

# ***HUMIDIFIRST***

ULTRASONIC HUMIDIFIERS

## **OWNER'S MANUAL FOR HC-301 MICROPROCESSOR**

(PRINT DATE 05/10/2010)



## **TIME-PULSE PROPORTIONAL USING PROPORTIONAL INPUT SENSORS (VERSION 103 AND 104)**

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## **INTRODUCTION**

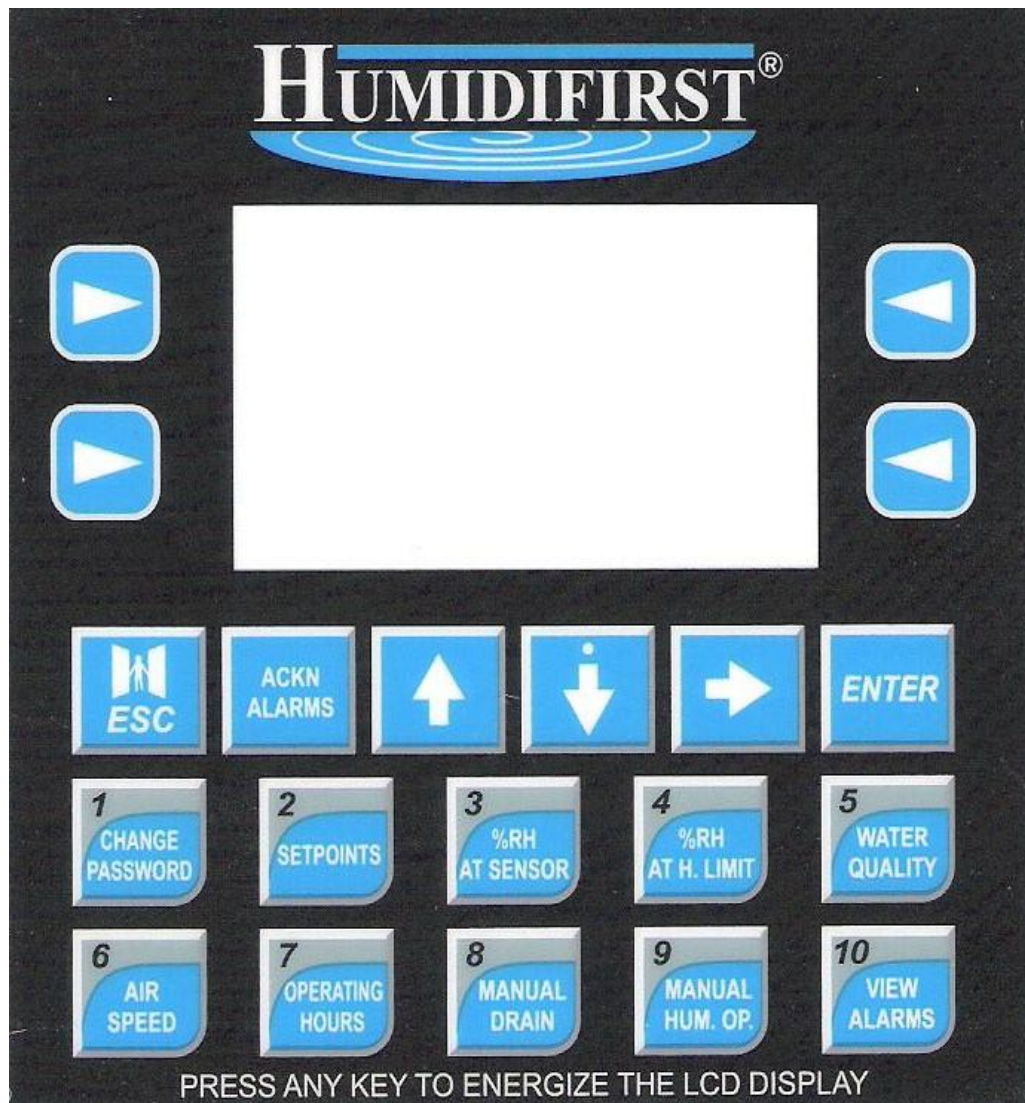
Our HC-301 is a state of the art, user-friendly microprocessor. It has an easy to read graphics and text LCD display. The 3.78" x 3.78" - 20 button control panel will allow you to:

1. Proportionally control the operation of Humidifirst ultrasonic humidifiers
2. Monitor the humidification system for alarms
3. Monitor and display the air speed in the ductwork/air handler
4. Provide audible and visual alarms
5. Monitor and display water leak detection alarm
6. Automatically drain the humidifier modules when they are not in use
7. Program automatic setback of humidity set-point when outdoor temperatures reach a predetermined set-point (eliminates inside icing of windows when it is very cold outside)
8. Monitor the quality of the water entering the humidifier module
9. Limit the maximum output capacity of the humidifiers
10. Display the actual relative humidity at the humidity sensor
11. Display the actual relative humidity at the humidity high limit sensor
12. Display the cumulative operating hours of the humidifiers
13. Display the actual air speed at the humidifier
14. Adjust the operating sensitivity of the humidification system
15. Change the password

The HC-301 microprocessor is mounted in the front door of the Master control cabinet. All remote wiring is connected to the HC-301 at Din Rail terminals located inside of the enclosure.

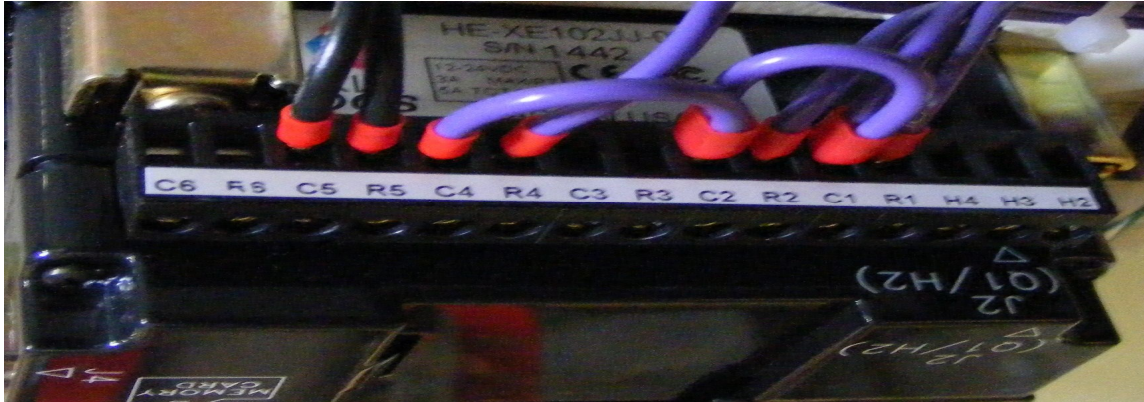
**PLEASE SEE THE NEXT PAGE TO VIEW THE MICROPROCESSOR FACEPLATE**

# HC-301 FACEPLATE



# HC-301 REAR

The inputs and outputs are as follows (note that Humidifirst offers numerous control software options so the input, output, and displays may vary slightly):



## Digital outputs

1. R1,C1 Energize solenoid valve (and fan circuit for Mist Pac/Mist free) when the humidity sensor calls for the humidifier to operate
2. R2,C2 DC Voltage output to energize the solid state relay (between 4-32 vdc)
3. R3,C3 Energize drain valve (optional)
4. R4,C4 Alarm Light
5. R5,C5 Remote Alarm Dry Contacts
6. R6,C6 When air velocity is less than 300 FPM (optional)



## Digital inputs

1. I1 Remote shut down (standard)
2. I2 Remote shut down by air safety switch (standard)
3. I3 From outdoor thermostat. When the circuit is completed the humidity set point will automatically be reduced by a preprogrammed amount. (optional)
4. I4 Water leak detected (optional)
5. I5 Air temperature entering humidifier too high (optional)
6. I6 Air temperature entering humidifier too low (optional)

## **HUMIDIFIRST**

### **Analog Inputs (4-20 ma standard, 0-10 vdc also available)**

|                                | <u>Reading</u>          | <u>Range</u> |
|--------------------------------|-------------------------|--------------|
| 1. Humidity sensor             | % RH                    | 0 to 100     |
| 2. High Limit humidity sensor* | % RH                    | 0 to 100     |
| 3. Water quality*              | Parts Per Million (ppm) | 0 to 20      |
| 4. Air Velocity*               | Feet Per Minute (fpm)   | 0-3000       |

\*Items 2, 3, and 4 are options and must be purchased with the initial system.

### **DESCRIPTION OF THE CONTROLLER**

The HC-301 microprocessor is used to operate, control, and monitor the complete humidifying system through analog inputs, and digital inputs and outputs.

Time-pulse proportional control will pulse the humidifier modules on and off as required to maintain accurate humidity control. Pulsing is done in increments of 1 to 10 seconds. The basic operational control concept is as follows:

1. The owner will program this microprocessor to the desired humidity set-point.
2. The owner will program this microprocessor to the desired sensitivity (the  $\pm$  accuracy requirement). This will determine the rate at which the humidifiers will “ramp up”. Some applications require tight sensitivity; others do not. Rapid “ramp up” increases the chance of wetting to occur in the ductwork.
3. The owner will program the “maximum output” limit – typically to be set at 100%. In cases where the humidifier is oversized, this can limit the operating time to minimize the potential of wetting in the ductwork.
4. The microprocessor receives a signal from the humidity transmitter and converts it to a humidity reading. It then compares this reading to the humidity set-point. The microprocessor will now pulse the humidifier modules on and off. The further the humidity strays from set-point the longer the humidifiers stay on.
5. An optional proportional humidity high limit transmitter is available that will override the input signal requirements and reduce the operating time of the humidifier modules. This is done to minimize the chance of wetting in the ductwork.

## **DISPLAY BUTTONS**

NOTE: A detailed description on control button usage will be provided later in the manual.



### **BUTTON 1**

CHANGE PASSWORD: The microprocessor will arrive with **4444** as the password. Use this button to change the password.



### **BUTTON 2**

SETPOINTS: View or change set-points, and view purchased electronic options.

#### **SCREEN 1 – VIEW PARAMETERS**

1. HUMIDITY SETPT
2. HI HUMIDITY ALM
3. LW HUMIDITY ALM
4. SENSITIVITY %
5. H.L. SENSOR STPT
6. MAX CAPACITY
7. AUTO DRAIN VLV
8. MAN OPERATION
9. OUTDOOR TEMP STBCK
10. DIRTY WTR 1<sup>st</sup> AL
11. DIRTY WTR 2<sup>nd</sup> AL
12. ACTIVATE 1<sup>ST</sup> ALARM
13. ACTIVATE 2<sup>nd</sup> ALARM
14. SHTDWN 2<sup>ND</sup> ALARM

#### **SCREEN 2 – VIEW PUR OPTIONS**

1. HL HUM. SENSOR
2. WTR QUAL SENSOR
3. AIR SPD SENSOR
4. AIR SPD DIG OUT
5. DRAIN VALVE
6. AUDIBLE ALARM
7. OUTDR TEMP STBCK
8. WATER LEAK DTCR
9. AIR TEMP TOO HIGH
10. AIR TEMP TOO LOW

**BUTTON 2 (CONTINUED)**

**SCREEN 3 – CHANGE PARAMETERS**

1. HUMIDITY SETPT
2. HI HUM ALARM
3. LOW HUMID ALM
4. OPER SENSITIVITY
5. HL SENSOR STPT
6. MAX CAPACITY
7. AUTO DRAIN VLV
8. MAN OPER HUMID
9. SETBCK HUM STPT
10. DIRTY WTR ALRM1
11. DIRTY WTR ALRM2
12. 1<sup>ST</sup> DIRTY H2O ALARM
13. 2<sup>ND</sup> DIRTY H2O ALARM
14. SHTDOWN 2<sup>ND</sup> ALARM



**BUTTON 3**

% RH AT SENSOR: Displays the actual relative humidity at humidity sensor, the percent the humidifiers are operating, and the relative humidity set point.



**BUTTON 4**

% RH AT H. LIMIT: Displays the actual relative humidity at the high limit humidity sensor, the set point of the high limit humidity sensor and the percent the humidifiers are being limited to,.



**BUTTON 5**

WATER QUALITY: Displays the water quality (ppm) at the water quality sensor.



**BUTTON 6**

AIR SPEED: Displays the air speed (FPM) at the air speed sensor.



**BUTTON 7**

OPERATING HOURS: Displays the cumulative operating hours of the humidifiers.

## DISPLAY BUTTONS (continued)



**BUTTON 8**

**MANUAL DRAIN:** Push to energize the drain solenoid valves. The humidifier flushes water into its basin for two minutes and opens the drain valve for 10 minutes.



**BUTTON 9**

**MANUAL HUMIDIFIER OPERATION:** Push for manual operation of humidifiers. The humidifiers will cycle, 3 seconds on/ 3 seconds off, for the programmed duration or until they are turned off.



**BUTTON 10**

**VIEW ALARMS:** Push to display alarms – display time and date of each alarm will appear.

### ALARM MONITORING AND ANNUNCIATION

The following points can be monitored and notification can be provided. Where “optional” appears, those items must be purchased with the initial system. When any alarm is active, a “common alarm” relay closure, with dry contacts, is provided for remote monitoring.

1. Remote Shutdown
2. Air Safety Switch
3. Humidity too high
4. Humidity too low
5. Air temperature entering humidifier too high (optional)
6. Air temperature entering humidifier too low (optional)
7. Air speed too slow (only occurs if the humidifier is operating). A set of contacts will be provided for remote annunciation (optional)
8. Water dirty - **call for service** (first stage) (optional)
9. Water too dirty – **dust will form** – turn humidifier(s) off (second stage) (optional)
10. Humidity sensor failure
11. High limit humidity sensor failure (optional)
12. Water quality sensor failure (optional)
13. Air speed sensor failure (optional)
14. When ambient temperature setback occurs (optional)
15. Water leak detected (optional)

**HC-301 PARAMETERS (set-points) DISPLAY**

Parameters are pre-set at the factory but can be changed by the end user. The following is a list of the parameters and their corresponding factory set points. Please note that many of the parameters are for purchased options that may not have been selected. Purchased options can be viewed under Button 2, VIEW PURCHASED OPTIONS.

Set points can be viewed without entering the password. Set points can be changed, but the correct password must be entered first. Options can only be turned on or off at the factory. The set points that are in bold print and are underlined will be entered at the factory. The allowable range of each set point is listed in parenthesis next to the factory settings. See the next page for a description of these parameters.

- a. Humidity set point     **50%**            (10% to 95%)
- b. High humidity alarm   **15%**            (2% to 40%) above set point
- c. Low humidity alarm    **15%**            (2% to 40%) below set point
- d. Operating sensitivity   **3%**            (1%, 2%, 3% or 4%)
- e. High humidity limit sensor set-point   **85 %**            (10% to 90%)
- f. Humidifier to operate at **100%** of max. capacity    (10% to 100%)
- g. Dirty water alarm (first stage) set point   **2ppm**    (0 to 20 ppm )
- h. Dirty water alarm (second stage) set point   **10 ppm**   (0 to 20 ppm)
- i. Auto drain of the humidifiers after no call for operation **120 minutes** (1 to 9,999 minutes) (auto resets after call for humidification)
- j. Manual operation of humidifier **10 minutes** (1 minute to 9,999 minutes)
- k. Reduce the humidity set point by this % when low ambient temperature is detected **10%**    (1% to 30%)

### **DESCRIPTION OF PARAMETERS (set-points)**

- a. **Humidity set point** – the relative humidity to be maintained in the humidified space.
- b. **High humidity alarm** – the number of relative humidity percentage points above the actual set point before going into alarm.
- c. **Low humidity alarm** - the number of relative humidity percentage points below the actual set point before going into alarm.
- d. **Operating sensitivity** – the number of relative humidity percentage points below the actual set point before the humidifier modules operate at full (100%) mist output.
- e. **High humidity limit sensor set-point** - the number of relative humidity percentage points above the actual set point before the humidifier modules start reducing the mist output.
- f. **Humidifier maximum output capacity** – the owner will program the “maximum output” limit – typically to be set at 100%. In cases where the humidifier is oversized, this can limit the operating time of the humidifier module(s) to minimize the potential of wetting in the ductwork.
- g. **Manual operation of humidifier** – the time period for the humidifier modules to cycle 3 seconds on and 3 seconds off. This is normally done for service inspections or during demonstrations.
- h. **Auto drain of the humidifiers** – the time period after the humidifiers have last operated that they are scheduled to automatically drain.
- i. **Low Ambient temperature set-back** – this reduces the humidity set point by this percentage point when low ambient temperature is detected.
- j. **Dirty water alarm (first stage)** - the water quality set-point when notification occurs that the water treatment system needs to be serviced. This option uses an analog conductivity probe.
- k. **Dirty water alarm (second stage)** - the water quality set-point when notification occurs that the quality of the water entering the humidifier is unacceptable. This option uses an analog conductivity probe.
- l. **1<sup>ST</sup> Dirty water alarm (first stage ppm)** – This option allows for an active alarm option of Y or N! For first stage dirty water. **IT IS RECOMMENDED THAT THERE IS A CALL FOR SERVICE AT THIS TIME**
- m. **2<sup>nd</sup> Dirty water alarm (second stage ppm)** – This option allows for an active alarm option of Y or N! For second stage dirty water. **IT IS HIGHLY RECOMMENDED THAT THERE IS A CALL FOR SERVICE AT THIS TIME**
- n. **Shutdown 2<sup>nd</sup> alarm** – This option allows for an active alarm option of Y or N! For second stage dirty water. **RECOMMEND BE SELECTED!**

### **VIEWING PARAMETER (set-points)**

1. Viewing the set points can be easily accomplished by pressing button 2 (**SET POINTS**) and press **ENTER** twice.
2. Press **ENTER** button twice to **VIEW PARAMETERS**
3. Now use   buttons to scroll through set points.
4. Push **ESC** once to go back to previous menu or twice to escape.

### **CHANGING PARAMETERS (set points)**

Tips for using this section:

- Use the number 10 button to enter 0's.



- Use the  to add a decimal point.

- To change the set points, you must know the password.



1. Push the **SETPOINTS** button; then push **ENTER** . 
2. Using the  button, scroll down to **→CHANGE PARAMETERS**
3. Press **ENTER** button and the **→ENTER PASSWORD \*\*\*\*\_** will appear.
4. Press the **ENTER** button TWICE to highlight only the four asterisk \*\*\*\*. Enter your 4 digit password. Then press the **ENTER** button.  
“**PASSWORD VALID YES**” appears. Password access will cease after 10 minutes.
5. Scroll down to the parameter you wish to change. Then press **ENTER** to select this parameter. Press **ENTER** again – you will see the curser only on the parameter set-points that you wish to change. Make the change and then press the **ENTER** button to lock in the new set-point.
6. Continue to scroll if you wish to make additional changes and follow the above  
 procedure or press the **ECS**  button twice to escape.

**VIEWING HC-301 PURCHASED OPTIONS**

Viewing the purchased control options can be easily accomplished by pressing button 2 (SET POINTS).

1. Press button 2, **SETPOINTS**.
2. Press ENTER
3. Using the  button, scroll down to **VIEW PUR. OPTIONS**
4. Press ENTER and now use   buttons to scroll through options. ON  
will appear next to those items that have been purchased.
5. Push ESC twice to escape.

**CHANGING YOUR 4 DIGIT PASSWORD**

1. Press button 1 (CHANGE PASSWORD).

→ **PASSWORD VALID: NO**  
**ENTER PASSWORD: \*\*\*\*** will appear

2. Press ENTER twice so that only the four asterisk \*\*\*\* are highlighted
3. Then enter your existing password (note that 4444 is the factory programmed password but will be void after it is changed). After entering your password, press the ENTER button.

**PASSWORD VALID: YES**  
**ENTER PASSWORD: \*\*\*\*** will appear

4. Press the  button to highlight

**NEW PASSWORD :**  
**PASSWORD NO.: \*\*\*\***

5. Press ENTER so that only the four asterisk \*\*\*\* are highlighted.
6. Enter new password
7. Press ENTER

**NEW PASSWORD: VALID**  
**PASSWORD NO.: \*\*\*\*** will appear

8. Press ESC

**VERY IMPORTANT !!!!!!!**

**RECORD THIS NEW PASSWORD SOMEWHERE SAFE NOW.**

**Without it you will not be able to make changes to the set points.**

**TURNING “MANUAL DRAIN” ON**

To achieve automatic drain, the solenoid drain valve(s) option must have been purchased.

To initiate humidifier module(s) drain, the humidifier must not be operating:

1. Press button number 8, MANUAL DRAIN

|                                 |
|---------------------------------|
| MANUAL DRAIN VALVE *            |
| OPERATION                  STOP |

appears

2. Press the ENTER button. Then press  button. Then press the ENTER button.

|                                  |
|----------------------------------|
| MANUAL DRAIN VALVE *             |
| OPERATION                  START |

appears

The drain sequence will now start. The transducers will automatically turn off. The drain valve(s) will open for 10 minutes. The fill solenoid valve will flush for three minutes.

**After the drain sequence is complete, the humidifiers will be reenergized when there is a call for humidification.**

## **TURNING “MANUAL HUMIDIFIER OPERATION” ON**

“Manual humidifier operation” will cycle the humidifiers on for 3 seconds and off for 3 seconds for the time period programmed into the PARAMETER section. (1 to 10,000 minutes).

To initiate manual operation:

1. Press button number 9, MANUAL HUM. OP.

|                    |
|--------------------|
| MANUAL OPERATION * |
| HUMIDIFIERS STOP   |

 appears

2. Press the ENTER button. Then press  button. Then press the ENTER button.

|                    |
|--------------------|
| MANUAL OPERATION * |
| OPERATION START    |

 appears

The humidifiers are now in manual operation and will operate for the preset time of 10 minutes

To stop MANUAL OPERATION, just reverse the above process.

## **VIEW ALARMS**

Alarms can be viewed by pushing button number 10, **VIEW ALARMS**. The alarms received will be stored in memory until they are acknowledged and the ENTER key is pushed. To stop the alarms from being annunciated or to open the remote monitoring contact, press the ACKN ALARMS button while viewing the specific alarm. The \* symbol will stop flashing once the alarm has been acknowledged. To clear the alarm from the display, press the ENTER button while the alarm is being displayed

## WATER QUALITY SENSOR

**This option applies only if you purchased a water conductivity sensor that sends water quality signals to the HC-301 microprocessor.**

- 1. NOTE: the Water Conductivity Sensor (WCS) should be located so that the water flows through it vertically. Horizontal mounting may cause the formation of air pockets and result in faulty water quality display.**
- 2. Button 5, “WATER QUALITY”, will display the water quality in Parts Per Million (PPM).**
- 3. Button 2, SETPOINTS, is used to set the Alarm points for the stage 1 conductivity alarm and stage 2 conductivity alarm. Typically, stage 1 alarm is 2 PPM; stage 2 alarm is 10 PPM (refer to the previous pages of this manual for directions on how to view or change set-points).**
- 4. Programming the water monitoring options:**
  - a. In Setpoints Button 2, access the change parameters menu and press the down arrow until one of the three parameters shown below are highlighted on the screen. Press “”ENTER” to highlight only the (N)**
  - b. Press the up arrow to change(N) to (Y)**
  - c. Press Enter**

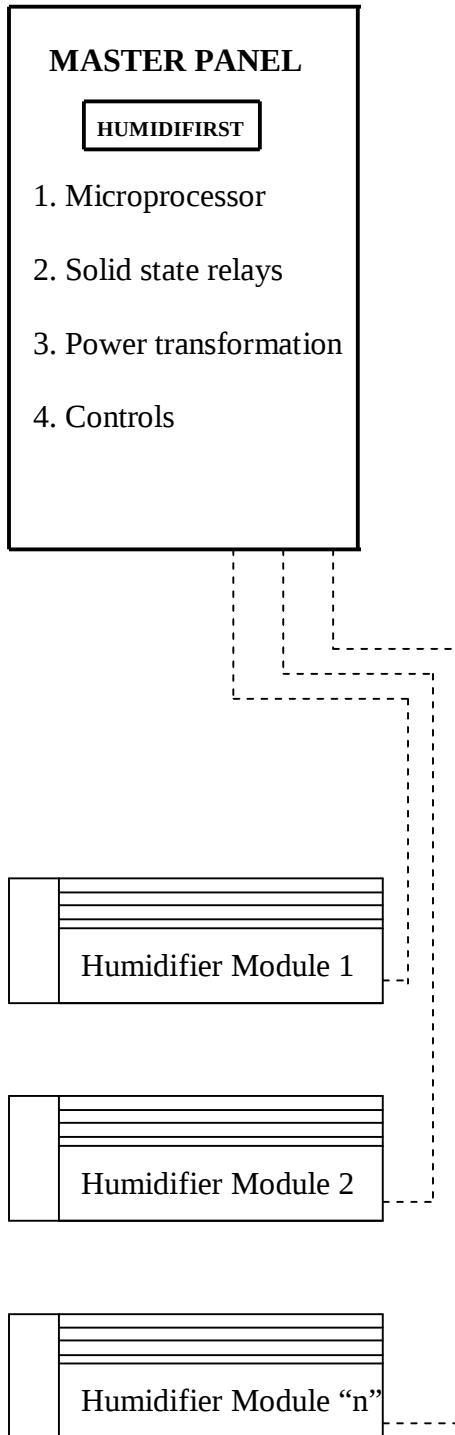
|                                                  |                   |
|--------------------------------------------------|-------------------|
| <b>► ACTIVATE 1<sup>ST</sup> STAGE ALARM</b>     | <b>(<u>N</u>)</b> |
| <b>ACTIVATE 2ND STAGE ALARM</b>                  | <b>(<u>N</u>)</b> |
| <b>STOP THE HUMIDIFIERS OPERATING AT STAGE 2</b> | <b>(<u>N</u>)</b> |

**Programming allows display of alarms or automatic shutdown of humidifiers when poor water quality occurs.**

**Y = Yes**

**N = No**

## Field Wiring Schematic for HC-301 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 input signals:**
  - Humidity sensor input
  - Humidity high limit sensor (optional)
  - H<sub>2</sub>O quality analog sensor (optional)
  - Air speed sensor (optional)
  - Humidity sensor output (optional)
  - H. L. humidity sen. output (optional)(2 wire twisted shielded cable, with drain, 4-20 ma)
- ◀ **Options:**
  - Air temp too low
  - Air temp too high
  - Ambient Temp setback
  - Water leak detected
  - Dirty water alarms (2)(2 wire, 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 for DT10 –DT40,  
12 wires for DT60 and DT-80)

## **HC-301 REMOTE MONITORING OPTIONS**

### **OPTION ONE – MODBUS**

The HC-301 can communicate directly to the Building Management system (BMS) via the MODBUS format. Special purchased software and hardware is required. The BMS system must orient a page to receive or send the information.

To communicate more than 10 feet, the owner must convert the RS232 signal to an RS485 signal. Once at the owner's computer, the signal must be converted back to RS232.

# ***HUMIDIFIRST***

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ULTRASONIC HUMIDIFIERS

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