

KU DESIGN GUIDELINES
APPENDIX XVI
RECOMMENDED BAS I/O CONTROL POINTS BY EQUIPMENT / SYSTEM

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Recommended BAS I/O Control Points by Equipment / System

This appendix describes recommended control Input/Output (I/O) points which should be utilized in implementing HVAC and utility systems controls. The I/O points are listed according to type of HVAC or utility equipment/system. These lists are comprehensive in that they include all I/O points which could be associated with a particular type of equipment/system. The I/O points to be utilized with a specific version of an equipment type will depend on the configuration of that version of equipment. For instance, an Air Handling Unit which does not have a reheat section would not utilize an I/O point "Reheat coil leaving dry bulb temperature".

AIR HANDLING UNITS – Include points as applicable.

1. Enable/disable unit
2. Start/Stop supply fan
3. Start/Stop return/exhaust fan
4. Open/close/modulate outside air damper
5. Open/close/modulate return air damper
6. Open/close/modulate relief air damper
7. Measure return air CO₂ level
8. Monitor supply fan operating status
9. Alarm supply fan failure
10. Monitor return/exhaust fan operating status
11. Alarm return/exhaust fan failure
12. Shut down fan(s) on detection of smoke
13. Alarm detection of smoke
14. Measure outside air dry bulb temperature
15. Measure return air dry bulb temperature
16. Measure unit mixed air dry bulb temperature
17. Measure pre-heat coil leaving air dry bulb temperature
18. Measure cooling coil leaving dry bulb and wet bulb temperatures
19. Measure re-heat coil leaving dry bulb temperature
20. Measure unit leaving air dry bulb and wet bulb temperatures
21. Control supply fan speed through VFD
22. Control return/exhaust fan speed through VFD
23. Control pre-heat coil control valve position
24. Control cooling coil control valve position
25. Control re-heat coil control valve position
26. Control electric coil operation through SCR controller
27. Reset pre-heat coil leaving air dry bulb temperature
28. Reset cooling coil leaving air dry bulb temperature
29. Reset re-heat coil leaving air dry bulb temperature
30. Reset unit leaving air dry bulb temperature
31. Measure supply duct static pressure
32. Alarm high supply duct static pressure
33. Monitor space temperature
34. Monitor space relative humidity
35. Alarm high space relative humidity
36. Interlock unit operation with other HVAC equipment

CHILLERS – Include points as applicable

1. Enable/disable chiller
2. Measure chilled water supply temperature
3. Measure chilled water return temperature
4. Measure condenser water supply temperature
5. Measure condenser water return temperature
6. Reset chilled water supply temperature
7. Monitor common trouble alarm signal from factory supplied control panel
8. Interlock chiller with other HVAC equipment

COOLING TOWERS – Include points as applicable

1. Enable/disable cooling tower
2. Open/close discharge damper(s)
3. Monitor damper(s) position (open/closed)
4. Start/Stop fan(s)
5. Monitor fan(s) operating status
6. Alarm fan(s) failure
7. Control supply fan(s) speed through VFD
8. Measure condenser water supply temperature
9. Measure condenser water return temperature
10. Reset condenser water supply temperature
11. Alarm high condenser water supply temperature
12. Interlock cooling tower operation with other HVAC equipment

CLOSED LOOP COOLERS – Include points as applicable

1. Enable/disable cooler
2. Open/close discharge damper(s)
3. Monitor damper(s) position (open/closed)
4. Start/Stop cooler circulating pump
5. Monitor pump operating status
6. Alarm pump failure
7. Start/stop fan(s)
8. Motor fan(s) operating status
9. Alarm fan(s) failure
10. Control supply fan(s) speed through VFD
11. Measure condenser water supply temperature
12. Measure condenser water return temperature
13. Reset condenser water supply temperature
14. Alarm high condenser water supply temperature
15. Interlock cooler operation with other HVAC equipment

MISCELLANEOUS SUPPLY FANS – Include points as applicable.

1. Enable fan
2. Start/Stop fan
3. Monitor fan operating status
4. Alarm fan failure
5. Monitor space temperature
6. Control fan(s) speed through VFD
7. Interlock fan operation with other HVAC equipment

PUMPS – Include points as applicable.

1. Enable/disable pump
2. Start/Stop pump
3. Monitor pump operating status
4. Alarm pump failure
5. Control pump speed through VFD
6. Control operating and stand-by pumps in lead/lag operation
7. Alternate lead/lag operating and stand-by pump operation
8. Interlock pump operation with other HVAC equipment

EXHAUST FANS – Include points as applicable.

1. Enable fan
2. Start/Stop fan
3. Monitor fan operating status
4. Alarm fan failure
5. Monitor space temperature
6. Control fan(s) speed through VFD
7. Interlock fan operation with other HVAC equipment

BOILERS – Include points as applicable.

1. Enable boiler
2. Start/Stop burner
3. Interlock combustion air damper/combustion air supply fan
4. Monitor combustion air damper position/combustion air supply fan status
5. Alarm combustion air damper fail to open/combustion air supply fan failure
6. Monitor heating water supply temperature
7. Monitor heating water return temperature
8. Reset heating water supply temperature
9. Alarm high heating water supply temperature
10. Interlock boiler operation with other HVAC equipment

DOMESTIC WATER BOILERS – Include points as applicable.

1. Enable boiler
2. Start/stop burner
3. Interlock combustion air damper/combustion air supply fan
4. Monitor combustion air damper position/combustion air supply fan status
5. Alarm combustion air damper fail to open/combustion air supply fan failure
6. Monitor domestic water storage tank temperature
7. Interlock boiler operation with other plumbing equipment

STEAM TO WATER HEAT EXCHANGERS – Include points as applicable.

1. Control heat exchanger steam control valve position
2. Measure heating water supply temperature
3. Alarm high heating water supply temperature
4. Reset heating water supply temperature

CONDENSING UNITS – Include points as applicable.

1. Enable unit
2. Start/stop unit
3. Monitor common trouble alarm signal from factory supplied control panel
4. Interlock condensing unit with other HVAC equipment

PACKAGED AIR CONDITIONING UNITS – Include points as applicable.

1. Enable unit
2. Start/Stop Unit
3. Monitor common trouble alarm signal from factory supplied control panel
4. Monitor unit leaving air dry bulb temperature
5. Reset unit leaving air dry bulb temperature
6. Measure supply duct static pressure
7. Alarm high supply duct static pressure
8. Monitor space temperature
9. Monitor space relative humidity
10. Alarm high space relative humidity
11. Shut down fan(s) on detection of smoke
12. Alarm detection of smoke
13. Interlock unit operation with other HVAC equipment

VARIABLE AIR VOLUME BOXES – Include points as applicable.

1. Measure space dry bulb temperature
2. Modulate damper position
3. Control re-heat coil control valve position
4. Control electric coil operation through SCR controller

FAN POWERED VARIABLE AIR VOLUME BOXES – Include points as applicable.

1. Enable fan
2. Start/Stop fan
3. Measure space dry bulb temperature
4. Modulate damper position
5. Control re-heat coil control valve position
6. Control electric coil operation through SCR controller
7. Monitor fan operating status
8. Alarm fan failure
9. Interlock fan operation with other HVAC equipment

FAN COIL UNITS/UNIT VENTILATORS – Include points as applicable.

1. Enable fan
2. Start/Stop fan
3. Open/close/modulate outside air damper
4. Open/close/modulate return air damper
5. Control pre-heat coil control valve position
6. Control cooling coil control valve position
7. Control re-heat coil control valve position
8. Control electric coil operation through SCR controller
9. Interlock fan operation with other HVAC equipment

MISCELLANEOUS DUCT COILS – Include points as applicable.

1. Measure space dry bulb temperature
2. Control coil control valve position
3. Control electric coil operation through SCR controller

DOMESTIC WATER MIXING VALVES – Include points as applicable.

1. Measure return water temperature
2. Measure supply water temperature
3. Alarm high supply water temperature

PRESSURE REDUCING VALVES – Include points as applicable.

1. Measure upstream system pressure
2. Measure downstream system pressure
3. Alarm high downstream system pressure

SPACE LIGHTING CONTROLS – Include points as applicable.

1. Monitor space occupancy through space sensor(s)
2. Turn light fixtures on
3. Turn light fixtures off

REFRIGERANT MONITORING SYSTEM – Include points as applicable.

1. Measure space refrigerant levels
2. Start/Stop exhaust fan
3. Start/Stop make-up air fan
4. Open/Close exhaust air damper
5. Open/Close make-up air damper
6. Sound local alarms
7. Sound alarms at BAS

DATA CLOSET MONITORING

1. Measure space dry bulb temperature
2. Alarm high space dry bulb temperature

UTILITY USAGE MEASUREMENTS

8. Monitor steam/condensate usage
9. Monitor natural gas usage
10. Monitor electricity usage
11. Monitor domestic water usage