SYSTEM Type = PVVT

Packaged Variable-volume Variable Temperature

This system is another variation of the VAV system. It is used almost exclusively for small (~5,000 ft2) commercial buildings but it can be used with modular building systems (e.g., one or two PVVT units for each floor of a multistory building) much the same as PVAVS is often used. Since the unit is either supplying cold or warm air which is then varied by zone dampers, the zones connected to each unit should have nearly similar needs. The first named zone controls whether the unit is on cooling or heating. For purposes of simulation, we suggest that similar zones be accumulated and modeled as one zone and assigned to one PVVT unit. The PVVT unit is usually supplied with an airside economizer, air filters, cooling coil, full sized electric heating coil used only for supplemental heat if a heat pump, a speed controlled VAV fan with a variable speed compressor, or a constant speed fan, controlled intermittently, if the compressor is standard electric/constant speed. A return fan is seldom supplied with such small units.
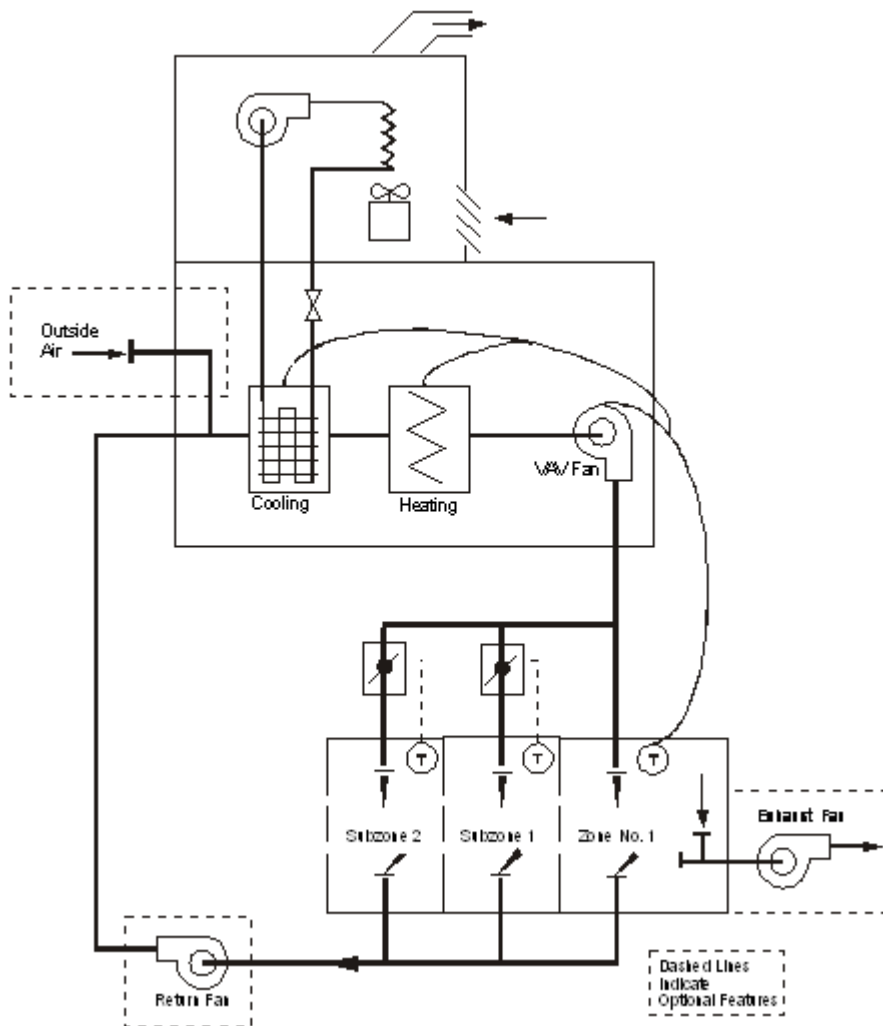

Figure 65 Packaged variable-volume variable-temperature system

Other names and/or applications for PVVT

- No other names

- The PVVT may be modeled with three different refrigeration cycles:

- Conventional compressor with either air cooled or water cooled condenser.

- A variable speed electric heat pump and air cooled condenser

- A gas engine driven heat pump and air cooled condenser

- In addition, the economizer for the unit with a conventional compressor may have either an air-side or water-side economizer. For the heat pump unit only, the air-side economizer is appropriate.

Standard Temperature Controls

- The CONTROL-ZONE controls whether the PVVT unit is heating or cooling. It also controls the supply airflow and temperature.

- In the cooling mode, as the control zone's cooling load drops, the zone airflow is first reduced with the supply air temperature held constant. Once the control zone is at its MIN-FLOW-RATIO, the flow is held constant and the supply air temperature is reset to maintain zone temperature.

- In the heating mode, as the control zone's heating load drops, the zone airflow is first reduced with the supply air temperature held constant. Once the control zone is at its MIN-FLOW-RATIO, the flow is held constant and the supply air temperature is reset to maintain zone temperature.

- The airflow to all other zones is proportionate to the airflow of the control zone. In other words, the thermostats in the non-control zones have no effect on either airflow or supply air temperature. They may, however, modulate a reheat coil or baseboard.

- At the central level, the airhandler modulates the airflow and supply temperature according to the control zone. If available, the unit will utilize an economizer prior to activating cooling, depending on the economizer control.

Subtopic help for this Topic:

◻ Input template for a standard PVVT unit with standard compressor with water cooled condenser

◻ Covered in detail by separate Topics are the following:

Input template for a standard PVVT unit with standard compressor with water cooled condenser

Under SYSTEM with suggested values

```
U-name = SYSTEM
TYPE          = PVVT
MAX-SUPPLY-T     = 95
MIN-SUPPLY-T     = 55
OA-CONTROL      = TEMP
ECONO-LIMIT-T     = 70
SUPPLY-STATIC    = 2              inches total static
SUPPLY-EFF      = 0.65            overall fan eff
```

```
    FAN-SCHEDULE     = U-NAME          fan run times
    NIGHT-CYCLE-CTRL = CYCLE-ON-ANY        if fans cycle on to
                              hold night setpoint
    MIN-FLOW-RATIO    =0.50           vary supply flow
                              above,supply T below
    REHEAT-DELTA-T   = 50            if subzone reheat
    HEAT-SOURCE      = ELECTRIC
    CONDENSER-TYPE   = WATER-COOLED      by CW or WLHP loop
    CW-LOOP        = U-NAME         of CW or WLHP loop
    CONTROL-ZONE     = U-NAME         of control zone
    ..
```

Under ZONE with suggested values

```
    U-NAME = ZONE                  different than SPACE
    TYPE        = CONDITIONED
    DESIGN-HEAT-T    = 68
    DESIGN-COOL-T    = 75
    HEAT-TEMP-SCH    = U-NAME          thermostat heat sch
    COOL-TEMP-SCH    = U-NAME          thermostat cool sch
    OA-FLOW/PER     = 15
    SPACE        = U-NAME        of corresponding
    ..                       SPACE in LOADS module
```

Covered in detail by separate Topics are the following:

- Night Ventilation (SYSTEM command)

- Service Hot Water heat Pump (SYSTEM and CIRCULATION-LOOP commands)

- Electric and Fuel Meters (SYSTEM, ZONE, ELEC-METER and FUEL-METER commands)

- Building Resources (CIRCULATION-LOOP command)

- Optimum Fan Start

- Heat Recovery of Relief Air (return fan is required)

- Variable Speed Electric Heat Pumps

- Gas Heat Pumps

- Water Cooled Condenser Option

- Evaporative Precooler for Air Cooled DX Units