Appendix B

AGRICULTURE AND AGRI-FOOD CANADA RESEARCH CENTER

HVAC CONTROL SEQUENCE

AIR FLOWS

- The total airflow of all the lab and office systems shall be calculated using a total air flow method. The area will be balanced using the total exhaust airflow on each wing compared with the total supply of AHU-8, 9, 10, 11, 12, and 13. Each floor will be individually calculated to ensure that the areas are properly balanced.

LABORATORY MODE CONTROL

- Laboratory systems will operate in one of the following modes:
    - UNOCCUPIED
    - OCCUPIED
    - FUME HOOD OVER-RIDE
    - Each laboratory system has it's own individual time schedule. The time schedules are set by PARC as per individual occupancy requirements.

OCCUPIED MODE

- Occupied mode is enabled when the DDC weekly schedule is on and upon the activation of the occupancy button on the room temperature sensor.
- Once enabled, the general exhaust system(s) and dual duct box system(s) open to their specified air flows. The supply air temperature will modulate to satisfy the space temperature set point.
- The space temperature will be maintain between a dead band of +/- .5°C, and is operator adjustable.
- If the space has a fume hood(s), and the occupied/unoccupied switch on the hood is in the occupied position, the fume hood is set at specified maximum air flow. The general exhaust system(s) and dual duct box system(s) air flows are adjusted to the specified air flows.
- When the switch on the fume is in the unoccupied mode position, the fume hood is set at specified minimum air flow and the general exhaust system (s) and dual duct box system(s) revert back to their occupied air flows.

UNOCCUPIED MODE

- Unoccupied mode is enabled whenever the DDC weekly schedule is off and the fume hood switch is in the unoccupied mode position.
- The air flows from the general exhaust system(s) and dual duct box system(s) are set to minimum air flows.
- The space temperature will be maintain between a dead band of +/- 3°C, and is operator adjustable.

UNOCCUPIED OVER-RIDE MODE

- When ever the lab is in unoccupied mode and when the occupied/unoccupied switch on the fume hood is turned to occupied, the exhaust and supply air system will revert to the occupied mode and operate as per the occupied sequence.
- When the switch is turned to unoccupied, the systems revert back to unoccupied mode operation.

FUME HOOD OVER-RIDE MODE

- When ever the emergency switch on the fume hood monitor is activated, the monitor will over ride the fume hood exhaust valve so it is at maximum scheduled exhaust flow. The supply air to the lab is over ridden to maximum schedule air flow regardless of the mode of operation.

INDIVIDUAL DUAL DUCT BOX MODE CONTROL

- Dual duct box system will operate in one of the following modes:
  - UNOCCUPIED
  - OCCUPIED
  - Each laboratory system has it's own individual time schedule. The time schedules are set by PARC as per individual occupancy requirements.

OCCUPIED MODE

- Occupied mode is enabled when the DDC weekly schedule is on and upon the activation of the occupancy button on the room temperature sensor.
- Once enabled dual duct box system(s) open to their specified air flows. The supply air temperature will modulate to satisfy the space temperature set point.
- The space temperature dead band will be maintain between a dead band of +/- .5°C, and is operator adjustable.

UNOCCUPIED MODE

- Unoccupied mode is enabled whenever the DDC weekly schedule is off or the over-ride time period from unoccupied to occupied mode has expired.
- The air flows from the dual duct box system are set to minimum air flows.
- The space temperature will be maintain between a dead band of +/- 3°C, and is operator adjustable.

GEV-2244 & GEV-2255

- Air flow proving switches install the exhaust duct will provide a alarm signal to the DDC system in the event of no air flow at the GEV.

GLYCOL HEAT RECOVERY SYSTEM

- The glycol pumps P-34 (AH-8) and P-35 (AH-11) are started by the DDC system and operate continuously when ever the outdoor air temperature drops below 4°C and turned off above 8°C.
- During winter operation, the frost control valves are operated by the DDC system as required to maximize the recovered heat from the exhaust air system. As the glycol temperature leaving a HEC coil starts to approach 2°C or the supply air temperature of the associated AHU approaches 12.7°C the associated frost control valve will bypass the HEC coil.

AHU-8 AND AHU-11 (COLD DECK)

- The air handling units normally operate continuously.
- The supply air fans on AHU-8 and 11 are each controlled by variable frequency drives. The VFD's are modulated simultaneously to maintain the supply air flow at a supply air pressure set-point, based upon input from the averaged duct static air pressure sensors on each system. In the event of loss of communication to either control panel or supply air fan failure, the operating air handler maintains the supply air flow at a supply air static pressure set-point, based upon input from it's own duct static air pressure sensor.
- When the outdoor air temperature is above 13°C, the heat recovery coil valve is closed.
- The cooling coil control valve is opened manually to 100% by PARC operators when required. Programming is in place to control the valve automatically to maintain a leaving air temperature of 12°C.
- When the outdoor air temperature is below 12°C , the heating coil valve is modulated to temper the ventilation air to maintain a leaving air temperature of 12°C .
- Heating coil pump is started when and operates continuously when ever the outdoor air temperature drops below 12°C and turned off above 13°C.

- When the low temperature thermostat trips on low supply air temperature, the supply air fan is turned off, the outdoor air damper is closed, heating control valve is fully opened and the heating coil pump is started.

AHU-9 AND AHU-12 (HOT DECK)

- The air handling units normally operate continuously.
- The supply air fans on AHU-9 and 12 are each controlled by variable frequency drives. The VFD's are modulated simultaneously to maintain the supply air flow at a supply air pressure set-point, based upon input from the averaged duct static air pressure sensors on each system. In the event of loss of communication to either control panel or supply air fan failure, the operating air handler maintains the supply air flow at a supply air static pressure set-point, based upon input from it's own duct static air pressure sensor.
- The supply air fan variable frequency is modulated by the DDC system to maintain the supply air flow at a supply air static pressure set-point, based upon input from a duct static air pressure sensor.
- When the outdoor air temperature is above 20°C, the pre-heat coil and heating coil valves are closed.
- When the outdoor air temperature is below 20°C , the pre-heat coil and heating coil valves are modulated to temper the ventilation air to maintain a leaving air temperature of 35°C .
- Heating coil pump is started when and operates continuously when ever the outdoor air temperature drops below 12°C and turned off above 13°C.
- When the low temperature thermostat trips on low supply air temperature, the supply air fan is turned off, the outdoor air damper is closed, heating control valves are fully opened and the heating coil pump is started.

AHU-10 AND AHU-13 (VAV AHU'S)

- The air handling units are designed to provide 12.7°C air to the perimeter VAV boxes.
- The supply air fans on AHU-10 and 13 are each controlled by variable frequency drives. The VFD's are modulated simultaneously to maintain the supply air flow at a supply air pressure set-point, based upon input from the averaged duct static air pressure sensors on each system. In the event of loss of communication to either control panel or supply air fan failure, the operating air handler maintains the supply air flow at a supply air static pressure set-point, based upon input from it's own duct static air pressure sensor.
- When the outdoor air temperature is below 12°C, the associated heating coil pump is started and the heating coil valve is modulated to temper the ventilation air to maintain a leaving air temperature of 12.7 °C .
- When the outdoor air temperature is above 15°C, heating coil circulating pump is turned off and the heating coil valve is closed. The cooling coil valve is modulated to maintain a leaving air temperature of 12.7°C.
- On unit startup when the supply air fan indicates operating status, the mixed air dampers slowly ramp open to the minimum outdoor air position, else they remain at full recirculation air position. Once the mixing dampers are at minimum position, they are then allowed modulate to maintain the supply air temperature at set-point. Should the outdoor air temperature be unsuitable for cooling purposes, the mixing dampers are modulated to their minimum position and remain at this position until either the unit is turned off or the outdoor air temperature is suitable for cooling purposes. Should the mixed air temperature start to get to cold, the mixed air controller starts to close off the amount of outdoor air introduced into the system
- If AHU-10's supply air fan status indicates fan operation, then RF-3's VFD is enabled to operate and is modulated to control the return air flow to a set-point. This set-point is a calculated value is based upon total supply air flow, a multiplier and the number of return air fans operating.

- If AHU-13's supply air fan status indicates fan operation, then RF-5 's VFD is enabled to operate and is modulated to control the return air flow to a set-point. This set-point is a calculated value is based upon total supply air flow, a multiplier and the number of return air fans operating.
- When the low temperature thermostat trips on low supply air temperature, the supply air fan is turned off, the return air fan, the mixing air dampers are closed, heating control valve is fully opened and the heating coil pump is started.

FC-1 (MAKE UP AIR UNIT IN PENTHOUSE)

- Make up air unit FC-1 is designed to provide 10°C supply air.
- The supply air fan on FC-1 is controlled by a variable frequency drive, and this VFD is modulated as required to slightly pressurize the penthouse.
- Exhaust fans EF-75, 76, 77 run continuously.
- When the outdoor air temperature is below 10°C, pump P-60 is started and runs continuously and the two way control valve serving the heat exchanger is modulated as required to maintain the leaving supply air at set-point.
- When the outdoor air temperature is above 11°C, pump P-60 is turned off and the two way control valve is closed.
- When the unit is turned off the outdoor air damper is closed.
- When the low temperature thermostat trips on low supply air temperature, the supply air fan is turned off, the outdoor air damper is closed, heating control valve is fully opened and the heating coil pump is started. A manual reset of the low limit thermostat is required bring the unit back into operation.

HEATING PUMPS

- Heating pump P-45 is manually controlled by PARC operators and monitored by the DDC system.
- Heating pump P-55 is manually controlled by PARC operators and monitored by the DDC system.

HUMIDIFIERS

- Humidifiers are controlled by duct mounted humidistats.
- Duct mounted humidity sensor located in RF-3 ducting is used to control humidifier H-1 for AHU-10.
- Duct mount humidity sensor located in RF-5 ducting is used to control humidifier H-2 for AHU-13.
- The average measured humidity from the east (old R/A) duct mounted humidistat and the east G/E duct mounted humidistat will be used to control AHU-8 and AHU-9 humidifiers in parallel.
- The average measured humidity from the west (old R/A) duct mounted humidistat and the west G/E duct mounted humidistat will be used to control AHU-11 and AHU-12 humidifiers in parallel.

Humidifier Operating Mode

- A hard wired air flow proving switch installed in the supply air duct will disable the associated humidifier from operating whenever no air flow is being sensed.
- A hard wired high limit humidistat installed after the steam manifold in the supply air ducting will disable the humidifier from operating and send an alarm signal to the DDC system upon detecting humidity levels above the humidistat's set-point.
- Input from the duct mounted humidistats is used to reset the associated supply air humidity set-point up or down as required. The reset control will not be permitted to raise the supply air humidity set-point beyond an operator adjustable Maximum S/A Humidity Set-point.
- The DDC system monitors the supply air humidity, should the supply air humidity rise above a High S/A Humidity Alarm Set-point, the associated humidifier is turned off.

LABORATORY EXHAUST FANS (LEF-1, 2, 3)

- On initial start up, restart due to power failure or return to normal power, see sequences EMERGENCY SHUTDOWN AND AUTO RESTART elsewhere in this section.
- Each of the LEF fans has a discharge velocity sensor installed on them. The velocity sensor will provide an input to the DDC system which in turn will modulate the outdoor air damper in the exhaust plenum at the base of the LEFs, to maintain a minimum velocity of 3000 FPM.
- Duct static pressure sensors at the general exhaust ducts shall modulate their associated dampers to maintain the duct static pressure at -450 Pa in the west side exhaust ducting and -725 Pa in the east side exhaust ducting.
- Hard wired pressure sensor in the LEF plenum and one in each of the exhaust ducts will shut down all the LEFs, whenever the pressure in the LEF plenum exceeds -5" WC or the pressure in either of the exhaust ducts exceeds 3.8"WC. Each of the 3 pressure switches have their own manual reset button and indicating light located on the exterior of the DDC panel enclosure controlling the LEFs. The indicating light will illuminate indicating which pressure switch has tripped and it's associated manual reset button must be pressed before the LEFs will re-start.
- Upon any fan failure, the DDC system will generate an alarm at the terminal.
- The DDC system monitors the HAND/OFF/AUTO switches for all the 3 LEFs. The DDC system is sent a signal when the HAND/OFF/AUTO switch is in the AUTO position.
- An LEF VFD can be operated in by-pass mode by either turned the associated by-pass switch on the VFD to the ON position, or by manually turning the associated DDC control point ON.
- Current sensors are installed on each of the LEF motors which provide operating feed back to the DDC system. This allows monitoring of the LEFs when in by-pass mode and normal operating mode.

EMERGENCY SHUTDOWN AND AUTO RESTART

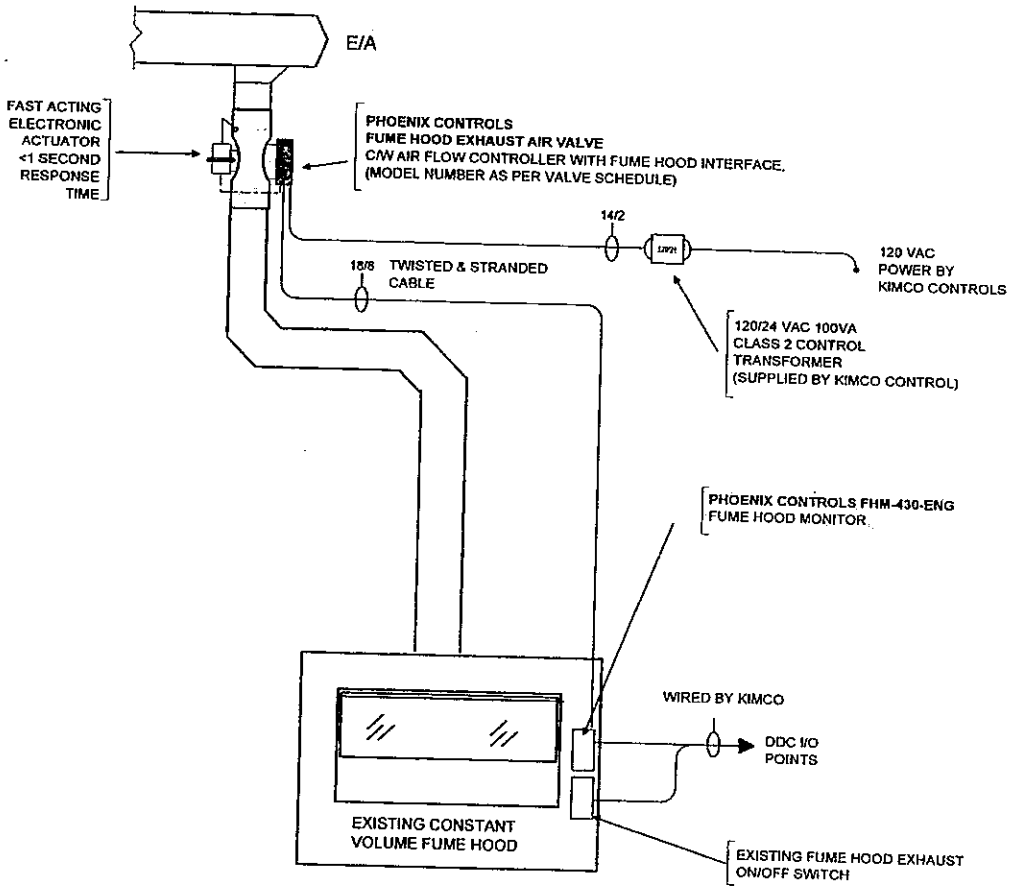
AUTO RESTART AFTER LOSS OF BUILDING POWER OR RETURN TO NORMAL POWER

- On a loss of building power or return to normal power, the DDC system turns off the control points for AHU-1 to 13 and the LEFs.
- After 20 sec. on a loss of building power or return to normal power, the DDC system enables AHU-3 to operate.
- After 60 sec. on a loss of building power or return to normal power, the DDC system enables AHU-4 to operate.
- After 90 sec. on a loss of building power or return to normal power, the DDC system enables AHU-6, 10, 13 to operate.
- After 120 sec. on a loss of building power or return to normal power, the DDC system enables AHU-1, 2, 5, 7 to operate.
- After 300 sec (5 min.), the DDC system enables AHU-9 and AHU-11 to operate.
- If AHU-9 and AHU-11 have been operating for 30 sec., the DDC system enables the LEF fans and they are ramped up to their minimum speed of 66%. The bypass damper is modulated as required.
- If AHU-9 and AHU-11 have been operating for 60 sec., the DDC system enables AHU-8 and AHU-12 and the LEFs fans are allowed to reach their maximum speed.

EXHAUST FANS

- EF-105 is controlled and monitored by the DDC system. The exhaust fan is turned on manually through the DDC system and operates continuously. Fan operation is monitored by a current sensor and should the values be out of normal operating parameters or no current reading, the DDC system will create an alarm at the DDC terminal and start audible and visual alarm in Vestibule 2250 and the corridor.
- EF-32 and 40 are controlled by the DDC system (existing points). The exhaust fans are now monitored by current sensors and should the values be out of normal operating parameters, an alarm is generated at the DDC terminal.

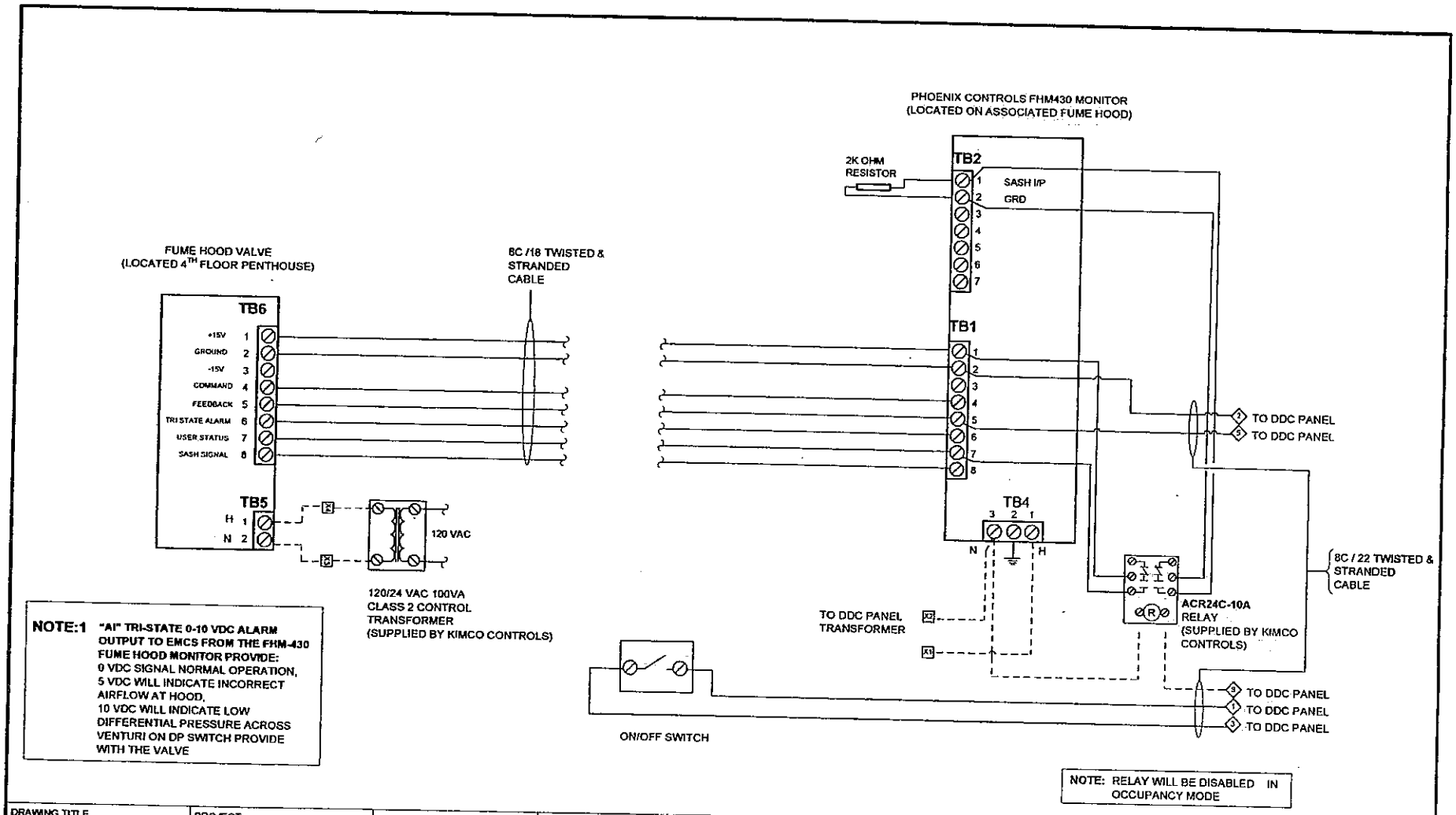
- EF-74 is controlled by the DDC system from an input from a on/off switch mounted on the fume hood. If the switch is off, the exhaust fan operates on low speed. If the switch is on, the exhaust fan operates on high speed. The exhaust fan is monitored by a current sensors installed on the low and high speeds and should the values be out of normal operating parameters, an alarm is generated at the DDC terminal.
- EF-62 is controlled by the DDC system from an input from a on/off switch mounted on the fume hood. If the switch is off, the exhaust fan is turned off. If the switch is on, the exhaust fan is turned on. The exhaust fan is monitored by a current sensor and should the values be out of normal operating parameters, an alarm is generated at the DDC terminal.



DRAWING TITLE	PROJECT	CONTRACT NUMBER		REFERENCE DRAWING	NUMBER	REVISION-LOCATION	ECN	DATE	BY	PAGE NUMBER
Existing Constant Volume Fume Hood	Summerland Ag Canada	OC-786	OLYMPIC CONTROLS INC. 344 HARBOUR AVENUE NORTH VANCOUVER B.C.		A	SUBMITTAL		APR/06	AP	A-1
		FILE NUMBER A1-VAVFH								

SALES ENGINEER	PROJECT MANAGER	APPLICATION ENGINEER	DRAWN		APPROVED	
DM	AB	AP	BY AP	DATE APR/06	BY	DATE

3/19/2012



DRAWING TITLE	PROJECT	CONTRACT NUMBER			REFERENCE DRAWING	NUMBER	REVISION-LOCATION	ECN	DATE	BY	PAGE NUMBER
Typical Fume Hood (FHEV & FHM) Wiring Diagram	Summerland Ag Canada	OC-786	OLYMPIC CONTROLS INC. 344 HARBOUR AVENUE NORTH VANCOUVER B.C.			A	SUBMITTAL		APR/06	AP	B-1
		FILE NUMBER B-1FHV									

SALES ENGINEER	PROJECT MANAGER	APPLICATION ENGINEER	DRAWN		APPROVED	
DM	AB	AP	BY AP	DATE APR/06	BY	DATE

3/19/2012

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A: **LABORATORY FUME HOOD AIRFLOW CONTROL SEQUENCES OF OPERATION**

1. The Phoenix Control Lab airflow control system will provide two state constant volume Fume Hood airflow operation.

2. Each fume hood is supplied with a **Phoenix Controls FHM430 VAV Hood Monitor** and a Phoenix Controls pressure independent EXVB series coated VAV Fume Hood Air Valve.

   NOTE: For this project the VAV Hood Monitors is set up to provide **two state constant volume operation** of the Fume Hood Air Valve rather than VAV operation.

3. The Fume Hood Monitor will command the Fume Hood Air Valve to either the **minimum hood flow** set point for **"Stand-by Operation"** or to the **maximum hood flow** set point for **"Standard Operation"**.

4. The **DDC System** will monitor the status of the **existing fume hood on/off switch** and provide a digital output wired to control a 24vac DPDT relay (located at the hood) to select the Fume Hood Monitor operating modes.

5. When the **Fume Hood selector switch** is turned **"ON"** the DDC System will de-energize a DPDT Control Relay. The normally open contacts are used to switch the Fume Hood Monitor operating mode to the "Standard Operation" mode. In this mode the fume hood monitor **'STANDARD OPERATION' LED** shall turn on and the Fume Hood Monitor will command the fume hood air valve to the **"Maximum hood flow "**airflow setting (as programmed into the monitor in set up step 8). The Standard In Use operating airflow setting for the fume hoods is **254 L/S.**

6. When the Fume Hood selector switch is turned **"OFF"** the DDC System will energize the DPDT Control Relay. The normally open contacts will close and switch the Fume Hood Monitor operating mode to the "Stand-by Operation" mode. In this mode the fume hood monitor **'STAND By OPERATION' LED** shall turn on and the Fume Hood Monitor will command the fume hood air valve to the **"Minimum hood flow "**airflow setting (as programmed into the monitor in set up step 7). In the stand by operating mode the airflow setting of **99 L/S** will provide sufficient airflow to ensure no chemical build up in the cabinet.

7. The air valve flow controller will generate a linearized 0-10 VDC feedback signal (94 L/S pre volt) which will be monitored by the BAS system.

8. The Fume Hood Monitor is provided with an **EMERGENCY BUTTON.** The emergency exhaust button will over ride the DDC Control System signal. When the emergency exhaust mode button is pushed the hood monitor alarm buzzer will sound and the fume hood exhaust air valve will be switched to its maximum flow set point of 254 L/S to evacuate the hood.

9. When the differential pressure drop across the fume hood exhaust valve is below 0.3" wc, the valve differential pressure switch shall open to signal a **"CAUTION FLOW ALARM"** at the fume hood monitor.

10. Upon a valve jam condition or airflow failure when the valve feedback signal does not equal the fume hood command signal the fume hood monitor shall generate a **"CAUTION FLOW ALARM".**

11. The fume hood monitor will generate a Tri-State Flow Alarm (0/5/10 VDC) for monitoring by the DDC Control System.

    0 volt is normal operation, **5 volt** when feedback doesn't match command or Emergency Mode is on and **10 volts** when pressure switch signals low differential pressure across the air valve venturi.

12. A mute button shall silence the audible portion of alarm. When system condition returns to normal, all alarms shall automatically be cleared.

B: **LAB CANOPY HOOD, INSECT & WIND TUNNEL EXHAUS AIR VALVE AIRFLOW CONTROL SEQUENCES OF OPERATION**

1. The Phoenix Controls Lab airflow control system will provide two state constant volume Canopy Hood Air Valves, Insect Room and Wind Tunnel Room Exhaust Air valve airflow operation.

2. Each Air Valve will be provided with a Phoenix Controls FHM430 VAV Hood Monitor and a Phoenix Controls pressure independent EXVB series coated VAV Fume Hood Air Valve to control and set and minimum and maximum desired exhaust airflow rate.

   NOTE: the Phoenix Controls FHM430 VAV Hood Monitor is set up to provide **two state constant volume operation** of the Air Valve rather than VAV operation.

3. The Monitor will command the Hood Air Valve to either the **minimum hood flow** set point for **"Stand-by Operation"** or to the **maximum hood flow** set point for **"Standard Operation"**.

4. The **DDC System** will monitor the status of the Exhaust **on/off switch** and provide a digital output wired to control a 24vac DPDT relay (located at the hood) to select the Fume Hood Monitor operating modes.

5. When the **selector switch** is turned **"ON"** the DDC System will de-energize a DPDT Control Relay. The normally open contacts are used to switch the Hood Monitor operating mode to the **"Standard Operation"** mode. In this mode the monitors **"STANDARD OPERATION LED"** shall turn on and the Monitor will command the Hood Air Valve to the **"Maximum hood flow"** airflow setting (as programmed into the monitor in set up step 8).

6. When the **selector switch** is turned **"OFF"** the DDC System will energize the DPDT Control Relay. The normally open contacts will close and switch the Hood Monitor operating mode to the **"Stand-by Operation"** mode. In this mode the hood monitor **"STAND By OPERATION LED"** shall turn on and the Monitor will command the Canopy Hood Air valve to the "**Minimum hood flow** "airflow setting (as programmed into the monitor in set up step 7).

7. The air valve flow controller will generate a linearized 0-10 VDC feedback signal (94 L/S pre volt) which will be monitored by the BAS system.

8. The Monitor is provided with an **EMERGENCY BUTTON.** The emergency exhaust button will over ride the DDC Control System signal. When the emergency exhaust mode button is pushed the hood monitor alarm buzzer will sound and the hood exhaust air valve will be switched to its maximum flow set point to evacuate the hood.

9. When the differential pressure drop across the hood exhaust valve is below 0.3" wc, the valve differential pressure switch shall open to signal a "**CAUTION FLOW ALARM**" at the hood monitor.

10. Upon a valve jam condition or airflow failure when the valve feedback signal does not equal the fume hood command signal the fume hood monitor shall generate a **"CAUTION FLOW ALARM".**

11. The fume hood monitor will generate a Tri-State Flow Alarm (0/5/10 VDC) for monitoring by the DDC Control System.

    0 volt is normal operation, **5 volt** when feedback doesn't match command or Emergency Mode is on and **10 volts** when pressure switch signals low differential pressure across the air valve venturi.

12. A mute button shall silence the audible portion of alarm. When system condition returns to normal, all alarms shall automatically be cleared.

Configuring the Calibration Parameters for Phoenix Controls Fume Hood Monitor (FHM430)

To configure the parameters for the FHM430 hood monitor:

1. You enter Hood Monitor **calibration and set up mode** by pressing and holding the **Mute button, the Emergency Exhaust button** and **Calibration Mode buttons down together at the same time.**

   NOTE 1: The Calibration mode button is not labeled. It is located to just to the right side of the Standard Operation LED You should be able to feel the button

   When all three buttons are pressed for approximately 2 seconds, two beeps will confirm that the monitor is in calibration mode.

   Once you are in the calibration mode parameter number 1 will appear briefly and then **"uAuu"** will light up in the hidden **display area. All the LED's should also be flashing**

   NOTE 2: The set up digital display is hidden from view. The digital display is however visible through the monitor cover. The digital display is located just below the Phoenix Controls Corp "red print" on the face of the monitor.

2. Find the desired calibration parameter by pressing the **Emergency Exhaust** button.

3. Select the desired value or setting within the parameter you are adjusting by pressing the **Mute** button.

4. Save the value displayed within the parameter and move to the next parameter by pressing the **Emergency Exhaust** button.

5. Repeat steps 3-4 until you have completed all of the parameters that need to be adjusted.

6. Save the values by pressing and holding the **Emergency Exhaust** button. Then press the **Calibration Mode** button while still holding down the Emergency Exhaust button. Three beeps will confirm that the values have been saved.

NOTE: The following **Calibration Parameters** are used to set up the **Phoenix Controls FHM430 VAV Hood Monitor** for Two State Constant Volume Air Valve operation that is required for this projects **Fume Hoods** and **Canopy Hoods**.

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Phoenix Controls FHM430 VAV Fume Hood Monitor Calibration Parameters settings for two state Constant Volume air valve operation

1. **FHM Mode:** for this two state constant volume application use the default **Mode** setting (**vAvv Standard VAV valve)**

   To accept this parameter and advance to the next, Press the **Emergency Exhaust** button.

2. **Display Parameter and Unit of Measure:** Press the **Mute** Button until you find **(0005)** for metric **L/S flow value.**

   To save this setting and advance to the next parameter, press the **Emergency Exhaust** button.

3. **Flow Scale Factor:** Press the **Mute** button until you find the flow scale factor of **94 L/S.**

   Note: This value corresponds to the flow feedback & command scale factor for the air valve (94 L/S per volt)

   To save this setting and advance to the next parameter, press the **Emergency Exhaust** button.

4. **Standard Face Velocity set point:** Press the mute button to set the face velocity to **0.760 m/s.**

   NOTE 1
   Clarification regarding Switching the Mute button operation between increase and decrease up and down operation
   If you pass the desired setting and you want to decrease the set point you need to push & hold down the Mute button. When you press the Mute button you will hear a clip, once you hear the click then while you are still pressing the Mote Button press the Emergency Exhaust button momentarily and release both button. Now when you press the mute bottom the setting should decease each time you press the button. If you what to switch back to increase the number follow the same step taken above.

   Note 2: Each time you press the Mute button the setting increases by 0.01 m/s.
   When you hold the Mute button the increments increase by 0.1 m/s

   To save this setting and advance to the next parameter, press the **Emergency Exhaust** button.

5. **Leakage Area:** This setting if not required for this two state constant volume application. The monitor however still needs to have a setting. As such use the default SI unit setting of 279 square centimeters. If the monitor is not set to this value, press the **Mute** button to set this factor to 279 square centimeters.

   Note: Each time you press the Mute button the setting increases by 10 cm2.
   When you hold the Mute button the increments increase by 100 cm2

   To save this setting and advance to the next parameter, press the **Emergency Exhaust** button.

6. **Sash Width:** This setting if **not required** for this **two state constant volume application**. The monitor however still needs to have a setting. As such we suggest that you use the **default SI unit** setting of **132 centimeters**.

   To accept this setting and advance to the next parameter, press the **Emergency Exhaust** button.

7. **Minimum Hood Flow:** This input sets the desired minimum hood airflow setting when the hood is turned **"OFF"**
   Press the **Mute** button until you find the appropriate minimum hood flow set point.

   NOTE 1 Regarding Switching the Mute button operation between increase and decrease up and down operation
   If you pass the desired setting and you want to decrease the set point you need to push & hold down the Mute button. When you press the Mute button you will hear a clip, once you hear the click then while you are still pressing the Mote Button press the Emergency Exhaust button momentarily and release both button. Now when you press the mute bottom the setting should decease each time you press the button. If you what to switch back to increase the number follow the same step taken above.

   Note 2: Each time you press the Mute button the setting increases by 5 L/S
   When you hold the Mute button the increments increase by 50 L/S

   Note 3: For this project the desired minimum Fume Hood airflow is 98 L/S.
   The closest monitor airflow setting to 98 L/S will be 99 or 100 L/S; you will need to accept this value.
   For canopy hoods check the schedule.

   To save this setting and advance to the next parameter, press the **Emergency Exhaust** button.

8. **Maximum Hood Flow:** This input sets the desired maximum hood airflow setting when the hood is turned **"ON"**
Press the **Mute** button until you find the appropriate minimum hood flow set point.

NOTE 1 Regarding Switching from Mute button up and down operation
If you pass the desired setting and you want to decrease the set point you need to push & hold down the Mute button. When you press the Mute button you will hear a clip, once you hear the click then while you are still pressing the Mote Button press the Emergency Exhaust button momentarily and release both button. Now when you press the mute bottom the setting should decease each time you press the button. If you what to switch back to increase the number follow the same step taken above.

Note 2: Each time you press the Mute button the setting increases by 5 L/S
When you hold the Mute button the increments increase by 50 L/S

Note 3: For this project the desired minimum Fume Hood airflow is 254 L/S.
The closest monitor airflow setting to 254 L/S will be 255 to 258 L/S; you will need to accept the value closet to 254
For canopy hoods check the schedule.

To save this setting and advance to the next parameter, press the **Emergency Exhaust** button.

9. **Minimum Airflow State Condition:** For VAV Fume Hoods applications this parameter is used to set the sash height at which the hood will exhaust the desired minimum airflow. For this **two state constant volume application** (as is the case for this project) this parameter records the condition at which the air valve will be commanded to the **minimum hood flow** setting as set in step 7.

IMPORTANT NOTE: To properly set this parameter the monitor must set to the **Standby Operation** mode.
To do this the DDC System Hood control **relay has to be energized**. To switch the hood to Standby mode turn the hood switch to the "OFF" position or have the DDC System over ride this to the "OFF" mode.

In the calibration mode the digital display should shows a value of **7.7** cm. The actual number is not important for this application. You still need to push the **Mute** button to set this condition to command the air valve to it desired minimum hood airflow setting as set in step 7.

To save this setting and advance to the next parameter, press the **Emergency Exhaust** button.

10. **Maximum Airflow State Condition:** For VAV Fume Hoods applications this parameter is used to set the sash height at which the hood will exhaust the desired maximum airflow. For this **two state constant volume application** (as is the case for this project) this parameter records the condition at which the air valve will be commanded to the **maximum hood flow** setting as set in step 8.

    IMPORTANT NOTE: To properly set this parameter the monitor must set to the **Standard (Hood In Use) Operation** mode. To do this the DDC System Hood control **relay has to be energized**. To switch the hood to Standby mode turn the hood switch to the "ON" position or have the DDC System over ride this to the "ON" mode.

    In the calibration mode the digital display should shows a value of **23.4** cm. As noted in step 9, the actual number is not important for this application. You still need to push the **Mute** button to set this condition to command the air valve to it desired maximum hood airflow setting as set in step 7.

    When the **Standard** operation **LED** is tuned **"ON"** and the digital display shows a value of 23.4, press the **Mute** button to set this condition to command the air valve to it desired maximum hood airflow setting as set in step 8.

    To save this setting and advance to the next parameter, press the **Emergency Exhaust** button.

11. **Face Velocity Display Offset Adjustment:** This parameter setting if not used or required for this two state VAV application. The monitor however still needs to have a setting. Use the **default value "n-A"** as displayed in the digital display.

    Press the **Emergency Exhaust** button to accept the default value and advance to the next parameter.

12. **Setback%:** This setting if not used or required for this two state constant volume application. The monitor however still needs to have a setting. Use the **default value "60"** as displayed in the digital display.

    Press the **Emergency Exhaust** button to accept the default value and advance to the next parameter.

13. **Minimum Setback Clamp:** Set back this setting if not used or required for this two state constant volume application. Set this value to (**NO**) by pressing the Mute button

    To accept this setting and advance to the next parameter, press the **Emergency Exhaust** button.

14. **Maximum SASH Opening Alarm:** This setting if not used or required for this two state constant volume application.
"oPAL" should be the value displayed on the monitor.

    To accept this setting and advance to the next parameter, press the **Emergency Exhaust** button.

15. **Reverse Vertical Sash Alarm or Broken Sash Threshold:** This setting if not used or required for this two state constant volume application.
"PY_o" should be the value displayed on the monitor.

    To accept this setting and advance to the next parameter, press the **Emergency Exhaust** button.

16. **Beep Volume:** Press the **Mute** until you find the desired volume setting. **Lo** (Low volume) or **Hi** (high beeper volume)

    To accept the setting and advance to the next parameter, press the **Emergency Exhaust** button.

17. **Emergency Mutable:** This parameter determines if the operator can mute the operator emergency exhaust alarm
Press the **Mute** to set this value to (YES).

    To accept this setting and advance to the next parameter, press the **Emergency Exhaust** button.

18. **Mute Duration:** This parameter is used to adjust the number of minutes the alarm sound is muted when the mute button is pressed on the fume hood monitor. An alarm can be muted from 1 to 10 or 15 to 20 minutes.

    Press the **Mute** button until you find appropriate mute duration setting.

    To accept this setting and advance to the next parameter, press the **Emergency Exhaust** button.

19. **Auto Mute:** This parameter is used to adjust the number of seconds the alarm will sound until the monitor mutes automatically. When O is selected the alarm will sound indefinitely until the mute button is pressed manually.

    Press the **Mute** bottom until you find the appropriate auto mute setting either O (the alarm will not mute until the Mute button is pressed) or 20 (the alarm will mute automatically after 20 seconds)

To accept this setting and advance to the next parameter, press the **Emergency Exhaust** button.

20. **Drive Application Scaling:** This setting if not used or required for this two state constant volume application.

    Press the **Emergency Exhaust** button to accept the default setting and complete the configuration.

NOTE: on newer models of Fume Hood Monitors they added Steps 21, 22 and 23 for new features. The features in these steps apply only to the FHM-631 Model of Fume Hood Monitor.

FINAL STEP: Save the Configuration values:

To exist the calibration mode and save all changes press and hold the **Emergency Exhaust** button and then at the same time press the **Calibration Mode** button.

After you hear **three beeps** (confirming that the values have been saved) you can release the buttons

Note:
If you do not want to save the new values press the Calibration button without pressing the Emergency exhaust button first