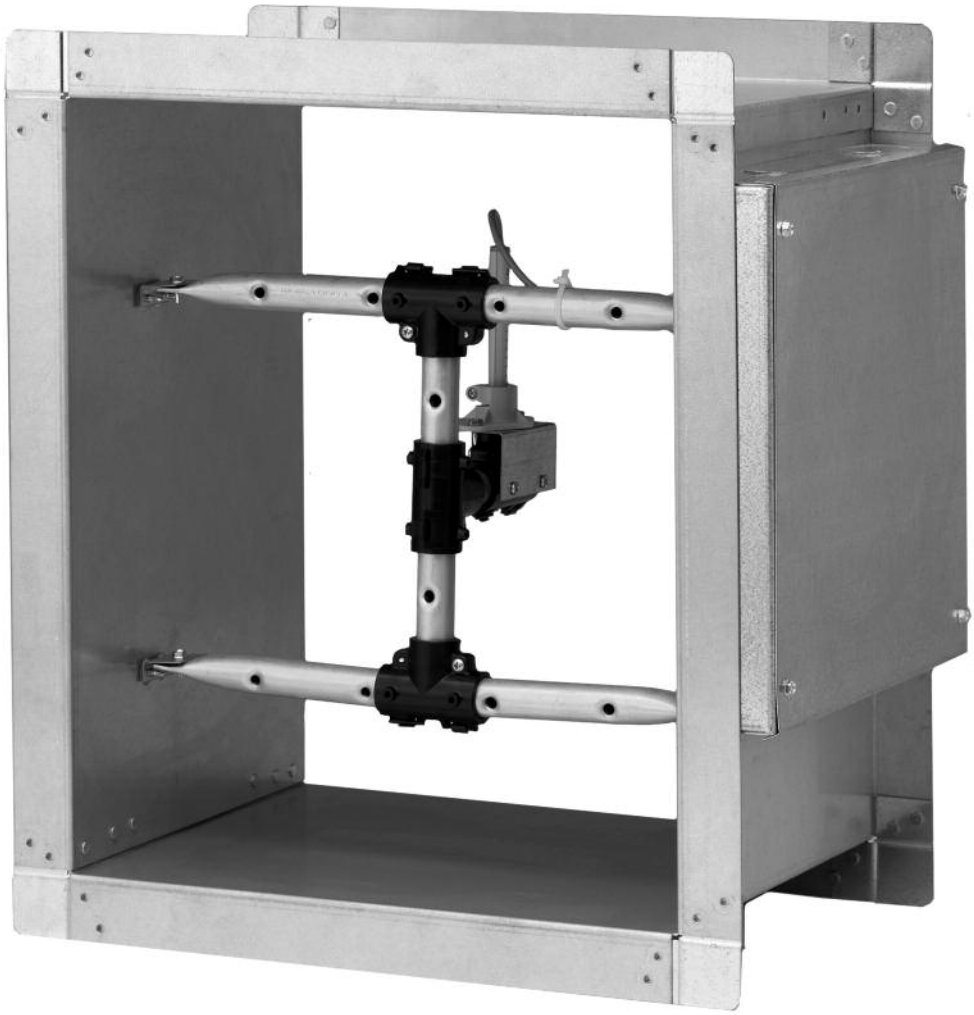
RUSKIN®

Air Quality Solutions

Installation & Maintenance Manual



Model: EAMS

Electronic Air Measuring Station

ALL STATED SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.

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! WARNING

THIS ACCESSORY IS TO BE INSTALLED BY A QUALIFIED SERVICE TECHNICIAN. TO AVOID UNSATISFACTORY OPERATION OR DAMAGE TO THE PRODUCT AND POSSIBLE UNSAFE CONDITIONS, INCLUDING ELECTRICAL SHOCK AND FIRE, THE INSTALLATION INSTRUCTIONS PROVIDED WITH THIS ACCESSORY MUST BE STRICTLY FOLLOWED AND THE PARTS SUPPLIED USED WITHOUT SUBSTITUTION. DAMAGE TO THE PRODUCT RESULTING FROM NOT FOLLOWING THE INSTRUCTIONS OR USING UNAUTHORIZED PARTS MAY BE EXCLUDED FROM THE MANUFACTURER'S WARRANTY COVERAGE.

! WARNING

DISCONNECT ELECTRICAL POWER PRIOR TO SERVICING THIS UNIT. FAILURE TO DO SO CAN RESULT IN ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.

Primary Application

The Electronic Air Measuring Station (EAMS) is designed to be used in any application that requires accurate airflow measurement at velocities between 100 and 2,000 feet per minute. Unit may be installed in the duct or in an air handling unit and can be used to measure outside air, return air, discharge air or exhaust air flows into or out of a building or air handling unit.

Key Features

- AMCA Certified.
- Factory calibrated airflow measurement, prior to shipment.
- Combines Ruskin's exclusive air scoop manifold and hot film anemometer (HFA) air flow sensor technologies to maximize performance and offer repeatable and accurate results.
- Temperature Compensated for changes in air density at varying temperatures.
- Altitude compensated to location installed.
- Sensor Chase protects the sensors from water damage - a common cause for sensor failure in other manufacturer's products.
- Modulates the damper actuator to maintain set point CFM.

Key Benefits

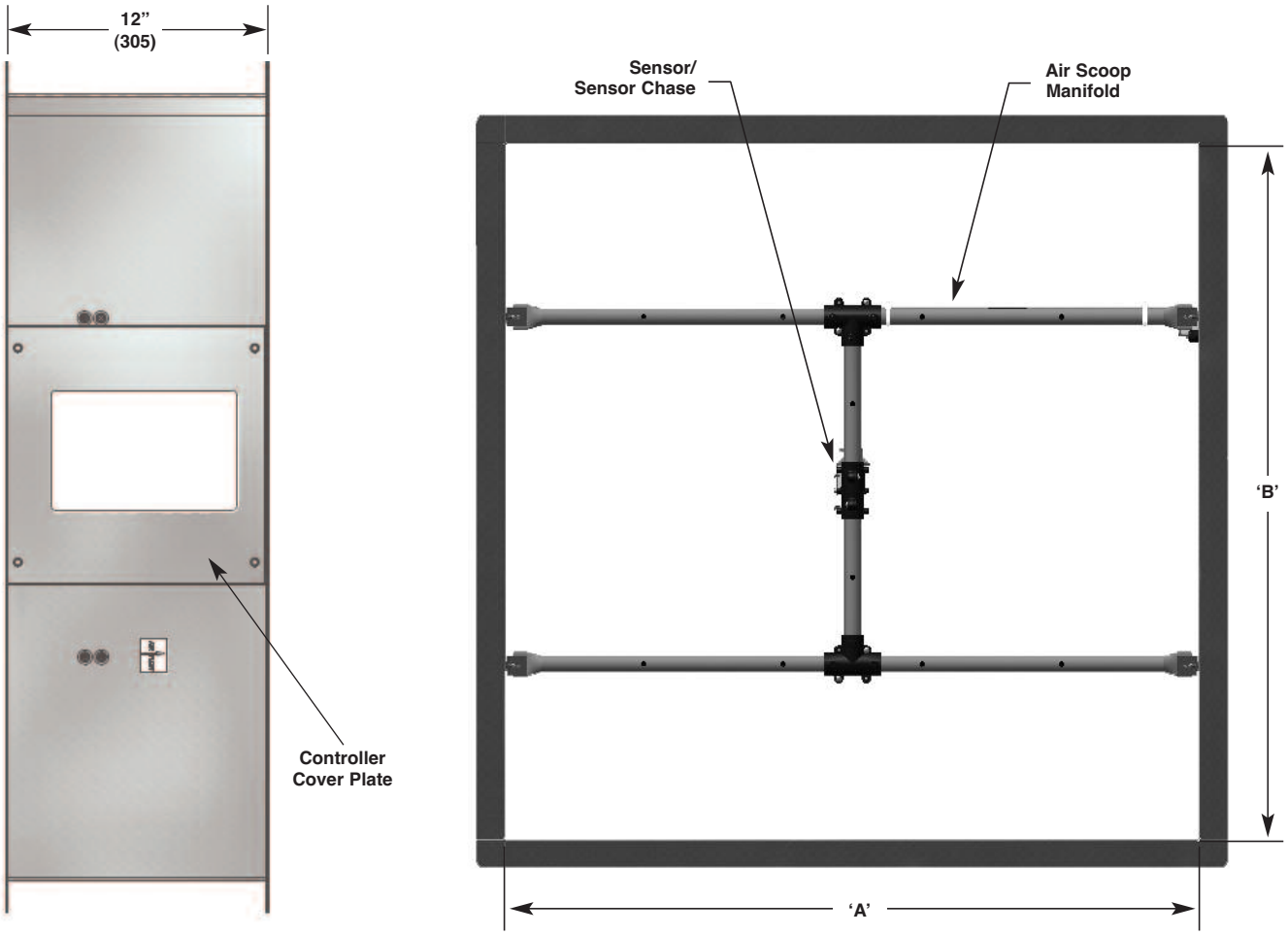
- Contributes to earning required Indoor Environmental Quality (EQ) and Energy and Atmosphere (EA) LEED prerequisites.
- Saves energy dollars by measuring the minimum ventilation airflow to within ±3% accuracy.
- Helps regulate the amount of unconditioned air into the space.
- Meets International Building Code (IBC) and International Energy Conservation Code (IECC) requirements.
- Helps maintain proper ventilation to dissipate dangerous indoor contaminants such as mold spores, bacteria and chemicals.
- Creates a healthy indoor environment to reduce absenteeism, increase productivity, improve comfort and reduce the risk of litigation.
- Ships fully assembled and factory calibrated.

Construction Details

The EAMS is an altitude and temperature compensated electronic air measuring device. The ambient air temperature is monitored with an integral temperature sensor that automatically compensates for changes in the ambient air temperature. The EAMS is highly dependable for outdoor air measurement applications.

The Air Scoop Manifold is centered in a 12" deep flanged frame. As air passes through the manifold it enters into a sensor chase where it is focused directly onto the mass flow sensor. The Ruskin EAMS is rated for 3% accuracy from the measured value, over a temperature range of -20°F to 140°F (-29°C to 60°C) for the sensor and -20°F to 120°F (-29°C to 50°C) for the controller. The combined air scoop and HFA technologies yield an accuracy of 3% over the entire range. We can effectively measure down to 100 FPM.

For applications requiring air flow measurement and control the EAMS can be supplied with a damper. This product (EAMS050 or EAMS060) is recommended for measuring branch air flow or any other duct flow measurement but is also suitable for outdoor air and exhaust locations. See the configuration section for more information on acceptable placement of this air measuring station.



Installation

The EAMS Electronic Air Measuring Station with integral controller is a NEMA 1 rated electrical enclosure. Larger units ship in multiple ship sections. Please verify the receipt of all sections and components prior to installation.

1. Remove the EAMS from its shipping container and inspect for damage, rust or corrosion. Care must be taken in handling the unit. Always handle the EAMS unit by its frame. DO NOT LIFT by the air scoop manifold. Do not drop, drag, step on or apply excessive bending, twisting or racking loads. Inspect the duct work and/or opening where the unit will be installed and check for any obstruction or irregularities that might interfere with its installation. If it is to be installed in ductwork, the ductwork may need to be supported at the area of the EAMS to prevent sagging due to the unit's weight.

2. Use appropriate shims between the EAMS frame and duct opening to prevent distortion of the frame by fasteners holding it in place. If creating a multi-section assembly, be sure that all the sections are fastened together on both sides.

3. The EAMS integral controller is factory calibrated and tested in order to perform correctly in its job-specific application. The integral control unit is typically mounted directly to the side of the EAMS, under a protective cover. A wiring schematic label is located on the cover for field wiring connections. The enclosure is NEMA 1 rated and should only be used in an environmentally controlled space that is free from moisture and excessive airborne particulate. If the optional NEMA 1 enclosure was ordered, it too must be installed in an environmentally controlled space. The optional NEMA 1 control panel must be securely attached to a flat solid surface, such as a wall or air handling unit casing.

4. Loosen the enclosure cover screws and remove the cover.

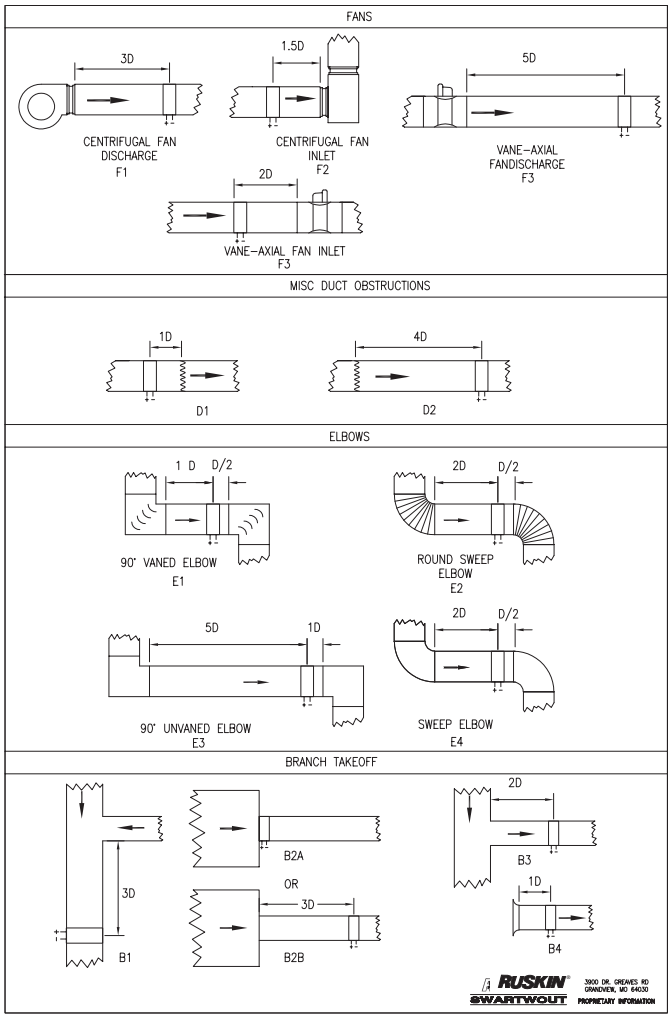
5. Connect 24 VAC supply to exposed terminal block on the side of the EAMS unit. If 24 VAC is not available a 120 VAC primary source may be stepped down to 24 VAC. Refer to wiring schematic on the cover plate or in this document for further details. For units ordered with a separate NEMA 1 enclosure, remove the appropriate knock-outs for connection of the field wiring from the power supply and the EAMS control panel to the terminal block on each air measurement section.

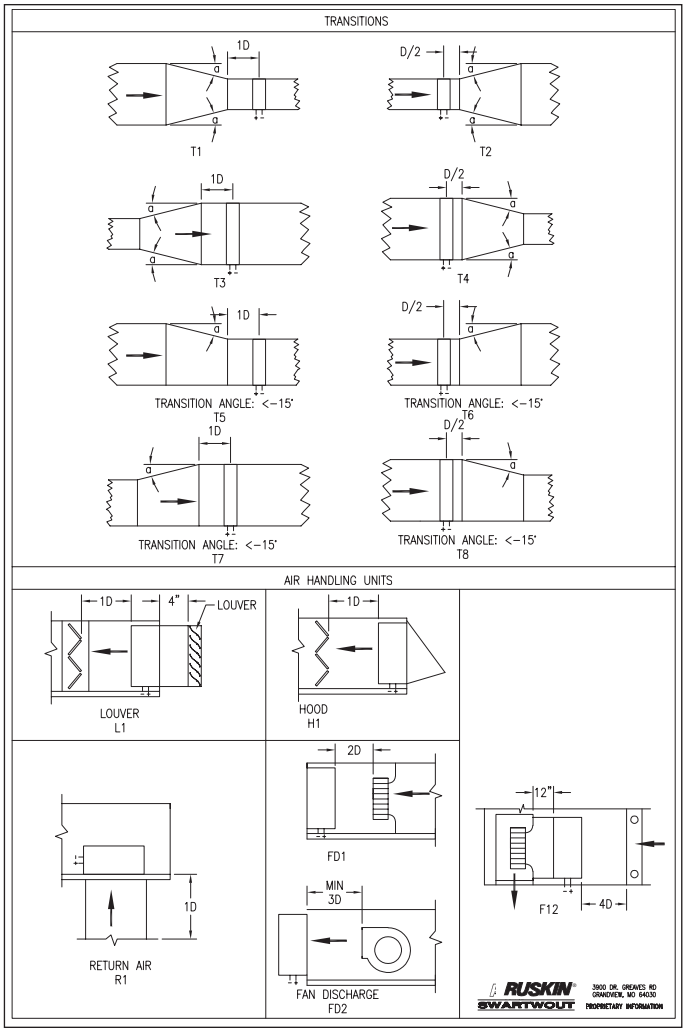
6. If equipped, fasten the optional NEMA 1 enclosure to the wall or flat surface using the four mounting holes in the back of the panel enclosure.

7. The EAMS digital controller is factory wired to the unit’s terminal strip unless the separate NEMA 1 electrical enclosure option is ordered. If this optional feature was ordered, the control panel must be wired to the terminal strip on the EAMS unit. For distances greater than 100 feet use at least 18 AWG or larger. This is low voltage (0-12V) signal cabling and cannot be run with power wiring. Note the three wires on the sensor, Green Brown and White need to be connected to the corresponding sensor terminals provided in the EAMS digital control panel.

8. The EAMS controller requires a 24VAC power supply. No additional power is required. The air measurement sensor is powered from the EAMS integral controller.

Placement





DUCT HEIGHT	1D EQUIVALENT CHART — DUCT WIDTH																												
	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
6	6.8	7.8	8.7	9.6	10	11	12	12	13	14	14	15	15	16	16	17	17	17	18	18	19	19	20	20	20	21	21	21
8	7.8	9	10	11	12	13	14	14	15	16	16	17	17	18	19	19	20	20	21	21	22	22	23	23	23	24	24	25
10	8.7	10	11	12	13	14	15	16	17	17	18	19	20	20	21	21	22	23	23	24	24	25	25	26	26	27	27	28
12	9.6	11	12	14	15	16	17	17	18	19	20	21	21	22	23	23	24	25	25	26	27	27	28	28	29	29	30	30
14	10	12	13	15	16	17	18	19	20	21	22	22	23	24	25	25	26	27	27	28	29	29	30	30	31	32	32	33
16	11	13	14	16	17	18	19	20	21	22	23	24	25	26	26	27	28	29	29	30	31	31	32	33	33	34	34	35
18	12	14	15	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30	31	32	32	33	34	35	35	36	36	37
20	12	14	16	17	19	20	21	23	24	25	26	27	28	29	29	30	31	32	33	33	34	35	36	36	37	38	38	39
22	13	15	17	18	20	21	22	24	25	26	27	28	29	30	31	32	33	33	34	35	36	37	37	38	39	40	40	41
24	14	16	17	19	21	22	23	25	26	27	28	29	30	31	32	33	34	35	36	37	37	38	39	40	41	41	42	43
26	14	16	18	20	22	23	24	26	27	28	29	30	32	33	34	35	35	36	37	38	39	40	41	41	42	43	44	45
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32	16	18	20	22	24	26	27	29	30	31	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	49
34	16	19	21	23	25	26	28	29	31	32	34	35	36	37	38	39	41	42	43	44	45	46	47	47	48	49	50	51
36	17	19	21	23	25	27	29	30	32	33	35	36	37	38	39	41	42	43	44	45	46	47	48	49	50	51	52	52
38	17	20	22	24	26	28	30	31	33	34	35	37	38	39	41	42	43	44	45	46	47	48	49	50	51	52	53	54
40	17	20	23	25	27	29	30	32	33	35	36	38	39	40	42	43	44	45	46	47	48	49	50	51	52	53	54	55
42	18	21	23	25	27	29	31	33	34	36	37	39	40	41	43	44	45	46	47	49	50	51	52	53	54	55	56	57
44	18	21	24	26	28	30	32	33	35	37	38	40	41	42	44	45	46	47	49	50	51	52	53	54	55	56	57	58
46	19	22	24	27	29	31	32	34	36	37	39	40	42	43	45	46	47	48	50	51	52	53	54	55	56	57	58	59
48	19	22	25	27	29	31	33	35	37	38	40	41	43	44	46	47	48	49	51	52	53	54	55	56	57	59	60	61
50	20	23	25	28	30	32	34	36	37	39	41	42	44	45	47	48	49	50	52	53	54	55	56	58	59	60	61	62
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58	21	24	27	30	32	34	36	38	40	42	44	45	47	49	50	52	53	54	56	57	58	60	61	62	63	64	65	67
60	21	25	28	30	33	35	37	39	41	43	45	46	48	49	51	52	54	55	57	58	59	61	62	63	64	65	67	68

To determine the placement of an air measuring station that is located down stream of a 90° vaned elbow (as shown in the detail E1 above); follow the duct width down to the duct height. The number at this intersection represents distance in inches (1D).

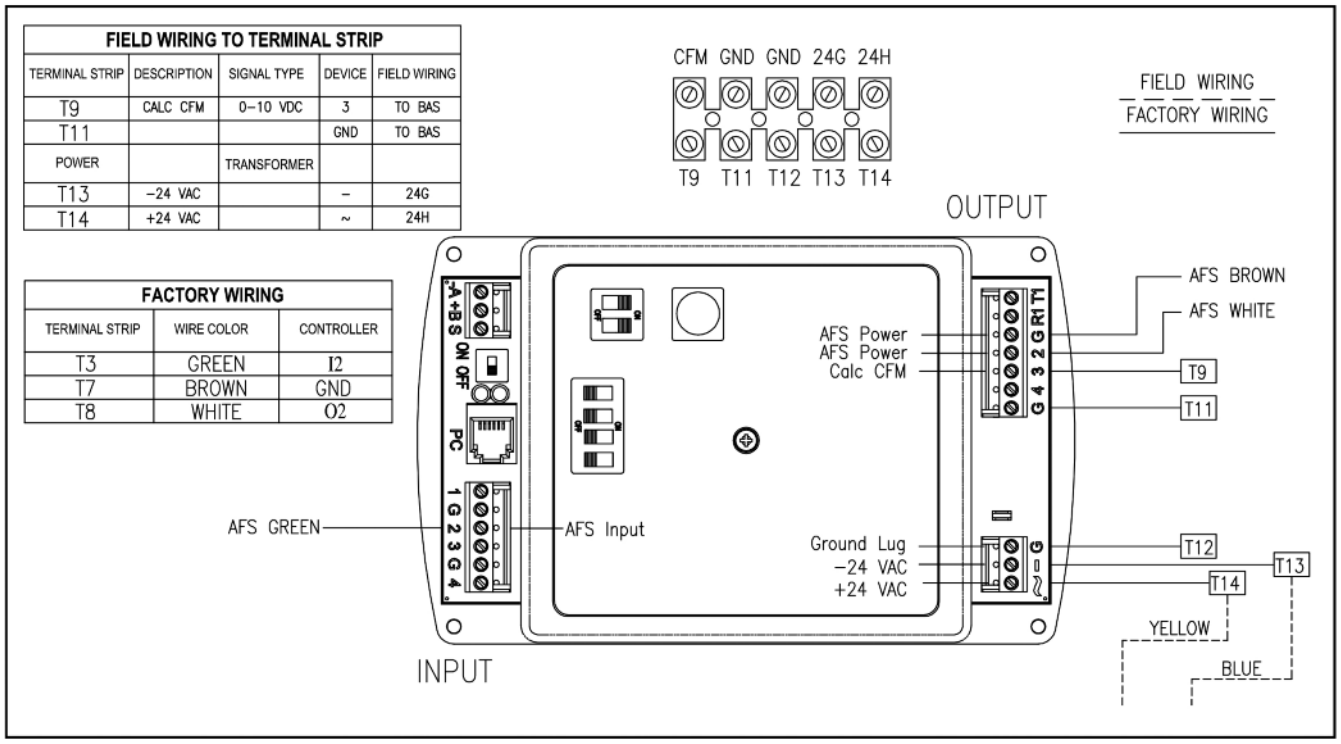
Example 1
The 1D Equivalent of a 20" x 10" duct = 16"

Example 2
The same 20" x 10" duct installed as shown in detail E3 would be 16" x 5 (5D)

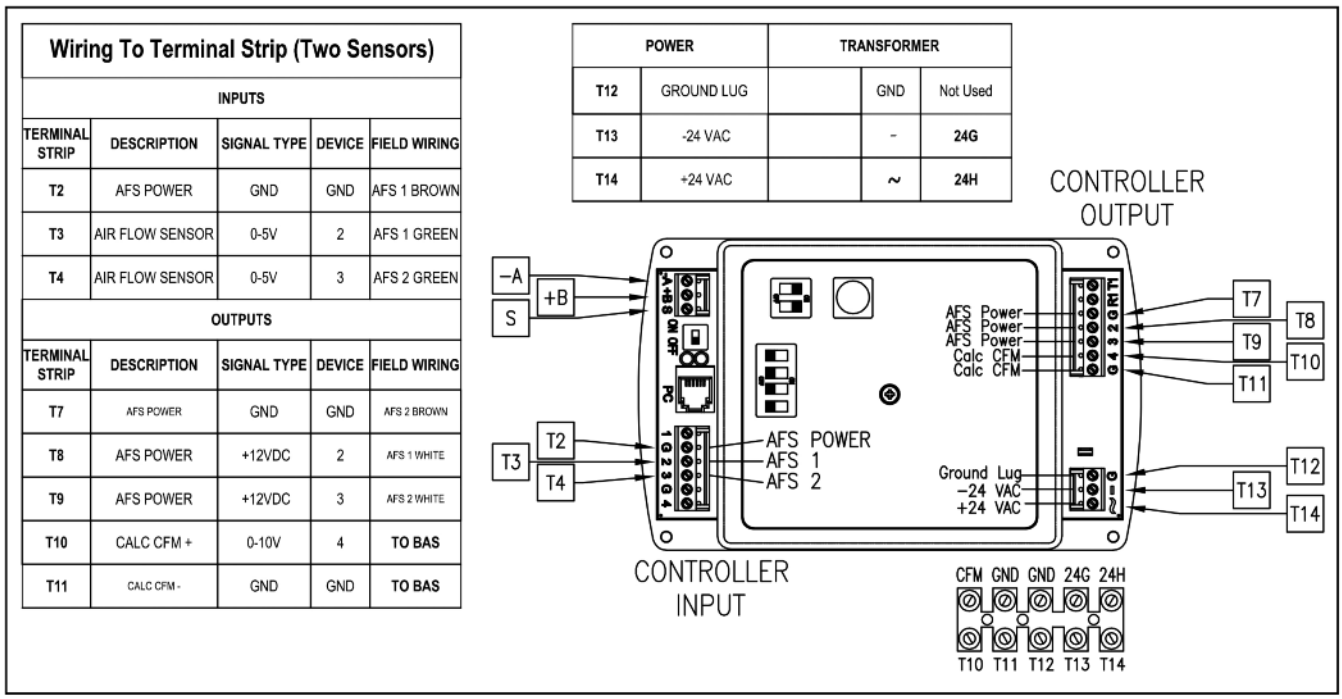
Notes:
1. All numbers are expressed in inches.
2. 2D = 1D x 2, 3D = 1D x 3, etc.

Ruskin's EAMS is supplied and calibrated with a dedicated controller. Attempting to use another controller (not supplied by Ruskin) or tampering with the wiring under the control panel cover plate will void the warranty and could render the EAMS unit ineffective. Please contact the factory prior to performing any service on the factory wiring.

Standard Wiring Schematic (one sensor)



Standard Wiring Schematic (two sensors)



Field Wiring Connections

1. The Controller and and mass flow sensor is factory wired for your convenience. It is only necessary to bring 24 VAC power to the terminal strip and connect the input and output signals as required.
2. Connect 0-10V Measured CFM output from T9 (+) & T 11 (-) to the BAS system. On 2-sensor units use T10 (+) & T11 (-). Observe polarity.
3. Connect 24VAC power supply to the EAMS Terminal strip at T13 & T14 (see table below).

Field Wiring To Terminal Strip (Single Sensor)

INPUTS				
TERMINAL STRIP	**DESCRIPTION**	**SIGNAL TYPE**	**DEVICE**	**FIELD WIRING**
T3	AIR FLOW SENSOR	0-5V	2	AFS GREEN
OUTPUTS				
TERMINAL STRIP	**DESCRIPTION**	**SIGNAL TYPE**	**DEVICE**	**FIELD WIRING**
T7	AFS POWER	GND	GND	AFS Brown
T8	AFS POWER	+12VDC	2	AFS White
T9	CALC CFM +	0-10V	3	**TO BAS**
T11	CALC CFM -	0-10V	GND	**TO BAS**
POWER		**TRANSFORMER**		
T12	GROUND LUG		GND	Not Used
T13	-24 VAC		–	**24G**
T14	+24 VAC		~	**24H**

Field Wiring To Terminal Strip (Two Sensors)

INPUTS				
TERMINAL STRIP	**DESCRIPTION**	**SIGNAL TYPE**	**DEVICE**	**FIELD WIRING**
T2	AFS POWER	GND	GND	AFS 1 Brown
T3	AIR FLOW SENSOR	0-5V	2	AFS 1 Green
T4	AIR FLOW SENSOR	0-5V	3	AFS 2 Green
OUTPUTS				
TERMINAL STRIP	**DESCRIPTION**	**SIGNAL TYPE**	**DEVICE**	**FIELD WIRING**
T7	AFS POWER	GND	GND	AFS 2 Brown
T8	AFS POWER	+12VDC	2	AFS 1 White
T9	AFS POWER	+12VDC	3	AFS 2 White
T10	CALC CFM +	0-10V	4	**TO BAS**
T11	CALC CFM -	0-10V	GND	**TO BAS**
POWER		**TRANSFORMER**		
T12	GROUND LUG		GND	Not Used
T13	-24 VAC		–	**24G**
T14	+24 VAC		~	**24H**

Controls

The Electronic Air Measuring and Flow Control Station EAMS includes the controller and factory calibration. The controller has been factory programmed for the expected range of air flow. The Controller will output a signal corresponding to the amount of air passing through the air measurement station at any point in time. See the output chart provided with this unit for output scaling or contact Ruskin with the control number to obtain this information.

Operation

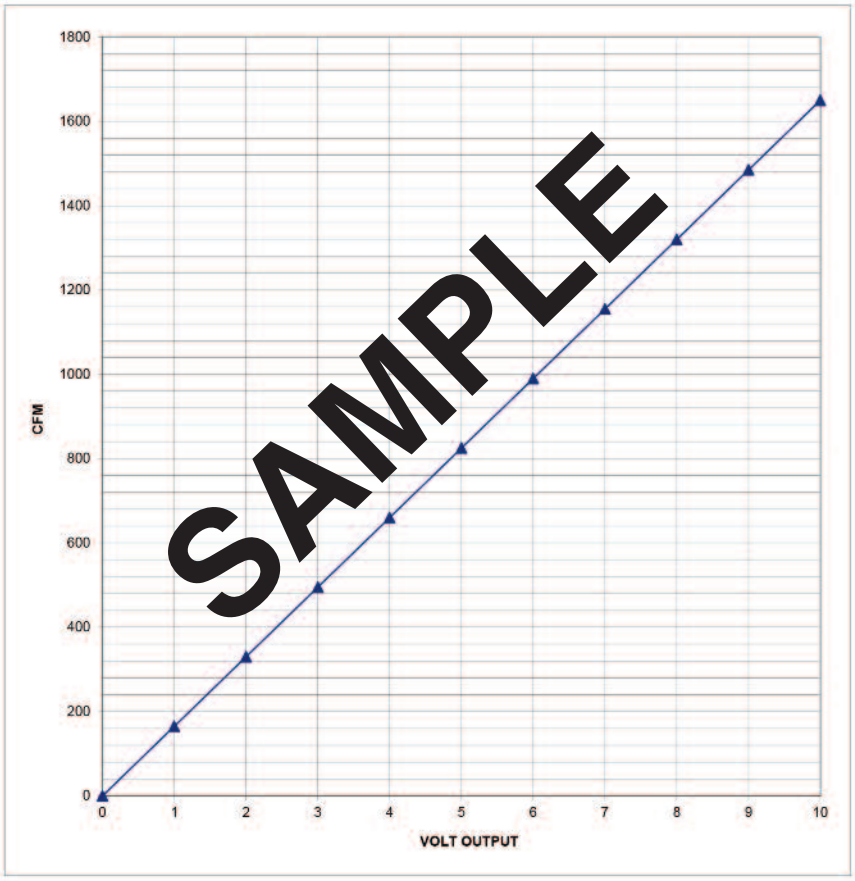
The EAMS controller outputs a 0-10V linear signal proportional to the amount of air flowing. A chart is provided with the controller showing the output expected for a range of CFM values. (See sample below.)

RUSKIN®
Air & Sound Control

EAMS AIR MONITOR

SOLD TO: CUSTOMER NAME
CONTROL NO. 1234567
TAG: Equipment ID
Project: Sample

"A" DIM. 24 Inches Wide
"B" DIM 24 Inches High
4.00 Square Feet



Volt OUTPUT	ACTUAL CFM
0	0
1	165
2	330
3	495
4	660
5	825
6	990
7	1155
8	1320
9	1485
10	1650

ACTUAL CFM

CFM = (Volts) : 165 CFM/Volt

Specifications

Inputs

Air Velocity Sensor	Mass Flow Sensor 0-5 volts DC

Outputs

CFM Flow	Field adjustable 0-10V analog signal, (less than 250 ohm load) or 0-10V calibrated output signal, w/o pot

Installation

Supply Voltage	24 VAC +/- 15%, 10VA, 50/60 Hz per controller (3 sections and larger will have multiple slave controller)

Enclosure (optional)

Type NEMA 1	EAMS control panel 12" x 12" x 6" (305 x 305 x 152) deep (includes a 120/24 VAC transformer and terminal strip)

Approvals

Controller	UL916 listed

Operating Range

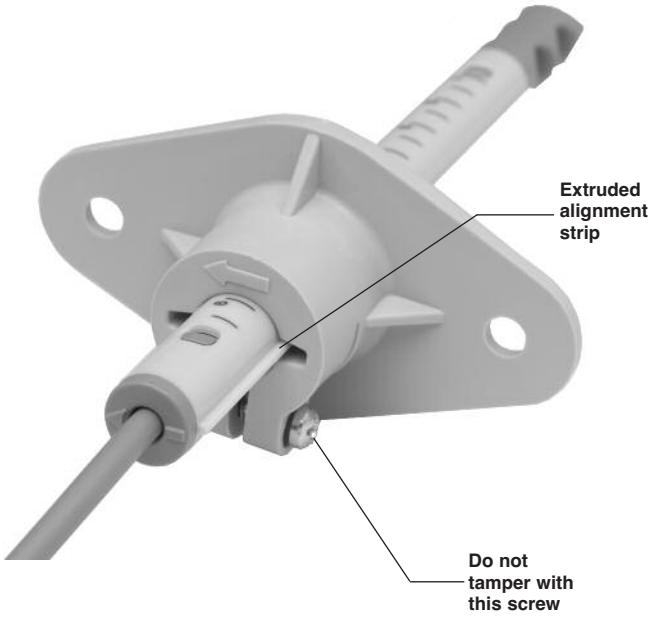
Air temperature	Range of -20°F to 120°F self compensating
Altitude Compensated	Programmed per installation (sea level to 10K feet)
Storage Temperature	-40°F to 140°F (-40 to 60C)
Humidity	0-95% relative humidity (non-condensing)

Memory

Nonvolatile memory
Auto Restart on power failure

Maintenance

1. Disconnect the power supply from the EAMS unit.
2. The air scoop manifold section of the air measuring station should be periodically inspected for particulate build-up. If accessible, use a damp cloth to wipe clean the air flow entry orifices of the Scoop Manifold. Using pressurized air for clearing any blocked orifices is not required, nor recommended. Special care must be taken not to damage the sensor. Remove sensor before using pressurized air to clean air scoop manifold.
3. To inspect or replace the sensor, remove two screws from the sensor mounting flange and mark orientation. Do not remove the screw holding the flange to the sensor shaft as this can affect the accuracy of the entire device (Detail 1). Very carefully clean the sensor if required, and then insert the sensor into the sensor chase. The sensor mounts in only one direction. The arrow on the sensor shows the direction of airflow. The sensor must be reinstalled with the thin film parallel to the direction of air flow through the air measuring station (Detail 2). Replace the two mounting screws.



DETAIL 1

INSTALLATION INSTRUCTIONS
EAMS/EAMS060 BACNET NETWORKING

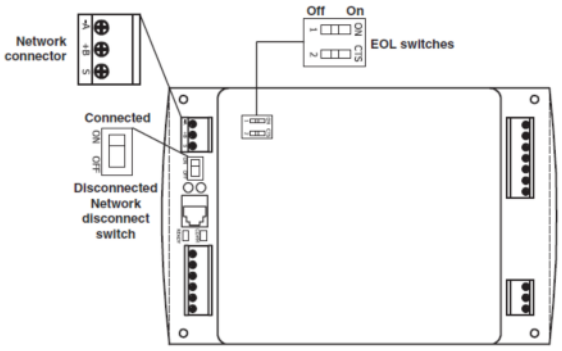
Ruskin MS/TP Networking
The EAMS is a versatile air measurement station for stand-alone and networked applications. The factory programmed control module is compatible with BACnet devices. As part of a complete facilities management system, the EAMS control module provides precise monitoring and control of the CFM set point, and damper position.

- BACnet MS/TP compliant
- EIA-485 operating up to 76.8 kilobaud
- Supplied with factory programmed sequences
- Damper position based on demand ventilation
- Easy to install, and simple to configure

Each EAMS unit is assigned a default MAC address starting at 127 and decremented for each additional unit on the network. Media Access Control Addresses are hardware addresses that uniquely identify each node on a network. In order to prevent network collisions, a desired MS/TP MAC address may be specified. To access the variables from a facilities management system, enter the MAC address of the specific EAMS control module followed by the variable name.
denotes MAC address

- ###-AV1 = CFM
  EAMS060 ONLY
- ###-AI1 = CFM set point
- ###-AO4 = Damper position
- ###-AI2 = Override damper closed
- ###-AI4 = Override damper open

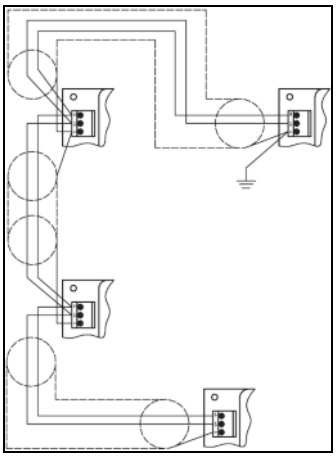
Connecting to an MS/TP network
End of line termination switches
The EAMS controllers on the physical ends of the RS-485 wiring segment must have end-of-line termination installed for proper network operation. Set the end-of-line termination to ON using the EOL switches.

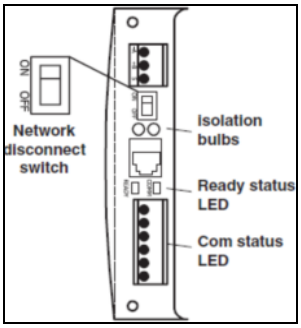


Connections and wiring
Use the following principles when connecting the EAMS controller to an MS/TP network:

- Connect no more than 128 addressable BACnet devices to one MS/TP network. The devices can be any mix or controllers or routers.
- To prevent network traffic bottlenecks, limit the MS/TP network size to 60 controllers.
- Use 18 gage, twisted pair, shielded cable with capacitance of no more than 50 picofarads per foot for all network wiring. Belden cable model #82760 meets the cable requirements.
- Connect the -A terminal in parallel with all other - terminals.
- Connect the +B terminals in parallel with all other + terminals.
- Connect the shields of the cable together at each controller. For EAMS control modules use the S terminal.
- Connect the shield to an earth ground at one end only.
- Use a repeater between every 32 MS/TP devices or if the cable length will exceed 4000 feet (1220 meters). Use no more than seven repeaters per MS/TP network.
- Place a surge suppressor in the cable where it exits a building.

Network disconnect switch
The network disconnect switch is located on the left side of the controller. Use this switch to enable or disable the MS/TP network connection. When the switch is ON the controller can communicate on the network; when it is OFF, the controller is isolated from the network. Alternately, you may remove the isolation bulbs to isolate the controller from the network.





MS/TP network wiring **Disconnect switch**

Status LEDs
Two Status LEDs are located on the left side of the controller above the power connector terminal. They are used to indicate the following:

Ready
This green LED flashes once per second when the controller is operating normally. The Ready LED and Communications LED alternating at a one-half second rate indicates an error in the controllers memory.

Communications
The yellow *Communications* LED flashes at a one-half second rate during power-up. Once the controller establishes communications with the network, the *Communications* LED will flicker as it receives and passes the token.

Isolation Lamps
Two isolation lamps are located near the network switch. These lamps serve three functions:

- Removing the lamps will open the MS/TP circuit and isolate the controller from the network.
- If one, or both, lamps are lit, it indicates the network is improperly phased. This means that the ground potential of the controller is not the same as other controllers on the network.
- If the voltage or current on the network exceeds safe levels, the lamps operate as fuses to protect the controller from damage.

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