



Installation
and Operation
Instruction
Manual
INSMAN-202

Industrial
Multi Media
Multi Tank

Phone: 951.656.6716 | Toll-Free: 800.854.4788 | www.yardneyfilters.com

Yardney Water Management Systems, Inc. | 6666 Box Springs Blvd. | Riverside, CA 92507

INDUSTRIAL SYSTEMS | MULTI MEDIA MULTI TANK

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GENERAL SAFETY GUIDELINES

Please read the entire manual before beginning any procedure.

1. Only properly trained personnel should operate and service the equipment.
2. Always wear proper safety gear when servicing equipment.
3. Before installing the system, ensure that the system falls within the designed operating parameters.
4. Know the safety operating limits of the system and any equipment directly connected to or affected by it.
5. Be sure that the system is depressurized before any maintenance work, removing components or opening of the vessels.
6. Be sure to re-examine the system before putting it back into service.
7. Be sure to maintain all equipment and to continuously check the system for leaks and or damage. Fixing problems as they occur will prolong the life of the system.

GENERAL: Yardney **Multi-Media Filtration Systems** are designed to remove suspended solids from industrial plant water efficiently and economically.

Water flows, under pressure, through the inlet port of the three-way valve, into the filter vessel and through the deflector assembly to be evenly distributed over the filter media bed. The filter media removes suspended solids and clean water passes through the under-drain to the vessel outlet. Minimum suggested operating pressure of the filter system is 40 PSI.

The filtration mode continues until a sufficient amount of solids have been collected to create a 10 lb. pressure drop across the filter bed. At this time, the filters will be automatically backwashed. During the backwash mode of operation, the three-way valve changes flow direction, shutting off the inlet water to the filter being backwashed. Clean filtered water from the other filters is then processed in the opposite flow direction creating the backwash condition. The water flows in this upward direction lifting and expanding the media, allowing it to release the collected contaminant. The contaminant is then carried away with this backwash water.

1. RECEIVING INSTRUCTIONS

Upon receipt of the filter system, inspect for any visible damage, missing parts, etc. If any damage is noted, advise the freight carrier and Yardney Water Management Systems at once. A damage claim should be filed with the freight company as soon as possible to avoid any unnecessary delays in settlement of the damage claim or installation of the filter system.

2. INSTALLATION

With a few exceptions, Yardney Filter Systems are shipped completely assembled and mounted on a structural steel skid. The larger systems, MM-4860-5 & 6 and MM-5460-5 & 6 are commonly shipped on two (2) separate skids and require minor assembly.

All filter systems must be installed on a level surface that will support the equipment. It is recommended that 1/4" tolerance be the maximum allowed out of level condition. A concrete base with grouting and/or shims under the structural members is generally the best method to obtain the levelness required. The grouting and/or shims should be kept to a minimum for best results.

A minimum of 48" service walkway should be maintained around the filter system to allow for media loading and system servicing.

2. INSTALLATION (CONT.)

The inlet and outlet manifolds are supplied with flanged ends. Line connections to the filter system should be the same size as those supplied with the system.

The inlet and outlet manifolds are supplied as standard with fusion epoxy lining and modifications to the manifolds that require welding, cutting, excessive heat, etc., should be avoided as this will burn the epoxy lining.

The backwash line piping is connected to the backwash restrictor valve on the backwash manifold. The backwash line piping should discharge into a floor drain or sump and should not be connected directly to a pressurized drain line.

If it is necessary to run the backwash piping a long distance to a drain, allowance should be made in the size and drainage of pipe to handle total backwash flow without any restriction.

Specific sizes for backwash piping are shown in the chart below.

	BACKWASH FLOW (PER FILTER)	MINIMUM PIPE SIZE
MM-2460	47 GPM	2"
MM-3060	75 GPM	2"
MM-3660	107 GPM	4"
MM-4860	189 GPM	4"
MM-5460	239 GPM	4"

TABLE 1: BACKWASH FLOW AND PIPE SIZE.

Restriction of backwash flow from filters to the drain will have an adverse effect on the overall backwashing capability and could lead to inadequate cleaning of the filter during the backwash cycle.

NOTE: Yardney Multi-Media Filter Systems that are supplied in two separate skids require the installation of the inlet and outlet tee's and connecting the backwash line prior to connecting to your process. Refer to the illustration below.

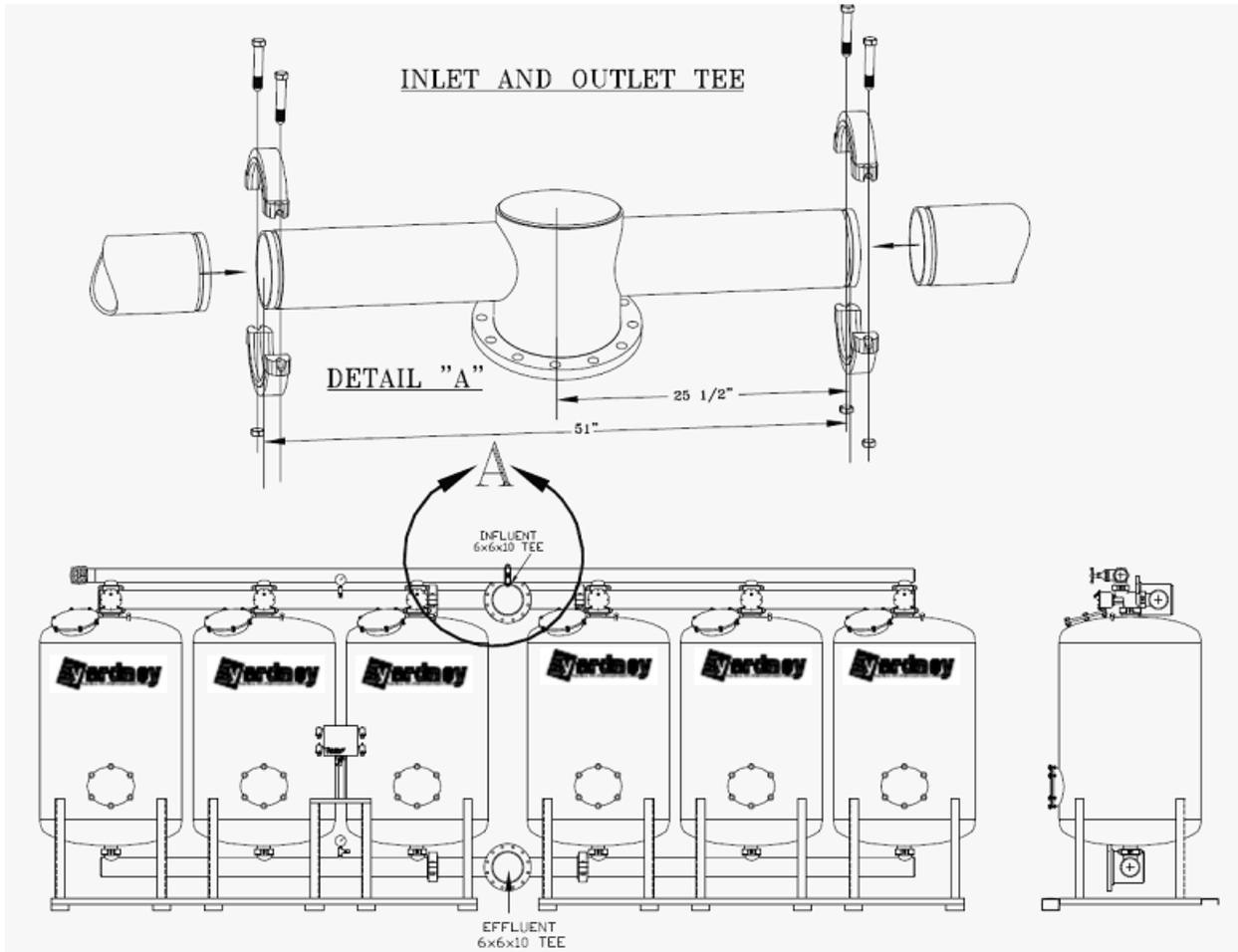


FIGURE 1: MULTI-MEDIA SYSTEM WITH TWO SKIDS.

3. MEDIA FILTRATION MEDIA LOADING

The media consists of one grade of crushed rock gravel pack, two grades of garnet media and one grade of anthracite media. The quantity of media, type of media, and loading sequence can be found in the Filter Tank Loading Table on Page 6.

The media depths should be marked on the outside of the vessel prior to media installation. These depth lines need not be continuous, but must be sufficient to indicate the media levels to installers.

Use CAUTION during media installation to avoid damage to the internal epoxy lining)

THE CRUSHED ROCK MUST BE THOROUGHLY WASHED PRIOR TO LOADING INTO THE FILTER. FAILURE TO WASH THE CRUSHED ROCK COULD LEAD TO COMPROMISED FILTER PERFORMANCE AND A FOULED UNDERDRAIN. ALWAYS LOAD THE ROCK GRAVEL FROM THE SIDE MANWAY.

NOTE: Installers should wear appropriate dust masks when working around and/or inside the vessel during media installation and should comply with confined space regulations.

Once the crushed rock has been installed and packed around the collection laterals, it should be raked moderately level. The succeeding layers of media should now be installed. Coarse garnet can generally be mostly installed also through the side manway.

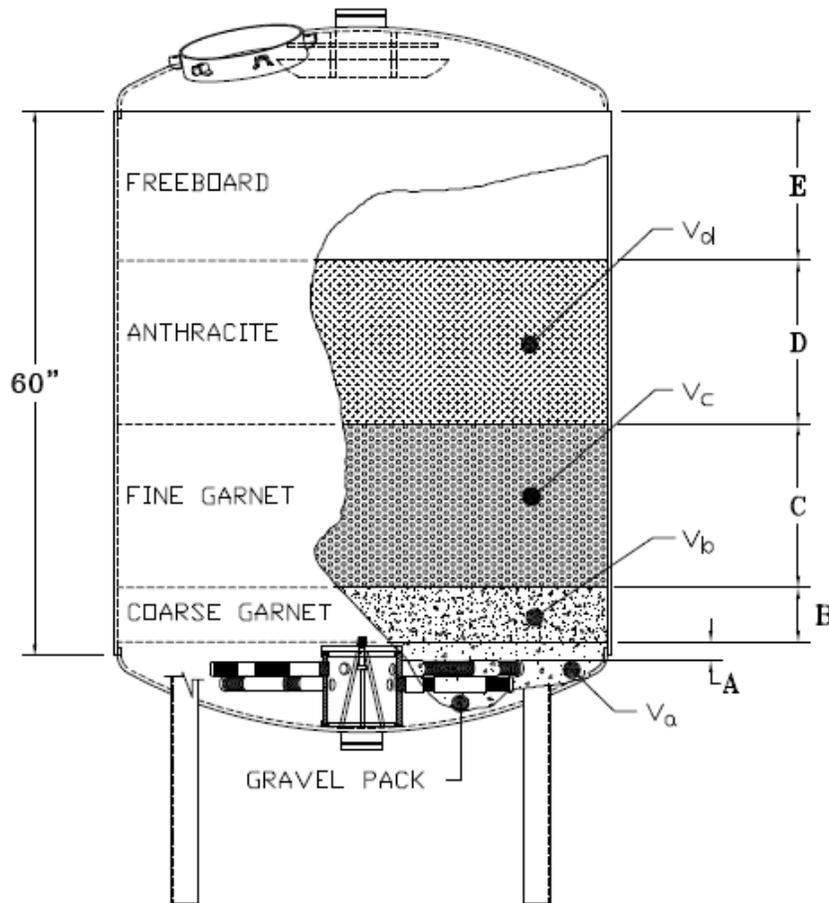
Close the side manway when necessary to finish loading the coarse garnet and subsequent layers, raking each layer moderately level prior to loading the next.

To properly close the manways, remove all foreign material from the filter vessel. Clean all sealing surfaces of the manway. Chipping of the vessel lining may occur unless the sealing surfaces are free of sand, grit, etc. Install the gasket and the cover. Tighten the bolts to 25 ft-lbs in a 3-step, criss-cross pattern. Bolts should be first tightened just snug, then to 15 ft-lbs, then to 25 ft-lbs.

REFER TO TABLE 1 BELOW FOR MEDIA REQUIREMENTS.

FILTER TANK LOADING TABLE

60" Deep Tank Sideshell



FILTER DIAMETER (INCHES)		18	24	30	36	48	54
1/2" TO 3/4" CRUSHED ROCK	A (INCHES)	2	2	2	2	2	2
	Va (FT ³)	1.0	1.5	2.5	4	7	9.5
1.45 MM GARNET	B (INCHES)	6	6	6	6	6	6
	Vb (FT ³)	1.0	1.5	2.5	3.5	6.5	8.0
0.35 MM GARNET	C (INCHES)	18	18	18	18	18	18
	Vc (FT ³)	2.5	4.5	7.5	10.5	19.0	24.0
0.85 MM ANTHRACITE	D (INCHES)	18	18	18	18	18	18
	Vd (FT ³)	2.5	4.5	7.5	10.5	19.0	24.0
E	(INCHES)	14.5	14.5	14.5	14.0	17.0	16.5

TABLE 2: MEDIA LOADING TABLE.

4. INITIAL MEDIA CLEANSING

Despite cleaning of the media prior to packaging, a certain amount of “fines” will be present in the media supplied. Serious operational problems could result if these “fines” remain in the filter during operation. Thus, it is necessary to clean the media prior to operating the filter system.

In order to accomplish this the filter should be filled with water after the media loading. This water should be as clean as possible. The media should now soak for 6 – 12 hours.

The media should be backwashed after the soaking period using the procedure as outlined on Page 12. It is recommended that the backwash operation be performed using the manual mode of operation. By using the manual mode the operator will become familiar with the filter system and will also be able to spot any potential operational problems prior to actual automatic operation of the filter system. The filter should be cleaned until such time as the backwash water becomes clear. Fill a glass container with the water as it exits the filter can make a quick check of the backwash water. The container should not have any sedimentation at the bottom after the water has settled.

Refer to Page 12 for backwash instructions used for this procedure.

5. ROUTINE MEDIA CLEANING THROUGH AUTOMATIC BACKWASHING

The filter media should be backwashed on a routine basis. The length of the filtering cycle between cleaning sequences is dependent upon the application. Typical filtering cycles are in the 12-24 hour range, however, some applications allow for a much longer cycle; in some cases, shorter cycles.

The condition that determines the length of the filtering cycle before the backwashing is required is the media bed differential pressure. The differential pressure may be determined by reading the influent and effluent pressure gauges. Subtract the effluent pressure gauge reading from the influent pressure gauge reading. The difference is the media bed differential pressure. The filter system should be cleaned when the differential pressure reaches approximately 10 PSID -- more than the clean filter pressure differential.

It is recommended that a filter be cleaned at least once a day regardless of the application or differential pressure.

6. OPERATION SEQUENCE

Regardless of the number of filter tanks, the operational sequence for each unit is identical, therefore; only one sequence example is explained (Standard 3-way valve sequence).

- On Line - The Influent/backwash valve open to the influent position, the online timer controls the duration.
(Time between flushes is set as required.)

- Backwash- Influent is closed; the backwash is open to the backwash position. The backwash timer controls the duration. Initial setting should be approximately 3 to 5 minutes (minimum).

7. OPERATION OF THE AUTOMATIC CONTROLS

Yardney Industrial Filters are normally supplied with solid-state electronic controls (see Yardney Synergy controller instructions contained within the control box.) The control box operation is detailed in a separate instruction manual.

- 7.1 Periodic - Sets the time between the backwash processes.
- 7.2 Flush Time - Sets the duration of the backwash.
- 7.3 Delay - Set to "5" seconds for air actuated valves. Set to allow for a slight valve overlap on hydraulically actuated valves.
- 7.4 Manual Start - Initiates and advances a backwash cycle.
- 7.5 Pressure Differential – The system is designed for use with the supplied pressure differential switch gauge that senses a differential in pressure across the filter bed as the contaminant accumulates in the filter bed. When a pressure drop through the filter reaches the setting on the gauge, the switch will initiate a backwash after sensing the sustained pressure loss for more than 30 seconds.

8. INITIATION OF THE BACKWASH CYCLE

The cleaning sequence may be initiated by one of the following initiation events: the filter cycle timer, the pressure differential override or the manual override. Generally, the filter cycle timer is the primary initiation source, while the pressure differential switch and manual override switch are secondary initiation sources.

8.1 Periodic

The optimum cycle length is critical to the proper and efficient operation of the filter system. If the cycle length is too long, the filter media will become excessively dirty, resulting in pressure differential initiated backwash sequences. On the other hand, an insufficient cycle length will result in too frequent backwashes and inefficient use of the filter. Due to these factors, the cycle length must be determined on site under actual operating conditions.

During start-up, the filters should be backwashed every two hours. After observing how rapidly the filters “load-up”, the interval between backwashing can be increased to as long as once every 7 days, depending on the amount of contaminant in the source water. The setting should trigger a backwash due to time prior to the PD switch initiated flush in 8.3 below.

The filter cycle controlled by the periodic flush timer should be adjusted as stated above until the optimum cycle length has been determined. In some applications the cycle length will vary depending upon actual operating conditions, such as the time of year, the amounts of solids in the influent water, etc.

8.2 Flush Duration

During the start-up and initial operation, the backwash duration should be set for 3 to 5 minutes. The minimum backwash duration should be set at 3 minutes. The backwash water should clear prior to the end of the backwash.

8.3 Pressure Differential Switch

The P.D. Switch gauge is field adjustable by rotating the black adjustment knob clockwise to desired set point. Yardney recommends that the maximum adjustment be no more than 10 PSI over the clean filter pressure differential.

Example: If the clean filter pressure differential is 6 lbs., the backwash pressure differential set point should be set at 16 lbs.

9. FILTER CYCLE LENGTH

The optimum cycle length is critical to the proper and efficient operation of the filter system. If the cycle length is too long, the filter media will become excessively dirty, resulting in pressure differential initiated backwash sequences. On the other hand, an insufficient cycle length will result in too frequent backwashes and inefficient use of the filter. Due to these factors, the cycle length must be determined on site under actual operating conditions.

The filter cycle controlled by the periodic flush timer should be adjusted as stated above until the optimum cycle length has been determined. In some applications the cycle length will vary depending upon actual operating conditions, such as the time of year, the amounts of solids in the influent water, etc.

10. BACKWASH VALVE AIR SUPPLY

The filters are designed to use industrial air pressure for backwash valve actuation. A pressure regulator and gauge assembly should be used prior to connecting the air supply to the solenoid valves. Once the system has been put on-line the air supply can be regulated for proper backwash valve opening. The backwash valves should open into the backwash position with minimal noise and hammer.

The air supply requirement varies with the size of the filters and the pressure at which the filters will operate. The **MM 36"**, **MM 48"**, and **MM 54"** require the air supply to the backwash valves to be at least 75% of the system operation pressure.

The air supply required to operate the valves on the **MM 18"**, **MM 24"** and **MM 30"** is approximately one-half of the system's operating pressure. In all cases, the air supply to the regulator should exceed the air supply requirements for the backwash valves.

The air supply is routed through 24 VAC normally closed solenoid valves. One solenoid valve is supplied for each backwash valve.

The solenoids are mounted on the backwash control box and pre-wired at the factory.

10. BACKWASH VALVE AIR SUPPLY (cont.)

On the larger systems, MM-4860-5&6 through MM-5460-5&6, it will be necessary to install the supply tubing from the solenoid valves to the backwash valves. The tubing is pre-cut and numbered to correspond with the respective backwash valve.

The solenoid valves are supplied with a manual override. In the event the electrical supply to the backwash controller is interrupted, the filters can be backwashed by using the manual operator. Turning the thumb screw located on the base of the solenoid valve to the "ON" position will change the position of the solenoid plunger, thus allowing air pressure to open the backwash valve.

To terminate the backwash, the manual operator should be turned to the "OFF" position.

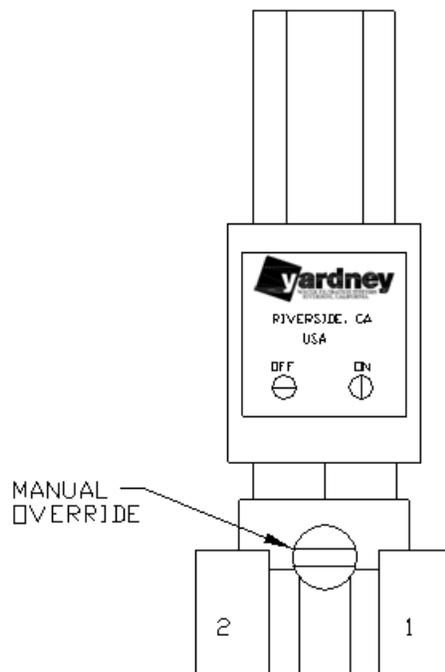


FIGURE 2: SOLENOID WITH MANUAL OVERRIDE THUMB SCREW.

11. SYSTEM START-UP

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 filters and related equipment. Please read the Synergy Quick Start Guide before system start-up.

- 11.1 Start the system manually with the controller in the System Disabled state by turning the dial to the System Menu, pressing the dial to select the menu and rotating the dial to Disabled and selecting. Open the backwash restriction valve 1/4 and introduce water into the filter system, filling lines and tanks slowly. (On the systems with hydraulic actuated valves the 1/2" shutoff valve on the water stack must be in the open position.)
- 11.2 When approximately 10 PSI is reached, turn the manual override knob on the solenoid for tank #1 to the "ON" position for 1 to 2 minutes. Turn tank #1 "OFF" and repeat the procedure on tank #2, etc -- this is done to purge entrapped air from the tanks.
- 11.3 When 50% of the system pressure is attained, repeat the manual flush cycle to again purge the entrapped air.
- 11.4 When 100% of the system pressure is reached, or after 15 minutes of operation, repeat the flush cycle allowing 3 minutes flush per tank.
- 11.5 With the manual override knob in the "OFF" position, activate the controller by Enabling the system following the same procedure in step 1. The Synergy controller will be pre-set to flush every two hours with a flush duration of 4 minutes. Push manual start button to go through an automatic flush cycle.
- 11.6 Set the pressure differential switch to 10 PSI over the clean filter pressure differential. (Example: Clean filter pressure differential of 5 PSI + 10 PSI = 15 PSI pressure differential switch setting.)
- 11.7 As described in Section 9, the automatic controller should be set so that the frequency of filter backwashing corresponds with the build-up of pressure drop to the established dirty filter pressure differential set point. Establishing the time frequency of flush may require several days of monitoring to determine the proper setting.

11.8 The backwash restrictor valve adjustment - A critical factor to successful Multi-media filtration operation!!!

- a) Open the backwash restrictor control valve approximately 25%. (1 to 1-1/2 turns depending upon valve brand.)
- b) Be sure that all air is purged from each tank by partially opening and closing each tank flush valve.
- c) Before proceeding with backwash adjustments, the pump must be run long enough to fill the entire system at the designed operating pressure and flow.
- d) Using the manual override on the solenoid valve, manually initiate a flush on one tank. This changes that tank from the filtering mode to backwash. (See page 10)
- e) By the use of a screen, your hand, or a sampling device, monitor the contents of the backwash water.
- f) Gradually open the backwash restrictor valve until a small amount of filter media appears in the backwash water.
- g) When media begins to show in the backwash water, close the backwash flow control valve until the water is essentially clear of media. A trace of media is acceptable since it is desirable that the lighter granules (fines) in the media bed be allowed to wash out. After completing the above adjustments, all tanks should be backwashed extensively (3 to 5 minutes each) to remove contaminants and fine material usually found in newly installed media.

IMPORTANT NOTE:

1. If at a later time, you make any significant changes in pressure or flow, the above adjustments should be rechecked.
2. Yardney recommends backwashing at 10 PSI above the clean filter pressure differential.

12. OPERATION OF THE AUTOMATIC CONTROLS

This Yardney Sand-Media Filter is equipped with a Yardney Synergy solid-state controller. The controller requires 115 VAC power input to the controller and provides 24 VAC output to activate standard 24 VAC solenoids on the filter valves. (Instructions for the Yardney Synergy controller are included inside the locked controller box.) Please see the Synergy Quick Start Guide for basic operations and navigation through the menu map.

13. INITIAL SETTINGS FOR THE AUTOMATIC CONTROLS

- 13.1 Periodic Flush: During start-up, the filters should be backflushed every two hours. After observing how quickly the filters load up, the interval between backflush can be increased to as long as once every 24 hours depending on the amount of contaminant accumulation. We recommend backflushing when the filter shows a 10-PSI (net of clean filter differential pressure) pressure differential between the inlet and outlet pressure gauges.
- 13.2 Flush Duration: During start-up and initial operation, the backflush duration should be set for 4-5 minutes. The minimum backwash duration should be set at 4 minutes.
- 13.3 Delay: The dwell should be adjusted to allow an overlapping of the backwash valves. The next valve in sequence should start to open a few seconds before the preceding valve closes. If the valve shuts off completely prior to the opening of the next valve, water hammer may occur. Set the delay to zero for air operated backwash valves (standard.)

14. PRESSURE DIFFERENTIAL

A pressure differential switch is connected electrically to the controller terminals marked "P.D." When the pressure drop reaches the setting set on this gauge, the switch will override the "periodic flush" setting and initiate a flush cycle. This is to protect the system from loading up with particulate prior to the setting for periodic backwash set on the controller. A flush cycle initiated by the pressure differential switch is treated like a regular flush cycle and will zero the elapsed time so that the correct periodic flush setting will initiate the next flush cycle.

EXAMPLE: If the interval setting is for 12 hours and the P.D. switch initiates a flush cycle 6 hours into this setting, the next scheduled flush cycle will be 12 hours later. This eliminates doubling-up backwash events.

REFERENCE | OPERATING TROUBLESHOOTING GUIDE

A. POOR FILTRATION

PROBABLE CAUSE	SOLUTION
Wrong media.	Addition of correct media or media replacement.
High-pressure differential forcing contaminants.	More frequent backwashes and/or readjustment of the backwash control valve.
Filter media low causing contaminants to pass through.	Addition of media to the correct level.

B. CONSTANT HIGH PRESSURE DIFFERENTIAL

PROBABLE CAUSE	SOLUTION
Filter sealed over -- not enough water available through filter for backwash.	Removal of covers and removal of the top layer of dirt from filter media. Replace covers and flush tanks for short intervals until clean. Readjust the backwash flow control valve.
Insufficient backwash flow.	Readjust the backwash control valve. (Section 11.8 on page 12 System Start-Up).
Fouled underdrain	Remove Media - Clean underdrain

C. BACKWASH VALVE LEAKAGE CAUSE

PROBABLE CAUSE	SOLUTION
Obstruction in the valve seat area.	Remove obstruction.
Valve seat element worn.	Replace.

D. AIR HAMMER

PROBABLE CAUSE	SOLUTION
Backwash line causing vacuum.	Install a vacuum breaker on the backwash manifold.

E. FREQUENCY OF BACKFLUSH INCREASING

PROBABLE CAUSE	SOLUTION
Improper backwash flow rate or improper duration of backflush.	Increase backwash flow rate and/or the length of backflush time. (Reference Section 11 Page 12-13 "Auto Controls")
Low filter bed.	Addition of media to the correct level.
Dirtier water.	Greater filter capacity required.

RECOMMENDED SPARE PARTS

<u>Number</u>	<u>Part</u>
1.	<u>Electrical</u>
	Solenoid valve 24 VAC _____ 166002460
	Pressure differential switch 0 – 20 PSI _____ 166070020
2.	<u>Gauges</u>
	0-100 PSI glycerin filled, SS body _____ 144025100
3.	<u>Valves</u>
	Urethane seal
	For 1 ½" D series valve _____ 136070150
	Urethane seal D series valve _____ 136070300
	For filter size MM-24, 30
	Urethane seal 454D series valve _____ 136070400
	For filter size MM-36, 48, 54
	O-rings (1 per valve) 1 ½" D series valve _____ 141000037
	O-rings (2 per valve) 342D and 454D series valves _____ 141006087
	Back-up rings (2 per valve) 1 ½" D series valve _____ 141090037
	Back-up rings (4 per valve) 342D & 454D series valves _____ 141090063
	Bushing O-rings (2 per valve) 342D & 454D series valves _____ 141008100
	Diaphragm (1 per valve) 1 ½" D series valve _____ 136090251
	Diaphragm (1 per valve) 342D series valve _____ 136090454
	Diaphragm (1 per valve) 454D series valve _____ 136090454
4.	<u>Gaskets for Grooved Couplings</u>
	2" for filter size MM-24 _____ 108560200
	3" for filter size MM-24, 30 _____ 108560300
	4" for filter size MM-24, 30, 36, 48, 54 _____ 108560400
	5" for filter size MM-36, 48, 54 _____ 108560500
	6" for filter size MM-48, 54 _____ 108560600
5.	<u>Lid Gaskets</u>
	Side Manway -- 9-3/4" x 7-3/4" _____ 142023036
	For filter size MM-24, 30
	Side Manway -- 14-1/4"OD _____ 140031114
	For filter size MM-36, 48, 54
	Top Manway – 5 ¼" X 4" _____ 142021418
	For filter size MM-14, 18
	Top Manway -- 7-5/16" x 5-1/8" _____ 142022400
	For filter size MM-24
	Top Manway -- 9-3/4" x 7-3/4" _____ 142023036
	For filter size MM-30, 36
	Top Manway -- 14-1/4" OD _____ 140031114
	For filter size MM-48, 54
6.	<u>Filtration Media</u>
	½" – ¾" crushed rock _____ 148055075
	.35mm Garnet _____ 148030035
	1.45mm Garnet _____
	_____ 148030145
	0.8-0.9mm Anthracite _____ 148060810