108050000-TD0006-R00

# Spallation Neutron Source

# Linac Tunnel Air Handler Controls Functional System Design (FSD)

June, 2002

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SNS Project Engineer

**Linac Air Handler Controls Description**
**TD80006 Rev 0**

## Operating Philosophy

Purpose:

The purpose of air handler operation is to:

a) control tunnel space temperature to a pair of setpoints selected by the operator
b) respond to tunnel control commands from the tunnel operation screen
c) respond to signals from the PPS, the ODH and the fire alarm systems

Assumptions: None

Operator Controls and Operating Modes

1) Cooling temperature setpoint – the temperature to which the tunnel is controlled by modulating the chilled water valve.
2) Heating temperature setpoint (must be less than the chilled water setpoint).
3) OFF: Air handler is not in use. Fan is de-energized. Damper is closed. Chilled water valve is closed. Setpoints remain at last setting.
4) AUTO: Respond to tunnel operation commands, PPS, ODH, and fire alarm signals as follows:
    a. Standby tunnel operation command: Place air handler in OFF configuration.
    b. Re-Circulation tunnel operation command: Fan is energized. Damper is open. Chilled water valve is modulated to control temperature at operation mode setpoint. Heater energized when temperature is below setpoint.
    c. Ventilation tunnel operation command: Fan is energized. Damper is open. Chilled water valve is modulated to control temperature at operation mode setpoint. Heater energized when temperature is below setpoint.
    d. Smoke Exhaust tunnel operation command: Place air handler in OFF configuration
    e. Receipt of fire alarm, ODH system or PPS signal: Place air handler in OFF configuration

## OPERATOR INTERFACE DEFINITIONS

### Local Hardware/Manual Operator Controls

1) HOA switch for fan/damper starter *(HS 2100, HS 2101, HS 2102, HS2103)*
2) Differential pressure gauge across AHU filter *(PDI 2100, PDI 2101, PDI 2102, PDI 2103)*
3) Chilled water return temperature indicator *(TI 2100A, TI 2101A, TI 2102A, TI 2103A)*
4) Chilled water supply temperature indicator *(TI 2100B, TI 2101B, TI 2102B, TI 2103B)*
5) FAULT indicator light on MCC
6) READY indicator light on MCC
7) RUN indicator light on MCC

**Software HMI/EPICS Digital Operator Controls**

1) Temperature control mode
    a. OFF
    b. AUTO

Software HMI/EPICS Digital Displays

1) Temperature control mode status
    a. OFF
    b. AUTO
2) Differential pressure switch status *(PDS 2100, PDS 2101, PDS 2102, PDS 2103)*
3) Smoke detector status *(NE 2100, NE 2101, NE 2102, NE 2103)*
4) HOA switch status *(HS 2100A, HS 2101A, HS 2103A, HS 2104A)*
5) Fan/damper status *(F 2100/SOV 2100/FCV 2100, F 2101/SOV 2101/FCV 2101, F 2102/SOV 2102/FCV 2102, F 2103/SOV 2103/FCV 2103)*
6) Heater element status *(BE 2100, BE 2101, BE 2102, BE 2103)*

**Software HMI/EPICS Analog Operator Controls**

1) Cooling temperature setpoint
2) Heating temperature setpoint

**Software HMI/EPICS Analog Displays**

1) Return air temperature *(TT 2100, TT 2101, TT 2102, TT 2103)*
2) Return air humidity *(MT 2100, MT 2101, MT 2102, MT 2103)*
3) Chilled water valve position command (% open) *(IP 2100/TCV 2100, IP 2101/TCV 2101, IP 2102/TCV 2102, IP 2103/TCV 2103)*

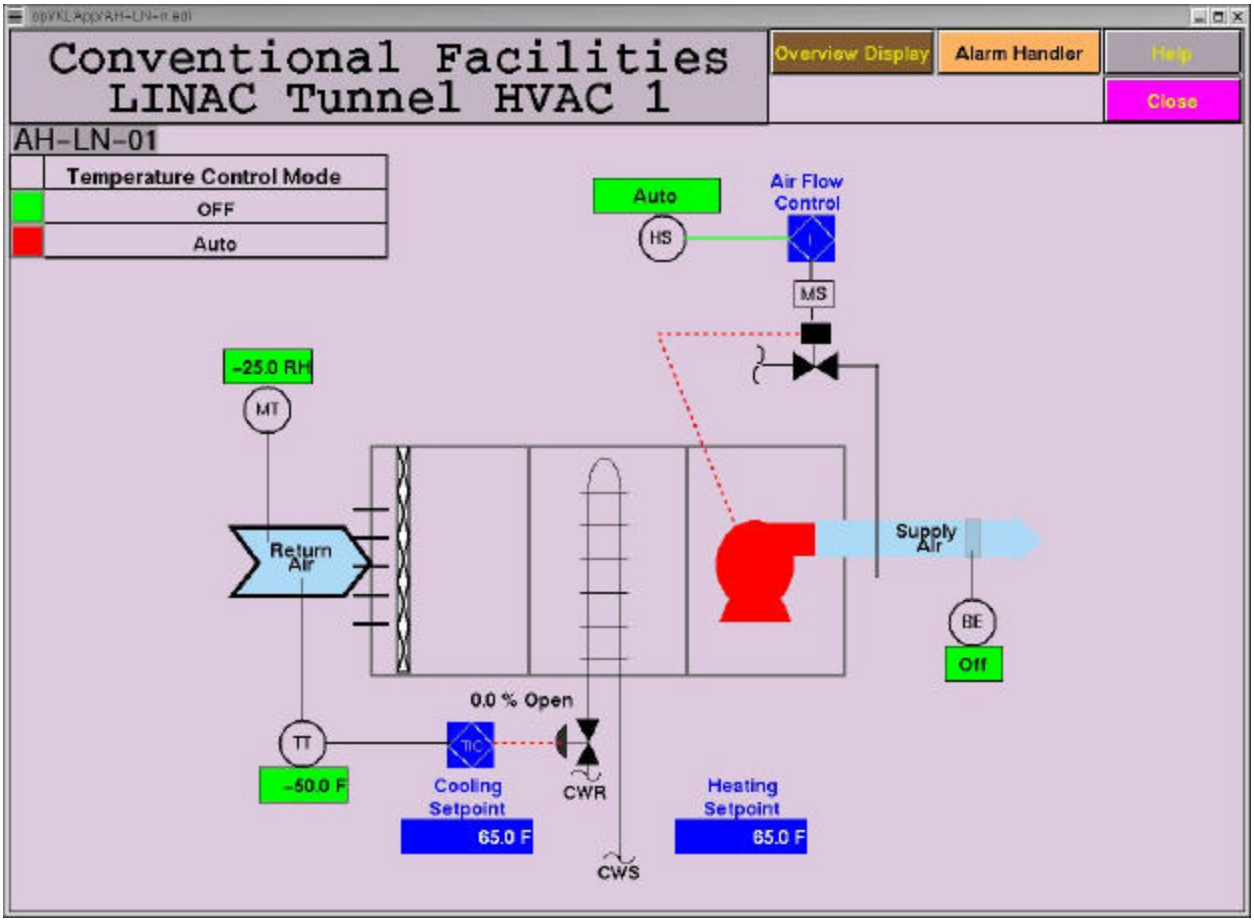
Alarms

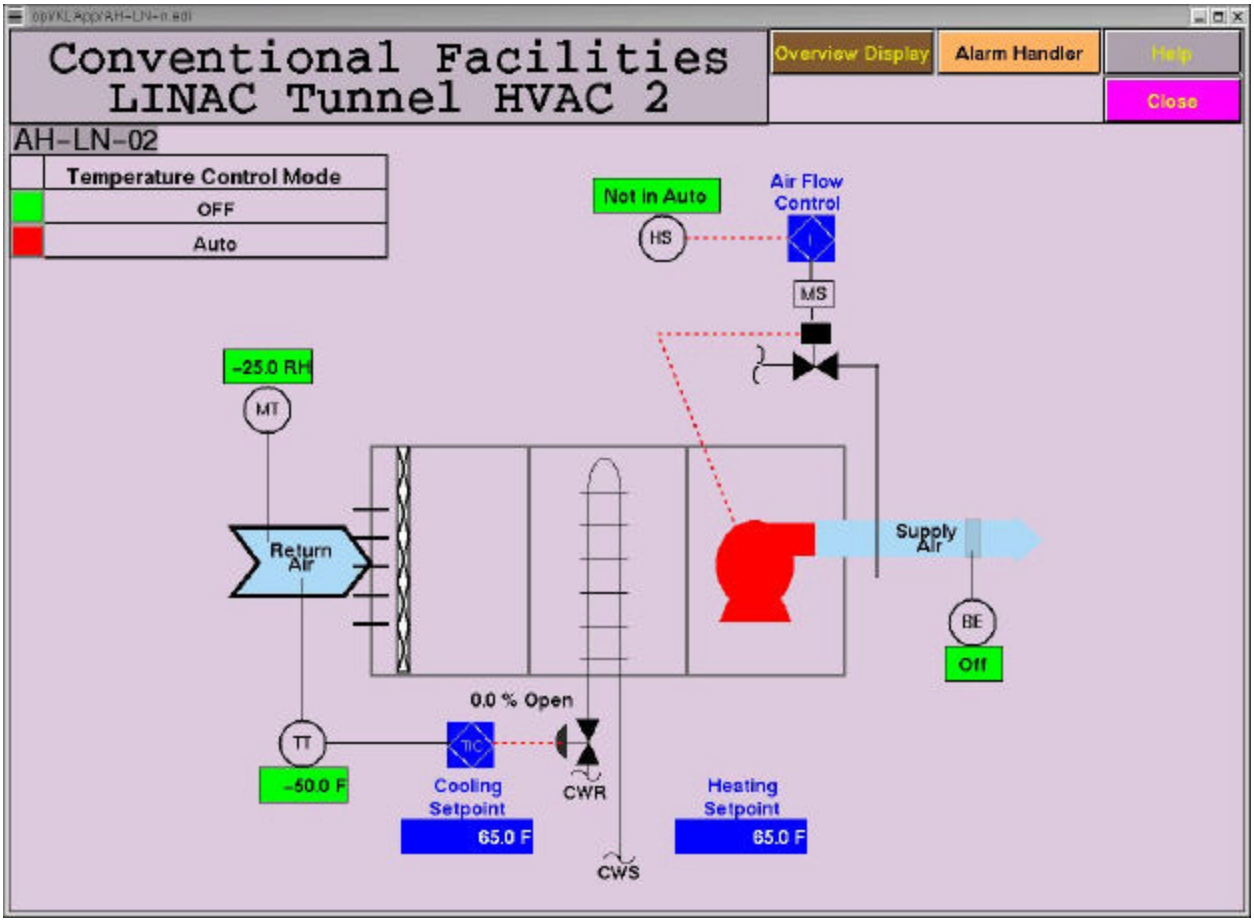
1) Return air temperature high and high, high
**2)** Return air temperature low and low, low

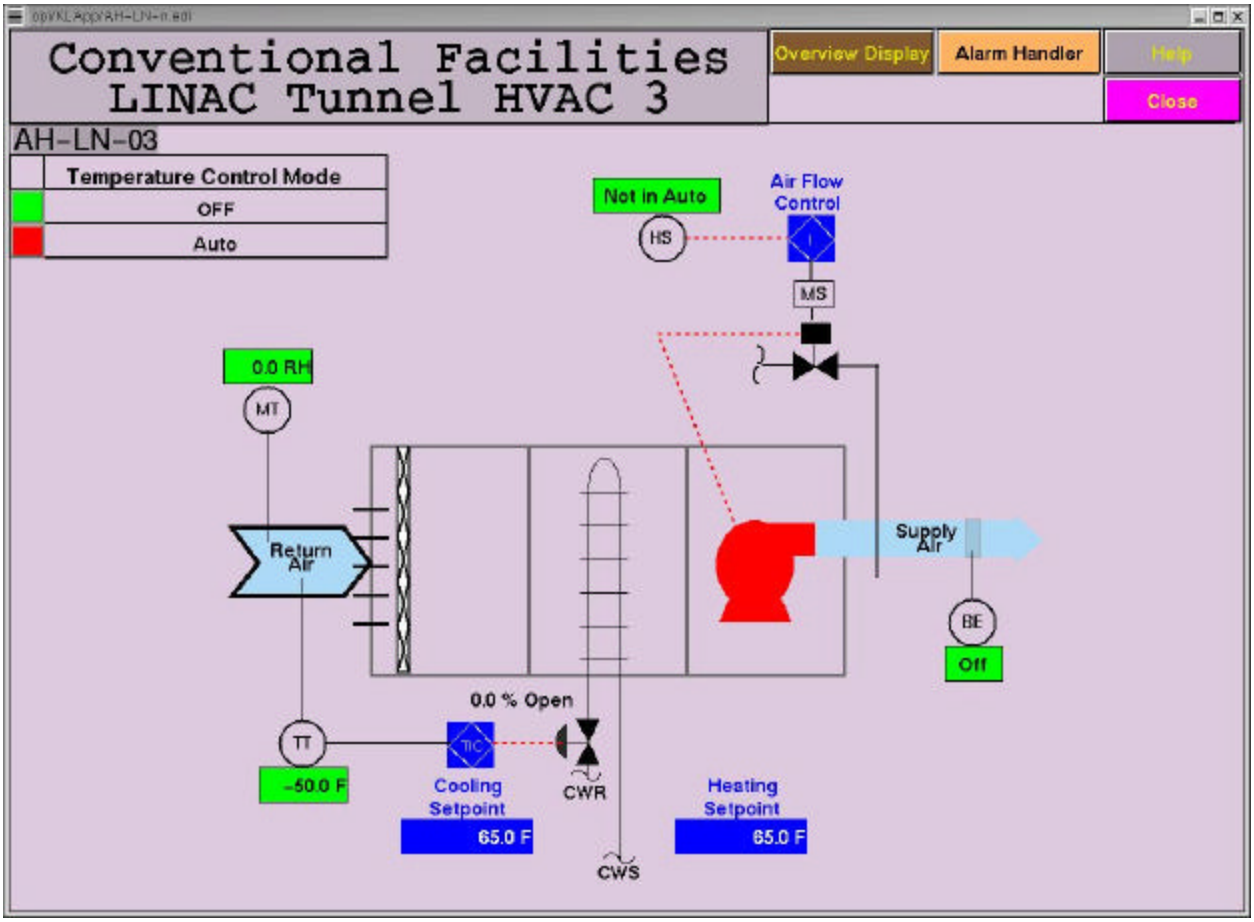
**Control Logic Description**

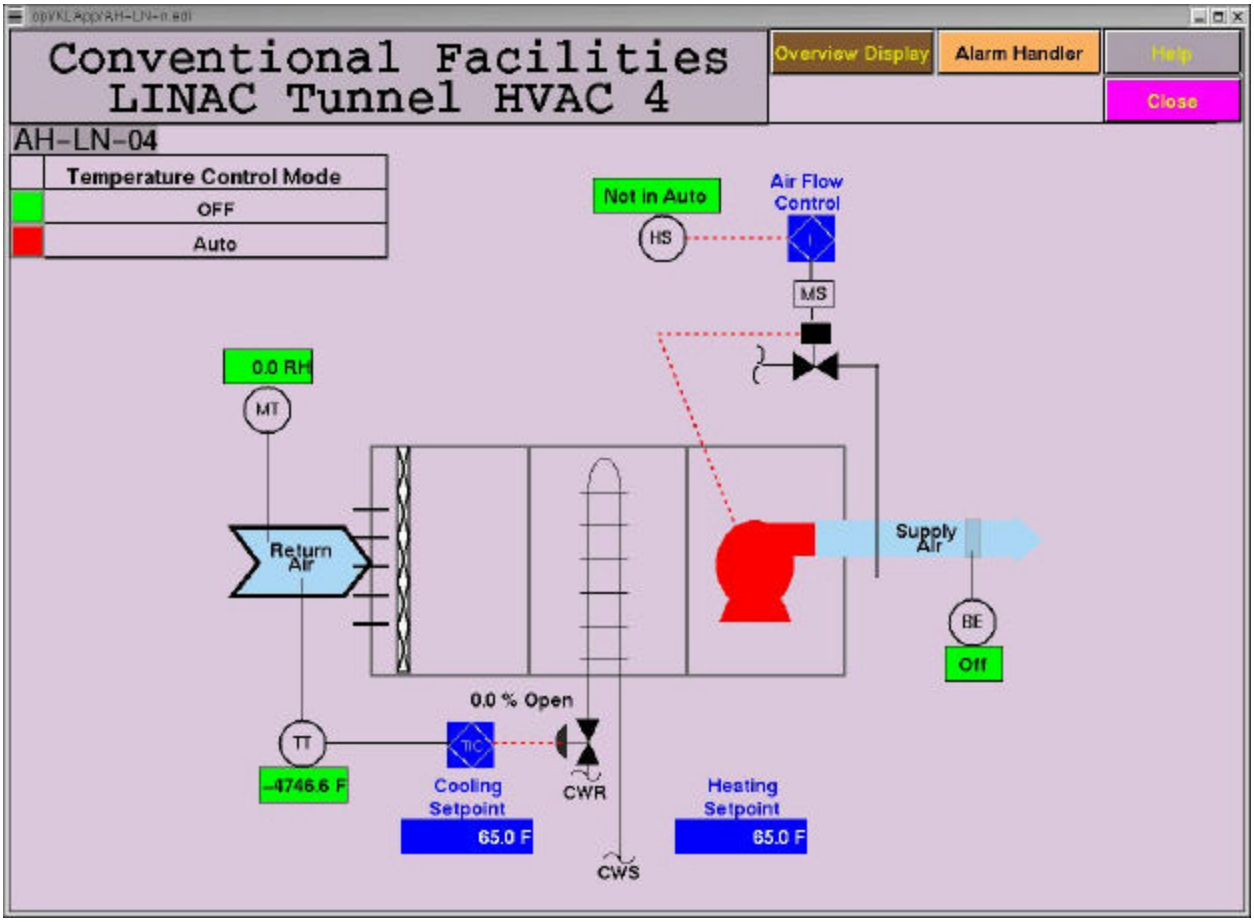
In the OFF mode, the air handler is deactivated. In AUTO mode, the logic will provide operating configurations as described above. In configurations where the air handler is active, it is activated by energizing the fan/damper and the chilled water valve controls tunnel temperature. As heat load decreases, the chilled water valve will close. Eventually, the chilled water valve will completely close and the temperature will fall below the chilled water control setpoint. When the temperature falls below the heater setpoint, the heater will be energized. It will be de-energized when the temperature rises above the heater setpoint.

As the heat load increases, the temperature will become greater than the chilled water setpoint and the chilled water valve will begin to open.


Conventional Facilities
LINAC Tunnel HVAC 1
Overview Display
Alarm Handler
Help
Close
AH-LN-01
Temperature Control Mode
OFF
Auto
Auto
HS
Air Flow Control
MS
-25.0 RH
MT
Return Air
Supply Air
BE
Off
0.0 % Open
TT
TIC
-50.0 F
Cooling Setpoint
65.0 F
CWR
CWS
Heating Setpoint
65.0 F


Conventional Facilities
LINAC Tunnel HVAC 2
Overview Display
Alarm Handler
Help
Close
AH-LN-02
Temperature Control Mode
OFF
Auto
Not in Auto
HS
Air Flow Control
MS
-25.0 RH
MT
Return Air
Supply Air
BE
Off
0.0 % Open
TT
TIC
-50.0 F
Cooling Setpoint
65.0 F
CWR
CWS
Heating Setpoint
65.0 F


Conventional Facilities
LINAC Tunnel HVAC 3
Overview Display
Alarm Handler
Help
Close
AH-LN-03
Temperature Control Mode
OFF
Auto
Not in Auto
HS
Air Flow Control
MS
0.0 RH
MT
Return Air
Supply Air
BE
Off
0.0 % Open
TT
TIC
-50.0 F
Cooling Setpoint
65.0 F
CWR
CWS
Heating Setpoint
65.0 F


Conventional Facilities
LINAC Tunnel HVAC 4
Overview Display
Alarm Handler
Help
Close
AH-LN-04
Temperature Control Mode
OFF
Auto
Not in Auto
HS
Air Flow Control
MS
0.0 RH
MT
Return Air
Supply Air
BE
Off
0.0 % Open
TT
TIC
-4746.6 F
Cooling Setpoint
65.0 F
CWR
CWS
Heating Setpoint
65.0 F