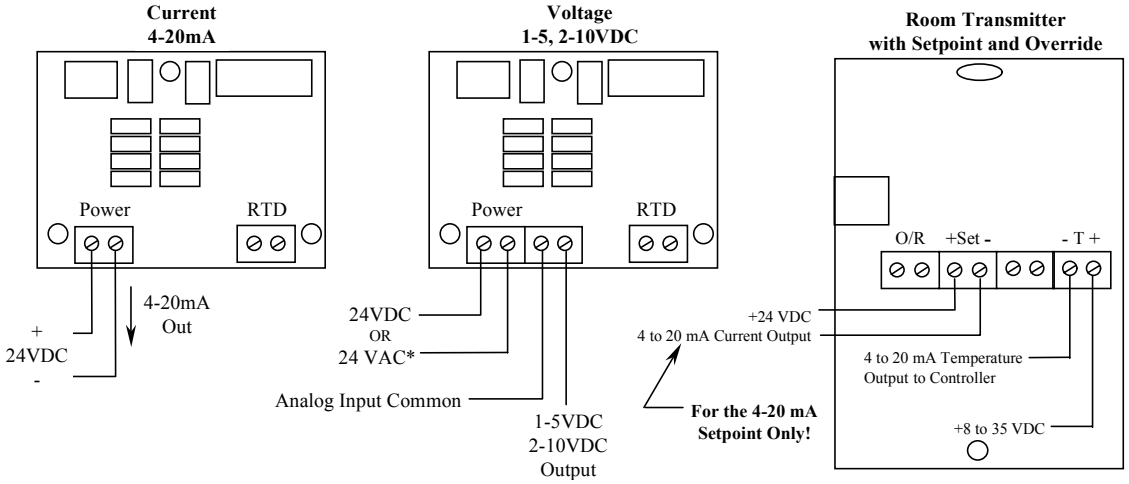
READ THESE INSTRUCTIONS BEFORE YOU BEGIN INSTALLATION

■ WIRING



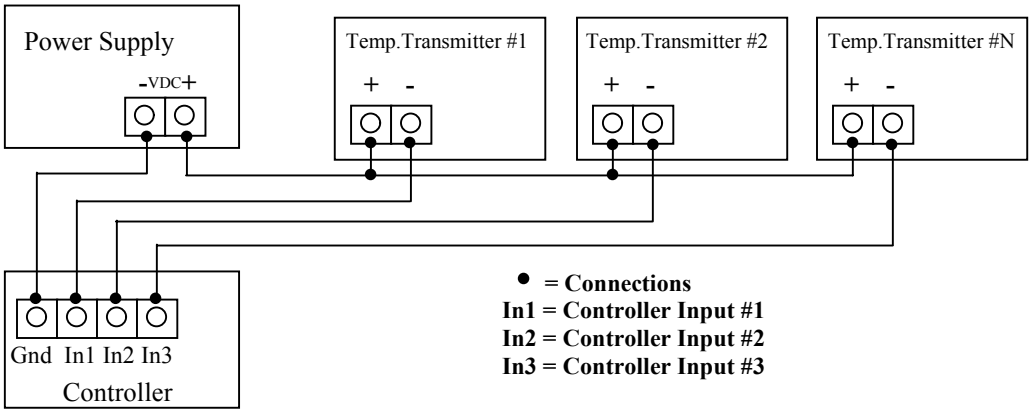
All ACI/TT and TTM temperature transmitters can be powered from either an unregulated or regulated +8 to 35VDC power supply. Several transmitters may be powered from the same supply as shown below. Each transmitter could draw 22mA. To determine the number of transmitters use the following formula:

$$N = I / 22mA$$

where: N = number of transmitters
I = current available from power supply
22mA = maximum current draw of transmitter

e.g., If I = 1.5A then:
N = 1.5/22mA
N = 68

Therefore a 1.5A power supply will safely power up to 68 transmitters.



All ACI/TT, TTM, and ACI/TTU temperature transmitters are non-polarity sensitive. That means that either the positive and negative outputs of the power supply can be connected to either side of the power terminal block. ACI transmitters will also accept AC power only if specified when ordering. The output must be specified as a +1-5 or +2-10 for this option when ordering the transmitters.

* Must be ordered as 24 VAC input

ACI
Automation Components, Inc.

Installation and Operation Instructions
ACI/RH Duct and Outside Series

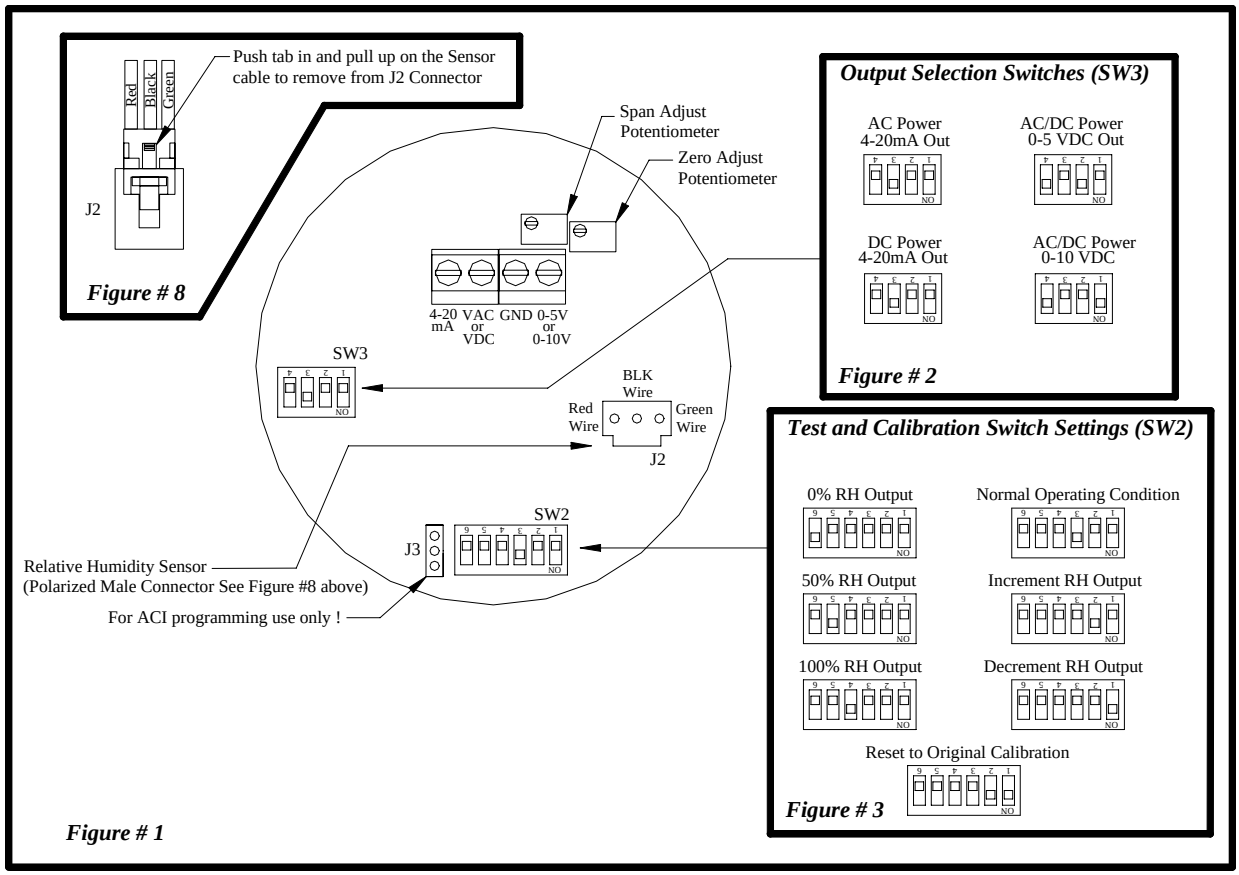
Please Read Instruction Carefully Before Installation!

The ACI/RH Duct and Outside series transmitters are a universal Relative Humidity transmitter that can be powered with either a +15 to 36 VDC or 24 VAC supply voltage. The ACI/RH uses a half-wave bridge rectifier to convert the AC power to a useable DC voltage. ***Caution: When using a 24 VAC transformer, ACI recommends that you use an isolated transformer. If sharing the transformer with your controller, valve, actuator, or any other device, be sure to connect all of the devices with the proper polarity, since most controllers are earth grounded. Failure to do so may result in damage to the ACI/RH, your controller, or any other devices that are attached due to a ground loop problem.***

The ACI/RH Duct and Outside transmitters are designed with a field selectable 4-20 mA, 0-5 VDC, or 0-10 VDC output signal that is equivalent to 0 to 100% RH. ***Unless specified upon ordering, all units are shipped from the factory to accept DC power with a 2-wire, 4-20 mA loop-powered output. Caution: When changing the Output Selection Switch (SW3) make sure that the power supply is turned off before making any changes. Failure to do this may cause damage to the unit.***

■ RH Duct and Outside Wiring Diagram *(ACI Standard in Euro Housing)*

ACI recommends that the ACI/RH 4-20 mA Duct and Outside relative humidity transmitters be wired with a two-wire, 16-22 AWG twisted pair or shielded cable for best results. All ACI/RH Duct and Outside voltage output or AC powered current output transmitters should be used with a 3-wire, 16-22 AWG shielded cable. ***Note: When using a shielded cable, be sure to connect only (1) end of the shield to ground at the controller. Connecting both ends of the shield to ground may cause a ground loop.***



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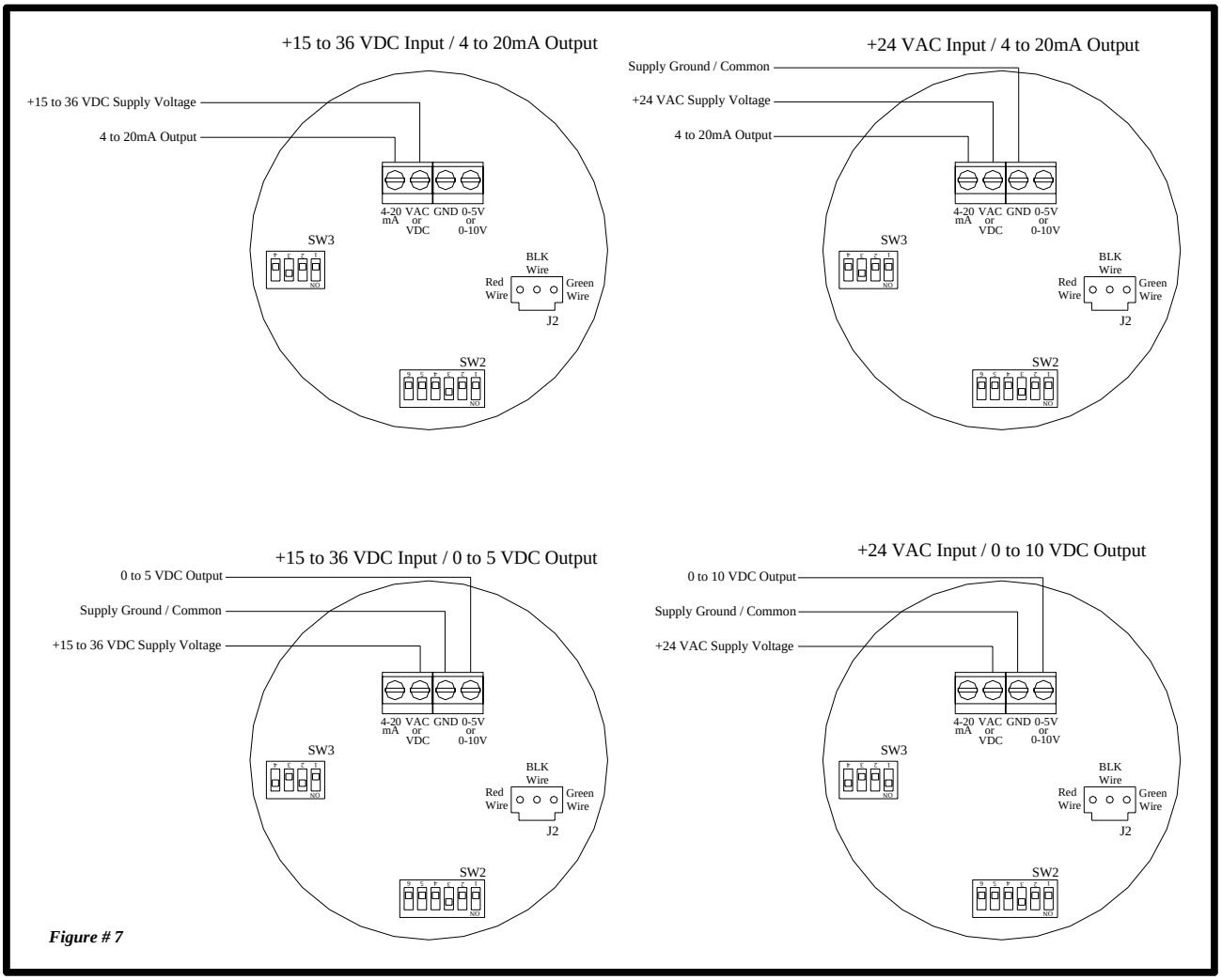


Figure # 7

■ RH Test and Calibration Dip Switch Settings *(See Figure #3 and Figure #6)*

Note: Do not adjust these switches unless you are using them to troubleshoot or recalibrate the sensor. Dipswitch #3 should always be left in the ON position during normal operating conditions. Failure to do so will not allow the RH transmitter to read the sensor (The output will always remain the same).

0% RH Output - Transmitter always outputs a signal of 4 mA or 0 VDC. Sensor doesn't affect the transmitter output. ***(For Trouble Shooting Purposes Only)***

50% RH Output - Transmitter always outputs a signal of 12 mA, 2.5 VDC, or 5 VDC. Sensor doesn't affect the transmitter output. ***(For Trouble Shooting Purposes Only)***

100% RH Output - Transmitter always outputs a signal of 20 mA, 5 VDC, or 10 VDC. Sensor doesn't affect the transmitter output. ***(For Trouble Shooting Purposes Only)***

Normal Operating Condition - The DIP switch must be set in this position for the RH signal to change, due to the actual measurement of the Relative Humidity by the humidity sensor.

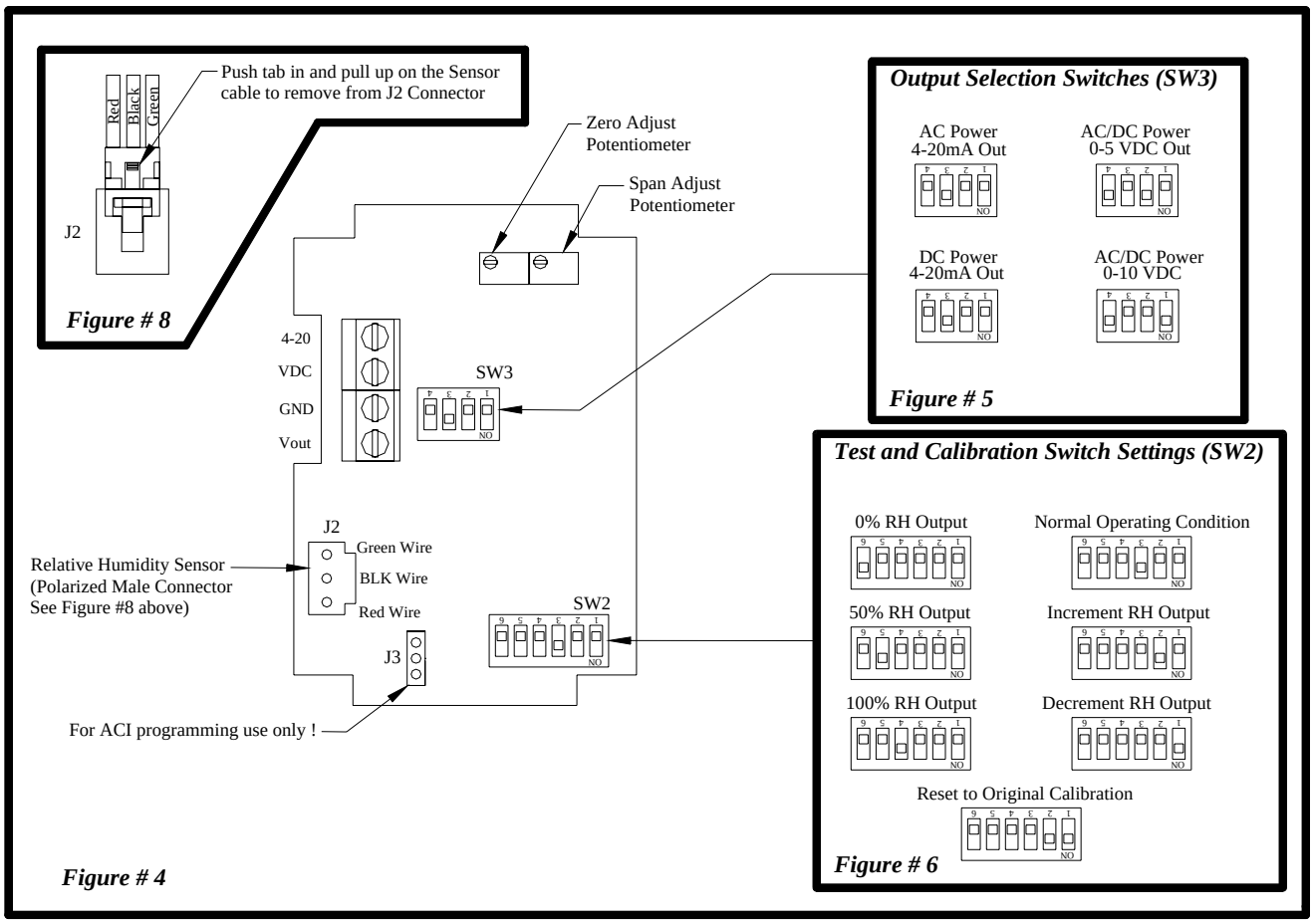
Increment RH Output - This DIP switch will allow you to calibrate the sensor through the software. The switch must be toggled from the ***Off*** to the ***On*** position and then returned to the ***Off*** position for an increase of 0.5% RH. This means that if your humidity has drifted 1% over a certain time period, you will be able to toggle the ***Increment RH Output*** switch **(2)** times in order to slide the whole curve upward 1%. ***Note: This is only a single point calibration, and is not recommended for critical applications. Please contact the factory before doing any field calibration.***

Decrement RH Output **-** This DIP switch will allow you to calibrate the sensor through the software. The switch must be toggled from the ***Off*** to the ***On*** position and then returned to the ***Off*** position for a decrease of 0.5% RH. This means that if your humidity has drifted 1% over a certain time period, you will be able to toggle the ***Decrement RH Output*** switch 2 times in order to slide the whole curve downward. ***Note: This is only a single point calibration, and is not recommended for critical applications. Please contact the factory before doing any field calibration.***

Reset to Original Calibration **-** Both the ***Increment*** and the ***Decrement*** DIP switches should be turned on for a ***minimum of 5 seconds*** before turning them both off again. This will allow you to reset the transmitter back to the original factory calibration.

■ RH Duct and Outside Wiring Diagram *(For Combination Units and NEMA Rated Enclosures)*

ACI recommends that the ACI/RH 4-20 mA Duct and Outside relative humidity transmitters be wired with a two-wire, 16-22 AWG twisted pair or shielded cable for best results. All ACI/RH Duct and Outside voltage output or AC powered current output transmitters should be used with a 3-wire, 16-22 AWG shielded cable. ***Note: When using a shielded cable, be sure to connect only (1) end of the shield to ground at the controller. Connecting both ends of the shield to ground may cause a ground loop.***



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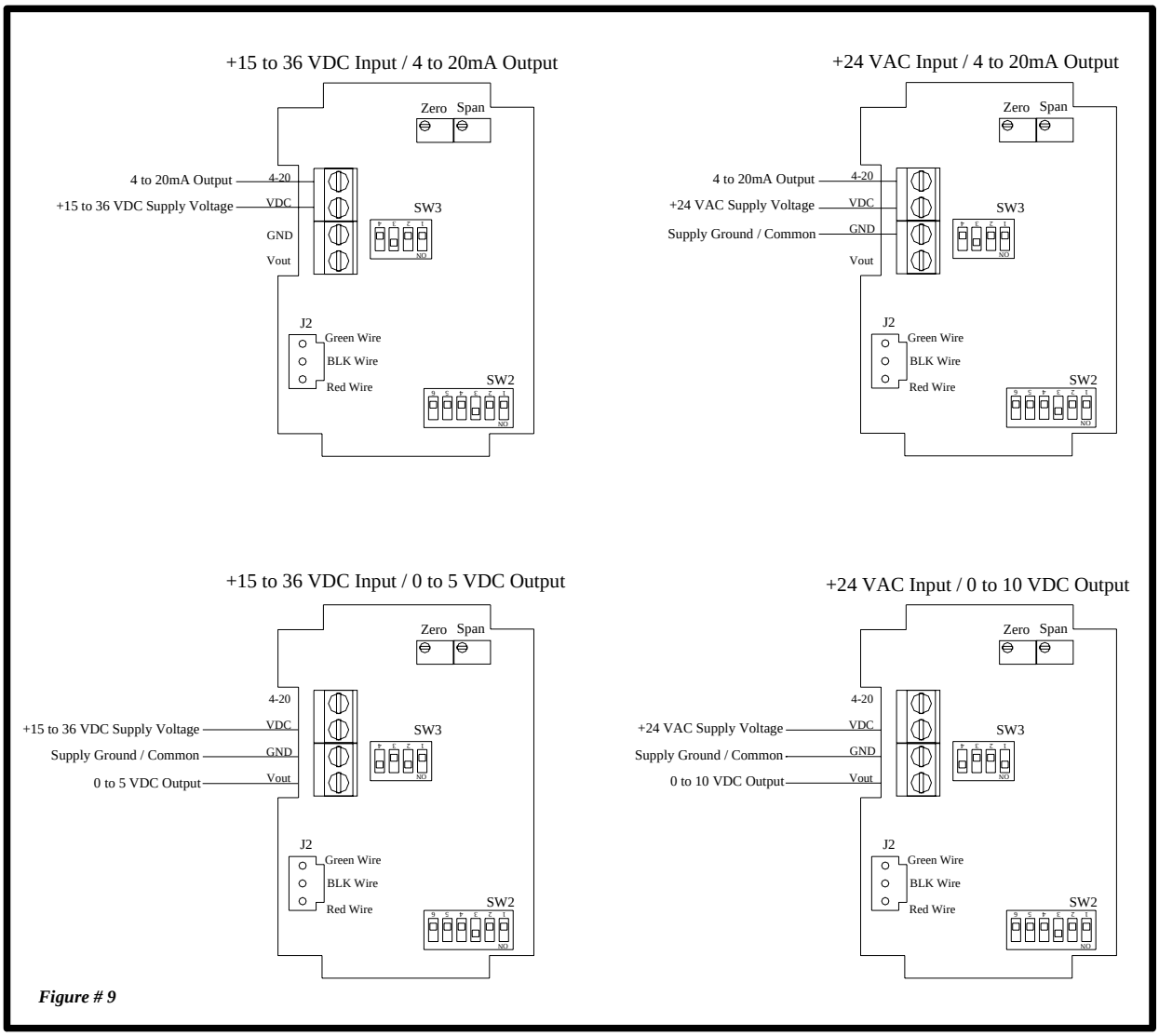


Figure # 9

■ Temperature Sensor Connections *(For RH/Temperature Sensor Combination Units only)*

All of the connections to the temperature sensor connections should be made to the (2 or 3) 22 AWG 24" Flying Lead wires using wire nuts or crimp style connectors. ***Please note that the wire colors will change depending on the type and value of the sensing element used.***

Duct Mounting Configuration:

The RH transmitter should be placed away from areas of excessive moisture, corrosive fumes, vibration, or extremely high temperatures. All of the RH sensors have a +/- 3% interchangeability. It is recommended to do a single point calibration for a much higher accuracy.

1. Drill a ¾" diameter hole in the duct where the sensor is to be mounted.
2. Now insert the stainless steel probe into the hole until the foam is in direct contact with the duct and attach the RH transmitter by using the (2) #8 x ¾" self tapping TEK screws that are included with the installation instruction.
3. Remove the cover and install your conduit connectors or watertight fittings. The outer ring should be used when using a ½" NPT conduit fitting. ***Please note that the inner ring will knockout first and then the outer ring should be tapped in (1) or (2) locations with a screwdriver before it can be peeled out. The cover will be connected to the housing by the RH sensor leads. To remove the RH sensor leads from the housing see Figure #8.***
4. Next connect all of the wires to the corresponding terminal blocks and/or flying leads the wires to the corresponding terminal blocks as shown in ***Figure #7*** and ***Figure #9***.

5. Now make sure that all of the dipswitches are properly configured as per ***Figures #2, #3, #5,*** and ***#6*** before initially powering the unit.
6. Now place the cover onto the unit and gently turn until it is tight. ***Be careful not to apply too much pressure when tightening.***
7. Now verify that you are getting a humidity reading on your Building Automation System. ***Please note that it may take ten to twenty minutes for the sensor reading to stabilize upon initial power up.***

Outdoor Mounting Configuration:

The RH transmitter should be mounted so that the unit is under an Eave, Shield or in area that is out of the elements or direct sunlight. All of the RH sensors have a +/- 3% interchangeability. It is recommended to do a single point calibration for a much higher accuracy.

1. Place the RH transmitter where it is to be mounted and mark the (2) mounting holes. Two #8 x ¾" self-tapping TEK screws are included with the installation instruction.
2. Now remove the cover and install your conduit connectors, watertight fittings, and or ½" vent plug. ***Please note that the inner ring will knockout first and then the outer ring should be tapped in (1) or (2) locations with a screwdriver before it can be peeled out. The cover will be connected to the housing by the RH sensor leads. To remove the RH sensor leads from the housing see Figure #8.***
3. Next connect all of the wires to the corresponding terminal blocks and/or flying leads the wires to the corresponding terminal blocks as shown in ***Figure #7*** and ***Figure #9***.
4. Now make sure that all of the dipswitches are properly configured as per ***Figures #2, #3, #5,*** and ***#6*** before initially powering the unit.
5. Now place the cover onto the unit and gently turn until it is tight. ***Be careful not to apply too much pressure when tightening.***
6. Now verify that you are getting a humidity reading on your Building Automation System. ***Please note that it may take tem to twenty minutes for the sensor reading to stabilize upon initial power up.***

■ Troubleshooting

No reading
1. Check that you have the correct supply voltage at the power terminal blocks.
2. Check wiring configuration and all DIP switch settings are as in ***Figure #7*** and ***Figure #9***.
3. Verify that the terminal screws are all connected tightly and that all of the wires are firmly in place.

Erratic readings
1. Verify that all of the wires are terminated properly.
2. Make sure that there is no condensation on the board.
3. Check that the input power is clean. In areas of high RF interference or noise, shielded cable may be necessary to stabilize signal.

Inaccurate readings
1. If you suspect that the transmitter is not reading within the specified tolerance, please contact the factory for further assistance.

■ RH Conversion Formulas

To convert transmitter output signal to %RH.

4-20mA to %RH ***(4 mA = 0% RH and 20 mA = 100% RH)***

Example: 12mA transmitter signal output
(12mA-4mA)/ 0.16 = 50% RH

0-5 VDC to %RH ***(0 VDC = 0% RH and 5 VDC = 100% RH)***

Example: 2 VDC transmitter signal output
2 VDC/0.05 = 40% RH

0-10 VDC to %RH ***(0 VDC = 0% RH and 10 VDC = 100% RH)***

Example: 8 VDC transmitter signal output
8 VDC/0.10 = 80% RH

■ROOM TEMPERATURE TRANSMITTERS

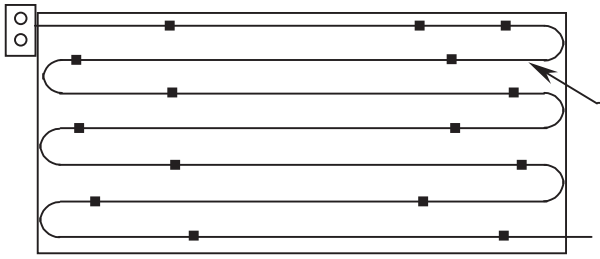
This unit is suitable for either drywall or junction box mounting. First, remove the cover of the housing and mount the base of the Room unit to the wall, using the (2) 6/32" x 1" screws that are provided. Once the base is mounted to the wall, make all of the proper connections and then place the cover back onto the unit. Now tighten the cover down, using the (2) 1/16" Allen screws located in the bottom of the housing. The Room transmitter is provided with a two pole terminal block for power and a two pole terminal block for the RTD, which allows for easy wiring of the unit.

■DUCT AND DUCT AVERAGING TEMPERATURE TRANSMITTERS

Duct Temperature Sensors - Drill a 3/8" hole in the duct and insert the probe through the hole until the foam pad is tight to the duct. Now insert (2) screws through the mounting holes in the flange and tighten until the unit is held firmly to the duct.

Duct Averaging Sensors - Drill a 3/8" hole in the duct and insert the averaging element through the hole until the foam pad is tight to the duct. Now insert (2) screws through the mounting holes in the flange and tighten until the unit is held firmly to the duct. The sensor should then be strung in a criss-cross pattern throughout the duct (see Figure #2) using the mounting clips provided, in a pattern that covers the greatest surface area of the duct, to insure that there is no stratification. When bending the copper tubing, be careful that you use a gradual bend and that you DO Not kink the copper tubing.

■ = Mounting Clips



■FLUID IMMERSION TEMPERATURE TRANSMITTERS

The ACI Fluid Immersion type transmitters are provided with a 2.5", 4", or 8" 304 series stainless steel thermowell. The thermowell has a 1/2" external or process NPT threads and 1/2" internal or instrument NPT thread. All of the ACI thermowells will accept a probe diameter of 0.250".

■STRAP-ON TEMPERATURE TRANSMITTERS

The ACI Strap-On transmitters are provided in a junction box with an adjustable 2" to 5" pipe clamp. The unit should be mounted on the bottom side of the pipe to ensure good temperature transfer. In hot water applications (over 150^{o}F) it is recommended that the transmitter be remote located so as not to exceed the operating temperature of the transmitter. Extra straps may be ordered for larger diameter pipes.

■OUTSIDE AIR TEMPERATURE TRANSMITTERS

The ACI Outside Air transmitters are provided in two parts including a weatherproof enclosure and a 2" X 4" junction box. The sensors will be mounted in the weatherproof enclosure and mounting hardware is provided. The transmitter will be provided in the 1 gang junction box and should be mounted on an inside wall so as not to exceed the operating temperature limits of the transmitter. This sensor should be mounted on either the North side of the building or anywhere out of direct sunlight with the sensor probe pointed downward. Weatherproof Aluminum Bell Boxes and NEMA 4X Polycarbonate enclosures are available upon request.

■STAINLESS PLATE TEMPERATURE TRANSMITTERS

The ACI Stainless Plate temperature transmitters are mounted on the back of a 2" x 4" stainless plate. The sensor is covered with a 1/8" foam insulation, which allows the sensor to sense the actual room temperature and ignore any heat produced by the transmitter or drafts from within the wall. All mounting screws are provided.

■TROUBLESHOOTING

No reading	No power to board - check voltage at power terminal - should be between +8 and 35 VDC
Reading too low	RTD wires shorted - check with ohmmeter - should be close to either 100 or 1000 Ohms
	Improper range of transmitter (too low) - check current - should be between 4 and 20mA
Reading too high	RTD opened - check with ohmmeter - should be close to either 100 or 1000 Ohms
	Improper range of transmitter (too high) - check current - should be between 4 and 20mA
RF Interference	Input power must be clean. Use twisted wires or shielded cable. RF resistant power supply
	Use a shielded cable to connect the sensor -- connect the shield to ground
	Encase the board in a RF shielded enclosure