

BUILDING AUTOMATION SYSTEMS

Tips for Maintaining,
Troubleshooting,
and
Knowing When to Call for Outside Help



O'CONNOR
GROUP



*“Creating
Customers
For Life”*

**PROVING INTEGRATED HEATING, VENTILATING
and AIR CONDITIONING SYSTEMS since 1970**



Three Companies, Many Specialties...

Indoor comfort is a complex process, yet it can all boil down to one simple solution – The O’Connor Group.

Whether working with contractors, testing and balancing your system, or

providing top-quality equipment – we’re committed to *Creating Customers For Life* by providing quality solutions for all of your heating, ventilation and air conditioning needs.



O’CONNOR
COMPANY

HVAC Equipment Solutions for Commercial & Institutional Markets



G & R
CONTROLS

Automatic Temperature Controls • Security Systems • Hydronic Heating & Cooling Equipment • Energy Management Services



BALANCING
PROFESSIONALS,
INC.

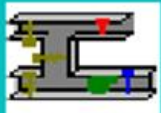
NEBB-Certified Testing & Balancing • Independently Owned & Operated



O’Connor Group
Ownership Team

*“There is no strength without unity.”
– Old Irish Proverb*

MECHANICAL REVIEW



RTU 7

DAY NGT
DAY

HEAT COOL
HEAT

HTG LOOPOUT
100.00 PCT

CLG LOOPOUT
0.00 PCT

HTG FLOW MAX
312.00 CFM

CLG FLOW MAX
600.00 CFM

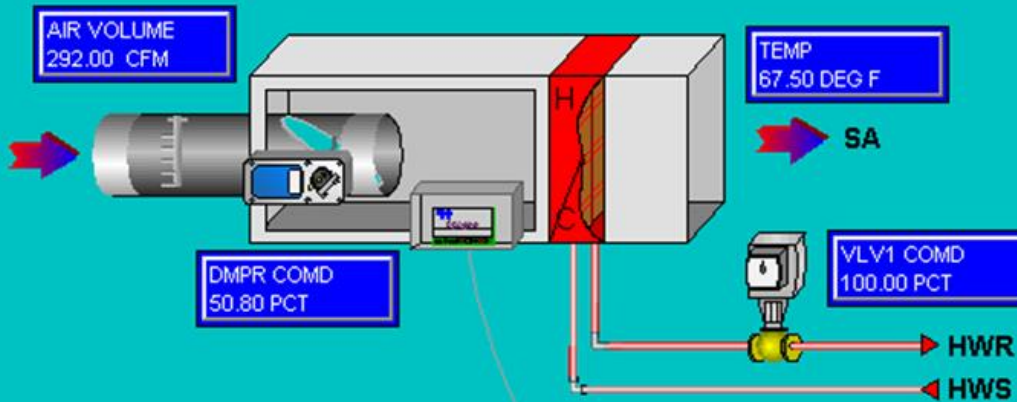
HTG FLOW MIN
300.00 CFM

CLG FLOW MIN
300.00 CFM

AIR VOLUME
292.00 CFM

TEMP
67.50 DEG F

SUPPLY FAN ON	DISCHARGE TEMP 59.58 F
SF SPEED 77.93 %	DUCT STATIC 0.67 " wc



DMPR COMD
50.80 PCT

VLV1 COMD
100.00 PCT

HWR

HWS

ROOM TEMP
67.25 DEG F



RM STPT DIAL
74.25 DEG F

RM STPT MAX
75.00 DEG F

RM STPT MIN
65.00 DEG F

NGT HTG STPT
65.00 DEG F

CTL STPT
74.25 DEG F

MECHANICAL REVIEW

UnitState Clg	AFSwWrn NORMAL
McQuayStatus Enabled	DrtyFitrWrn NORMAL
EconoStatus OffAmb	ActiveFault 0.00

Rooftop Unit #1
Location: Roof, Above Dietician 2118
Serves: First Floor

OUTDOOR TEMP
75.74 DEG F

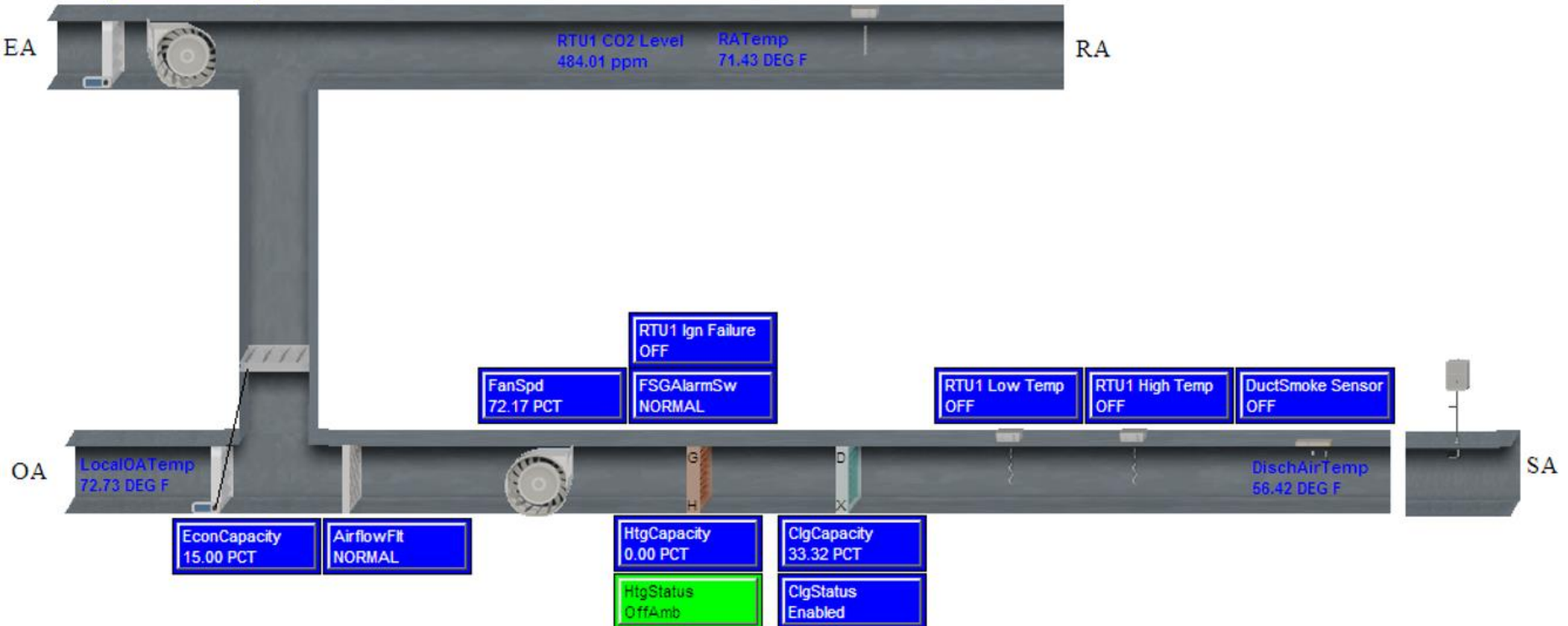
First Floor MOB

Second Floor MOB

RTU 2

PRVs 3_5

ExhFanState ON
ExhFanValue 33.00 PCT



MECHANICAL REVIEW

Chilled Water Loop

OA Temp
88.54 Deg F
OA Humidity
45.71 %RH



CHW Mode
ON
CHW Mode STPT
62.00 Deg F

Pump 1 Enable
OFF
Pump 1 Speed
0.00 Pct
VFD:FAULT ACTIVE
NO
VFD:RESET FAULT
NORMAL
VFD:RUN ENABLE
ENABLE

CHW PUMP 1
CHW Pump 1 VFD
Sub Points

CHW Pump 2 VFD
Sub Points

CHW PUMP 2

Pump 2 Enable
ON
Pump 2 Speed
100.00 Pct
VFD:FAULT ACTIVE
NO
VFD:RESET FAULT
NORMAL
VFD:RUN ENABLE
ENABLE

CHW Set Point
42.00 DEG F
Supply Temp
45.28 Deg F

CHWS

CHW DP Loop
100.00 Pct
CHW Diff Press
12.84 psi
CHW DP Set Point
15.00 psi

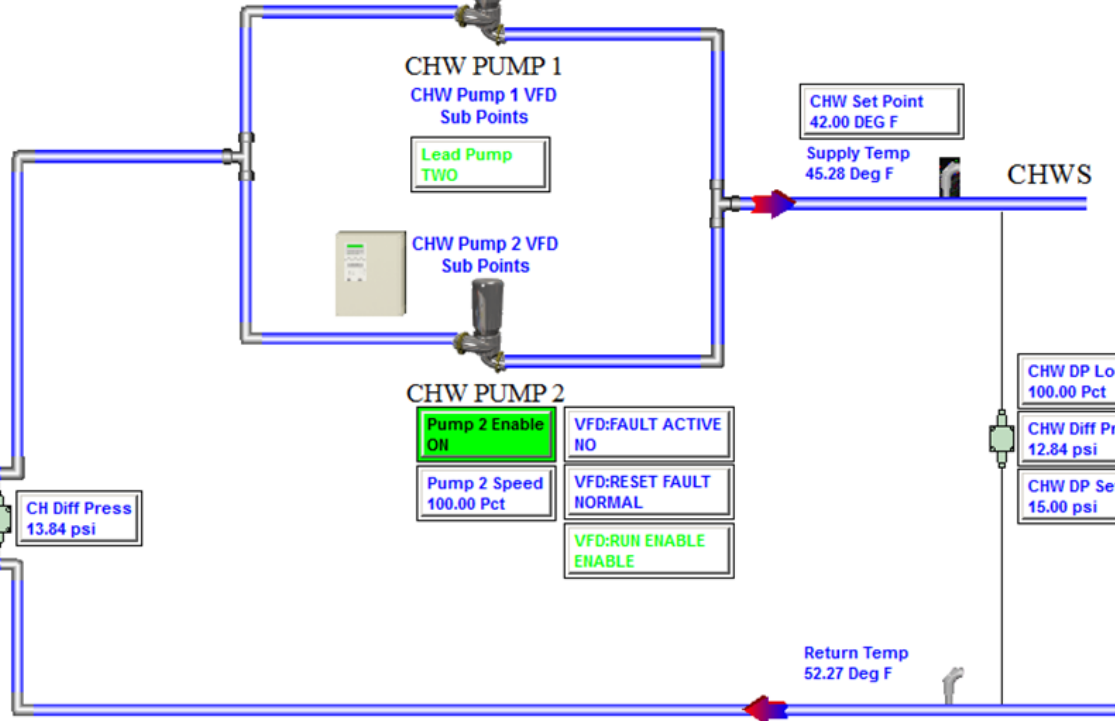
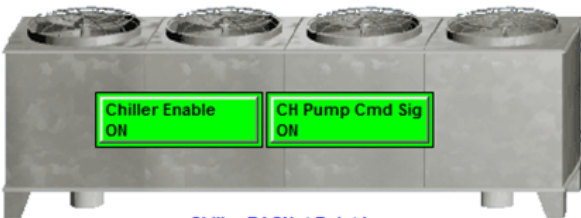
CH Diff Press
13.84 psi

Return Temp
52.27 Deg F

CHWR

Chiller Enable
ON
CH Pump Cmd Sig
ON

Chiller BACNet Point Log



MECHANICAL REVIEW

Hot Water Loop

OA Temp
88.54 Deg F

OA Humidity
45.17 %RH

HW Mode ON

HW Mode STPT
90.00 Deg F

HW Mode Deadband
10.00 Deg F

Emer Stop Button OFF

Summer HW Mode ON

Max Summer Mod
50 Pct

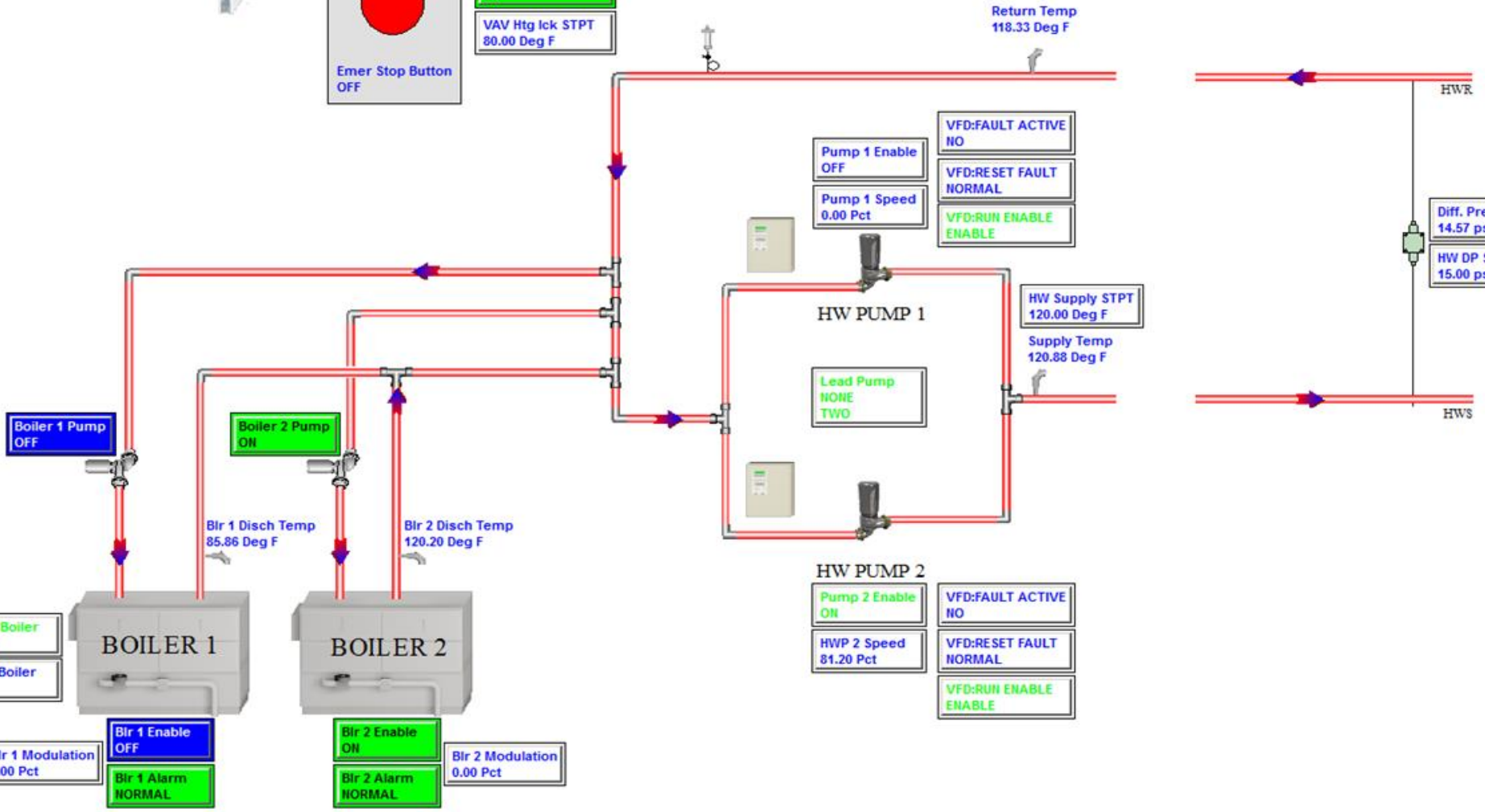
VAV htg lck Mode ON

VAV Htg lck STPT
80.00 Deg F

HW High OA STPT
75.00 Deg F

HW Low OA STPT
0.00 Deg F

Return Temp
118.33 Deg F



TIPS FOR MAINTAINING

Hot Water Loop

OA Temp
88.54 Deg F

OA Humidity
45.17 %RH

HW Mode ON

HW Mode STPT
90.00 Deg F

HW Mode Deadband
10.00 Deg F

Summer HW Mode ON

Max Summer Mod
50 Pct

VAV htg lck Mode ON

VAV Htg lck STPT
80.00 Deg F

Emer Stop Button OFF

HW High OA STPT
75.00 Deg F

HW Low OA STPT
0.00 Deg F

Return Temp
118.33 Deg F

Boiler 1 Pump
OFF

Boiler 2 Pump
ON

Bir 1 Disch Temp
85.86 Deg F

Bir 2 Disch Temp
120.20 Deg F

Lead Boiler
TWO

B-up Boiler
NO

Bir 1 Modulation
0.00 Pct

Bir 1 Enable
OFF

Bir 1 Alarm
NORMAL

Bir 2 Enable
ON

Bir 2 Alarm
NORMAL

Bir 2 Modulation
0.00 Pct

Pump 1 Enable
OFF

Pump 1 Speed
0.00 Pct

VFD:FAULT ACTIVE
NO

VFD:RESET FAULT
NORMAL

VFD:RUN ENABLE
ENABLE

HW Supply STPT
120.00 Deg F

Supply Temp
120.88 Deg F

Lead Pump
NONE

TWO

Pump 2 Enable
ON

HWP 2 Speed
81.20 Pct

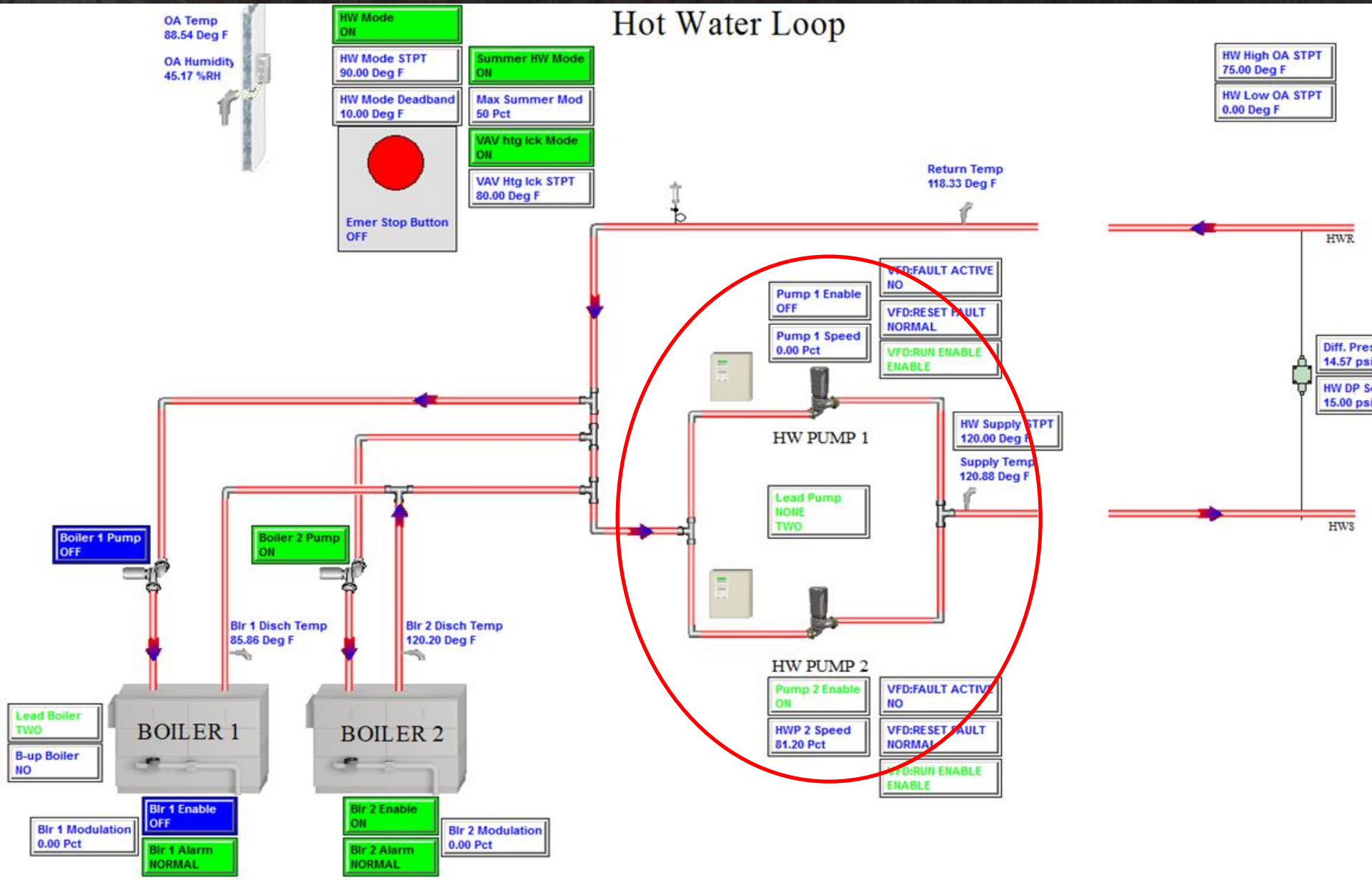
VFD:FAULT ACTIVE
NO

VFD:RESET FAULT
NORMAL

VFD:RUN ENABLE
ENABLE

Diff. Pres
14.57 psi

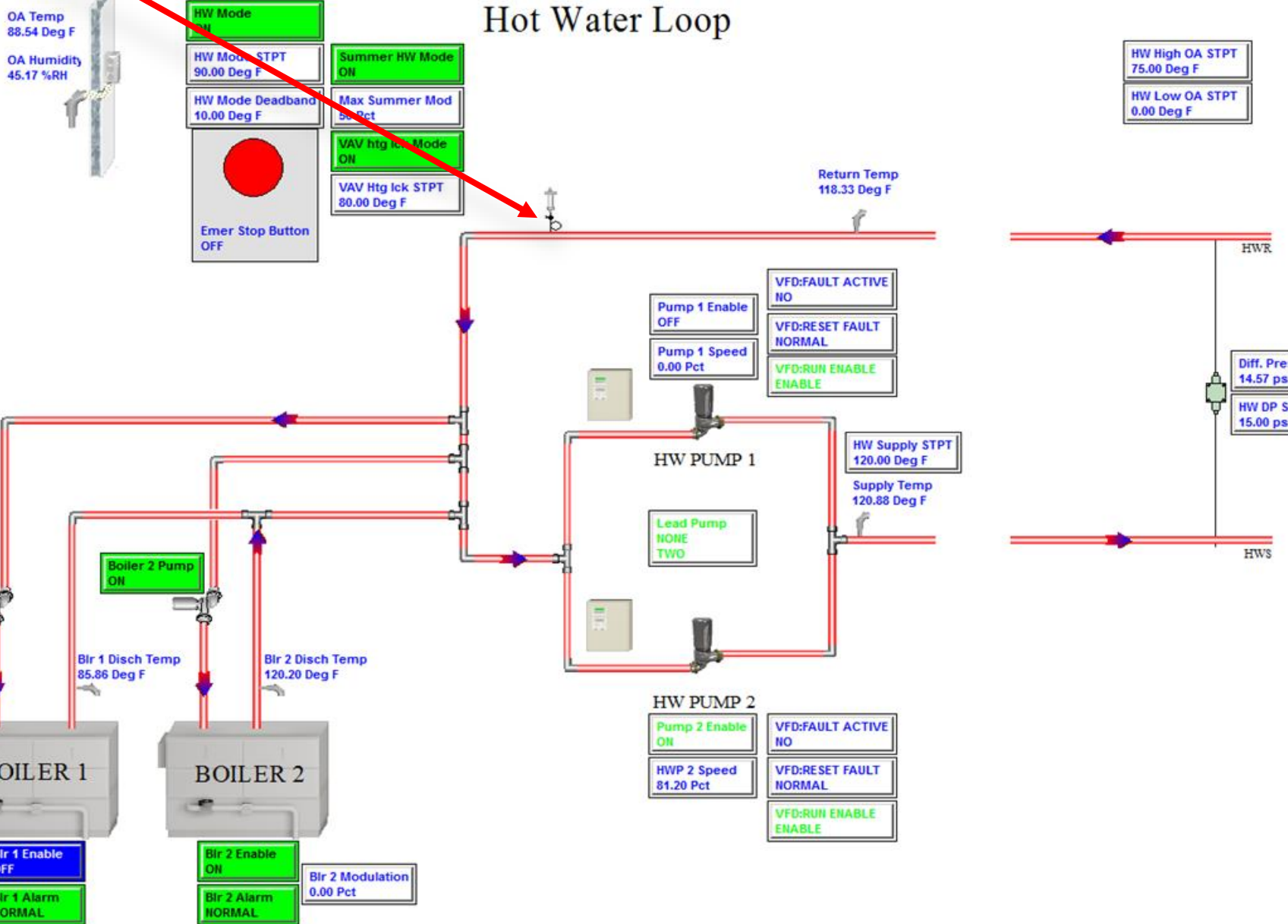
HW DP S
15.00 psi





TIPS FOR MAINTAINING

Hot Water Loop

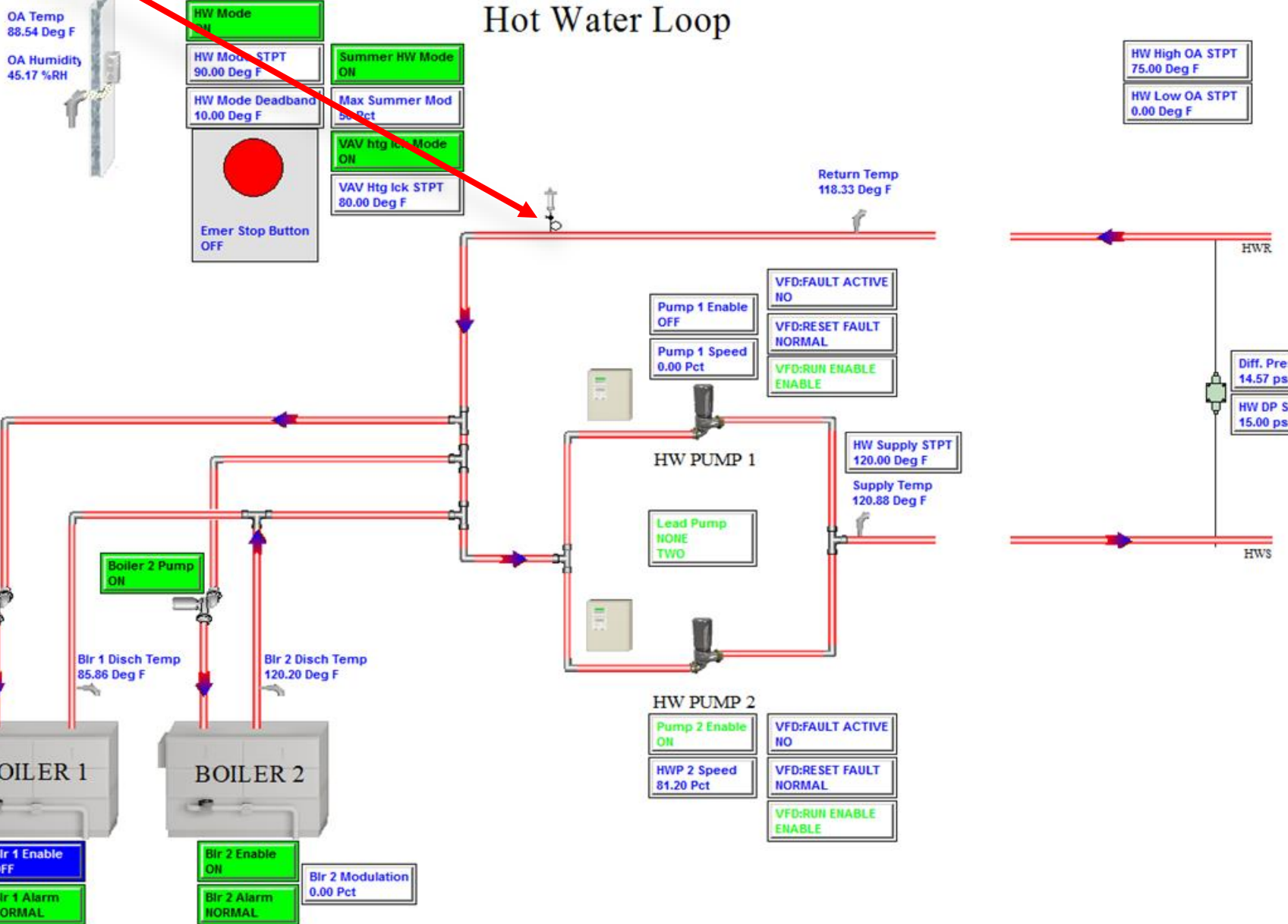


CAUSE?



TIPS FOR MAINTAINING

Hot Water Loop



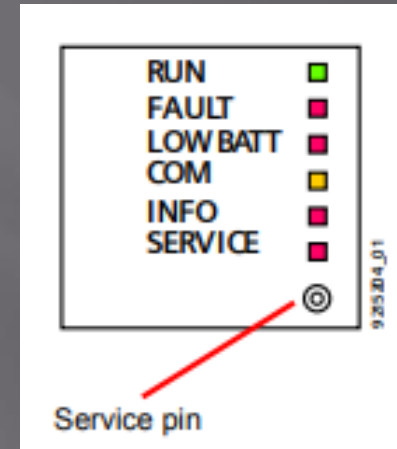
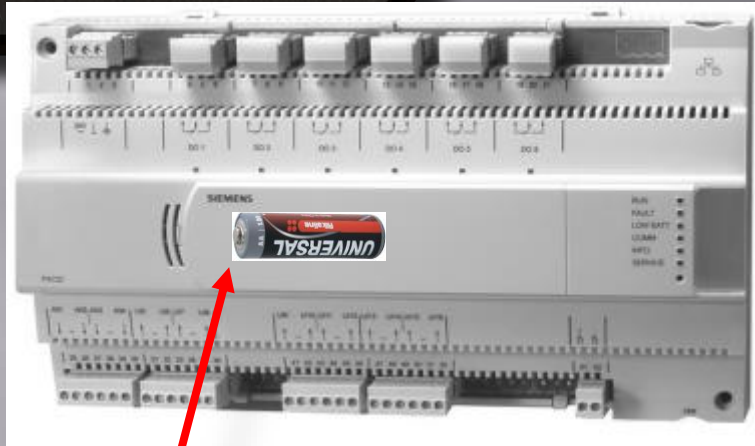
TIPS FOR MAINTAINING



$$\begin{array}{l} 30 \text{ ft head} \\ \times .433 \text{ psi/ft} \\ \sim 13 \text{ psi fill (min)} \end{array}$$



TIPS FOR MAINTAINING



LED	Color	Activity	Function
RUN	Green	Continuously off Continuously on	No supply Supply OK
FAULT	Red	Continuously off Continuously on Quick flashes	OK Fault Missing / Corrupt Firmware
LOW BATT	Red	Continuously off Continuously on	Battery ok Battery low - replace ¹⁾
COMM	Yellow	Continuously off Continuously on Flashing	No Link to switch Link to switch Communication
INFO	Red		Freely programmable
SERVICE (Ethernet)	Red	Continuously off Continuously on Flashing Flashing acc. to wink command pattern ²⁾	OK No Link to switch or DHCP server No IP Address configured Physical identification of automation station after receiving wink command

TIPS FOR MAINTAINING

IPv4 address in dotted-decimal notation

172 . 16 . 254 . 1



10101100 . 00010000 . 11111110 . 00000001



8 bits



32 bits (4 bytes)



TIPS FOR MAINTAINING

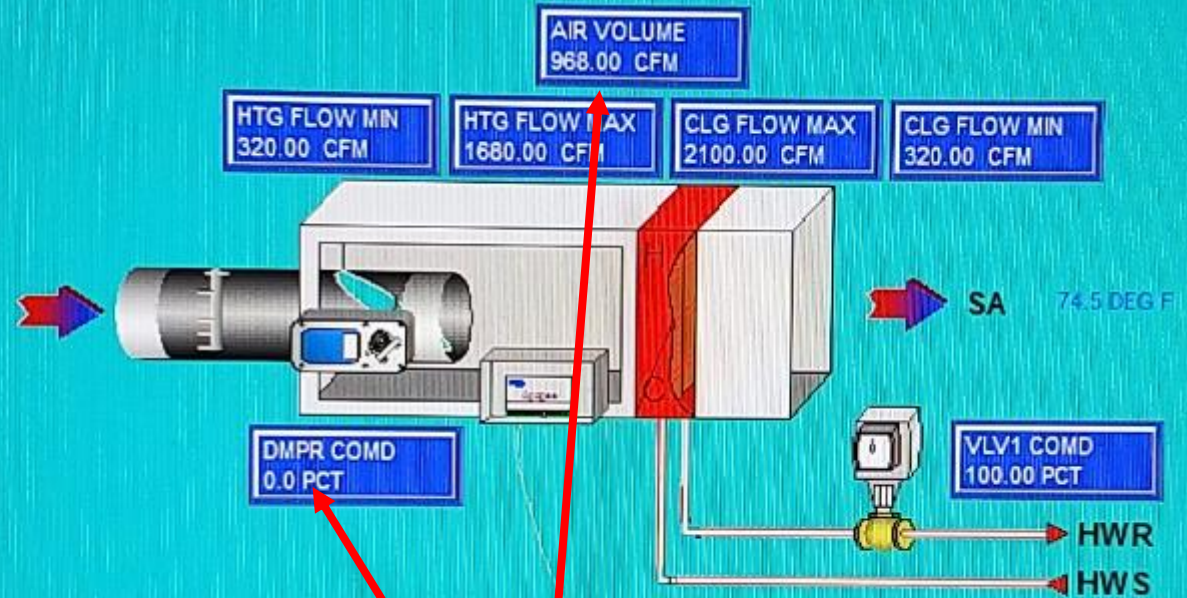
AH1 SUP FAN
ON

AH1 DISCH TEMP
64.56 DEG F

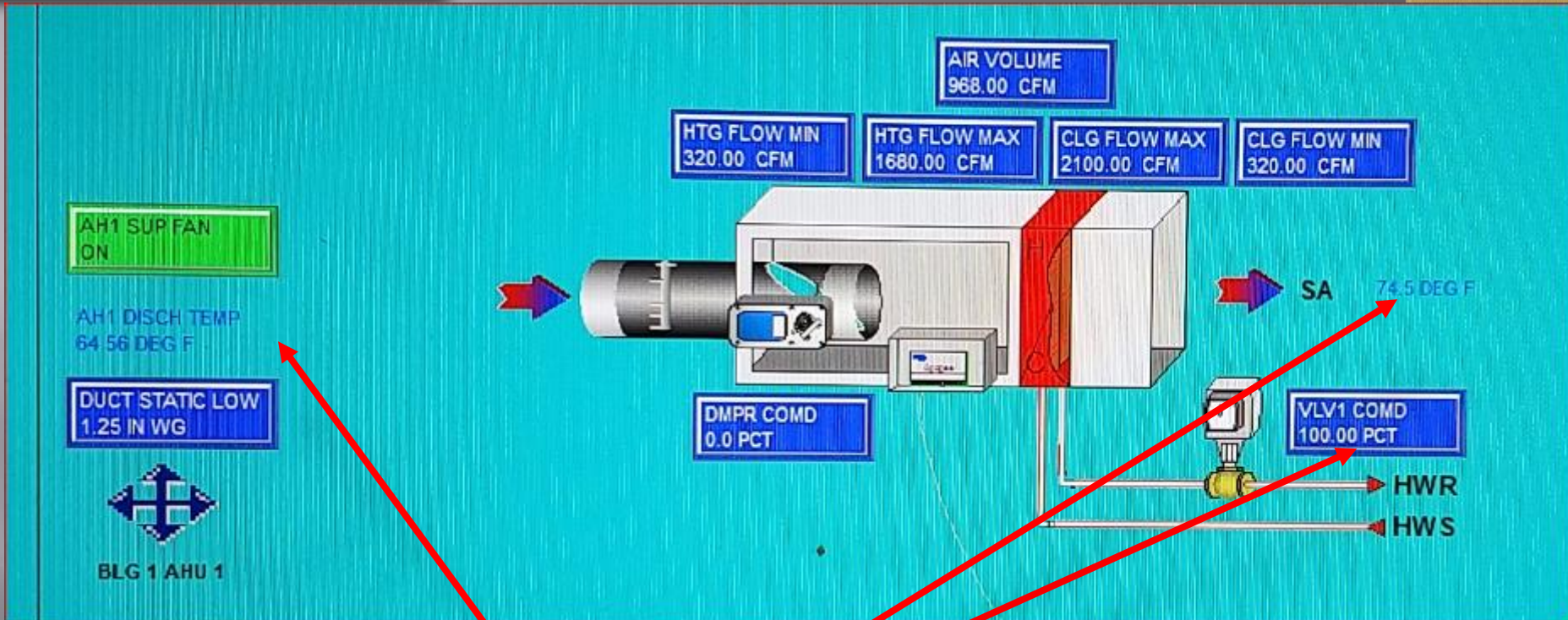
DUCT STATIC LOW
1.25 IN WG



BLG 1 AHU 1



TIPS FOR MAINTAINING



TROUBLESHOOTING

Things to look for when surveying your BAS:

- Failed Points
- Actual Condition vs. Setpoint
- Commanded Points
- Points in Alarm

SYSTEM SURVEY

Alarm View Help



Active **0008**

Disabled **0000**

I	A	R	M	Point Name	Value	Initial	Current	Ack	Status	Priority	Ack By	Count
				BLG01.HWB1P	OFF	8:07:19 AM	3:00:30 PM		-N-	OPER		10
				BLG01.HWP1	ON	11:04:09 PM	8:09:18 AM		-N-	NONE		8
				RC01.EF1	ON		12:00:14 AM	12:00:14 AM	*A1*	BN16	SYS	
				BLG01.HWP2	ON	11:03:39 PM	7:45:47 AM		-N-	NONE		4
				RC01.EF2	ON		12:00:15 AM	12:00:15 AM	*A1*	BN16	SYS	
				BLG01.LTEPLSS	OFF	2:29:49 PM	2:45:47 PM		-N-	NONE		2
				BLG01.LTEWPSS	OFF	2:29:49 PM	2:45:46 PM		-N-	NONE		2
				BLG01.AH1EF	OFF	8:59:16 AM	9:00:07 AM		-N-	NONE		2
				BLG01.AH1FZ	NORMAL	8:59:16 AM	9:00:01 AM		-N-	NONE		2
				BLG01.AH1HMS	ON	6:45:07 PM	10:29:55 PM	10:29:55 PM	*A3*	NONE	CC	
				BLG01.AH1EFOLD	ON	11:28:11 AM	10:28:15 PM	10:28:15 PM	*A1F*	NONE	CC	
				BLG01.AH1HMF	FAULT	6:45:07 PM	10:28:04 PM	10:28:04 PM	*A1*	NONE	CC	
				RC01.FRONTLTPRF	ON		5:49:48 PM	5:49:48 PM	*A1*	NONE	SYS	
				RC01.HPON	ON		11:37:44 AM	11:37:44 AM	*A1*	BN16	SYS	

SYSTEM SURVEY

Selected Points: * CTL t*

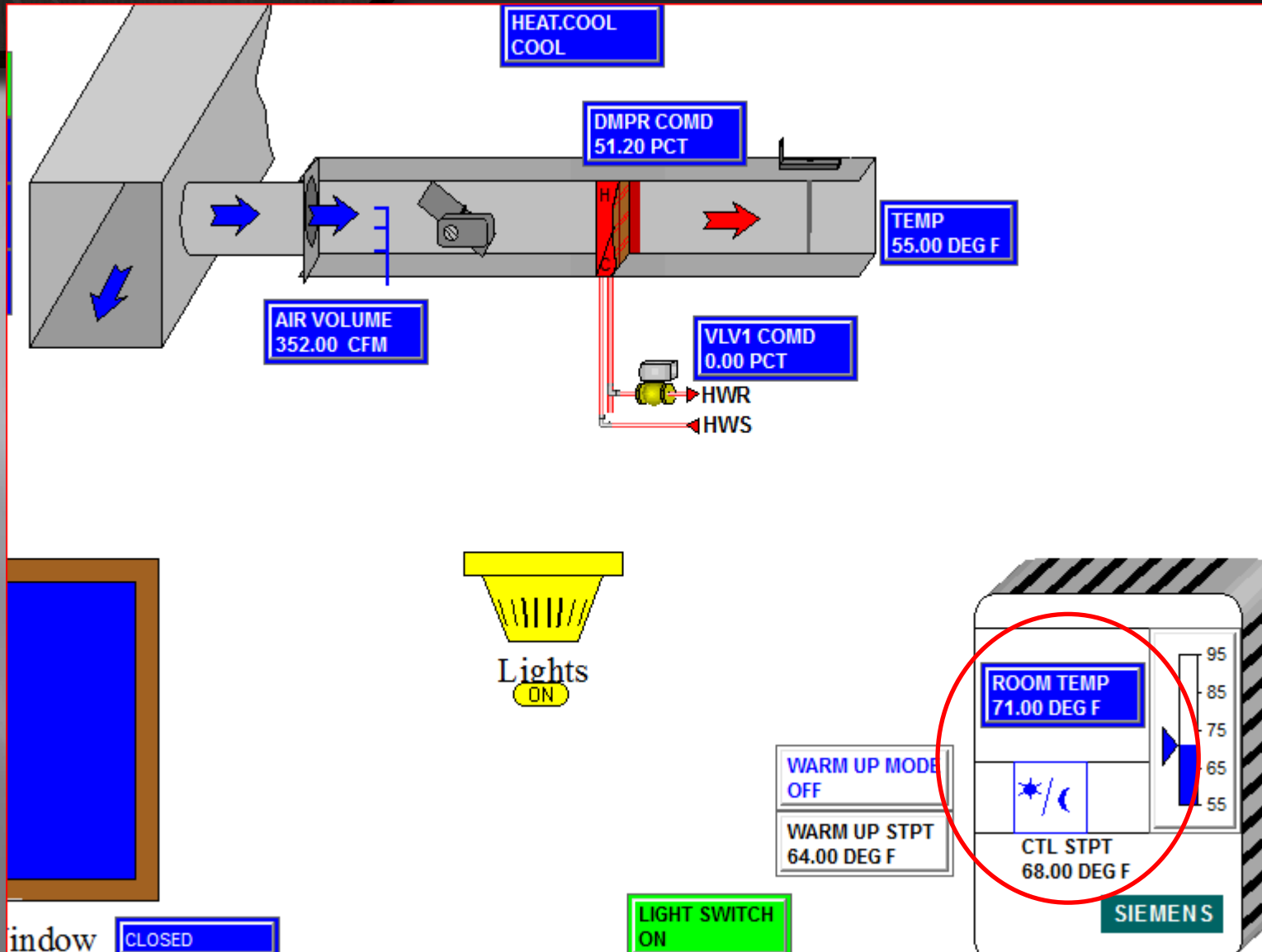
Selected Panels: *

Filter: All Points

Name: Suffix	Address	Description	Value/State	Status	Priority
BLG01.T135:CTL TEMP	001 2 07 78	()	70.25	DEG F -N-	NONE
BLG01.T137:CTL STPT	001 2 05 92	()	70.00	DEG F -N-	NONE
BLG01.T137:CTL TEMP	001 2 05 78	()	69.50	DEG F -N-	NONE
BLG01.T141:CTL STPT	001 2 02 92	()	74.00	DEG F -N-	NONE
BLG01.T141:CTL TEMP	001 2 02 78	()	73.75	DEG F -N-	NONE
BLG01.T143:CTL STPT	001 1 03 92	()	72.00	DEG F -N-	NONE
BLG01.T143:CTL TEMP	001 1 03 78	()	71.25	DEG F -N-	NONE
BLG01.T144:CTL STPT	001 2 01 92	()	73.00	DEG F -N-	NONE
BLG01.T144:CTL TEMP	001 2 01 78	()	71.25	DEG F -N-	NONE
BLG01.T146:CTL STPT	001 1 02 92	()	70.00	DEG F -N-	NONE
BLG01.T146:CTL TEMP	001 1 02 78	()	71.75	DEG F -N-	NONE
BLG01.T148:CTL STPT	001 1 01 92	()	72.00	DEG F -N-	NONE
BLG01.T148:CTL TEMP	001 1 01 78	()	71.00	DEG F -N-	NONE
BLG01.T148:CTL STPT	001 2 17 92	()	71.00	DEG F -N-	NONE



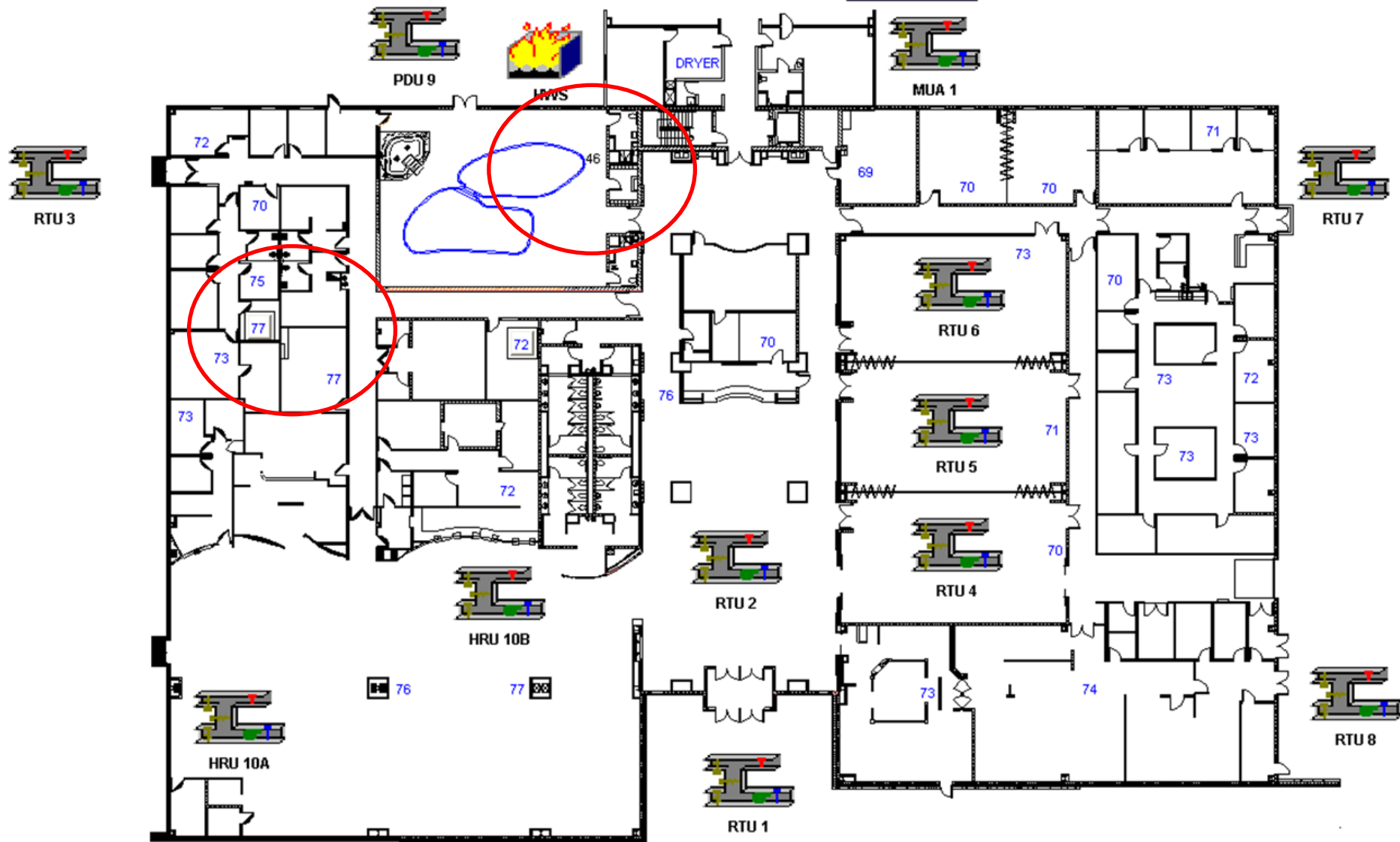
TROUBLESHOOTING



SYSTEM SURVEY

Main Floor Plan

OUTSIDE AIR TEMP
87.19 F



FAILED POINTS

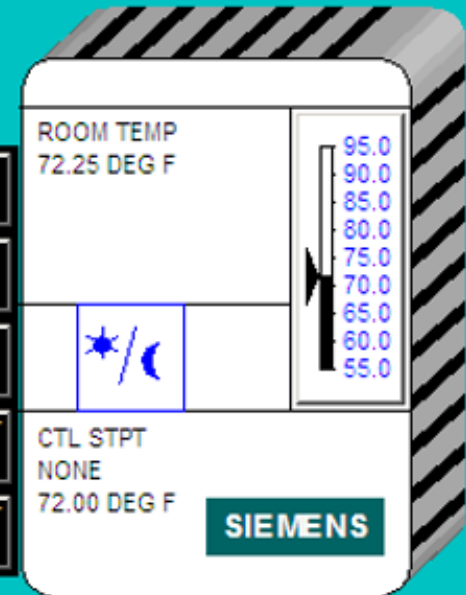
DAY.NGT DAY	HEAT.COOL HEAT
CLG FLOW MAX 520.00 CFM	HTG FLOW MAX 208.00 CFM
CLG FLOW MIN 208.00 CFM	HTG FLOW MIN 200.00 CFM
DMPR COMD 39.60 PCT	AIR VAV1-5

Point: RTU1.VAV1-5.RM1164:HTG FLOW MIN
Desc: Pod. Nurse Work
Status: **FAILED**
Pri: NONE
Value: 200.00 CFM
Ex-State: N/A
Total: Total



HEAT STAGE 1
ON
HEAT STAGE 2
OFF

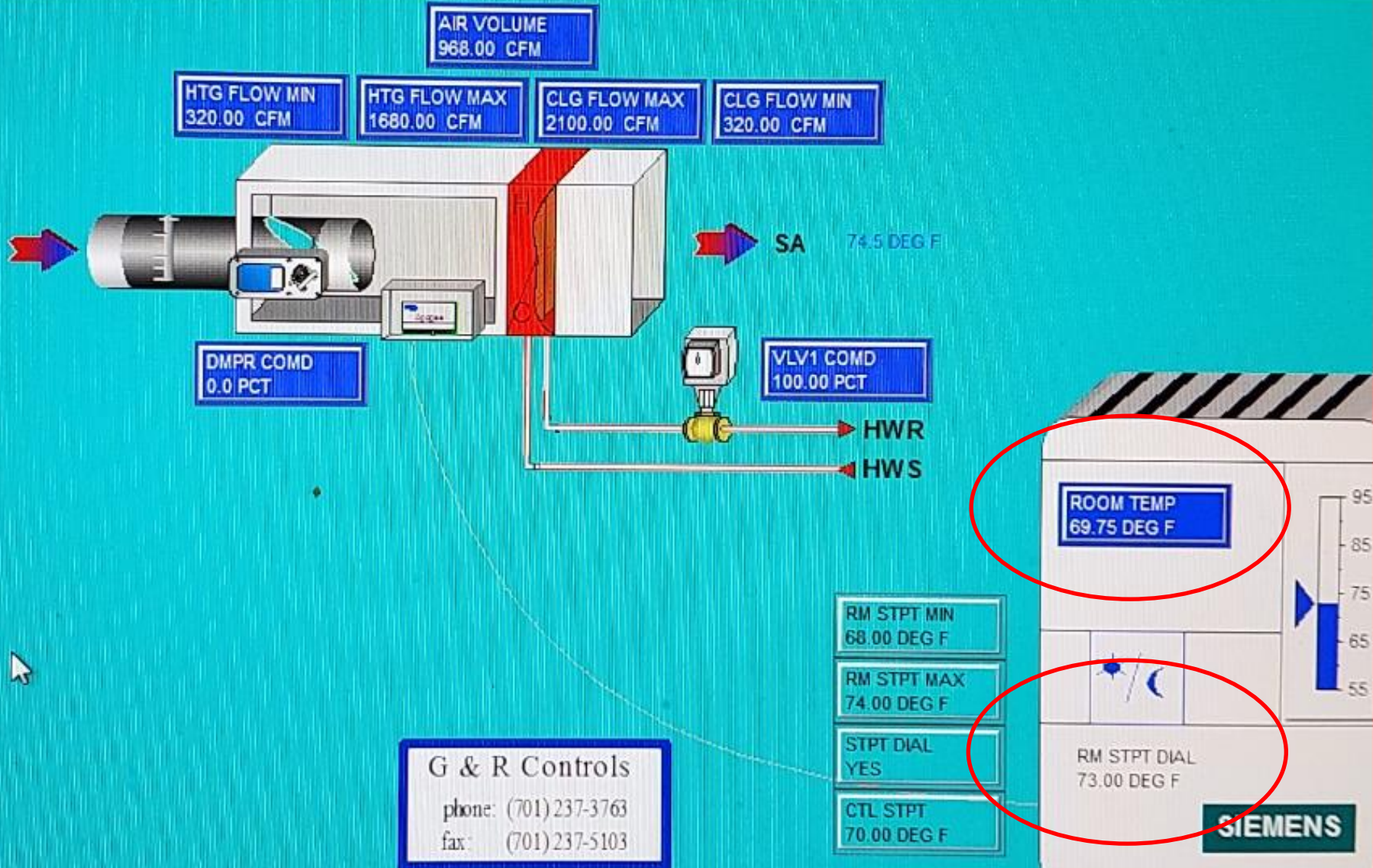
RM STPT DIAL 72.00 DEG F
RM STPT MAX 75.00 DEG F
RM STPT MIN 69.00 DEG F
NGT CLG STPT 82.00 DEG F
NGT HTG STPT 65.00 DEG F



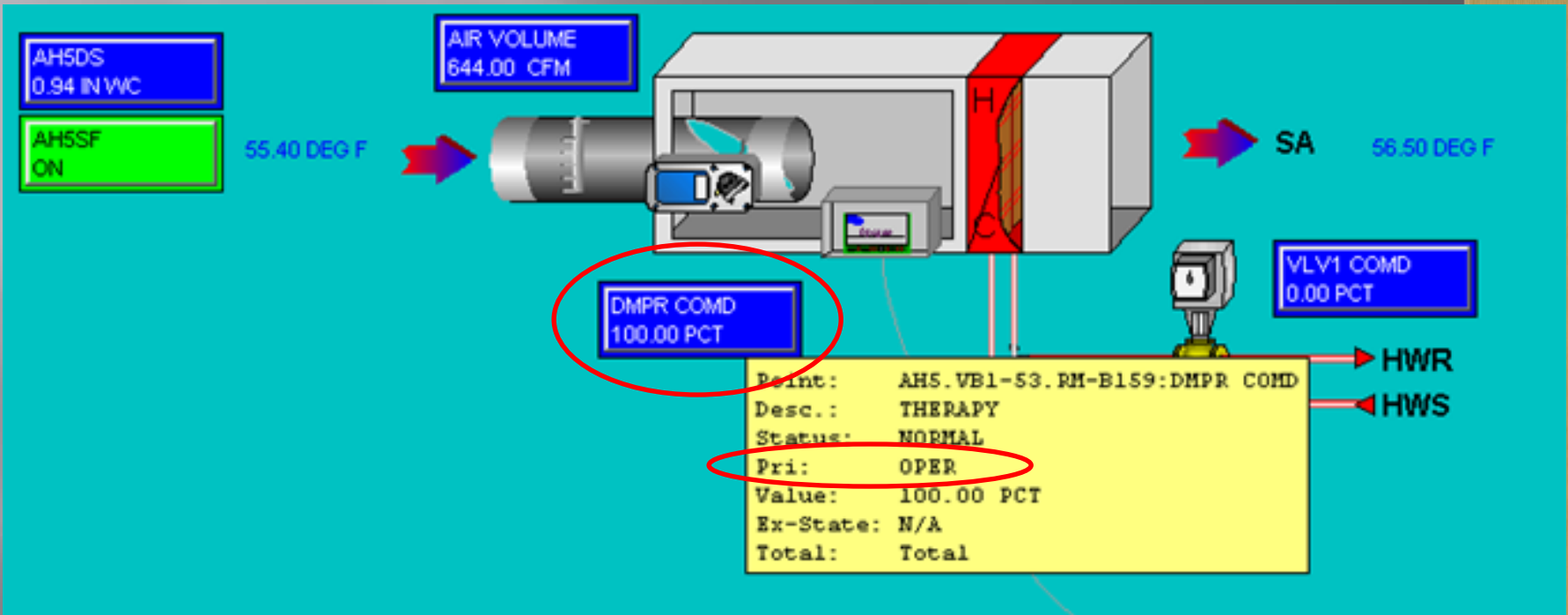
Look for:

- Communication loss
- Disconnect, Transformer
- Bad controller

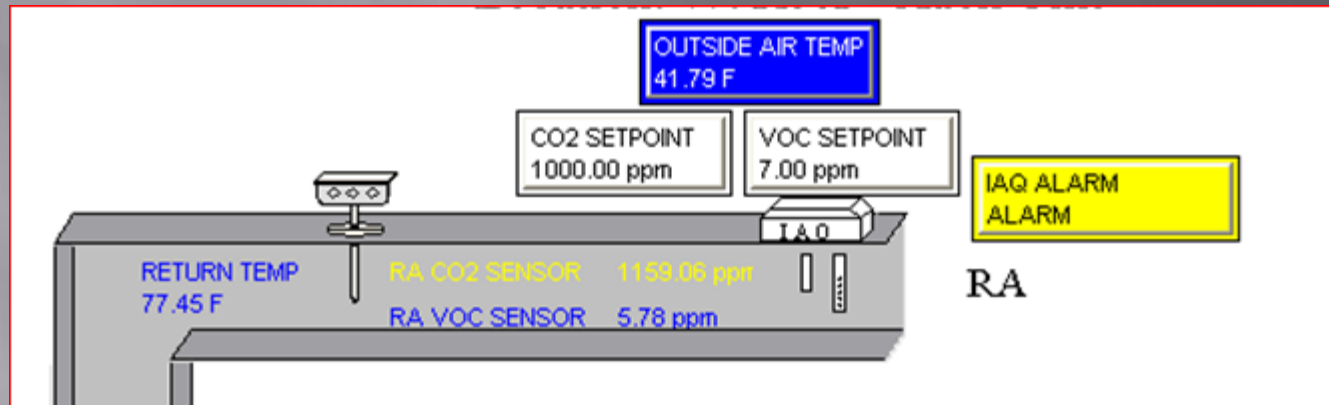
CONDITION VS. SETPOINT



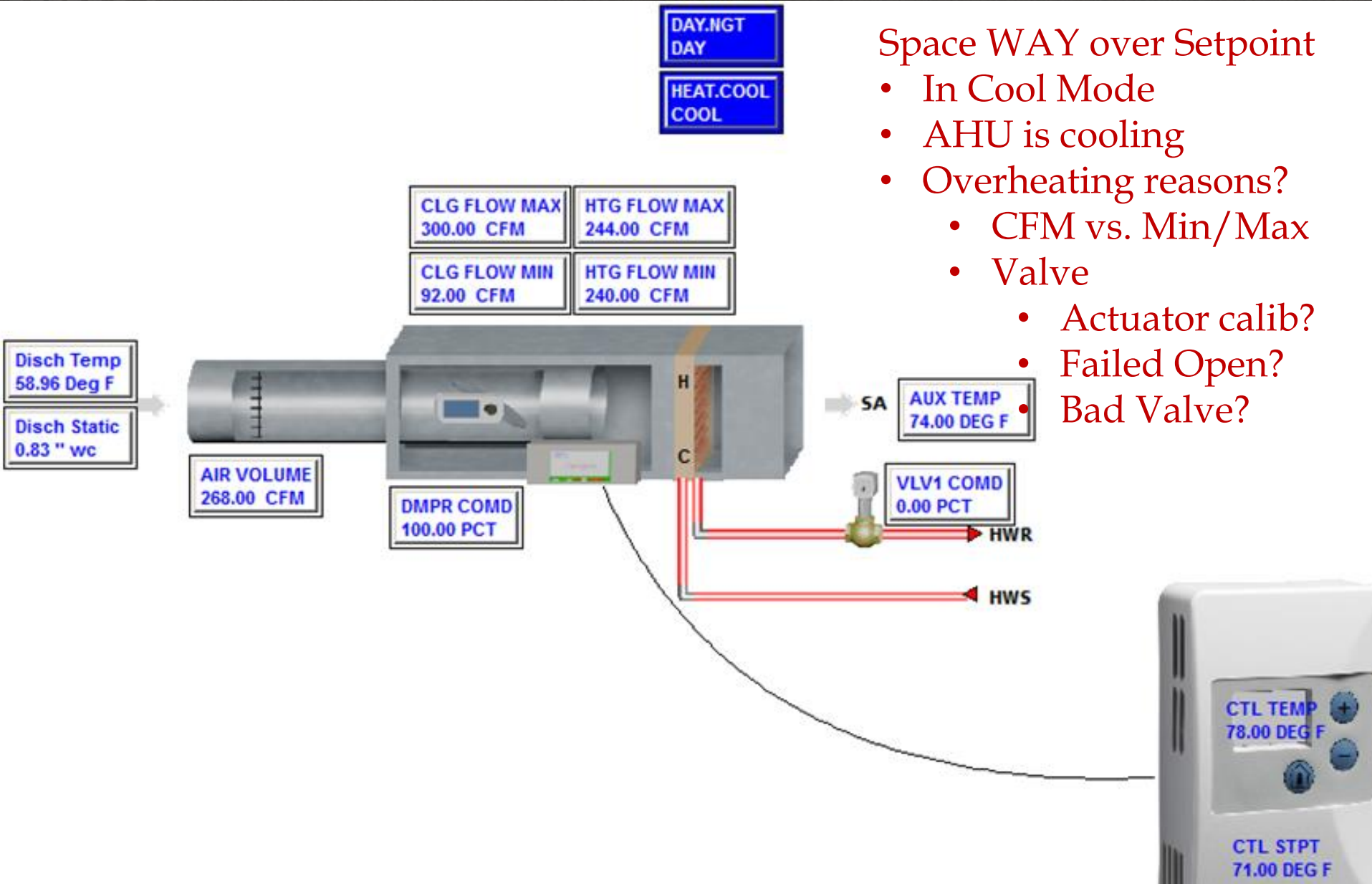
COMMANDED POINTS



POINTS IN ALARM



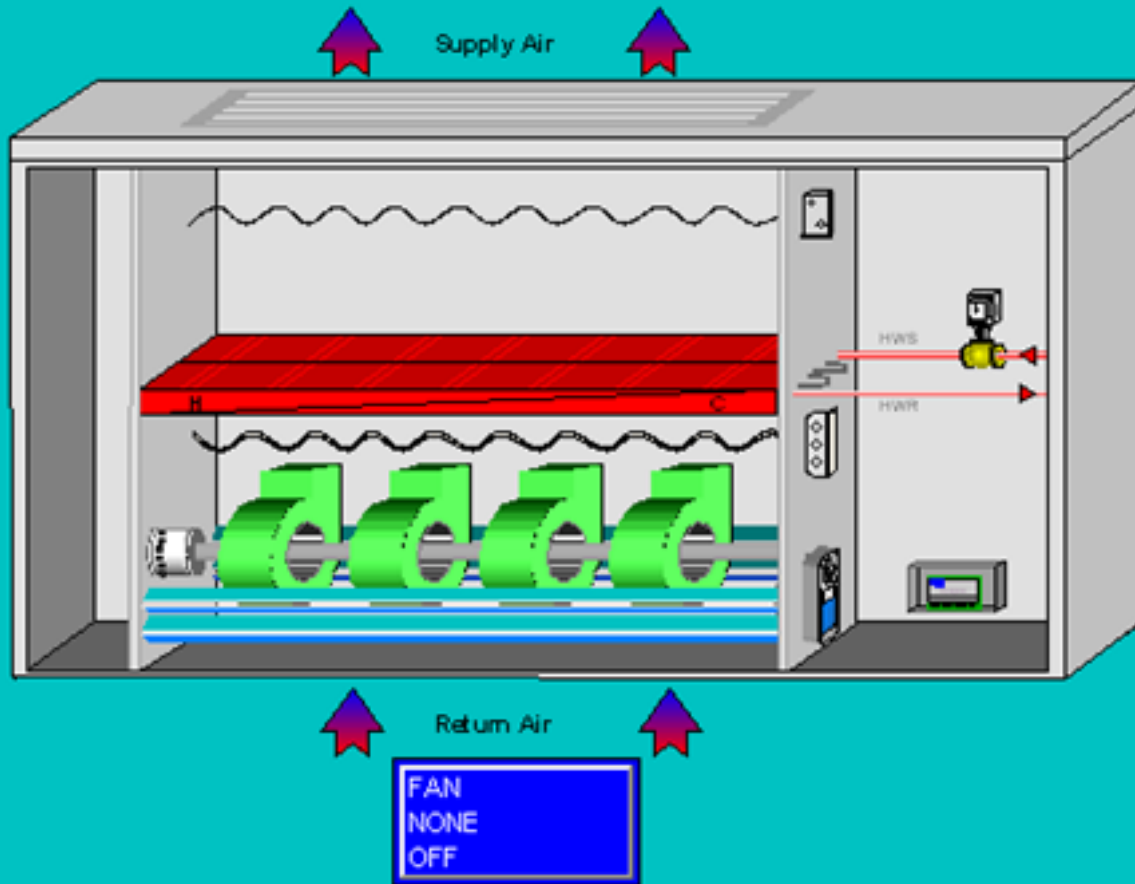
TROUBLESHOOTING



Space WAY over Setpoint

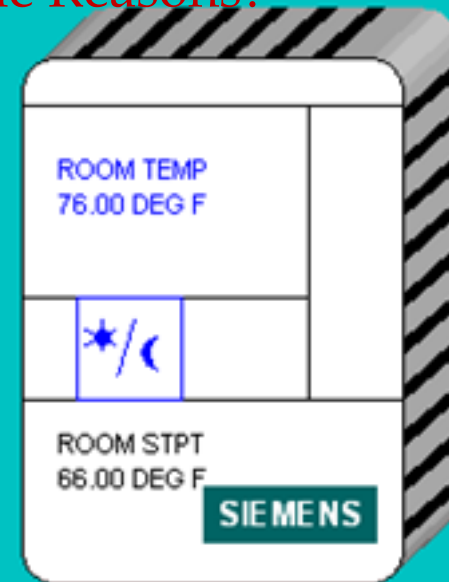
- In Cool Mode
- AHU is cooling
- Overheating reasons?
 - CFM vs. Min/Max
 - Valve
 - Actuator calib?
 - Failed Open?
 - Bad Valve?

TROUBLESHOOTING



Space WAY over Setpoint

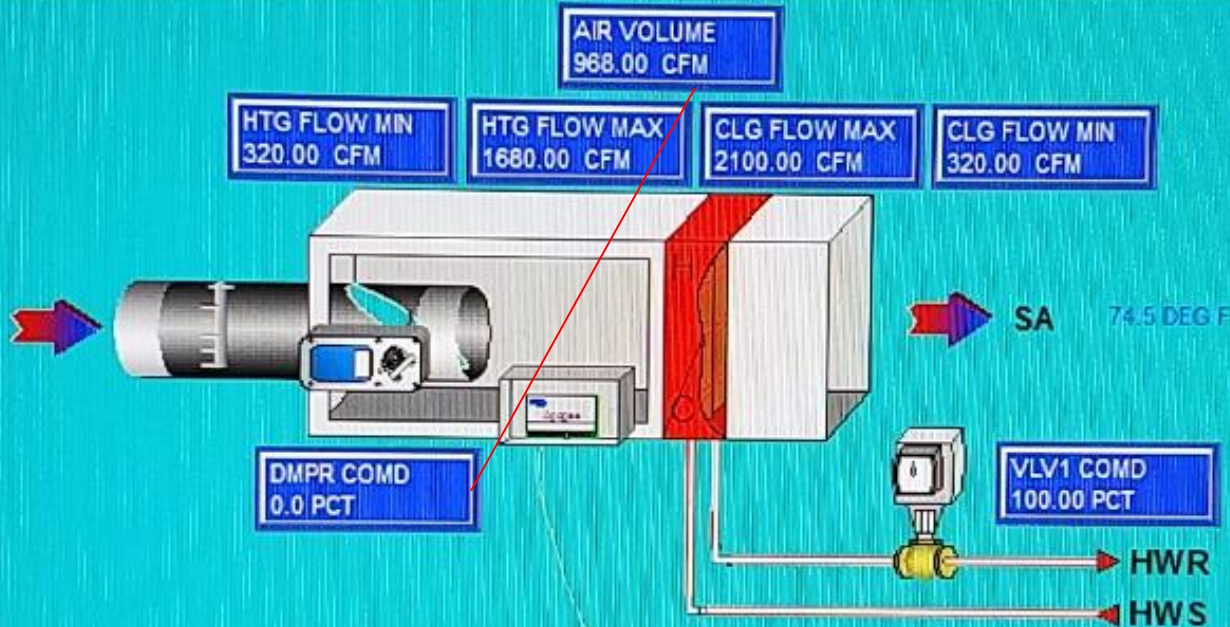
- Fan is off
- Heating only cabinet
- Valve closed
- Possible Reasons?



Temperature

DSCH TEMP LOOP
0.00

TROUBLESHOOTING



Notice continuous air noise

- Space close to setpoint
- Air Volume not tracking damper position
- Results in VAV nearly always in full heating and full cooling simultaneously
- Problem is _____ ?

G & R Controls

phone: (701)237-3763

fax: (701)237-5103

RM STPT MIN
68.00 DEG F

RM STPT MAX
74.00 DEG F

STPT DIAL
YES

CTL STPT
70.00 DEG F

ROOM TEMP
69.75 DEG F

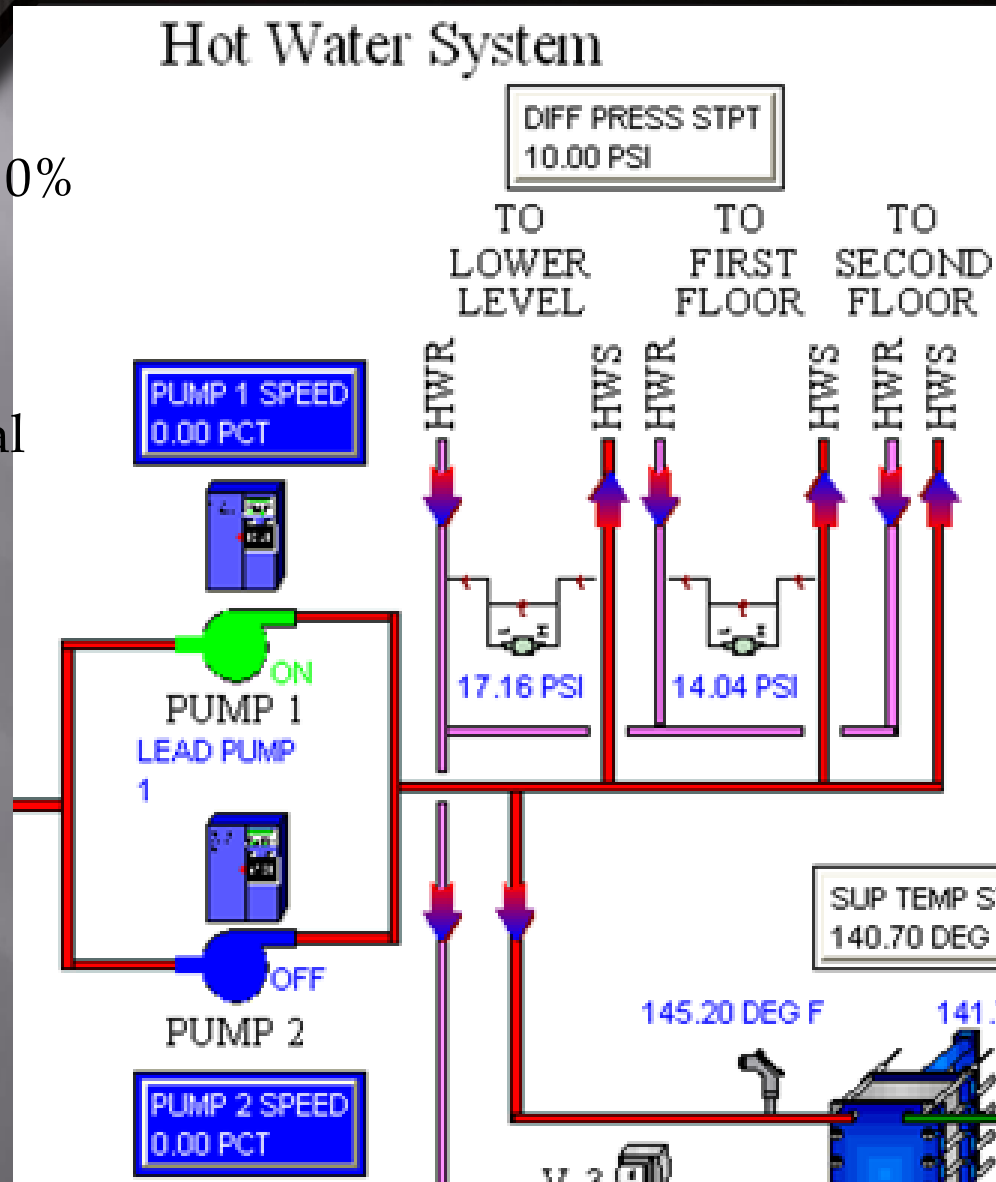
RM STPT DIAL
73.00 DEG F

SIEMENS

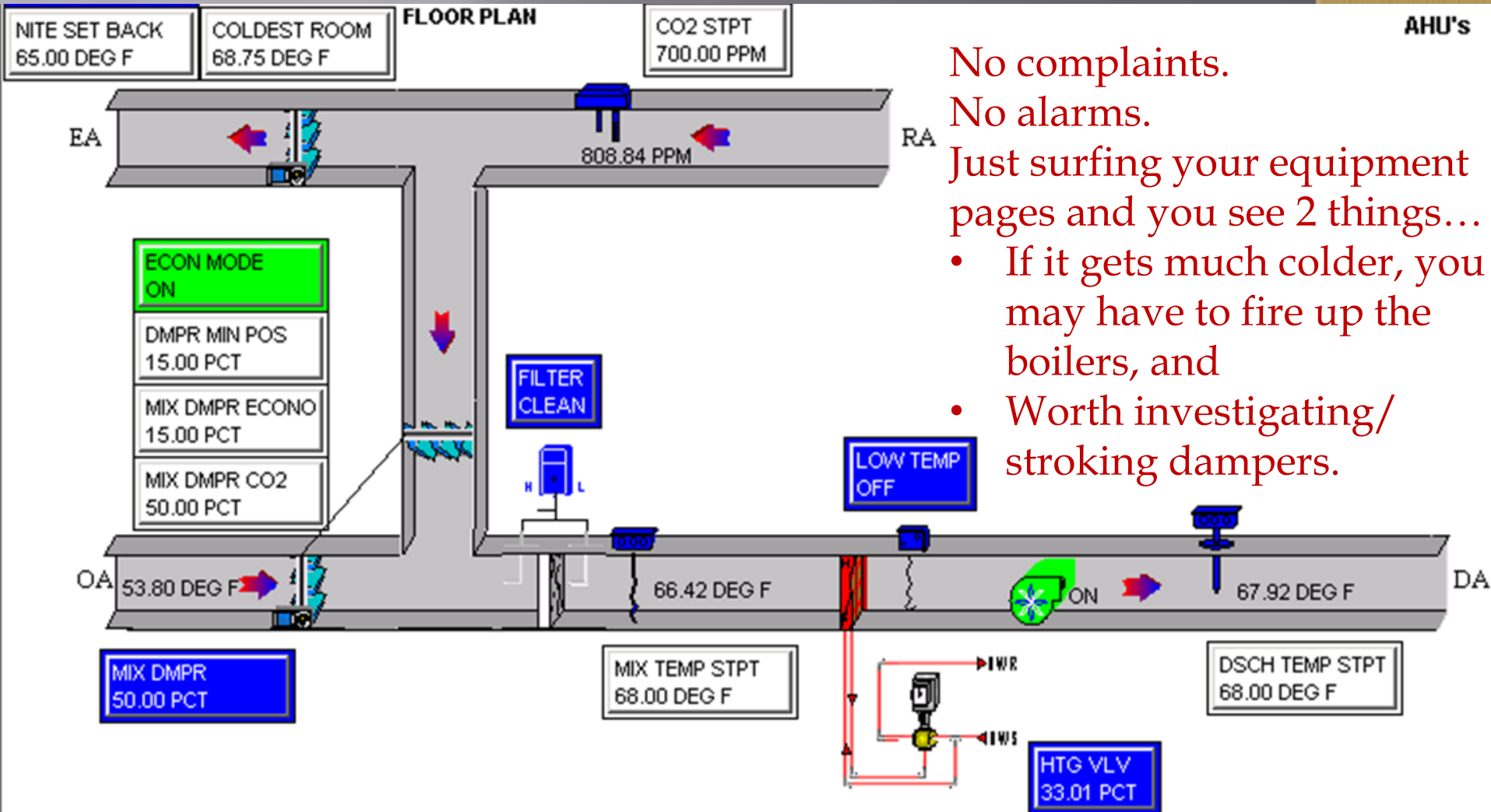
TROUBLESHOOTING

Pump Speed signal @ 0%

- DP setpoint met
- Possible reasons?
 - HOA
 - Min VFD signal



TROUBLESHOOTING



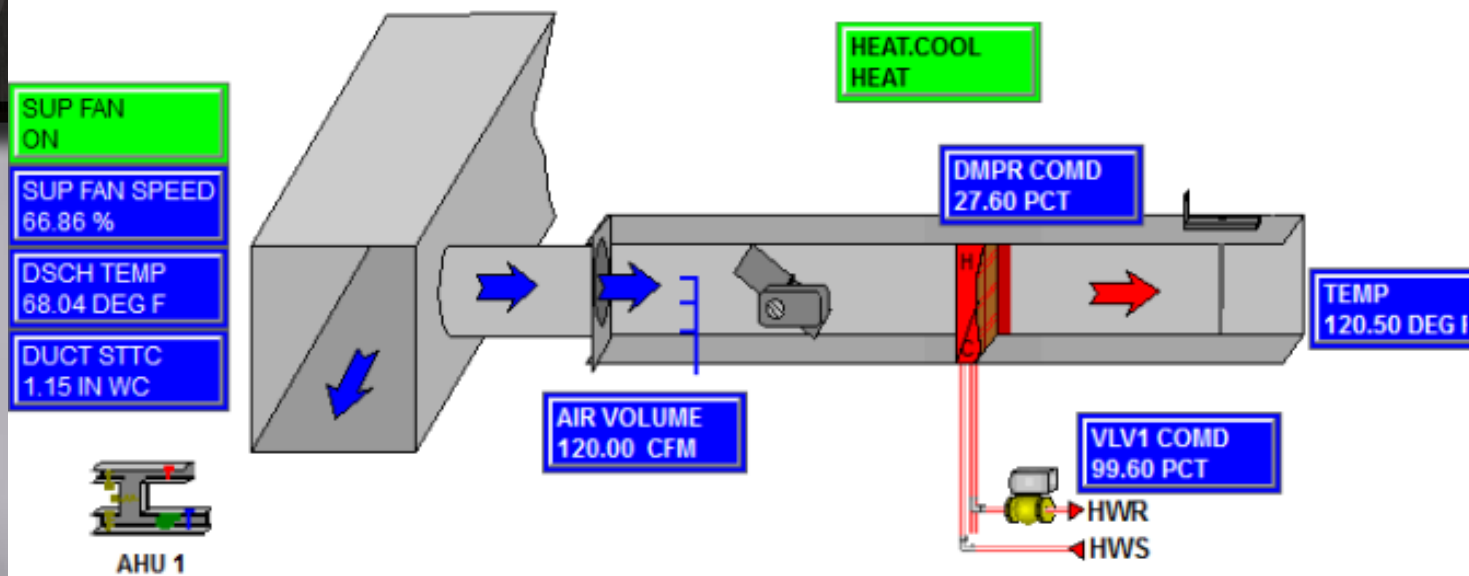
No complaints.

No alarms.

Just surfing your equipment pages and you see 2 things...

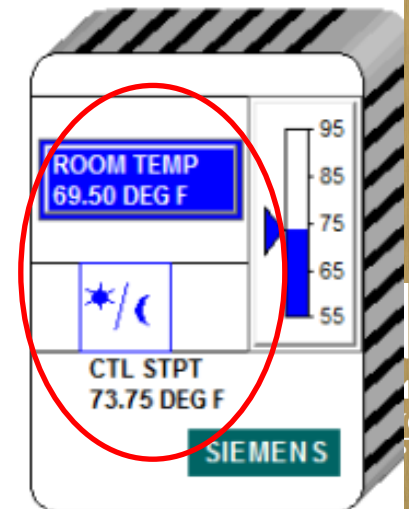
- If it gets much colder, you may have to fire up the boilers, and
- Worth investigating/stroking dampers.

TROUBLESHOOTING



Occupant complains it has been cold in their space for the past hour...

- AHU running well (DAT, DSP)
- Hear airflow thru diffusers
- Appears VAV reheat is working
- Test DAT with IR gun
- Stroke both damper and valve actuators 130 sec.
- Why won't space warm up?

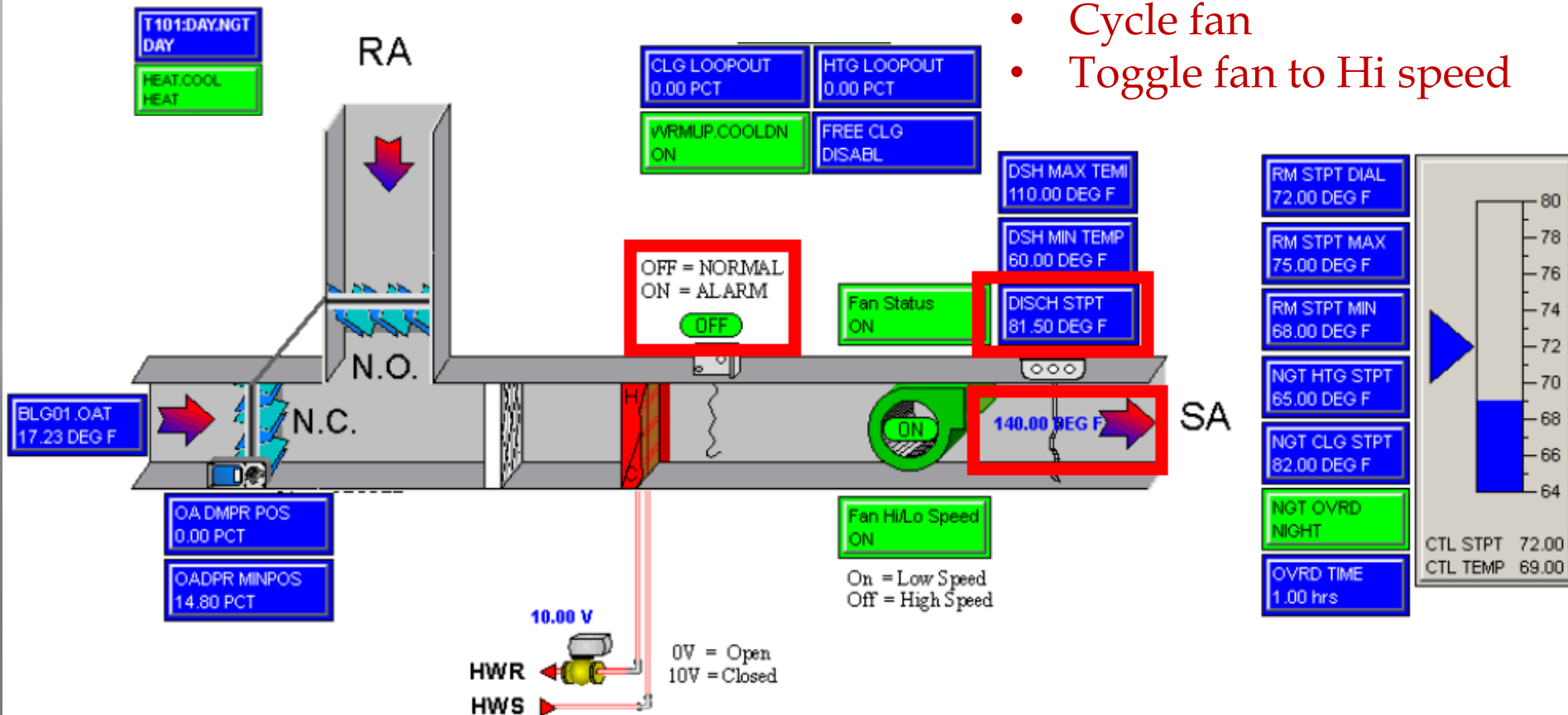


TROUBLESHOOTING

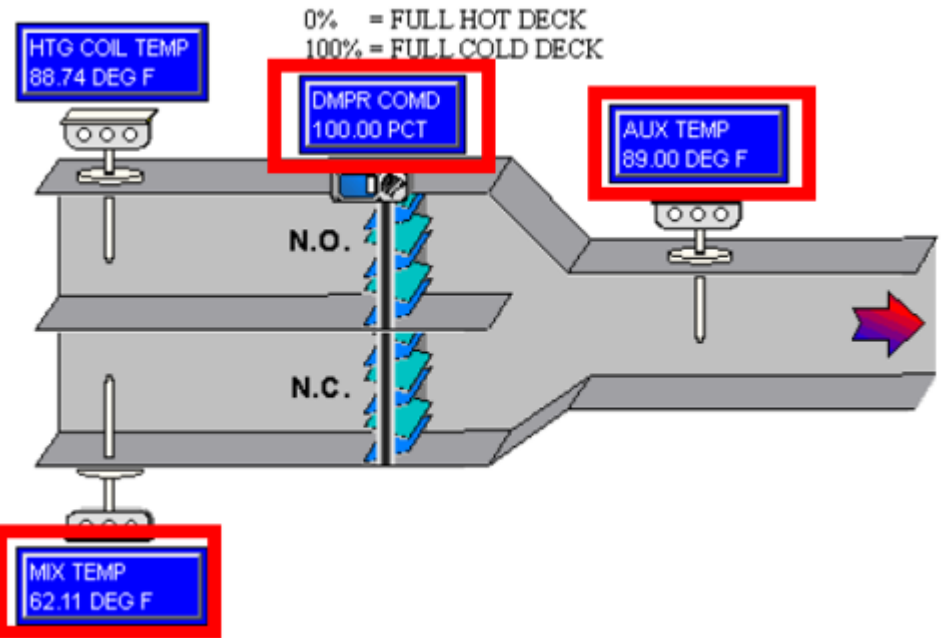
UNIT VENTILATOR

Cold Classroom Complaint:

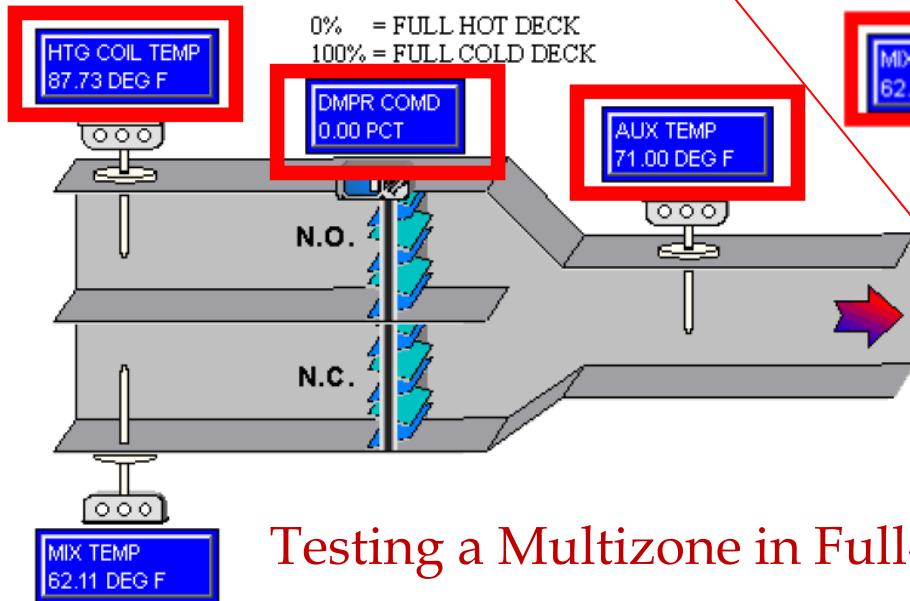
- Cold outside
- Stroke closed valve open
- Cycle fan
- Toggle fan to Hi speed



TROUBLESHOOTING



Testing a Multizone in Full-Cooling



Testing a Multizone in Full-Heating

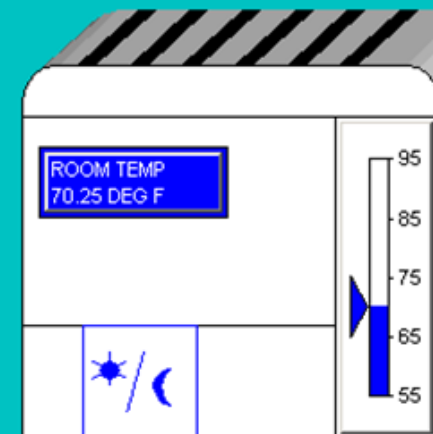
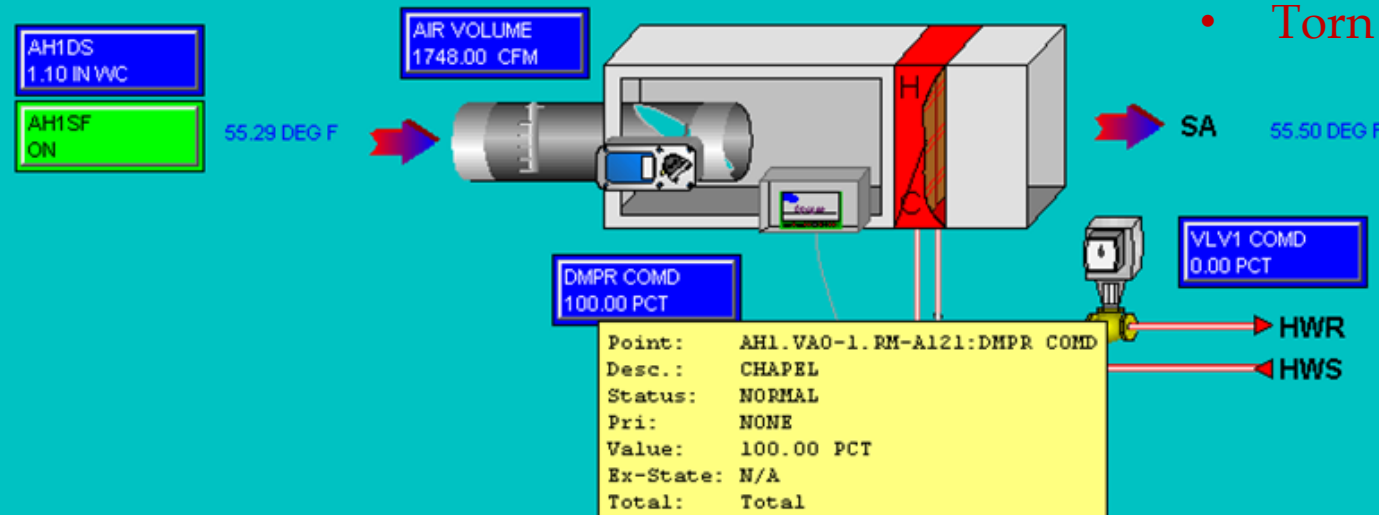
TROUBLESHOOTING

You ran a "Damper Position Report"

- Didn't notice it before because space is at setpoint

DAY_NGT DAY	HEAT.COOL COOL
HTG LOOPOUT 0.00 PCT	CLG LOOPOUT 94.40 PCT
HTG FLOW MIN 740.00 CFM	CLG FLOW MIN 740.00 CFM
HTG FLOW MAX 744.00 CFM	CLG FLOW MAX 2252.00 CFM

- Damper is 100% but CFM is low compared to max
- What does it mean if you:
 - Close damper & CFM increases?
 - Stroke damper and CFM tracks?
 - Balancing damper bumped?
 - Compare DSP with TAB?
 - Torn flex?



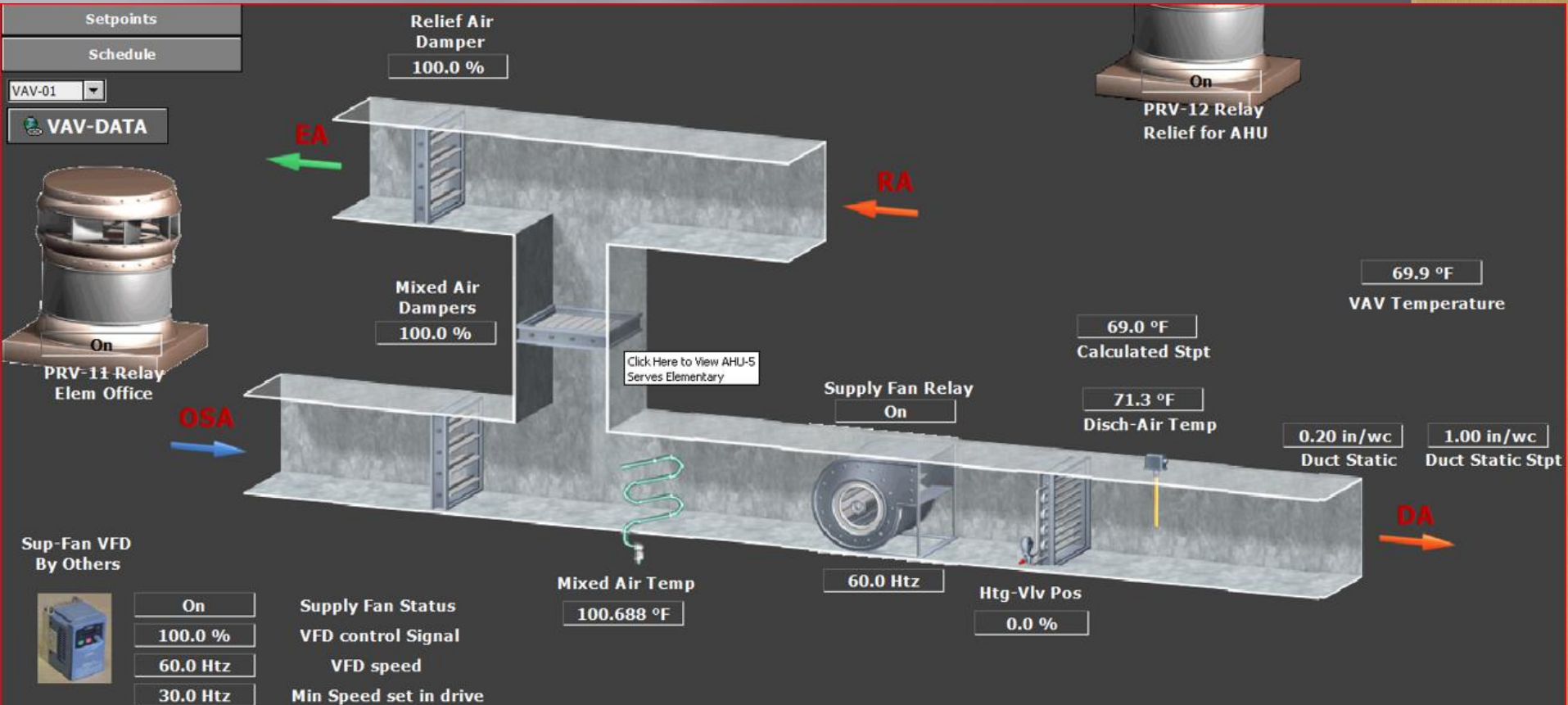
DAY CLG STPT 74.00 DEG F	NGT CLG STPT 80.00 DEG F	HTG LOOPOUT 0.00 PCT	RM STPT MAX 78.00 DEG F
DAY HTG STPT 70.00 DEG F	NGT HTG STPT 60.00 DEG F	CLG LOOPOUT 94.40 PCT	RM STPT MIN 68.00 DEG F

CTL STPT
70.25 DEG F

TROUBLESHOOTING

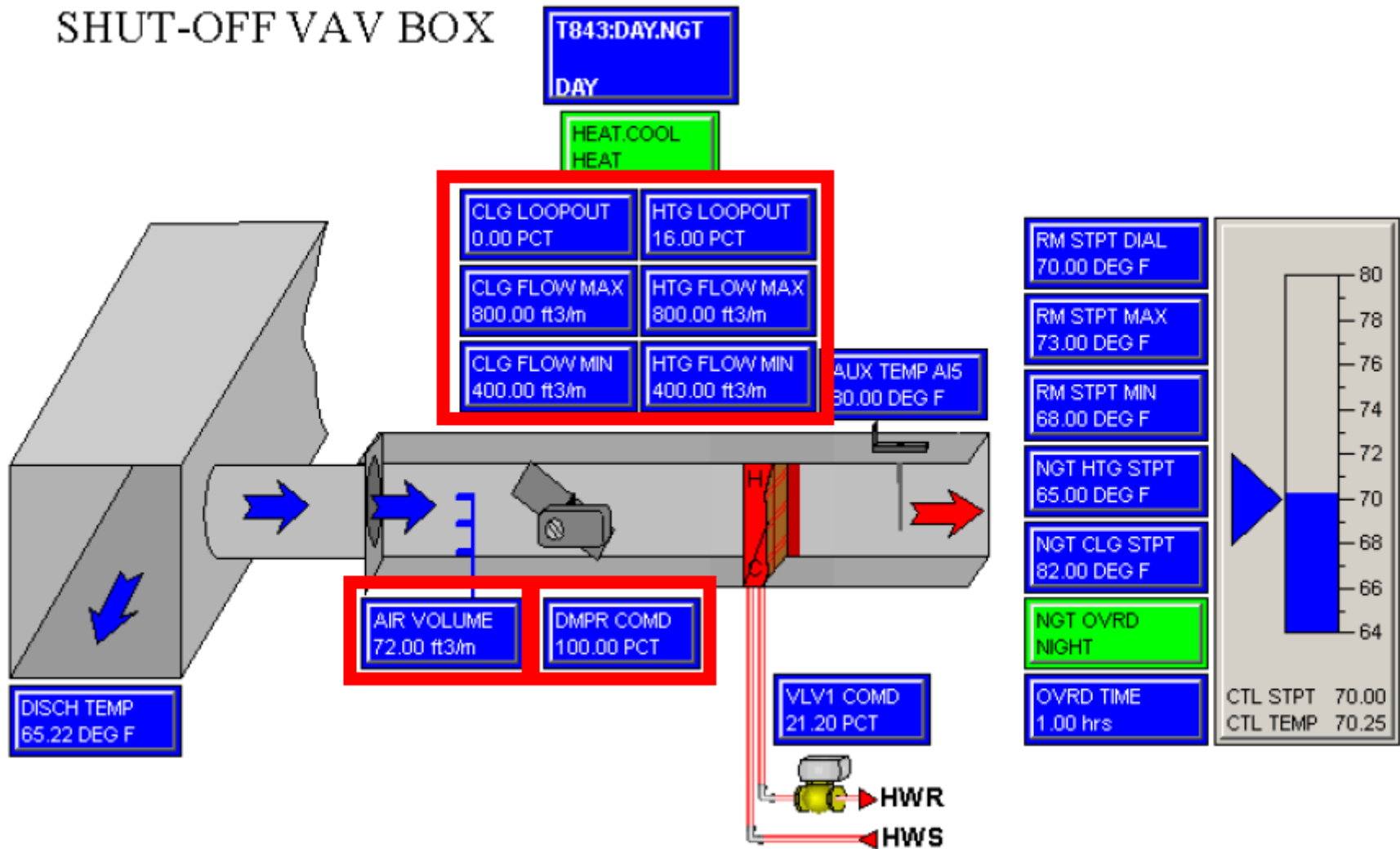
You ran a "Damper Position Report" and see MULTIPLE VAVs @ 100%

- 100% OSA and spaces are ok
- All boxes calling for cooling? TAB? Fan/VFD issues?



TROUBLESHOOTING

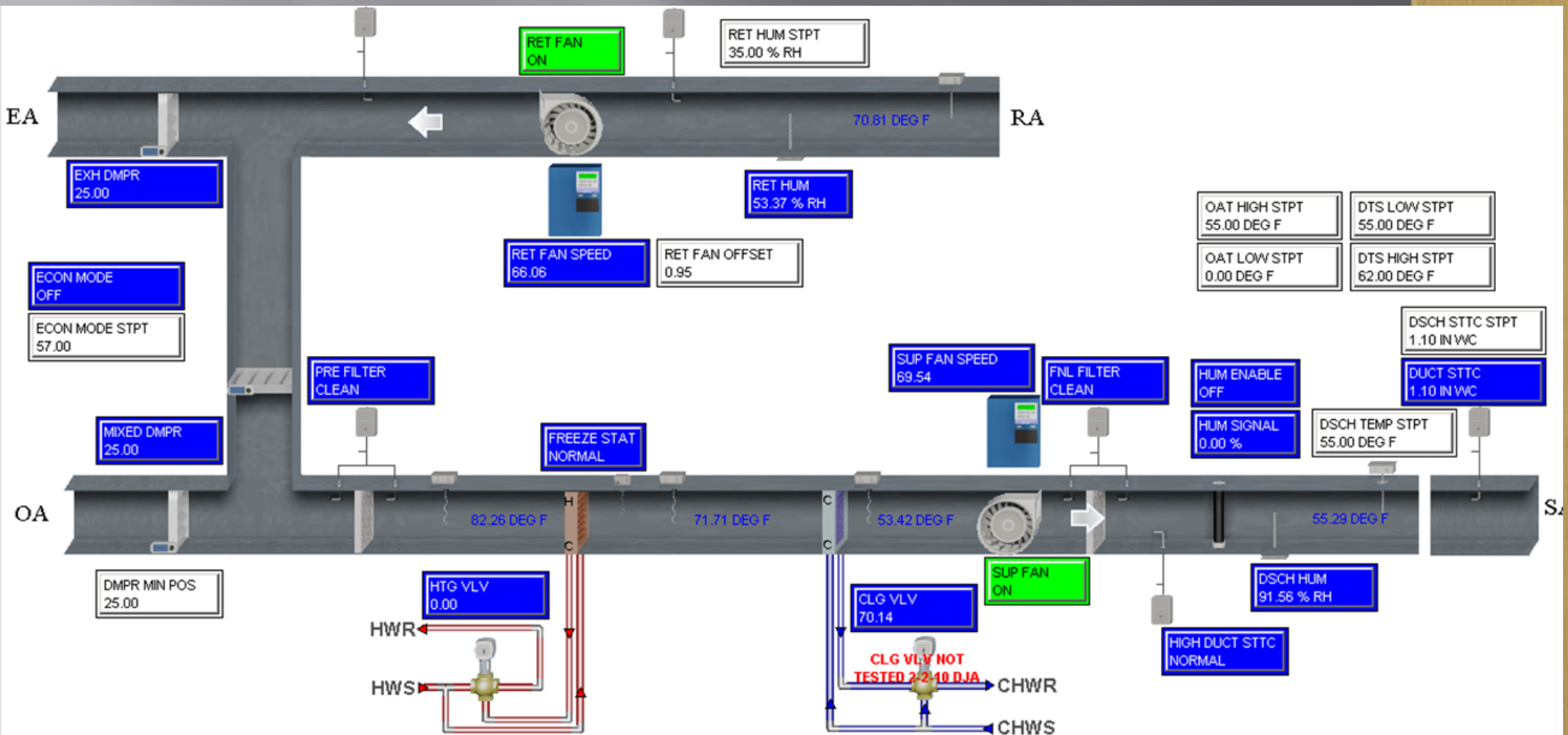
SHUT-OFF VAV BOX



TROUBLESHOOTING

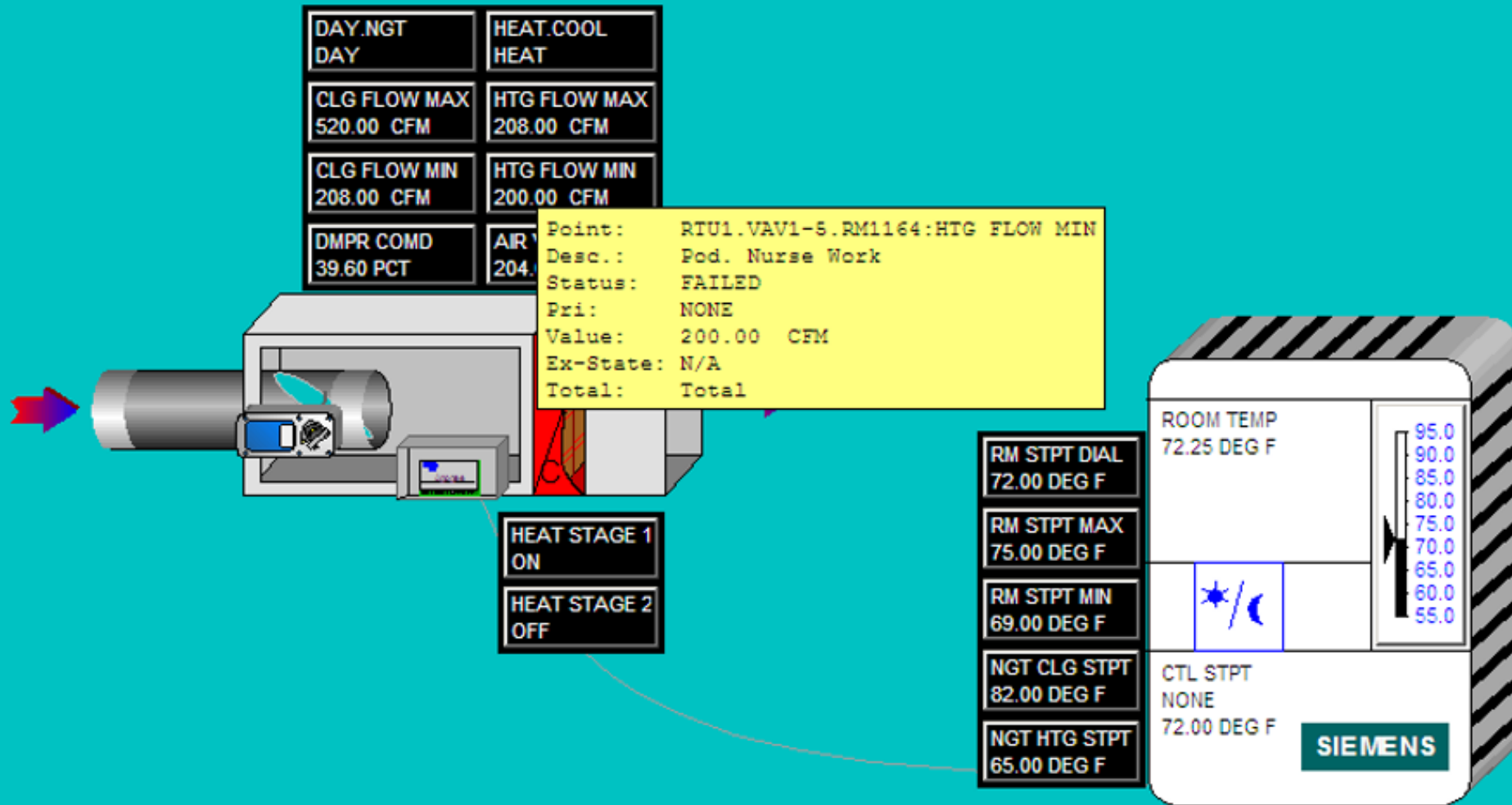
You are Surfing again, checking temps. RAT thru DAT.

- MAT vs. HCLT vs. CCLT???



CALL FOR HELP

Skill Set Dependent:



CALL FOR HELP

View basic information about your computer

Windows edition

Windows 7 Professional

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Service Pack 1

[Get more features with a new edition of Windows 7](#)



System

Manufacturer:

Dell

Model:

Optiplex 3020

Rating:

[View system details](#)

Thank You!

Doug Straus

701-261-2625



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COMPANY

G & R
CONTROLS

BALANCING
PROFESSIONALS

O'Connor Company

Sioux Falls: 605.336.0333

Rapid City: 605.348.2033

G & R Controls:

Sioux Falls: 605.336.3788

Rapid City: 605.343.7037

Fargo: 701.237.3763

Bismarck: 701.751.4870

Balancing Professionals:

Sioux Falls: 605.336.1823

Rapid City: 605.348.8298

Fargo: 701.237.5095

Bismarck 701.751.4871

