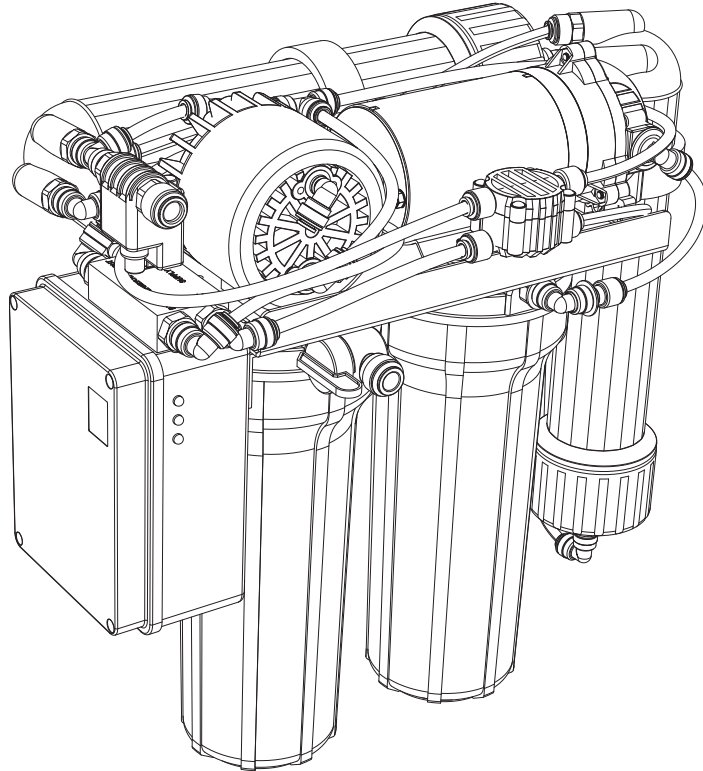


IMPORTANT! Read and save these instructions. This manual to be left with the equipment.



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

Reverse Osmosis System
RO-U

Thank you for choosing Condair

Installation date (DD / MM / YYYY):

Commissioning date (DD / MM / YYYY):

Site:

Model:

Serial number:

Proprietary Notice

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1 Introduction

1.1 Before You Start

Thank you for purchasing the Reverse Osmosis System.

The Reverse Osmosis System incorporates the latest technical advances and meets recognized safety standards. Improper use of the Reverse Osmosis System may result in danger to the user or third parties, and/or damage to property.

To ensure safe, proper, and efficient operation of the Reverse Osmosis System, please observe and comply with all information and safety instructions contained in this manual, as well as all relevant documentation of components of the installed humidification system.

If you have additional questions, please contact your Condair representative. They will be glad to assist you.

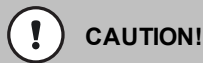
1.2 General

1.2.1 Limitations of the Manual

The subject of this manual is the Reverse Osmosis System. It is intended as a supplement to the installation, operation and maintenance manuals.

This manual is restricted to the **installation, operation, and maintenance** of the Reverse Osmosis System. This manual is intended for **well trained personnel** who are suitably qualified for their respective tasks.

1.2.2 Symbols Used in This Manual



The catchword "CAUTION" in conjunction with the general caution symbol is used to provide safety instructions that, if neglected, may cause damage and/or malfunction of the unit or damage to property.



The catchword "WARNING" in conjunction with the general warning symbol is used to provide safety instructions that, if neglected, may cause injury to personnel. Other specific warning symbols may also be used in place of the general symbol.



The catchword "DANGER" in conjunction with the general danger symbol is used to provide safety instructions that, if neglected, may cause severe injury to personnel or even death. Other specific danger symbols may also be used in place of the general symbol.

1.2.3 Storage of Manual

Keep this manual in a place where it is safe and readily accessible. If the equipment is moved to another location, please ensure that it remains with the equipment.

If the manual is lost or misplaced, please contact your Condair representative for a replacement.

1.2.4 Available Manuals and Languages

Table 1: Document (Part) Numbers and Languages of Available Manuals

	Installation Manual	Operation and Maintenance Manual	Installation, Operation, and Maintenance Manual	Spare Parts List	Engineering Manual
Ultrasonic Humidifier US	2588786_A_EN_1907_US_IM	2588787_A_EN_1907_US_OM	—	2588788_B_EN_1907_US_SPL	—
Reverse Osmosis System RO-U	—	—	2594385_B_EN_1907_RO_IOM	—	—

1.3 Receiving and Storage

1.3.1 Inspection

After receiving the shipment, inspect the goods as follows:

- Inspect the shipping boxes for damage. Report any shipping box damages to the shipping company without delay.
- Check the goods against the packing slip to ensure that all items have been delivered. Report any shortages to your Condaire representative within 48 hours of receipt of the goods. Condaire does not assume responsibilities for any shortages beyond this period.
- Unpack the parts/components and check for any damage. If parts/components are damaged, notify the shipping company immediately.
- Verify the model type on the specification label to ensure that it is suitable for your installation. Refer to "[Model Designation](#)" on page 15.

1.3.2 Storage, Packaging, and Transportation

Storage

Store the Resistive Steam Humidifier in its original packaging inside a protected area that meets the following requirements until it is installed, or if it needs to be stored for an extended period of time:

- Room temperature: 5 to 40 °C (41 to 104 °F)
- Room humidity: 10 to 95% RH (non-condensing)

Transportation

For optimum protection always transport the unit and components in their original packaging, and use appropriate lifting/transporting devices (ex. forklift).

Lifting or handling must be carried out by trained and qualified personnel. Ensure that lifting has been fully planned and assessed for possible risks, and that equipment is checked and operated by a skilled operator. It is the customer's responsibility to ensure that operators are fully trained to handle heavy goods and to enforce any applicable lifting regulations.

Packaging

Keep the original packaging of the unit/components for later use.

If the packaging needs to be disposed, observe local regulations on waste disposal. Please recycle packaging where possible.

1.4 Safety Precautions

Regard all safety precautions described in this manual.

For more information, refer to ["For Your Safety" on page 8](#).

1.5 Compliance

Follow all local guidelines and regulations regarding the installation and operation of the unit; this includes (and not limited to) mounting, plumbing, water, gas, ventilation, and electrical connections.

Please consult your local Condair representative to learn more.

2 For Your Safety

General

Every person who is tasked with the installation, operation and/or maintenance of the Reverse Osmosis System must read and understand this manual, as well as any respective installation, operation and/or maintenance manuals before performing any work. Knowing and understanding the contents of these manuals is a basic requirement for protecting personnel against any kind of danger, preventing faulty operation, and operating the unit safely and correctly.

All labels, signs and markings applied to the Reverse Osmosis System must be observed, kept in a readable state, and NOT removed or altered.

Personnel Qualifications

All procedures described in this document must only be performed by personnel who are adequately qualified, familiar with the unit, well trained, and are authorized by the customer.

For safety and warranty reasons, any activity beyond the scope of this manual must only be performed by qualified personnel authorized by Condair.

The unit may not be used by persons (including children) with reduced physical, sensory, or mental abilities, or persons with lacking experience and knowledge, unless they are being supervised by a person responsible for their safety, or they have received proper instruction on the operation of the system.

All personnel working with the Reverse Osmosis System unit must be familiar with, and comply with the appropriate regulations on workplace safety and prevention of accidents.

Intended Use

The is intended exclusively for air humidification using Condair-approved within specified operating conditions. Refer to "[Technical Data](#)" on page 19 for details. Any other type of application, without the express written consent of Condair, is considered to be NOT conforming to its intended purpose, and may lead to dangerous operation and will void the warranty.

In order to operate the equipment in the intended manner all information contained in this manual, in particular the safety instructions, must be observed closely.

Safety Precautions that Must be Observed



DANGER!

Risk of electric shock!

The Reverse Osmosis System is 24 VAC powered. Live parts may be exposed when the access panels or doors are removed. Touching live parts may cause severe injury or even death.

Prevention: The Reverse Osmosis System must be connected to the humidifier only after all mounting and installation work has been completed and checked for correct workmanship, and the access panels/doors to the humidifier are closed and fastened securely.

Only qualified personnel should perform maintenance or repairs on the unit.

Follow any lockout procedures when servicing the unit.

**DANGER!**

Poorly maintained RO-U systems may be hazardous.

Poor maintenance of the Reverse Osmosis System poses a health risk to spaces humidified by the Ultrasonic Humidifier. When adequately operated or poorly maintained, micro-organisms that cause disease, such as Legionnaire's, may grow in the water system and in the humidifier which dispel the micro-organisms into the air.

Prevention: Read, understand, and follow maintenance guidelines to ensure the humidification system remains safe. Ensure that the unit is cleaned and disinfected, as directed in this manual, and avoid shutting off the unit (max. 48 hours). If the unit has been off for 48 hours or more, disinfect and flush the system thoroughly before humidifying the space with the Ultrasonic Humidifier.

**WARNING!**

Do NOT leave the unit without power. Risk of contamination.

Do NOT leave the unit unpowered for more than 48 hours, or else a total system disinfect will be required. Without power, the system will not flush properly, resulting in standing water and conditions that may promote the growth of micro-organisms.

Prevention: Leave your unit powered on. If you do not need humidification during the 48 hours, set the humidifier to standby or set the demand to 0.

**WARNING!**

Risk of contamination.

Do NOT use oil, grease, glue, Teflon, silicon, O-ring lubrication, etc. when assembling pipes or hose connections. All of the above products can act as food for bacteria, posing health risks.

Prevention: For lubricant, use dish soap. Wash hands and wear clean gloves while assembling parts in direct contact with water. Keep dust covers on pipes and hoses until assembly.

**WARNING!**

Water from RO-U systems may cause metals to corrode quickly.

Water produced from a Reverse Osmosis System is aggressive and can cause some metals to quickly corrode. The RO-U system should always be connected to piping and equipment that is suitable to handle RO water.

Prevention: Read, understand, and follow maintenance guidelines to ensure the humidification system remains safe.

**CAUTION!**

The RO-U System contains pressurized water.

Hoses in the RO-U System contain pressurized water that may spray if the hose connections are loose or there is a leak.

Prevention: Do not re-tighten or unscrew hoses while the system is pressurized. Test for leaks and replace broken hoses.

**CAUTION!**

Do NOT fasten the RO-U System, including the tank, hoses, and pipes to vibrating surfaces.

Preventing Unsafe Operation

All personnel working with the must immediately report to the customer any alterations or changes to the unit that may affect safety, and **secure the unit against accidental power-up**.

If it is suspected that the unit cannot be operated safely for any of the reasons listed below, shut it down immediately.

Alterations and changes that may affect safe operation include:

- damage to the unit
- loose or damaged electrical connections
- improper operation
- leaks in the distribution system

Modifications to the Unit Prohibited

Modifications are NOT permitted on the Reverse Osmosis System without the express written consent of Condair.

3 Hygiene

3.1 Important Notes on Hygiene

Observe the local health and safety executive's technical guidance on the control of Legionella in water systems.

The user is responsible to ensure that the water system complies with local regulations, bylaws, and guidelines (such as the HSE ACoP L8, VDI 6022, ISO 22000, HACCP, or equivalent). If inadequately maintained, water systems, of which any humidifier is a part, can support the growth of microorganisms, including the bacterium responsible for Legionnaires' disease.

Any risks or hazards relating to the system, including during installation and maintenance, should be identified by a competent health and safety representative who is responsible for introducing effective control measures.

3.2 Hygiene Risk Management

Cold water humidification presents the risk of spreading pathogenic microorganisms into the air. The Ultrasonic Humidifier and Ultrasonic Blower Pack distribute tiny water droplets (mist) that are blown into the space before being absorbed into the air. If the mist was contaminated before leaving the unit and then evaporates, these contaminants are deposited onto surfaces in the space, or are otherwise inhaled or redistributed into the ventilation system.

Pathogens include, and are not limited to, Legionella, E. coli, and viruses, and may originate from contaminated water, air, and equipment.

Regular cleaning and disinfecting is required to reduce health risks. Refer to "[Hygiene Risk Management](#)" [above](#) for more information on managing hygiene hazards.

Follow all safety precautions and local regulations. Refer to "[For Your Safety](#)" on [page 8](#).

There are multiple points in the humidification system where a contamination can occur. It is the responsibility of the customer and of Condaire to ensure that health hazards due to contamination are reduced to acceptable levels. The use of a hygiene risk assessor is recommended.

Regularly clean and maintain the humidifier and its components, and do NOT miss or ignore the warnings in this manual and service messages displayed on the humidifier.

Supply Air and Water

Pathogens can originate from the water supply, such as a tank or water line. It is important that standing water in the tank or in the water line is flushed frequently to prevent the buildup of contaminants, and the water is filtered and treated.

Pathogens may also enter the humidification system through the ventilation system or from within the humidifier space. A fan blows air out of the water reservoir into flexible tubes, and further into a blower pack and into the atmosphere. Contaminated air can join the mist, so it is recommended to use air filters in the ventilation system, in the humidifier, and in the Ultrasonic Blower Pack. Ensure to use the supplied air filters at all times and replace them regularly (as recommended in the Ultrasonic Humidifier Maintenance and Operation Manual).

3.2.1 Guidelines to Keep a Clean System and Prevent Micro-organism Growth

- Perform a risk assessment of the water system using a competent person, and implement an appropriate monitoring and control program.
- Connect a RO system to a clean, potable main water supply.
- Ensure that the system is cleaned and/or flushed regularly.
- Ensure that the buffer tank is clean and sterile before use.
- Enter a service contract that suits the needs of the company.
- Stop the system if polluted drinking water is found in the area.

- Avoid water temperatures above 20 °C (68 °F). Temperatures between 20-60 °C (68-140 °F) favor the growth of Legionella.
- Do not stop the system unless it is faulty or leaking (to avoid water stagnation).
- If the power to the system is interrupted (such that the unit fails to flush or drain) for more than 48 hours, complete a total system disinfection.
- Refrain from closing sections of the system, unless there is a leakage or fault (to avoid water stagnation).
- Disinfect at least once per year, and after every maintenance or repair.
- Analyze the water and test for harmful bacteria at least once per year.
- Conduct follow-up measurements until the system is clean if bacteria has been detected in the system.

The Condair service team can help with expert technicians who can provide:

- Bacteriological troubleshooting on-site*.
- Cleaning and disinfecting.
- Preventative maintenance.
- Repair and fault finding.
- Training and guidance.

Note: * Condair uses a quick method for measuring bacterial activity in the water with the use of BactiQuant (BQ). Once the water sample has been taken, the bacteriological quality of the water is read within 30 minutes, and the Condair service team will disinfect the system if necessary.

Please contact your local Condair representative for further information about our services.

3.3 Risk Monitoring and Assessment

Water hygiene assessments must be performed at the site to determine the risk and severity of hygiene hazards that affect the health and safety of the public. Performing a risk assessment with regular monitoring will allow procedures to be adjusted.

Ensure that the person conducting the assessment is qualified.

A typical assessment inspects the following:

- Supply water quality. Refer to "[Technical Data](#)" on page 19.
- Environment around the humidifier.
- Maintenance procedures. Refer to .
- Water pre-treatment options (such as using UV light, using reverse osmosis or deionized water, etc.).

Proper maintenance procedures along with recommended site controls will help ensure compliance to local regulations and protect the public.

It is recommended to monitor the humidification system weekly, and then monthly once satisfactory levels are maintained.

Ensure that the results of every assessment is recorded.

IMPORTANT! Failure to make adequate provision against the outbreak of disease, such as Legionnaires' disease, may cause fatalities, illness, and liabilities.

4 Product Description

4.1 General Description

The use of RO, de-mineralized (permeated) water is recommended for use with Nortec Ultrasonic Humidifier systems for the following reasons:

- Prolonges lifetime of transducers. Any minerals, salts, sediment, and pathogens that enter the humidifier will pollute the water reservoir. The integrated flushing function will delay this process, but will not prevent it entirely. Depending on the quality of the added water, the water reservoir will eventually become blocked. As a result, the energy of the transducers in the humidifier will no longer be effective, and they will wear more quickly. In addition, the float switch could transmit the wrong information to the electronics system and cause damage to the system.
- Reduces dusts and deposits. The minerals and salts (such as calcium) present in the water will deposit onto surfaces in spaces being humidified by the Nortec Ultrasonic Humidifier.
- Reduces bacterial growth. Bacteria, such as Legionella, could multiply in the water in the buffer tank and would constitute a health hazard.
- Reduces maintenance.

The Nortec RO-U System is fitted with a high-grade (Dow Chemical) membrane. Working on the principle of Reverse Osmosis (R.O.), the membrane only allows water molecules to pass through. A flushing system prevents clogging, increases the service life of the membrane, and improves performance. Flushing occurs as long as the unit is powered, and will occur every 24 hours.

Systems can be supplied with a capacity of 20 kg/h at 10 °C (44 lbs per hour at 50 °F) and the capacity is dependent on the water pressure. Two preliminary filters are positioned ahead of the membrane; a 5 µm pre-filter and an active carbon filter.

An electric booster pump in the Nortec RO-U System increases the pressure to compensate for low water pressure or high demand.

The water shut off valve is automatic and prevents water from being wasted when the system flushes.

A permeate pump (Water Saver) and Water Safe Guard is included with the Nortec RO-U system. The pump increases the efficiency of the flushing and reduces water use. The water Safe Guard continuously monitors the membrane function and indicates when to replace a Nortec RO-U membrane.

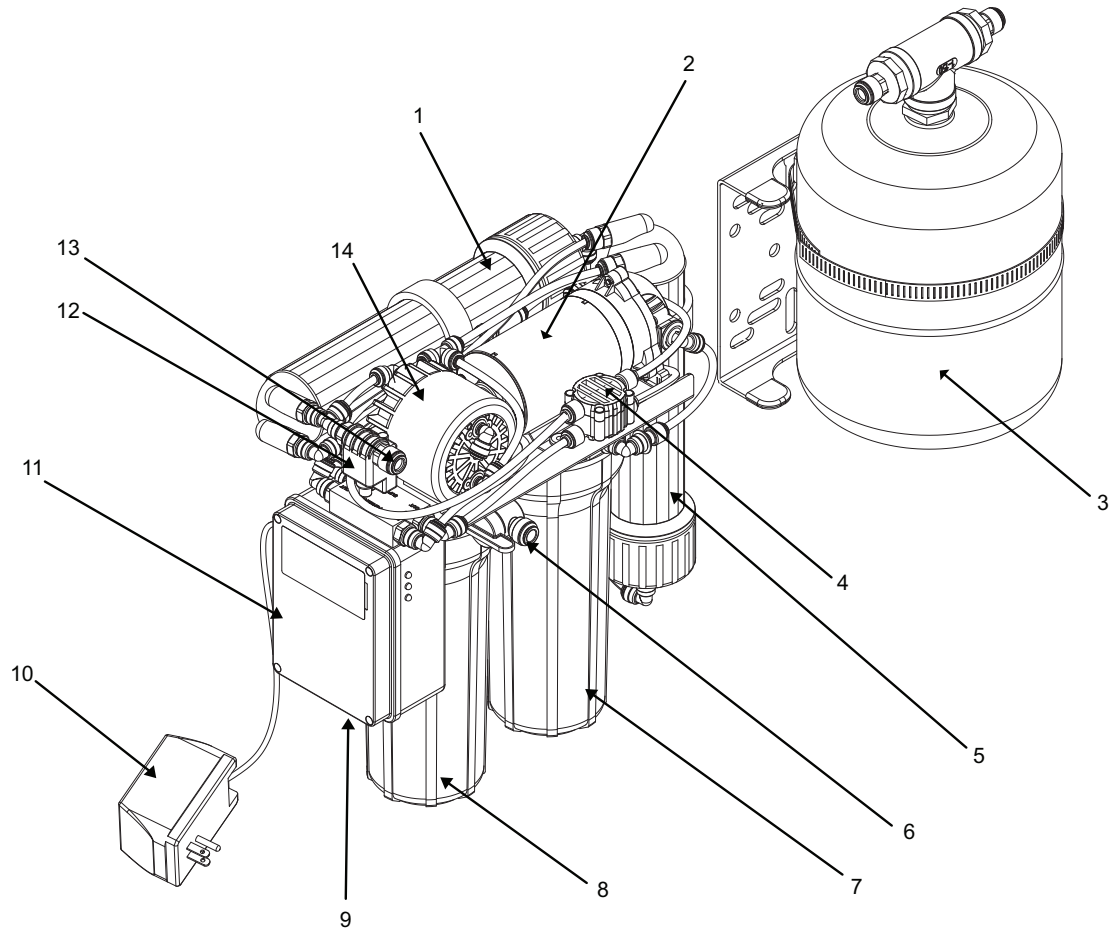


Figure 1 - Nortec RO-U Overview (with Buffer Tank)

- | | |
|-----------------------|---|
| 1. RO membrane | 8. Sediment filter |
| 2. Booster Pump | 9. Fuse (inside) |
| 3. Buffer tank | 10. Wall transformer |
| 4. Shut-off valve | 11. Water Safe Guard |
| 5. RO membrane | 12. Pressure Switch |
| 6. Source water inlet | 13. Water outlet (de-mineralized, to buffer tank) |
| 7. Carbon filter | 14. Permeate pump |

4.1.1 Buffer tank, Fitting, and Wall Bracket






A buffer tank and T-piece connector is included in the delivery. The buffer tank contains a polymer bag that stores the permeated water, and will supply additional water whenever the humidifier is consuming more water than the RO-U System is able to supply, such as during flushing and filling (at any other time, the system supplies more than the required consumption and any excess water will be used to refill the tank).

The buffer tank and T-piece connector should be fitted in the supply line to the humidifier.

Note: The space between the polymer bag and the tank contains pressurized air. The air pressure between the bag and the shell of the buffer tank should be greater than the RO-U water in the bag.

4.2 Model Designation

The specification label on the side of the RO-U system shows the model type, serial number, and other ratings. Refer to the figure below. The label is located on the Water Safe Guard.

Type Designation	 Model: RO-U 44		rev.1.2	Revision #
	Production kg/lb / day at 10 °C / 50 °F	480 / 1058		
	Production kg/lb / day at 25 °C / 77 °F	750 / 1653		
	Rejection salts (%)	98		
	Production compared to feedwater (%)	20 - 35		
	Max. ambient temperature (°C / °F)	45 / 112		
	Energy consumption (W)	25		
	PSI	15		
			1750	Month / Year
Serial number	 S/N: ??????????	 EP RO-U 44		Article #

4.3 Functional Description

Inlet water enters the Reverse Osmosis System and first passes through two filters. The first is the sediment filter that removes large particles from the source water before it passes through the active carbon filter.

Filtered water then enters the booster pump and is pressurized before it passes through the Water Safe Guard and the water shut off valve.

The Water Safe Guard measures the relative impurities between the filtered water and the permeated, RO water from the RO membrane. This is represented by the **X** in the equation below.

$$X = \frac{\mu\text{S permeate}}{\mu\text{S water supply (filtered)}} \times 100\%$$

The Water Safe Guard indicates proper operation with 3 LED lights; red, yellow, and green. The display of these lights are dependent on the value of **X**, above, and the duration.

- Green LED: RO membranes are working properly.
X < 10%
- Yellow LED: RO membranes should be replaced at the next maintenance cycle.
10% ≤ X < 20% for greater than 3 minutes
- Red LED, flashing: RO membranes must be replaced within 24 hours or the unit will shut off.
- Red LED: RO membranes are not functioning and the humidifier unit is shut off. The humidifier will resume function when the RO membranes are replaced. If the humidifier and its components are off for more than 48 hours, a complete clean and flush of the system is required.
X ≥ 20% for greater than 24 hours

Note: During start up, the green and yellow LED will both light.

After passing the Water Safe Guard, the water passes through the water shut off valve. The water shut off valve is dependent on the incoming water pressure and the back pressure from the tank. The valve stops fluid flow when the permeate pressure is at a set-point greater than the inline water pressure.

When the permeate pressure drops below the set-point, the shut off valve will open and allow water to enter the tank. Without the water shut off valve, permeated water will end up being drained after the tank has been filled (due to back pressure from the tank).

From the water shut off valves, the water enters two RO membranes. In the RO membranes, the incoming water is split into two streams; permeated water, and brine (water rejected by the membrane). The incoming water passes through sheets that contain small pores that only allow water to pass. The 'fresh' water moves towards the center of the membrane where they exit the other side of the RO membrane. The brine cannot pass through the perforated sheets and is sent to the flow restrictor (not shown), the permeate pump, and then the drain.

Note: The flow restrictor is required for proper functioning of the RO membrane. The restrictor in the drain line increases the pressure against the membrane and forces water to enter the sheets in the membrane. Without the restrictor, permeate would re-enter the brine.

Permeate leaving the RO membrane passes through a one-way, non-return valve, through the water shut off valve, and to the permeate pump. The permeate pump uses the energy of the brine to improve the efficiency of the RO membrane by overcoming the back pressure from the RO buffer tank.

From the permeate pump, the brine is drained and the permeate is sent to the pressure switch, and then the buffer tank. The pressure switch shuts off the pump when a set pressure is reached in the tank, and is designed to prevent the maximum system pressure from being reached. When the buffer tank is full, the pressure switch will power down the system.

The buffer tank consists of a hard shell enclosing a plastic bag that is surrounded by air. The air inside the tank is pressurized and may be altered by adding air to the bottom of the tank. The plastic bag is filled with RO water where it is stored and used to supplement water usage of the Ultrasonic Humidifier.

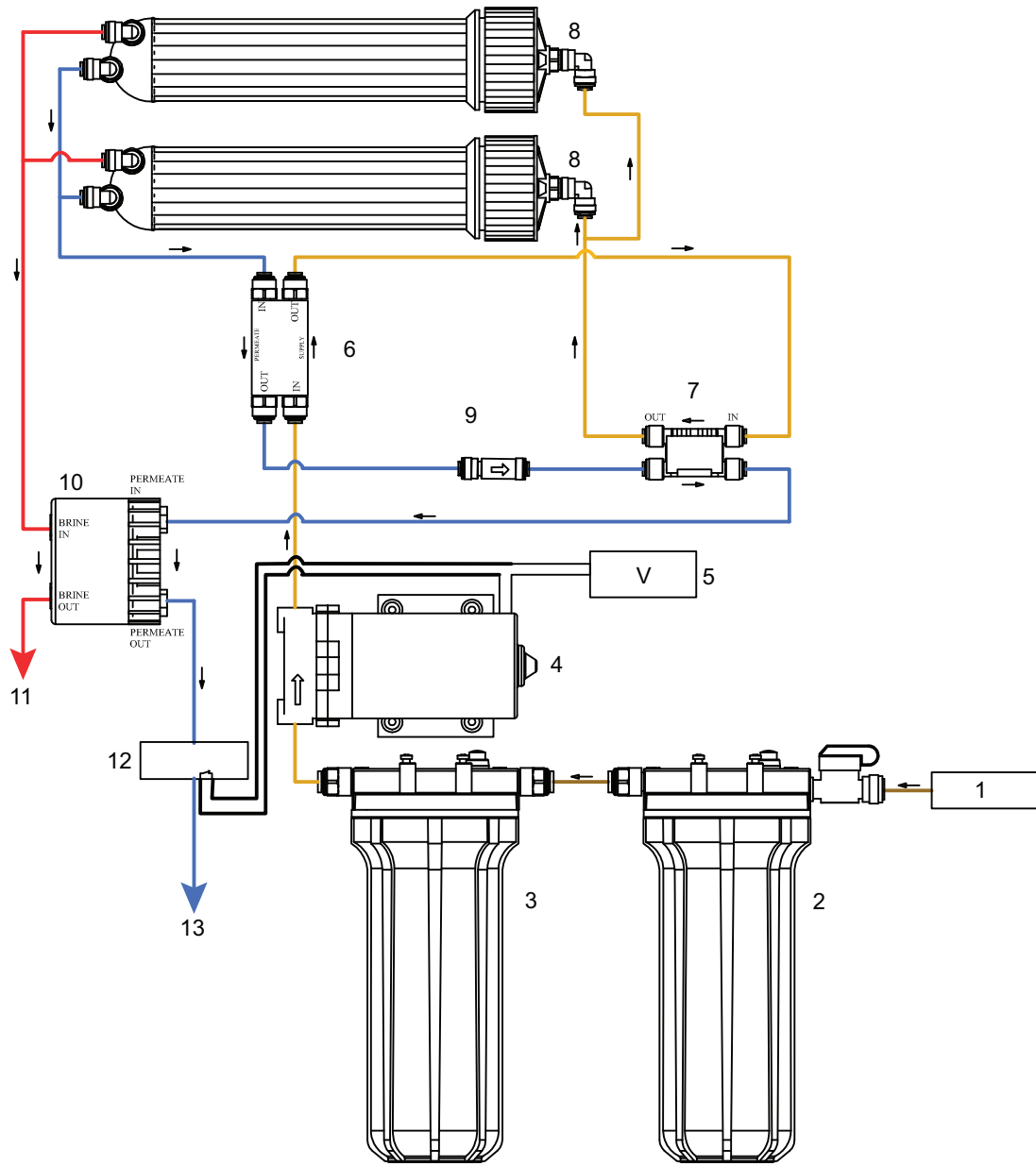


Figure 2 - Hydraulic Diagram

- | | |
|-------------------------|--|
| 1. Source water | 8. RO membrane |
| 2. Sediment pre-filter | 9. One way valve |
| 3. Carbon filter | 10. Permeate pump |
| 4. Booster pump | 11. Brine water to drain |
| 5. Wall transformer | 12. Pressure switch, 2.5 bar |
| 6. Water Safe Guard | 13. RO water (permeate) to buffer tank |
| 7. Water shut-off valve | |

4.4 Options

The buffer tank (PN: 2586532) option is required for the Ultrasonic Humidifier if the RO-U is installed.

4.5 Accessories

Accessories for the Reverse Osmosis System:

- Wall mounting brackets (supplied) to mount the unit and buffer tank.
- Reverse Osmosis System *Installation, Operation, and Maintenance Manual* (P/N: 2594385_B_EN_1907_RO_IOM) (supplied).

5 Product Specifications

5.1 Technical Data

5.1.1 Capacity

Reverse Osmosis System Capacity (with Booster Pump, Water Saver, and Water Safe Guard)

Model	Capacity	
RO-U	water temperature at 10°C (50 °F): 20 kg/h / 5.3 g/h (44 lb/h / 0.19 oz/h)	maximum, water temperature at 25 °C (77 °F), at 1 bar (15 psi) min.: 31.2 kg/h / 8.2 g/h (69 lb/h / 0.29 oz/h)

5.1.2 Weights

Table 2: Reverse Osmosis System Weight

Model	Weight
RO-U	9.7 kg (21 lb)
Buffer Tank	8.7 kg (19 lb)

5.1.3 Dimensions

Model	Dimensions
RO-U	L x W x H: 36 x 23 x 46 cm (14 x 9 x 18 in)
Buffer Tank	H: 30 cm (12 in), 35 cm (14 in) with tee; diameter: 21 cm (8 in)

5.2 Operating Data

5.2.1 Water Quality

See also ["Water Supply Requirements"](#) on page 24.

Water Quality:	
inlet: 3/4 in, outlet: 3/8 in JG	
Water supply quality	Potable / Mains with CFU < 200 CFU/ml
Permeate Quantity (retention of salts and minerals)	98 %
Permeate Concentration Quality (yield compared to the supplied water)	20-35 %
Admissible Water Temperature	10-20 °C (50-68 °F).

5.2.2 Temperature

Temperature:	
Ambient Temperature	0-25 °C (32-77 °F)
Ambient Water Temperature	0-25 °C (32-77 °F)

5.2.3 Power

Power (see the specification label on the unit):	
Supply Voltage	24 VAC / 110 VAC transformer
Consumption	27 W

6 Installation and Planning

6.1 General

Strictly observe and perform all installation tasks including the mounting of the unit and connection of the water and power supplies as described in this manual. Observe and comply with all local and national codes dealing with water and electrical installations. Condair does not accept any liability for installation of humidification equipment by unqualified personnel, or the use of equipment and parts that are not authorized by Condair.

Personnel Qualifications

All installation work must be performed only by licensed personnel authorized by the customer. It is the customer's responsibility to verify qualifications of the personnel.

Safety

Observe the following safety precautions:



DANGER!

Risk of electric shock!

The Reverse Osmosis System is 24 VAC powered. Live parts may be exposed when the access panels or doors are removed. Touching live parts may cause severe injury or even death.

Prevention: The Reverse Osmosis System must be connected to the humidifier only after all mounting and installation work has been completed and checked for correct workmanship, and the access panels/doors to the humidifier are closed and fastened securely.

Only qualified personnel should perform maintenance or repairs on the unit.

Follow any lockout procedures when servicing the unit.



DANGER!

Poorly maintained RO-U systems may be hazardous.

Poor maintenance of the Reverse Osmosis System poses a health risk to spaces humidified by the Ultrasonic Humidifier. When adequately operated or poorly maintained, micro-organisms that cause disease, such as Legionnaire's, may grow in the water system and in the humidifier which dispel the micro-organisms into the air.

Prevention: Read, understand, and follow maintenance guidelines to ensure the humidification system remains safe. Ensure that the unit is cleaned and disinfected, as directed in this manual, and avoid shutting off the unit (max. 48 hours). If the unit has been off for 48 hours or more, disinfect and flush the system thoroughly before humidifying the space with the Ultrasonic Humidifier.



WARNING!

Do NOT leave the unit without power. Risk of contamination.

Do NOT leave the unit unpowered for more than 48 hours, or else a total system disinfect will be required. Without power, the system will not flush properly, resulting in standing water and conditions that may promote the growth of micro-organisms.

Prevention: Leave your unit powered on. If you do not need humidification during the 48 hours, set the humidifier to standby or set the demand to 0.

**WARNING!**

Risk of contamination.

Do NOT use oil, grease, glue, Teflon, silicon, O-ring lubrication, etc. when assembling pipes or hose connections. All of the above products can act as food for bacteria, posing health risks.

Prevention: For lubricant, use dish soap. Wash hands and wear clean gloves while assembling parts in direct contact with water. Keep dust covers on pipes and hoses until assembly.

**WARNING!**

Water from RO-U systems may cause metals to corrode quickly.

Water produced from a Reverse Osmosis System is aggressive and can cause some metals to quickly corrode. The RO-U system should always be connected to piping and equipment that is suitable to handle RO water.

Prevention: Read, understand, and follow maintenance guidelines to ensure the humidification system remains safe.

**CAUTION!**

The RO-U System contains pressurized water.

Hoses in the RO-U System contain pressurized water that may spray if the hose connections are loose or there is a leak.

Prevention: Do not re-tighten or unscrew hoses while the system is pressurized. Test for leaks and replace broken hoses.

**CAUTION!**

Do NOT fasten the RO-U System, including the tank, hoses, and pipes to vibrating surfaces.

6.1.1 Installation Overview

This section covers the mounting and water connections for the RO-U System.

The RO-U System (with buffer tank) can be installed with any Ultrasonic Humidifier, and one should be installed for each tank in the humidifier (1 in the medium and 2 in the large). The RO-U System must be mounted on the wall, or suitable, non-vibrating mounting surface, and should have access to a drain, water supply, and power supply, and should be placed in a location that is easy to service, with enough room to install the buffer tank.

IMPORTANT! Do NOT commission the RO-U System until installation is complete and the unit is flushed. The pump in the system contains preservation fluid and must be flushed out before being connected.

IMPORTANT! Once installation is complete, and the unit has been commissioned. Avoid turning the unit off, as this creates stagnant water and health risks.

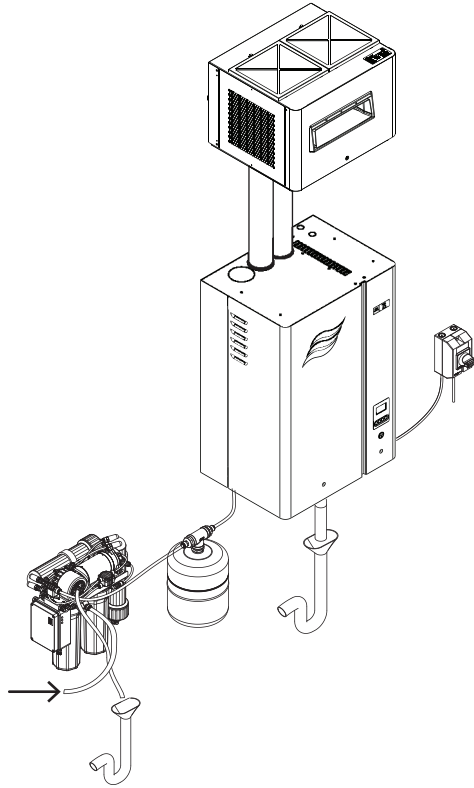


Figure 3 - Typical Configuration (medium Ultrasonic Humidifier and Ultrasonic Blower Pack shown)

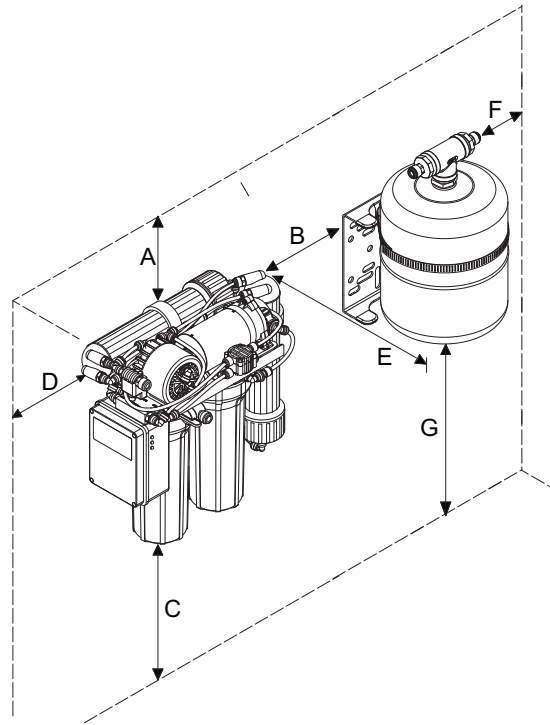
6.2 Location Requirements

The RO-U System should be installed vertically (it is possible to have the system installed horizontally, however, air bleeding will be slower and pre-filter replacements may be more difficult), and mounted on a non-vibrating wall or other vertical surface that is suitable for holding the RO-U with buffer tank.

It is recommended to install the buffer tank at the same elevation as the humidifier. There may be cases where the Ultrasonic Humidifier is installed at a higher elevation than the buffer tank. Significant height differences will result in low pressures from the buffer tank, so to compensate for this pressure drop, note the height difference and increase the air pressure in the tank. Refer to ["Adjusting the Buffer Tank Pressure" on page 38](#).

6.3 Clearance Requirements

The clearances in Figure are shown for reference only, and are suggested for ease of maintenance. Consult local and national installation codes. Condaire does not accept responsibility for violations of the installation codes.



*Figure 4 - Minimum Clearances for the RO-U
(image not to scale)*

- A. min. 100 mm (3.94 in)
- B. min. 250 mm (9.84 in)
- C. min. 100 mm (3.94 in)
- D. min. 250 mm (9.84 in)
- E. min. 300 mm (11.82 in)
- F. min. 150 mm (5.91 in)
- G. min. 300 mm (11.82 in)

6.4 Site Requirements

Prepare the for installation by ensuring the following site requirements are satisfied. Report any discrepancies to your representative.

Ensure that the installation of the is compliant with all applicable local regulations and codes.

6.4.1 Water Supply Requirements

IMPORTANT! Ensure that the water supply line is flushed out before it is connected.

To prevent the new humidifier from being contaminated with low-quality water, the entire supply line must be flushed out and tested until the water supply quality and the bacteria counts are compliant with local water quality specifications.

- Water supply connection must be installed to local plumbing codes.
- Inner diameter of the water supply line should be constant throughout the entire length.

- Water supply piping material made of stainless steel, or plastic (certified for RO or DI water systems).
- The connection material must be pressure-proof and certified for use with the R.O. system.
- The R.O system must be installed as close as possible to the humidifier.
- Should a DI system be installed, contact your Condair representative.
- Upon completion of installation, flush the water supply and drain lines to clear out debris in the lines.
- Water supply should be free of additives, such as corrosion inhibitors and disinfectants.

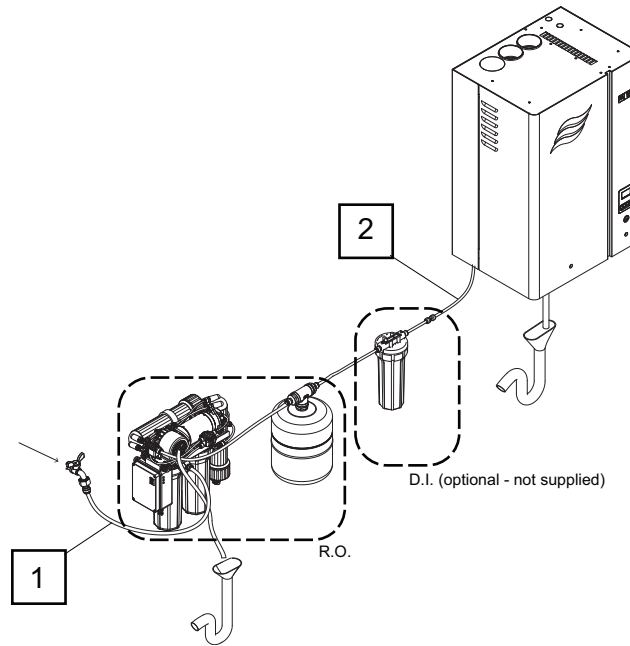


Figure 5 - Water Supply Requirements

1. Water from the source entering the RO-U system
2. Water entering the US

Mains Water Supply to RO-U			
Conditions	Value		
Quality	Potable, drinkable		
Pressure	2.0-5.0 bar (30-75 psi)		
Temperature *	10-20 °C (50-68 °F)		
Turbidity (max)	1.0 NTU		
Max pH without Softener*	8.0		
pH	pH of water supply		
	pH 6.5-7.0	pH 7.1-7.5	pH 7.6-8.0
Max Hardness *	30 °dH	17 °dH	10 °dH
Max US Hardness *	31 gpg	18 gpg	10 gpg
Max Conductivity (at 20 °C / 68 °F)*,**	1300 µS/cm	750 µS/cm	600 µS/cm
Max Total Dissolved Solids (TDS) *	800 mg/l	500 mg/l	375 mg/l
Silt Index (max)	3		
KMnO ₄ Potassium permanganate (max)	10 mg/L		
Fe Iron (max)	0.2 mg/L		
Mn Manganese (max)	0.05 mg/L		
Ca Calcium (max)	300 mg/L		
Cu Copper (max)	1 mg/L		
SiO ₂ Silica (max)	1 mg/L		
Ammonium (max)	0.5 mg/L		
Chloride (max)	300 mg/L		
Sulphates (max)	250 mg/L		
Colony-forming Unit (CFU) (max)	200 CFU/ml ; no pathogens allowed		
* If the water entering the RO-U system is greater than the values indicated in this table, install a water softener between the water supply and the Reverse Osmosis System.			
** Contact your Condair representative if the conductivity of the supply water is greater than 350 µS/cm.			

Water Supply Requirements to the US	
Conditions	Value
Pressure	2-5.5 bar (30-80 psi) spike pressure limited to 8 bar (120 psi)
Temperature	1-25 °C (34-77 °F)
Min-Max Conductivity * , Max Total Dissolved Solids (TDS)	2-15 µS/cm , TDS: 9 mg/L
Quality	RO or DI water refer to the water supply requirements for the RO-U
Colony-forming Unit (CFU)	< 200 CFU/ml for industrial applications** follow applicable regulations
* if the conductivity of the water entering the RO-U system is greater than 350 µS/cm, contact your Condair representative .	
** CFU leaving the unit via mist should be <1000 CFU/ml for industrial applications. Keep the CFU entering the humidifier as low as possible, such that the CFU leaving the unit is within acceptable guidelines.	

6.4.2 Drainage Requirements

- Drain piping material is suitable for RO water and DI water (if used).

IMPORTANT! Avoid copper.

- (Recommended) Floor drains present under the unit in case of leaks or overflowing water.
- Drain line connections must be installed to local plumbing codes.
- Ensure that the drain line is correctly fixed and is easily accessible for service.
- Each drain line must be installed with a constant decline (minimum 1.2 °).
- The drain line should be as short as possible.
- The air gap funnel should have a minimum diameter of 64 mm (2-1/2 in).
- Ensure that the open end of each drain does NOT touch the funnel. The minimum air gap allowed is 20 mm (0.79 in).
- Each drain line must lead to its own separate air gap funnel with trap, before connecting to the drain.
- Each drain line must be secured to prevent the line from:
 - » slipping out of the funnel
 - » or going through, the funnel.
- Upon completion of installation, flush the drain lines to clear out any debris in the lines.

6.4.3 Power Supply Requirements

- The Reverse Osmosis System is mains powered, at 27 W with 24 VAC / 110 VAC transformer. The power requirements are indicated on the specification label on the Water Safe Guard. Refer to "[Model Designation](#)" on page 15.

6.5 Installation

6.5.1 Safety

Observe all safety precautions and comply with local installation codes. Refer to ["For Your Safety" on page 8](#).

6.5.2 Mounting the Reverse Osmosis System

Refer to ["Mounting Requirements"](#) for mounting requirements.

IMPORTANT! Keep the system bacteria-free by washing your hands and wearing gloves.

1. Ensure that the location meets the clearance requirements. Refer to ["Clearance Requirements" on page 23](#).
2. Remove the RO membrane on top of the RO-U System.
3. Locate 2x4 wooden studs, or equivalent support, on the mounting surface, and mark the attachment points at the desired position. Use a level.
4. Insert screws (capable of holding the unit) at the attachment points.
5. Remove any cellophane around the sediment and carbon filters.
6. Install the sediment pre-filter on the left (closest to the Water Safe Guard).
7. Install the carbon filter. Ensure that the O-ring on the holders are seated correctly between the carbon filter element and the holders. The carbon filter element is fitted with flat rubber flanges.
8. Place the RO-U System over the screws, against the mounting surface.

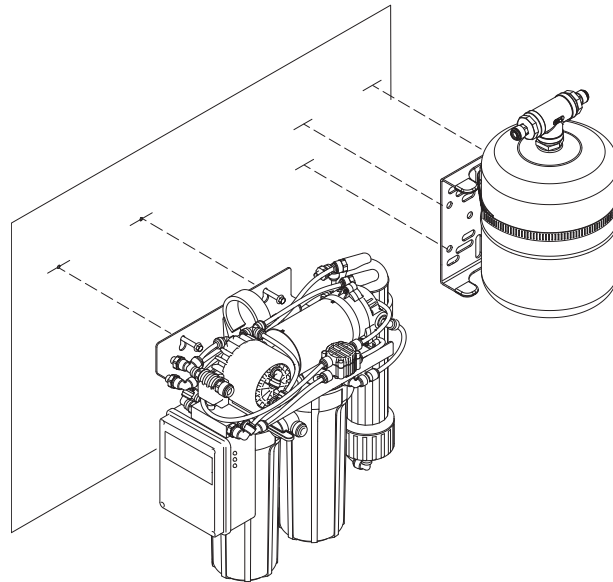


Figure 6 - Mounting the RO-U

6.5.3 Connecting the Water Supply

Refer to ["Water Supply Requirements" on page 24](#) for water supply requirements.

RO-U and Ultrasonic Humidifier

1. Check that the supply water pressure is greater than 1 bar (15 psi).
2. Turn off the water supply.

3. Connect the RO-U System to a female swivel adapter with an air bleed valve.
4. Connect the female swivel adapter to the water source.
5. Fit a 3/8 in tube from the RO water connection port to the T-piece connector.

IMPORTANT! Condair recommends using plastic or stainless steel tubing for RO water.

6. Connect the T-piece connector to the inlet valve on the buffer tank. Ensure that the orientation of the T-piece connector allows water to flow through in one direction only. Water from the RO unit should face the opening of the plastic attachment in the T-piece connector. Refer to [Figure 7 - on the next page](#).
7. Fit a 3/8 in tube from the T-piece connector to the humidifier. A 3/4 in adapter to the humidifier is supplied.

Note: The RO-U unit has a shut-off tap for the water supply to stop fluid flow when the buffer tank is full, and when no water is being consumed.

Note: The buffer tank should be depressurized to 0.5 bar (7 psi) before being filled with water. Refer to ["Adjusting the Buffer Tank Pressure" on page 38](#).

6.5.3.1 (Optional) DI System

If it is found that your TDS or conductivity levels in the source water are high (>350 $\mu\text{S}/\text{cm}$), a DI system (supplied by others) should be installed (suggested to further reduce 'white dust' from forming in the humidified areas) after consulting with your Condair representative. Should a DI system be installed, the location would be between the buffer tank and the humidifier.

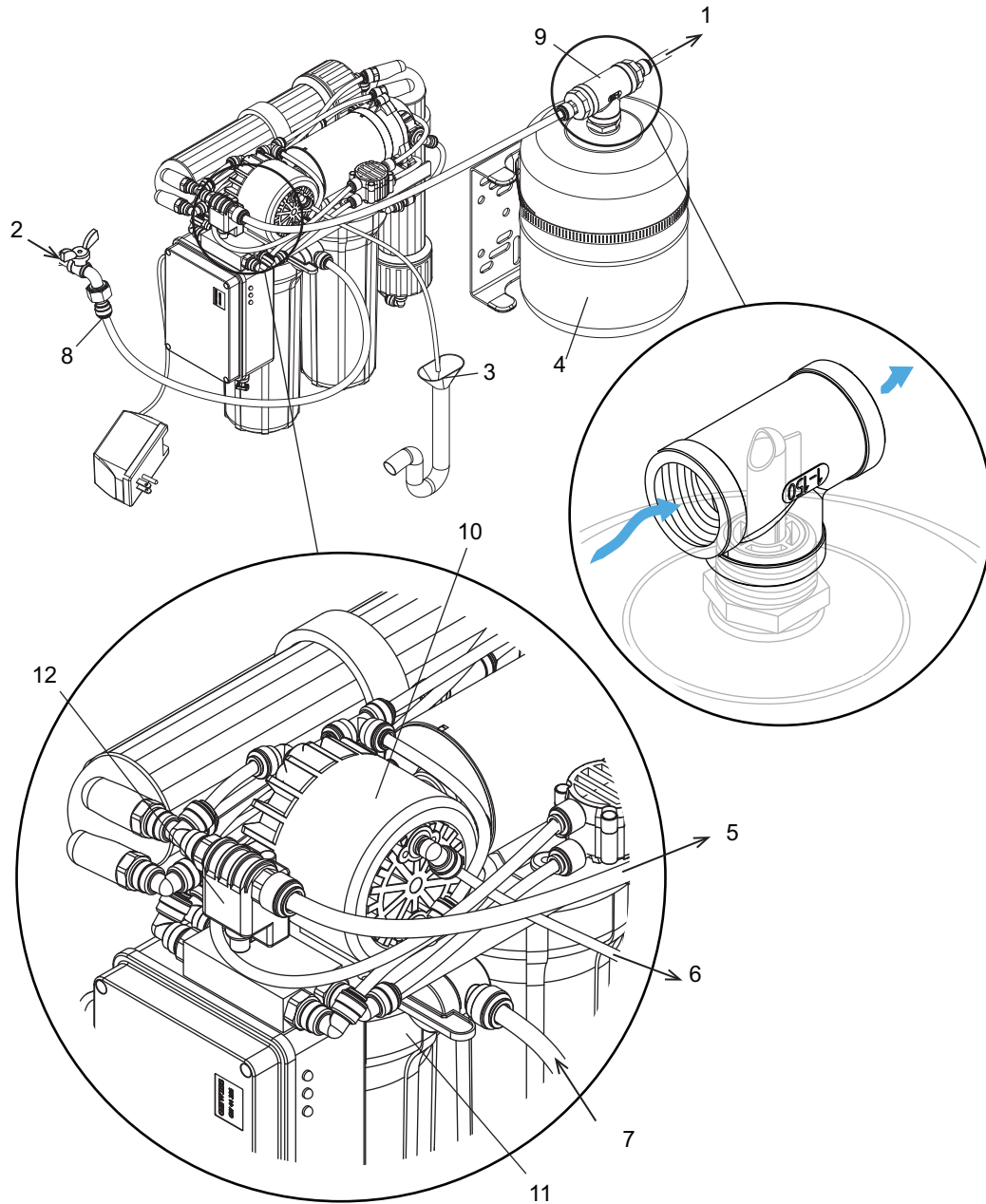


Figure 7 - Supply Water Connection

- | | |
|--|--|
| 1. Hose from buffer tank to humidifier | 7. Hose from water source to sediment filter |
| 2. Inlet source water | 8. Female swivel adapter |
| 3. Air gap funnel to drain | 9. T-piece connector |
| 4. Buffer tank | 10. Permeate pump |
| 5. Hose from pressure switch to tank | 11. Sediment filter |
| 6. Hose from permeate pump to drain (air gap funnel) | 12. Pressure switch |

6.5.4 Connecting the Drain Line

Refer to "[Drainage Requirements](#)" on page 27 for drain line requirements.

1. Fit a tube, 1/4 in minimum, from the discharge port to the air gap funnel (recommended) leading to the drain. Refer to [Figure 7 - on the previous page](#).

Note: Leave a gap between the drain line and the drain to prevent water from flowing back into the RO-U System.

6.5.5 Installing the Electrical Connections

Refer to "[Model Designation](#)" on page 15 and "[Power Supply Requirements](#)" on page 27 for the electrical requirements. All wiring must be in accordance with local electrical codes.

Safety

The electrical installation work requires removal of the door panels in the humidifier. Observe the following safety precautions:



DANGER!

Risk of electric shock!

The Reverse Osmosis System is 24 VAC powered. Live parts may be exposed when the access panels or doors are removed. Touching live parts may cause severe injury or even death.

Prevention: The Reverse Osmosis System must be connected to the humidifier only after all mounting and installation work has been completed and checked for correct workmanship, and the access panels/doors to the humidifier are closed and fastened securely.

Only qualified personnel should perform maintenance or repairs on the unit.

Follow any lockout procedures when servicing the unit.



CAUTION!

Electrostatic discharge (ESD)!

The electronic components inside the control cabinet in the humidifier are sensitive to electrostatic discharge (ESD).

Prevention: Take appropriate measures to protect the electronic components inside the unit against damage caused by electrostatic discharge (ESD). Refer to ANSI/ESD-S20.20.

- All electrical installation work must be performed only by a licensed electrician authorized by the customer. It is the customer's responsibility to verify qualifications of the personnel.
- The electrical installation must be performed according to the wiring diagrams in this manual, the instructions in this section, as well as applicable national and local codes.
- All cables must lead into the unit, via appropriate cable glands or grommets, and be properly supported.
- Make sure the cables are secured, and do not rub on any components or become a tripping hazard.
- Observe national and local codes for maximum cable length and required wire sizes for cables.

To power the RO-U System:

1. Insert the transformer plug into the socket. The system requires 24 VAC power.

7 Operation

7.1 General

Personnel Qualifications

The Reverse Osmosis System must only be operated by personnel who are adequately qualified, well-trained, and are authorized by the customer.

Safety

Observe the following safety precautions.



DANGER!

Risk of electric shock!

The Reverse Osmosis System is 24 VAC powered. Live parts may be exposed when the access panels or doors are removed. Touching live parts may cause severe injury or even death.

Prevention: The Reverse Osmosis System must be connected to the humidifier only after all mounting and installation work has been completed and checked for correct workmanship, and the access panels/doors to the humidifier are closed and fastened securely.

Only qualified personnel should perform maintenance or repairs on the unit.

Follow any lockout procedures when servicing the unit.



DANGER!

Poorly maintained RO-U systems may be hazardous.

Poor maintenance of the Reverse Osmosis System poses a health risk to spaces humidified by the Ultrasonic Humidifier. When adequately operated or poorly maintained, micro-organisms that cause disease, such as Legionnaire's, may grow in the water system and in the humidifier which dispel the micro-organisms into the air.

Prevention: Read, understand, and follow maintenance guidelines to ensure the humidification system remains safe. Ensure that the unit is cleaned and disinfected, as directed in this manual, and avoid shutting off the unit (max. 48 hours). If the unit has been off for 48 hours or more, disinfect and flush the system thoroughly before humidifying the space with the Ultrasonic Humidifier.



WARNING!

Do NOT leave the unit without power. Risk of contamination.

Do NOT leave the unit unpowered for more than 48 hours, or else a total system disinfect will be required. Without power, the system will not flush properly, resulting in standing water and conditions that may promote the growth of micro-organisms.

Prevention: Leave your unit powered on. If you do not need humidification during the 48 hours, set the humidifier to standby or set the demand to 0.



WARNING!

Risk of contamination.

Do NOT use oil, grease, glue, Teflon, silicon, O-ring lubrication, etc. when assembling pipes or hose connections. All of the above products can act as food for bacteria, posing health risks.

Prevention: For lubricant, use dish soap. Wash hands and wear clean gloves while assembling parts in direct contact with water. Keep dust covers on pipes and hoses until assembly.

**WARNING!**

Water from RO-U systems may cause metals to corrode quickly.

Water produced from a Reverse Osmosis System is aggressive and can cause some metals to quickly corrode. The RO-U system should always be connected to piping and equipment that is suitable to handle RO water.

Prevention: Read, understand, and follow maintenance guidelines to ensure the humidification system remains safe.

**CAUTION!**

The RO-U System contains pressurized water.

Hoses in the RO-U System contain pressurized water that may spray if the hose connections are loose or there is a leak.

Prevention: Do not re-tighten or unscrew hoses while the system is pressurized. Test for leaks and replace broken hoses.

**CAUTION!**

Do NOT fasten the RO-U System, including the tank, hoses, and pipes to vibrating surfaces.

7.2 Starting Up

Ensure that all connections are secure.

Before beginning:

- disconnect the power source from the RO-U System.
- disconnect the tube connecting the buffer tank to the humidifier.
- close the inlet valve on the buffer tank. This will prevent water from entering the tank and to raise the system pressure quickly, without having to wait for the tank to fill. This must also be done so that the RO membranes can be flushed.
- relieve air pressure in the buffer tank. See instructions below for details.

IMPORTANT!

Has your unit been inactive and without power?

Inactivity of the humidifier for more than 48 hours requires you to clean and disinfect your system before starting up. There is risk of the membrane fouling if the RO-U unit has been 'inactive' for a long period, so it is advised to keep the RO-U system on and running to regularly flush every 24 hours.

7.2.1 Start Up Procedure

First Time Start Up

IMPORTANT! Clean and disinfect the unit if the unit has been unpowered for an extended period of time (over 48 hours). Refer to "[Cleaning and Disinfecting](#)" on page 35.

1. Open the water inlet valve and allow water to flow through the RO-U.
2. Check for leaks. If leaks are found, shut off the water and repair them.
3. Connect the power supply.
4. Allow the water to flow freely for 2 minutes to flush the RO membrane.

5. While the RO membrane is being flushed, **relieve the air pressure in the buffer tank from 2.76 bar to 0.5 bar (40 psi to 7 psi)** by opening the black cap and valve at the bottom of the buffer tank. Refer to ["Adjusting the Buffer Tank Pressure" on page 38](#). Lowering the pressure will allow water to flow into the tank.
6. Reconnect the tube from the buffer tank to the humidifier.
7. Open the water valve to the buffer tank and wait until the tank is completely filled. The green and yellow lights on the Water Safe Guard will illuminate. After 3 minutes, only the green LED will remain illuminated (if the water is OK).
8. Turn on the humidifier.

Start Up (Restart)

IMPORTANT! Clean and disinfect the unit if the unit has been unpowered for an extended period of time (over 48 hours). Refer to ["Cleaning and Disinfecting" on page 35](#).

1. Open the supply valve to the RO-U System and let the system flush for 5 minutes.
2. Supply voltage to the pump by plugging in the wall adapter.
3. Reconnect the tube to the buffer tank.
4. **Relieve the air pressure in the buffer tank from 2.76 bar to 0.5 bar (40 psi to 7 psi)** by opening the black cap and valve at the bottom of the buffer tank. Refer to ["Adjusting the Buffer Tank Pressure" on page 38](#). Lowering the pressure will allow water to flow into the tank.
5. Open the water valve on the storage tank.
6. Wait until the system reaches the correct pressure. When this happens, the discharge water will stop.
7. Turn on the humidifier.

7.3 Shutting Down the Unit

IMPORTANT! Clean and disinfect the unit if the unit has been unpowered for an extended period of time (over 48 hours). Refer to ["Cleaning and Disinfecting" on page 35](#). Avoid unpowering the unit.

To shut down the unit:

1. Turn off the humidifier. Refer to the humidifier Operation and Maintenance Manual for the proper procedure.
2. Unplug RO-U unit.
3. Close the supply water valve.
4. Close the water inlet valve on the buffer tank.
5. Disconnect the buffer tank from the humidifier. Excess water will be drain.

8 Maintenance

8.1 General

Strictly observe all safety precautions, and perform only those maintenance tasks described in this manual. Refer to ["For Your Safety" on page 8](#).

Use only original Condaire replacement parts.

All maintenance work must be performed only by licensed personnel authorized by the customer. It is the customer's responsibility to verify qualifications of the personnel.

The maintenance work may require removal of the cover on the unit.

The Ultrasonic Humidifier may need to be unplugged to safely maintain and operate on the unit. Refrain from unpowering the unit (for more than 48 hours) unless it is deemed necessary, as unpowered units will not flush.

8.2 Cleaning and Disinfecting

Cleaning and disinfecting should be performed by authorized persons. Contact your Condaire representative for more details.

Refer to ["Maintenance List" on page 37](#) for the general procedure and frequency of maintenance.

Disinfectants are mandatory, and must NOT produce toxic residue. Observe all safety precautions labeled on the disinfectants and cleaner.



CAUTION!

Risk of damage to the humidifier components!

Do NOT use solvents, aromatized, or halogenized hydrocarbons, or other harsh chemicals for cleaning.

Do NOT use cleaning materials that could leave scratches on wet, plastic and metal surfaces of the unit.

Do NOT use hard or metallic brushes to clean the unit.

Condaire recommends the following:

- Avoid recontaminating the components. Use clean gloves (that are safe to use with the agents listed below) when handling components and cleaning agents.
- For cleaning: dish washing soap
- For descaling: citric acid solution
Note: pH 2, or 20g citric acid in 1 L water, or 0.18 lbs for every 1 gallon
- For disinfecting: 0.1% hydrogen peroxide, H₂O₂
- At the end of each cleaning, allow the humidifier to fill and create mist for 2-3 minutes, then perform a full drain cycle. This should be performed manually or through changing the demand signal (full demand to mist; zero stop mist and allow to drain).

Condaire provides a cleaning and disinfecting kit for the Ultrasonic Humidifier (P/N: 2594996)

IMPORTANT! Avoid cleaning with hard or rough materials, such as steel wool, or metal brushes. Abrasions on the surface of any components may prevent micro-organisms from being cleaned easily. Instead use a clean cloth or soft brush.

Avoid materials that will leave particles behind.

Avoid using a hard, or metal (or otherwise abrasive) brush.

To disinfect a component:

1. Review the maintenance instructions for the component that will be cleaned and disinfected. Specific considerations must be taken into account for some components.
2. Ensure UV assembly is shut down before disinfection.
3. Clean the component with hot water and soap, and rinse with water. Remove biofilms and any surface impurities. Avoid using hard or metallic brushes (to avoid surface abrasions) to clean and disinfect.
4. Descale components using citric acid* (pH 2), then rinse with water.
 - *Let the component soak for 20 minutes and avoid scrubbing. Do NOT agitate the piezo-electric transducers because they are very fragile.
5. Apply disinfecting agent (0.1% hydrogen peroxide) to the component and allow to air dry (this allows the agent to penetrate and kill pathogens).
6. Rinse thoroughly with **clean** water (RO or DI water) to remove residue.

To disinfect hoses:

1. Clean and disinfect hose connections, as described above.
2. Remove any residue or particles from the hoses.
3. Flush the hoses with hot water.
4. Flush the hoses with disinfecting liquid and allow to air dry.
5. Rinse the hoses with **clean** water (RO or DI water) to remove residue from disinfectant.

IMPORTANT! A new RO membrane arrives with disinfecting agent inside. The disinfecting agent is flushed upon first start-up, and should remain moist for optimum performance (i.e. Do NOT let the RO membrane dry out). It is NOT suggested to further clean the RO membrane. To ensure proper functioning of the RO membrane, avoid disassembling the component, and replace the RO membrane as necessary.

IMPORTANT! If the RO system must be disinfected, contact your Condair representative.

8.2.1 Diluting your Disinfecting Solution (H₂O₂) to 0.1%

A 0.1% hydrogen peroxide solution is recommended to disinfect the unit. If a 0.1% solution is not readily available, you may need to dilute your current solution.

General Formula

Before mixing your solutions, you should know the following:

- The desired concentration of disinfectant (Hydrogen Peroxide) in the mixture (0.1%).
- The current concentration of the disinfectant (Halomist is 5% Hydrogen Peroxide).

If the total volume of the required final mixture is known:

1. Calculate the required volume of concentrated disinfectant

$$\text{Required Volume of Concentrated Disinfectant} = [\text{Desired Volume of Mixture}] \times \frac{[\text{Desired Concentration of Mixture}] \%}{[\text{Concentration of Disinfectant}] \%}$$

2. Calculate the required volume of fresh water

$$\text{Required Volume of Fresh Water} = [\text{Desired Volume of Mixture}] - [\text{Required Volume of Concentrated Disinfectant}]$$

It may be easier to submerge some components of the unit into the disinfecting solution, or the volume of the diluted solution may not be known (i.e. fresh water has already been secured).

If the total volume of the required final mixture is NOT known, but volume of fresh water is known:

1. Calculate the required volume of concentrated disinfectant

$$\text{Required Volume of Concentrated Disinfectant} = \frac{[\text{Volume of Fresh Water}] \times [\text{Desired Concentration of Mixture}]\%}{[\text{Concentration of Disinfectant}]\% - [\text{Desired Concentration of Mixture}]\%}$$

Table 3: Volume of water and H₂O₂ required for 0.1% hydrogen peroxide solution.

Desired concentration of Hydrogen Peroxide: 0.1%				
Desired volume of diluted solution (0.1% hydrogen peroxide)	Volume Units to Mix to Produce 0.1% Hydrogen Peroxide			
	Water	Halomist, H ₂ O ₂ (5%)	Water	H ₂ O ₂ (3%)
1 unit	0.98	0.02	0.967	0.033
2 units	1.96	0.04	1.933	0.067
3 units	2.94	0.06	2.900	0.100
4 units	3.92	0.08	3.867	0.133
5 units	4.90	0.10	4.833	0.167
6 units	5.88	0.12	5.8	0.2
7 units	6.86	0.14	6.767	0.233
10 units	9.80	0.20	9.667	0.333
30 units	29.40	0.60	29.00	1.00
50 units	49.00	1.00	48.333	1.667

8.3 Maintenance List

Perform the following maintenance tasks at the intervals specified in [Table 4 on the next page](#).

Table 4: Maintenance List

Task/Component	Frequency	Description
Replace sediment filter	Yearly	If the supply water is heavily polluted with minerals, it is recommended to do this more often.
Replace carbon filter	Yearly	-
Replace RO membrane	2-5 Years	Typical replacements range between 24-60 months. Replacement is necessary when the Water Safe Guard displays a red light, or when the capacity has dropped more than 10%.
Assess permeate water	Yearly	-
Inspect the buffer tank	Yearly	-

8.4 Maintenance Procedures

Ensure that the humidifier is shut down properly and observe all safety precautions described in this manual. Refer to ["Shutting Down the Unit" on page 34](#) and ["For Your Safety" on page 8](#).

8.4.1 Adjusting the Buffer Tank Pressure

The air pressure pushes against the water-filled bag inside the buffer tank. Air pressure that is much greater than the pressure of the supply water pressure will prevent the tank from being completely filled. Air pressure that is too low will reduce the water pressure being sourced to the humidifier.

Adjusting the air pressure in the tank will require a pressure gauge and an air compressor; or any other device that can supply air to the buffer tank, such as a bicycle pump. For accurate pressure readings, ensure that the buffer tank is drained of water.

To adjust the air pressure in the buffer tank:

1. Turn off the RO-U System and turn off the humidifier.
2. Close the valve for the water source.
3. Close the water valve at the buffer tank.
4. Disconnect the buffer tank from the humidifier. Water will drain from the tube, so direct excess water into a drain.
5. Open the water valve at the buffer tank, and continue to let the water drain until the tank is empty.
6. Close the water valve at the buffer tank.
7. Locate and open the black cap and valve at the bottom of the buffer tank.
8. Insert compressed air until the desired pressure is attained, then close the valve and cap.
Adjust the air to 0.5 bar (7 psi) + 0.1 bar for every meter (or 0.44 psi/ft) below the humidifier.
9. Open the valve for the water source.
10. Turn on the RO-U System.
11. Open the water valve at the buffer tank. The buffer tank should fill with water.
 - If the tank does not fill completely, carefully open the valve at the bottom of the tank and release small amounts of air until the tank is full.
 - If the pressure in the buffer tank is too low, carefully open the valve at the bottom of the tank and add more compressed air.
12. Once the desired pressure is attained, turn on the humidifier.

8.4.2 Replacing the RO-U Filter

The buffer tank in the RO-U System must be depressurized before the filters can be replaced.

To replace the filters:

1. Empty water from the buffer tank. Refer to ["Adjusting the Buffer Tank Pressure" on the previous page](#).
2. Shut down the unit, as described in ["Shutting Down the Unit" on page 34](#).
3. Twist the filter holders (these encase the filters) to remove the filters from the unit.
Note: The filter holders will contain water. Beware of spilling.
4. Empty the filter holders and clean them with soap, water, and chlorine (optional, but recommended). Rinse thoroughly.
5. Place the new filters in their filter holders.
 - For the carbon filter, ensure that the O-ring is centered on top.
6. Re-install the filter holders into the unit and hand-tighten.
7. Restart the unit and check for leaks.

8.4.3 Testing the Permeate

To test the permeate (de-ionized water from the RO membrane):

1. Take a sample of the water supply and measure the conductivity of the water with a conductivity meter. Wipe off the conductivity meter after the reading.
Note: If the micro-seimens value (μS) of the source water supply is greater than $500 \mu\text{S}$, install a descaling system ahead of the RO-U System (recommended).
2. Take a sample of the permeate and measure the conductivity with a conductivity meter.
3. Perform the following calculation:
 - a. Divide the (value found in step 2) by the (value found in step 1).
 - b. Multiply this ratio by 100%.
4. The results indicate the following:
 - <10 %: the permeate is good.
 - Between 10% and 20%: the permeate is acceptable.
 - >20 %: the permeate is poor. Replace the membrane.

8.4.4 Cleaning-RO-Membrane

Do not clean the RO membrane. The RO-U system, as long as it is powered, will flush every 24 hours. Should cleaning be performed, please contact your Conair representative first. It is advised that RO membranes be replaced for RO-U systems that have been unpowered for over 24 hours.

Note: A new RO membrane should come packaged with disinfectant. This disinfectant is flushed out of the system upon first time use.

9 Troubleshooting

9.1 General

Troubleshooting of the Reverse Osmosis System must only be performed by well qualified and well trained personnel. Electrical repairs must only be performed by a licensed electrician authorized by the customer, or by Condair service technicians.

Troubleshooting the Reverse Osmosis System may require the user to access the inside of the humidifier to the control and plumbing cabinets, which may expose the user and equipment to hazards described in "[For Your Safety](#)" on page 8.

9.2 General Troubleshooting

Most operation warning and fault conditions are caused by improper installation, or by not adhering to the suggested best practices for installation of the humidifier and system components. Hence, a full fault diagnosis always requires a thorough examination of the entire system (hose connections, control systems, etc.).

General guidelines for troubleshooting are described below. For detailed troubleshooting of auxiliary system components, refer to their respective manuals.

<u>Problem</u>	<u>Probable Cause</u>	<u>Corrective Action</u>
No drinkable water being produced	Poor water connection	■ Check the inlet for the water pressure and ensure that the valve is open. Also ensure that the valves from the buffer tank are open.
	T connector improperly installed	■ The T connector on the buffer tank is a 1-way valve. The change the direction of the valve.
	Incorrect or no voltage	■ Check the voltage supply and ensure the unit is plugged in.
	Buffer tank air pressure is too high	■ Carefully open the air valve at the bottom of the buffer tank and slowly release air until the tank is full. Refer to " Adjusting the Buffer Tank Pressure " on page 38.
RO Membrane not producing enough permeate	Blocked discharge hose	■ Check the flow restrictor (from the waste-end of the RO membrane) and the drain hose for blockages. Clean the drain hoses or restrictor if there is a blockage, or replace if necessary. The ratio of drain to permeate water should be 3:1.
	Defective or broken membrane	■ Replace the RO membrane. A proper membrane will have a good rejection rate; the minerals in the permeate should be less than 10% of the minerals in the supply water.

<p>RO Membrane not producing enough discharge water</p> <p>Blocked discharge hose</p>	<p>Corrective Action</p> <ul style="list-style-type: none"> ■ Check the flow restrictor (from the waste-end of the RO membrane) and the drain hose for blockages. Clean the drain hoses or restrictor if there is a blockage, or replace if necessary. The ratio of drain to permeate water should be 3:1.
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<p>Red LED is flashing or illuminated</p> <p>RO membrane is losing effectiveness</p> <p>Leaks in the system</p>	<p>Corrective Action</p> <ul style="list-style-type: none"> ■ RO membrane should be replaced within 24 hours of when the red LED began flashing. The RO-U will shut off after 24 hours and the red LED will remain solid red. ■ Fix any leaks in the system and reset the RO-U unit (turn off and turn on).
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<p>Calcium deposits from humidification</p> <p>Ineffective RO membrane</p> <p>Water supply is too hard</p>	<p>Corrective Action</p> <ul style="list-style-type: none"> ■ Test the RO membrane. Refer to "Testing the Permeate" on page 39. Replace membrane as necessary. ■ If the inlet water is too hard (based on testing), and is over 500 µS, install a de-scaling system ahead of the RO-U system. Ensure that the ratio of discharge water to permeate is 3:1.
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<p>Booster pump not working or is too quiet</p> <p>Broken or defective pump</p> <p>Pump is short cycling (frequent on and off)</p>	<p>Corrective Action</p> <ul style="list-style-type: none"> ■ Replace the booster pump. Ensure the pump is cool before handling. ■ The pump should turn off if there is not enough water being drawn into the system to offset what the pump outputs. Check the valves and check for blockages. Ensure enough water is being drawn into the pump. If this issue is frequent, replace the pump.
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<p>Filter housings clicking or are leaking</p> <p>Blockage in the filter</p> <p>Leak in the filter cover</p> <p>Broken O-ring</p>	<p>Corrective Action</p> <ul style="list-style-type: none"> ■ Clear the blockage or replace the filter. ■ Switch the housing containers for the filters to check if the covers are faulty. If the original, leaking filter is still leaking, inspect the O-ring with the filter. If the switched housing is leaking (and the original stopped), the cover is defective. Contact a Condaire representative for a replacement. ■ Open the filter housing and check the O-ring for damage or improper installation. Replace the O-ring if necessary.
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10 Spare Parts List: Reverse Osmosis System

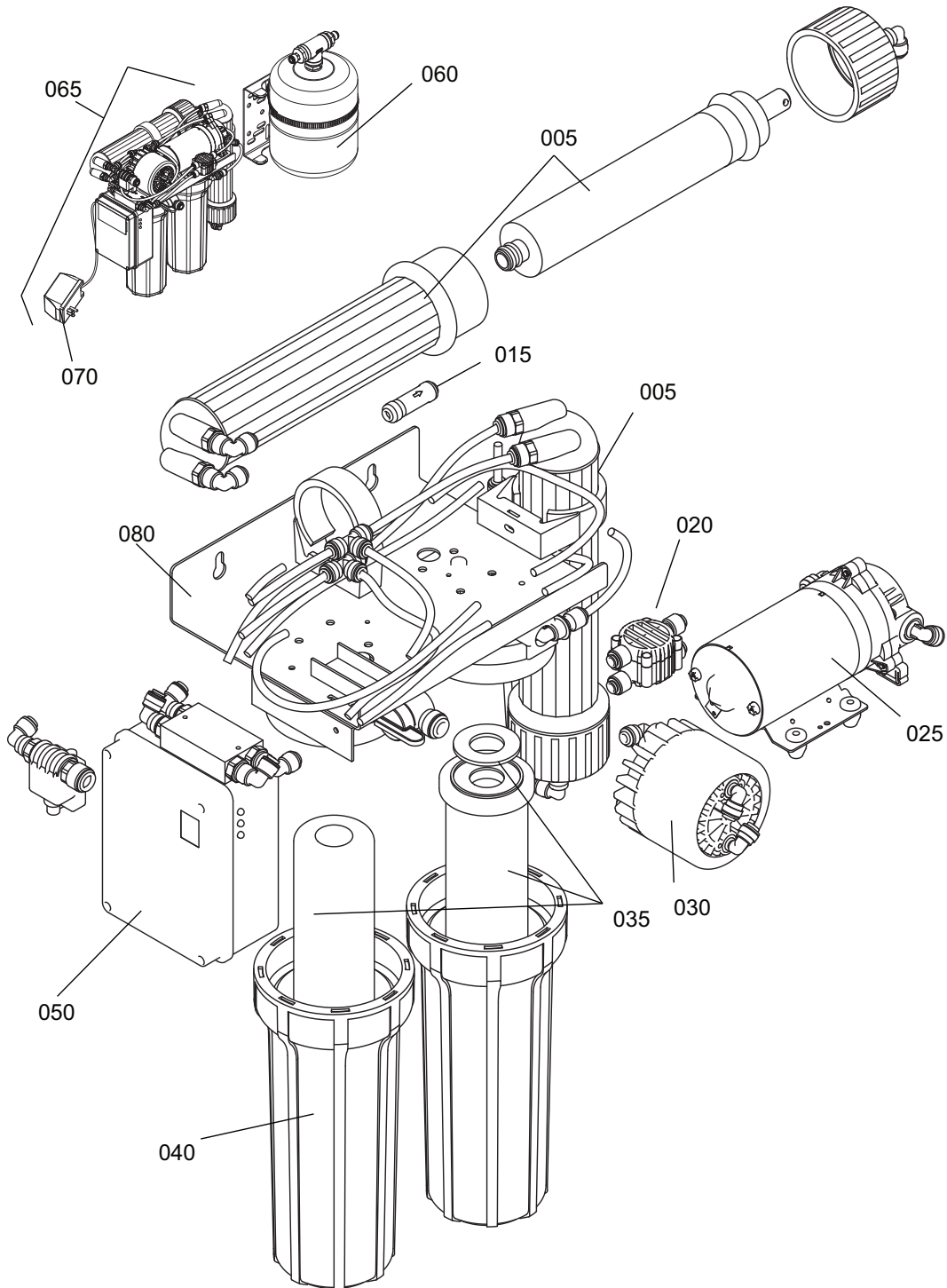


Figure 8 - RO-U Spare Parts. Refer to [Table 5 on the next page](#).

Table 5: RO-U Spare Parts List (refer to [Figure 8 - on the previous page](#))

Item	Part Number	Description	Quantity
005	2594388	SP, RO membrane (x2) 100 gal, US Humidifier	1
015	2594396	SP, NoReturn Valve 0.25", US Humidifier	1
020	2594394	SP, Shut Off Valve, US Humidifier	1
025	2594395	SP, Booster pump, 24 VDC, US Humidifier	1
030	2594393	SP, Permeate pump, US Humidifier	1
035	2594386	SP, RO Filter Kits, US Humidifier	1
040	2594392	SP, Filter Holder, US Humidifier	1
050	2594390	SP, Water Safe Guard , US Humidifier	1
060	2586532	Ultrasonic FlowThru Tank 2.1 gal	1
N/S	2594398	SP, Accessories FlowThru Tank, US RO	1
065	2594387	SP, RO Unit with Transformer, US Humidifier	1
070	2594391	SP, Transformer 120V to 24V / 40VA	1
080	2594397	SP, RO Membrane Holder, US Humidifier	1
N/S	2594389	SP, Shut off valve, 24 VDC, US Humidifier	1
N/S = item not shown			

11 Commissioning

11.1 General

The Reverse Osmosis System must be commissioned and operated only by personnel who are adequately qualified and familiar with the Reverse Osmosis System. It is the customer's responsibility to verify the qualifications of personnel.

11.2 First-time Commissioning

The unit must always be commissioned for the first time by a service technician from your Condair representative, or by personnel who are well trained and authorized by the customer. For this reason, this manual only provides an outline, and not the details of the commissioning protocol.

Outline:

1. Inspect the mounting of the unit.
2. Inspect the mist, water, and drain line installation.
3. Inspect the electrical installation.
4. Configure the Reverse Osmosis System through the humidifier controls.
5. Conduct any applicable performance tests, including controls.
6. Fill out the commissioning protocol documents.

12 Decommissioning

12.1 General

If the Reverse Osmosis System needs to be replaced or removed from service for disposal, strictly follow the instructions in this section.

Personnel Qualifications

All decommissioning work must be performed only by a qualified service technician authorized by the customer. It is the customer's responsibility to verify proper qualifications of the personnel.

Safety

Refer to ["For Your Safety" on page 8](#).

12.2 Removing Unit from Service

Remove the from service for disposal, or long-term storage, as follows:

1. Disconnect the humidifier from the power source.
2. Disconnect the control signal inputs (including any power and security loop connections) from the terminal strips in the humidifier.
3. Remove the Reverse Osmosis System from its mounting surface.
4. If the unit is to be put in long-term storage, store the unit in its original packaging inside a protected area. Ensure that the RO membrane is stored in a 0.01% hydrogen peroxide solution, and is kept in a dark and cold (avoid freezing) location. Refer to ["Receiving and Storage" on page 6](#).
5. If the unit is to be disposed, refer to ["Disposing or Recycling the Unit" below](#).

12.3 Disposing or Recycling the Unit

The and its components must NOT be disposed in domestic waste, and should only be disposed in accordance with local regulations at authorized collection facilities.

If you have any questions, please contact the appropriate local authorities, or your local Condair representative.

APPENDIX

A Appendix:

Installation Checklist

Mounting

- Unit installed in a suitable location? Refer to "[Location Requirements](#)" on page 23.
- Unit installed with suitable clearances? Refer to "[Clearance Requirements](#)" on page 23.
- Mounting surface is stable and capable of supporting the full operating weight of the unit? Refer to "[Weights](#)" on page 19.
- Unit is level?
- Unit is fastened securely?

Water Supply Connection

- Is the minimum inside diameter of the water supply line constant throughout the entire length?
- Water supply temperature 1-15 °C (41-59 °F)?
- Water supply surge-free and pressure regulated to 207-550 kPa (30-80 psig)?
- Are all components and tubes and hoses secured and are all threaded connections securely tightened?
- Leak-free water supply line?
- Water supply line flushed?

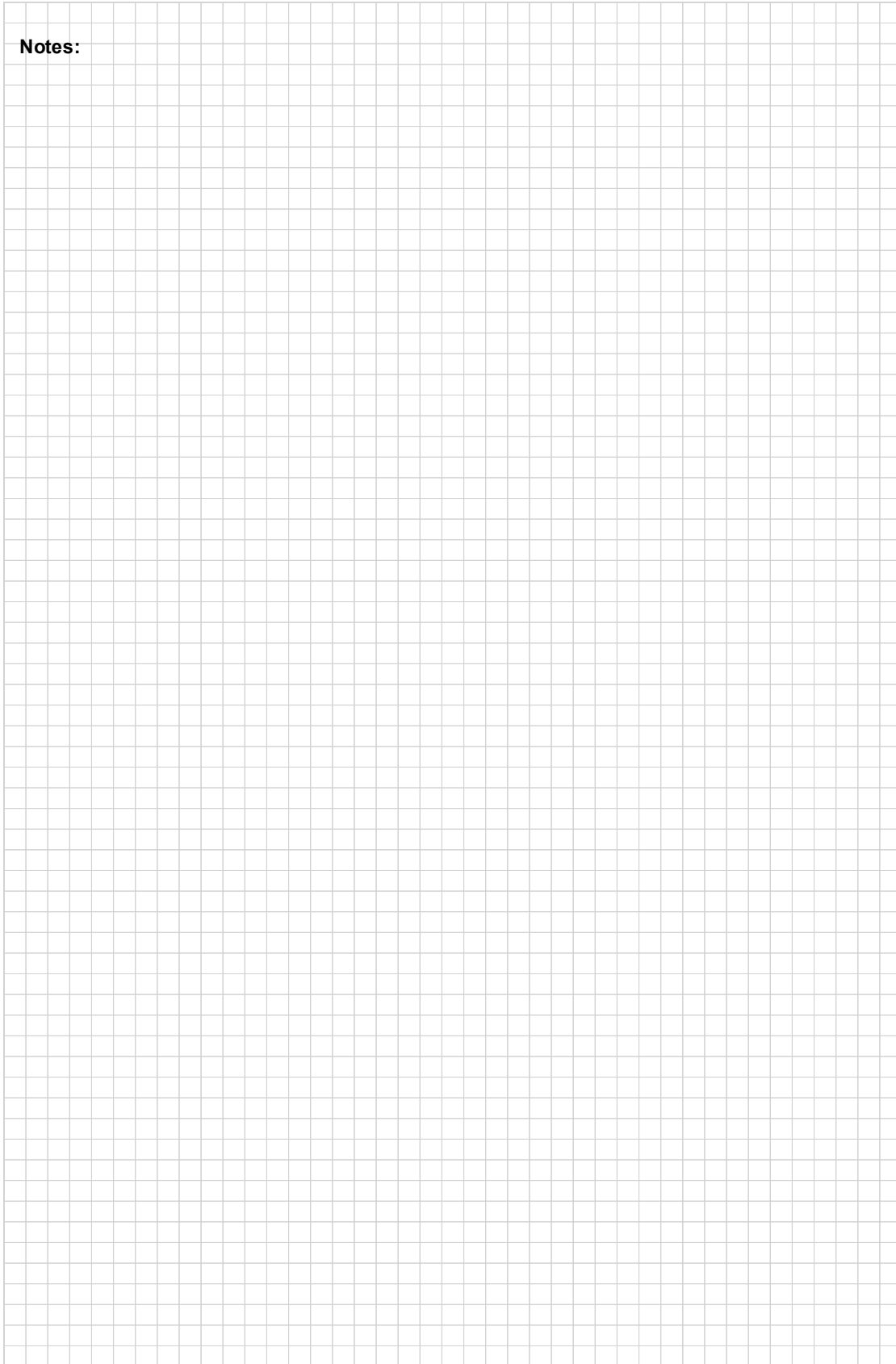
Drain Line Connection

- Are all components and pipes secured and are all threaded connections securely tightened?
- Leak-free drain line?
- Air gap funnel has a minimum diameter of 64 mm (2-1/2 in)?
- Each drain line must lead to its own separate air gap funnel with trap, before connecting to the drain?
- Open end of each drain does NOT touch the funnel? The minimum air gap allowed is 20 mm (0.79 in).
- Drain line has a constant minimum decline of (1.2°) to funnel ?
- Drain lines flushed?
- Drain piping suitable for RO water (piping is not copper)

Electrical Connection

- Power supply meet the voltage and current requirements shown on the specification label? Refer to "[Model Designation](#)" on page 15.
- All cables fastened securely?
- All cables free of tension and pass through any applicable cable glands or grommets?
- Electrical installation meet the applicable national and local codes?

Notes:



Warranty

Condair Inc. and/or Condair Ltd. (hereinafter collectively referred to as THE COMPANY), warrant for a period of two years after installation or 30 months from manufacturer's ship date, whichever date is earlier, that THE COMPANY's manufactured and assembled products, not otherwise expressly warranted, are free from defects in material and workmanship. No warranty is made against corrosion, deterioration, or suitability of substituted materials used as a result of compliance with government regulations.

THE COMPANY's obligations and liabilities under this warranty are limited to furnishing replacement parts to the customer, F.O.B. THE COMPANY's factory, providing the defective part(s) is returned freight prepaid by the customer. Parts used for repairs are warranted for the balance of the term of the warranty on the original humidifier or 90 days, whichever is longer.

The warranties set forth herein are in lieu of all other warranties expressed or implied by law. No liability whatsoever shall be attached to THE COMPANY until said products have been paid for in full and then said liability shall be limited to the original purchase price for the product. Any further warranty must be in writing, signed by an officer of THE COMPANY.

THE COMPANY's parts or materials that are considered consumables, including but not limited to: cylinders, filters, nozzles, membranes, media, gaskets, O-rings, etc. are NOT covered by the warranty.

THE COMPANY makes no warranty and assumes no liability unless the equipment is installed in strict accordance with a copy of the catalog and installation manual in effect at the date of purchase and by a contractor approved by THE COMPANY to install such equipment.

THE COMPANY makes no warranty and assumes no liability whatsoever for consequential damage or damage resulting directly from misapplication, incorrect sizing or lack of proper maintenance of the equipment.

THE COMPANY makes no warranty and assumes no liability whatsoever for damage resulting from freezing of the humidifier, supply lines, drain lines, or quality of the water used.

THE COMPANY retains the right to change the design, specification and performance criteria of its products without notice or obligation.

THE COMPANY's limited warranty on accessories, not of the companies manufacture, such as controls, humidistats, pumps, etc. is limited to the warranty of the original equipment manufacturer from date of original shipment of humidifier.

Extended Warranty

Extended warranties are available to purchase under the conditions listed above.

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