

VAV AHU Standard Sequence of Operation

Occupancy:

The unit shall be scheduled from a seven day schedule to meet the needs of the occupants.

Unoccupied/ Disabled Mode:

Both the supply and return fans will be disabled. The chilled water valve will be closed. The preheat (If Equipped) will remain enabled if the OA Temp is below the Preheat enable setpoint. Preheat pump will remain enabled below 40 DegF. Outside air and exhaust damper will be closed. The return dampers will be open.

Safeties, Interlocks:

If the fire alarm panel or duct mounted smoke detectors indicate a fire or smoke the fans will be disabled and the AHU will be in its Unoccupied/ Disabled Mode.

If the manual reset high or low pressure safeties trip the fans will be disabled and the AHU will be in its Unoccupied/ Disabled Mode.

LL35: If the Manual Reset LL35 trips the AHU Supply Fan shall be disabled. Return Fan with VFDs shall run at Minimum speed. The OA Dampers, Min OA Dampers and Exhaust Dampers will be closed. The Return Air Damper shall be 100%Open. The Preheat (If Equipped) shall remain in control. Coils pumps shall be enabled. The Chilled Water Valve will only open if the LL40 is also tripped.

LL40: If the auto reset LL40 trips the CHW Valve shall go to its predetermined position (25-30%Open) All Mixed Air dampers and preheat will remain under normal control. If the LL40 is tripped and the Sanity Relay is de-energized due to a controller issue the N/O CHW Valve will go 100% Open.

Temp Control Sequence:

Chilled Water Mode: When OA Temp is no longer suitable for free cooling. OA Temp above 68 to 72°F dry bulb or enthalpy above 22-24 BTU\LB Note: Comparing OA and RA enthalpy and using the air that contains the least amount of total heat is also acceptable.

The DA Temp Control Loop shall modulate the Chilled Water Valve to control at the DA Temp at the DA Setpoint.

OA Dampers will be at minimum position

Preheat if equipped will be locked out.

Combined Chilled Water Economizer Mode: When OA Temp is suitable for free cooling OA Temp below 68 to 72°F dry bulb and enthalpy below 22-24 BTU\LB Note: Comparing OA and RA enthalpy and using the air that contains the least amount of total heat is also acceptable.

The DA Temp Control Loop shall modulate the economizer to maintain DA Temp Setpoint. If the economizer is at 100% and the DA Temp is above setpoint the Chilled Water Valve will modulate to

meet the DA Temp Setpoint. The economizer shall be 100% open before the chilled water valve is allowed to open.

Preheat (if equipped) will be locked out.

Economizer Mode: Below 55°F OA Temp

The DA Temp Control Loop shall modulate the economizer to maintain DA Temp Setpoint. A Mixed Air Lo Limit Loop shall prevent the MA Temp from dropping below the MA Setpoint. The MA Setpoint shall be the same as the DA Setpoint minus 2°F (adj.) If the unit does not have a preheat coil the Mixed Air Lo Limit Loop shall be capable of overriding the minimum position. This is to prevent the unit from tripping off on the Low Limit Safety.

If the unit is equipped with a preheat coil. The minimum position shall not be overridden by the Mixed Air Lo Limit Loop. The preheat coil will modulate to maintain the PH Temp at the preheat setpoint. The PH Temp setpoint shall be the same as the MA Temp Setpoint minus 2°F (adj.) The control loop shall be sequenced so that the economizer is at minimum position before the preheat valve is opened.

Chilled Water will be locked out below 55°F OD Temp

Preheat if equipped will be locked out. Above 50°F OD Temp

Face and Bypass Dampers Mode: Preheat will be locked out above 50°F OD Temp

When preheat is not in use due to the OA Temp above the enable setpoint the Preheat Valve shall be locked out. The dampers shall go to full bypass unless this bypasses the chilled Water coil.

When OA Temp is between 50 and 40°F the dampers will be 100% face and the Preheat Valve will modulate to control the preheat at the preheat setpoint. Below 40°F OA Temp the Preheat Valve will be 100% open and the Face and Bypass Dampers will modulate to control the preheat at the preheat setpoint.

RA Humidity Control Sequence: The DA Temp setpoint shall be reset to lower the setpoint on rise in RA Humidity. Per ASHREA the setpoint shall not exceed 65 %RA. Setpoint may be lower for comfort reasons. Reheat if equipped can then modulate to maintain desired supply temp otherwise the VAV will be reheat if needed.

Minimum Outside Air Control/ Demand Control Ventilation:

Minimum low OA Setpoint: The Minimum OA shall be set to make-up for any exhaust in the area or building served to prevent building from being negative in pressure.

Minimum High OA Setpoint: The high Minimum setpoint should be the maximum amount of outside air needed to properly ventilate the space or building.

The Minimum outside air shall modulate between the Low Minimum setpoint and the High Minimum setpoint based on CO2 levels to maintain CO2 levels below 900 PPM setpoint (Adj) in the AHU common RA Duct.

Building Pressure Sequence:

Direct Pressure Control is the preferred method of controlling building pressure with the use of a SOAP and building static sensor. As the building pressure increases above .05" W.C. (adj.) setpoint the exhaust dampers will modulate open to maintain building pressure. The return fan VFD shall modulate to control the return fan discharge static at a 0.1 "W.C. adj. setpoint.

If Direct Pressure Control is not feasible fan track should be used. The return fan speed shall track the supply fan VFD minus a calculated offset. The calculated offset should come from balancer. The exhaust dampers should follow the mixed air signal and may also have an offset from the mixed air signal.

VFD Supply and Return Fan Speed Control/ building pressure:

On start-up the fans shall be ramped up to speed to prevent over pressuring the duct. The discharge static sensor shall be mounted 2/3rds down the supply duct. The supply fan VFD shall modulate to control the supply static at setpoint. A return fan static sensor shall be mounted in the discharge side of the fan and before the return dampers. The return fan VFD shall modulate to control the return static at a 0.1 "W.C. Setpoint. If it is not feasible to control the return fan off of static the fan shall track the supply fan minus an offset.

ALARMS and alarm reporting/paging:

All DDC system paged alarms shall include Building # Equipment # and Mech. Room # in the text.

AHU/DOA/MAU	Paged	Report to Main Page or "Alarm Status"	Graphic	Notes
Fan Failure Alarms	Yes	Yes	Yes	
LL35	Yes	Yes	Yes	
LL40	No	Yes	Yes	
Pressure Safeties	Yes	Yes	Yes	
Hum/Temperature Alarms	No***	No***	No***	*** Unless serving critical area
VFD Faults	Yes	Yes	Yes	
Filter Alarms	No	No	Yes	
Low DA Static	No***	No***	No***	*** Unless serving critical area
Smoke	Yes	Yes	Yes	
Coil Pump Alarms	Yes	Yes	Yes	
Humidifier Alarms	No***	No***	No***	*** Unless serving critical area
Wheel Alarms	Yes	Yes	Yes	

AHU Standard Economizer Sequence



- Chilled Water Enabled ... Chilled water is enabled above 55°F ODT
- Chilled Water Locked out... Chilled water is locked out below 55°F
- Econ Enabled... Economized is enabled if the Enthalpy is below 22.24 btu/lb setpoint and the ODT is below the 68.72°F setpoint
- Econ Disabled... Economized is Disabled if the Enthalpy is above 22.24 btu/lb setpoint or the ODT is above the 68.72°F setpoint
- Econ and Chilled Water Enabled... Note the Economizer should be 100% open before CHW Valve opens.

