

# CONTINUOUS FAN POWERED BOXES SUBZONED WITH THERMA-FUSER™ VAV DIFFUSERS

## BACKGROUND

Continuous fan powered boxes are also known as series fan powered boxes and constant volume induction boxes. The fan is on whenever the system is on providing a constant air flow to the conditioned space. For intermittent or parallel fan powered boxes, see Form 6.14.

## GOALS

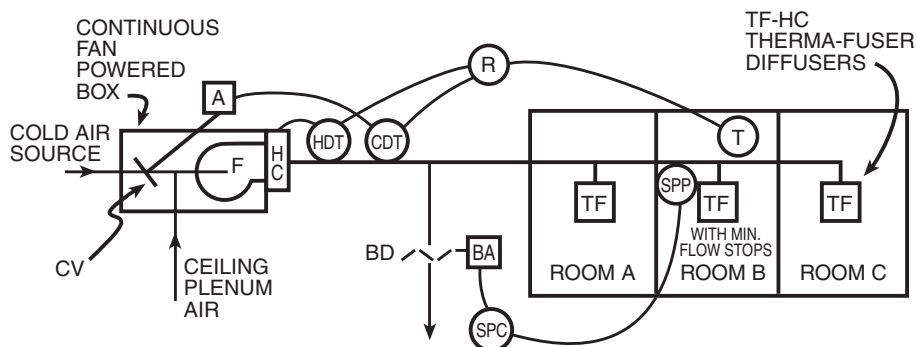
The goals of applying Therma-Fuser™ VAV diffusers in a continuous fan powered box system may include:

- 1) **Individual temperature control.** A continuous fan powered box that serves more than one space may become a master zone which is subzoned with Therma-Fuser VAV to provide individual room temperature selection and control. This need occurs when each person has a different temperature preference. This need may also occur when heat releasing equipment such as a personal computer is installed or portions of the zone have a different operating schedule.
- 2) **Additional refrigeration and heating energy savings** from not overcooling or overheating any of the rooms in the Therma-Fuser subzones.

## METHOD OF UPGRADING

Each room will be equipped with one or more type HC Therma-Fusers diffusers. The continuous fan powered box becomes the master zone which supplies heated or cool air to the Therma-Fuser subzones.

It is assumed that the existing system has an effective constant temperature cold air supply control at the cool air source and some form of static pressure control at the central fan.



## LEGEND

- HC: HEATING COIL. CONTROL VALVE (HOT WATER OR STEAM) OR ELECTRICAL CONTACTOR(S) ARE NOT SHOWN.
- CV: COLD AIR DAMPER OR AIR VALVE IN TERMINAL.
- A: ACTUATOR POSITIONING CV. MAY USE ACTUATOR IN TERMINAL.
- F: FAN. RUNS CONTINUOUSLY.
- TF: TYPE HC THERMA-FUSER DIFFUSER. OPTIONAL TF-HC-R (THERMA-FUSER WITH R-RING BY PASS). SEE STATIC PRESSURE CONTROL.
- T: ROOM THERMOSTAT.
- CDT: DISCHARGE THERMOSTAT TO CONTROL COOLED AIR. SET AT 55°F / 13°C.
- HDT: DISCHARGE THERMOSTAT TO CONTROL HEATED AIR. SET NO HIGHER THAN REQUIRED FOR HEATING NEED, BETWEEN 80°F / 26.5°C AND 120°F / 49°C.
- R: PNEUMATIC OR ELECTRICAL RELAY(S) TO ACTIVATE CDT OR TO ACTIVATE HDT. MAY NOT BE REQUIRED WITH A TWO CIRCUIT ELECTRIC ROOM THERMOSTAT.
- BD: BYPASS DAMPER. OPTIONAL—SEE STATIC PRESSURE CONTROL.
- BA: BYPASS DAMPER ACTUATOR. OPTIONAL—SEE STATIC PRESSURE CONTROL.
- SPC: STATIC PRESSURE CONTROLLER. LOCATE WHERE ACCESSIBLE. SET AT APPROX. 0.20"wg / 50Pa. OPTIONAL—SEE STATIC PRESSURE CONTROL.
- SPP: STATIC PRESSURE PROBE. LOCATE APPROX. MIDWAY IN DUCT RUN. OPTIONAL—SEE STATIC PRESSURE CONTROL.

## SEQUENCE OF OPERATION FOR SPECIFIC ROOM TEMPERATURES AT T

T	CV	FAN	HEAT	BD
WHEN ROOM TEMP. IS ABOVE COOLING SETPOINT	MODULATE WITH CDT SETPOINT	ON	OFF	OPENS WITH INCREASED STATIC PRESSURE
WHEN ROOM TEMP. IS BELOW COOLING SETPOINT	CLOSED	ON	OFF	OPENS WITH INCREASED STATIC PRESSURE
WHEN ROOM TEMP. IS BELOW HEATING SETPOINT	CLOSED	ON	<b>ELECT. HEAT ON</b> WHEN DISCHARGE AIR TEMP. BELOW HDT SETPOINT	OPENS WITH INCREASED STATIC PRESSURE
			<b>H.W./STEAM VALVE</b> OPENS WHEN DISCHARGE AIR TEMP. BELOW HDT SETPOINT	

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## CONTINUOUS FAN POWERED BOXES SUBZONED WITH THERMA-FUSER™ DIFFUSERS—*continued*

Discharge thermostats provide for a constant supply air temperature which will be able to satisfy the load in any space regardless of its location in the master zone. They also control the heated air supply to prevent excessive supply air temperature whether heating is steam, electrical or hot water. Discharge thermostats assure that heated supply air temperature is warm enough to change the Therma-Fuser unit to the heating mode.

### SUPPLY AIR TEMPERATURE CONTROL

*Note: BMS controls use sensors instead of thermostats. Control from BMS sensors located where thermostats are shown.*

Thermostat, T, serves to select the mode: either cooling or heating. Usually the existing room thermostat can be used for this purpose.

For room temperatures **above the cooling set point of T**, discharge thermostat, CDT, controls the cold air valve, CV. CV is modulated to introduce enough cooling air to achieve the set point of CDT, usually 55°F/13°C. The difference between the cooling air and total fan capacity is made up with air from the ceiling plenum.

For room temperatures **below the cooling set point of T**, cold air valve, CV, is closed and air from the ceiling plenum is circulated.

For room temperatures **below the heating set point of T**, discharge thermostat, HDT, controls the heating coil. When discharge temperature is below the set point of HDT, the heating coil is activated. It is desirable for heated air to be supplied at a temperature (1) no higher than required to meet the heat loss of the space (lower temperatures mean less stratification), (2) high enough to accomplish TF changeover (80°F / 26.5°C or

above), (3) not high enough to impair TF sensing of room temperature (less than 120°F / 49°C). We recommend that HDT be set to accomplish these goals.

**Use minimum flow stops on the Therma-Fuser diffuser in the room with the thermostat (Room B).**

### STATIC PRESSURE CONTROL

Depending on how much the Therma-Fuser diffusers turn down within the continuous fan powered box master zone, the system may operate at acceptable noise levels without addition of static pressure control measures. Otherwise the system should have a bypass to the ceiling plenum. **Use either R-Ring bypass or a automatic bypass damper such as an Acutherm PIM (shown as BD).** See Options of Static Pressure Control and Pressure Independence (Form 6.3).



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