

READ AND SAVE THESE INSTRUCTIONS

CARNES®

WHOLE HOME HUMIDIFIER

OWNERS MANUAL AND QUICK REFERENCE GUIDE

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CARNES RESIDENTIAL MODEL "HRAC"



FORM 16761
ISSUED: 03-24-21

Carnes Model HRAC | WHOLE HOME HUMIDIFIER

Introduction

The Carnes HRAC residential steam humidifier provides humidity to conditioned spaces through the use of the existing ductwork of the home HVAC system. The humidifier mounts near a supply duct and is connected to existing plumbing for the water supply. Carnes residential humidifiers can operate using hard or soft water and function by introducing steam into circulating air through the use of a steam pipe hose connected to a distribution pipe mounted inside an air duct.

Unpacking and Inspection

Open the cabinet and check for concealed shipping damage. Report any damage immediately to the carrier who delivered the shipment. Verify the following items listed in the materials supplied section are all accounted for before proceeding. If any item is missing, contact vendor.



Materials Supplied in the Box

- Humidifier (HRAC)
- Cylinder (RX300)
- Carnes Residential Humidistat Kit (HXHAFT)
- Dispersion Tube, 10" (HXSAB010S)
- Steam Hose 7/8" I.D. (HXSAB, 6 feet)
- Hose Clamps
- Install Instructions, form 16761 (this document)

Materials Needed Not Supplied in the Box

- Main Power Disconnect (rated for operating current)
- Electrical Service Wire (rated for operating current)
- Mounting Hardware
- Supply Water Hose
- Drain Hose (1" I.D.)
- Drain & Supply Plumbing Fittings

Humidifier Configuration

The HRAC is configured at the factory to operate optimally right out of the box. The default settings are:

- 16 amps (maximum current)
- 240 V_{AC} supply voltage

To adjust these settings look to the Electrical Power Section of this document.

Important Note: Because the humidifier is factory set for optimal performance, Carnes recommends careful consideration before adjusting any settings other than those necessary for electrical connection.

Important Note: Using a licensed HVAC professional to install the humidifier and distribution pipe is recommended.

Before Installation

1. Ensure that available voltage and phase corresponds with the humidifier settings and ratings.
2. Ensure the dedicated circuit breaker is of sufficient size to handle the rated current as indicated on the specification label. Refer to local codes.
3. Ensure sufficient clearances will be available as described in the Choosing a Location section.
4. Ensure the steam hose can be routed to the duct as described in the Routing the Steam Hose section.

Tools Needed

- Flat-head Screwdriver
- Phillips Screwdriver
- Adjustable Wrench
- Level
- Step Drill or Hole Saw (1")
- 1/2" Drill Bit

CAUTION! DO NOT INSTALL, USE OR OPERATE THIS EQUIPMENT UNTIL THIS MANUAL HAS BEEN READ AND UNDERSTOOD. SAVE THESE INSTRUCTIONS FOR FUTURE USE.

⚠ CAUTION — Verify all safety steps before powering unit.

1. Do not mount in area where freezing can occur. Do not mount outdoors. Do not mount on vibrating surface. Do not mount on floor. The HRAC produces steam at atmospheric pressure. Steam lines must be installed so that no restriction can produce back pressure in the humidifier.
2. All electrical work should be done according to local and national electrical code. Electrical connection should be performed by a licensed electrician. Unit recommended to be powered by a dedicated circuit.
3. Plumbing should be performed by a licensed plumber. Drain water from humidifier can be very hot. Do not drain to public sink. All plumbing work should be done according to local plumbing code.
4. The HRAC requires a cold water connection from your home's main water supply between 20-120 PSIG. A throttle valve may be necessary, and a water shut-off valve is recommended for safety. Reverse Osmosis (RO) and Deionized (DI) water should not be used. Water conductivity is important to ensure the electrode cylinder operates effectively. Carnes recommends using water with conductivity levels between 125-1200 Micromhos (micro siemens/cm).

⚠  WARNING: HOT SURFACES — Water/Steam and Distribution Methods

An electrode cylinder steam humidifier creates steam by passing electrical current directly through water, causing the water to boil. Temperatures of boiling water and steam can reach up to 212°F (100°C). This creates hot surfaces (cylinder surface, steam hose, steam pipe, condensate hose/pipe, distribution piping), hot water, and visible/non-visible steam. Even discharged condensate water can be extremely hot. Contact with these surfaces, water, or steam can cause personal injury. To avoid severe burns, always proceed with extreme caution. Before any service or maintenance is performed, turn off unit, disconnect electrical service, and allow humidifier unit to cool completely.

⚠  WARNING — De-energize Electrical Supply

Before any service or maintenance is performed make sure main power supply is disconnected and safety labeled. Failure to turn off main power supply could result in fire, electrical shock or both, resulting in damage to property, personal injury or death.

CAUTION

Follow all recommendations, instructions and precautions in this Installation, Operation and Maintenance Manual to maximize performance, maintain efficiency and to provide a safe operational environment.

Liability:

Carnes does not accept any liability for installations of humidifier equipment installed by unqualified personnel, or the use of parts, components, equipment, or alterations of Carnes manufactured equipment that is not authorized or approved by Carnes.



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



Listed UL Standard 998.

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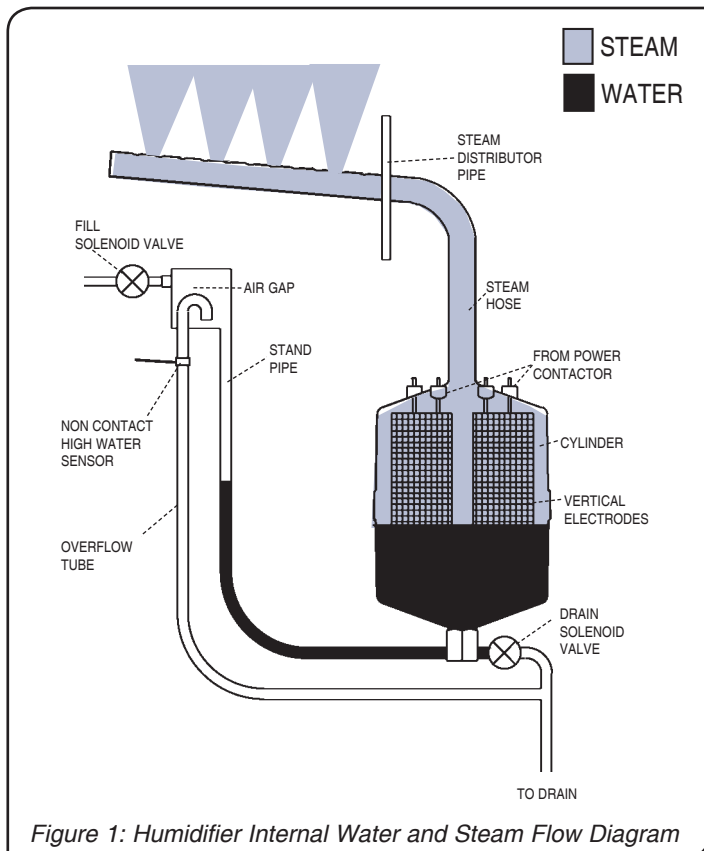
The Carnes HRAC residential steam humidifier delivers humidity to conditioned spaces through the use of the home's existing HVAC ductwork. Carnes humidifiers use electrode technology to generate pure and sanitary steam. Steam generation is controlled through the use of external interlocks, a control signal, and water levels to introduce the desired amount of steam into the air supply. When the humidifier receives a call for steam, the fill valve allows water to flow into the fill cup. The water then falls into the standpipe and flows directly into the steam cylinder. The air gap in the fill cup prevents the cylinder from pressurizing due to water supply line pressure, as shown in *Figure 1*. The steam cylinder normally operates at a pressure of approximately 0-0.5 psi.

Steam is generated in the cylinder when the power contactor is activated. The contactor allows current to flow to the electrodes inside the steam cylinder. Current flows directly through the water between the electrodes using minerals in the water as a conductor, heating the water to a boil. This electrode method is the most efficient way to generate clean steam from tap or softened water. The steam will exit the top of the cylinder, pass through the flexible steam hose, and make its way out of the steam distributor pipe mounted inside the ductwork of the HVAC system. The design of the distribution pipe delivers steam over a wide area in the duct.

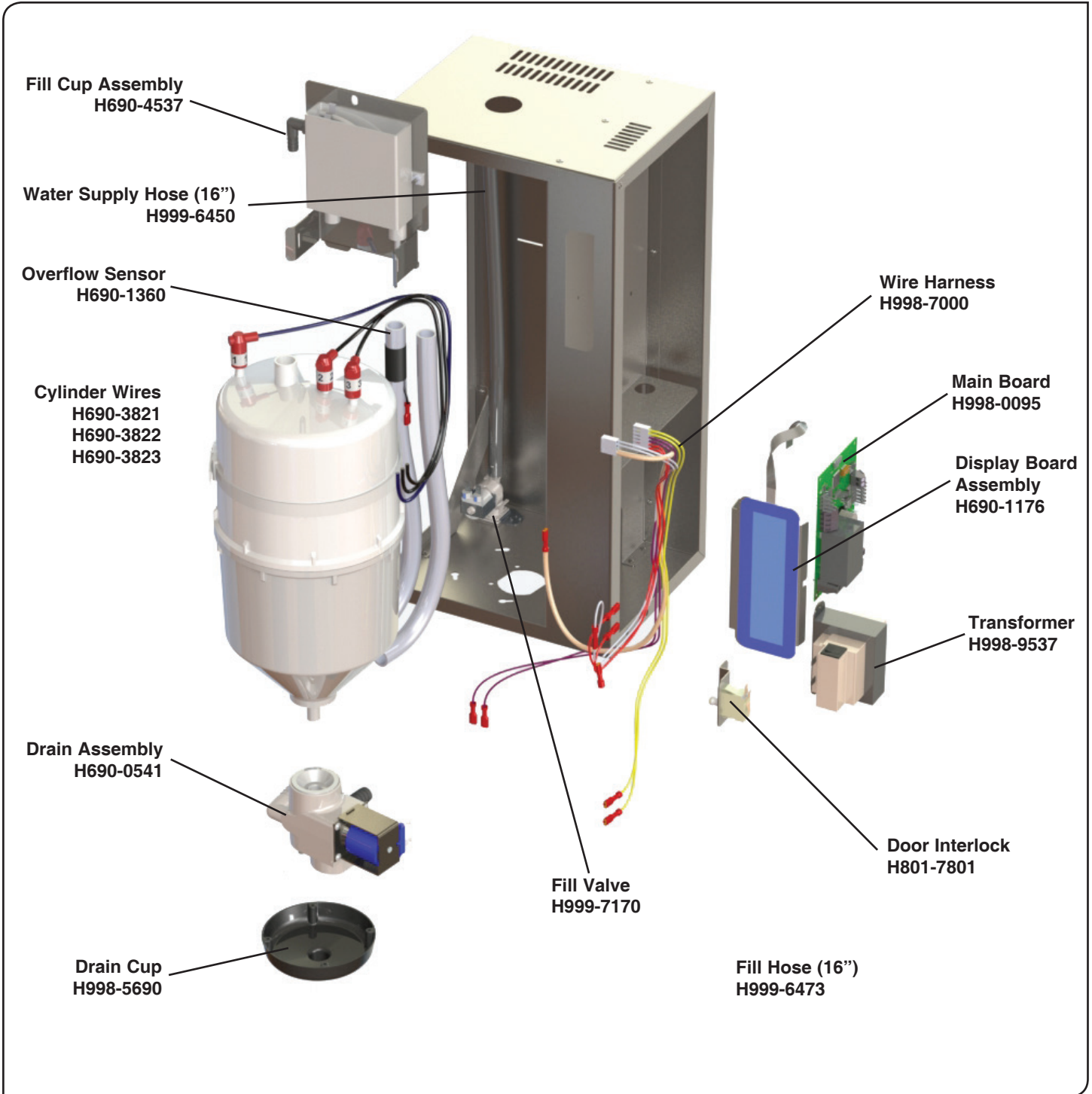
The humidifier automatically controls the water level in the cylinder to provide stable operation and long cylinder life. As mineral deposits build up within the cylinder the water level will slowly rise to make use of clean electrode surfaces to maintain the desired steam output rate. When mineral deposits have covered all available electrode surfaces, electrical current flow will be reduced to a level where the desired steam output cannot be reached and the service light will signal the need for a new cylinder. The cylinder can be easily changed with only a flat head screwdriver.

The Carnes humidistat will link the humidifier with the furnace and run the humidifier only when the HVAC blower is operating. The humidistat will adjust the steam output of the humidifier based on the humidity reading and the desired humidity setpoint. The Carnes humidistat has multiple installations and control configurations discussed further in the Humidistat Installation and Operations Manual.

Important Note: Due to the many variables effecting the operation of humidifiers (water condition, conductivity, water hardness, etc.) it could take up to 24 hours of steam generation before a humidifier is operating in the nominal range and the water is completely conditioned. Conditioned water contains dissolved minerals and is more conductive than fresh water from the fill valve.



WHOLE HOME HUMIDIFIER | Humidifier Component Listing



Specifications & Dimensions | WHOLE HOME HUMIDIFIER

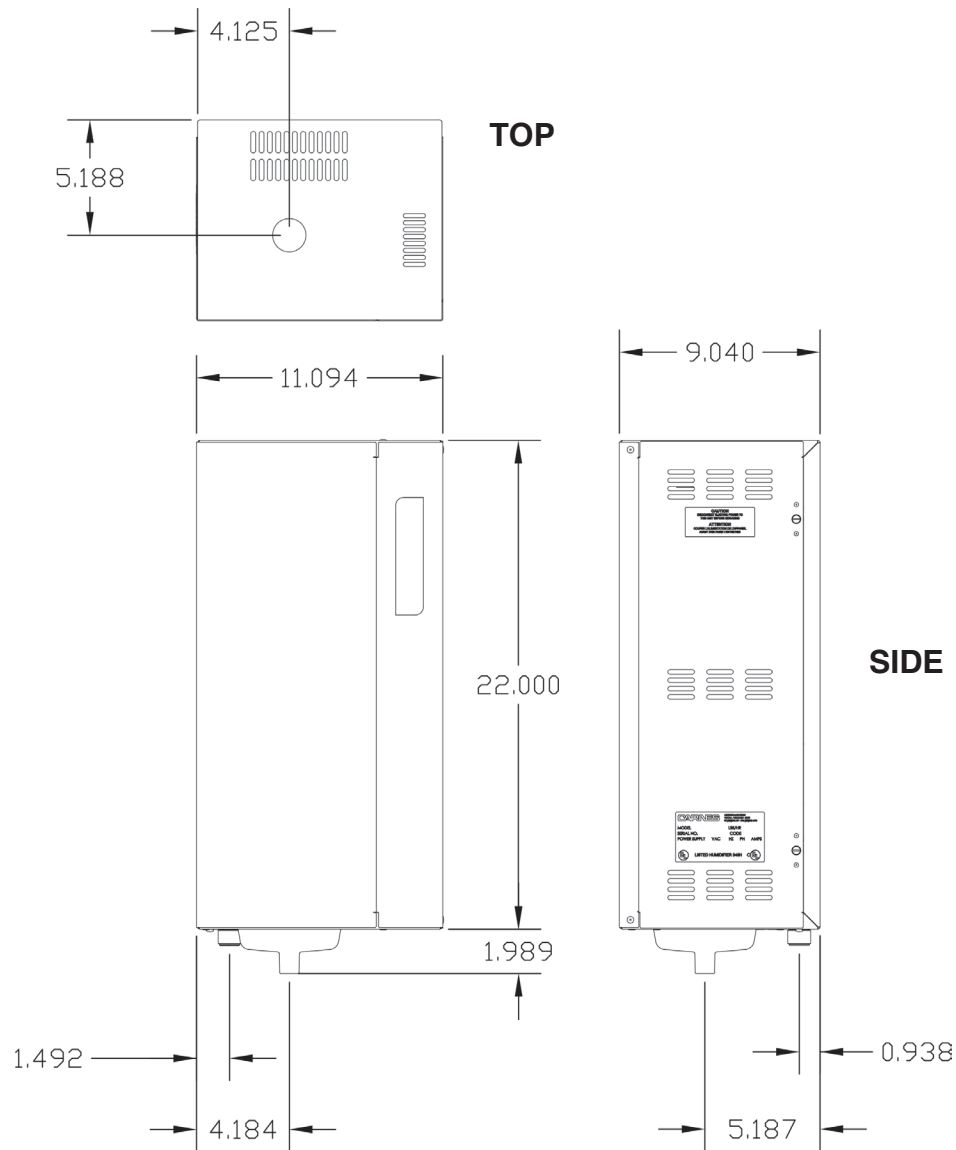


Table 1:

Model	Max Current Setting	Voltage/Phase	Max Output (Lb/Hr)	Max Output (Gal/Day)	Max Power (kW)	Disc. Size	Cylinder
HRAC	8 Amps	120v/1p	2.85	8.19	0.96	15	RX300
		208v/1p	4.94	14.19	1.66	15	RX300
		240v/1p	5.7	16.37	1.92	15	RX300
	12 Amps	120v/1p	4.27	12.29	1.44	15	RX300
		208v/1p	7.41	21.28	2.50	15	RX300
		240v/1p	8.55	24.56	2.88	15	RX300
	16 Amps	120v/1p	5.70	16.38	1.92	20	RX300
		208v/1p	9.87	28.37	3.33	20	RX300
		240v/1p	11.39	32.74	3.84	20	RX300

System Includes: RX300 Cylinder; Membrane Switch Control with Graphic LED Display; Completely Connected Internal Wiring and Plumbing; Fill Valve Water Strainer; Electronic Overload Protection; Door Interlock which Disconnects Power to Cylinder Electrodes; Removable Door with Screw Locks; Electronically Controlled Overflow Sensor

Finish: 304 B 20 gauge Stainless Steel

WHOLE HOME HUMIDIFIER | Sizing

Important Note:

The Carnes HRAC should only be installed if it has been sized properly. The volume of your home (in square feet) should be used when choosing the steam output setting (square feet x ceiling height). It is also important to take into consideration the home's construction type and available electrical power. Use *Table 2* below to estimate the steam setting. Home sizes that fall between those listed should use the larger output setting.

Table 2: Humidification Load Requirement (Information from AHRI Guideline F)

	Volume of Building (ft ³)							
	8,000	10,000	12,000	16,000	20,000	24,000	32,000	40,000
Structure Seal	Humidity Required (Gallons/Day(GPD))							
Tight	3.3	4.2	5.0	6.7	8.3	10.0	13.4	16.7
Average	6.7	8.3	10.0	13.4	16.7	20.0	26.7	33.4
Loose	10.0	12.5	15.0	20.0	25.0	30.1	40.1	50.1

Important Notes:

- Loads shown in the table are based on indoor conditions of 70°F and 35% RH with 20°F and 70% RH outdoors
- An amount of 2.0 gallons per day may be deducted from these figures if it is desired to take credit for internal sources of moisture (based on family of four)

Table 3: Correction Factor for Other Indoor Temperatures and RH Conditions (Information from AHRI Guideline F)

Indoor Temperatures (°F)	70.0			75.0		
Indoor (%RH)	30%	35%	40%	30%	35%	40%
Correction Factor	0.8	1.0	1.3	1.0	1.2	1.4

Important Note:

- This table provides the correction factor to use for other indoor temperatures and relative humidity conditions. Multiply Humidification Load Required from *Table 2* by the appropriate correction factor in *Table 3*.

Water quality greatly affects how a humidifier will operate. Conductivity, measured in microseimens per centimeter, and hardness are directly related. In general, hard water will conduct electricity more efficiently than soft water. Lower conductivity water may cause the humidifier to take longer to reach desired output from startup because the unit will need time to condition the water.

Water is conditioned by temporarily reducing the output and allowing water to boil inside the cylinder. Mineral deposits are left behind as steam leaves the unit. The minerals mix with fresh incoming water, increasing conductivity. The humidifier controls conductivity of the water by closely timing fill, drain, and steady state sequences.

There are positive and negative affects to using either hard or soft water. When it comes to overall cylinder lifespan, using soft water will lead to longer cylinder life. There are various reasons for this change, but the most notable

is that using soft water will require the unit to drain and fill more frequently, thus allowing minerals to flush out of the cylinder more often. However, more frequent draining and filling means there is a loss of efficiency in water and electrical power. Draining and filling more frequently also means that the unit will not control as steadily as a hard water supplied unit. Hard water will reduce the lifespan of the cylinder as compared to soft water fed, but will increase water, electrical and control efficiencies because the unit will not need to drain for conductivity reasons as often.

The Carnes residential humidifier is equipped with a dual electrode cylinder, (RX300), that can be adjusted to handle a wide water hardness range. The residential humidifier unit and cylinder (RX300) were designed to operate properly, out of the box, with any water that has a conductivity measurement between 50uS/cm and 1500uS/cm.

Table 4: Cylinder setup based on Water Conductivity vs. Unit Voltage

Conductivity (uS/cm)	Hardness	Recommended Canister Configuration Based on Unit Voltage		
		120VAC	208VAC	240 VAC
		Recommended Cylinder Wire Configuration (see <i>Figure 2</i>)		
0-50	Extremely Soft	Installation Not Recommended		
50-150	Naturally Soft	B Configuration	B Configuration	B Configuration
150-300	Naturally Soft	B Configuration	B Configuration	B Configuration
300-500	Slightly Hard	B Configuration	B Configuration	B Configuration
500-750	Moderately Hard	B Configuration	B Configuration	A Configuration
750-1000	Hard	B Configuration	A Configuration	A Configuration
1000-1500	Very Hard	B Configuration	A Configuration	A Configuration
>1500	Extremely Hard	Installation Not Recommended		
---	Softened	B Configuration	A Configuration	A Configuration

Important Note: *Table 4* shows the corresponding cylinder setups based on incoming water conductivity and desired unit voltage. The two different cylinder setups are shown below in *Figure 2*.

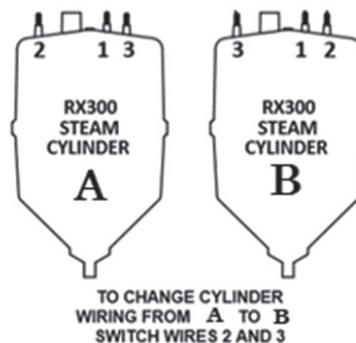


Figure 2: Cylinder Setups

WHOLE HOME HUMIDIFIER | Choosing a Location

Important Note: Using a licensed HVAC professional to install the humidifier and distribution pipe is recommended.

When choosing a location for the humidifier and distribution pipe the following should be considered:

- Location in the duct with respect to other HVAC equipment
- Height difference between the humidifier and the distribution pipe
- Horizontal distance from humidifier to the duct
- Proximity of drain receptacle
- Proximity to incoming water supply

Humidifier:

Important Note: The humidifier must never be located outside or where it may be exposed to freezing temperatures. Do not mount the humidifier on a hot or vibrating surface.

The humidifier should be mounted upright and level and as close to the steam distribution pipe as possible, but also at a convenient height for servicing. Allow 12 inches or more on each side for panel access and 16 inches from the bottom of the unit to floor to allow for drain connections. Allow 18 inches in front of the cabinet for servicing. See *Table 5* below.

Table 5: Clearance Tolerances

Top Clearances	24"
Side Clearances	12" + on each side
Front Clearances	16"
Bottom Clearances	18"

In a typical installation, the humidifier is located below the duct as shown in *Figure 5*. The distance between the humidifier cabinet and the steam distributor pipe should be the minimum distance possible (No more than 6 feet is recommended).

Steam Distribution Pipe:

The steam distribution pipe (*Figure 3*) should be located on a vertical surface so any condensate that forms will run back into the steam line. The pipe should be located in the center of the duct to insure proper distribution of steam into the airstream. A minimum clearance of 4 inches should be maintained between the top of the duct and the distribution pipe.

The best location for the steam distribution pipe is in the supply duct downstream of the fan (*Figure 4*). Under normal conditions, most absorption distances will be approximately 6 inches to 3 feet. It is always recommended that there be a minimum of 3 feet between the distribution pipe and any downstream fans, coils, filters, dampers, elbows, or outlets to reduce the possibility of condensation.

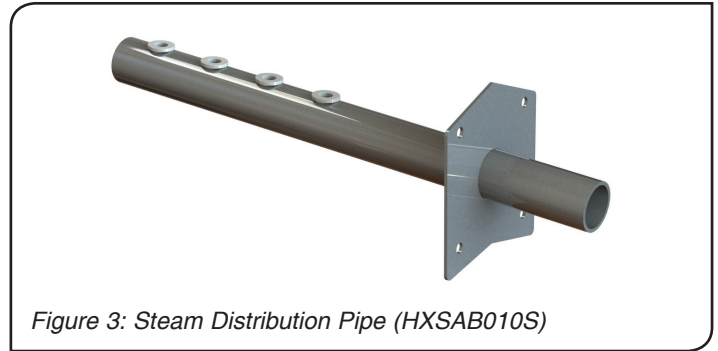


Figure 3: Steam Distribution Pipe (HXSAB010S)

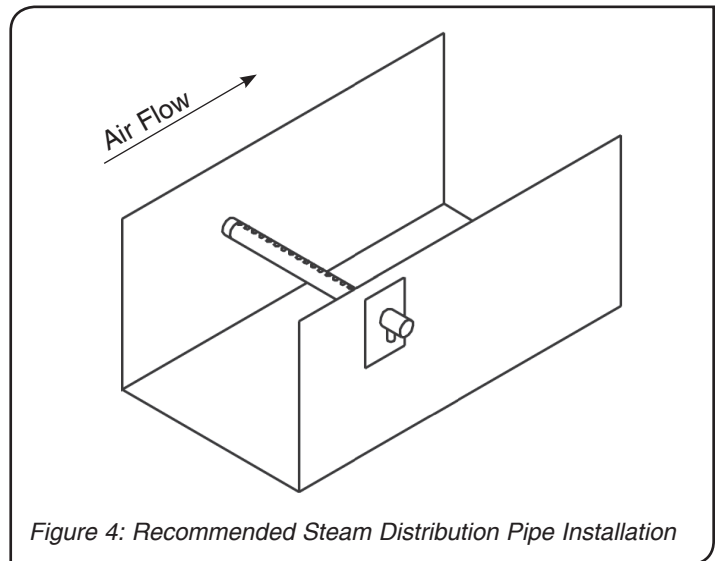


Figure 4: Recommended Steam Distribution Pipe Installation

Important Note: Always avoid locating the distribution pipe upstream from any insulation in the duct, as excess moisture may cause damage.

The recommended maximum length of steam hose as shown in *Figure 5* is 6 feet. Up to 10 feet can be used if required and can be purchased from carneshumidifiers.com. The hose should continuously rise vertically from the cabinet with no sags, low points, dips, or horizontal runs. The rise should be at least 2" of vertical for every 12" of horizontal to allow for proper condensate drainage (*Figure 6*). Carnes electrode steam humidifiers are non-pressurized, with a maximum of 1/2 psi under normal operating conditions and cannot overcome any resistance caused by standing water in the steam hose. Accumulation in the condensate return hose will hamper the flow and may cause water to back up into the duct.

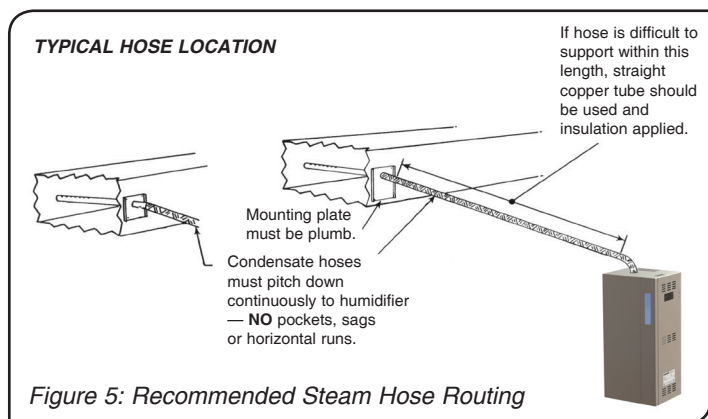


Figure 5: Recommended Steam Hose Routing

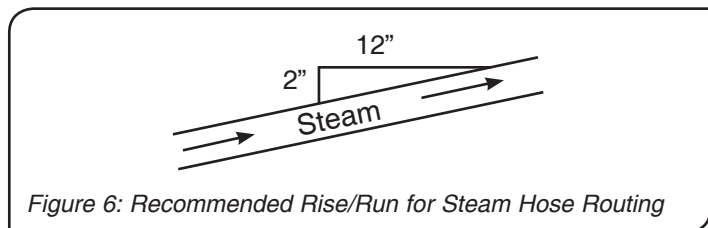


Figure 6: Recommended Rise/Run for Steam Hose Routing

Important Note: If the installation cannot accommodate the steam output, the only recourse may be to lower the output of the unit to prevent damage to the home.

Important Note: Over time and extended heat, hose sag can occur. It is important to perform monthly visual inspections to maintain and potentially fix any improper routing of steam and condensate lines.

If it is not possible to install the steam hose to prevent sags (*Figure 7*), it is recommended that copper tube be used as a substitute. If a copper tube is used, a minimum of one inch of insulation must be applied to prevent excessive condensation, as shown in *Figure 8*. A short length of steam hose must be used to connect the cylinder in the humidifier to the copper tube and another short length to connect the copper tube to the distributor pipe. Size 3/4" copper tube (with 7/8" steam hose) can be used with steam cylinders. Hose lengths of no longer than 6 feet and proper inclines or routing, as expressed in this manual, will provide the best chance of having a proper operating humidifier with efficient and effective steam dispersion.

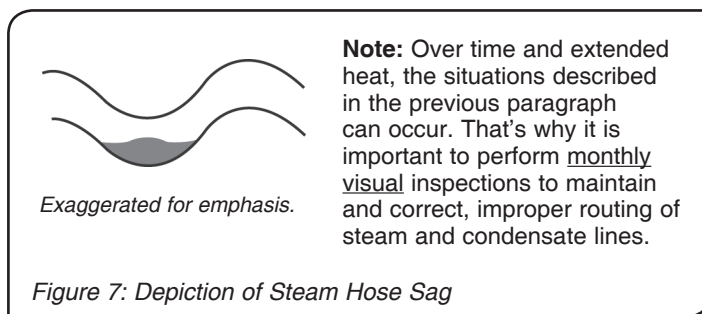


Figure 7: Depiction of Steam Hose Sag

Under less than perfect conditions, (installation issues and extreme steam hose lengths) it is possible to substantially reduce steam output. The use of 90° elbows should be avoided as they add approximately 3 feet of equivalent length when hard tubing is used, thus negatively affecting capacity, efficiency, and can cause back pressure issues and cylinder arcing.

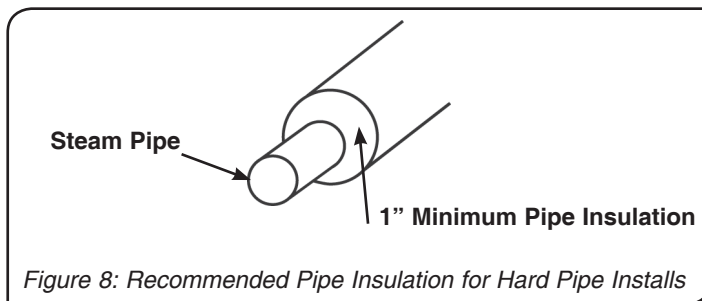
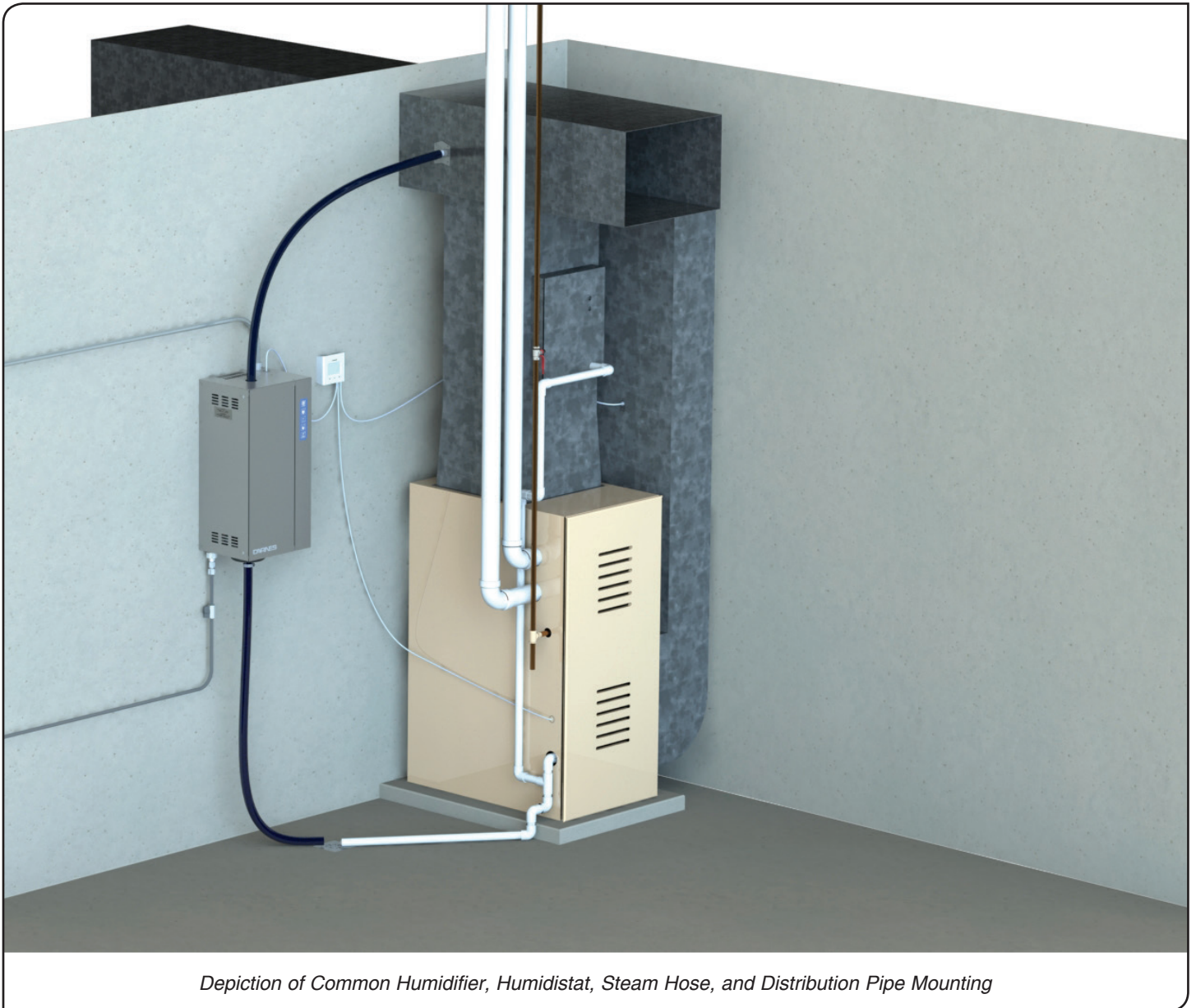


Figure 8: Recommended Pipe Insulation for Hard Pipe Installs

WHOLE HOME HUMIDIFIER | Typical Installations

Important Note: Using a licensed HVAC professional to install the humidifier and distribution pipe is recommended.



Distribution Pipe Installation:

1. Refer to the Choosing a Location section of this document to determine proper placement and orientation of distribution pipe before mounting anything.
2. Drill a 1-1/4" diameter hole in the section of the duct that the steam distribution pipe will be mounted.
3. Insert the distribution pipe into duct and secure with four sheet metal screws.

Mounting the Humidifier:

1. Refer to the Choosing a Location section of this document to determine proper placement and orientation of distribution pipe before mounting anything.
2. Fasten the unit to wood studs, solid wood, or a concrete wall using the eyelet mounting holes, located on the back panel of the humidifier. Fasteners should be installed through the back of the humidifier cabinet to secure the humidifier to the mounting surface (fasteners are not included). FASTENER RECOMMENDATION* #8 Screw, 2" minimum in length.

Table 6: Unit Weight

Model	Dry Weight (lbs.)	Max. Operating Weight (lbs.)
HRAC	23.4 lbs.	36.4 lbs.

Connecting the Water Supply:

Important Note: Using a licensed plumbing professional to install the water supply is recommended.

1. Verify the water supply being connected meets the water supply guidelines listed on next page.
2. Connect a hose to the 3/8" FPT fitting that is provided, located at the bottom of the humidifier for connection to tap water. **Note:** A shutoff valve (not provided) should be installed ahead of this fitting.

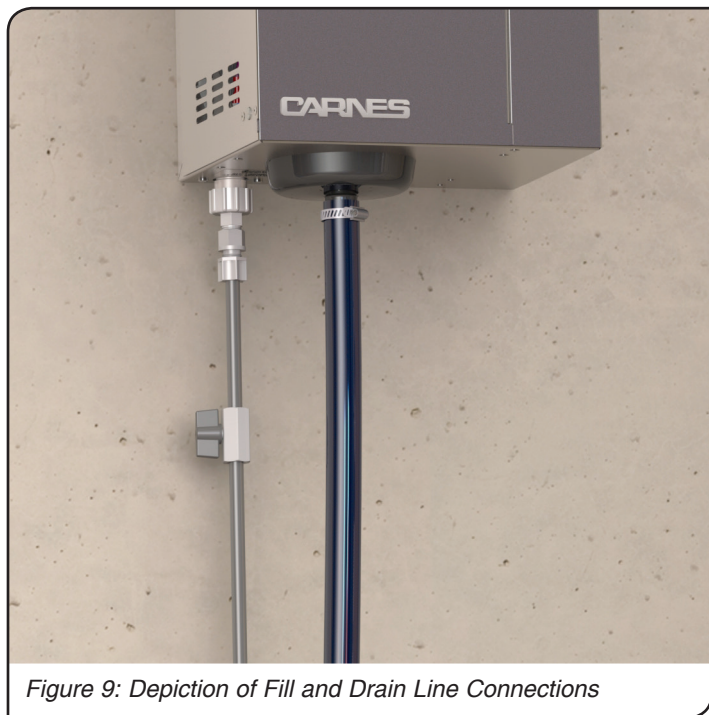


Figure 9: Depiction of Fill and Drain Line Connections

Supply Water Guidelines

Use ordinary cold tap water (20 to 120 psi) with a conductivity level that falls within normal operating range, as shown in Table 4. DO NOT use hot water, DI (deionized water), or RO (reverse osmosis) water.

Supply water quality is a very important factor on how a humidifier functions and how often it will need to be maintained. When water is boiled into steam, it creates a scale build-up that is left behind in the cylinder. This material left behind continues to change the properties of the water. Having corrosive supply water can decrease the service life of the humidifier and the cylinder and using excessively hard supply water can increase maintenance requirements. It is recommended that a water supply having a total water hardness between 50-120 (ppm) parts per million be used.

High amounts of chlorides or other corrosive substances in the supply water can cause damage and rapid corrosion to the cylinders electrodes. Using a water supply having less than 50 ppm of measured chlorides is recommended.

Connecting the Drain Line

Important Note: Using a licensed plumbing professional to install the water supply is recommended.

1. Securely connect a 1" I.D. hose (not included) to the port of the humidifier drain cup located at the bottom of the unit as shown in Figure 9.
2. The drain should continually slope downward to avoid bubbles in the line that may cause water to back up into the humidifier cabinet.
3. An S or P-trap or air gap may be required.

Important Note: Use plumbing material capable of handling hot water.

Electrical Power

Important Note: It is always recommended to have a licensed electrical professional connect power to the humidifier. All local and national codes must be followed when connecting power.

Important Note: The Carnes HRAC Steam Humidifier is factory set for 240 V_{AC} with a max of 16 amps. Connecting to any other power, without verifying and changing the configuration of the controls may cause damage to the unit and will void the warranty.

Selecting Desired Power and Breaker Sizing

The user can select between 8, 12, and 16 amps as the rated current of the unit by toggling the DIP-switches located on the humidifier control board, shown in Figure 10. The max current setting corresponds directly to the maximum steam output as shown in Table 7. Refer to the Sizing Section of this document to determine required steam output of the humidifier.

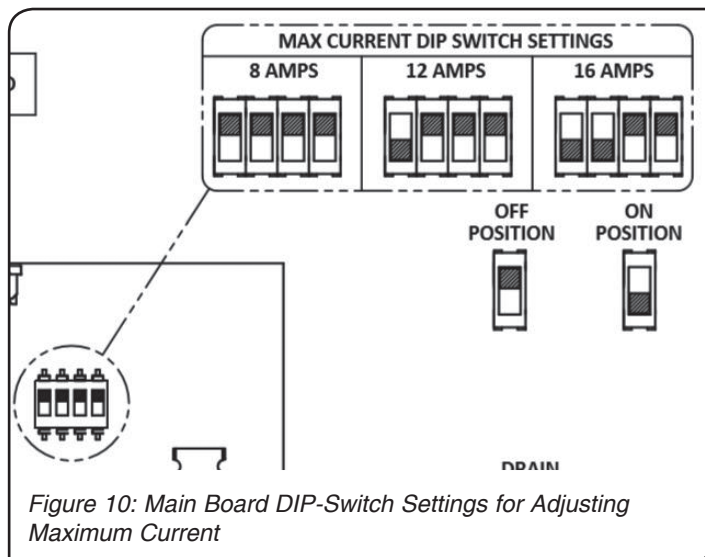


Figure 10: Main Board DIP-Switch Settings for Adjusting Maximum Current

Important Note: A fused disconnect or circuit breaker (not provided) MUST be installed per local and national codes. See Table 7 for recommended circuit ratings.

Table 7: Carnes HRAC Specifications and Data Sheet

Model	Max Current Setting	Voltage/Phase	Max Output (Lb/Hr)	Max Output (Gal/Day)	Max Power (kW)	Disc. Size	Cylinder
HRAC	8 Amps	120v/1p	2.85	8.19	0.96	15	RX300
		208v/1p	4.94	14.19	1.66	15	RX300
		240v/1p	5.70	16.37	1.92	15	RX300
	12 Amps	120v/1p	4.27	12.29	1.44	15	RX300
		208v/1p	7.41	21.28	2.50	15	RX300
		240v/1p	8.55	24.56	2.88	15	RX300
	16 Amps	120v/1p	5.70	16.38	1.92	20	RX300
		208v/1p	9.87	28.37	3.33	20	RX300
		240v/1p	11.39	32.74	3.84	20	RX300

Table 7 Breakdown:

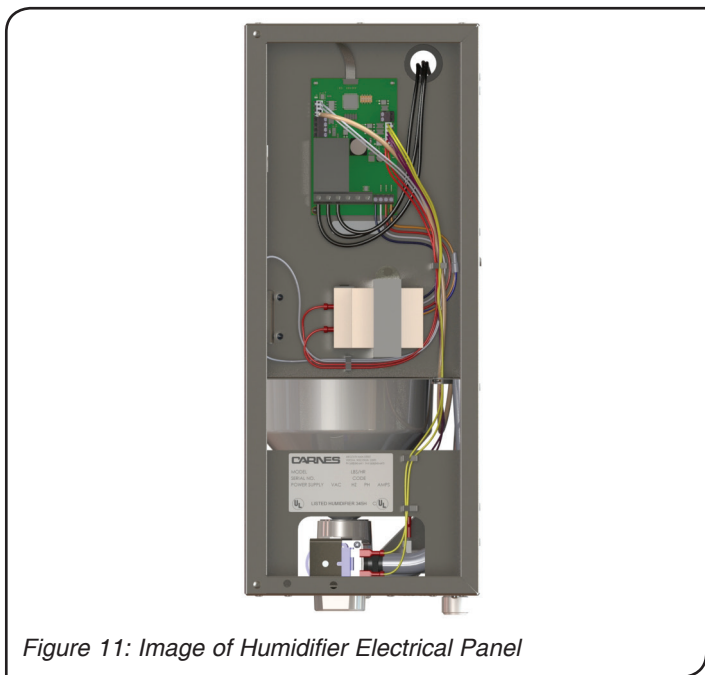
- **Maximum Current Setting:** User configured amperage draw of the unit. This setting, along with the available voltage in the electrical service panel, will be used to determine max output of the humidifier and required breaker size.
- **Voltage/Phase:** The available power from the electrical service panel.
- **Maximum Output (Lb/Hr):** The maximum capacity of the humidifier in pounds per hour.
- **Maximum Output (Gal/Day or GPD):** The maximum capacity of the humidifier in gallons per day.

Note: The output rate may be easily configured after installation by changing the Max Current Setting (see wiring diagram *Figures 10 & 14* for explanation).

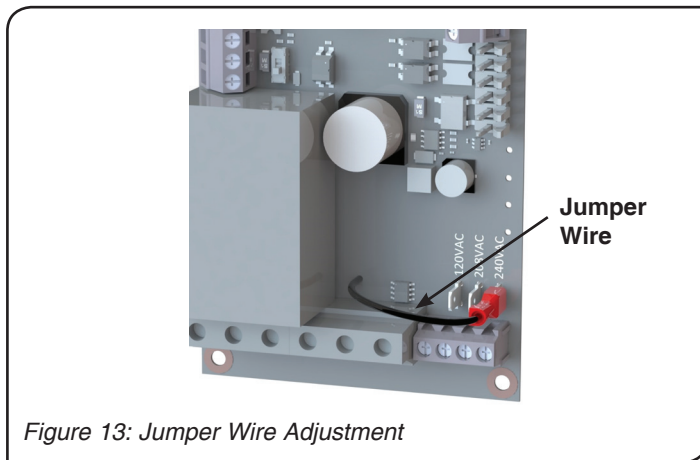
- **Maximum Power (kW):** This is the maximum power rating when the humidifier is operating at maximum output. If the maximum output of the unit is adjusted lower, the power rating is reduced proportionally.
- **Breaker Sizes:** Amperage ratings for use in selecting electrical service requirements.

Installing Electrical Power

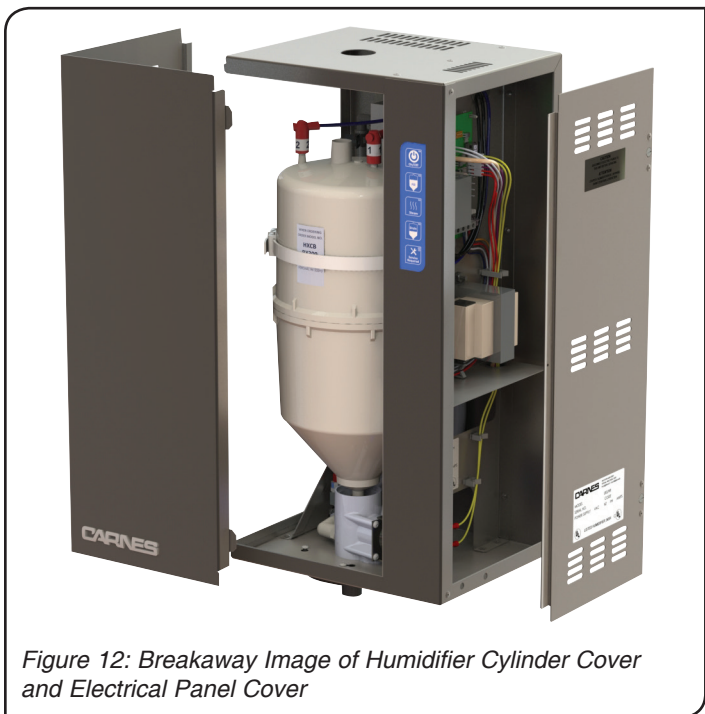
1. Remove side panel for access to wiring and refer to *Figure 11*, and *Figure 12* for different electrical locations.



2. Adjust the power supply setting on the internal circuit board to match the desired supply voltage by moving the jumper shown in *Figures 13 & 14*.



3. Set the maximum current setting by adjusting the DIP-Switches shown in *Figures 10 & 14*.
4. Bring electrical power wires through the opening provided in the top panel and connect to electric power terminals as shown in the humidifier wiring diagram *Figure 14* on the next page.



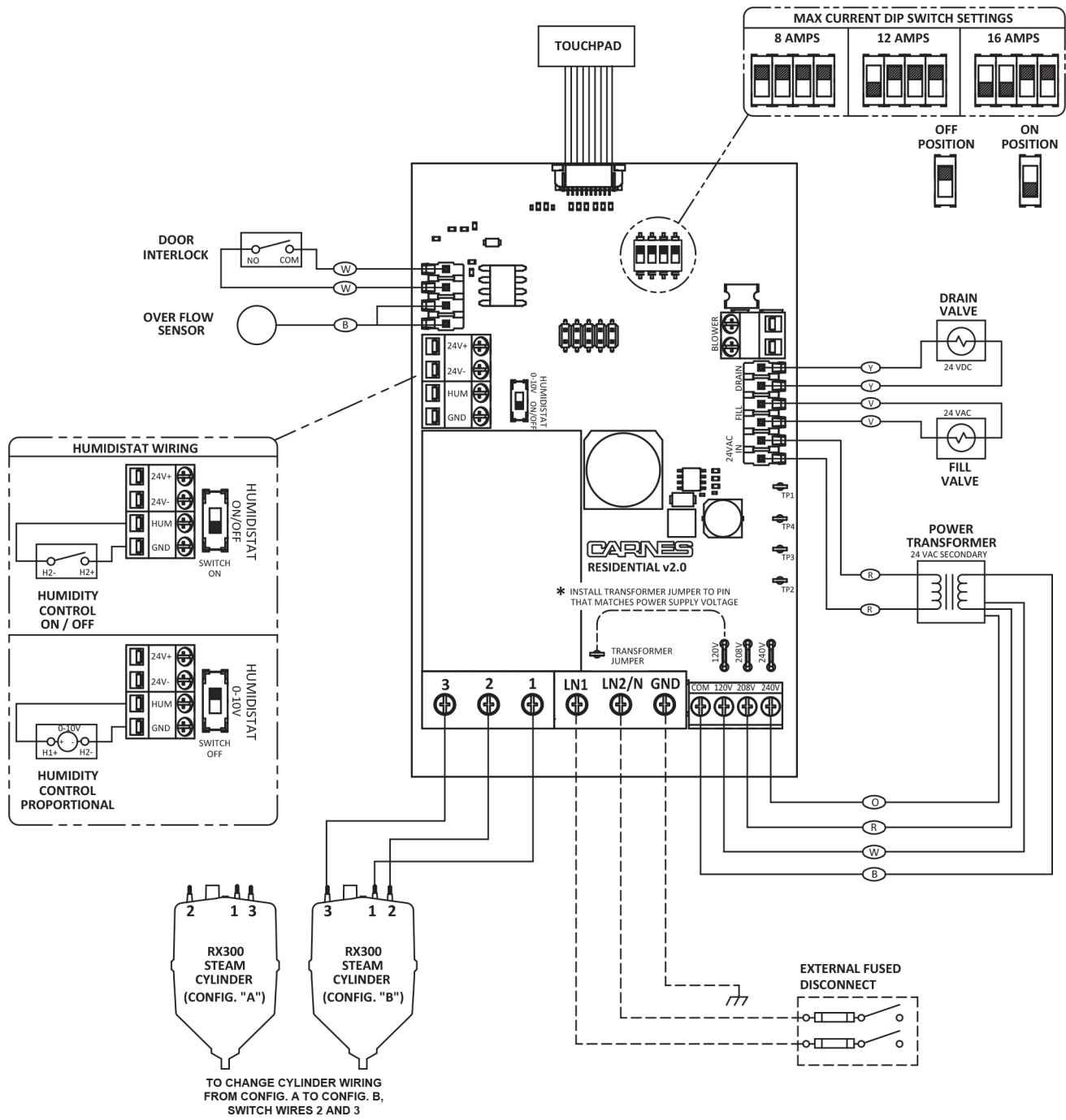


Figure 14: Humidifier Wiring Diagram

WHOLE HOME HUMIDIFIER | Humidistat and External Controls

Important Note: Every Carnes HRAC unit is shipped with a Carnes room or duct mount residential humidistat. When installing this humidistat, refer to the humidistat IOM for placement, wiring, and control setup.

located on the internal humidifier circuit board, shown in *Figure 14*. When using the Carnes residential humidistat, it is important to make sure that both devices are set to the same control settings or the unit will not function properly.

The HRAC humidifier can accept universal 0-10VDC proportional control signals or dry-contact on/off control signals. Each of these settings can be adjusted via switch

The image below, *Figure 15*, shows the proper wiring of a Carnes residential humidifier, humidistat, and residential HVAC unit.

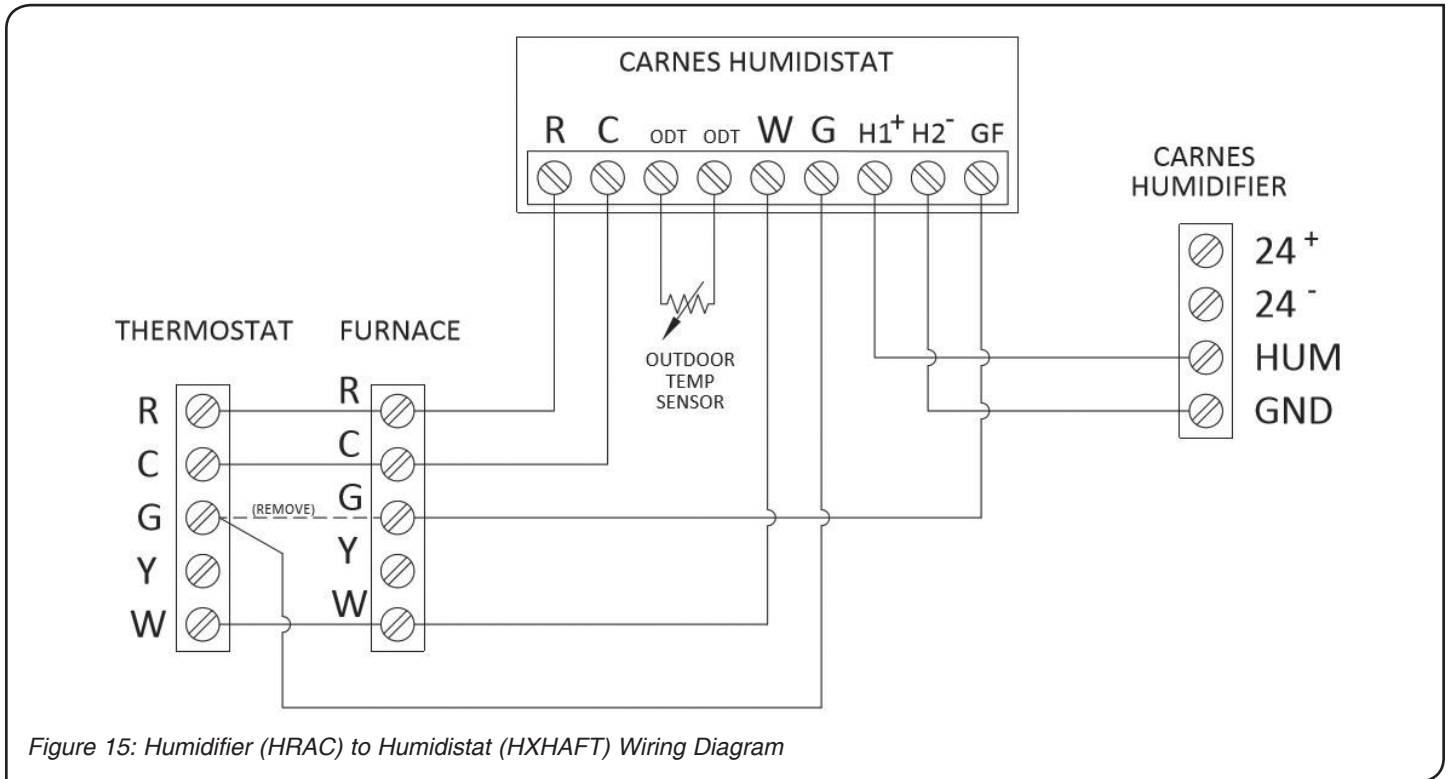


Figure 15: Humidifier (HRAC) to Humidistat (HXHAFT) Wiring Diagram

Start-Up Procedure:

1. Connect supply water, drain, steam hose, electrical power, and control wiring to the unit.
2. Verify the user selections regarding unit voltage and steam output, located on the circuit board, are correct, see Electrical Power section.
3. Verify that the steam cylinder is properly installed in the drain valve assembly and that all wires and wire connectors are in the proper position and secure on the top of the cylinder.
4. Open valve allowing water to flow to the humidifier and check for leaks inside and outside the humidifier cabinet.
5. Reattach the front and side panels.
6. Turn on main power to the unit.
7. Adjust the desired humidity setpoint on the humidistat or thermostat.
8. Press the On/Off button on the front panel to turn the humidifier on. The green light on the On/Off button will illuminate.
9. The humidifier will run if the unit is turned on, the HVAC blower is operating, and the humidistat is measuring a humidity level that is lower than the user entered setpoint.
10. Press the drain button on the front display to verify the drain function is operating properly. The fill valve and drain valve will open in sync to lower the water temperature from the unit to the drain.
11. Press the drain button again to enter back into the normal operation of the humidifier.

The humidifier is directly controlled by the humidistat. When the humidistat detects a humidity level below setpoint and the HVAC system blower is on the humidifier will begin to generate steam. The humidifier control board will read the demand signal from the humidistat and vary the steam output to bring up the humidity level to the user entered setpoint. The humidifier will control the steam output by measuring the current flowing between the electrodes in the steam cylinder and varying the water level in the cylinder to allow for more or less current to flow. The current will range between +/-10% of the max current set by the user with the DIP-switches on the board. The water level in the cylinder will depend upon the cylinder electrode selection and the overall hardness of the supply water.

Operating Modes:

Off:

The green "On" light will not be illuminated and the unit will provide zero function.

Manual Drain:

If the drain button is pressed the unit will enter into a manual drain state. The unit will drain until the user has pressed the drain button again, turned the unit off, or 10 minutes of continuous draining has elapsed. If the drain button is pressed again, the unit will enter back into the mode it was in prior to the drain.

On/Standby:

If the unit is off and the On/Off button is pressed, the unit will transition into a standby mode. In standby mode, the unit will not generate steam; it will wait and continuously check for a demand signal from the humidistat. Once the humidifier senses that the humidistat is calling for humidity, the unit will transition to Steady State Mode.

Steady-State:

In steady state mode the unit will close the power relay and begin generating steam. The blue "Steam" LED will illuminate, signaling to the user that the unit is generating steam. The unit will continue to stay in steady state mode as long as there is demand from the humidistat and the measured current does not go below or exceed allowable electrical current thresholds, pre-programmed into the humidifier controller board. If the measured current drops below -10% of the desired current setpoint, the unit will transition to the fill state, where current will go up due to water being introduced into the cylinder. Likewise, if the measured current exceeds +10% of the current setpoint, the unit will transition to the drain state, where current will go down due to water leaving the cylinder.

Fill:

In the fill state the unit continues to generate steam with the power relay energized, but will open the fill valve, allowing water to flow into the cylinder. The blue "Fill" LED will illuminate, signaling to the user that the unit is filling. If the measured current exceeds the current setpoint by +5%, the unit will transition back into steady-state.






Automatic Drain:

In the automatic drain state the unit continues to generate steam and will open the fill valve and drain valve, allowing for tempered water to flow out of the cylinder base. The blue "Fill" and "Drain" LEDs will illuminate, signaling to the user that the unit is draining. If the measured current exceeds the current setpoint by +15%, the unit will transition to off and illuminate the red service required light. Also if the measured current drops below +5% of current setpoint the unit will transition back into steady-state.

Pulse Drain:

If the unit senses that the fill or drain valve are having trouble controlling the water level in the cylinder, the unit will enter a pulse-drain mode. The unit will pulse the drain on and off for 20 seconds, in attempt to dislodge any materials or sediment that may be causing issues with the drain valve assembly.

WHOLE HOME HUMIDIFIER | Display Panel

Display	LED	Description
	Off	The humidifier has no power or is currently off.
	On	The humidifier is on.
	Flashing	The humidifier is on and the front panel is open.
	Off	The fill valve is closed (no water flowing to the unit).
	On	The fill valve is open (water is flowing to the unit).
	Off	The power relay is open (no electrical current flowing to the steam cylinder).
	On	The power relay is closed (electrical current is flowing to the steam cylinder).
	Off	The drain valve is closed (no water exiting the unit).
	On	The drain valve is open (water exiting the unit).
	Yellow Flashing, Red Off	The unit has been operating at a reduced setpoint for over 8 hours, due to overflow and water conditioning issues. The unit will continue to run.
	Yellow Flashing, Red Flashing	Boil-down issues have persisted for 5 straight fill cycles, meaning that there is a water conductivity issue inside the cylinder, as it is flash boiling.
	Yellow Solid, Red Off	The unit has been operating at a reduced setpoint for over 5 days, due to overflow and water conditioning issues (unit will turn off and needs new cylinder or cylinder configuration).
	Yellow Solid, Red Flashing	The unit cannot get to the lowest current setting (unit will turn off and needs new cylinder or cylinder configuration).
	Yellow Off, Red Flashing	The fill or drain sequence lasted longer than 10 minutes and the unit never reached desired setpoint (unit will turn off and the drain and/or fill assemblies need to be inspected).
	Yellow Off, Red Solid	The unit is experiencing high-water issues during steady-state (no drain or fill) signaling that there may be a clog in the steam hose or overflow tubing (unit will turn off and needs inspection).
	Yellow Flashing, Red Solid	The unit is experiencing high-water issues during drain cycles, signaling that there may be an issue with the drain valve assembly (unit will turn off and drain valve/tubing needs inspection).
	Yellow Solid, Red Solid	The unit is experiencing over-current issues due to high conductivity water or incorrect cylinder configuration (unit will turn off and the cylinder will need to be adjusted or a water conductivity test completed).
	Yellow Off, Red Off	No unit issues at this time.
	Yellow Single Flash	The unit has experienced a water overflow due to a high water level in the cylinder or an obstruction in the fill line.

SYMPTOM	CAUSE	ACTION
Humidifier unit will not turn on	No electrical power to unit	Verify voltage of main power supply
		Verify position of main power breaker
		Check input power terminal block connections
Cylinder not generating steam	No electrical power to humidifier control board	Verify that the output of the low voltage transformer is 24V _{AC}
	Improper cylinder wiring	Verify proper electrical connections to the cylinder top
	Electrode degradation	Visually inspect the cylinder for severe electrode degradation. If electrodes show signs of corrosion or are completely covered in mineral buildup, replace the cylinder
	No demand for humidity from humidistat	Verify that controls are sending a demand signal for steam generation
Unit will not fill with water	Water supply issues	Verify proper connection to water supply
		Verify that external water supply valve is open and allowing water to flow to unit
		Check the fill valve input strainer for mineral deposits. If so, clean strainer or replace.
Unit will not stop filling with water	Malfunctioning fill valve (cannot open)	Verify proper operation of fill valve by checking for obstructions in the valve assembly, verifying electrical connections to the valve, and verifying proper voltage levels (24V _{AC}) to the fill valve when it is being commanded on by the unit. The fill valve will receive an on command if the unit is put into manual drain mode, which is done by pressing the drain button on the front panel. Replace valve if needed.
	Malfunction drain valve (stuck open)	Check for obstruction in drain valve assembly and remove.
Unit will not stop filling with water	Issues with overflow indication	Check that the high-water indication probe is functioning properly by allowing fill cup to overflow into the overflow tube. This can be done by removing the electrical connection to the drain valve and pressing the drain button on the front panel. This will cause the fill valve to turn on while the drain valve remains off, and the unit will eventually overflow with water.
	Malfunctioning fill valve (stuck open)	Verify there are no obstructions in the fill valve that could be causing issues with seating properly. If so clean or replace valve.
	Malfunctioning drain valve (cannot open)	Verify proper operation of drain valve by checking for obstructions in the valve assembly, verifying electrical connections to the valve, and verifying proper voltage levels (24V _{DC}) to the valve when it is being energized on by the unit. The drain valve will receive an on command if the unit is put into manual drain mode, which is done by pressing the drain button on the front panel. Replace valve if needed.

WHOLE HOME HUMIDIFIER | Troubleshooting Guide

SYMPTOM	CAUSE	ACTION
The unit cannot drain	Malfunctioning drain valve (cannot open)	Verify proper operation of drain valve by checking for obstructions in the valve assembly, verifying electrical connections to the valve, and verifying proper voltage levels (24V _{DC}) to the valve when it is being energized on by the unit. The drain valve will receive an on command if the unit is put into manual drain mode, which is done by pressing the drain button on the front panel. Replace valve if needed.
Humidifier output cannot meet desired humidity setpoint level	Humidifier is not receiving proper demand signal	Verify wiring of external controls.
	Humidifier output is not large enough to satisfy area	Increase output of humidifier by selecting a higher max current or by wiring unit to a higher voltage level, if possible
		Check steam hose for leaks.
		Verify that there is not excessive internal steam pressure in the cylinder. This can be caused by improper installation of steam hose, absorption manifold or even high duct static pressures.
Look into upgrading to larger Carnes humidifier units.		
Humidifier output is higher than desired humidity setpoint level	Humidifier is not receiving proper demand signal	Verify wiring of external controls
	Malfunctioning external controls	Verify the external controls are functioning properly
	Improperly located external control	Relocate external controls to meet guidelines discussed in humidifier IOM
Humidifier generating noise	Filling, draining, and power relay noise	It is normal for the unit to make small amounts of noise periodically. The fill and drain valves along with the power relay will all make a clicking sound when energized or de-energized, and the fill valve will hiss as water flows through the assembly.
		Loud buzzing noises indicates a poorly aligned valve stem and the valve will need to be replaced for proper operation.
Arcing	High conductivity water	Verify water conductivity levels of incoming water meet the standards required for steam generation
	Flakes of debris in cylinder	Fill and drain cylinder a few times in attempt to return to proper operation. If problem persists, replace cylinder.
Service required indications illuminated	Yellow Flashing, Red Off: The unit has had high water and water conditioning issues for longer than 8 hours (unit will stay on, only used as signal to user that there are potential future issues).	Allow the unit to continue to operate, if problem continues to persist re-evaluate user settings of unit, i.e. max current setpoint, supply voltage selections and dual electrode configuration.
	Yellow Flashing, Red Flashing: The door is open (door interlock switch not met, unit will turn off).	Close door and unit will return to proper function.
	Yellow Solid, Red Off: The unit has had high water and water conditioning issues for longer than 5 days (unit will turn off).	If the cylinder is nearing end of life, replace the cylinder.
If the cylinder is new, re-evaluate user settings of unit, i.e. max current setpoint, supply voltage selections and dual electrode configuration.		

SYMPTOM	CAUSE	ACTION
Service required indications illuminated <i>(Continued)</i>	Yellow Solid, Red Flashing: The unit cannot get to the lowest current setting (unit will turn off and needs new cylinder or cylinder configuration).	Verify water conductivity levels of incoming water meet the standards required for steam generation. Re-evaluate user settings of unit, i.e. max current setpoint, supply voltage selections and dual electrode configuration. Replace cylinder.
	Yellow Off, Red Flashing: The unit timed out on drain or fill before it could get to the desired setpoint (issues with the fill and or drain valve).	Verify the fill and drain valve are functioning properly. Verify that there are no clogs in the exiting steam hose or overflow tubing.
	Yellow Off, Red Solid: The unit is experiencing high-water issues during steady-state (no drain or fill) signaling that there may be a clog in the steam hose or overflow tubing (unit will turn off and needs inspection).	Verify that there are no clogs in the exiting steam hose or overflow tubing.
	Yellow Flashing, Red Solid: The unit is experiencing high-water issues during drain cycles, signaling that there may be an issue with the drain valve assembly (unit will turn off and drain valve/tubing need inspection).	Verify that the drain valve assembly is functioning properly, with no clogs or debris Verify the fill valve and overflow tubing is functioning properly, with no clogs or debris.
	Yellow Solid, Red Solid: The unit is experiencing over-current issues due to high conductivity water or incorrect cylinder configuration (unit will turn off and the cylinder will need to be adjusted or a water conductivity test completed).	Verify the incoming water falls within the range of allowable conductivity to the unit. Inspect the cylinder for excess debris, and run some manual drain cycles to clear out any remaining debris. Replace cylinder.
	Water in duct or spitting from distributor pipe	Improper installation of steam or condensate hose
Malfunctioning condensate line		Verify condensate line is not blocked or kinked, allowing for water to flow freely.
Improper installation of distributor pipe		Verify distributor pipe installation meets guidelines discussed in humidifier IOM.
Foaming	Foreign material or impurities in water supply.	Clean all water lines, replace if necessary.
		Replace cylinder.
		Reduce softening mix or concentration.
		Increase water volume by correcting any draining issues.
		Switching dual electrode configuration .