yardney
WATER FILTRATION SYSTEMS

Installation and Operation Instruction Manual

INSMAN-200

Industrial Sand Media And Deep Bed Sand Media Filters

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 | SAND MEDIA

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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: The Yardney **Sand 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 of the filter system is 30 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, IL-4824-5 & 6 and IL-5436-5 & 6 are 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.
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A minimum of 48" service walkway should be maintained around the filter system to allow for media loading and system servicing.

The inlet and outlet manifolds are supplied with either a flange or groove ends (for use with groove type couplings). In either case, 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
IL-1824	26 GPM	1 1/2"
IL-2424	47 GPM	2"
IL-3024	75 GPM	2"
IL-3624	107 GPM	4"
IL-4824	189 GPM	4"
IL-5424	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 on two separate skids require the installation of the inlet and outlet tee and connecting the backwash line prior to connecting to your process. Refer to the illustration below.

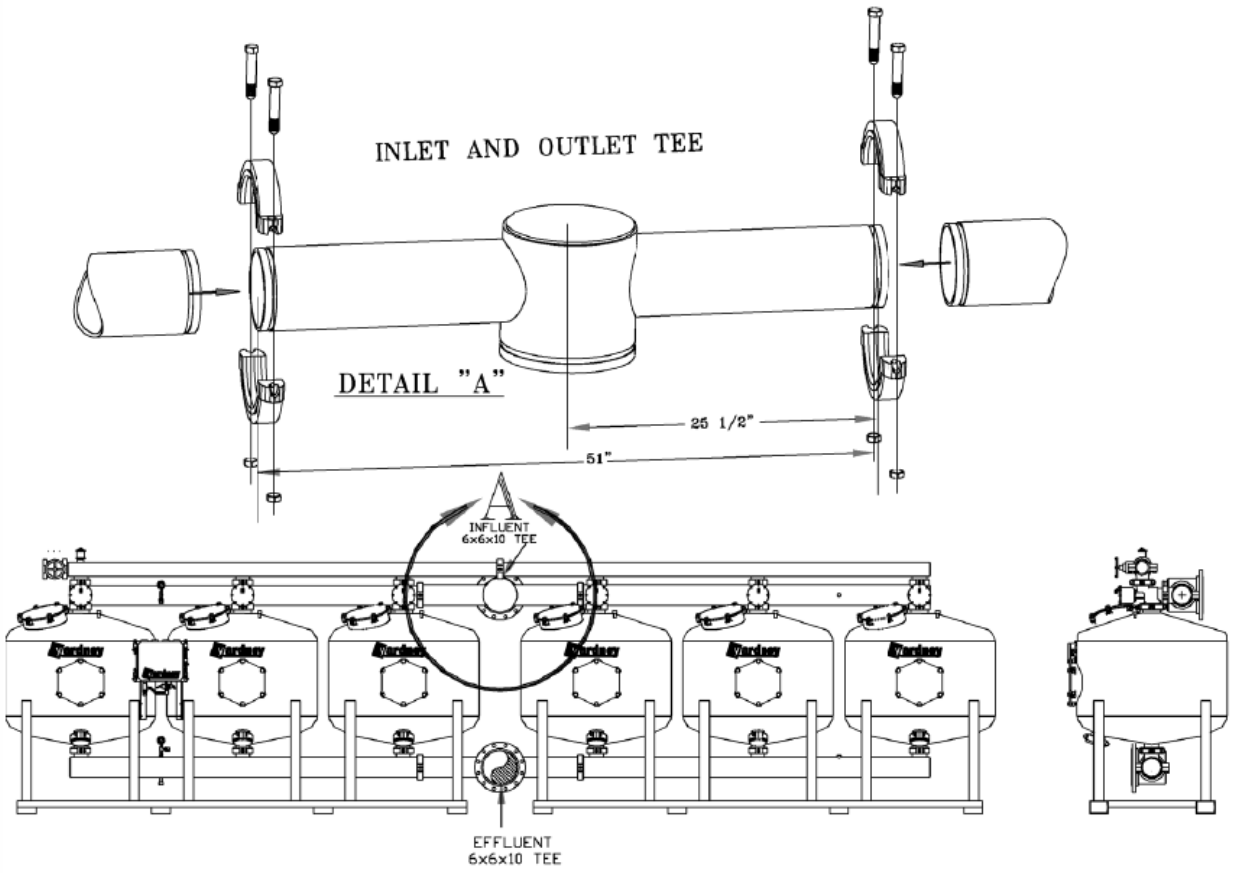


FIGURE 1: SAND MEDIA SYSTEM WITH TWO SKIDS.

3. SAND MEDIA FILTRATION MEDIA LOADING

The sand media filtration system consists of one grade of crushed rock gravel pack and one grade of silica sand media. The quantity of media, type of media and loading sequence can be found in the Filter Tank Loading Table on Page 5.

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.

Based upon prior experience, it has been determined that one of the most efficient methods for installation of media is by the use of air conveying equipment. The use of this method is acceptable with one stipulation; the velocity of the air conveyed media must be low enough to avoid a sandblasting effect. The internal lining on the vessel will not stand up to high velocities of air conveyed media. If air-conveying equipment is not available, the media should be installed by hand loading of media bags.

THE CRUSHED ROCK MUST BE THOROUGHLY WASHED PRIOR TO LOADING INTO

THE FILTER. FAILURE TO WASH THE CRUSHED ROCK COULD LEAD TO

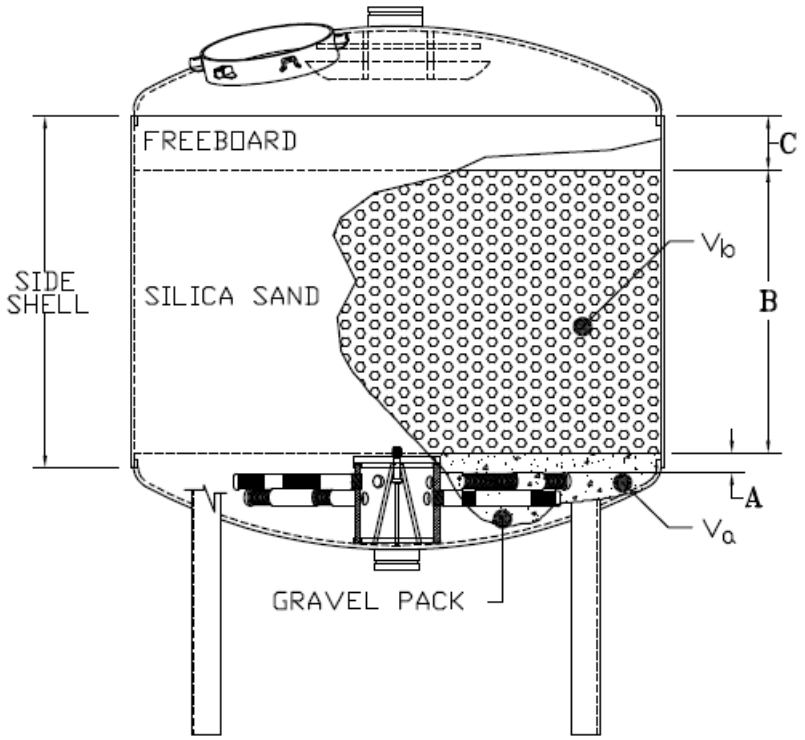
COMPROMISED FILTER PERFORMANCE AND A FOULED UNDERDRAIN.

NOTE: Installers should wear appropriate dust masks when working 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.

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. Close the manway.

REFER TO PAGE 5 FOR MEDIA REQUIREMENTS.



24" DEEP BED SIDESHELL					
FILTER DIAMETER (INCHES)	1/2" TO 3/4" CRUSHED ROCK		MEDIA		C
	A (INCHES)	Va (CUBIC FT.)	B (INCHES)	Vb (CUBIC FT.)	INCHES
18	2	1.0	17.0	2.5	3
24	2	1.5	17.5	4.5	3
30	2	2.5	17.5	7.0	3
36	2	4.0	17.0	10.0	3
48	2	7.0	20.0	21.0	3
54	2	9.5	17.0	23.0	3
36" DEEP BED SIDESHELL					
FILTER DIAMETER (INCHES)	1/2" TO 3/4" CRUSHED ROCK		MEDIA		C
	A (INCHES)	Va (CUBIC FT.)	B (INCHES)	Vb (CUBIC FT.)	INCHES
18	2	1.0	29.0	4.5	3
24	2	1.5	29.5	7.5	3
30	2	2.5	29.5	12.0	3
36	2	4.0	29.0	17.0	3
48	2	7.0	32.0	33.5	3
54	2	9.5	29.0	38.5	3

TABLE 2: MEDIA LOADING TABLE; ALL DIMENSIONS AND VOLUMES ARE APPROXIMATE.

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. 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 sequence designed for this filter system as outlined on Page 11. 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. Filling 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 11 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. The cleaning sequence of a filter system varies from one step (for simple systems) to as many as 20 steps (for more complex systems).
If the filter system is comprised of several filters, the number of filters would multiply the cleaning sequence steps. However, regardless of the complexity of the cleaning sequence, reversing the water flow inside the filter vessel cleans all filters.
In a simple cleaning sequence, valve manipulation will occur in one step. While in a complex cleaning sequence, the valve manipulation will occur over a period of several minutes and several valve sequences. In the case of the multiple unit filter system, a

slight delay between stations is recommended to minimize water surges within the filter system

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 minutes.

7. CLEANING CYCLE CONTROLLER SETTINGS

Refer to separate manual for operation of the automatic backwash controller.

Various types of controllers may be supplied with filter systems to control the duration of the various steps in the backwash cleaning cycle sequence. As a general rule, timer settings are recommendations only. The settings that should be observed for proper filter system start-up are as follows:

Backwash Duration	180 seconds
Delay between filter vessels	10 seconds
D/P Delay	30 seconds

All other timer settings should be determined on-site based upon dirt load, etc.
(With regard to adjustable valves)

8. INITIATION OF THE CLEANING SEQUENCE

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 and manual override are secondary initiation sources. In all cases, the automatic controls will accept the first initiation signal. Any subsequent signals will not have any effect on the controls until such time as the cleaning sequence has been completed. Each of the cleaning initiation sources is explained individually below.

9. FILTER CYCLE TIMER

The filter cycle timer is generally referred to as the periodic start timer. When the timer reaches its elapsed time setting, a signal is sent to the controlling component to begin a cleaning sequence.

As stated above, this timer is generally the primary initiation source and its set time should be adjusted as required so that it remains the primary source.

10. AUTOMATED MODE

The filter system may be cleaned in either of two modes, automated or manual. With the automatic controls in the automated mode, the filter system is capable of completely unattended operation. However, if the case arises, the system may be operated manually to initiate the back-flush sequence.

11. FILTER CYCLE LENGTH

The filter cycle time is the period of elapsed time between cleaning of the filters(s). The periodic start timer controls this period of time.
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.

12 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 IL 36", IL 48", and IL 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 IL 18", IL 24" and IL 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 a 24 VAC normally closed solenoid valve. One solenoid valve is supplied for each backwash valve.

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

On the larger systems, IL-4824-5&6 through IL-4836-5&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 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. The filter can now be backwashed.

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

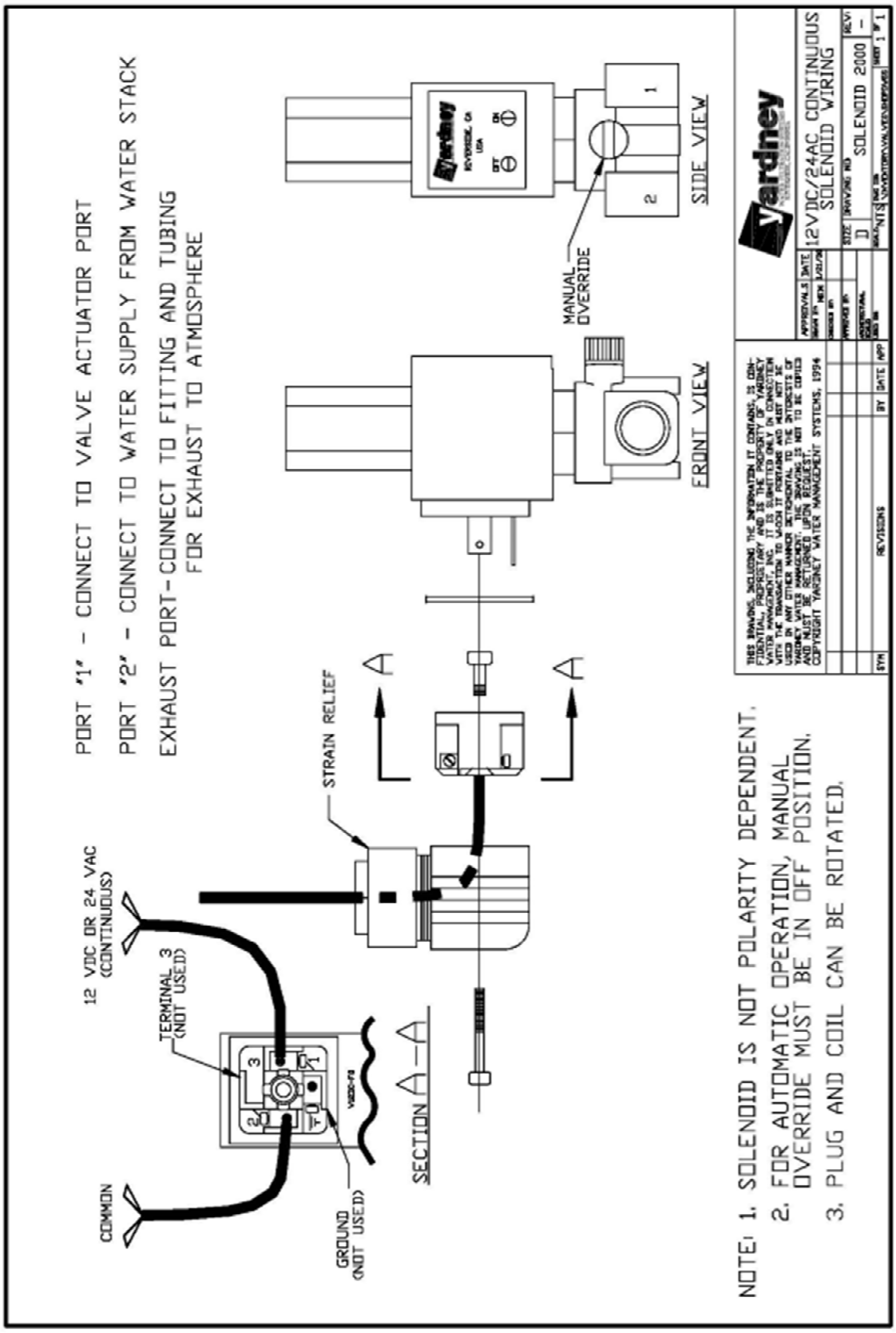
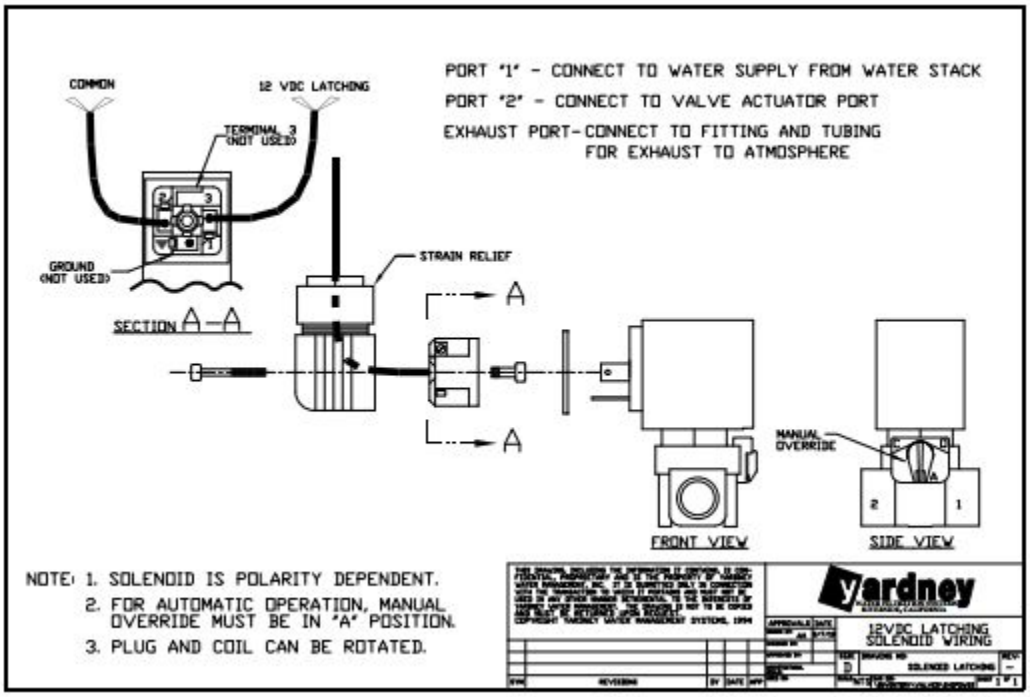
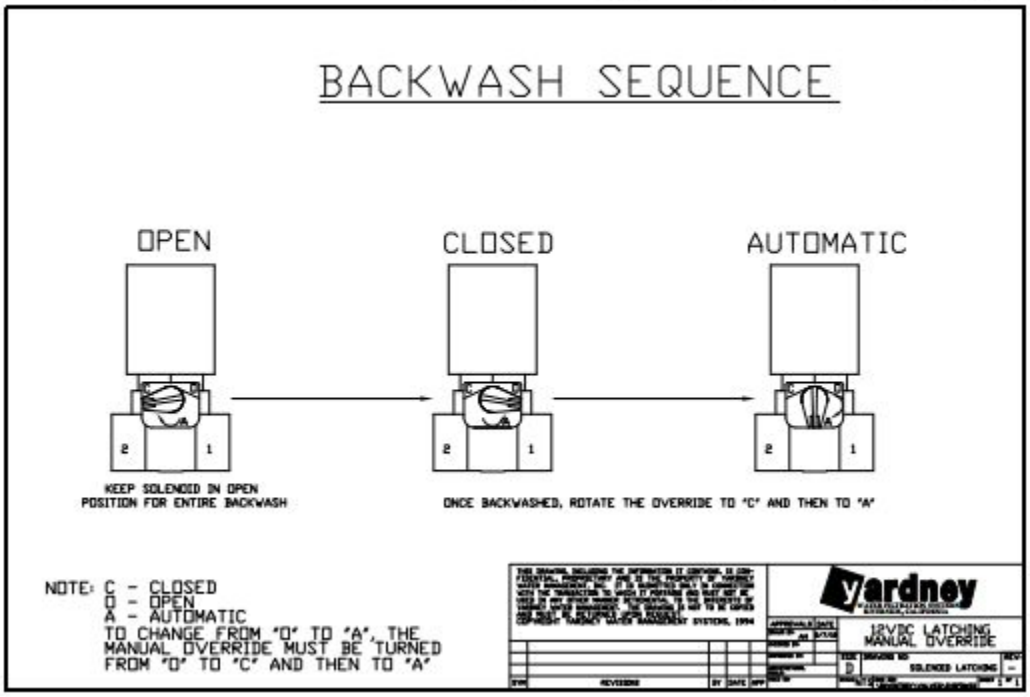


FIGURE 2: 12VDC/24VAC CONTINUOUS SOLENOID WIRING.





12VDC/24VAC CONTINUOUS SOLENOID WIRING.

13. SYSTEM START-UP

The following start-up sequence can be used for the starting up of both automatic and manual backwash filter systems. In the event that the filter system is supplied with manual backwash valves, then the manual backwash valve operator supplied with the system must be used for opening and closing the backwash valves.

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.

13.1 Start the system manually with the controller in the System Disabled mode 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 ¼ and introduce water in to the filter system, filling lines and tanks slowly. (On the systems with hydraulic actuated valves the ½" shutoff valve on the water stack must be in the open position.)

13.2 When approximately 10PSI 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.

13.3 When 50% of the system pressure is attained, repeat the manual flush cycle to again purge the entrapped air.

13.4 When 100% of the system pressure is reached, or after 15 minutes of operation, repeat the flush cycle allowing 3 minutes flush per tank.

13.5 With the manual override 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 duration of 4 minutes. Push the manual start button to go through automatic flush cycle.

13.6 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.)

13.7 The automatic controller should be set so that the frequency of the filter backwashing corresponds with the buildup 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. (Example: If it takes 6 hours of operation to reach a dirty filter pressure switch setting of 15 PSI, the backwash frequency should be set at 6 hours in the controller.

13.8 The backwash restrictor valve adjustment – A critical factor to successful media filtration operation!!!

a) Open the backwash restrictor control valve approximately 25%. (1 to 1–½ 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 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 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 NOTES:

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

14. 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.

15. INITIAL SETTINGS FOR THE AUTOMATIC CONTROLS

15.1 Periodic Flush: During start-up, the filters should be backflushed every two hours. After observing how quickly the filters load up, the interval between backflushes can be increased to as long as once every 24 hours depending on the amount of contaminant accumulation. Backflushing is recommended when the filter shows a 10-PSI (net of clean filter

differential pressure) pressure differential between the inlet and outlet pressure gauges.

15.2 Flush Duration: During start-up and initial operation, the backflush duration should be set for 2-1/2 to 3 minutes. The minimum backwash duration should be set at 2 minutes.

15.3 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.

16. PRESSURE DIFFERENTIAL

A pressure differential switch is connected electrically to the controller terminals marked "Diff Press." When the pressure drop reaches the setting set on this gauge, the switch will override the "periodic hour" 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 schedules 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 13.8 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.
Low filter bed.	Addition of media to the correct level.
Dirtier water.	Greater filter capacity required.

RECOMMENDED SPARE PARTS

		Part Number
1.	**Electrical**	
	Solenoid valve 24 VAC	166002460
	Pressure differential switch 0 – 20 PSI	166070020
2.	**Gauges**	
	0-100 PSI glycerin filled, SS body	144025100
3.	**Valves**	
	Urethane seal	
	For 1 ½" D series valve	136070150
	Urethane seal D series valve	136070300
	For filter size IL-24, 30	
	Urethane seal 454D series valve	136070400
	For filter size IL-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.	**Gaskets for Grooved Couplings**	
	2" for filter size IL-24	108560200
	3" for filter size IL-24, 30	108560300
	4" for filter size IL-24, 30, 36, 48, 54	108560400
	5" for filter size IL-36, 48, 54	108560500
	6" for filter size IL-48, 54	108560600
5.	**Lid Gaskets**	
	Side Manway -- 9-3/4" x 7-3/4"	142023036
	For filter size IL-24, 30	
	Side Manway -- 14-1/4"OD	140031114
	For filter size IL-36, 48, 54	
	Top Manway – 5 ¼" X 4"	142021418
	For filter size IL-14, 18	
	Top Manway -- 7-5/16" x 5-1/8"	142022400
	For filter size IL-24	
	Top Manway -- 9-3/4" x 7-3/4"	142023036
	For filter size IL-30, 36	
	Top Manway -- 14-1/4" OD	140031114
	For filter size IL-48, 54	
6.	**Filtration Media**	
	½" – ¾" crushed rock	148055075
	.47 mm crushed silica sand	148020047

Other medias are available as may be required. Consult the factory.