



VAV-4040/VAV-4040N Installation Instructions

Description

NOTE! Novar's Variable Air Volume Controller is available with an integral damper actuator (VAV-4040) or without it (VAV-4040N). Throughout this document, "VAV-4040" is used generically to refer to both modules unless otherwise noted.

Novar's Variable Air Volume Controller (VAV-4040) is part of Novar's Logic One[®] family of direct digital controllers. It was created to cover the widest variety of VAV and Variable Volume and Temperature (VVT) applications possible. It offers the following features and more:



- Integral damper actuator (VAV-4040 only)
- On-board differential pressure airflow sensor
- Accommodations for external damper actuator (tri-state or 2–10 VDC)
- Pressure-independent or pressure-dependent control
- Staged reheat control
- Tri-state or 2–10 VDC modulating reheat control
- Series or parallel reheat fan control
- Air quality compensation/ventilation override
- Integration with Hawki[®] Advanced Air-Handling Controller
- Stand-alone control

The VAV-4040 is designed to be used with Novar's Futura Temperature Sensor (the FTS-4 or FTS-4A with temperature setpoint adjustment). A 10,000-ohm, Type 2, thermistor temperature sensor should also be used with the VAV-4040 to monitor discharge-air temperature.

NOTE! The VAV-4040 requires a xcm, Savvy[®], Lingo[®], or Envoi[®] executive module.



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Specifications

Agency Approvals

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

Recognized component: CUL/UL E134292
Standards used: UL 873 and CSA C22.2, No. 24-93
Temperature-Indicating and Temperature-Regulating Equipment

Power Requirements

Voltage: 24 VAC, 50/60 Hz, Class 2

Consumption: VAV-4040: 15 VA (not including external actuators)
VAV-4040N: 10 VA (not including external actuators)

Triac Outputs: 0.5 amps max each

NOTE! If external damper or heating actuators are to be powered by the VAV-4040, the transformer's capacity must be increased appropriately. Do not exceed 0.5 amps through any single output.

Inputs and Outputs

Analog Outputs (3): Internal actuator (VAV-4040 only), tri-state damper outputs, 2- to 10-volt signal for external damper or heating actuator

Digital Outputs (3) Heat 1, Heat 2, Reheat Fan

Analog Inputs (4): Temperature inputs are 10,000-ohm thermistor, Type 2. Zone temperature, supply-air temperature, setpoint reset adjustment, CO₂ (CO₂ signal: 0–10 VDC)

Digital Inputs (2): Timed Override and CO₂ (software-defined as analog or digital)

Operating Environment

Temperature: 32 to 122 F (0 to 50 C)

Humidity 0 to 90% Relative, noncondensing

Physical Dimensions

Height: 6 in.

Width: 8.25 in.

Depth: 3 in.

Weight: 1 lb 13 oz (Packaged Controller: 2 lb, 8 oz)

Actuator Torque (VAV-4040 only)

Maximum guaranteed torque: 45 in-lb

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Precautions

The following precautions should be taken during installation:

- Observe all national and local electrical codes.
- Observe voltage and current limits marked on the module.

Mounting the VAV-4040 with Integral Actuator

CAUTION! To prevent electrical shock or equipment damage, disconnect all power sources to controllers and loads before installing or servicing this equipment or modifying any wiring.

The following procedure should be used to mount the VAV-4040 with integral actuator (refer to Figure 1, as necessary).

Step	Procedure
1	Rotate the damper shaft until the damper is completely closed.
2	Press the black motor release on the motor housing and rotate the actuator until it is fully closed (Figure 1).

continued

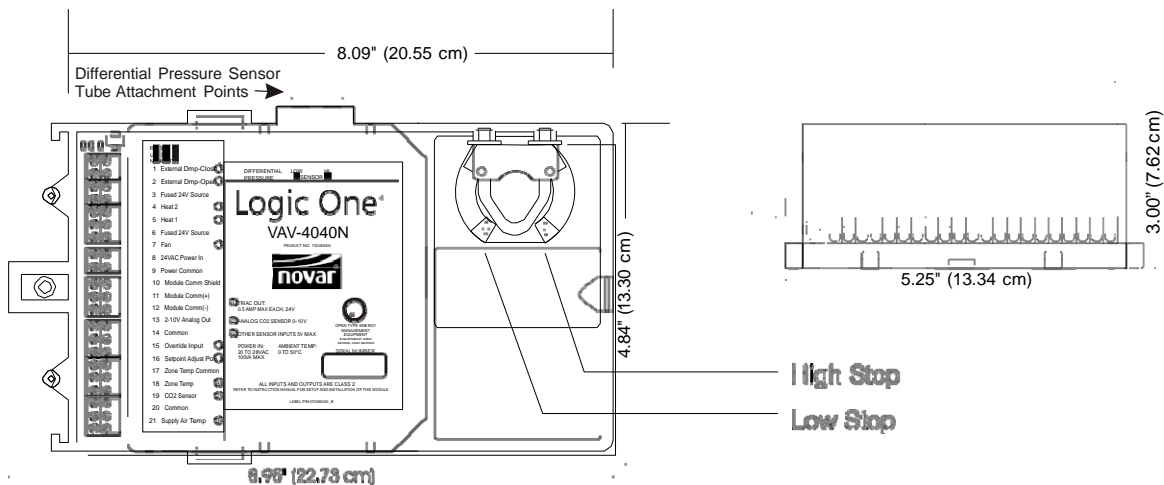


Figure 1. VAV-4040 mounting dimensions

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Step	Procedure
3	Slide the controller down over the damper shaft so that the shaft goes through the round opening above the actuator motor.
4	Tighten the retaining nuts to secure the actuator to the damper shaft.
5	Remove the tape that secures the mounting screw to the mounting tab at the left of the controller.
6	Drive the mounting screw through the hole in the mounting tab and into the metal of the damper box.
7	Set the motor stops to prevent the actuator motor from overtaxing the damper. <ul style="list-style-type: none">● Rotate the damper until it is completely open and set the high stop.
8	Attach the differential pressure sensor tubes from the airflow pitot tubes to the inputs at the top of the controller. <hr/> <p style="text-align: center;">NOTE! Attach the “low” and “high” tubes to the “Low” and “High” attachment points on the controller.</p> <hr/>

Mounting the VAV-4040N

The VAV-4040N should be mounted within 5 feet of the VAV box that it will be controlling. The following procedure should be used to mount it.

Step	Procedure
1	Remove the tape that secures the mounting screws to the mounting tab at the left of the controller.
2	Drive a mounting screw through each of the mounting tabs on the sides of the controller and into the mounting surface.
3	Attach the differential pressure sensor tubes from the airflow pitot tubes to the inputs at the top of the controller

Wiring the VAV-4040

Figure 2 shows the input and output wiring and can be used as reference while the VAV-4040 is being wired.

VAV-4040 Input and Output Wiring

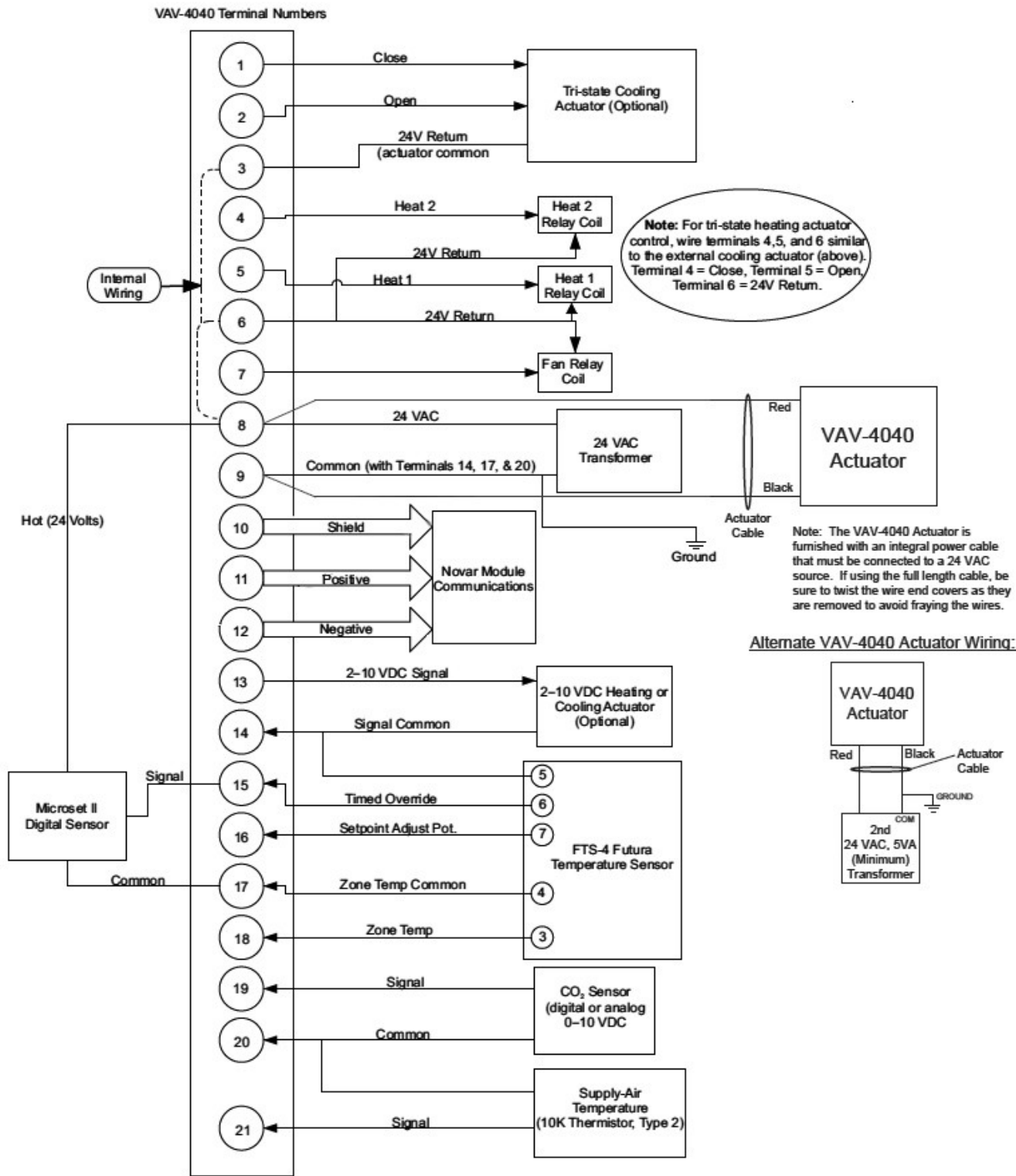


Figure 2. VAV-4040 input and output wiring connections

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Sensor Input Connections

The sensor input connections are shown in Figure 2. The VAV-4040 temperature sensors are 10,000-ohm thermistors, Type 2. To support the timed override and/or setpoint reset functions properly, one of the following Novar zone temperature sensors should be used:

- Futura Temperature Sensor (FTS-4) includes the temperature sensor and timed override functions.
- Futura Temperature Sensor (FTS-4A) includes the temperature sensor and timed override functions and a temperature reset potentiometer.

NOTE! Novar also offers another choice for the zone temperature sensor, the Microset II digital sensor. It offers the schedule override and temperature adjustment functions and more. Wiring information is provided in the Microset II Installation and Operating Instructions.

By default, when the VAV-4040/VAV-4040N is shipped, a W2 jumper is installed in the “S” position on the circuit board inside the enclosure. If a Microset II sensor is used with the VAV-4040/VAV-4040N, the W2 jumper must be moved to the “A” position.

The supply-air temperature sensor is also a 10,000-ohm thermistor, Type 2. There are several commercially available products that will fill this requirement.

The timed override input can be a momentary or maintained contact and can be used with a motion detector. For the motion detector application, a continuous contact closure must be present while the sensor detects occupancy. For the timed override function, a momentary dry contact closure (such as that provided by the FTS-4) should be provided.

The Carbon Dioxide (CO₂) input can be digital or analog. A digital CO₂ (IAQ) sensor must provide a continuous contact closure when its limit is exceeded. An analog CO₂ sensor must provide a 0- to 10-VDC signal.

Supplying the VAV-4040 with Power

The VAV-4040 with the on-board actuator requires a minimum of 15 VA (24 VAC). The VAV-4040N requires a minimum of 10 VA.

CAUTION! Do not let 24-V power touch the Communication terminal (Terminal 10). It could damage the VAV module.

NOTE! If the VAV’s power terminals are going to power external actuators, the size of the transformer must be increased appropriately. Do not exceed 0.5 amps on any single output.

Module Communications Network

A suitable two-conductor, shielded cable (Belden 8761, Novar WIR-1010, or equivalent) must be used for the communications connection between the VAV-4040 and the executive module. Polarity must be consistent with the other Logic One modules.

Airflow Sensor Connections

The airflow sensor uses ¼-inch nominal PVC tubing. The module should be mounted so that the length of the tubing does not exceed 8 feet.

- Connect the static pressure tube to the VAV-4040 connection labeled “Low.”
- Connect the total pressure tube to the VAV-4040 connection labeled “Hi.”

The sensor will operate with a differential pressure up to 2 inches of water column.

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 inside the plastic enclosure, on the top of the plug-in circuit board. The Lingo is 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 3 (address setting 64 is the same as address setting 00, etc.).

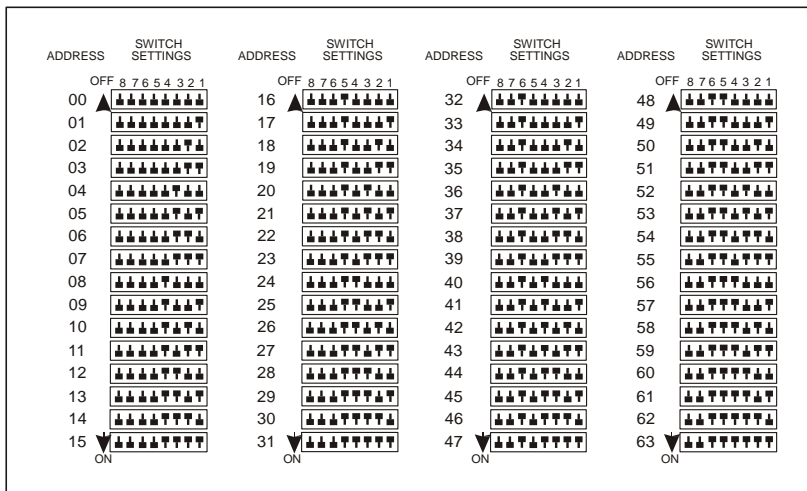


Figure 3. VAV-4040 Address Settings

NOTE! Only Switches 1–6 are used to set the address. Switch 7 is not used—its position does not matter. Switch 8 is used to set the module communication baud rate. The default position for Switch 8 is on (9600 baud) but, if necessary, the switch can be set to off (baud rate 1747).

Light-Emitting Diode (LED) Operation

Status LEDs

The VAV-4040 contains three status LEDs on the main circuit board that operate as follows:

- Red (FLT) flashes briefly upon power-up or reset of the module.

The VAV-4040 is equipped with a Flash RAM download feature that can be used to refresh the module's core program. While the Flash RAM download is in progress the red LED will be on continuously.

- Yellow (WNK) comes on for only 1 minute after power-up or reset.
 - Green (RUN) turns on 1 minute after power-up or reset to indicate normal operation.
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Communication LEDs

The plug-in daughter board contains one green and one amber communications LEDs that operate as follows:

- Green flashes when it detects network traffic on the communications bus.
 - Amber flashes when the VAV transmits data onto the communications bus.
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Air-Balancing Procedures

Two people using ESS32 and/or iScope will be needed to complete the air-balancing and cubic feet per minute (cfm) calibration procedures outlined below. The same procedures (and more) can be completed by one person via the Microset II digital sensor—instructions are provided with the sensor.

NOTE! Theoretically, the VAV-4040 will read accurately when the scaling factor is set to equal the cubic foot/minute (cfm) value that the manufacturer specifies for the VAV box at 1 inch of velocity pressure. Before any air-balancing procedures are performed, this value must be entered for each VAV-4040. If this degree of relative accuracy is satisfactory, no further calibration is required.

The following instructions can be used to verify air-balancing results and recalibrate.

NOTE! This calibration procedure might require two people using walkie-talkies or telephones—one person in the VAV zone and one at the monitoring station.

For the air-balancing procedures to produce accurate results:

- Manual balancing dampers in the duct work must be open far enough to allow sufficient airflow.
- Air modulating devices at the air handler must be set to allow sufficient air flow.

Air-balancing procedures involve completing the following tasks:

- Forcing the damper to a known position (usually full open).
- Using ESS or iScope® to check and calibrate the airflow.

The following procedures should be used to complete these tasks.

Forcing the Damper to Specific cfm Values

The following procedure can be used to force the damper to specific cfm values.

Step	Procedure
1	Access the VAV-4040's General Control Settings and Parameters screen in ESS32, iScope or in the appropriate screen in Opus or from the touchscreen of a Savvy, Lingo, or Envoi.
2	Select 1 (Program Operating Mode).
3	Select Force to and enter the desired cfm value.

The module will move to the cfm value entered and remain in this state until the Operating Mode is set back to Run.

Calibrating the Airflow Sensor for Proper cfm Readings

Once the VAV-4040 has been forced to a specific cfm value (see procedure above), the following procedure should be used to calibrate the airflow reading.

Step	Procedure
1	Access the VAV-4040's General Control Settings and Parameters screen in ESS32, iScope or in the appropriate screen in Opus or from the touchscreen of a Savvy, Lingo, or Envoi.
2	Select 5 (Airflow Scaling Factor).
3	Press enter until the prompt reads "CFM Reading from Monitoring Screen."

continued

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Step	Procedure
4	Enter the cfm reading currently displayed on the VAV-4040's monitoring screen.
5	Measure all diffusers associated with the VAV box (using an airflow hood), total the values, and enter this value in the field for "CFM Reading as Measured at Job Site." <ul style="list-style-type: none">• The Airflow Scaling Factor will automatically recalculate to make the readings match.
6	Repeat Steps 4–5 until satisfactory results are achieved.
7	Return the VAV-4040's Program Operating Mode to Run to release it from its forced cfm condition.

This procedure should be repeated for the remaining VAV-4040s in the group.

Model and Part Numbers

The part numbers shown in Table 1 should be used to order Novar parts.

Table 1. Novar Part Numbers		
PRODUCT	MODEL NO.	PART NO.
Variable Air Volume Controller with integral actuator	VAV-4040	732080000
Variable Air Volume Controller (no actuator)	VAV-4040N	732085000
Microset II digital sensor	MS2	732090000
Futura Temperature Sensor with timed override	FTS-4	732503000
Futura Temperature Sensor with timed override and temperature setpoint adjustment	FTS-4A	732501000
Transformer	24V-XFR	730090000

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 UL 873, Temperature-Indicating and Regulating Equipment, and is recognized 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.

This device has been tested and found to be in compliance with the requirements set forth in C22.2, No. 24-93, Temperature-Indicating and Regulating Equipment, and is recognized by Underwriters Laboratories, Inc., for installations in Canada.

Electromagnetic Compatibility (EMC)

Federal Communications Commission (FCC)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE! This device has been tested and found to comply with the limits established for Class A digital devices. It is intended to be used in a commercial environment. Operation of this equipment in residential environments may cause harmful interference, in which case the user may be required to correct the interference at his own expense.

CAUTION! Any changes or modifications not expressly approved by Novar Controls Corporation could void your authority to operate this equipment.

Industry Canada

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled Digital Apparatus, ICES-003, of Industry Canada.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouiller: Appareils Numériques, NMB-003, édictée par l'Industrie Canada.

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