

**READ AND SAVE THESE INSTRUCTIONS**

# ***HUMIDIFIRST***

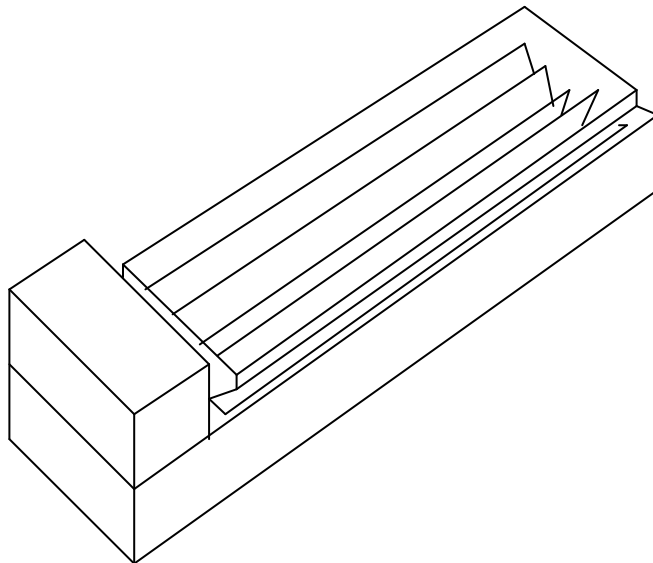
**ULTRASONIC HUMIDIFIERS**

**OWNER'S MANUAL**

**FOR**

**DT SERIES**

**(DUCT/AHU MOUNT)**



**ULTRASONIC HUMIDIFIERS**

2-23-08

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## **INTRODUCTION**

Congratulations on your purchase of a HUMIDIFIRST duct mounted ultrasonic humidifier – the highest quality and most “User Friendly” commercial/industrial humidifier available today. Your selection of an ultrasonic humidifier provides you with the benefits of this technology, including **energy efficiency, minimal maintenance, and healthy, uncontaminated moisture**. And HUMIDIFIRST humidifiers are 100% American made.

HUMIDIFIRST humidifiers are made of high-grade stainless steel. This ensures unit longevity, minimal maintenance, and a clean, healthy humidifier.

## **UNDERSTANDING HUMIDIFICATION**

Maintaining a specific relative humidity level in a building or a room is not an exact science. Quality of construction, vapor barrier, air infiltration, and air exhaust all play a role in the ability of a humidifier to maintain the relative humidity of a space. Also, some older buildings may form ice in colder temperatures on the outside walls due to humidified air seeping through cracks. Windows, too, may ice up when the outside temperature drops. The type of window (e.g. single pane, double pane) can affect the amount of window icing or sweating. The level of relative humidity in a space may also affect the amount of window icing or sweating. For example, a building may have moisture problems at 50% RH but not at 30% RH.

Also, relative humidity may fluctuate in a given space. If one were to walk around a large room with a hand held relative humidity meter, variations in relative humidity would be discovered. This is typically due to variations in space temperature. Relative humidity is “relative” to temperature, and hence changes in space temperature will affect the relative humidity of the air.

## **PRINCIPLES OF ULTRASONIC HUMIDIFIERS**

Ultrasonic humidifiers vibrate a water mist into the air by using piezoelectric crystals (transducers). The transducers are mounted in a basin of water approximately 1.5 inches deep. Each transducer is approximately the size of a nickel and vibrates at approximately 1.6 megahertz, a speed so fast that the water above the crystal cannot follow the speed of the transducer, causing the water to cavitate. This process creates a “finger” column of water above each transducer, which emits very small water droplets into the air, approximately one micron in diameter (similar in size to steam droplets). The water droplets are so small that they evaporate almost immediately.

The water feeding an ultrasonic humidifier must be pure so that minerals and other contaminants are not vibrated into the air. Such purity is achieved with de-ionized (DI) water filters to remove all minerals and foreign matter from the water. DI water offers additional benefits. It assures a pure, healthy mist for those breathing the air, and it significantly reduces the amount of maintenance required for the humidifier, i.e. no scaling or sludge to be removed from the humidifier pan.

## **HUMIDIFIRST** humidifier sizing calculations

When calculating the humidification loads of a space we will generalize and assume that the majority of the humidification load will come from two areas:

1. **Ventilation, Exhaust, or Infiltration of air:** most buildings have air exchanges with the outside because of one or more of these three items.
  - A. **Ventilation** is a result of air conditioning systems bringing in outside air to provide fresh air to the inhabitants.
  - B. **Exhaust** is the mechanical removal of air from a space when processes inside of the building require the removal of dirty, hot or unwanted air.
  - C. **Infiltration** occurs when air comes into a space from outside. Air may come in through small openings around doors, windows, ceilings, etc. Also, infiltration often occurs from frequent opening of doors.

For each **Cubic Foot per Minute (CFM)** of outside air that is brought into the space, moisture must be added to achieve relative humidity requirements.

2. **Air conditioning:** When an air conditioner runs, it removes moisture from the air. This is known as Latent Cooling. If the air conditioner will be running during the humidification season, then this dehumidification process must be taken into account. The cooling ability of an air conditioner is normally rated by the manufacturer and is stated in Sensible and Total cooling capacity in btu's per hour. Subtract the **Sensible** cooling capacity from the **Total** cooling capacity to get the **Latent** cooling capacity. For every 1000 btu's/hour of latent cooling capacity, a stable relative humidity level requires that one pound of moisture be added to the air.

Please note that there are other factors that can affect humidification requirements, such as moisture absorption of items in the space. These factors generally may be ignored because **most often** they play only a minor part in the humidification requirements. Contact Humidifirst for any unique applications.

See the next page for a simple chart that can be filled in and sent to Humidifirst. We are happy to assist with the sizing of any humidification system.

**HUMIDIFIRST**

**HUMIDIFIRST** can assist you with your humidifier sizing. Fax us (801-760-2777) the following information:

Your name:	_____
Your Company:	_____
Phone number:	_____
Fax number:	_____

Project name: _____
Zone: _____
<b>Indoor design conditions required: Temperature _____ ° F Relative humidity _____ % RH</b>
<b>Outdoor (ambient) design condition: Temperature _____ ° F Relative humidity _____ % RH</b>
<b>CFM of outdoor (ventilation) air: (see item 1 on previous page) _____</b>
<b>BTU's per hour of Latent cooling (see item 2 on previous page) _____</b>

**Please do not hesitate to call us (561-752-1936) if you have any questions or if we can help you with your calculations.**

**WATER QUALITY CONVERSION CHART**

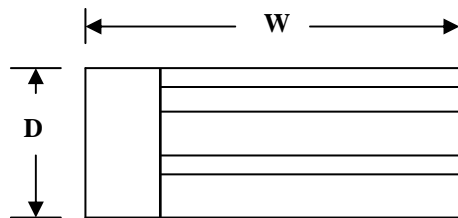
CONDUCTIVITY ( $\mu$ S)	RESISTIVITY (ohms)	DISSOLVED SOLIDS (parts per million , ppm) (also mg/liter)	GRAINS PER GALLON (GPG)
0.125	8,000,000	0.0625	0.003655
0.167	6,000,000	0.08333	0.004873
0.2	5,000,000	0.1	0.005848
0.25	4,000,000	0.125	0.007310
0.5	2,000,000	0.25	0.014620
1.0	1,000,000	0.5	0.029240
2.0	500,000	1.0	0.058480
▶ <b>5.0</b>	<b>200,000</b>	<b>2.5</b>	<b>0.146200</b> ◀
6.0	166,666	3.0	0.175439
8.0	125,000	4.0	0.233918
10	100,000	5.0	0.292398
12	83,333	6.0	0.350877
14	71,428	7.0	0.409357
16	62,500	8.0	0.467836
18	55,555	9.0	0.526316
▶ <b>20</b>	<b>50,000</b>	<b>10</b>	<b>0.584795</b> ◀
22	45,454	11	0.643279
24	41,666	12	0.701754
26	38,461	13	0.760234
28	35,714	14	0.818713
30	33,333	15	0.877193
40	25,000	20	1.17
50	20,000	25	1.46
60	16,666	30	1.75
70	14,286	35	2.05
80	12,500	40	2.34
100	10,000	50	2.92
120	8,333	60	3.51
140	7,142	70	4.09
160	6,250	80	4.68
180	5,555	90	5.26
200	5,000	100	5.85
250	4,000	125	7.3
263	3,800	132	7.7
285	3,500	143	8.4
303	3,300	152	8.9



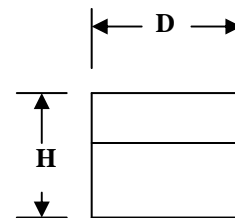
**HUMIDIFIRST**

**Humidifier module data**

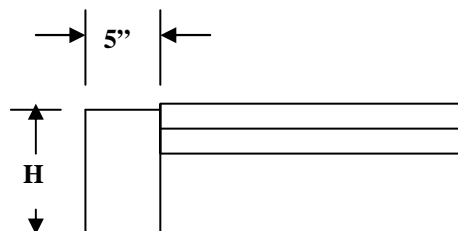
<b>Humidifier Module</b>	<b>Capacity (#/hr)</b>	<b>Power (va)</b>	<b>Weight (lbs.)</b>	<b>Dimensions W x D x H (in.)</b>	<b>Duct block (sq. ft.)</b>	<b>No. of Xcers</b>
<b>DT-10</b>	<b>10.6</b>	<b>240</b>	<b>15</b>	<b>15.0 x 9.0 x 10</b>	<b>1.0</b>	<b>8</b>
<b>DT-20</b>	<b>21.1</b>	<b>495</b>	<b>20</b>	<b>23.0 x 9.0 x 10</b>	<b>1.6</b>	<b>16</b>
<b>DT-30</b>	<b>30.8</b>	<b>750</b>	<b>25</b>	<b>30.5 x 9.0 x 10</b>	<b>2.1</b>	<b>24</b>
<b>DT-40</b>	<b>39.6</b>	<b>960</b>	<b>30</b>	<b>39.9 x 9.0 x 10</b>	<b>2.5</b>	<b>30</b>
<b>DT-60</b>	<b>60.0</b>	<b>1410</b>	<b>46</b>	<b>42.1 x 15.5 x 10</b>	<b>2.7</b>	<b>47</b>
<b>DT-80</b>	<b>80.0</b>	<b>1860</b>	<b>56</b>	<b>53.8 x 15.5 x 10</b>	<b>3.4</b>	<b>62</b>



**TOP VIEW**



**SIDE VIEW**



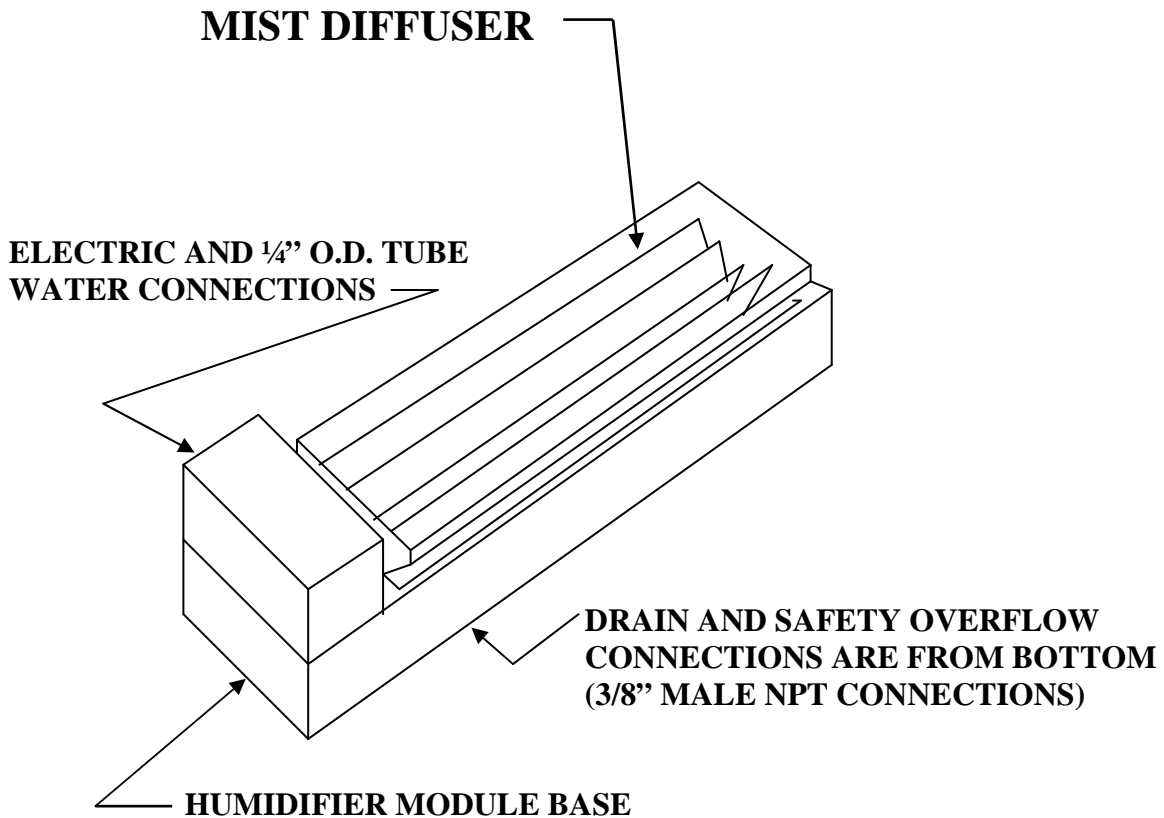
**FRONT/BACK VIEW**

## **HUMIDIFIRST**

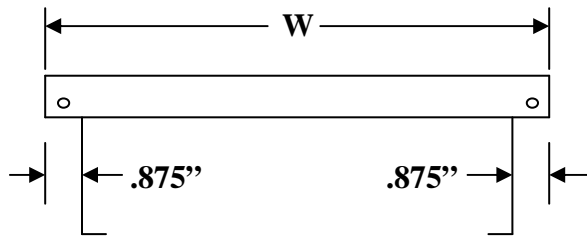
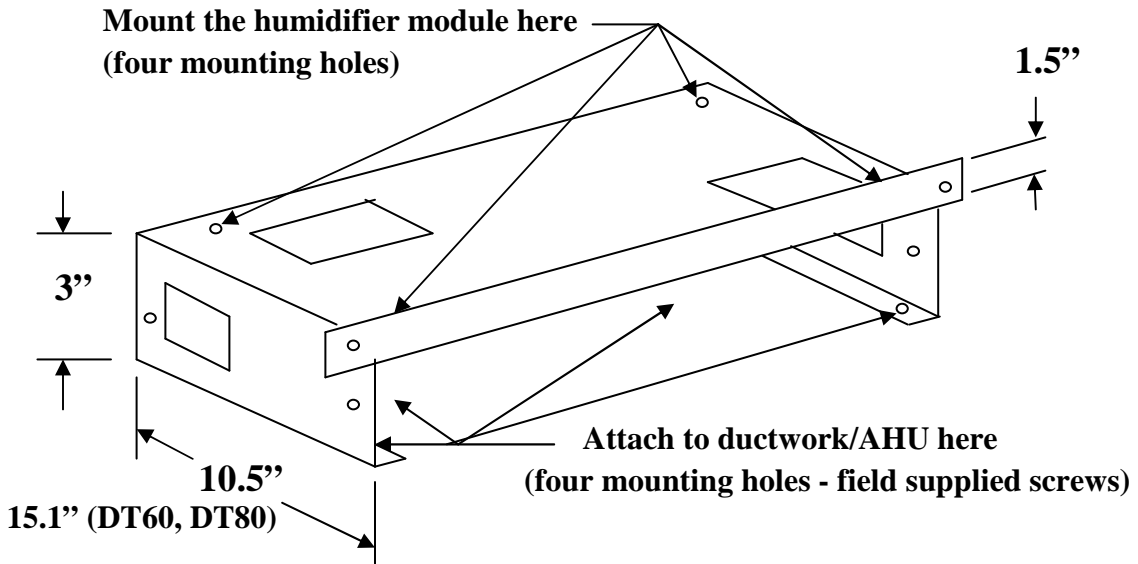
The Humidifirst DT series design gives you a choice of mounting the **HUMIDIFIER MODULE BASE** with the electrical and water connections facing **upstream or downstream**. This allows you to orientate the humidifier module base so that access to the connection points is the most convenient for your application.

Please note that **MIST DIFFUSER** is reversible and must always be mounted so that the **AIR FLOW** arrows are **pointed downstream**.

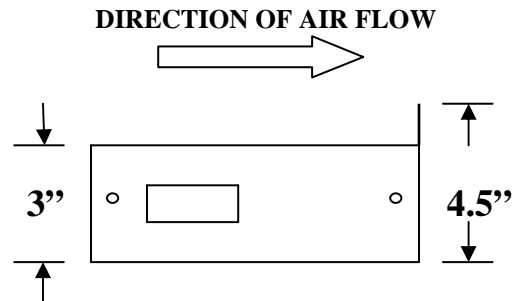
See page 32 for the explosion view of the DT-Series.



**DT SERIES MOUNTING SHELF**



**FRONT VIEW**



**SIDE VIEW**

MODEL	W (inches)
DT - 10	18.0
DT - 20	25.7
DT - 30	33.2
DT - 40	42.25
DT - 60	45.0
DT - 80	56.75

- When stacking shelves vertically, use 1 1/4" square tube
- Use 1/4" X 1" bolts to attach the humidifier to the shelf. Use 1/4" x 2 1/4" bolts to attach corner when stacking shelves

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Drwg. no. DT - 005

Rev. F

## **The Master Panel**

The Master Panel powers and controls the humidifier modules. It interfaces with sensors located in the facility and will energize the humidifier module(s). All power for the humidifier module(s) comes from the Master Panel. One (1) transformer, one (1) solid state relay, and one (1) solenoid valve relay are provided for each humidifier module. The ultrasonic transducers operate at 48 volts ac, the solenoid valve at 24 volts ac and the controls operate at 24 volts AC or DC.

The physical size of the Master Panel will vary, depending on the number of humidifier modules being powered and controlled, and the size of the transformer(s) required for the various humidifier module sizes. For example, a Master Panel built for one DT-10 humidifier module will be 24" x 24" x 10". A Master Panel built for eight (8) DT-80 humidifier modules will be 80" x 48" x 16". The exact sizes of the Master Panel, humidifier modules, and racks will be contained in the submittal information for a particular project. Please feel free to contact the factory for this information in advance.

**Please see page 16 for a general wiring schematic of the Master Panel.**

### **Rack sizes for humidifier mounting**

When installing multiple humidifier modules in the duct or air handler, they must be mounted on rack(s) or shelving (see individual shelf on page 11). The structure should be made of a polyester resin or of stainless steel. The installer may wish to provide the racking, or it can be provided optionally by Humidifirst. The humidifiers should never be placed one in front of the other. The racking system places one above the other. The maximum number of modules per rack is five (5). For module requirements greater than five, two or more racks may be used.

Humidifirst racks will be provided as follows:

1. Either polyester resin or stainless steel structure (choose one)
2. All humidifier modules to be mounted on the shelves.

Number of humidifier Modules	Minimum Height (in.)
2	30
3	42
4	54
5	66

## **HUMIDIFIER MODULE SPECIFICATIONS**

The ultrasonic humidification system shall include packaged, self-contained ultrasonic humidifier module(s) using the principle of ultrasonic nebulization. Each transducer circuit shall use the “thickness vibration method” of humidification via a piezoelectric converter. The ultrasonic transducers shall convert the electric energy into mechanical energy, causing the water to cavitate, resulting in the production on one micron sized water particles. The design of the humidifier housing shall prevent larger droplets from leaving the humidifier assembly.

Each humidifier module shall use a multiple of ultrasonic transducers that vibrate at approximately 1.6 megahertz, producing a droplet size of approximately 1 micron (.52 cubic micron droplet volume).

The humidifier shall consume no more than 30 watts per pound of humidification generated.

The ultrasonic humidifier shall not produce any unacceptable noise.

The humidifier module(s) shall contain no fans and shall be designed to be located inside of ductwork or air handlers and to receive air at velocities of 300 feet to 1500 feet per minute.

The ultrasonic humidifier shall not require a flush cycle and shall have instant on and off operation in order to maintain precise room relative humidity.

The humidifier housing and discharge nozzles shall be made of stainless steel; plastic is not acceptable.

## **HUMIDIFIER MODULE - continued**

**Each humidifier shall have the following components:**

- A. Solenoid valve to control water flow into the humidifier
- B. Float switch to control water level.
- C. Float switch to provide for low water shutdown
- D. Piezoelectric crystals (transducers)

### **Mist discharge diffuser**

The mist discharge diffuser shall be adjustable so that when field conditions dictate higher velocities, air can be restricted and small droplet size can be maintained.

### **Solenoid valve and low water safety control**

No circuit boards for control of the solenoid valve or low water safety shall be permitted in the humidifier module. Damp conditions can deteriorate the circuit boards and result in high maintenance costs. All such controls shall be located inside of the central Master Power and Control Panel. Indicator lights in the Master panel shall be energized when the solenoid valve is energized and when the low water safety/high temperature safety cut-out is in effect.

### **Solenoid valve**

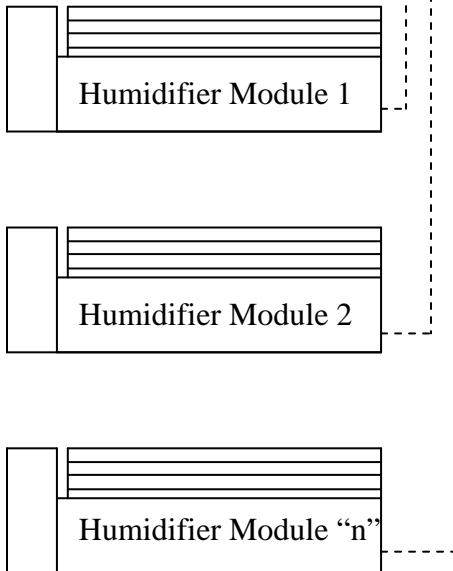
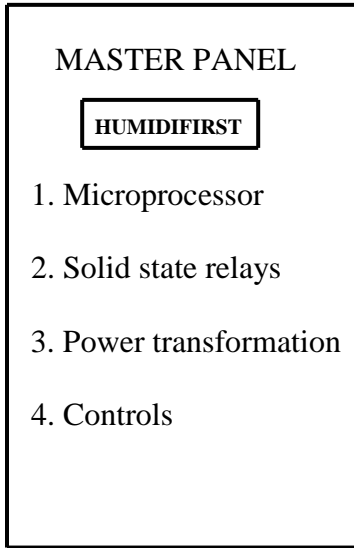
Stainless steel solenoid valves shall be provided when de-ionized or reverse osmosis water is being used.

Hermetically seal solenoid valve coils shall be used.

### **Water connection kit**

A water line connection kit to each humidifier module shall be provided and include a set of quick disconnect service valves (checked) to easily isolate the humidifier when servicing.

## Field Wiring Schematic for HC-300 Controller



### Field wiring to Master Panel

- ◀ **Common alarm**  
(2 wire dry contact signal)
- ◀ **Air proving circuit**  
(2 wire- 24 Vdc)
- ◀ **Remote shut down**  
(2 wire- 24Vdc)
- ◀ **Analog signals:**
  - Humidity sensor
  - Humidity high limit sensor (optional)
  - Water quality sensor (optional)
  - Air speed sensor (optional)

(2 wire shielded cable, with drain, 4-20 ma)
- ◀ **Options:** - Air temp too low
  - Air temp too high
  - Ambient Temp setback
  - Water leak detected

(2 wires, 24 Vdc)
- ◀ **Drain valve(s)** (optional)  
One valve per humidifier module. The valves can be wired together in parallel, and then one set of wires can be run to the Master panel.  
(2 wires)
- ◀ **Power supply to Master panel**  
As specified
- ◀ **Power/control wires to EACH humidifier module**  
10 wires, includes grnd, DT10, 20, 30, & 40  
12 wires, includes grnd, DT60 & 80



**HUMIDIFIRST**

**Transducer power wire sizing from the Master Panel to the humidifier module(s)**

1. Field wiring for transducer power (**hot and common**) typically has a voltage range of 42 to 50 volts.
2. Check the wiring diagram for number of transducer rows, depending on the model they will vary from 1 to 3 rows.

Model	Transducer rows	Current (amps per row)	Minimum Wire size (AWG)			
			0-25 ft.	50 ft	75 ft	100 ft
DT-10	2	3	16	16	14	12
DT-20	2	6	16	14	12	10
DT-30	2	9	16	14	12	10
DT-40	2	11	16	14	12	10
DT-60	3	12	16	14	12	10
DT-80	3	15	14	12	10	10

**IMPORTANT:** Use the above as a guideline only. Refer to the National Electric Code when sizing wire for your specific application. Type of wire, number of wires in the conduit, ambient temperature, etc., all impact the wire sizing.

The wire gauge of the 10-foot harness that is shipped with the humidifier may be less than the gauge listed above but is generally adequate for most applications that are less than 10-foot in length.

## **Layout of your Humidifirst Ultrasonic humidification system**

### **Locating the humidifier module(s)**

Properly locating the humidifier module(s) is very important and by doing so will eliminate many potential problems. Adequate air velocity (speed and direction), temperature, turbulence and return air relative humidity all play a role in the distance required for full evaporation. More than one module may be (and often is) used to achieve the desired design capacity. When using multiple humidifier modules, never locate one module directly in front of the other. The modules can be located one above the other or can be mounted in a stepped configuration with the highest humidifier being the first one in the air stream. The optimal air velocity above the humidifier module is between 800 to 1000 feet per minute (fpm). If the air speed is slower than 300 fpm, the transducers may overheat. If air speed is slower than 800 fpm, output capacity may be reduced. If the air speed is faster than 1000 fpm, larger water droplets may be drawn out of the humidifier module and cause wetting in the ductwork. Remember to subtract the area of the humidifier module(s) from the cross-sectional area of the ductwork to determine the actual air speed at the humidifier module (the smaller the free area the faster the air speed).

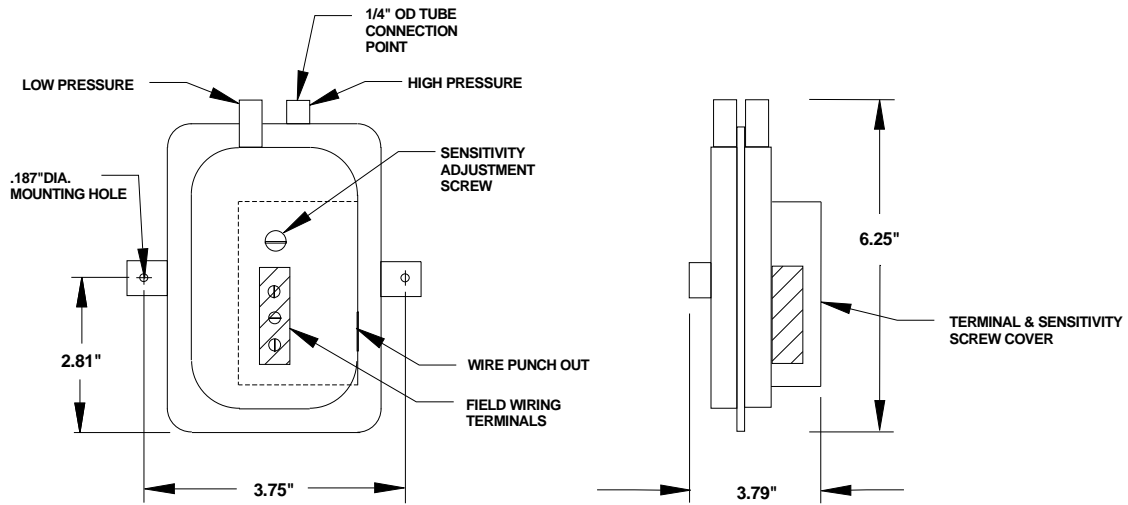
See the typical duct/AHU installation sketch on the following pages.

See the “Installation Parameters & Guidelines” on the following pages.

### **Locating the Master Panel**

The Master Panel, depending on its size, can be mounted on the side of the air handler, on an adjacent wall or, for larger cabinets, be floor mounted. See the previous charts for correct wire sizing and Master Panel sizes.

# AIR PRESSURE SWITCH



1. The air pressure switch must be mounted to a vertical surface, as this device is gravity sensitive.
2. The adjustable range of the switch is from 0.05"WC to 2.0"WC with an accuracy of +/- 0.02" WC
3. Adjusting the screw in a clockwise direction increases the air pressure required to actuate the switch
4. The maximum sustained rating of the switch is 0.5 PSI.
5. The switches ambient air temperature range is -40F to 180F

## **Locating the humidity sensors**

Two styles of humidity sensors are available for sensing the relative humidity – wall mount or duct mount. Each offers unique features and benefits. Please consult the factory to determine the best sensor(s) for your application.

### **A. Locating wall mounted sensors**

Install the sensor where the relative humidity and the temperature will be most representative of the environment that is to be maintained. Consider the following when locating the sensor:

1. Do not locate it near cooling or heating coils, or air diffusers
2. Do not locate it where it will have direct sunlight exposure
3. Do not install it on an outside wall
4. Nothing should restrict vertical (upward) airflow through the sensor

### **B. Locating duct mounted sensors**

Duct mounted sensors can be used for two purposes:

1. Measuring the relative humidity in the return air ductwork, upstream (before) of the humidifier. Locate the sensor where the relative humidity will be most representative of the environment that is to be maintained.
2. Using the sensor for “high limit” sensing so that the humidity level in the ductwork does not exceed the saturation point. The sensor for this application is mounted downstream (after) of the humidifier. It must be located far enough downstream of the humidifier so that un-evaporated mist does not collect on the sensor. This distance is normally at least 20 feet downstream of the humidifier.

Consider the following when locating the duct-mounted sensor:

1. Do not locate near heating or cooling coils
2. Do not locate in turbulent airflow (near elbows, fans, etc.)
3. Install where the air velocity is at least 200 feet per minute (1 meter per second)

## **DESIGN OF DUCTWORK or AIR HANDLER APPLICATIONS**

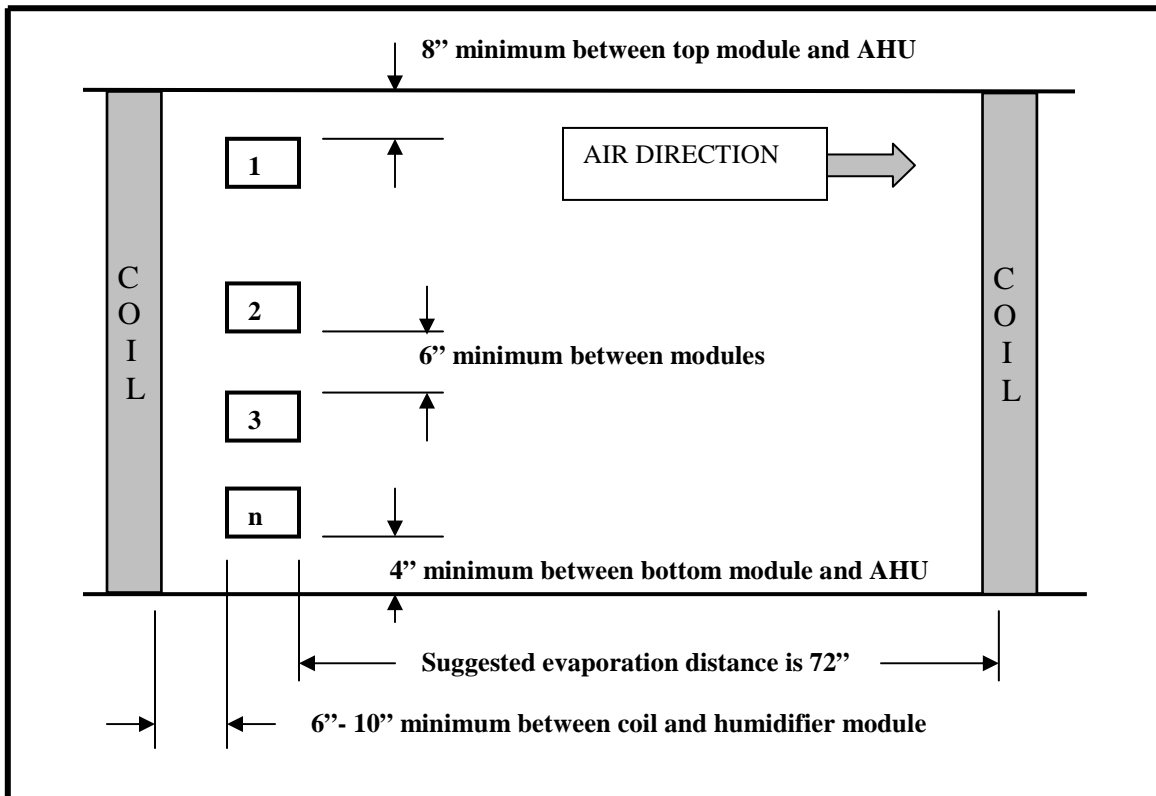
It is important to consider the complete HVAC system when designing the ductwork and control system for ultrasonic humidifier module(s). **Please do not hesitate to call Humidifirst's engineering department to discuss your application.**

The following are important items to consider:

1. Humidifirst humidifier modules are designed and tested to operate in air velocities between 300 to 1500 feet per minute (FPM) (velocity of air passing above the humidifier module). The air speed at the humidifier module(s) will play a key role in determining the mist output of the system. The listed nominal output capacity rating of the humidifier modules is based on air speeds of 800 - 1000 (FPM) passing over the humidifier module. Air speeds below these velocities may reduce the humidifier output capacity; air speeds above these velocities may increase or decrease the humidifier output capacity, and may cause wetting. Contact the factory for capacity ratings for your design requirement. In addition, the air speed should never go below 300 FPM or the transducers may overheat and fail. The air speed should be calculated by determining the net free area of the ductwork. Subtract the area of the humidifier module(s) from the total area of the ductwork to determine the airspeed at the humidifier modules.
2. Ultrasonic humidifiers are an evaporative technology (adiabatic) and typically provide the client with considerable energy savings. Because of an ultrasonic's cooling effect, care must be taken not to over-saturate the air. Use the formula  $BTU/HR = CFM \times 1.1 \times \Delta T$  to calculate the air temperature downstream of the humidifiers. Follow the constant enthalpy lines on the psychrometric chart to make sure the air does not become saturated. Preheating of the air may be required in some instances to prevent the air from becoming saturated. Make sure a high limit temperature sensor is provided upstream of the humidifiers so that the air temperature never exceeds 105°F. Also, a high limit humidity sensor can be provided down stream of the humidifiers to stop air saturation from occurring.
3. When installing ultrasonic humidifiers in variable air volume systems, please pay close attention to item one and two above.
4. When installing ultrasonic humidifiers in 100% outdoor air units, please pay close attention to items 1 and 2 above. Whenever possible, it is best to mix outdoor air with return air before humidifying. This will help to reduce the  $\Delta T$  of the air.
5. Sizing of ductwork and layout of the humidifier modules is depicted on the next page. Please note that the spacing distances are ideal for servicing and operation but may not be appropriate for achieving a desired air speed. Air speed should be the determining factor and can override the ideal module placement.

## FOR AHU INSTALLATIONS

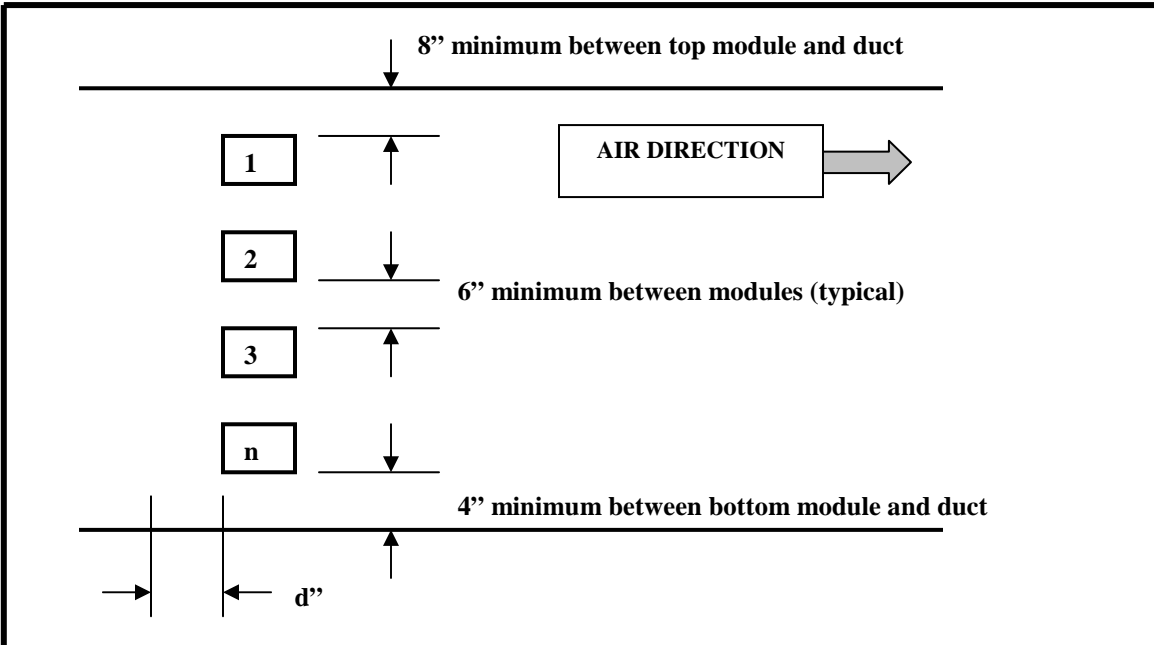
Humidifier ideal module placement (see note on page 21)



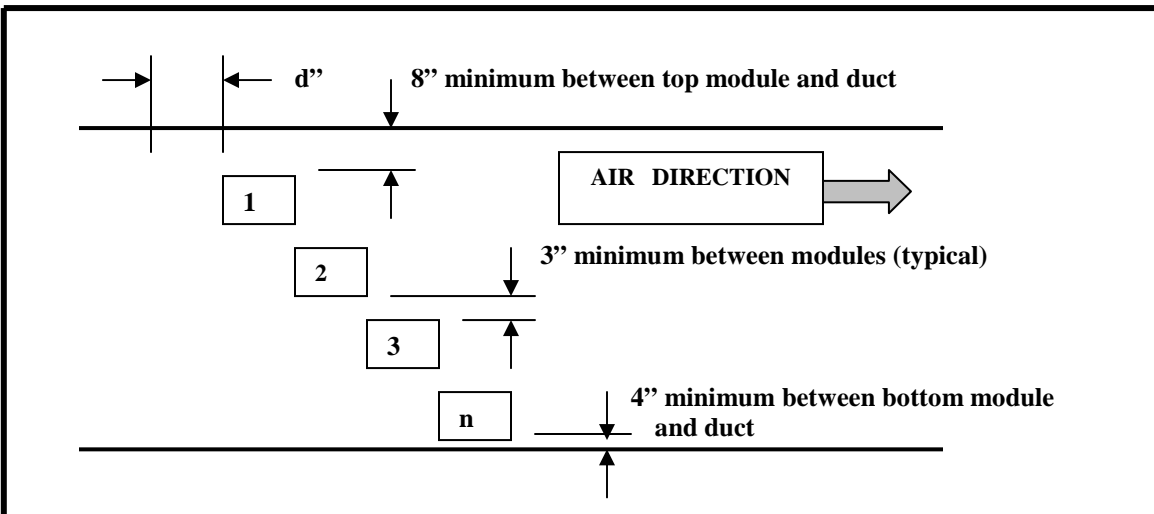
1. This AHU section should have a sealed drain pan in full length of the base
2. Position the humidifier modules in from either side a minimum of 4"
3. An access door with view port should be provided

# FOR DUCT INSTALLATIONS

Humidifier ideal module placement (see note 5 on page 21)



**OPTION ONE – MOUNTING THE HUMIDIFIER MODULES VERTICALLY**



**OPTION TWO – STEP MOUNTING OF HUMIDIFIER MODULES**

1.  $d = 10''$  after HVAC coils or air straightener
2.  $d = 36''$  after ducted elbows or tees
3. Install a condensate pan starting  $10''$  upstream of the first module and continuing at least  $36''$  downstream of the last module
4. Keep module(s) in  $4''$  from the sides of the duct

**DESIGN & INSTALLATION GUIDELINES FOR DT-SERIES HUMIDIFIERS**

	<b>MECHANICAL</b>	

1. The supply air temperature to the humidifier modules should be between 40 °F and 105 °F at 90% relative humidity or less.
2. Mount the humidifier modules in laminar airflow. Turbulent air flow increases evaporative distance and increases risk of wetting.
3. The ductwork in the humidifier/evaporation area should be constructed of stainless steel.
4. See the previous page for suggested humidifier module mounting positions.
5. Humidifirst humidifier modules are designed and tested to operate in air velocities between 300 to 1500 feet per minute (FPM) (velocity of air passing over the humidifier module). The air speed at the humidifier module(s) will play a key role in determining the mist output of the system. The listed nominal output rating for the humidifier modules is based on an air speeds of 800 - 1000 (FPM) passing over the humidifier modules. Air speeds below these velocities may reduce the humidifier output capacity; air speeds above these velocities may increase or decrease the humidifier output capacity. Contact the factory for capacity ratings at your design requirement. In addition, the air speed should never go below 300 FPM or the transducers may overheat and fail. The airspeed should be calculated by determining the net free area of the ductwork. Subtract the area of the humidifier module(s) from the total area of the ductwork to determine the airspeed at the humidifier modules.
6. Each humidifier module should be suspended in the ductwork so that air can pass both above and below the module.
7. Stainless steel or fiberglass angle is a preferred racking structure.
8. In ducted applications, allow 8-12 feet for evaporation downstream of the humidifiers. In air handler applications, allow 6 feet for evaporation upstream of the coils. If discharging into a fan, consult the factory. The distance for complete evaporation will vary depending on the air velocity, air relative humidity, air temperature and air turbulence.
9. In ducted applications, the humidifiers can be mounted in a stepped formation in order to minimize blockage of airflow.
10. A condensate pan should be formed in the duct beneath the humidifiers and extend the full length of the evaporative section.
11. An access door should be provided to inspect and maintain the humidifier(s). A see-through window in the door can be helpful. Make the access door as large as possible for the service technician and in larger applications make this door large enough for a service technician to step through.
12. The humidifier should be mounted so that the air enters the long side of the humidifier.
13. The humidifier module(s) should be located no closer than 10” downstream of a heating or cooling coil.
14. The humidifier must be mounted level from front to back and from side to side.
15. Humidifier modules must not operate unless there is airflow in the ductwork.
16. A duct mounted proportional high limit transmitter can be specified to prevent saturated air from occurring in the ductwork/air handler.
17. The overflow safety drain connection (3/8” mpt) is located on the bottom of the humidifier module below the electric box. When humidifier modules are stacked one above the other, this drain should be extended to the side of the humidifier.



**HUMIDIFIRST**

**INSTALLATION PARAMETERS AND GUIDELINES (continued)**

	<b>WATER AND WATER PIPING</b>	
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1. Water supply pressure should be between 10 psi to 75 psi.
2. Water supply temperature should be between 40°F and 100°F.
3. Pure water, three parts per million (ppm) or cleaner, should be used in the humidifier. Water dirtier than 10 ppm can introduce dust into the air, which will eventually collect inside of the facility. Dirty water will normally not damage the humidifier but will require more frequent humidifier maintenance.
4. Reverse osmosis systems with de-ionization polishing or just de-ionization bottles are typically used for water treatment. Please contact Humidifirst for sizing and/or selection of water treatment equipment. Undersized water treatment systems can cause damage to the humidification system.
5. Piping to each humidifier should be designed for use with de-ionized water i.e. stainless steel, appropriate plastic, etc.  
(check requirements of local building codes)
6. Overflow piping should be directed to the condensate pan/drain.

	<b>ELECTRICAL</b>	
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1. Follow all local, state, and federal wiring guidelines.
2. Allowable voltage variance +/- 10%.
3. The power source must be provided with a circuit breaker.
4. A power/control panel will be provided and must be wired to each humidifier module. The panel will include one transformer for each humidifier module. The transducers run off of 48 volts and the controls are 24 volts. The panel will vary in size and will be either wall/unit mounted or floor mounted, depending on the number of humidifier modules.
5. Each humidifier module will require 10-12 wires between the control panel and each humidifier module. **Please note that most humidification systems have more than one module.** It is suggested that the wire be multi-colored, stranded, and be a minimum of 16 gauge. Heavier gauge wire may be required, depending upon the distance between the control panel and the humidifier module(s). Please note that proper wire sizing procedures should be used following the applicable building codes.
6. Insulation resistance 100 M-Ohm or greater is suggested.
7. Power should be applied to the humidifier only when the air handler is moving air.
8. Control wiring to field mounted sensors will be required (humidistats, air safety switch, etc.)

**READ THIS MANUAL**  
**before starting the humidification system**

**CAUTION !!**

1. It is recommended at the initial humidifier start up to cover the transducers with one inch of water. This will reduce the chance of damaging the transducers if the field wiring is incorrect.
2. Failure to maintain a 1.5” water level in the humidifier during normal operation will cause the transducers to fail prematurely.
3. Ensure that the humidifier is mounted on a flat surface so that water covers the transducers at an equal depth. Use a level to confirm that the humidifier is mounted correctly.
4. Always have at least 10 psi of water pressure connected to the humidifier module. 40 psi is recommended.

**Caution:**

- a. When water purification systems are used, pressure drops may be substantial and may reduce water flow to the humidifier.
  - b. Reverse osmosis systems may have re-pressurization pumps. We suggest that you adjust the output pressure so that the pressure at the humidifier is approximately 40 PSI.
  - c. Never operate the humidifier by “hand pouring” water into the humidifier. Operating the humidifier for extended periods of time without 1.5” of water covering the transducers will cause the transducers to fail. The humidifier has a low water safety switch but this safety device is only used to prevent the humidifier from running dry. It does not protect the transducers from low water level operation. Also, water must flow through the water solenoid valve during humidifier operation; otherwise, the valve may overheat and fail.
5. Never service the humidifier with the power connected.
  6. Incorrect field wiring between the Master Panel and the humidifier module(s) can cause immediate failure of all of the transducers.

## **START-UP**

Start-up assistance by a factory technician is always recommended; however, if this is not possible, a qualified technician may perform the start-up procedure. First, ensure that the system is ready to be started. This means that the humidifier module(s) and control box(s) are mounted properly and are wired. All the water connections must be in place and supply water must be available. All electrical connections must be ready and the main power must be available. Make sure the drain plug on the humidifier module(s) is secure and tight.

1. Before the Humidifirst humidification system is started, the lines that supply water to the humidifier modules should be flushed for 15-20 minutes to ensure that any small particles do not wedge in the solenoid valve and prevent it from closing.
2. Complete the **“Humidifirst DT-series Start-up Form”** while doing the start-up.
3. The humidifier modules should be washed out to remove any construction debris.
4. **Make sure the main power is turned off.** All circuit breakers should also be off. Use a meter to test and confirm that no power is going to the Master Panel. Make sure that all water and electrical connections are correct. Inspect each electrical connection at the terminal strip and at the humidifier module(s) to make sure the connections are at the correct locations. **WARNING – IF WIRED INCORRECTLY, IMMEDIATE DAMAGE TO THE TRANSDUCERS CAN OCCUR. SEE THE CAUTION SHEET ON PAGE 29.** Make sure all of the connections are tight, particularly at the manual motor starters, circuit breakers, fuses and relays.
5. Verify that the wires running from the humidifier module(s) to the Master Panel are the proper gauge and connect to the proper terminals.
6. Turn the disconnect switch to the **“ON”** position, if the Master Panel has one, or switch on the main power to the Master Panel. Be very careful – the Master Panel now has high voltage power in it. Check the incoming power with a voltage meter and verify that it is not fluctuating and that it is not off by more than 10% from the design voltage of the Master Panel. Record this reading on the start-up sheet.
7. Turn **“ON”** all of the circuit breakers or fuses in the Master Panel. Check the voltages at the secondary side of each transformer(s). Record this reading on the start-up sheet. **Make sure that the remote shutdown features (remote on/off and air safety switch) are wired and the circuit is complete.**
8. If there is a call for humidity, the humidifier module(s) should begin filling with water. It may take some time to fill the humidifier module basins, depending on the water pressure.

**START-UP (continued)**

9. To verify that the units are filling with water, briefly lift the mist diffuser of the humidifier module and visually inspect the water.
10. Once the humidifier module is full, the “low water safety” relay will switch to the “on” position and the humidifier module(s) will begin operating. This will not happen until there is approximately 1 ½” of water covering the transducers in the basin.
11. Once the humidifier modules are operating, take an amperage reading of each transducer wire feed and record these measurements on the start-up sheet. Also, check the voltage at the humidifier module – the voltage to the transducers should be 48 volts. If not, go to the Master Panel and adjust the transformer secondary tap to the 50v position so that the voltage reading is closer to 48 volts.
12. Visually inspect the humidifier modules for proper operation and estimate the mist absorption path (vapor trail).

**START-UP TROUBLE SHOOTING**

**Field wiring problems**

Most problems at start-up are a result of incorrect wiring from the Master Panel to the humidifier module. Inspect the terminal connections at both the Master Panel and the humidifier module.

If one humidifier module is operating and another is not, try switching the wires of the module that is not working with the wires of a humidifier module that is working. For example, if module #1 is operating and module #2 is not, switch the connections for module #1 and module #2 inside the Master Panel. When doing this, use the wiring diagram provided with the Master Panel as a guide. If unit #2 now operates and unit #1 does not, then the problem is not with the humidifier module. Next, leave the Master Panel and go to the humidifier module. Switch the wire connections of modules #1 and #2 at the humidifier module’s electric box. If module #2 stops working, then this indicates that one or more of the wires connecting the Master Panel to the module are faulty. Consult the factory if problems still exist.

**START-UP TROUBLE SHOOTING (continued)**

**Humidity sensors**

1. Another possible problem at start-up is the sensor. The wiring diagram shows the connections that need to be made for the sensor to operate properly.
2. Make sure that the humidity sensors are placed in the proper location. For duct sensors, the control sensor should be located in the return air duct. If fresh air is introduced, make sure that the control sensor is located upstream of where the fresh air is introduced. For a high limit sensor, locate it at least 12 feet downstream of the last humidifier module. For a room sensor, always locate it in an area where there is proper air movement. Locating it near a return air grille is the norm.

**Proportional controller**

All of the Master Panels are factory tested before shipment. Wiring diagrams are included for each panel. **Also, see the Controller Owner's Manual for the controller that you have purchased.**

**START-UP TROUBLE SHOOTING (continued)**

**Humidifier modules**

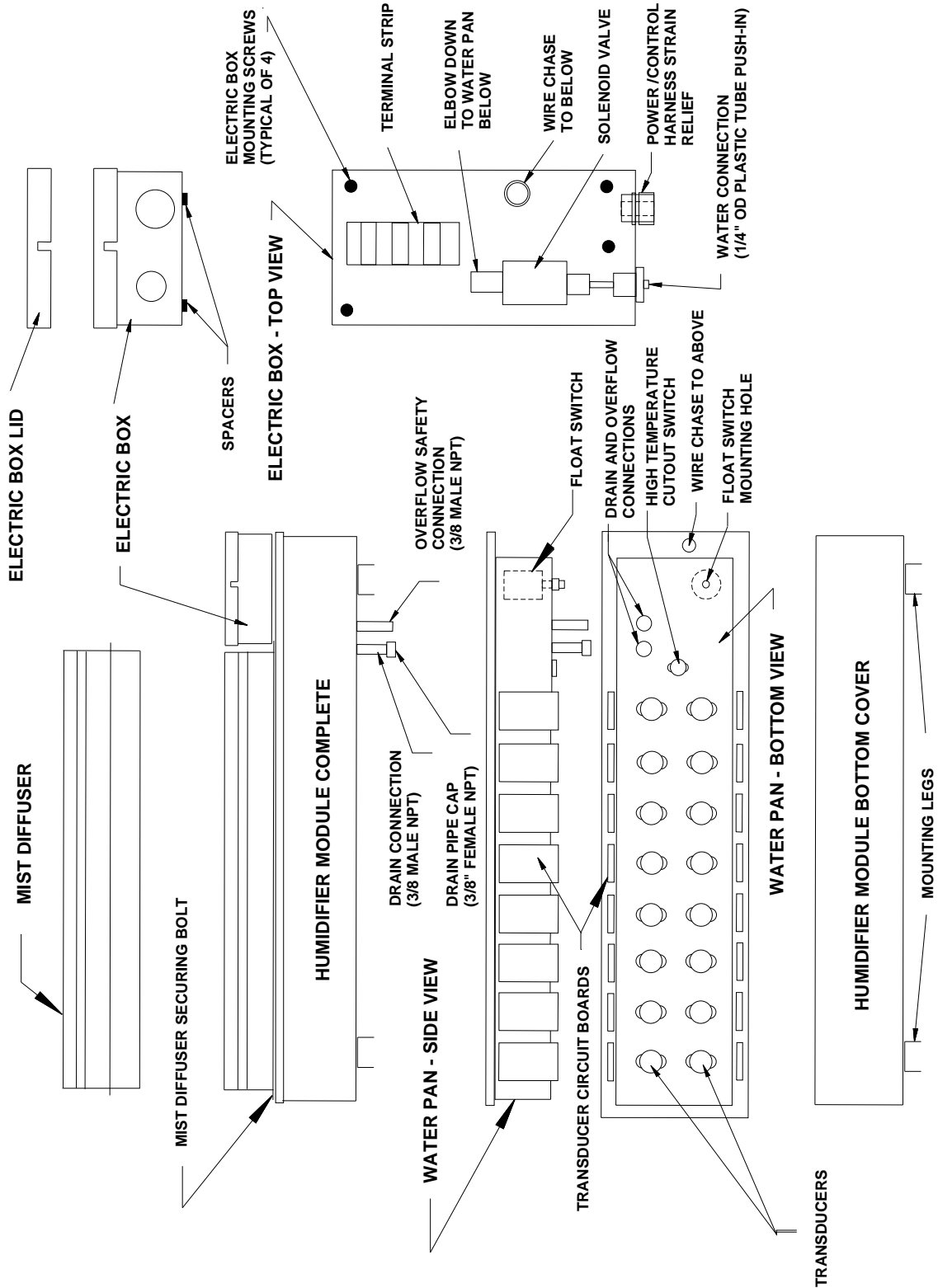
The humidifier module may have one of the following problems:

1. If the humidification system will not operate, first make sure that there is a call for humidification and that the humidifier set-point is higher than the relative humidity in the space.
2. The humidifier modules operate sporadically. They run, and then shut down for a time period, and start back up again. Is the humidifier pan water too hot? The water should only be warm. If hot, there is probably not enough air flowing through the humidifier module(s). Three hundred (300) feet per minute air speed is the minimum recommended airflow. Too little airflow may cause the water to become overheated and the thermal safety switch will open, thereby shutting off the transducers. When the water cools, the transducers will start to operate again. The relay is inside the humidifier module and no warning will be displayed on the microprocessor. Highly turbulent air in the area of the humidifier modules can also cause this condition to occur. If this is the case, correct the air turbulence or relocate the humidifier module(s).
3. All of the transducers stop running at once and then do not restart. First, check to see if the “low water safety” relay is energized. If it is, check to see that there are 48 volts at the humidifier module. If there are, then the problem is either with the high temperature cut outs or with the transducer circuit boards and/or transducers. **NEVER RUN THE TRANSDUCERS WITHOUT 1 ½” OF WATER COVERING THEM. FAILURE TO DO SO MAY RESULT IN THEIR IMMEDIATE FAILURE.** Shut off the power to the humidifier module, disassemble the humidifier module body, and check the “high temperature” cut outs to make sure that you have conductivity through them. If conductivity is present, then the likelihood is that the transducer circuit boards and/or transducers are bad.
4. If the humidifier does not fill with water, first confirm that there is water pressure at the humidifier module. If so, verify that 24 volts is getting to the solenoid valve. If so, the solenoid valve is bad. If 24 volt power is present at the humidifier module but not at the solenoid valve, check the float switch terminals controlling the relay that energizes the float switch for proper operation.

## **Trouble shooting after the humidifier has operated for a period of time**

1. *The transducers are so covered with deposits that they do not work properly and the “finger” column of water is very small and puts out little mist.* The transducers must be kept clean. The time period between cleanings depends upon the cleanliness of the air and water. Drain the humidifier module, and clean it with a mild vinegar and water solution. Sometimes the transducers get coated with an oily substance, typically coming from new PVC or stainless steel pipe. If this is the case, try washing the humidifier water basin and transducers with a mild dishwasher liquid solution.
2. *The room has a very large humidity swing:* Is the sensor mounted in the room or in the duct? If in the room, is it centrally located? If you have the HC-300 controller, the differential can be lowered so that the humidity will swing less. The sensor ships from the factory set at 3%, which means that at 3% below set-point the humidifier modules will be operating at 100% output. Lowering the differential will tighten the control over the relative humidity. Consequently, the humidifier modules will operate more often but for less time.
3. *Some of the transducers run and some do not:* How long has the humidifier module been in operation? The average life span of the transducer is 10,000 hours. If some of them operate and some do not, it indicates that some of the transducers may have run their lifespan and need replacement. Peeling, surface bubbling and cracking are indications of this. If the transducers are discolored it means that overheating has depolarized the transducer material and damaged them.
4. *The transducers have power to them but they do not operate:* The thermal protection device may be defective. It is located inline in the wiring of the humidifier module electric box.

# DT - SERIES EXPLOSION VIEW





# MAINTENANCE

## **General Maintenance - Humidifier module(s)**

Maintenance of Humidifirst ultrasonic humidifiers is simple and plays an important part in keeping the humidifier modules operating properly and extending the life of the components inside. Not later than one month after start-up, the humidifier modules should be inspected for cleanliness. An inspection/maintenance program time period should be set up that takes into account the cleanliness of the air and water going through the humidifier modules. The procedure for cleaning the humidifier modules is as follows:

1. Make sure that the power supply to the humidifier module is disconnected.
2. The humidifier modules should be completely drained and the mist diffuser removed.
3. The humidifier water basin and transducers can be cleaned thoroughly with standard bathroom/kitchen type cleaners (example: Clorox Clean-up, Cleaner with Bleach). These products are a liquid and they spray with a hand-pump applicator. They also help to deodorize if odors are picked up from the humidified space.
  - a) **Never scrape the transducer surfaces or use abrasive cleaners as this may cause damage.**
  - b) **Never use a cleaner that advertises a “shining” agent. Shining agents can leave a film on the transducers, which will reduce the mist output.**
4. The basin should be rinsed thoroughly after cleaning.
5. The mist diffuser should be cleaned and rinsed before it is replaced.

## **Master Panel**

1. Check the cabinet vents to confirm that they are not obstructed. Poor venting will cause internal electronic components to fail.
2. Disconnect the power to the Master Panel and check all the wiring connections in the Master Panel and humidifier module(s) for tightness. This should be checked at least two times per year.

## **End of humidifying season shutdown**

The humidifier Master Panel should be powered off when the humidification system will not be required for long periods of time. This will stop heat gain from the transformers. This will also reduce wear on the microprocessor that may occur during summer storms. Shut off the power from the building electric panel that feeds the Humidifirst Master Panel.

## **Transducers**

The transducers and the printed circuit driver board produce the mist. The normal lifespan of a transducer depends upon several variables. Typically, the operating life of the transducer is 10,000 hours. See “Basic Maintenance” above for cleaning directions. The variables listed on page 34 will affect the life of the transducer.

## **Maintenance (continued)**

### **Transducers (continued)**

1. The transducers will function best at 48 volts. A voltage less than 48 volts will reduce the mist output of the transducer. A voltage higher than 48 volts will increase the transducer output but will reduce the life of the transducer. 52 volts or above can cause the transducer to fail. Humidifirst provides a multi-tap transformer in the Master Panel so that the voltage at the humidifier module can be adjusted.
2. The mineral content of the water affects the length of the transducer life. The cleaner the water, the longer the transducers will last.
3. High entering water temperature will cause premature failure of the transducers.
4. High entering air temperature may cause premature failure of the transducers.
5. Excessively dirty air can soil the transducers and reduce the transducer output. Caked on debris could cause overheating of the transducers and eventual failure.
6. Poor water pressure may not allow proper water flow into the humidifier basin. A water level in the basin of less than 1 ½” may cause the water to become hot and therefore lead to transducer failure.

### **Humidity sensors**

Inspect the humidity sensor for dust accumulation. The sensor is a delicate instrument. Be very careful when removing the dust.

### **Warranty**

The warranty for the humidifier modules and the Master Panel is for one year from the date of start-up or 15 months from shipment, whichever comes first. Please find and complete the “HUMIDIFIRST DT-SERIES START-UP FORM”. There will be no warranty of the equipment without the form being completed and returned to Humidifirst. This warranty does not include labor. The warranty is for parts only. Spare parts are under warranty for 60 days from the date of shipment. Humidifier modules controlled by non-Humidifirst control boxes carry no warranty.

### **Owner’s Manual Disclaimer**

Humidifirst has made every effort to ensure accuracy in the manual, and assumes no responsibility and disclaims all liability for damages resulting from the use of this information or for any errors or omissions.

	<b>HUMIDIFIRST DT-SERIES START-UP FORM</b>	

Important – Read the complete Owner’s manual before starting your Humidifirst Ultrasonic Humidification system. Failure to read and understand the Owner’s manual may result in incorrect wiring, installation, and operation of the system and could cause immediate harm to YOU and/or the humidification system.

Please complete the following checklist and return it to Humidifirst (1520 Neptune Dr., Suite A, Boynton Beach, FL 33426, Attn: Start-up). There will be no warranty of the equipment without the form being completed and returned.

<p><b>The End User/Owner of the Humidification System:</b></p> <p>Company name: _____</p> <p>Company location: City _____</p> <p>State: _____</p>
<p><b>Serial number of the Master Panel:</b> _____</p> <p><b>For Zone/AHU:</b> _____</p> <p><b>Number of humidifier modules attached:</b> _____</p>
<p><b>Installer of the humidification System:</b></p> <p>Company name: _____</p> <p>Company phone number: _____</p>
<p><b>Start-up of the system is being completed by:</b></p> <p>Name: _____</p> <p>Company name: _____</p> <p>Phone number: _____</p> <p>Signature*: _____</p> <p>Date of Start-up: _____</p>

**\*By signing the above you are representing that the following information is accurate to the best of your knowledge.**

**Page 8 is reserved for any notes that you wish to make and communicate to us.**

	<b>HUMIDIFIRST DT-SERIES START-UP FORM</b>	

**Master Panel serial number:** \_\_\_\_\_

**Name of person doing start-up:** \_\_\_\_\_

The following items can be completed without operating the humidification system:

<p><b>1. Location of humidifier module(s).</b></p> <p><b>A. The distance upstream of the first humidifier module to either the nearest the filter or HVAC coil _____ inches or nearest duct elbow/ tee _____ inches.</b></p> <p><b>B. The distance downstream of the last humidifier module to either the nearest filter or HVAC coil _____ inches or nearest duct elbow/ tee _____ inches.</b></p>
<p><b>2. The distance from the top module to the duct or AHU wall _____ inches</b></p>
<p><b>3. The distance from the bottom module to the duct or AHU wall _____ inches</b></p>
<p><b>4. Regarding the condensate pan, measure the distance:</b></p> <p><b>A. upstream of the first humidifier module _____ inches</b></p> <p><b>B. downstream of the last humidifier module _____ inches</b></p>
<p><b>5. Are the humidifier modules mounted:</b></p> <p><b>A. _____ one module directly above the other</b></p> <p><b>B. _____ in a stepped fashion</b></p> <p><b>C. the vertical distance between humidifier modules is _____ inches</b></p>
<p><b>6. The humidifier module(s) is mounted level: (if not correct before starting)</b></p> <p><b>A. front to back: _____ yes</b></p> <p><b>B. side to side: _____ yes</b></p>

	<b>HUMIDIFIRST DT-SERIES START-UP FORM</b>	

**Master Panel serial number:** \_\_\_\_\_

<p>7. Record the distance from the Master panel:</p> <p>A. to the humidifier module(s). _____ feet</p> <p>B. to the conductivity probe. _____ feet</p>
<p>8. Record the gauge of the wires connecting the Master Panel to the humidifier module(s). _____ gauge wire</p>
<p>9. Inspect the field wiring connections to assure that they are correct. Terminal numbers of the humidifier module should correspond to terminal numbers in the Master Panel. Make sure that the terminal connections are tight.</p> <p>_____ Yes, the field-wiring is correct.</p> <p>_____ Yes, the terminal connections are tight.</p> <p>_____ Yes, I have checked and tightened all wire connections in the Master Panel</p>
<p>10. The location of the humidity/ dewpoint sensor: (choose one)</p> <p>A. In the space _____</p> <p>B. In the return-air duct or AHU _____</p>
<p>11. The "high humidity" sensor (optional) is:</p> <p>A. Not being used _____ (therefore not applicable)</p> <p style="text-align: center;"><b>OR</b></p> <p>B. The sensor is located _____ feet downstream of the last humidifier module</p>
<p>12. Inspect the water pressure at one of the humidifier modules. Shut off the water supply to one of the humidifier modules and disconnect the water line from that module. Open the water valve to inspect the water flow.</p> <p>A. _____ The water flows out freely for two minutes</p> <p style="text-align: center;"><b>OR</b></p> <p>B. _____ The water trickles out</p>
<p>13. Record the conductivity of the water going to the humidifier module(s) at the RO system's display panel. _____ Parts Per Million (ppm)</p>

	<b>HUMIDIFIRST DT-SERIES START-UP FORM</b>	

Master Panel serial number: \_\_\_\_\_

Name of person doing start-up: \_\_\_\_\_

<p><b>14. Has the air safety switch been connected?</b> Yes _____ No _____</p> <p>Is the air safety switch wired directly to the Master Panel? Yes _____ No _____</p> <p>Is the BMS controlling the air safety switch? Yes _____ No _____</p>	
<p><b>15. Is shielded cable used for all analog sensors?</b> Yes _____ No _____</p> <p>Is the shielded cable grounded on the sensor end? Yes _____ No _____</p>	
<p><b>16. Is the access door to the humidifier module(s) adequate in size for proper inspecting, servicing, and removing modules?</b></p> <p style="text-align: right;">Yes _____ No _____</p>	
<p><b>17. Before energizing the Master Panel, we suggest that you pour water into each humidifier basin to a depth of 1". If the humidifier field wiring is incorrect, the transducers may operate dry, causing their immediate failure. Did you pour water into the humidifier basins?</b> Yes _____ No _____</p>	
<p><b>18. Before energizing the Master Panel with the door mount power disconnect switch, check that all of the circuit breakers/fuses in the Master Panel are in the "off" position. When testing the humidifier modules, energize only one transformer at a time. This will help to confirm that the humidifier modules are not cross-wired.</b></p> <p>Are all of the circuit breakers/fuses in the "off" position? Yes _____ No _____</p>	
<p><b>19. Before energizing the first humidifier module, test the air safety input to confirm that it is working. With all humidifier module transformers' circuit breakers/fuses in the off position, energize the door mount power disconnect switch. Now energize the circuit breaker/fuse that energizes the DC power supply. The microprocessor will now boot up. Once the microprocessor has booted up, program the microprocessor (or BMS) so that there is a call for humidification. Go to the appropriate button on the microprocessor and confirm that a % Operation is called for. A % Operation display should only occur if the AHU fan is operating. A % Operation display should not occur when the AHU fan is not running. Also, apply this test if the remote off option is being used.</b></p> <p>Has this test(s) been completed? Yes _____ No _____</p>	

	HUMIDIFIRST DT-SERIES START-UP FORM	

Master Panel serial number: \_\_\_\_\_

Name of person doing start-up: \_\_\_\_\_

The following items should be inspected with the humidification system energized and the humidifier module(s) operating. Make sure that there is water connected and flowing.

20. Record the voltage entering the Master Panel: _____ volts
21. Measure the voltage feeding the Master Panel at the power disconnect switch. Record the voltage. _____ volts
22. Measure and record the voltage at the 24 volt circuit breaker. Record on pages 6 and 7.
23. Record the volts/amperage for each row of transducers for each humidifier module. Measure this at the electric box at humidifier module. Record on page 6 and 7.
23. Record the set-point for the relative humidity in the space: _____ %
24. Record the owner's desired room temperature: _____ °F
25. Record the set-point for the High Limit sensor: _____ %
26. Record the quality of the water displayed on the LED: _____ ppm
27. If the automatic drain valve option was purchased, record the time duration for the auto-flush cycle: _____ hours
28. Record the air speed in the AHU/duct down stream of the humidifier module(s): _____ feet per minimum (fpm)
25. Record the air speed in the vertical space between the module(s): _____ fpm

	HUMIDIFIRST DT-SERIES START-UP FORM	
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**Master Panel serial number:** \_\_\_\_\_

**Name of person doing start-up:** \_\_\_\_\_

Humidifier module	Sol. valve volts	Power reading			
		Trans volts	Transducer		Amperage
			Row 1	Row 2	Row 3
#1 @ Panel					
#1 @ DT					
#2 @ Panel					
#2 @ DT					
#3 @ Panel					
#3 @ DT					
#4 @ Panel					
#4 @ DT					
#5 @ Panel					
#5 @ DT					
#6 @ Panel					
#6 @ DT					
#7 @ Panel					
#7 @ DT					



	<b>HUMIDIFIRST DT-SERIES START-UP FORM</b>	

Master Panel serial number: \_\_\_\_\_

Name of person doing start-up: \_\_\_\_\_

Humidifier module	Sol. valve volts	Trans volts	Power reading		
			Transducer Row 1	Amperage Row 2	Row 3
#8 @ Panel					
#8 @ DT					
#9 @ Panel					
#9 @ DT					
#10 @ Panel					
#10 @ DT					
#11 @ Panel					
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#12 @ Panel					
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#13 @ Panel					
#13 @ DT					
#14 @ Panel					
#14 @ DT					

	<b>HUMIDIFIRST DT-SERIES START-UP FORM</b>	

**Master Panel serial number** \_\_\_\_\_

**Name of person doing start-up:** \_\_\_\_\_

**Notes from start-up:**

# ***HUMIDIFIRST***

ULTRASONIC HUMIDIFIERS

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