

FAVCRR6C2100-B01

Digital Ventilation Controller & Fresh Air Damper



Safety & Installation Instructions

**READ AND SAVE THESE
INSTRUCTIONS**

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SAFETY INSTRUCTIONS

ATTENTION INSTALLER: This product must be installed by a qualified HVAC contractor.

WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death. Disconnect electrical power to the HVAC system before proceeding.

CAUTION

CUT HAZARD

Failure to follow this caution may result in personal injury. Sharp metal edges can cause personal injury from cuts. Use gloves when cutting plenum openings and handling ductwork.

CAUTION

INSTALLATION HAZARD

Failure to follow this caution may result in unit component damage.

Do not mount the Ventilation Controller on the supply plenum or duct. The unit will malfunction at heated temperatures and lose its calibration.

When installing the Ventilation Controller on downflow furnaces, ensure that the blower continues to run after the heat call is satisfied to prevent high temperatures from damaging the Controller circuit board.

Do not mount the Ventilation Controller downstream from any fresh air intake port, humidifier or bypass outlet. False humidity conditions will cause the Ventilation Controller to operate incorrectly.

SPECIFICATIONS

Operating temperature range	20-160°F
Maximum current through VENT relay	2A
Input voltage	22-30 VAC
Minimum VA required	2.0 VA
Ventilation time/hour	0-60 min.

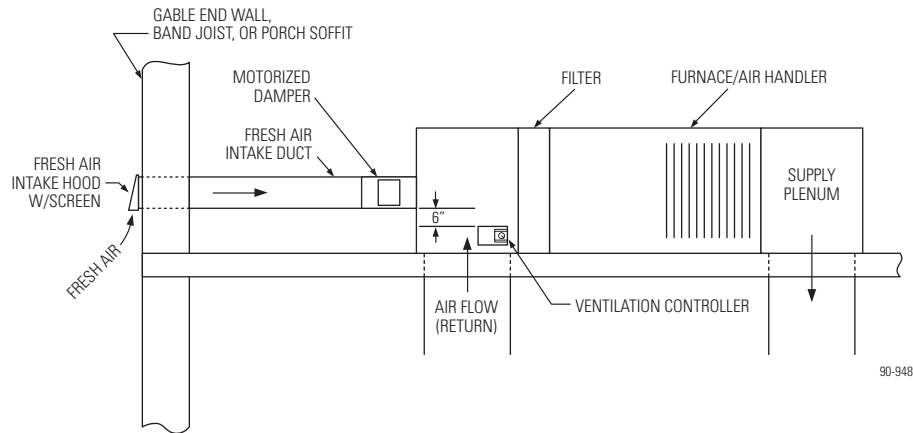
OVERVIEW

The ventilation controller will bring in fresh air and activate the HVAC fan to cycle the fresh air throughout the home. The controller is designed to meet the ASHRAE 62.2-2010 standard for ventilation. The ventilation mode selection allows for time only operation or for temperature and humidity limits to be applied to the incoming air.

MOUNTING LOCATION

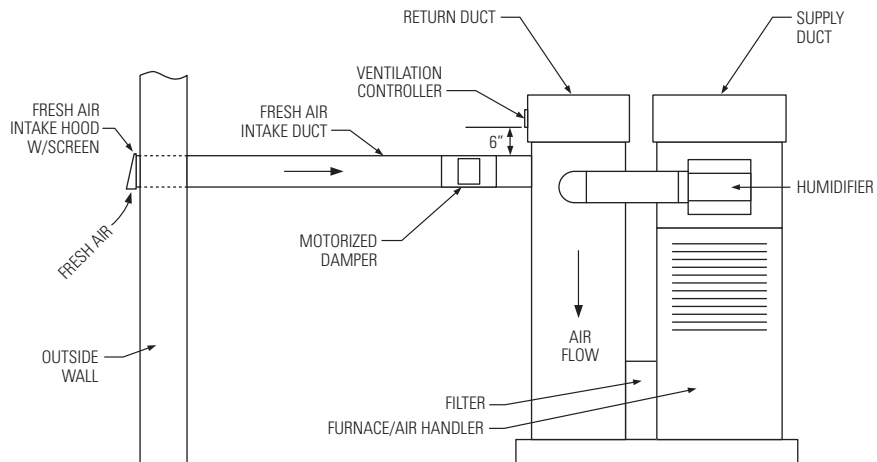
The controller must be installed in the return duct, at least 6 inches upstream of the fresh air intake opening, the humidifier if present, and/or the humidifier bypass duct opening (see **Figures 1 & 2**).

FIGURE 1 – Typical Attic Installation



MOUNTING LOCATION

FIGURE 2 – Typical Basement Installation



90-948

MOUNTING CONTROLLER

DISASSEMBLE THE CONTROLLER

Remove the knob. Remove the cover by pulling at the bottom and swinging out and up.

MOUNT CONTROLLER TO DUCT

See **Figure 3**.

After the location of the controller is selected, drill a 3/4 inch hole for the RH sensor (the RH sensor extends from the back of the controller).

Before removing the adhesive backing, use the controller to mark the mounting holes and place anchors if applicable.

Clean the mounting surface of the duct, remove the adhesive backing from the gasket on the controller, and secure the controller to the duct making sure to align mounting holes and the RH sensor with the drilled hole.

Mounting to Metal Duct

Use field supplied sheet metal screws to secure controller to duct.

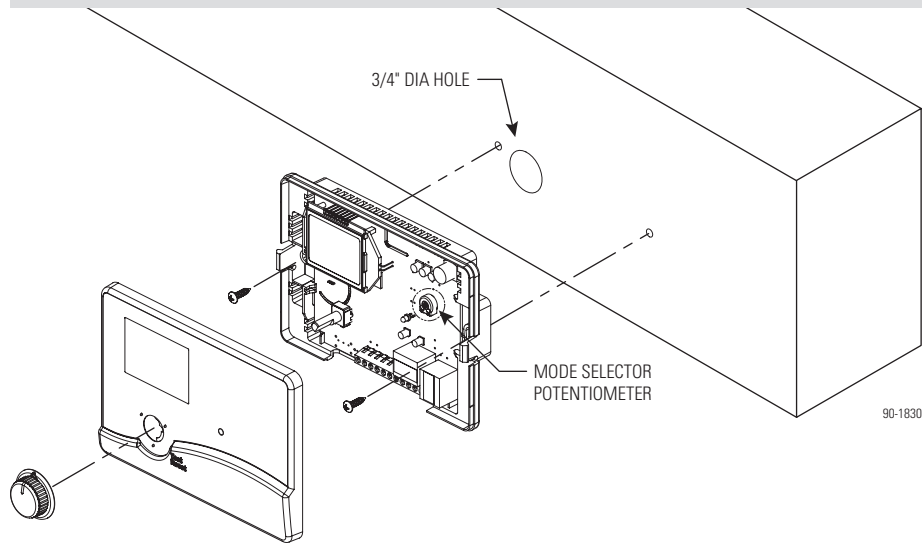
Mounting to Duct Board

Use field supplied screws and anchors to secure controller to duct.

Make sure the controller sensor gasket is sealed tightly around the drilled hole. Do not install the controller without the gasket.

MOUNTING CONTROLLER

FIGURE 3 – Fiberboard and Sheet Metal Duct Mount



DUCTWORK & DAMPER INSTALLATION

CAUTION

1. Sharp edges may cause serious injury from cuts. Use care when cutting openings and handling duct work.
2. Install damper in fresh air duct as close to the return duct as possible.
3. Do not force damper blades by hand, as damage may occur.

DUCTWORK SPECIFICATIONS

- Insulated duct of at least R-4 insulating value with a continuous vapor barrier must be used for the fresh air intake duct. The vapor barrier must be sealed at both ends.
- All flexible ducts must meet UL safety standards for Class I air ducts and connectors.
- All ducting must be installed according to HVAC codes and standards.
- For optimum performance, keep fresh air intake duct run as short and straight as possible.
- All duct connections should be sealed with UL181 foil tape or mastic to prevent leakage.
- Exterior intake hood must be weather resistant.
- Exterior intake hood must have a screen (1/4" openings) to prevent unwanted debris, animals, and insects from entering ductwork. A metal open hood model is recommended. An intake vent with plastic louvers significantly reduces airflow.
- Exterior intake hood should be above the expected snow line or a minimum of 18" above ground level, whichever is greater.
- Exterior intake hood should be a minimum of 10 ft. from appliance vents or other sources of pollution and/or extreme temperatures, such as furnace exhaust or car exhaust, etc.

DUCTWORK & DAMPER INSTALLATION

DAMPER INSTALLATION

Step 1: Install damper with crimped end downstream.

Step 2: Slide damper over end of crimped duct and secure to duct with 1/2 inch long sheet metal screws (not included).

Step 3: Insulate the damper assembly. Leave the motor cover exposed for wiring.

NOTE: Support all duct work in accordance with local code or SMACNA standards.

NOTE: The damper blade, as supplied, is fully closed when not powered and will fully open when powered. There is an adjustable thumbscrew on the outside of the actuator that can be used to limit how much the blade opens when powered. To prevent the blade from fully opening, loosen the thumbscrew, slide it to the desired position and retighten.

FIGURE 4 – Damper

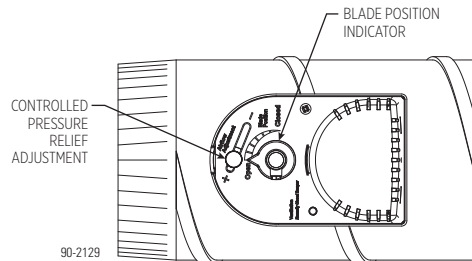
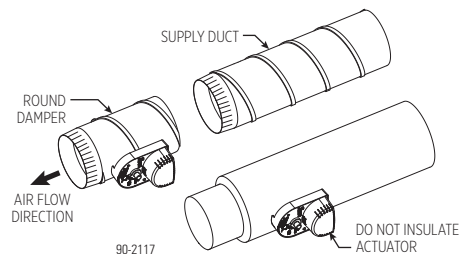


FIGURE 5 – Damper Installation



WIRING

Disconnect power to HVAC equipment. Make wire connections as shown in **Figure 6**.

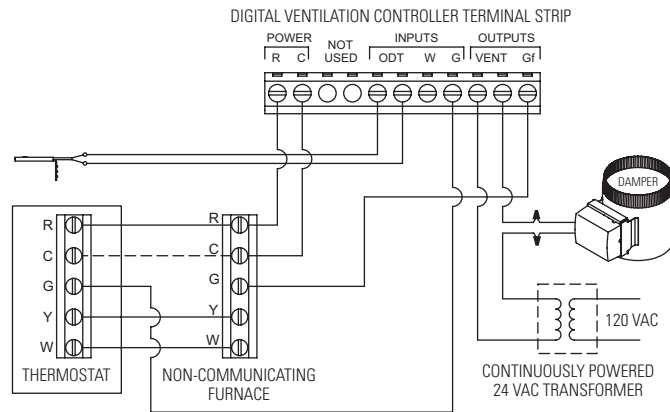
- Wire the 24VAC transformer. The transformer should be continuously energized, do not wire to the HVAC blower circuit. The transformer, damper and the ventilation controller "VENT" terminals will be wired in series.

- Wire R and C terminals on the ventilation controller to the corresponding terminals on the HVAC control board. Leaving any existing R, C, and W leads in place.

- Disconnect the thermostat wire from the HVAC terminal G and connect it to the ventilation controller G terminal.

- Wire Gf on the ventilation controller to the HVAC terminal G. The only wire connected to HVAC G will be from the ventilation controller Gf terminal.

FIGURE 6 – Wiring to Controller



90-1829

WIRING

Note 1: For communicating furnaces and fan coils only:

1. Configure the G terminal at the user interface and set fan speed. See **Figure 7**.
2. Wire the G terminal from the ventilation controller to the furnace.

Note 2: PURPOSE OF MODE B DEFAULT. Ventilation of outside air under 20°F db (-7°C) is not recommended in order to prevent cold air discharge temperatures, and meet furnace application requirements (see Figure 8). If ventilation is required under 20°F (-7°C) connect the W terminal of the ventilation controller to the corresponding terminal of the HVAC equipment. For communicating furnaces, wire the W terminal from the ventilation controller to the R terminal on the furnace. The ventilation controller must be set to Mode B.

In order to meet furnace application requirements, the mixture temperature of fresh air and returning air entering the furnace blower must not fall below 60°F db (16°C) (or intermittent operation down to 55°F db (13°C) such as when used with a night setback thermostat).

When calculating the mixture temperature, use of this ventilation damper when outdoor temperatures fall to local design conditions such as 0°F db (-17°C) must be considered if appropriate along with the settings of night setback thermostats. Failure to follow this mixture of fresh and return air temperature limit may affect reliability of heat exchangers, motors, and controls.

Use the damper stop adjustment (**Figure 4**) to set table airflows as required to meet the 60°F (16°C) minimum.

WIRING

FIGURE 7 – Using Fresh Air with Infinity/Evolution Control

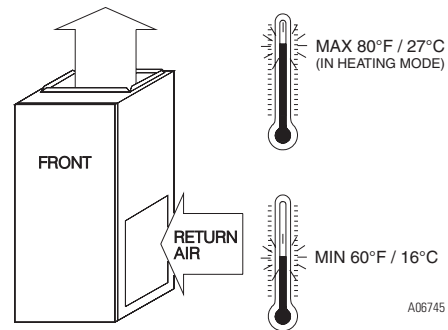


For Infinity & Evolution Touch screen controls, enter the Install/Service screen (found under Menu) by touching and holding the Service icon for 10 seconds.

Enter the Set-up menu and select “Furnace” or “Fan coil”. Then select the “G terminal”.

Then select “Fan” and the desired speed.

FIGURE 8 – Return Air Temperature Requirement for Furnaces



The furnace is designed for minimum continuous return-air temperature of 60°F db/16°C db or intermittent operation down to 55°F db/13°C db such as when used with a night setback thermostat. Return-air temperature must not exceed 80°F db/27°C db in the heating mode. Failure to follow these return-air temperature limits may affect reliability of heat exchangers, motors, and controls.

For accessory installation details, refer to the applicable instruction literature.

WIRING

If selecting a mode with temperature limits (B, C or D), the outdoor temperature sensor must be installed.

SELECT MOUNTING LOCATION FOR OUTDOOR TEMPERATURE SENSOR (ODT)

The temperature sensor can be located in the fresh air duct, in the vent inlet, or on the outside of an exterior wall. See **Figures 9 and 10**.

- Do not mount in direct sunlight.
- Do not mount closer than three feet to any exhaust vent.
- Do not route wire alongside 120VAC wires.
- Do not use more than 300 feet of wire to connect the sensor.
- Do not mount below the expected snow line on exterior walls.

FIGURE 9 – ODT Mounted Outside

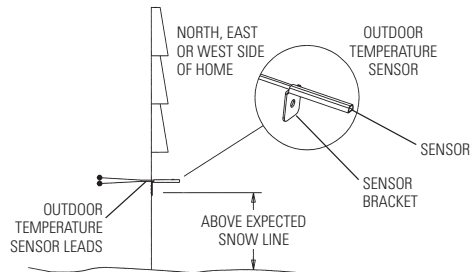
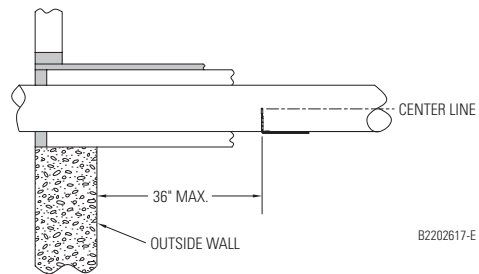


FIGURE 10 – ODT Mounted in Intake Duct



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MODE SELECTION

To access the Mode Selector Potentiometer, remove the knob and remove the cover by pulling at the bottom and swinging out and up. See **Figure 3**.



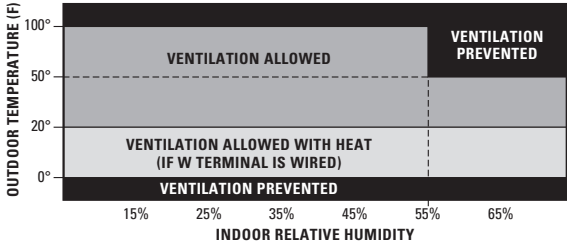
This controller is equipped with 4 mode settings. The "A" mode allows the controller ventilate based on time only. The "B", "C", and "D" modes allow the controller to ventilate based upon time, outdoor temp, and indoor humidity.

Note: PURPOSE OF MODE B DEFAULT. Ventilation of outside air under 20°F db (-7°C) is not recommended in order to prevent cold air discharge temperatures, and meet furnace application requirements (see Figure 8). If ventilation is required under 20°F (-7°C) connect the W terminal of the ventilation controller to the corresponding terminal of the HVAC equipment. The ventilation controller must be set to Mode B.

The following formula is used to determine mixed air temperature.


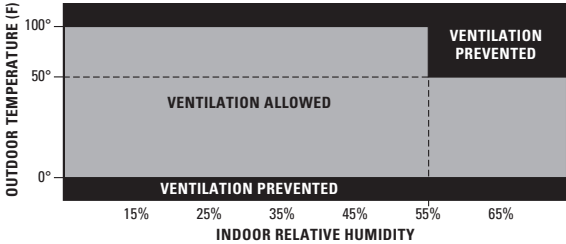

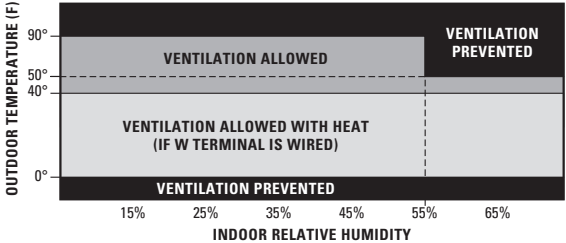
$$\frac{\left(\text{Outside CFM} \times \text{Outside Temp (}^{\circ}\text{F)} \right) + \left(\text{Indoor CFM} \times \frac{\text{R/A}}{\text{Temp (}^{\circ}\text{F)} \right)}{\text{Total CFM}} = \text{Final R/A Temp (}^{\circ}\text{F)}$$

MODE SELECTION

Position	Description	Chart
A (Time Only) 	Timer controlled ventilation (No temperature or humidity limits). <i>See note below prior to selecting this mode.</i>	This setting can be calculated with ASHRAE 62.2-2010 standard. (Temperature and humidity sensors are ignored.)
B (Default) 	Timer controlled ventilation with humidity and temperature limits. (Recommended setting.)	

Note: The unit is shipped with Mode B pre-selected. This is the recommended setting. Use of Modes A and C may result in cold air discharge temperatures. Modes A and C should only be used when a mixed air temperature calculation is completed and results in air temperatures that do not fall below the recommended limits. If Mode D is selected, and outside temperature is below 40°F, then ventilation may be limited.

MODE SELECTION

Position	Description	Chart
C 	Timer controlled ventilation with humidity and temperature limits. <i>See note on page 16 prior to selecting this mode.</i>	
D (Warm Climate) 	Timer controlled ventilation with humidity and temperature limits. <i>See note on page 16 prior to selecting this mode.</i>	

DETERMINE VENTILATION REQUIREMENTS

CALCULATE VENTILATION TIME REQUIREMENTS AND SELECT VENTILATION TIME SETTING

TABLE 1A – ASHRAE 62.2-2010 Ventilation Requirements

House Size		Number of Bedrooms									
		0 – 1		2 – 3		4 – 5		6 – 7		> 7	
Sq. Feet	Sq. Meters	CFM	L/S	CFM	L/S	CFM	L/S	CFM	L/S	CFM	L/S
≤ 1500	≤ 139	30	14	45	21	60	28	75	35	90	42
1501 – 3000	139.1 – 278	45	21	60	28	75	35	90	42	105	50
3001 – 4500	279.1 – 418	60	28	75	35	90	42	105	50	120	57
4501 – 6000	418.1 – 557	75	35	90	42	105	50	120	57	135	64
6001 – 7500	557.1 – 697	90	42	105	50	120	57	135	64	150	71
> 7500	> 697	105	50	120	57	135	64	150	71	165	78

1. Determine the minimum ventilation requirement using either Table 1A or 1B.

Table 1A is calculated using ASHRAE 62.2-2010.

Airflow in CFM = [House Area in Sq Ft x 0.01] + [(No. bedrooms +1) x 7.5].

Use the number of bedrooms (plus 1) or the number of occupants, whichever is larger.

Additional ventilation may be required for pets, hobbies, fireplaces and attached garage, etc.

Indicate the required CFM _____

DETERMINE VENTILATION REQUIREMENTS

TABLE 1B – AHSRAE 62.2-2013 Ventilation Requirements*

House Size		Number of Bedrooms									
		1		2		3		4		5	
Sq. Feet	Sq. Meters	CFM	L/S	CFM	L/S	CFM	L/S	CFM	L/S	CFM	L/S
< 500	< 47	30	14	38	18	45	21	53	25	60	28
501 – 1000	47 – 93	45	21	53	24	60	28	68	31	75	35
1001 – 1500	93 – 139	60	28	68	31	75	35	83	38	90	42
1501 – 2000	140 – 186	75	35	83	38	90	42	98	45	105	49
2001 – 2500	186 – 232	90	42	98	45	105	49	113	52	120	56
2501 – 3000	232 – 279	105	49	113	52	120	56	128	59	135	63
3001 – 3500	279 – 325	120	56	128	59	135	63	143	66	150	70
3501 – 4000	325 – 372	135	63	143	66	150	70	158	73	165	77
4001 – 4500	372 – 418	150	70	158	73	165	77	173	80	180	84
4501 – 5000	418 – 465	165	77	173	80	180	84	188	87	195	91

*For 2013, CFM and L/S values shown are used if no Blower Door Test is done. If test is done, leakage values can be deducted from the above.

Table 1B is calculated using ASHRAE 62.2-2013.

Airflow in CFM = [House Area in Sq Ft x 0.03] + [(No. bedrooms +1) x 7.5].

Use the number of bedrooms (plus 1) or the number of occupants, whichever is larger.

Additional ventilation may be required for pets, hobbies, fireplaces and attached garage, etc.

Indicate the required CFM _____

DETERMINE VENTILATION REQUIREMENTS

TABLE 2 – CFM Delivered

Duct Length	Negative Static Pressure ("w.c.) as Measured for Return Duct or Plenum											
	0.05		0.1		0.15		0.2		0.25		0.3	
	Flex	Pipe	Flex	Pipe	Flex	Pipe	Flex	Pipe	Flex	Pipe	Flex	Pipe
10 ft.	60	65	85	90	105	110	120	125	135	140	150	160
20 ft.	55	60	80	85	100	105	115	120	130	135	140	150
30 ft.	50	55	75	80	95	100	110	115	125	130	130	140

2. Determine the ventilation controller fresh air delivery rate.

Measure the negative static pressure of the return system and consult **Table 2** for approximate inlet airflow. These values are not absolute. An airflow measuring device (Nailor-Hart, etc.) will give the Ventilation Controller's airflow exactly.

For **Table 2**, the flex duct is laid loose with 2 wide 90° bends, and the damper is full open. For the rigid pipe the values are based on two 90° elbows, and the damper is open. For both cases the air intake is through a metal vent hood with a bird screen. Adjust airflow up or down for variations, including elbows or bends, or if the length of duct you're using isn't listed, etc.

Measure the delivered airflow or determine from **Table 2** and record _____

SETTING VENTILATION TIME

TABLE 3 – Ventilation Time Setting (minutes) for Airflow Delivered vs. Airflow Required for 1 Hour Cycle

CFM Delivered	CFM Required															
	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	
60	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	
80	15	25	30	40	45	55	60	70	75	85	90	100	105	115	120	
100	15	20	25	30	35	40	50	55	60	65	70	80	85	90	95	
120	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	
140	10	15	15	20	25	30	35	40	45	50	55	55	60	65	70	
160	10	10	15	20	25	25	30	35	40	45	50	50	55	55	60	

3. Determine the ventilation controller knob setting.

Use your entries from Steps 1 and 2 in the **Table 3** to determine the correct knob setting. For example, if 80 CFM is required, and the Vent delivers 120 CFM set the knob to 40 minutes.

If more outdoor air is required, increase delivered CFM by reducing bends in duct, increasing duct size, adding a second duct, or adding a powered fan.

SYSTEM CHECKOUT

1. Turn the time setting knob to the TEST/RESET position. If the installation is correct the HVAC blower will turn on (independent of heat or cooling operation) and the damper will open for 1 minute unless the knob is turned off of TEST/RESET. If the system does not operate see the Troubleshooting Guide.
2. Return the time setting knob to the calculated setting. **Do not leave in TEST/RESET, the Ventilation Controller will not operate.**

TROUBLESHOOTING

TABLE 4 – Troubleshooting Guide

Symptom	Troubleshooting Procedure
HVAC Blower does not turn on in Test Mode.	<ol style="list-style-type: none">1. Make sure HVAC equipment has power.2. Check the wiring for R, C, W and G and Gf at both the HVAC equipment and the Ventilation Controller.3. Check voltage across the Ventilation Controller R&C and C&Gf terminals. Voltage should be in the 22 VAC to 30 VAC range.
Damper does not open in Test Mode.	<ol style="list-style-type: none">1. Follow steps 1-3 above.2. Check wiring diagram to make sure the damper is wired in series with the circuit board and transformer.

TROUBLESHOOTING

TABLE 4 – Troubleshooting Guide (continued)

Symptom	Troubleshooting Procedure
The damper does not open with the HVAC blower operating.	<ol style="list-style-type: none"> The damper will not operate once the ventilation time interval has been met. For example, if the knob is turned to 5 minutes and 5 minutes has elapsed, the damper will close and it will stay closed until the next 1-hour interval. <p>For all modes except Mode A:</p> <ol style="list-style-type: none"> If the Indoor RH is above 55% and the outdoor temperature is above 50° the damper will not open because of the potential for excess humidity. If the outdoor temperature is below 0° or above 100° the damper will remain closed. Verify that the outdoor temperature sensor is located properly. See page 14. Turbulence in the return duct, plenum or mixing box can give false readings. Confirm proper location. See pages 5-6. In Mode B, a heat call is required for ventilation under 20°F. In Mode D, a heat call is required for ventilation under 40°F.
Blower turns on unexpectedly.	If ventilation time has not been met, the controller will activate the blower. This is normal operation.

TROUBLESHOOTING

TABLE 5 – Error Codes

Displayed Error Code	Troubleshooting Procedure																														
Display Error Code: E1: RH Sensor	Rotate knob to the “Test/Reset” position. After 5 seconds, the green indicator will blink, resetting the error. If E1 returns, replace the controller.																														
Display Error Code: E2: Controller Knob	Rotate knob to the “Test/Reset” position. After 5 seconds, the green indicator will blink, resetting the error. If E2 returns, replace the controller.																														
Display Error Code: E3: Outdoor Temperature Sensor	<ol style="list-style-type: none"> Make sure that the Outdoor Temperature Sensor is properly connected to the ODT terminals on the controller. Measure the resistance of the ODT sensor by removing the wires from the terminals and measuring the resistance across the wires with an ohmmeter. Confirm the reading with the temperature in the table. If the resistance value does not match the temperature value, replace the ODT sensor. Reset error by rotating knob to Test/Reset then back to the normal setting. <p>Note: ODT must be installed for Mode B, C, and D.</p> <table border="1"> <thead> <tr> <th>Outdoor Temperature (°F)</th> <th>Resistance (kΩ) ±10</th> </tr> </thead> <tbody> <tr><td>-30</td><td>231.8</td></tr> <tr><td>-20</td><td>163.4</td></tr> <tr><td>-10</td><td>117.3</td></tr> <tr><td>0</td><td>84.8</td></tr> <tr><td>10</td><td>62.2</td></tr> <tr><td>20</td><td>46.1</td></tr> <tr><td>30</td><td>34.4</td></tr> <tr><td>40</td><td>26.1</td></tr> <tr><td>50</td><td>19.9</td></tr> <tr><td>60</td><td>15.3</td></tr> <tr><td>70</td><td>11.9</td></tr> <tr><td>80</td><td>9.3</td></tr> <tr><td>90</td><td>7.3</td></tr> <tr><td>100</td><td>5.8</td></tr> </tbody> </table>	Outdoor Temperature (°F)	Resistance (kΩ) ±10	-30	231.8	-20	163.4	-10	117.3	0	84.8	10	62.2	20	46.1	30	34.4	40	26.1	50	19.9	60	15.3	70	11.9	80	9.3	90	7.3	100	5.8
Outdoor Temperature (°F)	Resistance (kΩ) ±10																														
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70	11.9																														
80	9.3																														
90	7.3																														
100	5.8																														

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