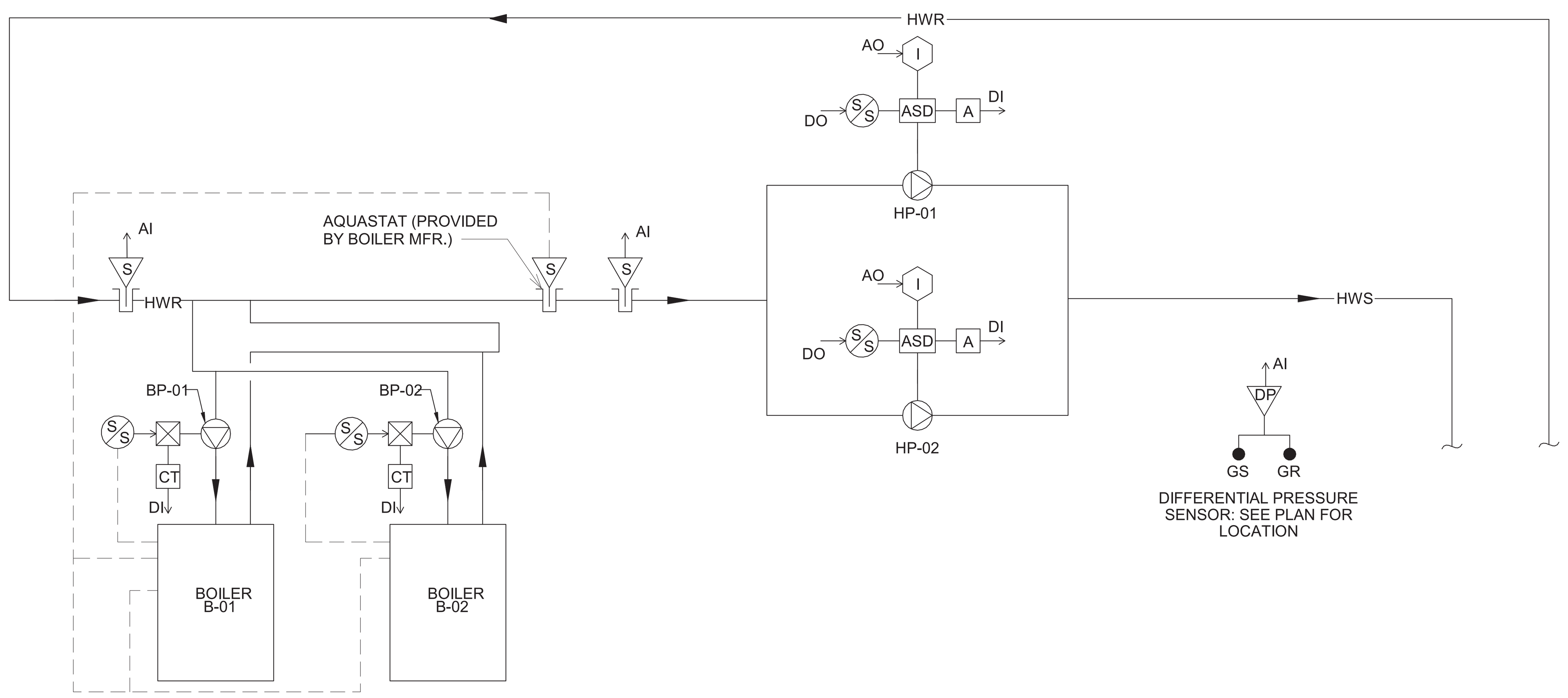
SYSTEM SUMMARY						
	INPUT		OUTPUT			
	ANALOG	DIGITAL	ANALOG	DIGITAL	ALARM	TREND
HOT WATER RETURN TEMPERATURE	X					
DIFFERENTIAL PRESSURE SENSOR	X				X	
PUMP BP-01 STATUS		X			X	
PUMP BP-02 STATUS		X			X	
PUMP HP-01 STATUS		X			X	
PUMP HP-02 STATUS		X			X	
PUMP HP-01 INTERFACE			X			
PUMP HP-02 INTERFACE			X			
PUMP BP-01 START/STOP				X		
PUMP BP-02 START/STOP				X		
PUMP HP-01 START/STOP				X		
PUMP HP-02 START/STOP				X		
PUMP HP-01 CURRENT TRANSDUCER				X	X	
PUMP HP-02 CURRENET TRANSDUCER				X	X	



HOT WATER HEATING SYSTEM CONTROLS SEQUENCE:

A. RUN CONDITIONS: THE HEATING SYSTEM SHALL RUN CONTINUOUSLY. TO PREVENT SHORT CYCLING, EACH BOILER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUT DOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS

B. EACH BOILER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS. BOILER CIRCULATOR PUMP (BP-01 & BP-02) SHALL BE INTERLOCKED WITH BOILER OPERATION AND SHALL BE OFF ONLY WHEN BOILER IS IN STANDBY MODE

C. BOILER B-01 SAFETIES: THE FOLLOWING SAFETIES SHALL BE MONITORED

1. BOILER ALARM
2. LOW WATER LEVEL

D. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. BOILER ALARM
2. LOW WATER LEVEL ALARM

E. BOILER B-02 SAFETIES: THE FOLLOWING SAFETIES SHALL BE MONITORED

1. BOILER ALARM
2. LOW WATER LEVEL

F. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. BOILER ALARM
2. LOW WATER LEVEL ALARM

G. THE BOILERS SHALL BE INDEXED ON YEAR ROUND AND SHALL BE CONTROLLED BY THEIR ON-BOARD CONTROLS. WHEN A BOILER IS INDEXED TO START, ITS ASSOCIATED BOOSTER PUMP SHALL BE STARTED AND FLOW SHALL BE CHECKED AS SENSE BY ITS ASSOCIATED FLOW SWITCH. ONCE FLOW IS SENSED THE BOILER SHALL BE ALLOWED TO START. THE BOILERS SHALL HAVE THE ABILITY TO COMMUNICATE AT A MINIMUM THE FOLLOWING POINTS:

1. BOILERS RUN CONDITION (ON/OFF) FOR EACH BOILER
2. BOILER PUMP COMMAND OUTPUT FOR EACH BOILER
3. EACH BOILER'S SUPPLY HEADER TEMPERATURE

H. A MANUAL EMERGENCY SHUTDOWN SWITCH AT THE EXIT OF THE MECHANICAL ROOM SHALL SHUT DOWN THE BOILERS COMPLETELY. THE BAS SYSTEM SHALL INCORPORATE A CONTACT FROM THESE SWITCHES TO PROVIDE AN ALARM AT THE FRONT END COMPUTER IN THE EVENT OF A MANUAL SHUT DOWN OCCURRING

I. THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING THE COMMISSIONING PERIOD TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS

J. BOILER LEAD/LAG/STANDBY OPERATION: THE TWO BOILERS SHALL OPERATE IN A LEAD/LAG FASHION

1. THE LEAD BOILER SHALL RUN FIRST
2. ON FAILURE OF THE LEAD BOILER, THE LAG BOILER SHALL RUN AND THE LEAD BOILER SHALL TURN OFF
3. THE LEAD BOILER SHALL MODULATE TO MAINTAIN HOT WATER SUPPLY TEMPERATURE OF 130°F (ADJ.)
4. IF LEAD BOILER REACHES FULL FIRE AND CANNOT MAINTAIN HOT WATER SUPPLY TEMPERATURE, LEAD BOILER SHALL BE ENABLED AND THE TWO BOILERS SHALL MODULATE IN UNISON TO MAINTAIN HOT WATER SUPPLY TEMPERATURE
5. AS HOT WATER TEMPERATURE RISES BACK TO 20°F ABOVE SETPOINT, THE LAG BOILER SHALL STAGE OFF
6. IF EITHER BOILER FAILS, THE STANDBY BOILER SHALL BE PROMOTED TO LAG BOILER AND RUN AS DESCRIBED ABOVE

K. THE DESIGNATED LEAD BOILER SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS (USER SELECTABLE):

1. MANUALLY THROUGH A SOFTWARE SWITCH
2. IF BOILER RUNTIME (ADJ.) IS EXCEEDED
3. DAILY
4. WEEKLY
5. MONTHLY

L. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. BOILER B-01
   a. FAILURE: COMMANDED ON, BUT THE STATUS IS OFF
   b. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON
   c. RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT
2. BOILER B-02
   a. FAILURE: COMMANDED ON, BUT THE STATUS IS OFF
   b. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON
   c. RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT
3. LEAD BOILER FAILURE: THE LEAD BOILER IS IN FAILURE AND THE STANDBY BOILER IS ON

M. HOT WATER SUPPLY TEMPERATURE SETPOINT RESET: THE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET BASED ON OUTSIDE AIR TEMPERATURE

1. AS OUTSIDE AIR TEMPERATURE RISES FROM 0°F (ADJ.) TO 70°F (ADJ.) THE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET DOWNWARDS BY SUBTRACTING FROM 0°F (ADJ.) TO 20°F (ADJ.) FROM THE CURRENT BOILER SETPOINT

N. PRIMARY HOT WATER TEMPERATURE MONITORING: THE FOLLOWING TEMPERATURES SHALL BE MONITORED

1. PRIMARY HOT WATER SUPPLY
2. PRIMARY HOT WATER RETURN

O. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. HIGH PRIMARY HOT WATER SUPPLY TEMP: IF GREATER THAN 140°F (ADJ.)
2. LOW PRIMARY HOT WATER SUPPLY TEMP: IF LESS THAN 80°F (ADJ.)

P. BOILER B-01 HOT WATER TEMPERATURE MONITORING: THE FOLLOWING TEMPERATURES SHALL BE MONITORED

1. BOILER B-01 HOT WATER SUPPLY
2. BOILER B-01 HOT WATER RETURN

Q. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. HIGH HOT WATER SUPPLY TEMP: IF GREATER THAN 140°F (ADJ.)
2. LOW HOT WATER SUPPLY TEMP: IF LESS THAN 80°F (ADJ.)

R. BOILER B-02 HOT WATER TEMPERATURE MONITORING: THE FOLLOWING TEMPERATURES SHALL BE MONITORED

1. BOILER B-02 HOT WATER SUPPLY
2. BOILER B-02 HOT WATER RETURN

S. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. HIGH HOT WATER SUPPLY TEMP: IF GREATER THAN 140°F (ADJ.)
2. LOW HOT WATER SUPPLY TEMP: IF LESS THAN 80°F (ADJ.)

T. SECONDARY HYDRONIC SYSTEM VARIABLE PUMP CONTROL SEQUENCE:

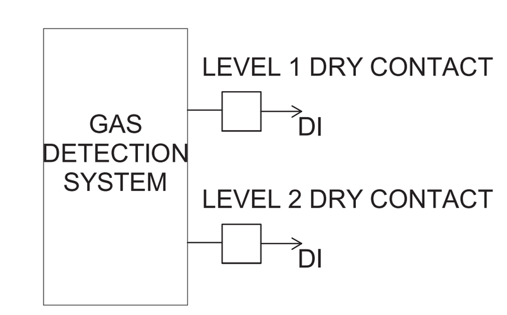
1. HOT WATER PUMPS HP-01 & HP-02
   a. THE BAS SHALL START THE PUMP AND IT SHALL RUN CONTINUOUSLY
   b. THE BAS SHALL ALTERNATE PUMP OPERATION TO EQUALIZE RUN TIME
   c. THE BAS SHALL MODULATE THE LEAD AND LAG PUMP SPEED TO MAINTAIN A WATER DIFFERENTIAL SETPOINT OF 15 PSI (ADJ.). THE ASD'S MINIMUM SPEED SHALL NOT DROP BELOW 30% (ADJ.)
   d. THE BAS SHALL STOP THE PUMP WHEN THE OUTSIDE AIR TEMPERATURE IS ABOVE 65°F (ADJ.)

U. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. DIFFERENTIAL PRESSURE: +/- 5PSI FROM SETPOINT
2. SUPPLY WATER TEMPERATURE: +/- 10°F FROM SETPOINT
3. PUMP HP-01 FAULT
4. PUMP HP-02 FAULT

1 BOILER SYSTEM CONTROLS SEQUENCE

NTS



SYSTEM SUMMARY						
	INPUT		OUTPUT			
	ANALOG	DIGITAL	ANALOG	DIGITAL	ALARM	TREND
DRY CONTACT 1		X			X	
DRY CONTACT 2		X			X	

CARBON MONOXIDE ALARM SYSTEM CONTROL SEQUENCE:

A. GENERAL: UNIT SHALL MONITORED THE HONEYWELL E3 POINT GAS DETECTION SYSTEM AND ALARM WHEN UNIT INTERNAL THRESHOLDS ARE REACHED.

B. ALARM 1: THE CONTROLLER SHALL MONITOR THE DRY CONTACT AND ALARM WHEN LEVEL IS REACHED (25 PPM CO).

C. ALARM 2: THE CONTROLLER SHALL MONITOR THE DRY CONTACT AND ONCE ALARM REACHED H&V UNIT SHALL BE SET TO FULL OA PER SEQUENCE AND ALARM (200 PPM CO).

D. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. CO LEVEL 1: IF THE UNITS DRY CONTACT 1 IS CLOSED. CO DETECTED LOW.
2. CO LEVEL 2: IF THE UNITS DRY CONTACT 2 IS CLOSED. CO DETECTED HIGH.

2 CARBON MONOXIDE ALARM CONTROL SEQUENCE

NTS

SYSTEM SUMMARY						
	INPUT		OUTPUT			
	ANALOG	DIGITAL	ANALOG	DIGITAL	ALARM	TREND
ZONE TEMPERATURE		X			X	
UNIT ENABLED/DISABLED			X			

DUCTLESS SPLIT SYSYTEM CONTROL SEQUENCE:

A. GENERAL: UNIT SHALL BE ENABLED/DISABLED AND TEMPERATURE MONITORED BY THE BUILDING MANAGEMENT CONTROL SYSTEM (BCS), AND CONTROLLED BY FACTORY PACKAGED CONTROLS TO MAINTAIN SPACE TEMPERATURE SETPOINT COOLING: 75°F (ADJ.) AND HEATING: 70°F (ADJ.)

B. ZONE TEMP: THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE

C. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN 80°F (ADJ.)
2. LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN 65°F (ADJ.)

3 DUCTLESS SPLIT SYSYTEM CONTROL SEQUENCE

NTS

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ENGINEERING

RHINEBECK ARCHITECTURE

Seal:

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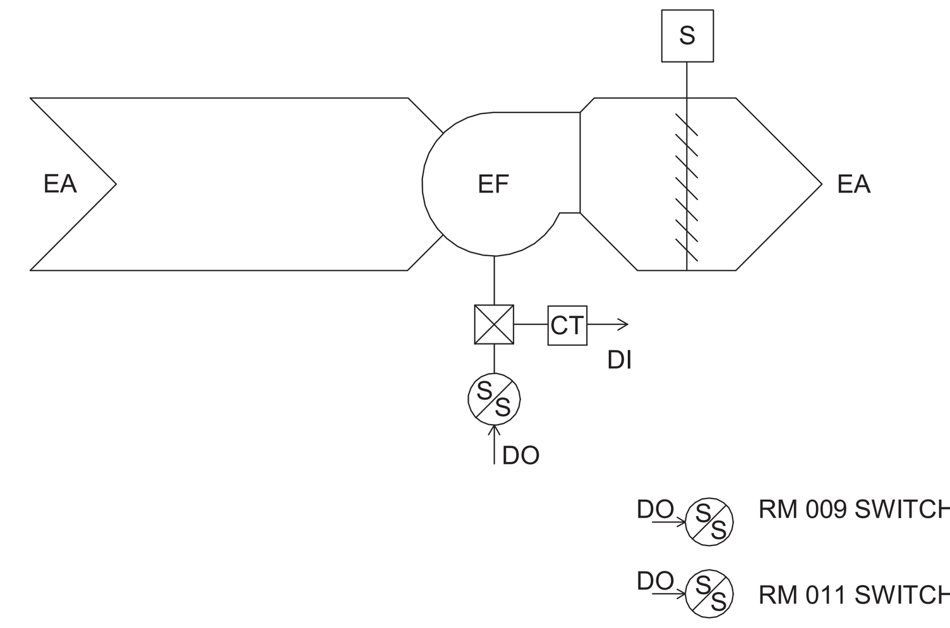


SYSTEM SUMMARY	INPUT		OUTPUT			
	ANALOG	DIGITAL	ANALOG	DIGITAL	ALARM	TREND
EXHAUST FAN STATUS		X			X	
EXHAUST FAN START/STOP				X	X	
EXHAUST DAMPER OPEN/CLOSE				X	X	
RM 009 SWITCH		X				X
RM 011 SWITCH		X				X

EXHAUST FAN MEF-1 CONTROLS SEQUENCE:

A. RUN CONDITIONS - USER ENABLED: THE FAN SHALL RUN WHENEVER EITHER SWITCH IS ENABLED.

B. EXHAUST AIR DAMPER:

1. THE DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS

2. THE DAMPER SHALL CLOSE 30 SEC. (ADJ.) AFTER THE FAN STOPS

C. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED

2. DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN

D. FAN STATUS: THE CONTROLLER SHALL MONITOR THE FAN STATUS. CONTROLLER SHALL REPORT STATUS TO H&V UNIT CONTROL SEQUENCE FOR MODULATION OF OUTDOOR AIR DAMPER.

1. IN ROOM 009 SWITCH IS PRESSED DDC SHALL ALTER HV-2 SEQUENCE.

2. IN ROOM 011 SWITCH IS PRESSED DDC SHALL ALTER HV-1 SEQUENCE.

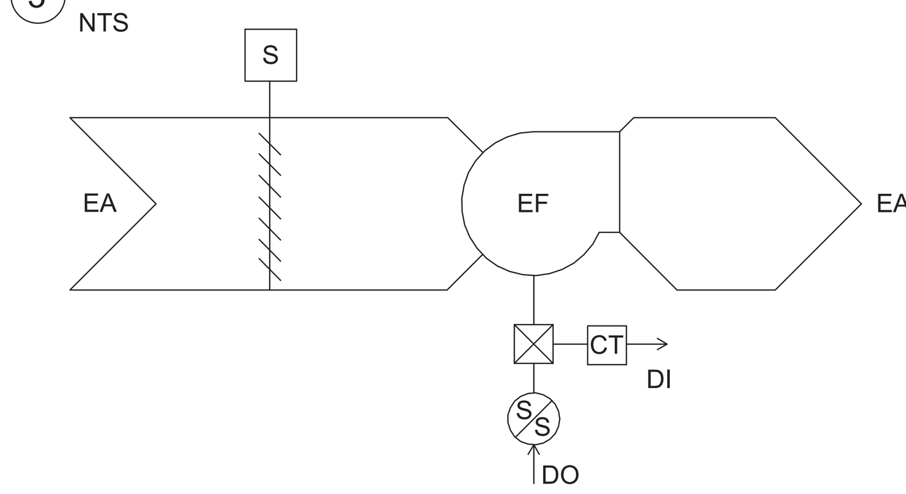
E. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF

2. FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON

3 EXHAUST FAN EF-116 & EF-117 CONTROLS SEQUENCE

NTS



SYSTEM SUMMARY	INPUT		OUTPUT			
	ANALOG	DIGITAL	ANALOG	DIGITAL	ALARM	TREND
FAN STATUS		X			X	
FAN START/STOP				X	X	

EXHAUST FAN CONTROLS SEQUENCE:

A. RUN CONDITIONS - CONTINUOUS: THE FAN SHALL RUN CONTINUOUSLY

B. FAN: THE FAN SHALL HAVE A USER DEFINABLE MINIMUM RUNTIME (ADJ.)

C. EXHAUST AIR DAMPER:

1. THE DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS

2. THE DAMPER SHALL CLOSE 30 SEC. (ADJ.) AFTER THE FAN STOPS

D. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED

2. DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN

E. FAN STATUS: THE CONTROLLER SHALL MONITOR THE FAN STATUS

F. ALARMS SHALL BE PROVIDED AS FOLLOWS:

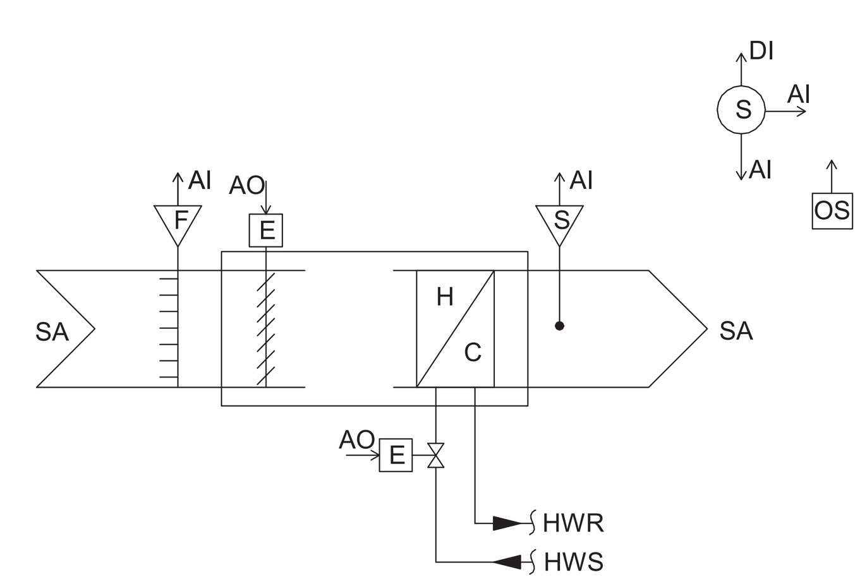
1. FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF

2. FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON

3. FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.)

2 EXHAUST FAN CONTROLS SEQUENCE

NTS



SYSTEM SUMMARY	INPUT		OUTPUT			
	ANALOG	DIGITAL	ANALOG	DIGITAL	ALARM	TREND
AIRFLOW	X				X	
SPACE TEMPERATURE	X				X	
DISCHARGE AIR TEMPERATURE	X				X	
ZONE SETPOINT ADJUST	X					
ZONE UNOCCUPIED OVERRIDE		X				
REHEAT VALVE			X			
ZONE DAMPER			X			

CONTROL SEQUENCE FOR VAV TERMINAL UNIT:

A. RUN CONDITIONS:

1. OCCUPIED MODE: THE UNIT SHALL MAINTAIN A 74°F (ADJ.) COOLING SETPOINT AND A 70°F (ADJ.) HEATING SETPOINT

2. UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN AN 85°F (ADJ.) COOLING SETPOINT AND A 55°F (ADJ.) HEATING SETPOINT

B. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.)

2. LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.)

C. ZONE SETPOINT ADJUST: THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR

D. ZONE UNOCCUPIED OVERRIDE: THE SPACE SENSOR SHALL BE FURNISHED WITH AN OCCUPIED/UNOCCUPIED OVERRIDE FEATURE. IF THE OVERRIDE IS ACTIVATED THE AIR HANDLING SYSTEM SHALL BE PLACED INTO OCCUPIED MODE FOR SPECIFIED TIME DURATION OF FOUR (4) HOURS (ADJ.)

E. REVERSING VARIABLE VOLUME TERMINAL UNIT - FLOW CONTROL:

1. OCCUPIED:

a. WHEN ZONE TEMPERATURE IS GREATER THAN ITS COOLING SETPOINT, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM OCCUPIED AIRFLOW (ADJ.) AND THE MAXIMUM COOLING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED

b. WHEN THE ZONE TEMPERATURE IS BETWEEN THE COOLING SETPOINT AND THE HEATING SETPOINT, THE ZONE DAMPER SHALL MAINTAIN THE MINIMUM REQUIRED ZONE VENTILATION (ADJ.)

c. WHEN ZONE TEMPERATURE IS LESS THAN ITS HEATING SETPOINT, THE CONTROLLER SHALL ENABLE HEATING TO MAINTAIN THE ZONE TEMPERATURE AT ITS HEATING SETPOINT. ADDITIONALLY, IF WARM AIR IS AVAILABLE FROM THE RTU, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM OCCUPIED AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED

2. UNOCCUPIED:

a. WHEN THE ZONE IS UNOCCUPIED THE ZONE DAMPER SHALL CONTROL TO ITS MINIMUM UNOCCUPIED AIRFLOW (ADJ.)

b. WHEN THE ZONE TEMPERATURE IS GREATER THAN ITS COOLING SETPOINT, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM UNOCCUPIED AIRFLOW (ADJ.) AND THE MAXIMUM COOLING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED

c. WHEN ZONE TEMPERATURE IS LESS THAN ITS UNOCCUPIED HEATING SETPOINT, THE CONTROLLER SHALL ENABLE HEATING TO MAINTAIN THE ZONE TEMPERATURE AT THE SETPOINT. ADDITIONALLY, IF WARM AIR IS AVAILABLE FROM THE RTU, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM UNOCCUPIED AIRFLOW (ADJ.) AND THE MAXIMUM HEATING AIRFLOW (ADJ.) UNTIL THE ZONE IS SATISFIED

F. REHEATING COIL VALVE: THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE REHEATING COIL VALVE OPEN ON DROPPING TEMPERATURE TO MAINTAIN ITS HEATING SETPOINT

G. DISCHARGE AIR TEMPERATURE: THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE

H. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. HIGH DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.)

2. LOW DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 40°F (ADJ.)

1 VAV CONTROL SEQUENCE

NTS

Project:

VILLAGE OF ARDSLEY, NY

VILLAGE OF ARDSLEY NEW YORK 1896

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CONTROLS

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M801

AIR HANDLING UNIT CONTROLS SEQUENCE:

A. RUN CONDITIONS - CONTINUOUS: THE UNIT SHALL RUN CONTINUOUSLY

B. RETURN AIR SMOKE DETECTION: THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A RETURN AIR SMOKE DETECTOR STATUS

C. FREEZE PROTECTION: THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A FREEZESTAT STATUS

D. AHU OPTIMAL START: THE UNIT SHALL START PRIOR TO SCHEDULED OCCUPANCY BASED ON THE TIME NECESSARY FOR THE ZONES TO REACH THEIR OCCUPIED SETPOINTS. THE START TIME SHALL AUTOMATICALLY ADJUST BASED ON CHANGES IN OUTSIDE AIR TEMPERATURE AND ZONE TEMPERATURES

E. SUPPLY FAN: THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUT DOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME

F. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF
2. SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON
3. SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.)

G. SUPPLY AIR AIRFLOW CONTROL: THE CONTROLLER SHALL MEASURE SUPPLY AIRFLOW AND SHALL MODULATE THE SUPPLY FAN VFD SPEED TO MAINTAIN THE SCHEDULED SUPPLY AIRFLOW (ADJ.) THE SUPPLY FAN VFD SPEED SHALL NOT DROP BELOW 30% (ADJ.)

H. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. HIGH SUPPLY AIRFLOW: IF THE SUPPLY AIRFLOW IS 25% (ADJ.) GREATER THAN SETPOINT
2. LOW SUPPLY AIRFLOW: IF THE SUPPLY AIRFLOW IS 25% (ADJ.) LESS THAN SETPOINT
3. SUPPLY FAN VFD FAULT

I. EXHAUST FAN: THE EXHAUST FAN SHAL RUN WHENEVER THE SUPPLY FAN RUNS

J. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. EXHAUST FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF
2. EXHAUST FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON
3. EXHAUST FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.)
4. EXHAUST FAN VFD FAULT

K. EXHAUST AIRFLOW: THE EXHAUST FAN VFD SHALL MODULATE TO MAINTAIN EXHAUST AIRFLOW SETPOINT. EXHAUST AIRFLOW SETPOINT SHALL BE 100% (ADJ.) OF THE OUTDOOR AIRFLOW MINUS AREA GENERAL EXHAUST (ADJ.). THE EXHAUST FAN VFD SPEED SHALL NOT DROP BELOW 12% (ADJ.)

L. ALARMS SHALL BE PROVIDED AS FOLLOWS:

1. HIGH EXHAUST AIRFLOW: IF THE EXHAUST AIRFLOW IS AN ADJUSTABLE PERCENTAGE GREATER THAN SETPOINT
2. LOW EXHAUST AIRFLOW: IF THE EXHAUST AIRFLOW IS AN ADJUSTABLE PERCENTAGE LESS THAN SETPOINT

M. SUPPLY AIR TEMPERATURE SETPOINT - OPTIMIZED: THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND SHALL MAINTAIN A SUPPLY AIR TEMPERATURE SETPOINT RESET BASED ON ZONE COOLING AND HEATING REQUIREMENTS

1. THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET FOR COOLING BASED ON ZONE COOLING REQUIREMENTS AS FOLLWS:
   a. THE INITIAL SUPPLY AIR TEMPERATURE SETPOINT SHALL BE 50°F (ADJ.)
   b. AS COOLING DEMAND INCREASES, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A MINIMUM OF 48°F (ADJ.)
   c. AS COOLING DEMAND DECREASES, THE SETPOINT SHALL INCREMENTALLY RESET UP TO A MAXIMUM OF 55°F (ADJ.)
2. IF MORE ZONES NEED HEATING THAN COOLING, THEN THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET FOR HEATING AS FOLLOWS:
   a. THE INITIAL SUPPLY AIR TEMPERATURE SETPOINT SHALL BE 72°F (ADJ.)
   b. AS HEATING DEMAND INCREASES, THE SETPOINT SHALL INCREMENTALY RESET UP TO A MAXIMUM OF 82°F (ADJ.)
   c. AS HEATING DEMAND DECREASES, THE SETPOINT SHALL INCREMENTALLY RESET DOWN TO A MINIMUM OF 62°F (ADJ.)

N. COOLING STAGES: THE CONTROLLER SHALL MODULATE THE DIGITAL STROLL COMPRESSOR TO MEET DISCHARGE AIR TEMPERATURE SETPOINT. THE COOLING SHALL BE ENABLED WHENEVER:

1. OUTSIDE AIR TEMPERATURE IS GREATER THAN 50°F (ADJ.)
2. THE ECONOMIZER IS DISABLED OR FULLY OPEN
3. THE SUPPLY FAN STATUS IS ON
4. THE HEATING IS NOT ACTIVE

O. ALARMS HSALL BE PROVIDEDC AS FOLLOWS:

1. HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5°F (ADJ.) GREATER THAN SETPOINT

P. HEATING STAGES: THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND STAGE THE HEATING TO MAINTAIN ITS HEATING SETPOINT. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER DEFINABLE (ADJ.) DELAY BETWEEN STAGES, AND EACH STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME. THE HEATING SHALL BE ENABLED WHENEVER:

1. OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.)
2. THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT
3. THE SUPPLY FAN STATUS IS ON
4. THE COOLING IS NOT ACTIVE

Q. ECONOMIZER: THE CONTROLLER SHALL MEASURE THE MIXED AIR TEMPERATURE AND MODULATE THE ECONOMIZER DAMPERS IN SEQUENCE TO MAINTAIN A SETPOINT 2°F (ADJ.) LESS THAN THE SUPPLY AIR TMEPERATRURE SETPOINT. THE OUTSIDE AIR DAMPERS SHALL MAINTAIN A MINIMUM ADJUSTABLE POSITION OF 30% (ADJ.) OPEN WHENEVER OCCUPIED. VERIFY VIA BALANCER THAT OPENING PERCENT PROVIDES SCHEDULED OUTDOOR AIR. ADJUST AS REQUIRED.

1. THE ECONOMIZER SHALL BE ENABLED WHENEVER:
   a. OUTSIDE AIR TEMPERATUER IS LESS THAN 65°F (ADJ.)
   b. THE OUTSIDE AIR ENTHALPY IS LESS THAN 22 BTU/LB (ADJ.)
   c. THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE RETURN AIR TEMPERATURE
   d. THE OUTSIDE AIR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY
   e. THE SUPPLY FAN STATUS IS ON
2. THE ECONOMIZER SHALL CLOSE WHENEVER:
   a. MIXED AIR TEMPERATUER DROPS FROM 40°F (ADJ.) TO 35°F (ADJ.)
   b. OR THE FREEZESTAT (IF PRESENT) IS ON\
   c. OR ON LOSS OF SUPPLY FAN STATUS
3. THE OUTSIDE AND EXHAUST AIR DAMPERS SHALL CLOSE AND THE RETURN AIR DAMPER SHAL OPEN WHEN THE UNIT IS OFF. IF OPTIMAL START-UP IS AVAILABLE THE MIXED AIR DAMPER SHALL OPERATE AS DESCRIBED IN THE OCCUPIED MODE EXCEPT THAT THE OUTSIDE AIR DAMPER SHALL MODULATE TO FULLY CLOSED

R. OUTSIDE AIR VENTILATION - FIXED PERCENTAGE: THE OUTSIDE AIR DAMPERS SHALL MAINTAIN A MINIMUM ADJUSTABLE POSITION DURING BUILDING OCCUPIED HOURS AND BE CLOSED DURING UNOCCUPIED HOURS

1. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. HIGH SUPPLY AIR HUMIDITY: IF THE AIR HUMIDITY IS GREATER THAN 90% RH (ADJ.)
   b. LOW SUPPLY AIR HUMIDITY: IF THE SUPPLY AIR HUMIDITY IS LESS THAN 30% RH (ADJ.)

S. PREFILTER DIFFERNTIAL PRESSURE MONITOR: THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE PREFILTER

1. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. PREFILTER CHANGE REQUIRED: PREFILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.)

T. FINAL FILTER DIFFERENTIAL PRESSURE MONITOR: THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FINAL FILTER

1. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. FINAL FILTER CHANGE REQUIRED: FINAL FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.)

U. MIXED AIR TEMEPERATURE: THE CONTROLLER SHALL MONITOR THE MIXED AIR TEMERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT) OR PREHEATING CONTROL (IF PRESENT)

1. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. HIGH MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS GREATER THAN 90°F (ADJ.)
   b. LOW MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS LESS THAN 45°F (ADJ.)

V. RETURN AIR HUMIDITY: THE CONTROLLER SHALL MONITOR THE RETURN AIR HUMIDITY AND USE A REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT) OR HUMIDITY CONTROL (IF PRESENT)

1. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. HIGH RETURN AIR HUMIDITY: IF THE RETURN AIR HUMIDITY IS GREATER THAN 70% (ADJ.)
   b. LOW RETURN AIR HUMIDITY: IF THE RETURN AIR HUMIDITY IS LESS THAN 35% (ADJ.)

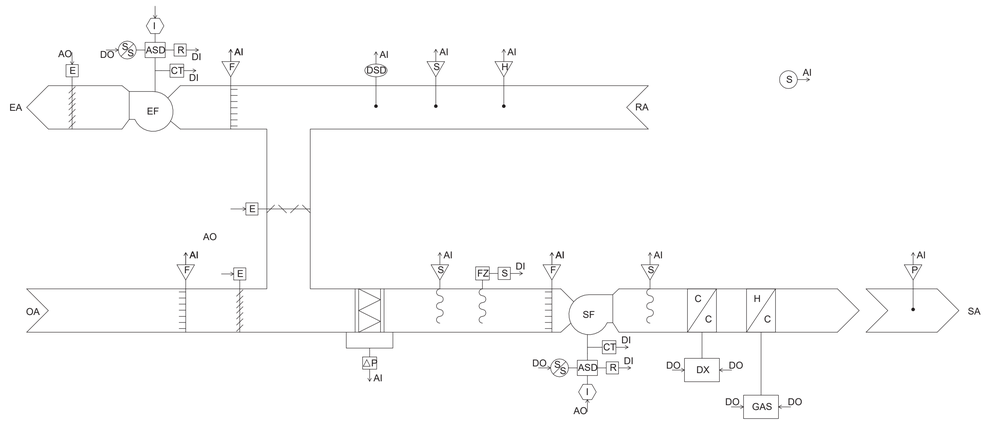
W. RETURN AIR TEMPERATURE: THE CONTROLLER SHALL MONITOR THE RETURN AIR TEMPERATURE AND USE AS REQUIRED FOR SETPOINT CONTROL OR ECONOMIZER CONTRL (IF PRESENT)

1. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. HIGH RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS GREATER THAN 90°F (ADJ.)
   b. LOW RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS LESS THAN 45°F (ADJ.)

X. SUPPLY AIR TEMPERATURE: THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE

1. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERTURE IS GREATER THAN 120°F (ADJ.)
   b. LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS LESS THAN 45°F (ADJ.)

SYSTEM SUMMARY	INPUT		OUTPUT			
	ANALOG	DIGITAL	ANALOG	DIGITAL	ALARM	TREND
OUTDOOR AIRFLOW	X					
SUPPLY AIRFLOW	X				X	
EXHAUST AIRFLOW	X				X	
PREFILTER DIFFERENTIALPRESSURE	X					
FINAL FILTER DIFFERENTIAL PRESSURE	X					
MIXED AIR TEMPERATURE	X				X	
RETURN AIR TEMPERATURE	X				X	
RETURN AIR HUMIDITY	X					
SUPPLY AIR TEMPERATURE	X					
SPACE TEMPERATURE	X					
SUPPLY FAN STATUS		X			X	
SUPPLY FAN VFD FAULT		X			X	
EXHAUST FAN STATUS		X			X	
EXHAUST FAN VFD FAULT		X			X	
CONDENSING UNIT ALARM		X			X	
RETURN AIR SMOKE DETECTOR		X				
SUPPLY FAN ASD SPEED			X			
EXHAUST FAN ASD SPEED			X			
MIXED AIR DAMPERS			X			
CONDENSING UNIT MODULATION			X			
CONDENSING UNIT ENABLE/DISABLE				X		
COOLING STAGE 1				X		
COOLING STAGE 2				X		
HEATING STAGE 1				X		
HEATING STAGE 2				X		
SUPPLY FAN START/STOP				X		
EXHAUST FAN START/STOP				X		



1 AIR HANDLING UNIT CONTROLS SEQUENCE
NTS

Project:

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Revisions:

Rev	Date	Description

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PROJECT TRUE

SCALE: AS NOTED

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CONTROLS

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