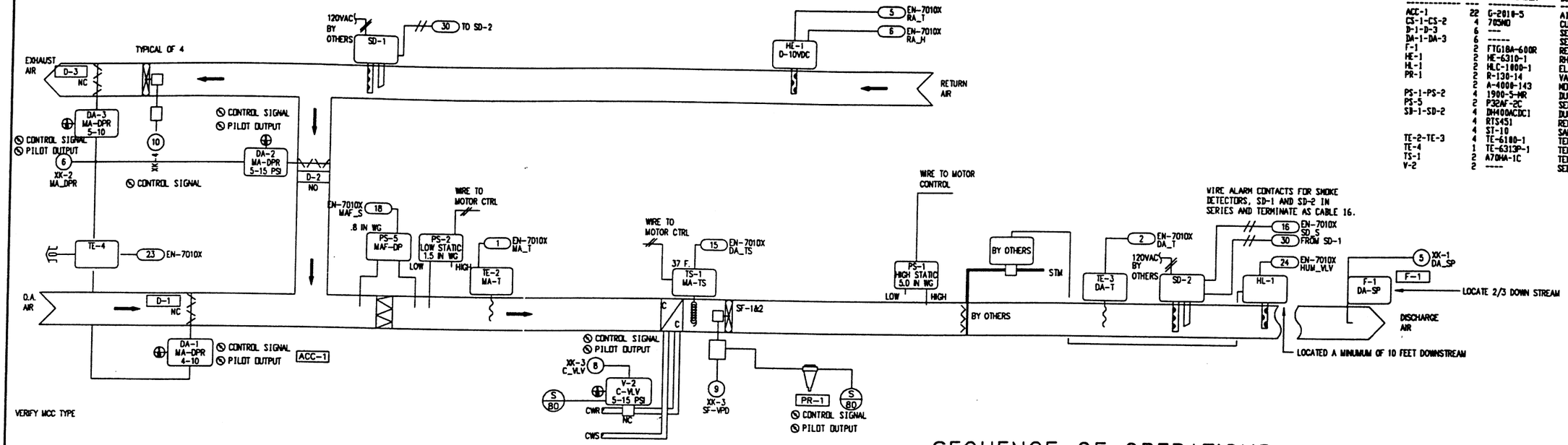
# FLOW DIAGRAM AND EQUIPMENT LOCATIONS FOR AIR HANDLING UNITS, AHU-1 AND AHU-2

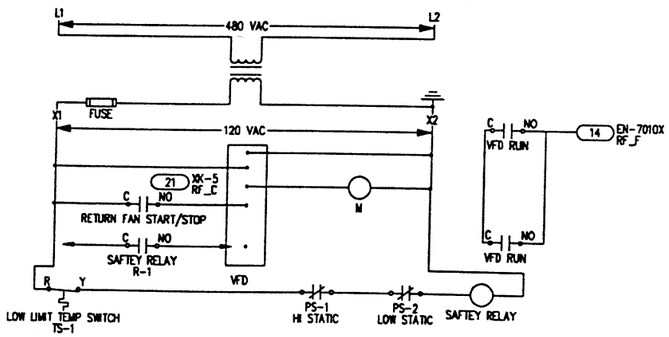



FIELD MATERIAL

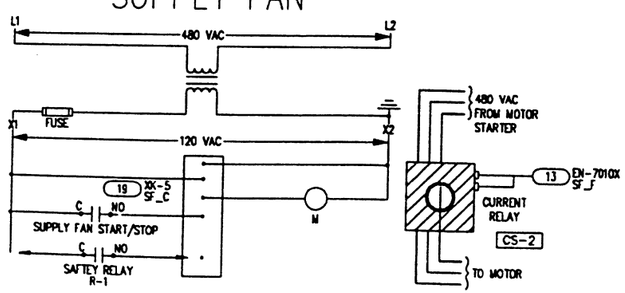
| DEVICE TAG | QTY | CODE NUMBER | DESCRIPTION |
|---|---|---|---|
| ACC-1 | 22 | G-2018-5 | AIR GAGE 1-1/2" |
| CS-1-CS-2 | 4 | 705MD | CURRENT SWITCH-VERIS |
| D-1-D-3 | 6 | ---- | SEE DAMPER SCHEDULE |
| DA-1-DA-3 | 6 | ----- | SEE DAMPER SCHEDULE |
| F-1 | 2 | FTG18A-600R | REMOTE MTD PROBE |
| HE-1 | 2 | HE-6310-1 | RH/TEMP TRANS/DUCT 0/100Z |
| HL-1 | 2 | HLC-1000-1 | ELEC HUMIDITY HIGH LIMIT-J.C.I. |
| PR-1 | 2 | R-130-14 | VALVE PRESSURE REGULATOR |
| | 2 | A-4000-143 | MOUNTING BRACKET, FOR |
| PS-1-PS-2 | 4 | 1900-5-MR | DUCT PRESS MONITOR-DWYER |
| PS-5 | 2 | P32AF-2C | SENSITIVE DIFF PRES CTL |
| SD-1-SD-2 | 4 | DH400ACDC1 | DUCT DETECTOR, ION. |
| | 4 | RTS451 | REMOTE TEST STATION DUCT |
| | 4 | ST-10 | SAMPLING TUBE FOR |
| TE-2-TE-3 | 4 | TE-6180-1 | TEMP SENSING ELEMENT 17' |
| TE-4 | 1 | TE-6313P-1 | TEMP SENSOR; 1000 OHM, NI |
| TS-1 | 2 | A70HA-1C | TEMP CONTROL 4 WIRE, 2-C |
| V-2 | 2 | ---- | SEE VALVE SCHEDULE |

## MOTOR CONTROL

### RELIEF FANS, TYP OF 2 DRIVES




### SUPPLY FAN




## SEQUENCE OF OPERATIONS

SYSTEM: Area Served: AHU-1 and AHU-2

CONFIGURATION: Constant Discharge Air Temperature Control
Mixed Air Single Path VAV with Supply Fan

**Occupied Mode**

The supply and relief 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 modulated 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-intergal cooling loop calculation. The digital controller modulates the controlled devices until the discharge air temperature equals the calculated discharge setpoint. The controller will provide an output between 0 and 100 percent as the discharge air temperature travels through the proportional bands.

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 then 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.

**Single Supply and Relief Fan - Control Signal Tracking**

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 control panel will establish a return fan signal by applying a ratio and offset bias to the supply fan position signal.

**Loss of Air Flow**

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

- Cooling valve, V-2 will be positioned at zero percent.
- Mixed air dampers, DA-1-3 will be positoned 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'.

**Power Fail Restart**

The power fail restart will delay the startup of the digital controller for 1 minute(AHU-1) and 3 minutes(AHU-2) after a power failure for controller reset condition. This logic will hold the controller in an OFF mode(All Binary outputs OFF and all Analog outputs at 0 %) until the restart timer has expired.

**Humidifier Control**

The digital controller and duct mounted humdity transmitter, HE-1 will modulate humidity controller. Duct mounted humidity controller, HL-1 will limit discharge humidity level to 90 percent.

**Static Limit**

Static limit differential pressure switches, PS-1 and PS-2 will stop the in the event that the levels are reached. Manual reset is required.

**Low Temp Event**

In the event that the cooling coil discharge temperature drops below 37 F., TS-1 will lockout the fan system.

**Filter Alarm**

An alarm will be provided to the ICS if the pressure drop accoss the filters exceed .8 in WG.

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DRAWING TITLE
Flow Diagram and Equipment Locations for AHU-1 & AHU-1 Single Path, Mixed Air-VAV W/Enclosure EN-7010X

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The Argonne National Labs
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Argonne, IL 60439

| REFERENCE DRAWING | NO. | REVISION-LOCATION | ECN | DATE | BY |
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