



Automatic Backwashing Screen Filter Installation and Operation Manual

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1.0 LOCATION AND PREPARATION OF THE FILTER SITE

The filter should be located on the pressurized line source after the pump discharge. Pressure must be at least 30 PSI into the filters to actuate valves. The following factors should be considered in selecting the installation site:

- A: Level surface for installation
- B: Access for servicing
- C: Electrical power for lights, electric tools and automatic control installation
- D: Disposal consideration for backwash water
- E: Security and safety

Tools and materials required:

Teflon tape	PVC fittings and pipe for backwash
Pipe dope	discharge line
Soapy water	Wire cutters
1/2" drive socket set (11/16 - 1 3/4")	Wire strippers
8" and 12" wrenches	Electrical tape and connectors
Miscellaneous hookup wire, conduit and conduit fittings	Screw drivers (Phillips and Standard)

NOTE: Inlet/Outlet and backwash system manifold are provided to the limits of the system. This manifold needs to be extended beyond the system to connect the pump discharge and irrigation main line hook ups. The backwash manifold needs to be extended to the point of discharge.

A concrete pad should be poured allowing for a minimum perimeter of 12" for servicing. Location of filter should also allow for cartridge removal clearance of buildings, fences, etc. Cartridge lengths are as follows:

Filter Series	Cartridge Length
BSF-6	25 3/4"
BSF-8	23 1/2"
BSF-10	45"

Note: In some countries, the prefix MFS may replace BSF

SERVICE NOTE: PRESSURE IS REQUIRED TO BE RELEASED FROM THE FILTER BEFORE PERFORMING ANY SERVICE OR MAINTENANCE OPERATION ON THE FILTER. WORKING ON A PRESSURIZED VESSEL CAN CAUSE INJURY AND SHOULD NEVER BE ATTEMPTED FOR ANY REASON. SERVICE FEE BASED SERVICE BY RAIN BIRD AUTHORIZED SERVICE PROVIDERS IS AVAILABLE IN MOST AREAS.

1.1 Installation Notes

The Automatic Backwashing Screen Filter uses grooved type couplings for assembly of all filter canister piping supplied with the filter. The grooved type couplings mechanically lock the filters together while allowing some line flexibility. The Automatic Backwashing Screen Filter comes standard with a flanged inlet and outlet connection. The same size and type of flange should be used for connecting the supply and discharge lines to the filter system. Filters that

Do not weld on the powder coated inlet and outlet filter manifolds. Welding will damage the polyester powder coating and could also damage nearby electronic equipment (Pump station, irrigation controller, etc.).

2.0 INLET/OUTLET PIPING

2.1 Assembly Procedure

Align the inlet piping with the supply plumbing of the irrigation system. Insert the rubber flange gasket on the inlet flange and tighten the bolts alternately until tight and flange faces have been completely drawn tight. Install outlet piping to the filter system using the same procedure.

3.0 BACKWASH MANIFOLD INSTALLATION

3.1 Backwash Manifold Assembly

The backwash manifold and backwash control valves are supplied with the filter system. It may be necessary to complete the assembly of this unit by connecting the backwash control valve to the backwash manifold.

The Rain Bird Automatic Backwashing Screen Filter System is supplied with a 4" butterfly type restricting valve. This valve is connected to the backwash manifolds with grooved type couplings and is used to regulate the flow of backwash water and cleaning of the screen cartridge.

The BSF6 and BSF8 filter systems are provided with a 2" gate valve. This valve is threaded onto the backwash manifold. This valve is used for backwash control on these smaller systems.

3.2 2" Restricting Valve Assembly – Model BSF10-X

To install the 2" butterfly type restricting valve (if not already assembled), remove the gasket from the 4" x 2" grooved reducing coupling. Lubricate the gasket with soapy

water; slide the gasket over the end of the backwash manifold. Align the restricting valve and slide the gasket back, centering it between the grooves. Install the grooved coupling and tighten bolts.

3.3 4" Waste Flush Line Hookup - Model BSF 10-X (Provided by Installer)

A 4" grooved by MNPT (threaded) adapter is provided with the backwash manifold assembly. This adapter is to be tied into the filter flush line provided by the installer. This adapter is connected to the restricting valve using the same procedure described in Paragraph 3.2.

3.4 2" Restricting Valve Assembly - Model BSF 6-X and BSF 8-X

To install the 2" gate-restricting valves wrap the male threads with Teflon tape or apply pipe dope. Thread the 2" restricting valve onto the backwash manifold and tighten securely.

3.5 2" Flush Line Hookup - Models BSF6 and BSF8 (Provided by Installer)

Connect drain line to the flush line adjusting valve with a 2" MNPT connection (valve is FNPT).

3.6 Filter Flush Line Considerations

The filter flush line should be discharged to atmosphere at a point in the lake or reservoir away from pump suction or intake boxes. Optionally the backwash water may be disposed of to a tree line, ravine lined with rip-rap (rock), or other suitable approved discharge location. The discharge of the flush line should be visible for visual verification of flush line water quality and flow.

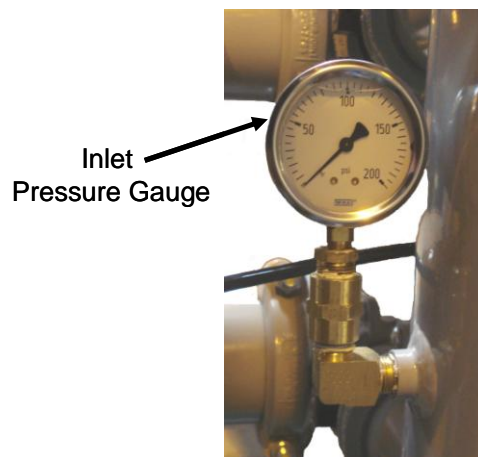
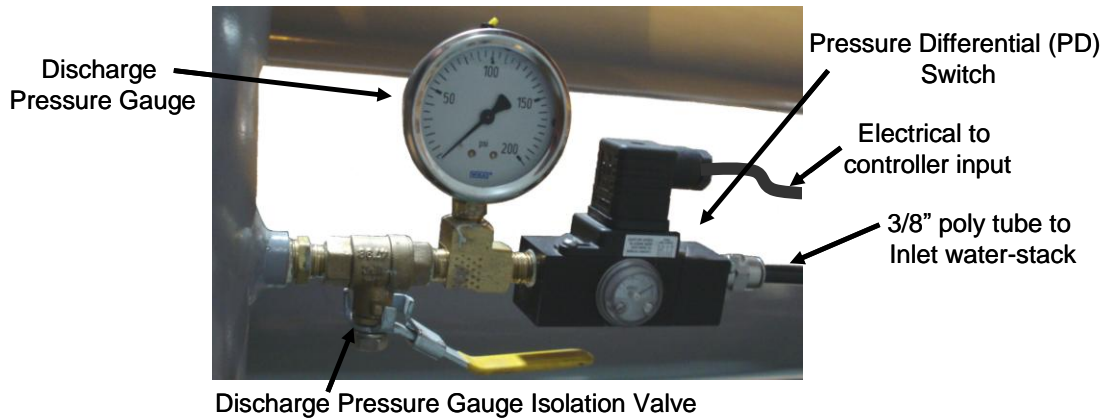
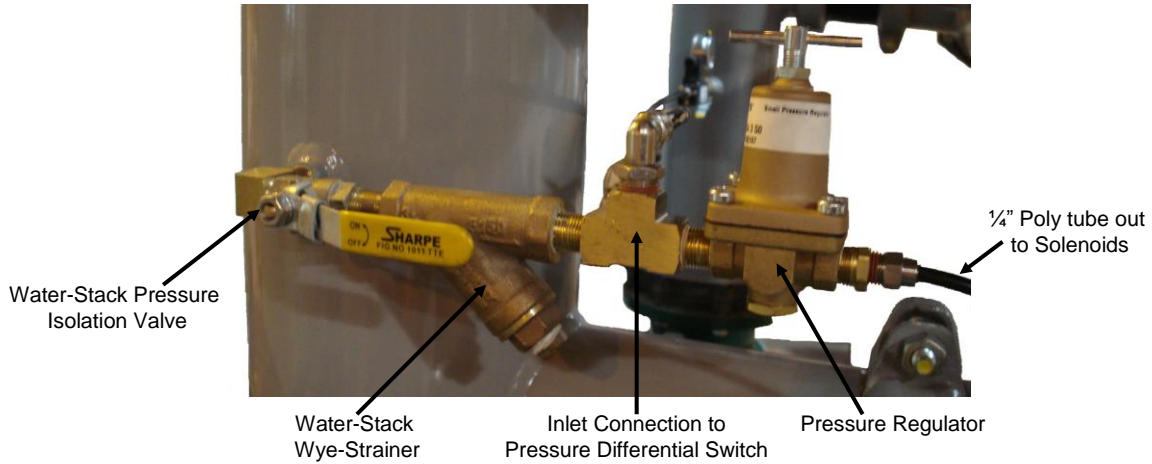
4.0 HYDRAULIC DETAIL OF THE WATER POWERED VALVES

A detailed picture of the water-stack assembly and its related system components are shown below. While the components may be connected in a slightly different configuration on the various filters, the order and operation is the same for them all. If this is serviced, use Teflon tape on all the threaded connections.

4.1 Discharge Pressure Indication and Pressure Differential (PD) Switch

A valve is provided on the input to the Discharge Pressure Gauge and Pressure Differential Switch for ease of servicing the DP switch which will have to occasionally be cleaned (see troubleshooting section for detail on this) to remove any debris (Inlet Pressure valve must also be turned off to service this component). The other side of the DP switch connects (via 3/8" poly tubing) to the inlet side of the filter on the water-stack assembly tee located after the wye-strainer and before the pressure regulator and Inlet

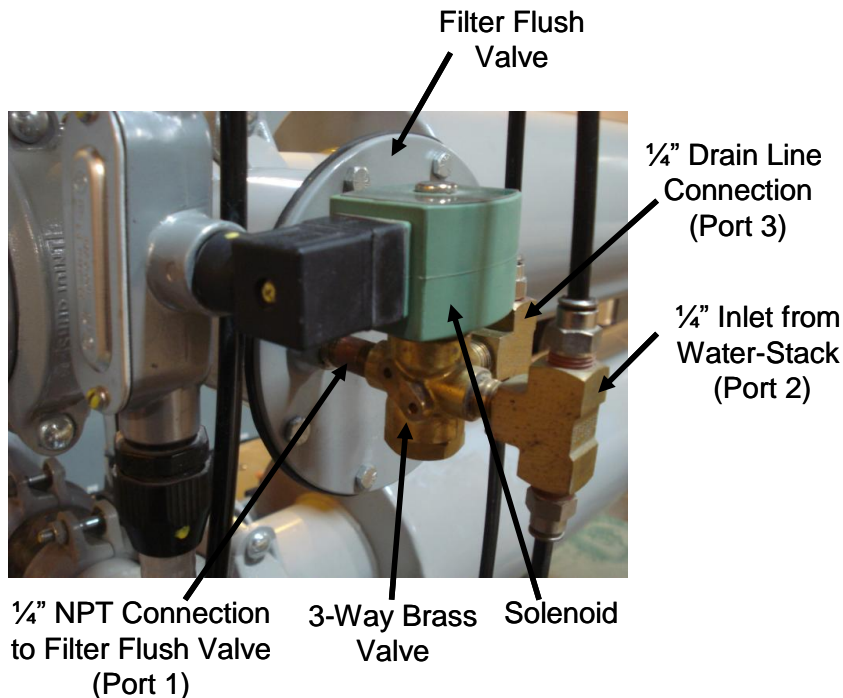
Pressure Gauge.



4.3 Solenoid Valve Assembly to Rain Bird Backwash Valve Actuator

The 3-way solenoid valves are connected to the backwash valve actuators with a 1/4" close nipple. These valves allow pressurized water to close the backwash valve in one

position and allow the backwash valve to open in the other position. The backwash valve is commanded to open when the 3-way solenoid valve actuates (Port 3 is opened to atmosphere) and allows water pressure off the diaphragm of the backwash valve (Port 1) to vent to atmosphere.



NOTE: 120VAC solenoids are used when the BSF filter is supplied as an integrated filter assembly on a Rain Bird Pump Station using a PLC to control the filter. 24VAC solenoids are used when an ULTRA 116 controller is used to control the filter in a stand-alone configuration.

5.0 AUTOMATIC BACKWASH CONTROLS HOOKUP (if not already assembled and mounted)

5.1 Control Box Mounting

The automatic backwash controller supplied with the filter system is mounted on unistrut provided with the filter system. If the backwash controller will be mounted to a remote panel or backboard, holes have been provided in the back of the enclosure. To gain access to the mounting holes open the door and remove the screws that secure the panels to the enclosure. Hinge down the top panel to gain access to the mounting holes.

5.2 Automatic Controller Power Hookup (Ultra 116)

The automatic backwash controller requires 120 VAC or 12 VDC (for optional latching solenoids – solar package) power for operation. Please refer to the automatic controller instruction manual for installation and operation information. The wiring of the controller

should be done in accordance with all state and local electrical codes.

6.0 SYSTEM CHECK PRIOR TO START-UP

Prior to system start-up it is advisable to check the filter system. This check should include the following items.

NOTE: PRESSURE IS REQUIRED TO BE RELEASED FROM THE FILTER BEFORE PERFORMING ANY OPERATION ON THE FILTER.

6.1 Cartridge Assembly Check

Remove the lid assembly and cartridge. Inspect the cartridge, making sure that u-channel seals are secure. Reinstall the cartridge and lid assembly. Tighten the lid securely.

6.2 Grooved Coupling and/or Flanged Connections

Check all grooved coupling and flanged connections making sure that all bolts are tight and the couplings are seated in the grooves.

6.3 Hydraulic Tubing Visual Inspection

Inspect all hydraulic lines making sure they are free of any kinks, bends or foreign material. Make sure all connections are tight and secure.

7.0 AUTOMATIC BACKWASH CONTROLS

Prior to system start-up, it is advisable for the operator to have a basic understanding of the automatic backwash controls. This will help minimize problems that may be encountered during the actual start-up and operation of the filter system. The automatic backwash controller is designed to provide for unattended backwashing of the filter system and incorporates all the functions that are required to perform this task.

7.1 Periodic Flush Time (Flush Frequency)

The periodic flush time setting is adjustable from 1/4 to 24 hours, and is used to set the frequency of backwashing. The frequency of backwashing should be determined by the elapsed time required by the filters to accumulate a full inventory of dirt before the next flush cycle. This elapsed time will vary depending upon the amount of dirt in the source water. Backwashing Screen filters are designed to operate at a 5 PSI or less clean filter pressure differential. The Backwashing Screen filter's flush cycle should be initiated at 8 PSI pressure differential. The periodic flush timer should be adjusted to backwash the filters when this pressure differential has been reached. This should be determined by operational observation during the initial start-up period.

7.2 Flush Time (Flush Duration)

The flush time setting is adjustable from 5 seconds to 240 seconds and is used to set the amount of time each filter station solenoid valve is energized. Once the solenoid valve is energized, there will be a short delay before the backwash valve begins its movement into the backwash position. Once the backwash valve is in the backwash position the time required to backwash each filter is approximately 15-20 seconds. When setting the backwash flush time consideration should be given to the time it takes for the backwash valve to complete its travel to the backwash position. Travel time is generally 10 seconds. A minimum flush time recommendation is 45 seconds. Excessively dirty water applications may require a slightly longer flush time to eliminate the accumulated dirt.

7.3 Dwell Time (Delay Between Housings)

The dwell time setting is adjustable from 5 seconds to 90 seconds and is used to adjust the amount of delay between the de-energizing of the previous solenoid valve and the energizing of the next solenoid valve in sequence. This delay is necessary in order to allow the preceding valve to return to its on-line position prior to the next valve going into the backwash position. When setting the dwell time, consideration should be given to the amount of time it takes for the backwash valve to return to the normal on-line position after the solenoid valve has been de-energized. Normally a 15-20 second delay allows for smooth "phasing" of the valves. Adjust this setting for smooth valve operation dependent upon your specific site conditions.

7.4 Pressure Differential Switch

The filter system pressure differential switch is connected electrically to the backwash controller. The pressure differential switch is adjustable from 0-15 PSID and is used to monitor the system pressure differential and should be used as a secondary and not a primary source of backwash indication. The primary backwash indicator should be the "periodic flush timer."

The pressure differential switch will override the periodic flush timer in the event the pressure differential set point has been reached prior to the periodic time. If this ever occurs, then the periodic timer will reset and start a new periodic flush cycle.

The pressure differential switch should be adjusted to initiate a backwash cycle at 8 PSI (5 PSI for the clean operating filter + 3 PSI for the accumulated dirt load = 8 PSI).

8.0 HYDRAULIC WATER-STACK (WATER PICKUP) ASSEMBLY

Backwashing Screen filters are supplied with a hydraulic water-stack assembly that is connected to the inlet manifold as is discussed in Section 4.0. The water-stack assembly is made up of the following main components: isolation valve, inlet pressure gauge, 3/8" screen filter and pressure regulator. The pressure differential switch is located with the discharge isolation valve and pressure gauge.

Hydraulic water pressure to operate the backwash valves is supplied through the water-stack assembly. The water is routed through the 3/8" filter to remove contaminate that could cause plugging of the solenoid valves, pressure differential switch, etc. The 3/8" filter in the water stack assembly should be cleaned periodically to remove accumulated dirt.

9.0 SYSTEM START-UP

The following start-up sequence can be used for starting Rain Bird Automatic Backwashing filter systems.

NOTE: First time start-up should be done with caution. All air must be purged out of all lines and filters. Valves and pumps must be opened slowly to prevent damage to the filters and irrigation system.

9.1 Controller Operation During Initial Start-up

Prior to filling the system, turn on the controller and initially set the controller to a flush time of 1 minute, periodic flush "off", and a delay time of 15 seconds. After setting these parameters, place the controller in the "OFF" position. Introduce water into filter system filling lines and tanks **slowly**; the 1/2" shut-off valve on the water-stack assembly should be in the "OPEN" position.

9.2 Air Purge Procedure and Initial Manual Flush (via manual "START" on controller)

When approximately 50% of the system pressure is reached, turn the controller on and perform a manual flush on each filter (push manual "START" button and system will go through a flush cycle - see filter controller manual for details on this procedure). Repeat this operation after all filters have been flushed. Increase system to 100% of system pressure.

9.3 Final Manual Flush Cycle

When 100% of system pressure is reached or after 15 minutes of operation, repeat the manual flush cycle.

9.4 Initial Automatic Flush Cycle

Set the controller Periodic Flush, Flush Duration, and Delay settings to the desired values and as recommended in Sections 7.1, 7.2 and 7.3 above.

9.5 Setting the Pressure Differential Switch

Set the pressure differential switch pointer/contact to 8 PSI.

9.6 Hydraulic Water Pressure Adjustment to Backwash Valves

On Backwashing filter systems it will be necessary to adjust the pressure regulator on the water stack assembly to permit the backwash valves to open. As soon as the system operating pressure has been reached, loosen the lock nut on the regulator and turn the adjustment handle counterclockwise. This will reduce the water pressure supplied to the backwash valve actuator. Backwash using the manual mode on the controller. Slowly turn the adjustment handle on the regulator clockwise, which increases the water pressure supplied to the backwash valve. Continue increasing the pressure until the backwash valve opens smoothly. This can be observed by watching the piston stroke through the observation slit in the valve actuator. Excessive pressure on the valve actuator could result in the backwash valve opening too quickly and creating water hammer along with possible valve damage. After reaching the proper regulation pressure tighten the locking nut.

9.7 Backwashing Frequency

The automatic controller should be set so that the timed frequency of filter backwashing corresponds to the pressure differential set point. Establishing the time frequency of flush may require several days of monitoring to determine the proper setting. (Example: If it takes 2 hours of operation to reach the dirty filter pressure switch setting of 8 PSI, the backwash frequency should be set at 2 hours on the controller.) If the system is not running at rated flow, a differential may never be reached. If that is the case, set the timed flush to operate once every 2-hour period.

9.8 Backwash Flow Adjustment

9.8.1 2" Restricting Valve - Model BSF 6 and Model BSF 8

The 2" restricting should be opened approximately two turns to provide for adequate flushing of contaminants from the filter system. If the filter does not return to its clean filter pressure differential after flushing, and the "flush duration" setting is adequate, the valve should be adjusted to a more open condition that provides for removal of contaminants. The valve should be set to a minimum open setting that still provides adequate dirt removal from the system. For 6" filters, the flush rate should be approximately 60 GPM. For 8" filters, the flush rate should be approximately 80 GPM.

9.8.2 2" Restricting Valve - Model BSF 10

The 2" restricting valve is supplied set in the minimum open position. If the filter does not return to clean filter pressure differential after flushing, and the "flush duration" is adequate, the valve should be adjusted to a more open condition. A 12" adjustable wrench will be required. To adjust the restricting, turn the hex nut on the valve clockwise until the desired valve opening is obtained. The valve should be set at its minimum open setting that still provides adequate dirt removal from the system. For 8" filters, the flush rate should be approximately 190 GPM.

TROUBLE SHOOTING GUIDE FOR RAIN BIRD BSF

PROBLEM: POOR FILTRATION

Probable Cause

1. Excessive flow through filters forcing contaminants through filter to outlet.
2. Air in filter(s)
3. Excessively high pressure forcing contaminants through filters.

Solution

1. Increase flush frequency and/or adjust pressure differential switch.
2. Install auto or manual air bleed device on inlet piping.
3. Readjust backwash flow control valve to proper setting to effect removal of entrapped dirt.

PROBLEM: CONSISTENTLY HIGH PRESSURE DIFFERENTIAL

Probable Cause

1. Filter sealed over with contaminants restricting backwash flow.
2. Insufficient backwash flow

Solution

1. Open filters and remove any excess or caked contaminants from the surface of the screen. Pressure wash cartridges if fouled with residual contaminant. Return filters to normal service. Backwash each unit until pressure differential returns to normal.
2. Readjust backwash flow control valve to proper setting to effect removal of entrapped dirt.



PROBLEM: BACKWASH VALVE(S) LEAK

Probable Cause

Solution

- | | |
|---|--|
| 1. Obstruction in valve seat. | 1. Remove obstruction. |
| 2. Polyurethane valve seal is worn or damaged. | 2. Replace seat disk. |
| 3. Diaphragm damaged (leaking from port of diaphragm chamber at rear of valve). | 3. Replace diaphragm. |
| 4. Pinched or worn o-ring. | 4. Replace o-ring and lubricate shaft. |

PROBLEM: WATER HAMMER

Probable Cause

Solution

- | | |
|---|---|
| 1. Air in tanks. | 1. Bleed off trapped air.
See start-up instructions Section 9.2.
Check also for leaks in pump suction line. An air bleed at filter inlet may also help. |
| 2. Long backwash line causing vacuum on backwash valve. | 2. Install vacuum breaker on backwash line. |
| 3. Excessive pressure on valve actuators causing rapid opening. | 3. Reduce water pressure to actuate valves by adjusting pressure regulator.
See Section 9.6. |

PROBLEM: INCREASING FREQUENCY OF BACKWASH CYCLE

Probable Cause

1. Backwash flow or duration is not adequate to flush filter of all contaminants.
2. Increased concentration of contaminants in water supply. (Note: May only be a seasonal problem.)
3. Water-stack wye-strainer plugged

Solution

1. Readjust backwash flow and/or increase flush time of backwash cycle.
2. Flush more frequently. Possible over filtering of water; consider coarser filtration.
3. Clean as shown below.

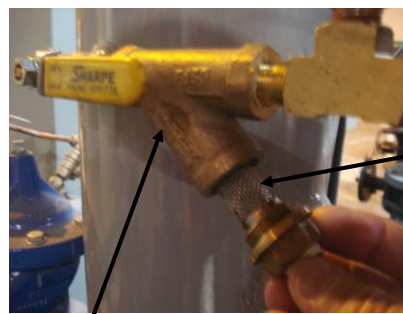
PROBLEM: AUTOMATIC BACKWASH FAILS TO CYCLE

Probable Cause

1. Controller power off, blown fuse or circuit breaker tripped.
2. Improper setting on differential pressure switch.
3. Solenoid(s) malfunctioning.

Solution

1. Turn power on. Be sure wiring is connected. Reset circuit breaker or install new fuse.
2. Adjust pressure differential switch.
3. Check connections. Clean ports. Close inlet valve to water-stack and discharge valve to DP switch. Check filter screen on water pickup assembly for damaged screen and clean or replace if necessary.



Wye-Strainer

WINTERIZATION

Winterization of the Rain Bird BSF Assembly

- (1) After the last irrigation cycle of the season run a back-flush cycle two (2) times.
- (2) Drain the system completely (ensure all 1/4" and 3/8" poly lines are completely drained). Use compressed air to remove remaining water from poly lines and components. Once it has been verified that all remaining water has been removed, reconnect lines.
- (3) Loosen the fasteners on the 3- Way Solenoid Hydraulic Actuator flanges to allow water to exit the valve. Remove (via quick connect fitting) 1/4" poly tubes from solenoids and blow remaining water out of the solenoid (replace poly tubes when complete). Use compressed air to ensure any remaining water is removed.
- (4) Remove the wedge-wire cartridges and pressure wash thoroughly. Either replace the cartridges or keep them stored in a secure place.



Loosen these fasteners
to allow water to drain.

Hydraulic Actuator
Valve

RAIN BIRD BACKWASHING SCREEN FILTER PREVENTIVE MAINTENANCE SCHEDULE

The following is a schedule for preventive maintenance. The chart should be located in an accessible, but protected, location.

TASK	Seasonal Start-Up	Seasonal Shutdown	Daily	Every Week	Alt. Month	Every Month	Every Quarter
Winterize		X					
Inspect and clean cartridge	X					X	
Clean water pickup assembly filter	X					X	
Inspect hydraulic line connections	X						
Inspect elect. Connector and control box seals	X						X
Lubricate backwash valve with general purpose water insoluble grease	X	X					X
Inspect valve interior components (seals, diaphragm, shaft)	X						
Check coupling closure gasket under pressure	X			X			
Check system Pressure differential	X		X				
Check backwash flow rate	X						X
Check flow meter to Assure proper flow rate	X			X			
Monitor duration of flush cycle	X				X		
Eval. Seasonal water quality fluctuations for possible settings adjustments					X		