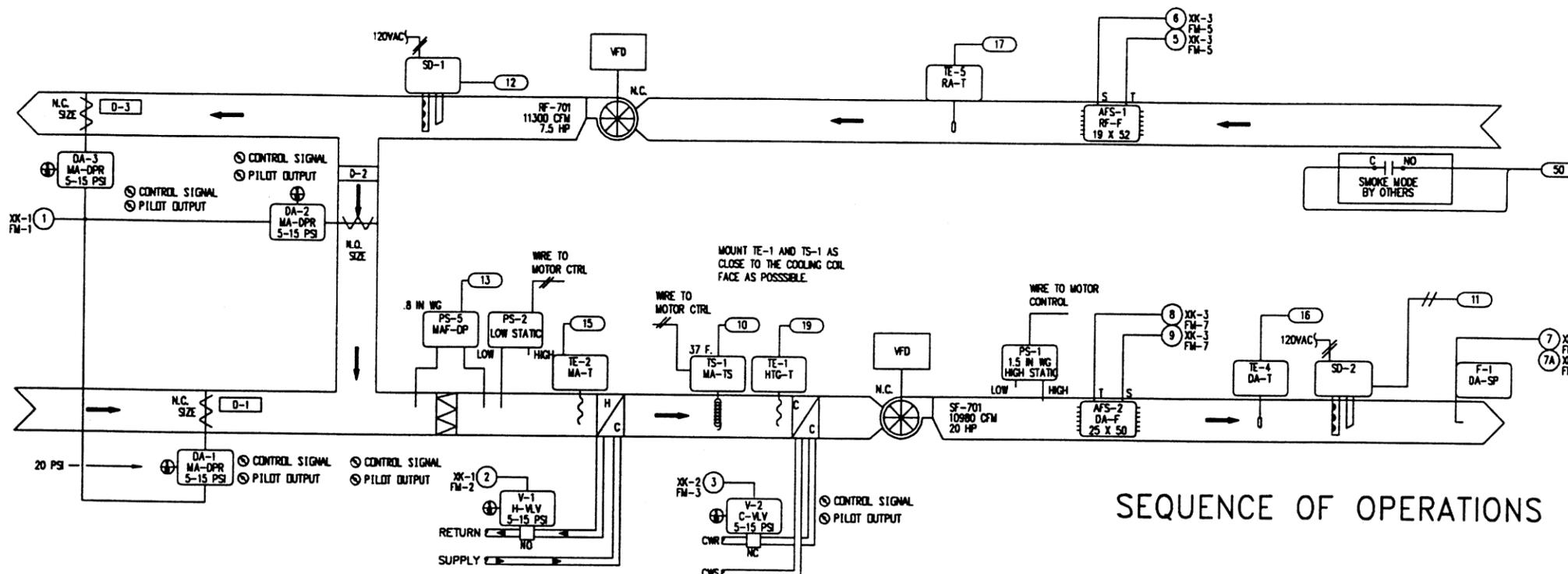


# FLOW DIAGRAM AND EQUIPMENT LOCATIONS FOR AIR HANDLING UNIT, AHU-701



| FIELD MATERIAL |     |             |   |
|----------------|-----|-------------|---|
| DEVICE TAG     | QTY | CODE NUMBER | DESCRIPTION                                   |
| V-1-V-2        | 2   | ----        | SEE SCHEDULE                                  |
| D-1-D-3        | 3   | ----        | SEE SCHEDULE                                  |
| DA-1-DA-3      | 3   | ----        | SEE SCHEDULE                                  |
| PS-1-PS-2      | 2   | 1900-5-NR   | DUCT PRESS MONITOR-DWYER                      |
| SD-1-SD-2      | 2   | DH1851AC-2  | DUCT DETECTOR, IOM.                           |
| TE-1-TE-2      | 2   | ST-10       | SAMPLING TUBE FOR HEATING COIL DISCHARGE TEMP |
| TE-4,5         | 2   | TE-6000-100 | SENSOR, 1000 OHM +/- .1% ELMENT HOLDER        |
| TS-1           | 2   | TE-6001-1   | TEMP CONTROL 2 WIRE, 2-C                      |
| ACC            | 10  | A70M-1C     | AIR GAGE 1-1/2"                               |
| R-2            | 1   | PD-109-20   | RELAY, PLUG IN, 3PDT                          |
|                | 1   | PD-101-35   | SOCKET, 119W BLADE                            |
| CS-1-CS-2      | 2   | 0150-1ND    | CURRENT SWITCH-NAK                            |
| PS-5           | 1   | P32AF-2C    | SEN DIFF PRESSURE SWITCH                      |
| AFS-1-AFS-2    | 2   | DAMD        | AIR FLOW MEASURING STATION                    |
| F-1            | 2   | FTG18A-600R | STATIC PROBE                                  |

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, Variable Volume Air Handling Unit AHU-701

**CONFIGURATION:** Supply Air Reset from Return Air Temperature Variable Air Volume with Supply and Return Fans

### Occupied Mode

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

### Discharge Air Temperature Setpoint

The building operating engineer will set the discharge air temperature by adjusting the discharge air setpoint, DA-SP form any ISC terminal. The digital controller will modulate controlled devices as described below to maintain a fan discharge temperature of 55 F.

### Discharge Temperature Loop

The discharge cooling deadband is added to the discharge 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 discharge air temperature equals the calculated discharge 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 discharge 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-701 will use a common outside air temperature value while the digital controller is online with its controlling NCM.

### 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.

### 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.

### Warm-up/Cool-down

The warm-up/cool-down mode initiation will take place through a command from the higher level digital controller, NC-20 on a schedule basis. When made active the AHU digital controller will start the fan system and will control at the occupied mode setpoints without the operation of the mixed air dampers. The controller will switch into the occupied mode when the mixed air temperature reaches 72 F., at this point the mixed air system will be enabled. The supply/return volume setpoint will be equal to zero in the warmup/cool-down mode.

### Single Supply and Return Fan - Volume Matching

The digital controller will provide an output command to the supply fan variable frequency drive based on the controller's PI loop calculation. The controller will add the static pressure offset value to the PI control calculation. The static pressure deadband value establishes a range above and below the static pressure setpoint where the error is considered zero, causing corrective action to stop. This value is input above and below the static pressure setpoint. The controller will establish a return fan volume setpoint by subtracting the CFM, Differential, 1,130 CFM from the actual supply fan CFM. The return volume proportional band integration value will cause the controller to continually provide corrective action until the actual return volume equals the return volume setpoint. If the calculation becomes unreliable, the output to the return fan will be zero percent.

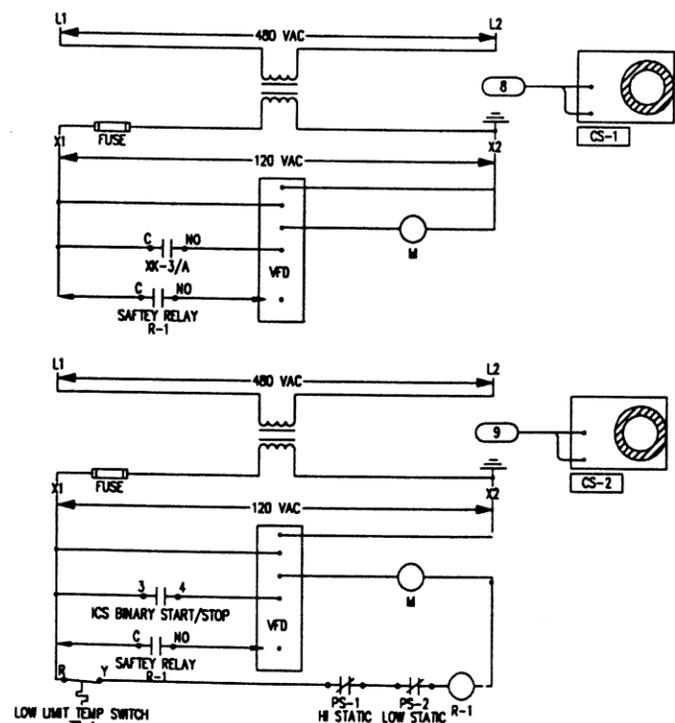
### Supply Static High/Low limit

The supply/return fans system will stop in the event that the supply static exceeds 5.00 inch WG or the mixed air static exceeds a negative 1.50 inches WG, at pressure sensing switches, PS-1 and PS-2. All controlled devices will be commanded to the position indicated in "Loss of Air Flow" until the appropriate pressure sensing switch is reset.

### 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.

## MOTOR CONTROL



DRAWING TITLE  
AHU-701  
FLOW DIAGRAM AND EQUIPMENT  
LOCATIONS  
CONTROL ENCLOSURE, EN-20108

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CONTRACT NUMBER  
91390-0009  
DRAWING NUMBER  
91-9-C-05A