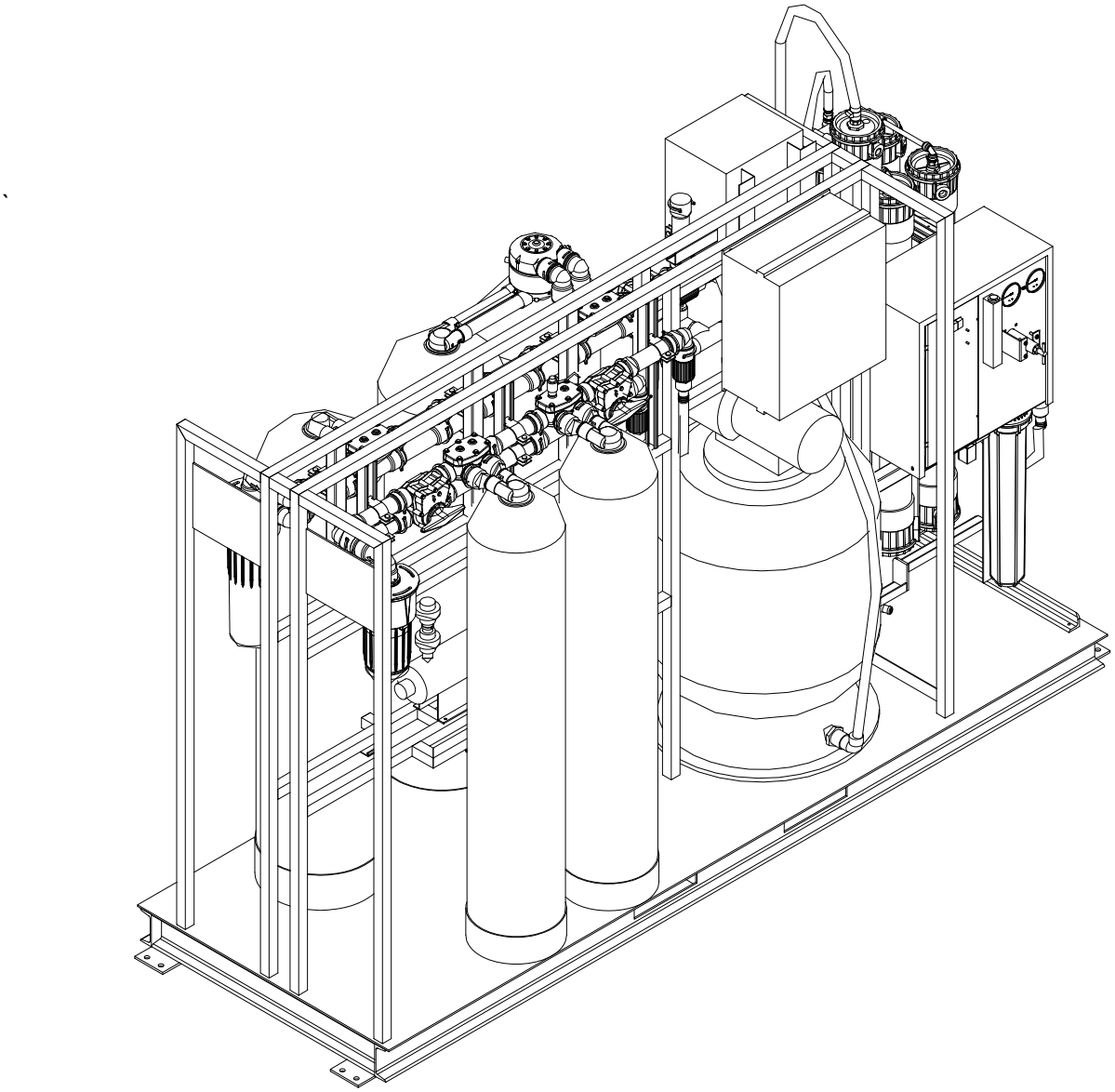
Kinetico®
water systems

Tech Manual
HP Series



Models:

HP 600p – Part #13028
HP 1200p – Part #13029
HP 2000a – Part #13030
HP 4000a – Part #13031
HP 6000a – Part #13032
HP 8000a – Part #13033

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About this Manual

This manual will cover information needed for the proper installation and operation of your Kinetico HP Series Commercial Reverse Osmosis System. We have also included information regarding the frequently asked questions about reverse osmosis systems. This information may be more technical in nature, but provides further insight to the continued operation of this equipment to its highest standards.

This manual will use various icons to help highlight issues that are relevant to the safe operation of this equipment. The following icons will be used as described:

General information regarding the application of this product will be highlighted by this icon. This will include technical specifications and expected operational results.

Lock Out Electrical Power
Use appropriate lockout procedures when servicing.

Maintain Safe Pressure
This sign indicates the safe operating pressure range.

Consult Maintenance Section
Refer to the maintenance section for specific instructions.

Consult Equipment Specifications Section
Refer to the equipment specifications section for specific instructions.

Consult MSDS Sheets

A caution icon will be used to present any information that may hold a potential hazard or concern during the installation, use or maintenance of this product. **Should this information not be followed, it may result in damage of this equipment and its surroundings.**

Electrical Shock or Electrocution Hazard

Pinch Point or Crushing Hazard

Chemical Hazard

The warning icon will be used to present any information that may result in a severe hazard or concern during the installation, use or maintenance of this product. **Should this information not be followed, it may result in severe physical harm.**

Stay Clear

Do Not Touch

No Access
Only properly trained and authorized persons can enter area or open panel.

Any tools or materials required during the installation, use or maintenance of this equipment will be preceded by this icon. Using these specific tools will minimize time and effort. Not using the proper tool may result in damage to this equipment, its surroundings or even physical harm.

If there are any additional questions pertaining to this equipment, please contact your local Kinetico Dealer for further assistance.

Reverse Osmosis (RO) Technology

RO technology offers the finest level of filtration available. The RO membrane acts as a barrier to dissolved salts and inorganic molecules, as well as organic molecules with a molecular weight greater than approximately 100. Water molecules, on the other hand, pass freely through the membrane creating a purified product stream.

Utilizing RO prior to Ion Exchange (IX) for the production of ultra high water qualities dramatically reduces operating costs and regeneration frequency of the IX system. Pressures associated with RO systems can range from 40 psi for tap water systems to 1,000 psi for sea water desalination systems.

Reverse osmosis is created when a force (pressure) is applied to a semipermeable membrane, thus "permeating" water through that membrane. This is the basis of the term reverse osmosis. Water is processed from the salt solution, since the membrane does not permit most salt to pass through it. The typical rejection of a semipermeable membrane is over 95%. This means that it will reject 95% of the salts and let 5% pass through.

Deionization Technology

Even though the water supply from the RO system has a reduced TDS, this water will still contain dissolved solids which form charged particles called ions. These ions are usually present in relatively low concentrations and permit the water to conduct electricity. These ionic impurities can lead to problems in many commercial and industrial applications. The process of deionization is the removal of all charged ions ("de"-"ion"-ization) from the source water.

Typical Deionization resins use a sulfone (from sulfuric acid) active site for the cation resin. This gives the resin a strong and effective removal of cations (positive ions) from the water. A typical strong base anion resin will use either trimethylamine (TMA) which creates a Type 1 strongly basic anion exchanger or dimethyl-thanolamine (DMEA) which makes a Type 2 anion resin.

By combining these two resins, a very high removal of ions can be accomplished. The resulting deionized water will typically have a specific resistance exceeding 10 MegOhm/cm. The specific resistance of ultrapure water, meaning no other ions will be present, is 18.3 MegOhm/cm.

The Kinetico HP Series Product Line

Kinetico's Reverse Osmosis / Ion Exchange product line is designed to provide a cost competitive solution compared to expensive service exchange mixed beds systems. This system integrates both RO and IX technologies to achieve maximum performance at minimal cost.

System features for the HP Series include:

- Preplumbed / Prewired, Skid Mounted System
- Six Stage Water Processing System
  - Filtration
  - Carbon Absorption
  - Softening
  - Reverse Osmosis
  - Deionization
  - Ultraviolet Sterilization
- Single Point Inlet / Outlet Connections
- Corrosion Resistant Skid
- High Purity Reservoir for Peak Demand Flow Consumption
- Compact System Design

Model Name	HP 600p	HP 1200p	HP 2000a	HP 4000a	HP 6000a	HP 8000a
Part Numbers	13028	13029	13030	13031	13032	13033
Prefilter	4" x 16"	4" x 16"	4" x 16"	4" x 16"	4" x 16"	4" x 16"
Carbon Filter	0.75 ft^3	0.25 ft^3	2.0 ft^3	2.0 ft^3	2.0 ft^3	2.0 ft^3
Softener	(2) 0.7 ft^3	(2) 0.7 ft^3	(2) 2.25 ft^3	(2) 2.25 ft^3	(2) 2.25 ft^3	(2) 2.25 ft^3
Reverse Osmosis System	TS 600	TS 1200	TL 2000	TL 4000	TL 6000	TL 8000
DI Tanks	(2) 1.0 ft^3	(2) 1.0 ft^3	(2) 2.2 ft^3	(2) 2.2 ft^3	(2) 2.2 ft^3	(2) 2.2 ft^3
U.V. Sterilizer	2 gpm	2 gpm	6 gpm	6 gpm	6 gpm	6 gpm
Rated* Daily Production	600 gpd	1,200 gpd	2,000 gpd	4,000 gpd	6,000 gpd	8,000 gpd
Continuous Flow Production	0.42 gpm	0.83 gpm	1.39 gpm	2.78 gpm	4.17 gpm	5.56 gpm
Storage Tank Capacity	40 gallons	40 gallons	230 gallons	230 gallons	230 gallons	230 gallons

Applications

From A to Z there are a variety of applications for the HP Series product line. Some ideas on how and where these applications can be found have been provided. Further detail of these application ideas will be available through case studies prepared for each market.

Autoclave Feed Water

Many laboratories are now equipped with their own sterilization equipment, the autoclave. This device sterilizes medical instruments and testing equipment through the use of heat and pressure. As part of its operation, feed water to the system is required. For many high-end sterilizers, the use of high quality deionized water is a requirement.

Reagent Grade Pretreatment Water

Analytical laboratories performing aqueous tests, will require high purity water as standards and mixture water. Laboratory grade water can be classified into four grades. Grades I-III are easily met using this type of multi-treatment process. For the top grade additional equipment may be required to meet biological and particle size standards.

Final Spot-Free Rinse Water

Operations requiring a final "spot free" rinse can benefit from the operation of a HP Series system. The quality produced by this system will be well above any spot free requirement.

Chemical Bath Makeup

Manufacturing facilities add large volumes of water to their chemical baths to make up for water lost by evaporation or drag-out. Using high quality water significantly reduces the risk of bath contamination from untreated water.

Parts Cleaning

Chemical cleaning formulations require purified rinse water following the cleaning process. By using water of the highest quality, chemical cleaning agents can work more effectively.

Humidifiers

High purity water is preferred and in many cases required for use in this equipment. With untreated water, maintenance on this equipment is very high. This is caused by the TDS contaminants from the raw water that concentrate in the humidifiers. Prolonged operation with typical raw water will eventually damage these units.

Ink additive

High volume printers such as newspapers, require high purity water to be used with the quick-drying printing press inks.

System Sizing

In sizing the HP System, the maximum output production is given based on the model number (i.e. HP2000 = 2,000 gallons per day). However, this output production is based on average system operating conditions, and depending on some factors, the output production can change significantly. The chart below compares the operation for the various systems.

	Continuous Production					Peak Production			
	40 °F	50 °F	60 °F	70 °F	80 °F	Flow Rate	Time	Reserve	Recovery
HP 600p	172 gpd	232 gpd	304 gpd	387 gpd	480 gpd	10 gpm	4 min.	40 gal.	336 min.
HP 1200p	343 gpd	465 gpd	608 gpd	773 gpd	961 gpd	10 gpm	4 min.	40 gal.	168 min.
HP 2000a	750 gpd	1,015 gpd	1,328 gpd	1,690 gpd	2,099 gpd	15 gpm	17 min.	250 gal.	480 min.
HP 4000a	1,501 gpd	2,031 gpd	2,657 gpd	3,380 gpd	4,199 gpd	15 gpm	17 min.	250 gal.	240 min.
HP 6000a	2,251 gpd	3,046 gpd	3,985 gpd	5,070 gpd	6,298 gpd	15 gpm	17 min.	250 gal.	160 min.
HP 8000a	3,001 gpd	4,061 gpd	5,314 gpd	6,759 gpd	8,398 gpd	15 gpm	17 min.	250 gal.	120 min.

	Continuous Production					Peak Production			
Temperature	40 °F	50 °F	60 °F	70 °F	80 °F	Flow Rate	Time	Reserve	Recovery
HP 600p	59 lb./hr.	80 lb./hr.	105 lb./hr.	134 lb./hr.	166 lb./hr.	10 gpm	4 min.	40 gal.	336 min.
HP 1200p	119 lb./hr.	161 lb./hr.	210 lb./hr.	267 lb./hr.	332 lb./hr.	10 gpm	4 min.	40 gal.	168 min.
HP 2000a	259 lb./hr.	351 lb./hr.	459 lb./hr.	584 lb./hr.	726 lb./hr.	15 gpm	17 min.	250 gal.	480 min.
HP 4000a	519 lb./hr.	702 lb./hr.	919 lb./hr.	1,169 lb./hr.	1,452 lb./hr.	15 gpm	17 min.	250 gal.	240 min.
HP 6000a	778 lb./hr.	1,053 lb./hr.	1,378 lb./hr.	1,753 lb./hr.	2,178 lb./hr.	15 gpm	17 min.	250 gal.	160 min.
HP 8000a	1,038 lb./hr.	1,404 lb./hr.	1,838 lb./hr.	2,338 lb./hr.	2,904 lb./hr.	15 gpm	17 min.	250 gal.	120 min.

EQUIPMENT SPECIFICATIONS

System Configuration

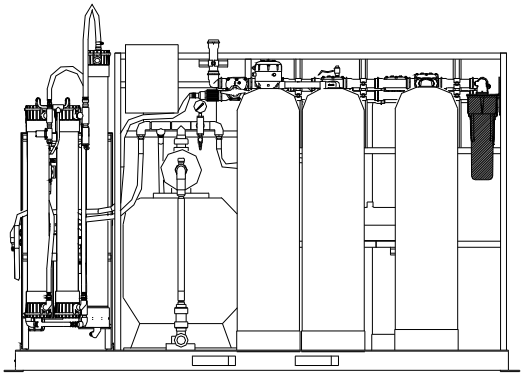
Kinetico's HP Series, is designed as a complete, prepackaged water treatment plant. The multi-stage treatment approach used accommodates a wide variety of inlet water qualities, while still producing a very high quality of process water. This multi-stage approach reduces the overall operating cost of the system, as the final polishing step, which uses service exchange tank mixed beds, can be run for a very long time, since the inlet load it considerably reduced.

Kinetico By-pass Valve Assemblies

Three Kinetico by-pass assemblies are used on the HP systems. The first, at the water inlet, can isolate the entire system or by-pass the prefilter, carbon and softener and allow the RO, mixed beds and UV to remain in service. The second by-pass valve by-passes the prefilter for filter changes. The third by-pass valve by-passes the post filter for filter changes.

Prefilter

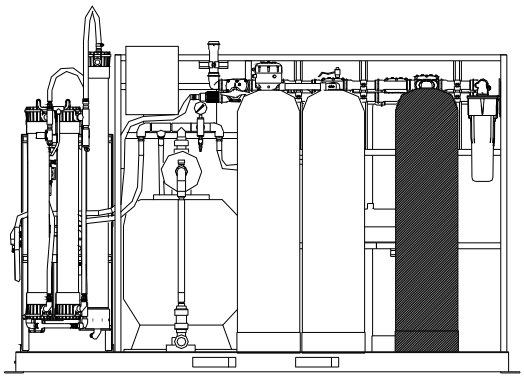
Cartridge prefiltration is used to protect the softener resin and reverse osmosis membranes from suspended solids fouling. The cartridge prefilter provides 20 micron nominal filtration.



Upflow Carbon Filter

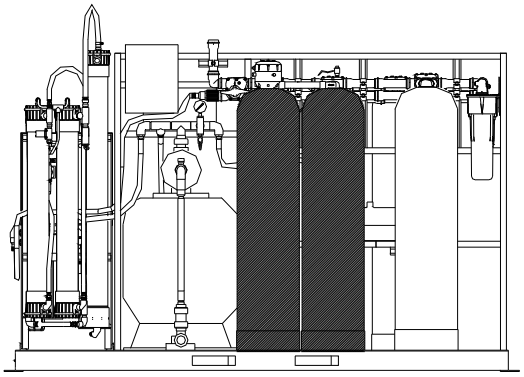
A carbon filter is used to protect the softener and reverse osmosis membranes from organic fouling and from chlorine degradation. Both these types of fouling can seriously damage the thin film composite membranes. With chlorine degradation, the membrane is slowly damaged and is irreversible.

The maximum influent level of chlorine to a thin film composite membrane is 0.05 mg/L. Prolonged exposure to excessive levels of chlorine will cause membranes to be destroyed.

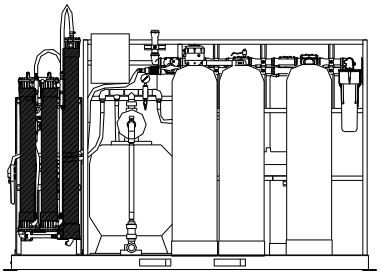


Softening

Calcium and magnesium are the two primary constituents leading to scale build up on reverse osmosis membranes. To prevent scaling and prolong membrane life, a softener is used to remove calcium and magnesium from the water. The softener is regenerated with salt, which is held in the brine tank. The brine tank is located off of the system skid, to allow flexibility in installation.



Reverse Osmosis

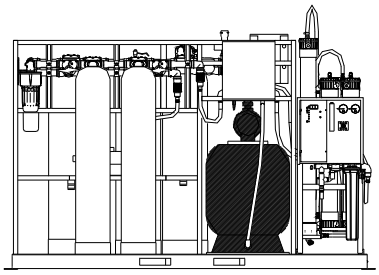


Following softening, reverse osmosis technology is used to reduce the level of total dissolved solids (TDS) in a feed stream. The system uses spiral wound membranes for production of permeate water. The permeate water from the system typically exhibits a 95% or better reduction of TDS from the feed water. The reject water contains the concentrated minerals that have not been permitted to pass through the membrane. The RO also features an EverClean Rinse™ which extends the operating life of the system's membranes by flushing the entire feed side of the membrane with high quality permeate water before its idling mode.

Two different RO system configurations are used in the HP series. The TS RO unit and the TL RO unit. The chart below describes which model RO is used on each system.

TS Series	TL Series
HP 600p	HP 2000a
HP 1200p	HP 4000a
	HP 6000a
	HP 8000a

Storage



The HP series uses either a pressurized or atmospheric storage tank to store reverse osmosis permeate water. The type of storage tank can be distinguished in the system's model number (designation a – atmospheric tank or p – pressurized storage tank). These storage tanks allow for a source of pressurized water to be used during the RO system's EverClean™ rinse cycle.

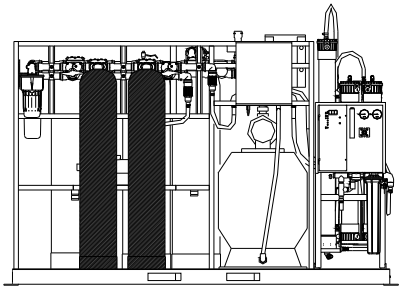
Pressurized Storage

The tank has an air pre-charged of 20 psi. and is located on the skid. The unit has a total capacity of 80 gallons, however, the effective usable volume is 40 gallons. The HP 600p and HP 1200p use pressurized storage. The pressure tank provides water for the permeate flush cycle.

Atmospheric

Atmospheric tank systems incorporate a 300 gallon storage tank. This tank is located off skid. With an atmospheric tank, a repressurization pump is included on the skid. The HP 2000a, 4000a, 6000a and 8000a use atmospheric storage. The repressurizer pump also provides water for the permeate flush.

Mixed Bed Deionization

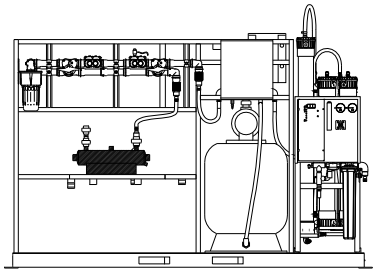


In the HP series, mixed beds resins are used to perform the deionization process. In this configuration, the resins remove virtually ALL positively and negatively charged elements from the water. The tanks used in this process are commonly known as "exchange tanks". These tanks require periodic regeneration, which is provided by Kinetico, Inc. or a local water treatment vendor. However unlike a typical exchange tank configuration, the HP series only feed high quality RO water to this polishing system. The result is tank capacity extensions 20 to 50 times greater than exchange tank supplied directly on feed water.

The HP system incorporates a resistivity lamp between the mixed bed exchange tanks to indicate when a tank is exhausted and requires regeneration. At this time, it is the client's responsibility to arrange an exchange of the exhausted tank for a freshly regenerated tank. This tank exchange is a billable service.

Post Filtration
Cartridge post filtration is provided. This will remove any solids that may come from the storage tank, or resin fines from the mixed beds.

Ultraviolet Sterilization
The final purification process in the HP System is sterilization through ultraviolet light transmission. Deionized water is passed through a clear tube and inundated with ultraviolet light waves. The light ruptures cellular walls, thus killing and reducing any microbial presence. For ultraviolet light to be effective, it is imperative that only clean water enter the clear chamber and that the ultraviolet lamp be monitored and replaced after burnout promptly. Typical lamp life is in the range of 12-18 months.



Operating Specifications

General operating parameters for the HP Series product line have been listed in the table below. These specifications have been provided to express the required conditions for the operation of this system. If there are other parameters that you may be concerned about, please contact your local Kinetico Dealer for further operating or performance data.

Exceeding the conditions in the table below may inhibit performance or could cause the system to be permanently damaged.

To assure that these factors are being met, a yearly water analysis is recommended to keep track of your influent water quality. This can be a beneficial tool in recognizing changes in your inlet water supply. If the inlet supply does change, please contact your area Kinetico Dealer. Modifications to the system or additional equipment may be required to maintain peak operation efficiency of your system.

Model		HP 600p	HP 1200p
*Production Rate	*gallons/day (gpd)*	360	720
*Production Rate	*liters/day (lpd)*	1,362	2,725
Inlet Flow Rate	*gallons/minute*	0.67	1.33
Inlet Flow Rate	*liters/minute*	2.54	5.1
Feed Water			
Pressure	*psi*	35 – 65	35 – 65
Temperature	*^{o}F*	35 – 90	35 – 90
pH	*SU*	4 – 10	4 – 10
Hardness (max.)	*gpg as $CaCO_3$*	54	54
Iron (max.)	*ppm as Fe*	2	2
Chlorine (max.)	*ppm as Cl_2*	3	3
Total Dissolved Solids (max.)	*ppm as $CaCO_3$*	3,000	3,000
RO Operating Pressure	*psi*	110	110
Product Water Storage Tank		pressurized	pressurized
Power – Domestic System	*volts*	110	110
Fitting Connections			
Inlet	*diameter*	1 1/4” FNPT	1 1/4” FNPT
Permeate	*diameter*	1/2" tubing	1/2" tubing
Drain	*diameter*	3/4” FNPT	3/4” FNPT
Product	*diameter*	3/4” FNPT	3/4” FNPT

**500 mg/L TDS, 77^{o}F*

Model		HP 2000a	HP 4000a	HP 6000a	HP 8000a
*Production Rate	*gallons/day (gpd)*	2,000	4,000	6,000	8,000
*Production Rate	*liters/day (lpd)*	7,572	15,144	22,717	30,289
Inlet Flow Rate	*gallons/minute*	2.78	5.56	8.33	11.11
Inlet Flow Rate	*liters/minute*	10.52	21.03	31.55	42.07
Feed Water					
Pressure	*psi*	35 – 65	35 – 65	35 – 65	35 – 65
Temperature	*^{o}F*	35 – 90	35 – 90	35 – 90	35 – 90
pH	*SU*	4 – 10	4 – 10	4 – 10	4 – 10
Hardness (max.)	*gpg as $CaCO_3$*	45	45	45	45
Iron (max.)	*ppm as Fe*	2	2	3	3
Chlorine (max.)	*ppm as Cl_2*	3	3	3	3
Total Dissolved Solids (max.)	*ppm as $CaCO_3$*	3,000	3,000	3,000	3,000
RO Operating Pressure	*psi*	110	110	110	110
Product Water Storage Tank		atmospheric	atmospheric	atmospheric	atmospheric
Power – Domestic System	*volts*	220	220	220	220
Fitting Connections					
Inlet	*diameter*	1 1/4” FNPT	1 1/4” FNPT	1 1/4” FNPT	1 1/4” FNPT
Permeate	*diameter*	1/2" tubing	1/2" tubing	1/2" tubing	1/2" tubing
Drain	*diameter*	3/4” FNPT	3/4” FNPT	3/4” FNPT	3/4” FNPT
Product	*diameter*	3/4” FNPT	3/4” FNPT	3/4” FNPT	3/4” FNPT

**500 mg/L TDS, 77^{o}F*

INSTALLATION

Getting Started

The following procedures have been developed to assist during the installation of your HP system.

The installation of this HP system should be performed by a qualified service person with an understanding of local and regional codes that may affect the installation requirements.

Pre-installation Review

Before beginning the installation of the HP system, confirm system configuration to be installed, and components that have been ordered. Please review HP system specification sheet which includes required components.

Review of the customer's facility is also recommended, especially critical operating data that could effect the operation of the system:

Water pressure to the HP system will affect the maximum flow permitted by the system. The HP system will not operate if the inlet pressure fluctuates below a dynamic pressure of 35 psi. This minimum pressure must be maintained to the system at all times. Should the pressure fluctuate below this level, a booster pump will be required. If the dynamic pressure to the system exceeds 65 psi a pressure regulator should be used.

Ambient temperature must be maintained above 35 °F (1.7°C). Freezing temperatures will cause breakage of equipment and void all warranties.

Inlet water temperature must be maintained between 35 °F (1.7 °C) and 90 °F (32.2 °C) to prevent damage to the system's membranes.

System Location

The HP system is designed for indoor installation only. When reviewing the installation site, please take into account the following factors:

level
dry
access to drain
access to electrical hookup
access to adequate water supply

HP Installation

Tools and Installation Materials
Since the HP system produces a high quality water, plumbing runs on the process, purge and drain outlets should all be completed with PVC piping, polyethylene or polypropylene tubing. Copper and galvanized pipe will be chemically attacked by the permeate water.

Tools and Materials

- Flat head screwdriver (medium)
- Phillips head screwdriver (medium and small)
- Multimeter
- Wire strippers/cutters
- PVC pipe cutters
- Hole saws
  - 1/2” for level control wire gripper
  - 1/2” - 1” for inlet conduit

PVC piping and PP tubing (see TI RO specification sheet for detailed pipe and tubing requirements)

- PVC cement
- PVC pipe hangers
- PVC isolation / by-pass valves
- Additional 316 SS pressure gauges
- PVC or steel conduit

Unwrap the HP system.

Open the brine drum box.

Inspect unit for possible shipping damage:

- -broken fittings
- -loose hoses or tubing
- -dents or scratches

Remove additional material from crate *(located inside the brine drum)*:

- -copy of manual
- -prefilter cartridge
- -level float package *(only for atmospheric tank systems)*
- -postfilter cartridge

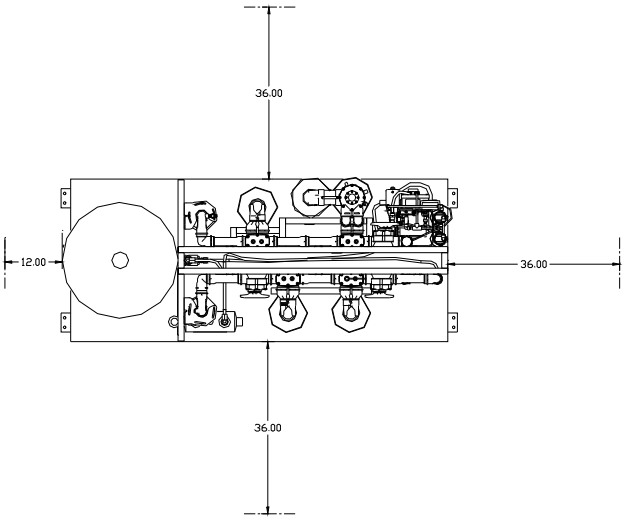
Check all internal skid connections and mounting bolts. Tighten as necessary as they may become loose during shipment. Check that all unions are tightened.

Skid Positioning

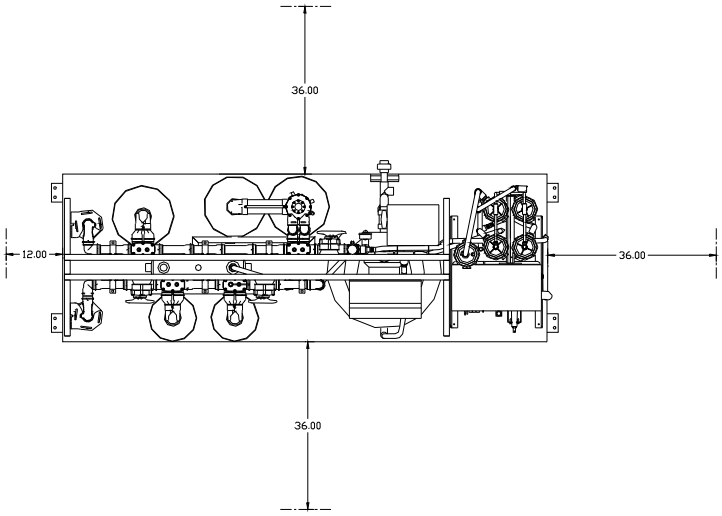
The HP skid is designed to be moved using a forklift. The dry weight of the skid is nearly 900 lbs. and caution should be used whenever moving the equipment.

After moving the unit to the installation site, select an area where the unit can serviced from the front and sides. When installing next to a wall, leave a minimum of a 12" (35" for atmospheric tanks) access path to allow service to the back of the unit. Leave a minimum of 36" on sides of the system with exchange tanks, 12" for sides without exchange tanks and 36" in front of the system. This will allow for easy removal of the exchange tanks, when they need to be changed.

HP 600p

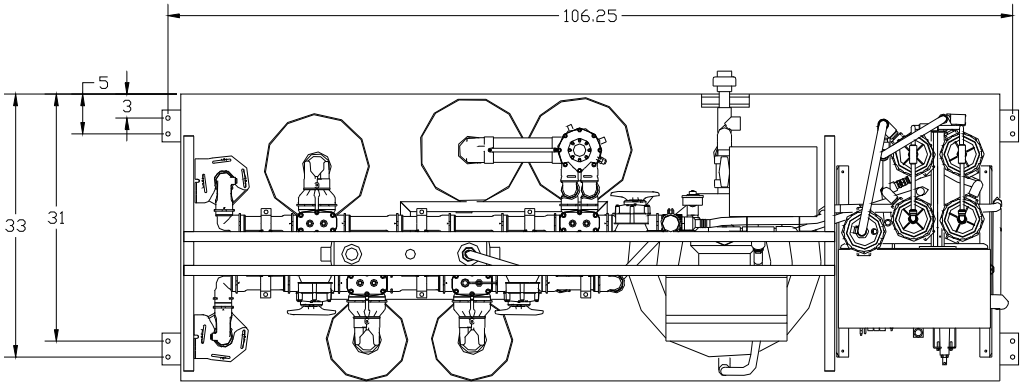


HP 1200p



Skid Leveling

After positioning the HP skid, the unit should be leveled and grounded. Four mounting holes can be found at the base of the frame. Two grounding lugs are also provided directly on the skid. Grounding connections should be made to assure proper electrical grounding of the system.



Plumbing Hook-ups

After positioning the HP skid, locate each plumbing connections:

Connection Name	HP 600p HP 1200p	HP 2000a HP 4000a HP 6000a HP 8000a
(1) System Inlet	1" FNPT	1" FNPT
(2) System Outlet	¾" FNPT	¾" FNPT
(3) Backwash Water	N/A	⅜" Tubing
(4) Brine Tank Overflow	⅜" Tubing	⅜" Tubing
(5) R.O. Drain	¼" Tubing	½" Tubing
(6) Softener Drain	½" Tubing	⅝" Tubing
(7) Permeate connection to atmospheric tank	N/A	½" Tubing
(8) Atmospheric tank to pump	N/A	1" NPT

When making these plumbing connections, it is recommended to install a system by-pass using adequately sized and pressure rated ball valves.

Electrical Hook-up

After installing the skid connections, bring power to HP skid. The system will be configured to run with the following electrical connections:

Connection Name	HP 600p HP 1200p	HP 2000a HP 4000a HP 6000a HP 8000a
RO	120 VAC, 10 amps	230 VAC, 25 amps
Quality Lamp	120 VAC, 2 amps	120 VAC, 2 amps
U.V. Sterilizer	120 VAC, 1 amp	120 VAC, 2 amps
One Point Power Hook-up	120 VAC, 15 amps	230 VAC, 25 amps

Use a multimeter to confirm power to be supplied to HP is the proper voltage. After confirming voltage of the source power, shut off power to system, and confirm it is de-energized with the multimeter. It is also recommended to use a lock-out kit on the power supply to prevent it from being energized during installation connections.

HP 600 and HP 1200

1) All electrical connections are 120 VAC. Each component has an independent 120 VAC plug. A single connection enclosure with 4 outlets is provided. A 15 amp connection is required.
2) Make the following connections:
   TS RO Connection
   Quality Lamp Connection
   UV Sterilizer Connection
3) Do not make electrical connections until you are ready to start up the unit, as the UV and RO will begin to operate once they are plugged in.

HP 2000, HP 4000, HP 6000 and HP 8000

1) Wiring must be done by a qualified electrician and must follow all local and appropriate codes.
2) The use of a grounded conduit is not suitable for proper equipment grounding. Please use a separate #12 AWG grounding conductor for this purpose.
3) Connect #12 AWG conductors to L1 and L2 terminals.
4) Connect #12 AWG ground wire to the grounding bar.
5) Connect high tank level float (N/O) lead to the terminals marked “System Float” on the system’s circuit board.
6) Connect low tank level float (N/C) lead to the terminals marked “Aux Float” on the system’s circuit board.
7) Plug any unused holes within the electrical enclosure with the metal clip plugs included with this package.

Electrical Hook-up -- 208 Volt Single Phase

The HP Series RO systems are designed for 230V, 60 Hz, single phase power. When only 208V, 60 Hz single phase power is present, a means of “boosting the voltage from 208V to 230V is required. Standard isolation-type transformers will work, however Kinetico Incorporated recommends the use of an autotransformer.

A “buck-boost” or “autotransformer” is an economical way to convert 208V single phase to 230V single phase. The autotransformer (buck-boost transformer), when properly sized, is a more efficient, smaller, lighter, and less costly way to make minor voltage changes. They are designed to raise the voltage by a small amount, typically 5 to 20%.

Buck-boost transformer nameplates can cause confusion. The nameplates depict their operation as isolation transformers, not when configured as autotransformers. Therefore, the primary voltage, secondary voltage, and KVA rating listed on the transformer nameplate are not the primary voltage, secondary voltage and KVA rating of the auto-connected configuration (autotransformer configuration).

Here is an example. One of the transformers Kinetico Incorporated recommends using is an Acme T-1-81051. The nameplate for this transformer says:

Primary Voltage:	120 x 240
Secondary Voltage:	12/24
KVA Rating:	0.5 KVA

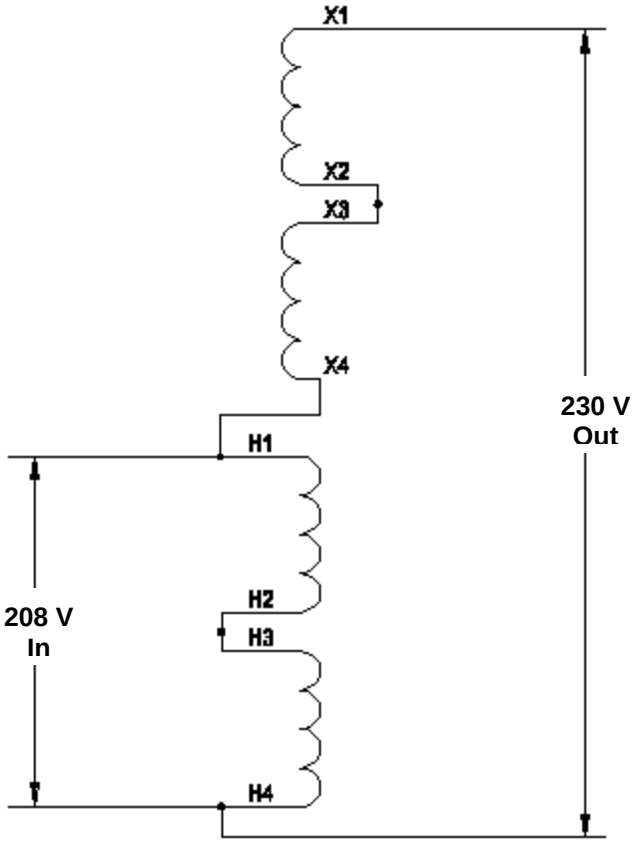
However, when used to boost 208 V to 230 V, this transformer has the following ratings:

Primary Voltage:	208V
Secondary Voltage:	230V
KVA Rating:	5.5 KVA

The improved performance results from the way the transformer is wired. When the transformer is auto-connected, the KVA rating of the transformer depends on the amount of voltage boost (or buck). All of the recommended transformers for the HP series have been sized to account for motor starting currents.

Buck-Boost Transformer Wiring

The following figure shows how to wire a Buck-Boost Transformer as an autotransformer.



120/240 x 12/24 V
Buck-Boost Transformer
(Autotransformer)

WARNING!! NEC Code, Article 450-4(a) prohibits fusing in the shunt winding of the autotransformer. Refer to all national and local electrical codes when fusing the transformer.

Transformer Recommendations

After determining the TL series configuration, and version, refer to the following table for the recommended Buck-Boost transformer. When using a Buck-Boost transformer from a different manufacturer, make sure the transformer is rated as listed below.

TLRO revision B or later without repressurizer		
Manufacturer	**Manufacturer P/N**	**Transformer Rating:**
Acme	T-1-81050	Single Phase
Dongan	85-M020	120/240 Primary
Square D	250SV43B	12/24 Secondary
GE	9T51B107	0.25 kVA
Jefferson Electric	216-1121-000	Dry Type

TLRO revision B or later with 1 HP repressurizer		
Manufacturer	**Manufacturer P/N**	**Transformer Rating:**
Acme	T-1-81051	Single Phase
Dongan	85-M025	120/240 Primary
Square D	500SV43B	12/24 Secondary
GE	9T51B108	0.5 kVA
Jefferson Electric	216-1131-000	Dry Type

Atmospheric Tank Installation

For systems using an atmospheric tank, additional connections to the off-skid tank are required. These connections include:

High Level Float
Low Level Float
Main Tank Connection

All other connections are pre-constructed on the skid.

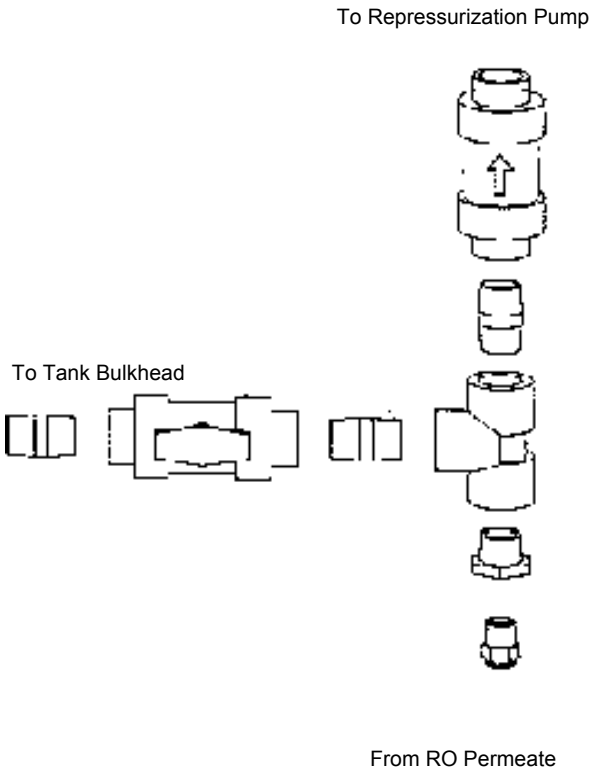
Tools and Installation Materials
TeflonTM Tape
Plastic Pipe Cleaner
Plastic Pipe Cement
Plastic Pipe Cutter

Use both Teflon tape and pipe sealant on all threaded connections. For plastic connections, make sure fittings are first cleaned, then glued. For tubing connections, plastic tubing should be cut straight with a sharp blade. These procedures will minimize leaks at the connections.

Tank Connection Assembly

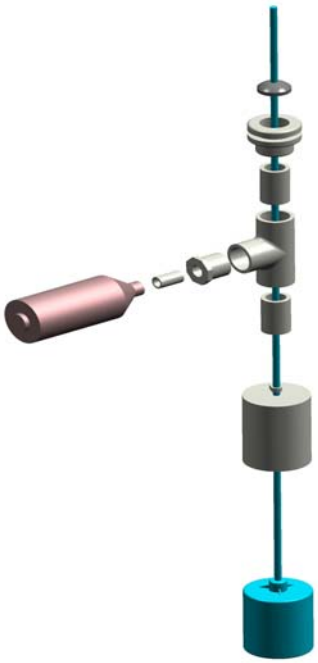
The figure at right shows the tank connection assembly. First, collect these components from the miscellaneous parts package, then assemble as follows:

- Connect 1/2” tubing connector to 1/2” x 1” adaptor.
- Connect adaptor to outlet of 1” NPT tee.
- To other outlet of tee, connect 1” short nipple.
- Connect nipple to 1” NPT ball check.
- To common inlet of tee, connect 1” short nipple.
- To nipple, connect 1” true union ball valve.
- To other end of ball valve, connect 1” short nipple.
- Disassemble the true union ball valve with the nipple. Make the connection from this nipple to the tank.
- Reassemble ball valve.

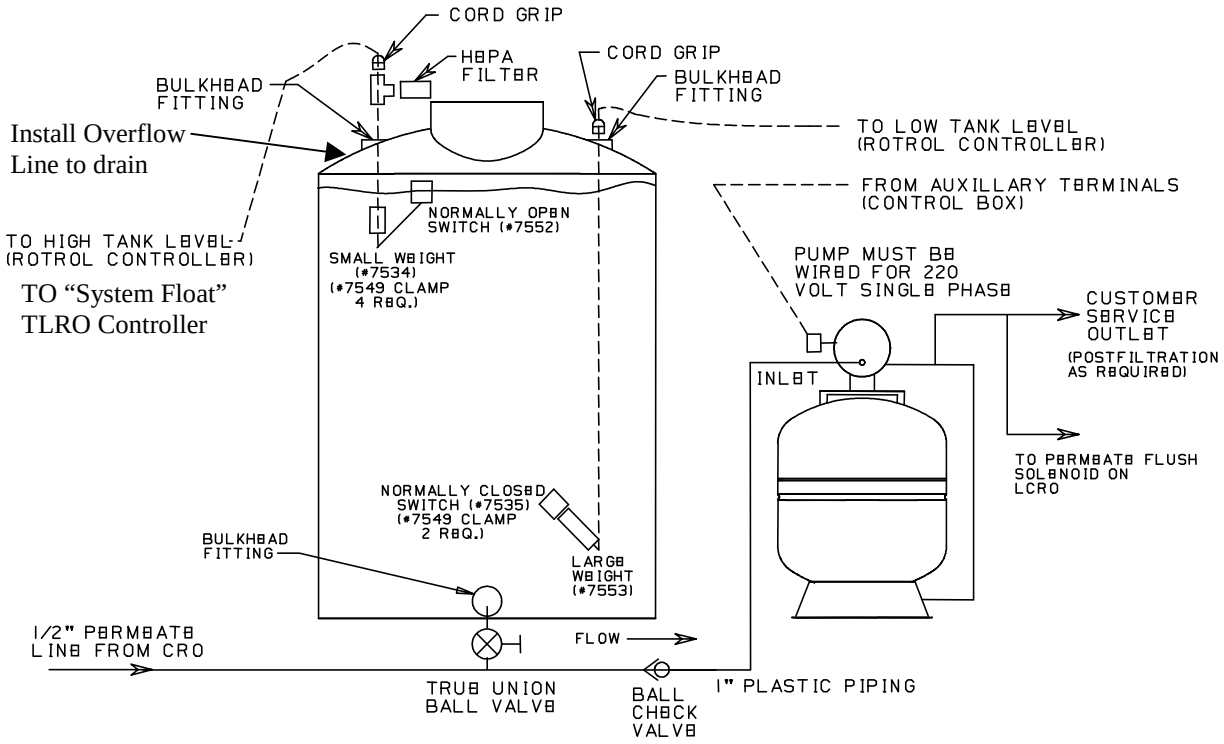


Floats – High and Low Level

The float switches also require assembly as a part of the off-skid atmospheric tank package. Refer to figure at right and assemble as instructed:



- Assemble the high level float switch components to the top of the tank. This switch uses a Normally Open (N.O.) contact.
- Place the high level control switch with the cord in the tank through the manway.
- Guide the cord out of the tank through the bulkhead, nipple, tee and the cord grip.
- Tighten in place as shown in the diagram below.
- Thread the HEPA filter horizontally onto the 3/8" nipple in the TEE.
- Disconnect all power to the HP System.
- Open the door on the front of the RO by removing the two set screws in the door..
- Route the cord into the RO Control box using another cord grip.
- Connect the wiring of the high level float to the "System Float" terminals as shown on the electrical wiring diagram.
- Next, connect the low level float switch through the top of the tank. This switch uses a Normally Closed (N.C.) contact.
- Position the float as shown in the diagram below.



Installation Checklist:

- ❑ Skid positioned, leveled, secured and grounded
- ❑ Front, side and back access requirements are met
- ❑ Inlet connection: > 35 psi, TDS <3,000 mg/L)
- ❑ Permeate connection: PVC pipe, polyethylene or polypropylene tubing
- ❑ Drain connections:
  - ❑ Softener regeneration drain
  - ❑ Brine tank overflow
  - ❑ R.O. reject water drain
  - ❑ R.O. high pressure relief valve drain *(for pressurized storage tank systems)*
  - ❑ Atmospheric tank overflow *(for units with an atmospheric tank)*
- ❑ Electrical connections made
- ❑ Electrical voltage verified
- ❑ Main power to system identification (fuse or circuit breaker number identified with equipment)
- ❑ System by-pass installed
- ❑ Documentation with equipment
- ❑ Prefilter cartridge installed

OPERATION AND MAINTENANCE

Normal Operating Procedures

During the normal operation of the HP system, a few items should be checked daily. The constant upkeep with these items will maintain the operation of the HP system to its highest standards.

Daily Start-up/Shutdown

The system's softening system is fully automatic and regenerates based on the volume of water used.

The RO system will also run in an automatic mode, shutting itself off each time a high level is achieved in the storage tank (pressurized or atmospheric). With the automatic control, the RO pump will shut off first. Just after this occurs, the flush solenoid valve will open on the RO system, thus initiating the permeate flush. This rinse flushes the membrane with permeate water, minimizing the possibility of membrane fouling.

Systems using an atmospheric tank, will incorporate an automatic repressurization pump. The pump incorporates its own 25 gallon hydrosphere, allowing the unit to operate with a pressure switch control. With all systems, water is delivered through the DI beds from a pressure source on a 20/50 psi switch. If higher pressure is required, then this switch can be adjusted.

The DI storage tanks are designed to last several months with normal operation, however, will require change-out. This replacement service can be locally contracted. If no local exchange tank service is present, Kinetico can offer this service at a nominal fee.

Replacement of these exchange tanks, is an additional cost to the operation of the service, and is not included with the equipment package.

Daily Log

On the back page of this manual, a daily log has been provided. Photocopy this template and use it for recording the system's daily performance. By recording various system characteristics each day, this will help in any future trouble- shooting of the equipment. It is also necessary to keep a daily performance log to show changing performance characteristics of the HP system. These changes may be the result of membrane fouling. With accurate logs kept on performance, timely cleaning of the membranes will insure maximum membrane life.

The parameters included on the daily log sheet are:

- Date / Time
- Feed Pressure
- Post Filter Pressure
- RO Pump Pressure
- RO Permeate Flow Rate (on models with flow meter)
- RO Water Quality (on models with quality monitor)
- Level of Brine in Salt Tank
- Addition of Salt
- Level of Storage Tank (for units with atmospheric tank)
- Quality Lamp Indication (red/green)
- Mixed Bed Tank Replacement
- Comments

Routine Maintenance

Filter Maintenance

If the inlet feed pressure is not above 35 psi during operation (dynamic pressure at the inlet flowrate), the system will shut down due to low feed pressure. In this situation, it is most probable that the cartridge filter requires replacement.

Check the daily log for changes in the inlet pressure. One can predict the life of the cartridge filter before its use has become over-exhausted by using the daily log as a preventative maintenance tool.

We recommend replacement of the cartridge filter when the pressure drop between pre and post filter reaches 15 psi, or if the post filter pressure is less than 30 psi.

Salt Additions

With the use of a softener, the unit operates by exchanging sodium ions for hardness ions such as calcium and magnesium in the water. This reaction is one that requires a periodic "regeneration" of the resin. The resin requires softener grade salt (NaCl) to properly operate. The level of salt in the brine tank should be monitored daily, and once a pattern has developed, refill of the brine tank can be done on a weekly schedule.

Carbon Replacement

All systems incorporate the use of carbon for the removal of free chlorine in the water as well as other organic contaminants. Carbon replacement should be done by a qualified water service professional. Kinetico can provide local representation for this service. Replacement of all carbon should be made each 18 months of service.

Membrane Replacement

To determine if the membrane requires cleaning, review of the daily log is required. If the permeate of the system has decreased by more than 25%, or if the permeate quality has risen by more than 50%, the membranes may require replacement. Please refer to the maintenance section for further details on membrane cleaning.

Mixed Bed Replacement

A quality lamp located between the dual mixed bed tanks is provided as a marker for bed exhaustion. During normal operation , the quality lamp should be green, indicating that the water being processed is greater that the preset quality of the lamp. Typically, this quality is set at 1,000,000 ohm/cm resistivity (1 Megohm). It is normal during system start ups for the quality lamp to temporary display red" indicator, this time should be minimal. If rinse up times exceed 10 minutes, then a new tank is required. If the quality lamp does not reach a green indicator, then that is also a signal for a new tank.

A dual polishing tank configuration is used to provide high quality water even after the first tank has become exhausted. Under normal conditions, the secondary tank in the system, will allow polishing to high levels. When the first tank is exchanged, the second tank will still have a substantial remaining capacity. At this time, that secondary tank, should be installed in the lead position, and a new polishing tank should be installed. This procedure will provide the most efficient use of the resin tank's capacity.

Exhausted tanks should be returned to a local vendor for regeneration. If no local service provider can be found for regeneration, Contact Kinetico for a quote on this service.

Ultraviolet Light Maintenance

In order to provide effective sterilization of microbiological content in the water, the transmittance of the ultraviolet light into the water is critical. The postfilter is provided to remove resin fines or any solids that could affect ultra violet light transmittance.

The ultraviolet lamp has an effective lamp life of 1 year. The bulb should be replaced at this time. It is important to recognize that even though the lamp may still burn and produced ultraviolet light, the effective dosage is reduced with time. After a year's worth of on-line running, the radiant dosage will have fallen to a minimal effect. Operating the lamp past this period will yield unsatisfactory and problematic results regarding biological growth the system.

System Commissioning (Initial Start-up)

The start-up procedures for the equipment should be followed if:

-It is the first time the unit is being put into operation.
-The equipment has been moved.
-The unit has been shutdown for an extended period of time (a few weeks).

After completing these start-up procedures, the normal operating procedure should be followed. Make sure unit has been properly installed by reviewing the installation section.

Recommended Start-up Tools
1/2" Tubing
Tube Cutter
Portable Conductivity Meter
Temporarily connect permeate line to drain using 3/4" hose. This will be used to flush the membranes of any preservatives before commissioning the system.

1. Make sure the unit has been properly installed by reviewing the installation section and confirming the items listed on the installation checklist.

2. Start-up of the system will should be organized in the same manner as the flow path within the system. Do not fully pressurize the system until each start-up point has been completed. The following order of start-up items should be followed:

   System By-pass
   Prefilter
   Carbon Filter
   Softener
   RO
   Storage Tank
   DI Tanks
   UV Lamp

3. **System By-pass** During the installation of a plumbing run, it is common to have debris left in the plumbing line. To prevent this debris from contaminating the components of the HP system, flushing this line is recommended. Opening the by-pass valve and close the inlet and outlet valves to the HP system. These valves would be located off skid, and are a part of the system's installation requirements. Allow water to flow are full rate for 20 minutes. Ideally, this water should be run to drain.

4. **Prefilter** The first piece of equipment is the prefilter. A 20 micron filter cartridge is recommended for operation with the system. One cartridge is provided with the unit. To install the prefilter, open the filter housing, by turning the lower housing counterclockwise. After opening the housing, insert the filter cartridge, then retighten the housing by turning clockwise. Do not over tighten.

5. **Softener** A twin tank, non-electric Kinetico softener is used to provide the best RO pretreatment possible. Since the softener is preplumbed, the only start-up requirements are for adjustment of the system dosing. In Kinetico softeners, the brine drum mixes and stores a solution of salt or potassium chloride for regeneration of the softener media. During the brine rinse cycle, this solution is drawn from the brine drum and through the media to regenerate it. The brine drum contains an adjustment to draw

the correct amount of salt or potassium chloride solution for each cycle. This adjustment is made in two places: the adjuster tube and the float cup. The adjuster tube measures the amount of solution that is drawn from the brine drum into the softener during the brine rinse cycle. The float cup height determines how much softened water flows back into the brine drum to prepare for the next regeneration.

6. **Carbon Filter** All units operate with our upflow carbon filter. Hook up a temporary tube from the outlet of the carbon filter to drain. Slowly open the by-pass valve, allowing water to enter the carbon tank. When water flows from the outlet, close the by-pass valve and allow the carbon to soak for 1 – 3 hours. Then, open the by-pass valve and allow water to flow through the carbon to drain. The flow should be 5 – 7 gpm. Allow the water to flow until it runs clear. Reconnect the carbon outlet.

Mach 2060sOD Softener Specifications

Used with HP 600p, HP 1200p

					Disc Selection (Compensated Hardness*)							
Setting	**Capacity**	**Efficiency**	**Dosing**	**Meter Disc**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
**2.7 lbs.	12,481 grains	4,622 gr./lb.	3.9 lbs./ft^3		3	6	9	11	14	17	19	22
**4.0 lbs.	15,813 grains	3,953 gr./lb.	5.7 lbs./ft^3		4	7	11	15	18	21	25	28
4.4 lbs.	16,630 grains	3,780 gr./lb.	6.3 lbs./ft^3		4	8	12	16	19	23	26	30
			Gallons/Regeneration:		3,171	1,586	1,057	793	634	529	453	396

** Settings certified by NSF and or WQA
Uses 18" x 35" brine drum

CP 213sOD Softener Specifications

Used with HP 2000a, HP 4000a, HP 6000a, HP 8000a

					Disc Selection (Compensated Hardness*)							
Overdrive Operation												
Setting	**Capacity**	**Efficiency**	**Dosing**	**Meter Disc**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
15 lbs.	60,000 grains	4,000 gr./lb.	6.0 lbs./ft^3		5	10	14	17	21	25	30	35
25 lbs.	70,000 grains	2,800 gr./lb.	10.0 lbs./ft^3		6	12	16	20	24	30	35	40
			Peak flow during regeneration:		28.0	28.0	28.0	20.7	15.7	12.4	10.0	8.3
Alternating Operation												
Setting	**Capacity**	**Efficiency**	**Dosing**	**Meter Disc**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
15 lbs.	60,000 grains	4,000 gr./lb.	6.0 lbs./ft^3		6	12	18	24	30	35	40	45
25 lbs.	70,000 grains	2,800 gr./lb.	10.0 lbs./ft^3		7	14	21	28	34	40	45	51
			Flow during regeneration (@ 15 psig):		20	20	20	20	15.7	12.4	10.0	8.3
			Gallons/Regeneration:		**8,922**	**4,461**	**2,974**	**2,231**	**1,784**	**1,487**	**1,275**	**1,115**

***Compensated hardness in gpg = Hardness + (3 x Fe in mg/L)**

Brine Drum Specifications

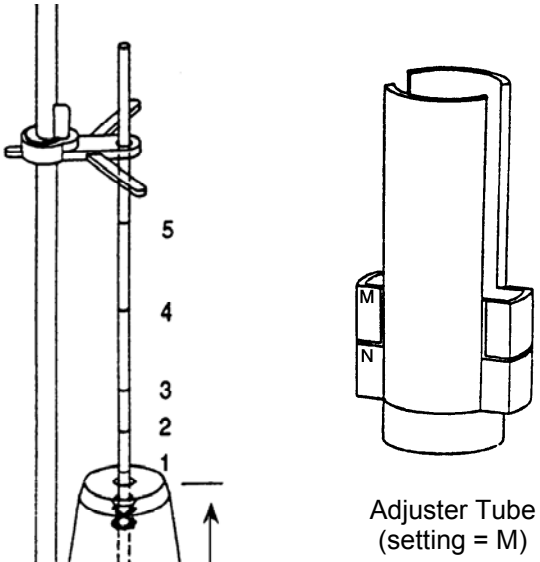
In Kinetico softeners, the brine drum mixes and stores a solution of salt or potassium chloride for regeneration of the softener media. During the brine rinse cycle, this solution is drawn from the brine drum and through the media to regenerate it.

The brine drum contains an adjustment to draw the correct amount of salt or potassium chloride solution for each cycle. This adjustment is made in two places: the adjuster tube and the float cup. The adjuster tube measures the amount of solution that is drawn from the brine drum into the softener during the brine rinse cycle. The float cup height determines how much softened water flows back into the brine drum to prepare for the next regeneration.

Adjuster Tube Setting

The adjuster tube is set by cutting and removing tabs on both sides of the tube. Using a pocket-knife, cut across each tab horizontally, following the channel in the plastic and break off each tab individually until the proper setting is reached. The remaining number or letter imprinted on the tab determines the correct setting.

The drawing at right shows an adjuster tube at setting "M".



Adjuster Tube (setting = M)

Float Cup Height

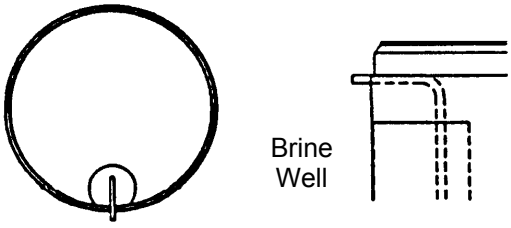
Float Cup Height Adjustment

Float Cup Setting

The float cup is set by adjusting its height above the bottom of the brine valve assembly. By removing the brine valve assembly and resting it on a flat surface, the height of the float cup can be measured with a ruler. The height is measured from the base of the brine valve assembly to the top of the float cup (see drawing at right). Note that standard settings are defined by markings on the rod of the brine valve assembly. The settings on the rod are listed in the tables at the end of this section. Where the predefined settings are not adequate, the actual float cup height, in inches, is listed, and the setting must be measured and set according to the measured float cup height.

Installing the Brine Valve

After the adjustments have been made to the adjuster tube and the float cup, the brine valve assembly must be installed in the brine drum. Locate the brine valve in the brine well so that the ⅜" bent tube is along the back of the brine well away from the brine drum wall. The ⅜" bent tube snaps into a notch and extends from the brine drum about 1".



Top View Side View

Brine Valve Installation

Application

Note: Do not drop the brine valve into the drum! Dropping may lower the float cup, resulting in an improper setting.

Determining the correct brine valve settings for a particular application is a three-step process:

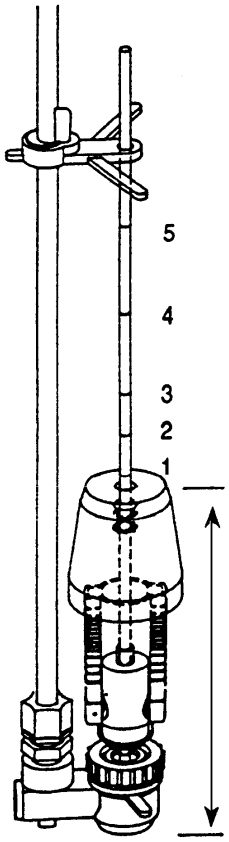
1. Determine compensated hardness. This requires a hardness test and an iron test on raw water at the application site. Compensated hardness is calculated by multiplying the ferrous iron (in ppm) by 3 and adding it to the grains of hardness.

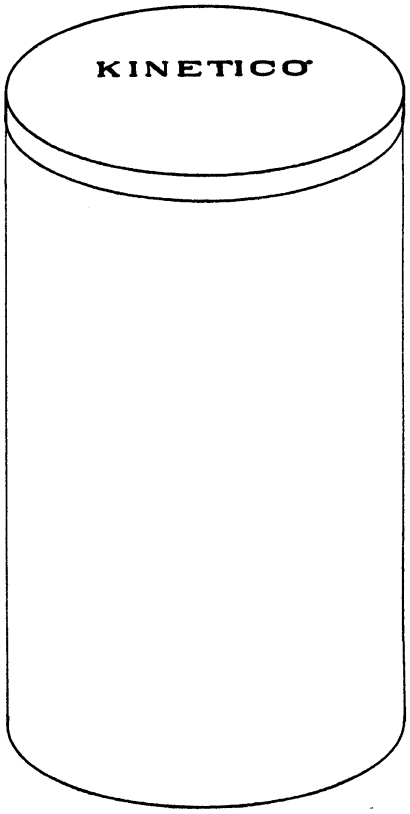
2. Determine salt setting. The salt setting is determined by taking the compensated hardness (calculated in step 1 above) and using the Specifications Table, located in each specification section, for the proper model of softener to look up a suitable meter disc and salt setting.
3. Determine adjuster tube and float cup height settings. Use the brine drum specifications on the following pages and the model of a brine drum to determine the correct settings for both the adjuster tube and the float cup height.

KEY (Salt Setting – Pounds of Salt)		
1.0 = 1.0	**E** = 3.0	**M** = 6.0
1.25 = 1.25	**F** = 3.3	**N** = 7.5
1.5 = 1.5	**G** = 3.6	**O** = 8.5
A = 1.8	**H** = 4.0	**P** = 10.0
B = 2.1	**J** = 4.4	**Q** = 12.5
C = 2.4	**K** = 5.0	**R** = 15.0
D = 2.7	**L** = 5.5	

18” x 35” Brine Drum used with HP 600 and HP 1200

Standard Settings	
1	7¾”
2	8⅝”
3	9½”
4	11⅜”
5	13⅜”





Salt - with Grid

Salt Setting	1.0	1.25	1.5	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R
Adjuster Tube	1.0	1.25	1.5	A	B	C	D	E	F	G	H	J	K	L	M	N	N	N	N	N
Float Cup	1	1	1	1	1	1	1	1	7½"	1	1	1	1	1	1	1	2	3	4	5

Salt - without Grid

Salt Setting	1.0	1.25	1.5	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R
Adjuster Tube	J	K	L	M	M	L	N	N	N	L	N	N	N	N	N	N	N	N	N	N
Float Cup	6"	6"	6"	6"	6½"	6½"	6"	6¼"	6½"	7¼"	6¾"	7"	7½"	1	8¼"	9"	10"	10¾"	12¼"	14¾"

KCl - with Grid*

Salt Setting	1.0	1.25	1.5	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R
Adjuster Tube	1.25	A	B	D	E	F	G	H	J	K	L	M	M	N	N	N	L	J	N	N
Float Cup	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	3	4	4	12½"	14½"

* Kinetico strongly recommends removing the grid plate when using potassium chloride.

KCl - without Grid

Salt Setting	1.0	1.25	1.5	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R
Adjuster Tube	K	M	M	N	N	N	N	N	N	N	N	N	M	N	N	N	N	N	N	N
Float Cup	6"	6"	6¼"	6"	6¼"	6½"	6¾"	7"	7¼"	7½"	1	8¼"	8¾"	9¼"	2	10½"	11"	12"	13"	14½"

24" x 40" Brine Drum used with HP 2000, HP 4000, HP 6000 and HP 8000

Salt - with Grid

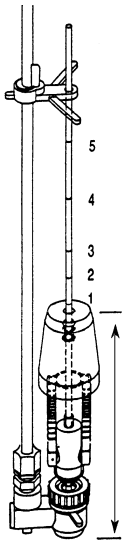
Salt Setting	15 lbs.	30 lbs.
Adjuster Tube	1.25	N
Float Cup	10½"	11"

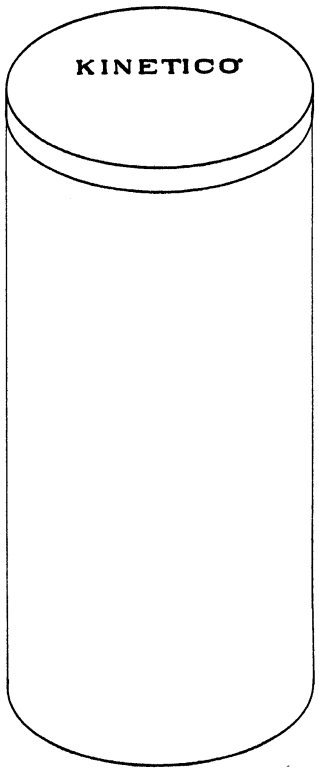
Salt - without Grid

Salt Setting	8.5 lbs.
Adjuster Tube	D
Float Cup	10½"

Potassium Chloride (KCl) - without Grid

KCL Setting	8.5 lbs.	15 lbs.
Adjuster Tube	removed	removed
Float Cup	9½"	13½"





Add Salt

Use a clean grade of softener salt at this time. DO NOT USE ROCK SALT.
On iron-bearing water, a salt that contains resin cleaning additives is recommended.

Pressurize the Softener

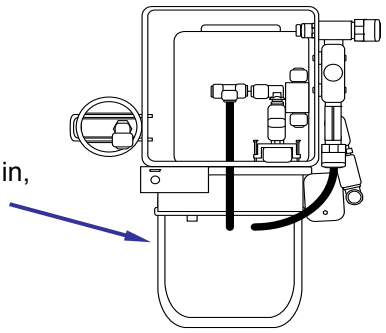
Open the inlet valve, and allow the tanks to fill slowly with water. Water will run at the drain until unit is full and pressurized.

With the unit in service and under pressure, allow the brine drum to fill with water until the brine valve shuts off.

After the unit is fully pressurized, purge air from the lines by opening soft water outlet.

VERY IMPORTANT! Where a brine drum overflow could cause damage, a 1/2" I.D. overflow line must be installed on the barbed overflow fitting on drum and connected to a drain. Make sure drain is not higher than barbed fitting.

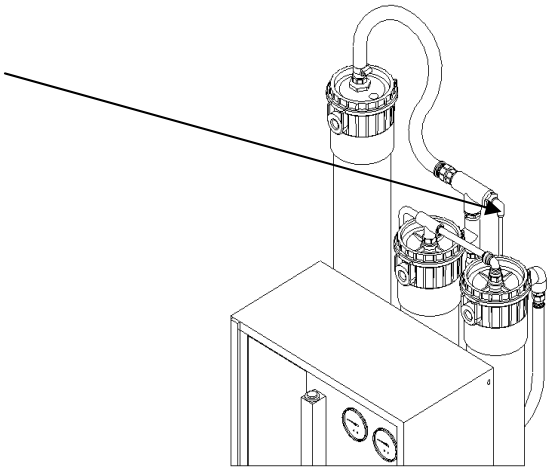
7a. R.O. System (600 and 1200 Series)



- Disconnect the permeate line from the storage vessel and temporarily connect to a drain or five gallon bucket or a suitable drain, so the preservative can be flushed out of the system. The membranes are preserved with 1% sodium bisulfite.
- Plug in the RO Unit. If the pump does not start when the unit is plugged in, the Teddington switch may need to be reset. This can be done by pressing the reset button at the top of the Teddington unit.
- Allow the pump to run for several minutes while observing the pressure gauge.
- Do not run the pump dry or operate in excess of 125 psi.
- With the pump operating, loosen the locking nut located on the pressure regulator on the right side of the unit.
- Slowly turn the large adjusting nut clockwise until the pressure reaches 105 psi. Systems may be set at pressures less than 105 psi if desired.
- Allow the system to run about 10 minutes with the permeate line running to a drain or bucket to allow the preservative in the RO to be flushed from the system.
- Reconnect the permeate line to the storage tank.
- Continuously flush the storage tank for a few hours to clear the lines of any possible debris.

7b. R.O. Systems (2000, 4000, 6000, 8000 Series)

- Temporarily connect permeate line to drain using 1/2" tubing.
- Open feed water valve slowly to pressurize the system.
- Check unit for leaks.
- Tighten any connections exhibiting leaks.
- Do not use a pipe wrench to tighten plastic pipe connections. This may result in damage of the pipe, causing a rupture in the plumbing assembly.
- Turn on disconnect switch.
- Energize system by toggling "Feed Pump" switch on front panel. This will activate the pump. The pump may shut down a number of times while the system purges itself of air.
- Reset the system if it has shut down due to this low pressure signal by pushing the reset button on the front panel (must hold in for 2.5 seconds).
- Repeat resetting the system until the pump runs automatically. (It may take 2 -3 resets to purge the air.)
- If after three attempts the system still fails to reach an adequate operating pressure, it may be necessary to assist bleeding the air out of the system.
- First shut off the pump, then system power.
- Decouple the tube connection for the pressure gauge line at the top of the membrane assembly.
- After pump is running in the automatic mode, observe pressure gauges.
- Do not exceed 140 psi on the pump pressure gauge and do not run the pump dry. These conditions will damage the system.
- While the system is running, turn the pump pressure regulator until the pump pressure reads 110 psi for the TL-RO.



- After 10 minutes of operation, the membranes should be adequately flushed of any preservatives. The membranes are preserved with 1% sodium bisulfite.
- Take a sample of the permeate water, measuring conductivity using a portable monitor. Compare this reading to the reading of the conductivity display.
- If this reading is different by more than 100 Ms/cm, the conductivity meter may require calibration (see service and maintenance section on System Controller).
- Shut the system down, including pump, system and disconnect switch.
- Connect permeate line to the storage tank
- Reconnect disconnect.
- Engage system power toggle.

- Engage system pump.
- Do not engage AUX toggle at this time.
- At this time, permeate water should begin filling the storage tank.

Storage Tank With either storage tank provided (80 gallon pressurized tank or 300 gallon atmospheric tank) the first ½ tank volume collected from the RO should be discarded. This is to insure any debris that may have been left in the tank, is purged from the system.

Mixed Bed DI Tanks Slowly open the By-pass valve for the mixed bed tanks or energize the AUX pump for 2000 – 8000 systems. This will allow the units to pressurize. After the tanks have filled, plug in the quality lamp. This lamp will display either a red of greed color. Allow water to flow threw the mixed bed tanks, within 10 minutes the lamp should change to green. It is normal for the lamp to go "red" during a daily start-up, however the rinse up time should be short, compared to the first rinse up. The longer the tank sits unused, the longer the rinse up time. Also, the more exhausted the tank, the longer the rinse-up time.

Postfilter The postfilter is a 5 micron filter cartridge designed to remove trace solids that could come from the storage tank, or resin fines from the mixed bed tanks. Filter changes should be infrequent.

Ultraviolet Lamp After water has filled the entire system, the last component to commission is the Ultraviolet sterilizer. Simply plug the unit in, and continue operation. When the unit is energized, an ultraviolet glow should be visible in the translucent viewing area.

System Maintenance

Membrane Preservation

In cases were the RO system is shut down for long periods it is recommended that the membranes are preserved in a solution containing 1% sodium bisulfite. The 1% sodium bisulfite solution will provide protection from biological growth.

While working with the preservative chemicals, please follow the appropriate local and national codes for chemical handling procedures to insure safety during this operation. This includes protective eyewear and gloves.


Disconnect and power to the system.

Close feed water supply.
Premix the specified volume of 1% sodium bisulfite (by weight) and water in a container. Open the housing, remove the filter cartridge and fill the housing with the bisulfite solution. (note- sodium bisulfite should be food grade, not cobalt activated)

After closing the housing, run the RO for 1 minute.

The system has now been preserved and can be restarted at a later date.

System Sanitation

Before preparing water for consumption with your new system, it is recommended the entire system be sanitized. It is also recommended that this procedure be repeated at least every 12 months (or more often if bacteriological concerns are prevalent in your area). If bacteria or mold has infected the RO system, sanitation of the system is required. There are several compatible biocides that can be used with type FT 30 membranes. Please consult supplier instructions for specific use of biocides.

FT 30 Compatible Brand Name Biocides:

Biocide	Maximum Concentration (20 - 25 °C)	Supplier
Bioclean 882	.2%	Argo Scientific
C-68	.09%	Betz
Kathon GC/ICP	.15%	Rohm and Haas
Nalco 2593	.15%	Nalco
Monarch Soak 40	5%	Monarch Chemical
Filtrapure Membrane Preservative	1%	Monarch Chemical

Before preparing water for consumption with your new system, it is recommended the entire system be sanitized.

While working with the sanitization chemicals, please follow the appropriate chemical handling procedures to insure safety during this operation. This includes protective eyewear and gloves.

Disconnect and lockout / tag out power to the system.

Close feed water supply.

Depressurize the system at the cartridge filter assembly.

Premix the specified volume of bisulfite and water in a container. Open the housing, remove the filter cartridge and fill the housing with the bisulfite solution.

After closing the housing, start the system and let it operate for 30 minutes.

After 30 minutes, shut the system down, remove the prefilter housing and reconnect the system in its original configuration.

The system has now been sanitized and can be restarted.

Troubleshooting

RO Pump Never Starts

No power	Use guidelines from “System dead”.
Teddington Switch Tripped	Reset by pressing button on top of Teddington switch (600 and 1200 units.)
Low Feed Pressure	Check by pressing and holding reset button for 2 seconds (2000, 4000, 6000 and 8000 units.)
System does not need to make water yet	If the storage tank is full, the system does not need to make water.
Outlet Valve Closed	Check system by-pass to make sure valving is in the correct position.
Low Inlet Pressure	Check pressure at TS RO inlet and correct if necessary.
Pump Motor Failed	Check or replace.

Poor Quality

Softener out of salt	Check brine tank, refill as necessary.
Inlet TDS too high	Check inlet TDS. TL RO is designed to operate with a ~ 98% rejection. For high TDS applications, reset poor quality alarm to higher setting.
Permeate flush not operating	Cycle system through permeate flush, check flush time, and volume to reject during flush. Check reject quality at end of flush, should be RO quality.
System not operating within specifications	Confirm system operating parameters. System should run at provided permeate, recycle and reject flow rates.
Brine seal leak	Check permeate conductivity for each housing. If one or some show poor readings, service membranes.
Chlorine/Oxidizer damage to membranes	Check inlet chlorine levels, residual less than 0.05 mg/L is required to prevent thin film composite membrane deterioration. Check free chlorine level after carbon filter. Replace carbon if free chlorine exceeds 0.05 mg/L. Typical carbon life is 12 –18 months.
Pump pressure low	Check and adjust.
Membrane plugged or fouled	Check, clean or replace.
Insufficient reject flow rate	See “no reject water.”
Membrane expended	Replace membrane.
Flush Solenoid Stuck	Replace or clean solenoid.

Mixed Bed Tanks Exhausted	Check rinse-up time of mixed bed tanks. Lead tank or both tanks may require replacement.

System Not Consistently Running

Low pressure alarm	Feed pressure too low. Check inlet PSI while system is running. System will shutdown if feed psi is below 15 psi. Check cartridge filter – replace if pressure loss exceeds 5 psi. System leak – check and repair.
Low Permeate flow	Water temperature is low. TDS too high. Membranes are fouled.
Membranes fouled	Check system log for history, if consistent declining production is found, clean membranes. Consult your Kinetico dealer for appropriate cleaning procedures and chemicals. Confirm system operating parameters.
Shut-off Float Valve not operating properly	Check operation of high level switch
Accumulator tank lost air precharge	Pump up tank air pressure to 20 psi. Check for cause of failure.
Prefilter fouled	Replace.
Low pressure safety switch defective	Replace.

Frequent Membrane Cleaning Required

Recovery too high	Depending upon water chemistry, a 50% system recovery is recommended as maximum. For source water high in silt, silica or organics, a reduced recovery % is recommended.
Ineffective cleaning solution	Silica treatment requires caustic cleaners that are heated to 90°F for maximum effectiveness. Hardness contamination is cleaned with acid chemistries.
Improper cleaning procedures	Temperature, flow rate, time and chemistry must all be matched to specific foulant being cleaned. Improper procedure will result in poor cleaning cycles.
Damaged membranes	Replace membranes.

Poor Production Volume

System not operating within specifications	Confirm system operating parameters. System should run at provided permeate, recycle and reject flow rates.

Cold Temperature	Inlet temperature less than 77 ^{o}F.
Fouled membranes	Check permeate quality.
Low pump pressure	The RO systems are designed to permeate projected volumes at a pump pressure of 100 psi. and a temperature at least 77 ^{o}F. Check if pump pressure yields less than 100 psi. Adjust pressure regulator valve to increase pressure.
Inlet quality changes	Analysis RO feed for Chlorine, hardness and temperature.
Tank precharge pressure too high	Relieve to 20 psi.
Tank lost air precharge	Pump up air precharge to 20 psi and check for cause of failure.
Prefilter cartridge plugged	Replace cartridge.
Insufficient reject flow rate	See “no reject water.”
Membrane fouled	Determine and correct cause; replace membrane.
Exceeding system capacity	Contact Kinetico Dealer.
Product check valve stuck	Replace check valve.
Insufficient storage capacity	Check charts in options section for draw down capacity.

No reject water

Flow control screen clogged	Check and clean.
Plugged drain line or outlet	Check and clean.

Low flow rate at point of use

Low water production	See “no water or not enough water.”
Tank lost air precharge	Pump up air precharge to 20 psi and check for cause of failure.
Tank diaphragm failed	Replace as necessary.
Pump pressure low	Check and adjust.

Unit cycles on/off intermittently

Air precharge too low	Adjust to 20 - 28 psi on 600 and 1200 units.

PARTS

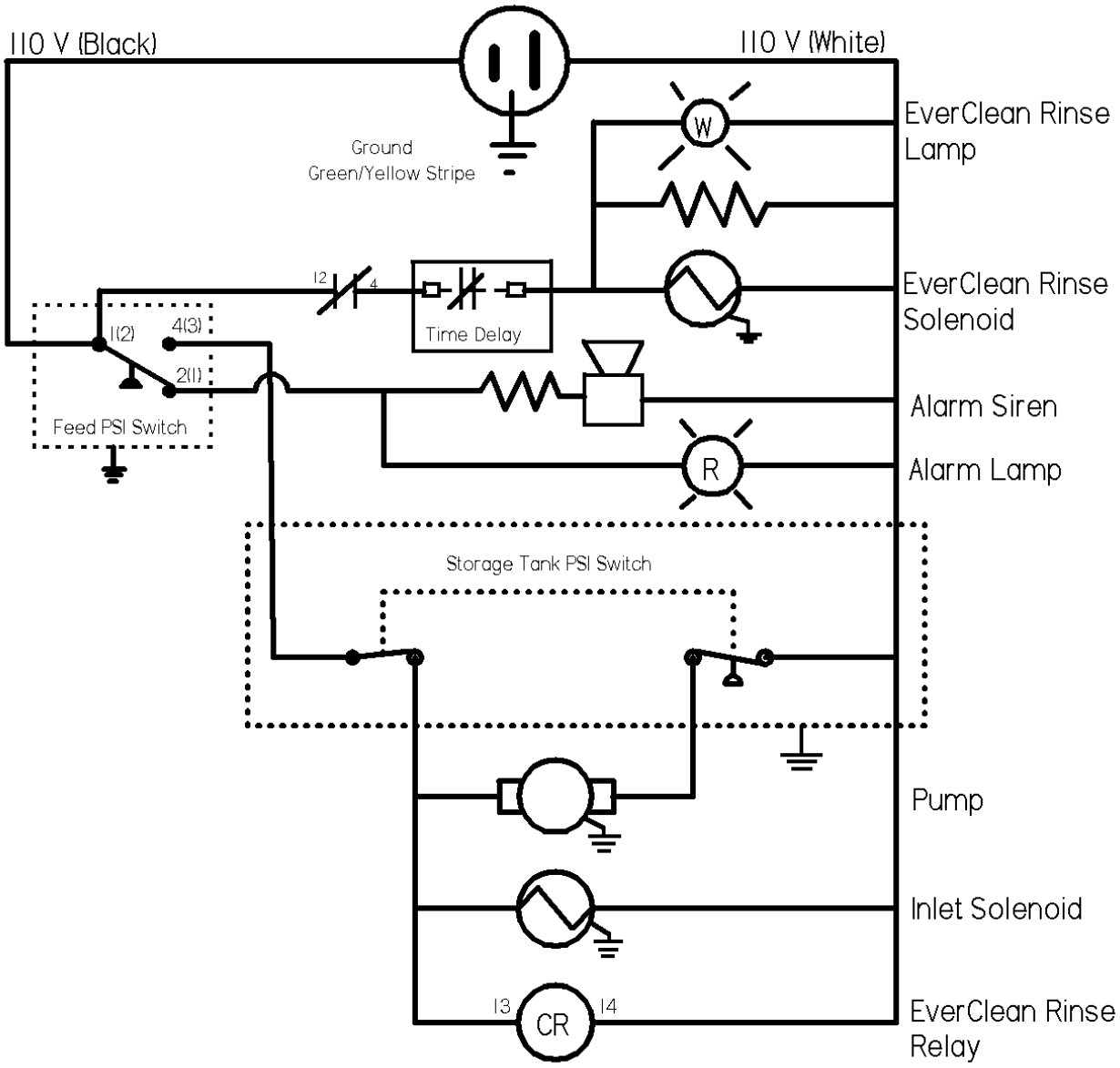
Pressurized Systems

Description	PN	HP 600p	HP 1200p
16” Prefilter Housing	11653	1	1
By-pass Assembly	10742	1	1
Upflow Dechlorinator	10286	1	1
10” Postfilter Housing	11652	1	1
TS 600 RO	9527	1	
TS 1200 RO	9547		1
Prefilter Cartridges Case	12566	1	1
Postfilter Cartridges Case	12563	1	1
80 Gallon RO Pressure Tank	7486	1	1
Mixed Bed DI Tank (10” x 40”)	67942	2	2
1 Megohm Quality Lamp	54684	1	1
UV Sterilizer – 2 gpm	71135	1	1

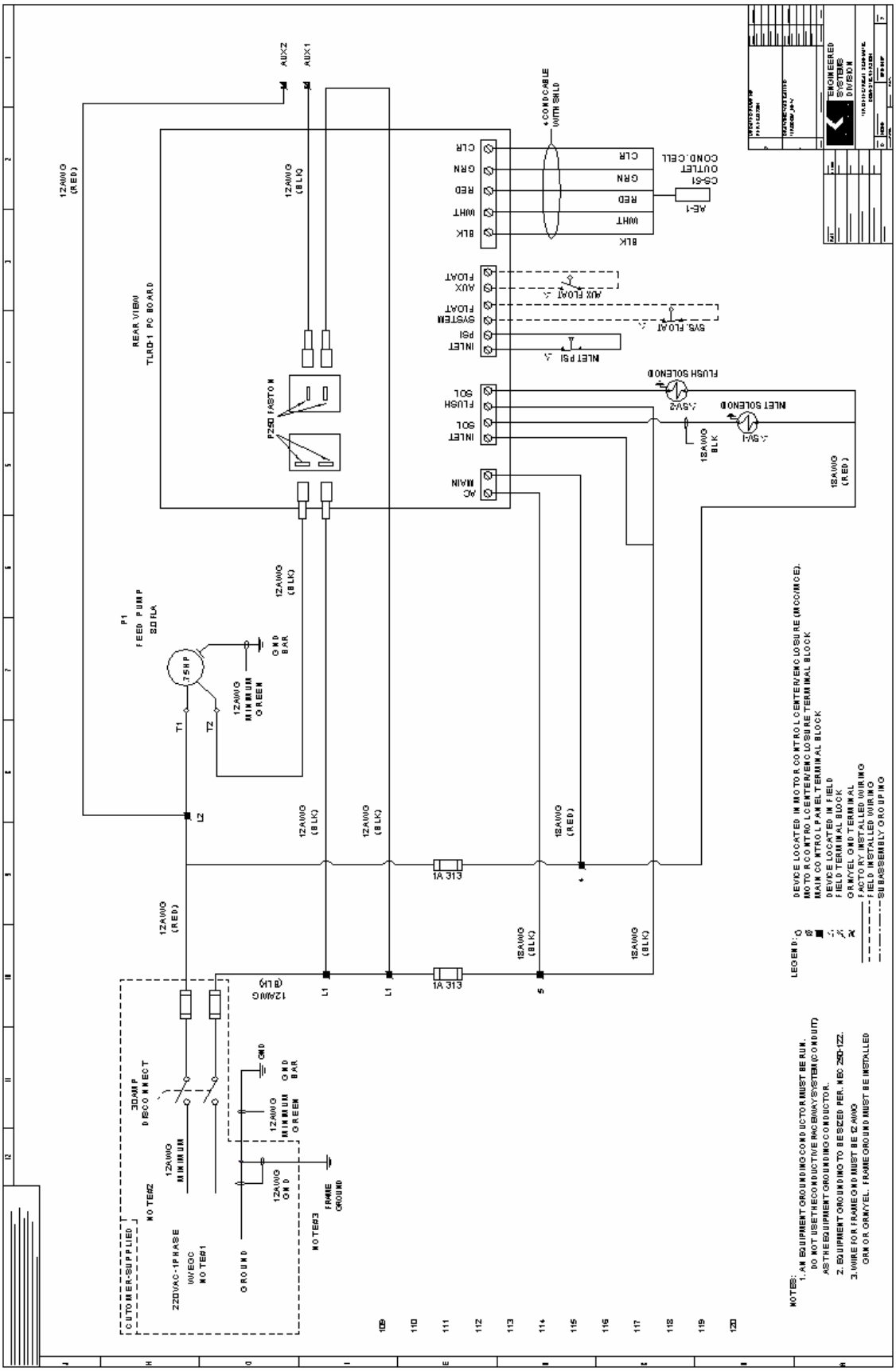
Atmospheric Systems

Description	PN	HP 2000a	HP 4000a	HP 6000a	HP 8000a
16” Prefilter Housing	11653	1	1	1	1
By-pass Assembly	10742	1	1		
Upflow Dechlorinator	13065	1	1		
10” Postfilter Housing	11652	1	1	1	1
TS 2000 RO	7507B	1			
TS 4000 RO	7508B		1		
TS 6000 RO	7509B			1	
TS 8000 RO	7510B				1
Prefilter Cartridges Case	12566	1	1	1	1
Postfilter Cartridges Case	12563	1	1	1	1
300 gallon RO Atm. Tank	7495	1	1	1	1
Tank Bulkhead Assembly	9837	1	1	1	1
Tank Level Control	8319	1	1	1	1
Repressurizer	10210	1	1	1	1
Mixed Bed DI Tank (10” x 54”)	67944			2	2
1 Megohm Quality Lamp	54684	1	1	1	1
UV Sterilizer – 6 gpm	71137	1	1	1	1

HP 600 and 1200



HP 2000, 4000, 6000 and 8000



SYSTEM LOG

PRESSURE Prefilter	PRESSURE Postfilter	PRESSURE Pump	Softener Salt Level	Softener Salt Added	R.O. Permeate Flow Rate	R.O. Permeate Quality	Storage Level	Mixed Bed Quality	Mixed Bed Replace Tank	Comments

TECH MANUAL
HP SERIES RO/DI SYSTEMS

Kinetico® water systems