

Installation Guide

EF-A1000 Series

Analog Output Electronic Low Flow (ELF) Airflow/Temperature Measurement Station

Document: IG_EF-A1000-T_R1A



IG_EF-A1000-T_R1A

LIST OF EFFECTIVE AND CHANGED PAGES

Insert latest changed pages (in bold text); remove and dispose of superseded pages.
Total number of pages in this manual is **12**.

Page No	Revision *	Description of Change	Date
1 through 12	R1A	Initial document release.	1/25/2016

* R1A indicates an original page without change

Table of Contents

1. INTRODUCTION AND SCOPE	3
2. EF-A1000, EF-A1001 INSTALLATION	4
3. ELF PREPARATION FOR USE	6
4. ELF INTERCONNECTIONS	6
4.1 ELF 24 VAC Power Connections	7
4.2 ELF Analog Output Connections	7
4.2.1 Converting the ELF Analog Output for 4-wire Current Loops	7
5. ELF ANALOG OUTPUT CONFIGURATION OPTIONS (CONFIG SW1 - SW4)	7
6. ELF INITIAL START UP / NORMAL OPERATION	11
6.1 Converting the Analog Airflow Output Signal from Linear to Volumetric flow - FPM to CFM	11
7. ELF ADDITIONAL INFORMATION	11

List of Figures

Figure 1. ELF Installation Applications and Orientation	5
Figure 2. ELF Installation Dimensions	6
Figure 3. ELF Main Circuit Board and Configuration Option Selector Detail	8
Figure 4. EF-A1000 ELF Single Output Power and Signal Wiring Interconnections	9
Figure 5. EF-A1001 ELF Dual Output Power and Signal Wiring Interconnections	10

List of Tables

Table 1. CONFIG Switch Settings	7
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1. INTRODUCTION AND SCOPE

This Quick Installation Guide provides basic installation information for the instrument installer. Information includes physical instrument installation, power and output cable connections as well as initial setup of the instrument. The self contained electronic low flow instrument in this document is referred to as the ELF.

Models covered in this document are as follows:

Single Analog Output, Single Sensor (4" Probe)

EF-A1110 0-10/2-10VDC Single Analog Output with Flow Integration (4" Single Sensor)
EF-A1110 /A1 0-5/1-5VDC Single Analog Output with Flow Integration (4" Single Sensor)

Dual Analog Output, Single Sensor (4" Probe)

EF-A1111 0-10/2-10VDC Dual Analog Output with Flow Integration (4" Single Sensor)
EF-A1111 /A1 0-5/1-5VDC Dual Analog Output with Flow Integration (4" Single Sensor)

Single Analog Output, Two Sensors (>4" Probe)

EF-A1120 0-10/2-10VDC Single Analog Output with Flow Integration (>4" Two Sensors)
EF-A1120 /A1 0-5/1-5VDC Single Analog Output with Flow Integration (>4" Two Sensors)

Dual Analog Output, Two Sensors (>4" Probe)

EF-A1121 0-10/2-10VDC Dual Analog Output with Flow Integration (>4" Two Sensors)
EF-A1121 /A1 0-5/1-5VDC Dual Analog Output with Flow Integration (>4" Two Sensors)

For complete and detailed specifications, operating instructions and technical information, refer to the separate Installation, Operation and Maintenance Technical Manual **TM_EF-A1000** under separate cover.

2. EF-A1000, EF-A1001 INSTALLATION

The ELF instruments are designed for use in small ducts and in VAV terminal box applications in an environment between -20°F to 120°F (-28.9°C to 48.9°C) where it will not be exposed to rain or snow. The ELF airflow measurement station sensor probes are designed for insertion mounting through one side of the duct or VAV box sidewall. Mount the instrument in an accessible location to permit set up. Locate the instrument so that the attached instrument cable will reach the customer provided BAS control interface.



CAUTION

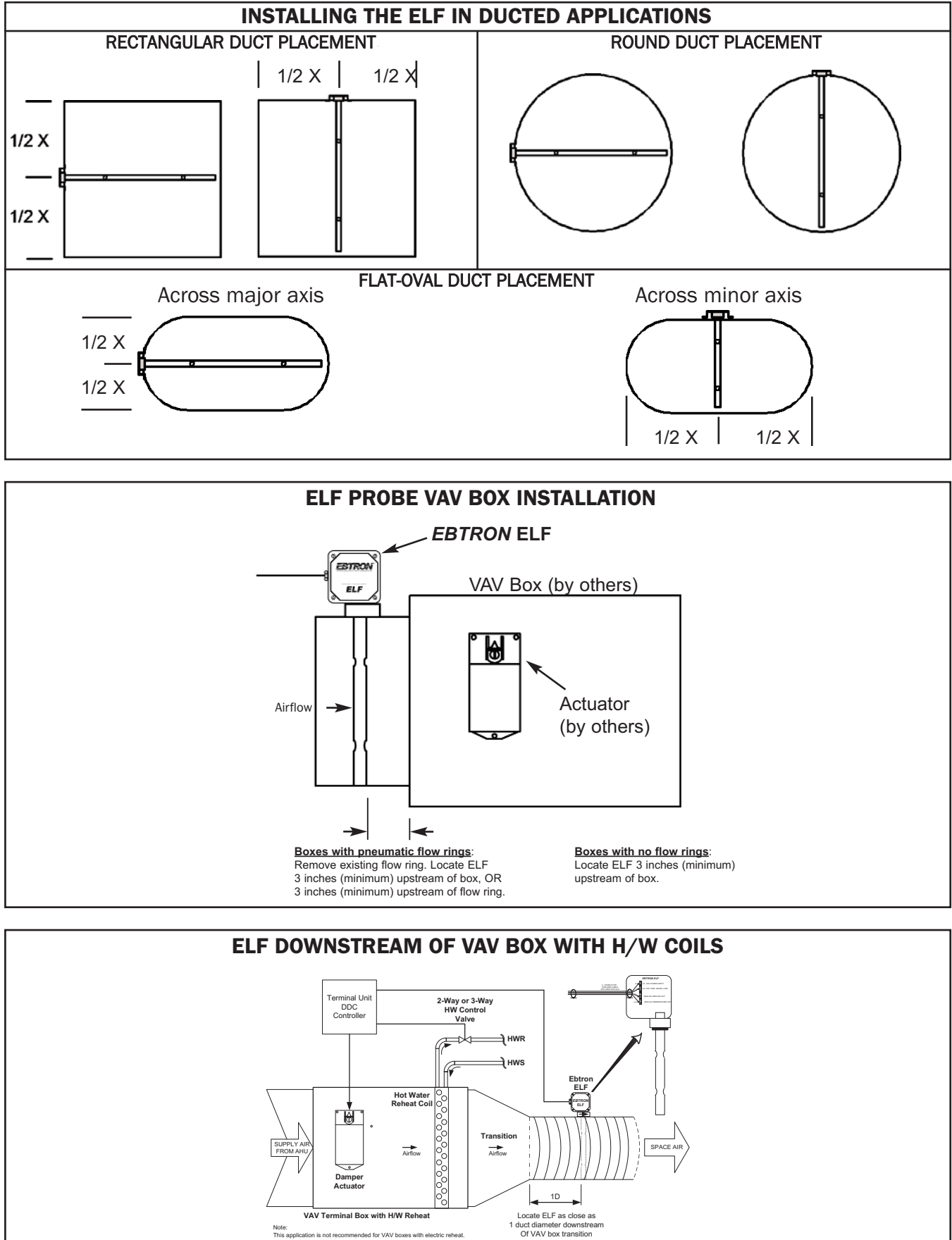
The installed location of the ELF is critical for proper performance. Refer to the Minimum Placement Guidelines in Technical Manual TM_EF-A1000 to determine the exact location recommended for the instrument.

The installed accuracy of the ELF is ensured in applications where the maximum inside duct dimension is 16 inches or less. Applications in larger duct sizes may degrade accuracy. Consult factory for these applications.

Ensure that adequate clearance exists around the duct to permit insertion of the probe, and to allow clearance for the instrument enclosure.

Insulation that interferes with probe mounting should be temporarily removed prior to installation. Mounting requires a 0.875 inches (22.2 mm) hole on the insertion side of the duct or VAV terminal box.

1. Determine where the ELF airflow measuring station is to be located as indicated on the engineer's plans.
2. Carefully open the ELF package and inspect for damage. If damage is noted, immediately file a claim with carrier.
3. Locate and mark the point on the duct or VAV box where the probe will be inserted, using the Minimum Placement Guidelines section of Technical Manual TM_EF-A1000. Figures 1 and 2 show ELF installation detail, probe orientation and dimensions.
4. Using a 0.875 inches (22.2 mm) hole saw, drill the insertion side hole where marked.
5. Place the probe through the mounting hole, making sure that the gasket is seated firmly against the integral mounting bracket. Ensure that the edge of the ELF mounting bracket is parallel to the edge of the duct or VAV terminal box, and that the airflow arrow printed on it is oriented in the direction of actual airflow. Ensure that the gasket is firmly seated against the bracket, and then fasten the mounting bracket at the four mounting holes using appropriate sheet metal screws.
6. Route the ELF instrument cable to the customer provided BAS interface. The following sections of this document describe instrument set up and operation.



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Figure 1. ELF Installation Applications and Orientation

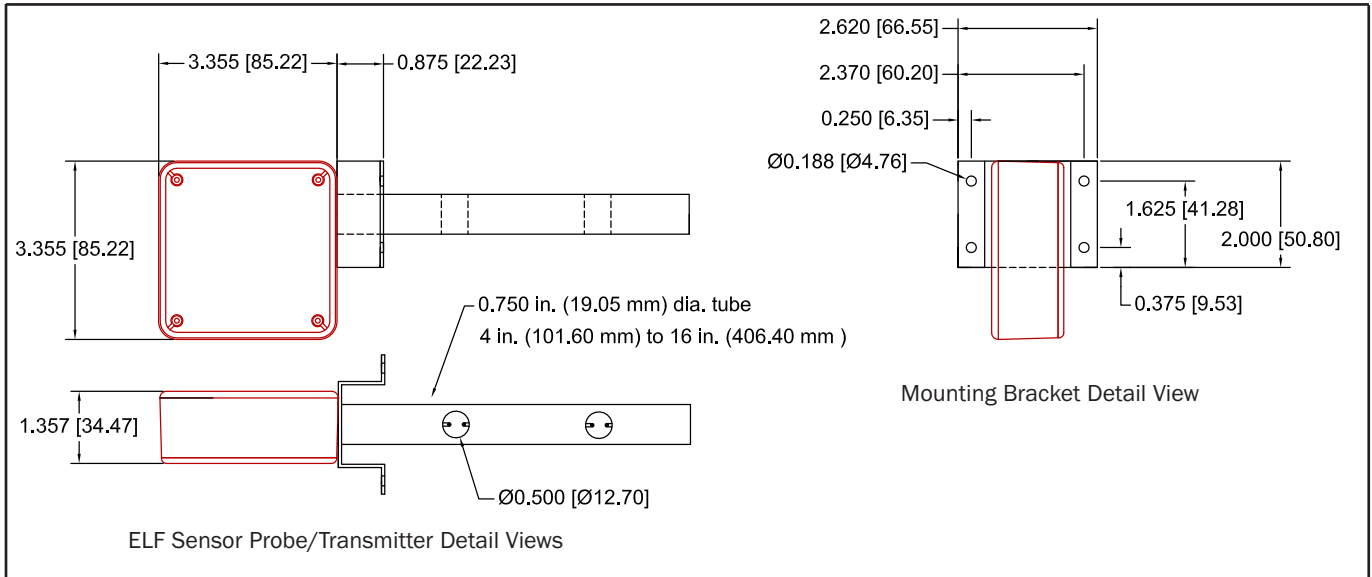


Figure 2. ELF Installation Dimensions

3. ELF PREPARATION FOR USE

Dual output ELF models provide two separate linear analog outputs with one for measured airflow (or equivalent velocity pressure) and the other for measured temperature. Single output ELF models provide a single analog output for airflow. The airflow analog output can be set for either air flow or equivalent velocity pressure measurement with four field selectable full scale range options. On the dual output ELF, the temperature output is set for a full scale range of -20 to 120°F (-28.9 to 48.9°C).

Preparation for use consists of connecting 24VAC input power and analog output signal wires from the ELF to the BAS interface, and if required, setting the ELF analog output CONFIG switch options (measurement mode, analog output signal type and full scale measurement range options).

4. ELF INTERCONNECTIONS

The ELF is equipped with plenum rated 18 AWG interconnecting cable for power and analog output connections with customer equipment. Connect 24 VAC power and analog output to customer interface as outlined in the following paragraphs. Refer to Figures 3 to 5 and the following ELF cable color code descriptions:

- Red** 24 VAC power
- Black*** Common ELF Power/Signal Ground (for 24 VAC and for analog output)
- White** Airflow Analog output signal
- Green** (on ELF dual analog output models only) Temperature Analog output signal

***CAUTION**



The ELF is equipped with a common 24VAC ground and analog output signal return. EBTRON strongly recommends that the BAS control interface be connected to the ELF analog output using TWO separate wires (twisted shielded pair) in order to eliminate any potential voltage drop on the common (from the 24VAC return) that would otherwise cause inaccurate readings.

CAUTION

To prevent damage to the ELF, deactivate 24 VAC power source until all connections to the instrument are completed.

NOTE

The 24 VAC input ground (GND) connection is shared with the analog output signal ground. If an isolated output is desired, a dedicated transformer is required to power the ELF.

4.1 ELF 24 VAC Power Connections

The ELF requires a power source capable of providing 22.8 to 26.4 VAC at 5 VA.



CAUTION
24 VAC power must be deactivated before making connections to the instrument.

Connect 24VAC power between the red wire and black wire as shown in Figures 4 and 5.

4.2 ELF Analog Output Connections

The ELF provides separate 0-10VDC (or 2-10VDC) analog outputs corresponding to airflow (or equivalent velocity pressure) and temperature. The outputs are capable of driving 20mA loads. The analog outputs are not isolated from the input power. The 24VAC input ground connection is shared with the analog signal ground (black wire - GND). If isolated outputs are required, the ELF must be powered by a dedicated transformer.

Connect the analog airflow output (white wire), temperature output (green wire on EF-A1001 only) and the signal common (black wire) to the BAS monitor/control interface using shielded twisted pair cable as shown in Figures 4 and 5.

4.2.1 Converting the ELF Analog Output for 4-wire Current Loops

The VDC output circuit of the EF-A1000 transmitter can drive the input circuit of devices designed to measure 4-wire current loops with a resistive load ≥ 250 ohms.

5. ELF ANALOG OUTPUT CONFIGURATION OPTIONS (CONFIG SW1 - SW4)

To access the field selectable analog output configuration switches, remove the four retaining screws at each corner of the ELF enclosure cover. Configuration selector switches SW1 through SW4 are part of a four-switch DIP package labeled CONFIG. Figure 3 shows the ELF main circuit board and the individual switches for setting the output measurement mode, analog output voltage range and output full scale values. Factory default switch settings are all OFF. The table below shows the CONFIG switch settings and resulting operation for each of the ELF model versions.

Table 1. CONFIG Switch Settings

SW POSITION -----> ↓ OUTPUT OPTION	SW1 POSITION MEASUREMENT MODE		SW2 POSITION ANALOG OUT SELECT		SW3/SW4 POSITION AIR FLOW MEASUREMENT RANGE SELECT			
	OFF	ON	OFF	ON	OFF/OFF	ON/OFF	OFF/ON	ON/ON
STANDARD (NO /A1 SUFFIX)	AIRFLOW	VEL PRESSURE	0-10VDC	2-10VDC	3000 FPM 0.5 lwc	2000 FPM 0.25 lwc	1000 FPM 0.15 lwc	500 FPM 0.05 lwc
/A1 MODEL SUFFIX	AIRFLOW	VEL PRESSURE	0-5VDC	1-5VDC	3000 FPM 0.5 lwc	2000 FPM 0.25 lwc	1000 FPM 0.15 lwc	500 FPM 0.05 lwc

BOLD TYPEFACE INDICATES FACTORY DEFAULT SWITCH SETTINGS

IG_EF-A1000-T_R1A

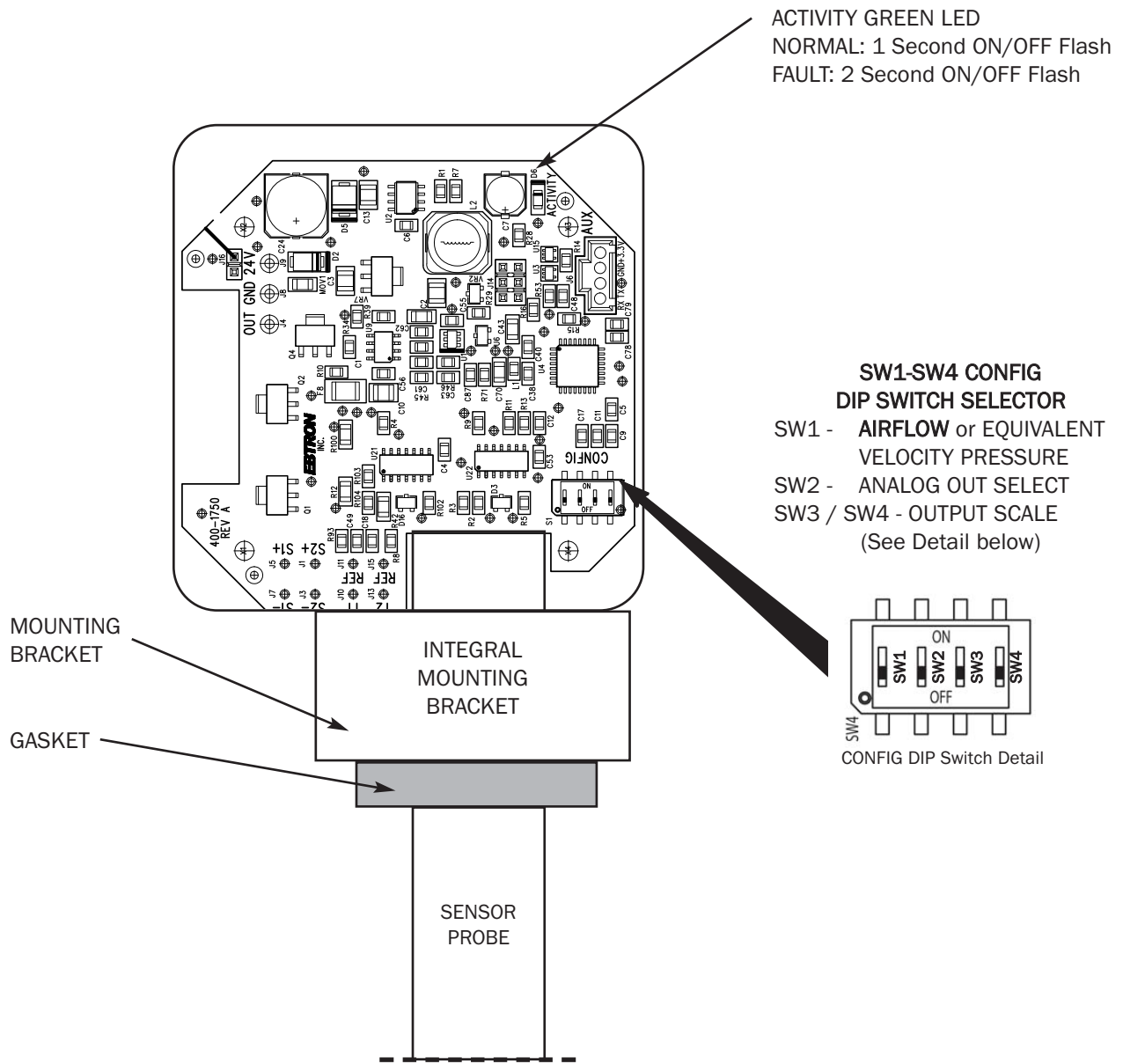
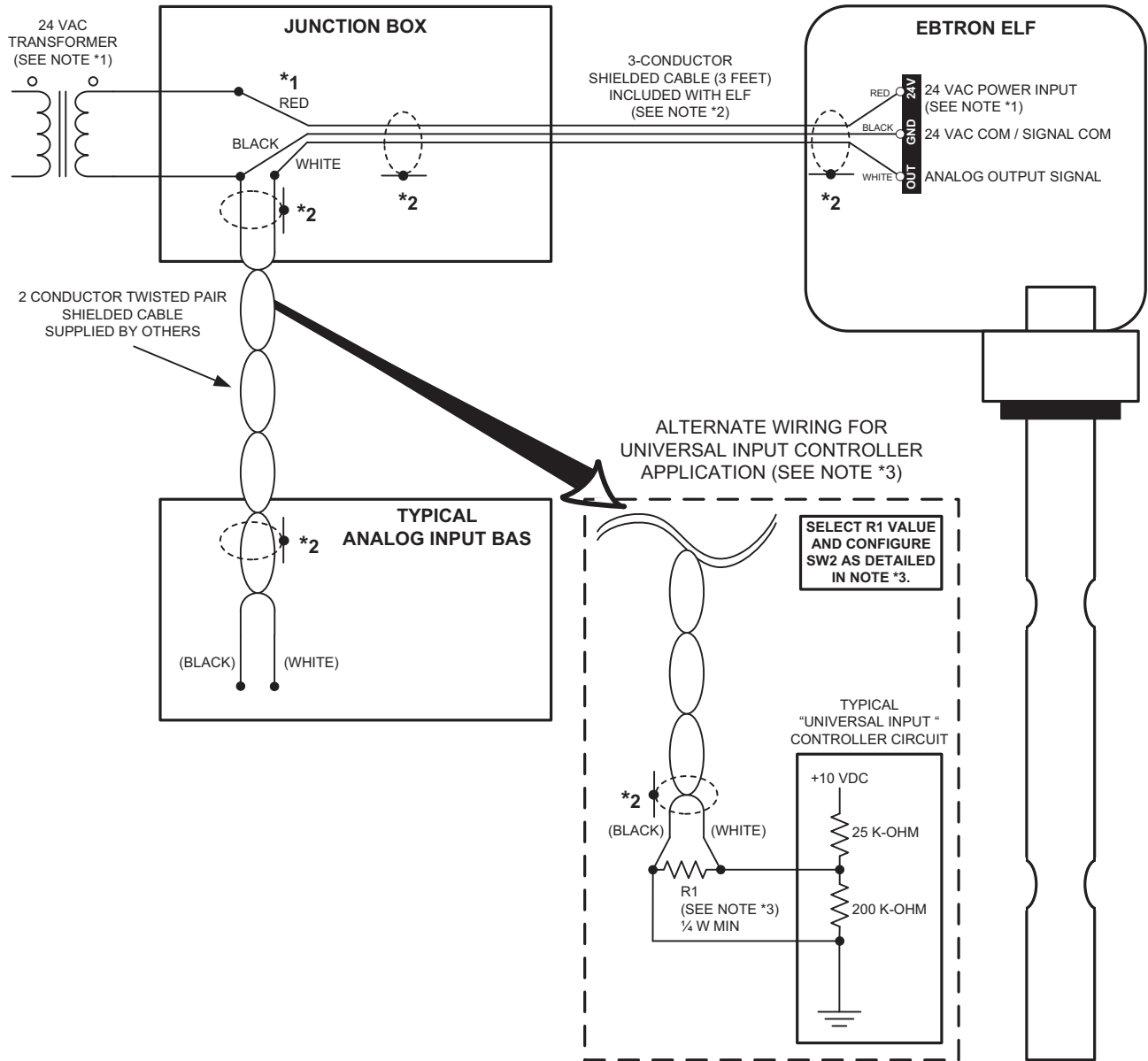


Figure 3. ELF Main Circuit Board and Configuration Option Selector Detail

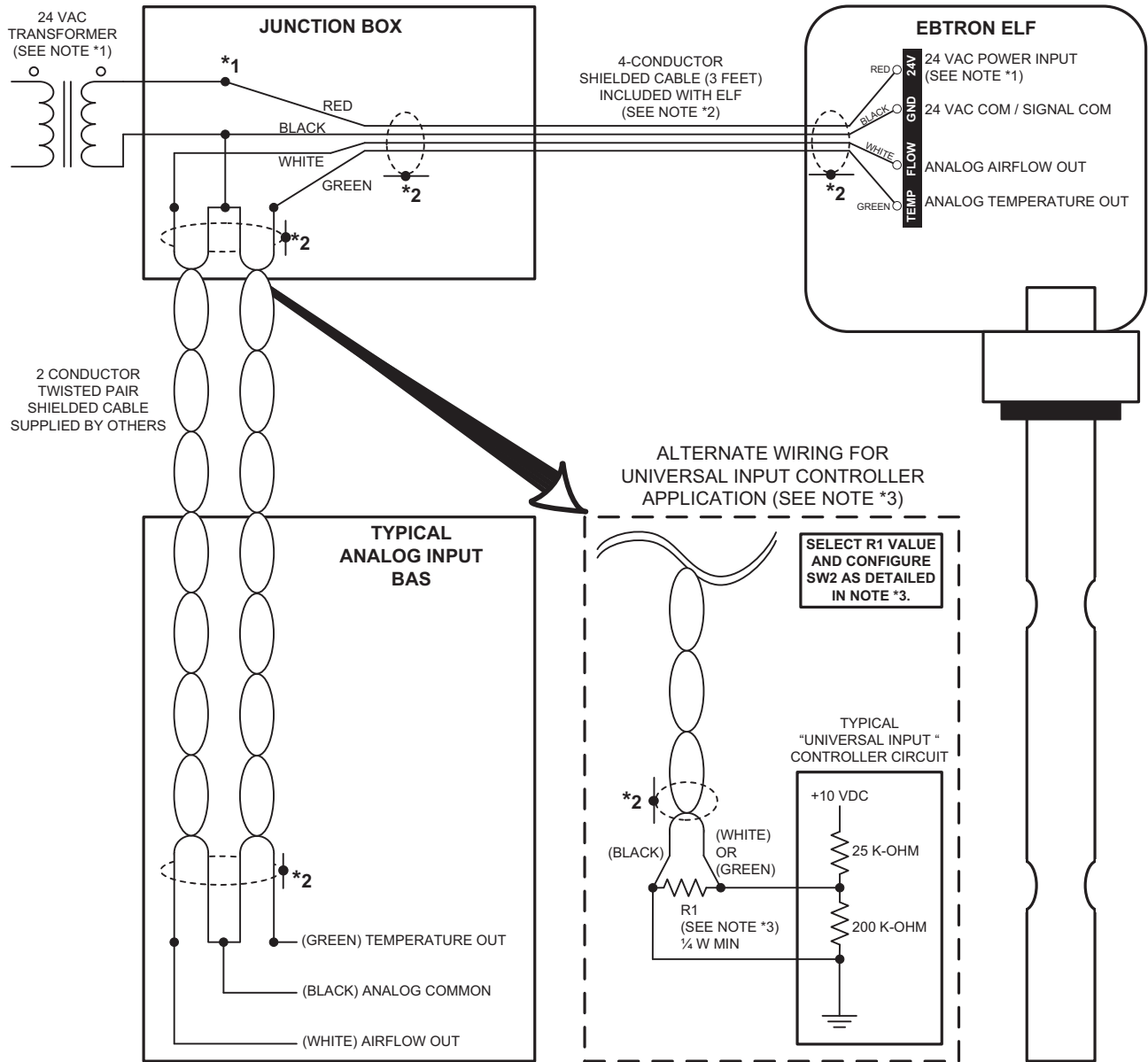


*** NOTES:**

- *1: THE 24 VAC COMMON AND ELF ANALOG OUTPUT SIGNAL COMMON ARE SHARED. THEREFORE, ON MULTIPLE ELF INSTALLATIONS ENSURE THAT ALL TRANSMITTERS ARE WIRED TO THE SAME TERMINALS ON THE 24 VAC POWER SOURCE.
- *2: CONNECT CABLE DRAINS TO EARTH GROUND AT ONE END OF EACH CABLE ONLY.
- *3: FOR UNIVERSAL INPUT CONTROLLER APPLICATIONS WITH PULL-UP RESISTORS ON ELF STANDARD AND ELF MODELS WITH /A1 SUFFIX, RESISTOR R1 MUST BE CONNECTED ACROSS THE CONTROLLER'S ANALOG INPUTS AS SHOWN. SELECT R1 VALUE AS FOLLOWS: **FOR STANDARD ELF, SET SW2 ON (FOR 2-10VDC OUTPUT), AND SELECT R1=500 OHMS. FOR ELF /A1 VERSION, SET SW2 ON (FOR 1-5VDC OUTPUT) AND SELECT R1=250 OHMS.**

Figure 4. EF-A1000 ELF Single Output Power and Signal Wiring Interconnections

IG_EF-A1000-T_R1A



*** NOTES:**

- *1: THE 24 VAC COMMON AND ELF ANALOG OUTPUT SIGNAL COMMON ARE SHARED. THEREFORE, ON MULTIPLE ELF INSTALLATIONS ENSURE THAT ALL TRANSMITTERS ARE WIRED TO THE SAME TERMINALS ON THE 24 VAC POWER SOURCE.
- *2: CONNECT CABLE DRAINS TO EARTH GROUND AT ONE END OF EACH CABLE ONLY.
- *3: FOR UNIVERSAL INPUT CONTROLLER APPLICATIONS USING PULL-UP RESISTORS, R1 MUST BE CONNECTED ACROSS THE CONTROLLER'S ANALOG INPUTS AS SHOWN. R1 VALUE AS FOLLOWS:
FOR STD ELF VERSIONS, SET SW2 ON (FOR 2-10VDC OUTPUT), AND SELECT R1=500 OHMS.
FOR ELF /A1 VERSIONS, SET SW2 ON (FOR 1-5VDC OUTPUT), AND SELECT R1=250 OHMS.

Figure 5. EF-A1001 ELF Dual Output Power and Signal Wiring Interconnections

6. ELF INITIAL START UP / NORMAL OPERATION

The following procedure is intended for initial start up of the instrument. Following the initial set up, no further user activity is required during normal operation.

1. Remove the cover to the electronics enclosure by removing the four screws on the cover.
2. Make sure that the 24VAC circuit breaker used to power the ELF is turned OFF until all wiring is complete!
3. Confirm 24VAC connection from the power source to the ELF 24VAC wire (red wire) as outlined in the ELF 24VAC Power Connections section of this document.
4. Confirm common ground 24VAC and signal ground connection from the power source to the ELF at the black wire.
5. Confirm ELF analog airflow (and temperature for EF-A1001) signal output connections at the white wire (and green wire for EF-A1001), to the analog input of the BAS as outlined in ELF Analog Output Connections section of this document. Note that the ground of the BAS must be at the same voltage reference as the ground of the ELF and the power source.
6. Set the desired analog output options using CONFIG switches SW1 to SW4 as outlined in the ELF Analog Output Option Switch Settings section of this document.
7. Activate the 24VAC power source to power on the ELF.
8. Following a brief instrument initialization, the green Activity LED will continuously flash ON for 1 second, then OFF for 1 second. This indicates normal operation. In the event of a sensor fault, the LED will produce longer continuous flashes ON for 2 seconds, and OFF for 2 seconds.
9. Confirm that the BAS is receiving the analog output signals that indicate instrument airflow (or equivalent velocity pressure) and temperature.
10. Replace the ELF electronics enclosure cover and secure with the four screws removed in step 1.

6.1 Converting the Analog Airflow Output Signal from Linear to Volumetric flow - FPM to CFM

The analog airflow output can be converted from velocity (FPM) to an equivalent volumetric flow (CFM) by multiplying the indicated flow velocity by the free area of the sensor installed location (in square feet). For example, with the ELF installed in a 12 inch round duct, using the 0-10VDC scale and 3,000 FPM full scale output range options; an airflow output of 5VDC indicates a flow velocity of 1,500 FPM (5VDC is one-half of the 0-10VDC output, corresponding to half of the 0-3,000 FPM scale; and equals 1,500 FPM). The ELF installed duct location area in this example is calculated at **0.785 ft²** (using $\text{Pi} \times \text{duct radius}^2$, or $3.14 \times 0.5\text{ft}^2$). Multiplying the indicated instrument output of **1,500 FPM** by the duct free area of **0.785 ft²** yields an equivalent volumetric flow of **1,177.5 CFM**.

7. ELF ADDITIONAL INFORMATION

Refer to the separate Installation, Operation and Maintenance Technical Manual **TM_EF-A1000-D** for additional information, or contact your local **EBTRON** representative or our Technical Support Team at 800.2**EBTRON** (1.800.232.8766).

