



SYSTEM OFF:

1. FCU SUPPLY FAN OFF.
2. MUA SUPPLY FAN OFF.
3. CHILLED WATER CONTROL VALVE CLOSED.
4. HEATING WATER CONTROL VALVE CLOSED.
5. ELECTRIC HEATING COIL DE-ENERGIZED.
6. HUMIDIFIER OFF.
7. CONTROL LOOPS INACTIVE.

B. SYSTEM START:

1. AUTOMATICALLY BY THE BMS BASED ON PREPROGRAMMED SCHEDULE.
2. OPERATOR ENTERED COMMAND AT THE BMS.
4. LOCAL SWITCH.
4. LOCAL TEMPERATURE SENSOR.

C. SYSTEM OPERATION:

1. THE FCU SUPPLY FAN SHALL RUN.
2. THE MUA SUPPLY FAN SHALL BE INTERLOCKED RUN WITH FCU SUPPLY FAN AT MINIMUM AIRFLOW.
3. COOLING:
ON A CALL FOR COOLING, THE COOLING COIL VALVE WILL BEGIN TO MODULATE OPEN. AS THE COOLING DEMAND INCREASES, THE VALVE WILL CONTINUE TO OPEN UNTIL THE DISCHARGE AIR TEMPERATURE REACHES 52°F (ADJ). ON CONTINUED CALL FOR COOLING, THE VALVE WILL BEGIN TO MODULATE TOWARD THE MAXIMUM COOLING FAN FLOW AS THE CHILLED WATER VALVE CONTINUES TO MODULATE UPON MAINTAINING A 52° (ADJ) DISCHARGE AIR TEMPERATURE. THIS PROCESS WILL CONTINUE UNTIL THE FAN REACHES THE COOLING MAXIMUM AIRFLOW AND THE CHILLED WATER VALVE REACHES MAXIMUM FLOW. UPON A DECREASE IN COOLING DEMAND, THE SEQUENCE WILL REVERSE.
4. DEAD-BAND:
WITH NO DEMAND IN THE SPACE, THERE WILL BE NO CALL FOR COOLING OR HEATING. THE FAN WILL BE AT MINIMUM AIRFLOW. THE HEATING COIL VALVE AND COOLING COIL VALVE WILL BE OFF.
5. HEATING:
ON A CALL FOR HEATING, THE HEATING COIL VALVE WILL BEGIN TO MODULATE OPEN. AS THE HEATING DEMAND INCREASES, THE VALVE WILL CONTINUE TO MODULATE OPEN UNTIL THE DISCHARGE AIR TEMPERATURE REACHES 50°F (ADJ). ON CONTINUED CALL FOR HEATING, THE FAN BEGINS TO MODULATE FROM DEAD-BAND TOWARDS THE MAXIMUM HEATING FAN FLOW. THIS PROCESS WILL CONTINUE UNTIL THE FAN REACHES THE HEATING MAXIMUM AIRFLOW AND THE HOT WATER VALVE REACHES MAXIMUM FLOW. UPON A DECREASE IN HEATING DEMAND, THE SEQUENCE WILL REVERSE.
6. THE MUA ELECTRIC COIL SHALL MODULATE TO MAINTAIN MUA DISCHARGE AIR TEMPERATURE.
7. THE UNIT NORMALLY OPERATE AT 200 CFM INTERLOCK WITH RANGE HOD AND INCREASE TO 750 CFM WHEN RANGE HOD TURNED ON.
8. CONTROL THE HUMIDIFIER FROM A HUMIDITY SENSOR LOCATED IN THE SPACE AS FOLLOWS:
a. UPON A DROP IN HUMIDITY SENSED, THE HUMIDIFIER CONTROL VALVE SHALL BE MODULATED OPEN AS REQUIRED TO MAINTAIN THE HUMIDITY AT SETPOINT.
b. A HIGH LIMIT, DUCT MOUNTED, HUMIDISTAT LOCATED TEN FEET DOWNSTREAM OF THE HUMIDIFIER SHALL OVERRIDE THE HUMIDIFIER CONTROL AND STOP THE HUMIDIFIER OPERATION WHENEVER THE HUMIDITY LEVELS SENSED ARE ABOVE ITS SETPOINT. INITIALLY 85 PERCENT. THE HIGH LIMIT HUMIDISTAT SHALL BE HARDWIRED TO INTERRUPT THE CONTROL LOOP.

D. SYSTEM STOP:

1. OPERATOR COMMAND AT THE BMS OR AUTOMATICALLY BY THE BMS BASED ON A PREPROGRAMMED SCHEDULE.
2. MANUAL OFF AT LOCAL SWITCH.
3. WHEN THE SYSTEM IS CALLED TO STOP, THE SYSTEM SHALL REVERT TO THAT 'OFF' STATE AS DESCRIBED ABOVE.

E. SETPOINTS

1. SPACE TEMPERATURE 70°F HEATING AND 75°F COOLING. ALARM AT BMS AT +2-2°F FROM SETPOINT.

SYSTEM OFF:

1. MINIMUM OUTSIDE AIR DAMPERS CLOSED.
2. RETURN AIR DAMPER OPEN.
3. SUPPLY FAN OFF.
4. CHILLED WATER VALVE CLOSED.
5. ALL OTHER CONTROL LOOPS INACTIVE.

B. SYSTEM START:

1. OPERATOR ENTERED COMMAND AT THE BMS.
2. AUTOMATICALLY BY THE BMS BASED ON PREPROGRAMMED SCHEDULES.

C. SYSTEM OPERATION:

1. FAN VOLUME CONTROL:
 - a. SUPPLY FAN VOLUME SHALL BE VARIED BY SENSING AIRFLOW DEMAND FROM ALL TERMINAL BOXES AND INCREASING OR DECREASING FAN SPEED TO SATISFY AIRFLOW REQUIREMENTS BASED ON RESET OF THE DUCT STATIC SYSTEM PRESSURE.
 - b. MINIMUM FLOW (1.0 GPM/ACH) AND THE MAXIMUM (7.5 GPM/ACH) (A.U.)
 - c. IF MULTIPLE VARIABLE VOLUME BOXES ARE OPERATING IN PARALLEL, THE LEAD FAN SHALL BE OPERATING AT 95 PERCENT OF THE FLOW DEMAND WHEN THE FOLLOWING FAN VOLUME IS REACHED:
 - i. 1.0 GPM/ACH (A.U.)
 - ii. 2.0 GPM/ACH (A.U.)
 - iii. 3.0 GPM/ACH (A.U.)
 - iv. 4.0 GPM/ACH (A.U.)
 - v. 5.0 GPM/ACH (A.U.)
 - vi. 6.0 GPM/ACH (A.U.)
 - vii. 7.0 GPM/ACH (A.U.)
 - d. IF ADDITIONAL FANS ARE IN THE GROUP FOLLOWING SIMILAR SCHEDULE FOR OTHER FANS, ALTERNATE THE LEAD FAN AUTOMATICALLY AT EACH SYSTEM START-UP.
2. SUPPLY AIR DUCT STATIC PRESSURE RESET CONTROL:
 - a. DUCT STATIC PRESSURE SENSOR LOCATED TWO-THIRDS DOWN THE MAIN DUCT, THROUGH THE BMS, MODULATE THE FAN SPEED TO MAINTAIN THE DUCT STATIC SYSTEM STATIC PRESSURE SETPOINT AS RESET BY ZONE AIR FLOW DEMAND.
 - b. THE FAN SPEED SHALL BE CONTINUED TO INCREASE UNTIL THE DUCT STATIC PRESSURE REACHES THE FAN VFD SPEED TO MAINTAIN THE DUCT STATIC PRESSURE SETPOINT OF BETWEEN 0.50 IN H₂O (A.U.) AND 1.50 IN H₂O (A.U.) BASED ON AIR FLOW DEMAND. THE OPERATOR SHALL BE NOTIFIED WHEN THE DUCT STATIC PRESSURE REACHES THE FAN VFD SPEED TO MAINTAIN THE DUCT STATIC PRESSURE RESET SHALL OPERATE AS FOLLOWS:
 - i. IF ON SUPPLY FAN START-UP, THE DUCT STATIC PRESSURE SETPOINT SHALL BE SET TO 0.50 IN H₂O (A.U.) FOR THE FIRST TWO (2) ZONES.
 - ii. IF THREE (3) ZONE OR MORE VAV BOXES ARE OPERATING AT 95 PERCENT OR GREATER AIR FLOW/DAMPENR POSITION, THE DUCT STATIC PRESSURE SHALL BE INCREASED TO 1.00 IN H₂O (A.U.) UNTIL NO MORE THAN THREE (3) VAV BOXES (A.U.) ARE OPERATING AT 95 PERCENT OR GREATER AIR FLOW/DAMPENR POSITION.
 - iii. IF FEWER THAN THREE (3) (A.U.) VAV BOXES ARE OPERATING AT 95 PERCENT OR GREATER AIR FLOW/DAMPENR POSITION, THE DUCT STATIC PRESSURE SHALL BE INCREASED AT A RATE OF 0.10 IN H₂O (A.U.) PER MINUTE (A.U.)
 - iv. TO ALLOW FOR A MINIMUM FIVE (5) MINUTE (A.U.) PERIOD OF OPERATION BEFORE A CHANGE/BETWEEN BETWEEN INCREASING AND DECREASING THE DUCT STATIC PRESSURE SETPOINT ADJUSTMENT.
 - c. THE LEAD FAN FOR THE SYSTEM TO STOP UNDER NORMAL CONDITIONS, THE DUCT STATIC PRESSURE SETPOINT SHALL BE RESET TO THE INITIAL START-UP STATIC PRESSURE SETPOINT (0.50 IN H₂O) AT A RATE OF 0.20 IN H₂O (A.U.) PER MINUTE (A.U.).
 - d. NOTIFY THE LEAD FAN BOXES SET TO OPERATE AT 100 PERCENT AT ALL TIMES ARE EXCEEDED FOR THE DUCT STATIC PRESSURE RESET SCHEDULE.

4. WARM-UP AND COOL-DOWN MODES:

1. DURING THE WARM-UP MODE, THE OUTSIDE AIR DAMPER SHALL BE CLOSED AND THE RETURN DAMPER SHALL BE OPEN, THE COOLING VALVE SHALL BE CLOSED AND THE PREHEAT VALVES SHALL BE MODULATED TO MAINTAIN THE MINIMUM SUPPLY AIR TEMPERATURE SETPOINT.
2. DURING THE COOL-DOWN MODE IF OUTSIDE AIR TEMPERATURE AND ENTHALPY IS GREATER THAN THE RETURN AIR TEMPERATURE AND ENTHALPY, THE DAMPERS SHALL BE POSITIONED AS DESCRIBED UNDER WARM-UP MODE. OTHERWISE THE DAMPERS SHALL BE CONTROLLED TO STAY MODULATED IN THE OCCUPIED MODE. ALL OTHER CONTROLS SHALL OPERATE AS DESCRIBED UNDER OCCUPIED MODE.
3. THE FAN VOLUMES SHALL BE CONTROLLED AS DESCRIBED IN THE OCCUPIED MODE, EXCEPT THAT THE DIFFERENTIAL VOLUME SHALL BE 0.50 GPM/ACH (A.U.) BEYOND THE 1.00 GPM/ACH (A.U.) MINIMUM.

4. OCCUPIED MODE:

1. THE MINIMUM OUTSIDE AIR DAMPER SHALL MODULATE TO MINIMUM AIRFLOW RETURN AS NOTED ON THE SCHEDULES. IF DAMPER IS FULLY OPEN AND CANNOT MAINTAIN AIRFLOW SETPOINT, MODULATE RETURN DAMPER CLOSED TO ACHIEVE MINIMUM OUTSIDE AIRFLOW SETPOINT. MINIMUM AIR FLOW SHALL BE A DIRECT MEASURED VALUE AND BE CONSTANT OVER THE ENTIRE RANGE OF OUTSIDE AIR TEMPERATURE AND ENTHALPY.
2. MODULATE THE HEATING VALVE, ECONOMIZER DAMPERS AND COOLING VALVE IN SEQUENCE TO MAINTAIN SUPPLY AIR TEMPERATURE SETPOINT.
3. THE HEATING VALVE SHALL BE CONTROLLED TO MAINTAIN A LOW LIMIT EXHAUST TEMPERATURE OF 90 DEGREES F. WHEN THE RETURN AIR TEMPERATURE AND ENTHALPY IS GREATER THAN THE OUTSIDE AIR TEMPERATURE AND ENTHALPY AND THE SUPPLY AIR TEMPERATURE AND ENTHALPY IS ACCORDING TO TEMPERATURE AND ENTHALPY DISCHARGE DESCRIBED ABOVE WHEN THE RETURN AIR TEMPERATURE AND ENTHALPY IS LESS THAN THE OUTSIDE AIR TEMPERATURE AND ENTHALPY THE ECONOMIZER DAMPER SHALL BE POSITIONED TO THE MINIMUM OUTSIDE AIR FLOW POSITION.
4. WHEN THE SUPPLY AIR TEMPERATURE CANNOT BE MAINTAINED THROUGH THE RETURN AIR ECONOMIZER SEQUENCE, MODULATE THE COOLING COIL CONTROL VALVE AS REQUIRED TO MAINTAIN SETPOINT.

5. UNOCCUPIED MODE:

1. a. THE HEATING VALVES SHALL BE CONTROLLED TO MAINTAIN A PLENUM TEMPERATURE OF 50 DEGREES F.
2. b. THE SYSTEM SHALL BE OFF.

6. SYSTEM STOP:

1. OPERATOR COMMAND AT THE BMS OR AUTOMATICALLY BY THE BMS BASED ON PREPROGRAMMED SCHEDULES.
2. THE SYSTEM SHALL REVERT TO THAT OFF STATE AS DESCRIBED ABOVE.

7. SAFETIES:

1. IF CONTACT WITH ITS ELEMENT SERPENTINED ACROSS THE DISCHARGE SIDE OF THE HEATING COIL, WILL STOP THE SUPPLY FAN, CLOSE THE OUTSIDE AIR DAMPER, OPEN THE HEATING COIL VALVE FULLY AND ALARM THE BMS. FREEZE/STAST SHALL BE THE AUTOMATIC RESET POINT. WHENEVER THE ALARM IS ACTUATED, THE POINT WILL BE HELD BY THE BMS UNTIL, MANUALLY RESET.
2. A DIFFERENTIAL PRESSURE SWITCH WITH INDICATOR GAUGE INSTALLED ACROSS THE FILTER SHALL INDICATE WHENEVER THE FILTER IS OBSTRUCTED AND INITIATE A NON-CRITICAL ALARM AT THE BMS.
3. VAV/COIL FREQUENCY DIVIDES ALARM.

