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MODEL PvV, Model RvV VAV Diffusers Installation Operation and Maintenance

Model PvV, RvV VAV Diffusers

ADJUSTMENT, BALANCING, & MAINTENANCE INSTRUCTIONS

Model PvV & Model RvV VAV diffusers have been specifically deigned for VAV system applications. The diffuser air discharge opening size is varied to optimize the discharge velocity and volume while maintaining the temperature setpoint of the wall controller / thermostat.

Installation

VAV diffusers are installed similar to any other diffuser and according to specifications and applicable codes and standards.

Anemostat

A MESTEK COMPANY

An optional relief collar Model PvV-RR (field installed) may be used in the installation and added to any VAV diffuser model. The collar is sized for both the supply duct size and the diffuser neck size. Attach the relief collar to the diffuser neck with the (3) attached spring clips. With the diffuser damper wide open, there will be an induction effect where ceiling air is induced with supply air. The circular sheet metal ring with a slit blanks off the relief area during balancing so that only primary conditioned air is measured if using a flow hood. The ring should be removed after adjustment and before normal operation to allow excess air to enter the ceiling plenum. As the disc closes, the excess air will be discharged through the opening between supply duct and diffuser neck.

Caution: Avoid obstructing relief area with supply duct and insulartion to maximize the relief area available.

Face Panel Removal

The face panel does not need to be removed as all adjustments are made at the wall controller / thermostat.

The face panel assembly includes (4) vertical posts with a hook at each end, that engages (4) slots in the diffuser back pan. To remove the face panel, push the panel up slightly, rotate the panel CCW to disengage the hooks, and remove the panel from the back pan.

Supply Air Temperature

The diffuser controls are designed for either cooling only or auto heating-cooling changeover. For auto heating-cooling changeover, a temperature probe (field installed and wired) in the supply air duct monitors the supply air temperature to determine the mode of the system and index the diffuser controls to either heating or cooling. The changeover temp is set at the wall controller / thermostat. Refer the the applicable control package diagram for point to point wiring. It is very important that the probe be installed in a location with a moving air stream. Installing the sensor in a supply duct for a diffuser with full shut-off will not accurately indicate the supply air temp.

Duct Design / Balancing Dampers

VAV diffusers are pressure dependent meaning that air flow volume (CFM) is based on damper position and static pressure at the neck of the diffuser. The discharge disc in the diffuser acts as a volume damper but does not eliminate the need for an upstream branch / balancing damper. The diffuser volume is adjusted at the balancing damper, not the diffuser. Some method of duct pressure control must be included as part of the overall system design as diffuser sound levels will increase dramatically when positioning closed against high static. Duct work should be designed and installed to prevent excess friction losses. Static pressure regain or constant loop duct designs are preferable to equal friction or equal velocity designs.





Figure 1: Relief Collar, side view



Static Pressure Control

VAV diffusers replace the volume control damper normally used in VAV boxes by utilizing a VAV damper in the diffuser itself. As such, and without a static pressure control system, room sound levels can reach unacceptable levels due to higher than required static pressures in the supply duct. A functioning static pressure control system is a mandatory requirement for proper system function and balancing procedures. A control pressure of .25" w.g. at mid-point between the static pressure control damper and the last branch duct is typical. The static pressure sensor should be located at that point. The static pressure sensor for a constant size duct loop system may be located anywhere within the loop, but at least 5 duct diameters downstream of the nearest obstruction.

Balancing Procedures

Model PvV, RvV VAV diffuser units are of the variable discharge area type. There are no applicable AK factors. Therefore, the air flow rate / volume (cfm) should be determined using a capture / balancing hood.

Note that total fan capacity may not provide 100% of the demand volume to all the outlets at the same time due to design diversity. Closing branch / balancing dampers or one or more diffusers may be required.

Balancing a system with Static Pressure control:

- 1. Confirm that the system pressure is under control and operating at design setpoint. The static pressure should control to the lowest operating pressure which will allow the maximum demand volume to be supplied from the diffuser requiring the highest total pressure loss (often the last diffuser on the duct system).
- 2. Verify the total fan capacity. The system's "instantaneous peak demand" will require a total fan volume less than the sum of the diffuser volumes.
- 3. Open the diffuser damper 100% by increasing (cooling mode) or decreasing (heating mode) the room temp setpoint at the wall controller/thermostat to the upper or lower limit allowed on the thermostat. Refer to the controller / thermostat adjustment procedures.
- 4. Measure the diffuser volume with a balancing hood. Note that excess volume indicates excess pressure.
- 5. Set the diffuser air flow rate by adjusting the branch / balancing damper to achieve maximum demand volume.



Electronic Analog Control Systems

Refer to the Control Packages at the back of this manual for typical wiring methods. The wiring for ONE Zone requires ONE wall controller / thermostat, one or more VAV diffusers, a 24vac power source, and factory pre-wired cables to complete the control system. Each VAV diffuser includes 2 ports to plug in the RJ12 jacks from the cables to speed installation. Using the pre-wired cables from Anemostat allows the user to interconnect all components for the zone in any arrangement - series, parallel, or series-parallel configurations. Note that the 24vac power source can supply more than one zone if sized with enough power (VA) for all control devices.

IMPORTANT: Do NOT interconnect multiple zones where more than one wall controller / thermostat is connected to the same diffusers.

Powering the System

The actuators for each VAV diffuser, when first powered, will perform an auto calibration routine, and will cycle to full open and full closed positions before controlling to the desired room temperature setpoint. All setpoints and calibration is done at the wall controller / thermostat.

Model PvV-24 Power Supply (Optional)

The power supply module includes (2) RJ-12 Ports to accept Anemostat's pre-wired cables. Note that both Ports 1 & 2 (by default) are interconnected and pass through both 24VAC and Thermostat signals. This allows the power supply to be connected in series or parallel with all diffusers and ONE wall controller / thermostat. If Ports 1 & 2 are used to power 2 separate zones with individual wall controllers / thermostats, Remove / Snip the GREEN wire from Port 1 to Port 2 to isolate / separate the thermostat signals from each other.





Model PvV-HIT Wall Controller / Thermosat Installation and Operation Guide

Installation

В



Α	В	С	D	Е
3.25 in.	5.16 in.	0.88 in.	3.25 in.	0.15 in. diameter
83 mm	116 mm	22 mm	83 mm	3.81 mm diameter

Rough-in Preparation

For optimum temperature sensor performance, the thermostat must be mounted on an interior wall and away from heat sources, sunlight, windows, air vents, and air circulation obstructions (e.g., curtains, furniture).

If replacing an existing thermostat, label wires as needed for reference when removing the existing thermostat.

Complete rough-in wiring at each location prior to thermostat installation. Cable insulation must meet local building codes.

Mounting and Wiring

The thermostat must **NOT** be:

- Mounted on an exterior wall.
- Mounted on or near a large thermal mass (e.g., concrete block wall).
- Blocked from normal air circulation by obstructions.
- Exposed to heat sources (e.g., lights, computers, copiers, or coffee makers) or to sunlight (at **any** time of the day).
- Exposed to drafts from windows, diffusers, or returns.
- Exposed to air flow through the conduit (from leaks in plenum ducts)—put plumber's putty or similar material inside the conduit to block air flow.
- 1. If the thermostat is locked on the backplate, turn the two hex screws (in the **two outermost holes**) in the backplate **CLOCKWISE** until they (just) clear the cover. Swing the thermostat up and away from the backplate to remove it.



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To prevent damage to the board, do not insert a screwdriver into any holes other than the two outermost holes. To prevent mounting screw heads from touching the circuit board in the thermostat, use only the mounting screws supplied by KMC Controls. Using other screws may damage the thermostat. Do not turn screws in farther than necessary to remove the cover.

2. Route the cable through the backplate.



- 3. With the hex screws toward the floor, fasten the backplate to the outlet/handy box with the supplied screws. (The backplate mounts directly on **vertical** 2 x 4 inch boxes, but requires an HMO-1161/HMO-1161W wall plate for horizontal 2 x 4, 4 x 4, or other boxes.)
- 4. Connect the wires to the terminal block per the applicable Control Package diagram.



- 5. Place the top of the thermostat over the top of the mounting base and swing it down over the hex screw brackets. Be careful not to pinch the wiring.
- 6. Back the hex screws out of the backplate brackets (**counterclockwise**) until they engage the thermostat and hold it in place.



Operation



Change Temperature Setpoint

To change the setpoint:

- 1. Push the Setpoint button (or either Up/Down button) to display the current value.
- NOTE: Sequences2 and 3 have **two** setpoints indicated by "snowflake/cool" and "fire/ heat" icons. When the Cooling setpoint is showing, pushing the Setpoint button will display the Heating setpoint.
- 2. Use the Up/Down buttons to change the value.
- 3. Press the Setpoint button again, and the thermostat will control at the new setpoint. (Alternately, after about 30 seconds of no activity, the display reverts back to displaying room temperature.)

Change Configuration

Press and hold both the Up and Down arrows buttons for about ten seconds until the display starts flashing "LIMITS ."

NOTE:

When a menu is flashing (LIMITS, ADVANCE, SYSTEM, or EXIT), pressing Up or Down displays the next menu item and pressing Setpoint selects that menu. When a menu is NOT flashing (e.g. DEAD BD), pressing Up or Down changes the value and pressing Setpoint displays the next menu item.

The LIMITS setpoints define the damper position at minimum and maximum air flow. 0 to 100% full open damper position is proportional to 2 to 10vdc LIMITS setpoints. For example to set the damper travel from 20% open (min ventilation) to 100% open, the limits would be set for 3.6 vdc (AO1 MIN) and 10vdc (AO1 MAX)

To change any of the LIMITS when LIMITS is flashing, press Setpoint button until the desired limit (AO1 MIN, AO1 MAX, AO1 AUX, AO2 MIN, AO2 MAX) is flashing on the screen. Adjust limits between 2-10vdc. Use the Up and Down buttons to change the desired values.

To change any of the system or advanced features, press the Up or Down button until the desired (flashing) ADVANCE or SYTEM menu appears and then press the Setpoint button.



SEQUENCE # 1:

- * Cooling Only
- * Auto Htg-Clg Changeover or Early Morning Warmup (field installed duct temp sensor required)
- * Cooling & Heating temperature setpoints the same
- * Minimum and Maximum air flow rates (damper positions) the same for both heating and cooling

SEQUENCE # 2:

- * Auto Htg-Clg Changeover or Early Morning Warmup (field installed duct temp sensor required
- * Separate Cooling & Heating temperature setpoints
- * Adjustable Heating & Cooling Deadband
- * Minimum and Maximum air flow rates (damper positions) the same for both heaing and cooling
- * Output AO2 (0-12vdc) available for auxiliary heating

SEQUENCE # 3:

- * Cooling Only
- * Output AO2 (Min and Max djustable from 0-10vdc) available for auxiliary heating
- * Separate Cooling & Heating temperature setpoints
- * Adjustable Heating & Cooling Deadband

The ADVANCE menu enables changing (via the Up/Down buttons) the values of:

- DEAD BD Deadband or "minimum setpoint differential" (Adj from1-10F, 2F default)
- SETBACK Standy/unoccupied setback offset (Adj from 0-10F, 2F default). Does not apply to Morning Warmup.
- PROP BD Loop Proportional band (Adj from 1-10F, 2F default)
- Rm OFST Room temperature offset (Adj +- 5F, 0F default)
- CNG OVR Changeover Temperature (Adj 55-85F, 77F default)
- I TIME Loop Integral Time (Adj from 0-60, 30 minutes default, 0= cancel integral action)

The SYSTEM menu enables changing (via the Up/Down buttons) the values of:

- SEQUENCE SEQ1, SEQ2, SEQ3
- UNITS Fahrenheit (IP) OR Celsius (SI)
- BLANK Display blanking (NO, YES). When blanked, the temp will display for no more than 30 seconds after a button is pushed











SEQUENCE OF OPERATION

THE WALL CONTROLLER / T'STAT SIGNALS THE DIFFUSER ACTUATOR IN RESPONSE TO THE SPACE TEMPERATURE. THE CONTROLS SENSE SUPPLY AIR TEMP AND AUTOMATICALLY INDEX TO D.A. COOLING OR R.A. HEATING MODE. NOTE UPON INITIAL POWER UP, THE DIFFUSER ACTUATOR WILL PERFORM A SELF-CALIBRATION ROUTINE. WHEN USER ADJUSTS WALL CONTROLLER FOR DAMPER POSITION (MIN AND MAX FLOW RATES), A01 MIN AND A01 MAX ARE SET BETWEEN 2VDC (DAMPER CLOSED) AND 10VDC (100% DAMPER OPEN).

COOLING MODE

- 1. WHEN SUPPLY AIR TEMP IS LESS THAN 77°F, THE THERMOSTAT D.A. COOLING OUTPUT CONTROLS FLOW (COOLING MODE). WITH SPACE TEMPERATURE BELOW THE THERMOSTAT SETPOINT, MINIMUM DAMPER POSITION IS MAINTAINED AS SET BY VOLTAGE FOR AO1 MIN.
- 2. AS THE SPACE TEMPERATURE INCREASES FROM SETPOINT TO 2°F ABOVE SETPOINT, THE DAMPER OPENS FROM MINIMUM POSITION (A01 MIN) TO MAXIMUM POSITION (A01 MAX) . AT OVER 2°F ABOVE SETPOINT, MAXIMUM DAMPER POSITION IS MAINTAINED.

HEATING MODE

- 1. WHEN SUPPLY AIR TEMP IS GREATER THAN 77°F, THE THERMOSTAT R.A. HEATING OUTPUT CONTROLS DAMPER POSITION (HEATING MODE). WITH SPACE TEMPERATURE ABOVE THE T'STAT SETPOINT, MINIMUM DAMPER POSITION IS MAINTAINED AS SET BY VOLTAGE AO1 MIN.
- 2. AS THE SPACE TEMPERATURE DECREASES FROM HEATING SETPOINT TO 2°F BELOW THE SETPOINT, THE DAMPER OPENS FROM MINIMUM POSITION (A01 MIN) TO MAXIMUM POSITION (A01 MAX) . AT OVER 2°F BELOW THE SETPOINT, MAXIMUM DAMPER POSITION IS MAINTAINED.

REFER TO WALL CONTROLLER INSTRUCTIONS FOR ACCESS TO MENUS AND SETTINGS. AO1 MIN AND MAX CONTROL THE DAMPER POSITION AND UNITS ARE VDC. ADJUST CHANGEOVER TEMP AS APPLICABLE. UPON LOSS OF POWER, DAMPER FAILS IN PLACE. THE DUCT TEMP SENSOR MUST BE IN AN AIR STREAM THAT INDICATES HEATING OR COOLING. DIFFUSER MIN DAMPER POSITION MUST ALLOW AIR FLOW TO PROPERLY SENSE CHANGEOVER CONDITIONS.

JOB NAME: SUBMITTED BY: DATE:







AUTO HTG-CLG CHANGEOVER

- ANALOG ELECTRONIC CONTROLS
- VAV HEATING & COOLING
- PRESSURE DEPENDENT



AIR FLOW SETPOINTS ADJUSTED AT THERMOSTAT





FROM 1 to 10°F IN "ADVANCE" MENU ON THERMOSTAT

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