SEQUENCE OF OPERATIONS

www.anteccontrols.com

ANTEC controls by price

v201

TABLE OF CONTENTS

Note:

The sequences described below represent the most commonly used sequences in the Healthcare and Laboratory environments. These sequences are designed to satisfy the majority of critical spaces. For more information on the full capability of the Antec Controls platform, please contact Applications@AntecControls.com.

1. Airflow Control

1.1. Flow Offset Control

1.1.1. Supply Only with Input Tracking

The Airflow Control System (ACS) will modulate the supply air device to meet the flow offset target. The ACS will not modulate the supply air device to maintain any additional control sequences.

The ACS will track the exhaust input as a:

☐ Static uncontrolled flow ☐ Dual-flow binary ☐ Modulating input signal

1.1.2. Supply and General Exhaust

The Airflow Control System (ACS) will modulate the supply and general exhaust to maintain the scheduled flow offset target. With no thermal demand, the supply and general exhaust will maintain their minimum scheduled values. As airflow demand increases (see section: Temperature Control) the supply and general exhaust will be increased to maintain the scheduled volumetric offset. With additional control sequences, the sequence with the highest demand for airflow will take priority.

1.1.3. Supply and General Exhaust with Fume Hoods and Equipment

The Airflow Control System (ACS) will modulate the supply and general exhaust to maintain the scheduled flow offset target. The ACS will sum the total exhaust airflow from all sources, including fume hoods and equipment exhaust and will modulate the general exhaust air device to maintain the flow offset target. With no thermal demand, the supply will maintain the minimum scheduled value. As airflow demand increases (see section: Temperature Control) the supply and general exhaust will be increased to maintain the scheduled flow offset. With additional control sequences, the sequence with the highest demand for airflow will take priority.

1.1.4. Supply Only with Fume Hoods and Equipment

The Airflow Control System (ACS) will sum the total exhaust airflow from all sources, including fume hoods and equipment exhaust and will modulate the supply air device to maintain the flow offset target. The ACS will not modulate the supply air device to maintain any additional control sequences.

1.1.5. General Exhaust Only with Input Tracking

The Airflow Control System (ACS) will modulate the exhaust air device to meet the flow offset target. The ACS will not modulate the exhaust air device to maintain any additional control sequences.

The ACS will track the supply input as a:

☐ Static uncontrolled flow ☐ Dual-flow binary ☐ Modulating input signal

1.1.6. General Exhaust with Fume Hoods and Equipment

The Airflow Control System (ACS) will modulate the exhaust air device to meet the flow offset target. The ACS will sum the total exhaust airflow from all sources, including fume hoods and equipment exhaust and will modulate the general exhaust air device to maintain the flow offset target. The ACS will not modulate the exhaust air device to maintain any additional control sequences.

The ACS will track the supply input as a:

☐ Static uncontrolled flow ☐ Dual-flow binary ☐ Modulating input signal

1.2. Pressure Control

1.2.1. Supply Only

The ACS will measure the differential pressure between the room and the reference space and will modulate the airflow to meet the required room pressure target. With no thermal demand, the ACS will maintain room airflow at the minimum scheduled value. As airflow demand increases (see section: Temperature Control) the supply and general exhaust will be increased to maintain the scheduled room pressure. With additional control sequences, the sequence with the highest demand for airflow will take priority. If door switches are present, the pressure control algorithm will pause when the door is open, and will resume after the door is closed.

1.2.2. Supply and General Exhaust

The ACS will measure the differential pressure between the room and the reference space and will modulate the airflow to meet the required room pressure target. With no thermal demand, the ACS will maintain room airflow at the minimum scheduled value. As airflow demand increases (see section: Temperature Control) the supply and general exhaust will be increased to maintain the scheduled room pressure. With additional control sequences, the sequence with the highest demand for airflow will take priority. If door switches are present, the pressure control algorithm will pause when the door is open, and will resume after the door is closed.

1.2.3. Supply and General Exhaust with Fume Hoods and Equipment

The ACS will measure the differential pressure between the room and the reference space and will modulate the airflow to meet the required room pressure target. With no thermal demand, the ACS will maintain room airflow at the minimum scheduled value. As airflow demand increases (see section: Temperature Control) the supply and general exhaust will be increased to maintain the scheduled room pressure. With additional control sequences, the sequence with the highest demand for airflow will take priority. If door switches are present, the pressure control algorithm will pause when the door is open, and will resume after the door is closed.

1.2.4. Supply Only with Fume Hoods and Equipment

The ACS will measure the differential pressure between the room and the reference space and will modulate the supply air device to meet the required room pressure target. The ACS will not modulate the supply air device to maintain any additional control sequences. If door switches are present, the pressure control algorithm will pause when the door is open, and will resume after the door is closed.

1.2.5. General Exhaust Only

The ACS will measure the differential pressure between the room and the reference space and will modulate the exhaust air device to meet the required room pressure target. The ACS will not modulate the exhaust air device to maintain any additional control sequences. If door switches are present, the pressure control algorithm will pause when the door is open, and will resume after the door is closed.

1.2.6. General Exhaust with Fume Hoods and Equipment

The ACS will measure the differential pressure between the room and the reference space and will modulate the exhaust air device to meet the required room pressure target. The ACS will not modulate the exhaust air device to maintain any additional control sequences. If door switches are present, the pressure control algorithm will pause when the door is open, and will resume after the door is closed.

1.3. Single Valve Airflow Control

1.3.1. Supply Airflow Control

1.3.1.1. Supply Only

The Airflow Control System (ACS) will control a single airflow device to maintain an airflow target. With no thermal demand, the valve will maintain its minimum scheduled airflow. The valve airflow will increase according to thermal demand (see section: Temperature Control). With additional control sequences, the sequence with the highest demand for airflow will take priority.

1.3.2. Exhaust Airflow Control

1.3.2.1. General Exhaust Only

The Airflow Control System (ACS) will control a single airflow device to maintain an airflow target. With additional control sequences, the sequence with the highest demand for airflow will take priority.

2. Temperature Control

2.1. Space Temperature Control

2.1.1. Heating

2.1.1.1. Single Stage Reheat – Stage I: Modulating Reheat Coil

The Airflow Control System (ACS) will monitor room temperature from a wall mounted room temperature sensor. In the first heating stage, the reheat coil will modulate to maintain space temperature.

If there are multiple reheat coils, all coils will modulate together to maintain space temperature.

2.1.1.2. Single Stage Reheat – Stage I: Modulating Reheat Coil and Added Airflow

The Airflow Control System (ACS) will monitor room temperature from a wall mounted room temperature sensor. In the first heating stage, the reheat coil will modulate and the airflow will increase simultaneously (between the Room Mode Minimum Airflow and the Room Mode Maximum Airflow) to maintain space temperature.

2.1.1.3. Two Stage Reheat: Stage I: Modulating Reheat Coil, Stage II: Added Airflow

The Airflow Control System (ACS) will monitor room temperature from a wall mounted room temperature sensor. In the first heating stage, the reheat coil will modulate to maintain space temperature. If the reheat coil reaches its maximum adjustable value and the space temperature is still below the room temperature set point, the ACS will enter the second heating stage where the airflow will begin to increase (between the Room Mode Minimum Airflow and the Room Mode Maximum Airflow) to maintain space temperature.

2.1.2. Cooling

2.1.2.1. Single Stage Cooling – Stage I: Added Airflow

The Airflow Control System (ACS) will monitor room temperature from a wall mounted room temperature sensor. In the first cooling stage, the airflow will increase (between the Room Mode Minimum Airflow and the Room Mode Maximum Airflow) to maintain space temperature.

2.1.2.2. Single Stage Cooling – Stage I: Modulating Cooling Coil

The Airflow Control System (ACS) will monitor room temperature from a wall mounted room temperature sensor. In the first cooling stage, the cooling coil will modulate to maintain space temperature.

If there are multiple cooling coils, all will modulate together to maintain space temperature.

2.1.2.3. Single Stage Cooling – Stage I: Modulating Cooling Coil and Added Airflow

The Airflow Control System (ACS) will monitor room temperature from a wall mounted room temperature sensor. In the first cooling stage, the Cooling Coil will modulate and the airflow will increase simultaneously (between the Room Mode Minimum Airflow and the Room Mode Maximum Airflow) to maintain space temperature.

2.2. Space Temperature Control with DAT limits (one ES-DT required per heating/cooling device)

2.2.1. Heating with DAT limits

2.2.1.1. Single Stage Reheat – Stage I: Modulating Reheat Coil [with DAT limits]

The Airflow Control System (ACS) will monitor room temperature from a wall mounted room temperature sensor. In the first heating stage, the reheat coil will modulate within the discharge air temperature limits to maintain space temperature.

2.2.1.2. Single Stage Reheat – Stage I: Modulating Reheat Coil and Added Airflow [with DAT limits]

The Airflow Control System (ACS) will monitor room temperature from a wall mounted room temperature sensor. In the first heating stage, the reheat coil will modulate within the discharge air temperature limits and the airflow will increase simultaneously (between the Room Mode Minimum Airflow and the Room Mode Maximum Airflow) to maintain space temperature.

2.2.1.3. Two Stage Reheat: Stage I: Modulating Reheat Coil, Stage II: Added Airflow [with DAT limits]

The Airflow Control System (ACS) will monitor room temperature from a wall mounted room temperature sensor. In the first heating stage, the reheat coil will modulate within the discharge air temperature limits to maintain space temperature. If the discharge air temperature reaches its maximum limit and the space temperature is still below the room temperature set point, the ACS will enter the second heating stage where the airflow will begin to increase (between the Room Mode Minimum Airflow and the Room Mode Maximum Airflow) to maintain space temperature.

2.2.2. Cooling with DAT limits

2.2.2.1. Single Stage Cooling – Stage I: Added Airflow [with DAT limits]

The Airflow Control System (ACS) will monitor room temperature from a wall mounted room temperature sensor. In the first cooling stage, the airflow will increase (between the Room Mode Minimum Airflow and the Room Mode Maximum Airflow) to maintain space temperature. The reheat coil will modulate to maintain the discharge air temperature within its limits.

3. Modes of Operation

One room network can have a maximum of six (6) Room Modes (one (1) default, five (5) additional). Users can assign a priority to each room mode. If there is a local conflict when calling for modes, the ACS will enter the mode with the highest assigned priority. When there is no call for any mode, the ACS will enter into the Default Mode (after specified amount of delay time). The BMS commands take priority over local commands.

3.1. Occupied Mode only (Default)

Occupied Mode is the default room mode. While in Occupied Mode, the Airflow Control System (ACS) will target the scheduled occupied airflows.

3.2. Unoccupied Mode

The Airflow Control System (ACS) will activate Unoccupied Mode by:

☐ Contact input ☐ Building Management System

While in Unoccupied Mode, the ACS will target the scheduled unoccupied airflows.

3.3. Emergency Mode

The Airflow Control System (ACS) will activate Emergency Mode by:

☐ Contact input ☐ Building Management System

While in Emergency Mode, the room air change rate will increase to the scheduled 'emergency' room flow value. The ACS will maintain the scheduled flow offset.

3.4. Purge Mode

The Airflow Control System (ACS) will activate Purge Mode by:

☐ Contact input ☐ Building Management System

While in Purge Mode, the ACS will move all supply airflow devices to their maximum position, and will move all exhaust airflow devices to their maximum position. The ACS will not maintain a scheduled flow offset in this mode.

4. Demand Control Ventilation (DCV) Control

The Airflow Control System (ACS) will receive Air Change Rate Demand as an analog signal. If the Air Change Rate Demand is greater than the current air change rate, the supply and general exhaust will increase until the Air Change Rate Demand is met. If the Air Change Rate Demand is lower than the current air change rate, the supply and general exhaust will decrease until the Air Change Rate Demand is met or the minimum scheduled air change rate is reached. The sequence with the highest demand for airflow will take priority.

5. Room Pressure Monitoring

☐ MVM ☐ PMT

Multi-Variable Monitor (MVM): A room pressure sensor will measure the room pressure. The room pressure is available to the building management system (BMS). The MVM will display room pressure locally via BACnet MS/TP.

Touchscreen Room Pressure Monitor (PMT): The PMT will display room temperature locally via MS/TP.

☐ Single-room monitoring ☐ Dual-room monitoring ☐ Triple-room monitoring

Single-room monitoring: A room pressure sensor will measure the differential pressure between the room and adjoining space. The PMT will display the room pressure locally. The room differential pressure and alarms are available to the building management system (BMS).

Dual-room monitoring: Two room pressure sensors will measure the differential pressure between two separate rooms and adjoining space. The PMT will display the room pressures locally. The room differential pressures and alarms are available to the building management system (BMS).

Triple-room monitoring: Three room pressure sensors will measure the differential pressure between three separate rooms and adjoining space. The PMT will display the room pressures locally. The room differential pressures and alarms are available to the building management system (BMS).

☐ Door contact switch ☐ Low room pressure alarm ☐ High room pressure alarm

Door Contact Switch: The DCS will monitor door state (open or closed). Door state is available to the BMS.

Low Room Pressure Alarm: The MVM/PMT will provide local visual and audible alert when the room pressure falls below the adjustable low room pressure alarm limit.

High Room Pressure Alarm: The MVM/PMT will provide local visual and audible alert when the room pressure rises above the adjustable high room pressure alarm limit.

6. Fume Hood

6.1. Fume Hood Control

6.1.1. Sash Position Control (Venturi Valve only)

(*Only available if SPS model selected*)

The Fume Hood Controller (FHC) uses a sash position sensor (SPS) to control the face velocity of the fume hood. When a user moves the fume hood sash, the SPS measures the height of the vertical fume hood sash. The FHC will calculate the correct airflow to result in the target face velocity and will modulate the air device to the airflow target. The FHC will maintain a minimum airflow at all times when the sash is closed to ensure the proper fume hood air change rate.

6.1.2. Sidewall Face Velocity Control

(*Only available if SWS model selected*)

The Fume Hood Controller (FHC) uses a sidewall sensor (SWS) to measure the face velocity of the fume hood. Upon a measured decrease in face velocity, the FHC will increase the exhaust air volume until the measured face velocity is equal to the target face velocity. On an increase in measured face velocity, the FHC will decrease the exhaust air volume until the measured face velocity is equal to the target face velocity. The FHC will maintain a minimum airflow at all times when the sash is closed to ensure the proper fume hood air change rate.

6.1.3. Hybrid Control (Venturi Valve only)

(*Only available if both SWS and SPS model selected*)

The Fume Hood Controller uses a sash position sensor (SPS) and a sidewall sensor (SWS) together to control the face velocity of the fume hood. When a user moves the fume hood sash, the SPS measures the height of the vertical fume hood sash. The FHC will calculate the correct airflow to result in the target face velocity and will modulate the air device to the airflow target. The FHC will then use the SWS to adjust the airflow until the measured face velocity meets the target face velocity. The FHC will maintain a minimum airflow at all times when the sash is closed to ensure the proper fume hood air change rate.

6.2. Fume Hood Monitoring

6.2.1. Sidewall Face Velocity

The Sidewall sensor (SWS) will measure the face velocity of the fume hood. Local audible and visual alarms will be activated when face velocity falls outside alarm low and high limits.

6.3. Fume Hood Occupancy

(*Only available if FPS model selected*)

The Fume Hood Controller (FHC) uses a presence sensor to determine if there is an occupant present in front of the fume hood. When no occupant is detected, the FHC will modulate the exhaust device to maintain an unoccupied face velocity target. When an occupant is detected, the fume hood controller will modulate the exhaust air device to target the occupied face velocity target.

6.4. Fume Hood Alarms

While the unit is in alarm, the LED light bars will be red. The audible alarm can be silenced but will re-engage after an adjustable time delay. Audible and visual alarms are available for face velocity, low/high valve pressure, sash height, and emergency purge.

6.4.1. Face Velocity

The Fume Hood Controller (FHC) will alarm if the measured face velocity drops below the adjustable low alarm limit, or rises above the adjustable high alarm limit.

6.4.2. Valve Pressure Alarms (Venturi Valve only)

The Fume Hood Controller (FHC) will alarm if the pressure across the venturi valve drops below the minimum or rises above the maximum operating pressure for the valve.

6.4.3. Sash Alarm (Sash Position Sensor only)

The Fume Hood Controller (FHC) will alarm if the sash height is above the sash height alarm limit. The FHC will also alarm if the sash position sensor cable fails or reports a value outside of the initially calibrated range.

6.5. Fume Hood Emergency Purge

An emergency purge feature will activate when the “Emergency” button on the fume hood interface is pressed. The air device will modulate to its fully open position to purge the fume hood. A visual and audible alarm will activate to indicate that the fume hood is being purged. The emergency purge feature can be deactivated by pushing and holding the “Emergency” button for 5 seconds.

6.6. Equipment Exhaust

6.6.1. Mechanically Set Constant Volume (Venturi Valve only)

The air device serving the (Canopy Hood/Snorkel/Biological Safety Cabinet) will constantly exhaust a set airflow volume. The Airflow Control System (ACS) will account for this airflow in its flow offset calculation. The venturi valve will be a mechanically set air device with no airflow feedback.

6.6.2. Controlled Constant Volume

The air device serving the (Canopy Hood/Snorkel/Biological Safety Cabinet) will constantly exhaust a set airflow volume. The Airflow Control System (ACS) will account for this airflow in its offset calculation. The ACS will control the airflow device to a constant volume set point.

6.6.3. Two Position (Relay Controlled)

A two-position switch (provided by others) will control the airflow device serving the (Canopy Hood/Snorkel/Biological Safety Cabinet). When activated, the airflow device will modulate to an in-use airflow set point. When not active, the air device will modulate to a not in-use airflow set point. The Airflow Control System (ACS) will account for this airflow in its offset calculation.

6.6.4. Dual-flow Set Point (Pace controlled)

A two-position switch (provided by others) will provide the binary state to the Airflow Control System (ACS). The ACS will update the airflow set point to either the active set point (when binary is in active state) or the inactive set point (when the binary is in inactive state).

6.6.5. Constant Volume Fume Hood

The air device serving the constant volume fume hood will maintain a constant airflow to maintain fume hood face velocity. A fume hood monitor will display the current face velocity on a Fume Hood Interface.

7. Environment Point Monitoring & Display

7.1. Temperature Monitoring

7.1.1. Room Temperature Monitoring

(*Only available if RM ES model selected*)

A room temperature sensor will measure the room temperature. Room temperature is available to the building management system (BMS).

☐ ES (only if LCD) ☐ PMT ☐ MVM

Environmental Sensor (ES): The ES will display room temperature locally on the LCD display.

Touchscreen Room Pressure Monitor (PMT): The PMT will display room temperature locally via MS/TP.

Multi-Variable Monitor (MVM): The MVM will display room temperature locally via BACnet MS/TP.

7.1.2. Duct Temperature Monitoring

(*Only available if DT ES model selected*)

A duct temperature sensor will measure the duct temperature. Duct temperature is available to the building management system (BMS).

7.2. Humidity Monitoring

7.2.1. Room Humidity Monitoring

(*Only available if RM RH ES model selected*)

A room humidity sensor will measure the room relative humidity. Room relative humidity is available to the building management system (BMS)

☐ ES (only if RH LCD) ☐ PMT ☐ MVM

Environmental Sensor (ES): The ES will display room relative humidity locally on the LCD display.

Touchscreen Room Pressure Monitor (PMT): The PMT will display room relative humidity locally via MS/TP.

Multi-Variable Monitor (MVM): The MVM will display room relative humidity locally via BACnet MS/TP.

7.2.2. Duct Humidity Monitoring

(*Only available if DT RH ES model selected*)

A duct mounted humidity sensor will measure the duct relative humidity. Duct relative humidity is available to the building management system (BMS).

7.3. Air Change Rate Monitoring

Air Change Rate is available to the building management system (BMS).

☐ PMT ☐ MVM

Touchscreen Room Pressure Monitor (PMT): The PMT will display room air change rate locally via MS/TP.

Multi-Variable Monitor (MVM): The MVM will display room air change rate locally via BACnet MS/TP.

8. Local/Room Level Communication

All valves and controllers in the Airflow Control System (ACS) within the room will communicate via an independent high-speed room level network called the Room Information Network (RIN).

9. Building Network Communication

The Airflow Control System (ACS) will communicate over a native BACnet MS/TP trunk to the building automation network. All points are available to the building management system (BMS) with no network gateway required.