SEQUENCE OF OPERATION

AIR HANDLING UNITS AHU–1A, 2A, 5A AND 8A:

1. The AHU supply fan will be energized through the BMS whenever the hand–off–auto switch is in the "auto" position. When the switch is in the "hand" position, the fan will run continuously. A differential pressure sensor at the supply fan shall prove airflow.
2. When the AHU is energized and the building is occupied, the minimum outside air damper shall be opened to provide the scheduled minimum outside air airflow, the return air damper shall be opened, and the supply air damper shall be opened. When the AHU is off, the minimum outside air damper, the return air damper, and the supply air damper shall be closed. This unit does not have an economizer cycle.
3. When the AHU is energized and the building is unoccupied, the minimum outside air damper shall remian closed, the return air damper shall be opened, and the supply air damper shall be opened. When the AHU is off, the minimum outside air damper, the return air damper, and the supply air damper shall be closed.
4. Occupancy Mode: The occupancy mode shall be communicated or hardwired to the AHU controller. OCCUPIED MODE: When the AHU is in the occupied mode, the unit shall maintain the space temperature at the active occupied heating or occupied cooling setpoint. The occupied mode shall be the default mode for the AHU. UNOCCUPIED MODE: When the AHU is is in the unoccupied mode, the unit shall maintain the space temperature at the active unoccupied heating or unoccupied cooling setpoint. UNOCCUPIED BYPASS: The tenant or the BMS operator shall be able to override the unoccupied mode from an unoccupied override pushbutton on the space temperature sensor or from an input from the BMS operator. The override shall shall place the AHU in the occupied mode for a maximum of 4 hours (adj.).
5. Setpoints: The occupied cooling setpoint shall be 75 deg.F (adj.). The unoccupied cooling setpoint shall be 85 deg.F (adj.). The occupied heating setpoint shall be 71 deg.F (adj.). The unoccupied heating setpoint shall be 60 deg.F (adj.). There shall be a minimum 4 deg.F (adj.) deadband between the occupied heating and cooling setpoints. An adjustble deadband, initially set at 3 deg.F (adj.) shall be provided between heating and cooling operation. The BMS operator shall be able to limit occupant adjustable space temperature setpoint to +/– 3 deg.F (adj.).
6. Heating Coil and Cooling Coil Control: The space temperature sensor shall modulate the heating water and chilled water control valves in sequence to maintain the active space temperature setpoint. If communications with the space temperature sensor is lost, the AHU shall control to setpoints using the return air temperature sensor.
7. Mixed air low limit: If the mixed air temperature sensor senses a mixed air temperature below 50 deg.F (adj.), the the outside air damper shall modulate to a position less than the minimum OSA damper position. If the mixed air temperature sensor fails, an alarm shall be annunciated to the BMS. The outside air damper shall close if the mixed air temperature sensor has failed and the outside air temperature is below 40 deg.F (adj.).
8. If the low limit thermostat (set at 38°F) trips, the AHU shall be shut down, the AHU's dampers shall close, and an alarm shall be annunciated at the BMS. The heating and cooling coil control valves shall be opened 100% for full flow through the coils. A manual reset shall be required to restart the AHU.
9. Duct smoke detectors in the return and supply air streams shall stop the air handling unit and send an alarm to the BMS and the Fire Alarm System any time products of combustion are detected. When the AHU is stopped, the AHU's associated SA, RA, & OSA dampers shall close. When the smoke detectors serving AHU–2A stop the AHU, the Smoke Exhaust Fan F–47A shall be energized & its associated motorized damper shall open. When the smoke detectors serving AHU–8A stop the AHU, the Smoke Exhaust Fan F–48A shall be energized & its associated motorized damper shall open.
10. Filter Status: A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes during normal operation, a dirty filter alarm shall be annunciated at the BMS.
11. If communications with the BMS is lost, the AHU controller shall operate using default modes and setpoints.
12. Provide float switch in cooling coil drain pan. Upon sensing a high water level, The chilled water valve shall close to the the cooling coil and an alarm shall be sent to the BMS.

MULTIZONE AIR HANDLING UNIT AHU–21A:

1. The AHU supply fan will be energized through the BMS whenever the hand–off–auto switch is in the "auto" position. When the switch is in the "hand" position, the fan will run continuously. A differential pressure sensor at the supply fan shall prove airflow.
2. When the AHU is energized and the building is occupied, the minimum outside air damper shall be opened to provide the scheduled minimum outside air airflow, the return air damper shall be opened, and the supply air dampers shall be opened. When the AHU is off, the minimum outside air damper, the return air damper, and the supply air dampers shall be closed. This unit does not have an economizer cycle.
3. When the AHU is energized and the building is unoccupied, the minimum outside air damper shall remian closed, the return air damper shall be opened, and the supply air dampers shall be opened. When the AHU is off, the minimum outside air damper, the return air damper, and the supply air dampers shall be closed.
4. Occupancy Mode: The occupancy mode shall be communicated or hardwired to the AHU controller. OCCUPIED MODE: When the AHU is in the occupied mode, the unit shall maintain the space temperature at the active occupied heating or occupied cooling setpoint. The occupied mode shall be the default mode for the AHU. UNOCCUPIED MODE: When the AHU is is in the unoccupied mode, the unit shall maintain the space temperature at the active unoccupied heating or unoccupied cooling setpoint. UNOCCUPIED BYPASS: The tenant or the BMS operator shall be able to override the unoccupied mode from an unoccupied override pushbutton on the space temperature sensor or from an input from the BMS operator. The override shall shall place the AHU in the occupied mode for a maximum of 4 hours (adj.).
5. Setpoints: The occupied cooling setpoint shall be 75 deg.F (adj.). The unoccupied cooling setpoint shall be 85 deg.F (adj.). The occupied heating setpoint shall be 71 deg.F (adj.). The unoccupied heating setpoint shall be 60 deg.F (adj.). There shall be a minimum 4 deg.F (adj.) deadband between the occupied heating and cooling setpoints. An adjustble deadband, initially set at 3 deg.F (adj.) shall be provided between heating and cooling operation. The BMS operator shall be able to limit occupant adjustable space temperature setpoint to +/– 3 deg.F (adj.).
6. Heating Coil and Cooling Coil Control: The chilled water control valve shall open whenever either of the 2 zone space temperature sensors is calling for cooling. Each of the zone space temperature sensors shall modulate its associated cooling coil face/bypass zone dampers and the zone's heating water control valve in sequence to maintain the active space temperature setpoint. If communications with the space temperature sensor is lost, the AHU shall control to setpoints using the return air temperature sensor.
7. Mixed air low limit: If the mixed air temperature sensor senses a mixed air temperature below 50 deg.F (adj.), the the outside air damper shall modulate to a position less than the minimum OSA damper position. If the mixed air temperature sensor fails, an alarm shall be annunciated to the BMS. The outside air damper shall close if the mixed air temperature sensor has failed and the outside air temperature is below 40 deg.F (adj.).
8. If the low limit thermostat (set at 38°F) trips, the AHU shall be shut down, the AHU's dampers shall close, and an alarm shall be annunciated at the BMS. The heating and cooling coil control valves shall be opened 100% for full flow through the coils. A manual reset shall be required to restart the AHU.
9. Duct smoke detectors in the return and supply air streams shall stop the air handling unit and send an alarm to the BMS and the Fire Alarm System any time products of combustion are detected. When the AHU is stopped, the AHU's associated SA, RA, & OSA dampers shall close. When the smoke detectors serving AHU–21A stop the AHU, the Smoke Exhaust Fan F–48A (field verify the actual interlocked fan) shall be energized & its associated motorized damper shall open.
10. Filter Status: A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes during normal operation, a dirty filter alarm shall be annunciated at the BMS.
11. If communications with the BMS is lost, the AHU controller shall operate using default modes and setpoints.
12. Provide float switch in cooling coil drain pan. Upon sensing a high water level, The chilled water valve shall close to the the cooling coil and an alarm shall be sent to the BMS.

AIR HANDLING UNITS AHU–9A AND 10A:

1. The AHU supply fan will be energized through the BMS whenever the hand–off–auto switch is in the "auto" position. When the switch is in the "hand" position, the fan will run continuously. A differential pressure sensor at the supply fan shall prove airflow.
2. When the AHU is energized and the building is occupied, the minimum outside air damper shall be opened to provide the scheduled minimum outside air airflow, the return air damper shall be opened, the supply air damper shall be opened, the damper at the smoke supply fan shall be closed, & the damper at the smoke exhaust fan shall be closed. When the AHU is off (under a non–smoke control situation), the minimum outside air damper, the return air damper, and the supply air damper, the damper at the smoke supply fan, and the damper at the smoke exhaust fan shall be closed. This unit does not have an economizer cycle.
3. When the AHU is energized and the building is unoccupied, the minimum outside air damper shall remian closed, the return air damper shall be opened, the supply air damper shall be opened, the damper at the smoke supply fan shall be closed, & the damper at the smoke exhaust fan shall be closed. When the AHU is off, the minimum outside air damper, the return air damper, and the supply air damper shall be closed.
4. Occupancy Mode: The occupancy mode shall be communicated or hardwired to the AHU controller. OCCUPIED MODE: When the AHU is in the occupied mode, the unit shall maintain the space temperature at the active occupied heating or occupied cooling setpoint. The occupied mode shall be the default mode for the AHU. UNOCCUPIED MODE: When the AHU is in the unoccupied mode, the unit shall maintain the space temperature at the active unoccupied heating or unoccupied cooling setpoint. UNOCCUPIED BYPASS: The tenant or the BMS operator shall be able to override the unoccupied mode from an unoccupied override pushbutton on the space temperature sensor or from an input from the BMS operator. The override shall shall place the AHU in the occupied mode for a maximum of 4 hours (adj.).
5. Setpoints: The occupied cooling setpoint shall be 75 deg.F (adj.). The unoccupied cooling setpoint shall be 85 deg.F (adj.). The occupied heating setpoint shall be 71 deg.F (adj.). The unoccupied heating setpoint shall be 60 deg.F (adj.). There shall be a minimum 4 deg.F (adj.) deadband between the occupied heating and cooling setpoints. An adjustble deadband, initially set at 3 deg.F (adj.) shall be provided between heating and cooling operation. The BMS operator shall be able to limit occupant adjustable space temperature setpoint to +/– 3 deg.F (adj.).
6. Heating Coil and Cooling Coil Control: The space temperature sensor shall modulate the heating water and chilled water control valves in sequence to maintain the active space temperature setpoint. If the heating setpoint cannot be maintained when the heating water coil is 90% (adj.) open, then the stages of electric preheat shall be staged on. If the mixed air temperature falls below 45 deg.F (adj.), then the stages of electric heat shall be cycled on to maintain a minimum of 45 deg.F (adj.) entering the cooling coil. If communications with the space temperature sensor is lost, the AHU shall control to setpoints using the return air temperature sensor.
7. Mixed air low limit: If the electric preheat coil discharge air temperature sensor senses an air temperature below 40 deg.F (adj.), the the outside air damper shall modulate to a position less than the minimum OSA damper position. If the electric preheat coil discharge air temperature sensor fails, an alarm shall be annunciated to the BMS. The outside air damper shall close if the electric preheat coil discharge air temperature sensor has failed and the outside air temperature is below 40 deg.F (adj.).
8. If the low limit thermostat (set at 38°F) trips, the AHU shall be shut down, the AHU's dampers shall close, and an alarm shall be annunciated at the BMS. The heating and cooling coil control valves shall be opened 100% for full flow through the coils. A manual reset shall be required to restart the AHU.
9. Duct smoke detectors in the return and supply air streams shall send an alarm to the BMS and the Fire Alarm System any time products of combustion are detected. The AHU shall remain running, the minimum outside air damper shall be closed, the return air damper shall be closed, the supply air damper shall be opened, the damper at the smoke supply fan shall be opened, & the damper at the smoke exhaust fan shall be opened. The AHU's associated smoke control exhaust fan and smoke control supply fan shall be energized.
10. Filter Status: A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes during normal operation, a dirty filter alarm shall be annunciated at the BMS.
11. If communications with the BMS is lost, the AHU controller shall operate using default modes and setpoints.
12. Provide float switch in cooling coil drain pan. Upon sensing a high water level, The chilled water valve shall close to the the cooling coil and an alarm shall be sent to the BMS.
13. BMS shall monitor each dampers position thru damper open and closed end switches and shall report to BMS when dampers are not in their current position.
14. The control dampers at the smoke exhaust fans and the smoke supply fans shall be interlocked to open and close whenever their associated fan is energized/de–energized.

AIR HANDLING UNITS AHU–1B AND 2B:

1. The AHU supply fan will be energized through the BMS whenever the hand–off–auto switch is in the "auto" position. When the switch is in the "hand" position, the fan will run continuously. A differential pressure sensor at the supply fan shall prove airflow.
2. When the AHU is energized and the building is occupied, the minimum outside air damper shall be opened to provide the scheduled minimum outside air airflow, and the supply air dampers shall be opened. When the AHU is off, the minimum outside air damper, and the supply air dampers shall be closed. This unit does not have an economizer cycle.
3. When the AHU is energized and the building is unoccupied, the minimum outside air damper shall remian closed, and the supply air dampers shall be opened. When the AHU is off, the minimum outside air damper, and the supply air dampers shall be closed.
4. Occupancy Mode: The occupancy mode shall be communicated or hardwired to the AHU controller. OCCUPIED MODE: When the AHU is in the occupied mode, the unit shall maintain the space temperature at the active occupied heating or occupied cooling setpoint. The occupied mode shall be the default mode for the AHU. UNOCCUPIED MODE: When the AHU is in the unoccupied mode, the unit shall maintain the space temperature at the active unoccupied heating or unoccupied cooling setpoint. UNOCCUPIED BYPASS: The tenant or the BMS operator shall be able to override the unoccupied mode from an unoccupied override pushbutton on the space temperature sensor or from an input from the BMS operator. The override shall shall place the AHU in the occupied mode for a maximum of 4 hours (adj.).
5. Setpoints: The occupied cooling setpoint shall be 75 deg.F (adj.). The unoccupied cooling setpoint shall be 85 deg.F (adj.). The occupied heating setpoint shall be 71 deg.F (adj.). The unoccupied heating setpoint shall be 60 deg.F (adj.). There shall be a minimum 4 deg.F (adj.) deadband between the occupied heating and cooling setpoints. An adjustble deadband, initially set at 3 deg.F (adj.) shall be provided between heating and cooling operation. The BMS operator shall be able to limit occupant adjustable space temperature setpoint to +/– 3 deg.F (adj.).
6. Heating Coil and Cooling Coil Control: The chilled water control valve shall open whenever the space temperature sensor is calling for cooling. The heating water control valve shall open whenever the space temperature sensor is calling for heating. The space temperature sensor shall modulate the cooling/heating coil face/bypass dampers to maintain the active space temperature setpoint. If communications with the space temperature sensor is lost, the AHU shall control to setpoint using the return air temperature sensor.
7. Mixed air low limit: If the mixed air temperature sensor senses a mixed air temperature below 50 deg.F (adj.), the the outside air damper shall modulate to a position less than the minimum OSA damper position. If the mixed air temperature sensor fails, an alarm shall be annunciated to the BMS. The outside air damper shall close if the mixed air temperature sensor has failed and the outside air temperature is below 40 deg.F (adj.).
8. If the low limit thermostat (set at 38°F) trips, the AHU shall be shut down, the AHU's dampers shall close, and an alarm shall be annunciated at the BMS. The heating and cooling coil control valves shall be opened 100% for full flow through the coils. A manual reset shall be required to restart the AHU.
9. Duct smoke detectors in the return and supply air streams shall stop the air handling unit and send an alarm to the BMS and the Fire Alarm System any time products of combustion are detected. When the AHU is stopped, the AHU's associated SA, & OSA dampers shall close.
10. Filter Status: A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes during normal operation, a dirty filter alarm shall be annunciated at the BMS.
11. If communications with the BMS is lost, the AHU controller shall operate using default modes and setpoints.
12. Provide float switch in cooling coil drain pan. Upon sensing a high water level, The chilled water valve shall close to the the cooling coil and an alarm shall be sent to the BMS.

AIR HANDLING UNITS AHU–8B AND 9B:

1. The AHU supply fan will be energized through the BMS whenever the hand–off–auto switch is in the "auto" position. When the switch is in the "hand" position, the fan will run continuously. A differential pressure sensor at the supply fan shall prove airflow.
2. When the AHU is energized and the building is occupied, the minimum outside air damper shall be opened to provide the scheduled minimum outside air airflow, the return air damper shall be opened, and the supply air damper shall be opened, anf the AHU's associated outside air intake fan shall be energized. When the AHU is off, the AHU's associated outside air intake fan shall be de–energized. When the AHU is off, the minimum outside air damper and the supply air damper shall be closed. This unit does not have an economizer cycle.
3. When the AHU is energized and the building is unoccupied, the minimum outside air damper shall remian closed, the unit's outside air intake fan shall remain off and the supply air damper shall be opened. When the AHU is off, the minimum outside air damper, and the supply air damper shall be closed, and the unit's outside air intake fan shall be off.
4. Occupancy Mode: The occupancy mode shall be communicated or hardwired to the AHU controller. OCCUPIED MODE: When the AHU is in the occupied mode, the unit shall maintain the space temperature at the active occupied heating or occupied cooling setpoint. The occupied mode shall be the default mode for the AHU. UNOCCUPIED MODE: When the AHU is is in the unoccupied mode, the unit shall maintain the space temperature at the active unoccupied heating or unoccupied cooling setpoint. UNOCCUPIED BYPASS: The tenant or the BMS operator shall be able to override the unoccupied mode from an unoccupied override pushbutton on the space temperature sensor or from an input from the BMS operator. The override shall shall place the AHU in the occupied mode for a maximum of 4 hours (adj.).
5. Setpoints: The occupied cooling setpoint shall be 75 deg.F (adj.). The unoccupied cooling setpoint shall be 85 deg.F (adj.). The occupied heating setpoint shall be 71 deg.F (adj.). The unoccupied heating setpoint shall be 60 deg.F (adj.). There shall be a minimum 4 deg.F (adj.) deadband between the occupied heating and cooling setpoints. An adjustble deadband, initially set at 3 deg.F (adj.) shall be provided between heating and cooling operation. The BMS operator shall be able to limit occupant adjustable space temperature setpoint to +/– 3 deg.F (adj.).
6. Heating Coil and Cooling Coil Control: The space temperature sensor shall modulate the heating water and chilled water control valves in sequence to maintain the active space temperature setpoint. If communications with the space temperature sensor is lost, the AHU shall control to setpoints using the return air temperature sensor.
7. Mixed air low limit: If the mixed air temperature sensor senses a mixed air temperature below 50 deg.F (adj.), the the outside air damper shall modulate to a position less than the minimum OSA damper position. If the mixed air temperature sensor fails, an alarm shall be annunciated to the BMS. The outside air damper shall close and the outside air intake fan shall be de–energized if the mixed air temperature sensor has failed and the outside air temperature is below 40 deg.F (adj.).
8. If the low limit thermostat (set at 38°F) trips, the AHU shall be shut down, the AHU's dampers shall close, the outside air intake fan shall be de–energized, and an alarm shall be annunciated at the BMS. The heating and cooling coil control valves shall be opened 100% for full flow through the coils. A manual reset shall be required to restart the AHU.
9. Duct smoke detectors in the return and supply air streams shall stop the air handling unit and send an alarm to the BMS and the Fire Alarm System any time products of combustion are detected. When the AHU is stopped, the AHU's associated SA & OSA dampers shall close, and the outside air intake fan shall be de–energized.
10. Filter Status: A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes during normal operation, a dirty filter alarm shall be annunciated at the BMS.
11. If communications with the BMS is lost, the AHU controller shall operate using default modes and setpoints.
12. Provide float switch in cooling coil drain pan. Upon sensing a high water level, The chilled water valve shall close to the the cooling coil and an alarm shall be sent to the BMS.

AIR HANDLING UNIT AHU–11B:

1. The AHU supply fan will be energized through the BMS whenever the hand–off–auto switch is in the "auto" position. When the switch is in the "hand" position, the fan will run continuously. A differential pressure sensor at the supply fan shall prove airflow.
2. When the AHU is energized and the building is occupied, the minimum outside air damper shall be opened to provide the scheduled minimum outside air airflow, the return air damper shall be opened, and the supply air dampers shall be opened. When the AHU is off, the minimum outside air damper, the return air damper, and the supply air dampers shall be closed. This unit does not have an economizer cycle.
3. When the AHU is energized and the building is unoccupied, the minimum outside air damper shall remian closed, the return air damper shall be opened, and the supply air dampers shall be opened. When the AHU is off, the minimum outside air damper, the return air damper, and the supply air dampers shall be closed.
4. Occupancy Mode: The occupancy mode shall be communicated or hardwired to the AHU controller. OCCUPIED MODE: When the AHU is in the occupied mode, the unit shall maintain the space temperature at the active occupied heating or occupied cooling setpoint. The occupied mode shall be the default mode for the AHU. UNOCCUPIED MODE: When the AHU is is in the unoccupied mode, the unit shall maintain the space temperature at the active unoccupied heating or unoccupied cooling setpoint. UNOCCUPIED BYPASS: The tenant or the BMS operator shall be able to override the unoccupied mode from an unoccupied override pushbutton on the space temperature sensors or from an input from the BMS operator. The override shall shall place the AHU in the occupied mode for a maximum of 4 hours (adj.).
5. Setpoints: The occupied cooling setpoint shall be 75 deg.F (adj.). The unoccupied cooling setpoint shall be 85 deg.F (adj.). The occupied heating setpoint shall be 71 deg.F (adj.). The unoccupied heating setpoint shall be 60 deg.F (adj.). There shall be a minimum 4 deg.F (adj.) deadband between the occupied heating and cooling setpoints. An adjustble deadband, initially set at 3 deg.F (adj.) shall be provided between heating and cooling operation. The BMS operator shall be able to limit occupant adjustable space temperature setpoint to +/– 3 deg.F (adj.).
6. Heating Coil and Cooling Coil Control: The chilled water control valve shall open and modulate whenever either of the 3 zone space temperature sensors is calling for cooling, and be controlled by the space temperature sensor that is calling for the most cooling. Each of the zone space temperature sensors shall modulate its associated zone heating water control valve in sequence to maintain the active space temperature heating setpoint. If communications with the space temperature sensors is lost, the AHU shall control to setpoints using the return air temperature sensor.
7. Mixed air low limit: If the mixed air temperature sensor senses a mixed air temperature below 50 deg.F (adj.), the the outside air damper shall modulate to a position less than the minimum OSA damper position. If the mixed air temperature sensor fails, an alarm shall be annunciated to the BMS. The outside air damper shall close if the mixed air temperature sensor has failed and the outside air temperature is below 40 deg.F (adj.).
8. If the low limit thermostat (set at 38°F) trips, the AHU shall be shut down, the AHU's dampers shall close, and an alarm shall be annunciated at the BMS. The cooling coil control valve shall be opened 100% for full flow through the coils. A manual reset shall be required to restart the AHU.
9. Duct smoke detectors in the return and supply air streams shall stop the air handling unit and send an alarm to the BMS and the Fire Alarm System any time products of combustion are detected. When the AHU is stopped, the AHU's associated SA, RA, & OSA dampers shall close.
10. Filter Status: A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes during normal operation, a dirty filter alarm shall be annunciated at the BMS.
11. If communications with the BMS is lost, the AHU controller shall operate using default modes and setpoints.
12. Provide float switch in cooling coil drain pan. Upon sensing a high water level, The chilled water valve shall close to the the cooling coil and an alarm shall be sent to the BMS.

AIR HANDLING UNITS AHU–16B:

1. The AHU supply fan will be energized through the BMS whenever the hand–off–auto switch is in the "auto" position. When the switch is in the "hand" position, the fan will run continuously. A differential pressure sensor at the supply fan shall prove airflow.
2. When the AHU is energized and the building is occupied, the minimum outside air damper shall be opened, the minimum OSA intake fan shall be energized, the return air damper shall be opened, the supply air damper shall be opened, the smoke maximum OSA supply damper shall be closed, & the damper at the smoke exhaust fan shall be closed. When the AHU is off, the minimum and maximum outside air dampers shall be closed, the minimum OSA intake fan shall be de–energized, the return air damper shall be closed, the supply air damper shall be closed, the damper at the smoke exhaust fan shall be closed, and the smoke exhaust fan shall be off. This unit does not have an economizer cycle.
3. When the AHU is energized and the building is unoccupied, the minimum and maximum outside air dampers shall remain closed, the return air damper shall be opened, the supply air damper shall be opened, the damper at the smoke exhaust fan shall be closed, the minimum OSA fan shall be off, and the smoke exhaust fan shall be off.
4. Occupancy Mode: The occupancy mode shall be communicated or hardwired to the AHU controller. OCCUPIED MODE: When the AHU is in the occupied mode, the unit shall maintain the space temperature at the active occupied heating or occupied cooling setpoint. The occupied mode shall be the default mode for the AHU. UNOCCUPIED MODE: When the AHU is in the unoccupied mode, the unit shall maintain the space temperature at the active unoccupied heating or unoccupied cooling setpoint. UNOCCUPIED BYPASS: The tenant or the BMS operator shall be able to override the unoccupied mode from an unoccupied override pushbutton on the space temperature sensor or from an input from the BMS operator. The override shall shall place the AHU in the occupied mode for a maximum of 4 hours (adj.).
5. Setpoints: The occupied cooling setpoint shall be 75 deg.F (adj.). The unoccupied cooling setpoint shall be 85 deg.F (adj.). The occupied heating setpoint shall be 71 deg.F (adj.). The unoccupied heating setpoint shall be 60 deg.F (adj.). There shall be a minimum 4 deg.F (adj.) deadband between the occupied heating and cooling setpoints. An adjustble deadband, initially set at 3 deg.F (adj.) shall be provided between heating and cooling operation. The BMS operator shall be able to limit occupant adjustable space temperature setpoint to +/– 3 deg.F (adj.).
6. Heating Coil and Cooling Coil Control: The space temperature sensor shall modulate the heating water and chilled water control valves in sequence to maintain the active space temperature setpoint. If the heating setpoint cannot be maintained when the heating water coil is 90% (adj.) open, then the stages of electric preheat shall be staged on. If the mixed air temperature falls below 45 deg.F (adj.), then the stages of electric heat shall be cycled on to maintain a minimum of 45 deg.F (adj.) entering the cooling coil. If communications with the space temperature sensor is lost, the AHU shall control to setpoints using the return air temperature sensor.
7. Mixed air low limit: If the electric preheat coil discharge air temperature sensor senses an air temperature below 40 deg.F (adj.), the the outside air damper shall modulate to a position less than the minimum OSA damper position. If the electric preheat coil discharge air temperature sensor fails, an alarm shall be annunciated to the BMS. The outside air damper shall close and the OSA fan shall be de–energized if the electric preheat coil discharge air temperature sensor has failed and the outside air temperature is below 40 deg.F (adj.).
8. If the low limit thermostat (set at 38°F) trips, the AHU shall be shut down, the AHU's dampers shall close, the OSA fan shall be de–energized, and an alarm shall be annunciated at the BMS. The cooling coil control valve shall be opened 100% for full flow through the coil. A manual reset shall be required to restart the AHU.
9. Duct smoke detectors in the return and supply air streams shall send an alarm to the BMS and the Fire Alarm System any time products of combustion are detected. The AHU shall remain running, the minimum outside air damper shall be closed, the minimum OSA fan shall be de–energized, the maximum OSA damper shall be opened, the return air damper shall be closed, the supply air damper shall be opened, the damper at the smoke exhaust fan shall be opened. The AHU's associated smoke control exhaust fan shall be energized.
10. Filter Status: A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes during normal operation, a dirty filter alarm shall be annunciated at the BMS.
11. If communications with the BMS is lost, the AHU controller shall operate using default modes and setpoints.
12. Provide float switch in cooling coil drain pan. Upon sensing a high water level, The chilled water valve shall close to the the cooling coil and an alarm shall be sent to the BMS.
13. BMS shall monitor maximum OSA damper position, return air damper position and supply air damper position thru damper open and closed end switches and shall report to BMS when dampers are not at their current position.

ROOFTOP AIR HANDLING UNITS RTU–1, 2, 3, & 4:

1. The AHU supply fan will be energized through the BMS whenever the hand–off–auto switch is in the "auto" position. When the switch is in the "hand" position, the fan will run continuously. A differential pressure sensor at the supply fan shall prove airflow.
2. When the AHU is energized and the building is occupied, the outside air damper shall be opened to provide the scheduled minimum outside air airflow, the relief damper shall open to relief building pressure, & the return air damper shall be opened. When the AHU is off, the minimum outside air damper, the relief air damper, & the return air damper shall be closed. This unit has an economizer cycle.
3. When the AHU is energized and the building is unoccupied, the minimum outside air damper shall remain closed, the relief damper shall remain closed, & the return air damper shall be opened. When the AHU is off, the minimum outside air damper, the relief air damper, & the return air damper shall be closed.
4. Occupancy Mode: The occupancy mode shall be communicated or hardwired to the AHU controller. OCCUPIED MODE: The AHU shall run continuously when the system is scheduled to run in the occupied mode. The occupied mode shall be the default mode for the AHU. UNOCCUPIED MODE: When the AHU is in the unoccupied mode, the unit shall be energized whenever any of its associated VAV terminal units requires heating or cooling to maintain the space temperature at the active unoccupied heating or unoccupied cooling setpoint. UNOCCUPIED BYPASS: The tenant or the BMS operator shall be able to override the unoccupied mode from an unoccupied override pushbutton on the terminal unit space temperature sensors or from an input from the BMS operator. The override shall shall place the AHU in the occupied mode for a maximum of 4 hours (adj.).
5. Cooling Coil Control: Whenever the unit is on, the chilled water control valve shall modulate to maintain discharge air temperature setpoint initially set as 56 deg.F (adj.). If economizing is enabled, the outside air, return air, and relief air dampers shall modulate to maitain discharge air temperature setpoint. If the discharge air temperature fails, the unit shall control the chilled water valve to maintain a default space temperature setpoint of 72 deg.F (adj.) as sensed by the unit's VAV terminal unit thermostats (control by the VAV terminal unit thermostat that requires the most cooling) and an alarm shall be annunciated at the BMS.
6. Economizer: When the outdoor air dry bulb/ wet bulb (enthalpy) conditions are favorable, the outside air damper, the relief air damper, and the return damper shall modulate and the chilled water valve shall modulate to maintain the supply air temperature setpoint. Mechanical cooling shall be locked out and the outside air, relief air, and return air dampers shall be modulated between the minimum OSA position and the 100% open OSA position to allow outside air to be delivered for free cooling operation. If the outside air damper reaches 100% open and the supply air temperature setpoint cannot be maintained using outside air alone, the outside air damper shall be held at 100% open and the mechanical cooling shall be enabled. When the outdoor air dry bulb/ wet bulb (enthalpy) conditions are favorable, the outside air damper shall be controlled to maintain minimum position, and mechanical cooling will be controlled to maintain supply air temperature at setpoint.
7. Supply/ Return fan control: The fans shall be off in the unoccupied mode. When the unit controller is in the occupied mode, the supply fan variable speed controller's speed shall be modulated to maintain duct static pressure setpoint. The duct static pressure setpoint shall be shall be sent by the BMS and shall be reset between the minimum and maximum staic pressure limits to maintain the critical zone VAV air damper in a position between 75 & 85% open (adj.). Operator shall, from a front end BMS graphic, have the ability to dynamically select the VAV terminal units used in the calculation that determines which zone is deemed the critical zone and used to calculate the duct static pressure setpoint. If the supply fan fails to prove status in 30 seconds (adjustable), the supply and return fans shall be commanded off, the outside air and relief dampers shall close, and an alarm shall be annunciated at the BMS. If the discharge high static pressure cut–off switch is tripped, the supply and return fans shall stop and the outside air/ relief dampers shall close, and an alarm shall be annunciated at the BMS. A manual reset of the high staTic pressure cutoff switch shall be required to restart the fans.
8. Return Fan/relief damper control: The return fan speed shall track the supply fan speed according to the airflow measuring equipment at the AHU supply and return fan fan inlet collars, with an airflow difference equal to the minimum outside air damper airflow. The relief air damper/ return air damper shall be modulated to maintain space to outdoor differential pressure of 0.02" w.c. (adj.).
9. Mixed air low limit: If the mixed air temperature sensor senses a mixed air temperature below 50 deg.F (adj.), the the outside air damper shall modulate to a position less than the minimum OSA damper position. If the mixed air temperature sensor fails, an alarm shall be annunciated to the BMS. The outside air damper shall close if the mixed air temperature sensor has failed and the outside air temperature is below 40 deg.F (adj.). If the RTU is in "smoke control" mode, the OSA damper shall remain open.
10. If the low limit thermostat (set at 38°F) trips, the AHU shall be shut down, the AHU's dampers shall close, and an alarm shall be annunciated at the BMS. The cooling coil control valve shall be opened 100% for full flow through the coils. A manual reset shall be required to restart the AHU. If the RTU is in "smoke control" mode, the supply fan shall remain on and its OSA damper shall remain open.
11. Duct smoke detectors in the return and supply air streams (and zone smoke detectors in the dorms) shall send an alarm to the BMS and the Fire Alarm System any time products of combustion are detected. The AHU supply fan shall remain running, the outside air damper shall be opened, the return air damper shall be closed, and the relief air damper shall be opened. The AHU controller shall send a signal to all of its associated VAV terminal units to open their primary air dampers to the full open position. The smoke exhaust fans interlocked with the RTU shall be energized. H–O–A switches in the guard station shall allow manual override of RTU and exhaust fan operation.
12. Filter Status: A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes during normal operation, a dirty filter alarm shall be annunciated at the BMS.
13. If communications with the BMS is lost, the AHU controller shall operate using default modes and setpoints.
14. Provide float switch in cooling coil drain pan. Upon sensing a high water level, The chilled water valve shall close to the cooling coil and an alarm shall be sent to the BMS.
15. Provide pressure high limit switch in supply air duct to shut off the AHU when static pressures above setpoint are seen. This feature shall be able to be disabled in the smoke control mode, as well as other safety interlocks such as THE temperature low limit.

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DESCRIPTION:
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