

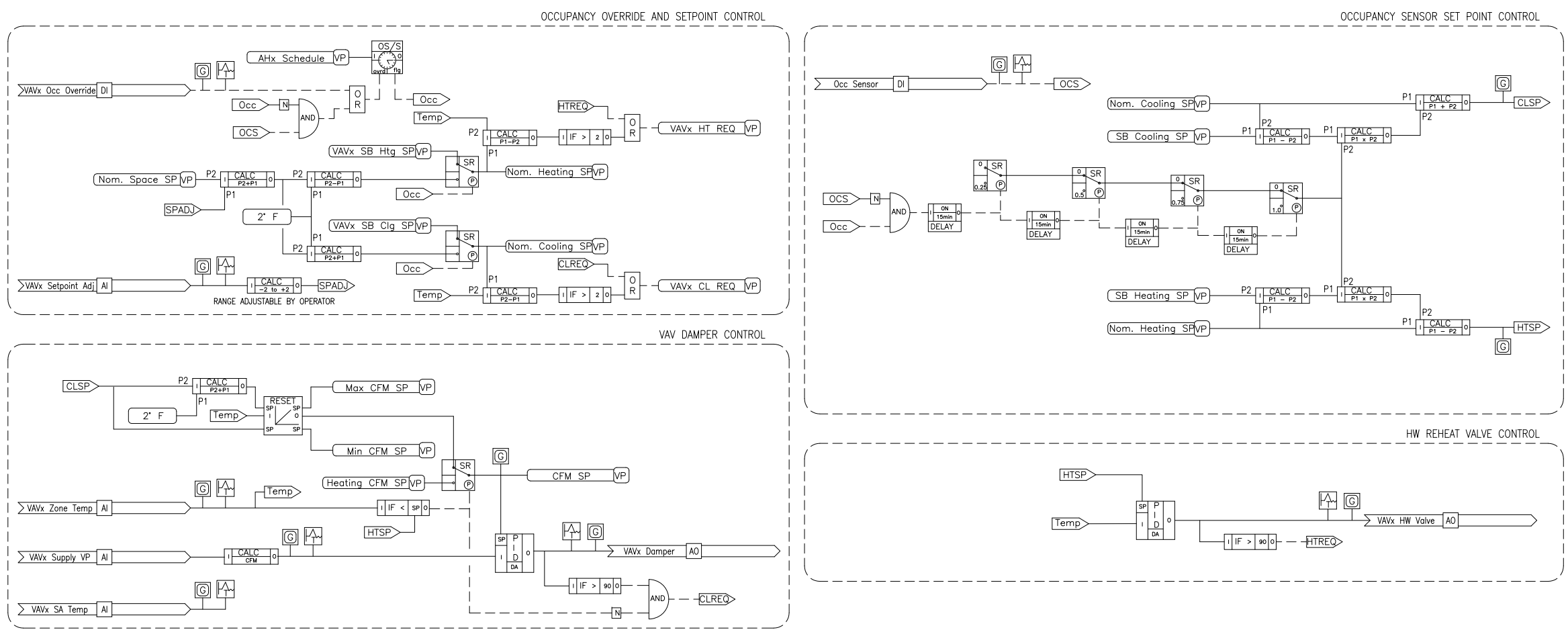
**NOTES**

1. Provide with temperature display and communications port.

**BILL OF MATERIAL**

DESIG	QTY	MODEL NO.	DESCRIPTION
TS 1	1		Temp Sensor, Zone
TS 2	1		Temp Sensor, Duct
V1	1		Valve Actuator
D1	1		Damper Actuator
OCC	1		Occupancy Sensor

**CONTROL SCHEMATIC**



**CONTROL LOGIC**

**SEQUENCE OF OPERATION**

**General:** The variable air volume terminal shall be fully controlled by the BAS. Control shall be pressure independent with minimum and maximum flow setpoints, scheduled occupancy with optimum pre-occupancy and occupancy override. Default schedule shall be the same as the parent AHU.

**Space Temperature Control:** During periods of occupied operation (space is occupied, scheduled to be occupied or occupancy is detected) the operator may adjust the Normal (72°F adj.) setpoint. Occupants may further adjust the Normal setpoint via the local sensor setpoint adjustment (the range of adjustment shall be configurable via the BAS, initially +/-2°F). The BAS shall automatically apply an offset for cooling and heating set points during occupied periods as follows:  
 1. Space cooling setpoint shall be the Normal space temperature setpoint plus 2°F (adj.).  
 2. Space heating setpoint shall be the Normal space temperature setpoint minus 2°F (adj.).

During periods of unoccupied operation (space is scheduled unoccupied or no occupancy is detected for a preset period) the operator may adjust Setback heating (50°F adj.), and Setback cooling (85°F adj.) setpoints. The BAS will prevent the operator from entering a Setback heating setpoint higher than the Space heating setpoint OR entering a Setback cooling setpoint lower than the Space cooling setpoint.

**Occupancy Override:** Occupancy override shall be initiated at the local zone sensor or via the occupancy sensor. Unit shall change to the occupied mode whenever the override button is depressed (or signal is received from the occupancy sensor) for a period of 2 hours (adj.) and reset to normal operation at the end of the period or whenever the override button is held for more than 5 seconds (adj.).

**Occupancy Sensor:**  
 GENERAL: Occupancy sensors shall be dual-technology (PIR / Ultrasonic) ceiling and/or wall mounted based on space size, configuration and use. Multiple sensors shall be networked to provide full coverage of any controlled space with 20% overlap. An isolated relay contact shall be provided for each controlled space designated for BAS monitoring.

**OCCUPIED MODE SENSING:** Once scheduled occupancy is established the BAS shall monitor the occupancy sensor contact and adjust the space temperature set point as follows:

- A) Sensor detects occupancy during occupied period:  
 1) BAS shall maintain normal occupancy set points.
- B) Sensor indicates no occupancy during occupied period:  
 1) Every continuous 15 minute (adj.) period after non-occupancy the normal space set points shall be reset 25% (adj.) toward their unoccupied set point. (i.e. 72°F normal cooling, 80°F setback cooling, after first 15 minutes set point adjusts to 74°F)  
 2) When occupancy is detected during occupied period set points shall reset to normal occupied schedule.
- C) Sensor detects occupancy during unoccupied period:  
 1) BAS shall initiate an occupancy override and reset to normal occupancy set points.

**Zone Damper:** Zone damper shall modulate in a PI loop to maintain zone volume setpoint. Zone volume setpoint shall be reset between maximum and minimum volume settings to maintain space temperature cooling setpoint with a 2°F (adj.) reset range. Zone volume setpoint shall be set to the heating volume setpoint whenever the space temperature falls below the heating space temperature setpoint.

1. Cooling minimum volume setpoint shall be 30% of design maximum flow when not specifically scheduled on the drawings. In the unoccupied period the minimum volume setpoint shall be 0 cfm.
2. Cooling maximum volume setpoint shall be as scheduled on the drawings during the occupied period and shall be set to zero otherwise.
3. Heating minimum volume setpoint: Whenever heating is requested from the box in any period, the minimum volume shall be set to an adjustable heating setpoint airflow. Initially, this setpoint shall be 30% of design maximum flow.

**Hydronic Reheat:** Whenever the heating minimum volume setpoint is active the normally closed zone reheat coil valve shall modulate in a PI loop to maintain space temperature heating setpoint as defined above with a 2°F throttling range. Valve shall be closed whenever the parent AHU is off.

**Cooling Request:** This terminal shall issue a "COOLING REQUEST" to the parent AHU as follows:

1. Whenever the zone damper output is controlling for a cooling setpoint and the calculated signal is greater than 90% (adj.), OR
2. Whenever the space temperature rises above the throttling range of the cooling loop.

**Heating Request:** This terminal shall issue a "HEATING REQUEST" to the HW System as follows:

1. Whenever the reheat output is greater than 90% (adj.), OR
2. Whenever the space temperature falls below the throttling range of the heating loop.

- Alarms:** The BAS shall generate an alarm under the following conditions:
1. Whenever the measured flow is more than +/-30% (adj.) continuously for 15 min. (adj.), OR
  2. Whenever the zone temperature is more than 2°F (adj.) below the cooling setpoint continuously for 30 min. (adj.) AND the measured flow is more than 50% (adj.) higher than the active flow setpoint. OR
  3. Whenever the zone temperature is more than 2°F (adj.) above the heating setpoint continuously for 30 min. (adj.) AND the supply air temperature is more than 5°F (adj.) higher than the primary air temperature.

**POINTS LIST**

POINT NAME	POINT DESCRIPTOR	POINT TYPE			REMARKS
		DI	AI	AO	
VAVxx.SA-F	VAVx SA Flow		1		
VAVxx.PRIM-D-C	VAVx Primary Dmper			1	
VAVxx.OCC-OVRD	VAVx Occ Override	1			
VAVxx.SA-T	VAVx SA Temperature		1		
VAVxx.OCC-OVRD-S	VAVx Occ Sensor	1			
VAVxx.ZN-xx-T-SP	VAVx Zone x SP Adj		1		
VAVxx.ZN-xx-T	VAVx Zone x Temp		1		
VAVxx.RH-V-C	VAVx Reheat Valve			1	
TOTALS		2	4	0	2

**LOGIC VARIABLES**

BINARY	ANALOG	DESCRIPTION	#
[Occ]		ON WHEN UNIT IS INDEXED TO OCCUPIED MODE	5
[OCS]		ON WHEN OCCUPANCY SENSOR INDICATES OCCUPANCY	3
[CLREQ]		ON WHEN DAMPER REQUESTS COOL	2
[HTREQ]		ON WHEN HW VALVE REQUESTS HEAT	2
[Temp]		VARIABLE VALUE OF CURRENT ZONE TEMPERATURE	5
[HTSP]		VARIABLE VALUE OF ACTIVE HEATING SETPOINT	3
[CLSP]		VARIABLE VALUE OF ACTIVE COOLING SETPOINT	2