
DRISTEEM[®]
The humidification experts



CRUV[®]

Electric Humidifier

**Installation, Operation,
and Maintenance Manual**

ATTENTION INSTALLER

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

DRI-STEEM® technical support

800-328-4447

WARNING!

Disconnect electrical power before installing supply wiring. Contact with energized circuits can cause severe personal injury or death as a result of electrical shock.

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, and/or fire.

The humidifier tank, dispersion assembly, and all connected hose or piping can contain or discharge hot steam and/or hot water at 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.

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.

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

Table of contents

Overview

Product overview	4
Specifications, capacities, and weights	6
Dimensions	7

Installation

Choosing a location	8
Mounting the humidifier	9
Piping	10
Supply water and drain piping.....	13
Wiring	14
Humidistat and transmitter placement.....	15
Dispersion	
Interconnecting piping requirements	17
Drip tee installation	19
Single tube	20
Rapid-sorb	22

Operation

Start-up and operation:.....	29
Standard water models	30
DI water models	33

Maintenance

Water quality.....	34
Standard water models	35
DI water models	38
Troubleshooting guide.....	42
Replacement parts	
Humidifier	46
Control cabinet with Vapor-logic3, SSR.....	48
Control cabinet with Vapor-logic3	50

Warranty

.....	back cover
-------	------------

Note:

The *Vapor-logic[®]3 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 *Vapor-logic3* manual was shipped with your humidifier. Additional copies can be viewed, printed, or ordered at www.dristeem.com

Download DRI-STEEM literature

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

Product overview

Notes:

Damage caused by chloride corrosion is not covered by your DRI-STEEM warranty.

CRUV® standard water models control water levels with an electronic probe

CRUV standard water models (shown below) require supply water conductivity to be least 100 µS/cm to operate. These models use an electronic probe to monitor water levels (see Figure 5-4). Standard water models will not operate with water treated by reverse osmosis (RO) or deionization (DI) processes.

CRUV-DI models control water levels with a float valve

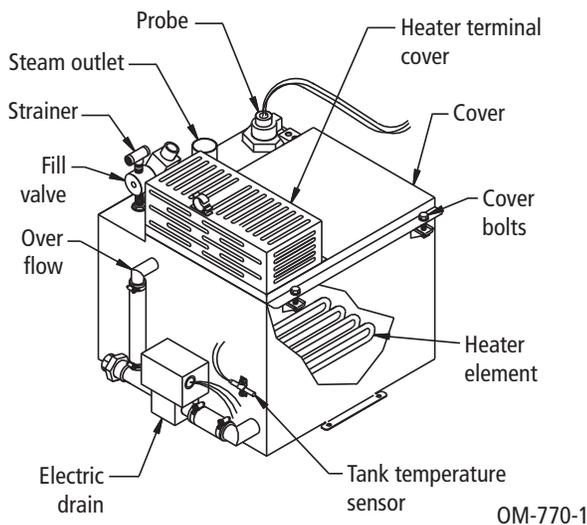
CRUV-DI models are designed specifically for use with DI/RO water. These models use a float valve to control water levels (see Figure 5-5). CRUV-DI models will not operate with standard (potable) water.

Convert to a different water type in the field

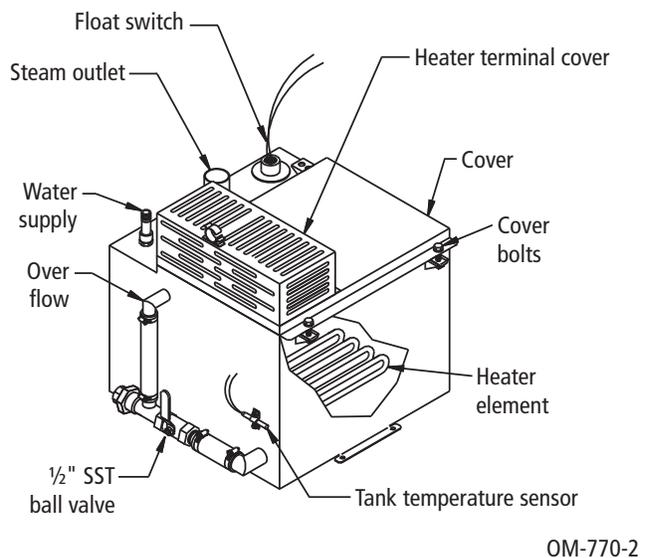
CRUV standard water models can be converted in the field for use with DI/RO water. CRUV-DI models can be converted in the field for use with potable or softened water. Contact your DRI-STEEM representative or distributor for parts and instructions.

**Figure 4-1:
CRUV humidifier**

Standard water model

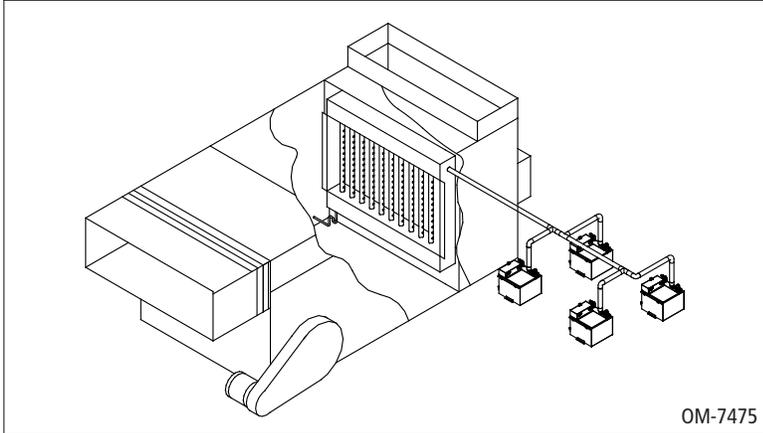


DI water model

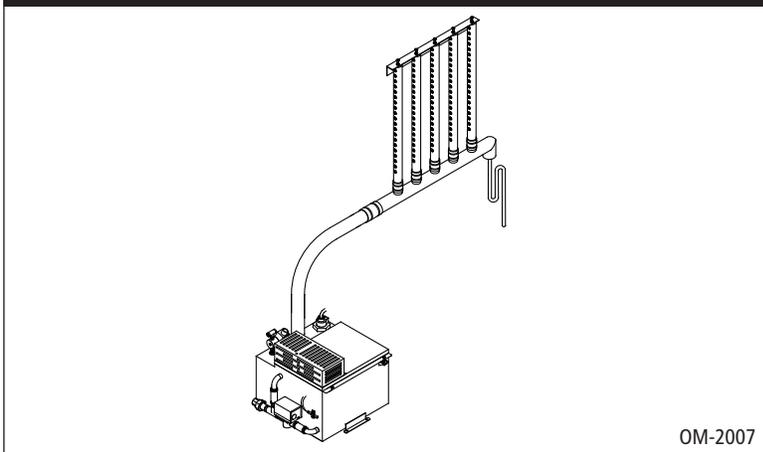


Product overview

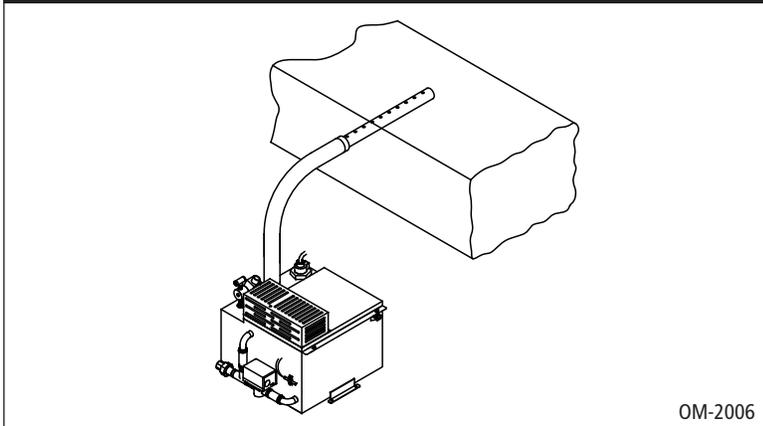
**Figure 5-1:
Ultra-sorb dispersion**



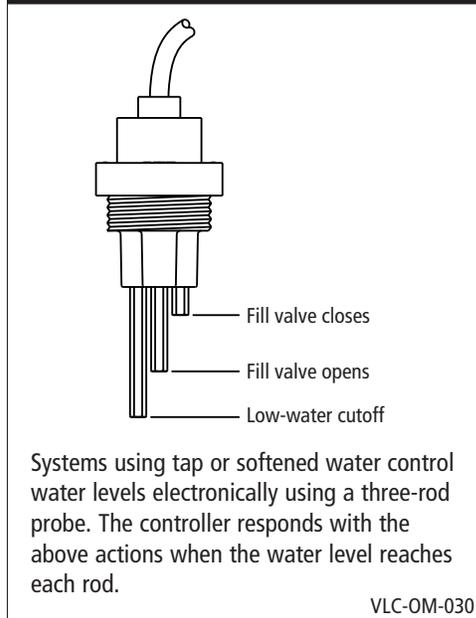
**Figure 5-2:
Rapid-sorb dispersion**



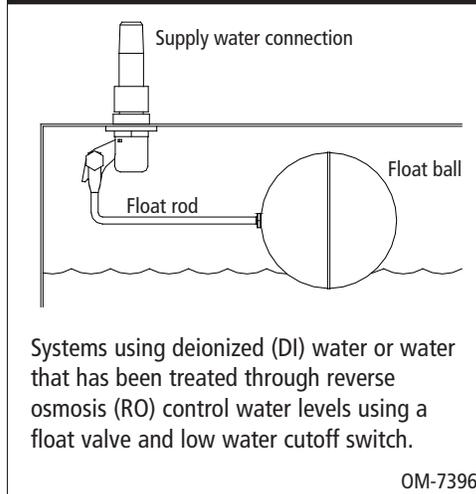
**Figure 5-3:
Single or multiple tube dispersion**



**Figure 5-4:
Water level control for standard
water systems**



**Figure 5-5:
Water level control for DI/RO
water systems**



Specifications, capacities, and weights

**Table 6-1:
CRUV specifications**

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

Notes:

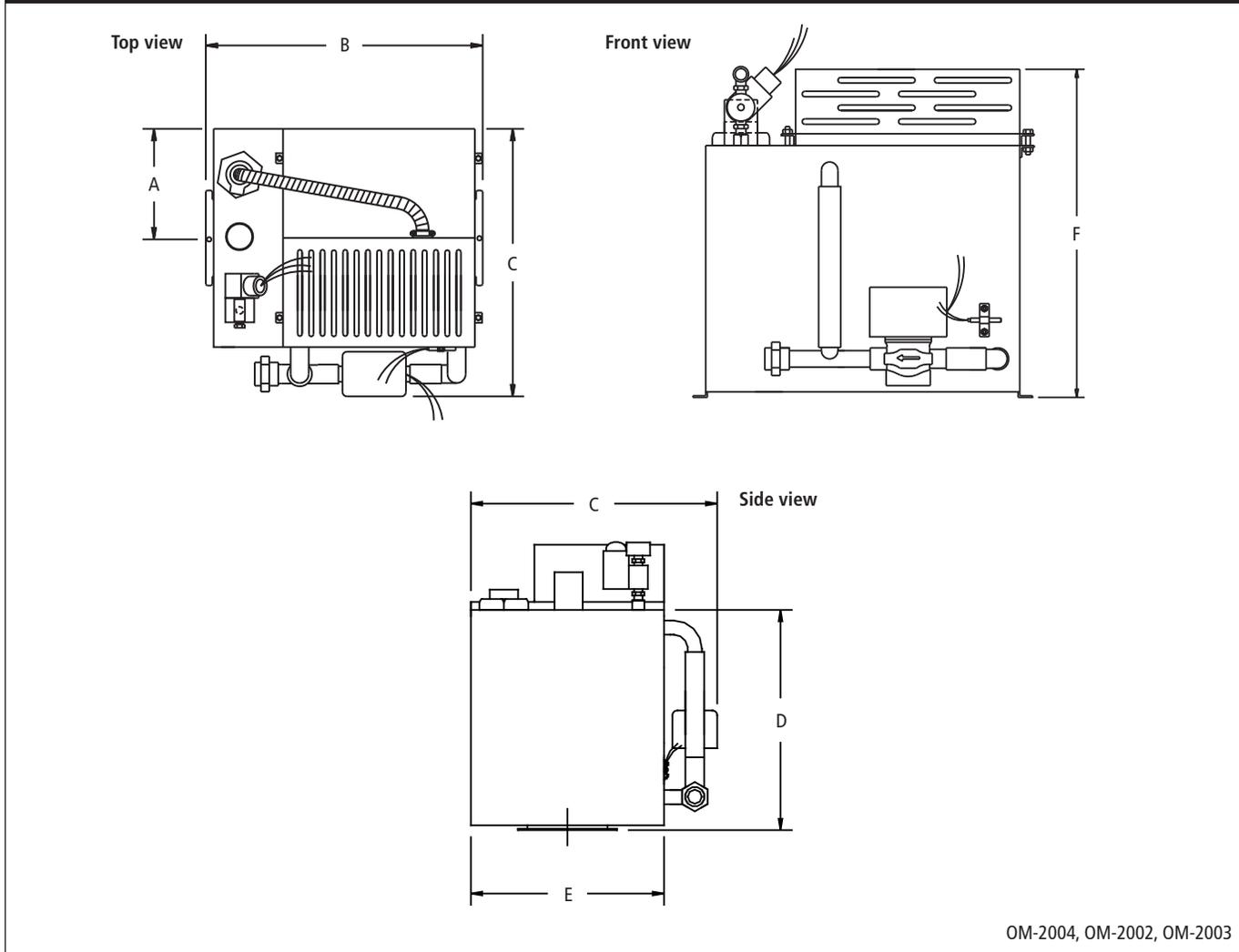
* For wire sizing, the highest leg draw is shown due to current imbalance.

** 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 DRI-STEEM Design Guide available for downloading and printing at www.dristeem.com

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

Dimensions

**Figure 7-1:
CRUV dimensions**



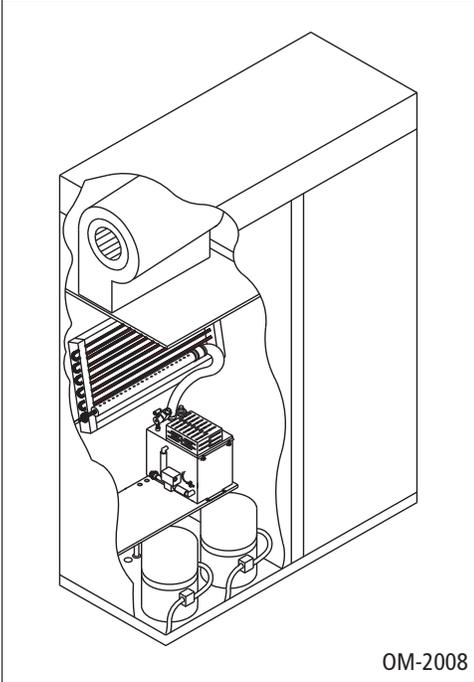
OM-2004, OM-2002, OM-2003

**Table 7-1:
CRUV dimensions**

CRUV/CRUV-DI model number	A		B		C		D		E		F	
	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

Choosing a location

**Figure 8-1:
Installation in an air conditioning unit**



Locate the CRUV humidifier near an electric power source, water supply and a drain. Verify that sufficient room is provided for a water seal in the drain piping (see Figure 10-1).

In an air conditioning unit

When installing a humidifier inside an air conditioning unit, provide adequate support; allow easy access for removing and servicing the evaporating chamber, and provide adequate clearance to install the vapor hose and dispersion tube (see Figure 4-1) and water seal. See Figure 7-1 for mounting hole locations.

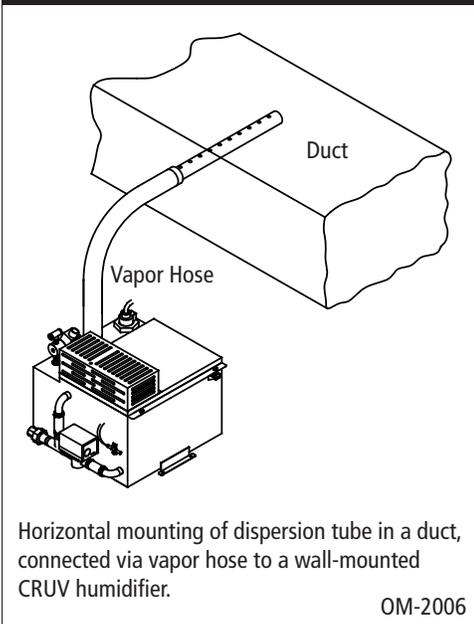
In a duct

When installing the dispersion tube in a duct, allow for a continuous pitch of the vapor hose back to the evaporating chamber. Otherwise, use a water seal and drain (see Figures 8-2 and 9-1). The dispersion tube can also be placed vertically in the duct with some models (see Figure 9-3).

Place the control cabinet or electrical sub-panel in a grounded protective metal enclosure and mount in a dry and accessible location.

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

**Figure 8-2:
Horizontal dispersion tube**



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

Mounting the humidifier

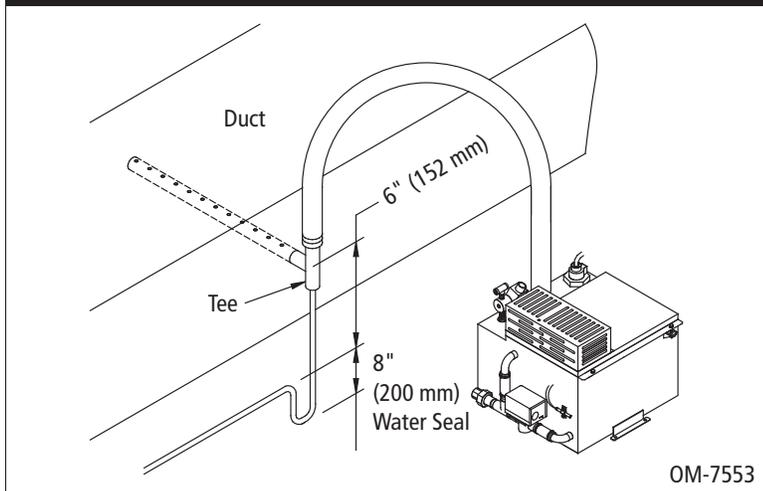
When horizontally mounting the dispersion tube in an air stream that is located lower than the CRUV humidifier a water seal (to prevent steam from escaping at the open drain) must be provided in the drain line and line extended to open drain, as shown in Figure 9-1, to drain the condensate.

The dispersion tube can be mounted vertically in the duct.

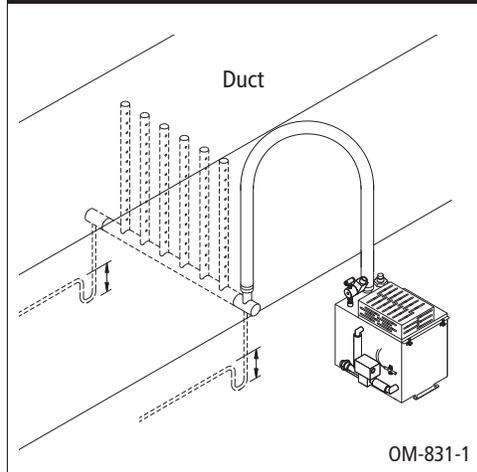
Note: When dispersion tube is more than 10' (3 m) from unit, insulated, 1½" (38 mm) diameter minimum rigid tubing or pipe should be used instead of vapor hose. This application is not recommended for CRUV-10 through CRUV-34.

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-30 or CRUV-34 because of their high output. See Figure 9-2 and the "Rapid-sorb" section beginning on Page 22.

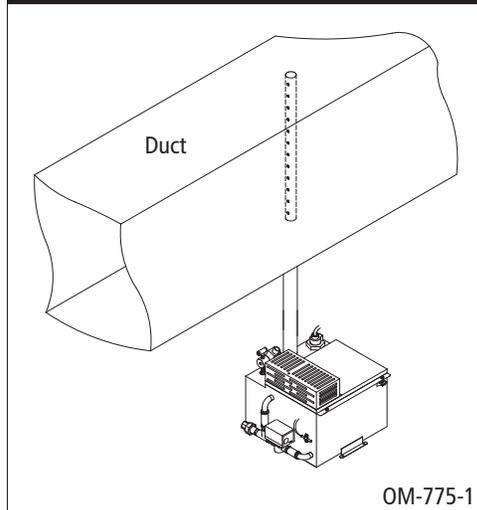
**Figure 9-1:
Horizontal dispersion tube lower than humidifier**



**Figure 9-2:
Rapid-sorb dispersion**



**Figure 9-3:
Vertical dispersion tube**



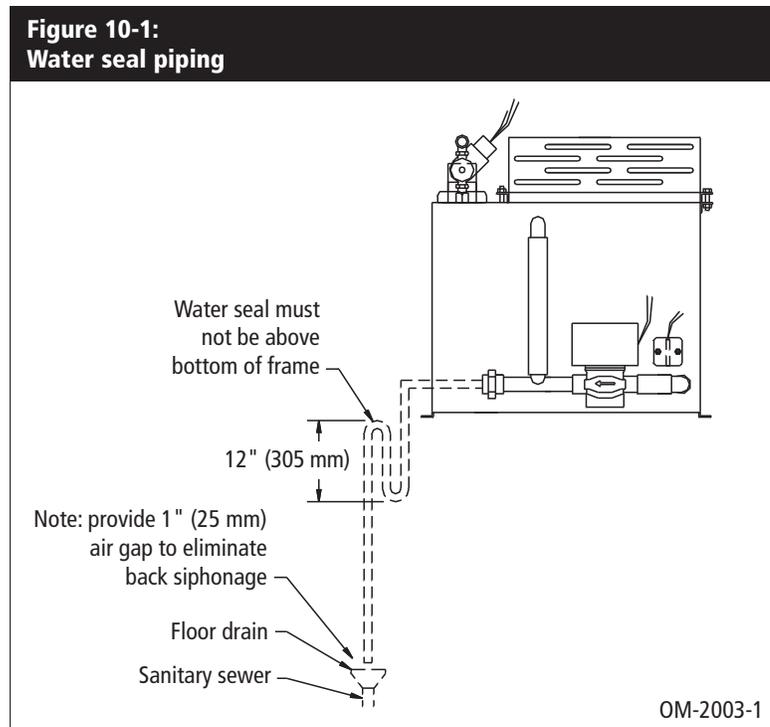
Piping

For complete information on calculating the number of dispersion tubes required to satisfy steam absorption distance requirements, consult your local DRI-STEEM representative, the DRI-STEEM factory, or use DRI-STEEM's Dri-calc[®] selection software.

Water make-up piping should be of corrosion-resistant, code-approved material (copper, steel, or plastic). The final connection size is 1/4" pipe thread. In cases where water hammer is possible, a shock arrestor should be considered.

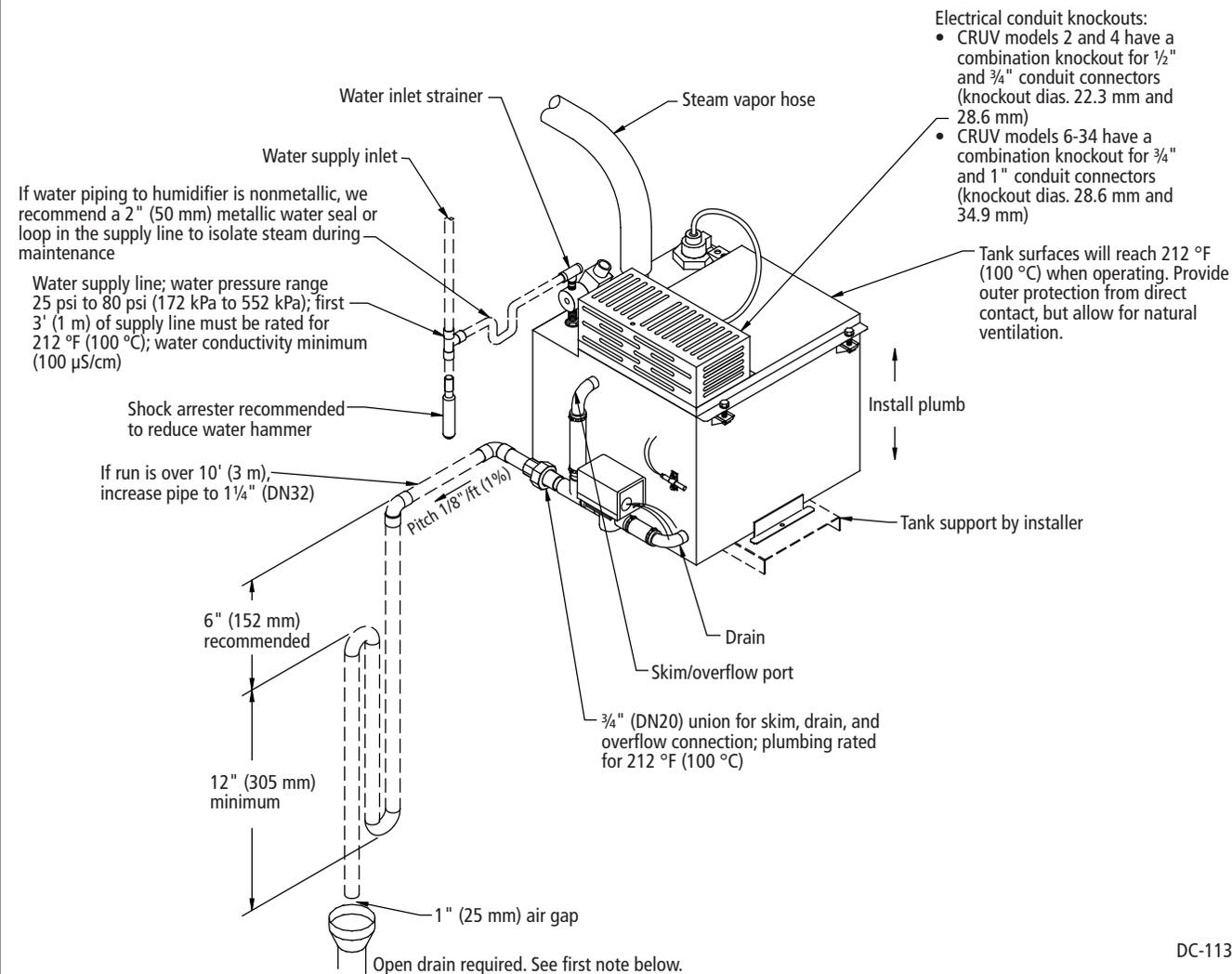
Drain piping should be of code approved material (copper, steel, or plastic rated for 212°F/100°C minimum). See Figure 10-1. The 3/4" O.D. copper sweat connection should not be reduced in size.

If there is no sewer available for drainage, the unit can be piped for manual drainage. Consult factory for instructions.



Piping

Figure 11-1:
Field piping overview for CRUV models (standard water models)



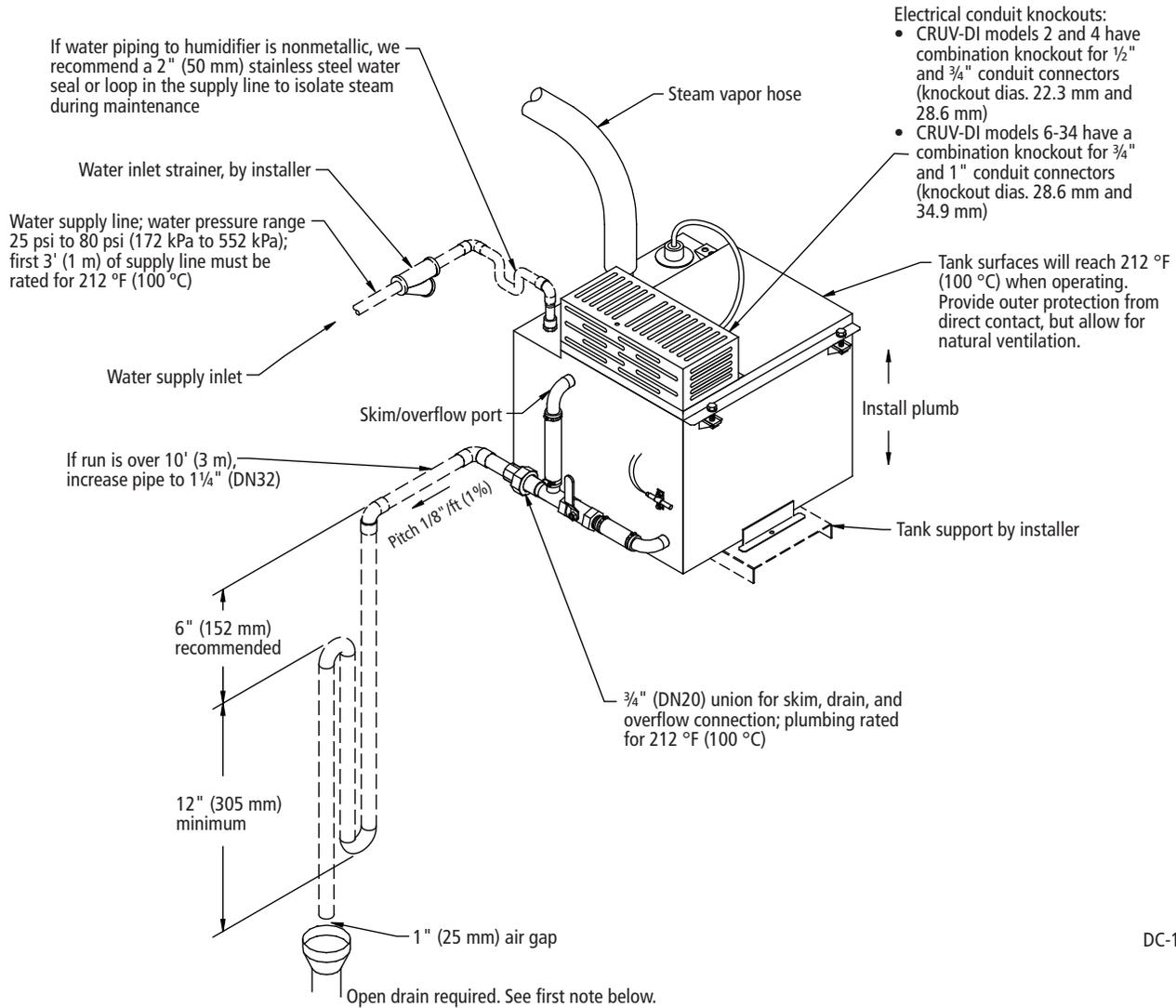
DC-1133

Figure 11-1 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 DRI-STEEM warranty.
- See the next page for recommended water supply piping for Model CRUV-DI (DI/RO water model).

Piping

Figure 12-1:
Field piping overview for CRUV-DI models (DI water models)



DC-1135

Figure 12-1 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 DRI-STEEM warranty.
- See the previous page for recommended water supply piping for Model CRUV (standard water model).

Supply water and drain 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 ¼" pipe thread (DN8) fitting except in Europe where it is a DN10 pipe thread 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 (DRI-STEEM Part No. 400280 for 120V pump and Part No. 400281 for 230V pump).

The final connection size is ¾" (DN20) copper for the tank and frame drains. Do not reduce this connection size. Pipe the tank and frame drains separately to prevent backflow of drain water into the humidifier cabinet.

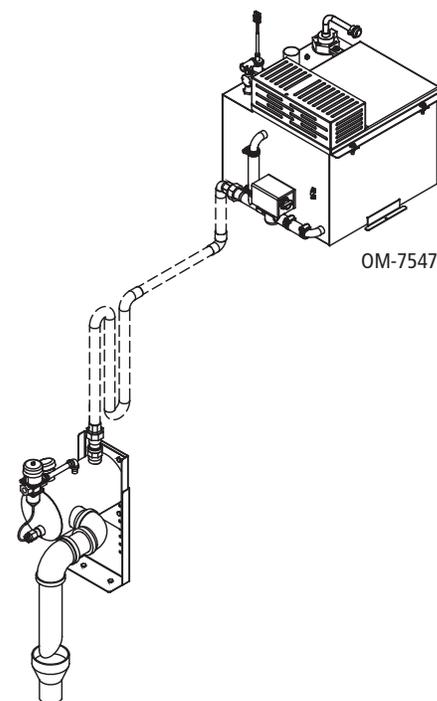
If the equivalent length of pipe from the humidifier drain to the plumbing system drain is more than 10' (3 m), increase the pipe size to 1¼" (DN32).

WARNING!

Opening the drain valve when the tank is hot can discharge water with a temperature up to 212 °F (60 °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 DRI-STEEM Drane-kooler.

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

Figure 13-1:
Drane-kooler water tempering device



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

Wiring

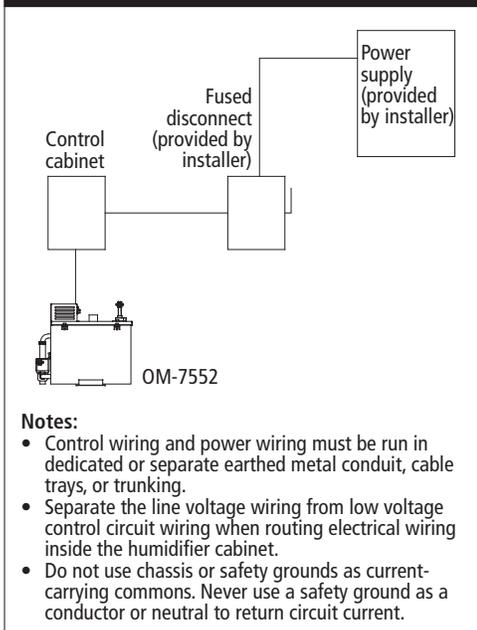
WARNING!

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.

WARNING!

DRI-STEEM 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.

Figure 14-1:
Field wiring requirements



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 CRUV, avoid areas close to sources of electromagnetic emissions such as power distribution transformers.

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 (in Europe, IEC 60364 requirements).

Proper wiring prevents 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.

WARNING!

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.

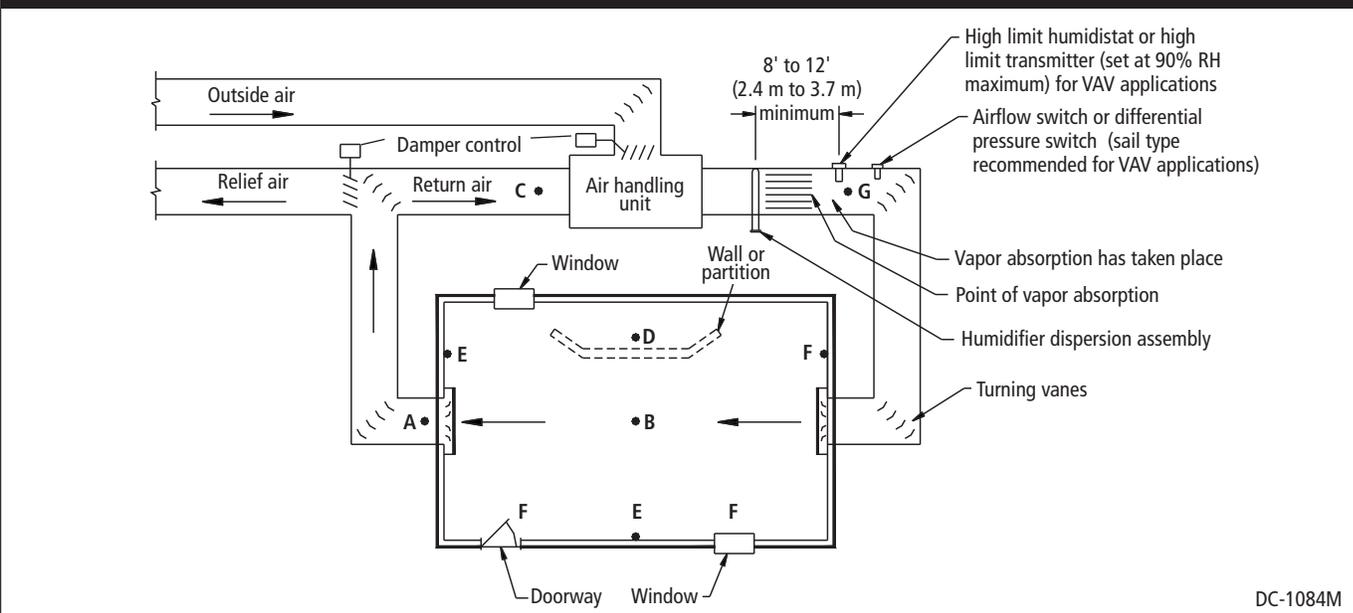
Humidistat and transmitter placement

Humidistat and transmitter locations are critical

Humidistat and humidity transmitter locations have a significant impact on humidifier performance. DRI-STEEM recommends that you do not interchange duct and room humidity devices. Room humidity devices are calibrated with zero or little airflow; whereas duct humidity devices require air passing across them. See the following recommendations and the locations in Figure 15-1.

- A Ideal humidistat or humidity transmitter location. Placement here ensures the best uniform mix of dry and moist air with stable temperature control.
- B Acceptable, but the room environment can affect controllability such as when the humidistat or transmitter is too close to air grilles, registers, or heat radiation from room lighting.
- C Acceptable, because this location provides a uniform mixture of dry and moist air. If there is a time lag between humidity generation and sensing, extend the sampling time.
- D Acceptable behind a wall or partition for sampling the entire room, if the sensor is near an air exhaust return outlet. Typical humidistat or transmitter placement for sampling a critical area.
- E Not acceptable, because these locations may not represent actual overall conditions in the space.
- F Not acceptable. Do not place humidistats or transmitters near windows, door passageways, or areas of stagnant airflow.
- G Best sensing location for a high limit humidistat or humidity transmitter and airflow proving switch.

Figure 15-1:
Recommended humidistat and transmitter locations



DC-1084M

mc_060508_0750

Dispersion: General instructions

Four places to find more information about dispersion

1. In this document:

- Interconnecting piping and drip tee installation, Pages 17–19.
- Single tube installation instructions, Pages 20–21
- Rapid-sorb® installation instructions, Pages 22–28

2. On our web site:

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

- Catalogs (include dispersion non-wetting distance graphs):
 - CRUV
 - Ultra-sorb®
- Installation, Operation, and Maintenance manuals:
 - Ultra-sorb
 - Vapor-logic3 (includes information about sensors, and troubleshooting information)
- *DRI-STEEM Design Guide* (includes steam loss tables and general humidification information)

3. On Dri-calc:

Dri-calc is our humidification system sizing and selection software, and can be ordered at our web site, www.dristeem.com. Included in Dri-calc:

- A comprehensive library of installation guide documents, including:
 - Rapid-sorb installation instructions for vertical airflows
 - Recommended dispersion placement within a duct or air handler
 - Recommended sensor placement

4. Or call us at 800-328-4447

While obtaining documents from our web site or from Dri-calc is the quickest way to review our literature, we'd also be happy to mail to you any literature you need.

Selecting the dispersion assembly location

- CRUV humidifiers operate with several types of dispersion assemblies: single tube, multiple tube, Rapid-sorb, and Ultra-sorb assemblies, installed in ducts or air handling units
- For each dispersion assembly, DRI-STEEM documents distances required for absorption to occur. If you have questions about absorption distances, see the non-wetting tables in the CRUV catalog, available for viewing, printing or ordering at www.dristeem.com
- It is important that the dispersion assembly be positioned where the water vapor being discharged is carried off with the airstream and is absorbed before it can cause condensation or dripping in the duct.
- In general, the dispersion assembly is best placed where the air can most readily 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. The filter can remove the visible moisture and become waterlogged.
- Place the dispersion assembly such that absorption will occur before coming in contact with any metal surface.
- Place the dispersion assembly such that absorption will occur before fire or smoke detection devices.
- Place the dispersion assembly such that absorption will occur 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) gap between the condensate drain piping and the drain. Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensation may form on nearby surfaces.

Dispersion: Interconnecting piping requirements

Connecting humidifier to dispersion assembly with vapor hose

- Always support vapor hose to prevent sags or low spots and to maintain a minimum pitch of 2"/ft (15%) back to the humidifier.
- See the maximum steam carrying capacity table on the next page.
- Use DRI-STEEM vapor hose. Other manufacturers of vapor 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 vapor hose in outdoor applications.
- Do not insulate vapor hose. Insulation causes accelerated heat aging, causing the vapor hose to become hard and susceptible to failure due to cracks.
- The steam outlet on the humidifier is sized to the output of the humidifier. DO NOT use hose with an inside diameter (ID) smaller than the humidifier steam outlet.
- If the humidifier must be located above the dispersion assembly, use the recommend installation as shown in Figure 19-1.
- For single tube applications, see the hose kit sizing Table 20-1.

Connecting humidifier to dispersion assembly with tubing or pipe

- See the following pages for interconnecting tubing and pipe pitch requirements for specific applications.
- The steam outlet on the humidifier is sized to the output of the humidifier. DO NOT use interconnecting tubing or pipe with an inside diameter (ID) smaller than the humidifier steam outlet.
- Steam supply adapters are available from DRI-STEEM. These adapters convert a tubing outlet on the humidifier to threaded pipe, allowing a pipe connection.
- 90° elbows are not recommended; use two 45° elbows, 1' (0.3 m) apart.
- Thin wall tubing heats up faster and causes less start-up loss than heavy wall pipe.

More on the next page ►

Important:

Failure to follow the recommendations in this section can result in excessive back pressures 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 the dispersion tube(s).

Important:

Reducing the inside diameter of the interconnecting piping will result in the internal humidifier system pressure exceeding the parameters for acceptable performance.

Dispersion: Interconnecting piping requirements

Connecting humidifier to dispersion assembly with tubing or pipe (continued)

- Insulating hard pipe reduces the loss in output caused by condensation.
- When using hard pipe, take care to remove ALL traces of lubricants used to thread the pipe. This will minimize the possibility of tank foaming. Denatured alcohol or mineral spirits work best for removing lubricant.
- If the humidifier must be located above the dispersion assembly, use the recommend installation as shown in Figure 19-1.
- See Table 18-1 below.

**Table 18-1:
Maximum steam carrying capacity and length of interconnecting vapor hose, tubing, and pipe***

Vapor hose						Copper or stainless steel tubing and Schedule 40 steel pipe					
Hose I.D.		Maximum capacity		Maximum length**		Tube or pipe size***		Maximum capacity		Maximum developed length†	
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

Notes:

- * Based on total maximum pressure drop in hose, tubing or piping of 5" wc (1250 Pa)
- ** Maximum recommended length for vapor hose is 10' (3 m). Longer distances can cause kinking or low spots.
- *** To minimize loss of capacity and efficiency, insulate tubing and piping.
- † Developed length equals measured length plus 50% of measured length, to account for pipe fittings.

Dispersion: Drip tee installation

Drip tee installation

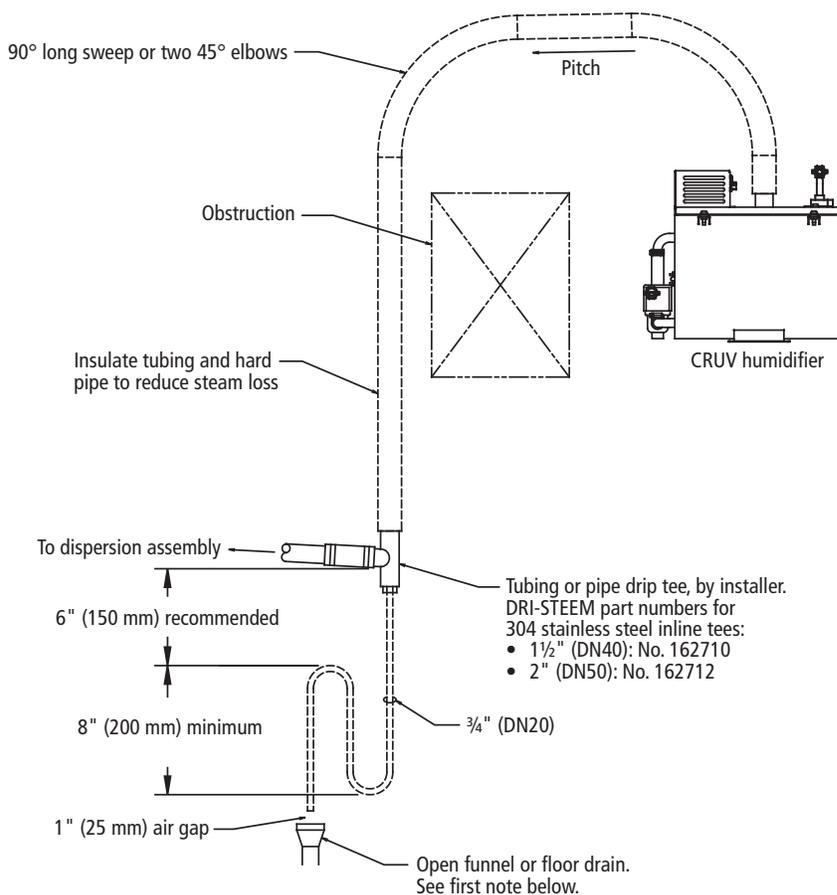
Install a drip tee as shown below when the humidifier is mounted higher than the dispersion assembly, when interconnecting hose or piping needs to go over an obstruction, or when interconnecting piping runs are long.

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

WARNING!

Dispersion tube, vapor 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.

**Figure 19-1:
Drip tee installation**



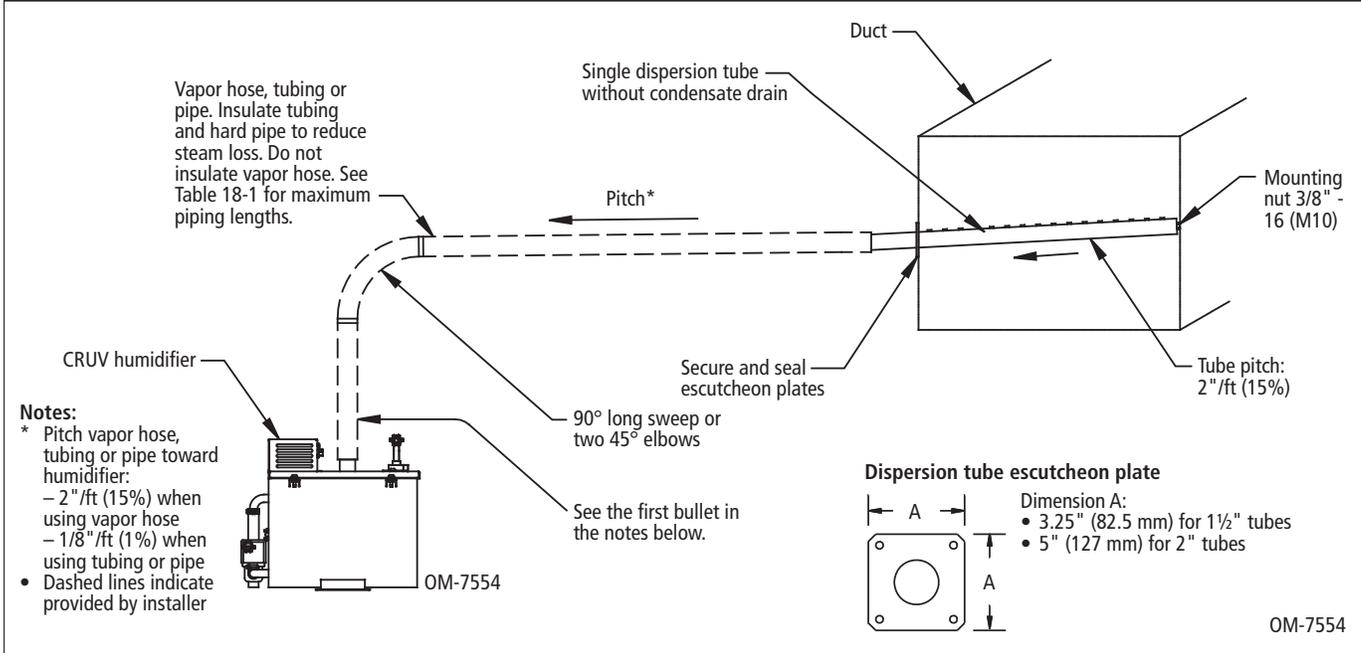
DC-7548

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 vapor hose so there are no sags or low spots.
- Dashed lines indicate provided by installer.

Dispersion: Single tube

**Figure 20-1:
Single tube without condensate drain**



**Table 20-1:
Hose kit sizing by model**

Humidifier models	Hose kit (vapor hose, dispersion tube and hardware)	Maximum capacity of dispersion tube	
		lbs/hr	kg/h
CRUV 2-8	1½" (DN40) hose kit without drain	28.4	13
CRUV 10-16	1½" (DN40) hose kit with drain	56.8	25.8
	2" (DN50) hose kit without drain	56.8	25.8
CRUV 21-25	2" (DN50) hose kit without drain	85.2	38.6
CRUV 30-34	These models require multiple tube assemblies and cannot use a hose kit.		

WARNING!

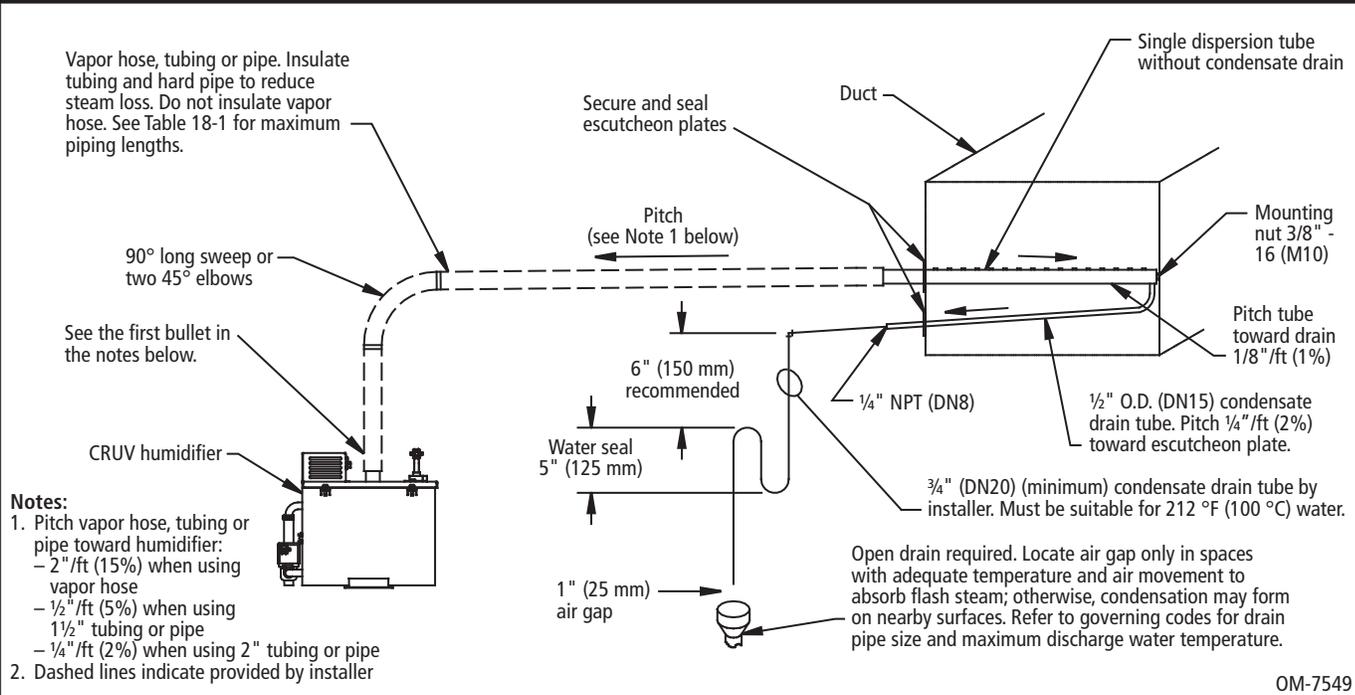
Dispersion tube, vapor hose, tubing, or hard pipe can contain steam, and surfaces can be hot. Discharged steam is not visible. Contact with hot surfaces or air into which steam has been discharged can cause severe personal injury.

Notes:

- Use DRI-STEEM’s hard pipe adapter kit to connect the steam outlet to hard pipe. Use a hose clamp to connect the steam outlet to vapor 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 CRUV steam outlet size 1½" (DN40) or 2" (DN50).
- See the steam carrying capacities in Table 18-1.
- Maximum capacity of dispersion tube (without condensate drain):
– 1½" (DN40): 28.4 lbs/hr (13 kg/h)
– 2" (DN50): 56.8 lbs/hr (25.8 kg/h)
- Orient dispersion tube so that tubelets (steam orifices) point up.
- When mounting the humidifier above the level of dispersion tube, see Figure 19-1.
- Failure to follow the recommendations on this page can result in excessive back pressures on the humidifier. This can lead to dispersion tube(s) spitting, steam blowing through water seals, or leaking gaskets.
- Table 20-1 shows hose kit sizes by humidifier model. A hose kit includes vapor hose, a dispersion tube and hardware. Note that the capacities of models CRUV-30 and CRUV-34 require multiple tube assemblies and therefore cannot use a hose kit. For multiple tube assemblies, see the “Rapid-sorb” section, beginning on Page 22.

Dispersion: Single tube

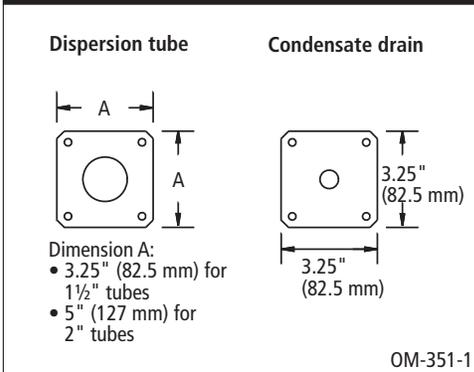
Figure 21-1:
Single tube with condensate drain



Notes:

- Use DRI-STEEM’s hard pipe adapter kit to connect the steam outlet to hard pipe. Use a hose clamp to connect the steam outlet to vapor 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 CRUV steam outlet size 1 1/2" (DN40) or 2" (DN50).
- See the steam carrying capacities in Table 18-1.
- Maximum capacity of dispersion tube with condensate drain:
 - 1 1/2" (DN40): 56.8 lbs/hr (25.8 kg/h)
 - 2" (DN50): 85.2 lbs/hr (38.6 kg/h)
- Orient dispersion tube so that tubelets (steam orifices) point up.
- When mounting the humidifier above the level of dispersion tube, see Figure 19-1.
- Failure to follow the recommendations on this page can result in excessive back pressures on the humidifier. This can lead to dispersion tube(s) spitting, steam blowing through water seals, or leaking gaskets.
- See the Hose Kit Sizing table on the previous page.

Figure 21-2:
Escutcheon plates



WARNING!

Dispersion tube, vapor 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: Rapid-sorb

Important:

Failure to follow the recommendations in this section can result in excessive back pressures 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 the dispersion tube(s).

**Table 22-1:
Rapid-sorb dispersion tube capacities**

Tube capacity		Tube diameter	
lbs/hr	kg/h	inches	DN
≤ 35	≤ 16	1½	40
36-70	17-32	2	50

**Table 22-2:
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

General Rapid-sorb installation instructions

- Before you begin installation, read all dispersion instructions in this manual.
- Before you begin installation, unpack shipment and verify receipt of all Rapid-sorb components with packing list. Report any shortages to DRI-STEEM factory immediately. The components typically include the following:
 - Multiple dispersion tubes
 - Header
 - ¾" × 2" (19 mm × 51 mm) L-bracket
 - 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 are in a plastic bag.
 - The bolts and washers for mounting the dispersion tubes to the bracket will be in the end of the tubes or packaged in a bag with the other accessories.
 - The tubes, header, and L-bracket are tagged with the customer requested identification number written on each component.
- When choosing a location for installation, select a 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.
- Rapid-sorbs are provided with an L-bracket for installation:
 - L-brackets that are 50" (1270 mm) or less in length have a hole 4" (102 mm) in from each end to mount the L-bracket to the duct or air handler wall.
 - L-brackets that are greater than 50" (1270 mm) in length have an additional hole in the center of the L-bracket.
 - **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 the table on the next page). The size, quantity, and location of penetrations are determined by the specific dimensions and configuration of the Rapid-sorb assembly you received.
 - **Note:** The hardware for mounting the L-bracket to the duct or air handler wall and the hardware for the header support bracket is not provided.
- The Rapid-sorb instructions that follow are for the most typical Rapid-sorb installations — installed in a duct horizontal airflow with Rapid-sorb header either inside or outside the duct. See the Dri-calc Installation Guides library or contact your representative/distributor or DRI-STEEM for installation instructions for air handler or vertical airflow applications.

Dispersion: Rapid-sorb

Rapid-sorb pitch requirements

- When installing a Rapid-sorb with the header outside a horizontal airflow duct, consider the following pitch issues:
 - For 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.
 - For 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 the table below and the drawings on the following pages for pitch requirements.

**Table 23-1:
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	Vapor 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	Vapor hose	1½" (DN40) 2" (DN50)	2" /ft (15%) toward Rapid-sorb	2" /ft 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 24-1:
Rapid-sorb dispersion assembly

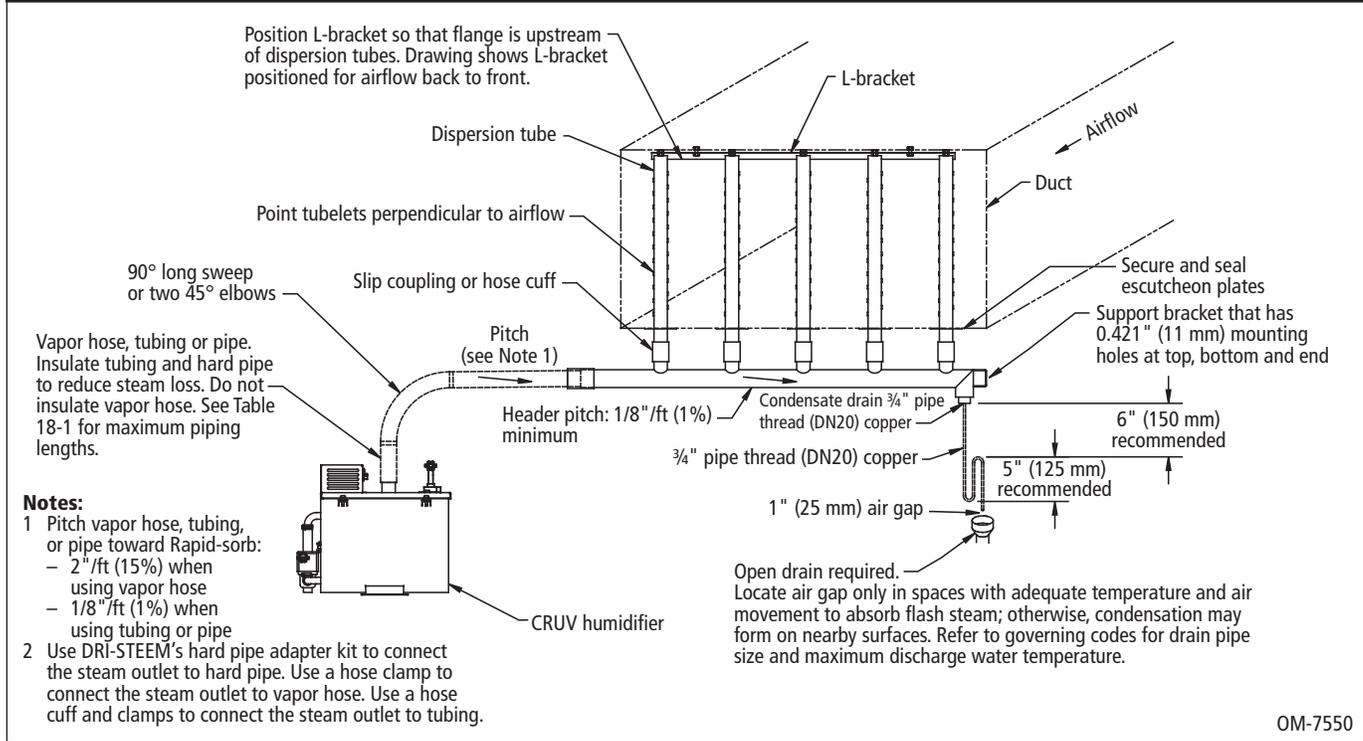
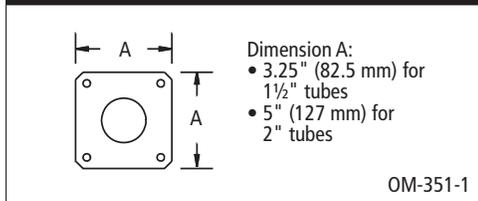


Figure 24-2:
Dispersion tube escutcheon plates



WARNING!

Dispersion tube, vapor 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.

Assembly and installation instructions for a Rapid-sorb installed with header outside the duct (horizontal airflow)

- Locate and cut the holes in the ductwork for the dispersion tubes. Use the L-bracket as a template to locate the holes on the duct floor.
- Temporarily, loosely suspend or support the header below the final location — the vertical balance point of the dispersion tube length dictates where the header should be suspended or supported temporarily.
- Mount the dispersion tubes to the header with the provided connector, either a slip coupling or a hose cuff.
 - 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 on to the tubing.
 - The O-rings are lubricated at the factory. If additional lubrication is necessary, DO NOT use a petroleum-based lubricant.

Dispersion: Rapid-sorb

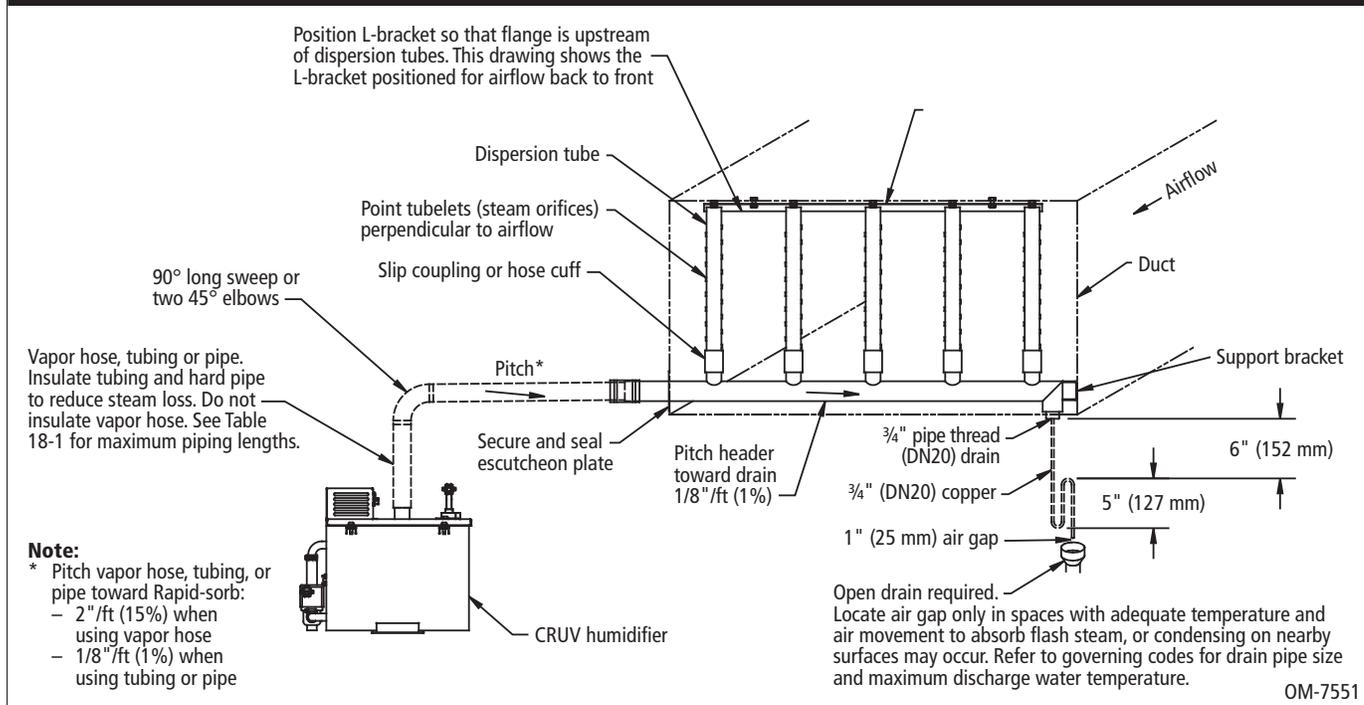
4. Position the flange of the L-bracket so it is upstream of the tubes when the assembly is raised and fastened into position. Fasten the L-bracket to the end of the dispersion tubes with the provided bolt, lock washer, and flat washer.
5. Before tightening the L-bracket bolts to the dispersion tubes follow these instructions:
 - For 1½" (DN40) dispersion tubes:
 - The dispersion tube will rotate in the slip coupling. Verify that the dispersion tube orifices are directed perpendicular to the airflow.
 - The dispersion tube and slip coupling must be fully engaged on to the header stub for the O-rings to provide a seal.
 - For 2" (DN50) dispersion tubes: Before securing the hose cuff in place with the hose clamps on the dispersion tube and the header stub, verify that the dispersion tube orifices are directed perpendicular to the airflow.
6. Slide the assembly up until the L-bracket aligns with the mounting holes in the duct.
 - For 1½" (DN40) dispersion tubes:
 - The header pitch is duplicated in the L-bracket.
 - The dispersion tube and slip coupling must be fully engaged on to the header stub for the O-rings to provide a seal.
 - The high end of the L-bracket can be fastened tight to the duct or air handler.
 - On the low end of the L-bracket, the fastener must be long enough to compensate for the pitch, and a nut should be provided and secured on both sides of the L-bracket and the duct or air handler for stability.
 - For 2" (DN50) dispersion tubes:
 - Fasten the bracket to the top of the duct and use the hose cuffs to compensate for the pitch of the header.
 - Before securing the hose cuff in place with the hose clamps on the dispersion tube and the header stub, verify that the header pitch, 1/8"/ft (1%) toward drain, is maintained.
7. Permanently secure both ends of the header and verify that the 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 28 for steam supply and condensate drain line connection instructions.

Dispersion: Rapid-sorb

Figure 26-1:
Rapid-sorb installed in a horizontal airflow with header inside the duct



Assembly and installation instructions for a Rapid-sorb installed with header inside the duct (horizontal airflow)

1. Locate and cut the 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.

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.

Dispersion: Rapid-sorb

4. Mount the dispersion tubes on the header with the slip couplings or hose cuffs.
 - When installing slip couplings for 1½" (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 on to the tubing.
 - The O-rings are lubricated at the factory. If additional lubrication is necessary, DO NOT use a petroleum-based lubricant.
5. Allow the dispersion tubes to rest against the bottom of the duct.
6. 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.
7. Rotate the assembly up until the L-bracket aligns with the mounting holes in the duct or air handler.
 - 1½" (DN40) dispersion tubes
 - The header pitch is duplicated in the L-bracket.
 - The dispersion tube and slip coupling must be fully engaged on to the header stub for the O-rings to provide a seal.
 - The high end of the L-bracket can be fastened tight to the duct or air handler.
 - On the low end of the L-bracket, the fastener must be long enough to compensate for the pitch, and a nut should be provided and secured on both sides of the L-bracket and the duct or air handler for stability.
 - 2" (DN50) dispersion tubes
 - Fasten the bracket to the top of the duct or air handler and use the hose cuffs to compensate for the pitch of the header.
 - Before securing the hose cuff in place, with the hose clamps on the dispersion tube and the header stub, verify that the dispersion tube orifices are directed perpendicular to the airflow.
8. 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
9. Secure and seal the header escutcheon plate around the header.
10. See the next page for steam supply and condensate drain line connection instructions.

WARNING!

Dispersion tube, vapor 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: Rapid-sorb

Steam supply connections to the Rapid-sorb header

1. 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.
2. If multiple humidifiers are supplying one Rapid-sorb, a multiple steam supply connector is provided.
 - Typically, the multiple steam supply connector attaches to the Rapid-sorb header supply end with hose cuff and clamps.
 - Route the necessary number of steam supplies from the humidifier tanks to the steam supply connector.
 - Position the steam supply connector to accept the steam supplies while maintaining the necessary pitch.
 - Make sure the hose clamps on the steam supply connector and header are tight.

Condensate drain connections to the Rapid-sorb header

1. Piping must be minimum ¾" I.D. (DN20) and rated for 212 °F (100 °C) minimum continuous operating temperature.
2. Condensate drain line must be piped as shown in the figures on the previous pages. 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
3. 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; otherwise, condensing on nearby surfaces may occur.
4. All drain lines must be installed and sized according to governing codes.

Start-up and operation:

Introduction

After the system is installed and connected properly, you can begin start-up procedures.

Start-up and checkout procedures

1. Verify that the humidifier, controls, piping, electrical connections, steam supply, and dispersion unit(s) are installed according to the following:
 - Mounting, piping, wiring, and dispersion instructions in the “Installation” section of this manual, beginning on Page 8
 - *Vapor-logic3 Installation and Operation Manual*, if using the Vapor-logic3 control option:
 - “Installation” section
 - Installation checklist
 - Wiring diagrams shipped with humidifier
 - All governing codes
2. Verify that the humidifier is mounted level and securely supported before filling with water (see the operating weights in Table 6-1).
3. Verify that the humidifier is level front to back and side to side after it is full of water.
4. Refer to the LW417 section of this start-up procedure or the *Vapor-logic3 Installation and Operation Manual*—the “Operation” section and the “Start-up checklist” (it is critical that the installer follow this checklist).
5. During start-up, do not leave the humidifier unattended.
6. Monitor humidifier operation through multiple fill cycles.
7. At start-up, DRI-STEEM recommends initially running the humidifier with the factory default setting for skim time. (See “Adjusting skim duration” on Page 34.)

The CRUV humidifier is available with either the standard LW417 Electronic Water Level Control Module or the optional Vapor-logic3 microprocessor control system. If your system is equipped with the Vapor-logic3 system, see the *Vapor-logic3 Installation and Operation Manual* for more information. Then continue reading this manual beginning with the “Maintenance” section on Page 34.

More on the next page ►

WARNING!

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.

CAUTION! 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.

Note:

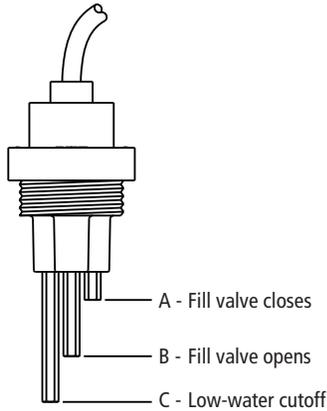
The *Vapor-logic3 Installation and Operation Manual* is a comprehensive operation manual. Refer to it for information regarding the following features:

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

The *Vapor-logic3* manual was shipped with your humidifier. Additional copies can be viewed, printed, or ordered at www.dristeem.com.

Start-up and operation: Standard water models

Figure 30-1:
Water level control for standard water systems



VLC-OM-030

LW417 electronic water level control (for standard water units only)

The LW417 is a custom microprocessor-based water level controller developed to operate with DRI-STEEM humidifiers. The features of this controller are:

- Water level control (for standard water units)
- 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. Filling continues until the water reaches level A (see Figure 30-1), at which time the fill valve closes. To ensure that a water seal is created in the field installed water seal, disconnect the probe plug and cable from the probe rod assembly (located on top of the tank), allowing the fill valve to re-energize and overfill the humidifier tank. This process takes a short time. Reconnect the probe plug and cable. Create a call for humidify to ensure the steam valve opens.

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

Water refill

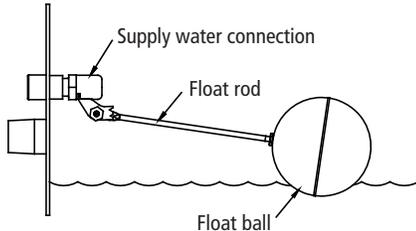
During operation, when the water line drops below level B, the fill valve opens and remains open until the water line returns to level A (see Figure 30-1).

Low water condition

Should the water line drop below level C, the steam valve is de-energized and remains OFF until the water line is restored to level C.

More on the next page ►

Figure 30-2:
Water level control for DI/RO water systems



Systems using deionized (DI) water or water that has been treated through reverse osmosis (RO) control water levels using a float valve and low water cutoff switch.

VLC-OM-026

Start-up and operation: Standard water models

Automatic drain and flush

The control module contains an integral electronic timer that tracks the humidifying time of the unit. When this accumulated time reaches what has been set in the timer, the drain/flush cycle is activated.

Upon activation, the following sequence occurs:

1. The drain valve opens, draining the mineral laden water from the evaporating chamber.
2. The default drain time is 10 minutes.
3. Flushing occurs during the last 10% of drain period.

The electronic timer is factory set for drainage after 40 hours of operation. Alternate settings of 20 hours and 80 hours are available. See the wiring diagram(s) attached to the unit for timer board location and instructions for changing the timer setting or refer to Table 31-1.

Test cycling the drain/flush system

The level control board incorporates a set of slide switches marked 1 through 8. To test:

1. Place “SW1” slide switches 1, 2, and 3 to the off position.
2. Set the humidistat high enough so the unit remains “on call” for at least 15 minutes.
3. After about 2 minutes of operation, activation takes place, causing the drain valve to open. The water level then drops to level C (see Figure 30-1) and allows the fill valve to open. Both valves will remain open for the remainder of the autodrain and flush period.
4. The drain valve then closes, and the water level rises to level A (see Figure 30-1), causing the fill valve to close.
5. Once the test cycle is complete, return the slide switches back to the desired operating mode. Failure to do so will result in a drain/flush cycle every 2 minutes.

Variable skim times

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 level A (see Figure 30-1). 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 “Adjusting skim duration” on Page 34. See wiring diagram(s) shipped with the unit for timer board location and instructions for changing the skim time setting.

End-of-season drain

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

**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

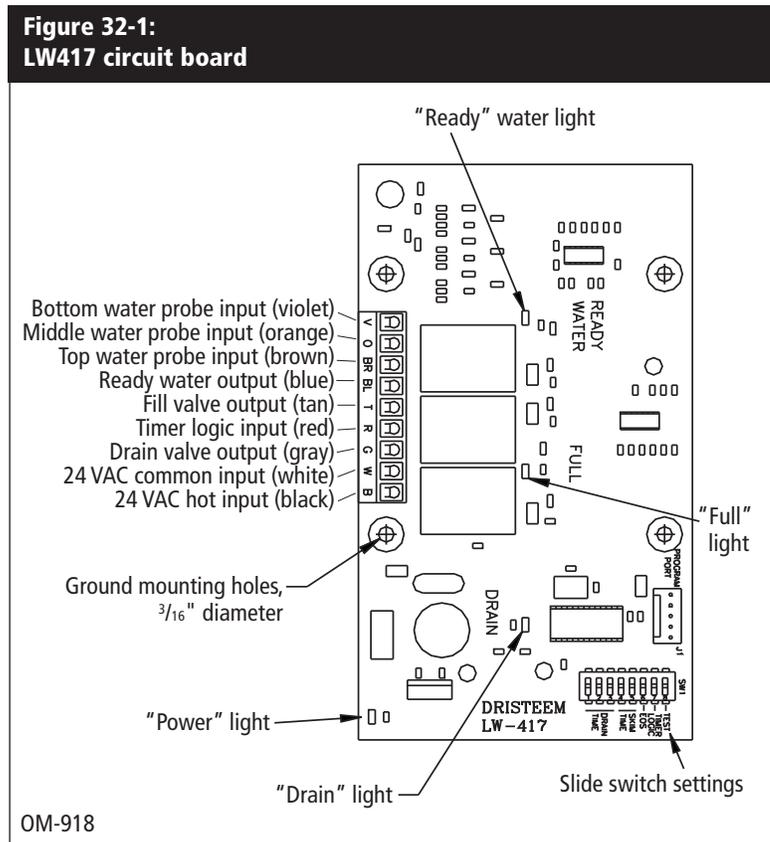
More on the next page ►

Start-up and operation: Standard water models

Onboard diagnostics

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 the troubleshooting guide on Pages 42–45 for any water level control module issues.

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



Start-up and operation: DI water models

1. Adjust the humidistat to the "call" setting.
2. Open the shut-off valve on the water supply line. Unit should begin filling with water through the fill valve.
3. Shortly before the fill valve shuts off, the float operated heater cut-off switch will "make." When this switch makes, the heating element contactor(s) will be actuated. A time delay relay circuit prevents contactor chatter due to bouncing of heater cut-off float.
4. Check the heater cut-off circuit:
 - a. Close the manual valve on the water supply.
 - b. Open the drain valve and start draining the unit.
 - c. When water level drops past the switching level on the heater cut-off float, the heating element contactor(s) will drop out.
 - d. When Step C has been satisfactorily completed, close drain valve.
5. Check the function of the field-installed safety controls, such as the fan proving switch. Contactor(s) should drop out when the proving switch is "open."
6. Check the heater draw by testing and recording voltage and amperage in each phase. Readings should match the name plate readings. The name plate is located on the humidifier housing.
7. Inspect the installation for steam or air leaks while operating the humidifier. Any leaks should be sealed.

Water quality

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 DRI-STEEM's Humidifier De-scaling Solution, available for purchase from your DRI-STEEM representative or distributor.

The De-scaling Solution cleans without risk of corroding humidifier tanks or welds; and there is no off-gassing, flammability, or added heat risks associated with other cleaning solutions. The De-scaling Solution also cleans surfaces unreachable by hand scraping.

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

mc_021908_1410

The best way to determine how often your particular system needs maintenance is to remove the tank cover and inspect it for mineral deposits after three months of duty. Potable water carries a variety of minerals and other materials in a mix that varies from location to location. This variation in water quality, combined with the hours of operation and duty cycle, will determine your own unique maintenance schedule.

Water quality makes a difference

- Light to moderately hard water (2 to 10 grains hardness per gallon [35 mg/L to 170 mg/L]) requires:
 - Annual cleaning
 - Regular skimming
- High mineral content water (more than 10 grains hardness per gallon [more than 170 mg/L]) requires:
 - Cleaning frequency determined by use and water quality
 - Regular skimming
 - Periodic drain and flush cycles
- Softened water, which dramatically reduces mineral accumulation inside the standard water models, requires:
 - Increased skim time
 - No drain and flush cycles

Note: Solids, like silica, are not removed in the softening process.
- DI/RO water (Model CRUV-DI)
 - No regular cleaning required (although regular inspections are advised)
 - No drain and flush cycles required
 - The presence of chlorides in DI water will eventually cause pitting and failure of the tank and its components.

Adjusting skim duration

The skim time duration determines the quantity of water skimmed with each fill cycle. The skim time is field adjustable using the dip switches on the LW417 (Table 34-1) or the Vapor-logic3 keypad.

Each time the humidifier refills, it fills to an elevation near the lip of the skim overflow fitting. A portion of the refill water then flows to the drain carrying most of the minerals left by the previous evaporating cycle. This reduces the mineral concentration, thereby reducing the frequency of cleaning needed.

Table 34-1:
Skim time settings

	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

Standard water models

This section is for CRUV non-DI humidifiers with either the LW417 or Vapor-logic3 control system:



Shut down humidifier

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

1. If the humidifier is equipped with a Vapor-logic3 controller, use the keypad to change the control mode to Standby.
2. Shut off all electrical power to the humidifier using the field-installed fused disconnect, and lock all power disconnect switches in the OFF position.
3. Close the field-installed manual water supply shut-off valve.

Inspection and maintenance

Annually (also recommended when maintenance is performed)

1. 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. 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.
3. Inspect tank and gaskets for leaks.

Seasonally (or as required, depending on water quality)

Clean the evaporating chamber. See Steps 3 and 4 on Page 37.

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.



Cool down humidifier

Before performing service or maintenance procedures, allow the tank to cool down. 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.

1. 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.
2. Verify that the tank is in Auto mode so it will fill after draining begins.
3. Drain the tank. See Step 1 on Page 36.

Standard water models

Mineral precipitate

As evaporation takes place in the humidifier, some of the minerals dissolved in the water precipitate out and float on the water surface. The minerals not removed by the skimmer will settle to the bottom of the evaporating chamber.

Cleaning the evaporating chamber

The heating element itself is self-cleaning. The mineral buildup on the element flakes off after reaching a thickness of about 1/16" (2 mm), and settles to the bottom of the chamber.

CAUTION!

Before this mineral scale builds up on the underside of the heating element, it must be removed. Failure to do so may result in premature heater burn-out.

Long heater element life can be expected when the operation of the humidifier is observed for a few weeks following initial start-up. By observing the mineral build-up rate, the frequency of both drain/flush use and manual cleaning can be determined and adjustments made.

The humidifier is designed for convenient cleaning and maintenance.

To inspect and service:

1. Drain the tank. See Step 3 at left.
 - a. 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.
 - b. Let the fill water run until the tank is cooled; then shut off the field-installed manual supply water shut-off valve.
 - c. Let the tank drain; then manually close the drain valve.
2. Clean the probes:
 - a. Unplug probe plug assembly. Leave ground wire connected to tank.
 - b. Unscrew the probe rod assembly using the probe tool connected to a 3/8" square drive.

Standard water models

- c. Inspect the probe housing and clean, ensuring that all the housing passageways are clear. Remove the housing from the holding bracket by sliding the housing horizontally toward the open end of the bracket.
 - The scale should flake off easily from the probe assembly rods.
 - The bottom 3/8" (10 mm) of each rod is the sensing portion; clean these areas with a wire brush, abrasive pad, or steel wool.
 - d. Inspect the composite plastic probe rod assembly for any signs of cracking, roughness, or deterioration. If found, replace probe assembly.
 - e. Reassemble and install the probe and probe plug assembly. Verify ground wire is solidly connected to tank.
3. Remove the tank cover and wet vac minerals out of tank (recommended).
 4. To remove tank for cleaning, disconnect drain line union, fill valve supply line, electrical connections to drain, (disconnecting field wiring in conduit is NOT recommended,) thermal trip, heaters, fill valve, and probe. Disconnect steam hose from top of tank and remove mounting bracket fasteners.
 5. Remove evaporating chamber and clean.
 6. Install the probe and probe plug assembly. Verify that ground wire is connected.
 7. Replace tank cover, making sure tank is sealed tight.
 8. Reconnect drain line union, fill valve supply line, electrical connections to drain, thermal trip, heaters, fill valve, and probe. Connect steam hose to top of tank.
 9. Verify drain valve lever is in AUTO position.

The CRUV humidifier is again ready to humidify.

Off-Season Shutdown

1. Switch off power.
2. Turn off water supply to make-up valve.
3. Drain evaporating chamber and clean if necessary. See steps 1 through 9 in "To inspect and service" above.
4. Leave chamber dry, power OFF and water shut-off valve closed until the next humidification season.

DI water models

This section is for CRUV-DI humidifiers with either the LW417 or Vapor-logic3 control system:



Cool down humidifier

Before performing service or maintenance procedures, allow the tank to cool down. 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.

1. 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.
2. Verify that the tank is in Auto mode so it will fill after draining begins.
3. Drain the tank. See Step 1 on Page 40.



Shut down humidifier

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

1. If the humidifier is equipped with a Vapor-logic3 controller, use the keypad to change the control mode to Standby.
2. Shut off all electrical power to the humidifier using the field-installed fused disconnect, and lock all power disconnect switches in the OFF position.
3. Close the field-installed manual water supply shut-off valve.

DI water models

Inspection and maintenance

Annually (also recommended when maintenance is performed)

1. 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 float
2. 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.
3. Inspect tank and gaskets for leaks.

Seasonally (or as required, depending on water quality)

1. Examine the evaporating chamber.
2. Check water conditioning equipment for proper operation.

Off-season maintenance

Perform complete inspection and cleaning of the following:

- Heaters
- Float valve
- Skimmer port and water seal
- Humidifier tank

After examining, the humidifier should remain empty until humidification is required.

DI water models

To inspect and service:

1. Drain the tank:

Models with a standard drain valve:

- a. Manually open the ball valve. The fill valve will open after enough water has drained out of the tank.
- b. Let the fill water run until the tank is cooled; then shut off the field-installed manual supply water shut-off valve.
- c. Let the tank drain; then manually close the drain valve.

For models with optional drain valves without the manual open lever, use the keypad to perform the cool down procedure:

- a. Go to the control modes screen and select Manual Drain.
- b. Allow approximately half the water to drain out of the tank.
- c. In the Control Modes screen select Auto; the fill valve opens and the humidifier cools down.
- d. 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-logic3 Installation and Operation Manual*.

2. Shut off electrical power to unit.
3. Shut off water supply to make-up valve.
4. Make sure evaporating chamber is drained.
5. Unscrew four cover bolts and remove cover.
6. Check operation of float valve and low-water cut-out.
7. Inspect heating elements.

DI water models

8. Inspect evaporating chamber and clean if necessary.
9. Inspect cover gasket, and replace if necessary.
10. Replace chamber cover.
11. Verify drain valve is in the closed position.
12. Open water supply valve and turn on electric power.
13. CRUV-DI humidifier is again ready to humidify.
14. If necessary, remove tank as follows: Remove flexible vapor hose from tank. Close drain valve. Disconnect unit from drain and supply water lines. **DO NOT DISCONNECT ANY OF THE ELECTRICAL CONDUITS.**

Water quality recommendations

DI models use DI/RO 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 DI water will eventually cause pitting and failure of the humidifier tank and its components. Damage caused by chloride corrosion is not covered by your DRI-STEEM warranty.

Troubleshooting guide

**Table 42-1:
CRUV troubleshooting guide (LW417 electronic water level system only)***

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	Lack of tank to probes electrical continuity. Water conductivity 100 microSiemens/cm (2 gr/gal) minute	Jumper wires violet, orange then brown to ground. If water stops, verify tank ground; check water supply 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	10 minute must complete first.
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	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.
Note:					
* For Vapor-logic3 troubleshooting, see the Vapor-logic3 Installation, Operation and Maintenance Manual.					
** 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 guide

**Table 43-1:
CRUV-DI troubleshooting guide**

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 guide

**Table 44-1:
CRUV troubleshooting guide (Vapor-logic3 only)**

Problem	Possible cause	Recommended action
Humidifier does not heat	Incorrect or nonexistent supply voltage to unit	Check main line safety switch. Check main line fuses. Check for proper supply voltage.
	Incorrect or nonexistent control voltage	Reset control transformer circuit breaker. Check for 24 VAC control circuit voltage at T-1 and T-2 on the control board.
	Humidistat not calling	Set humidistat to call. Inspect for faulty humidistat.
	Safety controls open	Check safety controls, airflow switch, and high limit humidistat.
Humidifier will not fill	No water pressure at valve	Check water supply/shut off valves.
	Faulty water fill valve	Check for 24 volts at the fill valve.
	Plugged strainer	Check strainer.
	Plugged valve	Check valve.
	Faulty control board	Verify control voltage across the fill valve output.
Humidifier does not stop filling	Lack of tank to probe electrical continuity. Water conductivity must be 100 microSiemens/cm (2 gr/gal)	Add salt to the tank. If this solves the problem, consult factory for further advise.
	Fill valve stuck open	Check valve for foreign matter
	Drain valve not closed	Check for correct water flow through valves by noting arrow.
	Autodrain mode	Humidifier may be in periodic drain and flush. Check controller display.
Low output	Electric drain valve not seating	Correct the cause of leakage or replace valve.
	Fill valve stuck open	Check valve for foreign matter.
Unit short-cycles	Controller cycle rate set too low	Review controller cycle set point.
Reduced or no output even though water is at the proper level	Heater malfunctioning	Verify that proper voltage is being applied to heaters. Check heater amp draw and compare to wiring diagram ratings.
	Malfunctioning control system	Replace heater contractor if not functioning. Verify Auxiliary limit controls (humidistat, airflow proving switch, etc.) and reset, replace or calibrate as needed.
Note: * 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.		

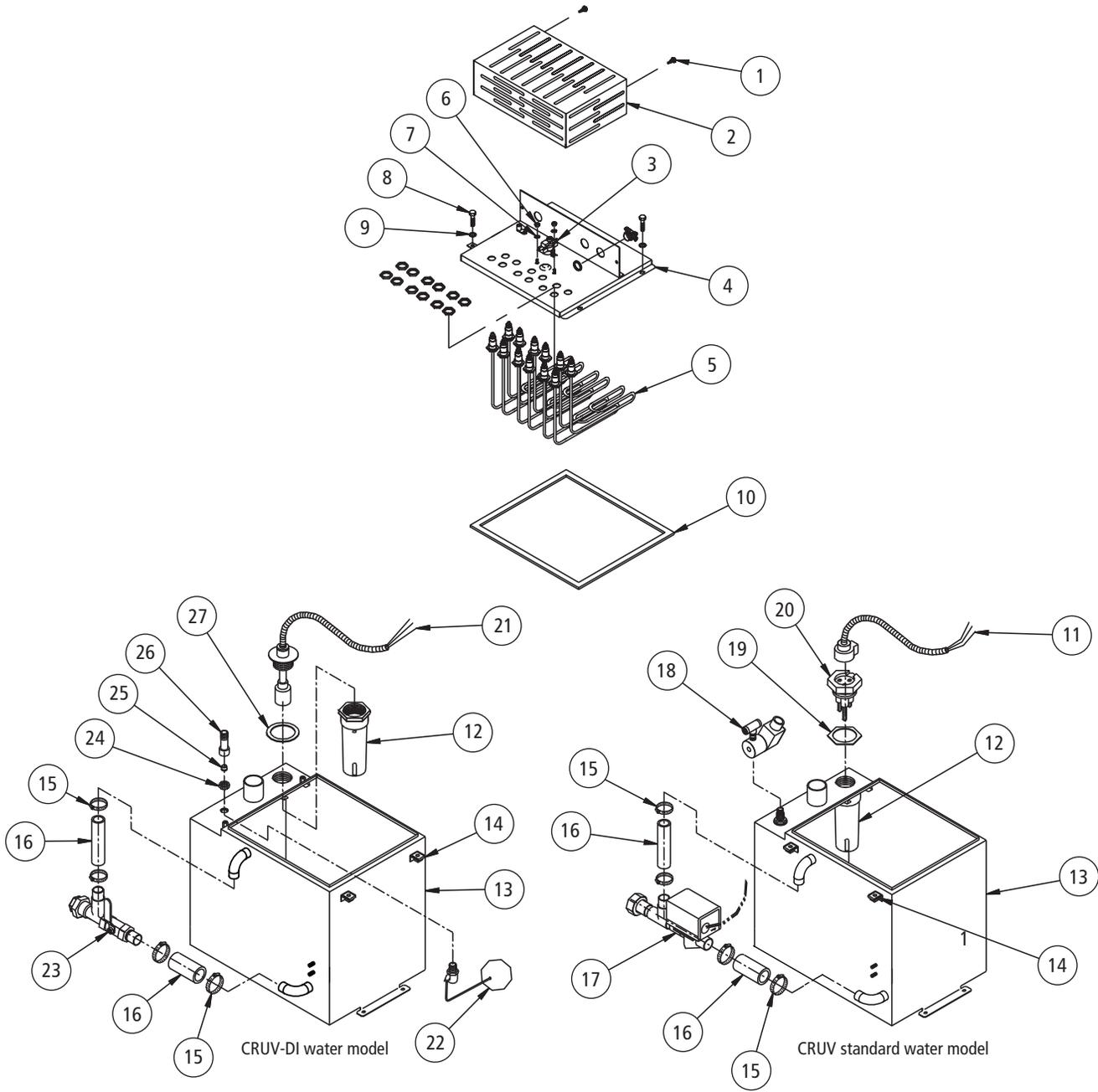
Troubleshooting guide

**Table 45-1:
CRUV-DI troubleshooting guide (Vapor-logic3 only)**

Problem	Possible cause	Recommended action
Humidifier will not heat	Control transformer	Reset control transformer circuit breaker.
	Humidistat is not calling	Set humidistat to call. Inspect for faulty humidistat.
	Safety controls open	Check safety controls, airflow switch, high limit humidistat, etc.
	Low water float cutoff	Check at board 32 and 33. Measure 0 volts for closed switch, approximately 2.5 volt for A.C. open switch.
Humidifier will not fill	No water pressure at valve	Check manual water supply. Valve, minimum 25 psi water pressure.
	Malfunctioning float switch	Check to make sure that float moves freely on stem.
	Plugged fill valve	Check fill valve inlet.
Humidifier does not stop filling	Open drain valve	Obstruction in drain valve will not allow complete closure, clean or replace valve.
	Manual drain valve not closed	Close drain valve.
	Fill valve stuck open	Check valve for foreign matter, water-logged float, broken float arm, or worn valve stopper.
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.

Replacement parts: CRUV Humidifier

Figure 46-1:
Replacement parts



OM-779-A

Replacement parts: CRUV Humidifier

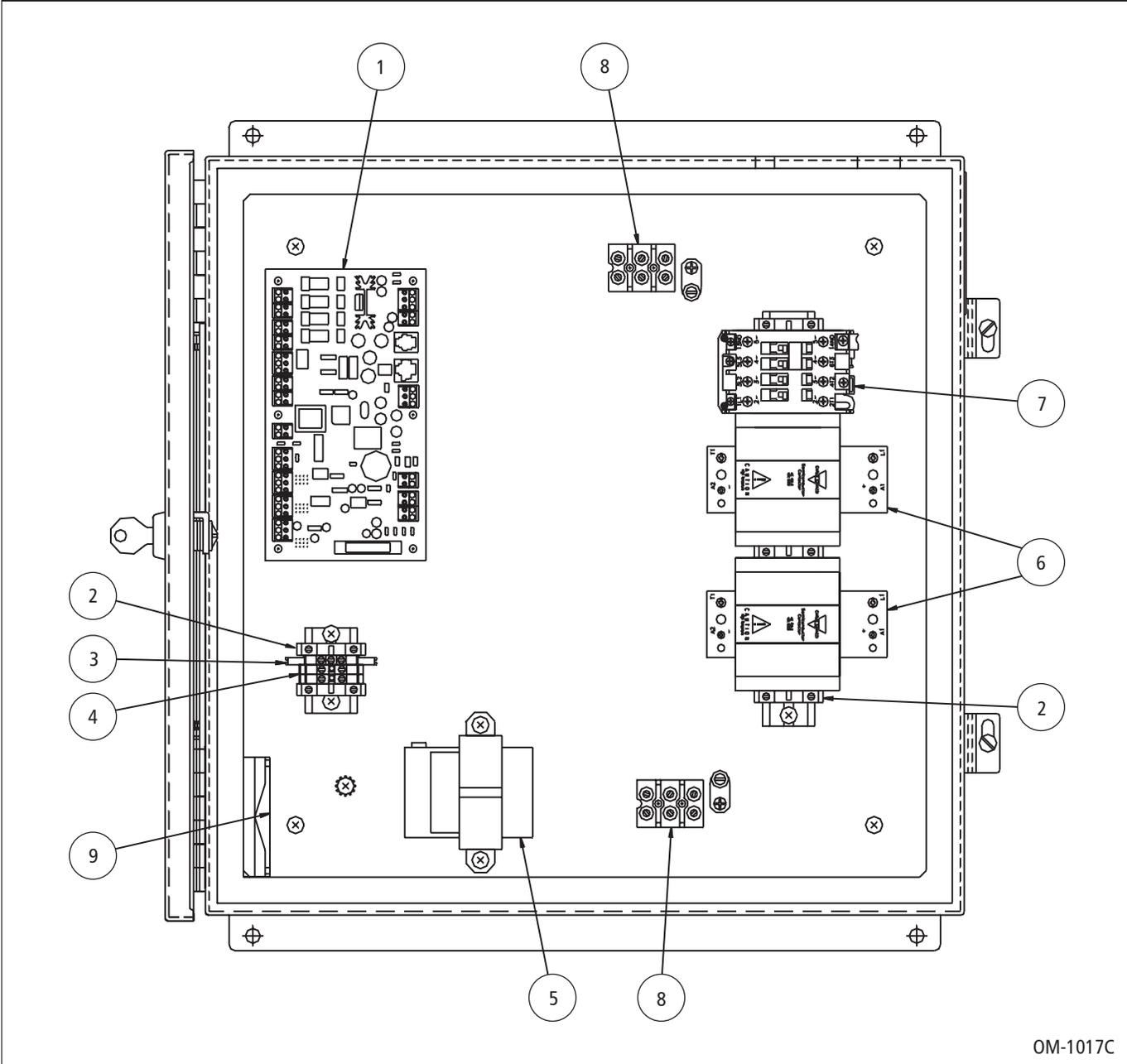
**Table 47-1:
Replacement parts**

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	505084
5	Heater element	*	409600-*	19	Probe assembly gasket	1	309750-003
6	Hex nut plated, #8-32	4	700200-002	20	Probe assembly (CRUV 2-4)	1	406270
	Hex nut plated DI, #8-32	6	700200-002		Probe assembly (CRUV 6-34)	1	406275
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 4-16)	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	309750-004

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

Replacement parts: Control cabinet with Vapor-logic3, SSR

Figure 48-1:
CRUV control cabinet with Vapor-logic3 and SSR option



OM-1017C

Replacement parts: Control cabinet with Vapor-logic3, SSR

**Table 49-1:
CRUV control cabinet with Vapor-logic3 and SSR option**

Item	Description	Qty	Part No.
1	Main board with Vapor-logic3	1	408490-001
2	Block, din rail stop	5	408252-006
3	Terminal, ground	1	408252-010
4	Terminal	2	408252-001
5	Transformer, 120/280/240/480*	1	408965-001
	Transformer, 600V*	1	408986
6	SSR, 480 VAC 50 amp 1 pole	2	408677-002
7	Contactator, 60 amp*	1	407001-021
	Contactator, 32 amp*	1	408991
8	3 Pole 3 phase power block*	2	408300-002
	2 Pole 1 phase power block*	2	408300-001
9	Fan, 24 volt	1	408677-001

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

Replacement parts: Control cabinet with Vapor-logic3

**Table 51-1:
CRUV control cabinet with Vapor-logic3 option**

Item	Description	Qty	Part No.
1	Subpanel, 13" x 15"	1	165720-003
2	DIN rail, 2-1/4" long	2	167765-0022
3	DIN rail, 4-1/2"	1	167765-0045
4	Contactora, 35A*	1	407010-001
	Contactora, 55A*	1	407010-002
5	Transformer, 600V*	1	408986
	Transformer, 120/240/480/208*	1	408965-001
6	3 pole 3 phase power*	1	408300-002
	2 pole 1 phase power*	1	408300-001
7	Block, DIN rail stop	4	408252-006
8	Terminal	2	408252-001
9	Terminal, ground	1	408252-010
10	Ground lug, L-70 6-8 GA CP-4	1	409250-018
11	Screw, #6-32 x 1-1/4" type F	2	700100-002
12	Screw, #8-32 x .38 phillips type F	8	700170-001
13	Screw, #6-32 x .75 phillips type F	6	700100-001
14	Standoff, metal #8 x 3/8"	6	409592
15	Nut hex #6-32 plated	6	700100-003
16	Microprocessor board	1	408490-001
17	Star washer, #8-32 external tooth	1	700200-003
18	Label, copper wire	1	805050
19	Label, machine ground	1	800010
20	Label, system ground	1	806810
21	Label, protective earthing	1	806820

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

Expect quality from the industry leader

For more than 40 years, DRI-STEEM has been leading the industry with creative and reliable humidification solutions. Our focus on quality is evident in the construction of the CRUV, which features cleanable stainless steel construction and an industry-leading Two-year Limited Warranty that covers all parts.

For more information

www.dristeem.com
sales@dristeem.com

DRI-STEEM Corporation

An ISO 9001:2000 certified corporation

Continuous product improvement is a policy of DRI-STEEM Corporation; therefore, product features and specifications are subject to change without notice.

U.S. Headquarters:
14949 Technology Drive
Eden Prairie, MN 55344
800-328-4447
952-949-2415
952-229-3200 (fax)

European office:
Marc Briers
Grote Hellekensstraat 54 b
B-3520 Zonhoven
Belgium
+3211823595 (voice)
+3211817948 (fax)
E-mail: marc.briers@dristeem.com

DRI-STEEM, CRUV, Rapid-sorb, and Vapor-logic are registered trademarks or trademarks of DRI-STEEM Corporation and are filed for trademark registration in Canada and the European community.

© 2009 DRI-STEEM Corporation



Form No. CRUV-IOM-0209
Part No. 890000-001 Rev. A

Two-year Limited Warranty

DRI-STEEM Corporation (“DRI-STEEM”) 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 DRI-STEEM ships such product, whichever date is the earlier.

If any DRI-STEEM product is found to be defective in material or workmanship during the applicable warranty period, DRI-STEEM’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 DRI-STEEM’s election. DRI-STEEM shall not be liable for any costs or expenses, whether direct or indirect, associated with the installation, removal or reinstallation of any defective product. The Limited Warranty does not include cylinder replacement for electrode steam humidifiers.

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

DRI-STEEM’s Limited Warranty is made in lieu of, and DRI-STEEM 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.

DRI-STEEM SHALL NOT, UNDER ANY CIRCUMSTANCES BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, REVENUE OR BUSINESS) OR DAMAGE OR INJURY TO PERSONS OR PROPERTY IN ANY WAY RELATED TO THE MANUFACTURE OR THE USE OF ITS PRODUCTS. The exclusion applies regardless of whether such damages are sought based on breach of warranty, breach of contract, negligence, strict liability in tort, or any other legal theory, even if DRI-STEEM has notice of the possibility of such damages.

By purchasing DRI-STEEM’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 DRI-STEEM 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.

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

mc_051308_0630

