

READ AND SAVE THESE INSTRUCTIONS

# **DRI-STEEM Model ULTRA-FOG<sup>®</sup>**

**Ultrasonic Fog Generator  
(UFG) Humidifiers**

**Installation Instructions  
and  
Maintenance Operations  
Manual**

**For Toll-Free Customer Support,  
Call: 1-800-328-4447**

**DRI-STEEM<sup>®</sup>**  
HUMIDIFIER COMPANY



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### TO THE PURCHASER AND THE INSTALLER

Thank you for purchasing our ULTRA-FOG® humidification equipment. We have designed and built this equipment to give you total satisfaction and many years of trouble-free service. Proper installation and operating practices will assure you of achieving that objective. We urge you to become familiar with the contents of this manual.

DRI-STEEM Humidifier Company

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# SAFETY PRECAUTIONS AND APPLICATION NOTES

## Safety Precautions

When installing or servicing this humidifier, be certain to read and follow these safety precautions.

- Before beginning the installation, read through these instructions completely.
- Improper installation, maintenance or use can result in personal injury or property damage. Installation should be performed only by a qualified technician.
- When working on equipment, observe precautions in this literature, tabs and labels attached to or shipped with the humidifier and other safety precautions that may apply.
- This humidifier uses compressed air under high pressure. Always wear safety glasses and work gloves.
- The installation should conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to all applicable codes.
- To prevent damage to your hearing, wear earplugs whenever adjusting fogger output. ULTRA-FOG foggers are rated at 98 dBA @ ½m and 95 dBA @ 1m when ambient conditions are 65 dBA. The OSHA permissible daily noise exposure limits for these levels range from 2-4 hours.

## General Information

- Inspect all parts upon arrival for damaged, missing, or improper parts. Verify against packing list. If there is a problem, call DRI-STEEM.
- Provide necessary access around and into duct work.
- Pay special attention to sizing compressed air lines for system consumption.

## Application Notes

- Unlike steam type humidifiers that can be fitted to an existing HVAC system, retrofitting an existing system to accommodate an ULTRA-FOG humidifier may require major modifications.
- Absorption distance for an ULTRA-FOG humidifier is much longer than for steam humidifiers.
- High duct velocities, above 500 fpm, increase the absorption distance.
- Higher entering air temperatures decrease the absorption distance.
- ULTRA-FOG foggers create high pitched harmonic frequencies (see Safety Precautions).
- All tubing, including headers and manifolds, should be installed inside the AHU.
- Only supply penetrations are required through the AHU wall.
- ULTRA-FOG foggers inherently drip during normal operation. Any installation must be equipped to handle excess condensate.
- Free adiabatic cooling results from ULTRA-FOG humidifiers; they are ideal for warm, dry climates.
- Compressed air needs to be filtered in order to be free of oil and moisture.

### Shipping Weight:

Each system varies.

### Electrical Ratings:

115 Vac, 60 Hz (15.0 Amps).

### Capacity Notes:

The minimum compressed air supply pressure is 70 psig at the control valve.

The minimum water supply pressure is 65 psig at the control valve.

# INSTALLATION

DRI-STEEM's ULTRA-FOG® (UFG) humidifier is shown in Figure 4-1 installed in an air handling unit. Foggers are factory mounted on stainless steel manifolds. Manifolds connect to headers located inside the AHU. Headers connect to the compressed air and water lines which are located outside the AHU. A microprocessor provides modulating control of both the compressed air and high pressure water valves.

Read these instructions completely before you begin the installation.

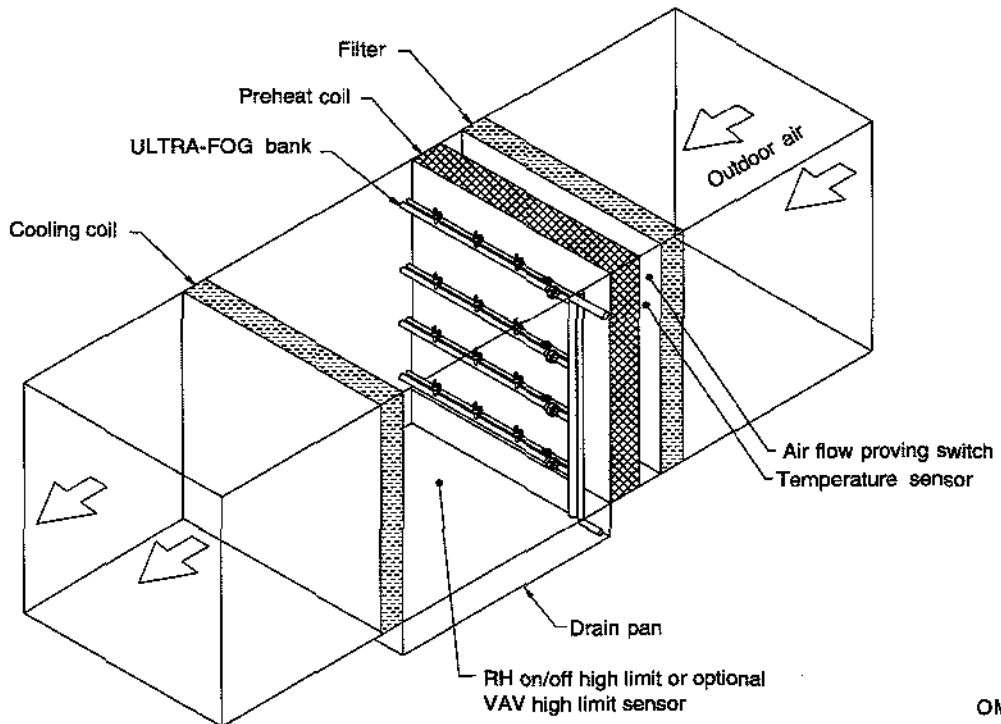
## Installation Steps

Installation of the ULTRA-FOG Ultrasonic Fog Generator Humidifier requires the following steps:

1. Select the appropriate humidifier location.
2. Locate and install headers for air and water supply.
3. Locate and install manifolds.
4. Install resonator arm on fogger heads.
5. Connect drain valve
6. Install and wire controls and options.

In addition, you must install compressed air and water supply piping for the system. This manual does not provide detailed instructions on installing and piping those systems. General information, however, is provided at the end of this installation section.

Figure 4-1: Typical UFG installation in AHU



OM-833-1

# INSTALLATION

## Step 1—Select an Appropriate Location

The ULTRA FOG humidifier is designed to be installed in an air handling unit, upstream of the cooling coil in the warmest, driest location possible. Figure 4-1 on page 4, shows a typical ULTRA-FOG installation in an air handling unit (AHU).

When selecting the appropriate location for installation, keep the following restrictions in mind:

- Do not locate the humidifier in duct work.
- Do not locate the UFG above any device that might be damaged by water.
- Provide a level foundation.
- Locate controls as close to the humidifier as possible.
- Locate the UFG in the *warmest*, driest available airstream.
- The complete humidifier is housed inside the air handling unit (AHU), with penetrations through the wall for compressed air, water supply, and drain connection.
- Allow enough room upstream and downstream for mounting provisions, routine maintenance, and fog absorption. Note the direction of airflow.
- In larger installations, allow room for a ladder upstream of the humidifier for use during installation.

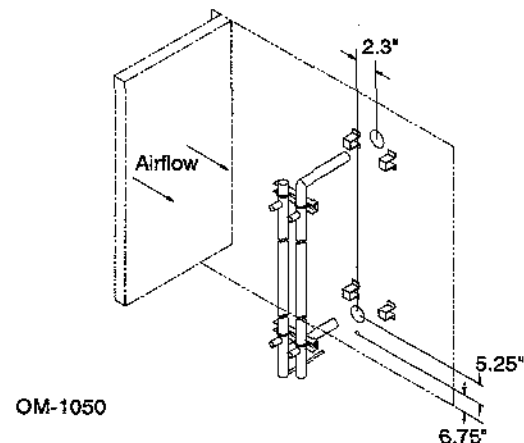
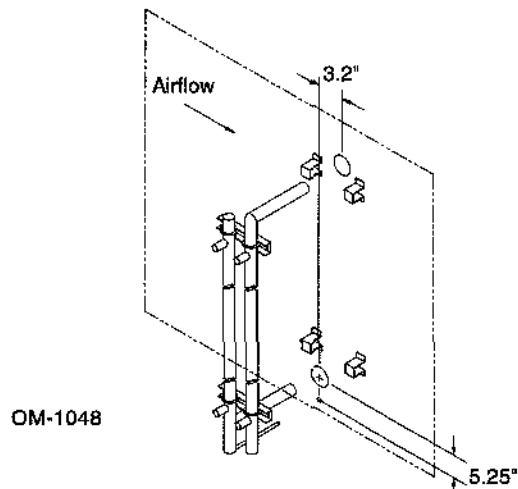
## Step 2—Install Headers

The humidifier consists of separate water and compressed air headers. Pay careful attention to the direction of airflow. The water header must be placed upstream of the compressed air header.

1. Once a suitable location is found for the installation, determine where the water and compressed air headers will penetrate the AHU (a water drain outlet is also required). For proper fog absorption, the bottom manifold row should be positioned 12 inches from the floor of the AHU and the top row should be 30 inches from the ceiling of the AHU (i.e., a duct dimension should be no smaller than 42 inches in height).

To determine where the headers will penetrate the wall, position the headers (held together with the header mounting brackets as shown in Figure 5-1) and mark the location where penetrations are required. Headers should be oriented to position the compressed air header downstream of the water header. (The water header has both a supply inlet and a drain outlet. The compressed air header has only a supply inlet.) Align the headers so that manifold outlets are on the same plane.

Figure 5-1 & 5-2: Position and mark the location where holes are required.



2. Cut holes in the AHU to accommodate the header connections.
3. The number of wall brackets you will need to support the headers depends on the size of your system. Headers require from two to five brackets.
4. Install wall brackets to the AHU wall. Holes for 3/8" diameter fasteners are provided.
5. Install header mounting brackets to the wall brackets using U-bolts and nuts supplied.

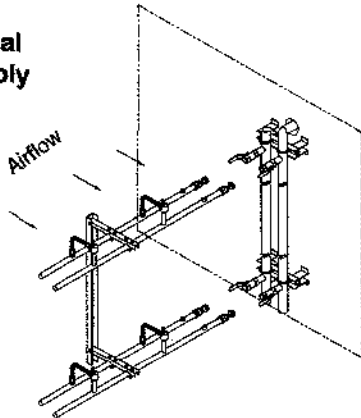
# INSTALLATION

## Step 3—Install Manifolds

Individual manifold placement is unique for each job and can be found on the assembly drawings provided with the system. Figure 6-1 illustrates a typical manifold assembly. Rows are made up of separate compressed air and water manifolds. The number of rows varies according to the unit capacity and the air handler size.

1. Assemble the manifolds by matching each end with the same letter as indicated on the assembly drawing provided.

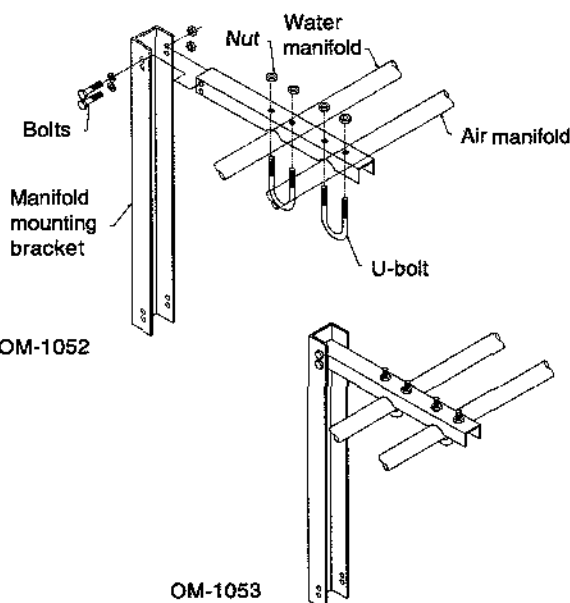
**Figure 6-1: Typical Manifold Assembly**



OM-1047

2. Manifolds are supported by channels that extend upstream of the humidifier. Fastening of the manifold mounting brackets to the manifold mounting channels is accomplished with  $\frac{1}{4}$ "-20 x  $\frac{3}{4}$ " U-bolts and nuts. DRI-STEEM recommends using 1-5/8" Unistrut as the vertical support for attaching the manifold mounting channel.

**Figure 6-2: Installing Manifolds**

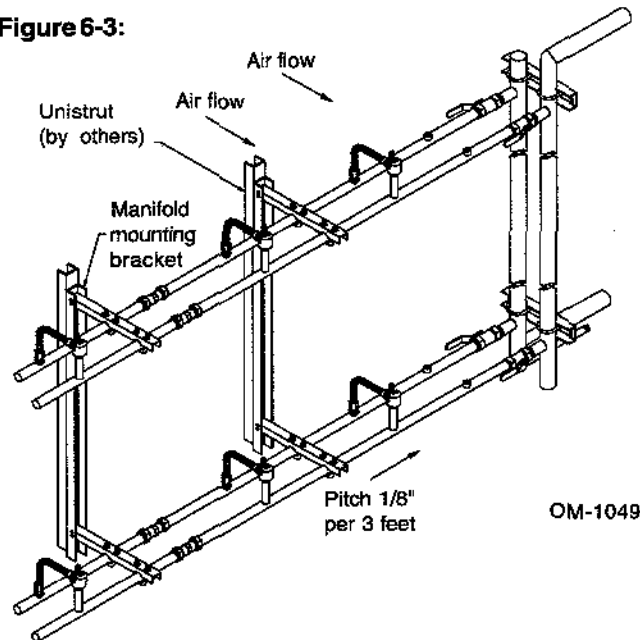


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OM-1053

3. Begin by determining the location of the center Unistrut support, which is located at the center of the manifolds on a non-split unit or the end of either manifold on split assemblies. (Manifolds over 10 feet in length are shipped split and must be joined during installation, refer to the assembly drawing shipped with your system.)
4. The location of the Unistrut is critical in the mounting of the unit. Determine the Unistrut position by installing the lower manifolds first. With the lowest set of manifolds connected to the headers, attach the manifold mounting bracket using u-bolts and nuts to both manifolds.
5. Next, attach the manifold mounting channel to the manifold mounting bracket. The position of the Unistrut can then be found.
6. Fasten the manifold mounting channel to the center Unistrut.

**Figure 6-3:**



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Repeat these steps for the remaining manifolds. On units with split manifolds, the same procedure should be used for the second set of manifolds. Depending on the size of the humidifier, additional Unistruts may be required to support the humidifier every six feet across the AHU.

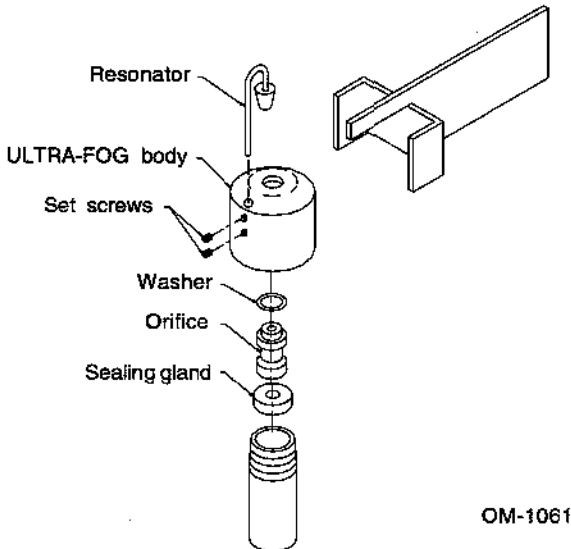
An alternate method of manifold installation can be done by referencing the distance from the water header centerline and measuring 7.5 inches upstream of the humidifier. The Unistrut will be located at this point behind the humidifier. (Be sure to allow room for positioning the headers, when using this method.) Install manifolds at an angle so water drains back to the header.

# INSTALLATION

## Step 4—Adjusting Fogger Heads

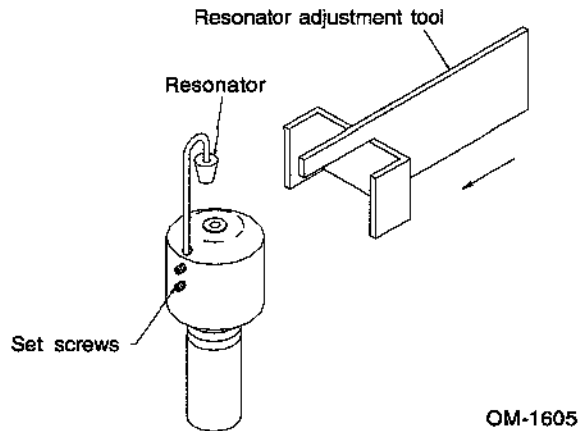
The ULTRA-FOG® system is assembled with the foggers installed on the compressed air manifolds. The following procedure should be used to install and adjust the detachable resonator arm.

**Figure 7-1: Exploded view of ULTRA-FOG fogger.**

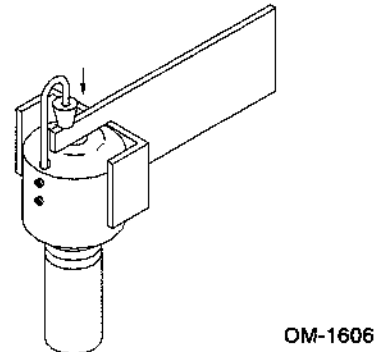


1. Using a 5/64" Allen wrench, loosen the set screws on the fogger. (Do not remove them.)
2. Insert the resonator arm in the fogger body and position it to rest on the resonator adjustment tool. See Figures 7-2 and 7-3.
3. Adjust the resonator arm using the resonator adjustment tool.
4. Tighten the set screws, leaving a gap (approximately 1/4") between the top of the fogger head and the bottom of the resonator.
5. Remove the resonator adjustment tool. Refer to Figure 7-4.

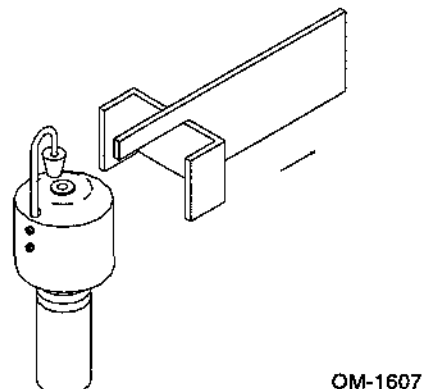
**Figure 7-2: Apply resonator adjustment tool.**



**Figure 7-3: Position resonator arm.**



**Figure 7-4: Remove resonator adjustment tool.**



# INSTALLATION

## Step 5—Connect Drain Valve

The drain valve connects directly with the humidifier system through a 3/8" male NPT connection (provided on the unit).

Connect drain piping to the outlet of the drain valve. The drain piping should be run via an air gap to a non-pressurized drain.

## Step 6—Install and Wire Controls and Options

When installing controls and options, refer to Figure 9-1, and 25-1, the controls wiring diagram in the back of this manual, and the wiring diagram that is provided with your system. (Any special features or wiring changes will be outlined in the wiring diagram for your application.)

**Note:** Install all parts of the humidifier before installing controls and options.

## Install Controls on Air and Water Lines

These controls include the pressure regulators, control valves, drain valve, gauges and low pressure switches.

Install controls as described in the installation instructions provided by their manufacturers. Observe all safety precautions and check the operation of each control independently of the system operation.

The humidifier uses a pneumatically operated control valve for compressed air control and an air loaded regulating valve for precise water control.

DRI-STEEM recommends installing the control valve and regulating valves as close as possible to the humidifier.

The low pressure switch, I/P transducers and pilot positioner are factory pre-set.

## Air and Water Control Valves

1. In preparing threaded pipe connections care should be taken to prevent threading sealant from getting into the pipe lines.
2. Install the control valve in the highest horizontal line of piping.

3. Install the control valve in a vertical, upright position only.
4. The flow arrow on the control valve body must be pointed in the direction of flow.
5. For best control allow for 3' straight sections on either side of the valve.

## Pressure Regulators

1. To protect the regulator from grit, scale, thread chips, and other foreign matter, all pipe lines and piping components should be blown out and thoroughly cleaned before the regulator is installed.
2. Shut-off valves, pressure gauges, and by-pass piping should be installed as indicated in the diagram to provide easier adjustment, operation and testing.
3. In preparing threaded pipe connections, care should be exercised to prevent pipe sealing compound from getting into the pipe lines. Pipe sealing compound should be used sparingly, leaving the two lead threads clean.
4. **A line strainer should be installed on the inlet side of the air regulator to protect it from grit, scale and other foreign matter. A .033 perforated screen is usually suitable.**
5. Install the regulator in the highest horizontal line of piping to provide drainage for inlet and outlet piping, to prevent water hammer, and to obtain faster regulation.
6. The flow arrow on the regulator body must be pointed in the direction of flow. The regulator may be installed in any direction, but damage to the seating surfaces may occur if installed in a vertical line with the flow upwards.
7. For best control, 3' straight sections of pipe should be installed on either side of the regulator.
8. Expand the outlet piping at least one pipe size. A standard tapered expander connected to the outlet of the regulator is recommended.



# PIPING, AIR AND WATER INSTALLATION

## Supply and Drain Connections

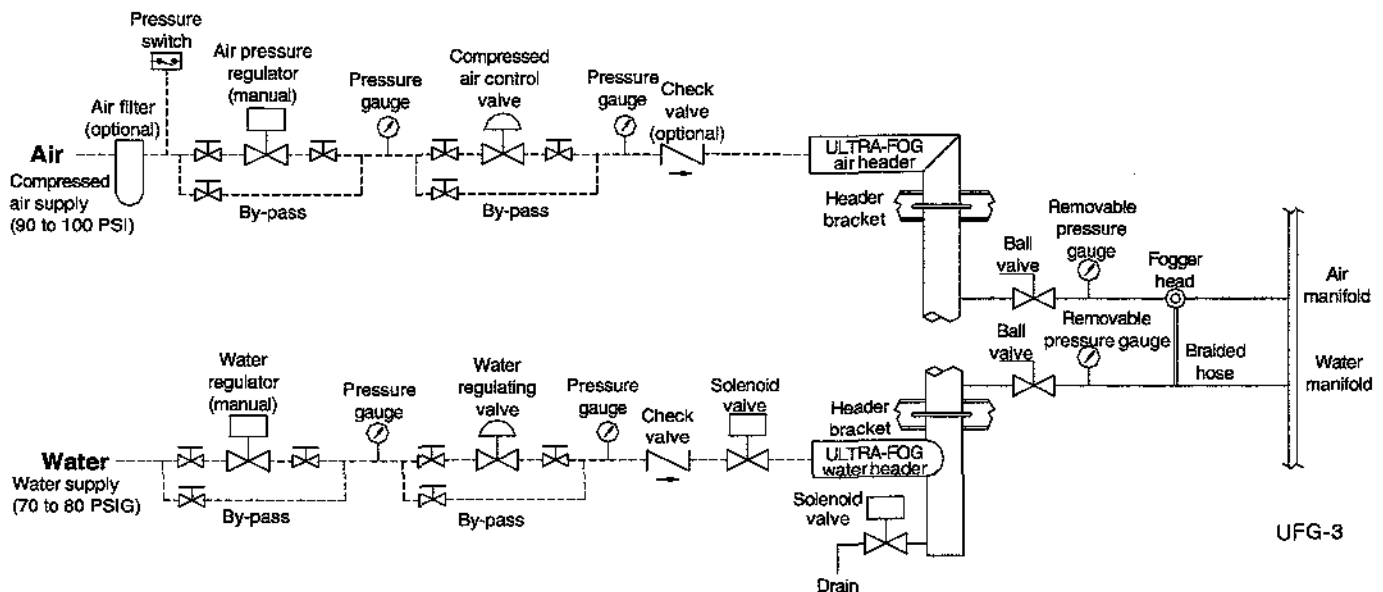
Figure 9-1 provides a recommended diagram of how the compressed air and water supplies should be piped. Keep the following points in mind.

- Connections will be made at the controls and the humidifier.
- Use a shutoff valve on both the compressed air line and the water line.
- Check all connections for tightness before applying pressure to the system

## Connections

Two supply connections are provided on the UFG. Connections can be provided with NPT, flange or tube on both.

Figure 9-1: Recommended diagram of water and compressed air piping to the UFG humidifier.



## Filtration

Compressed air should be filtered to 1 micron and be treated to remove oil and condensate for maximum cleanliness.

## Controls

Separate control valves and regulators are required to control the compressed air and water. Only treated (filtered) air or water should be introduced to these controls. DRI-STEEM recommends placing the valves and regulators as close to the humidifier as possible.

The required regulator valves are supplied with the system. The larger valve is for compressed air; the smaller valve is for water.

## Piping Materials

- Compressed air piping may consist of brass, black steel or copper.
- Use 316 stainless steel for DI/RO water.
- For drain piping follow the same recommendations as for supply piping.
- Piping need not be suitable for 212°F, since steam condensate is not present.
- Insulation of the piping is not required.

## Pneumatics

Low pressure compressed air (20 psig) is required for control of the compressed air valve actuator and pilot positioner. The I/P transducer located in the control cabinet also requires 20 psig.

High pressure compressed air (25 psig) is required for control of the water regulating valve. The I/P transducer located in the control cabinet also requires 75 psig. Refer to the Figures 9-1 and 10-1 for location of these pneumatic components.

# CONTROLLER INSTALLATION

## Control Cabinet

Figure 10-1 shows the control cabinet and its major components. The control cabinet contains the connection points for both low voltage and high voltage field connections for the humidity transmitter, high limit humidistat, air flow switch, pressure switch, drain solenoid, and other devices.

1. Install the control cabinet in an appropriate location.
2. Identify the low voltage control block in the control cabinet. Because control requirements vary, check the wiring diagram provided with the system before wiring (refer to Figure 9-1 and Figure 25-1).

Terminals are used as follows:

- Terminals 1, 2 and 3 are used for the humidity transmitter.
- Terminals 4, 5, 6 and 7 are used for the optional high limit humidity control.
- Terminals 8, 9, and 10 are used for the optional temperature transmitter.
- Terminals 11 and 12 are used for the optional air flow proving switch.
- Terminals 13 through 16 are unused.
- Terminals 21 and 22 are used for the low pressure switch.
- Terminals 23 and 24 are used for the drain valve.

## Zone Terminal Control Unit

The Zone Terminal Control Unit is the primary monitoring device for the ULTRA-FOG humidifier.

1. The wall mount base assembly measures 6.94" X 7.44" X 2" and should be mounted in a convenient location no more than 50 feet (wire length) from the humidifier.

2. Connect the cable with the RJ-122 connector inserted into the socket on the Johnson Metasys® VAV Controller in the Control Cabinet.
  - The interconnect cable furnished with the system is 5 feet in length. Extended lengths are available.
  - The Zone Terminal Control Unit may be installed with up to 50 feet of interconnecting cable from the humidifier.
  - Do not mount the Zone Terminal Control Unit in an area with vibration.
  - Do not mount the Control Unit where corrosive chemical vapors may damage the electronic components.

The installation of the Control Unit must meet the following requirements:

- Ambient operating temperature of 32 to 122°F (0 to 50° C).
- 10 to 90% relative humidity (non-condensing).
- 86° F (30° C) maximum dew point.

All wiring must be installed in accordance with local and National Electrical Codes and ordinances.

Always check that the electrical power supply used agrees with the voltage and frequency shown on the equipment nameplate.

## Wall Mount Installation

For office or other types of remote connections, attach the Wall Mount to a flat surface or wall. Use three screws and plastic anchors (not provided). For easy reading, mount the ZT at least 65 inches from the floor to the top of the ZT. Insert the telephone-type cord from the controller into the back of the ZT.

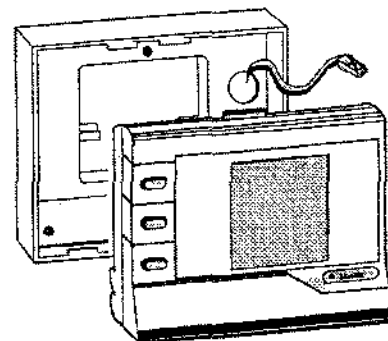
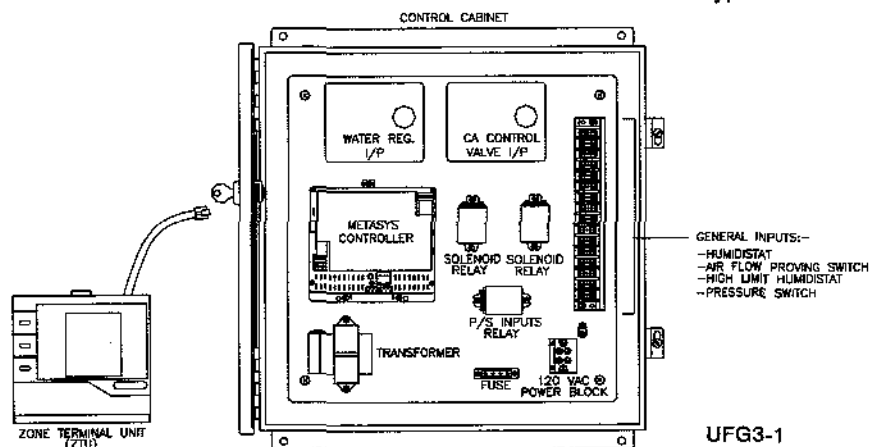


Figure 10-1: The UFG control cabinet.



UFG3-1

# PROGRAMMING THE CONTROLLER

## Humidifier Control

The controller for the ULTRA-FOG humidifier allows a number of different control options that can be grouped into four categories: Dewpoint Control, Humidity Control, Humidistat Control, and Control By Others.

- With Dewpoint Control, humidity and temperature are sensed through remote transmitters. The values are fed back to the microprocessor where a dewpoint is calculated. The user adjusts the setpoint and controls the humidifier using the Zone Terminal Control Unit
- With Humidity Control, humidity is sensed through a remote transmitter and fed back to the microprocessor. The user adjusts the setpoint and controls the humidifier using the Zone Terminal Control Unit.
- With Humidistat Control, humidity is controlled using a remote humidistat. The humidity setpoint is set on the humidistat, and the Zone Terminal is used only for humidifier maintenance, troubleshooting, setting drain cycles, etc.
- With Control By Others, humidity is controlled by a signal from another source, such as an energy management system. The Zone Terminal is used only for humidifier maintenance, troubleshooting, setting drain cycles, etc.

Each of these control options is described in more detail in the following paragraphs.

### Dewpoint Control

With dewpoint control, the UFG humidifier is controlled by a Johnson Controls VAV Controller with a Zone Terminal interface. The basic control algorithm is a PI loop (Proportional-Integral) which takes the signal from the temperature and humidity sensors and calculates a dewpoint; accurate to within +/- 3°F. The controller compares the calculated, actual dewpoint and compares it with the user

determined setpoint. From this information, the loop generates a demand signal that the humidifier carries out. The process of comparing the signal with the setpoint and updating the demand is repeated every 1-1/2 seconds.

The controller sends out a voltage of 0-10 VDC to either the I/P Transducer or control valve actuator. At one percent (1%) demand, the controller sends a voltage of "Air Zero Setpt" and "Wtr Zero Setpt" to either valve. At 100 percent (100%) demand, the controller sends a voltage of "Air Range" and "Wtr Range" to either valve. The valves are then modulated between these setpoints to vary output.

### Humidity Control

With humidity control, the UFG humidifier is controlled by a Johnson Controls VAV Controller with a Zone Terminal interface. The basic control algorithm is a PI loop (Proportional-Integral) which takes the signal from the humidity sensor and compares it with the setpoint determined by the user. From this information, the loop generates a demand signal that the humidifier carries out. The process of comparing the signal with the setpoint and updating the demand is repeated every 1-1/2 seconds.

The controller sends out a voltage of 0-10 VDC to either the I/P Transducer or control valve actuator. At one percent (1%) demand, the controller sends a voltage of "Air Zero Setpt" and "Wtr Zero Setpt" to either valve. At 100 percent (100%) demand, the controller sends a voltage of "Air Range" and "Wtr Range" to either valve. The valves are then modulated between these setpoints to vary output.

### Humidistat Control

In this scenario, the humidifier is controlled by a remote humidistat that provides a demand signal back to the VAV Controller. The humidifier then runs until the demand signal is satisfied. The humidity setpoint is adjusted on the humidistat rather than on the Zone Terminal.

# PROGRAMMING THE CONTROLLER

## Control By Others

In this control option, the humidifier is controlled by a remote source that sends a demand signal back to the VAV Controller. The humidifier runs until the demand signal is satisfied. The signal source is typically an energy management system or some other form of building automation system. Possible control signals are: 6-9 VDC, 1-10 VDC and 4-20 mA.

## Programming Details

### PI Loop Control

The PI loop has five control parameters that can be adjusted. They are the setpoint (Set F Dwpt), the proportional band (Set Prop Band), the integral or reset (Set Integral), the deadband (Set Deadband) and the offset (Set F Offset).

**Setpoint** - The setpoint is the dewpoint level the user wants to achieve.

**Proportional Band** - This is the band (in °F) within which the humidifier will modulate. The proportional band works as follows: If you assume a setpoint of 65°F and a proportional band of 5°F, the humidifier would perform as follows: If the dewpoint is lower than 60°F, the humidifier is full on. If the humidity is between 65°F and 60°F, the humidifier modulates based on the distance to the setpoint (65°F). And when the humidity reaches 65°F, the humidifier turns off.

Of course, the humidifier generally does not actually reach its setpoint. In almost all applications there is some constant load on the humidifier just as there is a constant load on the heating equipment.

What actually happens is the humidifier finds a "happy medium" where the actual humidity is something less than the setpoint, which allows the humidifier to continue to run. The difference between the setpoint and the actual running humidity level is called the "droop", and it can be corrected using the next variable, the integral.

**Integral or Reset** - This variable determines how fast the humidifier will react to a droop condition. The lower the number, the faster the reaction. (An integral term of zero disables the variable and allows the unit to run on the proportional band only.)

When the actual dewpoint is in the proportional band, the humidifier demand is somewhere between 0 and 100 percent. Every 1-1/2 seconds the demand is updated. With an integral variable greater than zero, each time the demand is updated it is increased slightly. The amount it is increased depends on the integral term and the difference between the actual dewpoint and the setpoint. (The closer to the setpoint, the smaller the addition. The larger the integral term, the smaller the addition.)

The total demand signal for the humidifier is the sum of the proportional part and the integral part. As the actual dewpoint approaches the setpoint, the integral portion makes up the majority of the demand and the proportional part makes up very little. Once the setpoint is achieved, the entire demand is made up of the integral part because the proportional part is zero.

**Deadband** - The deadband is the band around the setpoint in which the demand signal is frozen. In other words, if a 65°F setpoint has a deadband of 1°F, the demand signal remains unchanged for an actual dewpoint between 66 and 64°F. (If the system demand was at 75% when the actual humidity entered this range, it is locked at 75% as long as the actual humidity is in this range.)

**Offset** - The offset allows the user to calibrate the dewpoint calculation to any source. If the display indicates that the actual dewpoint is 65°F and your dewpoint sensor says 69°F, a correction can be made by entering an offset of +4°F to compensate for the difference.

### Setup Tips

A large proportional band (5 to 10°F) yields tighter and more stable control with longer response time. A small proportional band produces quicker response times but control may become unstable. As a rule of thumb, start with a band of 5°F. If the unit does not "hunt" and quicker response is needed, the band can be lowered. If the unit hunts or the fast response is not needed, increase the band to provide more system stability. A large integral term (75 to 150) also yields tighter and more stable control with a longer response time. A small integral quickens the response but may cause control to become unstable. As a rule of thumb, start with an integral term of 100. If the unit does not "hunt" and quicker response is needed, lower the integral. If the unit hunts or does not need the fast response, increase the integral. In most applications, the deadband is set to zero. If you are controlling a zone that can have abrupt changes in dewpoint (a shipping dock where garage doors open and close), increase the deadband to 1 or 2° F. This allows the humidifier to run through these changes instead of hunting.

# ZONE TERMINAL CONTROL UNIT

The following description of operation and features is reviewed as an example of the capability of the Zone Terminal Control Unit. Not all features and/or operation may have been selected for a specific job.

A picture of the Zone Terminal Control Unit is shown in figure 13-1 with the bottom flap open. This is the interface device that allows the user to monitor and control the humidifier. A description of the keys, parameters and status points is as follows.

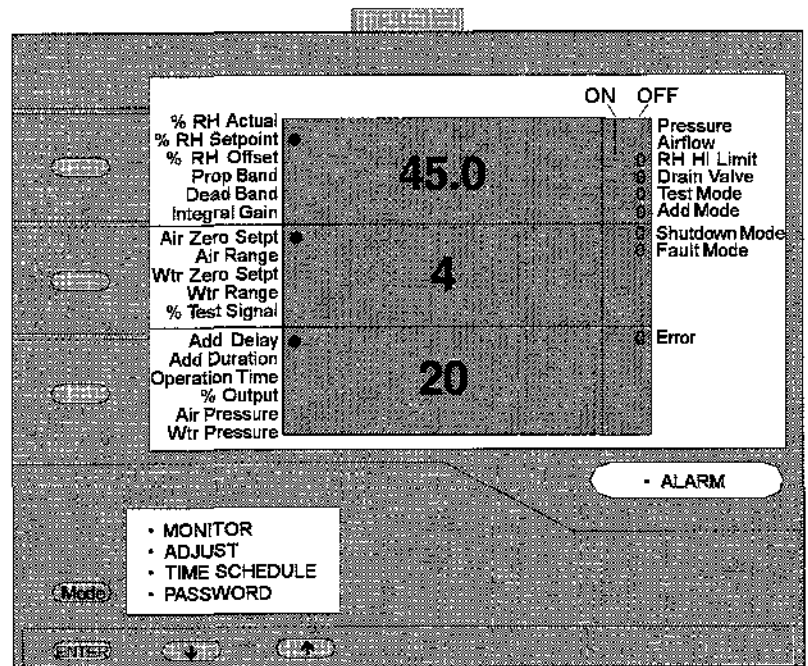
## Keys

The three keys on the left toggle through the parameters listed to their right. For example, the top key toggles through % RH Actual, % RH Setpoint, % RH Offset, Prop Band, Dead Band, and Integral Gain. Likewise, the two other keys toggle through the parameters to their right. The parameter that is currently displayed, has a black dot to the right of its name. In Figure 13-1, the parameters “% RH Setpoint”, “Air Zero Setpt” and “Add Delay” are currently displayed.

The mode key to the left of the section containing MONITOR, ADJUST, TIME SCHEDULE and PASSWORD toggles the operating mode of the keypad. When in MONITOR mode, you can only view the information on the display. Press the key once to enter the ADJUST mode. When in this mode, you can change parameters on the display. Press the key again to enter PASSWORD mode which is not used on the ULTRA-FOG. Press the key again to reenter the MONITOR mode. (Time schedule is not used on the ULTRA-FOG and is automatically skipped.)

The three keys at the bottom of the display screen are for adjusting parameters. To adjust a parameter, press the key described above until you are in the ADJUST mode. Then, press one of the keys on the left of the display until

Figure 13-1: Example for Zone Terminal Control Unit Display



the parameter you want to modify is selected and displayed. If the parameter that you have selected is adjustable it will flash. (If it does not flash, the parameter that you have selected is a status parameter and cannot be adjusted.) With the parameter flashing, press the up or down arrow key until the desired value is displayed, and then press the ENTER key to lock in the new value.

Continue to modify other parameters as desired. Once all modifications are complete, press the mode key to return to MONITOR mode.

**Note:** When adjustments are made, the ENTER key must be pressed in order for them to be remembered and entered into the program. If the ENTER key is not pressed, the data will be lost when returning to MONITOR mode.

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## ZONE TERMINAL CONTROL UNIT

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### Parameters

The parameters that can appear on the Zone Terminal Control Unit display are described below. Depending on the options selected on the humidifier, all of these parameters will not be present:

**Dewpoint DegF** - This is a read only parameter showing the actual dewpoint being sensed by the humidity sensor and temperature sensor.

**Setpoint DegF** - This is a changeable parameter that allows you to adjust the current dewpoint reading.

**Offset DegF** - This is a changeable parameter that allows you to adjust the current offset for the dewpoint reading.

**Humidity %RH** - This is a read only parameter showing the actual humidity being sensed by the humidity sensor.

**Setpoint %RH** - This is a changeable parameter that allows you to adjust the current humidity setpoint.

**Offset %RH** - This is a changeable parameter that allows you to adjust the current offset for the humidity reading.

**Prop Band** - This is a changeable parameter that allows you to adjust the proportional, % RH or °F, band through which the humidifier modulates.

**Dead Band** - This is a changeable parameter that allows you to adjust the band around the setpoint at which demand is frozen.

**Integral** - This is a changeable parameter that allows you to adjust the integral term which will correct for droop as the actual humidity or dewpoint enters the proportional band.

**Air Zero Setpt** - This is a changeable parameter that allows you to adjust the required output to close the compressed air valve (see next section for more information).

**Air Range** - This is a changeable parameter that allows you to adjust the required output to open the compressed air valve (see next section for more information).

**Test Signal %** - This is a changeable parameter that allows you to adjust the percentage of system demand for testing purposes.

**ADD Delay** - This is a changeable parameter that allows you to adjust the time (in seconds) that the compressed air blows out residual water.

**ADD Duration** - This is a changeable parameter that allows you to adjust the time (in seconds) required for the drain valve to open after the humidifier has entered ADD mode.

**Run Time Hrs** - This is a read only parameter showing the total run time of the humidifier (in hours).

**Output lb/hr** - This is a read only parameter showing the current humidifier output (in pph).

**Capacity %** - This is a read only parameter showing the humidifier output (in percent).

## ZONE TERMINAL CONTROL UNIT

### Status Points

As shown in Figure 13-1, status point indicators are on the right of the Control Unit Display. The "I" indicates an ON state; the "O" indicates an OFF state. The description of each status point is as follows.

POINT	I	O
Air Pressure	Compressed air pressure is satisfactory	No compressed air
Airflow	Airflow is adequate for humidification	No Airflow
High Limit	The high limit has been reached	The humidity high limit is OK
Drain Valve	The drain valve is closed	Open
Test Mode	The humidifier is in Test mode	The humidifier is not in Test mode
ADD Mode	The humidifier is in Automatic Drain down mode	The humidifier is not in Shutdown mode
Shutdown Mode	The humidifier has been completely disabled	The humidifier is not in Shutdown mode
Fault	The humidifier has sensed a fault condition	The humidifier is operating normally
Temp Limit	The temperature low limit has been reached	The temperature low limit is OK

## START-UP

Before starting the UFG humidifier, read this manual completely and verify that all installation steps have been performed properly and all safety precautions met.

### Start-Up

Start-up the UFG by turning on the electrical supply to the humidifier along with the compressed air and water supplies. The following actions should occur:

1. After the humidifier has been adjusted for a demand for humidification, the compressed air control valve will receive a signal from the controller allowing the valve to open.
2. When the controller senses 15 psig of pressure, the pressure switch will close.
3. When the pressure switch closes, the water control valve will receive a signal from the controller allowing the valve to open .
4. The system will run until the demand for humidification is satisfied. On units with modulating control, output is modulated based on humidification load.
5. When the demand has been satisfied, the humidifier will enter ADD mode.
6. The controller will close the water valve. The compressed air valve will remain open, allowing compressed air to blow out any water in the fogger orifice.
7. When the ADD Delay time expires the drain valve will open, allowing compressed air to flush the system tubing of any remaining water.
8. Upon ADD Duration time expiration the controller will close the compressed air valve and put the humidifier into Shutdown Mode.

The controller operates the control valves independently. You must adjust them through the keypad of the control unit. Adjust the: Air Zero Setpt and Air Range as follows:

1. Set the *Air Zero Setpt* to 0.00 (zero).
2. Set the *Air Range* to 10.00
3. Set *Test Signal %* to 1.
4. Verify that the I/P transducer gives a 3 psig output at zero volts and 15 psig at 10.00 volts.
5. Adjust the pilot positioner on the compressed air control valve to close off at 3 psi.
6. Set the pilot positioner span for 12 psi.

7. Set *% Test Value* to 100.
8. Adjust the compressed air valve to 62 psi outlet pressure.
9. Adjust the water valve to 50 psi outlet pressure.
10. Modify the *Air Range* to a value where the control valve has just completely opened.
11. Modify the *Air Zero Setpt* to a value that gives a 15 psi valve outlet pressure.
12. Repeat steps 10 and 11 until all conditions are attained.

**Note:** *This is an iterative process. You cannot make all necessary adjustments with a single pass.*

### Automatic Drain Down (ADD)

**Note:** *This feature is available only on models installed in AHUs.*

The ADD mode is initiated by a zero demand for humidity. Upon a signal for zero demand, the humidifier closes the water control valve. The compressed air valve remains open. After the ADD Delay timer has expired, the drain valve opens, allowing any remaining water to be flushed to the drain. When the ADD Duration timer has expired, the compressed air valve closes. The humidifier is then in the shutdown mode.

### Checkout Fogging Pattern and Resonator

Visually inspect the fogging pattern and verify that they are not spitting. If necessary, use the following procedure to adjust the fogger for proper operation.

### Adjusting Resonator

When adjusting the resonator, refer to Figure 7-4.

1. Loosen the two set screws of the resonator.
2. Insert the resonator adjustment tool between the fogger head and the resonator.
3. Allow the resonator to rest on the tool head.
4. Tighten the two set screws to secure the resonator.
5. Remove the resonator adjustment tool and check that the resonator head is aligned directly over the orifice.



## AIR COMPRESSOR REQUIREMENTS

Each fogger requires .125 SCFM of compressed air per pound of water vapor per hour.

The compressor used with the ULTRA-FOG® system *must meet or exceed the following requirements:*

### Compressor size

The compressor should be sized based on .125 SCFM at 100 psig per pound of water vapor per hour. So, for example, a system delivering 1760 pounds per hour (1760 pph x .125 SCFM) requires 220 SCFM at 100 psig. Sizing should not be based on HP rating because most compressors are rated on peak HP, not continuous output.

### Compressor type

Compressors are either reciprocating or rotary-screw type. We recommend the use of rotary-screw type

compressors for ULTRA-FOG systems. (They are normally rated for 100% demand loading.)

Reciprocating type compressors are adequate for ULTRA-FOG systems only when fitted with pressure control tanks large enough to compensate for reciprocating pressure cycling.

### Distribution lines

Distribution lines can be stainless steel, copper or black pipe. They should be sized for no more than a 2 psi drop from the compressor to the regulating valve.

### Filtration

Filtration of the compressed air is important. Use a filtering system that removes all oil, water and particulates.

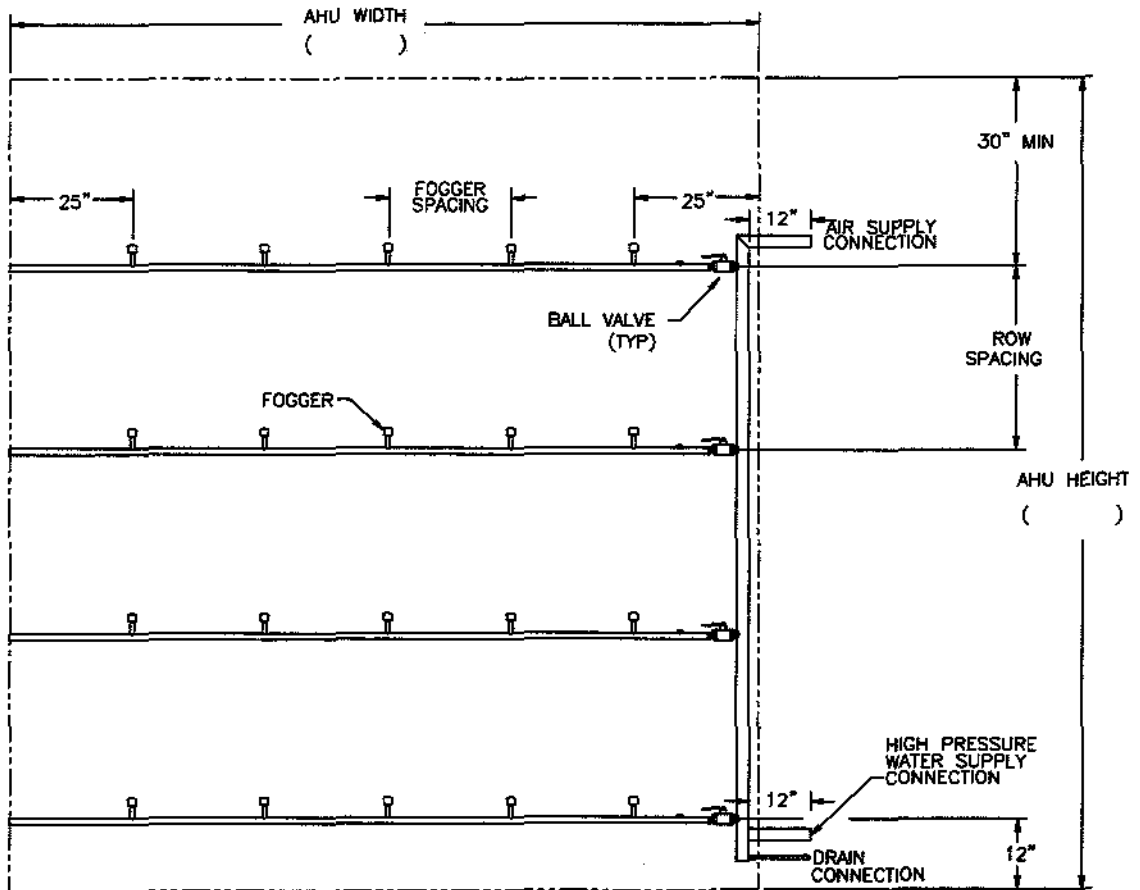
Table 17-1: Screw compressor sizing

Pounds of water	Kilograms of water	Required capacity SCFM	Estimated power required hp
80	36	10	3
160	73	20	5
240	109	30	7.5
320	145	40	10
400	181	50	15
560	254	70	15
640	290	80	20
720	327	90	20
800	363	100	25
960	435	120	25
1040	471	130	30
1120	508	140	30
1200	544	150	40
1600	726	200	40
1680	762	210	50
2000	907	250	50
2080	943	260	60
2240	1016	280	60

# DIMENSIONS

Each ULTRA-FOG® humidifier is designed for its particular application. Figure 18-1 shows the dimensions of a "typical" four-row unit. Note the minimum distance from floor to ceiling

Figure 18-1: Dimensions of a typical four-row UFG humidifier unit.



HDR-air

## TROUBLE-SHOOTING GUIDE

Symptom	Possible Cause	Recommended Action
<b>Fogger pulsates</b>	Foreign matter in the orifice Loose inside fittings due to gaskets not being sealed Bias is to high	Disassemble the fogger and clean out orifice Remove the fogger and install correctly being sure to compress all gaskets inside the fogger Adjust the control system to provide higher water pressure
<b>Fog ball not symmetrical</b>	Resonator is not aligned properly Resonator height is incorrect Turbulent airflow	Re-align the resonator. Adjust to correct height. Check that the tapered plug has not loosened from the resonator arm. Contact the factory.
<b>Unit is not reaching full capacity</b>	Low water pressure Undersized regulator(s) Control valve(s) are not opening completely Undersized air compressor	Install high pressure booster pump. Replace with correct size. Replace control valve(s). Replace with correct size.
<b>Compressed air valve produces a high pitched noise when in operation</b>	This is normal and does not require any remedy	
<b>When adjusting the outlet pressure on the compressed air regulator, the outlet pressure for the water changes.</b>	This is normal and does not indicate a faulty system	
<b>When adjusting the outlet pressure on the water regulator, the outlet pressure for the compressed air changes.</b>	This is normal and does not indicate a faulty system	
<b>Upon a call for humidification, the system takes a few seconds until fogging occurs</b>	This is normal and does not indicate a faulty system	
<b>Humidifier does not fog</b>	The low pressure safety switch has not been made Compressed air pressure is too high Water control valve is not open	Adjust the switch setting. Check that the drain valve is not open. Increase the water pressure or decrease the compressed air pressure. Adjust the settings through the keypad. Adjust the settings through the keypad. Check for movement from actuator, replace if necessary. Control wiring incorrect.
<b>Pressure bias fluctuates</b>	This is normal and does not indicate a faulty system	
<b>Foggers drip when system is shutdown</b>	Setting for the ADD mode are incorrect Compressed air pressure has been lost Incorrect resonator height	Increase the ADD delay time. Increase the ADD duration time. Determine cause for pressure loss and correct. Adjust the resonator height.

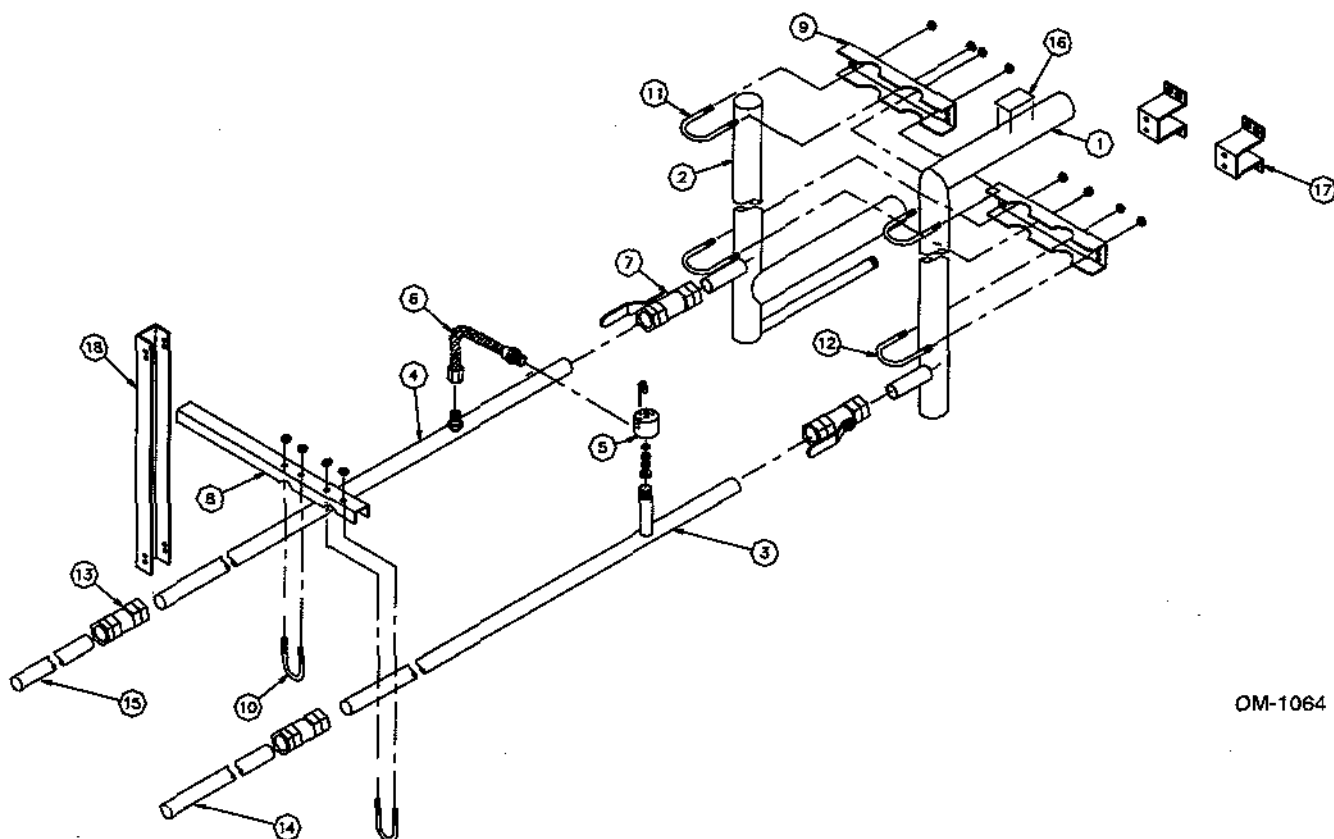
## TROUBLE-SHOOTING GUIDE

Symptom	Possible Cause	Recommended Action
<b>Pressure bias changes from row to row</b>	Balancing valves are incorrectly adjusted	Re-adjust balancing valves to equalize bias.
<b>Tapered resonator plug loosens</b>	The thread sealant has deteriorated Threads on the resonator rod or inside the tapered plug have been stripped	Remove the tapered plug and apply thread lock to the threads, reattach the tapered plug. Replace the resonator assembly.
<b>No Water Discharges From the Fogger(s)</b>	Low water pressure. Fouled orifice Control valve not opening	Locate the cause of the low water system Foreign material may be inside nozzle. Remove and clean Foreign matter in the valve. Check and clean. Valve spring broken. Replace spring. Valve installed backwards Actuator has failed - replace actuator.
<b>Intermittent Output from Nozzles</b>	Low humidifier output	Normal
<b>Fog Pattern Not Correct</b>	Low pressure bias High Pressure Bias Resonator too high Resonator too low Resonator not centered	Decrease the water valve range. Increase the Air Range. Increase the water valve range. Decrease the Air Range. Lower resonator height Increase resonator height Reposition and center resonator plug
<b>Humidifier is Noisy</b>	Air pressure too high Bias is too high	Reduce air pressure setting on compressed air regulator Decrease the pressure bias
<b>Condensate in Duct</b>	Humidifier is mounted too close to internal devices (dampers, turning valves, etc.) in duct The air passing through the humidifier is not warm enough for absorption. Air cannot absorb quantity being discharged.	Move humidifier assembly an appropriate distance upstream of internal devices. Consult DRI-STEEM Humidifier Co. Increase the entering air temperature. Humidifier operates when blower is off. Provide interlock.
<b>Space Humidity Will Not Rise to Humidistat Set Point</b>	Compressed air pressure is too low.	Compressed air valve is not opening Low pressure safety switch is not closed

## TROUBLE-SHOOTING GUIDE

Symptom	Possible Cause	Recommended Action
<b>Unit Does Not Energize</b>	<p>Incorrect or non-existent supply voltage to unit</p> <p>Incorrect or non-existent control voltage</p>	<p>Check the main line fuse Check the main line safety switch</p> <p>Verify proper transformer voltage Verify proper wiring of transformer</p>
<b>Condensate Forming in Duct</b>	<p>Humidifier is mounted too close to internal devices in duct</p> <p>Non-insulated duct passing through unheated areas.</p> <p>Over humidify (saturating) air stream</p>	<p>Relocate humidifier a sufficient distance upstream of internal device. Consult DRI-STEEM catalog for correct distance.</p> <p>Externally insulate duct.</p> <p>Air temperature in duct is too low. Humidifier is not interlocked with blower controls (humidifying when blower is "off")</p>
<b>Hunting - Humidity swings above and below desired set-point</b>	<p><i>Control system is malfunctioning</i></p> <p>Air Volume is varying too rapidly</p>	<p><i>Faulty or inaccurate humidity controller, replace or calibrate. Use appropriate guide.</i></p> <p>Poor location of control components, relocate. See DRI-STEEM catalog for recommendations.</p> <p>Inappropriate control components, change components.</p> <p>Stabilize</p>

# REPLACEMENT PARTS



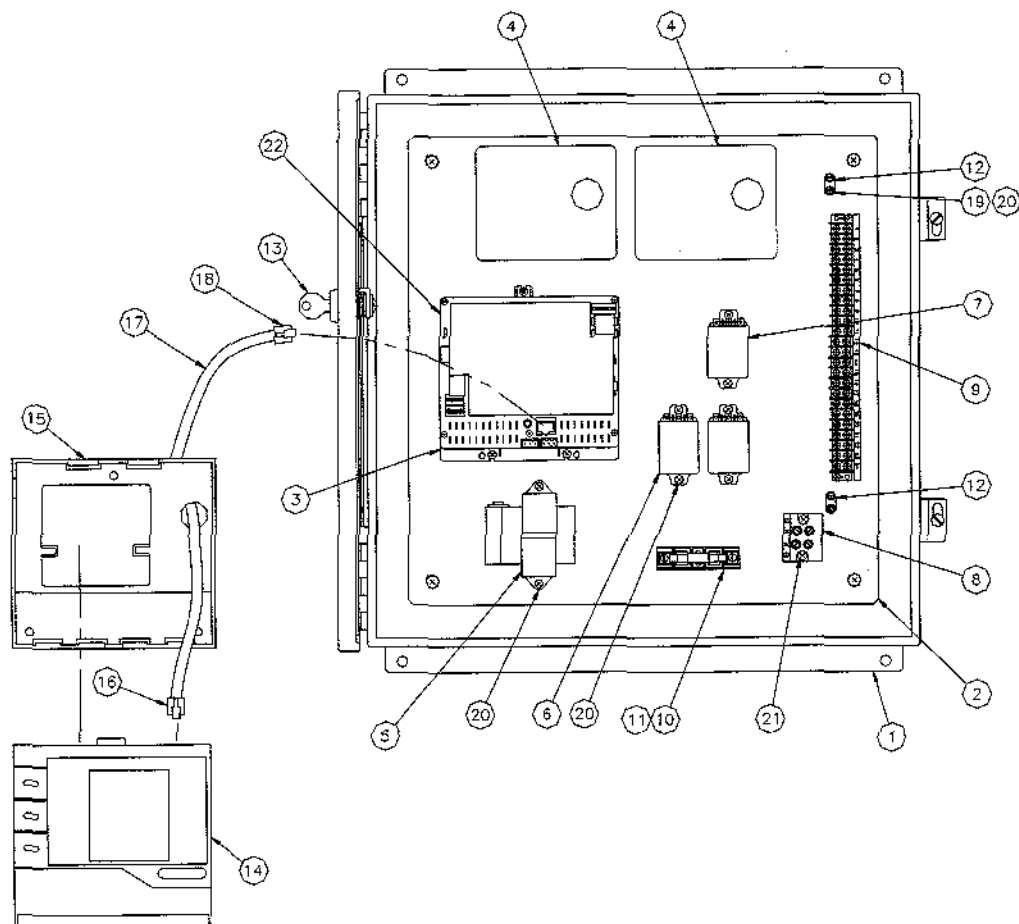
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**Table 23-1: Humidifier Replacement Parts (Industrial)**

No.	Description	Qty	Part No.
1	Air Header Weld, 1 1/2" dia. UFG	1	168031
1	Air Header Weld, 2" dia. UFG (316)	1	168033
1	Air Header Weld, 3" dia. UFG (316)	1	168035
2	Water Header Weld, UFG (316)	1	168041
3	Air Manifold Weld, UFG (316)		168056
4	Water Manifold Weld, UFG (316)		168076
5	Head, 1/8" orifice		501800-125
6	Braided Hose Fitting, 1/4 NPT x 5" (316)		260002
7	Ball Valve, 3/4" NPT (316)		260005
8	Mounting Channel Weld, UFG Manifold (316)		168511

No.	Description	Qty	Part No.
9	Bracket, UFG 2" dia. Air Header Mounting		126163
10	U-Bolt, 3/4" dia. (316)		700550-002
11	U-Bolt, 1 1/4" dia. (316)		700550-003
12	U-Bolt, 1 1/2" dia. (316)		700550-004
13	Union, 1" dia. Swagelok		260006
14	Air Manifold Weld (316)		168057
15	Water Manifold Weld (316)		168077
16	Label, Ultra-Fog	1	800220
17	Bracket, Wall Mount (316)		126151
18	Plate, Mounting Channel (316)		126156-001

# REPLACEMENT PARTS



OM-1063

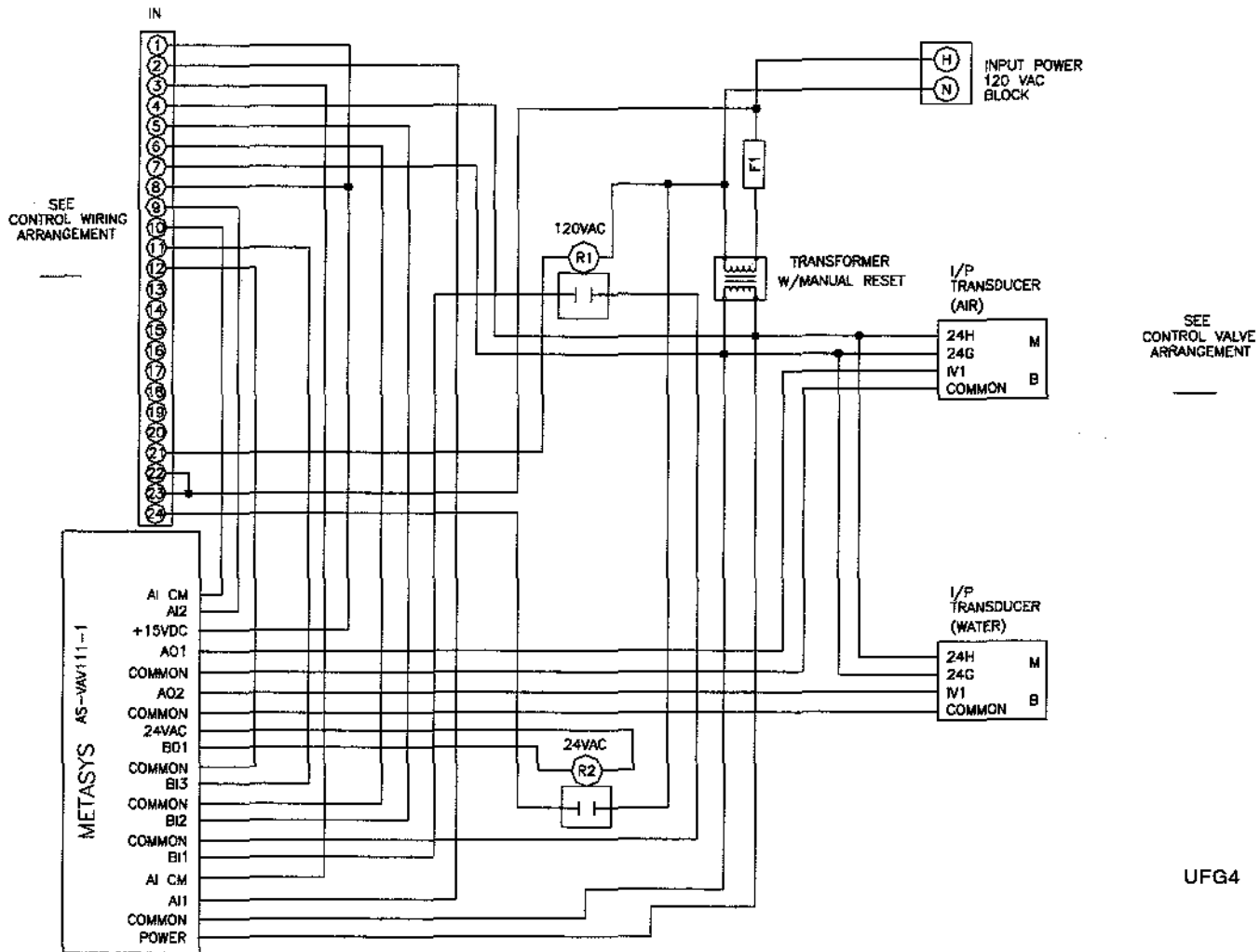
**Table 24-1: Control Cabinet Replacement Parts**

No.	Description	Qty	Part No.
1	Control Cabinet	1	407100-007
2	Subpanel	1	165720-004
3	Controller, Unit Digital	1	405750
4	I/P Transducer	1	
5	Transformer, 120V, 75VA	1	408960
6	Relay, 2 pole 24V	1	407900-001
7	Relay, 2 pole 120V	1	407900-002
8	Terminal Block, 2 PT Contact	1	408300-001
9	Terminal Block, 24 position	1	408155-024
10	Fuse Holder, 1-pole midjet	1	407450-002
11	Fuse	1	

No.	Description	Qty	Part No.
12	Ground Lug, L-35	2	409250-017
13	Door Lock W/Key, NEMA-12	1	700700
14	Terminal Unit, Zone (ZTU)	1	405751
15	Base, Zone Terminal Wall Mounting	1	405751-001
16	Plug, modular male	1	405886
17	Cord, modular line	5 ft.	405885
18	Plug, 8 pin modular	1	406250-001
19	Washer, #8 Ext. tooth	2	700200-003
20	Screw, 8-32 x 3/8" self-tapping	10	700170-001
21	Screw, 8-32 x 1 1/4" self-tapping	2	700170-003
22	Screw, 8-32 x 5/8" self-tapping	3	700170-002

# WIRING DIAGRAM

**Figure 25-1: Metasys Controller Wiring Diagram**





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## MAINTENANCE

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### Humidifier Nozzles:

- Inspect the humidifier foggers at least twice a year when using DI/RO water. Clean any fogger that is not operating correctly.
- Check tightness of resonator rods.
- Check tightness of water connections for leakage.

### Humidifier Tubing:

- Check for leakage near any fitting (annually).
- Check all mounting brackets for loose bolts (annually).

### Control Valves:

- Pneumatic Type: Inspect annually to be sure that the valve closes off tightly, it is not leaking, and the diaphragm is not leaking air.
- Hydraulic Type: Inspect bi-annually to be sure that the valve is not leaking hydraulic fluid.
- Solenoid Type: Inspect annually to verify proper functioning with tight shut off.

# MAINTENANCE SERVICE RECORD

<b>DATE INSPECTED</b>	<b>PERSONNEL</b>	<b>OBSERVATION</b>	<b>ACTION PERFORMED</b>

## 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 re-installation 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.

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Continuous product improvement is a policy of DRI-STEEM Humidifier Company. Therefore, product features and specifications are subject to change without notice.

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