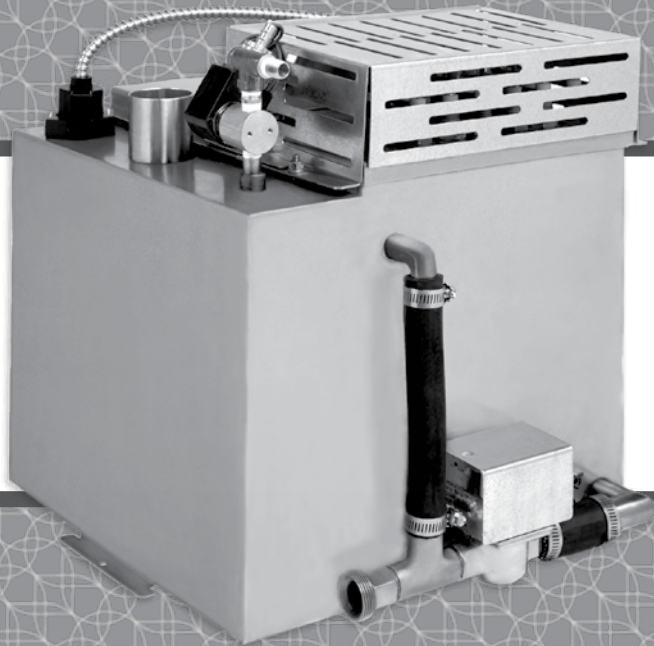


READ AND SAVE THESE INSTRUCTIONS




CRUV®





Electric Humidifier

Installation, Operation, and Maintenance Manual




Warnings and cautions

 WARNING	CAUTION
Indicates a hazardous situation that could result in death or serious injury if instructions are not followed.	Indicates a hazardous situation that could result in damage to or destruction of property if instructions are not followed.

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 WARNING	
	<p>Attention installer</p> <p>Read this manual before installing, and leave this manual with product owner. This product must be installed by qualified HVAC and electrical contractors and in compliance with local, state, federal, and governing codes. Improper installation can cause property damage, severe personal injury, or death as a result of electric shock, burns, or fire.</p> <p>DriSteem Technical Support: 800-328-4447</p> <p>Read all warnings and instructions</p> <p>Read this manual before performing service or maintenance procedures on any part of the system. Failure to follow all warnings and instructions could produce the hazardous situations described, resulting in property damage, personal injury, or death.</p> <p>Failure to follow the instructions in this manual can cause moisture to accumulate, which can cause bacteria and mold growth or dripping water into building spaces. Dripping water can cause property damage; bacteria and mold growth can cause illness.</p> <p>mc_011909_1215</p>
 	<p>Hot surfaces and hot water</p> <p>This steam humidification system has extremely hot surfaces. Water in tanks, steam pipes, and dispersion assemblies can be as hot as 212 °F (100 °C). Discharged steam is not visible. Contact with hot surfaces, discharged hot water, or air into which steam has been discharged can cause severe personal injury. To avoid severe burns, follow the cool-down procedure in this manual before performing service or maintenance procedures on any part of the system.</p> <p>mc_011909_1130</p>

Warnings and cautions

 WARNING	
 	<p>Disconnect electrical power</p> <p>Disconnect electrical power before installing supply wiring or performing service or maintenance procedures on any part of the humidification system. Failure to disconnect electrical power could result in fire, electrical shock, and other hazardous conditions. These hazardous conditions could cause property damage, personal injury, or death.</p> <p>Contact with energized circuits can cause property damage, severe personal injury, or death as a result of electrical shock or fire. Do not remove humidifier electrical panel cover, heater terminal cover, or subpanel access panels until electrical power is disconnected.</p> <p>Follow the shutdown procedure in this manual before performing service or maintenance procedures on any part of the system.</p>
	<p>Electric shock hazard</p> <p>If the humidifier starts up responding to a call for humidity during maintenance, severe bodily injury or death from electric shock could occur. To prevent such start-up, follow the procedure below before performing service or maintenance procedures on this humidifier (after the tank has cooled down and drained):</p> <ul style="list-style-type: none">• If the humidifier is equipped with a Vapor-logic® controller, use the keypad to change the control mode to Standby.• Shut off all electrical power to humidifier using field-installed fused disconnect, and lock all power disconnect switches in OFF position.• Close field-installed manual water supply shut-off valve.

CAUTION	
<p>Hot discharge water</p> <p>Discharge water can be as hot as 212 °F (100 °C) and can damage the drain plumbing.</p> <p>To prevent such damage from humidifiers without water tempering, allow the tank to cool before draining.</p> <p>Humidifiers equipped with a water tempering device such as a DriSteem Drane-kooler need fresh make-up water in order to function properly. Make sure the water supply to the water tempering device remains open during draining.</p> <p>Excessive supply water pressure</p> <p>Supply water pressure greater than 80 psi (550 kPa) can cause the humidifier to overflow.</p>	

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ATTENTION INSTALLER

Read this manual before installing. Leave manual with product owner.

DriSteem Technical Support
800-328-4447

Where to find more information

On our Web site:

The following related documents can be viewed, printed or ordered from our web site, www.dristeem.com

- Catalogs:
 - CRUV
 - Ultra-sorb®
- Installation, Operation, and Maintenance manuals:
 - Ultra-sorb
 - Vapor-logic® controller (includes humidifier operation and troubleshooting)
- DriSteem Design Guide (includes steam loss tables and general humidification information)

In DriCalc:

DriCalc® is our humidification system sizing and selection software, which can be ordered from our website. Also in DriCalc:

- Library of installation guides
- Dispersion and sensor placement in ducts and air handlers
- Vertical airflows

Or call us at 800-328-4447

While obtaining documents from our web site or from DriCalc is the quickest way to review our literature, we will also mail to you any literature you need.

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Keypad/display and troubleshooting

The *Vapor-logic Installation and Operation Manual*, shipped with your humidifier if ordered with optional Vapor-logic control, is a comprehensive operation manual. Refer to it for information about using the keypad/display and Web interface, and for troubleshooting information.

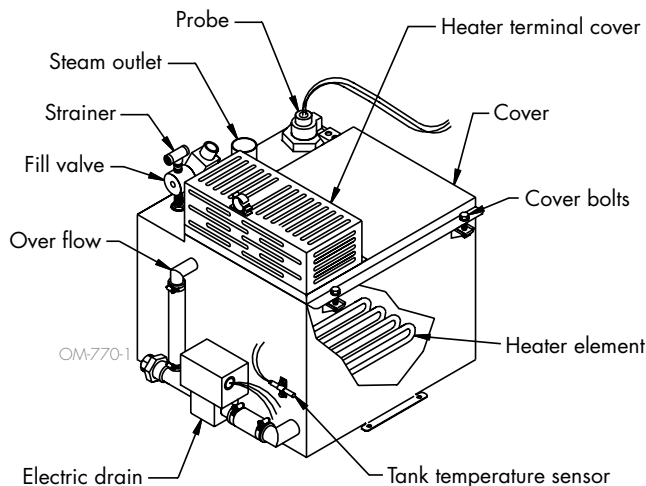
Download DriSteem literature

Most DriSteem product manuals can be downloaded, printed, and ordered from our web site: www.dristeem.com

Product overview

FIGURE 2-1: CRUV HUMIDIFIER

Tap/softened water model



TAP/SOFTENED WATER

CRUV humidifiers with tap/softened water (shown above) use electricity to heat tap or softened fill water into steam for humidification. A conductivity probe monitors the water level; therefore, water conductivity must be at least 30 $\mu\text{S}/\text{cm}$ for proper operation. CRUV with tap/softened water will not operate with RO/DI water. For RO/DI water, use CRUV with the RO/DI water option.

RO/DI WATER OPTION

CRUV humidifiers with RO/DI water systems (systems using deionized water or water that has been treated using reverse osmosis) use electricity to heat RO/DI fill water into steam for humidification. Water level is controlled with a float valve and low water cutoff switch. Float valves are compatible with RO/DI water only.

Humidifiers with the RO/DI water option are virtually maintenance free and require little or no downtime.

WATER TYPE CONVERSION

CRUV tap/softened water humidifiers can be converted in the field for use with RO/DI water, and CRUV RO/DI water humidifiers can be converted in the field for use with tap/softened water. Contact your DriSteem representative or distributor for parts and instructions.

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Supply water guidelines

Supply water quality is an important component of humidifier reliability and maintenance.

Examples:

- Corrosive water can decrease the service life of the humidifier.
- Excessive water hardness can increase the humidifier maintenance requirements.

To maximize humidifier service life and minimize humidifier maintenance, DriSteem has established guidelines for supply water. See Table 2-1.

Table 2-1:
DriSteem supply water guidelines

Chlorides*	
RO or DI water	< 5 ppm
Softened water	< 25 ppm
Tap water	< 50 ppm
* Damage caused by chloride corrosion is not covered by your DriSteem warranty.	
Total hardness	
Tap water	< 500 ppm
pH	
RO, DI, or softened water	7 to 8
Tap water	6.5 to 8.5
Silica	
	< 15 ppm
You may wish to take action to mitigate potential negative effects to your humidifier. Supply water outside of these guidelines may void your DriSteem warranty. Please contact your DriSteem Representative or DriSteem Technical Support if you need advice.	

Notes:

See Pages 8 and 9 for detailed installation drawings.

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Product overview

DISPERSION OPTIONS

Dispersion options shown on this page are available for CRUV humidifiers. See the installation instructions beginning on Page 6.

FIGURE 3-1: ULTRA-SORB DISPERSION

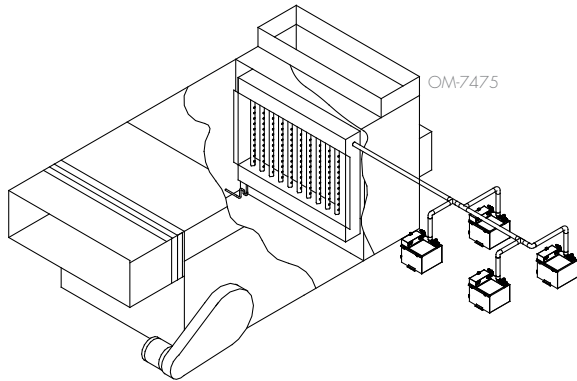


FIGURE 3-3: RAPID-SORB DISPERSION

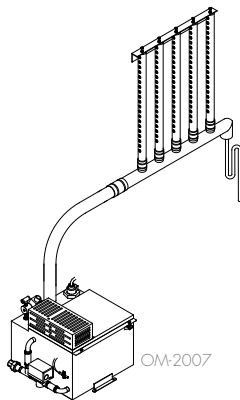


FIGURE 3-5: SINGLE OR MULTIPLE TUBE DISPERSION

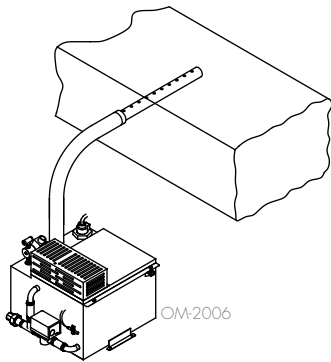
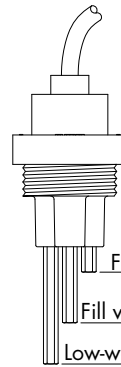


FIGURE 3-2: WATER LEVEL CONTROL FOR TAP/SOFTENED WATER HUMIDIFIER



Fill valve closes when water level rises to this probe.

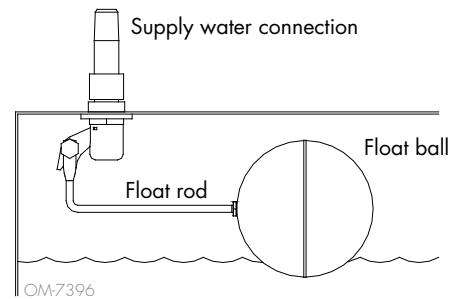
Fill valve opens when water level is below this probe.

Low-water cutoff. Power to heaters is cut if water level drops below this probe.

VLC-OM-030

Humidifiers using tap or softened water control water levels electronically using a three-rod probe. The controller responds with the above actions when the water level reaches each rod.

FIGURE 3-4: WATER LEVEL CONTROL FOR RO/DI WATER OPTION HUMIDIFIER



Humidifiers using RO/DI water control water levels using a float valve and low-water cutoff switch.

Capacities, electrical specifications, and weights

Table 4-1:
CRUV capacities, electrical specifications, and weights

CRUV model	Maximum steam capacity**		Current draw (amps)											Shipping weight***		Operating weight***	
			Single-phase						Three-phase								
kW	lbs/hr	kg/h	120V	208V	240V	277V	480V	600V	208V	240V	277V	480V	600V	lbs	kg	lbs	kg
2	6	2.7	16.7	9.6	8.3	7.2	4.2	3.3	—	—	—	—	—	25	11	45	20
4	12	5.4	33.3	19.2	16.7	14.4	8.3	6.7	16.7*	14.4*	12.5	7.2*	5.8*	27	12	47	21
6	18	8.2	—	28.8	25.0	21.7	12.5	10.0	25.0*	21.7*	18.8	10.8*	8.7*	37	17	75	34
8	24	10.9	—	38.5	33.3	28.9	16.7	13.3	33.3*	28.9*	25.0	14.4*	11.5*	37	17	75	34
10	30	13.6	—	—	41.7	36.1*	20.8	16.7	29.1*	25.3*	21.9	12.6*	10.1*	39	18	90	41
12	36	16.3	—	—	—	43.3	25.0	20.0	33.3	28.9	25.0	14.4	11.5	39	18	90	41
14	42	19.1	—	—	—	—	29.2	23.3	38.9	33.7	29.2	16.8	13.5	39	18	90	41
16	48	21.8	—	—	—	—	33.3	26.7	44.4	38.5	33.3	19.2	15.4	39	18	90	41
21	63	28.6	—	—	—	—	43.8	35.0	—	—	43.8	25.3	20.2	43	20	104	47
25	75	34.0	—	—	—	—	—	41.7	—	—	—	30.1	24.1	43	20	104	47
30	90	40.9	—	—	—	—	—	—	—	—	—	36.1	28.9	48	22	109	49
34	102	46.3	—	—	—	—	—	—	—	—	—	40.9	32.7	48	22	109	49

* For wire sizing, the highest leg draw is shown due to current imbalance.

** Total humidifier load = load to meet design conditions + load to compensate for steam loss from the dispersion assembly and interconnecting piping. If total humidifier load is more than the humidifier's maximum capacity, design conditions will not be met. For steam loss data see the DriSteam Design Guide available for downloading and printing at www.dristeam.com

*** Depending on configuration, add up to 28 lbs (13 kg) for weight of control cabinet, subpanel, and other electrical control components.

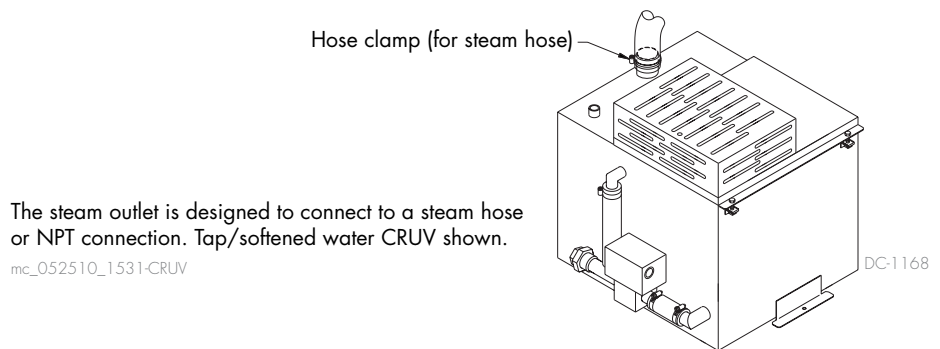
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Table 4-2:
Steam connection sizes

CRUV model	Steam outlet
2, 4, 6, 8	1 ½" hose or NPT connection
10, 12, 14, 16	1 ½" or 2" hose or NPT connection
21, 25, 30, 34	2" hose or NPT connection

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FIGURE 4-1: STEAM OUTLET CONNECTIONS



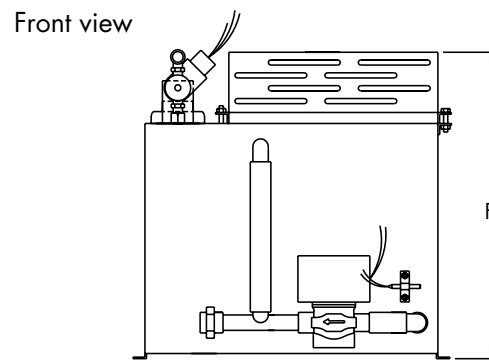
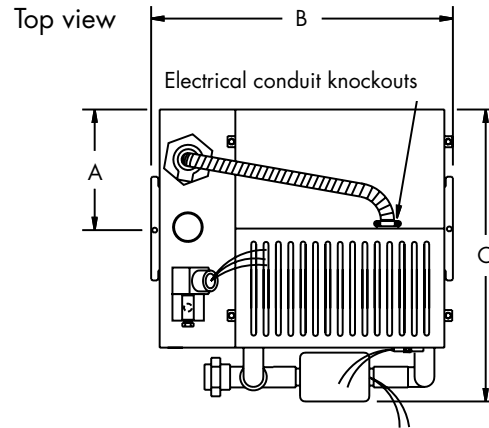
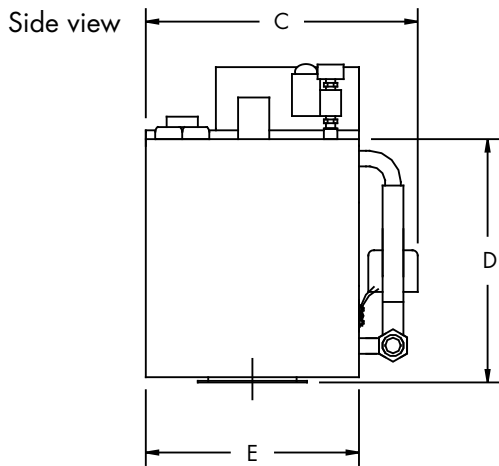
Dimensions

FIGURE 5-1: CRUV DIMENSIONS

Tap/softened water CRUV shown

Electrical conduit knockouts:

- CRUV Models 2 and 4 have combination knockout for ½" and ¾" conduit connectors; knockout diameters are 22.3 mm and 28.6 mm.
- CRUV Models 6 through 34 have combination knockout for ¾" and 1" conduit connectors; knockout diameters 28.6 mm and 34.9 mm.



Note: Maintain 12" (305 mm) clearance for service and maintenance.

OM-2004, OM-2002, OM-2003

**Table 5-1:
CRUV dimensions**

CRUV model	A		B		C		D		E		F	
	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
2, 4	4.50	114	15.50	394	12.50	318	9.00	229	9.00	229	12.13	308
6, 8	7.18	183	16.00	406	16.88	429	10.00	254	14.34	369	13.25	337
10, 12, 14, 16	7.18	183	16.00	406	16.88	429	11.75	199	14.34	364	14.88	378
21, 25, 30, 34	7.18	183	16.00	406	16.88	429	13.25	337	14.34	364	16.38	416

Selecting a location

Locate the CRUV humidifier near an electric power source, a water supply, and a drain. Verify that sufficient room is provided for a water seal in the drain piping. See Figures 8-1 and 9-1.

Place the control cabinet or electrical subpanel in a grounded protective metal enclosure, and mount in a dry and accessible location.

CRUV IN A PACKAGED UNIT

When installing a humidifier inside a packaged unit, provide adequate support. Allow easy access for removing and servicing the evaporating chamber, and provide adequate clearance to install the steam hose and dispersion tube and water seal.

DISPERSION IN A DUCT

When rapid absorption is extremely critical, a Rapid-sorb can provide 100% steam absorption within three feet or less at any duct temperature. A multiple tube or Rapid-sorb is required for CRUV Models 30 and 34 because of their high output. See Figure 7-1 and the "Rapid-sorb" section beginning on Page 22.

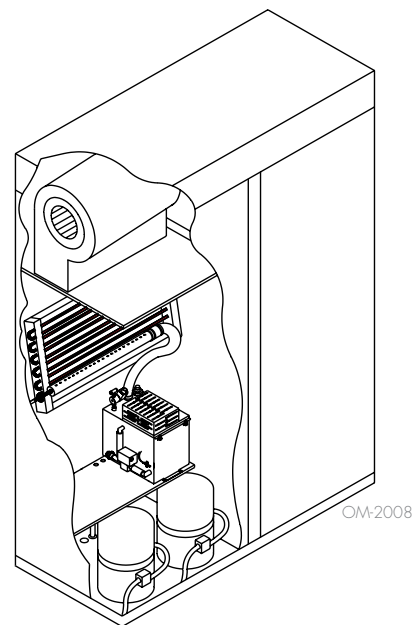
When installing a dispersion tube in a duct, allow for a continuous pitch of the steam hose back to the evaporating chamber (Figure 6-2), or use a water seal and drain (Figure 7-1).

If draining the evaporating chamber by gravity is not possible, use a small condensate pump rated for 212 °F/100 °C water.

The dispersion tube can be mounted vertically in the duct (Figure 7-2).

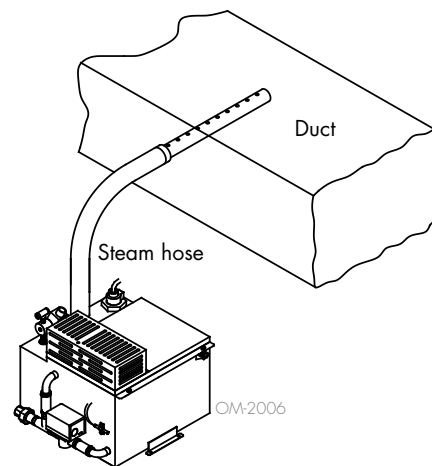
Note: When dispersion tube is more than 10' (3 m) from unit, insulated, 1 ½" (38 mm) diameter minimum rigid tubing or pipe should be used instead of steam hose. This application is not recommended for CRUV Models 10 through 34.

FIGURE 6-1: INSTALLATION IN AN AIR CONDITIONING UNIT



CRUV with a single dispersion tube in a packaged air conditioning unit

FIGURE 6-2: HORIZONTAL DISPERSION TUBE



Horizontal mounting of dispersion tube in a duct, connected via steam hose to a wall-mounted CRUV humidifier.

Selecting a location

HUMIDIFIER

When selecting a location for the humidifier, consider the following:

- **Proximity to the duct**

Install the humidifier near the air duct system where the dispersion assembly will be located. The maximum recommended length for steam hose connecting a single humidifier to a dispersion assembly is 10' (3 m). The maximum recommended developed length for tubing or pipe connecting a single humidifier to a dispersion assembly is 20' (6 m).

For more information about installing dispersion assemblies, see "Dispersion," beginning on Page 14.

- **Elevation of the installed dispersion assembly**

The recommended installation location for the dispersion assembly is at an elevation higher than the humidifier. However, if the dispersion assembly must be installed at an elevation lower than the humidifier, install a drip tee and drain. See "Drip tee installation" on Page 15.

Before installing a dispersion assembly or interconnecting piping, review all pitch requirements in the "Dispersion" section of this manual.

- **Required clearances** (see Figure 5-1)

- **Electrical connections**

Electrical power supply connections are at the lower or upper right rear corner of the unit. See "Wiring" on Page 12.

- **Supply water and drain piping connections**

Water supply piping and drain connections are at the lower left rear corner of the unit. See the piping illustrations and instructions starting on Page 8.

- **Exterior wall insulation**

Install the humidifier on an exterior wall only if the wall is properly insulated.

DISPERSION CONTROL DEVICES

See Figure 13-1 for recommended installation locations for the dispersion assembly and associated control devices.

FIGURE 7-1: RAPID-SORB DISPERSION

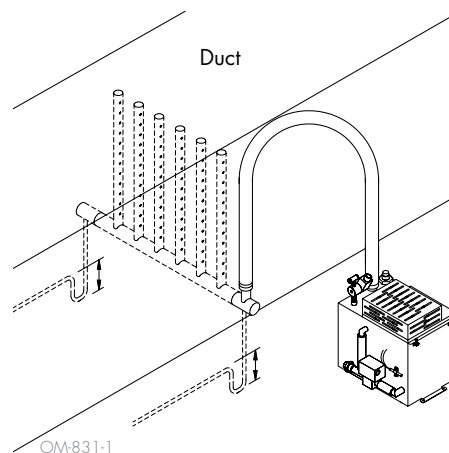
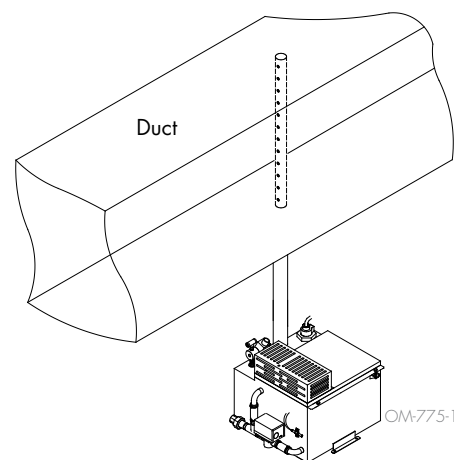
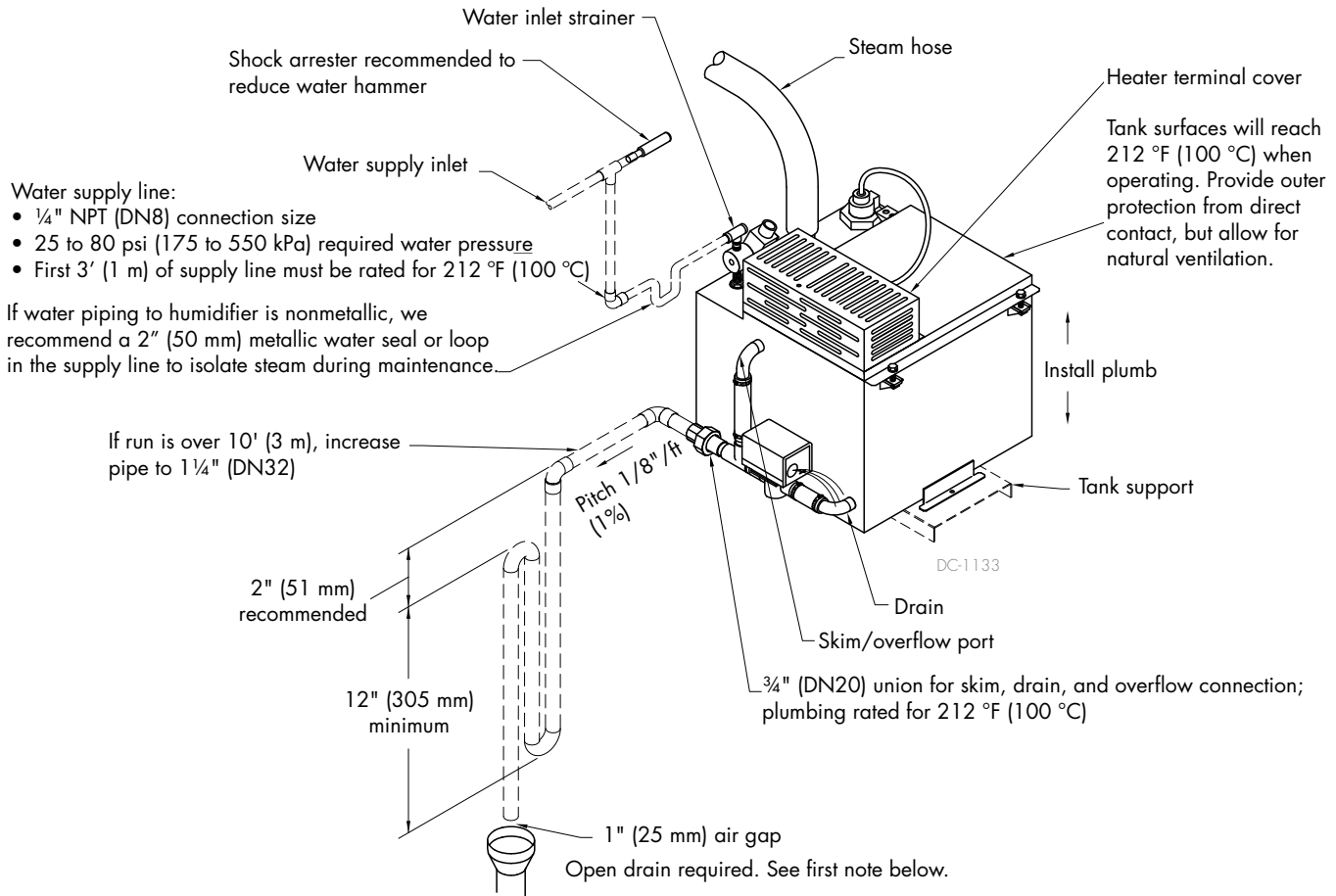


FIGURE 7-2: VERTICAL DISPERSION TUBE



Piping: Tap/softened water

FIGURE 8-1: CRUV (TAP/SOFTENED WATER) FIELD PIPING OVERVIEW



Notes:

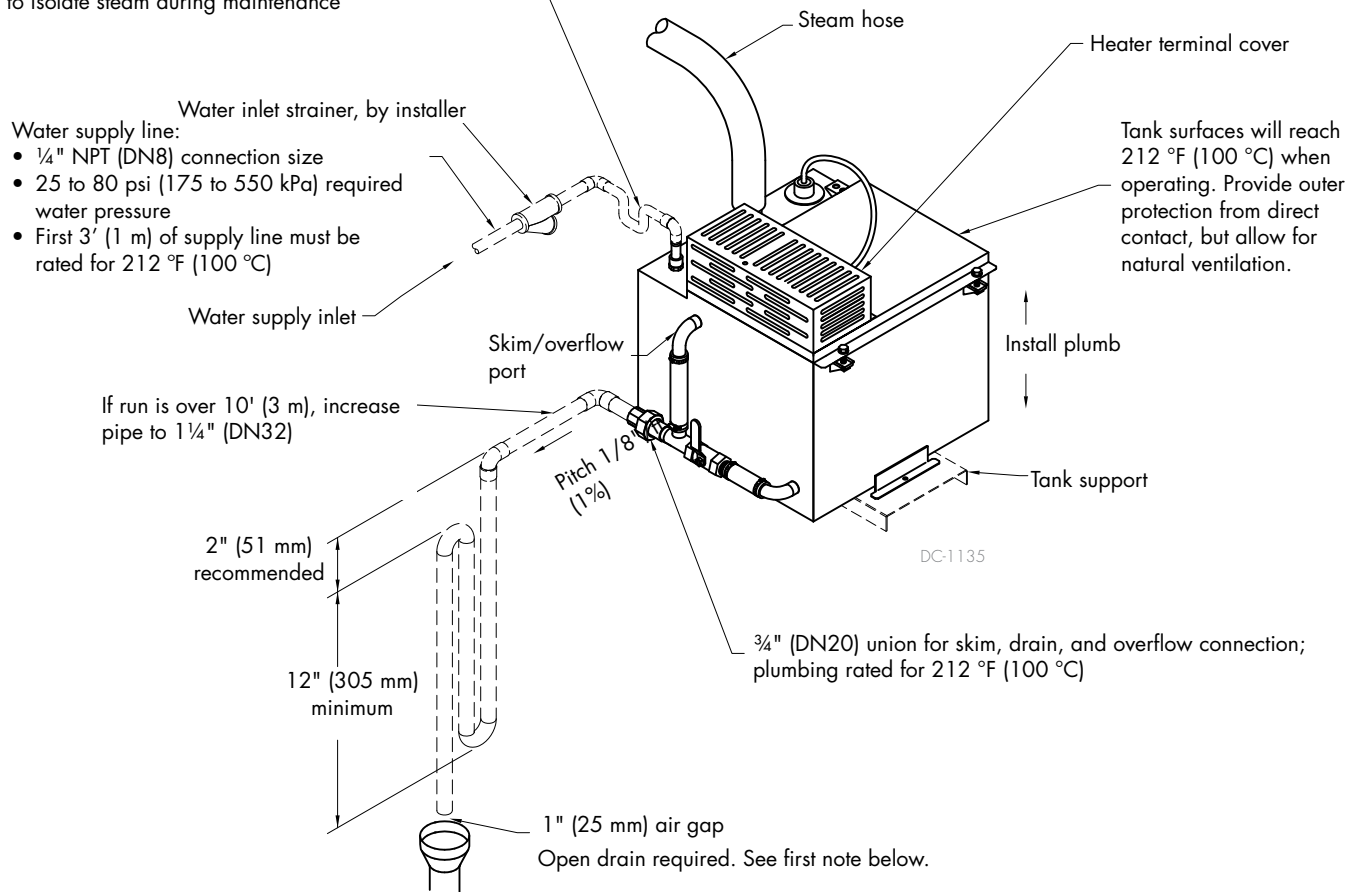
- Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensation may form on nearby surfaces. Refer to governing codes for drain pipe size and maximum discharge water temperature.
- Offset humidifier from floor drain to prevent flash steam from rising into the humidifier.
- Dashed lines indicate provided by installer.
- The water supply inlet is more than 1" (25 mm) above the skim/overflow port, eliminating the possibility of backflow or siphoning from the tank. No additional backflow prevention is required; however, governing codes prevail.
- Damage caused by chloride corrosion is not covered by your DriSteam warranty.

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Piping: RO/DI water option

FIGURE 9-1: CRUV (RO/DI WATER OPTION) FIELD PIPING OVERVIEW

If water piping to humidifier is nonmetallic, we recommend a 2" (50 mm) stainless steel water seal or loop in the supply line to isolate steam during maintenance



Notes:

- Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensation may form on nearby surfaces. Refer to governing codes for drain pipe size and maximum discharge water temperature.
- Offset humidifier from floor drain to prevent flash steam from rising into the humidifier.
- Dashed lines indicate provided by installer.
- The water supply inlet is more than 1" (25 mm) above the skim/overflow port, eliminating the possibility of backflow or siphoning from the tank. No additional backflow prevention is required; however, governing codes prevail.
- Damage caused by chloride corrosion is not covered by your DriSteem warranty.

Piping: Supply water and drain piping

Supply water piping may be of any code-approved material (copper, steel, or plastic). The fill valve connection size is a 1/4" pipe thread (DN8) fitting. In cases where water hammer may be a possibility, consider installing a shock arrestor. Water pressure must be between 25 psi and 80 psi (175 kPa and 550 kPa).

If water piping to humidifier is nonmetallic, we recommend that the first 3' (1 m) of water supply piping from the humidifier be metallic with a 2" (50 mm) water seal or loop in the supply line to isolate steam from nonmetallic supply piping.

Drain piping may be of any code-approved material (copper, steel, or plastic rated for 212 °F [100 °C] minimum). If drainage by gravity is not possible, use a reservoir pump rated for 212 °F (100 °C) water.

The final connection size is 3/4" (DN20) copper for the tank and frame drains. Do not reduce this connection size. Pipe the tank and frame drains separately, as shown in Figures 8-1 and 9-1, to prevent backflow of drain water into the humidifier cabinet.

If the equivalent length of pipe from the humidifier drain to the plumbing system drain is more than 10' (3 m), increase the pipe size to 1 1/4" (DN32).

See Figures 8-1 and 9-1 for more piping instructions.

Important: Install unions in the water supply and drain lines as shown in Figures 8-1 and 9-1 to allow tank removal.

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CAUTION

Hot discharge water

Discharge water can be as hot as 212 °F (100 °C) and can damage the drain plumbing.

To prevent such damage from humidifiers without water tempering, allow the tank to cool before draining.

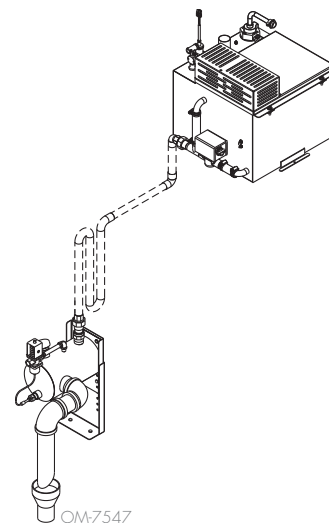
Humidifiers equipped with a water tempering device such as a DriSteem Drane-kooler need fresh make-up water in order to function properly. Make sure the water supply to the water tempering device remains open during draining.

Excessive supply water pressure

Supply water pressure greater than 80 psi (550 kPa) can cause the humidifier to overflow.

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FIGURE 10-1: DRANE-KOOLER WATER TEMPERING DEVICE



DriSteem's Drane-kooler, shown mounted to a CRUV humidifier, tempers discharged water. For other Drane-kooler mounting options or for more information, contact your DriSteem representative/distributor, or view the Drane-kooler product data sheet in the literature section at www.dristeem.com.

Piping: Drane-kooler

FIGURE 11-1: FIELD PIPING CONNECTIONS, DRANE-KOOLER™ WATER TEMPERING DEVICE

Notes:

- Dashed lines indicate provided by installer
- Total length of pipe between humidifier and Drane-kooler not to exceed 10' (3 m)

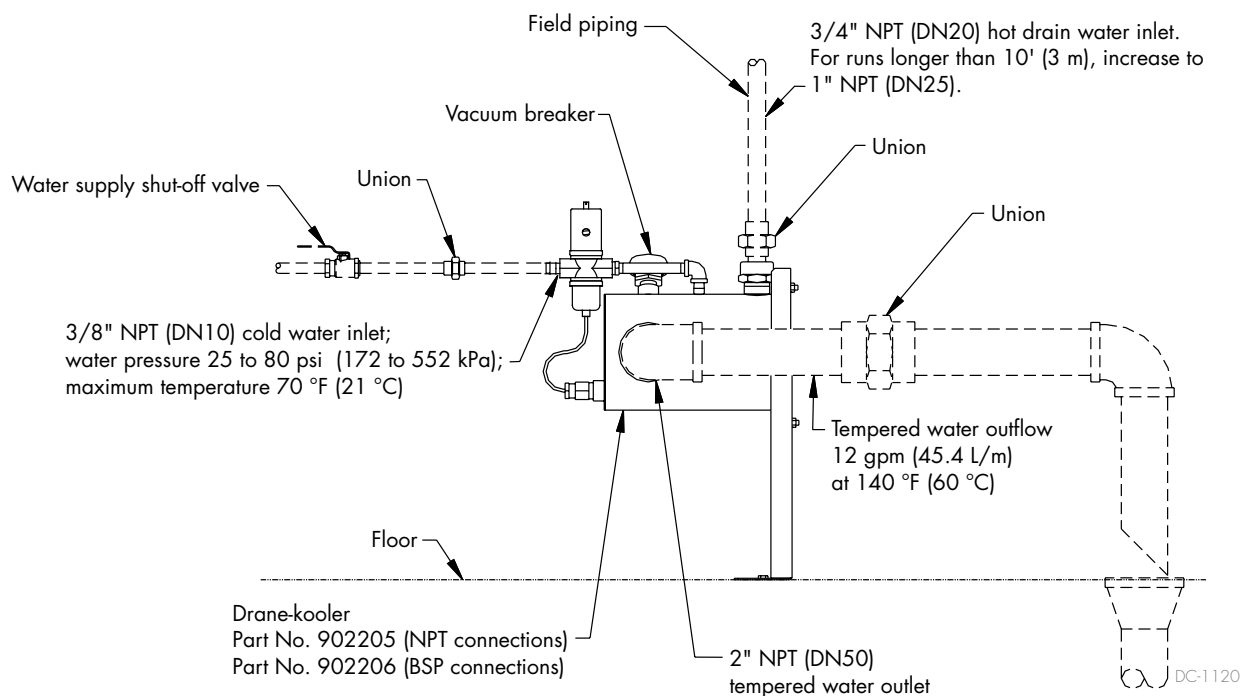
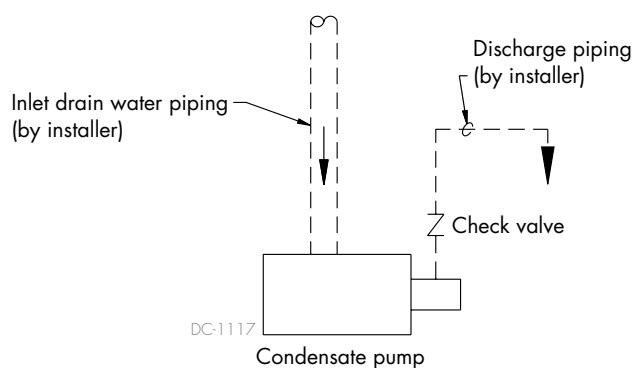


FIGURE 11-2: LIFTING DRAIN WATER



Note:

Use a condensate pump rated for your application. Pumps are rated by fluid temperature, head (pressure), and flow (gpm). Contact your local DriSteem representative for pump selection.

Wiring

HUMIDIFIER FIELD WIRING

All wiring must be in accordance with all governing codes, and with the humidifier wiring diagrams. The diagrams are located inside the removable subpanel cover on the right side of the humidifier cabinet. Power supply wiring must be rated for 220 °F (105 °C).

When selecting a location for installing the humidifier, avoid areas close to sources of electromagnetic emissions such as power distribution transformers.

The fill valve, drain valve, probes, and temperature sensors use Class 2, 24 VAC power.

The use of semiconductor fusing sized per the National Electric Code is recommended with the SSR option.

GROUNDING REQUIREMENTS

The approved earth ground must be made with solid metal-to-metal connections and must be a good conductor of radio frequency interference (RFI) to earth (multistranded conductors).

Ground wire should be the same AWG (mm²) size as the power wiring or sized per NEC requirements.

PROPER WIRING TO PREVENT ELECTRICAL NOISE

Electrical noise can produce undesirable effects on electronic control circuits, which affects controllability. Electrical noise is generated by electrical equipment such as inductive loads, electric motors, solenoid coils, welding machinery, or fluorescent light circuits. The electrical noise or interference generated from these sources (and the effect on controllers) is difficult to define, but the most common symptoms are erratic control or intermittent operational problems.

Important:

- For maximum EMC (electromagnetic compatibility) effectiveness, wire all humidity, high limit, and airflow controls using multicolored shielded/screened plenum-rated cable with a drain wire for the shield/screen. Connect the drain wire to the shield/screen ground terminal with wire less than 2" (50 mm) in length.
- Do not ground shield at the device end.

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WARNING

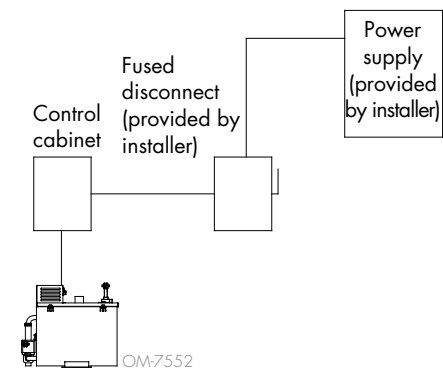
Electric shock hazard

Only qualified electrical personnel should perform field wiring installation procedures. Improper wiring or contact with energized circuits can cause property damage, severe personal injury, or death as a result of electric shock and/or fire.

Do not remove the humidifier electrical panel cover or the heater terminal cover until electrical power is disconnected. Contact with energized circuits can cause property damage, severe personal injury, or death as a result of electrical shock.

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FIGURE 12-1:
FIELD WIRING REQUIREMENTS



Notes:

- Control wiring and power wiring must be run in dedicated or separate earthed metal conduit, cable trays, or trunking.
- Separate the line voltage wiring from low voltage control circuit wiring when routing electrical wiring inside the humidifier cabinet.
- Do not use chassis or safety grounds as current-carrying commons. Never use a safety ground as a conductor or neutral to return circuit current.

Sensor placement

SENSOR LOCATION IS CRITICAL

Sensor location has a significant impact on humidifier performance. See the recommendations below and Figure 13-1.

Note: DriSteem recommends that you do not interchange room and duct humidity devices. Room humidity devices are calibrated with zero or little airflow, whereas duct humidity devices require air passing across them.

Recommended humidity control (transmitter/humidistat) locations:

- A** Ideal. Ensures the best uniform mix of dry and moist air with stable temperature control.
- B** Acceptable, but room environment can affect controllability, such as when sensor is too close to air grilles, registers, or heat radiation from room lighting.
- C** Acceptable. Provides uniform mixture of dry and moist air. If extended time lag exists between humidity generation and sensing, extend sampling time.
- D** Acceptable (behind wall or partition) for sampling entire room if sensor is near an air exhaust return outlet. Typical placement for sampling a critical area.
- E** Not acceptable. These locations might not represent actual overall conditions in the space.
- F** Not acceptable. Do not place sensors near windows, door passageways, or areas of stagnant airflow.

Recommended safety (airflow and high limit) sensor location:

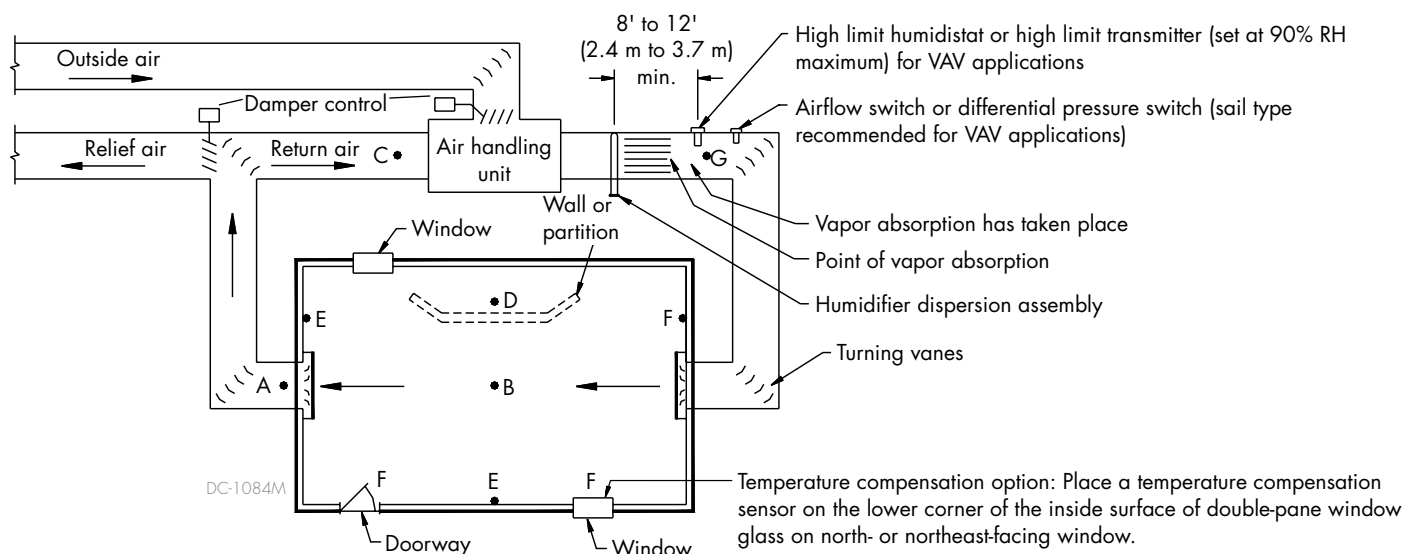
- G** Best sensing location for high limit humidistat or humidity sensor and airflow proving switch.

Other factors affecting humidity control

Humidity control involves more than the controller's ability to control the system. Other factors that play an important role in overall system control are:

- Size of humidification system relative to load
- Overall system dynamics associated with moisture migration time lags
- Accuracy of humidistats and humidity transmitters and their location
- Dry bulb temperature accuracy in space or duct
- Velocities and airflow patterns in ducts and space environments
- Electrical noise or interference

FIGURE 13-1: RECOMMENDED SENSOR LOCATIONS



Dispersion: Selecting the dispersion assembly location

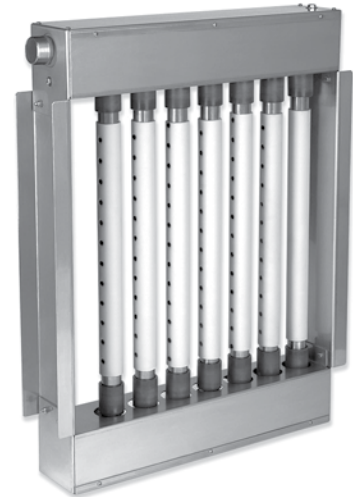
DriSteem humidifiers operate with several types of dispersion assemblies for open spaces and for ducts and air handling units.

Dispersion assemblies in ducts and air handling units must be positioned where the water vapor being discharged is carried off with the airstream and is absorbed before it can cause condensation or dripping.

- Non-wetting distance is the dimension downstream from the leaving side of the steam dispersion assembly to the point where wetting will not occur, although wisps of steam may be present. This distance was calculated during humidification system design and is dependent on several application parameters. To determine your dispersion assembly's non-wetting distance, consult your system's design engineer or project documentation. Non-wetting distance can also be calculated using DriSteem's DriCalc sizing and selection software, available at www.dristeem.com. Note that your current design conditions may vary from conditions used for system design.
- In general, the dispersion assembly is best placed where the air can absorb the moisture being added without causing condensation at or after the unit. This normally will be after the heating coil or where the air temperature is highest.
- Place the dispersion assembly such that absorption will occur
 - before the intake of a high efficiency filter, because the filter can remove the visible moisture and become waterlogged;
 - before coming in contact with any metal surface;
 - before fire or smoke detection devices;
 - before a split in the duct; otherwise, the dispersion assembly can direct more moisture into one duct than the other.
- When draining dispersion condensate to an open drain, provide a 1" (25 mm) air gap between the condensate drain piping and the drain. Locate the gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensation may form on nearby surfaces.

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FIGURE 14-1: ULTRA-SORB WITH THE HIGH-EFFICIENCY TUBE OPTION



HIGH-EFFICIENCY TUBE OPTION

Dispersion assemblies with the High-efficiency Tube option are designed to produce significantly less dispersion-generated condensate and airstream heat gain, which reduces wasted energy by up to 85%. These improvements are accomplished by reducing the thermal conductivity of the tubes with 1/8" of polyvinylidene fluoride (PVDF) insulating material on the outside of the tubes. These assemblies require careful unpacking, installation, and handling. If your dispersion assembly has the High-efficiency Tube option, be sure to read this section carefully.

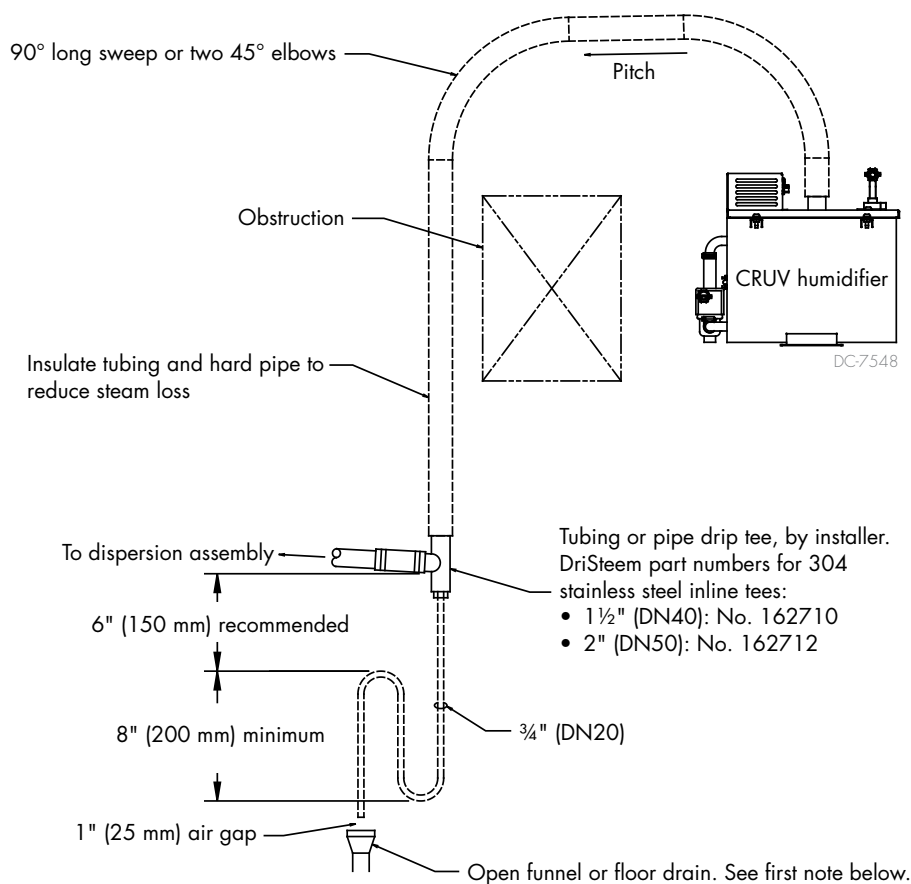
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Dispersion: Drip tee installation

Install a drip tee as shown below when the humidifier is mounted higher than the dispersion assembly, when interconnecting hose or piping needs to go over an obstruction, or when interconnecting piping runs are long.

Important: Steam hose must be supported to prevent sagging or low spots.

FIGURE 15-1: DRIP TEE INSTALLATION



Notes:

- Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensation may form on nearby surfaces. Refer to governing codes for drain pipe size and maximum discharge water temperature.
- Support steam hose so there are no sags or low spots.
- Dashed lines indicate provided by installer.

WARNING

Hot surface and steam hazard

Dispersion tube, steam hose, tubing, or hard pipe can contain steam, and surfaces can be hot. Discharged steam is not visible. Contact with hot surfaces or air into which steam has been discharged can cause severe personal injury.

Dispersion: Interconnecting piping requirements

- The steam outlet on the humidifier is sized to the output of the humidifier. DO NOT use interconnecting piping with an inside diameter smaller than the humidifier steam outlet.
- See the maximum steam carrying capacities and maximum piping lengths in Table 16-1.
- See the steam loss data in Table 17-1.
- See Figures 18-1 and 19-1 for interconnecting tubing and pipe pitch requirements for single tube applications. See Table 21-1 for interconnecting tubing and pipe pitch requirements for Rapid-sorb applications.
- If the humidifier must be located higher than the dispersion assembly, use the recommended installation shown in Figure 15-1.
- For single tube applications, see the capacities in Table 19-1.

Important:

Failure to follow the recommendations in this section can result in excessive back pressure on the humidifier. This will result in unacceptable humidification system performance such as leaking gaskets, blown water seals, erratic water level control, and spitting condensate from dispersion tubes.

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Table 16-1:

Maximum steam carrying capacity and length of interconnecting steam hose, tubing and pipe*

Steam hose ¹						Copper or stainless steel tubing					
Hose I.D.		Maximum capacity		Maximum length ²		Tubing size		Maximum capacity ³		Maximum developed length ⁴	
inches	DN	lbs/hr	kg/h	ft	m	inches	DN	lbs/hr	kg/h	ft	m
1½	40	150	68	10	3	1½	40	150	68	20	6.1
2	50	250	113	10	3	2	50	220	100	30	9.2
1. When using steam hose, use DriSteem steam hose for best results. Field-supplied hose may have shorter life and may cause foaming in the evaporating chamber resulting in condensate discharge at the dispersion assembly. Do not use steam hose for outdoor applications. 2. Maximum recommended length for steam hose is 10' (3 m). Longer distances can cause kinking or low spots.						3. Insulate tubing to minimize loss of capacity and efficiency. 4. Developed length of tubing equals measured length plus 50% of measured length, to account for fittings. Longer tubing lengths are possible at capacities lower than listed maximums. Consult factory.					
Note: Capacities and lengths in this table are based on total maximum pressure drop in hose or tubing of 5" wc (1250 Pa)											

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Dispersion: Interconnecting piping requirements

CONNECTING TO DISPERSION ASSEMBLY WITH STEAM HOSE

- Support steam hose to prevent sags or low spots and to maintain a minimum pitch of 2"/ft (15%) back to the humidifier.
- Use DriSteem steam hose. Other manufacturers of steam hose may use unacceptable release agents or material mixes that can affect humidifier system performance adversely. Using hose from alternative manufacturers increases the possibility of tank foaming and accelerated aging. Foaming causes condensate discharge at the dispersion assembly.
- Do not use steam hose in outdoor applications.
- Do not insulate steam hose. Insulation causes accelerated heat aging, causing the steam hose to become hard and susceptible to failure due to cracks.

CONNECTING TO DISPERSION ASSEMBLY WITH TUBING

- Support interconnecting piping between the humidifier steam outlet and the dispersion system with pipe hangers. Failure to properly support the entire steam piping weight may cause damage to the humidifier tank and void the warranty.
- 90° elbows are not recommended; use two 45° elbows, 1' (0.3 m) apart.
- Insulate tubing to reduce the loss in output caused by condensation.

WARNING

Excessive moisture hazard

DriSteem strongly recommends installing a duct airflow proving switch and a duct high limit humidistat. These devices prevent a humidifier from making steam when there is low airflow in the duct or when the RH level in the duct is too high. Failure to install these devices can result in excessive moisture in the duct, which can cause bacteria and mold growth or dripping through the duct.

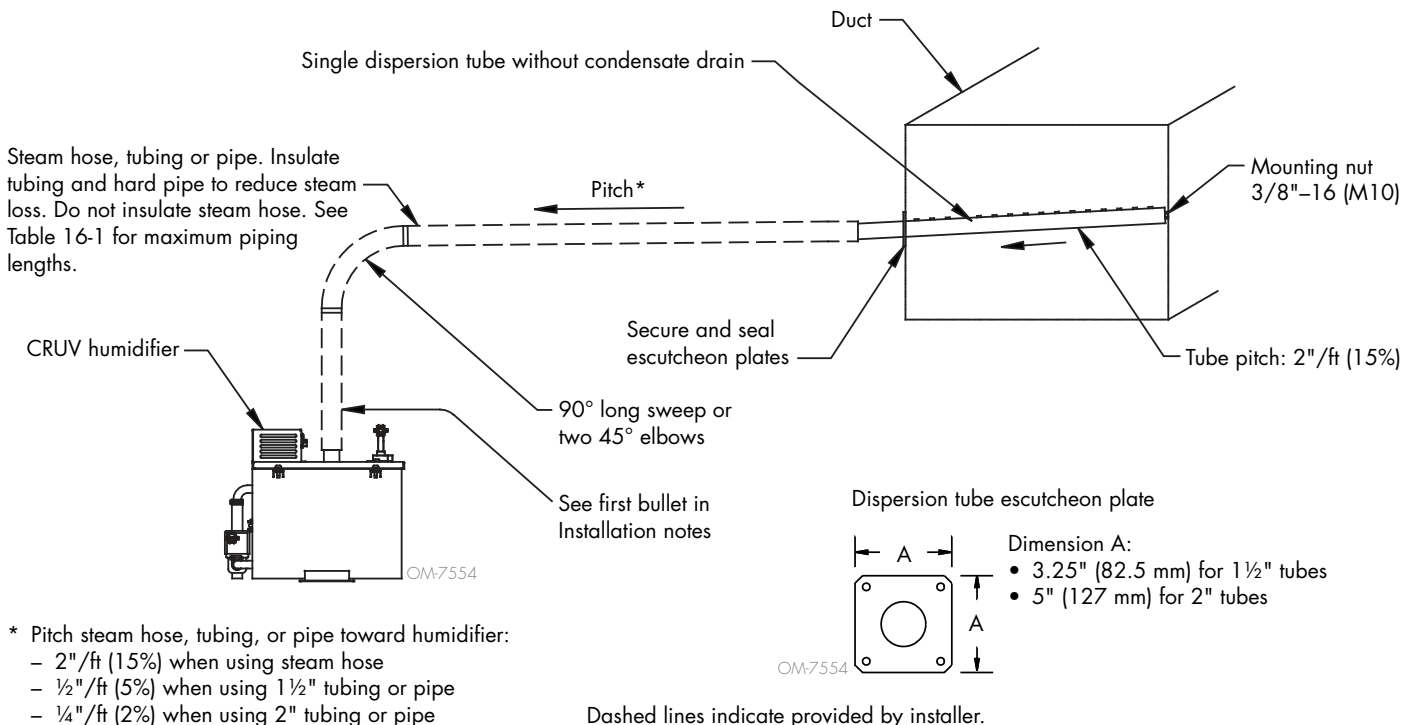
Table 17-1:
Steam loss of interconnecting steam hose, tubing, and pipe

Description	Nominal hose, tubing or pipe size		Steam loss				Insulation thickness	
			Noninsulated		Insulated			
	inches	DN	lbs/hr/ft	kg/h/m	lbs/hr/ft	kg/h/m	inches	mm
Hose	1 ½	40	0.15	0.22	N/A	N/A	N/A	N/A
	2	50	0.20	0.30	N/A	N/A	N/A	N/A
Tubing	1 ½	40	0.11	0.164	0.02	0.03	2	50
	2	50	0.14	0.21	0.025	0.037	2	50
Pipe	1 ½	40	0.22	0.33	0.02	0.03	2	50
	2	50	0.25	0.38	0.025	0.037	2	50

Note: These data are based on an ambient air temperature of 80 °F (27 °C), fiberglass insulation, copper tubing, and Schedule 40 pipe.

Dispersion: Single tube

FIGURE 18-1: SINGLE DISPERSION TUBE WITHOUT CONDENSATE DRAIN



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INSTALLATION NOTES

- Use DriSteam's hard pipe adapter kit to connect the steam outlet to hard pipe. Use a hose clamp to connect the steam outlet to steam hose. Use a hose cuff and clamps to connect the steam outlet to tubing.
- Thin-walled tubing heats up faster than heavy-walled pipe causing less steam loss at start-up.
- Hard pipe or tubing diameter must match Vapormist steam outlet size 1½" (DN40), 2" (DN50), or NPT connection.
- See the Maximum Steam Carrying Capacity and Steam Loss tables on Pages 16 and 17.
- Orient dispersion tube with tubelets (steam orifices) pointing up.
- If mounting the humidifier above the level of dispersion tube, see "Drip tee installation" on Page 15.
- Table 16-1 lists hose kit sizes by humidifier model. Note that the capacities of Models 30 and 34 require multiple tube assemblies and cannot use a hose kit. For multiple tube assemblies, see "Rapid-sorb," beginning on Page 20.



WARNING

Hot surface and steam hazard

Dispersion tube, steam hose, tubing, or hard pipe can contain steam, and surfaces can be hot. Discharged steam is not visible. Contact with hot surfaces or air into which steam has been discharged can cause severe personal injury.

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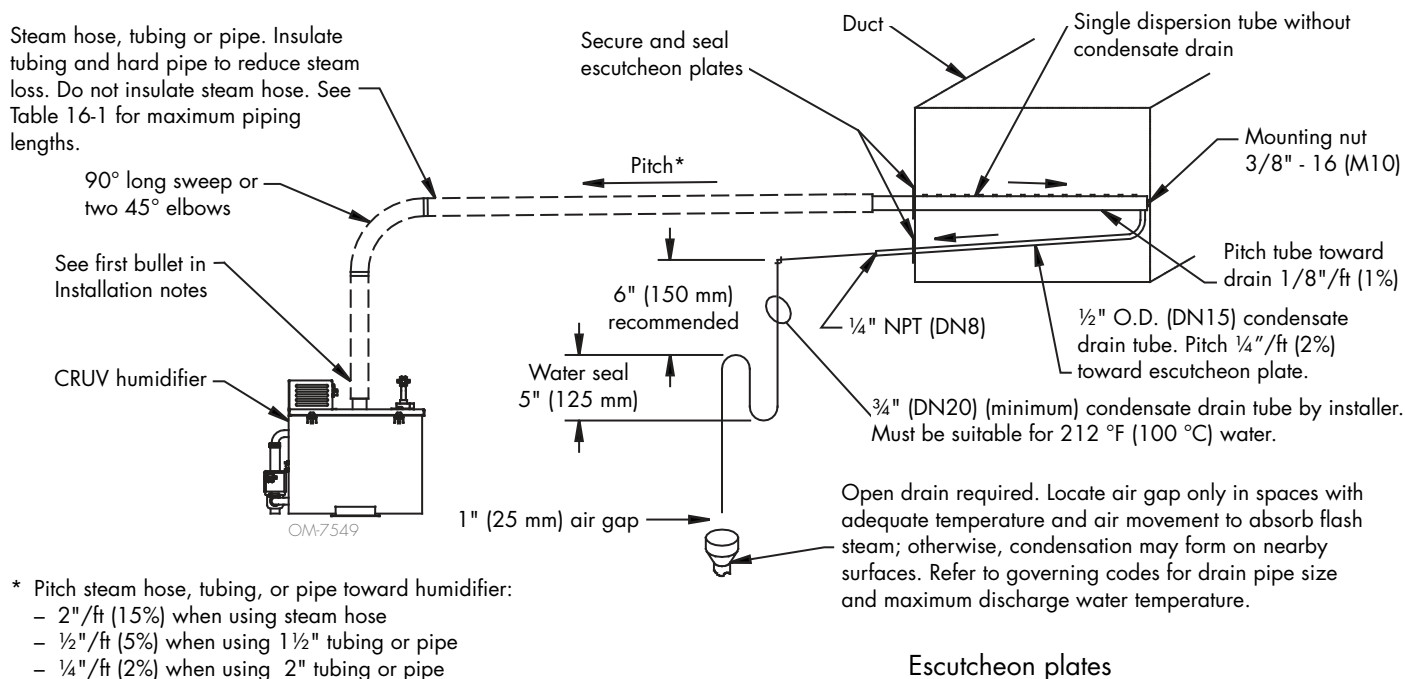
Important:

Failure to follow the recommendations in this section can result in excessive back pressure on the humidifier. This will result in unacceptable humidification system performance such as leaking gaskets, blown water seals, erratic water level control, and spitting condensate from dispersion tubes.

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Dispersion: Single tube

FIGURE 19-1: SINGLE DISPERSION TUBE WITH CONDENSATE DRAIN



Dashed lines indicate provided by installer.

Escutcheon plates

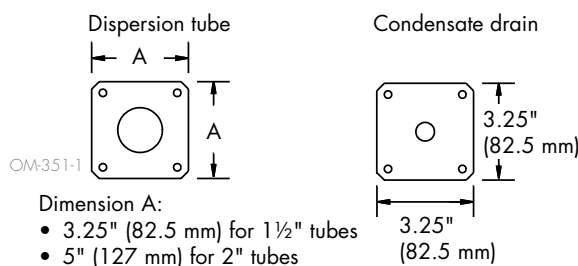


Table 19-1:
Single dispersion tube capacities*

Tube size		Insulated (High-Efficiency Tubes)				Uninsulated			
		Without drain		With drain		Without drain		With drain	
inches	DN	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h
1 1/2	40	29	13.2	65	29.5	28	12.7	62	28.2
2	50	65	29.5	97	44.1	62	28.2	93	42.3

Note:

Single dispersion tube available with face width between 6" (152 mm) up to 120" (3048 mm) in 1" (25 mm) increments.

* If face width is <19" (483 mm), tube capacity may be reduced. Consult DriSteem or see DriCalc for the correct capacity.

* Hose kits are available that include dispersion tube, 10 ft (3 m) of steam hose, and hardware

Dispersion: Rapid-sorb

Read all dispersion instructions in this manual, and follow the installation instructions below:

- Unpack shipment and verify receipt of all Rapid-sorb components with packing list. Report any shortages to DriSteem immediately. The components typically include the following:
 - Multiple dispersion tubes
 - Header
 - ¾" x 2" (19 mm x 51 mm) L-bracket
 - Note: Dispersion tubes, header, and L-bracket are each tagged with the customer requested identification number.
 - A single duct escutcheon plate the size of the header
 - Slip couplings or hose cuffs and clamps
 - Accessories such as duct plates, slip couplings, or hose cuffs
 - Bolts and washers for mounting the dispersion tubes to the bracket
- L-bracket mounting holes (see note at left):
 - L-bracket 50" (1270 mm) long or shorter has a mounting hole 4" (100 mm) from each end for mounting the L-bracket to the duct or air handler wall.
 - L-bracket longer than 50" (1270 mm) has an additional mounting hole in the center.
 - Note: Hardware for mounting the L-bracket to the duct or air handler wall and the hardware for the header support bracket is not provided.
- Select an installation location that provides necessary access in and around the ductwork or air handler.
- The Rapid-sorb typically is installed centered side to side in a duct, or is installed across the face of a coil in an air handler.
- The center line of the outer dispersion tubes should never be closer than 4.5" (114 mm) from the side of the ductwork or air handler wall.
- The following instructions are for a typical Rapid-sorb installation — horizontal-airflow duct with Rapid-sorb header either inside or outside the duct. See the DriCalc Installation Guides library or contact your representative/distributor or DriSteem for installation instructions for air handler or vertical airflow applications.

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WARNING

Hot surface and steam hazard

Dispersion tube, steam hose, tubing, or hard pipe can contain steam, and surfaces can be hot. Discharged steam is not visible. Contact with hot surfaces or air into which steam has been discharged can cause severe personal injury.

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Important:

Before marking and drilling holes in the duct or air handler, refer to ALL pitch requirements for the Rapid-sorb assembly you received (see Table 21-3). The size, quantity, and location of penetrations are determined by the dimensions and configuration of the Rapid-sorb assembly you received.

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Important:

Failure to follow the recommendations in this section can result in excessive back pressure on the humidifier. This will result in unacceptable humidification system performance such as leaking gaskets, blown water seals, erratic water level control, and spitting condensate from dispersion tubes.

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Dispersion: Rapid-sorb

PITCH REQUIREMENTS

- For Rapid-sorb with the header outside a horizontal-airflow duct, consider the following:
 - 1½" (DN40) dispersion tubes: Use a fastener of sufficient length to accommodate the 1/8"/ft (1%) pitch requirements toward the ¾" pipe thread (DN20) header drain fitting.
 - 2" (DN50) dispersion tubes: The bracket can be mounted flush to the ductwork. The 1/8"/ft (1%) pitch typically can be accomplished in the length of the hose cuffs used to connect the tubes to the header.
- See Table 21-3 and the drawings on the following pages for pitch requirements.

Table 21-1: Rapid-sorb tube capacities*					
Tube diameter		Insulated (High-Efficiency Tubes)		Uninsulated	
inches	DN	lbs/hr	kg/h	lbs/hr	kg/h
1½	40	43	19.5	40	18.2
2	50	80	36.4	77	35

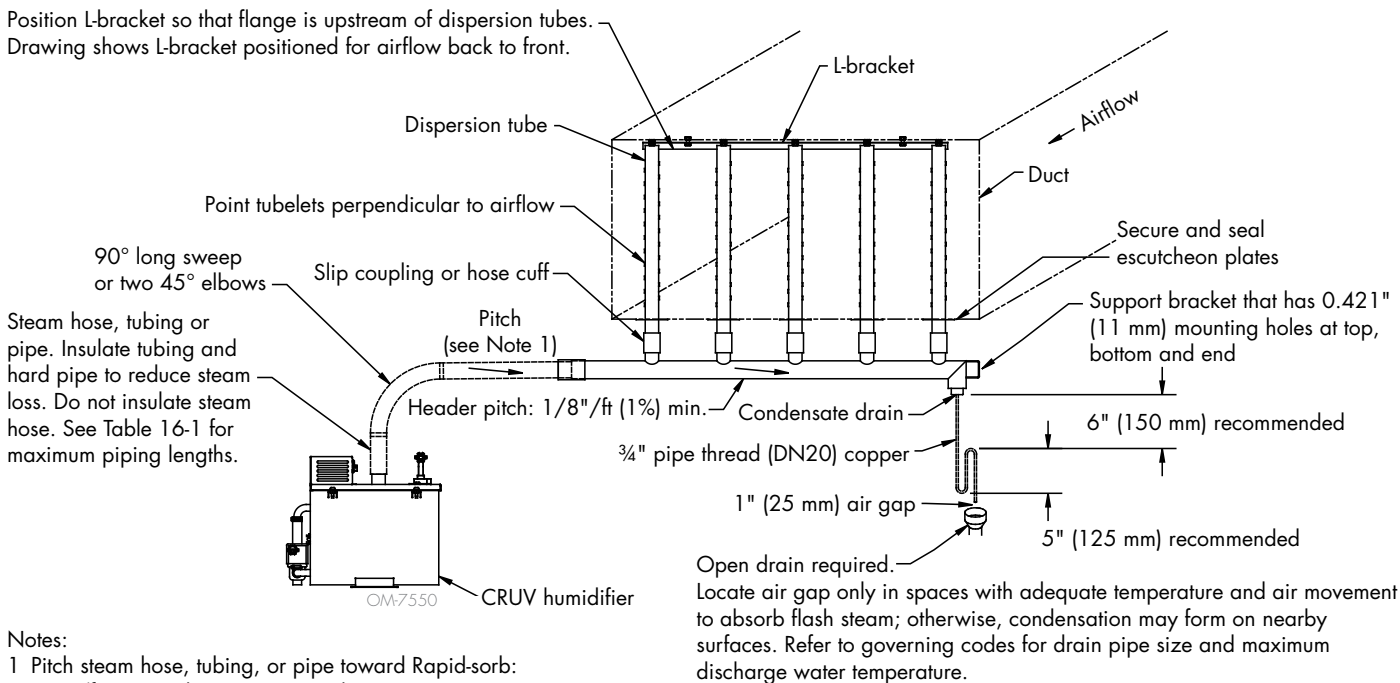
Note:
* Capacities shown are for horizontal airflow. See DriCalc for vertical airflow capacities.
If face height is <22" (559 mm), tube quantity per panel may need to increase to compensate for reduced capacity of short tubes. Consult DriSteem or see DriCalc for the correct calculation.

Table 21-2: Rapid-sorb header capacities			
Header capacity		Header diameter	
lbs/hr	kg/h	inches	DN
≤ 250	≤ 113	2	50
251-500	114-227	3	80
501-800	228-363	4	100
801-1300	364-591	5	125
1301-2100	592-955	6	150

Table 21-3: Pitch of interconnecting piping, dispersion tubes, and headers for Rapid-sorb evaporative dispersion units					
Airflow	Type of interconnecting piping	Diameter of interconnecting piping	Pitch of interconnecting piping	Pitch of dispersion tubes	Pitch of header
Horizontal	Steam hose	1½" (DN40) 2" (DN50)	2"/ft (15%) toward Rapid-sorb	Vertically plumb	1/8"/ft (1%) toward condensate drain
	Tubing or pipe	1½" (DN40) 2" (DN50)	1/8"/ft (1%) toward Rapid-sorb		
Vertical	Steam hose	1½" (DN40) 2" (DN50)	2"/ft (15%) toward Rapid-sorb	2"/ft (15%) toward header	1/8"/ft (1%) toward condensate drain
	Tubing or pipe	1½" (DN40) 2" (DN50)	1/8"/ft (1%) toward Rapid-sorb		

Dispersion: Rapid-sorb

FIGURE 22-1: RAPID-SORB IN A HORIZONTAL AIRFLOW WITH HEADER OUTSIDE THE DUCT

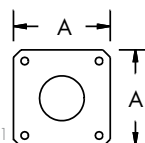


Notes:

- 1 Pitch steam hose, tubing, or pipe toward Rapid-sorb:
 - 2"/ft (15%) when using steam hose
 - 1/8"/ft (1%) when using tubing or pipe
- 2 Use DriSteam's hard pipe adapter kit to connect steam outlet to hard pipe. Use a hose clamp to connect steam outlet to steam hose. Use a hose cuff and clamps to connect steam outlet to tubing.

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Dispersion tube escutcheon plates



Dimension A:

- 3.25" (82.5 mm) for 1 1/2" tubes
- 5" (127 mm) for 2" tubes

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HEADER OUTSIDE OF DUCT, HORIZONTAL AIRFLOW

1. Mark and cut holes in the ductwork for the dispersion tubes. Use the L-bracket as a template to mark the holes on the duct floor.
2. Temporarily, loosely suspend or support the header below the final location. Vertical balance point of the dispersion tube length dictates where the header should be suspended or temporarily supported.
3. Mount the dispersion tubes to the header with the slip coupling or hose cuff (provided).
 - When installing slip couplings for 1 1/2" (DN40) dispersion tubes, take care not to shear the O-rings.
 - Set the slip coupling on the header stub or dispersion tube so the O-ring is resting on the face of the tubing.
 - Rotate the slip coupling as you push it onto the tubing.
 - The O-rings are lubricated at the factory. If additional lubrication is necessary, DO NOT use a petroleum-based lubricant.



WARNING

Hot surface and steam hazard

Dispersion tube, steam hose, tubing, or hard pipe can contain steam, and surfaces can be hot. Discharged steam is not visible. Contact with hot surfaces or air into which steam has been discharged can cause severe personal injury.

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Dispersion: Rapid-sorb

4. Position the flange of the L-bracket so it is upstream of the tubes when the assembly is raised and fastened into position. Fasten the L-bracket to the end of the dispersion tubes with the provided bolt, lock washer, and flat washer.
5. Before tightening the L-bracket bolts to the dispersion tubes:
 - For 1 ½" (DN40) dispersion tubes:
 - Dispersion tube will rotate in slip coupling. Verify that dispersion tube orifices are directed perpendicular to airflow.
 - Dispersion tube and slip coupling must be fully engaged on header stub for O-rings to provide a seal.
 - For 2" (DN50) dispersion tubes:

Before securing hose cuff in place with hose clamps on dispersion tube and the header stub, verify that dispersion tube orifices are directed perpendicular to airflow.
6. Slide the assembly up until the L-bracket aligns with the mounting holes in the duct.
 - For 1 ½" (DN40) dispersion tubes:
 - Header pitch is duplicated in the L-bracket.
 - Dispersion tube and slip coupling must be fully engaged on header stub for O-rings to provide a seal.
 - High end of L-bracket can be fastened tight to duct or air handler.
 - Fastener on low end of L-bracket must be long enough to compensate for pitch. Use a nut on both sides of L-bracket and duct or air handler for stability.
 - For 2" (DN50) dispersion tubes:
 - Fasten bracket to top of duct and use hose cuffs to compensate for header pitch.
 - Before securing hose cuffs with hose clamps on dispersion tube and header stub, verify that header pitch, 1/8"/ft (1%) toward drain, is maintained.
7. Permanently secure both ends of header, and verify that header pitch, 1/8"/ft (1%) toward drain, is maintained.
8. Verify that all fasteners are secure:
 - L-bracket to duct
 - Dispersion tubes to L-bracket
 - Hose clamps on 2" (DN50) tubes
9. Secure and seal the dispersion tube escutcheon plate and condensate drain tube escutcheon plate around the respective tubes, if applicable.

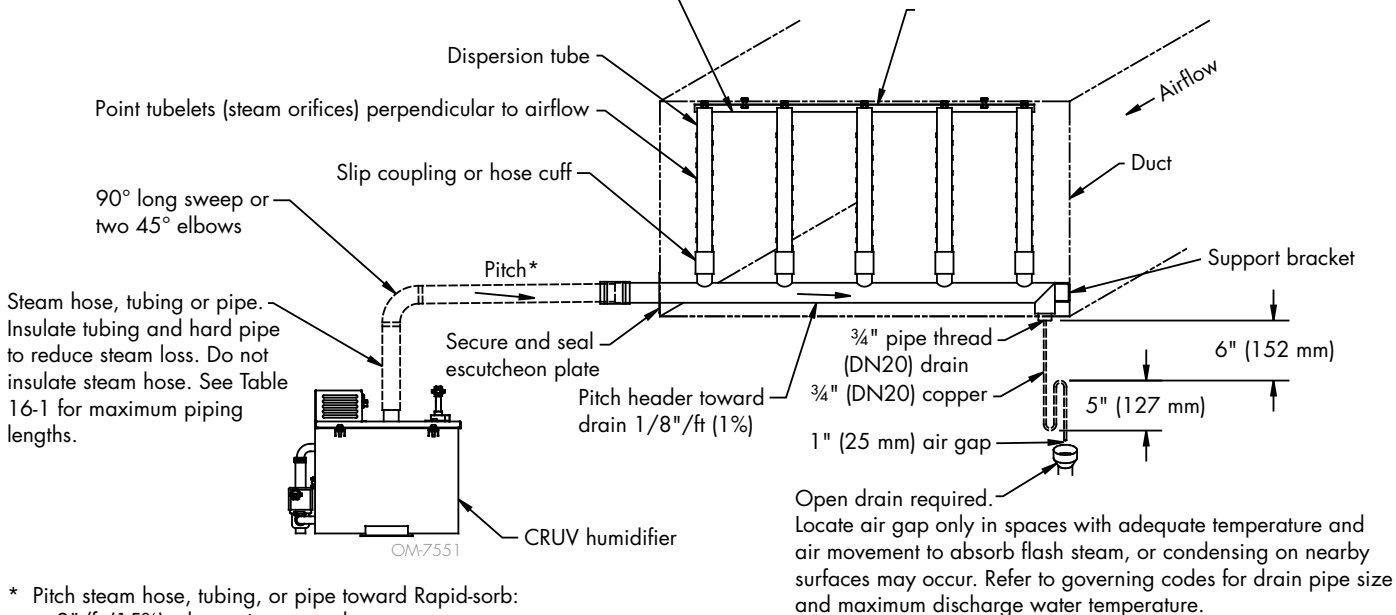
Note:

See Page 26 for steam supply and condensate drain line connection instructions.

Dispersion: Rapid-sorb

FIGURE 24-1: RAPID-SORB IN A HORIZONTAL AIRFLOW WITH HEADER INSIDE THE DUCT

Position L-bracket so that flange is upstream of dispersion tubes. This drawing shows the L-bracket positioned for airflow back to front



- * Pitch steam hose, tubing, or pipe toward Rapid-sorb:
- 2"/ft (15%) when using steam hose
 - 1/8"/ft (1%) when using tubing or pipe

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HEADER INSIDE OF DUCT, HORIZONTAL AIRFLOW

1. Mark and cut holes in ductwork or air handler for steam header penetration, condensate drain piping, and header support bracket fastener. Allow 1/8"/ft (1%) header pitch toward the support bracket when you drill the hole for the header support bracket fastener.
2. Loosely fasten the header in place.
3. Rotate the header 90° so the header stubs point horizontally in the duct.
4. When installing in an air handler, the rotation of the header is often less than 90°. Typically, due to the condensate drain piping requirements, the header can be set on the floor of the air handler, assembled in the vertical position, and then raised and mounted in place.

WARNING

Hot surface and steam hazard

Dispersion tube, steam hose, tubing, or hard pipe can contain steam, and surfaces can be hot. Discharged steam is not visible. Contact with hot surfaces or air into which steam has been discharged can cause severe personal injury.

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Dispersion: Rapid-sorb

5. Mount the dispersion tubes on the header with the slip couplings or hose cuffs:
 - When installing slip couplings for 1 ½" (DN40) dispersion tubes, take care not to shear O-rings.
 - Set slip coupling on header stub or dispersion tube so O-ring is resting on face of tubing.
 - Rotate slip coupling while pushing it onto the tubing.
 - O-rings are lubricated at factory. If additional lubrication is necessary, DO NOT use petroleum-based lubricant.
6. Allow the dispersion tubes to rest against the bottom of the duct.
7. Position the flange of the L-bracket so it is upstream of the tubes when the assembly is rotated into position. Fasten the L-bracket to the end of the dispersion tubes with the provided bolt, lock washer, and flat washer.
8. Rotate the assembly up until the L-bracket aligns with the mounting holes in the duct or air handler.
 - For 1 ½" (DN40) dispersion tubes:
 - Header pitch is duplicated in the L-bracket.
 - Dispersion tube and slip coupling must be fully engaged on header stub for O-rings to provide a seal.
 - High end of L-bracket can be fastened tight to duct or air handler.
 - Fastener on low end of L-bracket must be long enough to compensate for pitch. Use a nut on both sides of L-bracket and duct or air handler for stability.
 - 2" (DN50) dispersion tubes
 - Fasten bracket to top of duct and use hose cuffs to compensate for header pitch.
 - Before securing hose cuffs with hose clamps on dispersion tube and header stub, verify that dispersion tube orifices are directed perpendicular to airflow.
9. Verify that all fasteners are secure:
 - L-bracket to duct
 - Dispersion tubes to L-bracket
 - Hose clamps on 2" (DN50) tubes
 - Header support bracket fastener
10. Secure and seal the header escutcheon plate around the header.

Note:

See Page 26 for steam supply and condensate drain line connection instructions.

Dispersion: Rapid-sorb

STEAM SUPPLY CONNECTIONS TO RAPID-SORB HEADER

Connect the steam supply interconnecting piping from the humidifier to the Rapid-sorb. The steam supply piping requires a minimum of 1/8"/ft (1%) pitch toward the header.

If multiple humidifiers are supplying one Rapid-sorb, a multiple steam supply connector is needed. Typically, the multiple steam supply connector attaches to the Rapid-sorb header supply end with hose cuff and clamps:

1. Route the necessary number of steam supplies from the humidifiers to the steam supply connector.
2. Position the steam supply connector to accept the steam supplies while maintaining the necessary pitch.
3. Make sure the hose clamps on the steam supply connector and header are tight.

CONDENSATE DRAIN CONNECTIONS TO RAPID-SORB HEADER

Piping must be minimum 3/4" I.D. (DN20) and rated for 212 °F (100 °C) minimum continuous operating temperature.

The condensate drain line must be piped as shown in Figures 8-1 and 9-1. Provide a 6" (152 mm) drop prior to a 5" (127 mm) water seal to:

- Ensure drainage of condensate from the header
- Keep steam from blowing out of the drain line

After the water seal, run the drain line to an open drain with a 1" (25 mm) vertical air gap.

- Cut the drain line at a 45° angle on the end above the drain to permit a direct stream of water into the drain pipe while maintaining a 1" (25 mm) air gap.
- Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam, or condensing on nearby surfaces may occur.

All drain lines must be installed and sized according to governing codes.

ULTRA-SORB

For Ultra-sorb steam dispersion panel instructions, see the installation, operation, and maintenance manual shipped with the Ultra-sorb.

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CAUTION

Operate Rapid-sorb within rated steam capacity

Excessive steam flow to the Rapid-sorb steam dispersion assembly can cause condensate to exit the tubelets, which can cause water damage and standing water in the duct or air handler.

To avoid condensate exiting the tubelets, do not operate the Rapid-sorb beyond its rated capacity.

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Start-up procedure

The CRUV humidifier is available with either the LW series controller or the optional Vapor-logic control system. If your system is equipped with the Vapor-logic system, refer also to the *Vapor-logic Installation and Operation Manual* as noted in the instructions below.

After the system is installed and connected properly:

1. Verify that the humidifier, controls, piping, electrical connections, steam supply, and dispersion unit(s) are installed according to the following:
 - Installation instructions in this manual
 - *Vapor-logic Installation and Operation Manual* (if using the Vapor-logic control option):
 - Installation section
 - Pre-installation checklist
 - Wiring diagrams shipped with humidifier
 - All governing codes
2. Confirm that proper grounding and an approved earth ground are provided.
3. Verify that all electrical connections are secure before applying power.
4. Make sure all electrical covers are in place and secure. See Warning at right.
5. Verify that the humidifier is mounted level and securely supported before filling with water (see the operating weights in Table 4-1).
6. Verify that the humidifier is level front to back and side to side after it is full of water.
7. Refer to "LW series controller" on page 28 or the "Operation" section of the *Vapor-logic Installation and Operation Manual*.
8. Perform all applicable "Start-up checklist" items on Page 28 or 29.
Note: During start-up, do not leave the humidifier unattended.
9. Monitor humidifier operation through multiple fill cycles.
10. On tap/softened water units, water skims from the humidifier after every fill cycle. Adjust the amount of skim by increasing or decreasing the skim time. See "Skim duration" on Page 33.
At start-up, DriSteem recommends initially running the humidifier with the factory default setting for skim time.

Continue reading this section before proceeding to "Maintenance" beginning on Page 34.

WARNING

Electric shock hazard

Only qualified electrical personnel should perform start-up procedure.

Contact with energized circuits can cause property damage, severe personal injury or death as a result of electrical shock or fire.

Make sure that all electrical covers are in place and secure before turning on electrical power. These include the heater terminal cover, electrical panel cover, and subpanel access panels.

CAUTION

Damage from dry startup

In the event the humidifier tank does not contain water and the heaters are energized, turn main power off. Operation of the heaters without water will cause damage to the humidifier. Before turning main power on, verify that all wiring has been completed per the wiring instructions in this manual and the unit wiring diagrams.

Start-up checklist: LW series controller

TAP/SOFTENED WATER

- ☐ Adjust humidistat setting to create a call for humidity.
- ☐ Open shut-off valve on water supply line, and confirm that drain valve is closed. Tank should begin filling with water through fill valve.
- ☐ Shortly before fill valve shuts off, rising water level causes water to come in contact with the bottom probe, and heating element contactor(s) will be actuated.
- ☐ Check heater cut-off circuit as follows:
 1. Close manual water supply valve, then open drain valve and start draining tank.
 2. When water level drops below bottom probe, the heating element contactor(s) drop out.
 3. When Step 2 above has completed, close drain valve.
- ☐ Check function of field-installed safety controls, such as fan proving switch. Contactor(s) should drop out when proving switch is open.
- ☐ Check heater draw by testing and recording voltage and amperage in each phase. Readings should match humidifier name plate readings (name plate is on humidifier housing).
- ☐ Inspect installation for steam or air leaks while operating humidifier. Seal any leaks.

RO/DI WATER OPTION

- ☐ Adjust humidistat setting to create a call for humidity.
- ☐ Open shut-off valve on water supply line, and confirm that drain valve is closed. Tank should begin filling with water through fill valve.
- ☐ Shortly before fill valve shuts off, float-operated heater cut-off switch will "make," and heating element contactor(s) will be actuated. A time delay relay circuit prevents contactor chatter that would otherwise occur due to bouncing of heater cut-off float.
- ☐ Check heater cut-off circuit as follows:
 1. Close manual water supply valve, then open drain valve and start draining tank.
 2. When water level drops past switching level on heater cut-off float, the heating element contactor(s) drop out.
 3. When Step 2 above has completed, close drain valve.
- ☐ Check function of field-installed safety controls, such as fan proving switch. Contactor(s) should drop out when proving switch is open.
- ☐ Check heater draw by testing and recording voltage and amperage in each phase. Readings should match humidifier name plate readings (name plate is on humidifier housing).
- ☐ Inspect installation for steam or air leaks while operating humidifier. Seal any leaks.

Start-up checklist: Vapor-logic controller

If an item in the Start-up checklist below does not apply to your system, skip to the next item and continue the process.

- ☐ Read this manual and all other information that was provided with your humidifier.
- ☐ Verify that all field wiring is done according to the instructions in this manual and in the humidifier wiring diagram.
- ☐ Confirm that the input signal is consistent with the Vapor-logic controller's expected input signal. Input signals are listed in the Vapor-logic Setup menu. See "Installation Step 2: Setup" in the *Vapor-logic Installation and Operation Manual*.
- ☐ Turn on the water supply, and confirm that the drain valve is closed.
- ☐ Turn on power to the humidifier, and confirm the Main menu is displayed on the keypad/display. The display may take several seconds to appear as the controller powers up.
- ☐ Confirm in the Main Menu that the mode is "Auto" and that tank status is "Filling."
- ☐ When "Filling" appears in main menu, confirm that the tank is filling with water.
- ☐ In the Status screen, confirm that the Duct Airflow Switch is closed.
- ☐ In the Status screen, confirm that the high limit humidistat input is closed or the high limit transmitter is connected.
- ☐ Make sure the tank has filled with water. See the "Damage from dry startup" Caution on Page 27.
- ☐ With sufficient water in the tank, the airflow switch closed, the high limit closed, and the humidifier getting a call for humidity, verify that the heater outputs are activated.
- ☐ Check the amp draw of the heaters. Refer to the humidifier wiring diagram for the proper rating.
- ☐ If you experience difficulties, have the keypad/display information available along with the serial number and humidifier Model, and call DriSteem Technical Support at 800-328-4447.

Start-up and operation: LW series controller

The LW series controller is a custom microprocessor-based water level controller for DriSteem humidifiers. The features of this controller are:

- Water level control
- Automatic drain and flush
- Variable skim times
- End-of-season drain
- Onboard diagnostics: Ready water, Full, and Drain LEDs to assist troubleshooting

When power is activated, the solenoid-operated water fill valve opens, filling the evaporating chamber until the water level reaches the top probe (see Figure 3-1), then the fill valve closes.

To ensure that a water seal is created in the field-installed water seal:

1. Disconnect probe plug and cable from probe rod assembly (located on top of the tank), allowing fill valve to energize and tank to fill.
2. Let fill water overflow humidifier tank and flow out of skim/overflow port for several seconds to fill the water seal in the drain line.
3. Reconnect probe plug and cable. Create a call for humidify to ensure fill valve opens.

Important:

Timer logic input wire (see Figure 32-1) must be connected per wiring diagram for proper automatic drain/flush and end-of-season drain operation. Power light blinks off twice at one-second intervals when these functions are disabled. Verify wiring with diagram supplied with humidifier.

Start-up and operation: LW series controller

AUTOMATIC DRAIN AND FLUSH (TAP/SOFTENED WATER)

The LW series controller employs an electronic timer that tracks the humidifying time of the unit. The controller activates a drain/flush cycle when a predetermined humidifying time has elapsed (factory default is 40 hours), and the following sequence occurs:

1. Drain valve opens, draining mineral laden water from tank.
2. Draining continues until a predetermined time has elapsed (factory default is 10 minutes).
3. Flushing occurs during the last 10% of drain period.

TEST CYCLING DRAIN/FLUSH (TAP/SOFTENED WATER)

The dip switches on the control board can be used to test the drain/flush cycle as follows:

1. Slide dip switches 1, 2, and 3 to OFF position, which is self test mode.
2. Set humidistat high, so call for humidity remains for at least 15 minutes.

The following sequence occurs:

- a) Drain valve opens after about two minutes, and water level drops.
 - b) When water level drops below middle probe (see Figure 3-1), fill valve opens.
 - c) Fill valve and drain valve remain open for drain/flush period, then drain valve closes.
 - d) Water level rises to top probe, and fill valve closes.
3. When drain/flush test cycle is complete, return dip switches 1, 2, and 3 to desired operating mode (see Table 31-1). Failure to do so will result in a drain/flush cycle every two minutes.

End-of-season drain

The end-of-season drain option drains the tank after 72 hours of no call for humidity to minimize microbial growth inside the humidifier. When there is a call for humidity, the tank fills and the unit runs when the operating level is reached.

LW series controller dip switches

Drain/flush intervals of 20 hours and 80 hours are available (factory default is 40 hours) and can be set via dip switches on the control board (see Figure 32-1). See the wiring diagram(s) attached to the unit for board location and instructions for changing the dip switch settings, and see Table 31-1.

Table 31-1:
Autodrain settings

	Switch			Drain time	Interval time
	1	2	3		
Self test	Off	Off	Off	10 min.	2 min.
Disabled	On	Off	Off	-	-
Option	Off	On	Off	10 min.	20 hours
Option	On	On	Off	30 min.	20 hours
Factory settings	Off	Off	On	10 min.	40 hours
Option	On	Off	On	30 min.	40 hours
Option	Off	On	On	10 min.	80 hours
Option	On	On	On	30 min.	80 hours

Start-up and operation: LW series controller

ONBOARD DIAGNOSTICS (TAP/SOFTENED WATER)

When the green Power light blinks on for one second and then is off for one second, enough scale has accumulated on the probes to begin to compromise the quality of the water level detection. Remove the probe assembly and brush off all scale and tarnish. See "Troubleshooting" on Pages 40 and 41 for any water level control issues.

VAPOR-LOGIC CONTROLLER

The *Vapor-logic Installation and Operation Manual* is a comprehensive operation manual. Refer to it for information regarding the following features:

- Keypad/display setup and menu information
- Control input signals and functions
- Drain, flush, and skim features
- Safety features
- Alarm screens and fault messages

The manual is shipped with CRUV humidifiers equipped with the optional Vapor-logic controller. It is also available at our Web site: www.dristeam.com

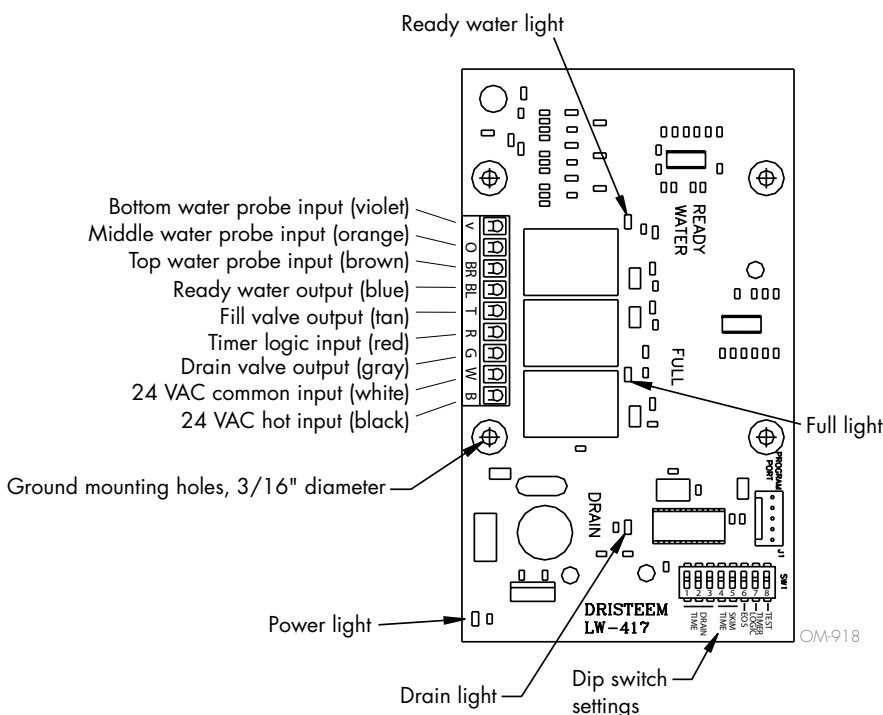
Variable skim times (tap/softened water)

The skim time feature removes surface solids and foam from the water. This keeps the fill valve open for a certain amount of time after the water reaches the top probe (see Figure 3-1). The skim time is factory set for 32 seconds but can be changed in the field for locations with water that requires more skimming. See "Skim duration" on Page 33. See LW series controller board location in Figure 44-1.

Important:

Timer logic input wire (see Figure 32-1) must be connected per wiring diagram for proper automatic drain/flush and end-of-season drain operation. Power light blinks off twice at one-second intervals when these functions are disabled. Verify wiring with diagram supplied with humidifier.

FIGURE 32-1: LW SERIES CONTROLLER BOARD



Tap/softened water

The best way to determine how often your humidifier needs maintenance is to remove the tank cover and inspect it for mineral deposits after three months of duty. Hours of operation and duty cycle will determine your maintenance schedule, as will water quality.

WATER QUALITY AND MAINTENANCE

Maintenance requirements vary with water quality, because tap and softened water carry a variety of minerals and other materials in a mix that varies from location to location. Very hard (high mineral content) water requires more frequent cleaning and drain/flush cycles than water with low mineral content.

Softened water significantly reduces mineral accumulation inside the humidifier.

Note: Solids, like silica, are not removed in the softening process.

SKIM DURATION

Skim duration determines the quantity of water skimmed with each fill cycle and is field adjustable:

- LW series controller, dip switches on controller board (see Table 33-1)
- Optional Vapor-logic controller, keypad/display or web interface (see the *Vapor-logic Installation and Operation Manual*)

Skimming reduces the need for frequent humidifier cleaning. Each time the tank refills, it fills to a level just above the lip of the skim/overflow fitting. A portion of the fill water flows out of the skim/overflow fitting to the drain, which flushes minerals left by the previous evaporating cycle and skims away surface residue.

Both humidifier cleaning and heated water flowing to the drain are operational costs. DriSteem recommends that the user observe and adjust the skim duration to achieve a balance between reducing mineral buildup and conserving heated water.

WARNING

Electric shock hazard

Contact with energized circuits can cause severe personal injury or death as a result of electric shock. To prevent shock, disconnect electrical power before performing service or maintenance procedures on any part of the humidification system.

When performing maintenance on the humidifier:

- If the humidifier is equipped with a Vapor-logic controller, use the keypad to change the control mode to Standby.
- Place all power disconnects in OFF position and lock in OFF position.
- Close the field-installed manual supply water shut-off valve.

Table 33-1:
Skim time settings

	Dip switch		Skim time
	4	5	
Option	Off	Off	3 seconds
Option	On	Off	9 seconds
Factory settings	Off	On	32 seconds
Option	On	On	45 seconds

Tap/softened water

Before performing service or maintenance procedures and before shutting off electrical power, cool down the humidifier according to the instructions below for your controller type. Insulated and uninsulated tanks will have hot surfaces.

Note: Fresh make-up water is used to speed up cooling. Do not close the manual water supply before cooling down the humidifier; otherwise the tank could stay hot for several hours.

COOL DOWN HUMIDIFIER (LW SERIES CONTROLLER)

1. Manually open the drain valve by moving the valve lever located on the back of the drain valve to the manual open position. The fill valve will open after enough water has drained out of the tank.
2. Let the fill water run until the tank is cooled; then shut off the field-installed manual supply water shut-off valve.
3. Let the tank drain; then manually close the drain valve.

COOL DOWN HUMIDIFIER (VAPOR-LOGIC CONTROLLER)

- Verify that there is no call for humidity and that the aquastat set point (adjusted using the keypad/display Setup screens) is less than room temperature (default setting is 40 °F [4 °C]) so that the heaters do not energize while cooling down the tank.
- Models with a standard drain valve:
 - Manually open the drain valve by moving the valve lever located on the back of the drain valve to the manual open position. The fill valve eventually opens.
 - Let the fill water run until the tank is cooled, then shut off the field-installed manual supply water shut-off valve.
 - Let the tank drain, then manually close the drain valve.
- Models with optional drain valves:
 - For drain valves without the manual open lever, use the keypad to perform the cool down process.
 - Go to the control modes screen and select Manual Drain.
 - Allow approximately half the water to drain out of the tank.
 - In the Control Modes screen select Auto; the fill valve opens and the humidifier cools down.
 - When the fill valve closes, select Manual Drain in the Control Modes screen and let the tank drain dry. The humidifier should be cool enough to work on.
 - For more information about using the keypad, see the *Vapor-logic Installation and Operation Manual*.

Shut down humidifier

Follow the procedure below before performing service or maintenance procedures (after the tank has cooled down and drained):

- If the humidifier is equipped with a Vapor-logic controller, use the keypad to change the control mode to Standby.
- Shut off all electrical power to the humidifier using the field-installed fused disconnect, and lock all power disconnect switches in the OFF position.
- Close the field-installed manual water supply shut-off valve.

WARNING

Hot surface and hot water hazard

Do not touch the tank or drain piping until the unit has had sufficient time to cool, or serious injury can occur.

Opening the drain valve when the tank is hot can discharge water with a temperature up to 212 °F (100 °C) into the plumbing system. This can cause damage to the plumbing system if the humidifier is not properly connected to a water tempering device such as a DriSteem Drane-kooler™.

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Tap/softened water

INSPECTION AND MAINTENANCE

1. **Annually** (also recommended when maintenance is performed)
 - Inspect tank and gaskets for leaks.
 - Measure current draw of heaters and verify amp values per stage by comparing to the wiring diagram located inside the subpanel cover. This identifies any burned out heaters. Only qualified electrical personnel should perform this task.
 - All safety devices in the control circuit should be cycled on and off to verify they are functioning. These include:
 - High limit switch
 - Airflow proving switch
 - Low water level probe. Pull out probe plug; fill valve should energize.
2. **Seasonally** (or as required, depending on water quality)

Clean the evaporating chamber:

- If the tank is hot, cool it down first. See “Cool down humidifier” on previous page.
- Shut off the water supply.
- Allow the tank to drain completely.
- Shut off the electrical supply.
- Disconnect the fill line at the supply side of the fill valve.
- Disconnect the electrical plugs between the tank components and the back of the electrical panel (includes: power plug, fill plug, drain plug, water level control plug, tank temperature sensor plug, and thermal trip plug).

Important: Disconnect by pulling on plug housing. Do not disconnect by pulling on cord or wires.

- Disconnect the drain union on the back left corner of the frame.
- Disconnect the steam supply hose from the top of the tank.
- Lift the tank foot above the frame flange, and slide the tank assembly forward to remove.
- Loosen the four cover bolts and remove the cover assembly from the tank.
- Clean the tank interior using a putty knife or similar flat instrument.

WARNING

Electric shock hazard

Do not remove humidifier electrical panel cover, heater terminal cover, or subpanel access panels until electrical power is disconnected. Improper wiring or contact with energized circuits can cause property damage, severe personal injury, or death as a result of electric shock and/or fire.

Only qualified electrical personnel should perform maintenance procedures.

Tap/softened water

- Clean and inspect probe rod assembly:
 - Unplug the probe plug assembly, and leave ground wire connected to tank.
 - Unscrew probe rod assembly, and clean plastic probe housing, ensuring that all passageways for water flow are clear.
 - Clean probe rods using steel wool or similar mild abrasive material.
 - Inspect composite plastic probe housing. If any signs of cracking, roughness, or deterioration, replace assembly.
 - When sliding probe housing into bracket from which it hangs, orient housing so neither water flow slot directly faces tank wall at back end of bracket.
- Secure the chamber cover, making sure the cover gasket is seated and the chamber is sealed.
- Re-install evaporating chamber:
 - Reconnect the fill line.
 - Reconnect electrical plugs (the plugs are color coded).
 - Reconnect the drain union.
 - Reconnect the steam hose.
- Verify electrical connections:
 - Verify that all DIN rail-mounted components are securely fastened to DIN rail.
 - Verify that all power terminal screws and lugs are tight from power block to heaters.
 - Verify that all plugs under the humidifier cover are completely plugged in.
- Move the drain valve lever back to the auto position.
- Turn on the water supply.
- Turn on the electrical power.

3. Off-season maintenance

- Perform complete inspection and cleaning of the following:
 - Heaters
 - Probe rods
 - Skimmer port and water seal
 - Humidifier tank
- After cleaning, the humidifier should remain empty until humidification is required.

Humidifier De-scaling Solution

Scale buildup on humidifier heaters acts as an insulator, reducing humidifier performance while increasing energy costs. To keep humidifiers operating as efficiently as possible, remove scale with DriSteem's Humidifier De-scaling Solution, available for purchase from your DriSteem representative or distributor.

The De-scaling Solution cleans without risk of corroding humidifier tanks or welds. The De-scaling Solution also cleans surfaces unreachable by hand scraping.

DriSteem's Humidifier De-scaling Solution is the only approved cleaner/de-scaler for use with DriSteem humidifiers. Use of other cleaners/de-scalers may void your DriSteem warranty.

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Tap/softened water

OFF-SEASON SHUT-DOWN PROCEDURE

1. Switch off electrical power.
2. Remove the enclosure.
3. Shut off the water supply to the makeup valve.
4. Drain the evaporating chamber, and clean if necessary following the instructions in this manual.
5. Replace the enclosure.
6. Leave the evaporating chamber dry, the power off, and the water shut-off valve closed until the next humidification season.

WARNING

Electric shock hazard

Do not remove humidifier electrical panel cover, heater terminal cover, or subpanel access panels until electrical power is disconnected. Improper wiring or contact with energized circuits can cause property damage, severe personal injury, or death as a result of electric shock and/or fire.

Only qualified electrical personnel should perform maintenance procedures.

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RO/DI water option

RO/DI humidifiers use RO/DI water. Because these water types are mineral free, cleaning the evaporating chamber should not be necessary. However, there are some maintenance steps that should be followed to ensure all parts of the unit are in working order.

Important: Verify regularly that water processing equipment is operating correctly. The presence of chlorides in improperly processed deionized water will eventually cause pitting and failure of the humidifier tank and its components. Damage caused by chloride corrosion is not covered by your DriSteem warranty.

COOL DOWN HUMIDIFIER

If the tank is hot, cool it down by opening the manual ball valve on the side of the tank. The float valve will open allowing cool water to run into the tank until it is cool enough to handle. Then shut off the water supply, and allow the tank to drain completely.

INSPECTION AND MAINTENANCE

1. Remove the evaporating chamber:
 - If the tank is hot, follow the instructions in "Cool down humidifier" above before proceeding.
 - Shut off the water supply.
 - Allow the tank to drain completely.
 - Shut off the electrical supply.
 - Disconnect the fill line at the fill fitting.
 - Disconnect the electrical plugs between the tank components and the back of the electrical panel (includes: power plug, low water switch plug, tank temperature sensor plug and thermal trip plug).
 - **Important:** Disconnect by pulling on plug housing. Do not disconnect by pulling on cord or wires.
 - Disconnect the drain union on the back left corner of the frame.
 - Disconnect the steam supply hose from the top of the tank.
 - Lift the tank foot above the frame flange and slide the tank assembly forward to remove.
2. Loosen the four cover bolts and remove the cover assembly from the tank.
3. Inspect the tank interior for debris or pitting.
4. Inspect the valve inlet for debris.

RO/DI water option

5. Check the operation of the float valve and the condition of the float seat.
6. Check the low water switch to make sure the float slides freely on the stem.
7. Secure the chamber cover making sure the cover gasket is seated and the chamber is sealed.
8. Reinstall the evaporating chamber.
 - Reconnect the fill line.
 - Reconnect electrical plugs (the plugs are color coded).
 - Reconnect drain union.
 - Reconnect steam hose.
9. Verify electrical connections:
 - Verify that all DIN rail-mounted components are securely fastened to DIN rail.
 - Verify that all power terminal screws and lugs are tight from power block to heaters.
 - Verify that all plugs are completely plugged in.
10. Close the drain valve.
11. Turn on the water supply.
12. Turn on the electrical power.

OFF-SEASON SHUT-DOWN PROCEDURE

1. Switch off electric power.
2. Remove the enclosure.
3. Shut off the water supply to the makeup valve.
4. Drain the evaporating chamber by opening the drain valve. For units with an end-of-season drain, refer to the *Vapor-logic Installation and Operation Manual*.
5. Replace the enclosure.
6. Leave the evaporating chamber dry, the power off, and the water shut-off valve closed until the next humidification season.

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Troubleshooting: LW series controller

Table 40-1:
CRUV troubleshooting guide (tap/softened water)

Problem	Module indicating lights			Possible cause	Recommended action
	Full	Ready water	Drain		
Humidifier will not heat	Off	Off	Off	Control transformer	Verify control voltage across secondary leads of transformer. Reset transformer circuit breaker.
	On	On	Off	Humidistat is not calling	Set humidistat to call. Inspect for faulty humidistat.
				Safety controls open	Check safety controls, airflow switch, high limit humidistat, etc.
				Faulty control board	Verify control voltage between terminals.
				Probe head deterioration *	Replace probe head.
Humidifier will not fill	Off	Off	Off	No water pressure at valve	Check water supply/shut off valves.
				Faulty water fill valve	Verify action of fill water solenoid valve by turning control module switch from standby to normal operation. Audible click should be heard as solenoid operates.
				Plugged strainer	Check strainer.
				Plugged valve	Check valve.
				Faulty control board	Verify control voltage across input terminals "B&W".
Humidifier does not stop filling	Off	Off	Off	Low fill water conductivity. Water conductivity must be at least 30 μ S/cm.	Jumper wires violet, orange then brown to ground. If water stops, verify tank ground, check fill water conductivity, then consult factory.
				Fill valve is stuck open	Check valve for foreign matter.
				Drain valve not closed, fill valve installed backward	Check for correct water flow through valve note arrow.
		Off	Off	On	Auto-drain mode
Low output	On	On	Off	Electric drain valve not seating	Correct cause of leakage or replace valve.
	On	On	Off	Fill valve is stuck open	Check valve for foreign matter.
Unit short cycles	On & Off	On	Off	Probes may be incorrectly wired	Confirm that unit is wired per diagram. Clean probe rod tips with steel wool.
Reduced or no output even though water is at the proper level	On	On	Off	Heater malfunctioning	Verify that proper voltage is being applied to heaters. Check heater (amp draw and compare to wiring diagram ratings).
				Malfunctioning control system	Heater contactor not functioning - replace. Service fuses blown. Auxiliary limit controls not allowing system to operate (duct humidistat, airflow proving switch, etc.). Reset, replace or calibrate as required. Faulty or inaccurate humidistat, replace or calibrate.
* Probe rod corrosion or probe head material aging may cause level control system failure. This generally does not occur in the first two years of operation.					

Troubleshooting: LW series controller and RO/DI water

Table 41-1:
CRUV troubleshooting guide (RO/DI water option)

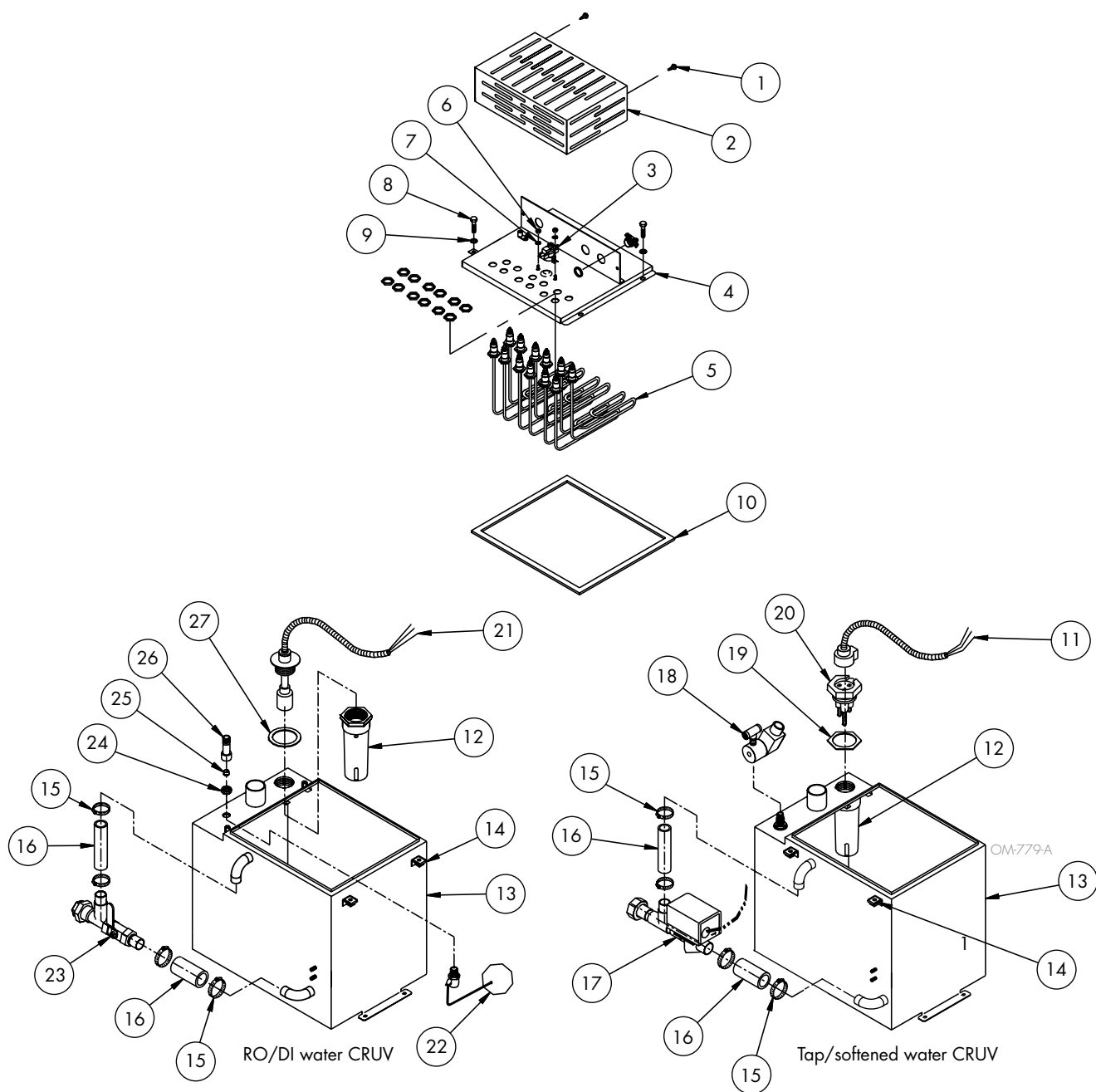
Problem	Possible cause	Recommended action
Humidifier will not heat	Control transformer	Verify control voltage across secondary leads of transformer. Reset transformer circuit breaker.
	Humidistat is not calling	Set humidistat to call. Inspect for faulty humidistat.
	Safety controls open	Check safety control. (Airflow switch, high limit humidistat, etc.)
	Low water float switch	Verify control voltage from float switch and transformer secondary common.
Humidifier will not fill	No water pressure at valve	Check manual water supply. Valve, minimum 25 psi water pressure.
	Malfunctioning water float valve	Check to make sure that valve float & stem moves freely.
	Plugged float valve	Check float valve seat.
Water float valve does not close	Open drain valve	Obstruction in drain valve will not allow complete closure, clean or replace valve.
	Manual drain valve not closed	Close drain valve.
	Malfunctioning float valve	Float ball has water leak. Float valve seat defective, replace.
	Water passing into overflow stand pipe	Readjust float valve rod, so water level reaches 1/4" - 3/8" from overflow edge when water is at ambient or cold state. Excessive water pressure, 80 psi maximum.
	Float valve stuck	Obstruction will not allow float valve to seat properly, clean or replace with new seat.
Reduced or no output even though water is at the proper level	Heater malfunctioning	Verify that proper voltage is being applied to heaters. Check heaters (amp draw and compare to wiring diagram ratings).
	Malfunctioning control system	Heater contactor not functioning, replace. Service fuses blown. Auxiliary limit controls not allowing system to operate (duct humidistat, airflow proving switch, etc.). Reset, replace, or calibrate as required. Faulty or inaccurate humidistat, replace or calibrate.
	Time delay/interlock relays	Relay delay on time is 10-15 seconds. Check relays.
	Low water cut-off switch	Check for proper operation.

TROUBLESHOOTING: VAPOR-LOGIC CONTROLLER

Troubleshooting for CRUV with the optional Vapor-logic controller is included in the *Vapor-logic Installation and Operation Manual* that was shipped with the humidifier.

Replacement parts: Humidifier

FIGURE 42-1: CRUV REPLACEMENT PARTS



Replacement parts: Humidifier

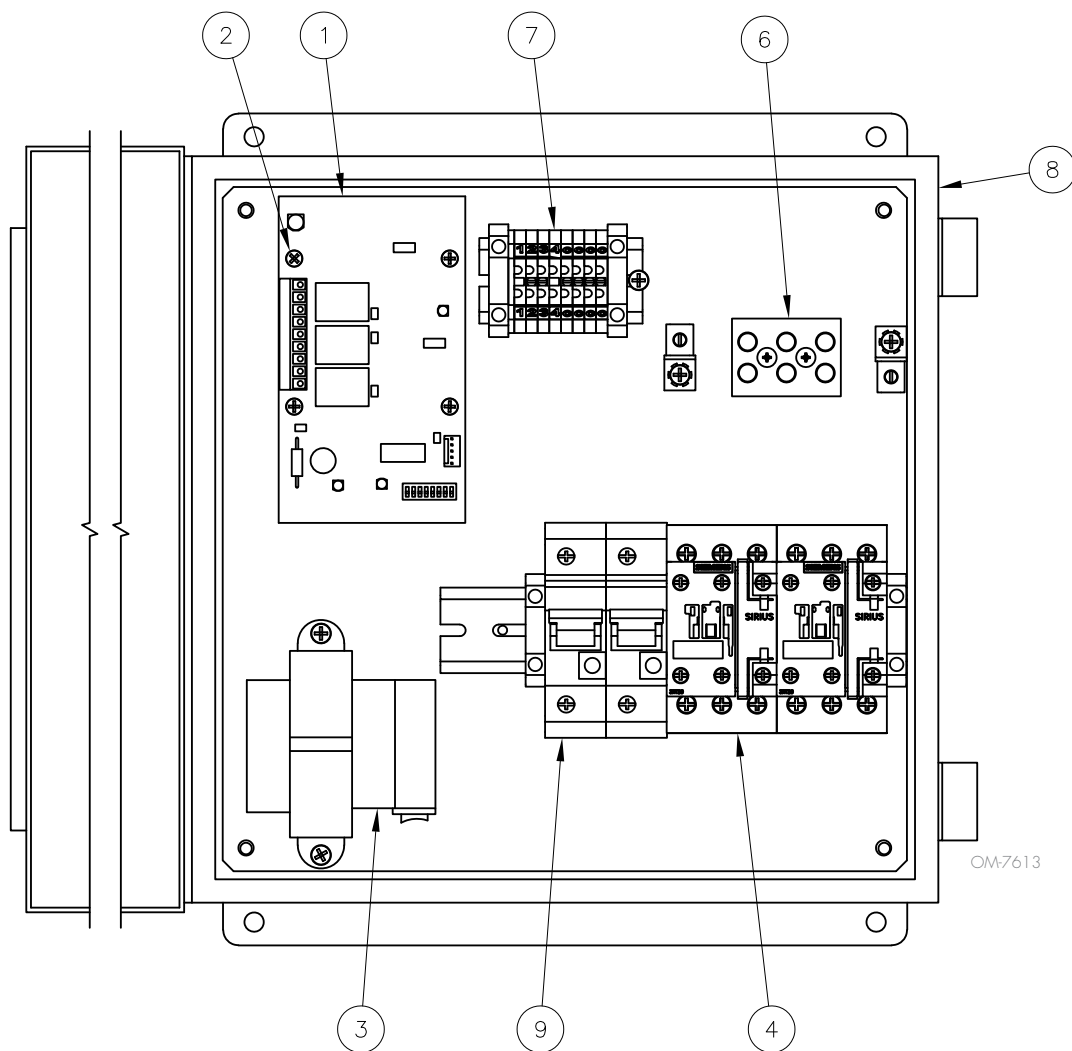
Table 43-1:
Replacement parts

Item	Description	Qty	Part No.	Item	Description	Qty	Part No.
1	Phillips head screw, #8-32 x 1/2"	2	700170-007	15	Hose clamp, 3/4"	4	700560-075
2	Heater terminal cover	1	*	16	Hose, 3/4" ID	1	307020-002
3	Thermo cut-out	1	409560-001	17	Electric valve, 24V 3/4"	1	505400-001
4	Tank cover	1	*	18	Solenoid valve, 24V with flying leads, 1/4"	1	505095
5	Heater element	*	409600-*	19	Probe assembly gasket	1	309750-004
6	Hex nut plated, #8-32	4	700200-002	20	Probe assembly (CRUV 2-4)	1	406303-105
	Hex nut plated DI, #8-32	6	700200-002		Probe assembly (CRUV 6-34)	1	406303-106
7	External tooth washer plated, #8	2	700200-003	21	Float switch assembly	1	*
8	LG phillips head bolt, 1/4-20 x 1"	4	700300-013	22	Float assembly	1	505310
9	Lock washer, 1/4"	4	700351-025	23	Ball valve assembly, 1/2" SST	1	505000-003
10	Cover to tank gasket	1	*		End of season drain valve assembly (not shown)	1	505086-003
11	Probe assembly with conduit and fitting	1	406050-100	24	Seal ring, 1/4" 18 pipe thread 303 SST	1	306365
12	Nylon probe housing	1	308500	25	Orifice, .041 fill models (CRUV 2-16)	1	160229-041
13	Tank weldment	1	*		Orifice, .052 fill models (CRUV 21-34)	1	160229-052
14	Nut assembly, 1/4"-20 (CRUV 2-4)	4	700650	26	Pipe weld, fill valve	1	160215
	Nut assembly, 1/4"-20 (CRUV 6-34)	2	700650	27	Probe assembly gasket	1	309750

* Specify humidifier model and serial numbers when ordering replacement parts.

Replacement parts: Subpanel with LW series controller

FIGURE 44-1: CRUV SUBPANEL WITH LW SERIES CONTROLLER (TAP/SOFTENED WATER)

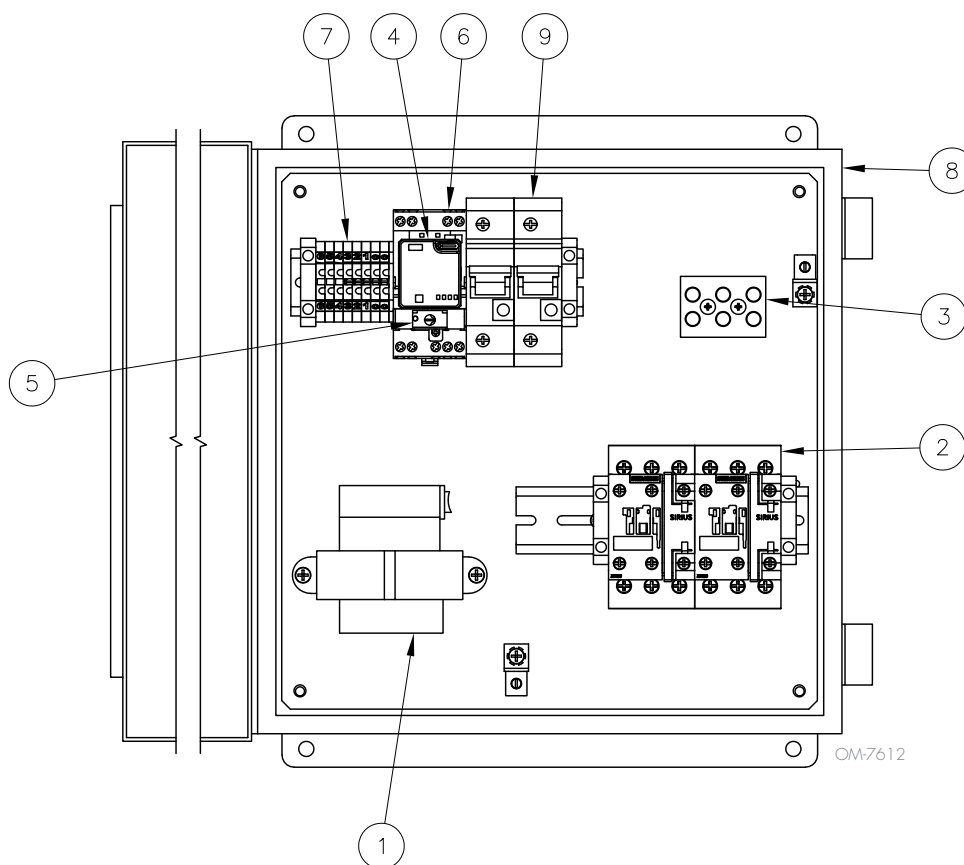


Replacement parts: Subpanel with LW series controller

Table 45-1: CRUV subpanel with LW series controller (tap/softened water)			
Item	Description	Qty	Part No.
1	Board, level control, 24V, LW-417	1	408632
2	Standoff, metal 1/4" x 3/8" (#8)	4	409592
3	Transformer, 600V, 24 VAC, Sec, 75 VA *	1	408986
	Transformer, 277V, 24 VAC, Sec, 75 VA *	1	408982
	Transformer, 120/208/240/480V, 24V Sec *	1	408965-001
4	Contactor *	1	407010- *
6	Power block, 3 pole	1	408300-002
7	Terminal, 20A DIN rail mount	*	408252-001
8	Enclosure, JIC, 16" x 14" x 6" (406 mm x 356 mm x 152 mm) *	1	407100-005
	Enclosure, NEMA-4, 16" x 14" (406 mm x 356 mm), (optional) *	1	408150-003
9	Circuit breaker	1	406775- *
* Specify humidifier model and serial numbers when ordering replacement parts.			

Replacement parts: Subpanel with time delay and relay

FIGURE 46-1: CRUV SUBPANEL WITH TIME DELAY AND RELAY (RO/DI WATER OPTION)

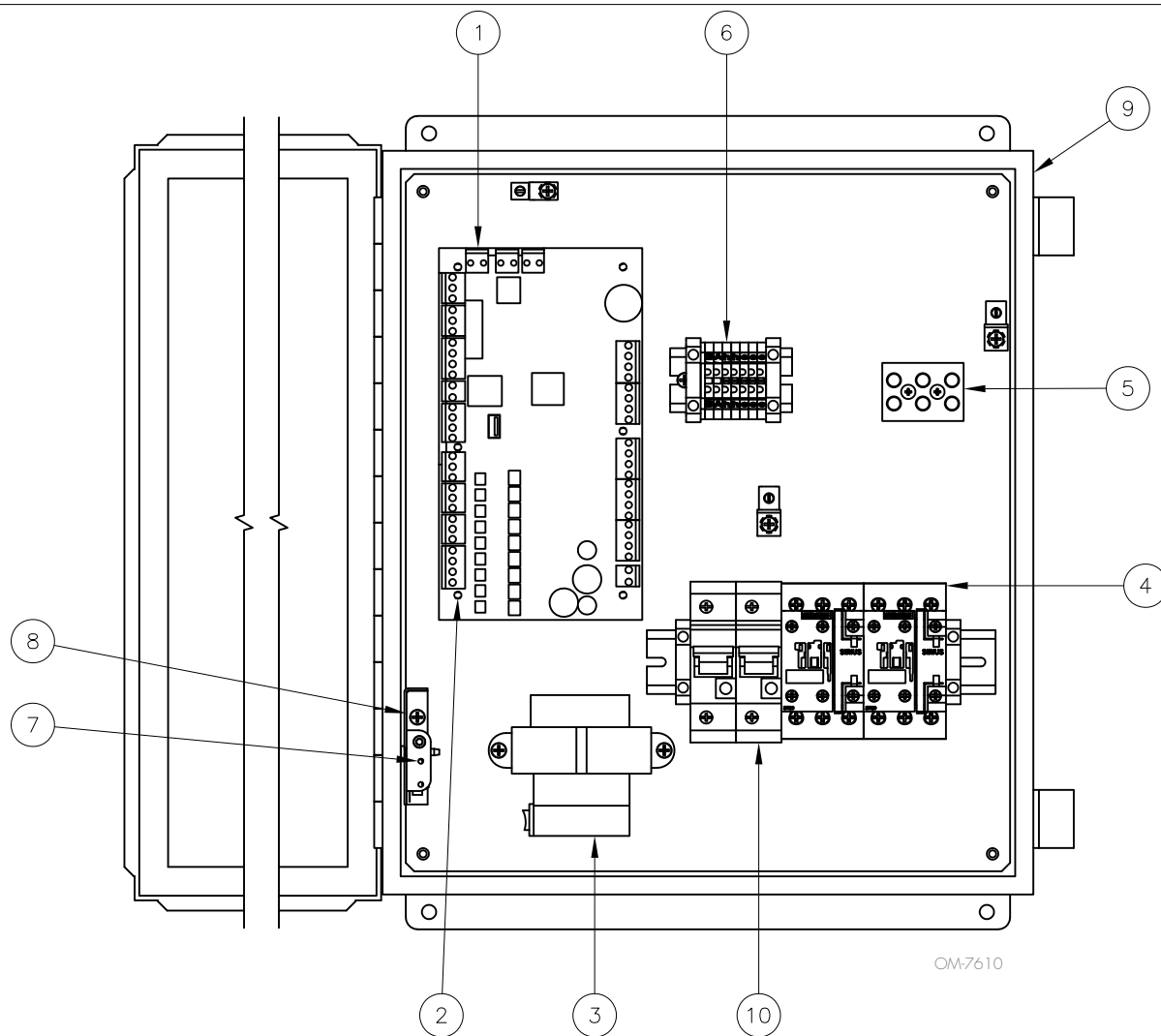


Replacement parts: Subpanel with time delay and relay

Table 47-1: CRUV subpanel with time delay and relay (RO/DI water option)			
Item	Description	Qty	Part No.
1	Transformer, 600V, 24 VAC Sec 75 VA *	1	408986
	Transformer, 277V, 24V Sec, 75 VA *	1	408982
	Transformer, 120/208/240/480V 24V Sec *	1	408965-001
2	Contactor *	1	407010- *
3	Power block, 3 pole	1	408300-002
4	Relay, 24V DPDT, finder	1	407900-016
5	Time delay, finder	1	407900-023
6	Relay socket, DPDT, with time delay	1	407900-020
7	Terminal, 20A, DIN rail mount	*	408252-001
8	Enclosure, JIC, 12" x 12" x 6" (305 mm x 305 mm x 152 mm) *	1	408150-002
	Enclosure, NEMA-4, 12" x 12" x 6" (305 mm x 305 mm x 152 mm), (optional) *	1	407100-004
9	Circuit breaker	1	406775- *
* Specify humidifier model and serial numbers when ordering replacement parts.			

Replacement parts: Subpanel with Vapor-logic option

FIGURE 48-1: CRUV SUBPANEL WITH VAPOR-LOGIC OPTION

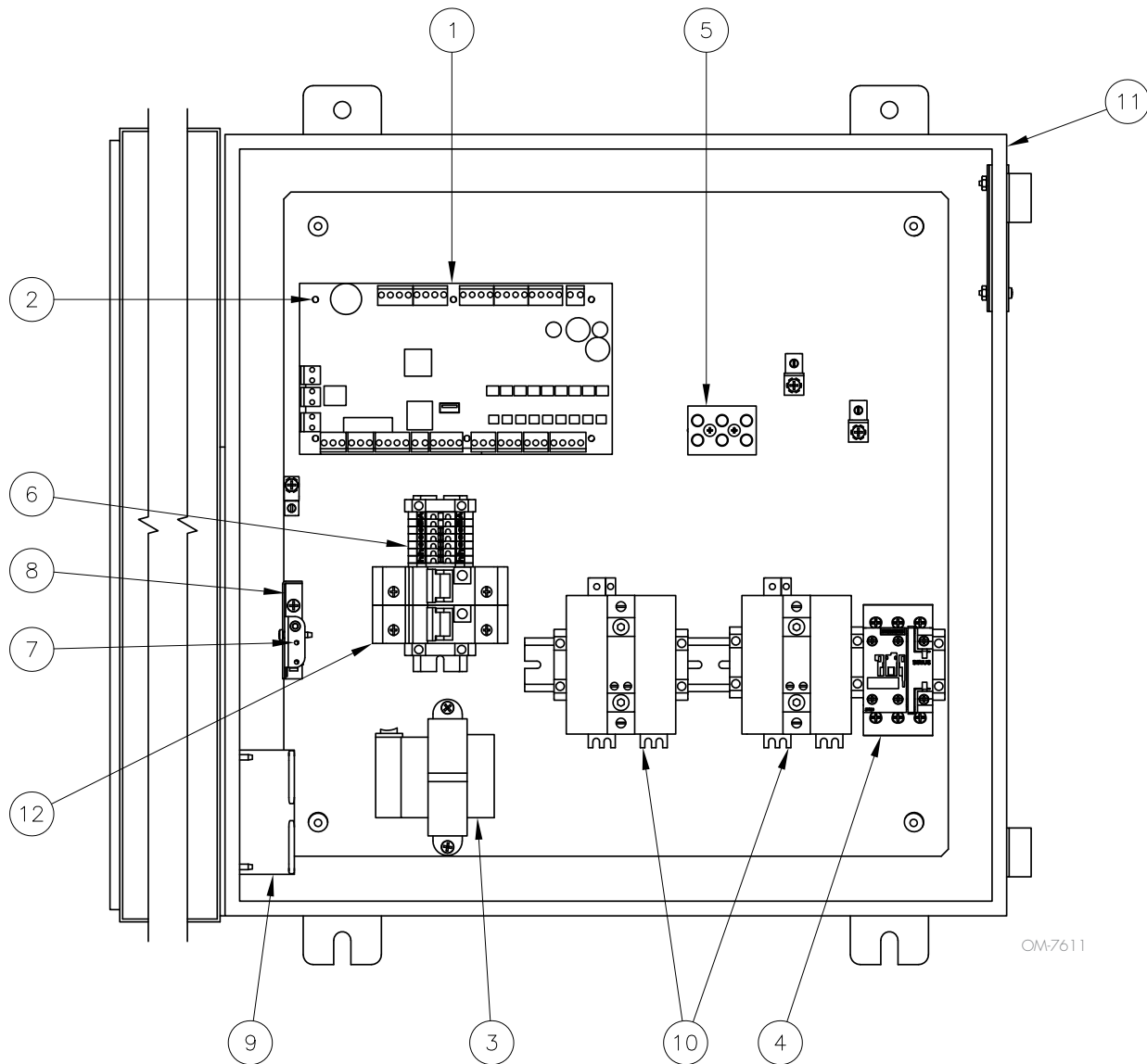


Replacement parts: Subpanel with Vapor-logic option

Table 49-1: CRUV subpanel with Vapor-logic option			
Item	Description	Qty	Part No.
1	Main controller, Vapor-logic	1	408496-006
2	PC board support, locking	4	409591-004
3	Transformer, 600V, 24 VAC Sec, 75 VA *	1	408986
	Transformer, 277V, 24 VAC Sec, 75 VA *	1	408982
	Transformer, 120/208/240/480V 24V Sec *	1	408965-001
4	Contactor *	1	407010- *
5	Power block, 3 pole	1	408300-002
6	Terminal, 20A, DIN rail mount	*	408252-001
7	Switch, door interlock, electric (optional)	1	408470
8	Bracket, door interlock, small (optional)	1	165614
9	Enclosure, JIC, 16" x 14" x 6" (406 mm x 356 mm x 152 mm) *	1	407100-005
	Enclosure, NEMA-4, 16" x 14" (406 mm x 356 mm), (optional) *	1	408150-003
10	Circuit breaker	1	406775- *
* Specify humidifier model and serial numbers when ordering replacement parts.			

Replacement parts: Subpanel with Vapor-logic and SSR options

FIGURE 50-1: CRUV SUBPANEL WITH VAPOR-LOGIC AND SSR OPTION



Replacement parts: Subpanel with Vapor-logic and SSR options

Table 51-1: CRUV subpanel with Vapor-logic and SSR option			
Item	Description	Qty	Part No.
1	Main controller, Vapor-logic	1	408496-006
2	PC board support, locking	4	409591-004
3	Transformer, 600V, 24 VAC Sec, 75 VA *	1	408986
	Transformer, 277V, 24V Sec 75 VA *	1	408982
	Transformer, 120/208/240/480V 24V Sec *	1	408965-001
4	Contactor *	1	407010- *
5	Power block, 3 pole	1	408300-002
6	Terminal, 20A, DIN rail mount	*	408252-001
7	Switch, door interlock, electric (optional) *	1	408470
8	Bracket, door interlock, small (optional)	1	165614
9	Fan, cooling, 24" (610 mm) leads	1	405800-054
10	SSR, 2 pole, 50 Amp	*	408679-003
	SSR, 1 pole	*	408679-003
11	Enclosure, JIC, 20" x 20" x 7" (508 mm x 508 mm x 178 mm) *	1	407100-007
	Enclosure, NEMA-4, 20" x 20" N4-20206 (508 mm x 508 mm), (optional) *	1	408150-004
12	Circuit breaker	1	406775- *
* Specify humidifier model and serial numbers when ordering replacement parts.			

Expect quality from the industry leader

Since 1965, DriSteem has been leading the industry with creative and reliable humidification solutions. Our focus on quality is evident in the construction of the CRUV humidifier, which features stainless steel construction. DriSteem also leads the industry with a Two-year Limited Warranty and optional extended warranty.

For more information

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Form No. CRUV-IOM-REVG-0420
Part No. 890000-001 Rev G

Two-year Limited Warranty

DRI-STEEM Corporation ("DriSteem") warrants to the original user that its products will be free from defects in materials and workmanship for a period of two (2) years after installation or twenty-seven (27) months from the date DriSteem ships such product, whichever date is the earlier.

If any DriSteem product is found to be defective in material or workmanship during the applicable warranty period, DriSteem's entire liability, and the purchaser's sole and exclusive remedy, shall be the repair or replacement of the defective product, or the refund of the purchase price, at DriSteem's election. DriSteem shall not be liable for any costs or expenses, whether direct or indirect, associated with the installation, removal or reinstallation of any defective product. Excluded from the Limited Warranty are all consumable and wear and tear items such as cylinders, membranes, filters, or media replacements. These items are subject to usual wear and tear during usage.

DriSteem's Limited Warranty shall not be effective or actionable unless there is compliance with all installation and operating instructions furnished by DriSteem, or if the products have been modified or altered without the written consent of DriSteem, or if such products have been subject to accident, misuse, mishandling, tampering, negligence or improper maintenance. Any warranty claim must be submitted to DriSteem in writing within the stated warranty period. Defective parts may be required to be returned to DriSteem.

DriSteem's Limited Warranty is made in lieu of, and DriSteem disclaims all other warranties, whether express or implied, including but not limited to any IMPLIED WARRANTY OF MERCHANTABILITY, ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, any implied warranty arising out of a course of dealing or of performance, custom or usage of trade.

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By purchasing DriSteem's products, the purchaser agrees to the terms and conditions of this Limited Warranty.

Extended warranty

The original user may extend the term of the DriSteem Limited Warranty for a limited number of months past the initial applicable warranty period and term provided in the first paragraph of this Limited Warranty. All the terms and conditions of the Limited Warranty during the initial applicable warranty period and term shall apply during any extended term. An extended warranty term of an additional twelve (12) months or twenty four (24) months of coverage may be purchased. The extended warranty term may be purchased until eighteen (18) months after the product is shipped, after which time no extended warranties are available. When a DriSteem humidifier is purchased with a DriSteem RO system, an extended twenty-four (24) month coverage is included.

Any extension of the Limited Warranty under this program must be in writing, signed by DriSteem, and paid for in full by the purchaser.