

## Appendix B – DCV System Information/Calculations

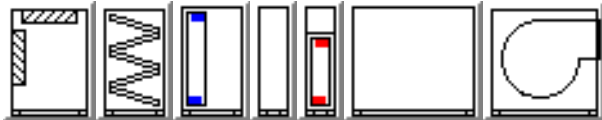
# Carrier AHUBuilder

April 5, 2006

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## Unit Parameters

Unit Size: Size 85 39RN  
2" Double Wall Construction  
Painted Exterior  
Interior Finish: Galvanized  
Painted Exterior

## Mixing Box

Door Right Side  
Door Left Side  
Damper: Top Premium Opposed 100 % Coverage  
Damper: Rear Premium Parallel 100 % Coverage

## Angle Filter

Door Right Side  
Angle Filter 4In. Side Loading  
Field Supplied 4in. Throwaway Filter  
Qty (8) 12in. x 24in.  
Qty (40) 24in. x 24in.

## Cooling Coil

Chilled Water 85.3 sq.ft 8 Row 10 FPI Double Circuit  
Coil Connection Right Side  
5/8 in. Tube Diameter  
AL fins Stainless Steel Casing  
5.125" Header Size  
4.0" Coil Connection

### Cooling Performance Ratings

|                     |         |           |       |
|---------------------|---------|-----------|-------|
| Altitude, ft        | 0       | EWT, °F   | 45.00 |
| Face Vel., fpm      | 527.5   | LWT, °F   | 60.00 |
| Site Airflow, CFM   | 45000   | Rise, °F  | 15.0  |
| Std. Airflow, CFM   | 45000   | Cv Rating | 243.8 |
| Total Clg. Cap, MBH | 4094.75 | EADB, °F  | 97.00 |

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|                    |         |                     |       |
|--------------------|---------|---------------------|-------|
| Sen. Clg. Cap, MBH | 2018.51 | EAWB, °F            | 80.00 |
| Flow Rate, gpm     | 545.2   | LADB, °F            | 55.66 |
| Fluid PD, ft wg    | 11.2    | LAWB, °F            | 55.34 |
| Fluid Vel., ft/s   | 4.7     | Air Friction, in wg | 1.17  |

**15in. Long Plenum/Access Section**

Inspection Panel Right Side

**Heating Coil**

Hot Water 53.3 sq.ft 2 Row 8 FPI Full Circuit

Coil Connection Right Side

5/8 in. Tube Diameter

AL fins Stainless Steel Casing

3.125" Header Size

2.5" Coil Connection

**Heating Performance Ratings**

|                   |         |                     |        |
|-------------------|---------|---------------------|--------|
| Altitude, ft      | 0       | EWT, °F             | 190.00 |
| Face Vel., fpm    | 844.3   | LWT, °F             | 160.0  |
| Site Airflow, CFM | 45000   | Drop, °F            | 30.0   |
| Std. Airflow, CFM | 45000   | Cv Rating           | 83.5   |
| Heating Cap., MBH | 2726.12 | EAT, °F             | 20.00  |
| Flow Rate, gpm    | 186.7   | LAT, °F             | 75.86  |
| Fluid PD, ft wg   | 7.6     | Air Friction, in wg | 0.28   |
| Fluid Vel., ft/s  | 5.2     |                     |        |

**35in. Long Plenum/Access Section**

Door with Viewport Right Side

Door Left Side

Light Right Side with with Outlet

**Draw-Thru Supply Fan**

Horizontal

Rear Inlet

Door Right Side

Door Left Side

Light Right Side with with Outlet

**Performance Ratings**

|                               |       |                           |       |
|-------------------------------|-------|---------------------------|-------|
| Site Airflow, CFM             | 45000 | Htg. Coil Static, in wg   | 0.28  |
| Altitude, ft                  | 0     | Other Losses, in wg       | 0.00  |
| Std. Airflow, CFM             | 45000 | Accessories Static, in wg | 0.72  |
| Upstream Ext. Static, in wg   | 1.00  | Total Static, in wg       | 12.17 |
| DownStream Ext. Static, in wg | 9.00  | Calculated Fan Speed, rpm | 1494  |
| Clg. Coil Static, in wg       | 1.17  | Calculated Motor BHP      | 121.7 |

**Acoustic Data:**

|        |              |        |         |         |    |    |    |
|--------|--------------|--------|---------|---------|----|----|----|
| Freq.  | Disch. Inlet | Casing | 1000 hz | 95      | 89 | 83 |    |
| 63 hz  | 105          | 102    | 98      | 2000 hz | 88 | 83 | 77 |
| 125 hz | 108          | 105    | 100     | 4000 hz | 84 | 79 | 73 |

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250 hz 107 101 95 8000 hz 79 74 69  
500 hz 100 94 90

1494 FanRPM Class III

AirFoil Standard Wheel AFTC01402

Top Horiz. Front Discharge

Right Side Fan Motor Location

125 HP Premium Efficiency ODP 460 3Ph 60Hz 1800 RPM

1.5 Service Factor

Fixed Pitch Drive

**Weights and Dimensions \*\***

(LxWxH in ft in) 24' 0" x 12' 0" x 9' 9" \*\*

Operating 14385 LB \*\*

**Ordering Information**

|                    |     |   |
|--------------------|-----|---|
| 39RJ17085KVYV21FBC | Qty | 1 |
| 39RJ2-JN18DBBWWH23 | Qty | 1 |
| 39RJ3BKED4R49RRGDM | Qty | 1 |
| 39RJ4-K-B97NHHHE26 | Qty | 1 |
| 39RJ567NJSL-M9T45J | Qty | 1 |
| 39RJ6TR52SKMLK1C-G | Qty | 1 |
| 39RJ7G-----Q       | Qty | 1 |

\*\* Weights and Dimensions are approximate. Weights include base unit weight, coils (wet & dry), fans and fan motors, and other components, but does not include filters, drives and skids. Approximate dimensions are provided primarily for shipping purposes, for exact dimensions, refer to submittal drawings. Shipping skids are not included.

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### Standard 62.1 - Office DCV AHU

| Level                                | Room #/s |                |  | CFM  |     | Design Occupancy<br>(ft <sup>2</sup> /person) | Area<br>(ft <sup>2</sup> ) | P <sub>z</sub><br>Occup. | R <sub>p</sub><br>(cfm/per) | R <sub>a</sub><br>(cfm/ft <sup>2</sup> ) | V <sub>bz</sub><br>(cfm) | E <sub>z</sub> | V <sub>oz</sub><br>(cfm) | Z <sub>p</sub> |
|--------------------------------------|----------|----------------|--|------|-----|---|----------------------------|--------------------------|-----------------------------|--|--------------------------|----------------|--------------------------|----------------|
|                                      | Box      | Room #/s       |  | Max  | Min |   |                            |                          |                             |  |                          |                |                          |                |
| 1 Lobby + Elevator Lobby             | S2       | R100,R100B     |  | 1350 | 675 | 250   | 1350                       | 5                        | 5                           | 0.06                                     | 108                      | 1              | 108                      | 0.160          |
| 1 Corridor                           | S40      | R1C1           |  | 1225 | 625 | 250   | 855                        | 3                        | 5                           | 0.06                                     | 68                       | 1              | 68                       | 0.109          |
| 4-8 Meeting Room                     | S1       | R402-R404      |  | 950  | 475 | 25  | 240                        | 10                       | 5                           | 0.06                                     | 62                       | 1              | 62                       | 0.131          |
| 4-8 Office (3)                       | S2       | R402-R404      |  | 675  | 350 | 100   | 385                        | 4                        | 5                           | 0.06                                     | 42                       | 1              | 42                       | 0.121          |
| 4-8 Interaction space/Elevator Lobby | S3,S12   | R400B,R400A    |  | 1250 | 625 | 250   | 1250                       | 5                        | 5                           | 0.06                                     | 100                      | 1              | 100                      | 0.160          |
| 4-8 Office (4)                       | S4       | R408           |  | 1100 | 550 | 100   | 490                        | 5                        | 5                           | 0.06                                     | 54                       | 1              | 54                       | 0.098          |
| 4-8 Conference Room                  | S5       | R408           |  | 975  | 500 | 25  | 630                        | 25                       | 5                           | 0.06                                     | 164                      | 1              | 164                      | 0.328          |
| 4-8 Corridor/Open Office             | S6       | R4C7,R421,R4C1 |  | 675  | 350 | 150   | 555                        | 4                        | 5                           | 0.06                                     | 52                       | 1              | 52                       | 0.148          |
| 4-8 Corridor/Open Office             | S7       | R4C6           |  | 725  | 375 | 100   | 700                        | 7                        | 5                           | 0.06                                     | 77                       | 1              | 77                       | 0.205          |
| 4-8 Office (3)                       | S8       | R411-R413      |  | 825  | 425 | 100   | 350                        | 4                        | 5                           | 0.06                                     | 39                       | 1              | 39                       | 0.091          |
| 4-8 Meeting Room                     | S9       | R414           |  | 950  | 475 | 25  | 240                        | 10                       | 5                           | 0.06                                     | 62                       | 1              | 62                       | 0.131          |
| 4-8 Office (3)                       | S10      | R415-R417      |  | 975  | 500 | 100   | 345                        | 3                        | 5                           | 0.06                                     | 38                       | 1              | 38                       | 0.076          |
| 4-8 Men's Restroom/Women's Restroom  | S11      | R418,R419      |  | 325  | 325 | N/A   | 320                        | 0                        | 0                           | 0.06                                     | 19                       | 1              | 19                       | 0.059          |
| 4-8 Interaction space/Break Area     | S12      | R422,R400C     |  | 1100 | 550 | 100   | 1100                       | 11                       | 5                           | 0.06                                     | 121                      | 1              | 121                      | 0.220          |

**Max Z<sub>p</sub> = 0.328**  
**V<sub>ou</sub> = 1007**  
**E<sub>v</sub> = 0.8**  
**Per Floor V<sub>ot</sub> = 1258**  
**System V<sub>ot,design</sub> = 6292**

### Standard 62.1 - Office DCV AHU

| Level                                | Room #s |     | CFM    |     | Design Occupancy<br>(ft <sup>2</sup> /person) | Area<br>(ft <sup>2</sup> ) | P <sub>z</sub><br>Occup. | R <sub>p</sub><br>(cfm/per) | R <sub>a</sub><br>(cfm/ft <sup>2</sup> ) | V <sub>bz</sub><br>(cfm) | E <sub>z</sub> | V <sub>oz</sub><br>(cfm) | Z <sub>p</sub> |
|--------------------------------------|---------|-----|--------|-----|---|----------------------------|--------------------------|-----------------------------|--|--------------------------|----------------|--------------------------|----------------|
|                                      | Max     | Min | Box    | Min |   |                            |                          |                             |  |                          |                |                          |                |
| 1 Lobby + Elevator Lobby             | 1350    | 675 | S2     | 675 | 250   | 1350                       | 5                        | 0.06                        | 108                                      | 1                        | 108            | 0.160                    |                |
| 1 Corridor                           | 1225    | 625 | S40    | 625 | 250   | 855                        | 3                        | 0.06                        | 68                                       | 1                        | 68             | 0.109                    |                |
| 4-8 Meeting Room                     | 950     | 475 | S1     | 475 | 25  | 240                        | 0                        | 0.06                        | 14                                       | 1                        | 14             | 0.030                    |                |
| 4-8 Office (3)                       | 675     | 350 | S2     | 350 | 100   | 385                        | 4                        | 0.06                        | 42                                       | 1                        | 42             | 0.121                    |                |
| 4-8 Interaction space/Elevator Lobby | 1250    | 625 | S3,S12 | 625 | 250   | 1250                       | 5                        | 0.06                        | 100                                      | 1                        | 100            | 0.160                    |                |
| 4-8 Office (4)                       | 1100    | 550 | S4     | 550 | 100   | 490                        | 5                        | 0.06                        | 54                                       | 1                        | 54             | 0.098                    |                |
| 4-8 Conference Room                  | 975     | 500 | S5     | 500 | 25  | 630                        | 0                        | 0.06                        | 38                                       | 1                        | 38             | 0.076                    |                |
| 4-8 Corridor/Open Office             | 675     | 350 | S6     | 350 | 150   | 555                        | 4                        | 0.06                        | 52                                       | 1                        | 52             | 0.148                    |                |
| 4-8 Corridor/Open Office             | 725     | 375 | S7     | 375 | 100   | 700                        | 7                        | 0.06                        | 77                                       | 1                        | 77             | 0.205                    |                |
| 4-8 Office (3)                       | 825     | 425 | S8     | 425 | 100   | 350                        | 4                        | 0.06                        | 39                                       | 1                        | 39             | 0.091                    |                |
| 4-8 Meeting Room                     | 950     | 475 | S9     | 475 | 25  | 240                        | 0                        | 0.06                        | 14                                       | 1                        | 14             | 0.030                    |                |
| 4-8 Office (3)                       | 975     | 500 | S10    | 500 | 100   | 345                        | 3                        | 0.06                        | 38                                       | 1                        | 38             | 0.076                    |                |
| 4-8 Men's Restroom/Women's Restroom  | 325     | 325 | S11    | 325 | N/A   | 320                        | 0                        | 0.06                        | 19                                       | 1                        | 19             | 0.059                    |                |
| 4-8 Interaction space/Break Area     | 1100    | 550 | S12    | 550 | 100   | 1100                       | 0                        | 0.06                        | 66                                       | 1                        | 66             | 0.120                    |                |

Max Z<sub>p</sub> = 0.205  
 V<sub>ou</sub> = 730  
 E<sub>v</sub> = 0.9  
 Per Floor V<sub>ot</sub> = 811  
 System V<sub>ot,min</sub> = 4054

| Zone | Room Description             | Area<br>ft2 | Ceiling<br>Height | Interior Load Information |         |     | ACH Criteria |     | 50%<br>Turndown | MAX<br>CFM | MIN<br>CFM |
|------|------------------------------|-------------|-------------------|---------------------------|---------|-----|--------------|-----|-----------------|------------|------------|
|      |                              |             |                   | CFM                       | CFM/ft2 | ACH | ACH          | CFM |                 |            |            |
| 1    | Conference Room              | 630         | 10                | 975                       | 1.5     | 9   | 0            | 0   | 500             | 975        | 500        |
| 2    | Office (R402-R404)           | 385         | 10                | 675                       | 1.8     | 11  | 0            | 0   | 350             | 675        | 350        |
| 3    | Break Area/Interaction Space | 1100        | 10                | 1100                      | 1.0     | 6   | 0            | 0   | 550             | 1100       | 550        |
| 4    | Meeting Room (R405)          | 240         | 10                | 950                       | 4.0     | 24  | 0            | 0   | 475             | 950        | 475        |
| 5    | Offices (R406-R409)          | 490         | 10                | 1100                      | 2.2     | 13  | 0            | 0   | 550             | 1100       | 550        |
| 6    | Office (R411-R413)           | 375         | 10                | 825                       | 2.2     | 13  | 0            | 0   | 425             | 825        | 425        |
| 7    | Meeting Room (R414)          | 240         | 10                | 950                       | 4.0     | 24  | 0            | 0   | 475             | 950        | 475        |
| 8    | Corridor/Open Office         | 555         | 10                | 675                       | 1.2     | 7   | 0            | 0   | 350             | 675        | 350        |
| 9    | Corridor/Open Office         | 700         | 10                | 725                       | 1.0     | 6   | 0            | 0   | 375             | 725        | 375        |
| 10   | Men's/Women's Restroom       | 320         | 10                | 325                       | 1.0     | 6   | 6            | 325 | 175             | 325        | 325        |
| 11   | Elevator Lobby/Interaction   | 1250        | 10                | 1250                      | 1.0     | 6   | 0            | 0   | 625             | 1250       | 625        |
| 12   | Level 1: Elevator Lobby      | 1350        | 10                | 1350                      | 1.0     | 6   | 0            | 0   | 675             | 1350       | 675        |
| 13   | Level 1: Corridor (R1C1)     | 855         | 10                | 1225                      | 1.4     | 9   | 0            | 0   | 625             | 1225       | 625        |

| Zone | Room Description             | Area<br>ft <sup>2</sup> | Ceiling<br>Height | People<br>ft <sup>2</sup> /person | Lighting<br>W/ft <sup>2</sup> | Equip.<br>W/ft <sup>2</sup> | Total Room<br>Load (BTUH) | Solar Load<br>(BTUH) | Cooling<br>Load (CFM) | Cooling<br>Load (1 CFM/ft <sup>2</sup> ) |
|------|------------------------------|-------------------------|-------------------|-----------------------------------|-------------------------------|-----------------------------|---------------------------|----------------------|-----------------------|--|
| 1    | Conference Room              | 630                     | 10                | 25                                | 1.5                           | 2.0                         | 20000                     | 0                    | 975                   | 650                                      |
| 2    | Office (R402-R404)           | 385                     | 10                | 100                               | 1.5                           | 4.0                         | 9133                      | 4668                 | 675                   | 400                                      |
| 3    | Break Area/Interaction Space | 1100                    | 10                | 125                               | 1.5                           | 2.0                         | 17496                     | 0                    | 875                   | 1100                                     |
| 4    | Meeting Room (R405)          | 240                     | 10                | 25                                | 1.5                           | 2.0                         | 7619                      | 11750                | 950                   | 250                                      |
| 5    | Offices (R406-R409)          | 490                     | 10                | 100                               | 1.5                           | 4.0                         | 11624                     | 10923                | 1100                  | 500                                      |
| 6    | Office (R411-R413)           | 375                     | 10                | 100                               | 1.5                           | 4.0                         | 8896                      | 7928                 | 825                   | 375                                      |
| 7    | Meeting Room (R414)          | 240                     | 10                | 25                                | 1.5                           | 2.0                         | 7619                      | 11750                | 950                   | 250                                      |
| 8    | Corridor/Open Office         | 555                     | 10                | 92.5                              | 1.5                           | 4.0                         | 13388                     | 0                    | 675                   | 575                                      |
| 9    | Corridor/Open Office         | 700                     | 10                | 233                               | 1.5                           | 4.0                         | 14627                     | 0                    | 725                   | 700                                      |
| 10   | Men's/Women's Restroom       | 320                     | 10                | 200                               | 1.5                           | 0.0                         | 2430                      | 0                    | 125                   | 325                                      |
| 11   | Elevator Lobby/Interaction   | 1250                    | 10                | 250                               | 1.5                           | 1.5                         | 15274                     | 10322                | 1250                  | 1250                                     |
| 12   | Level 1: Elevator Lobby      | 1350                    | 10                | 250                               | 1.5                           | 0.5                         | 11888                     | 15620                | 1350                  | 1350                                     |
| 13   | Level 1: Corridor (R1C1)     | 855                     | 10                | 250                               | 1.5                           | 0.5                         | 7529                      | 17123                | 1225                  | 875                                      |



## TR9290 “No-Frills” - Self Calibrating - CO<sub>2</sub> Transmitter



Wall Mount  
TR9290-L



Wall Mount  
TR9290



In-Duct Mount  
TR9291



Aspiration Duct Probe  
TR9292-L

### The “No-Frills” CO<sub>2</sub> Transmitter Now With Temperature Option!

The TR9290 is a valued engineered CO<sub>2</sub> transmitter targeted at applications where all that is needed is a dependable CO<sub>2</sub> sensor with a 0-10 volt output. A temperature thermistor options is also available. This sensor utilizes the identical and proven infrared CO<sub>2</sub> sensor technology used in AirTest’s popular TR-9220 CO<sub>2</sub> transmitter.

- ✓ Self-calibrating sensor eliminates calibration & maintenance requirements. No calibration required for life of the sensor (rated at 15 years).
- ✓ Attractive wall mount display with locking, snap-on cover.
- ✓ Inexpensive duct mount enclosure designed to mount directly in the duct. No tubes to clog, no filters to clean. In-duct mounting also means fast response. Aspiration probe also available.
- ✓ Gold plated optical sensor ensures long-term durability and stability.
- ✓ Purposefully built for quality – one of the few CO<sub>2</sub> sensors designed and built using Internationally Certified ISO 9001 processes to ensure consistent quality.

### Why Active Ventilation Control With CO<sub>2</sub>?

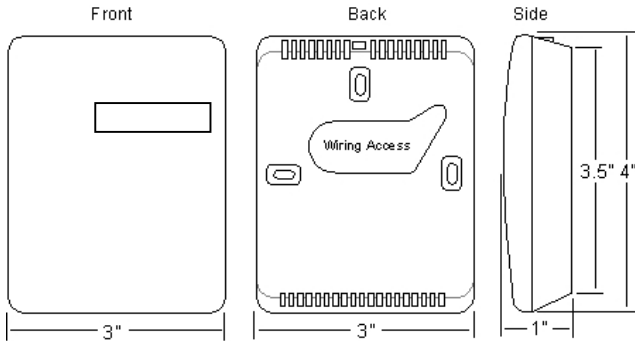
Ventilation control with CO<sub>2</sub> is a viable and energy efficient way of controlling ventilation to target cfm/person levels based on actual occupancy. This approach offers many advantages over the traditional approach of providing fixed ventilation based on maximum occupancy.

- ⇒ Reduce ventilation and energy costs in applications with variable occupancy.
- ⇒ In static occupancy applications, owner can continuously control ventilation rates to reflect current occupancy conditions.
- ⇒ Actively control ventilation to eliminate unintended over and under ventilation conditions resulting from post commissioning adjustment of outside air quantities.
- ⇒ Monitor and control zone ventilation efficiency and take advantage of using preconditioned transfer air from under occupied spaces for ventilation.
- ⇒ Documented CO<sub>2</sub> levels can provide ongoing verification that code-required ventilation rates are being maintained.

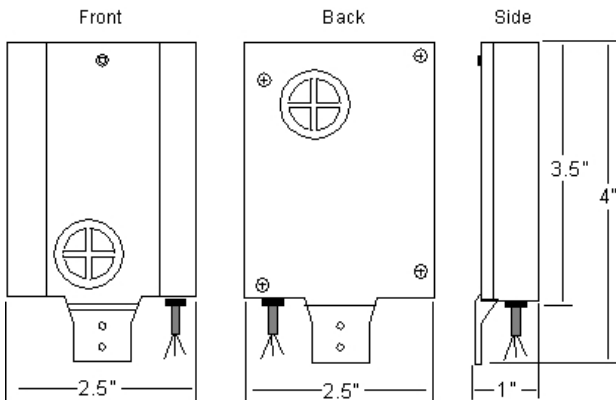
## Now With Thermistor/RTD Option

If you need to measure temperature and CO<sub>2</sub>, you can now get the TR9290 with a wide variety of temperature sensors (wall mount only). Just add the desired temperature sensor to the end of the product number when you order. Thermistor options include: 1.8K, 2.2K, 3K, 3.3K, 10K-2, 10K-3, 10K-3(11K), 20K, 47K, 50K, 100K. Other options possible.

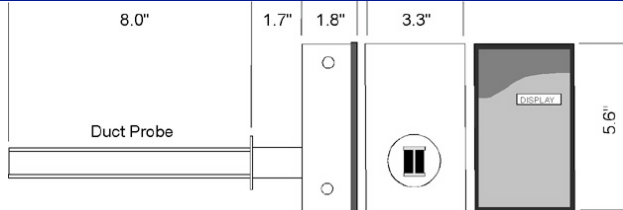
### Dimensions: TR-9290 (Wall)



### Dimensions: TR-9291 (In-Duct)



### Dimensions: TR9292 (Aspiration Duct Probe)



## Order Options

| Type                         | Model No | With Temp                          |
|------------------------------|----------|------------------------------------|
| <b>Wall Mount</b>            |          |                                    |
| Without Display              | TR9290   | + Add thermistor value to Model No |
| With CO <sub>2</sub> Display | TR9290-L | + Add thermistor value to Model No |
| <b>In Duct</b>               |          |                                    |
| Without Display              | TR9291   | Not Available                      |
| <b>Aspiration Duct Probe</b> |          |                                    |
| Without Display              | TR9292   | + Add thermistor value to Model No |
| With CO <sub>2</sub> Display | TR9292-L | + Add thermistor value to Model No |

## Distributed By:

## Specifications

### General

**CO<sub>2</sub> Detection Method:** Gold Plated Non-Dispersive Infrared Optical Sensor with Automatic Baseline Correction for Self-Calibration. Diffusion Sampling.

**Certification:** CE, EMC89/336/EEC, CA Energy Commission, ISO 9001 Manufactured for Quality & Consistency.

**Transmitter Rated Life:** 15 years

**Operating Conditions:** 32 to 122° F (0 to 50°C), 0 to 95% RH

**Storage Conditions:** -40 to 158° F (-40 to 70° C)

### Performance

**CO<sub>2</sub> Measurement Range:** 0-2000 ppm (factory set),

**CO<sub>2</sub> Accuracy:** +/- 1% of measurement range + 5% of measured value.

**Calibration:** Self Calibrating, Calibration Not Required

**Response Time:** T<sub>90</sub> = <2 minutes (diffusion)

### Power

**Input:** 18-30 VAC, 50-60 hz (half-wave rectified)

**Average Power Consumption:** ≤ 3 Watts average

**Ground:** Must share common ground with control system

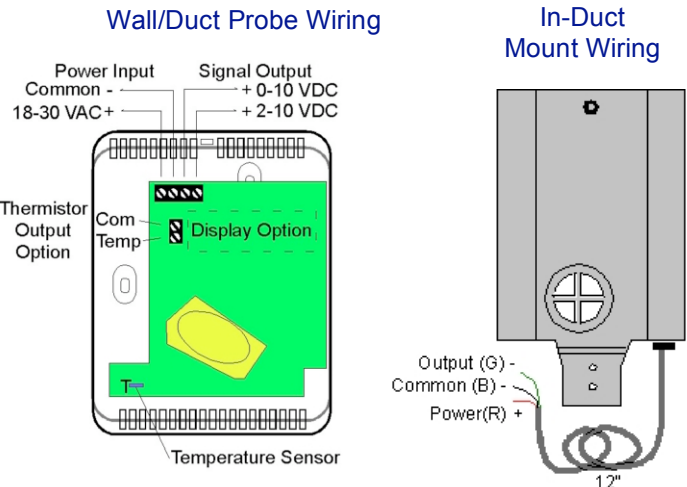
### Outputs

**Linear Analog Output:** 0 to 10, 2-10 VDC R<sub>OUT</sub> < 100 ohm  
Note: 0-5V option available – contact factory.

**Thermistor Options:** 1.8K, 2.2K, 3K, 3.3K, 10K-2, 10K-3, 10K-3(11K), 20K, 47K, 50K, 100K

**Wiring Access:** Wall: remove front panel of transmitter to access wiring terminals and mounting plate.

Duct: 12" cable with 3-wire connection.



Note: Common ground allows for 3 or 4 wire connection (wall mount)

Covered By US Patents: 6194735, 6016203, other patents pending



**AirTest™ Technologies Inc.** specializes in the application of cost effective, state-of-the-art air monitoring technology to ensure the comfort, security, health and energy efficiency of buildings.



Specifications Subject To Change Without Notice

8/13/04