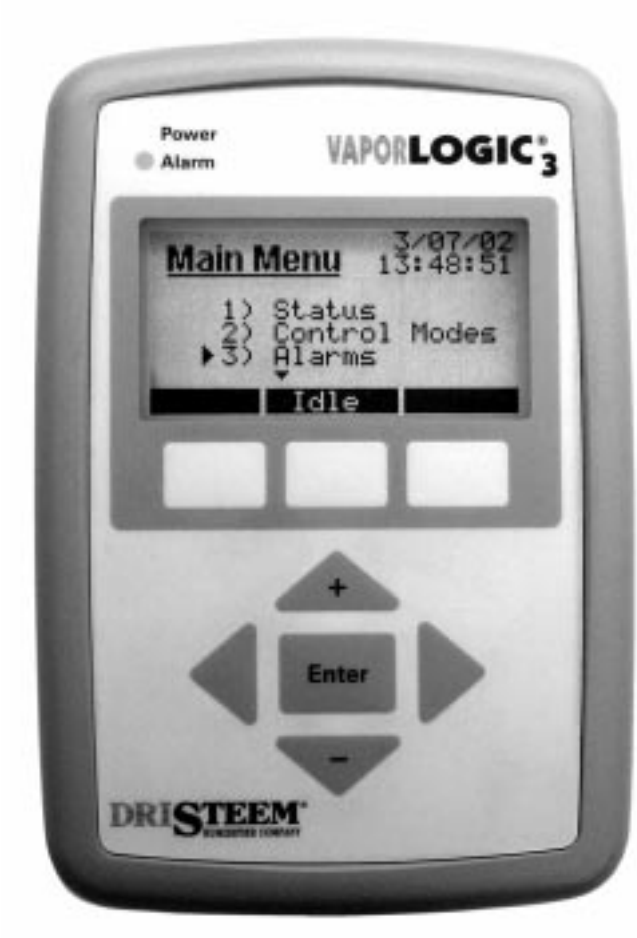
*Read and save these instructions.*

# VAPOR-LOGIC®3

## Microprocessor-based humidifier control system

## Installation and operation manual




DRISTEEM® HUMIDIFIER COMPANY

A SUBSIDIARY OF RESEARCH PRODUCTS CORPORATION

ISO 9001
DNV
DNV Certification, Inc.
Certificated Firm

# VAPOR-LOGIC$_3$® table of contents

**PLEASE: read this manual**

This manual will guide you through installation and operation procedures for your new VAPOR-LOGIC$_3$ microprocessor-based humidifier control system. Proper installation and operating practices will ensure years of trouble-free service.

For information about your humidifier tank or dispersion unit, see the manuals for those specific products.

# VAPOR-LOGIC$_3$® features overview

## Accurate, responsive microprocessor control

Our newest controller, VAPOR-LOGIC$_3$, provides unprecedented, comprehensive control for DRI-STEEM® humidifiers. With expanded capabilities, easy-to-use keypad, and modular, open protocol design, the VAPOR-LOGIC$_3$ efficiently controls all humidifier functions.

Navigating the keypad to adjust or review humidifier functions is an intuitive process of walking through easily read screen menus.

You will find no other controller in the humidifier market able to provide such functionality, ease of use, and accurate RH control.

## Control options

- **On-off control:** VAPOR-LOGIC$_3$ uses a humidistat to enable single-staged or multiple-staged electric outputs.

  Expected accuracies: ± 5% to 7% RH

- **Time proportioned control:** VAPOR-LOGIC$_3$ directly reads space RH and uses a PID loop to vary the duty cycle of humidifier outputs to the SSR power controllers.

  Expected accuracies:

  – Contactor action: ± 2% to 4% RH

  – SSR action: ± 1% to 3% RH

- **Modulated control:** VAPOR-LOGIC$_3$ directly reads space RH and uses a PID loop to control modulating steam or hot water valves (on STS® or LTS®) or GTS® burners by providing a linear analog signal to the combustion air blowers.

  Expected accuracies: ± 2% to 5% RH

- **Control signal by others:** VAPOR-LOGIC$_3$ accepts an analog control signal from another controller that directly determines the output of the humidifier.

  Expected accuracies: determined by external control system

**More on next page ...**

# VAPOR-LOGIC$_3$® features overview

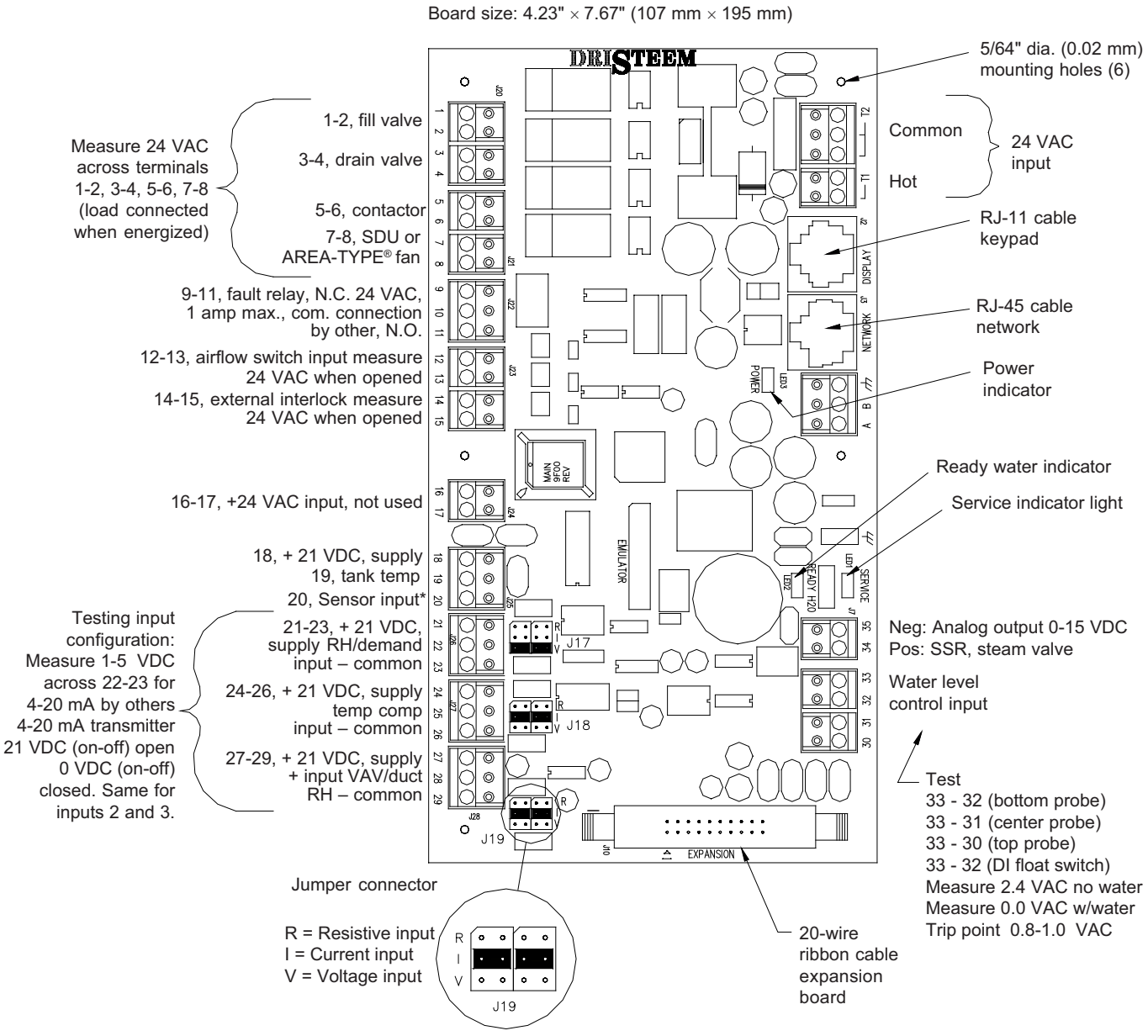
## Summary of features

The VAPOR-LOGIC$_3$ features the following:

- **PID control** provides accurate, responsive, and adjustable relative humidity (RH) control.
- **Self-diagnostic test at startup**
- **End-of-season autodrain**
- **Real-time clock** allows time-stamped alarm tracking and three ways to program drain and flush cycles:
  1. Usage (unit drains after a set number of gallons [liters] cycle through)
  2. Usage and time (unit drains at a preset time after a set number of gallons [liters] cycle through)
  3. At a preset time
- **Keypad** has a backlit display and features:
  - Intuitive menu-driven access to all system functions
  - Default screen for quick viewing of status and set points
  - Data reports to track performance and efficiency
  - System diagnostics and alarm tracking for troubleshooting
  - Password protection of setup parameters
  - Easy viewing in low light environments
  - Three ways to mount the keypad:
    1. Hand held (shipped with a 5' [1.5 m] cable)
    2. Mounted on the side of the control cabinet
    3. Mounted remotely using a standard telephone plate. The keypad can be located up to 500' (152 m), the maximum length of the keypad cable, from the controller board and control cabinet.
- **Tank temperature sensor**, mounted on the evaporating chamber, allows VAPOR-LOGIC$_3$ to provide:
  - Overtemperature protection
  - Freeze protection
  - Tank preheating, allowing rapid response to a call for humidity
- **Sensitivity to low conductivity water** (important when using a standard humidification system with low mineral content water)
- **Single-controller platform; modular design** The new VAPOR-LOGIC$_3$ controller soon will be standard on all DRI-STEEM humidifiers. The base configuration includes a main controller board and keypad. Expansion modules will increase capability, thereby allowing all systems to use the same controller platform and keypad interface.

# VAPOR-LOGIC$_3$® circuit board diagram

**Figure 5-1: VAPOR-LOGIC3 printed circuit board**




*Sensor resistance:
1000 ohms, 72 ° F (22.2 ° C), 2.75 VDC term. 19, 20
1625 ohms, 200 ° F (93.3 ° C), 4.1 VDC term. 19, 20
1695 ohms, 212 ° F (100 ° C), 4.3 VDC term. 19, 20

VL3-OM-008

# Main control board connections

## VAPOR-LOGIC®3 main control board connections

**J1** Wire terminal supplies 24 VAC to power the VAPOR-LOGIC$_3$ control board.
- Double terminal T1 to 24 VAC, 10 VA maximum load
- Triple terminal T2 to 24 VAC common

**J2** RJ-11 female modular jack connection for supply voltage and FTT-10A communication to keypad/display

**J3** RJ-45 female modular jack connection for FTT-10A communication to LonTalk® network

**J4** Wire terminal connection for FTT-10A communication to LonTalk network. Terminals A and B provide the communication lines. The last terminal is earth ground.

**J5** End-of-line communication terminator pins

**J6** ¼" (6.4 mm) push-on connector for earth ground

**J7** 0 to 15 VDC analog output, typically connected to the input of a steam or hot water valve and 0 to 10 VDC digital output to solid state control (SSR). Terminal 34 is the positive output signal and terminal 35 is common.

**J8** Connector receives necessary continuity input signals from water detection devices:
- Standard water level detection (probe system)
  - Terminal 30 detects maximum water level from top probe rod and brown or black plug wire.
  - Terminal 31 detects water level at refill point from middle probe rod and orange or white plug wire.
  - Terminal 32 detects water level at its lowest point from lower probe rod and purple or red plug wire.
  - Terminal 33 is the common return path for all water detection rods from the humidifier tank machine ground back to VAPOR-LOGIC$_3$ control.
- DI/RO water level (float valve system)
  - Terminals 30 and 31 not used.
  - Terminal 32 is connected to the humidifier tank low water float switch (normally open).
  - Terminal 33 receives the return signal from the float switch to VAPOR-LOGIC$_3$ control via machine ground.

**J9** Not used

**J10** Ribbon cable connector for VAPOR-LOGIC$_3$ expansion modules

**More on next page ...**

# Main control board connections

## Main control board connections (cont.)

⚠ Important note about J17, J18, and J19:

All external wiring connection diagrams show shunts on J17, J18, and J19. The shunts and appropriate software are configured by DRI-STEEM® based on original customer orders. **Field modification of these shunts requires control input modification: See page 24, "Changing control input."**

**J17** These jumper pins determine the type of analog input signal that is read at the RH sensor input (terminals 21 through 23, terminal block J26). The three jumper positions are summarized below:

- R = Resistance, 0 to 150 ohms range
  - Used with on-off humidistats, staging switches, PE switches
  - Used with analog 0 to 150 ohm input devices (pneumatic transducer or humidistat)
- I = Milliamp, 0 to 20 mA range
  - Used with any humidity sensor with 4 to 20 mA output
  - Used with any computer or energy management system with 4 to 20 mA output
  - Internal resistance is 249 ohms
- V = Volts DC, 0 to 15 volt range
  - Used with any DC voltage control signal, the default input signal is 0 to 10 VDC

**J18** These jumper pins determine the type of analog input signal that is read at the duct high limit RH input (terminals 24 through 26, terminal block J27). The jumper positions (R, I, and V) are identical to those specified for J17.

**J19** These jumper pins determine the type of analog input signal that is read at the window temperature sensor input (terminals 27 through 29, terminal block J28). The jumper positions (R, I, and V) are identical to those specified for J17.

**J20** Wire terminal connector supplies 24 VAC control voltage to the fill valve via terminals 1 and 2 and to the drain valve via terminals 3 and 4.

**J21** Wire terminal connector supplies 24 VAC control voltage to the power contactor (power vent relay on GTS®) via terminals 5 and 6 and to the SDU or area-type fan relay via terminals 7 and 8.

**J22** Wire terminal connection allows for remote fault indication via isolated relay contacts (1 amp max.). Terminal 10 is the isolated common connection; terminal 9 provides the normally closed connection, and terminal 11 provides the normally open connection.

**More on next page ...**

# Main control board connections

### Main control board connections (cont.)

**J23** Wire terminal connection provides optically isolated input connections for the airflow proving switch and safety interlock circuit. Terminal 12 supplies 24 VAC to the airflow proving switch (single pole, single throw [SPST), which closes when airflow is present. Terminal 13 is the return connection from the switch into the VAPOR-LOGIC$_3^{®}$ controller. Terminal 14 supplies 24 VAC to the safety interlock circuit (SPST), which is closed under normal operating conditions. Terminal 15 is the return connection from the safety circuit into the VAPOR-LOGIC$_3$ controller. The humidifier is disabled when the safety interlock circuit is open.

**J25** Wire terminal connector provides input for the tank temperature sensor. The sensor is connected between terminals 19 and 20. Terminal 18 supplies 21 VDC and is not used.

**J26** Wire terminal connector reads the analog input signal from the controlling RH sensor or external demand source.

- Terminal 21: Positive polarity 21 VDC supply (25 mA max.)
- Terminal 22: Control signal input
- Terminal 23: Signal ground
- Input selector pin J17 configures J26 input

**J27** Wire terminal connector reads the analog input signal from the duct high limit RH sensor.

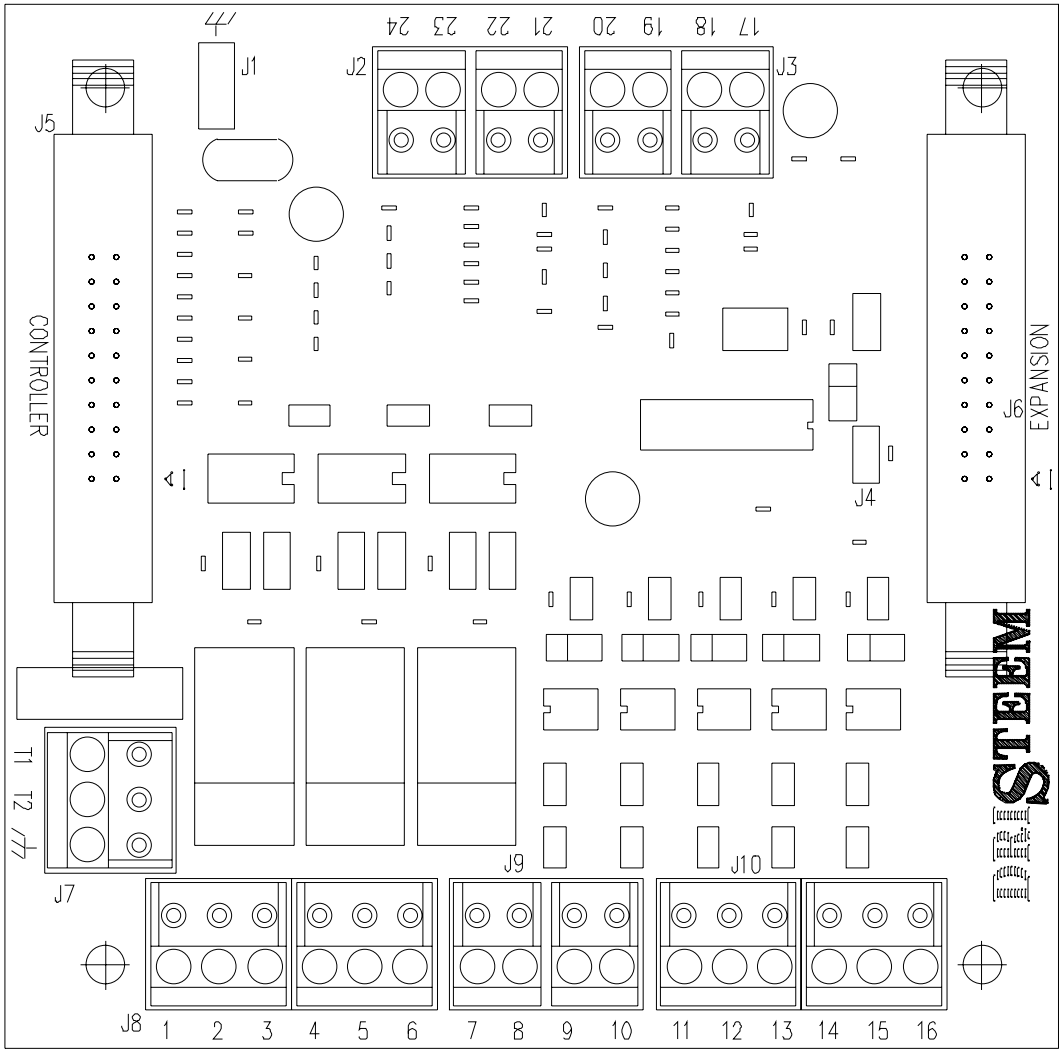
- Terminal 24: Positive polarity 21 VDC supply (25 mA max.)
- Terminal 25: Control signal input
- Terminal 26: Signal ground
- Input selector pin J18 configures J27 input

**J28** Wire terminal connector reads the analog input signal from the window temperature sensor.

- Terminal 27: Positive polarity 21 VDC supply (25 mA max.)
- Terminal 28: Control signal input
- Terminal 29: Signal ground
- Input selector pin J19 configures J28 input

# Expansion board diagram

**Figure 9-1: GTS® expansion board**

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# Expansion board connections

### GTS® expansion board connections

**J1** ¼" push-on connector for earth ground

**J2** Combustion air blower 2 control

- Terminal 21: Positive polarity 21 VDC supply (25 mA max.)
- Terminal 22: Blower tachometer feedback
- Terminal 23: pulse with modulation speed command to blower
- Terminal 24: Common

**J3** Combustion air blower 1 control

- Terminal 17: Positive polarity 21 VDC supply (25 mA max.)
- Terminal 18: Blower tachometer feedback
- Terminal 19: Pulse with modulation speed command to blower
- Terminal 20: Common

**J4** When this jumper is left open, the GTS expansion module is configured to control burners 1 and 2. When jumped, the module is configured to control burners 3 and 4.

**J5** Ribbon cable connector for VAPOR-LOGIC$_3^{®}$ main controller connection

**J6** Ribbon cable connector for additional VAPOR-LOGIC$_3$ expansion modules

**J7** Wire terminal supplies 24 VAC to power the GTS expansion module.

- Terminal T1 to 24 VAC, 10 VA maximum load
- Terminal T2 to 24 VAC common

**J8** Wire connection terminal for 24 VAC discrete outputs

- Terminal 1: Enables the ignition control module for burner 1
- Terminal 3: Enables the ignition control module for burner 2
- Terminal 5: Spare
- Terminals 2, 4, and 6: Common

**J9** Wire connection terminal for optically isolated 24 VAC discrete inputs. Terminals 7 and 9 provide 24 VAC and are not used. Terminal 8 receives a 24 VAC feedback signal from gas valve 1. Terminal 10 receives a 24 VAC feedback signal from gas valve 2.

**J10** Wire connection terminal for optically isolated 24 VAC discrete inputs from the combustion air damper limit switch and power vent pressure switch. Terminal 11 supplies 24 VAC to the combustion air damper limit switch, which closes when the damper has opened. Terminal 12 is the return connection from the limit switch into the GTS expansion module. Terminal 13 supplies 24 VAC to the power vent pressure switch, which closes when the fan starts. Terminal 14 is the return connection from the pressure switch into the GTS expansion module.

# Expansion board connections

### VAPORSTREAM® expansion board connections

**J1** 1¼" (6.4 mm) push-on connector for earth ground

**J2** Not used

**J3** Ribbon cable connector for VAPOR-LOGIC$_3^®$ main controller connection

**J4** Ribbon cable connector for additional VAPOR-LOGIC$_3$ expansion modules

**J5** Wire terminal supplies 24 VAC to power the VAPORSTREAM expansion module.

- Terminal T1 to 24 VAC, 10 VA maximum load
- Terminal T2 to 24 VAC common

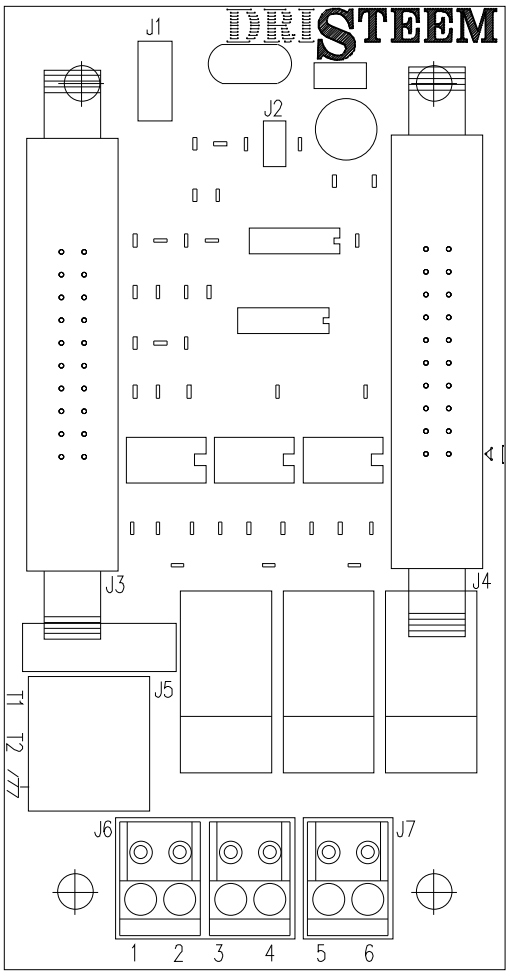
**J6** Wire connection terminal for 24 VAC discrete outputs

- Terminal 1: Enables the power contactor for heater stage 2
- Terminal 3: Enables the power contactor for heater stage 3
- Terminals 2, 4: Common

**J7** Wire connection terminal for 24 VAC discrete output

- Terminal 5: Enables the power contactor for heater stage 4
- Terminal 6: Common

**Figure 11-1: VAPORSTREAM expansion board**




VLC-OM-004

# Configuration string nomenclature

## Configuration string explained

A 15-digit VAPOR-LOGIC$_3^{®}$ configuration string appears on the front of the control cabinet and on the wiring diagram inside the control cabinet. This string specifies the parameters of the VAPOR-LOGIC$_3$ microprocessor that controls your humidification system. Below is a detailed explanation of the configuration string. (See example on next page.)

## VAPOR-LOGIC$_3$ configuration string

**A. Type of units:**
E = U.S. English (inch-pound)
M = Metric (SI)

**B. VAPOR-LOGIC$_3$ system type**
G = GTS®
S = STS®
L = LTS®
V = VAPORSTREAM®
M = VAPORMIST® (HUMIDI-TECH®)
C = CRUV™
N = Steam Injection

**C. VAPOR-LOGIC$_3$ board classification**
1 = One-tank system
2 = Two-tank system
3 = Three-tank system
4 = Four-tank system
5 = Five-tank system
6 = Six-tank system

**D. Digital display/keypad features**
1 = Single keypad

**E. Number of heat stages (0 to 4)**
0 = Steam valve or 100% SSR*
1 = One heat stage
2 = Two heat stages
3 = Three heat stages
4 = Four heat stages

**F. System pounds output**
##### = Output capacity
(e.g., 00285 = output capacity in lbs/hr [kg/h])

**G. Type of water level control**
D = DI/RO, manual drain
E = DI/RO, end-of-season drain
X = DI/RO, autodrain, no end-of-season drain
M = Potable/softened water, manual drain
A = Potable/softened water, autodrain
Z = Potable/softened water, autodrain, no end-of-season drain

**H. Operating mode**
1 = Single staged
2 = Externally staged
5 = 100% SSR**
6 = GTS
7 = Time proportioning (TP)
8 = SSR, SSR sequencing
9 = Steam valve

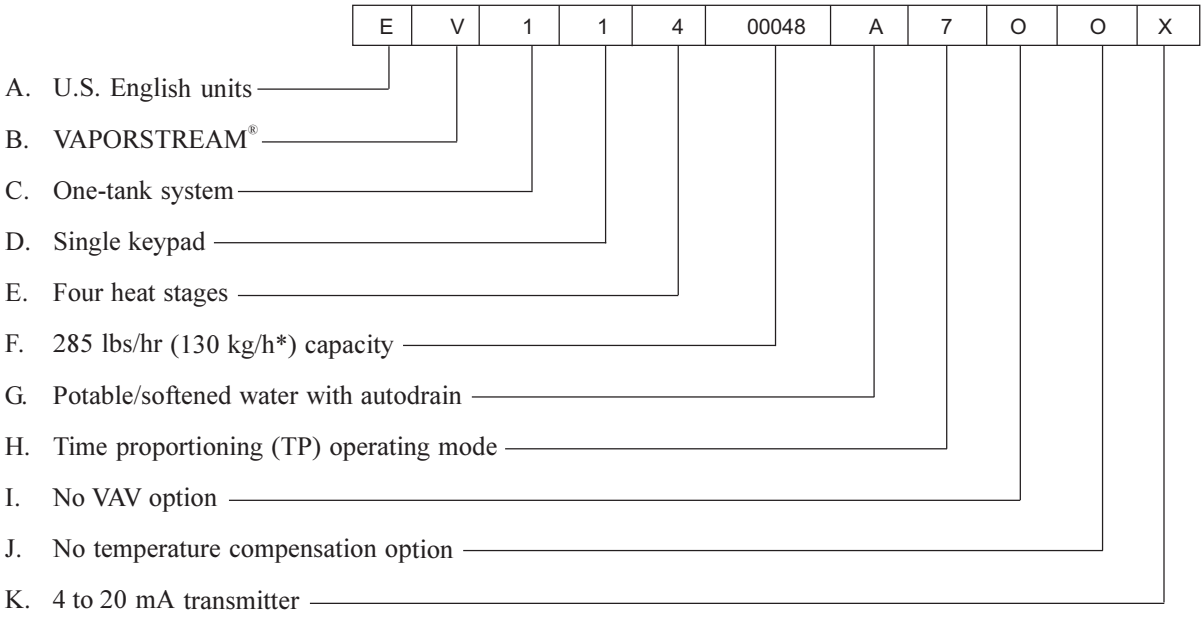
**I. SDU and AREA-TYPE™ VAV options**
V = Option present
O = Option not selected
S = SDU option
A = AREA-TYPE fan option

**J. Temperature compensation options**
T = Option present
O = Option not selected

**K. Type of humidity sensing device**
N = None, for on-off
C = 0 to 135 ohm humidistat
D = 6 to 9 VDC humidistat
H = 0 to 10 VDC humidistat
E = 4 to 20 mA humidistat
X = 4 to 20 mA transmitter
Q = Dew point transmitter
S = Special

*Removed in version 3.0.1
**Added in version 3.0.1

# Configuration string example




*Enter 00130 for metric units.

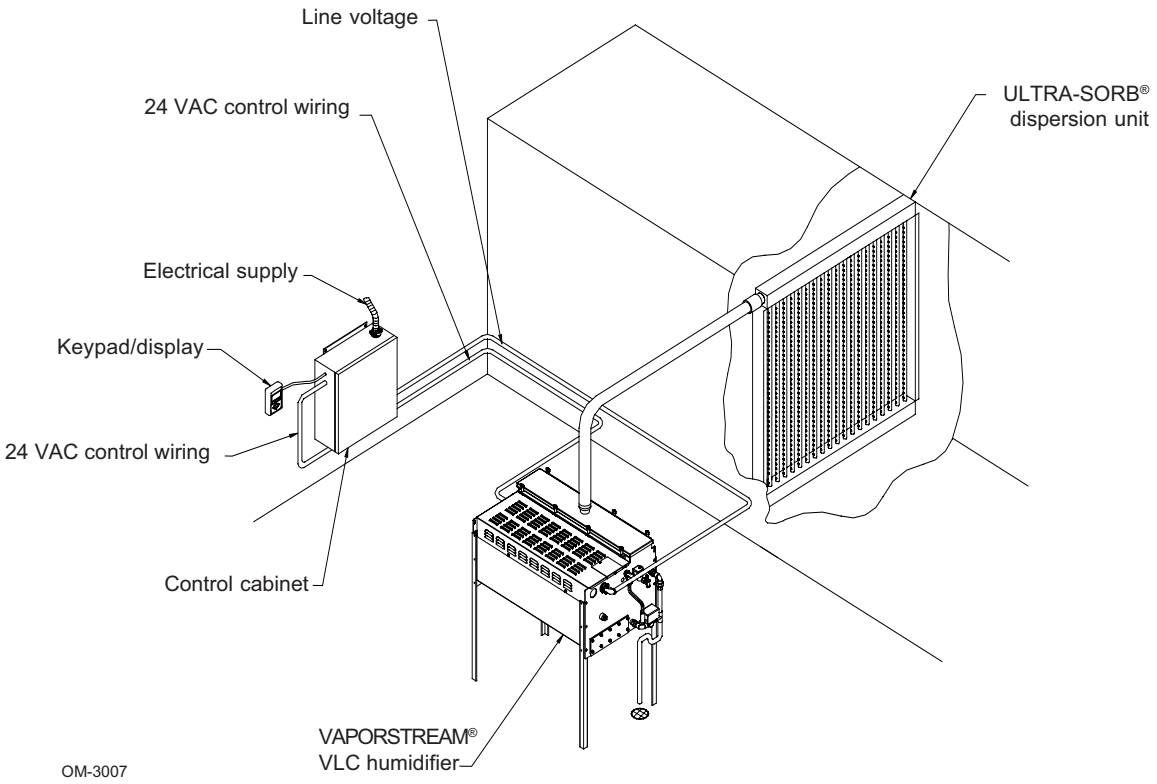
# Installation checklist

Before installing your VAPOR-LOGIC®3 control system, review this checklist to ensure proper installation of the product. Failure to follow the recommendations listed below could result in failure or damage to the humidifier or microprocessor.

- ❑ Read this manual and information before starting.
- ❑ See wiring diagram and information located inside the control cabinet door. Return all information to the control cabinet after installation.
- ❑ Position the control cabinet so it is in sight of the humidifier tank and the **wire length from the control cabinet to the humidifier is 50' (15 m) or less.**
- ❑ Connect an approved electric earth ground to the earth ground lug in the control cabinet.
- ❑ Never route the low voltage field control wires near the line voltage section of the control cabinet or in the same conduit as line voltage wires.
- ❑ **Never use shielded (screened) cable for water level probe and DI float switch wiring,** terminals 30 to 33.
- ❑ Connect the heater/machine ground lug, located in the junction box on the humidifier, to the subpanel machine ground lug with the appropriate wire, sized per the equipment grounding section of The National Electric Code (in Europe, IEC 60364 requirements).
- ❑ Use 2-wire, 18-gauge (1 $mm^2$) shielded (screened) plenum nonconduit-rated cable with shield (screen) wire for all humidity and temperature sensor wiring. (See wiring diagram for appropriate connections.)
- ❑ **Never ground shield (screen) wire at sensor end.** A shield (screen) grounding lug is provided on the control cabinet subpanel to ground the cable shield (screen) wire.
- ❑ Route keypad cable within control cabinet away from line voltage circuits.
- ❑ **Verify that the VAPOR-LOGIC$_3$ configuration string**, detailed on pages 12 and 13 of this manual, matches field requirements.
- ❑ Follow the recommended control cabinet field conduit knockout locations shown on pages 16-17.

# System diagram

**Figure 15-1: Sample humidifier system layout**



# Wiring procedures

### Proper wiring prevents electrical noise

Electrical noise can produce undesirable effects on electronic control circuits, thereby affecting 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 operation or intermittent operational problems.

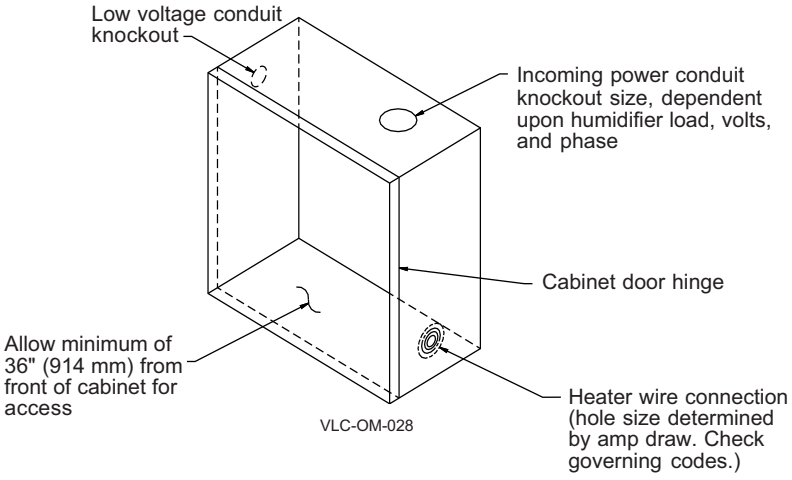
Most noise problems can be prevented by using proper wiring practices and techniques to prevent coupling or inducing of electrical interference into control circuits. The following wiring practices should minimize interaction of noise and controls:

- Connect humidifier and control cabinets to a code-approved earth ground.
- Separate the line voltage wiring from the low voltage control circuit wiring when routing electrical wiring inside the control cabinet.
- Use separate electrical conduits for line voltage and low voltage control wiring from the humidifier to humidity sensors, airflow switches, etc.

**More on next page . . .**

**Figure 16-1: Recommended control cabinet locations for power and control field wiring: VAPORSTREAM® VLC and VLDI**

Standard control cabinets for VLC and VLDI are shipped loose. An available option is to order the cabinet mounted and wired to the humidifier. Common control cabinets are always shipped loose.




⚠ **CAUTION:** When making holes and knockouts in the control cabinet, protect all internal components from debris and vacuum out cabinet when finished. Failure to comply with this warning may damage sensitive electronic components and void the DRI-STEEM® warranty.

# Wiring procedures

**Figure 17-1: Recommended control cabinet locations for power and control field wiring: CRUV™ and CRUV-DI**

A prewired electric subpanel is available as an option, with or without a control cabinet.

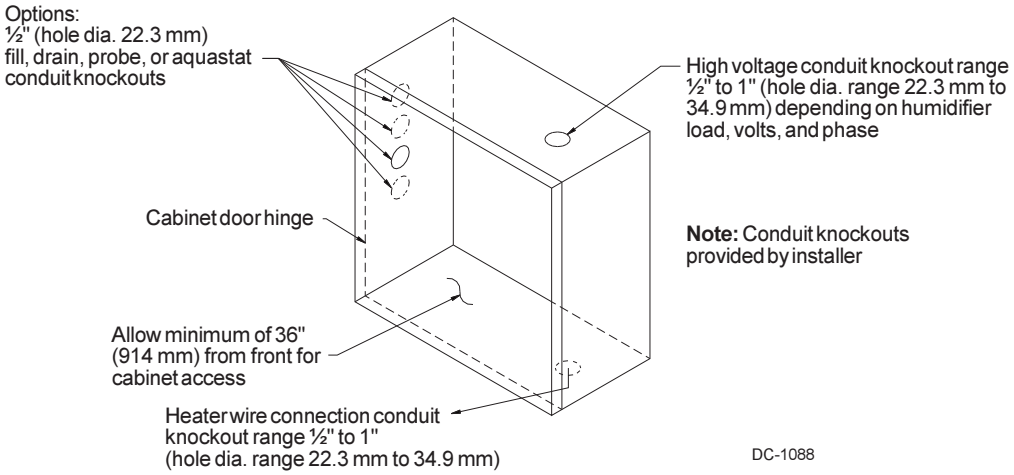
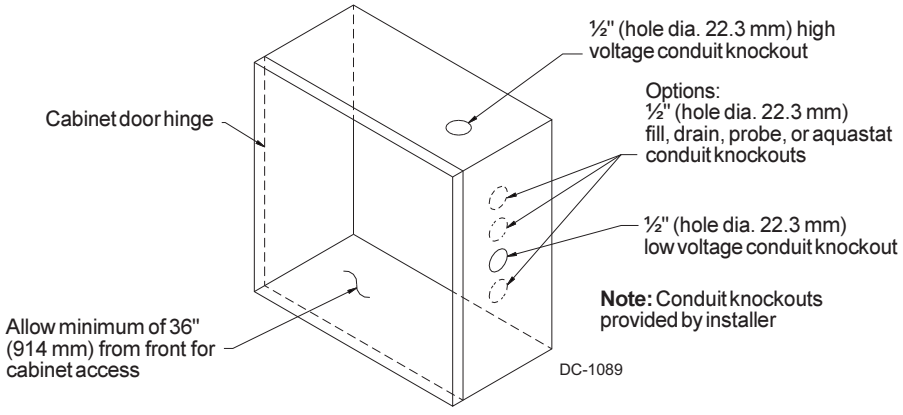



**Figure 17-1: Recommended control cabinet locations for power and control field wiring: STS®, STS-DI, LTS®, and LTS-DI**

Control cabinets for all STS and LTS models are shipped loose. An available option is to order the cabinet mounted and wired to the humidifier.

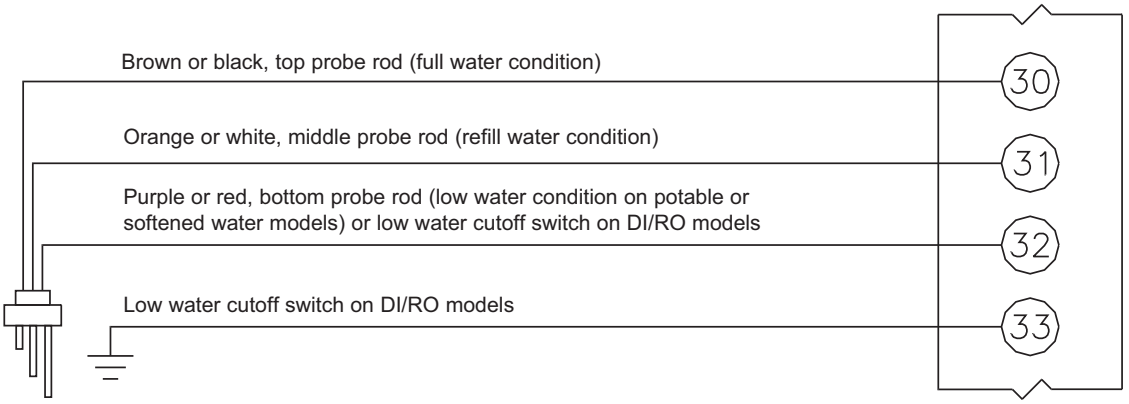


# Wiring procedures

### Proper wiring prevents electrical noise (cont.)

- Do not use chassis or safety grounds as current-carrying commons. Safety grounds should never be used as a conductor or neutral to return circuit current.
- When wiring external electrical connections to humidistats, room/duct humidity and temperature transmitters, or control signal input connections from a building control system, use 18-gauge (1 $mm^2$) (minimum) plenum-rated, twisted-pair wire, with cable shield (screen) wire for grounding.
- Return all shielded (screened) cable connections to the control cabinet for grounding. Do not ground shield (screen) at the device end.
- ⚠ **IMPORTANT:** Locate the control cabinet so that wire lengths are 50' (15 m) or less to the humidifier.
- Use 18-gauge (1 $mm^2$) stranded wire run in conduit (see Figure 18-1) for probe and low water cutoff wiring.
- ⚠ **IMPORTANT:** Do not use shielded (screened) cable for probe wiring.

**Figure 18-1: Probe wiring**




OM-VL3-11

Probe wiring to be 18-gauge (1 $mm^2$) stranded wire run in conduit independent of line voltage wiring.

⚠ Do not use shielded (screened) cable for probe wiring.

# Control cabinet installation and wiring

The VAPOR-LOGIC$^{®}_{3}$ control board is shipped mounted with all internal wiring completed within a control cabinet. All software is custom programmed into your VAPOR-LOGIC$_3$ system according to the original order requirements.

**Important control cabinet installation points:**

- All humidifier power wiring is represented on the humidifier wiring diagram located on the inside of the control cabinet door along with an installation guide. Return all instructions to the control cabinet after installation.
- Refer also to the VAPOR-LOGIC$_3$ circuit board drawing on page 5 of this manual for detail of the board and connection points.
- Pick a location that allows easy access to the control cabinet and internal electrical components. (Not applicable on GTS® and VAPORMIST®.)

  ⚠ **IMPORTANT:** Locate the control cabinet so that wire lengths are 50' (15 m) or less to the humidifier.
- Mount control cabinet using the mounting tabs.
- Always wire the VAPOR-LOGIC$_3$ control board per governing codes.
- VAPOR-LOGIC$_3$ is powered by a low voltage Class 2 control transformer. The transformer provides a 24 VAC supply and is protected by an integral manual reset circuit breaker.
- Follow field wire torque requirements shown on the electrical component in *The General Installation Instructions* when connecting the power and control wiring inside the humidifier control cabinet.
- Use only a 1/8" (3 mm) standard or ASC screwdriver on VAPOR-LOGIC$_3$ control board terminal blocks.
- Use a single 18-gauge (1 mm$^2$) pre-tinned wire in each terminal at the VAPOR-LOGIC$_3$ terminal block. Torque to 4 inch-pounds (0.4 Nm).
- Do not terminate multiple wires to a single VAPOR-LOGIC$_3$ terminal. Use the single additional wire's opposite end to connect to the VAPOR-LOGIC$_3$ terminal block.
- Never run the control system wires bundled with, or in the same conduit as, power wires.

# Keypad/display installation

## Installing modular cable

⚠ **IMPORTANT:** When routing modular cable inside the control cabinet, route cable away from all power wiring and connect the male modular plug into the VAPOR-LOGIC$_3^{®}$ printed circuit board-mounted female modular receptacle, J2. Push the male plug in until you hear a "click." (The cable should be plugged into the keypad/display as well.)

The six-wire RJ-ll plug/cable provides the AC power to the keypad/display and completes the FTT-10A digital communication between the keypad/display and the VAPOR-LOGIC$_3$ control board.

⚠ **CAUTION:** If a longer cable is needed, do not attempted to fabricate one. Improper wiring can permanently damage the VAPOR-LOGIC$_3$ board, keypad, or display. Contact your local DRI-STEEM® representative for longer cable options. The keypad cable can be up to 500' (152 m) in length.

## Installing the keypad/display

Note that the keypad/display requires an ambient temperature range of 32 °F to 122 °F (0 °C to 50 °C) to operate properly. Exceeding these limits may result in poor display performance and/or damage to the unit.

We recommend that you mount the keypad/display to a surface using a field-supplied network phone wall plate. To mount, simply slide the keypad/display onto the tabs on the phone plate.

# Sensing devices and humidity control

### Sensing device location is important

Humidity sensing devices must be located in the correct area of the space being controlled to achieve accurate humidity control. A typical small air-handling system is shown in the drawings on pages 15 and 22 (Figures 15-1 and 22-1). For the best control, place the humidity sensing device in the center of a room, or just inside the return air duct (location “A”). These locations provide the least amount of variation caused by airflow patterns and room temperature. Placement of the duct humidity sensing device within the outlet of the air handler (location “D”) is ideal for duct high limit control, but the actual placement must be a sufficient distance downstream from dispersion tubes to ensure that steam absorption has occurred. Accurate control of temperatures in rooms and ducts is also important to improve control of relative humidity.

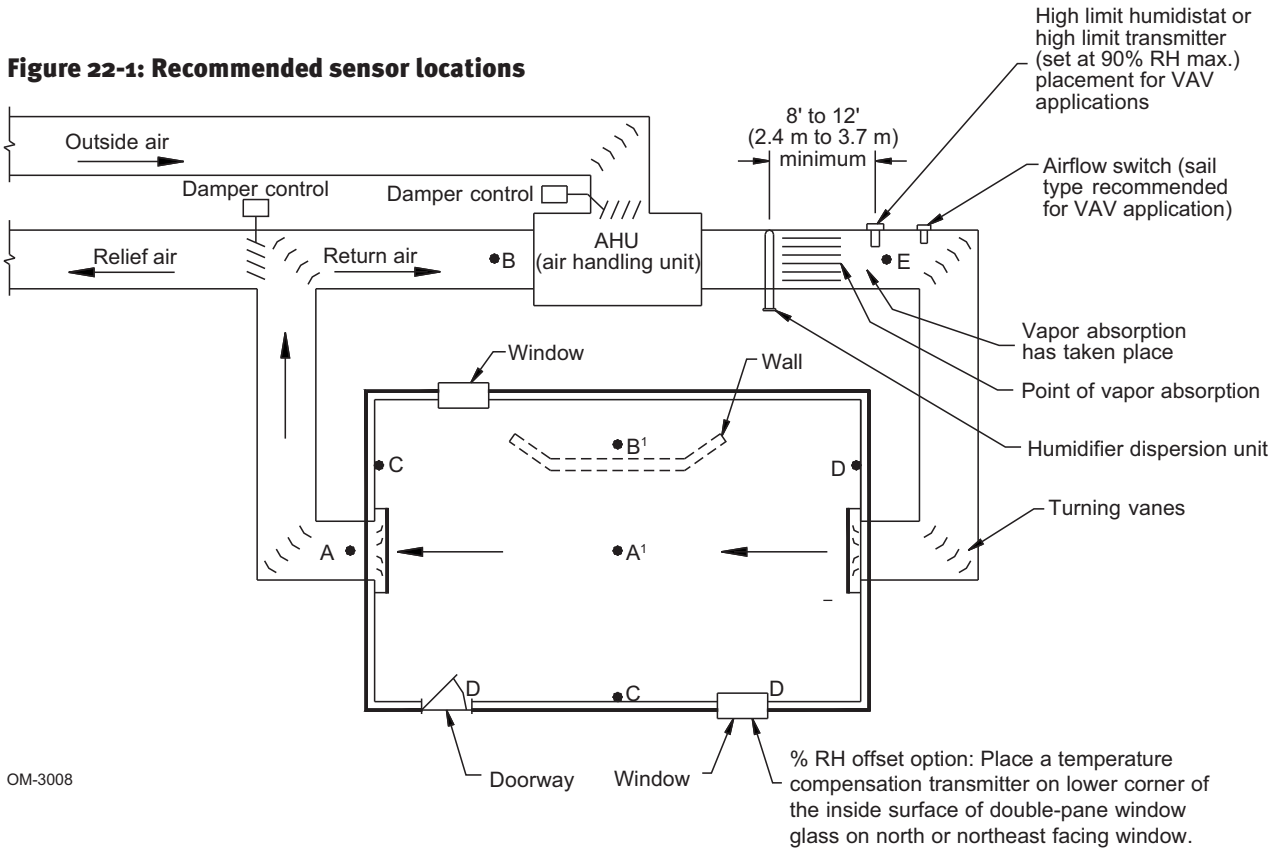
### Other factors that affect humidity control

Unsatisfactory humidity control may involve more than the controller’s capability to control the system. Other factors that play an important role in overall system control are:

- Size of the 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

# Placement of sensing devices

**Figure 22-1: Recommended sensor locations**




**IMPORTANT**
In most cases, 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.

**Recommended sensor locations**

**A** This is the ideal sensing location because this placement ensures the best uniform mix of dry and moist air with stable temperature control.

**A[1]** This location is acceptable, but the room environment can affect controllability, such as when the sensor is too close to air grilles, registers, or heat radiation from room lighting.

**B** This location is acceptable because it provides a good uniform mixture of dry and moist air, but if an extended time lag exists between moisture generation and sensing, make sure the control contractor extends the sampling time.

**B[1]** This location behind a wall or partition is acceptable for sampling the entire room if the sensor is near an air exhaust return outlet. This location is also typical of sensor placement for sampling a critical area.

**C** These locations are not acceptable because they may not represent actual overall conditions in the space.

**D** These locations are not acceptable. Do not place sensors near windows, door passageways, or areas of stagnant airflow.

**E** This is the best location for a duct high limit humidistat or humidity sensor.

# Wiring of sensing devices

### Wiring on-off humidistats

DRI-STEEM® provides two types of on-off control: wall-mounted humidistat and duct-mounted humidistat, or external staging by others. The wiring diagram (located on the inside of the humidifier control cabinet) shows proper wiring for these controls.

### Wiring modulating humidistats

The signal from a humidistat directly controls the amount of output from the humidifier. The standard modulating humidistat controllers DRI-STEEM provides are either duct mounted or wall mounted.

The humidistats are powered by a 21 VDC supply provided by the VAPOR-LOGIC®3 control board. A variable control signal is returned to modulate function on the humidifier.

For a pneumatic modulating signal, DRI-STEEM offers a transducer that accepts a 3 to 20 psi (21 to 138 kPa) pneumatic input range.

### Wiring modulating humidity or temperature transmitters

Transmitters provide an analog signal proportional to the process variable being measured. All transmitters provided by DRI-STEEM are two-wire devices. (See your wiring diagram for proper connections.) The humidity transmitters have a range of 0 to 100% RH with an output of 4 to 20 mA. The temperature transmitter has a range of –20 °F to 160 °F (–29 °C to 71 °C) with a 4 to 20 mA output.

### Calculation of transmitter % RH

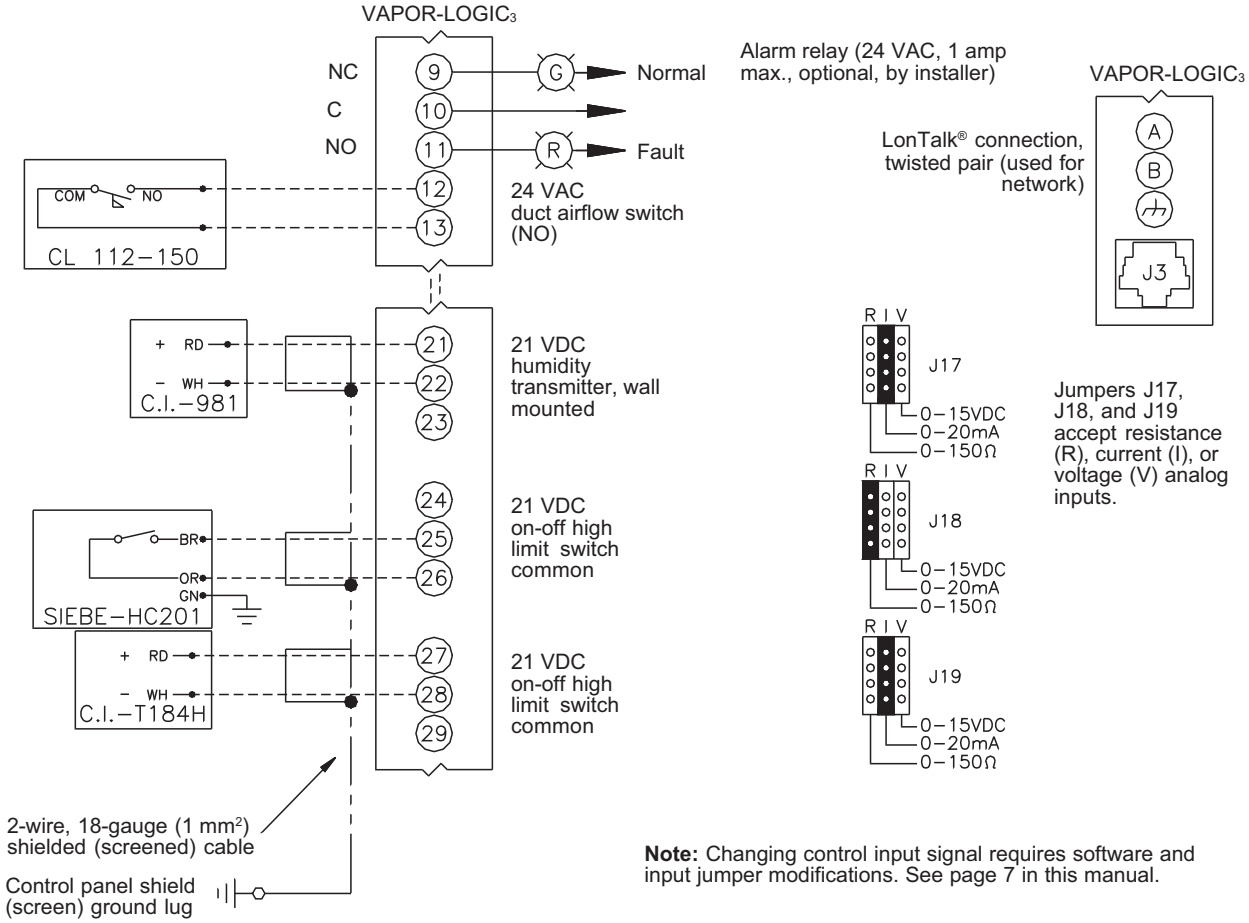
$$\%\ \text{RH} = \frac{(\text{milliamp reading minus } 4)}{0.16}$$

Example: $\dfrac{12\ \text{mA} - 4}{0.16} = 50\%$

**More on next page ...**

# Wiring sensing devices

**Figure 24-1: Example of proper shielding techniques when connecting humidity or temperature devices to VAPOR-LOGIC® 3 control inputs**




**Note:** Changing control input signal requires software and input jumper modifications. See page 7 in this manual.

**Note:** The wiring diagram (located on the inside of the humidifier control cabinet) shows correct control wiring.

OM-VL3-17

⚠ **IMPORTANT:** Consult control cabinet wiring diagram. Control changes require wiring and programming changes.

# VAV sensing devices installation

### Variable air volume (VAV) option

This option is identified as a "V" in the third-from-last place of your program code configuration string (for example: EV11400285A7**V**OX).

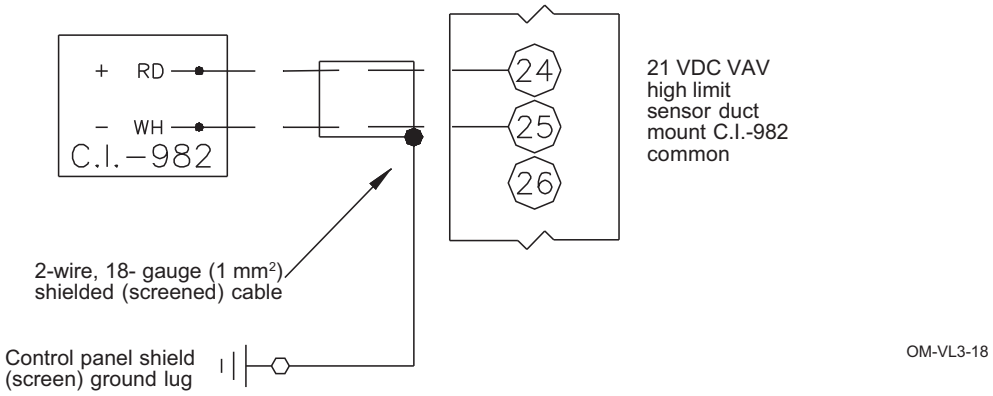
When the VAV control option is requested, DRI-STEEM® provides a duct mounted humidity transmitter (4 to 20 mA output, 0 to 100% RH range). Install using shielded cable (see Figure 25-1 below).

The modulating high limit transmitter signal operates in conjunction with the room or duct controlling transmitter signal through the VAPOR-LOGIC$^{®}_{3}$ control system to prevent over humidification in the duct. VAPOR-LOGIC$_3$ starts lowering the humidifier output when the duct relative humidity is within 6% of the duct high limit set point.

When this occurs, the message "VAV output limit" appears in the keypad/display. If necessary, the reduction of the humidifier output continues until maximum high limit set point is reached, shutting off the humidifier completely.

When the high relative humidity starts to decrease in the duct, VAPOR-LOGIC$_3$ slowly starts to increase the production of steam vapor. When the duct relative humidity decreases to greater than 6% below the duct high limit set point, the control transmitter is restored as the primary controller, and the "VAV output limit" text no longer appears in the keypad/display, returning the control system to normal operation.

**Figure 25-1: VAV transmitter wiring**




**IMPORTANT:** Ground shield at control panel end only. Do not ground shield at device end.

# Temperature compensation transmitter

### Temperature compensation offset option

This option is identified as a "T" in the second-from-last place of your program code nomenclature (for example: EV11400285A7O**T**X).

When selected as an option, DRI-STEEM® provides a temperature compensation (temp. comp.) transmitter. The temperature compensation transmitter continually monitors interior window glass temperature and transmits this temperature to VAPOR-LOGIC®$_3$.

VAPOR-LOGIC$_3$ assumes a 70 °F (21 °C) room temperature and uses the glass temperature and the RH in the space being controlled to calculate the dew point (°F or °C) for the space.

If the window temperature falls below the dew point, VAPOR-LOGIC$_3$ automatically decreases the RH set point so moisture does not form on windows. The Idle screen displays the modified RH set point, and an asterisk (*) appears next to the modified RH set point, denoting that temperature compensation has taken control of the RH set point. The "* Temp Comp" message appears on the status line. When the interior window glass temperature rises above the dew point, VAPOR-LOGIC$_3$ restores system control to the normal RH set point for the space.

The transmitter provided with VAPOR-LOGIC$_3$ is calibrated for –20 °F to 160 °F (–29 °C to 71 °C) with output from 4 to 20 mA. For example, a temperature reading of 70 °F (21 °C) should produce a measurement of 12 mA. You can calibrate the sensor by adjusting the Temp Comp Offset in the Set Up menu.

Install using an 18-gauge (1 mm$^2$) plenum-rated shielded (screened) cable for transmitter wiring with grounding shield (screen) at the shield (screen) ground lug in the control cabinet (see Figure 27-1 on the next page).

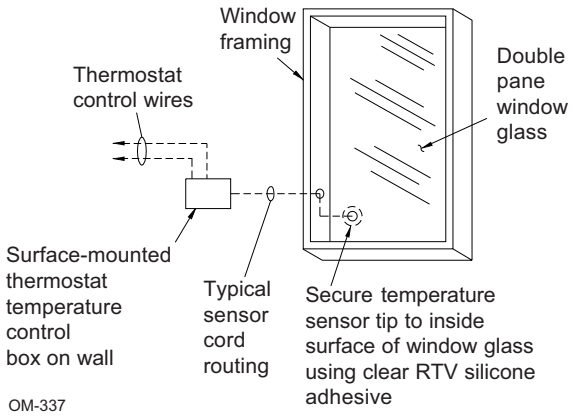
# Temperature compensation transmitter

### Temperature compensation transmitter placement

To place the temperature compensation transmitter, follow these steps. See Figure 27-1 below.

1. Position the temperature compensation transmitter control box on a wall adjacent to a window frame facing north or northeast.
2. Place flat surface of temperature sensor tip on lower corner of glass surface.
3. Temporarily hold the sensor tip in place with strips of masking tape.
4. Apply a small amount of clear RTV silicone adhesive over and around the sensor tip (making sure the sensor tip is in contact with the window glass).
5. After adhesive cures, remove masking tape.

**Figure 27-1: Temperature compensation transmitter placement**



# Changing control input

## Changing control input

You can configure the control input on the VAPOR-LOGIC®3 board to read either an external demand signal or RH signal. It also can read different types of analog signals from energy management systems, humidistats, or RH transmitters. Follow these steps when a signal change is needed:

1. Remove the old signal wires from the control board (terminals 21, 22, and 23).
2. Refer to the configuration string text on pages 12 and 13. Refer to: “K. Type of humidity sensing device” to identify the new signal that is needed.
3. Enter the Set Up menu on the VAPOR-LOGIC$_3$ keypad and scroll to the Configuration String screen.
4. Change the last character in the configuration string to the desired input signal type identified from the configuration string information on pages 12 and 13.
5. Adjust the shunt connector J17 to the proper signal type, if necessary (see page 5):
   - If the signal is electrical current, the jumper should be on I.
   - If the signal is voltage, the jumper should be on V.
   - If the signal is resistance or on-off, the jumper should be on R.
6. Connect the new signal wires to the board as per the external connections diagram.

# Start-up checklist

**Note: Your humidification system may not have all of the options listed below. If an item does not apply to your system, skip to the next item and continue the process.**

- ❑ Verify that the field wiring is done per the instructions in this manual and the unit wiring diagram.
- ❑ If your humidifier uses standard potable water (non-DI water), check probe voltages in the Diagnostics menu. The reading should be 2.4 VAC without water and 0 VAC with water from ground (terminal 33 on J8) to probe inputs (terminals 30, 31, and 32 on J8).
- ❑ Check the heater cycle time setting (except for GTS®) in the "System Set Up" menu of the keypad/display (default is 60 seconds; 2 seconds for SSR).
- ❑ If your system uses an RH transmitter, check the proportional band setting in the System Set Up menu of the keypad/display (default is 10%).
- ❑ If your system uses an RH transmitter, check the proportional gain (Kp) setting in the System Set Up menu of the keypad/display (default is 80).
- ❑ If your system uses an RH transmitter, check the integral gain (Ki) setting in the System Set Up menu of the keypad/display (default is 40).
- ❑ If your system uses an RH transmitter, check the derivative gain (Kd) setting in the System Set Up menu of the keypad/display (default is 0).
- ❑ If your system has an electronic drain valve, check the drain duration (system dependent; see page 56).
- ❑ Check the flush duration (default is 1 minute).
- ❑ Check the RH set point and set at the desired level.
- ❑ Confirm that the control signal being connected to the VAPOR-LOGIC®$_3$ system is compatible with the VAPOR-LOGIC$_3$ program. Identify the VAPOR-LOGIC$_3$ configuration string on the wiring diagram or on the outside of the control cabinet door. Refer to the configuration string description on pages 12 and 13.

**More on next page ...**

# Start-up checklist, continued

- ❑ Confirm that all wiring is correct per the wiring diagram.
- ❑ Confirm that proper grounding and an approved earth ground are provided.
- ❑ Confirm that the analog inputs are configured properly by verifying that J17, J18, and J19 shunt connectors on the VAPOR-LOGIC$_3^{®}$ board are in their correct position per the wiring diagram. See page 5 for the physical locations.
- ❑ Confirm that the keypad/display is mounted with modular cable routed away from high voltage circuits and connected to the J2 female connector on the VAPOR-LOGIC$_3$ board.
- ❑ Turn water supply on and confirm that the drain valve is closed.
- ❑ Turn power on and confirm that the display shows the Main Menu screen with an operational clock.
- ❑ Enter the Control Modes screen and make sure the system is in auto mode.
- ❑ When “Filling” appears on the status line of the Idle screen, confirm that the tank is filling with water.
- ❑ Confirm that the airflow switch is closed.
- ❑ Confirm that the high limit humidistat input is closed or that the variable air volume (VAV) control system high limit transmitter is connected.

⚠ **IMPORTANT: Confirm that the tank has sufficient water.** If the tank does not contain water and the heat outputs are activated, or the burners are fired by the VAPOR-LOGIC$_3$ control system, a serious failure will result. If this happens, immediately remove power from the system and verify that all wiring is done per the wiring instructions in this manual and the unit wiring diagram.

- ❑ With sufficient water in the tank, the airflow switch closed, the high limit humidistat closed, the safety interlock circuit closed, and a call for humidity, verify that the heat outputs are activated.
- ❑ Check amp draw of heaters for electric units; refer to wiring diagram for proper rating. If unit is powered by steam, check for steam flow. For gas fired units, verify gas flow and combustion.
- ❑ During normal operation, the humidifier operating status appears in the keypad/display. See pages 36 and 37 for descriptions of keypad/display status items.
- ❑ If you experience difficulties, have the above keypad/display information available with the model and serial numbers of the humidifier and the VAPOR-LOGIC$_3$ configuration string and call DRI-STEEM® for help.

# Keypad/display overview

### Components of the keypad/display

The VAPOR-LOGIC®$_3$ keypad/display consists of (see Figure 31-1 below):

- A 128 × 64 pixel backlit liquid crystal display (LCD)
- A power light
- An alarm light
- Eight keys:
  - Four arrow keys
  - An Enter key
  - Three soft keys

The three soft keys are located directly beneath the LCD. Each soft key's function is determined by the screen currently displayed. The function appears on the screen directly above each soft key.

Use the arrow keys to adjust the values of the different parameters or to navigate the blinking cursor on many of the screens.

Use the Enter key to make selections on various screens.

The power light illuminates whenever power is applied to the keypad/display.

The alarm light is activated any time a fault condition is detected.

### The menu system

The VAPOR-LOGIC$_3$ keypad/display organizes the control and monitoring of the humidification system into six top-level menus:

- Status
- Control Modes
- Alarms
- Set Up
- Diagnostics
- Reports

Each of these menus controls or monitors a different aspect of the humidifier. To access any of these screens, activate the Main Menu of the keypad by pressing the Main soft key whenever it is visible. This immediately takes you to the Main Menu selection screen. Select where you want to go by using the up and down arrow keys and by pressing the Enter key. The menu structure is diagrammed on the following page with a brief description of the submenus on the pages following.

### Metric conversion

VAPOR-LOGIC$_3$ can display all information in metric as well as English units. To change the current setting, modify the "type of units" in the configuration string under the Set Up menu.

**Figure 31-1: VAPOR-LOGIC3 keypad/display**

# VAPOR-LOGIC®3 menu structure

**Main Menu**

- **1) Status**
  - Soft key) **Main** – Returns to the **Main Menu** screen
  - Soft key) **Back** – Scrolls to the previous **Status** item
  - Soft key) **Next** – Scrolls to the next **Status** item
- **2 ) Control Modes**
  - **1 Auto Mode**
  - **2 Test Mode**
    - **Test Status***
      - Soft key) **Main** – Returns to the **Main Menu** screen
      - Soft key) **Back** – Returns to the **Control Modes** screen
  - **3 Manual Drain**
  - **4 Standby**
  - Soft key) **Main** – Returns to the **Main Menu** screen
  - Soft key) **Idle** – Switches display to the **Idle** screen
- **3) Alarms**
  - Soft key) **Main** – Returns to the **Main Menu** screen
  - Soft key) **Info** – Displays the date and time the selected alarm occurred, along with more information on the alarm
  - Soft key) **Clear** – Clears the selected **Alarm** and keeps it in the alarm log

    **Note:** Pressing the Enter key also displays the date and time the selected alarm occurred, along with more information on the alarm.
- **4) Set Up**
  - Soft key) **Main** – Returns to the **Main Menu** screen
  - Soft key) **Back** – Scrolls to the previous **Set Up** item
  - Soft key) **Next** – Scrolls to the next **Set Up** item

**More on next page ...**

* Only on version 3.0.1 or greater

# VAPOR-LOGIC® 3 menu structure

**Main Menu, cont.**

- **5) Diagnostics**
  - Soft key) **Main** – Returns to the **Main Menu** screen
  - Soft key) **Back** – Scrolls to the previous **Diagnostics** item
  - Soft key) **Next** – Scrolls to the next **Diagnostics** item
- **6) Reports**
  - **1 ) H2O Converted**
    - Soft key) **Main** – Returns to the **Main Menu** screen
    - Soft key) **Back** – Returns to the **Reports** screen
    - Soft key)* **Reset** – Resets the report and flags when report was reset
  - **2) Energy Used**
    - Soft key) **Main** – Returns to the **Main Menu** screen
    - Soft key) **Back** – Returns to the **Reports** screen
    - Soft key)* **Reset** – Resets the report and flags when report was reset
  - **3) RH History**
    - Soft key) **Main** – Returns to the **Main Menu** screen
    - Soft key) **Back** – Returns to the **Reports** screen
    - Soft key) **Reset** – Resets the report and flags when report was reset
  - **4) RH Graph**
    - Soft key) **Main** – Returns to the **Main Menu** screen
    - Soft key) **Back** – Returns to the **Reports** screen
    - Soft key) **Scale** – Toggles the time base of the RH history graph between the last 10 minutes, 1 hour, or 24 hours.
- **Soft key) Idle**
  - Soft key) **Main** – Returns to the **Main Menu** screen
  - Soft key) **Idle** – Displays the default informational screen
  - Soft key) **Main** – Returns to the **Main Menu** screen
  - Soft key) **Control** – Switches display to the **Control Modes** screen
  - Soft key) **Alarms** – Switches display to the **Alarms** screen

* Only on version 3.0.1 or greater

# Set Up menu information

Below is a complete list of Set Up menu options. Your system may not have all these options.

| Set Up menu readout | Set Up menu description | Range | Default |
|---|---|---|---|
| RH Setpoint | Relative humidity set point | 20% RH to 80% RH | 35% |
| RH Offset | RH offset calibration | ±20% RH | 0% |
| Dewpoint Setpoint | Dew point set point | 20 °F to 80 °F ( –7 °C to 27 °C) | 50 °F (10 °C) |
| Dewpoint Offset | Dew point offset calibration | ±20 °F (±20 °C) | 0 °F (0 °C) |
| PID Band | PID loop modulation band | 1% RH to 20% RH | 10% |
| Kp | Proportional gain factor | 1 to 1000 | 80 |
| Ki | Integral gain factor | 0 to 1000 | 40 |
| Kd | Derivative gain factor | 0 to 1000 | 0 |
| Duct High Lim RH | Duct high limit RH set point | 50% RH to 95% RH | 80% |
| Duct RH Offset | Duct RH offset calibration | ±20% RH | 0% |
| Temp Comp Offset | Temp comp sensor calibration | ±20 °F (±20 °C) | 0 °F (0 °C) |
| ADS Mode (automatic drain sequence) | Autodrain operating mode | Use<br>Use + Interval<br>Interval | Use |
| Lbs of H20 Until ADS<br>(Kg of H20 Until ADS) | Lbs (kg) of water that must be boiled for ADS to start | 1 to 32,767 lbs<br>(.5 to 14,863 kg) | System dependent |
| ADS Day | Day to start ADS sequence | Sunday (1) through Saturday (7) | 1 |
| ADS Hour | Hour to start ADS sequence | 0 to 23 (midnight to 11:00pm) | 0 |
| ADS Interval | Number of days between ADS cycles | 1 to 180 days | 7 days |
| ADS Duration | Auto drain sequence duration | 0 to 120 minutes | System dependent |
| AFS Duration | Auto flush sequence duration | 0 to 15 minutes | 1 minute |

**More on next page ...**

# Set Up menu information

Below is a complete list of Set Up menu options. Your system may not have all these options.

| Set Up menu readout | Set Up menu description | Range | Default |
|---|---|---|---|
| Service Setpoint | Service interval set point | 100 to 3,276,700 lbs<br>(100 to 1,486,300 kg) | System dependent |
| Water til Service | Amount of water remaining until service interval is met | Enter key resets service interval | NA |
| Skim Duration | Skim time duration | 0 to 120 seconds | System dependent |
| Heater Cycle Time (TP-type control) | Cycle time | 30 to 99 seconds | 60 seconds |
| Heater Cycle Time (SSR-type control) | Cycle time | 1 to 30 seconds | 2 seconds |
| SDU Area-Type Duration | How long the fan runs after there is no call for humidity | 5 to 30 minutes | 5 minutes |
| Aquastat | Aquastat set point | 40 °F to 180 °F ( 4 to 82 °C) | 40 °F (4 °C) |
| Inactivity Until EOS | Inactivity time until end-of-season drain cycle starts | 1 to 168 hours | 72 hours |
| Set Up Password | Password required to enter the Set Up screen | 0 to 255<br>(0 = password disabled) | 0 |
| Configuration String | See configuration string information in manual | System dependent | System dependent |
| Date: Time: | Date and time settings | NA | Current date/time |
| Idle Time | Keypad inactivity duration until the idle screen appears | Off to 1000 minutes | 5 minutes |

# Idle screen status messages

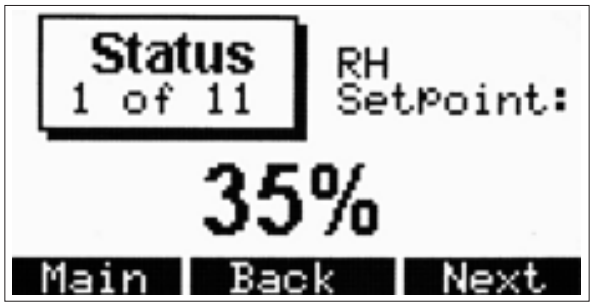
| Readout display | Description |
|---|---|
| Filling | The unit is filling with water. |
| Skimming | The unit completed a fill cycle and now is skimming. |
| Draining | The unit is draining. |
| Flushing | The unit is flushing. |
| No Duct Air Flow | The airflow proving switch is open and has disabled the humidifier. |
| Interlock Disable | The interlock circuit is open and has disabled the humidifier. |
| VAV Output Limit | The unit is approaching or has reached the duct RH high limit set point. |
| Preheating Tank | The unit received a call for humidity and is heating the tank at 100% until it reaches the water boiling set point. |
| Freeze Protection | The tank temperature has fallen below the freeze protection set point, and the unit is being heated to prevent the tank from freezing |
| Aquastat Heating | The tank temperature fell below the aquastat set point, and the unit is being heated to maintain the aquastat set point. |
| End of Season Drain | The unit is in end of season drain mode. |
| End of Season | The unit is in end of season and is no longer draining. |
| Low Tank Level | The water level is below the probes on a standard water unit or below the float on a DI/RO water unit. |
| Temp Comp | The RH set point was temporarily modified to prevent moisture from forming on the windows. The modified set point is identified with an asterisk. |
| Duct RH High Limit | The duct high limit RH was reached and disabled the humidifier. |
| Service Humidifier | It is time to perform routine service on the humidifier. |
| Clean Probes & Tank | The system detected the need to clean the tank and water level probe assembly to prevent false water level readings. |

# Main menu: 1) Status

### Status

The Status screen is used to view the operating parameters of the humidification system. The configuration string determines which parameters appear. The parameters that can appear are listed below:

- RH Setpoint
- Room RH
- Dewpoint Setpoint
- Measured Dewpoint
- Duct Setpoint
- Duct RH
- Window Temp
- System Demand
- Stage 1 Demand
- Stage 2 Demand
- Stage 3 Demand
- Stage 4 Demand
- System Output
- Tank Temp
- Water til ADS
- Water til Service



# Main menu: 2) Control Modes

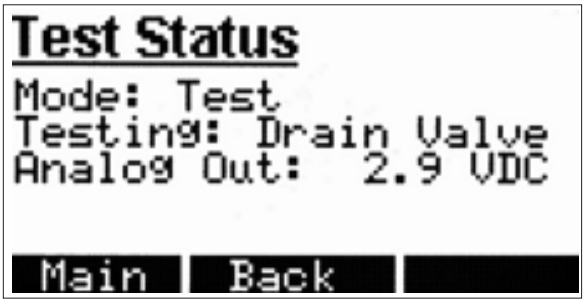
### Control Modes

In the Control Modes screen, the operational mode of the humidifier can be set. You can choose from auto, test, standby, or manual drain.

**In Auto Mode,** the humidifier operates normally. All inputs and outputs are monitored and controlled. If there is a call for humidification, the system reacts.

**In Test Mode,** the controller sequentially cycles on each of the 24 VAC outputs for four seconds (30 seconds for the drain valve) so that their operation can be confirmed. The analog output linearly ramps from 0 to 10 VDC and back to 0. If the unit is a GTS®, the combustion air blowers also are ramped up and down. Once all outputs are cycled on and off, the controller reverts to the Standby mode.

When the unit is in Test mode, the Test Status screen appears. The Test Status screen displays which output is being actuated and displays voltage level at the analog output. If the unit is a GTS, the blower tachometer value also appears. The Test Status screen also displays the current mode of operation. Press the Back key to return to the Control Modes screen. Press the Main key to return to the Main Menu.





**In Standby Mode,** the humidification system is taken off line. All humidity control inputs appear but are not acted upon; however, if the tank temperature falls below the freeze protect set point, the drain valve opens.

**In Manual Drain Mode,** the automatic drain valve (if so equipped) opens and the tank drains. All humidifier operation is suspended, and the drain valve remains open until the unit is taken out of Manual Drain Mode.

**To select a new mode,** use the vertical arrow keys to move the selection pointer on the left side of the screen up or down. When the pointer is positioned next to your new selection, press Enter. Your new selection now appears as highlighted text.

Note that the current mode of the humidifier is always shown as highlighted text on this screen.

# Main menu: 3) Alarms

### Alarms

The Alarms screen is used to clear system alarms and to view the alarm log. **Use the vertical arrow keys to scroll through the alarm log.**

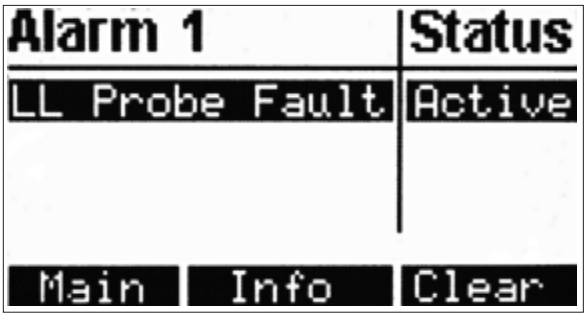
The alarm log contains a record of the previous 10 faults that occurred on the humidifier. The first column displays the alarm name. The second column displays the status of the alarm.

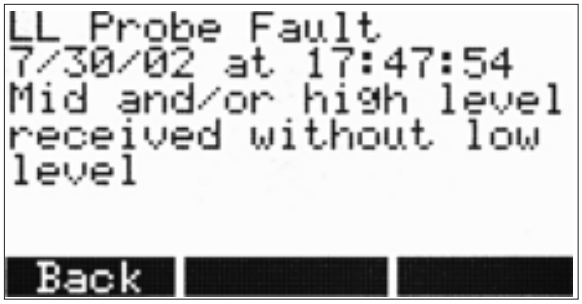
Clear active alarms by pressing Clear below the display. The Clear key leaves the alarm in the log for future reference. Pressing either Enter or Info displays the date and time the selected alarm occurred along with more information on the alarm.

If more than 10 alarms occurred since the unit was powered, the oldest alarms are removed from the alarm log first.

**Note:** Power loss clears the alarm log.

For more information about alarms, see the "Troubleshooting guide" in this manual.



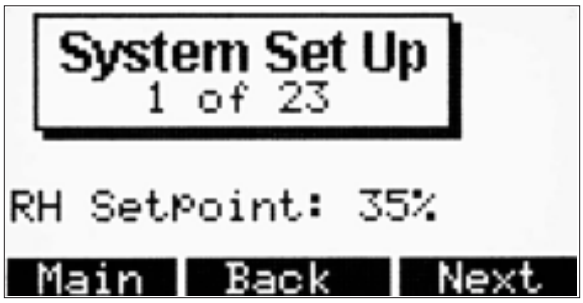



# Main menu: 4) System Set Up

### System Set Up

In the System Set Up screen, the operational parameters of the humidifier can be set. Depending on system options, parameters available may include:

- RH Setpoint
- RH Offset
- Dewpoint Setpoint
- Dewpoint Offset
- Duct high lim RH
- Duct RH offset
- Temp comp offset
- PID Band
- PID gains (Kp, Ki, Kd)
- ADS Mode
- Lbs of H2O until ADS
- ADS Day
- ADS Hour
- ADS Interval
- ADS Duration
- AFS Duration
- Inactivity Until EOS
- Service Setpoint
- Water til Service
- Heater Cycle Time
- Skim Duration
- SDU Duration
- Aquastat
- Configuration String
- Date/Time set
- Set Up Password
- Idle Time




To modify a value, use the Next and Back soft keys to locate the parameter in need of modification. Once the parameter is located, use the vertical arrow keys (or + and – keys) to change values, and use the left and right arrow keys to move to a different digit on the parameter being modified. Your parameter modification takes effect as soon as you press the Enter key or move to another parameter using the Next or Back soft key or exit the Set Up menu using the Main soft key.

For more information on each of the Set Up menu parameters, see pages 34 and 35.

# Main menu: 5) Diagnostics

## Diagnostics

The Diagnostics screen allows you to monitor all of the analog and discrete inputs on the VAPOR-LOGIC®3 control system. The Next and Back soft keys are used to scroll through the input signals on your system.

The Diagnostics screen is particularly useful when troubleshooting. For example, if you were going to troubleshoot the RH signal input, select RH Signal on the Diagnostics screen. The display then shows you what the input signal is in mA. It also shows you what this current translates to in terms of relative humidity. You then can verify that the input is working correctly.


Depending on system options and type, the available Diagnostics menu items may include:

- RH input
- Demand input
- Dewpoint input
- Duct HL input
- Temp comp input
- High probe voltage
- Mid probe voltage
- Low probe voltage
- DI float
- Tank temp input
- Airflow switch
- Safety interlock
- Blower 1 RPM
- Blower 2 RPM
- Blower 3 RPM
- Blower 4 RPM
- Burner 1 gas valve
- Burner 2 gas valve
- Burner 3 gas valve
- Burner 4 gas valve
- Combustion air switch
- Power vent switch

# Main menu: 6) Reports

### Reports

The Reports menu displays up to four report options to help the user gain historical data on the humidification system. The information contained in each report is explained below.

### Water usage report

The Water Used report displays how many pounds (kilograms) of water were converted to steam on the humidifier. On version 3.0.1 and higher, this total can be reset from the water usage report screen by pressing the Reset soft key. The date the water usage was reset last also appears on the report. On previous versions of software, the water usage report is reset when the service interval is reset from the Set Up menu.

### Energy usage report

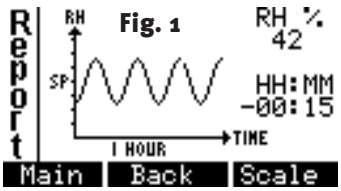
The Energy Used report displays how much energy was consumed by the humidifier. Depending on the system type, this number may be in kWh, MBtu, therms, etc. On software version 3.0.1 and higher, this total can be reset from the energy usage report screen by pressing the Reset soft key. The date the energy usage was last reset also appears on the report. On previous versions of software, the energy usage report is reset when the service interval is reset from the Set Up menu.

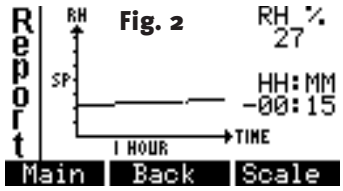
### RH/dew point history report

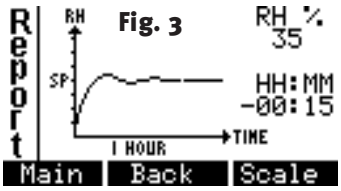
The RH (or dew point — depending on system configuration) history report provides a way to track minimum and maximum RH or dew point. This data can be reset at any time by pressing the Reset soft key to allow trending over a desired interval of time. The date the RH or dew point history was reset last also appears on the report. The Back soft key returns to the Reports menu. The Main soft key returns to the Main Menu. The history report is disabled on systems with an external control signal by others.

### RH/dewpoint/demand graph

The RH (or dew point or demand) graph provides a graphical depiction of RH versus time. Examples of this are shown in Figures 1 through 3. The vertical axis either displays RH in 1% increments, dewpoint in 1 degree increments, or demand in 2.5% increments depending on system configuration. On the RH graph, the RH set point is denoted by SP in the middle of the vertical axis. Data is graphed over three different time intervals: the last 10 minutes, the last 1 hour, or the last 24 hours. Each interval can be scrolled through by pressing the Scale soft key. The Back soft key returns to the Reports menu. The Main soft key returns to the Main menu. The left and right arrows move the blinking cursor across each data point on the curve. The value of the blinking cursor's data point appears in the upper right corner of the screen. The time (how long ago) when that data point was taken appears directly below its value.



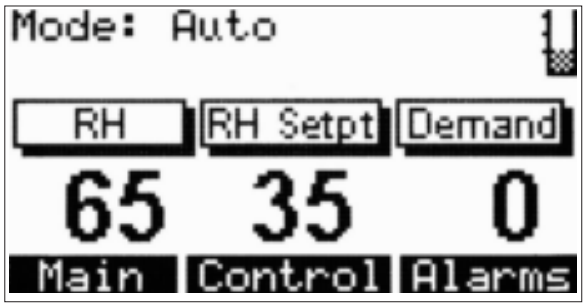




The graph is useful when tuning the PID loop (adjusting the proportional, integral, and derivative gain values). Consider the following examples: Figure 1 depicts a system where the RH is oscillating and may not maintain the RH set point. This is an example where Ki (integral gain) is too high. Figure 2 depicts a system where the RH either takes too long to reach set point or never reaches set point. This system would benefit from increased Ki. Figure 3 depicts a perfectly tuned system.

# Main menu: Idle screen

### Idle Screen




The Idle screen provides a convenient way to monitor the humidifier's basic operation. Depending on system options, the system set point, the actual space condition, and/or the system demand predominantly appear on the Idle screen.

The top line of the display shows the current mode of the humidifier: Auto, Test, Standby, or Manual Drain.

The second line is a system status line. This line continuously scrolls through current system status items. This can include (depending on your system's options) Filling, Skimming, No Duct Air Flow, High Limit Disable, etc. See page 36 for a complete list. The soft keys provide quick, direct access to the Control Modes screen, the Alarms screen, or back to the Main menu screen.

A tank-level indicator appears in the upper right corner of the screen when the system is configured for potable or standard water. On potable or softened water systems, a three-probe system is employed to detect water at three different levels in the tank. For more information on the water level control system, refer to page 54. When water is in contact with all three sensing probes, the *full* graphic appears. When water is in contact with the bottom two probes, the *mid level* graphic appears. When water is only in contact with the bottom probe, the *low level* graphic appears. When there is no water in contact with any probes, the *empty* graphic appears.

- Full tank
- Mid level tank
- Low level tank (fill cycle initiated)
- Empty tank (heaters disabled)

# Control input signals

### On-off control

On-off control is the simplest control scheme and does exactly what its name implies: the output device turns fully on, then fully off. Most residential furnaces use this type of control.

The humidistat that controls the humidifier has a differential between the on and off switch points. The differential is established at a range sufficient to prevent output short cycling. In other words, the humidity level has to fall a little below set point before the humidistat closes and energizes the humidifier. Once the humidifier is energized, the humidistat stays closed until the humidity is a little above set point. This creates an operating range that prevents the humidifier from running for very short periods of time.

This type of operation is an available control option for all DRI-STEEM® humidification systems controlled by VAPOR-LOGIC®$_3$. In applications where there are multiple contactor outputs, such as a VAPORSTREAM®, the contactors for the different heat stages are pulled in one at a time with a one-second delay between them to prevent a brownout condition. In applications with a variable output stage, such as an STS® or GTS®, the outputs are ramped up until they reach 100%.

### Demand signal control

With demand signal control, the VAPOR-LOGIC$_3$ controller provides the output level that a master control signal calls for. This signal can be generated either by a humidistat or by a building energy management system. The signal that is sent to the VAPOR-LOGIC$_3$ board is a modulating signal (typically 4 to 20 mA or 0 to 10 VDC). VAPOR-LOGIC$_3$responds to this signal by producing a direct proportional output. In other words, with a 4 to 20 mA signal, a command of 4 mA produces no output. A command of 12 mA runs the humidifier at 50% capacity, and a command of 20 mA runs the humidifier at 100% capacity. With a humidistat provided by DRI-STEEM producing this signal, the humidity set point is set at the humidistat. The keypad/display then is used for maintaining and troubleshooting the humidification system, with humidifier control stemming from the humidistat itself. With an energy management system (EMS) providing the signal, the humidity set point is established on the EMS, and the humidifier responds to the EMS commands.

### Transmitter control

With transmitter control, the VAPOR-LOGIC$_3$ board receives a linear signal that corresponds to the actual humidity level measured in the space being controlled. (With a transmitter provided by DRI-STEEM, the signal is 4 to 20 mA, which corresponds to 0 to 100% RH). The VAPOR-LOGIC$_3$controller employs an internal PID loop that uses this humidity measurement along with a user-defined humidity set point to calculate a demand level. This demand level is the level at which the humidifier will run. For more information on the PID control loop, refer to page 49.

# Modulation types: TP modulation

### TP modulation (electric humidifiers)

The standard form of modulation with an electric humidifier is time proportioning (TP) modulation. With TP modulation, the outputs are cycled on and off at a certain rate to approximate humidifier demand.

To calculate the example below, imagine that each contactor represents 25% of the output of the humidifier. With a 55% system demand, we need two full contactors plus 5/25 of a third contactor. Therefore, two contactors are full on and a third contactor is on for 5/25 of 60 seconds, or 12 seconds.

For example, if a VAPORSTREAM® humidifier has four heat output stages (four contactors) and a demand of 55%, two of the contactors are energized all of the time; one contactor cycles on and off at a certain rate, and one contactor is off. The rate at which the third contactor cycles is determined by the demand and the heater cycle time. Continuing with our example, if we have a heater cycle time of 60 seconds and a demand of 55%, the third contactor cycles at a rate of 12 seconds on and 48 seconds off.

To minimize wear on cycling contactors, VAPOR-LOGIC$_3$® keeps track of the number of cycles on all contactors, and it rotates the TP cycling contactor to ensure that all get equal wear. In addition, to prevent short cycling, no contactor has a cycle time less than two seconds or greater than the heater cycle time minus two seconds.

If system demand dictates that a contactor needs to be on for less than a second, the contactor does not energize. If the contactor needs to be on for between one and two seconds, the contactor is energized for the minimum two-second period. Also, if a contactor needs to be de-energized for less than one second, it stays on. If a contactor needs de-energize for between one and two seconds, the contactor de-energizes for the minimum two-second period.

These measures prevent short cycling of the contactors and extend their life. On a TP system with contactors, the heater cycle time is user adjustable and can be set from 30 seconds to 99 seconds (default is 60 seconds) via the VAPOR-LOGIC$_3$ keypad/display.

### TP modulation (gas humidifiers)

GTS® burners provide TP modulation control when system demand is low. See page 47 for more information about gas burner modulation.

# Modulation types: SSR modulation

DRI-STEEM® electric humidifiers are available with two basic types of solid state relay (SSR) modulation: SSR modulation with contactors and 100% SSR modulation.

### SSR modulation with contactor sequence

On systems that employ SSR modulation with contactors, the operation of the unit is the same as with TP modulation. In this scenario, one of the cycling contactors is replaced with an SSR. The SSR now is the device that carries out all of the cycling duties. The contactors are always either on or off. Any needed TP cycling is handled by the SSR stage.

This provides two distinct advantages over standard TP modulation. First, an SSR can turn on and off much faster than a contactor can. Therefore, as the unit modulates around a demand signal, tighter control is achieved because the cycle time on an SSR system can be as low as one second (factory set at two seconds). This means that every two seconds, the controller can adjust the on and off times of the SSR to closely track desired demand.

The second major advantage over standard TP modulation is reliability. With a solid state device like an SSR, component wear and tear is almost nonexistent compared with an electromechanical device such as a contactor. Therefore, with the SSR doing all of the heavy cycling work, the life expectancy of the contactors is extended.

### 100% SSR modulation

The ultimate in electric humidifier modulation is 100% SSR modulation. With this type of control, all heat stages are controlled by SSRs. This allows the output of the humidifier to track the actual demand closely because all heat stages now can cycle on and off at the rapid SSR cycle rate.

With 100% SSR modulation, a contactor is still provided in series with the SSR device as an additional safety feature. This contactor is energized any time there is demand on the humidifier and remains energized until the demand is satisfied. In this way, if there is a failure in the SSR device, the contactor serves as a backup to shut down the humidifier.

# Modulation types: valves and burners

### STS® and LTS® valve modulation

With a valve system, the demand signal simply determines how far the valve opens. In other words, if the system demand is 25%, the valve opens 25%.

### GTS® burner modulation

A GTS burner assembly consists of a variable speed blower, a constant air/gas ratio modulating gas valve, and a burner. The minimum modulated output capability of an individual burner is 25%. The burner output can modulate from its minimum capacity up to its full-rated capacity. To modulate the output, VAPOR-LOGIC® 3 controls the combustion air blower's speed. As the blower speed varies, the gas valve automatically adjusts the amount of gas introduced into the burner to maintain a constant air/gas ratio. This variable combination of gas and air results in clean combustion over the entire range of the burner capacity.

When system demand dictates that an individual burner must operate below its minimum output capability, burner operation changes from modulated to time proportioned (TP), meaning that the burner output is kept constant while it is on, but is cycled on and off. The burner cycle time is two minutes, and the burner on time is determined by the system demand. The breakpoint between burner modulation and burner time proportioning depends on the number of burners on the GTS: 25% for a one burner, 12.5% for a two burner, 8.33 % for a three burner, and 6.25% for a four burner.

To ignite the burner, the blower is run at a speed optimized for ignition to provide the smoothest, quietest, most reliable ignitions. If the tank is cold, the unit runs at 100% capacity to preheat the tank. Once the tank temperature rises above 190 °F (88 °C), the burner output is determined by system demand. In a multiple burner system, one burner is always running when there is demand, while the other burners may or may not be running depending on system demand. Once all burners are off, the ignition order reverses upon re-ignition to maintain even wear on combustion system components.

# Adjusting set point

### Adjusting the set point through the Set Up menu

Set point adjustments are accomplished through the Set Up menu, which is under the Main menu (refer to the menu structure diagram on pages 32 and 33).

Once you access the Set Up menu, you can adjust a number of parameters including the set point of the unit. To adjust the humidity set point, your unit must be configured for a humidity transmitter. You can enter a desired humidity set point anywhere in the range of 20% to 80%. Your set point modifications take effect as soon as you press Enter, or move to another parameter using the Next or Back soft keys, or exit the Set Up menu using the Main soft key.

Depending on your options, you also can adjust the high limit humidity set point and the dew point set point. The high limit set point has a valid range of 50% to 95%. The dew point set point has a valid range of 20 °F to 80 °F (–7 °C to 27 °C). If your unit is equipped with the dew point control option, you have a humidity set point option.

# PID tuning

### Tune your system with PID loop

When your unit is equipped with a humidity or dew point transmitter, you can adjust the set point through the keypad/display. Control is accomplished through a proportional, integral, and derivative (PID) control loop.

With a PID loop, you are able to "tune" your system for maximum performance using the proportional (Kp), integral (Ki), and derivative (Kd) gain terms. These gain factors work in the following way: the overall demand in a PID system is made up of three distinct parts that are added together. There is the proportional piece, the integral piece, and the derivative piece. Each one of these parts is calculated and then multiplied by its corresponding gain factor. These gain factors are the setup variables that you have access to from the Set Up menu. By making a gain factor larger, you increase its overall influence on system demand. Once each PID component is multiplied by its gain factor, all three terms are added together to determine the overall demand percentage.

### The proportional term

The proportional term is the difference between the RH set point and the actual humidity multiplied by the proportional gain. For example, with a Kp of 80 and the actual humidity 5% below the RH set point, the proportional contribution to the demand is: $5 \times 80 \times 0.085 = 34\%$ (the 0.085 is an internal scalar used to increase the usable span of Kp).

There is a problem with using only proportional gain to control the RH. In almost all applications there is some constant load on the humidifier just as there is a constant load on heating equipment. If the proportional term is all that is used, the actual humidity must be less than the set point for the humidifier to be on.

What happens is the humidifier finds a "happy medium" where the actual humidity is something less than the set point, which allows the humidifier to continue to run. This difference between the set point and the actual running humidity level is called the "droop." This droop can be corrected using the next term, the integral gain.

**More on next page ...**

# PID tuning

### The integral term

The integral term is an accumulation of RH error over time multiplied by the integral gain. The way this works is as follows: every ½ second when the demand is updated, the instantaneous RH error (RH set point – actual RH) is added to a temporary variable that accumulates the error. This accumulated error is multiplied by the integral gain to create the integral term. The integral gain affects how fast the humidifier corrects a droop condition. The higher the integral gain (Ki), the faster the reaction. (An integral gain of zero disables this variable and allows the unit to run on the proportional term only.)

With an integral gain term greater than zero and an actual humidity below set point, each time the demand is updated it increases slightly. If the actual humidity is above set point, the demand decreases slightly. The amount it increases or decreases depends on the magnitude of the RH error and the integral gain value. The closer you are to the set point, the smaller the addition or subtraction.

When looking at this control scheme, an interesting pattern occurs. The total demand signal for the humidifier is the sum of the proportional part, the integral part, and the derivative part. As the actual humidity approaches the set point, the integral portion makes up the majority of the demand, and the proportional part makes up very little. Once the set point is achieved and the unit stabilizes, the entire demand is made up of the integral part because the proportional part is zero.

If the actual humidity goes over the set point, the integral term starts to decrease. In addition, the proportional term becomes negative and actually starts to subtract from the total system demand. These two items work in conjunction with each other to bring the humidifier back to set point.

### The derivative term

The derivative term is the measured change in error over time multiplied by the derivative gain (differentiating error with respect to time). Its basic operation is as follows: if the actual measured RH is below set point and is rising, the derivative term subtracts from the demand in anticipation of the approaching set point.

If the actual measured RH is below set point and is falling, the derivative term adds to the demand in anticipation of the need to get the demand up faster and start climbing toward set point. If the actual measured RH is above set point and falling, the derivative term adds to the overall demand in anticipation of the approaching set point. It generally is used to increase damping and, in some cases, improves the stability of the system.

However, in the majority of control situations, the derivative term is not needed and is simply set to zero. The proportional term and integral term provide tight, accurate control without the addition of the derivative term.

**More on next page ...**

# PID tuning

### PID band

The last user-controlled term in the PID equation is the PID band. The PID band defines the range of measured RH values (°F/°C for dew point control) where the PID loop is in operation. The PID loop is in operation when the measured RH is in the range of (RH set point – PID band) to (RH set point + PID band). If the measured RH is below the PID band, the PID calculations are suspended and the demand is set to 100%. Conversely, if the measured RH is above the PID band, the demand is set to 0%.

For example, if starting with an RH set point of 35% and a PID band of 10%, the PID loop operates when the actual humidity is in the range of 25% to 45%. If the actual humidity is lower than 25%, the humidifier is full on. If the actual humidity is above 45%, the humidifier demand is 0%. The PID band aids in speeding the response time of the system. It allows the RH to get somewhat close to the set point and then lets the PID loop precisely control the RH when it is within the PID band. The default value for the PID band is 10%.

Large spaces where the humidification system influences the RH very slowly typically benefit from a smaller PID band. Small spaces where the humidification system can quickly influence the RH typically benefit from a larger PID band. Rarely should it be set to less than 10%.

### PID setup tips

A large PID band (10 to 20%) yields tighter and more stable control with longer response times. A small PID band produces quicker response times, but control may become unstable if the RH regularly goes outside the band.

As a rule, start with a PID band of 10%. Make sure that when the humidifier is operating at steady state, the RH does not go outside the PID band. The intent of the PID band is to quickly get the RH into a controllable range. To increase or decrease the effect of the proportional term on system performance, adjust the proportional gain (Kp).

However, for the majority of systems, the factory default setting of 80 is sufficient. Generally speaking, a large integral gain quickens the system response but may cause it to oscillate and become unstable. A small integral gain yields tighter, more stable control at the expense of a long response time.

These principles can be applied in the following examples: if a system eventually reaches the desired RH level but takes a long time to do so without overshooting the set point, faster response can be achieved by increasing the integral gain (Ki). If the measured RH oscillates above and below the set point numerous times before finally reaching set point, decrease the integral gain.

Typically speaking, if a large adjustment is made to the integral gain, better response is achieved by decreasing the magnitude of the change. Then modify the proportional gain slightly in the same direction the integral gain was changed. The RH graph on the reports menu can aid in PID loop tuning by displaying the effect modifying PID gain values has on system response. The RH graph feature is explained in the reports section on page 42.

# VAV, temp comp, dew point control

## VAV control

With VAV control, the system is equipped with a duct RH transmitter. This transmitter monitors the RH in the duct downstream from the steam dispersion unit and transmits the duct RH to the VAPOR-LOGIC®3 controller. The controller then compares the measured duct RH with the high limit set point (Duct High Lim RH), which is entered through the keypad/display in the Set Up screen. If the measured duct RH comes within 6% of the duct high limit set point, the system output is proportionally throttled back.

If the duct RH reaches the duct high limit set point, the humidifier is completely disabled. Any reduction in system output due to the VAV control option displays the "VAV Output Limit" message on the Idle screen. When the measured duct RH is more than 6% below the duct high limit set point, normal system operation is restored automatically, and the "VAV Output Limit" message is removed from the Idle screen.

## Temperature compensation control

With temperature compensation (temp comp) control, the system is equipped with a window temperature transmitter. This transmitter monitors interior window glass temperature and transmits this temperature to VAPOR-LOGIC$_3$. VAPOR-LOGIC$_3$ assumes a 70 °F (21 °C) room temperature and uses the glass temperature and the RH in the space being controlled to calculate the dew point temperature for the space.

As the window glass temperature decreases and approaches the dew point of the room, the RH set point decreases automatically to prevent moisture from forming on the windows. The modified RH set point appears on the Idle screen. An asterisk (*) appears next to the modified RH set point, denoting that temp comp has taken control of the RH set point, and the "*Temp Comp" message appears on the Idle screen.

Once the window temperature rises, the original RH set point is restored. The temperature compensation option is available only when the system is equipped with an RH transmitter. It is not available when a remote humidistat or energy management system is used to control the humidifier.

## Dew point control

Dew point control functions in exactly the same way as RH control except the dew point is being measured instead of the RH. The dew point transmitter sends a signal to the VAPOR-LOGIC$_3$ controller. Users can modify the dew point set point and PID parameters through the keypad/display just as they can with an RH transmitter.

## Tank preheat feature

The tank preheat feature heats the water in the tank to near boiling to allow a rapid response to a demand signal. Its operation is as follows: If the tank is cold when a small demand signal is present, the VAPOR-LOGIC$_3$ controller overrides the demand signal and runs the humidifier at 100% demand until the tank temperature reaches 190 °F (88 °C).

At this point, control is returned to the original demand signal and the humidifier begins normal operation. This allows the system to respond quickly to even the smallest demand. When preheating, the "Preheating Tank" message appears on the Idle screen. This feature is standard on all DRI-STEEM® humidifiers with VAPOR-LOGIC$_3$ control except Steam Injection humidifiers.

# Aquastat, heat-up, SDU, offsets

### Aquastat operation

The aquastat set point is the minimum tank temperature the VAPOR-LOGIC®$_3$ controller should maintain when there is no call for humidity. It is adjusted through the Set Up screen. This feature shortens the tank preheat time, which provides an even quicker response to a call for humidity.

For example, if the aquastat is set at 180 °F (82 °C) when a call for humidity occurs, the tank only needs to warm up 32 °F (18 °C) to reach the boiling point and start producing steam. However, if the aquastat is at its minimum default setting of 40 °F (4 °C) and the tank is in an average-temperature occupied room, the tank will be about 70 °F (21 °C).

Now, when a call for humidity occurs, the tank needs to warm up 142 °F (79 °C) to reach the boiling point and begin producing steam. When an aquastat call is heating the tank, the "Aquastat Heating" message appears on the Idle screen.

This feature is standard on all DRI-STEEM® humidifiers with VAPOR-LOGIC$_3$ control except Steam Injection humidifiers.

### Freeze Protection

Freeze protection is similar to the aquastat with several notable exceptions. The freeze protect set point is fixed at 40 °F (4 °C). Its sole purpose is to prevent the tank from freezing in cold environments. Unlike aquastat, if a condition exists that prevents the heaters from firing (alarm, external interlock, standby), instead of remaining idle, the tank drains to prevent freezing.

When the tank is heating or draining to prevent freezing, the "Freeze Protection" message appears on the Idle screen.

This feature is standard on all DRI-STEEM humidifiers with VAPOR-LOGIC$_3$ control except Steam Injection humidifiers.

### SDU operation

If your humidifier is equipped with a Space Distribution Unit (SDU) or an AREA-TYPE™ fan, it is enabled after a call for humidity is received and the tank temperature rises above 150 °F (66 °C).

When the humidifier stops heating after it loses its call for humidity, the SDU or AREA-TYPE fan continues to run for the SDU Duration. The SDU Duration is adjustable in one-minute intervals (default is 5 minutes) through the Set Up screen.

### Sensor offsets

All external transmitters shipped with VAPOR-LOGIC$_3$ can be field calibrated using the keypad/display through the Set Up screen. For example, if the system is equipped with an RH transmitter, there is an RH offset setting.

The factory default for all transmitter offset settings is zero. If an adjustment is necessary, use the keypad to adjust the transmitter reading up or down through this setting. The sensors that have this adjustment capability are the humidity, VAV high limit, temp comp, and dew point transmitters.

# Conductivity probe

## Probe system

Standard or softened water systems use conductivity probes to measure and control water levels for optimum operating efficiency. The three-probe system is monitored by the VAPOR-LOGIC®$_3$ board, which performs all the necessary logic and timing functions to provide total water level control and safety shutdown.

VAPOR-LOGIC$_3$ automatically maintains the water level between the upper two probes A and B (see Figures 54-1 and 54-2 below). When the water level falls below probe B, the fill valve opens until the water level reaches the upper probe A. Water must remain in contact with the probe surface for three seconds for VAPOR-LOGIC$_3$ to determine that the water is at the probe's level.

Conversely, water must stay out of contact with the probe surface for three seconds for VAPOR-LOGIC$_3$ to determine that the water is below the probe's level. This three-second delay ensures that turbulence does not cause an incorrect level reading.

Each time the fill valve is energized, the VAPOR-LOGIC$_3$ system tests the probe system. If the signal from the probe assembly is beginning to deteriorate, the message "Clean Probes and Tank" appears. Once the probe system reaches its maximum usable life, the humidifier shuts down from a "Probe Assembly fault."

An adjustable skim time allows for an extended skim period (0 to 120 seconds) to reduce surface mineral accumulation. When skimming, the fill valve remains energized after the water level reaches the upper probe A for the amount of time specified by the Skim Duration. The Skim Duration is adjustable in one-second intervals through the Set Up screen.

Probe C provides low water protection for the heating outputs. If the water level falls below probe C, the heating outputs are disabled.

**Figure 54-1: Conductivity probe for GTS®, VAPORSTREAM®, VAPORMIST®, and CRUV™**

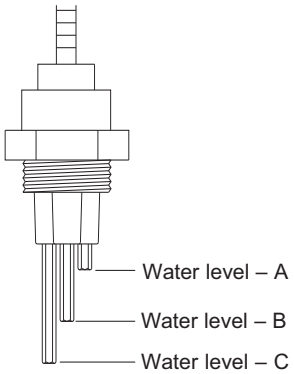



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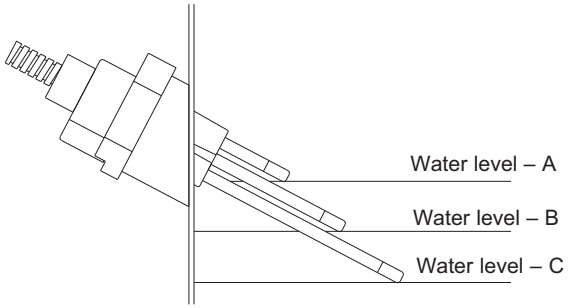
**Figure 54-2: Conductivity probe for STS® and LTS®**




OM-270

# Float valve

## Float valve system

DI/RO water systems (except for steam injection) use a float valve system to control water levels for optimum operating efficiency. DI/RO systems are used where water/steam purity is important, where demineralized water is needed to improve performance or lessen maintenance requirements, or where a potable water source has minimal or no conductivity, thus requiring a float rather than a probe to sense water levels.

The float valve system consists of a fill float and a low water cutoff float.

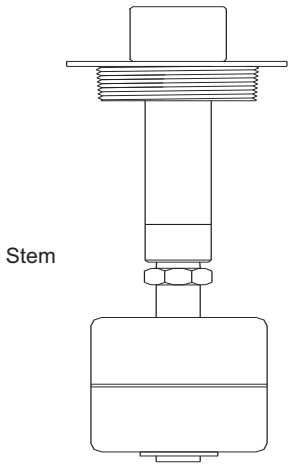
**The fill float regulates how much water is added to the tank** via a float ball, float arm, and mechanical valve. The valve is adjusted to fill the evaporating chamber within ¼" (6 mm) of the overflow (skimmer) port allowing heated and therefore expanded water at startup to fill the external P-trap.

**The low water cutoff float has an electrical switch that closes when a ready water condition is reached.** A low voltage AC current runs from the VAPOR-LOGIC$_3^{®}$ controller to the switch allowing the controller to sense a ready water condition. This float switch provides low water protection for the heating outputs. If the water falls below the float, the heating outputs are disabled.

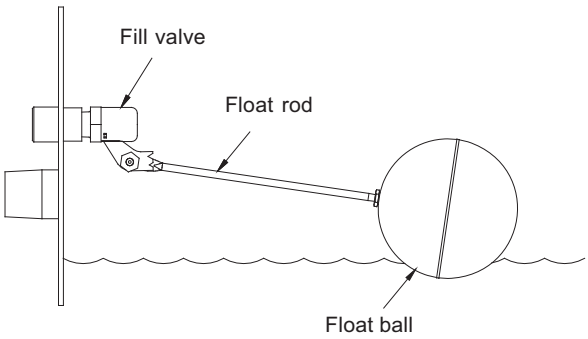
VAPOR-LOGIC$_3$ uses the same three-second delay that is used with the probe system to determine whether water is in contact with the float.

### Figure 55-1: Low water cutoff float system used with DI/RO systems

A "zero" mark on top of the float indicates proper float placement on stem. Switch normally is open when float ball is at its lowest point on stem.




OM-3009




VLC-OM-026

# Automatic drain sequence

## Automatic drain sequence

When configured to run a potable or softened water humidifier with an automatic drain valve, VAPOR-LOGIC$^{®}_{3}$ uses an Automatic Drain Sequence (ADS) to help reduce mineral accumulation in the tank and drain line to decrease tank maintenance.

The ADS starts by opening the drain valve to empty the tank. The default drain time (ADS duration) is product specific (8 to 18 minutes) for potable water or softened water. Once the drain time expires, the fill and drain valves are held open to flush the tank. The default flush time (AFS duration) is one minute. The ADS day is the day the humidifier starts an ADS for the first time.

Once the flush timer expires, the ADS is complete and the humidifier resumes normal operation. The drain and flush times are parameters that can be adjusted in the Set Up screen along with ADS mode. The ADS mode determines how the ADS is triggered. The three ADS modes — Use, Usage + Interval, and Interval — are explained in greater detail below.

Please note that these options are available only with a standard or softened water system with an automatic drain valve. If the humidifier is configured for DI/RO water or if the unit has a manual drain valve, these drain and flush options are not available.

| Automatic drain sequence system dependent defaults | | |
|---|---|---|
| | Drain | Drain and flush |
| VM® | 8 minutes | 1 minute |
| CRUV™ | 8 minutes | 1 minute |
| VLC® | 12 minutes | 1 minute |
| STS® | 14 minutes | 1 minute |
| LTS® | 14 minutes | 1 minute |
| GTS® | 18 minutes | 1 minute |

**1. Use (default ADS mode)**
The humidifier enters the drain and flush sequence after a user-selected amount of water is converted to steam. In other words, if the "Lbs of H2O until ADS" setup parameter is set to 10,000 lbs (4536 kg/h) in the Set Up menu, the unit enters the drain and flush sequence the moment 10,000 lbs (4536 kg/h) of water converts to steam. This allows the unit to drain and flush the moment it is needed. ADS day, ADS hour, and ADS interval are not used when the ADS mode is set to Use.

**2. Use + Interval**
The humidifier enters the drain and flush sequence after both the use and interval requirements, as stated in sections 1 and 3, are met. For example, assume the user sets the "Lbs of H2O until ADS" to 10,000 lbs (4536 kg/h), the ADS day to Sunday, ADS hour to 23, and the ADS interval to one day. Every day at 11:00 p.m., the unit checks to see if at least 10,000 lbs (4536 kg/h) of water converted to steam since the last ADS. If so, the unit drains and flushes. If not, the unit waits until the next interval to see if the usage requirement is met. This allows the unit to drain and flush at a convenient time.

**3. Interval**
The humidifier enters the drain and flush sequence at specific intervals in time, ignoring the amount of water converted to steam. The interval is established by setting the ADS day, ADS hour, and ADS interval from the Set Up menu (Lbs of H2O until ADS is not used when the ADS mode is set to interval). Once the ADS day is reached, the drain and flush occurs at the ADS hour. The unit drains and flushes again after the number of days specified by the ADS interval has passed.

For example, if the user sets the ADS day to Sunday, ADS hour to 13, and the ADS interval to seven days, the unit enters the drain and flush sequence every Sunday at 1:00 p.m. In this example, if the ADS interval is changed from seven to six days, the first ADS occurs on Sunday, the next on Saturday, the next on Friday, and so on.

Note that if the ADS interval is not a multiple of seven days, the ADS day becomes meaningless after the first drain and flush sequence. It is re-used only if the ADS mode is reset. The interval ADS mode allows the user to keep the humidifier on-line until a convenient time for the drain and flush sequence.

# Skim, service interval, EOS, date set

### Skim timer

With a potable or softened water configuration, the VAPOR-LOGIC$_3^{®}$ controller comes equipped with a skim timer. This timer is activated at the end of each fill cycle. The timer keeps the fill valve open for a user-determined amount of time after the tank has filled, to skim minerals off the water surface. The skim time is adjusted through the Set Up screen on the keypad/display.

### Service interval

The VAPOR-LOGIC$_3$ controller tracks the amount (pounds/kilograms) of water converted to steam. When the amount of water converted to steam by the humidifier exceeds the Service Set point, the "Service Humidifier" message appears on the Idle screen of the keypad/display.

The Service Set point is a user-defined amount of water in pounds/kilograms that can be adjusted through the system Set Up screen.

The humidifier continues to operate after the message appears. The message notifies the user that the service interval has been reached and the humidifier should be cleaned. To remove the "Service Humidifier" message from the Idle screen and reset the Service Interval, press the Enter key when viewing the "Water til Service" parameter in the Set Up menu.

### End-of-season drain

If there is no call for humidity for a preset time period, the humidifier is placed in End of Season (EOS). When the unit enters EOS mode, the drain valve is held open for ten hours to allow the tank to drain and then closes. When the humidifier receives a call for humidity after the end-of-season drain, the tank refills and the humidifier resumes normal operation.

The amount of inactivity time that is needed before the humidifier enters End Of Season is adjustable through the Set Up screen on the keypad/display (Inactivity Until EOS). This option is available only on units equipped with automatic drain and fill valves.

### Setting date and time

The VAPOR-LOGIC$_3$ controller contains a real-time clock that is used for several features including the drain and flush sequence and the logging of alarms. If it becomes necessary to reset the date or time, they are accessible through the Set Up screen on the keypad/display.

# Safety features

### Tank level fault

The VAPOR-LOGIC® $_3$ controller keeps track of how much water is converted to steam. If this total amount exceeds a preset limit without the fill valve being energized, a low water condition is assumed. This shuts down the humidifier and logs a tank level fault. The humidifier will not resume operation until the user clears this fault from the Alarms screen. Each time the fill valve is energized, the total is reset to zero.

Note that this system is not used on a DI/RO humidifier because the fill valve is not an electric solenoid type. On a DI/RO tank, a mechanical fill valve maintains the proper water level. This fill valve operates independently of the VAPOR-LOGIC$_3$ controller. Therefore, on a DI/RO system, VAPOR-LOGIC$_3$ cannot keep track of the amount of water converted to steam between fill cycles.

### Overtemperature fault

The tank temperature is constantly monitored by the VAPOR-LOGIC$_3$ controller. If the temperature rises above the overtemperature set point (235 °F [113 °C]), the humidifier shuts down and a thermal trip fault is logged on the Alarms screen of the keypad/display. The humidifier will not resume operation until the user clears this fault on the Alarms screen.

# Alarms screen, fault messages

### Alarms screen

The Alarms screen on the keypad/display logs the last ten alarms that occurred on the humidifier. To scroll through the alarms, use the up and down arrow keys. You can clear an alarm by pressing the Clear soft key. The alarm then is cleared and is left in the alarm log for future reference.

When viewing the alarm log, only the first alarm can be active. All subsequent alarms listed in the log are cleared and occurred in the past. If you want more information on any alarm in the log, select that alarm using the arrow keys and then press either the Info soft key or the Enter button. A screen appears with the date and time the alarm occurred as well as a more detailed explanation of what the alarm means. Please note that this is a complete list of faults. Your system may not have all of these options.

### Sensor faults

The following is a list of sensor faults that can occur. The text in parentheses is the text that actually appears in the alarm log.

- **Humidity transmitter fault (RH Trans Fault)**

  The humidity sensor is incorrectly wired or defective.

- **Dew point transmitter fault (DP Trans Fault)**

  The dew point sensor is incorrectly wired or defective.

- **VAV humidity transmitter fault (VAV Trans Flt)**

  The duct humidity sensor is incorrectly wired or defective.

- **Temperature compensation transmitter fault (Temp Trans Flt)**

  The temperature compensation sensor is incorrectly wired or defective.

### Water level control faults

The following is a list of water level control faults that can occur. The text in parentheses is the text that actually appears in the alarm log.

- **Fill fault (Fill Fault)**

  The fill valve has been energized for more than 40 minutes without the water reaching the top probe.

- **Drain fault (Drain Fault)**

  The drain valve has been energized for more than 20 minutes without the water falling off the bottom probe.

- **Tank level fault (Tank Level Flt)**

  The unit has run too long without the fill valve opening. Fill valve may be stuck open, heating devices may be damaged, or heater control may be faulty.

- **Low level probe fault (LL Probe Fault)**

  The sensor has indicated that the water in the tank reached the middle or top probe without reaching the lower probe.

- **Mid level probe fault (ML Probe Fault)**

  The sensor has indicated that the water in the tank reached the top probe without reaching the middle probe.

- **Probe assembly fault (Probe Assy Fault)**

  The signal from the probes has deteriorated severely. Clean the probes and tank; however, the probes may need replacing.

# Fault messages

### Humidifier faults

The following is a list of humidifier faults that can occur. Please note that this is a complete list of faults. Your system may not have all of these options. The text in parentheses is the text that actually appears in the alarm log.

- **Temperature sensor fault (Tank Temp Fault)**

  The temperature sensor on the humidifier tank is incorrectly wired or defective.

- **Thermal trip fault (Thermal Trip)**

  The tank temperature has exceeded 235 °F (113 °C).

- **Boil time fault (Boil Time Flt)**

  The water in the tank failed to boil within the maximum boil time.

- **SDU fault (SDU Fault)**

  The SDU blower pressure switch failed to close when the SDU started.

- **Flue fault (Flue Fault)**

  The air damper limit switch and/or the power vent pressure switch failed to close after the combustion air blowers started.

- **Burner [No.] fault (Burner [No.] Fault)**

  The burner failed to light after nine ignition attempts.

- **Ignitor [No.] fault (Ignitor [No.] Fault)**

  The ignition control module failed to energize the gas valve on every ignition attempt.

- **Blower [No.] fault (Blower [No.] Fault)**

  The specified blower was unable to reach the desired speed.

# Troubleshooting introduction

**1. Review troubleshooting index.**
If you have a control-related problem, first check the problem list in this section. If you have a tank-related or dispersion-related problem, you may also need to refer to those specific product manuals.

**2. Review possible causes and recommended actions.**
The troubleshooting guide on the following pages presents possible causes and recommended actions for typical problems.

**3. If you're still having problems, call us.**
If the troubleshooting guide does not help you solve your problem, call us with the following information available:

- **Product name, configuration string code, and order number**

  You'll find this information on the wiring diagram and on the outside of the control cabinet door.

- **Problem definition**

  Example: water leaking, low humidity, high humidity, etc.

- **Time problem began**

  Example: Always, after remodel, after a change in weather, etc.

- **System changes**

  Example: Pressure, new boiler, new service, new controller, relocation, change in maintenance, etc.

**Humidifier model number** _____

**Humidifier serial number** _____

**VAPOR-LOGIC® 3 configuration string** _____

**Order number** _____

# Index to troubleshooting guide

Below is an index to possible control-related problems described on the following pages. To find solutions, refer to the page number.

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Green power indicator light is off.** | • No control voltage present | • Check for proper supply voltage. |
| | • Heater fuses open | • Check heater fuses for voltage present at transformer. |
| | • Transformer secondary circuit breaker tripped | • Check for wiring shorts; reset breaker. |
| **No remote fault indication** | • Field wiring not installed | • Provide field wiring to a remote fault indicator from VAPOR-LOGIC® 3 terminal block J22 (see page 7). |
| | • Field-supplied remote fault indicator lamp is burned out. | • Check if lamp by others is burned out; replace if needed. |
| | • Remote fault VAPOR-LOGIC$_3$ relay is not switching. | • Check relay continuity (VAPOR-LOGIC$_3$ terminal J22) for contact closure (see page 7). |
| **No readable information on keypad/display** | • No power or incorrect voltage to VAPOR-LOGIC$_3$ board | • Check main power supply.<br>• Control transformer, circuit breaker tripped. Reset. |
| | • Modular communication cable is disconnected. | • Connect modular cable. |
| **Transmitter faults/ Humidistat faults**<br>• **Humidity transmitter fault (RH Trans Fault)**<br>• **Dew point transmitter fault (DP Trans Fault)**<br>• **VAV humidity transmitter fault (VAV Trans Flt)**<br>• **Temp comp transmitter fault (Temp Trans Flt)** | • Open, shorted, or incorrect wiring of transmitter or humidistat<br>• Signal is incorrect, out of range, or miswired.<br>• Ground loop<br>• Control signal exceeded the range limits. Correct control signals are 4 to 20 mA, 0 to 135 ohms, or 0 to 15 VDC | • Check DC supply voltage terminals:<br>RH transmitter: terminal 21: 21 VDC, terminal 23: GND<br>DP transmitter: terminal 21: 21 VDC, terminal 23: GND<br>VAV humidity transmitter: terminal 24: 21 VDC, terminal 26: GND<br>Temp comp transmitter: terminal 27: 21 VDC, terminal 29: GND<br>Humidistat: terminal 23: 21 VDC, terminal 23: GND<br>• If there is no output, 4 to 20 mA, replace transmitter. Transmitter by others not be compatible. Consult DRI-STEEM®.<br>• Isolation board by others.<br>• Recalibrate if there is a calibration error: Normal Range 4 to 20 mA = 0 to 100% RH; 12 mA = 50% RH<br>• Measure for normal 1 to 5 VDC range on Control RH transmitter or 4 to 20 mA by others: terminal 22 +, terminal 23 –. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Fill fault** | When in fill sequence, VAPOR-LOGIC® 3 allows 40 minutes for the water to reach the maximum upper water level. If the water does not reach the designated level, and the probe system is not satisfied, a fault is indicated.<br><br>There are two main possibilities: either the water is not there or the water is not being detected. | **Tank is not full**<br>• Fill and drain valve wiring are reversed.<br>• Low water supply pressure (25 psi [552 kPa] minimum)<br>• Water shut-off valve is closed.<br>• Check the in-line strainer; clean as needed.<br>• Check for proper wiring of humidifier cover interlock switch.<br>• Check if there is 24 VAC present across fill valve coil. If yes, replace valve.<br>• Verify proper fill valve wiring at terminals 1 and 2. Initiate a VAPOR-LOGIC$_3$ test cycle.<br>• Check if needle valve is open and free of sediment.<br>• Incorrect operating voltage fill valve was installed. Valve coil should be 24 VAC.<br>• Remove fill valve and check for any foreign material plugging the valve.<br>• Fill valve may be plumbed backward. Note flow direction and correct as needed.<br>• Excessive water hammer can bend a needle valve and make it difficult to open. If this is happening, the valve may need to be replaced. Install a water hammer arrester.<br>**Tank is full**<br>• Clean or replace probe<br>• Low conductivity water. (Minimum 100 microSiemens/cm or 2 grains/gallon.) Add salt to increase water conductivity. Consult DRI-STEEM® for further advice. |
| **Drain fault** | When in autodrain sequence or end-of-season drain, VAPOR-LOGIC$_3$ allows 20 minutes for the water level to drop from the top probe to below the lowest probe. If the tank does not drain to this level in the time allotted, a fault is indicated. | • Check drain valve wiring.<br>• Check for voltage present at the valve. If present, clean or replace valve.<br>• Check if the tank drain outlet from humidifier is plugged. Clean.<br>• Reset VAPOR-LOGIC$_3$. |
| | • Water detection probes | • Clean probe or replace probe rod assembly. |
| | • Drain valve wiring | • Check to be sure drain valve is wired to terminals 3 and 4 on control board. |
| | • Fill valve | • Fill valve may be leaking water through. |
| | • System programmed for manual drain | • Run a test cycle to see if the system activates drain output. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Drain fault (continued)** | • Drain line backing up with water<br>• Drain line plugged | • Insufficient drain line pitch<br>• Insufficient drain line size, 1¼" (32 mm) minimum for distance over 10' (3 m) |
| **Tank level fault (Tank Level Flt)** | • Fill valve is stuck open | • Check valve for foreign matter. |
| | • Fill valve is installed backward | • Check arrow direction on valve, or "In" should be visible on fill valve body. |
| | • Water probes have not proven | • Drain valve may be stuck open. Clean or replace valve.<br>• Water is not conductive for probe system. Add salt or convert to DI control. (If this solves the problem, you have low-conductivity water. Consult DRI-STEEM® for further advice.) |
| | • Excessive condensate draining into tank | • Consult DRI-STEEM to increase the amount of water that can be converted to steam before receiving fault |
| **Boil time fault** | • Faulty tank temperature sensor<br>• Diminished output | • Verify tank temperature sensor is functioning correctly and is affixed to the tank (70 °F [27 °C] measures 1000 ohms).<br>• See "Reduced or no output" entry in this troubleshooting guide. |
| **Low level probe fault (LL probe fault)** (The lowest probe showed no water when one of the upper probes did show water.)<br><br>**Mid level probe fault (ML probe fault)** (The middle probe showed no water when the upper probe did show water.) | • Low conductivity water supply | • If conductivity is less than 100 micro Siemens/cm or 2 grains/gallon minimum, add salt to increase. Consult DRI-STEEM for further advice.<br>• Measure 0 VAC from probes to ground when water is in contact with probes. |
| | • Dirty or oxidized probes | • Clean probe; remove oxidation and/or minerals. |
| | • Incorrect installation | • Verify proper wiring of probe system. Shielded (screened) wiring is not recommended.<br>• Probe wiring routed with high voltage wiring.<br>• Wiring between control cabinet and humidifier exceeds the recommended 50' (15 m) limit.<br>• Check fill and drain plumbing installation.<br>• Back pressure from dispersion system, distance, elbows, restrictions.<br>• No P-trap installed on tank and/or P-trap is plugged.<br>• Poor maintenance; tank needs cleaning. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Clean probes & tank** (This message appears on the Idle screen; it is not an alarm.) | • Low water conductivity | • Check conductivity. Water conductivity must be at least 100 microSiemens/cm or 2 grains/gallon hardness. Add salt to increase. Consult DRI-STEEM® for further advice. |
| | • System detected a need to clean or replace probe. | • Remove and clean probe rods.<br>• Drain tank of water below probe, then reset system and restart. |
| | • Mineral buildup or oxidation on probe rod | • Clean probe rods. |
| | • Incorrect wiring of probe | • Check for proper wiring.<br>• Do not use shielded cable.<br>• Probe wires must be routed separately from high voltage wires to avoid interference. |
| | • Humidifier interlock switches and/or overtemperature thermostat | • Switch or thermostat not wired.<br>• Interlock switch not set correctly or humidifier cover off.<br>• Overtemperature thermostat not reset. |
| | • Deterioration of probe rod assembly | • Replace probe rod assembly. |
| | • Probe signal too low | • Measure probe voltages. With water off the probe, voltage should be 2.2, or greater, VAC from each probe to ground; with water, 0 VAC. |
| | • Probe wiring | • Check for proper wiring.<br>• Machine ground must be present between control cabinet and humidifier tank.<br>• Do not use shield (screen) cable. Individual 18-gauge ($1mm^2$) standard wire is recommended.<br>• Maximum wiring distance is 50' (15 m) from humidifier to control cabinet. |
| | • Reset to clear message | • Drain humidifier tank completely; reset VAPOR-LOGIC®$_3$ to restart system. |
| | • Poor continuity | • No machine ground between control cabinet and humidifier tank. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Probe assembly fault (Probe Assy Flt)** | • Deterioration of probe rod assembly<br>• Foaming | • Replace probe rod assembly.<br>• Clean tank/increase skim duration |
| **Tank temperature fault** | • Open, shorted, or incorrect wiring of sensor | • Check wiring terminals (terminal J25) for correct wiring and voltages (see page 8). |
| **Thermal trip fault** | • Unit has overheated. | • Check for proper water level in tank. |
| | • Faulty sensor | • Repair sensor or replace. |
| **SDU fault** | • SDU blower or airflow proving switch is incorrectly wired. | • Check SDU for proper wiring. |
| | • SDU blower cover is off. | • Install cover. |
| | • SDU blower motor is defective (SDU fan does not start). | • Replace SDU blower. |
| **Checksum failure** | • Internal program changed (VAPOR-LOGIC® 3 detected a change from its previous program check) | • Consult DRI-STEEM® for reprogramming instructions. |
| **Flue fault** | • The combustion air damper is incorrectly wired or failed to open. | • Check for proper combustion air damper wiring. |
| | • The power vent pressure switch is incorrectly wired, or the power vent failed to start. | • Check for proper power vent wiring. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Burner [no.] fault** | • No gas supply to unit | • Verify that gas service valve is on and receiving minimum pressure to manifold per rating plate. |
| | • Gas valve is off or there is no power to the valve. | • Verify that valve is in the “on” position and that there is power to the valve. |
| | • Broken ignitor | • Verify that ignitor glows. |
| | • Gas valve/ignitor/sensing electrode is out of sequence. | • Verify wire connections to these components. |
| | • Gas valve outlet pressure is too low. | • Verify out pressure is set per rating plate. |
| | • Blower inlet is dirty or obstructed. | • Clean inlet and check for obstructions. |
| **Ignitor [no.] fault** | • Defective ignition control module | • Verify ignition sequence |
| | • Gas valve/ignitor/sensing electrode is out of sequence. | • Verify wire connections to these components. |
| **Blower [no.] fault** | • The blower is incorrectly wired, or the blower failed to start. | • Check for proper blower wiring.<br>• Replace blower |
| **Control does not energize.** | • Nonexistent supply voltage to unit | • Check main line fuse.<br>• Check main line safety switch.<br>• Check heater fuses. |
| | • Nonexistent control voltage | • Check for proper supply.<br>• Verify proper transformer voltage characteristics.<br>• Verify proper wiring of transformer.<br>• Check for control circuit voltage, 24 VAC. If voltage is not present, check transformer circuit breaker. Reset if needed. |
| | • Humidifier overtemperature thermostat open | • Reset manual switch located above heater below humidifier cover. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Unit does not fill with water.** | • Malfunctioning fill valve | • Unplug probe head. Fill valve should open.<br>• If fill valve does not open, verify proper 24 VAC (terminals 1 and 2) to fill valve. If voltage is present and valve does not open, replace valve or valve coil.<br>• Verify that coil is 24 VAC.<br>• Verify that valve stem moves freely. |
| | • No water supply to fill valve | • Check if water supply line strainer is plugged.<br>• Verify that manual water line shut-off valve is open and that pressure exists.<br>• Check that in-line needle valve is open. |
| | • Unit is not in auto mode. | • Go to Control Modes screen and select Auto. |
| | • VAPOR-LOGIC® $_3$ control is in "end-of-season" drain mode. | • Check for humidification demand signal at control board terminals 21, 22, and 23 of terminal block J26 (see page 8.) |
| | • Malfunctioning level control system | • Check terminals 30, 31, 32, and 33 on VAPOR-LOGIC$_3$ control board terminal block J8 for correct voltage:<br>– 32 to 33, no water present > 2 VAC<br>– 32 to 33, water present < 2.5 VAC<br>– 31 to 33, same readings as above<br>– 30 to 33, same readings as above |
| | • Inlet water needle valve is closed. | • Check needle valve. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Fill valve does not close.** | • Open drain valve | • If automatic drain valve is locked in manual open position, reset to automatic.<br>• Replace valve if there is a broken return spring on the drain valve.<br>• Clean or replace drain valve if an obstruction in the valve does not allow complete closure.<br>• Close manual drain valve, if it is open.<br>• If VAPOR-LOGIC® 3 shorted output to fill valve coil, replace board. |
| | • Malfunctioning level control system | • Check that probe head is plugged in fully.<br>• If needed, clean probe rods.<br>• Verify whether VAPOR-LOGIC$_3$ control board with nylon mounting standoffs terminal 33 needs to be grounded.<br>• If there is low water conductivity, add salt to tank water. (If this solves the problem, you have low-conductivity water; consult DRI-STEEM for further advice.)<br>• Replace board if VAPOR-LOGIC$_3$ control board is defective.<br>• Verify that system is in auto mode.<br>• Verify that probe is wired correctly.<br>• Check terminals 30, 31, 32, and 33 on VAPOR-LOGIC$_3$ control board terminal block J8 for correct voltage:<br>– 32 to 33, no water present > 2 VAC<br>– 32 to 33, water present < 2.5 VAC<br>– 31 to 33, same readings as above<br>– 30 to 33, same readings as above |
| | • Fill valve is stuck | • Check if fill valve is installed backwards. If yes, repipe.<br>• If there is a faulty internal spring or diaphragm in the fill valve, replace valve.<br>• Check if there is an obstruction that does not allow valve to seat properly. Clean or replace valve as needed.<br>• Check for control voltage across fill valve coil. (Check wiring and controls.) |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Reduced or no output (even though water level is correct)** | **Electric units**<br>• Heater malfunctioning | • Verify that proper voltage is being applied to heaters.<br>• Check heater amperage.<br>• If heater contactor is not functioning, replace. |
| | • Malfunctioning control system | • Check if heater fuses are blown and replace if required.<br>• Check if auxiliary limit controls are not allowing system to operate, e.g., duct humidistats, airflow proving switch, etc.). Reset, replace, or calibrate as needed. (Airflow switch, terminals 12 and 13, measures 24 VAC if open. On-off high limit, terminals 25 and 26, measures 21 VDC if open.)<br>• Check if the heater overtemperature thermostat has tripped. Reset if necessary. |
| | **GTS®/STS® units**<br>• Dirty heat exchanger<br>• Dirty burners<br>• Low gas pressure | • Fix as appropriate. |
| **Fill valve cycles on and off frequently (several times per minute).** | • Malfunctioning level control system | • If needed, clean probes.<br>• Check water conductivity. (Minimum conductivity for proper operation of level control system is 100 microSiemens/cm or 2 grains per gallon.)<br>• Verify that probe wiring is correct. |
| | • Drain valve not fully closed | • If an obstruction does not allow drain valve to fully close, clean valve.<br>• If there is a broken or weak return spring on drain valve, replace the valve.<br>• Check if 24 VAC is present at valve. If so, check wiring of VAPOR-LOGIC®3 control board terminals 3 and 4. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Heater burnout** | • Water level is too low. | • Replace probes |
| | • Improper wiring | • Verify proper voltage applied to heater.<br>• Verify proper electrical connections. |
| | • Mineral buildup on heaters | • The humidifier may be undersized.<br>• Inspect tank for severe mineral buildup on or around heater. Increase skim duration, frequency of drain cycle, and/or frequency of cleaning. Use softened makeup water. |
| | • Heater corrosion | • Inspect heater for surface corrosion or pitting. |
| **Noisy operation** | • Thunder-type noise coming from tank during refill | • Normal on larger units. Caused by the cold fill water collapsing steam in the tank. Reduce psi (minimum of 25 psi [172 kPa]) if inlet water pressure is too high or adjust the needle valve. |
| | • Contactor noise | • Contactor normally makes a “clunk” as it pulls in. A continuous chattering noise is not normal and is symptomatic of a failing contactor or malfunctioning controls. Replace contactor or troubleshoot the control system. |
| | • Fill valve noise | • A clicking sound as fill valve opens or closes and a hissing sound during fill are normal. A slamming sound as fill valve closes is “water hammer” and can be minimized by installing a shock arrester.<br>• A loud buzzing sound indicates poor alignment of valve stem. Replace valve. |
| **Display completely black** | • Keypad overheated | • Cool off the keypad. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Humidity below desired level** | • Unit operating but fails to meet required humidity output | • Unit undersized; replace with a larger unit or add additional humidifier.<br>• Skim duration is too high.<br>• If drain valve does not close fully, determine the cause and clean, repair, or replace as needed.<br>• If drain pipe water seal is allowing steam to go down the drain, repair as needed.<br>• If there is an improper water seal height, increase to recommended height. (See humidifier tank manual.)<br>• If there is excessive internal steam pressure, determine the cause of the high pressure (e.g., high duct static pressure, undersized orifices in dispersion tubes, water, or crushed vapor hose) and repair as required.<br>• Replace leaking gasket or vapor hose.<br>• Recalibrate if controls are out of calibration.<br>• If fill valve is stuck open, repair or replace.<br>• If zone valve will not open, repair or replace. |
| | • No call for humidity from humidistat or from control and high limit humidity transmitters | • Low or no signal strength from humidistat. Check for proper wiring.<br>• Check humidity transmitters (4 to 20 mA output).<br>• Adjust set point if VAPOR-LOGIC®3 set point is too low. |
| | • Excessive outside air volume | • Verify proper operation of fans, dampers, VAV systems, etc. |
| | • Heating elements not operating | • If heaters are burned out, refer to "Heater burnout" problem on page 72.<br>• Verify that humidistat is calling for humidity.<br>• Check for control voltage if limit controls (airflow proving switch, zone valves, etc.) are not allowing unit to operate.<br>• Check fuses and replace if they are blown.<br>• Check if the heater overtemperature has been tripped. Reset if necessary. |
| | • Humidity control input type not the same as VAPOR-LOGIC$_3$ software | • Check VAPOR-LOGIC$_3$ control board connections J26, J27, and J28 (see page 8). Consult DRI-STEEM®. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Humidity above set point** | • High entering relative humidity | • Dehumidify. |
| | • Unit oversized | • Consult DRI-STEEM®. |
| | • Reduced airflow | • Check fans, dampers, VAV systems, etc. |
| | • Improperly located humidistat or humidity transmitters | • Relocate, using guidelines established in this manual (see pages 21-27). |
| | • Malfunctioning controls | • Check for incorrect supply voltage.<br>• Check for incorrect control signal.<br>• Check for improper wiring hookup.<br>• If humidity controller or transmitter are out of calibration or malfunctioning, repair or recalibrate.<br>• Check if SSR/contactor shorted. Repair or replace as needed. |
| **Hunting (humidity swings above and below desired set point)** | • Malfunctioning control system | • If there is a faulty or inaccurate humidity controller or transmitter, repair or replace.<br>• Check for proper VAPOR-LOGIC®3 control settings: RH set point, HL set point, cycle rate, PID tuning, etc.<br>• Relocate poorly located control components. See humidity control placement information on page 22 for recommendations.<br>• On SSR units: Control wire and power wires must be physically separated from each other. If they are not, an induced control voltage can occur, causing erratic operation.<br>• Verify that 6-wire keypad/display modular cable is isolated from power wiring. |
| | • Air volume varies rapidly. | • Stabilize. |
| | • Air temperature is varying rapidly. | • Stabilize to ±1 °F (±1 °C). |
| | • Band is too small and /or Integral gain (Ki) is to large | • If RH swings outside PID band, increase PID band from Set Up menu.<br>• Decrease Integral gain (Ki) from Set Up menu. |

**More on next page ...**

# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Tank does not heat up** | • Overtemperature thermostat switch located under heater wiring cover tripped | • Reset thermostat switch. |
| | • Humidifier cover interlock switch | • Humidifier cover (VLC®, VLDI) not wired; adjust interlock switch. |
| | • Incorrect or nonexistent control voltage | • Check for proper supply voltage on electrical diagram.<br>• Verify proper transformer voltage characteristics.<br>• Verify proper wiring of transformer.<br>• Check for control circuit voltage on electrical diagram. If voltage is not present, troubleshoot boards and wiring system for potential short circuit. |
| | • Incorrect or nonexistent supply voltage to the unit | • Check main line fuse.<br>• Check main line safety switch.<br>• Check heater fuses, electrical diagram. |
| **Unit does not perform autodrain sequence** | • System may not have automatic drain system. | • Inspect unit to verify that automatic drain valve was furnished.<br>• Check configuration string (see page 12). |
| | • Drain fault, plugged drain valve, or plugged drain pipe | • Clean drain valve piping. |
| | • Malfunctioning autodrain sequence | • Check VAPOR-LOGIC®$_3$ ADS settings from the Set Up menu and reset if necessary. |
| | • No power to automatic drain valve | • Check if 24 VAC is present at VAPOR-LOGIC$_3$ terminals 3 and 4 and drain valve. |
| | • Defective automatic drain valve | • If voltage is present at valve and it still does not open, replace valve |
| | • VAPOR-LOGIC$_3$ configuration: the unit may be set for manual drain. | • Initiate a test cycle to see if drain valve cycles open and then closes. If not, system needs to be reprogrammed. |

**More on next page ...**

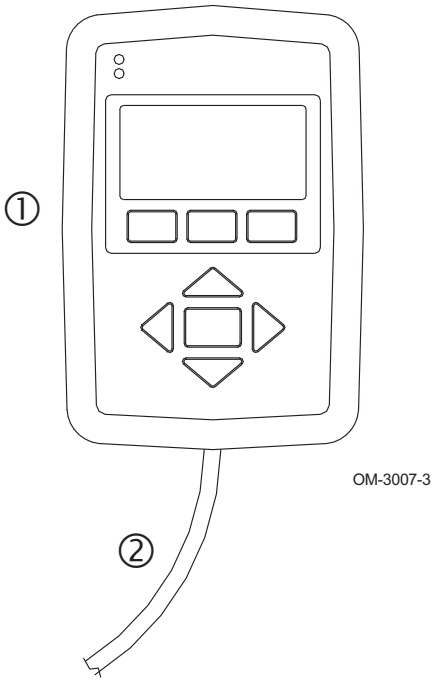
# Problem/Possible cause/Action

| Problem | Possible cause | Action |
|---|---|---|
| **Unit does not perform end-of-season drain** | • Input signal always has a demand. | • Reduce demand signal. |
| | • VAPOR-LOGIC® 3 program | • Program may be arranged for manual drain. Run a test cycle to see if system operates drain valve. |
| | • Drain valve<br>• Drain valve | • Valve not wired, or incorrectly wired, to control board.<br>• Check 24 VAC across valve coil during test cycle. |
| **Humidifier tank has proper water level and is always warm** | • Aquastat | • Normal, aquastat is maintaining a certain water temperature in tank range 40 °F to 180 °F (4 °C to 82 °C).<br>• Readjust Aquastat temperature to a lower set point. |
| | • SSR Power Controller | • SSR control devices shorted closed; check/replace.<br>• Phase-to-phase wiring crossed. |
| | • Contactor | • Contactor shorted closed; check/replace |

# Replacement parts

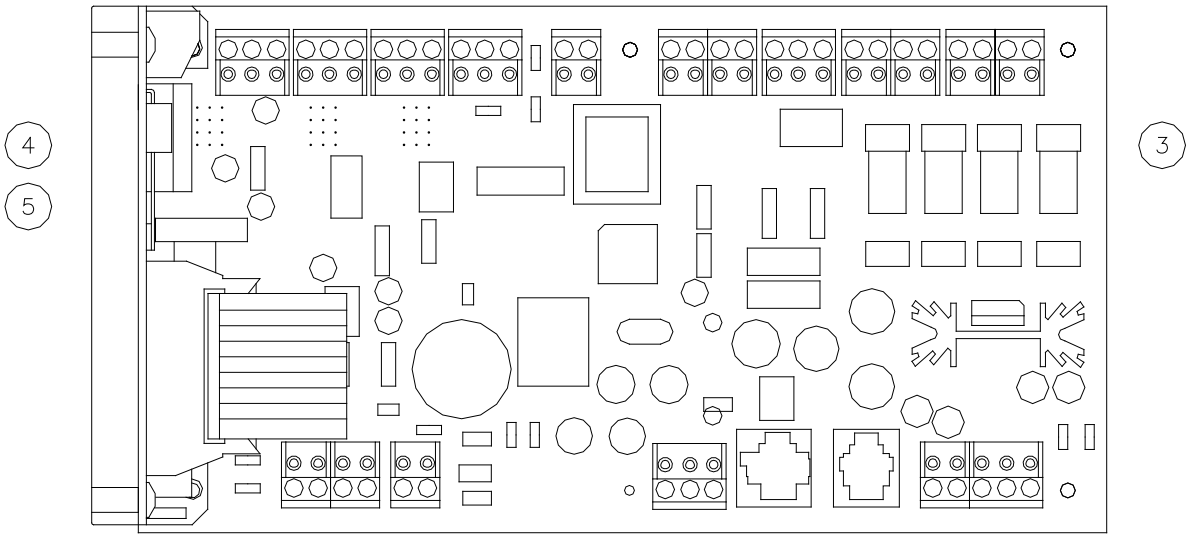
| No. | Description | Qty. | Part no. (v2.x) | Part no. (v3.x) |
|---|---|---|---|---|
| 1 | Display board | 1 | 408490-002 | 408491-002 |
| 2 | Cable | 1 | 408490-* | 408490-* |
| 3 | Main board | 1 | 408490-001 | 408491-001 |
| 4 | Expansion board (GTS®) | 1 or 2 | 408490-004 | 408490-004 |
| 5 | Expansion board (VAPORSTREAM®) | 1 | 408490-003 | 408490-003 |

*Part number varies with cable length. Specify humidifier model and serial number when ordering.




**More on next page ...**

# Replacement parts, continued



# Two-year limited warranty

DRI-STEEM® Humidifier Company ("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.

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.

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.

**Technical support: 800-328-4447**

If you have questions, first review pages 61-76, which describe typical problems and solutions and also list information you will need to give us if you call.

Our toll-free customer support line is 800-328-4447 (in North America). Technicians are available from 7:00 a.m. to 5:00 p.m. (Central Standard Time) Monday through Friday, excluding major holidays.

**Visit our Web site: www.dristeem.com**

For information about other DRI-STEEM products, visit our Web site, or contact us using the information listed below.

DRI-STEEM® HUMIDIFIER COMPANY

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