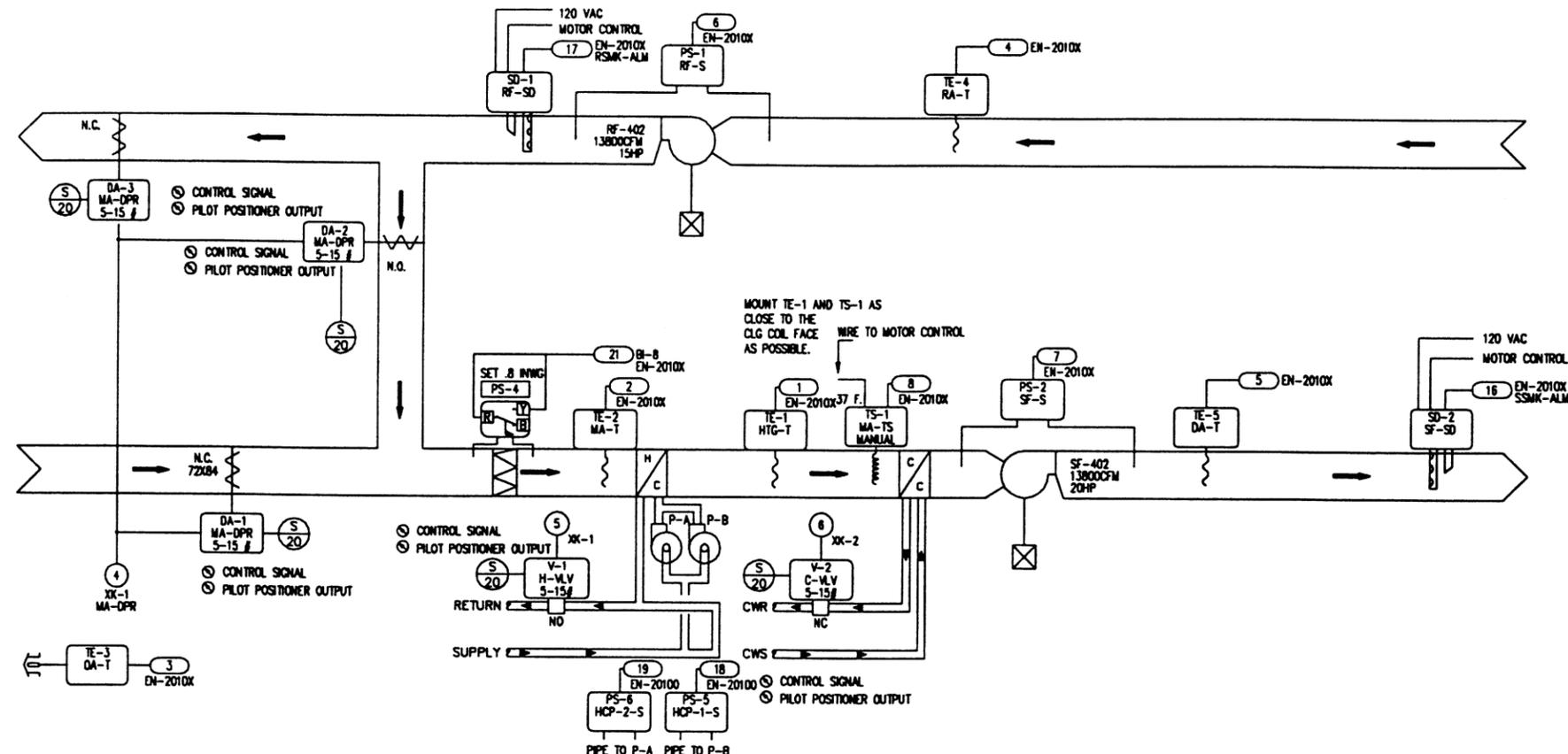


Flow Diagram and Equipment Locations For AHU-402 and AHU-404



FIELD MATERIAL			
DEVICE TAG	QTY	CODE NUMBER	DESCRIPTION
PS-1-PS-2,4	6	P32AF-2C	SENSITIVE DIFF PRES CTL
	12	FTG18A-600R	REMOTE WTD PROBE
TE-1,2,	4	TE-6100-1	TEMP SENSING ELEMENT 17'
TE-3	2	TE-6000-4	SENSOR, 1000 OHM +/- .25X
	2	TE-6001-2	HOUSING F/O O.A. TEMP.
TE-4-TE-5	4	TQ-6000	TRANSMITTER
	4	TEA-K000000	20 FT. AVE. 100 OHM TE
	4	BZ-1000-6	ENCLOSURE
TS-1	2	A70HA-1C	TEMP CONTROL 4 WIRE, 2-C
V-1-V-2	---	---	SEE VALVE SCHEDULE
DA-1-DA-4	---	---	SEE DAMPER SCHEDULE
SM-1-SM-2	4	DH1851	SMOKE DETECTOR
	4	ST-10	SMOKE TUBES
R-1	2	RR2BA-UL	RELAY, 120 VAC
PS-5-PS-6	4	P74FA-5C	DIFF PRESS SWITCH
ACC	10	G-2010-5	1 1/2, 0-30 GAUGE

ANY MATERIAL WITH A (P) PRECEDING THE DEVICE TAG IS CONSIDERED PROPRIETARY EQUIPMENT AND IS BEING SUPPLIED BY JOHNSON CONTROLS, INC. ALL OTHER MATERIAL IS NON-PROPRIETARY EQUIPMENT.

Sequence of Operations

SYSTEM: Mixed Air Single Path, Constant Volume Air Handling Unit
AHU-402, AHU-404

CONFIGURATION: Return Air Temperature Control
Constant Air Volume with Supply and Return Fans

Occupied Mode

The supply and return fans will operate continuously in this mode.

Return Air Temperature Setpoint

The building operating engineer will set the return air temp. setpoint by adjusting the return air setpoint, RA-SP Form any ISC terminal. The digital controller will modulate controlled devices as described below to maintain a fan return air temperature of 75 F.

Return Air Temperature Loop

The return cooling deadband is added to the return air setpoint. This value establishes the point at which mechanical cooling begins when the controller uses proportional only control. The digital controller will continually adjust the damper and mechanical cooling command in sequence according to the controller's result of the proportional-integral cooling loop calculation. The digital controller modulates the controlled devices until the return air temperature equals the calculated return setpoint. The digital controller will continually adjust the heating command according to the controller's result of the proportional-integral heating loop calculation. The digital controller will modulate the heating control valve, V-1, mixed air dampers, DA-1-DA-3 and cooling control valve, V-2 until the discharge air temperature equals the setpoint. The controller will provide an output between 0 and 100 percent as the return air temperature travels through the proportional bands.

The state of 'Heating Mode' and 'Cooling mode' will lockout the operation of the controlled device, V-1 and V-2 if the respective mode is set 'OFF'. The PID control algorithm will sequence the heating and cooling devices so that both do not operate in the same proportional band.

The digital controller will control the mixed air dampers between minimum and 100 percent in the occupied mode and from 0 percent in the unoccupied mode.

Mixed air low limit

The mixed air low limit setpoint and the mixed air low limit proportional band will establish a back off effect to the mixed air damper output command. This happens when the mixed air temperature, TE-2 decreases into the range of the mixed air low limit plus the mixed air low limit proportional band. This back-off feature multiplies the damper command by the proportional percentage of the mixed air temperature inside the mixed air low limit proportional band. The mixed air low limit proportional band is reset inversely by 20 degrees between outdoor air temperatures of 40 and -30 degrees F.

Dry Bulb Economizer Switchover

When the outdoor air temperature, TE-3 is greater than the Econo Switchover setpoint, 68 F.(Adj.) the digital controller commands the mixed air dampers to minimum position(Adj.). When the outdoor air temperature decreases below the Econo Switch Setpoint minus the Econo Switch Differential, the controller modulates the mixed air dampers to provide free cooling. When ECON is on, free cooling is available.

Control systems, AHU-402 and AHU-404 will use a common outside air temperature value while the digital controller is online with its controlling NCM. In the event that communication is lost the controller will operate using the temperature element that is hardwired to that system, TE-3.

Heating Mode

The digital controller will enter the heating mode at outdoor air temperatures below 45 F. The digital controller will position the cooling control valve at zero percent and the heating water circulating pump will be turned on.

Cooling Mode

The digital controller will enter the cooling mode at outdoor air temperatures above 50 F. The digital controller will position the heating control valve at zero percent.

Electric Low Limit

The supply/return fans system will stop and the mixed air dampers will be positioned at zero percent in the event that the heating coil discharge drops below 37 F.(adjustable) at temperature switch, TS-1.

Filter Alarm

The mixed air filter condition will be monitored by differential pressure switch, PS-3. The switch will close in the event that the pressure drop exceeds .8 (adjustable) inches WG and an alarm will be sent to the ICS network, 'Dirty Mixed air Filter'.

The smoke detectors' condition will be monitored by the digital controller. The alarm contact will close in the event that smoke is detected in the supply or return ductwork and an alarm will be sent to the ICS network, 'Supply(or return) smoke detected'. The supply and return fans will stop through a hardware interlock in the event that either smoke detector is activated.

Loss of Air Flow

Upon loss of air flow as determined by sensitive pressure switches, PS-1 and PS-2 the following controlled devices will be commanded to the following states:

- Heating valve, V-1 will remain in control.
- Heating Circ Pump will remain on.
- Cooling valve, V-2 will be positioned at zero percent.
- Mixed air dampers, DA-1-3 will be positioned at zero percent.
- Return and supply fan positions will be commanded to zero percent.

Unoccupied Mode

The supply and return fans will remain off and the controlled devices will be commanded to the positions indicated above under 'Loss of Air Flow'.

Shutdown

Upon a command from the higher level digital controller, NC-28, the AHU digital controller will command all analog outputs to zero percent and will turn off all binary outputs.

Power Fail Restart

The power fail restart will delay the startup of the digital controller for 1 minute after a power failure for controller reset condition. This logic will hold the controller in the shutdown mode until the restart timer has expired.

The following point objects will be adjustable from any ICS terminal:

- Discharge air setpoint
- Heating and Cooling lockout setpoints
- Cooldown temperature setpoint(return air)

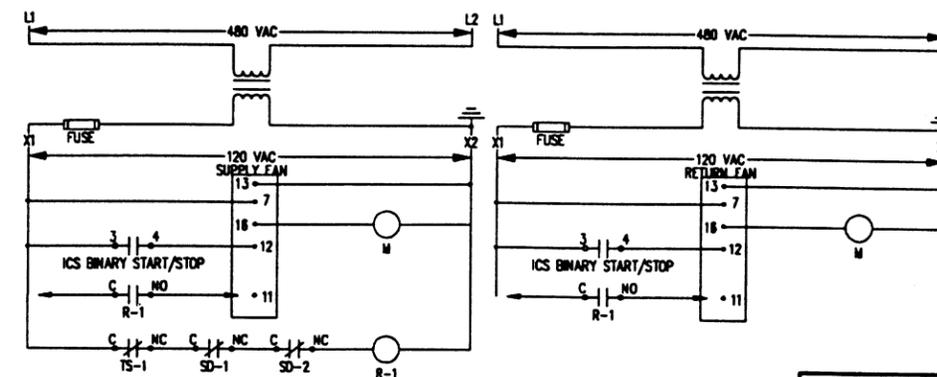
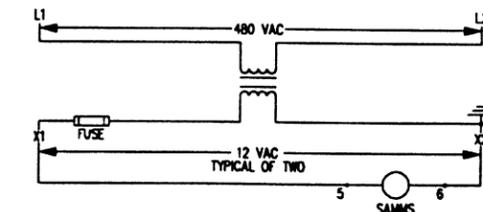
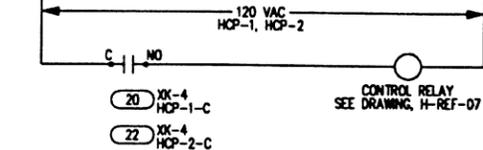
The following point objects will be monitored/alarmed at any ICS terminal:

- Electric low limit temperature switch, TS-1 status
- Mixed air filter differential pressure alarm, PS-3
- Supply and Return fan status, PS-1 and PS-2
- Smoke detectors, SD-1 and SD-2 status
- Smoke detectors, SD-1 and SD-2 status
- Heating Circ Pump Status, HCP-1 and HCP-2

Heating Water Circulating Pumps

The digital controller will start the lead pump at the start of the heating mode. In the event that the lead pump fails, the lag pump will be started. The lead/lag designation can be changed at the operator's discretion by scheduling binary data point 'HCP-LL'.

Motor Control



DRAWING TITLE		RECORD		DATE	
Air Handling Units AHU-402 and AHU-404		NO.	REVISION-LOCATION	ECN.	DATE
Single Path, Mixed Air, Constant Volume		SALES ENGR	PROJECT MGR	APPL ENGR	DRAWN
		JP	SF	DCS	BY SF
		DATE: 11/14/91		DATE	
PROJECT		The Argonne National Labs		CONTRACT NUMBER	
Advanced Photon Source Campus		9700 Cass Avenue South		91390-0009	
Argonne, IL 60439		JOHNSON CONTROLS		DRAWING NUMBER	
		Systems & Services Division		91-9-C-04A	
		3007 MALMO ROAD		DATE	
		ARLINGTON HEIGHTS		DATE	
		ILLINOIS 60005		DATE	
		708/364-1500 Mein		DATE	
		708/808-4438 Eng		DATE	