



INSTALLATION & OPERATING INSTRUCTIONS

Model 8120X

Digital Ventilation Controller

Installed By:	
Installer Phone:	Date Installed:



**PLEASE LEAVE THIS MANUAL WITH
THE PRODUCT OWNER**

Product Info &
Digital Manual

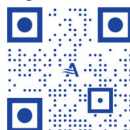


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SAFETY INSTRUCTIONS

WARNING

- **ATTENTION INSTALLER:** Read this manual before installing. Improper installation or maintenance may cause property damage or injury. It is recommended that installation, service, and maintenance be performed by a trained service technician. This product must be installed in compliance with all local, state, and federal codes.
- **ELECTRIC SHOCK HAZARD:** 120 volts may cause serious injury from electric shock. Disconnect electrical power to the HVAC system and humidifier before starting installation or servicing. Leave power disconnected until installation/service is completed.

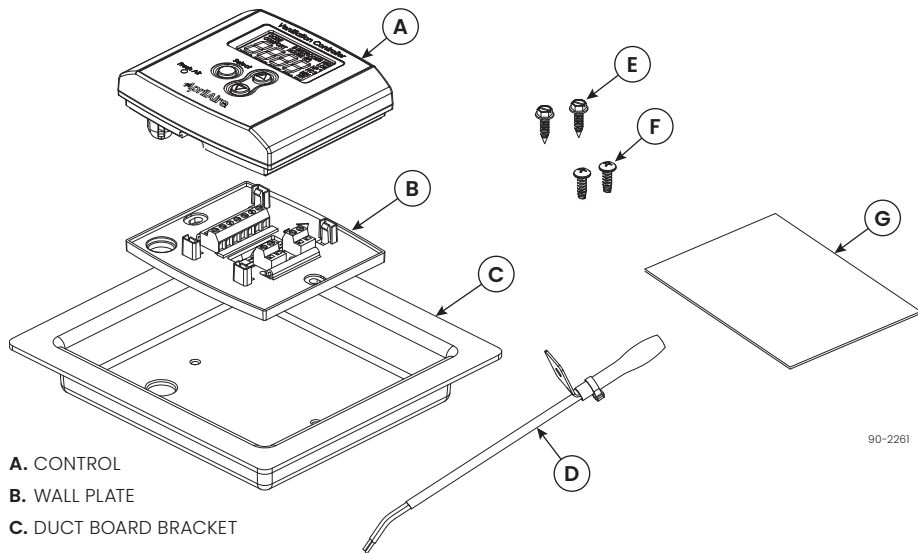
CAUTION

SHARP EDGES MAY CAUSE INJURY FROM CUTS. Use care when cutting plenum openings and handling ductwork. Always wear glasses/goggles and gloves when installing the unit.

NOTICE

- When installing the Ventilation Controller on downflow furnaces, ensure that the furnace blower continues to run sufficiently long after the heat call is satisfied to prevent temperatures from exceeding the maximum operating temperature.
- Do not mount the Ventilation Controller downstream from any fresh air intake port, humidifier bypass or zone control bypass. False humidity conditions will cause the Ventilation Controller to operate incorrectly.

PACKAGE CONTENTS



90-2261

- A. CONTROL
- B. WALL PLATE
- C. DUCT BOARD BRACKET
- D. OUTDOOR TEMP SENSOR
- E. #8 X 5/8" HEX HEAD SHEET METAL SCREW (2)
- F. #8 X 1/2" PAN HEAD TYPE 25 SCREW (2)
- G. INSTALLATION MANUAL

SPECIFICATIONS

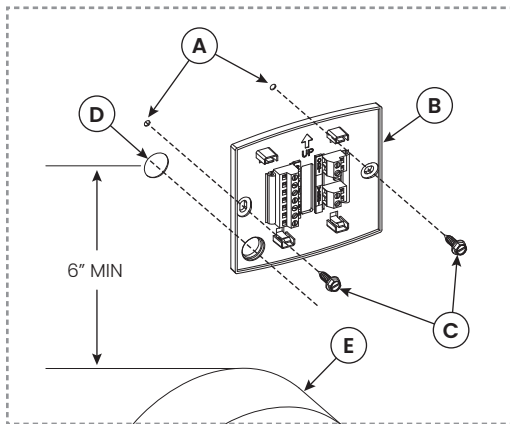
Operating Temperature Range	20°F to 140°F
Maximum Load on VENT and Gh Outputs	10 VA @ 30 VAC max
Input Voltage	18 to 30 VAC
Controller Power Consumption	2.0 VA

MOUNTING THE CONTROLLER AND OUTDOOR TEMPERATURE SENSOR

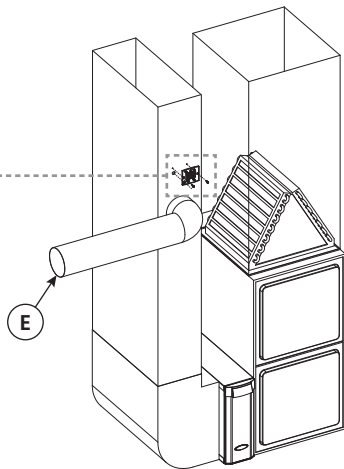
MOUNTING THE CONTROLLER TO THE RETURN DUCTWORK

SHEET METAL INSTALLATION

1. Remove the wall plate from the control and put the rest of the control in a safe location until after wiring is completed.
2. Mark the location of the wall plate sensor hole on the duct. Use a step-drill bit to create a $5/8"$ (.625") hole for the sensor.
3. Center the sensor hole in the wall plate over the hole in the duct, level the wall plate and mark the locations of the two mounting slots. Drill a small pilot hole using a #36 (.106") or smaller drill bit at the two mounting locations.
4. Use the supplied #8 standard hex head sheet metal screws to mount the wall plate to the duct.



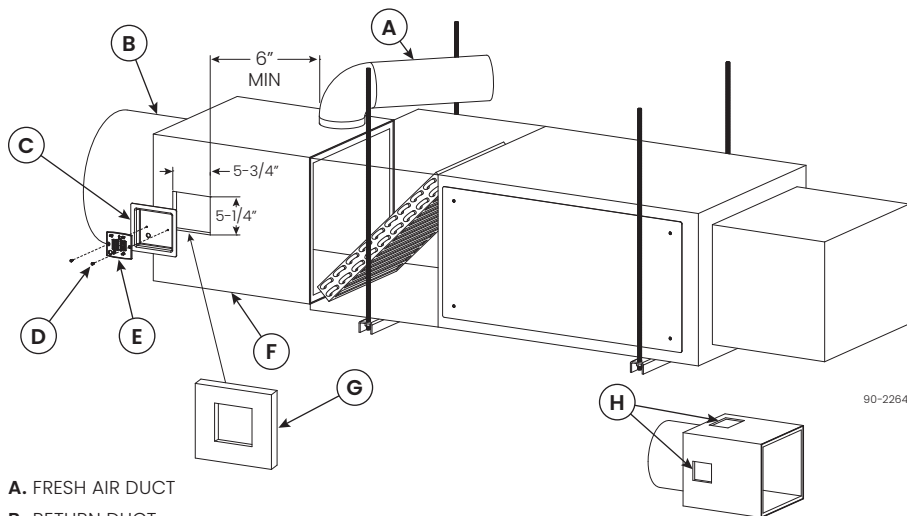
- A.** PILOT HOLES FOR SCREWS **D.** $5/8"$ DIAMETER HOLE
B. WALL PLATE **E.** FRESH AIR DUCT
C. #8 HEX HEAD SCREWS



90-2269

DUCT BOARD INSTALLATION

1. Take out the duct board mounting bracket, remove the wall plate from the control and put the rest of the control in a safe location until after wiring is completed.
2. Cut a 5.75" x 5.25" rectangular opening in the return plenum. Save the piece cut out to insulate the duct board bracket around the controller. The display of the control will run parallel with the long dimension. **Do not mount the control in a position where it is facing down.**
3. Use the supplied #8 x 1/2" type 25 pan head screws to mount the control wall plate to the duct board mounting bracket.
4. Place the bracket in the cut out and seal in place using metal foil tape and/or mastic.
5. Insulate the duct board bracket around the wall plate using the plug cut out of the duct board.



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A. FRESH AIR DUCT

B. RETURN DUCT

C. DUCT BOARD BRACKET

D. #8 PAN HEAD TYPE 25 SCREW

E. WALL PLATE

F. DUCT BOARD RETURN PLENUM

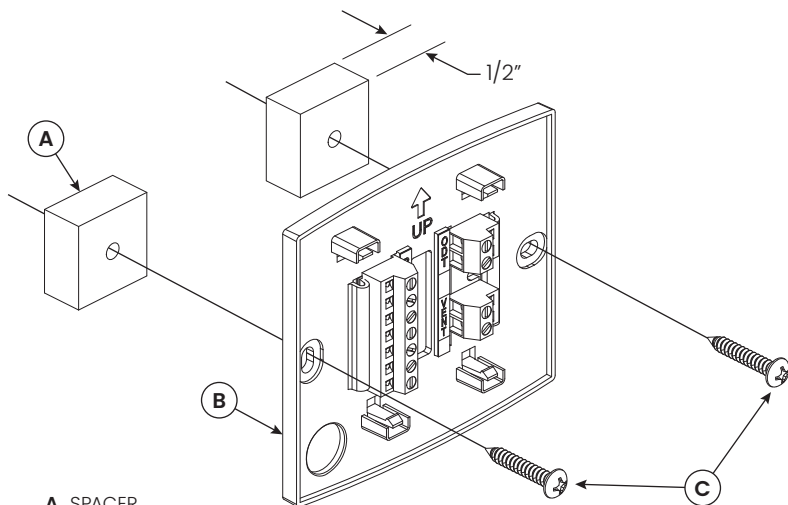
G. USE CUT-OUT INSULATION TO INSULATE DUCT BOARD BRACKET AROUND CONTROLLER

H. MOUNT VENT CONTROLLER SIDE OR TOP ONLY

MOUNTING THE CONTROLLER IN A CLOSET RETURN PLENUM

NOTE: Do not mount directly in the path of the outdoor air. Mount the control where it will sense the relative humidity of the return air.

1. Use spacers or brackets to mount the controller to an interior wall surface or return plenum/duct surface that is at room temperature (i.e. do not mount to supply ductwork or to the air handler/furnace) to space the wall bracket a minimum of 1/2" away from the surface.
2. Mount the wall bracket to the surface using #8 screws (field supplied – **do not use flat head screws**) and wall anchors (field supplied) if mounting to drywall. Ensure that there is room for air to flow behind the wall bracket. **DO NOT install screws in the wall bracket anywhere except intended mounting holes.**



A. SPACER

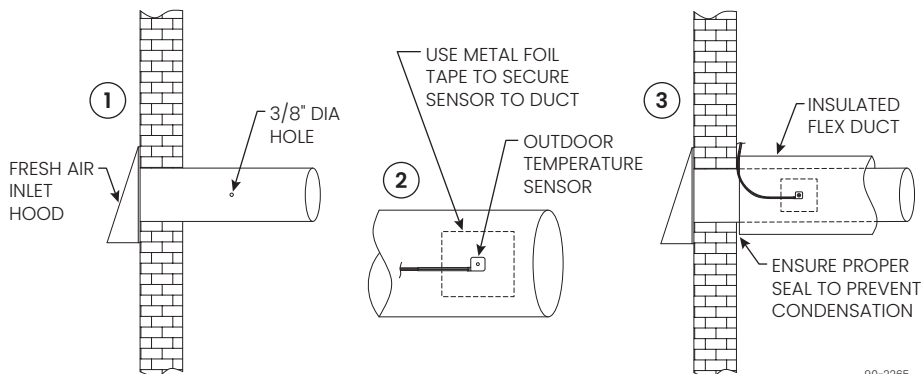
B. WALL PLATE

C. #8 SCREW (2) DO NOT USE FLAT HEAD SCREWS

90-2278

MOUNTING THE OUTDOOR TEMPERATURE SENSOR

1. Drill a 3/8" diameter hole in the duct of the fresh air inlet hood.
2. Install the outdoor temperature sensor into the duct and use metal foil tape to secure it in place and seal the opening. Run the wire toward the inside of the exterior wall.
3. Secure ductwork to the inlet hood duct while allowing the wire of the sensor to extend outside of the insulation. Tape and/or mastic the duct as needed and properly insulate.



90-2265

WIRING

Disconnect power to the HVAC system to prevent electrical shorts while wiring.

1. Run a 2-conductor cable from the control to the outdoor temperature sensor (if installed) and wire to the controller ODT terminals.
2. Run an 8-conductor thermostat cable from the control to the HVAC equipment. Wire the controller to the HVAC equipment in accordance with **FIGURE 1** or **FIGURE 2**. Contact customer service if wiring assistance is needed for other equipment configurations.
3. Run a 2-conductor cable from the control to either the damper in Model 8126X installations or to the Fresh Air Ventilator and wire according to **FIGURE 3** (Model 8140NC or Model 8145NC), **FIGURE 4** (Model 8142NC), **FIGURE 5** (Model 8144NC) or **FIGURE 6** (damper).

(continued on page 12)

FIGURE 1: WIRING TO FURNACE

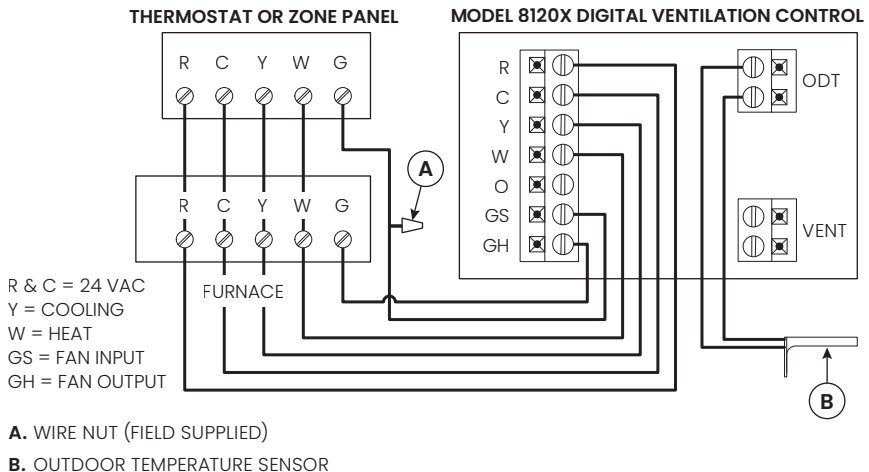


FIGURE 2: WIRING TO HEAT PUMP

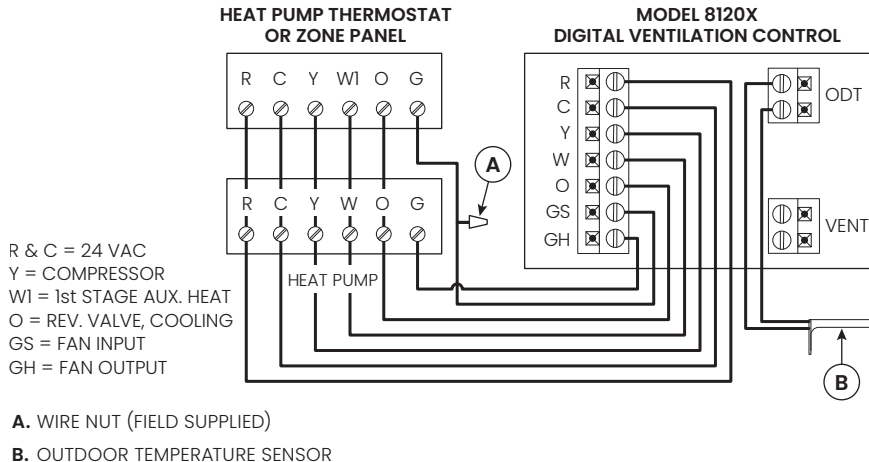


FIGURE 3: WIRING TO MODEL 8140NC OR 8145NC FRESH AIR VENTILATOR

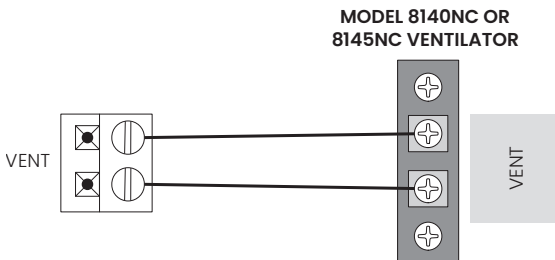


FIGURE 4: WIRING TO MODEL 8142NC FRESH AIR VENTILATOR

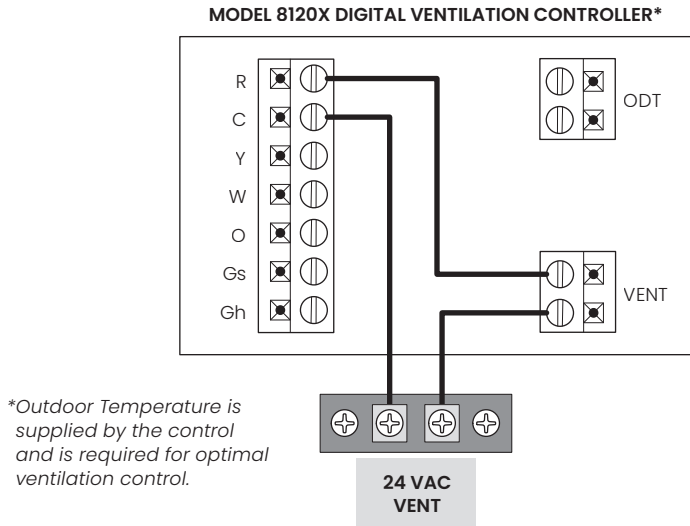


FIGURE 5: WIRING TO MODEL 8144NC FRESH AIR VENTILATOR

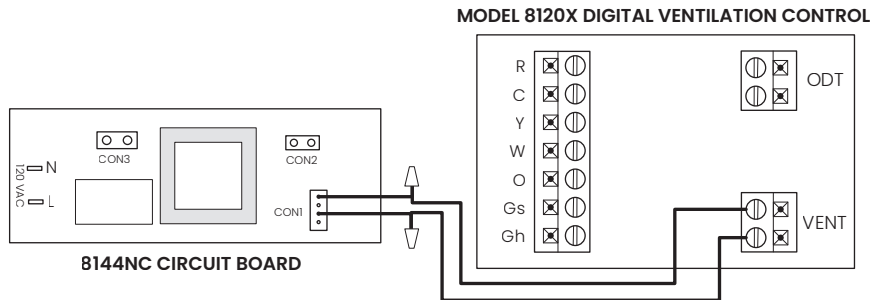
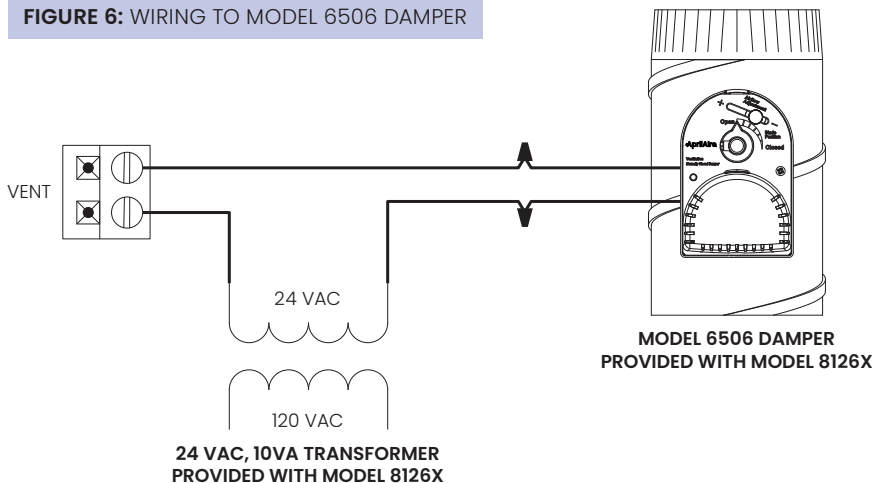
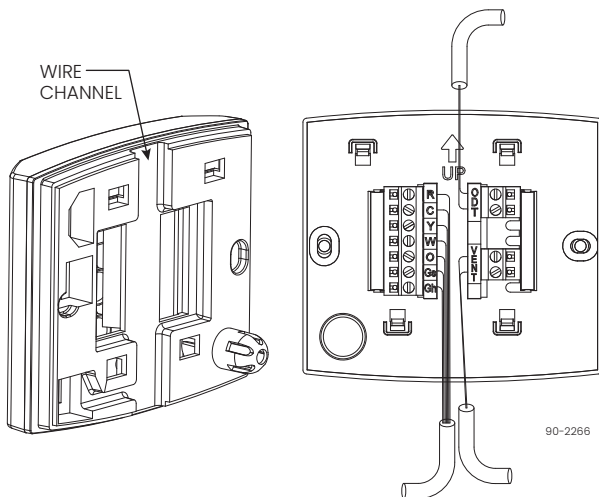


FIGURE 6: WIRING TO MODEL 6506 DAMPER



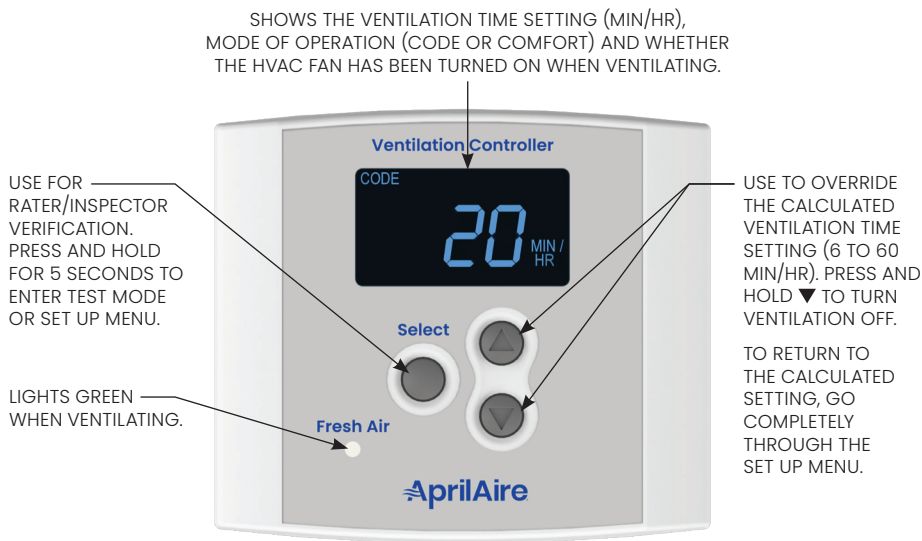
(continued from page 9)

4. Route the wires into the channels in the back of the control to either the top or bottom of the control and snap the control onto the wall plate.
5. Restore power to the HVAC system when complete.



OPERATION

NOTE: The display will appear faint normally; the first press of any button will turn on the display at full power.

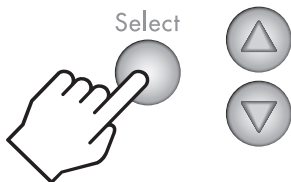


SET UP MENU

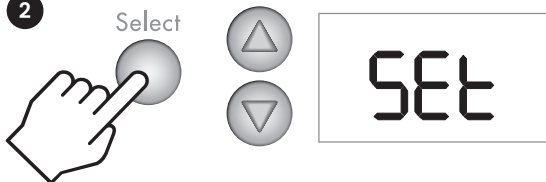
NOTICE

Before setting up the control for use, the amount of ventilation air being delivered (CFM) by the installed ventilation system must be measured.

- 1 Hold for 5 seconds, then release.



- 2



Throughout the Set Up Menu, the ▲ and ▼ buttons are used to change values, the **Select** button is used enter the value and move on to the next Set Up Menu item.

TABLE 1: SET UP MENU

Menu Item	Values ▲ ▼	Description
	HP or HC	HP if wiring to a heat pump. HC if wiring to furnace and AC.
	A 10 or A 13	ASHRAE code year. A 10 for ASHRAE 62.2 2010 A 13 for ASHRAE 62.2 2013
	1 to 10	Number of bedrooms – used to calculate required continuous ventilation rate.
	500 to 7500 square feet	Square footage – used to calculate required continuous ventilation rate.
	30 to 250 CFM	Measured outdoor airflow delivered during ventilation.
	OFF, 85°F to 105°F	Ventilation high temperature limit. Ventilation is limited when the outdoor temperature exceeds the setting. Turn OFF if no high limit is desired.
	OFF, -10°F to 40°F	Ventilation low temperature limit. Ventilation is limited when the outdoor temperature falls below the setting. Turn OFF if no low limit is desired.
	On, bLnd, or OFF	ON HVAC fan turns on whenever ventilation occurs. bLnd (blend) HVAC fan turns on with ventilation only when the outdoor temperature is outside a set range. OFF HVAC fan is not turned on with ventilation.

TABLE 1: SET UP MENU

Menu Item	Values ▲ ▼	Description
	OFF, 60°F to 5°F less than Vent. High Temp. Limit	Only available when blnd is selected. When the outdoor temperature is above the setting, the HVAC fan will be turned on to mix (blend) outdoor air with indoor air for tempering.
	OFF, 5°F less than Vent. Low Temp. Limit to 55°F	Only available when blnd is selected. When the outdoor temperature is below the setting, the HVAC fan will be turned on to mix (blend) outdoor air with indoor air for tempering.
	codeE or cFrt	codeE No RH limits and any missed ventilation due to temperature is made up per ASHRAE 62.2-2010. cFrt (comfort) Adds indoor RH limits to ventilation; ventilation missed due to limits is not made up.
	OFF, 45% to 70% RH	Only available when cFrt is selected. When the outdoor RH exceeds the setting, ventilation will not occur.
	OFF, 10% to 30% RH	Only available when cFrt is selected. When the outdoor RH drops below the setting, ventilation will not occur.

When all Set Up Menu options have been entered, the control will display **doneE**.

TEST MODE

After wiring and set up have been completed, Test Mode can be used to verify that all components in the ventilation system function and that wiring to the HVAC system fan is correct.

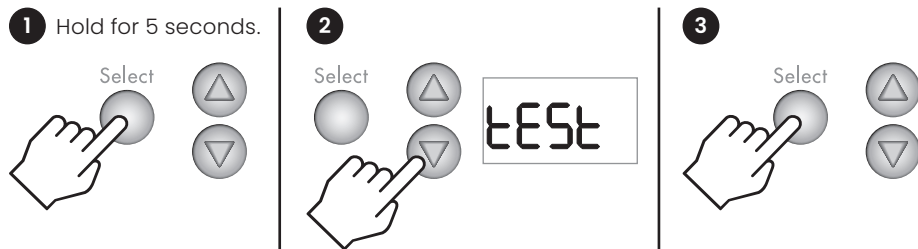
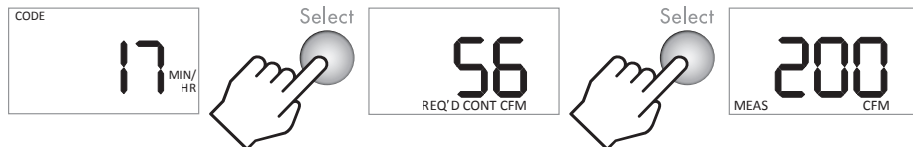


TABLE 2: TEST MODE MENU

Test Sequence	Description
	Shows - - - °F to indicate that no separate outdoor temperature sensor has been installed. V42SNX installations do not require a separate sensor – outdoor temperature is measured by the control's on-board sensor.
	tEst shows on the display, the green Fresh Air LED will light and either the damper will open or the power ventilator will turn on depending on what has been wired to the VENT terminals.
	After 15 seconds, the HVAC fan will turn on if it has been wired and set up to do so. The display will show FAN along with tEst .
	After 45 seconds Test Mode automatically completes and the display returns to the operating display.

RATER/INSPECTOR VERIFICATION

To verify the ventilation time setting, press the **Select** button to scroll through the calculated **Required Continuous CFM** and the **Measured CFM** for this installation. If any value does not match the expected value, the Set Up Menu must be entered to change the floor area, number of bedrooms or measured CFM.



The calculation used for the ventilation time setting is:

$$\text{Minutes per Hour} = 60 * \left(\frac{\text{Required Continuous CFM}}{\text{Measured CFM}} \right)$$

Measured CFM is entered during set up and **Required Continuous CFM** is calculated according to the equations below.

Calculation when selecting **A10** (ASHRAE Standard 62.2-2010) in the set up menu:

$$\text{Required Continuous CFM} = ((\text{Floor Area ft}^2 * .01) + (\text{No. of Bedrooms} + 1) * 7.5)$$

Calculation when selecting **A13** (ASHRAE Standard 62.2-2013 or later) in the set up menu:

$$\text{Required Continuous CFM}^1 = ((\text{Floor Area ft}^2 * .03) + (\text{No. of Bedrooms} + 1) * 7.5)$$

Note 1: Unlike the ASHRAE Standard 62.2-2010, the ASHRAE Standard 62.2-2013 and subsequent versions does not include a default infiltration rate in the base formula but allows for an infiltration credit which reduces required continuous CFM based on natural infiltration. It is determined using a blower door test and a calculation incorporating weather and shielding factors. Further information and helpful calculators to determine the infiltration credit can be found at the following website from ENERGY.GOV: <https://basc.pnnl.gov/redcalc/about>

Required continuous CFM after the infiltration credit is subtracted can be significantly lower than the ASHRAE 62.2-2013 base calculation.

The calculation performed by the 8I20X control with menu setting A13 does not account for the infiltration credit. The required continuous CFM must be manually adjusted to account for this infiltration credit.

SEQUENCE OF OPERATION

"CODE" SETTING

The control will turn on ventilation with a heating, cooling or fan call for the set number of minutes during a one-hour cycle period.

- If outdoor temperature is above the high temperature limit, ventilation will not occur with a call for cooling or fan call.
- If outdoor temperature is below the low temperature limit, ventilation will occur with a heat call.
- If outdoor temperature is between the high and low temperature limits and the HVAC equipment does not turn enough to meet ventilation time within the hour, the control will turn on ventilation without a heating, cooling or fan call.
 - The control will also turn on the HVAC blower if wired to do so.

If the outdoor temperature exceeds the limits set at the end of the first hour, then no additional ventilation will occur for another 60 minutes, and the cycle period will automatically adjust to four hours.

- When the ventilator starts again, it will sample the air temperature and if in range, will meet the set amount of ventilation during the four-hour cycle period.
 - For example, if Vent Time was set to 25 minutes per hour and the temperature fell below the low limit, ventilation would only occur during a heating call.
 - If the heating only operated for 10 minutes during the hour, the control will automatically change the cycle period to four hours and work to provide the additional 90 total minutes of ventilation ($25 \text{ min/hr} \times 4 \text{ hours} = 100 \text{ minutes}$, minus the 10 minutes of ventilation that occurred during heating) during the four-hour cycle period.
- If the air temperature is still out of range, the control will automatically switch to an 8-hour cycle period, then a 12-hour cycle period and finally a 24-hour cycle period. During 8, 12 and 24 hour cycle periods, the total ventilation time increases to compensate for ventilation effectiveness as defined in ASHRAE Standard 62.2-2010. When the cycle period automatically adjusts to 24-hours, the control will turn on ventilation to meet the requirements even if the temperature is outside of the set limits.

"COMFORT" SETTING

The control will turn on ventilation with a heating, cooling or fan call by the HVAC equipment, if the outdoor air temperature is within the high and low ventilation temperature limits and the indoor RH is within the high and low RH limits, for the set number of minutes during a one-hour cycle period. If the HVAC equipment does not turn on enough to meet the ventilation time within the hour, the control will turn on ventilation without a call, if the outdoor air temperature and indoor RH is within the set limits. The control will also turn on the HVAC system blower, if wired and set up to do so. If the outdoor temperature or indoor RH are outside of the set limits, then no ventilation will occur.

TROUBLESHOOTING

TABLE 4: TROUBLESHOOTING GUIDE

Code	Explanation	Correction
E1	Sensor failure. Non-recoverable fault. Not field-correctable.	Power cycle the control/unit. If error does not resolve itself, call technician to inspect HVAC equipment for damage. If no damage found, replace control.
E2	External temperature sensor was detected at start-up, but has failed when the control is configured to use it. The control will continue as though the temperature limits are set to OFF.	Inspect the ODT sensor connection for loose or broken wires. If no issue found, follow the instructions in TESTING ODT SENSOR RESISTANCE section that follows. If the ODT sensor functions correctly, replace control.
E4	Invalid vent input – can be caused by bad ventilation setup variables or sensor error.	You can re-enter installer setup by pressing and holding the Select button to check the installer setup. If the installer setup is OK, replace control.

TABLE 4: TROUBLESHOOTING GUIDE

Code	Explanation	Correction
Ventilator or Fresh Air Damper does not operate in Test Mode	Incorrect installation.	Review wiring diagrams and ensure proper control installation.
Ventilator or Fresh Air Damper only operates in Test Mode	Measured conditions are outside programmed limits.	Ventilation should not occur when outdoor temperature and humidity are outside programmed limits. If outdoor conditions are confirmed within programmed limits, follow the instructions in TESTING ODT SENSOR RESISTANCE section that follows.
Ventilator or Fresh Air Damper operates constantly	Ventilation run time is set to 60 min/hr.	You can re-enter installer setup by pressing and holding the Select button to check the installer setup. Ensure Number of Bedrooms, Square Footage, and Measured Airflow are entered correctly.
Ventilator or Fresh Air Damper control “chatters” or clicks ON and OFF rapidly	Improper wiring between controller (GH), thermostat (G), and furnace or heat pump (G).	Separate controller GH and thermostat G wires if connected. Refer to diagram in the WIRING section for proper wiring.

TESTING ODT SENSOR RESISTANCE

1. Disconnect the ODT sensor leads from the control terminals.
2. Measure the resistance across the wires with an ohmmeter.
3. Confirm the reading with the temperature in **TABLE 5**.
4. Reconnect the ODT sensor leads.
5. If the resistance value (+/- 10 k Ω) does not match the temperature value, replace the ODT sensor.
6. Replace the filter in the ventilator and press the outside edges of the filter door to snap it in place.

TABLE 5

Outdoor Temperature (°F)	Resistance (k Ω) ± 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

LIMITED WARRANTY

Terms of Coverage

Your AprilAire® Ventilation Controller is expressly warranted to be free from defects in materials or workmanship for five (5) years from date of purchase.

What Is Covered

The exclusive obligation of AprilAire under this Limited Warranty shall be, at the sole discretion of AprilAire, to supply, without charge, a replacement for any component or product which is found to be defective. A defective part will be replaced pursuant to this Limited Warranty with a genuine AprilAire part. A defective product will be replaced pursuant to this Limited Warranty with a new AprilAire product of equal or similar features and functionality if the original product has been discontinued or is no longer available.

Not Covered by the Limited Warranty

- Consumable or maintenance products, such as, but not limited to: Air Filters, Evaporative Humidifier Water Panels, Steam Canisters, or Steam Humidifier Electrode Wires.
- Products purchased from third parties that were previously used, such as previously-used products purchased from eBay, similar third party/auction sites, or individuals selling used products.
- Labor charges, shipping costs, removal fees, service fees, or reinstallation costs.
- Materials furnished by the installer.
- Damage caused by misuse, abuse, improper installation, or failing to install, use, or maintain the product in accordance with the instructions provided.
- Damage to HVAC equipment caused by improper installation(s) or misapplication installation(s).
- Modifications, changes, repurposing, or alterations to the AprilAire product.
- Extended warranties or satisfaction guarantees offered by third parties.
- Cosmetic damage or normal wear and tear, including, but not limited to: scratches, peeling finish, or dents that do not impede the mechanical functionality of the product.
- Damage caused by acts of nature, including but not limited to: fire, collision, flood, wind, power surge, lighting strike, or mold.
- Damage caused during transit.
- Damage caused during installation due to failure to follow local, state, or federal laws, statutes, codes, or ordinances.
- Damage caused by defects in materials furnished by the installer.

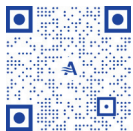
LIMITED WARRANTY (CONTINUED)

Limit of Liability

IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED IN DURATION TO THE AFOREMENTIONED EXPRESS WARRANTY PERIOD. APRILAIRE LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, OTHER THAN DAMAGES FOR PERSONAL INJURIES, RESULTING FROM ANY BREACH OF THE AFOREMENTIONED IMPLIED WARRANTIES OR THE ABOVE LIMITED WARRANTY IS EXPRESSLY EXCLUDED. THIS LIMITED WARRANTY IS VOID IF DEFECT(S) RESULT(S) FROM FAILURE TO INSTALL THE PRODUCT ACCORDING TO THE APRILAIRE INSTALLATION INSTRUCTIONS. IF THE LIMITED WARRANTY IS VOID DUE TO MISAPPLICATION OR IMPROPER INSTALLATION, ALL DISCLAIMERS OF IMPLIED WARRANTIES SHALL BE EFFECTIVE UPON INSTALLATION.

Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitation(s) may not apply to your situation. This Limited Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Register Your AprilAire® Product



Thank you for choosing AprilAire. Register your product at aprilair.com/warranty to receive important updates and notifications, and to streamline the process in the unlikely event you file a claim.

Your warranty registration information will not be sold or shared outside of this company.

Make a Warranty Claim

For questions regarding the Limited Warranty or to initiate a claim, contact AprilAire Customer Service at 1.800.334.6011 Monday through Friday, 7:00 a.m. to 5:00 p.m. Central Time.

At the sole discretion of AprilAire, you may be required to: return the product not later than thirty (30) days after the warranty period to the place of purchase or (if directed) to AprilAire, contact a professional contractor to provide warranty service, submit a product for testing related to a warranty claim, and/or send pictures of the original product with the serial number (if applicable) to AprilAire Technical Support for inspection as a condition to reviewing a claim and/or receiving a replacement product under this Limited Warranty.

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Manufacturing
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