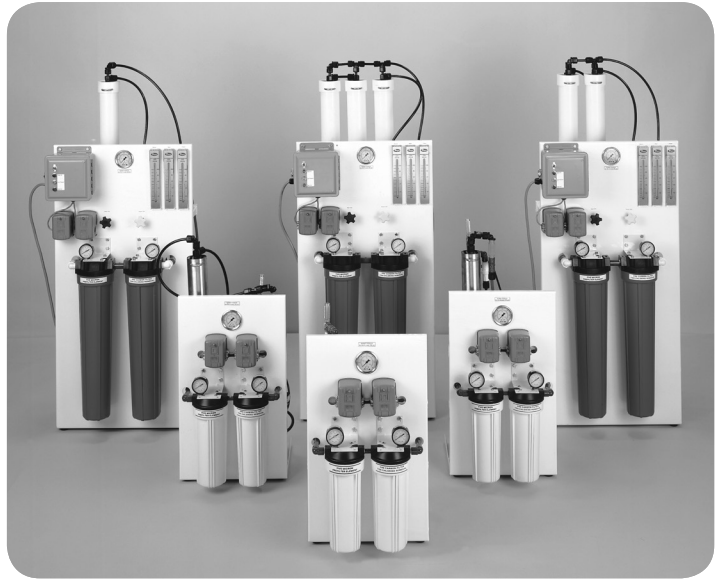


OWNERS MANUAL

WGR Series Reverse Osmosis System

WGR-150
WGR-300
WGR-450



- ◆ Please read carefully all instructions before proceeding with the installation. Systems must be properly installed, operated and maintained . Failure to do so voids the warranty.
- ◆ Pre-treatment equipment must be properly installed and must always be operated as intended. The pre-treatment equipment must not pass untreated water to the RO when regenerating. A RO lock out switch can be used to shut down the RO during these regeneration periods. Failure to do so will void the warranty.
- ◆ The systems must be protected from freezing temperatures and avoid installing in direct sunlight.
- ◆ Do not use the system with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.
- ◆ Test the water periodically to verify that the system is operating satisfactorily. A regular preventative maintenance inspection by a water professional is recommended.
- ◆ Handle all components with care. Do not drop, drag or turn components upside down.
- ◆ Check all local plumbing and electrical codes. The installation must conform to them.
- ◆ It is recommended to wait until the entire system is fully pressurized , confirmed to be operating properly, and recheck for leaks before leaving the site.

U.S.A.

9760 Mayflower Park Drive,
Suite 110
Carmel, IN 46032

4645 McDowell Rd. W
Suite 106
Phoenix, AZ 85035

56 Lightcap Rd.
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INTRODUCTION TO REVERSE OSMOSIS (RO)

Common Terms & Definitions:

Feed Water: The water that is introduced to the RO membrane for purification.

Product Water: The purified water produced by the RO unit.

Waste Water: The water that does not pass through the RO membrane. This water is to be directed to a drain.

Membrane: The fabric that the feed water passes through to become product water. It is usually a large surface area sheet that is spiral wound into a tube shape. It has channels for product flow and removal once the feed water has passed through the membrane.

Module: This is the completed package with the RO membrane installed inside the pressure vessel.

Gallons per Day (GPD): RO systems are normally sized with this rating. A 450 GPD rating means this unit could produce 450 gallons per day of purified water at a given temperature.

TDS: Total Dissolved Solids. This is a measure of product water purity, measured in parts per million.

Parts per Million (ppm): The measure of TDS. The parts of Total Dissolved Solids per one million parts of water (i.e. one pound of mineral salts dissolved in one million pounds of water will give one part per million of TDS).

Percent Recovery: The amount of feed water that passes through the membrane to become product water (i.e. If 1000 gallons of feed water are introduced to the RO system and 500 gallons of product water are produced then the percent recovery would be 50%).

Percent Rejection: The amount of total dissolved solids or chemicals rejected by the RO membrane.

Turbidity: Suspended biological, inorganic and organic particles in water which may be in sufficient amount to make the water seem cloudy.

How Reverse Osmosis Works:

Osmosis is the process by which water moves across a semi-permeable membrane from a low concentration of solute to a high concentration of solute. Reverse osmosis depends on the presence of a barrier or membrane that is selective so that solvent of a solution can pass through the membrane while other components of the solution cannot. The osmotic pressure is the pressure required to stop the flow of solvent through a semi-permeable membrane separating two solutions of different concentrations. To separate water from dissolved solids by reverse osmosis, the applied pressure must be greater than the osmotic pressure.

Reverse osmosis is the finest level of filtration available. The RO membrane acts as a barrier to all dissolved salts and inorganic molecules, as well as organic molecules with molecular weight greater than approximately 100. Water molecules on the other hand pass freely through the membrane creating a purified product stream. Rejection of dissolved salts is typically 95% to greater than 99%.

Factors Affecting Performance:

Permeate flux and salt rejection are the key performance parameters of the reverse osmosis process. They are mainly influenced by variable parameters such as; pressure, temperature, recovery, and feed water salt concentration.

Pressure: Increased feed water pressure will increase permeate flux and decrease the permeate TDS. With excessive pressure the membrane may become deformed or compacted and a decrease in product flow will result.

Temperature: Increased temperature will increase permeate flux, which increases salt passage. It is also important to note that every unit is rated for a product flow temperature of 77°F (25°C). With a temperature decrease, the product flow will decrease. On average the membranes lose about 2% production for every degree below 77°F.

Recovery: The recovery is the ratio of the permeate flow to the feed flow. When recovery is increased, the permeate flux will decrease and the salt passage will increase.

Feed water Concentration: Increased TDS or salt concentrations will decrease permeate flux and increase salt passage. This can also lead to surface coating or fouling by the salt.

Bacteria: If bacteria is allowed to grow on the membrane it will digest the top layer of the membrane and reduce the ability of the membrane to reject salt.

Hydrolysis: This is the effect of chemicals in the feed water on the membrane. This happens when the water temperature is high and the pH of the water is above 7 and below 2.5. To achieve optimum membrane life, a pH between 5 and 6 should be maintained.

WGR SERIES SPECIFICATIONS

| Performance Specifications | | | |
|----------------------------------|---------------|-----------|-----------|
| Item Number | 2610 | 2611 | 2612 |
| Model | WGR-150 | WGR-300 | WGR-450 |
| Capacity (GPD) ⁽¹⁾ | 150 | 300 | 450 |
| Maximum Operating Pressure (psi) | 190 | | |
| Typical TDS Rejection | > 97% | > 97% | > 97% |
| Recovery | up to 50% | up to 50% | up to 50% |
| Membranes | 1 | 1 | 2 |
| Dimensions, H x W x D (inches) | 32 x 14 x 20 | | |
| Inlet Connection | 1/2" | 1/2" | 1/2" |
| Motor (HP) | 1/4 | 1/3 | 1/3 |
| Electrical (Standard) | 115V/1Ph/60Hz | | |
| Shipping Weight (lbs) | 50 | 50 | 55 |

NOTE

Operating in excess of these conditions may result in more frequent cleaning or premature failure of the membrane. The limited warranty will become void if failure or reduced performance is due to improperly treated feed water

| Feed Water Requirements | | | |
|------------------------------|---------------------------------------|-------------------------------------|------------|
| Minimum Feed Pressure (psi) | 30 | Hydrogen Sulfide (H ₂ S) | 0.00 mg/L |
| Maximum Feed Pressure (psi) | 85 | Organics Tolerance ⁽²⁾ | 0 mg/L |
| Temperature Range | 40 - 100°F (4 - 37°C) | Oil (Hydrocarbons) Tolerance | 0 mg/L |
| Total Dissolved Solids (TDS) | <2000 ppm | Turbidity ⁽²⁾ | <1 NTU |
| Hardness | <10 Grains/USGal as CaCO ₃ | SDI (Silt Density Index) | <5 |
| Total Iron (Fe) | <0.1 mg/L | Chlorine Tolerance ⁽²⁾ | 0 mg/L |
| Manganese (Mn) | <0.05 mg/L | pH Range | 2.0 - 11.0 |

⁽²⁾ Sediment and Carbon pre-filters, standard on the WGR Series must be replaced regularly to protect membranes. These feed requirements also include that the water be potable before treatment by a WGR Series RO system.

| Model | Qty Membranes | Nominal Rating | | Recovery % | Rejection | Operating Pressure | Motor HP | Voltage | Connections | | | Dimensions (in) HxWxD inches | Shipping Weight |
|---------|---------------|----------------|-------|------------|-----------|--------------------|----------|---------|-------------|-------|---------|------------------------------|-----------------|
| | | USGPD | USGPM | | | | | | Inlet | Waste | Product | | |
| WGR-150 | 1 | 150 | 0.1 | Up to 50% | > 97% | 190 psi | 1/4 HP | 120V | 1/4" | 3/8" | 3/8" | 32 x 14 x 20 | 50 lbs |
| WGR-300 | 1 | 300 | 0.21 | Up to 50% | > 97% | 190 psi | 1/3 HP | 120V | 1/4" | 3/8" | 3/8" | 32 x 14 x 20 | 50 lbs |
| WGR-450 | 2 | 450 | 0.31 | Up to 50% | > 97% | 190 psi | 1/3 HP | 120V | 1/4" | 3/8" | 3/8" | 32 x 14 x 20 | 55 lbs |

¹ The maximum permeate flow as defined by the membrane specifications and the feed water conditions of 2,000 ppm NaCl, 77 deg. F, 200 psi operating to atmosphere.

² TDS rejection and water recovery are variable and can be affected by temperature and feed water conditions.

SYSTEM COMPONENTS

- 1. Feed Water Pressure Gauges:** The inlet pressure gauge reads the feed water pressure. The second pressure gauge, after the sediment filter and carbon filter, reads the water pressure entering the process pump. As the filters become clogged, a pressure drop will develop across the filters. A pressure drop of 7 psi or more will indicate the need to check or replace filters.
- 2. System Pressure Gauge:** This gauge indicates the water pressure that is being discharged by the pump and applied to the first R.O. membrane. The recommended system operating pressure is 200 psi. This should not be exceeded.
- 3. Process Pump:** The R.O. unit uses a rotary vane positive displacement pump. It has a brass external housing with stainless steel internal components. Maximum discharge pressure for the pump is 200 psi.
- 4. Operating Pressure Control:** The maximum system operating pressure is controlled by a built in by-pass in the positive displacement pump. The pump is factory pre-set for 200 psi. In the event an adjustment is required, turn the slot blade screw to the right for higher pressure and to the left to decrease the pressure.
- 5. Pump Motor:** The electrical service required for the motors is 120 V, 60 HZ, single phase. Verify that available power exactly matches the voltage, hertz, and phase on the motor name plate before connecting any power to the unit. Connecting the unit to a power source which does not match the unit power rating exactly may cause damage and void the warranty.
- 6. Low Pressure Switch:** The low pressure switch will automatically shut down the system should the feed water pressure drop below 15 psi. The system will re-start when the pressure rises to 25 psi. Operating the system below feed water pressure of 20 psi will cause pump damage.
- 7. Tank Full Switch:** The system is designed for pressurized storage tank system. The system will shut down when the storage tank pressure reaches 50 psi. It will re-start when the storage tank pressure drops below 30 psi.
- 8. Float Switch (optional):** The system can be used in conjunction with an atmospheric tank as well. A float switch installed in the tank will measure tank level and turn the RO system on when levels are low and off when levels are high.
- 9. Pressure Regulator:** This valve controls the amount of concentrate being recycled to the feed inlet of the pump. It is also used to fine tune and adjust the system pressure. **WARNING - DO NOT TURN THE PRESSURE ADJUSTMENT ALL THE WAY OUT. IT WILL COME OFF THE THREADS AND MAY CAUSE INJURY BY SHOOTING UPWARDS.**
- 10. Pre-Filter:** This filter is a 10" sediment filter that removes suspended particles such as dirt or scale down to 5 micron in size.
- 11. Carbon Filter:** This is a 10" granular activated carbon filter. It removes chlorine from the feed water. Chlorine will attack and destroy thin film composite membranes. dirt or scale down to 5 micron in size.
- 12. Inlet Solenoid Valve:** This 1/2" normally closed solenoid valve opens to allow feed water into the system when feed pressure rises above 25 psi and shuts off when pressure falls below 15 psi to ensure that damage does not occur to the pump.
- 13. Manual Flush Valve:** This 1/4" ball valve can be manually opened when the unit is in operation to fast flush the membranes. The waste water is diverted through a bypass around the waste water valve and recycle valve to drain.

NOTE

Open and close valve slowly as system pressure is reduced and increased greatly during operation of the flush valve.

- 14. Pre-Filter Isolation Valve:** This 1/4" ball valve is the inlet connection for the feed water to the system. It allows the feed water to be turned off directly on the unit.

INSTALLATION INSTRUCTIONS

Location:

The WGR system should be positioned in a suitable location near inlet water, drains, and electrical outlet. The unit should be located indoors on a solid level base which can support the weight of the unit. Allow enough space for servicing of the unit and removal of the membranes.

Install the unit away from direct sunlight in a well ventilated location. Ensure that the system is protected from weather or excessive dust.

Dimensions: height -- 30"

Width: -- 15"

Depth: -- 18"

Water Supply Connection:

The water supply connection is 1/4" FNPT on pre-filter isolation valve. Run 1/2" or 3/8" softened water supply line to the valve.

⚠ CAUTION!

Use only Non-Ferrous materials when connecting the water supply to the WGR system. Iron is detrimental to the membrane and causes fouling and pre-mature failure of the membrane.

Product Water Connection:

The WGR system comes with 10 ft of blue 3/8" tubing running from the product water flow meter. This tubing is to be connected to the storage tank using 3/8" compression tubing fittings.

Reject Water Connections:

The WGR system comes with 10 ft of black 3/8" tubing running from the waste water flow meter. This tubing should be run to a suitable drain (floor drain or stand pipe) This connection should include a proper air gap to prevent possible

back flow. (Consult local plumbing codes) Ensure that the drain line tubing is fastened securely. When the system goes into fast flush mode, considerable pressure is applied and the tubing may come loose.

Electrical Connections:

Verify that the available power exactly matches the voltage, hertz, and phase specified on the systems name plate before connecting any power to the unit.

Float Switch Connections:

A float switch can be supplied by the manufacturer for this system. The float switch will come with a plug in that the RO unit plugs into. The other end of the piggy back then is plugged into the wall outlet. This will cut power to the RO unit when the atmospheric tank is full and restore power when tank is empty. The mechanical float switch works on a 45 degree angle for pump on and off levels.

⚠ CAUTION!

Connecting the unit to a power source which does not exactly match the unit power rating exactly may cause damage and void the warranty.



SYSTEM COMPONENTS

Float Switch Connections (Optional):

A float switch may be connected to this system for use with an atmospheric tank. Remove the pressure switch covers from both the low pressure and tank full switches. Disconnect the black wire at both ends of the cable connecting the two pressure switches. Connect the black and white wires of the float switch to the pressure switch where the old black ones were. Replace the pressure switch covers.

START-UP PROCEDURE

Before running the RO system the granular activated carbon filter has to be flushed. To do this place the carbon filter into the first filter housing and leave the second filter housing removed. Place a bucket under the second filter top to catch runoff. Open the pre filter isolation ball valve and flush for 2 minutes. Throw waste water away. Once the carbon filter has been washed install it in the second housing and replace the sediment filter into the first housing.

Pre-Start Check List:

1. Sediment filter and Carbon filters in place.
2. Minimum inlet pressure 30 psi.
3. System is plugged into proper electrical supply.
4. Black waste water and blue product water lines are connected to drain and storage tank.
5. Carbon filter has been flushed to remove excess carbon.
6. Open pressure regulator almost completely. **WARNING - DO NOT TURN THE PRESSURE ADJUSTMENT ALL THE WAY OUT. IT WILL COME OFF THE THREADS AND MAY CAUSE INJURY BY SHOOTING UPWARDS.**

MAINTENANCE

Pump:

Before running the RO system the granular activated carbon filter has to be flushed. To do this place the carbon filter into the first filter housing and leave the second filter housing removed. Place a bucket under the second filter top to catch runoff. Open the pre filter isolation ball valve and flush for 2 minutes. Throw waste water away. Once the carbon filter has been washed install it in the second housing and replace the sediment filter into the first housing.

Reverse Osmosis Membranes:

The condition of the membranes is indicated by comparing the current permeate water quality (TDS) and production to the baseline permeate quality and production values that were established upon initial installation.

Flushing Membrane:

Organic and/or mineral sludge tends to build up on the surface of the membrane that can reduce its performance. Open the manual flush valve located on the back of the system slowly and let the unit fast flush for five minutes. Once a week flushing is helpful. In some cases, once a day flushing may be desired to control odor from organic build up.

Membrane Removal and Replacement:

Disconnect all piping connected to the membrane at the point closest to the membrane. Remove the membrane and housing from the RO unit. Remove the 'U' bolt at the bottom of the membrane. The end cap will only have one hole.

Start-Up:

1. Open pre-filter isolation valve.
2. Check that the manual flush valve is in the open position. The valve is open when the handle is in line with the valve.
3. Immediately monitor the system pressure gauge to insure that the system does not exceed 200 psi.
4. With pump running, slowly close the manual flush valve. Immediately monitor the system pressure gauge to insure that the system does not exceed 200 psi.
5. With pump running, slowly close the pressure regulator until the system pressure reaches 150 psi. Observe that as the regulator is closed, the system pressure increases. Do not let the system pressure go over 200 psi. If necessary, open the regulator to lower system pressure. By continuing this fine tuning process, the desired system pressure can be achieved.
6. To check the operation of the low pressure switch, slowly close the pre-filter isolation valve. The system should shut down at 15 psi. Slowly open the valve and the system should initiate start-up at 25 psi.
7. Leave the system running until the storage tank fills to ensure proper operation of the tank full switch.
8. The system should stabilize after 20-30 minutes of operation.

This should be the high pressure end. This end has a brine seal which forces the water to pass through the inside of the membrane. Carefully remove the end cap from the vessel using a pulling/twisting motion.

Remove the membrane from the pressure vessel by pulling on the product water tube. If additional force is required, pliers in tape wrapped could be used for removal. Check the internal and external 'O' rings for wear or damage. If damage is evident they must be replaced.

Re-install membrane in the same manner as it was removed. Slide end cap back into the membrane and replace the 'U' bolt. Replace all piping that was removed. Test membrane for any leaks. Once all leaks are repaired, restart the unit using normal start-up procedures.

TDS Reading:

After initial installation, check and note the TDS of the product water using a portable hand held TDS meter. Subsequent readings should be compared to this reading to determine whether any potential problems are developing. Over a period of time, a gradual increase in product water TDS can be expected. Rapid increases require further attention.

Product water TDS can increase by one or more of the following factors;

1. Increase in feed water TDS
2. Membrane is fouled with mineral salts due to a recovery rate that is too high.
3. Carbon filter is exhausted and no longer removing chlorine. Chlorine will permanently damage the membrane.
4. Membrane is fouled with biological contamination such as algae or bacteria.

MAINTENANCE

Filters:

When a large pressure differential (7 psi or more) develops across the 5 micron sediment filter and the granular activated carbon filter, they should be replaced.

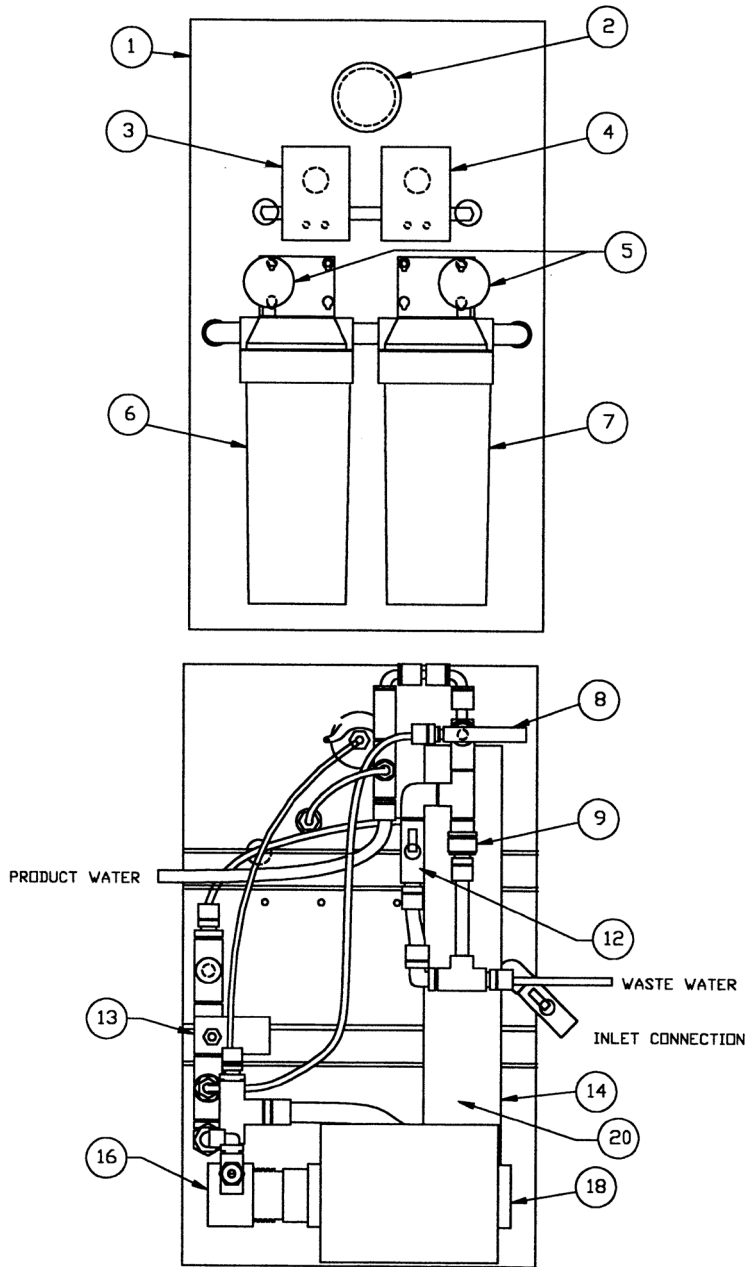
The activated carbon filter reduces volatile organic compounds and removes chlorine. When the permeate water shows the first sign of objectionable taste or odor, the carbon filter is nearly expended. It should be changed every 3-6 months or sooner if chlorine is detected after the cartridge filter.

TROUBLE SHOOTING

| Problem | Probable Cause | Solution |
|---------------------------------|--|---|
| R.O. UNIT WILL NOT START | No electrical power to control circuit | Check power supply, circuit breakers, fuses etc. |
| | Storage tank full | Drain portion of water from storage tank |
| | Low feed pressure | Check feed water supply |
| | Pump motor | Check or replace |
| | Pressure or float switch defective | Check or replace |
| LOW FEED PRESSURE | Feed water valve turned off | Check |
| | Feed water solenoid defective | Check or replace |
| | Obstructed feed line | Check |
| | Upstream pre-treatment | Check |
| | Inlet feed pressure | Check |
| NO HIGH SYSTEM PRESSURE | System pressure gauge broken | Check and replace |
| | Pump impellers worn | Check and replace |
| | Low water volume to pump | Check |
| | Malfunctioning pump | Check, replace if necessary |
| NO REJECT WATER | Clogged drain line | Check and clean |
| NO HIGH SYSTEM PRESSURE | Low pump pressure | Check and adjust |
| | Membrane plugged | Check, clean, or replace |
| | Low water temperature | Check |
| LOW FLOW RATE | Membrane fouled | Check, clean, or replace |
| | Product water check valve stuck | Replace |
| HIGH PRODUCT | Membrane expended | Replace |
| WATER TDS | Insufficient brine flow | Replace or flush concentrate valve |
| | Increase in feed water TDS | Check |
| | Membrane brine seal not sealed against membrane housing | Check brine seal, use care when re-installing |
| BAD TASTING WATER | Filter Cartridges exhausted | Replace |
| | Tank and system contaminated | Replace filters and sanitize the tank |
| | Tank diaphragm ruptured | Re-sterilize tank |
| | Cartridge not flushed completely | Flush one or two tanks of pure water through |
| CLOUDY WATER | Dissolved air in feed water is concentrated in the product water | Usually clears up as condition of feed water changes. Letting water stand for a few minutes will allow the air to dissipate |

PARTS BREAKDOWN

WGR - 150

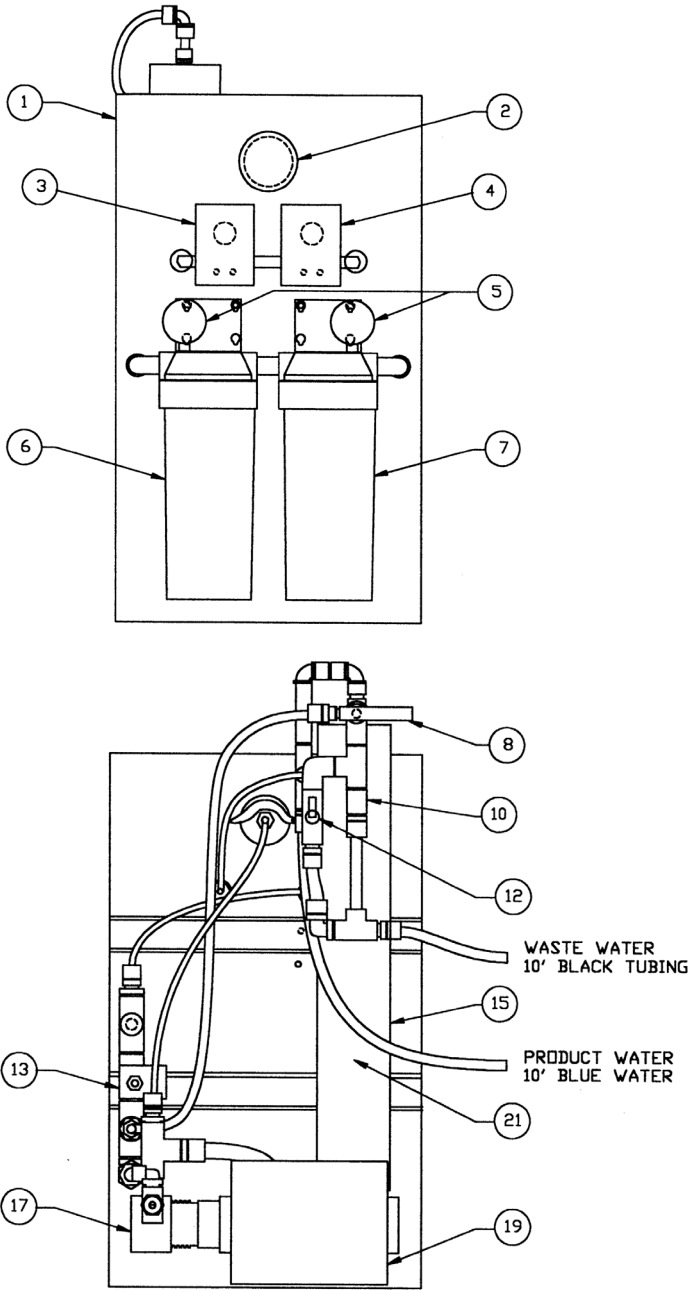


WGR Series Parts List

| No. | Part # | Description |
|-----|--------|------------------------------------|
| 1 | 92270 | Powder coated steel bracket |
| 2 | 101051 | Pressure gauge, 0-300 psi |
| 3 | 101031 | Pressure switch, 15 - 25 psi |
| 4 | 101032 | Pressure switch, 30 - 50 psi |
| 5 | 101047 | Pressure gauge, 0 - 100 psi |
| 6 | 92091 | 5 micron sediment filter, 10" |
| 7 | 92081 | Radial flow carbon filter, 10" |
| 8 | 965646 | Brass pressure regulator |
| 9 | 92462 | 150 gpd flow restrictor |
| 10 | 92463 | 300 gpd flow restrictor |
| 11 | 92464 | 450 gpd flow restrictor |
| 12 | 80702 | Manual Flush Ball valve, 1/4" npt |
| 13 | 80307 | Solenoid valve, 1/2" npt |
| 14 | 92030 | Membrane housing, SS, 14" |
| 15 | 92029 | Membrane housing, SS, 21" |
| 16 | 74906 | Pump, po201, 68 gph |
| 17 | 74907 | Pump, po2501, 85 gph |
| 18 | 100785 | Electric motor, 1/4 hp |
| 19 | 100786 | Electric motor, 1/3 hp |
| 20 | 92011 | Membrane, 14", thin film composite |
| 21 | 92007 | Membrane, 21", thin film composite |

PARTS BREAKDOWN

WGR - 300

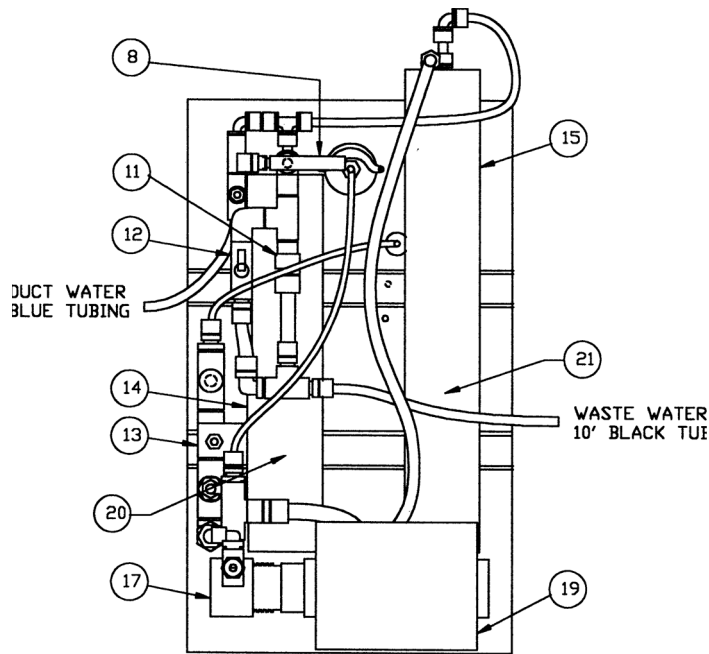
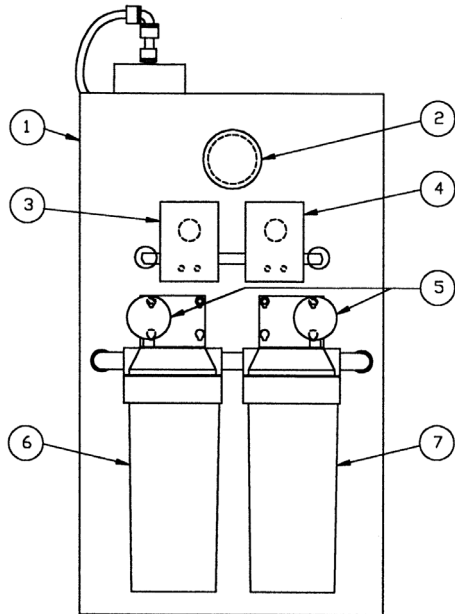


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| 21 | 92007 | Membrane, 21", thin film composite |

PARTS BREAKDOWN

WGR - 450

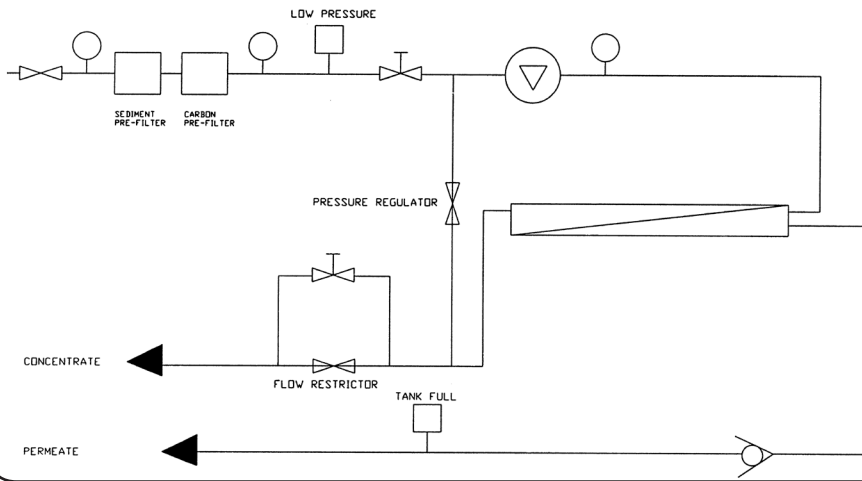


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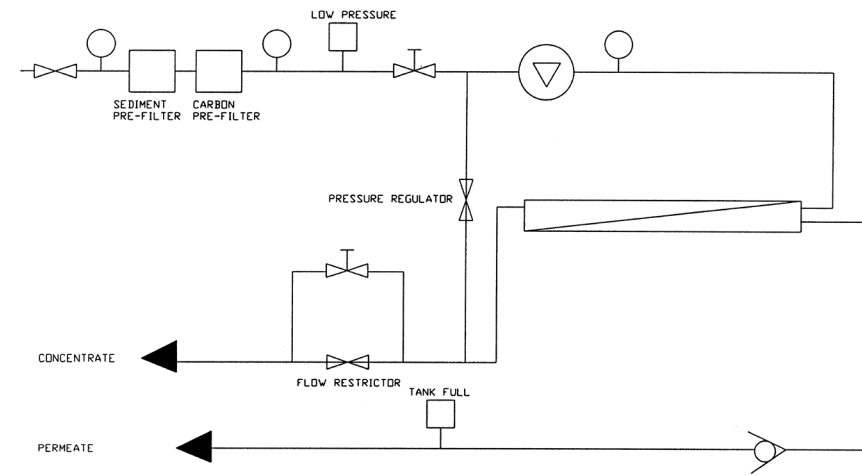
PIPING & INSTRUMENTATION

WGR - 150



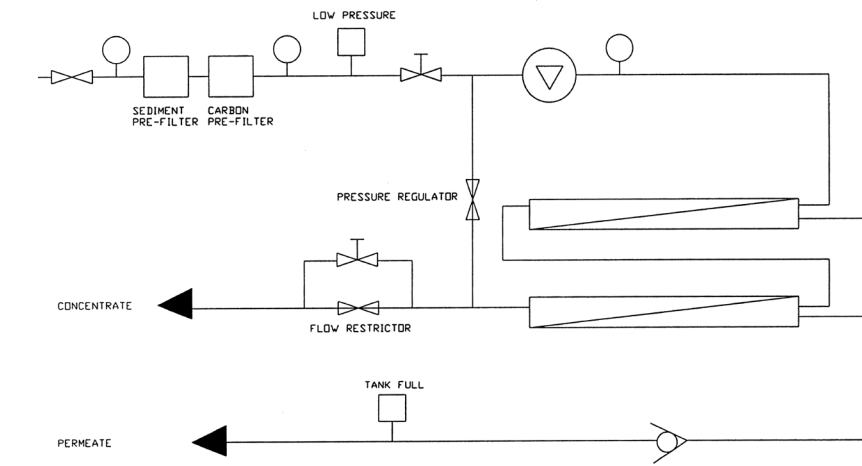
- LEGEND
- PROCESS PUMP
 - PRESSURE GAUGE
 - ISOLATION VALVE
 - SOLENOID VALVE
 - NEEDLE VALVE
 - PRESSURE SWITCH
 - FLOW METER
 - PRE-FILTER
 - CHECK VALVE
 - CONDUCTIVITY PROBE

WGR - 300



- LEGEND
- PROCESS PUMP
 - PRESSURE GAUGE
 - ISOLATION VALVE
 - SOLENOID VALVE
 - NEEDLE VALVE
 - PRESSURE SWITCH
 - FLOW METER
 - PRE-FILTER
 - CHECK VALVE
 - CONDUCTIVITY PROBE

WGR - 450



- LEGEND
- PROCESS PUMP
 - PRESSURE GAUGE
 - ISOLATION VALVE
 - SOLENOID VALVE
 - NEEDLE VALVE
 - PRESSURE SWITCH
 - FLOW METER
 - PRE-FILTER
 - CHECK VALVE
 - CONDUCTIVITY PROBE



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