



## Outdoor Airflow Measurement System

*Engineered for accuracy, applicability, durability and simplicity in HVAC air systems*

# Model OAFE-1550

## Outdoor Airflow Measurement System



*Pictured with optional inlet bell, NEMA 4 Enclosure, and NEMA 4 temperature sensor/transmitter*

### DESCRIPTION

The **OAFE-1550** is an airflow measurement station with integral signal processor that is capable of producing an overall  $\pm 0.5\%$  accuracy through the velocity range of 100 to 1,200 fpm.

The airflow measurement station consists of multiple airflow elements, factory mounted and pre-piped in a casing designed for flanged connection to ductwork, control dampers, louvers, etc. An optional inlet bell is available for plenum applications. Standard materials consist of a G90 galvanized casing and 6063-T5 anodized aluminum flow sensors, suitable for most HVAC applications. The airflow averaging elements are head type devices, which generate a differential (velocity) pressure signal similar to an orifice plate, venturi, and other head producing primary elements. The airflow measurement station is constructed to comply with ASHRAE Standard 111 for equal area traversing of an airflow measurement plane. Multiple elements are manifolded together for connection to the integral airflow signal processor.

The signal processor utilizes current state-of-the-art digital microprocessor technology capable of producing unequaled 24-bit (16,777,216 steps) A/D and 12 bit (4,096 steps) D/A signal conversion resolution. Having a twelve-point linearization capability, the signal processor can be field calibrated to accurately determine true airflow rates even when the primary airflow measurement stations do not meet their minimum installation requirements. The ultra low 0.03" w.c. differential pressure (693 fpm) full scale operating range and the auto zeroing function of the signal processor provides accurate airflow measurement down to 100 fpm. The signal processor accepts a temperature input signal for air temperature indication and air density compensation for standard or actual airflow calculations. A password protected configuration menu provides quick and simple field configuration by authorized personnel. Field configuration of engineering units, process noise filtering, operating range, alarm set points, etc. are performed via user friendly menus and a six button touch pad. Device monitoring and configuration can also be performed by a building management system through either a LonWorks®, BACnet-MS/TP® Master or Modbus® RTU Slave communication network.

An optional NEMA 4 temperature transmitter with 4 to 20mA output and a temperature range of -30 to 130°F is available to provide the temperature input signal to the signal processor for air density compensation.

An optional controller is available that utilizes a proprietary algorithm which results in true three mode control incorporating proportional band, integral (reset) and inverse derivative (P, I, 1/D) controller functionality and tuning. The controller will provide responsive modulation of a control damper or variable speed drive guaranteeing that a constant airflow is maintained. An economizer override option is available that allows the building management system to override the minimum outdoor airflow rate.

### Features

- AMCA certified  $\pm 0.5\%$  accuracy through the velocity range of 100 to 1,200 fpm
- Multiple total and static pressure sensing ports to comply with ASHRAE Standard 111 for duct traversing
- Not susceptible to condensation or moisture
- Aerodynamically designed to resist fouling by airborne particulates
- Factory mounted and pre-piped in a flanged duct section (casing)
- Optional inlet bell for plenum applications
- Standard construction includes a galvanized casing and 6063-T5 anodized aluminum flow sensors
- All airflow stations can be operated in humidity ranges of 0 to 100% with no effect on the station
- Standard airflow stations have good salt air resistance and are suitable for most HVAC applications
- Full scale ranges as low as 693 fpm (3.52 m/s) velocity
- Excellent AD/DA resolution:  
24 bit (16,777,216 steps) A/D  
12 bit (4,096 steps) D/A
- Modbus® RTU Slave & BACnet® Master Communication
- LonWorks® certified
- Twelve point linearization and four point flow correction
- Large back lit LCD for configuration and local indication of the measured process
- Auto zeroing function
- Temperature compensation for air density correction
- NEMA 4X rated enclosure (optional); standard with controller option
- NEMA 4 Temperature sensor and transmitter (optional)
- High and low airflow alarms (optional)
- Economizer Override (optional)
- Three-mode (P, I, 1/D) controller (optional)

# Model OAFE-1550

## Technical Specifications

### Outdoor Airflow Measurement System

- 1. Accuracy**  
Within  $\pm 0.5\%$  of actual flow through the velocity range of 100 to 1,200 fpm when installed in accordance with published recommendations
- 2. Operating Velocity Range**  
100 to 2,800 fpm

### Airflow Station

- 3. Material**  
*Elements*  
6063-T5 anodized aluminum (standard)  
*Casings*  
16 ga G90 galvanized steel (standard)
- 4. Temperature**  
350°F continuous operation (in air)  
400°F intermittent operation (in air)
- 5. Humidity**  
0 to 100%
- 6. Corrosion Resistance**  
*Galvanized Casings*  
Widely used for most air handling systems; not recommended for corrosive atmospheres  
*Aluminum Elements*  
Good salt, air, and mild acid gas resistance; excellent solvent and aromatic hydrocarbon resistance

### Signal Processor

- 7. Operating Range**  
The operating range is calculated using 30% to 100% of the value entered as full scale range at factory calibration. The operating value entered will represent full scale output of 5 VDC, 10 VDC, or 20 mA
- 8. Temperature Effect**  
Zero: No zero effect with temperature  
Span: 0.03% of transducer full span per °F

- 9. Temperature Limits**  
Operating: 32 to 122°F (0 to 50°C)  
Storage: -20 to 158°F (-29 to 70°C)
- 10. Overpressure Limits**  
Proof Pressure: 15 psid (1.034 bar)  
Burst Pressure: 25 psid (1.724 bar)
- 11. Humidity Limits**  
0 to 95% RH, non-condensing
- 12. Mounting Position Effect**  
Below 0.5"w.c. (124.5 Pa):  $\leq 0.25\%$  full scale  
Above 0.5"w.c. (124.5 Pa):  $\leq 0.10\%$  full scale
- 13. Span and Zero Adjustments**  
Performed via display menus
- 14. Auto Zero Interval**  
Frequency is menu selectable between 1 and 24 hours on 1 hour intervals
- 15. Display Low Pass Filter**  
Response time to reach 98% of a step change is menu adjustable from 0 to 200 seconds
- 16. Output Low Pass Filter**  
Response time to reach 98% of a step change is menu adjustable from 0 to 200 seconds
- 17. Programmable Constants**  
Constants such as temperature, barometric pressure (altitude), area factor etc. can be easily entered via display menu's

### Indication

- 18. Display**  
A backlit, graphical LCD providing 4 lines of data display (8 lines with optional controller). Also used for programming

### Communication (Optional)

- 19. Network**  
LonWorks®  
BACnet MS/TP® Master  
Modbus® RTU Slave

### Inputs/Outputs

- 20. Analog Inputs**  
Temperature Input: 0 to 10 VDC or 4 to 20 mA 2-wire internally or externally loop powered temperature signal.  
Controller Setpoint: 0-10VDC or 4-20mA.  
Economizer Override: 0-10VDC or 4-20mA.
- 21. Analog Outputs**  
Process output signal, optional temperature and controller output signals are jumper selectable 0 to 5 VDC, 0 to 10 VDC, or 4-20 mA (Max. load 700Ω)
- 22. Digital Inputs**  
Controller System Start input
- 23. Digital Outputs**  
Optional Hi/Lo Alarm: two single (1 form C) dry contacts rated for 5 amps at 30 VAC/VDC and 10 amps at 120 VAC resistive load

### Power

- 24. Power Supply**  
20 to 28 VAC/DC
- 25. Power Consumption**  
Standard Unit: 5.2 VA at 24 VAC  
3.6 VA at 24 VDC  
Full Options: 6 VA at 24VAC  
4.2 VA at 24VDC
- 26. Circuit Protection**  
Power input is isolated, reverse polarity protected and supplied with a resettable fuse

### Enclosure

- 27. UL & CSA Rating**  
NEMA 1 (standard)  
Material: Flame retardant ABS plastic  
Dimensions: 4.625"H x 8.750"W x 2.265"D  
NEMA 4X (optional)  
Material: impact and corrosive resistant  
Dimensions: 9.56"H x 5.0"W x 3.18"D  
*Note: NEMA 4X Enclosure is standard when the controller option is ordered*

# Model OAFE-1550 AMCA Certified Test Results



Paragon Controls Inc. certifies that the Outside Airflow Measurement System shown herein is licensed to bear the AMCA Certified Ratings Seal – Airflow Measurement Station Performance. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 611 and comply with the requirements of the AMCA Certified Ratings Program.

### Test Data

Model: OAFE-1550

Type: Differential Pressure

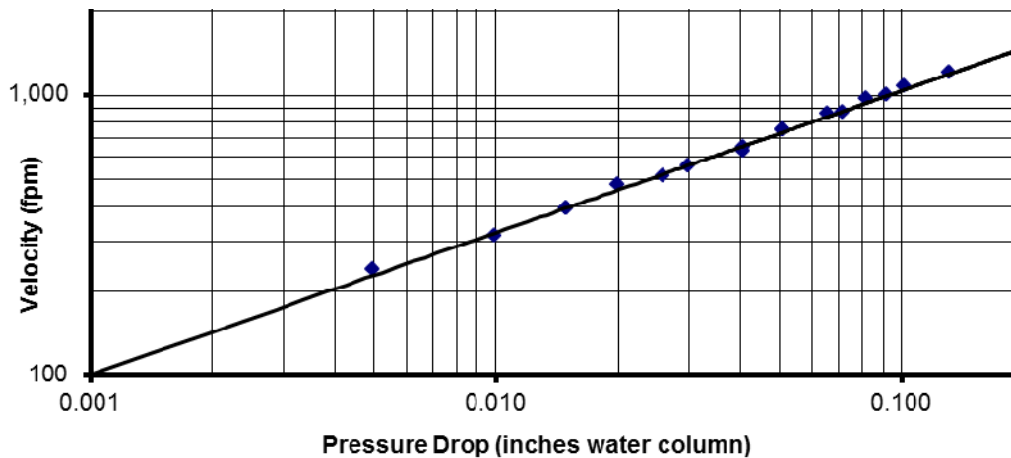
Conversion Formula:  $V = 1096.7 \sqrt{\frac{\text{Velocity Pressure}}{\text{Air Density}}}$

Size Tested: 48" x 30" Rectangular

Test Setup: AMCA Standard 610-06, Figure 4

Test No.	Reference Velocity	PCI Indicated Velocity	% Deviation
Test 28433-PC3			
1	1,202	1,225	1.93
2	1,072	1,093	1.95
3	964	978	1.48
4	856	865	1.04
5	747	750	0.39
6	649	653	0.52
Test 28433-PC2			
1	651	662	1.63
2	558	567	1.69
3	479	486	1.57
4	394	398	0.99
5	315	319	1.14
6	240	240	0.17
Test 28433-PC4			
1	350	355	1.23
2	295	298	1.12
3	245	249	1.59
4	197	200	1.42
5	148	150	1.28
6	97	97	-0.10

## Model OAFE-1550 Resistance to Airflow

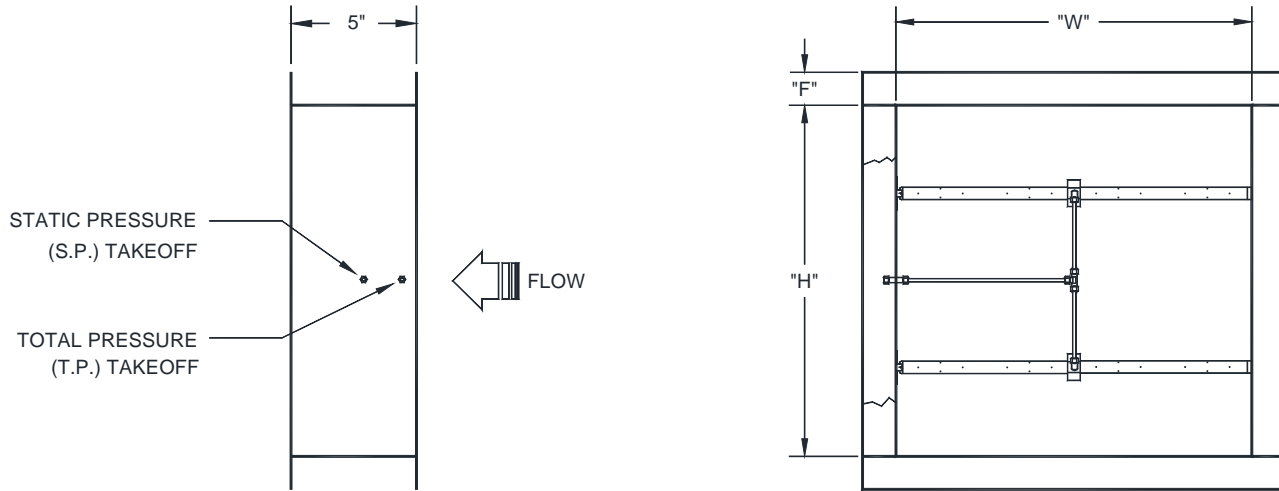


Pressure Drop (inches w.c.)	Velocity (fpm)	Pressure Drop (inches w.c.)	Velocity (fpm)	Pressure Drop (inches w.c.)	Velocity (fpm)
0.005	239	0.030	556	0.072	864
0.010	314	0.041	629	0.082	961
0.015	392	0.041	647	0.092	998
0.015	393	0.051	744	0.102	1,071
0.020	477	0.051	746	0.132	1,198
0.026	511	0.066	853	--	--

# Model OAFE-1550

## Dimensions

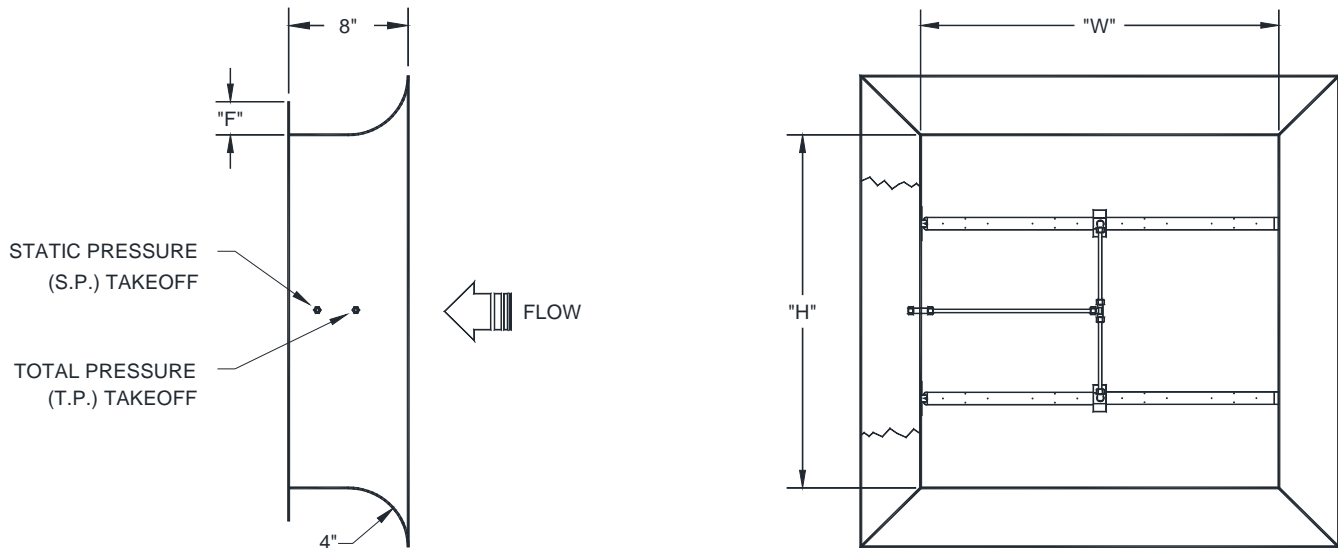
### FLANGED STATIONS FOR DUCTED APPLICATIONS



Note: Custom casing depths are available; consult factory for details.

Station Size	Flange Size
8" – 72"	1½"
73" & Over	2"

### STATIONS WITH OPTIONAL INLET BELL FOR PLENUM APPLICATIONS



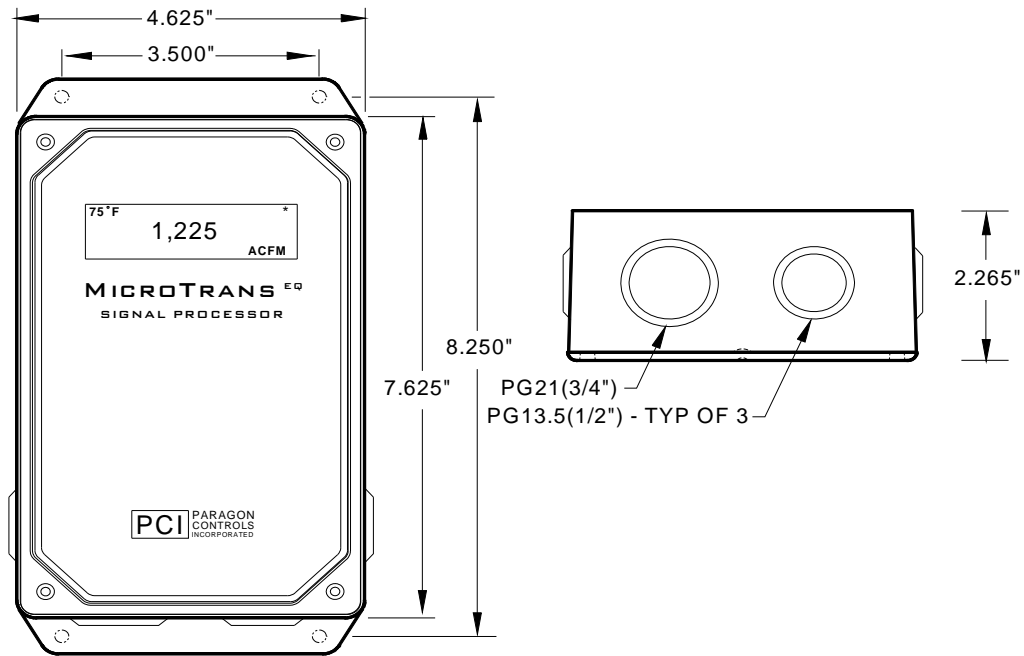
Note: Custom casing depths and inlet bell radii are available; consult factory for details.

Station Size	Flange Size	Inlet Bell Radius
8" – 72"	1½"	4"
73" & Over	2"	4"

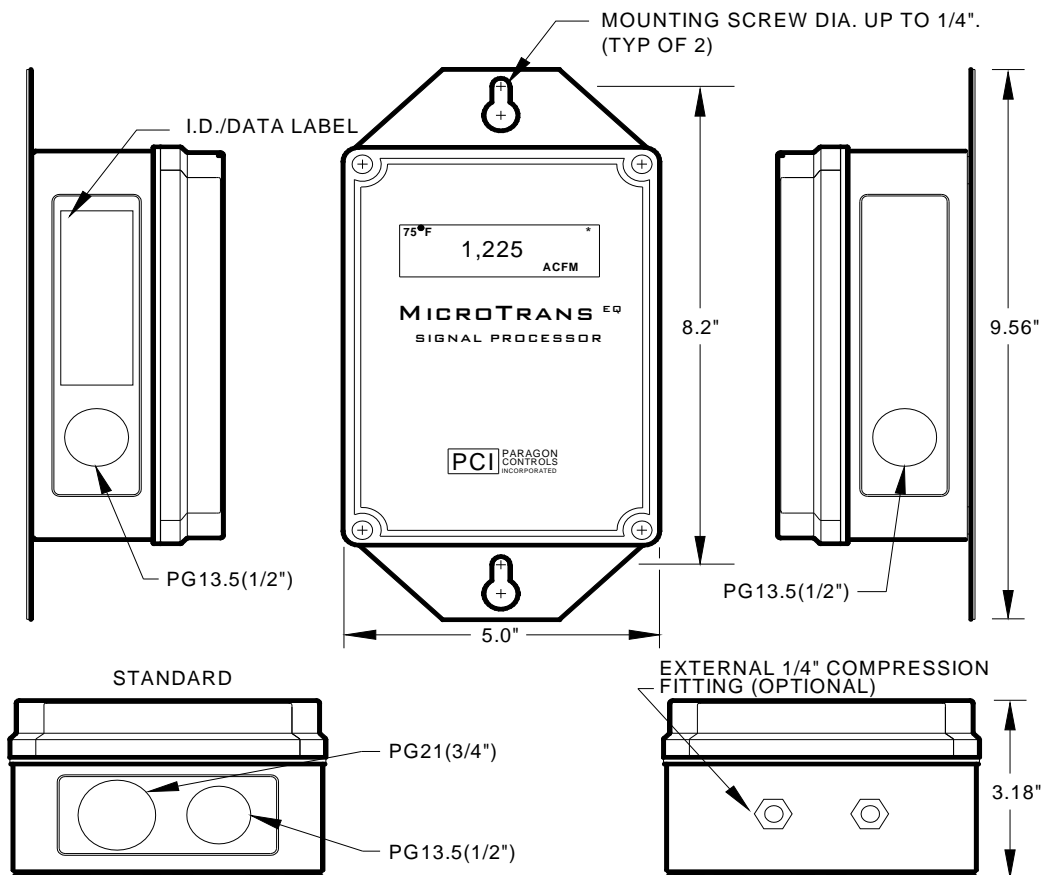
# Model OAFE-1550

## Dimensions Continued

### MICROTRANS<sup>EQ</sup> SIGNAL PROCESSOR WITH NEMA 1 ENCLOSURE (STANDARD)



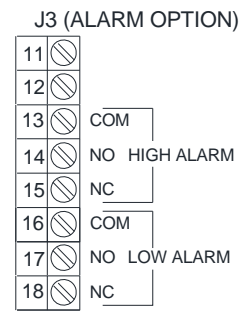
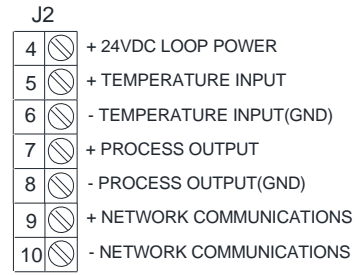
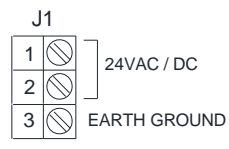
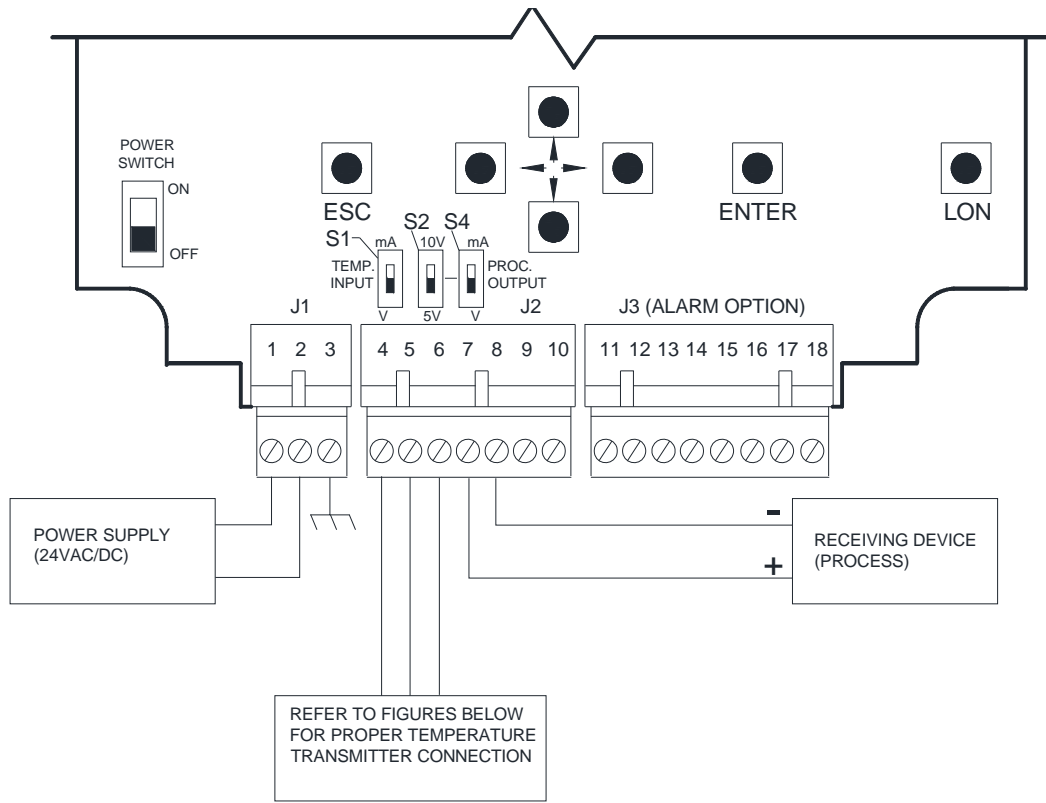
### MICROTRANS<sup>EQ</sup> SIGNAL PROCESSOR WITH NEMA 4X ENCLOSURE (OPTIONAL)



# Model OAFE-1550

## Dimensions Continued

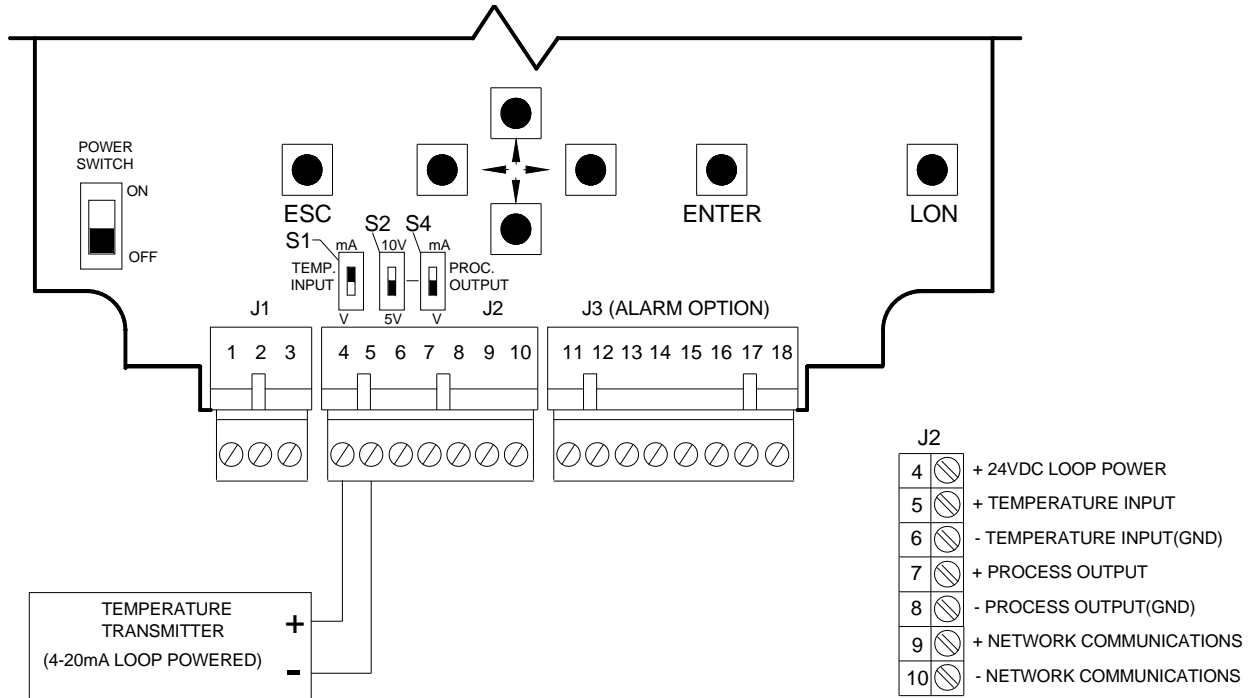
### MICROTRANS<sup>EQ</sup> SIGNAL PROCESSOR FIELD CONNECTIONS



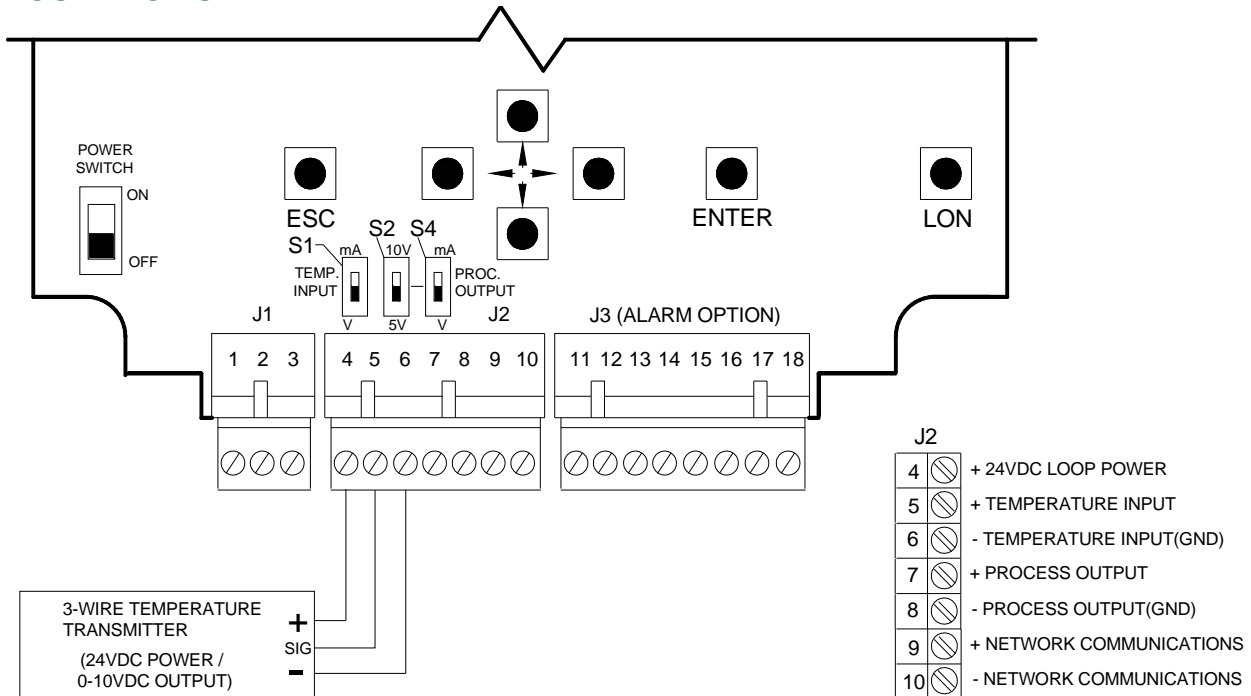
# Model OAFE-1550

## Dimensions Continued

### MICROTRANS<sup>EQ</sup> TYPICAL 4-20mA LOOP POWERED TEMPERATURE TRANSMITTER FIELD CONNECTION



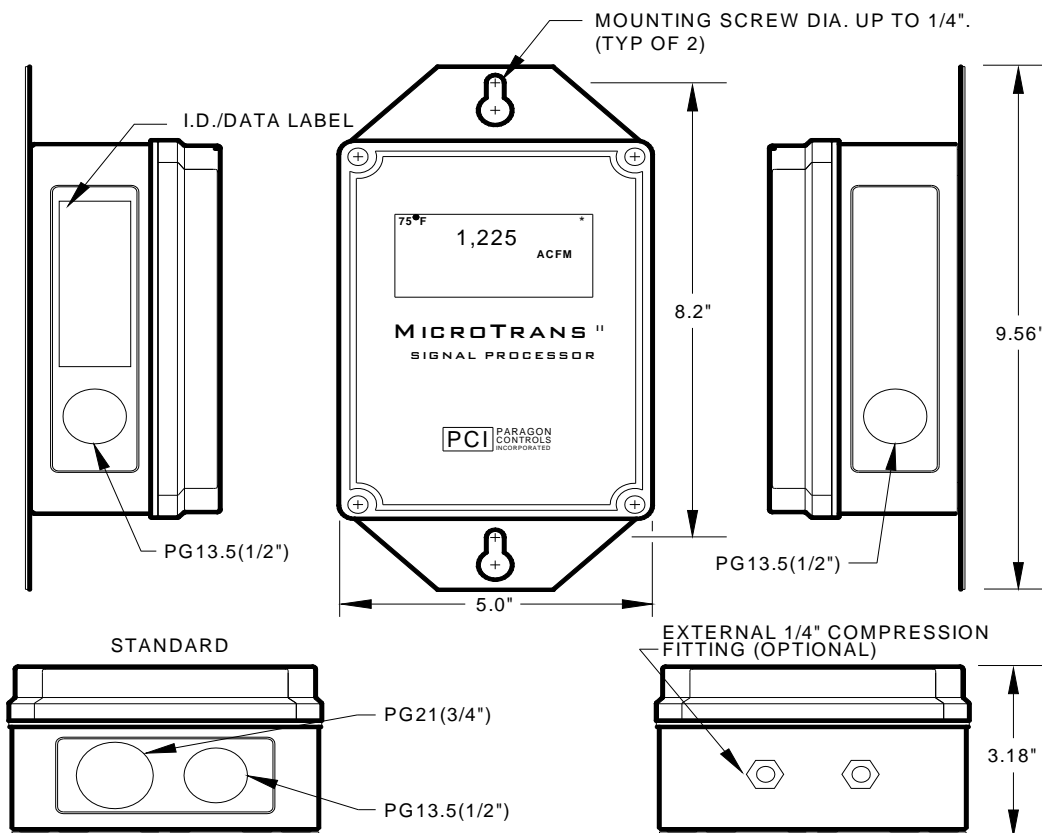
### MICROTRANS<sup>EQ</sup> TYPICAL 0-10VDC 3-WIRE TEMPERATURE TRANSMITTER FIELD CONNECTION



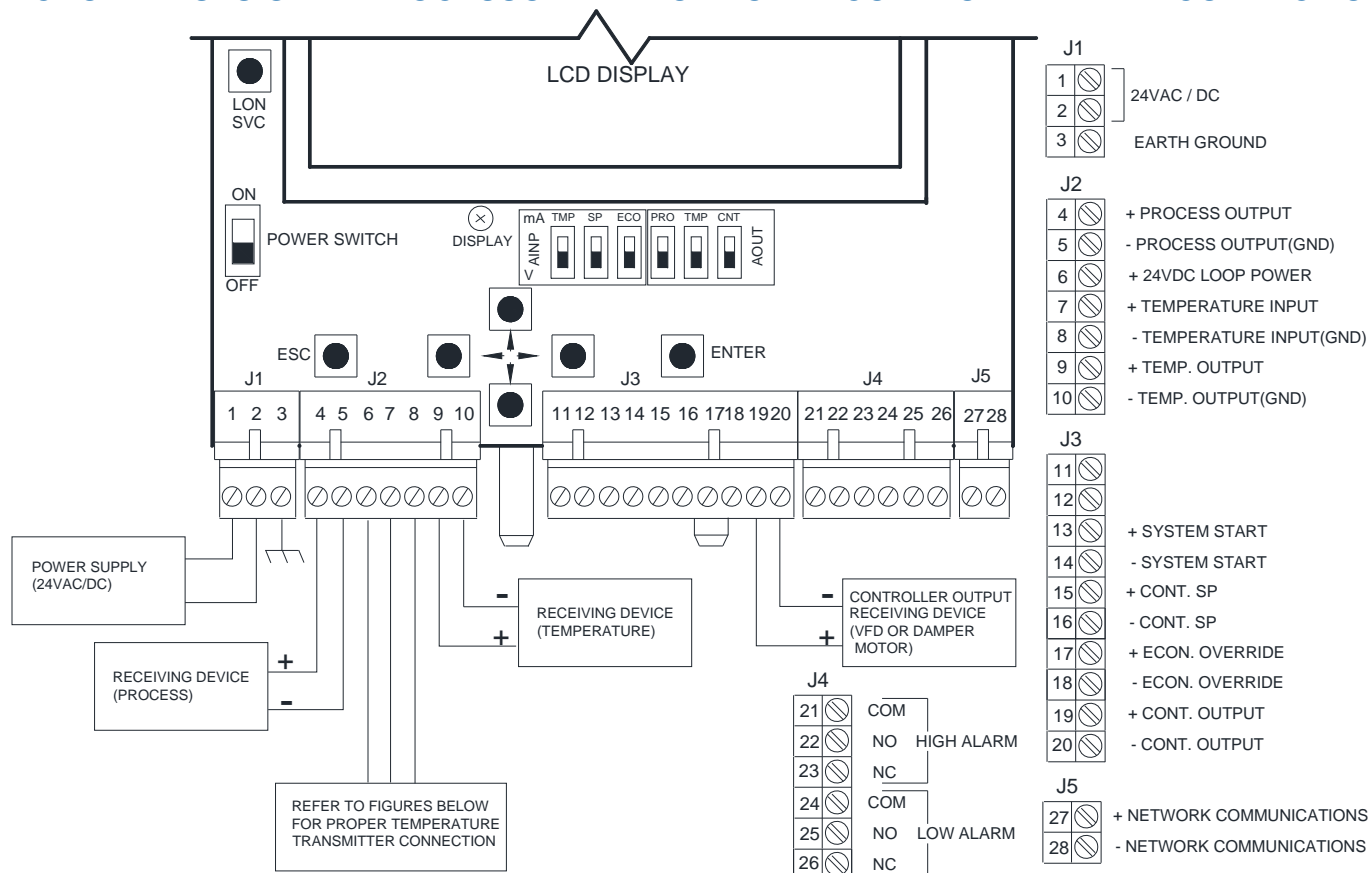


# Model OAFE-1550 Dimensions Continued

## MICROTRANS<sup>II</sup> SIGNAL PROCESSOR WITH OPTIONAL CONTROLLER



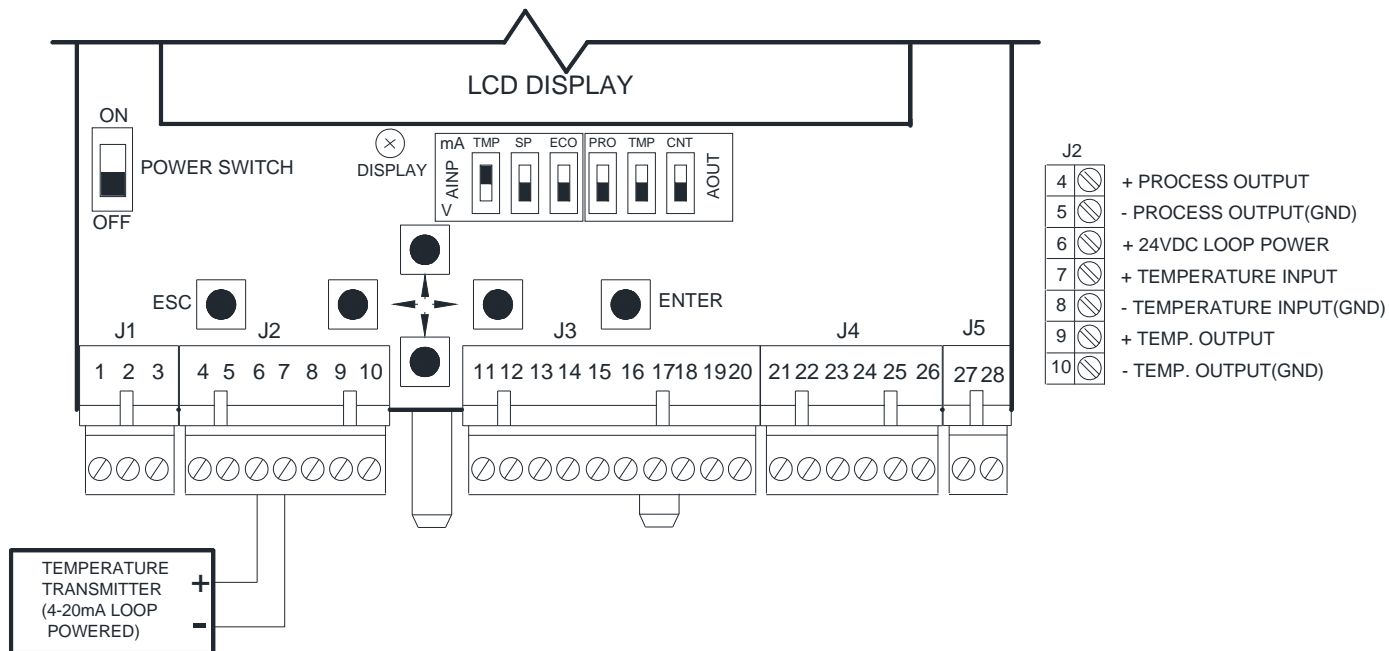
## MICROTRANS<sup>II</sup> SIGNAL PROCESSOR WITH OPTIONAL CONTROLLER FIELD CONNECTIONS



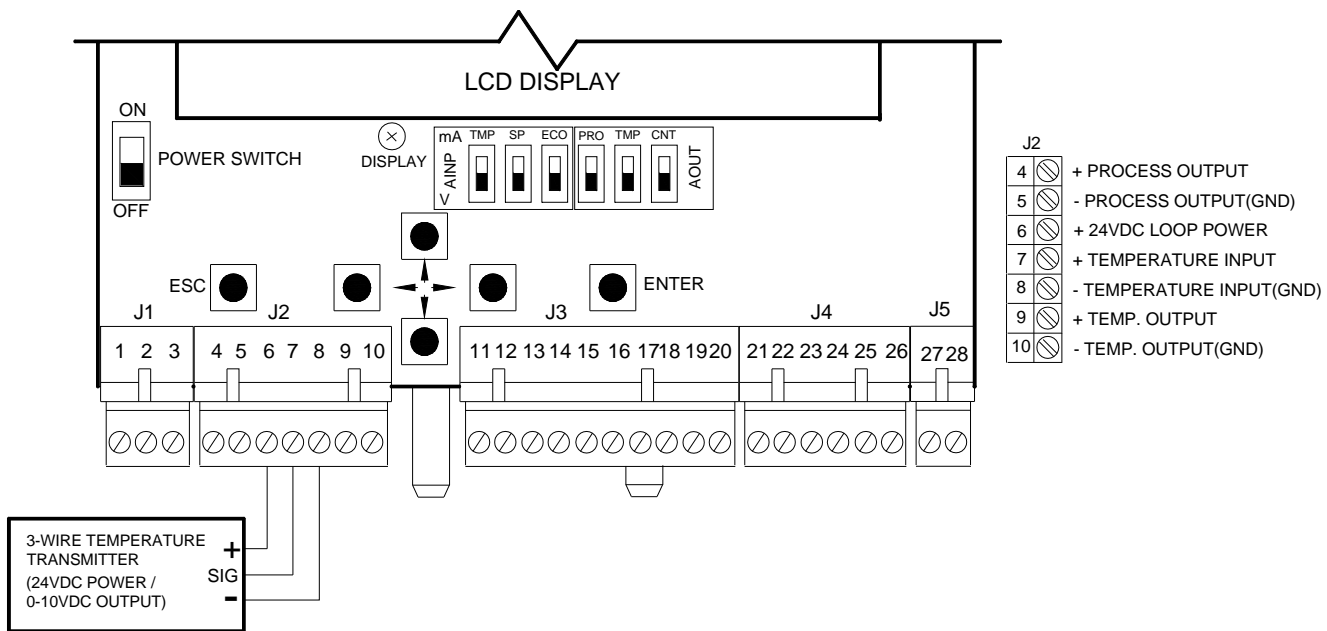
# Model OAFE-1550

## Dimensions Continued

### MICROTRANS<sup>II</sup> TYPICAL 4-20mA LOOP POWERED TEMPERATURE TRANSMITTER FIELD CONNECTION



### MICROTRANS<sup>II</sup> TYPICAL 0-10VDC 3-WIRE TEMPERATURE TRANSMITTER FIELD CONNECTION



# Model OAFE-1550

## Typical Installations

Airflow measuring stations should be sized so that the minimum velocity at the point of measurement is at least 180 fpm, which can be accomplished using an integral inlet bell and/or blank off plate. Figures 1 through 12 below show various installations of the Outdoor Airflow Measurement System in rooftop air handling units, outdoor air plenums, and ducted outdoor air intakes. For applications with dampers, the element orientation with respect to the duct width and height should be taken into consideration (elements should run perpendicular to the damper blades).

### ROOFTOP AHU WITH RAIN HOOD - EXTERIOR MOUNTED AIRFLOW STATION

On a rooftop air handling unit with a rain hood, the airflow measuring station can be mounted on the exterior of the unit with the rain hood remounted on the intake side of the airflow measuring station. The airflow measuring station can be made with a 5 inch deep casing (see Figure 1) with mounting flanges matching the rain hood flanges. To accelerate the velocity and improve the velocity profile for better measurement accuracy, the airflow measuring station can also be constructed with an integral 4 inch radius inlet bell with an 8 inch deep casing (see Figure 2). Custom inlet bell radii and casing depths are also available; consult factory for details.

FIGURE 1

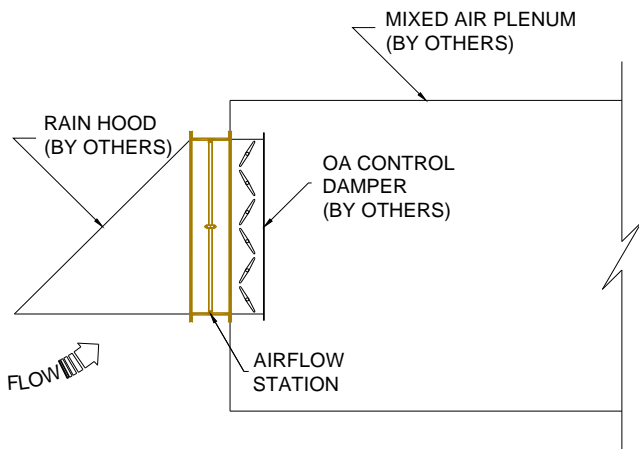
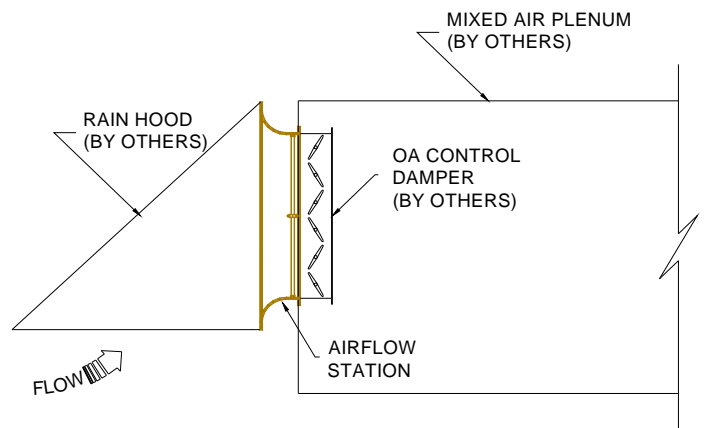


FIGURE 2



### ROOFTOP AHU WITH RAIN HOOD - INTERIOR MOUNTED AIRFLOW STATION

On a rooftop air handling unit with a rain hood, the airflow measuring station can be mounted on the interior of the unit just upstream of the OA control damper. The airflow measuring station can be made with a 5 inch deep casing (see Figure 3) with mounting flanges matching the OA control damper flanges. To accelerate the velocity and improve the velocity profile for better measurement accuracy, the airflow measuring station can also be constructed with an integral 4 inch radius inlet bell with an 8 inch deep casing (see Figure 4). Custom inlet bell radii and casing depths are also available; consult factory for details. The OA control damper is remounted on the downstream side of the airflow measuring station.

FIGURE 3

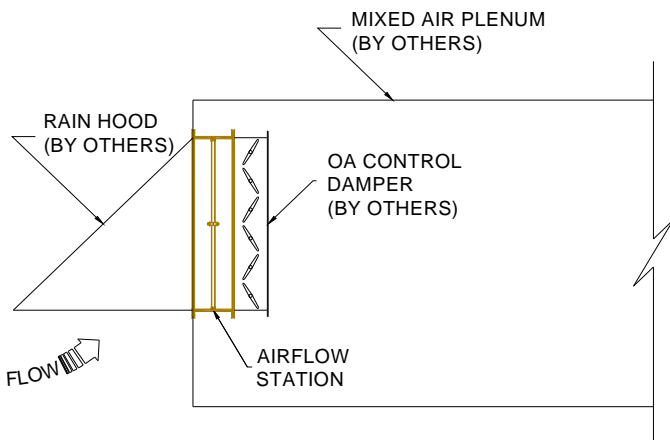
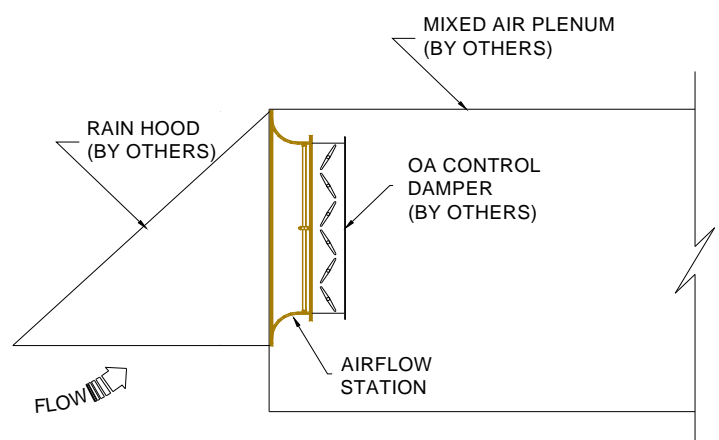


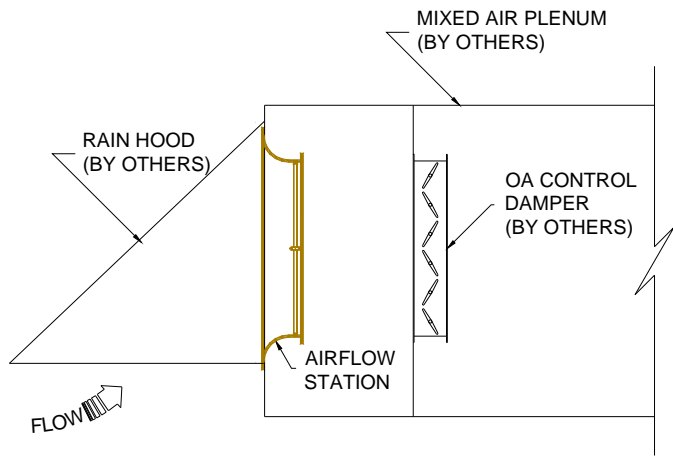
FIGURE 4



# Model OAFE-1550

## Typical Installations Continued

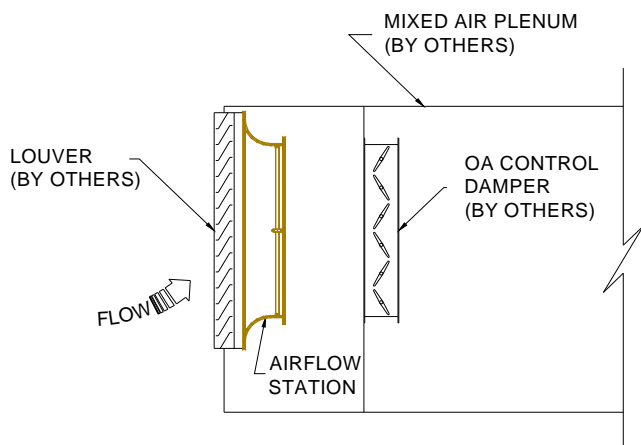
### ROOFTOP AHU WITH AIRFLOW STATION MOUNTED UNDER RAINHOOD



**FIGURE 5**

On a rooftop air handling unit with a rain hood, the airflow measuring station can be mounted under the rain hood, screwed to the exterior wall, with the depth of the station transitioning into the outdoor air plenum. To accelerate the velocity and improve the velocity profile for better measurement accuracy, the airflow measuring station is constructed with an integral 4 inch radius inlet bell with an 8 inch deep casing. Custom inlet bell radii and casing depths are also available; consult factory for details. On the air entering side a flat 1 inch flange is provided to accommodate mounting to the exterior of the AHU.

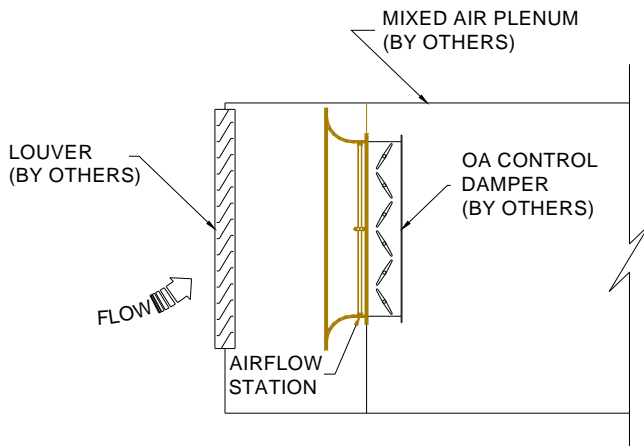
### OUTDOOR AIR PLENUM - AIRFLOW STATION MOUNTED DOWNSTREAM OF LOUVER



**FIGURE 6**

In an outdoor air plenum, the airflow measuring station can be mounted directly to the interior of the plenum just downstream of the louver. To accelerate the velocity and improve the velocity profile for better measurement accuracy, the airflow measuring station is constructed with an integral 4 inch radius inlet bell with an 8 inch deep casing. Custom inlet bell radii and casing depths are also available; consult factory for details. On the air entering side a flat 1 inch flange is provided to accommodate mounting at the interior of the louver.

### OUTDOOR AIR PLENUM - AIRFLOW STATION MOUNTED TO OA CONTROL DAMPER



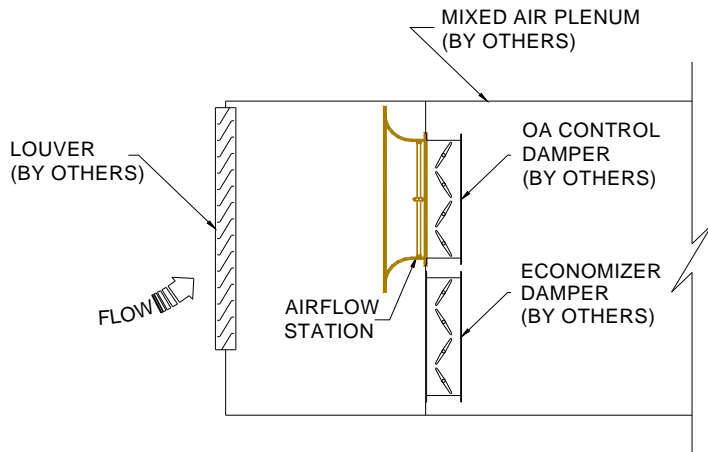
**FIGURE 7**

In an outdoor air plenum, the airflow measuring station can also be mounted directly on the upstream side of the OA control damper. To accelerate the velocity and improve the velocity profile for better measurement accuracy, the airflow measuring station is constructed with an integral 4 inch radius inlet bell with an 8 inch deep casing and mounting flanges matching the OA control damper flanges. Custom inlet bell radii and casing depths are also available; consult factory for details.

# Model OAFE-1550

## Typical Installations Continued

### OUTDOOR AIR PLENUM - AIRFLOW STATION MOUNTED TO MIN OA CONTROL DAMPER



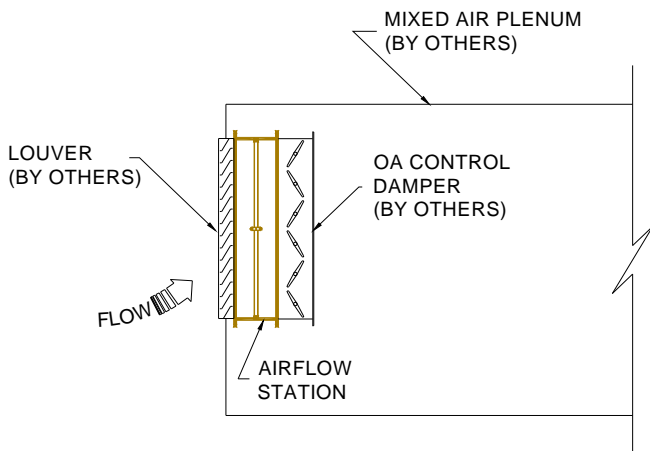
**FIGURE 8**

In an outdoor air plenum, where the OA control dampers are divided into minimum OA and economizer sections, the airflow measuring station can be mounted directly on the upstream side of the minimum OA control damper section for measurement of the minimum OA intake flow rate only. To accelerate the velocity and improve the velocity profile for better measurement accuracy, the airflow measuring station is constructed with an integral 4 inch radius inlet bell with an 8 inch deep casing and mounting flanges matching the OA control damper flanges. Custom inlet bell radii and casing depths are also available; consult factory for details.

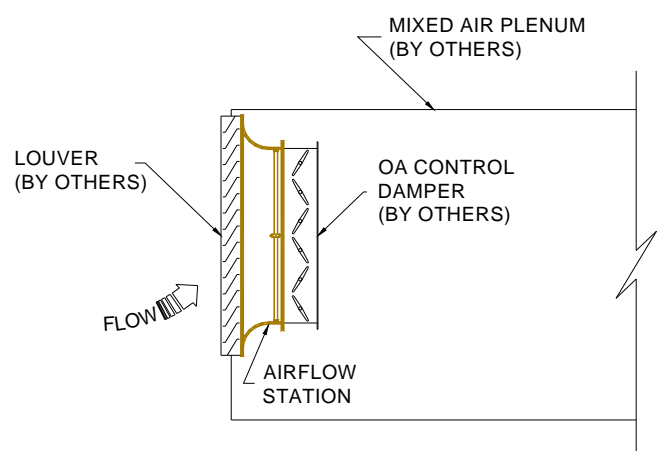
### OUTDOOR AIR PLENUM - AIRFLOW STATION MOUNTED BETWEEN LOUVER AND OA CONTROL DAMPER

In an outdoor air plenum, the airflow measuring station can be mounted directly to the interior of the plenum between the louver and OA control damper. The airflow measuring station is made with a 5 inch deep casing (see Figure 9) with mounting flanges matching the louver flanges on the air entering side of the station and mounting flanges matching the damper flanges on the air exiting side. To accelerate the velocity and improve the velocity profile for better measurement accuracy, the airflow measuring station can also be constructed with an integral 4 inch radius inlet bell with an 8 inch deep casing (see Figure 10). Custom inlet bell radii and casing depths are also available; consult factory for details.

**FIGURE 9**



**FIGURE 10**



# Model OAFE-1550

## Typical Installations Continued

### DUCTED OUTDOOR AIRFLOW MEASURING STATION

For applications with a ducted outdoor air intake to the air handling unit, a standard construction airflow measuring station is typically used. This airflow measuring station is 5" deep with 1.5" flanges (see Figure 11). The airflow measuring station may be installed in any duct configuration. However, the element orientation with respect to the duct width and height should be taken into consideration for ducted inlet applications with stations being mounted on the downstream side of an elbow (elements should run perpendicular to the axis of flow and across the velocity gradient). The accuracy of the installation is dependent on the flow conditions in the duct. The minimum installation requirements for the airflow measuring stations based upon a uniform velocity profile approaching the duct disturbance for flow rates less than 2,500 fpm are shown below (see Figure 12). These are not ideal locations. It is always best to locate the airflow measuring stations as far as possible from all duct disturbances, with upstream disturbances being the most critical consideration.

FIGURE 11

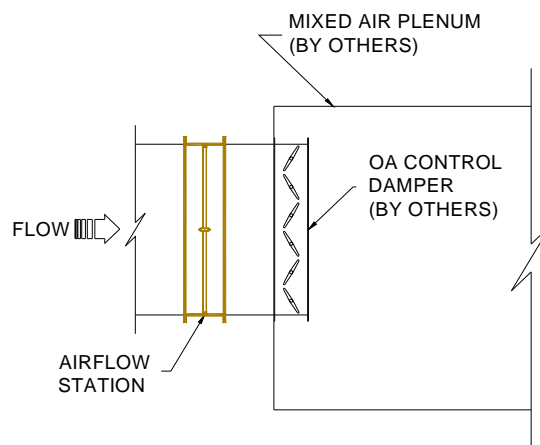
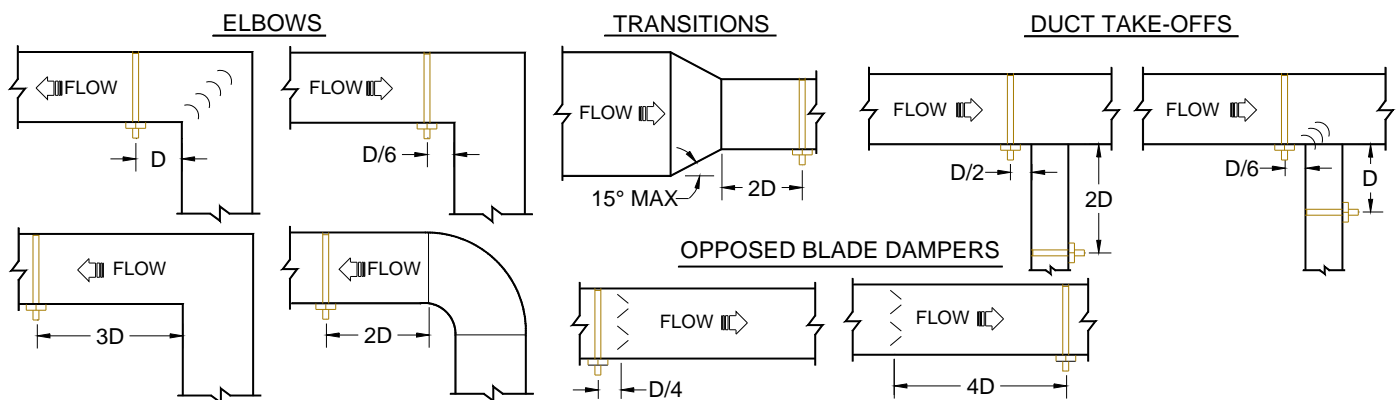


FIGURE 12



Notes:

Rectangular Ducts:

$$D = \sqrt{\frac{4HW}{\pi}}$$

H = Duct height      W = Duct width

## Model OAFE-1550 Specification Guide

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Furnish and install an airflow measurement system for monitoring and controlling the minimum outdoor airflow rate. The minimum outdoor airflow measurement system shall measure the minimum amount of outside air as recommended by ANSI/ASHRAE Standard 62.1-2010, Ventilation for Acceptable Indoor Air Quality, and shall provide an input to the building automation system that is linear to the measured airflow rate. The airflow measurement system shall be tested in accordance with ANSI/AMCA Standards 610-06, Figure 4, Methods of Testing Airflow Measurement Stations for Rating, and AMCA Standard 611-06, Certified Ratings Program – Airflow Measurement Performance, in an AMCA-registered testing facility. The airflow measurement system shall be accurate to  $\pm 1\%$  over an operating range of 200 to 1,200 feet per minute, and within  $\pm 5\%$  for operating ranges as low as 100 feet per minute. The airflow measurement system shall bear the AMCA International Certified Ratings Seal for Airflow-Measurement Station Performance. The airflow measurement system shall be model OAFE-1550 as manufactured by Paragon Controls, Inc., Santa Rosa, California, (707) 579-1424.

