

1 BUILDING AUTOMATION RISER DIAGRAM
SCALE: N.T.S.

PRELIMINARY NOT FOR CONSTRUCTION

| Revision Schedule | Description |
|-------------------|-------------|
| Rev. # | Date |
| | |

NWA PEDIATRICS ADDITION
3730 S PINNACLE HILLS PKWY #3
ROGERS, AR 72758
MANA
3383 N MANA CT, SUITE 201
FAYETTEVILLE, AR 72703

| | |
|------------|------------|
| DATE | DRAWN BY |
| Issue Date | Designer |
| PROJECT # | CHECKED BY |
| 2438 | Checker |

SHEET
M3.1
MECHANICAL CONTROLS

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Sequence of Operations RTU-5
Building Automation System Interface
The Building Automation System (BAS) shall send the controller Occupied Bypass, Morning Warm-up / Pre-Cool, Occupied / Unoccupied and Heat / Cool modes. If a BAS is not present, or communication is lost with the BAS the controller shall operate using default modes and setpoints.

Occupied Mode:
During occupied periods, the supply fan shall run continuously and the outside air damper shall open to maintain minimum ventilation requirements. The unit controller shall control the supply fan speed to maintain the current duct static pressure setpoint (adj.). The DX cooling shall stage and gas heat shall modulate to maintain the current discharge air temperature setpoint. If economizing is enabled the outside air damper shall modulate to maintain the current discharge air temperature setpoint.

Dehumidification:
Dehumidification will be activated when the space relative humidity rises above the dehumidification set point of 50% rh (adj.). In dehumidification mode, each compressor and its associated hot gas reheat coil solenoid valves shall be commanded on in stages as needed to maintain the space relative humidity at the dehumidification setpoint.

Unoccupied Mode:
When the space temperature is below the unoccupied heating setpoint of 66.0 deg. F (adj.) the supply fan shall start, the outside air damper shall remain closed and the gas heat shall be enabled. When the space temperature rises above the unoccupied heating setpoint of 66.0 deg. F (adj.) plus the unoccupied differential of 4.0 deg. F (adj.) the supply fan shall stop and the gas heat shall be disabled.
When the space temperature is above the unoccupied cooling setpoint of 78.0 deg. F (adj.) the supply fan shall start, the outside air damper shall open if economizing is enabled and remain closed if economizing is disabled and the DX cooling shall be enabled. When the space temperature falls below the unoccupied cooling setpoint of 78.0 deg. F (adj.) minus the unoccupied differential of 4.0 deg. F (adj.) the supply fan shall stop, the DX cooling shall be disabled and the outside air damper shall close.

Optimal Start:
The BAS shall monitor the scheduled occupied time, occupied space setpoints and space temperature to calculate when the optimal start occurs.

Morning Warm-Up Mode:
During optimal start, if the average space temperature is below the occupied heating setpoint a morning warm-up mode shall be activated. When morning warm-up is initiated the unit shall enable the heating and supply fan. The outside air damper shall remain closed. When the average space temperature reaches the occupied heating setpoint (adj.), the unit shall transition to the occupied mode.

Pre-Cool Mode:
During optimal start, if the average space temperature is above the occupied cooling setpoint, pre-cool mode shall be activated. When pre-cool is initiated the unit shall enable the fan and cooling and economizer. The outside air damper shall remain closed, unless economizing. When the average space temperature reaches occupied cooling setpoint (adj.), the unit shall transition to the occupied mode.

Optimal Stop:
The BAS shall monitor the scheduled unoccupied time, occupied setpoints and space temperature to calculate when the optimal stop occurs. When the optimal stop mode is active the unit controller shall maintain the space temperature to the space temperature offset setpoint.

Occupied Bypass:
The BAS shall monitor the status of the "on" and "cancel" buttons of the space temperature sensors. When an occupied bypass request is received from a space sensor, the unit shall transition from its current occupancy mode to occupied bypass mode and the unit shall maintain the space temperature to the occupied setpoints (adj.).

Economizer:
The supply air sensor shall measure the dry bulb temperature of the air leaving the evaporator coil while economizing. When economizing is enabled and the unit is operating in the cooling mode, the economizer damper shall be modulated between its minimum position and 100% to maintain the discharge air temperature setpoint. The economizer damper shall modulate toward minimum position in the event the mixed air temperature falls below the low limit temperature setting. Compressors shall be delayed from operating until the economizer has opened to 100%.

Reference Dry Bulb:
Outside air (OA) temperature shall be compared with a reference dry bulb setpoint. The economizer shall be disabled when OA temperature is greater than reference dry bulb setpoint + 5.0 deg. F.

Supply Fan:
The supply fan shall be enabled while in the occupied mode and cycled on during the unoccupied mode. A differential pressure switch shall monitor the differential pressure across the fan. If the switch does not open within 40 seconds after a request for fan operation a fan failure alarm shall be announced at the BAS, the unit shall stop, requiring a manual reset.

Supply Duct Static Pressure Control:
The unit controller shall modulate the supply fan output as required to maintain the duct static pressure setpoint. If the duct static pressure falls below the supply air static setpoint + deadband, the unit controller shall increase the output to the supply fan to maintain setpoint. If the duct static pressure rises above the supply air static setpoint + deadband, the unit controller shall decrease the output to the supply fan to maintain setpoint.
If for any reason the supply air pressure exceeds the fixed supply air pressure limit of 3.5 inches of W.C. the supply fan shall shut down. The unit shall be allowed to restart three times. If the overpressurization condition occurs on the fourth restart, the unit shall shut down and a manual reset diagnostic is displayed at the remote panel and/or the BAS system.

Building Pressure Control:
The barometric relief dampers shall open with increased building pressure. As the building pressure increases, the pressure in the unit return section also increases, opening the dampers and relieving air.

Filter Status:
A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes for 2 minutes after a request for fan operation a dirty filter alarm shall be announced at the BAS.

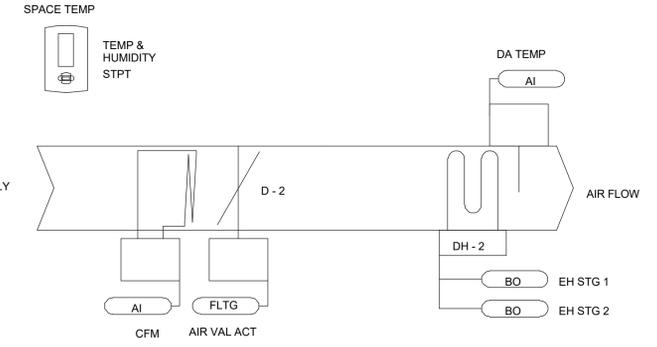
Sequence of Operations Single Duct VAV
Building Automation System Interface:
The Building Automation System (BAS) shall send the controller Occupied and Unoccupied commands. The BAS may also send a Heat/Cool mode, priority shutdown commands, space temperature and/or space temperature setpoint. If communication is lost with the BAS, the VAV controller shall operate using its local setpoints.

Occupancy Mode:
The occupancy mode shall be communicated or hardwired to the VAV via a binary input. Valid Occupancy modes for the VAV shall be:
Occupied:
Normal operating mode for occupied spaces or daytime operation. When the unit is in the occupied mode the VAV shall maintain the space temperature at the active occupied heating or cooling setpoint. Applicable ventilation and airflow setpoints shall be enforced. The occupied mode shall be the default mode of the VAV.
Unoccupied:
Normal operating mode for unoccupied spaces or nighttime operation. When the unit is in unoccupied mode the VAV controller shall maintain the space temperature at the stored unoccupied heating or cooling setpoint regardless of the presence of a hardwired or communicated setpoint. When the space temperature exceeds the active unoccupied setpoint the VAV shall modulate fully closed.
Occupied Bypass:
Mode used to temporarily place the unit into the occupied operation. Tenants shall be able to override the unoccupied mode from the space sensor. The override shall last for a maximum of 4 hours (adj.). The tenants shall be able to cancel the override from the space sensor at any time. During the override the unit shall operate in occupied mode.
Heat/Cool Mode:
The Heat/Cool mode shall be set by a communicated value or automatically by the VAV. In standalone or auto mode the VAV shall compare the primary air temperature with the configured auto changeover setpoint to determine if the air is "hot" or "cold". Heating mode implies the primary air temperature is hot. Cooling mode implies the primary air temperature is cold.
Heat/Cool Setpoint:
The space temperature setpoint shall be determined either by a local (e.g., thumbwheel) setpoint, the VAV default setpoint or a communicated value. The VAV shall use the locally stored default setpoints when neither a local setpoint nor communicated setpoint is present. If both a local setpoint and communicated setpoint exist, the VAV shall use the communicated value.

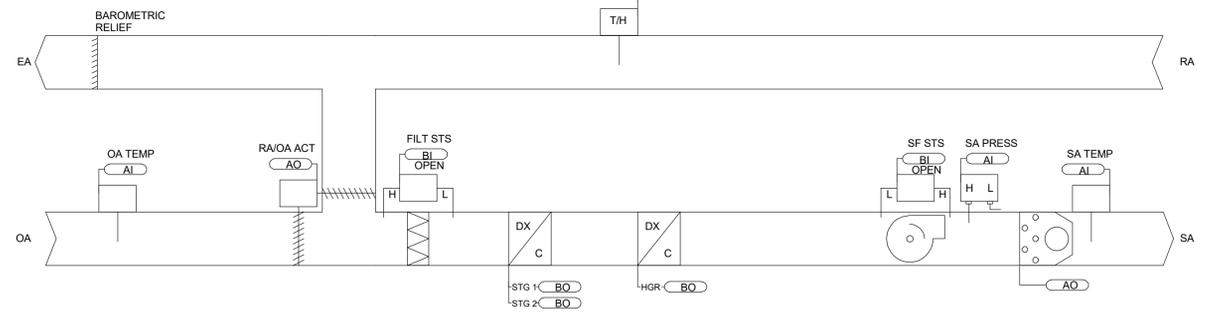
Cooling Mode:
When the unit is in cooling mode, the VAV controller shall maintain the space temperature at the active cooling setpoint by modulating the airflow between the active cooling minimum airflow setpoint to the maximum cooling airflow setpoint. Based on the VAV controller occupancy mode, the active cooling setpoint shall be one of the following:
Setpoint
Default Value
Occupied Cooling Setpoint 74.0 deg. F
Unoccupied Cooling Setpoint 78.0 deg. F
Occupied Standby Cooling Setpoint 78.0 deg. F
Occupied Min Cooling Airflow Setpoint See VAV Schedule
Occupied Max Cooling Airflow Setpoint See VAV Schedule
The VAV shall use the measured space temperature and the active cooling setpoint to determine the requested cooling capacity of the unit. The outputs will be controlled based on the unit configuration and the requested cooling capacity.

Heating Mode:
When the unit is in heating mode, the VAV controller shall maintain the space temperature at the active heating setpoint by modulating the airflow between the active heating minimum airflow setpoint to the maximum heating airflow setpoint and staging the reheat coil. Based on the VAV controller occupancy mode, the active heating setpoint shall be one of the following:
Setpoint
Default Value
Occupied Heating Setpoint 71.0 deg. F
Unoccupied Heating Setpoint 66.0 deg. F
Occupied Standby Heating Setpoint 67.0 deg. F
Occupied Min Heating Airflow Setpoint See VAV Schedule
Occupied Max Heating Airflow Setpoint See VAV Schedule
The VAV controller shall use the measured space temperature and the active heating setpoint to determine the requested heating capacity of the unit. The outputs will be controlled based on the unit configuration and the requested heating capacity.

Space Sensor Failure:
If there is a fault with the operation of the zone sensor an alarm shall be announced at the BAS. Space sensor failure shall cause the VAV to drive the damper to minimum air flow if the VAV is in the occupied mode, or drive it closed if the VAV is in the unoccupied mode.



2 SV BOX CONTROL DIAGRAM AND SEQUENCE - ELECTRIC HEAT
SCALE: N.T.S.



3 RTU CONTROLS DIAGRAM AND SEQUENCE
SCALE: N.T.S.