Zonex Systems GEN V: VRF-VAV System enhances VRF operation, providing engineers, contractors and building owners a means to maximize system efficiency, reduce installation costs, and provide greater comfort to individual zones within a building. This system allows up to 20 Smart Air Valves (SAV) to be connected to a VRF Fan Coil and uses VRF Manufacturer's Legacy Thermostat Interface to place calls for heating, cooling, or ventilation without compromising VRF operations or logic, in any way.

The GEN V system is an auto changeover, vote based VAV system. The system's algorithm is based on a first call, first served majority wins on changeover. As thermostats call for heating or cooling, votes are tallied by the GEN V controller. Each minute the GEN V controller polls all thermostats in the system to determine majority vote and then initiates a call for Heat, Cool, or if no votes for heating or cooling are present – VENT mode of operation is initiated. If voting majority switches from Heat to Cool or vice versa, GEN V controller will initiate a changeover sequence shutting down the current mode of operation, performing a time delay and after delay energize majority call to meet current majority demand.

System configuration, onsite management, and control are performed via the GEN V's HUB thermostat. The HUB thermostat is a zone stat that is also the single point where system wide changes can be made such as scheduling, set point changes, lock/unlock stats, system diagnostics, system configuration and much more.

Cooling

Each Smart Air Valve (SAV) is controlled via the EzTouchX zone thermostat that monitors zone temperature. When zone temperature rises 1° above zone thermostat's cooling set point it will send a vote for cooling. On the next poll of the GEN V controller, this vote will be counted and if there is a single vote or majority vote for cooling, GEN V controller will initiate a call for cooling.

Once cooling call is initiated, GEN V controller will energize 24-volt legacy outputs to VRF 24-volt thermostat interface (Interface is VRF Manufacturer Specific and is supplied by others). Y and G will be energized for cooling operations. The VRF interface will convert 24-volt input and forward this call for cooling to VRF Air Handler. VRF Air Handler then uses proprietary logic to bring on the VRF unit in the cooling mode. VRF Air Handler will automatically set fan speed, enable compressor operation, and allow superheat to be communicated to outdoor unit to maximize efficiency and provide desired comfort.

When cooling call has been initiated by the GEN V controller, all Smart Air Valve (SAV) devices connected to this GEN V controller are notified that VRF System is operating in cooling mode.

SAV dampers calling for cooling will use smart technology located within the SAV controller to adjust damper position to provide designed airflow. Airflow design varies based on the size of SAV damper, see sizing and engineering charts for airflow information. The SAV controller monitors air velocity continuously and automatically repositions the SAV in order to provide targeted CFM to that zone. When zone temperature has reached set point the zone thermostat will end call for cooling and on the next poll of GEN V this vote will be removed from the tally. If other cooling calls remain in the majority, cooling operation will continue, satisfied zone thermostats will reset their SAVs to a minimum CFM position while other calling SAVs will continue to maintain targeted air flows. Minimum CFM position is also set by SAV controller, again measuring air velocity, adjusting damper for targeted velocity, and CFM. During this ventilation mode, a minimal amount of cool air will enter zone to assist in maintaining room temperature. If room temperature falls 2° below cooling set point the SAV will fully close or drive to its minimum position.

Heating

Each Smart Air Valve (SAV) is controlled via the EzTouchX zone thermostat that monitors zone temperature. When zone temperature drops 1° below zone thermostat's heating set point it will send a vote for heating. On the next poll of the GEN V controller, this vote will be counted and if there is a single vote or majority vote for heating, GEN V controller will initiate the heating call.

Once heating call is initiated, GEN V controller will energize 24-volt legacy outputs to VRF 24-volt thermostat interface (Interface is VRF Manufacturer Specific and is supplied by others). W will be energized for heating operations. The VRF interface will convert 24-volt input and forward this call for heating to VRF Air Handler. VRF Air Handler then uses proprietary logic to bring on the VRF unit in the heating mode. VRF Air Handler will automatically set fan speed, enable compressor operation, and allow superheat to be communicated to outdoor unit to maximize efficiency and provide desired comfort.

When heating call has been initiated by the GEN V controller, all Smart Air Valve (SAV) devices connected to this GEN V controller are notified that VRF System is operating in heating mode. SAV dampers calling for heating will use smart technology located within the SAV controller to adjust damper position to provide designed airflow. Airflow design varies based on the size of SAV damper, see sizing and engineering charts for airflow information. The SAV controller monitors air velocity continuously and automatically repositions SAV in order to provide targeted CFM to that zone. When zone temperature has reached set point the zone thermostat will end call for heating and on the next poll of GEN V this vote will be removed from the tally. If other heating calls remain in the majority, heating operation will continue, satisfied zone thermostats will reset their SAVs to a minimum CFM position while other calling SAVs will continue to maintain targeted air flows. Minimum CFM position is also set by SAV controller, again measuring air velocity, adjusting damper for targeted velocity, and CFM. During this ventilation mode, a minimal amount of warm air will enter zone to assist in maintaining room temperature. If room temperature rises 2° above heating set point the SAV will fully close or drive to its minimum position.

Each zone thermostat has the ability to control auxiliary or supplemental heating devices such as reheat or baseboard heat. Auxiliary heat is configured at the zone thermostat. If there is a cool call, heat call, or the VRF system is a cooling only unit, the zone thermostat will energize AUX heat outputs if the zone temperature drops 2° below heat set point. If the zone thermostat is configured for reheat, SAV will position SAV damper to provide airflow over electric strip heat, hot water coil or other heating element.

Changeover

GEN V: VRF-VAV is an auto changeover system with an algorithm that operates on a majority vote or first call, first served operation. GEN V controller polls all associated EzTouchX zone thermostats each minute to tally calls for cooling and heating. If the majority of calls are for cooling, the system will operate in cooling mode. If the majority of calls are for heating, the system will operate in heating mode.

If the system is operating in cooling and after system poll a majority of the zone thermostats are calling for heating, GEN V recognizes this and will initiate a changeover strategy allowing cooling to run for an additional period (Configured via the HUB stat), shut down cooling operations and then run a 8-minute time delay to protect the equipment. At the end of the time delay, GEN V will initiate Heat operation.

If the system is operating in heating and after system poll a majority of zone thermostats are calling for cooling, GEN V will initiate a changeover strategy allowing heating to run for an additional period (Configured via the HUB stat), then shut down heating operations and run a 8-minute time delay to protect equipment. At the end of the time delay, GEN V will initiate cool operations.

All Calls Satisfied

When all calls for cooling and heating are satisfied EzTouchX zone thermostats will operate in Vent Mode. Outputs for cooling and heating are de-energized and the GEN V controller will continuously run the fan. The VRF Air Handler blower will be operational during Occupied times and ventilation air will be provided to all zones.

GEN V - VRF – VAV - designed to simplify and streamline VRF installations and operation.

Pat. 11131467