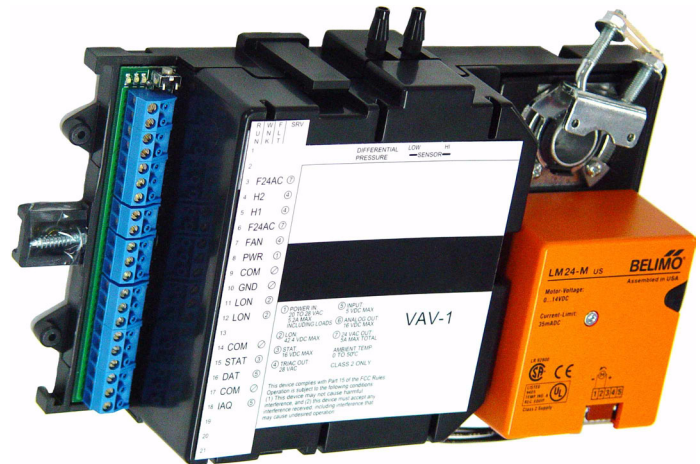




iWorX VAV Series Installation Instructions

VAV-1

The iWorX VAV-1 is a stand-alone microprocessor-based controller for pressure independent variable air volume zone terminal units. The VAV-1 is capable of communications on a LONWORKS network for monitoring and control purposes. The VAV-1 would be used to control commercial VAV zone terminal units. It performs a wide range of VAV zone terminal box applications with various combinations of sensors.



Application

VAV Series controllers support a digital thermostat module. Basic to each unit is an electronics module with LED indicators and field wiring terminal blocks.

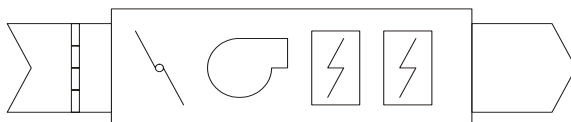
They function in standalone mode or as part of a LONWORKS® Network using the integral FTT-10 Free Topology communications transceiver. This network interface enables the controllers to be integrated with a building automation system.

The controllers also monitor the temperature of the primary air flow and indoor air quality.

Applicable Documentation

Description	Audience	Purpose
iWorX LCI User's Guide	<ul style="list-style-type: none"> Application Engineers Installers Service Personnel Start-up Technicians End user 	Provides instructions for setting up and using the iWorX Local Control Interface.
iWorX VAV-1 Application Manual	<ul style="list-style-type: none"> Application Engineers Wholesalers Contractors 	Provides specific application information about the VAV-1, including sequence of operation and configuration information.
iWorX MPU-1 Application Manual		Provides specific application information about the MPU-1, including sequence of operation and configuration information.
Additional Documentation	<i>LonWorks FTT-10A Free Topology Transceiver User's Guide</i> , published by Echelon Corporation. It provides specifications and user instructions for the FTT-10A Free Topology Transceiver.	

Typical Use



Innovex Technologies
511 Braddock Avenue
Turtle Creek, PA 15145
www.innovextechnologies.com

iWorX is a trademark of Innovex Technologies
LON, LonWORKS, & LonMARK are trademarks of Echelon Corporation

Copyright Notice

This document copyright © 2006, Innovex Technologies. All other intellectual property rights and copyrights related to or arising from these products belong to a third party.

Precautions

General



This symbol is intended to alert the user to the presence of important installation and maintenance (servicing) instructions in the literature accompanying the equipment.



WARNING: Electrical shock hazard. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Make all wiring connections in accordance with these instructions and in accordance with pertinent national and local electrical codes. Use only copper conductors that are suitable for 167 °F (75 °C).

Static Electricity

Static charges produce voltages that can damage this equipment. Follow these static electricity precautions when handling this equipment.

- Work in a static free area.
- Touch a known, securely grounded object to discharge any charge you may have accumulated.
- Use a wrist strap when handling printed circuit boards. The strap must be secured to earth ground.

Location

Avoid locations where corrosive fumes, excessive moisture, vibration or explosive vapors are present.

Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.

This equipment is intended for indoor use only. Preferably, or as required by National Electrical Code, the unit is intended to be installed within an electrical control enclosure. Operate where ambient temperatures do not exceed 122 °F (50 °C) or fall below 32 °F (0 °C) and relative humidity does not exceed 90%, non-condensing.

For Installation in the United States

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference. This equipment can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to a power source different from that to which the receiver is connected.
- Consult the equipment supplier or an experienced radio/TV technician for help.

You are cautioned that any changes or modifications to this equipment not expressly approved in these instructions could void your authority to operate this equipment.

For Installation in the European Community

This equipment meets the requirements of the European Community Directives for Electromagnetic Compatibility (EMC Directive 89/336/EE).

Before Installing

About this Document

The instructions in this manual are for the VAV-1 module, which supports one VAV terminal unit.

Inspecting the Equipment

Inspect the shipping carton for damage. If damaged, notify the carrier immediately. Inspect the equipment for damage. Return damaged equipment to the supplier.

What is Not Included with this Equipment

- A power source for the equipment electronics and peripheral devices.
- Tools necessary to install, troubleshoot and service the equipment.
- Peripheral devices such as sensors, contactors, etc.
- Cabling, cabling raceway, and fittings necessary to connect this equipment to the power source, FTT-10A network and peripheral devices.

Equipment Location



Abide by all warnings regarding equipment location provided earlier in this document.

The equipment must be installed indoors unless contained within a protective enclosure. The enclosure must maintain internal temperature and humidity within the ranges specified for this equipment.

The equipment must be installed within 500 feet of all input peripherals (sensors, etc.) that will be connected to the equipment. It must be within 200 feet of any connected thermostats.

Selecting a Power Source

This equipment requires a UL recognized or CE marked (as appropriate) external power source (not supplied) to operate. The controller power input requires a voltage of 24 volts AC. Innovex Technologies recommends that the controller use a separate power source from any peripheral devices.

To calculate power source current requirements, add the power consumption of all peripheral devices to that of the controller.

The controller and triac output loads can use the same power source. Due to UL requirements for Class 2 devices, the power source used to power the controller cannot exceed 100 VA. Also, the loads must have EMF protection. This protection can be integral to the load, or installed across the load's coil.

To provide necessary RFI and transient protection, the controller's ground (GND) pin (T10) must be connected to earth ground or the earth ground of the packaged unit's enclosure ground. Failure to properly ground the controller may cause it to exceed FCC & CE limits. Excessive noise could also produce inaccurate sensor data. The power source must be capable of operating with this connection to ground.

Installation

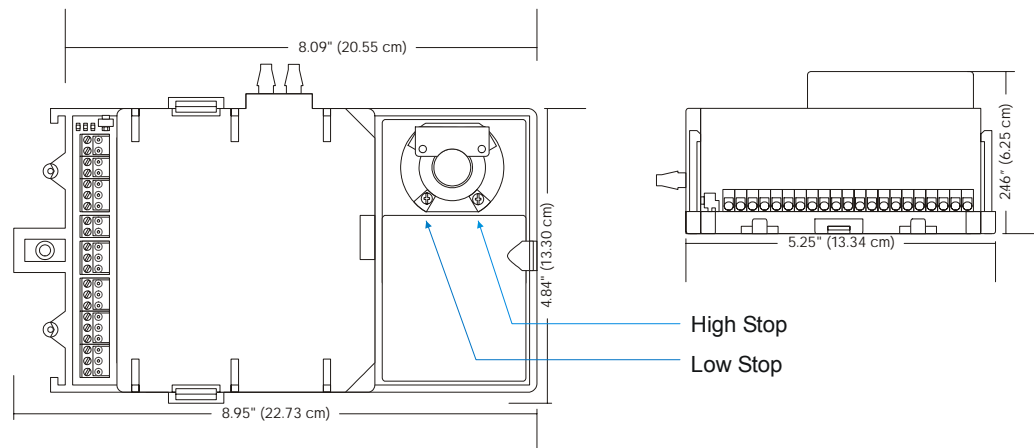


Warning: Electrical shock hazard. To prevent electrical shock or equipment damage, disconnect **ALL** power sources to controllers and loads before installing or servicing this equipment or modifying any wiring.

Mounting the Device

1. Open the damper halfway.
2. Press the black motor release on the motor housing and rotate the actuator so that its flat edge is parallel to the edge of the housing as shown in Figure 1.
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 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 driving the damper.
 - a. Rotate the damper shaft until the damper is completely closed.
 - b. Loosen the screw that holds the low stop, and slide it around until it rests against the actuator.
 - c. Tighten the screw to secure the low stop.
 - d. Rotate the damper until it is completely open, and set the high stop.
8. Attach the differential pressure sensor tubes from the duct to the inputs at the top of the controller. Make sure to attach the “Low” and “High” tubes to the “Low” and “High” attachment points on the controller.
9. Wire the controller (see “Wiring Information” on page 5).

Figure 1: Mounting Dimensions



Routing Cabling to the Device



Cabling used to connect the power source and cabling used to connect the FTT-10A network must remain separated within the control enclosure and wiring conduit.

Grounding the Device



The ground terminal (T10) must be securely connected to earth ground, and T9 must be connected to T10 using a jumper wire. Failure to properly ground this equipment may increase the risk of electrical shock and the possibility of interference to radio/TV reception, and will decrease the reliability of the device’s sensor readings.



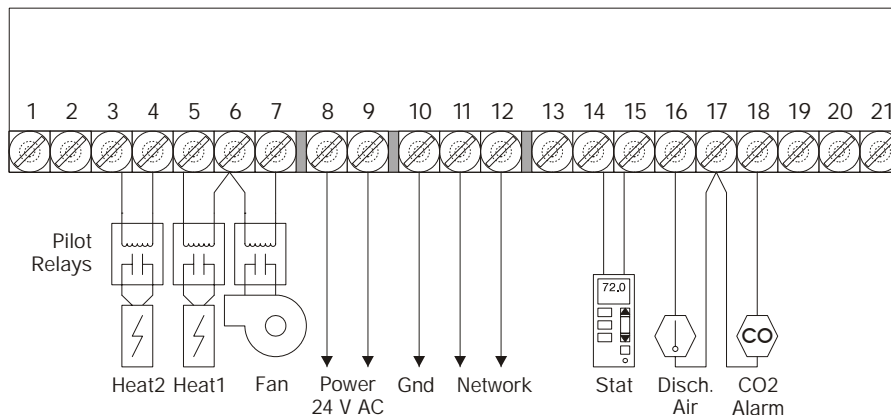
Connecting the device commons (COM) to earth ground will also connect the power source to earth ground.

Wiring Information



WARNING: Terminals 9, 14, 17, and 20 are connected internally on all VAV Series controllers. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Figure 2: VAV-1 Terminal Connections



Connecting Input Devices

Thermostat (STAT)

Connect one wire of a Innovex Technologies digital thermostat module (DTM) to the STAT (T15) terminal. Connect the other wire to the adjacent common (T14).

Discharge Air Temperature (DAT)

To connect the discharge air thermistor to the unit, attach one wire from the thermistor to DAT (T16) and the other wire to the adjacent common (T17). The thermistor used must be 10K Precon Type III.

Internal Air Quality Alarm Sensor (IAQ)

To connect the digital CO₂ level sensor to the unit, attach one wire from the sensor to IAQ (T18) and the other wire to the adjacent common (T17). The sensor must provide a contact closure when the CO₂ limit is exceeded.

Connecting Output Devices

Heating Stages 2 (H1, H2)

The heating stage outputs must be connected to 24 VAC pilot relays with EMF protection. See Figure 2 for details.

Fan Start/Stop (FAN)

The fan outputs must be connected to a 24 VAC pilot relay with EMF protection. See Figure 2 for details. If the controller is being used with auxiliary heat sources, this output is used as the auxiliary heat output.

Other Connections

Network (LON)

Network wiring must be twisted pair. One network wire must be connected to one LON (T11) terminal and the other network wire must be connected to the other LON (T12) terminal. Polarity is not an issue since an FTT-10A network is used for communications.

Power (PWR)

Connect one output wire from a 24 VAC power supply to PWR (T8) and the other output wire from the power supply to the adjacent common terminal (T9). Also place a jumper wire between T9 and GND (T10).

Specifications

Electrical

Inputs

- Cabling: twisted shielded pair, 18 AWG recommended—500 feet max. (152 meters)
- Resolution: 10 bit

Thermostat Network

- 12 Volt nominal, internally limited to 0.04 A

Discharge Air Temperature Sensor

- Precon Type III 10K thermistor

Internal Air Quality Alarm CO₂ Sensor

- Dry Contact
- Normally open
- 5 Volts DC max

Outputs

Fan Start/Stop, Heating Stages 1 & 2 or Heating Valve Open & Close

- 20 to 28 Volts AC
- 0.7 Amp max each

FTT-10A Network

- Speed: 78 KBPS
- Cabling: Maximum node-to-node distance: 1312 feet (400 meters)
- Maximum total distance: 1640 feet (500 meters)
- 42.4 Volts DC max

For detailed specifications, refer to the FTT-10A Free-Topology Transceiver User’s Guide published by Echelon Corporation. For information on ordering Connect Air items, contact Connect Air International; 4240 B Street; Auburn, WA 98001 <www.connect-air.com>.

Table 1: Network Wire Specifications

Cable Type	Pairs	Details	Connect Air Catalog No.
Level 4 22AWG (0.65mm)	1	Unshielded, Plenum, U.L. Type CMP	W221P-2001
Level 4 22AWG (0.65mm)	1	Unshielded, Non-Plenum, U.L. Type CM	W221P-1002

Power

Power Requirements

- 24 VAC nominal (requires an external supply)

Power Consumption

- With no external loads: 15 VA

Mechanical

Housing

- Dimensions: 5.25" (13.34 cm) high, 8.87" (22.53 cm) wide, 2.75" (6.99 cm) deep
- ABS Polycarbonate

Weight

- Controller weight: 29 ounces (0.82 kilograms)
- Shipping weight: 40 ounces (1.1 kilograms)

Electronics

- Processor: 3150 Neuron 10 MHz
- Flash: 48 Kilobytes
- SRAM: 8 Kilobytes
- Termination: 0.197" (5.0 mm) Pluggable Terminal Blocks, 14-22 AWG

Actuator

- Angle of rotation: 95° (adjustable)
- Torque: 35 in-lb [4 Nm] nominal

Environmental

- Temperature: 32 °F to 122 °F (0 °C to 50 °C)
- Humidity: 0 to 90%, non-condensing

Agency Listings

- UL916
- UL873

Agency Compliances

- FCC Part 15 Class A

Troubleshooting

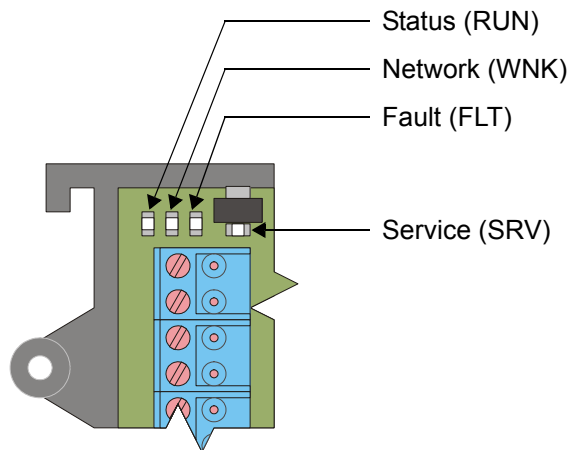
Diagnostic LEDs

The controller has 4 LED indicators. These indicators can aid in troubleshooting equipment operation problems. The following table lists the functions of the controller's LEDs in the order they appear from left to right on the unit.

Table 2: Controller LED Indicators.

LED	Indication
Status	<ul style="list-style-type: none"> - Solid green when running and configured by an LCI - Flashing green when running and NOT configured by an LCI
Network	<ul style="list-style-type: none"> - Yellow while the controller is transmitting data onto the FTT-10A network - Green when there is network activity - Off when there is no network activity
Fault	<ul style="list-style-type: none"> - Solid red when a fault condition exists
Service	<ul style="list-style-type: none"> - Illuminated when the service pin is pushed

Figure 3: VAV Series Controller LEDs



Troubleshooting Tips

Controller is not running and Status LED is not illuminated.

No power to controller. Verify the voltage on the controller's power connector (24 VAC).

How do I reset the controller?

The controller can be reset by the LCI, or you can cycle power to the controller. Refer to the LCI documentation for more information on resetting the controller using the LCI.

I am using a DTM-4 thermostat and cannot force the fan ON.

On the VAV Series controller, the Fan Override button is disabled. DTM-4s are not recommended for use with the VAV Series controller.

On other iWorX controllers, the status LED will turn Red when the controller has entered a fault mode that requires a reset. Are there any such modes on the VAV Series?

Yes, but it doesn't require a reset. As with any of the controllers, if the controller detects that no DTM present, an alarm is issued, the controller enters fault mode, and the LED is turned red. However, this type of failure doesn't require a manual reset.

Can VAV Series controllers have independent schedules?

Yes, each VAV Series controller on the network can be part of a different LCI group containing a different schedule. Remember the LCI is limited to 16 groups and 16 schedules.

What is the maximum number of VAV Series controllers that the LCI can support?

Since VAV Series controllers require either a VPU-1 or MPU-1 controlling the air-handling unit, the LCI can support up to 32 VAV Series controllers per MPU-1 and up to 60 VAV Series controllers per VPU-1. Remember the LCI can only support a maximum of 63 controllers.

When will the damper be controlled to the minimum flow value?

The damper will be controlled to the minimum flow value when the space temperature is satisfied.

Is there any provision for an air balancer to override the VAV box damper?

Yes, using the LCI there is a mode that an air balancer can manipulate the damper or set it to maintain a specified flow.

My VAV boxes are not entering heating or cooling mode.

Have the VAVs been grouped with an VPU-1 or MPU-1? Have you sent the grouping information to the controllers?

My temperature and flow readings are fluctuating rapidly.

Verify that the VAV Series is properly grounded. There must be a wire jumper between terminals T9 and T10.

Controller is not in stand alone mode, even though it has been ungrouped.

The VAV does not automatically re-enter stand alone mode when it is deleted from a VPU-1 or MPU-1's group. Manually place the VAV in stand alone mode from the "System Options" screen of the LCI, and reset the controller.

Controller is operating as if in stand alone mode, even though it is grouped.

If the VAV has been manually switched to stand alone mode, it does not automatically exit stand alone mode when it is added to a VPU-1 or MPU-1's group. Switch "Stand Alone Mode" to "Off" on the "System Options" screen of the LCI, and reset the controller.

Changes to system options are not taking effect.

To prevent inadvertent changes to the functionality of the VAV, the controller must be reset after any changes on the "System Options" screen of the LCI.

