

Sequence of Operation

CCC – Child Development Center
2600 Mission Bell Drive
San Pablo, CA 94806

Packaged Carrier Rooftop Units AC-1, 2, 5, 6, 7 & 8

The packaged rooftop Carrier Units AC-1, 2, 5, 6, 7 & 8 will be scheduled by the Building Automation system (BAS) DDC or shall be manually commanded from an override pushbutton on zone sensor to run for a minimum of four hours during unoccupied mode. The AC units are equipped vendor furnished local Carrier controls that control economizer dampers and powered exhaust fans. BAS will control gas fired 2-stage heat exchangers & 2-stage DX cooling coils to maintain indoor temperature set point. For energy management purposes, the BAS DDC System shall place the AC units in the appropriate operating mode for:

- System Occupied/Unoccupied Control based on prescheduled time of day and holiday schedule
- Optimum Start Control and
- Warm-up mode Control.

Upon request for operation, the BAS system shall start the supply fan. The BAS system shall monitor the current in amps drawn by each unit fan as sensed by current transducer CT-1 and shall generate a software alarm if the current drawn exceed its setpoint by 5 Amps (adjustable).

System Start/stop: Optimum Start Control shall be scheduled from 1 hour before the normal occupied start hour until scheduled unoccupied time at the end of each day. During warm-up control mode, BAS system shall reset the unit discharge air temperature up to warm-up setpoint of 75 deg.F (adjustable), close the OA damper, disable cooling by disabling DX cooling and start the supply fan. The BAS system shall disable the warm-up mode when the return air temperature reaches setpoint of 69 Deg.F (adjustable) as sensed by return air sensor (DTE-3). Upon completion of warm-up mode control cycle, the BAS system shall disable the warm-up control mode and return the AC units to normal occupied control mode by returning the OA dampers to economizer controls and by returning the cooling to normal DX staging control.

Supply air temperature setpoint reset: The BAS system shall maintain supply air temperature setpoint between 55 deg.F and 65 deg.F (adjustable) as sensed by supply air sensor (DTE-3) by modulating in sequence, the outside/return dampers (in economizer mode) and staging DX cooling. The compressor stage control outputs shall have minimum ON time of 2 minutes and OFF time of 2 minutes (adjustable) to prevent short cycling. The BAS system shall monitor the supply air temperature as sensed by supply air sensor (DTE-3) on each unit and shall reset the supply air temperature setpoint based upon zone cooling requirements as determined from the zone sensor (RTS-2). The supply air temperature setpoint shall be reset based upon cooling requirements of the zones served by the unit. Supply air temperature setpoint reset shall utilize a direct acting PID loop for both economizer dampers & DX Cooling & reverse acting PID loop for gas fired 2-stage heating.

A comparative enthalpy control is carried out by BAS system to sense and compare enthalpy in outdoor air and return air to determine if outdoor air is suitable for "free" cooling. If OA is suitable for free cooling, the OA dampers shall modulate in response to the unit's SA temperature controls. If outside air temperature permits, the mixed air dampers shall modulate to maintain supply air temperature setpoint. The mixed air dampers shall be set to a minimum position of 15% (software adjustable) if outside air temperature exceeds return air temperature of 68 deg.F (adjustable). The DX cooling shall be staged to maintain supply air setpoint if the mixed air dampers are either at 100% open or are at minimum position.

AC Unit serves several zones in 1st Floor North area. BAS system shall monitor AC zone temperature on 1st Floor area as sensed by zone sensor (RTS-2) and shall generate a software alarm if the zone temperature exceeds setpoint by +/- 5 Deg.F. for 15 minutes (adjustable).

The following additional values for each AC Unit shall be available at the Central Campus interface equipment via the communication network:

- Quantity of active cooling stages
- Quantity of active heating stages
- room override status

Smoke Detection Shutdown: The supply fan and exhaust fan shall be hardwire interlocked with supply air duct mounted smoke detector and shall automatically shutdown the supply fan and exhaust fan and close the OA damper in the event of smoke detection in the supply duct.

Outside Air Temperature

The BAS system shall monitor outside air temperature and humidity as sensed by outside air temperature sensor (OAT-1) typical measurement for entire project.

Packaged Carrier AC Units AC-3 & 4 (with VVT sub-zone dampers)

The packaged rooftop Carrier Units AC-3 & 4 will be scheduled by the Building Automation system (BAS) DDC or shall be manually commanded from an override pushbutton on zone sensor to run for a minimum of four hours during unoccupied mode. The AC units are equipped vendor furnished local Carrier controls that control economizer dampers and powered exhaust fans. BAS will control gas fired 2-stage heat exchangers & 2-stage DX cooling coils to maintain supply air temperature set point. For energy management purposes, the BAS DDC System shall place the AC units in the appropriate operating mode for:

- System Occupied/Unoccupied Control based on prescheduled time of day and holiday schedule
- Optimum Start Control and
- Warm-up mode Control.

Upon request for operation, the BAS system shall start the supply fan. The BAS system shall monitor the current in amps drawn by each unit fan as sensed by current transducer CT-1 and shall generate a software alarm if the current drawn exceed its setpoint by 5 Amps (adjustable).

System Start/stop: Optimum Start Control shall be scheduled from 1 hour before the normal occupied start hour until scheduled unoccupied time at the end of each day

Supply air temperature setpoint reset: The BAS system shall maintain supply air temperature setpoint between 55 deg.F and 65 deg.F (adjustable) as sensed by supply air sensor (DTE-3) by modulating in sequence, the outside/return dampers (in economizer mode) and staging DX cooling. The compressor stage control outputs shall have minimum ON time of 2 minutes and OFF time of 2 minutes (adjustable) to prevent short cycling. The BAS system shall monitor the supply air temperature as sensed by supply air sensor (DTE-3) on each unit and shall reset the supply air temperature setpoint based upon zone cooling requirements as determined from the zone sensor (RTS-2). The supply air temperature setpoint shall be reset based upon cooling requirements of the VVT Terminals served by the unit. Supply air temperature setpoint reset shall utilize a direct acting PID loop for both economizer dampers & DX Cooling & reverse acting PID loop for gas fired 2-stage heating. Heating versus cooling and the magnitude of each to be programmed to satisfy the majority of the space with critical spaces having more priority.

Supply Duct Static Pressure Control: The BAS system shall modulate the bypass damper (DA-B) to maintain supply duct static pressure at setpoint. The BAS system shall monitor supply air static pressure as sensed by duct static pressure sensor (DPT-10A) and shall reset the supply air setpoint based upon supply air pressurization required by the operating VAV boxes. The BAS system shall generate a software alarm if supply air static pressure drops below 0.40"WC.

The following additional values for each AC Unit shall be available at the Central Campus interface equipment via the communication network:

- Room temperature at each VVT sensor
- Supply Duct static pressure (inches WC)
- By-pass damper position (0-100%)
- Supply air quantity to each VVT box (CFM)
- Damper position of each VVT box (0-100%)
- Quantity of active cooling stages
- Quantity of active heating stages
- room override status

Smoke Detection Shutdown: The supply fan and exhaust fan shall be hardwire interlocked with supply air duct mounted smoke detector and shall automatically shutdown the supply fan and exhaust fan and close the OA damper in the event of smoke detection in the supply duct.

Restroom exhaust fans EF-1, 3, 6, 7 & 8

The restroom exhaust fans EF-1, 3, 6, 7 & 8 will be scheduled by the Building Automation system (BAS) DDC or shall be manually commanded from local starter. The BAS system shall monitor the current in amps drawn by each exhaust fan as sensed by current transducer CT-1 and shall generate a software alarm if the current drawn exceed its setpoint by 5 Amps (adjustable).

Electrical Room exhaust fan EF-2

The electrical room exhaust fan EF-2 will be start/stopped via line voltage thermostat (set at 85 Deg.F). Building Automation system (BAS) shall not monitor its status.

Kitchen Exhaust Hood exhaust fans EF-4 & 5

The kitchen exhaust hood exhaust fans EF-4 & 5 will be start/stopped via local hood mounted on/off switch. Building Automation system (BAS) shall not monitor their status.