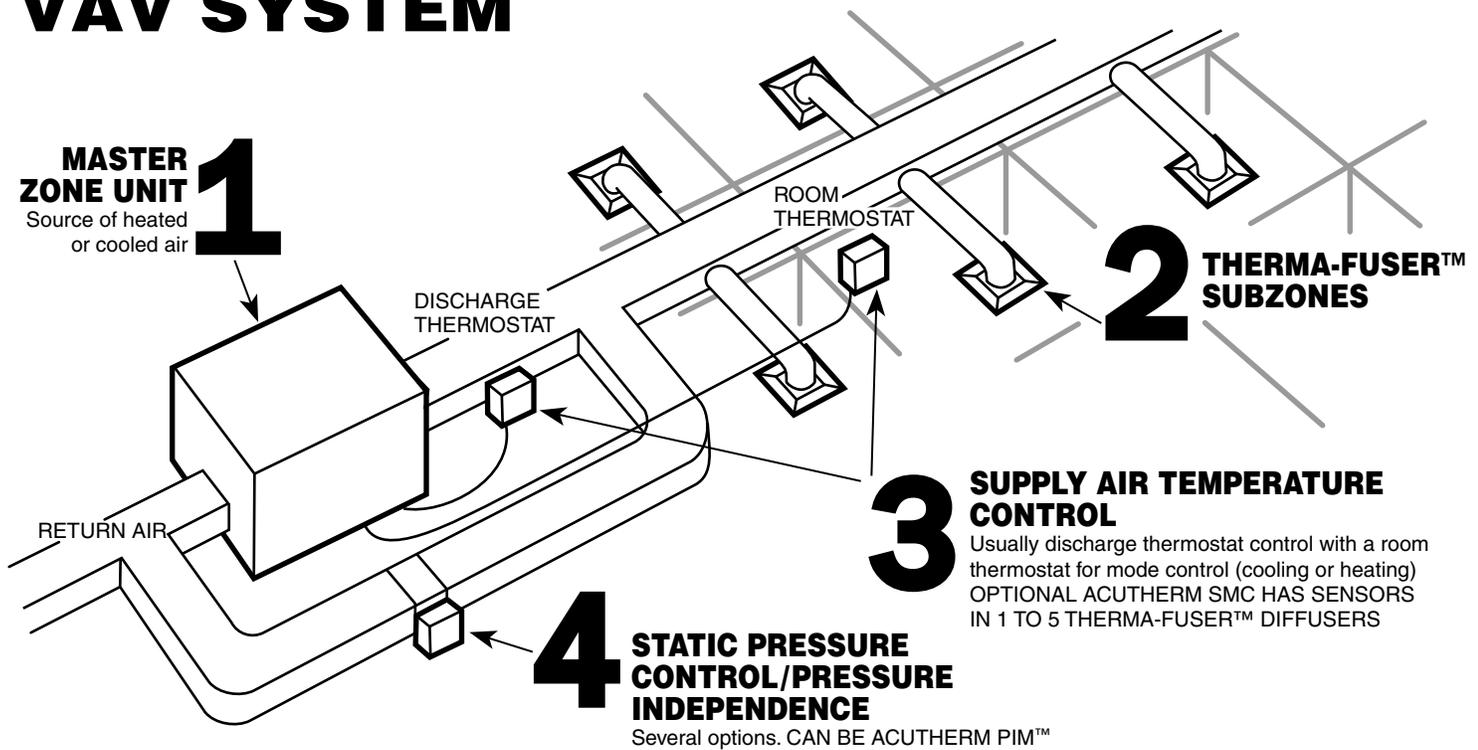


# ESSENTIALS OF A MODULAR VAV SYSTEM



Every Modular VAV System has four essential elements. These are:

- 1) Master Zone Unit
- 2) Therma-Fuser™ Subzones
- 3) Supply Air Temperature Control
- 4) Static Pressure Control/Pressure Independence

Each of these essentials is discussed below.

## Master Zone Unit

A master zone may be considered to be a unit or a zone of control that supplies conditioned air to one or more Therma-Fuser™ VAV diffusers. Each Therma-Fuser diffuser is a subzone which controls a module of space by varying the volume of air delivered to that module of space.

Examples of master zone units are:

Low pressure systems

- 1) Direct Expansion package unit
- 2) Ducted heat pump
- 3) Air handling unit
- 4) Ducted fan coil unit.
- 5) Constant volume reheat zone
- 6) "Texas Multizone" zone
- 7) Two deck multizone zone

Low pressure zones

- 1) Dual duct box
- 2) VAV box
- 3) VAV reheat zone
- 4) Continuous fan powered box
- 5) Intermittent fan powered box

Because these master zone units are capable of supplying only heated air or only cooled air at one time, the system should be designed with master zones which do not have simultaneous heating and cooling loads to a troublesome degree. If significant simultaneous heating and cooling loads are expected in one master zone, the system should be redesigned to place the spaces with like heating and cooling loads in separate master zones.

## Therma-Fuser Subzones

The Therma-Fuser™ VAV diffuser is a diffuser with the VAV box function and thermostat built in. Type HC Therma-Fuser diffusers are recommended for most applications.

A thermostat in the neck of the type HC Therma-Fuser diffuser senses supply air temperature, while separate heating and cooling thermostats sense a sample of room temperature air

which is continuously induced into the Therma-Fuser diffuser.

When supply air temperature is cold (under 68°F/20°C), the cooling thermostat controls. On a room temperature rise, the Therma-Fuser diffuser dampers open, and on a room temperature drop, the dampers close.

When supply air temperature is warm (over 80°F/26.5°C), the heating thermostat controls. On a room temperature rise, the Therma-Fuser diffuser dampers close, and on a room temperature drop, the dampers open.

Please note that a type HC Therma-Fuser diffuser does not *cause* supply air temperature to be at some level, it *responds* to the supply air temperature level to select the mode of control (heating or cooling).

Information and ratings on Therma-Fuser diffusers can be found in the Acutherm catalog. The purpose of the following chapters on upgrading systems for individual comfort is to address the application of Therma-Fuser diffusers when supplied with conditioned (heated or cooled) air

(Continued)

from a particular type of air conditioning unit or master zone of control.

## Supply Air Temperature

The method of changeover from the heating mode to the cooling mode and the method of supply air temperature control is discussed for each of the various master zone units described in the following chapters. The subject is addressed as though all of the spaces are served by Therma-Fuser diffuser subzones.

For most types of master zones, there usually is a simplified and preferred approach. The simplified approach uses a room thermostat to control supply air temperature and may be adequate if heating temperature is limited such as hot water heat with controlled hot water temperature and if the needs of the space with the room thermostat keep the system operating with enough capacity to satisfy all subzones. To provide enough capacity, on-off master zone units, such as DX package units, must be on enough and proportioning master zone units, such as continuous fan powered boxes, must supply cool enough air or warm enough air when heating to satisfy all subzones.

The preferred approach uses discharge air thermostats to control supply air temperature and provides for constant supply air temperatures in both heating and cooling modes. This will satisfy the load in any space regardless of its location in the master zone. The preferred approach also prevents excessive supply air temperature

even if the heating is gas, oil, steam, electrical or uncontrolled hot water and assures that the heated supply air temperature is warm enough to change the Therma-Fuser diffuser to the heating mode.

The Acutherm System Mode Control Module (SMC™) provides multiple changeover thermostats for use in a preferred approach. It also has a seven day clock to control setback and warm-up.

When Therma-Fuser diffusers are used in a system with fixed diffusers, it is usually the space with the fixed diffuser that must control the master zone. This is the only control that those spaces have. When Therma-Fuser subzones are used, each adjusts air volume to control its module of space.

## Static Pressure Control/Pressure Independence

Noise level at any air diffuser is influenced by air velocity through the diffuser which is, in turn, a function of static pressure in the neck of the diffuser. Noise level at a Therma-Fuser diffuser will not increase as it closes if the static pressure in the neck is held constant. As static pressure in the neck increases, sound level increases.

In an average office environment, the sound level of most Therma-Fuser diffusers will begin to be noticed as static pressure in the neck increases past .25"wg. See catalog ratings for accurate data.

Static pressure change is encountered as (1) the Therma-Fuser diffuser modulates when supplied with air from a constant volume fan; and (2) when duct pressure in a system varies due to variation in air flow.

Also, a means of static pressure control is required when the air source is operated at a higher pressure level than suitable for quiet Therma-Fuser diffuser performance.

If the pressure of the supply air is low enough not to require pressure reduction and is not subject to significant variation, a means of pressure independence may not be required. A low pressure system in which 30% or less is VAV may be such a case. As a rule of thumb, if the existing diffusers are not noisy, some means of static pressure control will not be required for an upgrade where no more than 30% of the air in the total system is supplied to Therma-Fuser diffusers.

Otherwise, automatic control of pressure reduction will be required as the Therma-Fuser diffusers must perform in a variable volume situation. A manual damper is fixed, will not control and is not recommended because the pressure drop will vary widely as velocity across the damper changes.

Several options of supply air relief/static pressure control are listed in the following chapter, "Options of Static Pressure Control and Pressure Independence" Form 6.3. Each provides "pressure independence" to one or more Therma-Fuser diffusers.



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