yardney
WATER FILTRATION SYSTEMS

Installation and Operation Instruction Manual

INSMAN-203

Industrial Granular Activated Carbon Single Tank

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INDUSTRIAL SYSTEMS | GAC SINGLE 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: The Yardney GAC Filtration Systems are designed to utilize granular activated carbon for the removal of dissolved organic pollutants from water by a process called absorption over the carbon. As the water passes through the porous granules of carbon, organic pollutants are attracted to the surface of the pores and are held by weak physical forces. This process continues until the carbon becomes saturated and its capability to absorb organic impurities is consumed.

The Yardney GAC Filtration Systems also have the ability to filter out suspended solid particles that can be removed during the backwash process. The minimum suggested operating pressure is 30 PSI.

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 Filtration 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 GAC Filter Systems are shipped completely assembled and mounted on structural steel skid. Yardney GAC Filter Systems are supplied complete with manifolding, valving and automatic backwash controls.

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. 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" should be maintained around the filter system to allow for media loading and servicing.

All filter systems are supplied with FIPT pipe connections to the filter and require the use of threaded male adapters. Refer to Table 1, page 4 for system pipe sizes.

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 table below.

FILTER MODEL	Backwash Flow (Per Filter)	Minimum Pipe Size
GAC-1872	18 GPM	2”
GAC-2472	32 GPM	2”
GAC-3072	49 GPM	2”
GAC-3672	71 GPM	4”
GAC-4872	126 GPM	4”
GAC-5472	159 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 backflushing capability and could lead to inadequate cleaning of the filter during the backwash cycle.

CAUTION: In certain carbon system applications, high voltage electrical charges may accumulate to levels of shock or ignition hazard. As a precaution against possible ignition or shock, all carbon treatment systems should be adequately grounded!!!

FILTER MODEL	FILTRATION AREA	MAXIMUM OPERATING PRESSURE	PIPE SIZE INLET/OUTLET (INCHES)	BACKWASH INLET/OUTLET (INCHES)
GAC-1872	**1.78 sq.ft.**	**100 PSI**	**2”**	**2”**
GAC-2472	**3.15 sq.ft.**	**100 PSI**	**2”**	**2”**
GAC-3072	**4.91 sq.ft.**	**100 PSI**	**3”**	**3”**
GAC-3672	**7.10 sq.ft.**	**100 PSI**	**3”**	**3”**
GAC-4872	**12.60 sq.ft.**	**80 PSI**	**4”**	**4”**
GAC-5472	**15.91 sq.ft.**	**80 PSI**	**4”**	**4”**

TABLE 2: FILTER SPECIFICATIONS.

3. GRANULAR ACTIVATED CARBON

The single tank GAC filtration system consists of one grade of crushed rock and one grade of granular activated carbon. Gravel is used for supporting the carbon while the activated carbon is used for filtering and absorption. Refer to the media requirement table and illustration on page 6.

NOTE: 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.

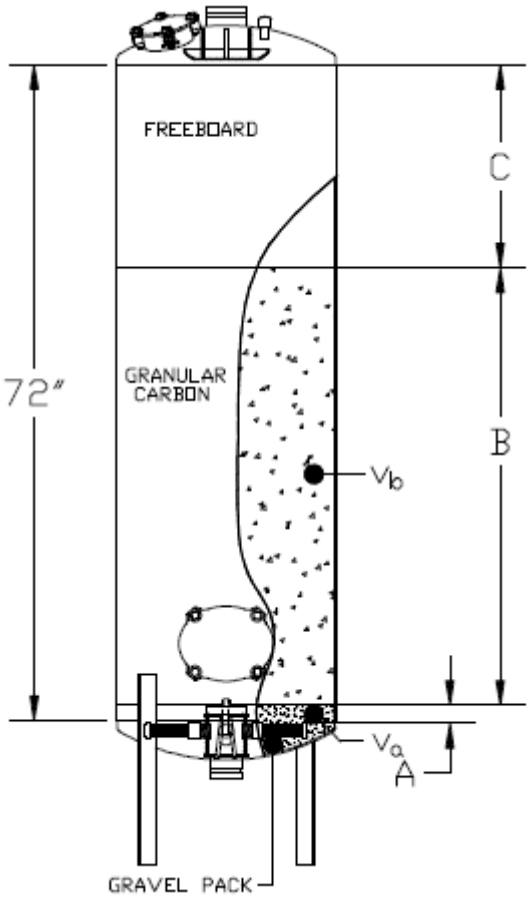
<u>CAUTION:</u> Wet granular activated carbon in closed vessels creates an oxygen depletion condition, which is hazardous to human health, unless proper precautions are observed. Lack of oxygen due to depletion can be fatal! Take caution and DO NOT enter a tank loaded with carbon.

Once the crushed rock has been installed and packed around the collection laterals, it should be raked moderately level. The succeeding layer of carbon should now be installed.

Remove all foreign material (i.e. pieces of media bagging 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.

4. INITIAL BACKWASHING

After completion of the loading process, the filters should be filled with clean, fresh water and allowed to soak for a minimum of 24 hours. After the soaking period the filters should be backwashed following the sequence designed for the filter system. It is recommended that the backwash operation be performed using the manual mode of operation. By the manual mode the operator will familiarize himself with the filter system and will also be available to spot any potential operational problems prior to actual operation of the filter system. The filter should be cleaned until such time as the backwash water becomes clear. A quick check of the backwash water may be made filling a glass container with the water as it exits the filter. The container should not have any sedimentation at the bottom after the water has settled. Granular activated carbon can have significant amounts of black dust associated with it and should be backwashed until the backwash water runs clear. **Refer to Page 11 for backwash instructions.**



FILTER DIAMETER (INCHES)	½" TO ¾" CRUSHED ROCK A (INCHES)	Va (ft³)	GRANULAR ACTIVATED CARBON B (INCHES)	Vb (ft³)	C (INCHES)
18	2	1.0	48	7.0	22.5
24	2	1.5	48	12.5	22.5
30	2	2.5	48	19.5	22.5
36	2	4.0	48	28.0	22.0
48	2	7.0	48	50.0	25.0
54	2	9.5	48	63.5	24.5

TABLE 3: MEDIA LOADING TABLE; ALL DIMENSIONS AND VOLUMES ARE APPROXIMATE.

5. ROUTINE MEDIA CLEANING

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

The condition, which determines the length of the filtering cycle, 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 twenty steps (for more complex systems). If the filter system were comprised of several filters, the cleaning sequence steps would be multiplied by the number of filters. However, regardless of the complexity of the cleaning sequence, all filters are cleaned by reversing the water flow inside the filter.

In a simple cleaning sequence, valve manipulation will occur simultaneously while in a complex cleaning sequence the valve manipulation will occur over a period of several minutes. In the case of the multiple unit filter system, a delay between stations is recommended to minimize water surges within the filter system.

6. DIAPHRAGM VALVES

The single tank GAC series carbon filter utilizes four (4) air actuated (standard) or hydraulically actuated (optional) diaphragm valves for routing of water during filtration and backwash. The standard system is designed to use air pressure to actuate the four (4) valves. The air supply to the valves should be regulated to provide air pressure equal to or slightly higher than the operating pressure.

NOTE: On systems that are supplied with hydraulically actuated valves (see page 9 and 10.)

Air supply must be maintained at all times when the filter is in operation. The “backwash in” and “backwash out” valves require a continuous supply of air to maintain the closed position. If air supply fails, the “backwash in” and “backwash out” valves will revert to the open position.

When the filter is in the **filtration cycle**, the valve position is as follows:

Inlet	open
Outlet	open
Backwash In	closed
Backwash Out	closed

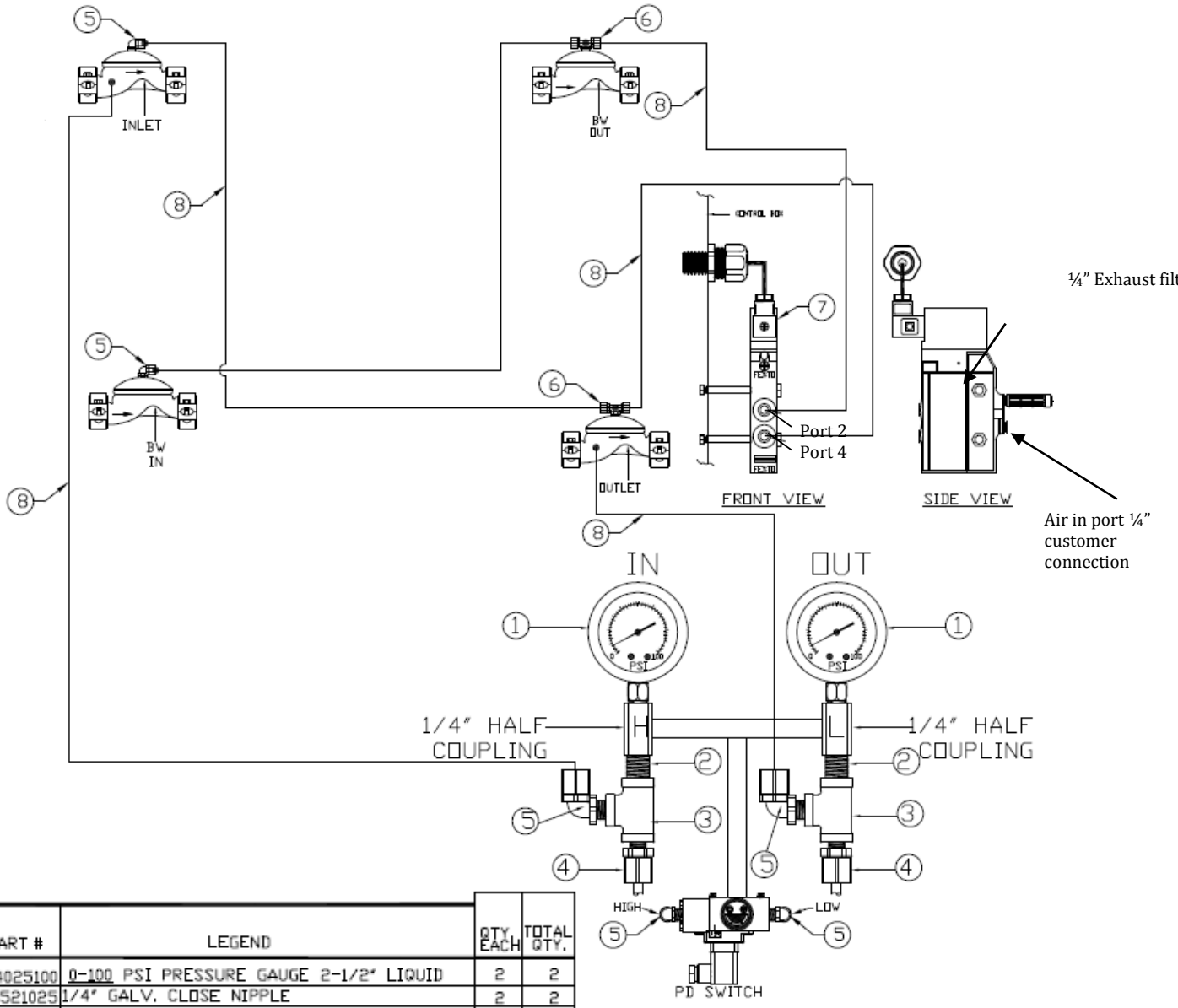
When the filter is in the **backwash cycle** the valve position is as follows:

Inlet	closed
Outlet	closed
Backwash In	open
Backwash Out	open

When the backwash cycle has been completed, the valves will automatically revert back to the position for the filtering cycle.

AIR ACTUATED VALVES –STANDARD

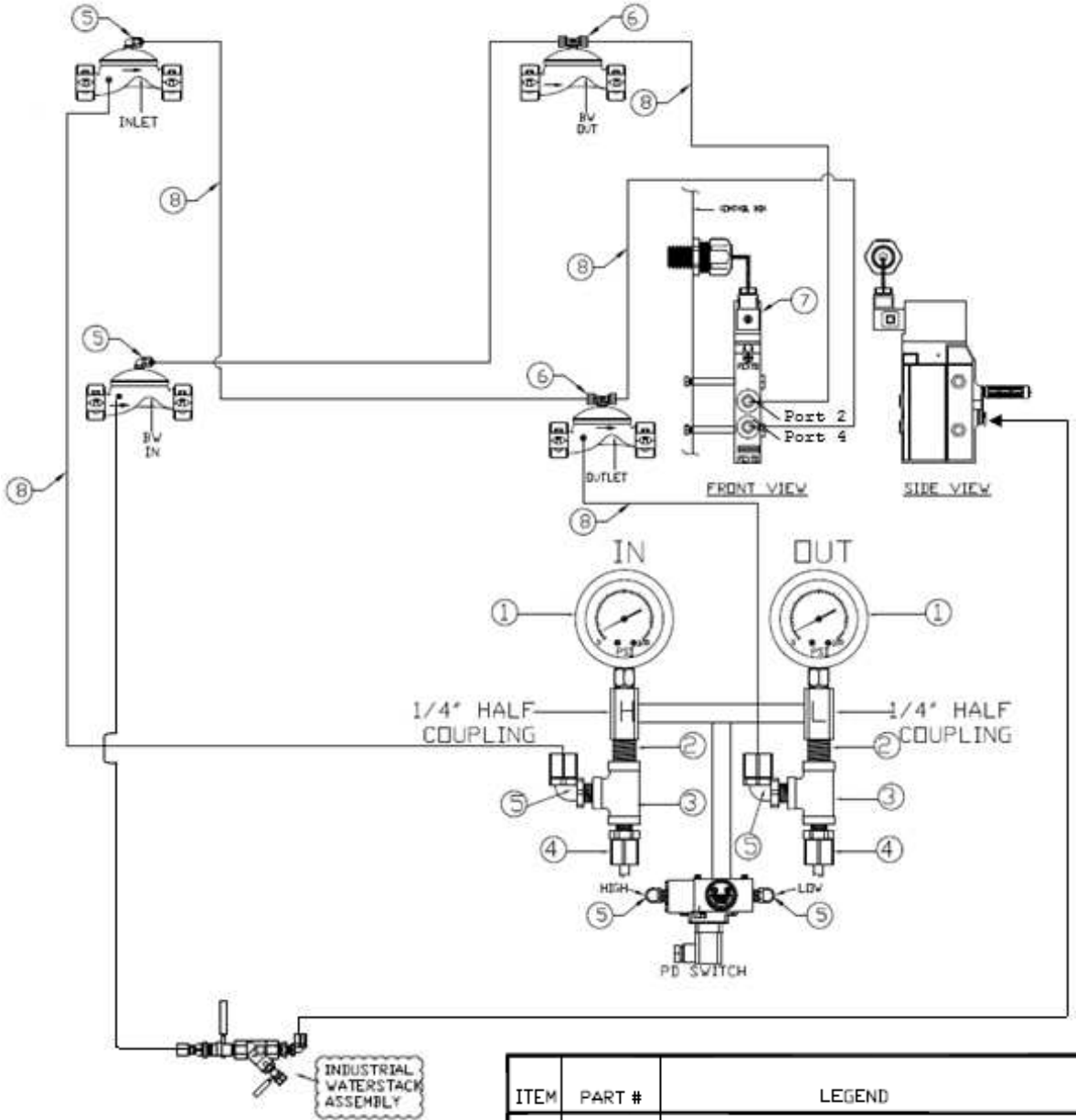
The air supply to operate the valves is connected to the pressure port on the back side of the solenoid valve, mounted on the backwash controller. The two ports on the front of the solenoid supply air to the influent and effluent valves and the backwash in and backwash out valves. During filtration mode air is supplied to the backwash in and backwash out valves through port 4. When a backwash cycle is initiated, air is supplied to the inlet and outlet valves through port 2.



ITEM	PART #	LEGEND	QTY. EACH	TOTAL QTY.
1.	144025100	0-100 PSI PRESSURE GAUGE 2-1/2" LIQUID	2	2
2.	106521025	1/4" GALV. CLOSE NIPPLE	2	2
3.	107011025	TEE GALVANIZED 1/4"	2	2
4.	143010404	POLYPROPYLENE P4MC4 CONNECTOR	2	2
5.	143003400	POLYPROPYLENE P4ME4 ELBOW	6	6
6.	143004000	1/4" POLY PROP "T" (P4MT4)	2	2
7.	166002478	SOLENOID 24VAC 4-WAY FESTO	1	1
8.	143000025	1/4" OD X .170" ID TUBING, POLYETHYLENE	AS NEEDED	
9.	106522150	NIPPLE GALVANIZED 1/8" X 1"	1	1

WATER ACTUATED VALVES – OPTIONAL

The hydraulic pressure supply to operate the valves is fed through the water-stack located on the inlet manifold. This supply is filtered through a small strainer inside the valve. The strainer should be cleaned during normal maintenance to remove any buildup of foreign material.



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5.	143003400	POLYPROPYLENE P4ME4 ELBOW	6	6
6.	143004000	1/4" POLY PROP "T" (P4MT4)	2	2
7.	166002478	SOLENOID 24VAC 4-WAY FESTO	1	1
8.	143000025	1/4" OD X .170" ID TUBING, POLYETHYLENE	AS NEEDED	
9.	106522150	NIPPLE GALVANIZED 1/8" X 1"	1	1

7. OPERATION OF THE AUTOMATIC CONTROLS

Yardney GAC 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 backwashes.

7.2 Flush Duration – Sets the duration of the backwash.

7.3 Delay – Set to “0” seconds for air actuated valves. Set to allow for a slight valve overlap on hydraulically actuated valves.

7.4 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. THE BACKWASH FUNCTION

Backwashing the filter is the process by which water flows upward through the filter bed, lifting and expanding the media allowing it to release the collected contaminant. Excessive backwash flow will expand the media to the point that the media itself is expelled out of the tank. Insufficient backwash flow will not expand the media enough to purge all the entrapped contaminant. This could result in a residual pressure loss through the bed even after backwash. To achieve maximum filter performance, the backwash flow must be properly adjusted.

BACKWASH FLOW CONTROL ADJUSTMENT PROCEDURE

8.1 Prior to adjustment, the filter must be ran for a few minutes to fill the system to the designed pressure and flow. The system discharge flow control valve should be adjusted prior to making any backwash flow adjustment.

8.2 Open the backwash control gate valve approximately one turn.

8.3 Press the start button on the controller. This will put the filter into a backwash cycle for the length of time set on the duration window. This sequence may have to be done more than once to provide enough time for proper backwash adjustments.

8.4 Using a piece of screen or a sampling device, monitor the content of the backwash water from the sand filter.

8.5 If the media shows in the backwash water, gradually close the backwash control gate valve until the water is showing only a slight trace of media. If no media is showing, gradually open the control gate valve until a trace amount of media is showing. A trace amount of media is acceptable since it is desirable that the lighter granules (fines) in the new media bed are allowed to wash out. After adjustment of the backwash adjustment valve, the handle should be covered or removed to avoid tampering.

OPTIONAL EXTERNAL WATER BACKWASH

On GAC series industrial filters that will utilize municipal for other clean water backwashing, the following instructions should be followed.

The clean water supply for backwashing is connected to the normally closed valve marked “backwash in.” The amount of water required for backwashing can be found in Table 1, page 4 of this manual.

The correct backwash flow can be achieved by either of the following two methods. The first method requires adjusting the flow of the **external supply** before the filter. This can be achieved by using a flow-regulating device installed in the external supply line. The other method is to adjust the backwash manifold. Either method will provide for correct adjustment of the backwash flow

If the system utilizes hydraulic pressure to actuate the valves, then the water system should be operational prior to turning in the clean water supply. If not the “backwash in” valve will be in the “OPEN” position allowing the water to flow into the system.

On systems that utilize air pressure to actuate the valves, the air pressure to the valves should be “ON” prior to starting the filter system.

NOTE: Provisions should be made to either by-pass the filter system or shut down the filter feed pump during the back flush cycle. If the pump is allowed to run, then a “deadhead” condition on the pump could result in damage to the pump.

If the supply for backwash has a higher pressure than the system operating pressure of the system, then the air supply should be regulated to provide an equal or higher pressure of this supply.