VRF – VAV

Sequence of Operation

GENERAL OPERATION:

Zonex Systems 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 Manufacturers Legacy Interface to place calls for heating, cooling, or ventilation without compromising VRF operations or logic, in any way.

The GEN XV system is an auto changeover, vote based VAV system. The systems 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 XV controller. Each minute the GEN XV 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 XV controller will initiate a changeover sequence shutting down current mode of operation, performing a time delay and after delay energize majority call to meet current majority demand.

System configuration, remote and onsite monitoring and system adjustments are performed via the Zonex GEN XV Mobile App. Mobile App allows for system configuration, scheduling, set point changes, and monitoring from mobile devices. This includes alarming and alerts via email and provides accessibility to the VRF-VAV system operation at all times.

Cooling

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

Once cooling call is initiated, GEN XV controller will energize 24-volt legacy outputs to VRF 24-volt interface (Interface is VRF Manufacturer Specific). Y and G will be energized for cooling operations. 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 provide cooling. 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 XV controller, all Smart Air Valve (SAV) devices connected to this GEN XV 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 SAV in order to provide targeted CFM to that zone. When VRF-STAT senses room temperature has approached set point, VRF-STAT will end call for cooling and on the next poll of GEN XV this vote will be removed from the tally. If other cooling calls remain in the majority, cooling operation will continue, satisfied SAVs will reset 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, and 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, SAV will fully close or drive to its minimum position.

Heating

Each SAV is controlled via a VRF-STAT that monitors zone temperature. When zone temperature falls 1° below VRF-STAT heating set point, a VRF-STAT will call for heating. On the next poll of the GEN XV controller, this vote will be counted and if there is a single vote or majority vote for heating, GEN XV controller will initiate heating operation.

Once heating call is initiated, GEN XV controller will energize 24-volt legacy outputs to VRF 24-volt interface (Interface is VRF Manufacturer Specific). W will be energized for heat pump operations. 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 provide heating. VRF Air Handler will automatically set fan speed, enable compressor operation, and allow Electronic Expansion Valve to communicate with outdoor unit to maximize efficiency and provide desired comfort.

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

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

Changeover

VRF-VAV is an auto changeover system with an algorithm that operates on a majority vote or first call, first served operation. GEN XV controller polls all associated VRF-STATs 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 VRF-STATs are calling for heating, GEN XV recognizes this and will initiate a changeover strategy allowing cooling to run for an additional period (Configured via the Zonex Mobile App), shut down cooling operations and then run a 8-minute time delay to protect the equipment. At the end of the time delay, GEN XV will initiate Heat operation.

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

All Calls Satisfied

When all calls for cooling and heating are satisfied VRF-STAT will operate in Vent Mode. Outputs for cooling and heating are de-energized and the GEN XV 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.

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