

VAV-4020 Installation Instructions



Regulatory Compliance

Safety

This device has been tested and found to be in compliance with the requirements set forth in UL 916, Energy Management Equipment, and is listed by Underwriters Laboratories, Inc., for installations in the United States.

This device has been tested and found to be in compliance with the requirements set forth in C22.2, No. 205-M1983, Signal Equipment, and is Certified by Underwriters Laboratories, Inc., for installations in Canada.

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Description

The Variable Air Volume Controller (VAV-4020) is a direct digital controller that is used as a replacement for conventional variable air volume thermostats. It uses an onboard airflow sensor and a remote temperature sensor to provide pressure-independent control.

The VAV-4020 is designed to be used with one of the following Logic One[®] sensors:

- Wall-Mount Temperature Sensor (WTS-VAV)
- Futura Temperature Sensor (FTS-2 or FTS-2A with temperature setpoint adjustment)

The UVC Remote Temperature Sensor (RTS-UVC) can also be used with the VAV-4020 to monitor discharge air temperature.

NOTE! The VAV-4020 is powered with 24-VAC. Make sure that the module is connected to the correct power source.

Specifications

Agency Approvals

Listed device:	CUL/UL E90949
Standards used:	UL 916, Energy Management Equipment CSA C22.2, No. 205-M1983, Signal Equipment

Power Requirements

Voltage:	24 VAC, Class 2
Consumption:	6 VA

Operating Environment

Temperature:	32° to 158°F (0° to 70° C)
Humidity	0 to 99% Relative, noncondensing

Physical Dimensions

Height:	6 in.
Width:	8.25 in.
Depth:	2 in.
Weight:	1 lb 9 oz

Precautions

Take the following precautions during installation:

- Observe all national and local electrical codes.
 - Observe voltage and current limits marked on the module.
 - Do *not* connect 115 volts to any terminal of the VAV-4020. It is a Class 2 (low voltage) control device.
 - Do *not* exceed 24 VAC at 1 ampere. The VAV-4020 outputs are controlled by low voltage triacs (AC switches).
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Mounting the VAV-4020 Baseplate

The following items are needed for installation:

- The VAV-4020 module
- Four screws (not included)
- Four hollow-wall anchors, if necessary (not included)

The VAV-4020 is designed to be mounted to the outside of the VAV box or within 3 feet of the airflow pickup devices (installed in the airstream). It is *not* intended for outdoor use (maximum operating temperature: 158°F [70°C]). The mounting hardware must not interfere with proper operation of the damper.

Use the following procedure and refer to Figure 1, as necessary, to mount the VAV-4020.

Step	Procedure
1	Turn off all power to the VAV box.
2	Position the module against the mounting surface and mark the surface to show the location of the four corner mounting holes.
3	Drill holes at each of the marked spots and install hollow-wall anchors, if necessary.
4	Insert screws into the drilled holes and tighten until the head of the screw is approximately one-quarter inch from the wall.
5	Position the VAV-4020 baseplate over the screws and slide it down until the screws slide into the slots.
6	Tighten the screws to secure the baseplate.

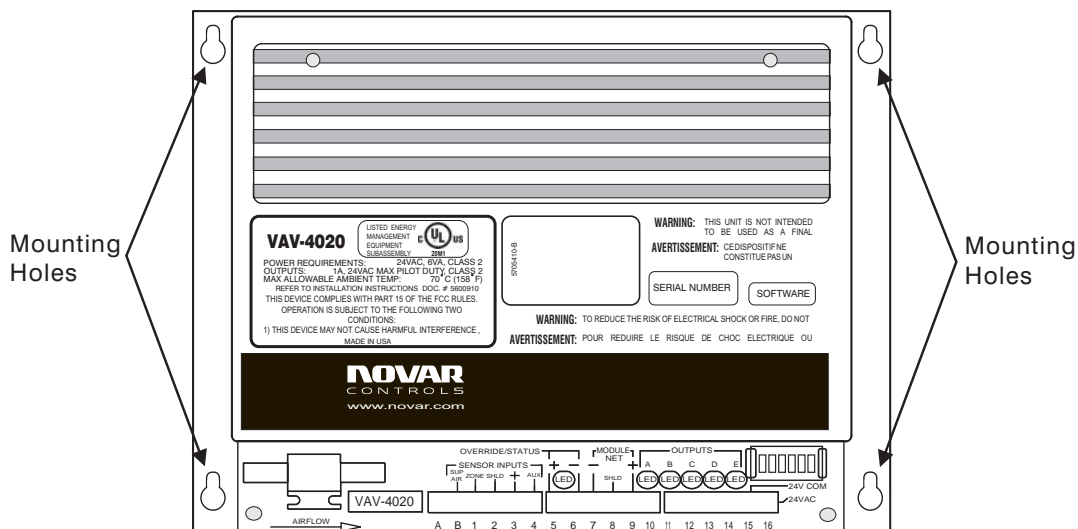


Figure 1. Mounting the VAV-4020

Wiring the Inputs and Outputs

The VAV-4020 has a removable terminal strip that uses screw connections. Refer to Figure 2, as necessary, when making the wiring connections.

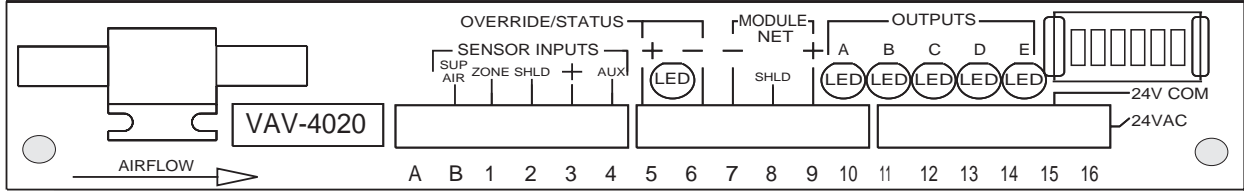


Figure 2. VAV-4020 terminal strip

Control Outputs

Table 1 shows the control output configuration for the VAV-4020.

Table 1. VAV-4020 Output Connections	
TERMINAL	FUNCTION
Terminal 10 (A)	Damper Open
Terminal 11 (B)	Damper Closed
Terminal 12 (C)	Heat Open (or Reheat Stage #1)
Terminal 13 (D)	Heat Closed (or Reheat Stage #2)
Terminal 14 (E)	Fan Control
Terminal 15 (24-V COMM)	Common (24-V power to outputs)

Connect the control wires from the VAV module to the terminal strip's heating, cooling, fan, and damper outputs as shown in Figure 3. The power for these circuits enters the module through Terminal 15, labeled 24-V COM. Terminal 15 is also used to power the electronics.

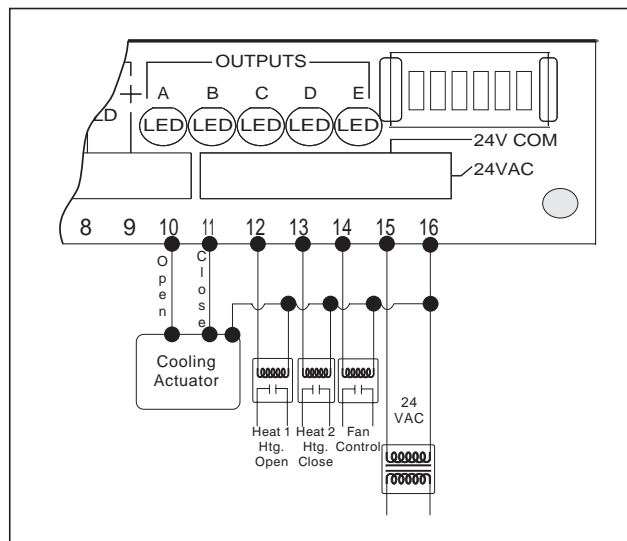


Figure 3. VAV-4020 Control Output Wiring Connections.

Sensor Inputs

When connecting sensors to the VAV-4020, observe sensor polarity.

Install one of the following Logic One temperature sensors. No other sensors are compatible. With the exception of the RTS-UVC, these sensors cannot be used with any other Logic One module except the ETM-3010.

- Wall-Mount Temperature Sensor (WTS-VAV)

To connect the Wall-Mount Temperature Sensor to the VAV-4020, use a two-conductor, shielded cable (Belden 8761, Novar Controls WIR-1010, or equivalent). Connect the Zone, Shield, and positive (+) wires from the VAV to the terminals with the same labels on the sensor.

- Futura Temperature Sensor (FTS-2 or FTS-2A with adjustable setpoint)

To connect the Futura Temperature Sensor to the VAV-4020, use a two-conductor, shielded cable (Belden 8761, Novar Controls WIR-1010, or equivalent).

- Connect the Zone wire from the VAV Terminal 1 to sensor Terminal 4.
- Connect the SHLD wire from the VAV Terminal 2 to sensor Terminal 3.
- Connect the plus (+) wire from the VAV Terminal 3 to sensor Terminal 8.

Refer to the installation instructions included with the Futura Temperature Sensor for a detailed wiring diagram.

The Futura Temperature Sensor has a status LED, a timed override button, and an optional potentiometer (temperature setpoint adjustment) that can be used to reset zone control setpoints $\pm 3^{\circ}\text{F}$. Refer to the installation instructions included with the sensors for proper wiring directions.

The Novar Controls Remote Temperature Sensor (RTS-UVC) can also be connected to the VAV-4020 to monitor discharge air temperature. Installation instructions are provided with each sensor.

If none of these sensors is used but a potentiometer is needed, wire the three potentiometer leads to Terminals 2, 3, and 4. To use a remote timed override switch, connect it to Terminals 5 and 6. Wire the status LED in parallel with the override switch to Terminals 5 and 6.

NOTE! The timed override switch is used to initiate the setup mode, which is used for air balancing procedures (see “Air Balancing Procedures” in this document).

To connect the UVC Remote Temperature Sensor to the VAV-4020:

- Connect the sensor’s red wire (+) to Terminal B, labeled Sup Air, on the VAV.
- Connect the sensor’s black wire (–) to Terminal 2 on the VAV.

A maximum of 100 feet of wire can be used between the RTS-UVC and the VAV.

Communications Network

Use a suitable two-conductor, shielded cable (Belden 8761, Novar Controls WIR-1010, or equivalent) to make the communication connection between the VAV-4020 Terminals 7, 8, and 9 and the module communications terminals of the executive module. Keep the polarity consistent with the other Logic One modules.

CAUTION! Do *not* connect power to these three terminals.

Testing the Wiring

With the terminal strip disconnected from the VAV module, turn on the power to the VAV box and double-check the wiring. To test the output wiring, jumper from Terminal 15 to Terminals 10–14, one at a time. The VAV box outputs should respond properly.

Connect the terminal strip to the module and use the setup mode to test the wiring (see “Air Balancing Procedures” in this document).

Supplying the VAV-4020 with Power

The VAV-4020 is powered by 24 VAC. It is rated at 6 VA. Verify the voltage of the power source before connecting the module. Connect the 24 volts to Terminals 15 and 16. Power for the outputs enters the module on Terminal 15 (see Figure 3).

Connecting the Airflow Sensor

The Airflow sensor uses ¼-inch (inside diameter) PVC tubing (3/8-inch nominal). Using smaller tubing will result in inaccurate airflow readings. The module should be mounted in a location so that the tubing length does not exceed 3 feet. Connect the “High” side tube to the inlet on the left side of the airflow sensor. Connect the “Low” side tube to the outlet on the right side of the airflow sensor. The sensor will operate over a differential pressure range of 0.01 to 2 inches of water column.

Air Balancing Procedures

The setup mode is used to force the VAV module to specific positions during air balancing procedures. It must first be enabled in the Novar Controls software within the control settings and parameters of each VAV module. Once the setup mode is enabled, the timed override button on the temperature sensor can be used to force the VAV to various positions.

Put the module in the setup mode by pushing the timed override button (or jumper out Terminals 5 and 6) in the sequence shown in the following procedure.

Step	Procedure
1	<p>Push in and hold the timed override button for 5 seconds to put the module in the setup mode.</p> <ul style="list-style-type: none">■ The LED flashes rapidly to indicate this.
2	<p>Push the button (within 10 seconds) the number of times required to achieve the desired position or state.</p> <ul style="list-style-type: none">■ 2 times forces the box to maximum (occupied cooling) cfm.■ 3 times forces the box to minimum (occupied cooling) cfm.■ 4 times forces the box to full open.■ 5 times forces the box to full closed. <p>While it is in this mode, the LED flashes the same number of times that the button has been pushed, pauses for 2 seconds, and repeats.</p> <p>To force it to a different position or state, start over by pushing the button for 5 seconds. Then push it for the required number of times for the new position or state.</p>

The VAV module stays in the setup mode for 90 minutes or until the button is pushed again for 5 seconds, whichever comes first.

NOTE! The setup mode can also be forced from the status monitoring screen in Novar Controls Corporation's ESS32 software. When forced from ESS32, the 90-minute time-out described above does not apply.

Write down the minimum and maximum cfm setpoints for future reference.

Setting the Module Address

Every Logic One module must have a unique address for the executive module to identify it. Addresses are assigned in the software during system programming. The system printout shows the address of the VAV being installed.

The address switch is located in the upper right corner of the terminal strip (see Figure 2). The EP/2 and Lingo® are designed to accept module addresses from 00 to 127 for any type of Logic One module. Address settings 64 through 127 duplicate the sequence of settings shown in Figure 4 (address setting 64 is the same as address setting 00, etc.).

NOTE! Address 00 may not be used by the VAV-4020 when operating on an EC. The IOM section of the EC uses address 00.

The EP/2 would require a Network Expander to communicate with addresses 64 through 127. Only unitary controllers can be connected to the Network Expander. More information about setting addresses 64 through 127 can be found in the Novar Controls *Network Expander Module Installation Instructions* (Doc. No. 560092000). When connecting additional modules to the EP/2, remember not to exceed the 128-input or 128-output limits.

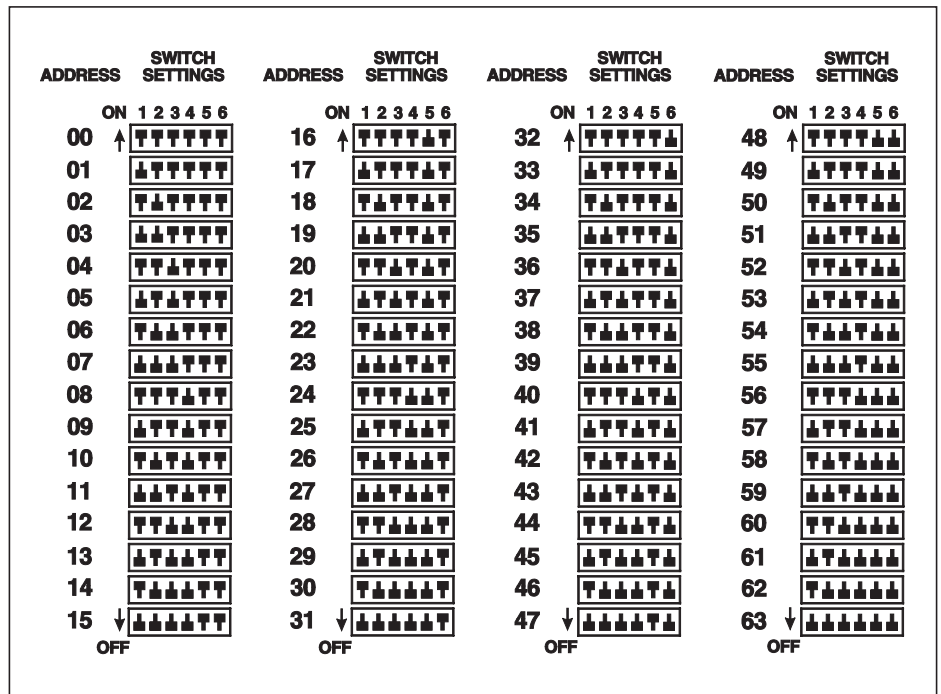


Figure 4. VAV-4020 Address Settings

Checking Installation

When installation is complete, check the following items to ensure proper operation.

- Turn on power to the VAV-4020 and to the VAV damper and its control circuitry. If the module is operating properly, the VAV-4020 begins to control the damper in about 1 minute (after performing a self-diagnostic check and establishing communications with the executive module).
- Observe the flashing pattern of the schedule status indicator to verify proper communications.
- Check the output status LEDs. Each indicator is lit when the corresponding output is on.
- Press the override switch input (if one has been installed) when the schedule status indicator is off. The schedule status indicator will flash steadily until the override period ends.
- Monitor the executive module's display during the testing procedures. Faults or malfunctions will be announced by alarm messages. Use the executive's keypad to change the VAV-4020's setpoints and monitor the status display for proper equipment response.

Model and Part Numbers

Use the part numbers shown in Table 2 to order the necessary Novar Controls parts.

Table 2. Novar Controls Part Numbers		
PRODUCT	MODEL NO.	PART NO.
Variable Air Volume Controller	VAV-4020	732032000
Wall-Mount Temperature Sensor	WTS-VAV	732019000
Futura Temperature Sensor	FTS-2	732303000
Futura Temperature Sensor (with temperature setpoint adjustment)	FTS-2A	732301000
Remote Temperature Sensor	RTS-UVC	736003000
Two-Conductor Cable (Belden #8761 equivalent)	WIR-1010	709001000
Network Expander Module	VAV-NE	732005000