

Zoning the Unico System

General

This Tech Note provides instructions for zoning the Unico System for heating or cooling. Do not attempt to zone a system without reading these instructions as there are some limitations for doing so.

Unico does not offer zone controls or instructions for wiring. There are many ways to do this and none are standard.

Scope

A zoned system is designed to independently heat or cool more than one space with one or more units. Zone control is accomplished by modulating the airflow or air temperature flowing into each conditioned space. The best method is dependent on the type of system and level of control required.

Quite often in multiple story homes and buildings it is difficult to design a system that will evenly heat and cool each floor. It is normal that the upper floors require less heat in the winter but proportionally more cooling in the summer. Therefore, multiple story buildings are always prime candidates for zoning.

Zoning with Multiple Units

The easiest and best method for zone control is to provide separate units with their own thermostats. This keeps the design simple and provides redundancy. A good example is a two-story house where there are two units. Each unit conditions each floor. This works well as the sleeping area is usually on the upper floor while the living area is downstairs.

There are no limitations for this type of zone control, provided each system has the proper number of outlets for the air flow required for that zone.

Zoning with a Single Unit

The type of system installed determines how easily the system can be zoned. The easiest to zone is a hydronic system – either chilled water or hot water. The most limited is any refrigerant system – cooling or heat pump. Systems with an electric duct heater fall in-between.

The simplest zoned system uses a separate plenum for each zone. Each plenum should have a two-position (open/close) damper with an end switch. A simple thermostat, located in each zone, will open the damper and close the end switch to start the blower. Additional relays may be required to operate the condenser or boiler/pump.

Closing the damper (off cycle) will reduce the total airflow and build up static pressure in the remaining open duct. This could create noise in the remaining open ducts by blowing more air than designed but the increased noise level is not normally objectionable.

Refrigerant Systems All refrigerant systems automatically balance themselves to the outdoor and indoor conditions. Reducing the airflow decreases the evaporator temperature and may cause the anti-frost switch to short cycle the condensing unit. If the system is a heat pump, reduced airflow could cause a high-pressure limit nuisance trip.

Therefore, do not reduce the airflow below 200 cfm per nominal ton. Likewise, do not bypass the supply air into the return duct, as this is similar to reducing the airflow. If you close off a main trunk you must open another. In other words, make sure that the number of open outlets remains essentially constant.

The most common type of system has two zones, where at any given time, the airflow never falls below the minimum. Delivering more than the minimum amount of air is rarely a problem. To illustrate, consider the following examples.

Example 1. Consider a nominal 3-ton application with two equal zones. Each zone has a plenum serving each area. The minimum airflow is 600 cfm so the system requires at least 15 full open outlets. Both zones are installed with 10 outlets. Each plenum has a two-position damper that is fully open or partially open (in the closed position). When either zone requires air, the damper in the plenum for that area is fully open. Otherwise, it is partially closed equal to half the airflow (or the equivalent of 5 full outlets). With either zone calling for conditioning the minimum number of outlets is 15 and with both zones open the number of outlets is 20. Notice the number of outlets never drops below 15 when the system is

operating. The actual number of outlets in each zone does not have to be equal so long as the equivalent of the minimum number of outlets is always open.

Example 2. Consider a nominal 5-ton system with three equal zones with a plenum serving each zone. Only two of the zones need to be controlled by a thermostat, the third zone is common space (between the zones) where the temperature does not need to be closely controlled. The minimum airflow is 1000 cfm with 25 full outlets. Both controlled zones have 13 outlets and the common zone has 12. Use two-position dampers in each plenum. The dampers are set for fully open or fully closed. With either controlled zone calling for conditioned air, the common zone is open and the minimum number of outlets is 25. If both controlled zones require conditioned air, the common zone damper is closed and the number of outlets is 26.

You will notice that the refrigerant systems in the examples just shift the air from zone to zone. The system never reduces the air below the minimum. This is called load switching and it does not rely on airflow modulation.

Hydronic Systems Hydronic systems are the easiest to zone as there is no possibility of coil freezing or high discharge pressure. The only limitation occurs if you have floor registers. If you have floor registers, you will need to maintain enough air to keep the discharge temperature below 140°F (60°C).

These systems do not have any limit to the number of zones. Just be aware that reducing the airflow could create noise in the remaining outlets due to over-pressurization of the plenum. If this occurs, use a spring loaded bypass damper to recirculate some of the supply air to the return duct.

Electric Duct Heater Systems If electric duct heaters are used the electric elements could cycle on the high temperature limits due to reduced airflow. Refer to the electric heater instructions for the minimum cfm.

Single Zone with Multiple Units

In some applications, particularly large commercial spaces such as a banquet hall, some sort of capacity reduction is required. This can be accomplished by installing multiple units throughout the room.

With multiple units, the duct systems can be separate or intertwined. Separated duct systems will establish zones in the room. This is good design for spaces that incrementally fill up. But if the occupants are interspersed throughout the room you will want to intertwine the duct systems.

A good way to intertwine the duct systems is to use one main plenum where up to three air-handling units blow into. All air handling units should come on simultaneously with individual or 3-stage thermostats to control zone valves for water flow to hydronic coils or the outdoor condensing unit or heat pump section for refrigerant systems. This system will circulate air evenly regardless how many systems are on.