is faulty.

If only one tank will backwash automatically.

✓ Recheck the controller **Dip Switches** on the backside of the controller for proper setting.

✓ While the solenoid Valves are energized, high-pressure water from the Hydraulic Charging system should be filling the Backwash Valve Actuator and causing the Backwash Valve to open. Does it sound like the Backwash Valve is trying to open?

- It may also be that everything up to this point is functioning properly, but there is **Insufficient Pressure to actuate the Backwash Valves**.
- It may be blockage of the Hydraulic Charging tubing or low water pressure.
- Is the hydraulic system well charged?
- If insufficient system pressure is suspected, partially close the mainline line valve to the field (downstream of the filters) to increase pressure in the filters.
- If the Backwash Valves now open, either (1) increase backwash pressure by irrigating fewer acres per set or (2) Install a Controller actuated (during backwash), pressure sustaining valve downstream of the filters.
- If there is sufficient pressure, **the hydraulic ports of the Solenoid valves may be blocked or stuck**. Even though the solenoid coils are energizing, the Actuator on the Backwash Valve is not filling with water.
- Attempt to initiate a backwash in one filter (with the Controller OFF) by rotating the Manual Override Screw **counterclockwise to the ON position**. If unsuccessful, the mechanical portion of the Solenoid Valve is faulty and requires cleaning or replacement.
- It may also be the Backwash Valves are seized and cannot open. (It is unlikely that all the Backwash Valves would be seized.)

Trouble Shooting, *continued*

The filters appear to be backwashing all the time, even when the Controller is OFF.

✓ Manual Override Screw on all of the Solenoid Valves is in the ON position.

✓ Listen to determine which Backwash Valve is allowing water to escape into the Backwash Manifold.

- Confirm that the Solenoid Valve is not stuck in the energized position. (You can close the Hydraulic Charging Valve and disconnect the hydraulic tube to the Solenoid Valve. If high-pressure water squirts out and the Backwash Valve closes, the Solenoid Valve is stuck in the "energized" position, and should be cleaned or replaced.)
- When using latching solenoids check wiring to verify that all wiring polarities are correct. See Controller Operating Manual for correct polarity.
- If no water escapes and the Backwash Valve remains backwashing, the Backwash Valve itself is stuck open or faulty and should be re-built.

The media level is low in the tanks.

✓ The sand should be up to the top weld line of the filter, or 1" below the inlet baffle.

✓ It is normal to lose 2 or 3 inches of media per tank per year.

- If you feel that you are losing too much media, adjust the Backwash Throttle Valve, as described in the *Backwash Throttle Valve* section on page 7.

The media remains dirty after backwashing.

✓ Confirm that the backwash sequences are appropriate for your type of source water.

- Review the sections on *Backwash Frequency and Duration*, pages 8-9, and make the necessary adjustments.

The differential pressure remains high after a backwash.

✓ Inspect and determine if the media bed is clean.

- If not, review the sections on Backwash Frequency and Duration, pages 8-9, and make the necessary adjustments.
- If the media is clean, it would appear that the underdrain is partially blocked with precipitates or organic material. Dig down through the media bed and uncover one or more of the Underdrain Elements and carefully remove it for close visual inspection. If the Element is plugged, it is necessary to clean all of the elements. This may or may not require removing the media and gravel, depending on the nature of the contamination. Contact your dealer for assistance.

Water is escaping through the drain hole on the bottom of the actuator housing.

✓ Check rolling diaphragm for holes. Replace if needed.

- If not, replace O-rings.

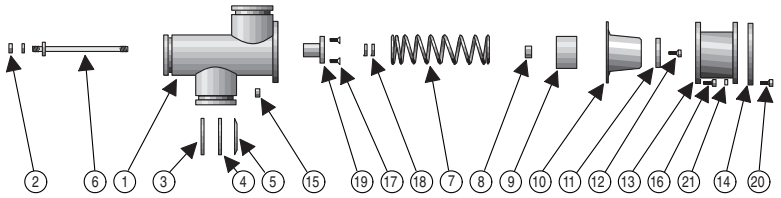
Media Filter longevity will be significantly lengthened, efficiencies improved and corrosion issues eliminated by following these procedures:

- ✓ Professional irrigation system design to prevent excessive pressures or frequent pressure 'spikes' resulting in weld fatigue
- ✓ Injection of all chemicals through a chemigation valve, downstream of the media filters
- ✓ Specifying 316 stainless steel in regions with high chloride/high salt source waters
- ✓ Frequent inspection of tank media for silt/organic matter accumulation and 'channeling' of media
- ✓ Annual media change, removing excess accumulation of silts/clay organic matter. Usually in regions where source waters and reservoirs have high, similar loads
- ✓ Startup / Seasonal / End-of-Season filter maintenance

Avoid the Following:

- ✓ Requiring systems to filter highly concentrated chemicals (usually containing high quantities of precipitates)
- ✓ Accumulation of corrosive compounds and salts in filters due to the injection chemical compounds through the filters*
- ✓ Inadequate end-of-season maintenance procedures in regions where source waters contain high salts/silts/organic loads

*Refer to Flowguard limited warranty.



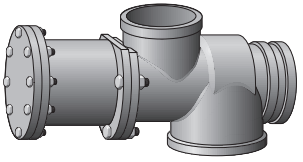
Backwash Valve Parts

	Part Number	Description
(1)	F011-S50-031	5" Valve Body
	F011-S40-031	4" Valve Body
	F011-S25-031	2 1/2" Valve Body
	F011-S20-031	2" Valve Body
(2)	F922-056	Hex Nut (1/2" -13, SS W/Nylon Insert)
(3)	F011-S40-006	Backup Washer, 5" & 4"
	F011-S25-006	Backup Washer, 2 1/2"
	F011-S20-006	Backup Washer, 2"
(4)	F011-94025	Plunger Seal, 4" & 5"
	F011-94026	Plunger Seal, 2 1/2"
	F011-94027	Plunger Seal, 2"
(5)	F011-S40-007	Guide Washer, 4" & 5"
	F011-S25-007	Guide Washer, 2 1/2"
	F011-S20-007	Guide Washer, 2"
(6)	F011-S40-001	Operating Stem, 2 1/2", 4", & 5'
	F011-S20-001	Operating Stem 2"
(7)	F011-94024	Actuator Spring
(8)	F922-054	Jam Nut
(9)	F011-S40-021	Actuator Piston, 2 1/2", 4", & 5"
	F011-S20-021	Actuator Piston, 2"

	Part Number	Description
(10)	F011-94020	Rolling Diaphragm, 2 1/2", 4", & 5'
	F011-94019	Rolling Diaphragm, 2"
(11)	F011-92516	Diaphragm Cap, 2 1/2", 4", & 5"
	F011-91325	Diaphragm Cap, 2"
(12)	F920-104	Stainless Steel Hex Bolt
(13)	F011-S40-011	Actuator Body
(14)	F011-S40-016	Actuator End Plate, 2 1/2", 4", & 5"
	F011-S20-016	Actuator End Plate, 2"
(15)	F011-94037	Stainless Steel Hex Nut (Ea., 3 req.)
(16)	F011-94038	Stainless Steel Hex Bolt (Ea., 3 req.)
(17)	F964-185	Flat Head Machine Screw (Ea., 2 req.)
(18)	F943-112	#112 O-ring (Ea., 2 req.)
(19)	F011-S20-005	Stem Guide Bushing
(20)	F920-112	Hex Bolt (Ea., 8 req.)
(21)	F922-010	Hex Nut (Ea., 8 req)

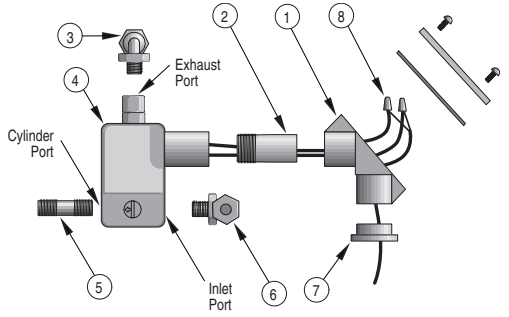
Parts and Accessories, *continued*

Backwash Valve



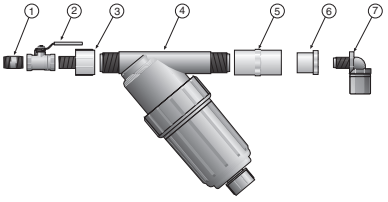
Part No.	Description
F011-S21	2" Backwash Valve
F011-S26	2 1/2" Backwash Valve
F011-S41	4" Backwash Valve
F011-S51	5" Backwash Valve

Valve Kit - Automatic



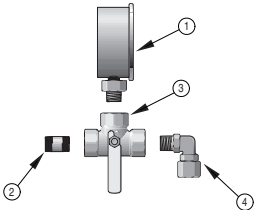
	Part Number	Description
	F011-S00A	**Valve Kit (Automatic)**
(1)	F011-0840	Access Elbow
(2)	F980-1882-005	Nipple, 1/2" x Close Toe, PVC
(3)	F011-0644	Tubing Elbow (#P6ME4 - 3/8" Tube x 1/4" MIPT)
(4)	F011-90110	Solenoid Valve
(5)	F012-0917	SS Nipple 1/4" x 1 1/2"
(6)	F011-0642	Tubing Tee (#P6MT4 - 3/8" Tube x 1/4" MIPT)
(7)	F011-0850	Snap-in Plug
(8)	F011-0820	Wire Nut (2 req.)

Hydraulic Charging Kit



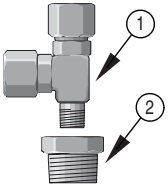
Part No.	Description
F011-AV200	**Hydraulic Charging Kit**
(1) F980-882-005	Nipple, 1/2" x Close PVC
(2) F094-120-04	Ball Valve, Brass 1/2"
(3) F980-446-074	IPT Adapter, 1/2" x 3/4"
(4) F012-0206	Y Strainer, Plastic, 80 Mesh
(5) F980-435-007	Female Adapter, PVC
(6) F980-438-098	Reducer Bushing, PVC 3/4" x 1/4"
(7) F011-0644	Tubing Elbow, #P6ME4

Pressure Gauge Kit



Part No.	Description
F011-AV020	**Pressure Gauge Kit**
(1) F011-0653	Pressure Gauge, Bottom Tap, Oil Filled
(2) F012-0917	SS Nipple 1/4" x 1 1/2"
(3) F011-0610	Ball Valve, 1/4" 3-Way
(4) F011-0644	Tubing Elbow (3/8" Tube x 1/4" MIPT)

Low Pressure Supply Kit - Automatic



Part No.	Description
F011-AV010A	**Lo-Pressure Supply Kit (Automatic)**
(1) F011-90646	Tubing Tee (#P6MR4 - 3/8" Tube x 1/4" MIPT)
(2) F980-439-072	Bushing, PVC 1/2" x 1/4", Thread x Thread

Parts and Accessories, *continued*

Filter Parts

Part Number	Description
F011-TV15A90	Porthole Cover, 15" Tank, Stainless Steel
F011-TV-023	Porthole Cover, 18" - 24" Tank, Stainless Steel
F011-T026	Porthole Cover, 30" - 48" Tank, Cast Iron
F011-90722	Porthole Cover Gasket, 15" Tank
F013-1002	Porthole Cover Gasket, 18" - 24" Tank
F011-90725	Porthole Cover Gasket, 30" - 48" Tank
F920-514	Porthole Cover Bolt, 18" - 24" Tank
F920-520	Porthole Cover Bolt, 30" - 48" Tank
F902-650	Porthole Cover Nut, Brass, 18" - 48" Tank
F922-150	Porthole Cover Washer, 18" - 48" Tank
F011-MJ000	Manifold Jack
F012-P0602	3/8" Black Poly Tubing
F011-P0830	Control Wire, 18-2 PVC Jacket
F011-T010	Filter Element

Grooved Couplers

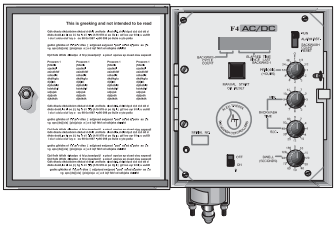
Part No.	Description
2"	F087-90-08G
2.5"	F087-90-10G
3"	F087-90-12G
4"	F087-90-16G
5"	F087-90-20G
6"	F087-90-24G

Coupler Gaskets

Part No.	Description
2"	F087-91-08
2.5"	F087-91-10
3"	F087-91-12
4"	F087-91-16
5"	F087-91-20
6"	F087-91-24

Grooved Adapters

Size	PVC Part No.	Steel Part No.
2"	F980-887030PG	F011-XC120
2.5"	F980-888030PG	F011-XC125
4"	F980-890030PG	F011-XC140



Controllers

Model No.	Part Number	Description
F2DCL-P	F011-CM02DCL	2 Station, DC Input, DC Latching Output
F2AC/DC-D/P	F011-CM02AD	2 Station, AC/DC Input, Alarm
F3AC/DC/DCL-D	F011-CM03AD	3 Station, AC/DC/Input, 24v AC/DC/DCL Output
F4AC/DC/DCL-D	F011-CM04AD	4 Station, AC/DC Input, 24 VAC/12v DC or DCL Output
F8AC/DC/DCL-D	F011-CM08AD	8 Station, AC/DC Input, 24VAC/12v DC or DCL Output
F12AC/DC/DCL-D	F011-CM12AD	12 Station, AC/DC Input, 24VAC/12v DC or DCL Output
F16AC/DC/DCL-D	F011-CM16AD	16 Station, AC/DC Input, 24VAC/12v DC or DCL Output

Notes

(Use this page to record important facts about your system.)