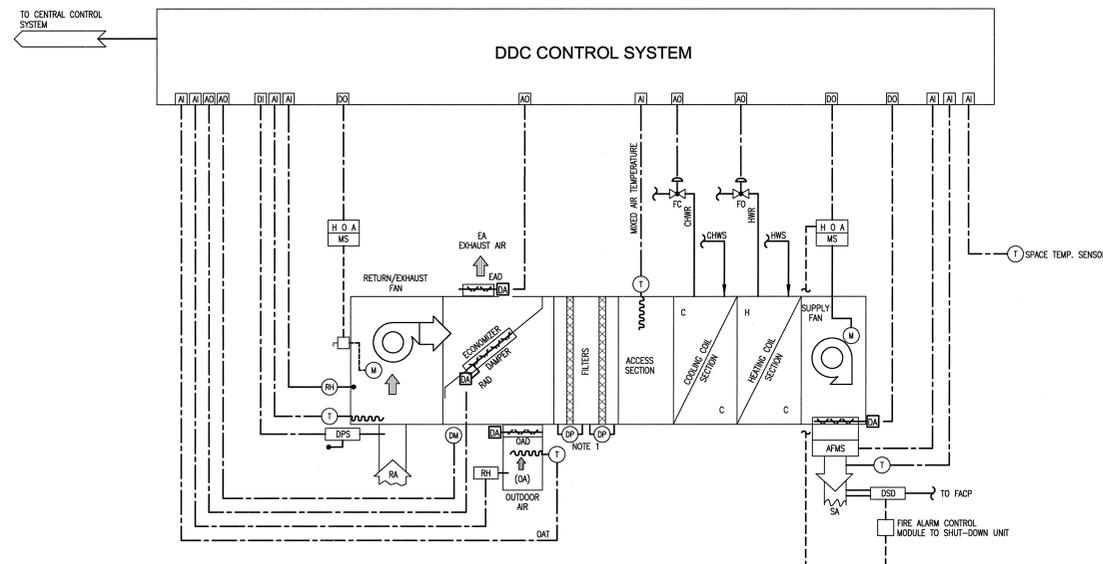
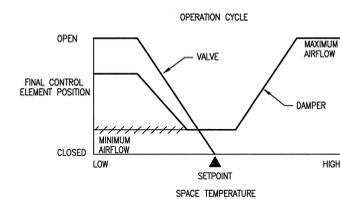
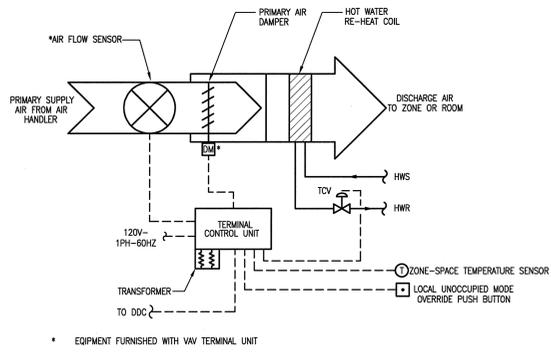


TYPICAL CONTROL POINT LIST -ROOF TOP AIR HANDLER AH-CN-15

POINT DESCRIPTION	OUTPUT FROM DDC										INPUT TO DDC										ALARMS				SOFTWARE				APPLICATIONS			
	DIGITAL					ANALOG					DIGITAL					ANALOG					DIGITAL		ANALOG									
	GRAPHIC DISPLAY (WINDOWS BASED SOFTWARE)	CONTROL RELAY	HAND OFF / AUTO	OPEN / CLOSE	CONTROL POINT ADJUSTMENT	PROPORTIONAL CONTROL	CONTACT CLOSURE	PULSE	DIFFERENTIAL PRESSURE SWITCH	PRESSURE SWITCH	ANALOGARY CONTACT	GENERAL ALARM	TEMPERATURE (F)	% RELATIVE HUMIDITY	PSIG, PSIA, PSD	POSITION SENSOR	FLOW	CONTACT CLOSURE--DRY FILTER	CONTACT CLOSURE--EQUIPMENT FAILURE	HIGH LIMIT	LOW LIMIT	RUN TIME	DUTY CYCLING	START/STOP	ECONOMIZER OFF/AUTO	LEAD/LAG	CHILLED WATER RESET	FAILURE MODE				
AH-CN-15	X																															
AHU RA/ECONOMIZER DAMPER				X																			X	X								
AHU DA DAMPER																																
AHU EA DAMPER																																
DISCHARGE AIR DAMPER/SUPPLY AIR (SMOKE)				X																												
SUPPLY FAN AIR FLOW																																
RETURN FAN DIFF. PRESS STATUS									X																							
SUPPLY FAN START/STOP		X																														
RETURN FAN START/STOP		X																														
COOLING COIL TEMP. CONTROL VALVE																																
HEATING COIL TEMP. CONTROL VALVE																																
SPACE TEMPERATURE (ROOM TEMP)													X																			
SUPPLY AIR TEMP.																																
MIXED AIR TEMP.																																
OUTSIDE AIR TEMPERATURE																																
RETURN AIR TEMPERATURE (RAI)																																
RETURN AIR RELATIVE HUMIDITY/ROOM													X																			
OUTSIDE AIR RELATIVE HUMIDITY														X																		

GENERAL NOTES:
 1) TEMPERATURE CONTROLS CONTRACTOR SHALL COORDINATE WITH TERMINAL BOX SUPPLIER TO ENSURE THAT ALL CONTROL FEATURES AND INTERFACES ARE PROVIDED. ALL TERMINAL CONTROLS MAY BE PROVIDED BY EITHER THE TERMINAL BOX SUPPLIER OR TEMPERATURE CONTROLS CONTRACTOR, HOWEVER RESPONSIBILITY FOR THE CONTROL FUNCTIONS AND INTERFACE RESIDE WITH THE TEMPERATURE CONTROLS CONTRACTOR.



TYPICAL ROOF TOP AIR HANDLER CONTROL DIAGRAM

SCALE: NOT TO SCALE
 NOTES:
 1) DIFFERENTIAL PRESSURE GAGES FURNISHED WITH EQUIPMENT

SEQUENCE OF OPERATION-ROOF TOP UNIT

- GENERAL:**
 THE AIR HANDLING UNIT SHALL BE ENERGIZED THRU THE CONTROL SYSTEM AND SHALL RUN CONTINUOUSLY. THE RETURN FAN SHALL BE INTERLOCKED TO THE SUPPLY FAN SUCH THAT IT RUNS ONLY WHEN THE SUPPLY FAN IS ENERGIZED. A DAMPER IN THE SUPPLY AIR DISCHARGE (SMOKE) SHALL BE CLOSED WHEN THE UNIT IS DE-ENERGIZED AND SHALL BE COMMANDED OPEN WHEN THE UNIT IS ENERGIZED. DUCT SMOKE DETECTOR (DSD) IN THE SUPPLY AIR STREAM SHALL BE CONNECTED TO THE FIRE ALARM CONTROL PANEL (FACP). SHOULD SMOKE BE DETECTED, THE DSD THROUGH THE FACP SHALL DE-ENERGIZE THE SUPPLY AND RETURN FAN. AN AIR FLOW MEASURING STATION (AFMS) SHALL REPORT UNIT SUPPLY AIR FLOW TO THE CONTROL SYSTEM, AND PROVE FLOW. SHOULD THE MIXED AIR TEMPERATURE DROP BELOW 40° F THE UNIT (SUPPLY AND RETURN FAN) SHALL BE DE-ENERGIZED. THE OUTSIDE AIR DAMPER SHALL CLOSE, THE CHILLED WATER CONTROL VALVE SHALL FAIL CLOSED AND THE HOT WATER CONTROL VALVE SHALL FAIL OPEN, AND AN ALARM CONDITION INDICATED AT THE CENTRAL CONTROL STATION.
- HEATING:**
 A SPACE TEMPERATURE SENSOR SHALL PROVIDE INPUT TO THE CONTROL SYSTEM. SHOULD THE SPACE TEMPERATURE DROP BELOW SETPOINT (72 DEGREES F), THE CONTROL SYSTEM SHALL MODULATE OPEN THE HEATING COIL CONTROL VALVE AS REQUIRED TO MAINTAIN THE DESIRED SPACE TEMPERATURE. OUTSIDE AIR DAMPERS SHALL BE AT MINIMUM POSITION DURING HEATING.
- COOLING:**
 A SPACE TEMPERATURE SENSOR SHALL PROVIDE INPUT TO THE CONTROL SYSTEM. SHOULD THE SPACE TEMPERATURE RISE ABOVE SETPOINT (73 DEGREES F), THE CONTROL SYSTEM SHALL MODULATE OPEN THE OUTSIDE AIR DAMPERS WHILE CLOSING THE RETURN AIR DAMPERS IN AN ATTEMPT TO UTILIZE FREE OUTDOOR AIR COOLING. SHOULD INSUFFICIENT COOLING BE AVAILABLE AND THE SPACE TEMPERATURE RISE TO 75 DEGREE F, THE CONTROL SYSTEM SHALL MODULATE OPEN THE COOLING COIL CONTROL VALVE AS REQUIRED TO MAINTAIN THE DESIRED SPACE TEMPERATURE.
 THE CONTROL SYSTEM SHALL USE TEMPERATURE AND RELATIVE HUMIDITY SENSORS IN THE RETURN AIR AND OUTSIDE AIR TO DETERMINE THE ENTHALPY OF EACH AIR STREAM. SHOULD THE ENTHALPY OF THE OUTSIDE AIR REACH THAT OF THE RETURN AIR, THE CONTROL SYSTEM SHALL DRIVE THE OUTSIDE DAMPERS TO MINIMUM POSITION.

SEQUENCE OF OPERATION

- GENERAL:**
 THE VAV UNITS SHALL MODULATE SUPPLY AIR FLOW TO MEET RESPECTIVE SPACE TEMPERATURE SETTINGS. THE UNIT CONTROLLER SHALL MAINTAIN COOLING OR HEATING AIRFLOW BY AN ELECTRONIC DUCT AIR FLOW SENSOR.
- OCCUPIED MODE:**
 THE CONTROL SYSTEM SHALL ENTER THE OCCUPIED MODE IN ONE OF THREE WAYS:
 1. A COMMAND FROM THE DDC.
 2. A SCHEDULED TIME OF DAY FROM THE DDC.
 3. LOCAL UNOCCUPIED MODE OVERRIDE PUSH BUTTON
- WHILE IN THE OCCUPIED MODE, THE CONTROL SYSTEM SHALL MAINTAIN THE ZONE TEMPERATURE AT THE HEATING OR COOLING TEMPERATURE SET POINTS AS FOLLOWS:**
- COOLING MODE:** WHEN THE ZONE TEMPERATURE IS WITHIN THE COOLING PROPORTIONAL BAND, THE UNIT CONTROLLER SHALL MODULATE THE PRIMARY AIR FLOW BETWEEN MINIMUM AND MAXIMUM AIR FLOW SET POINTS USING A PROPORTIONAL - INTEGRAL - DERIVATIVE (PID) ALGORITHM TO MAINTAIN THE COOLING SET POINT.
- HEATING MODE:**
 WHEN THE ZONE TEMPERATURE DROPS TO ONE AND HALF DEGREE FAHRENHEIT BELOW THE HEATING SETPOINT, THE CONTROL SYSTEM SHALL MODULATE OPEN THE HEATING WATER CONTROL VALVE, WHILE MODULATING OPEN THE VAV TERMINAL BOX DAMPER.
- UNOCCUPIED MODE OVERRIDE:**
 IF THE SYSTEM IS IN THE UNOCCUPIED MODE THE SETPOINT MAY BE ADJUSTED BACK TO OCCUPIED MODE VALUES BY PUSHING THE OVERRIDE PUSH BUTTON. PUSHING THE BUTTON SHALL RESET THE TEMPERATURE FOR A PERIOD OF TWO HOURS.
- UNOCCUPIED MODE:**
 THE CONTROL SYSTEM SHALL ENTER THE UNOCCUPIED MODE IN ONE OF TWO WAYS:
 1. A COMMAND FROM THE DDC.
 2. A SCHEDULED TIME OF DAY FROM THE DDC.
- WHILE IN THE UNOCCUPIED MODE, THE CONTROL SYSTEM SHALL MAINTAIN THE ZONE TEMPERATURE AT THE UNOCCUPIED HEATING OR COOLING TEMPERATURE SET POINTS AS SELECTED BY THE OWNER.**

TYPICAL VAV ZONE TERMINAL - CONVENTIONAL TURNDOWN TYPE

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NUMBER OF SECTION OR DETAIL
 DRAWING ON WHICH SECTION OR DETAIL IS SHOWN OR TAKEN
 SECTION AND DETAIL KEY

THIS DOCUMENT CONTROLLED BY
 CHANGE CONTROL SYSTEM
 ENGINEERING PROCEDURE

REV	DATE	DESCRIPTION	DSN	CHK	DEPT	DATE	PE	DATE	REV	DATE	UTB	DATE	RPE	RPE NO	DATE	ST	CV	EC	EE	EM	IE	M	PD	SE	AR
0		CERTIFIED FOR CONSTRUCTION - 12/9/02	JG	EWJ												BZ	AW	EWJ	AK	IM	DM		EWJ		TW
1	11/2/03																								

RPE
 DSN
 DRW
 CHK
 DEPT
 DESIGNED BY: CLG
 DRAWN BY: IS
 CHECKED BY: J. H. H. 12/9/02
 12/9/02
 REV. DATE 12/9/02
 LTB JRL

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Oak Ridge National Laboratory
 PROJECT NAME:
**CENTER FOR NANOPHASE MATERIALS SCIENCES
 CNMS HVAC VAV CONTROLS
 OFFICE/DRY/LAB VAV SYSTEMS**

1	48	49	50	PLANT	BLDG	FL	SH.	OF	TYPE	CLASS
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51	52	53	A/E DRAWING NUMBER:							
NC	NA			H8.11.44						