GSA Public Buildings Service

Office of Facilities Management - Facility Technologies

GSA Data Normalization for Building Automation Systems

Required NCMMS asset parameters, how NCMMS interacts with Building Automation System (BAS) points, standardizing BAS point names and standardizing data tagging methods within the GSA.

DOCUMENT CHANGE LOG

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SECTION 1 - INTRODUCTION

The GSA has created national programs and implemented enterprise technology to better utilize the technology and time required to manage the thousands of GSA facilities. As part of leveraging this technology, the GSA intends to standardize data for building systems by implementing a standard for BAS equipment/point naming conventions and point tagging. As regional buildings are connected at the national level for systems such as NCMMS-Maximo and GSAlink, normalizing provides a smoother and faster path to integration when programmers know what to expect when connecting to various Building Automation Systems.

This document is designed to establish standardized requirements related to BAS point naming, implement Haystack tagging requirements, and clarify the necessary fields in the National CMMS Maximo system for matching assets to Building Automation System (BAS) equipment, across the GSA portfolio.

In the following sections, this document will guide you through the requirements for BAS point naming, outline the requirement for data tagging by standardizing on the Project Haystack open source data initiative and cover the proper procedure when configuring NCMMS Asset naming.

SECTION 2 - INTENDED AUDIENCE & APPLICABILITY

1. **GSA AND O&M PERSONNEL** shall use this document to correctly configure the National CMMS assets (Section 7) so that all BAS related assets match the equipment as named in the BAS. This document can also be utilized to better understand the BAS naming convention and the Haystack tagging requirements.

2. **BMC SYSTEM CONTRACTORS** shall utilize this document to configure all building systems with the perspective of the GSA's overall portfolio. All new installation and *renovated systems shall be configured with the naming and tagging conventions as described within this document to provide consistency throughout all of the GSA. All BMC system-related documentation and submittal packages shall reflect these naming and tagging conventions. A point summary table shall be created by the BAS contractor and kept current throughout the duration of the project as the master list of all I/O points. A minimum BAS server-level point list is provided within this document to accurately engineer, specify, and quote BAS projects. Project closeout documents shall include an up-to-date and accurate "Point Summary Table", along with relevant commissioning documentation related to point tagging checkout. For each project, the contractor shall submit the documentation for approval prior to final acceptance of the system. The point summary table shall be used as a reference and guide throughout the commissioning process.

   **Renovated systems applies to major upgrades which replace existing programming along with equipment and system renovations. The standard as described within this document does not require partial renovations to modify existing programming and point names that don't fall under the scope of work or may negatively impact other existing programming.*

SECTION 3 - DEFINITIONS

1. **Point** – Points are typically a software level variable representing a digital or analog sensor or actuator type object or entity (sometimes called *hard points*). Points can also represent a configuration or programmed value such as a setpoint or schedule log (sometimes called *soft points*). Typically, the attributes of a point constitute a point object.

2. **Tag** – A *tag* is a name/value pair applied to an object or entity within the Building Automation System and is further defined by referencing Project Haystack. A tag defines a fact or attribute about an object or entity and can also be known as "metadata."

3. **NCMMS** – The GSA's National Computerized Maintenance Management System. The National CMMS is a central repository (database) for all maintainable GSA assets that runs on the Maximo software platform. The NCMMS provides a mandatory, agency-wide means and method for processing and reporting all maintenance work and repairs done for PBS regardless of region or contractor.

4. **NCMMS Asset** – NCMMS assets are used to store asset numbers and corresponding information, such as parent, location, vendor, status, description, and maintenance costs for each asset in the Maximo system. You can build the asset hierarchy as an arrangement of buildings, departments, assets, and subassemblies.

SECTION 4 - NATIONAL BAS OBJECT NAMING STANDARD

As stated in the introduction, implementing a standard for BAS equipment and point naming provides added value to the GSA. As regional buildings are connected at the national level for systems such as NCMMS-GSAlink and SkySpark, normalizing offers a smoother and faster path to integration, as programmers know what to expect when connecting to various BAS.

As times and technology have progressed, there are now different methods utilized to normalize data. One method is to standardize BAS object and point naming conventions. The second method covered in this document will be described in "Section 6 –Tagging". There is a great deal of value in normalizing regional/building server BAS names, building names, global controller names, floor IDs, equipment abbreviations and point names. Having a unified hierarchy across the GSA portfolio will make national level implementations less complex and less costly overall.

This GSA Smart Building Technology Device & Object Naming Standard is intended to standardize the names and tagging of BAS, Lighting, Metering, and other devices and control objects. **Note:** *It is understood that certain BAS manufacturers will have different requirements and limitations regarding acceptable character types and overall character length limitations. It is also understood that certain manufacturers allow for more generalized "tree" structuring of objects which means aspects like equipment name and building do not necessarily have to be included in the point name due to parent/child folder structuring.*

The provided documentation and diagrams in Appendix-C are intended to give the project engineer and technician the ability to find the appropriate names and tags for each object based on GSA requirements. The diagrams show generic HVAC, lighting, metering, and other equipment containing control points and objects, some of which may or may not be present in a particular application.

All device tagging and object naming shall be submitted to the GSA Regional Office of Facility Management (OFM) or the Facilities Management Division (FMD) for review and approval prior to implementation – any system objects implemented prior to OFM/FMD approval shall be corrected by the vendor at no additional cost to GSA.

Any control object, tag or point that is not represented in this document must be submitted to the OFM/FMD via RFI. A response will be generated identifying the name that should be used for the application. If the supplied name is not currently represented in the standard document, it may be added.

Note: *It is understood that the object names for some products cannot be modified (i.e. "canned application" or "pre-configured" controllers.) These devices/object names shall be submitted with an indication that the controller cannot be customized.*

1. Process

This Object Naming Standard shall be implemented according to the following process:

a. Engineer automation system to understand what objects are required.

b. Using the National BAS Object Naming & Tagging Standard document (APPENDIX-C), identify and document the standardized names and tags for the control objects and devices.
c. Submit the proposed names to the OFM/FMD.
d. Receive comments back, correct errors, and resubmit. Repeat process until all issues are resolved.
e. Object naming is approved by OFM/FMD.
f. Implement names and tags into the BAS database and programming.

Failure to follow and complete these steps in order may result in substantial re-work by and at the expense of the BAS contractor.

2. Scope

This Object Naming Standard covers all BACnet-discoverable devices and objects which includes:

a. AI, AO, AV, BI, BO, BV, MO, & MV point types
b. Calendar objects (Cldr)
c. Schedule objects (Sched)
d. Trend Log objects (Td)
e. Event Enrollment objects (Evt)
f. Notification Class objects (Not)
g. File objects (File)
h. Command objects (Cmd)
i. Devices

This Standard also covers all points, registers, etc. (objects) that are mapped using a driver, integration device, or system (such as Niagara Framework), and any additional objects created in the integration device or system. For example, registers mapped from a third-party Modbus device to a BAS controller or integration device using a driver must be named using this Standard.

3. Understanding the Standard

To properly implement this Object Naming Standard, it is important to understand the intended goal, the desired outcome, the design philosophy of the naming system and the methodology used to meet those goals.

GOAL:
Ensure that the way the BAS devices and objects are named, enables any user of the system or system data to instantly identify the device or object and understand the function of system objects, whether they are sensors, actuators, schedules, trend logs, etc. A user can be a human operator, but it can also be a computer that stores or processes information from the system.

PHILOSOPHY:
To allow a human to instantly identify a device or object simply by reading the name. At minimum, the name must indicate which building, what equipment/system to which it is associated, the type of object, and the object's primary function. The parts of the name must be human-readable using standardized abbreviations. These standardizations allow an operator or analyst to read, search, sort, group, and filter objects with ease.

A computer interpreter of any type would be able to use the building and equipment/system indications to group objects. To make the function of an object clear to a machine, the object type/function portion of the name is composed of standardized "camel-cased" abbreviations that a computer can break apart and use to automatically apply metadata tags. These tags allow applications, such as analytics engines or CMMS, to interpret information directly from the BAS or from a trend archive and create actionable responses and outputs.

METHODOLOGY:
To create names that are both human-readable and machine-readable, the structure and abbreviations of the names are standardized. Each name has three parts separated by underscores: Building Number, Equipment Designator, and Object Name. (See the "Object Name Anatomy" section below for technical details on structure standardization.) Building Numbers are provided by GSA in accordance with a pre-existing numbering system. The "Equipment Designator" is a free-form field; the mechanical drawings equipment schedule can be used as a guide. The "Object Name" is a camel-cased, standardized name for the object.

4. Object Unit Descriptions

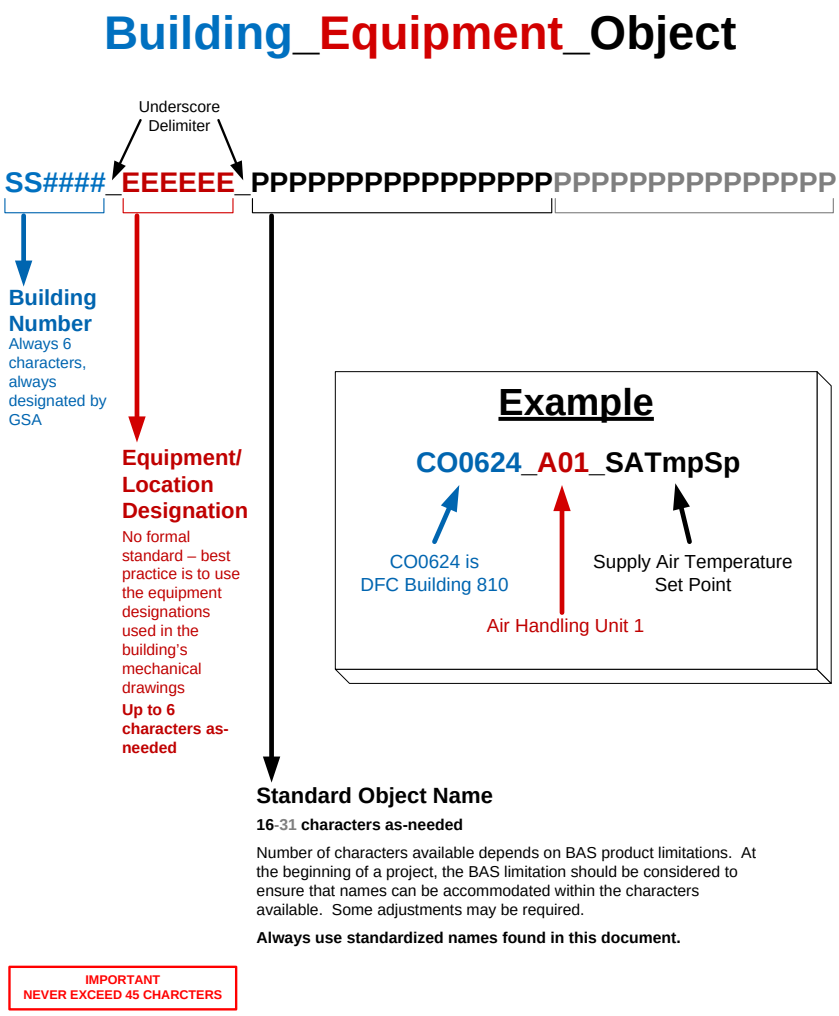
Object units are suggested in parentheses, such as: (°F)

For analog points, the engineering units are provided. Engineering units are standardized, and the OFM/FMD should be consulted where the standard units are inappropriate for the measurement or application.

Generally, analog outputs are expressed in percent (%, or pct). For valves and dampers, %open/%closed is used. 0% open would indicate that the control object is closed. 100% open would indicate that the control object is open. For mixing dampers, diverting valves, face/bypass dampers, etc., see unit indications where objects are found in diagrams in this document.

Binary outputs are generally expressed with (Off/On). Other binary units are provided depending on the application. The order of the state text labels is determined by the default position of the device. For example, a damper that is normally closed would use the units (Closed/Open), whereas a damper that is normally open would use (Open/Closed).

5. Object Name Anatomy



6. Typical Conventions (Suffixes with Examples)

Ena

Usually applied to BV objects. An “Ena” point indicates that conditions have been met to allow a device to be commanded, but is not the actual command.

- CHWSysEna
- HHWSysEna
- BlrEna
- EconEna

Cmd

Usually applied to BO and AO objects, and sometimes BV and AV objects also. A “Cmd” point commands something – starts a motor, modulates a valve, etc.

- SFCmd
- ChlrCmd
- MADmprCmd
- BlrCmd
- CCVlvCmd
- CTDivVlvCmd

Sts

Usually applied to BI objects. Corresponds to the “Cmd” point. This is the actual status of the commanded equipment.

- SFSts
- ChlrSts
- SFVFDSts
- CHWPmpSts

Pos

Applied to AI objects, “Pos” is feedback from a device such as a valve or a VFD. Corresponds to command (Cmd) in the case of a valve or damper, or speed (Spd) in the case of a VFD.

- CCVlvPos
- CTFPos
- MADmprPos
- SashPos

Sp

Applied to AV objects, “Sp” is shorthand for Setpoint. Used to indicate the setpoint that corresponds to a control variable.

- SATmpSp
- CHWSTmpSp
- SAStPrsSp
- HWSFlwRatSp
- CHWSysOATmpEnaSp

Alm

Usually applied to BI or BV objects (but not limited to). Alarm (Alm) should only be used on objects that have a corresponding event notification.

- BlrAlm
- MATmpAlm
- LowTempAlm
- DAStPrsAlm
- FireAlm
- ServiceAlm

Td

Applied to the end of an object name to indicate that it is the trend object associated with the control point object.

- SATmpTd
- SFStsTd
- CCVlvCmdTd
- MATmpSpTd

Sched

Applied to schedule objects.

- AHU01_Sched
- IceSys_Sched
- CHW_Sched
- EF01_Sched

SECTION 5 - BAS SERVER LEVEL POINT REQUIREMENTS

To effectively and efficiently integrate GSA buildings at a national level (GSAlink), there is a requirement to have certain data points available over the network from the BAS supervisor/server. These data points or histories should be made available via an open protocol as described below.

The GSA has a standard requirement that states, all high-level network-based control applications like scheduling, overrides, etc. shall exist at the global network controller level within the building. In the event of a network outage, the O&M still retains the ability to directly connect to the controllers and make necessary modifications while the server is unavailable (disaster recovery procedure). Though the control level aspects of the programming shall reside in the global network controllers, the long-term trends will be maintained at the server level and the I/O points shall be mapped to the server for display on the Graphical User Interface (GUI) and made available via an open protocol for national level integrations.

This can be accomplished in many ways and will differ depending on the BAS manufacturer utilized for the project. The goal is to have relevant, national-level historical trend data accessible utilizing a 1:1 connection from the national server (i.e. GSAlink, SkySpark, etc.) to the BAS server. For example:

1. NiagaraAX and Niagara4 (i.e. Vykon, Honeywell, Johnson FX, etc.) based systems shall have the required data points for operations and maintenance imported to the Niagara Supervisor so these points/historical trends can be accessed by national-level systems with a 1:1 connection to the server.

2. All other Building Automation Systems shall conform to a similar practice of providing open source access to point or historical data at the BAS-server level by either enabling the BACnet Server feature of the software application (if available) or exporting historical point data to a GSA-provided SQL Database.

Utilize the table found in "Appendix A - Points Required at the BAS Server Level" to determine and configure the necessary server-level historical trend data. **Note:** *If the entire point or historical database is made available as described above by exporting over BACnet or exporting to an SQL database, there is no need to use the table to select points since all points will be accessible to the national-level system/s*.

SECTION 6 - TAGGING

Discussed within this section and further detailed in Appendix-C, are the requirements for "tagging" BAS objects with the correct metadata when configuring systems for the GSA. Equipment and point naming was covered previously within this document, but as mentioned, the key to normalizing BAS data and providing the greatest impact is to properly tag objects with "facts" or "attributes" that give the data better meaning, thus providing more ways to analyze, prioritize and act upon the collected data.

The standard tagging model for the GSA will be modeled after Project Haystack. The tagging requirements described in Appendix-C are modeled after the Haystack documentation which can be found here.

Note: *If the Building Automation System has the capability to implement tagging, the standards detailed in "Appendix C – National BAS Object Naming & Tagging Standard" shall be used for all new construction and renovation projects within the GSA.*

Why Haystack?

As tagging is adopted and implemented by more BAS manufacturers, there is no guarantee that all manufacturers will adopt the Haystack tagging method as their base tagging model. Even so, Haystack has developed a very robust list of available tags along with the ability to create custom libraries and those tags should be available or creatable using any manufacturer tagging process in the future.

For example, the BACnet committee is currently working on a tagging scheme that supports multiple namespaces such as Haystack and any other tagging schemes that may come along in the future. Similarly, ASHRAE is also pursuing a published list of tags for Standard 223 in conjunction with the BACnet committee's efforts. Both efforts are in the early stages of design but both seek alignment with Haystack wherever possible.

What is Haystack?

Project Haystack is an open source initiative to streamline working with data from the Internet of Things. We standardize semantic data models and web services with the goal of making it easier to unlock value from the vast quantity of data generated by the smart devices that permeate our homes, buildings, factories, and cities. Applications include automation, control, energy, HVAC, lighting, and other environmental systems.

Why Do We Need Tagging?

Macro trends in technology are making it increasingly cost effective to instrument and collect data about the operations and energy usage of buildings. We are now awash in data and the

new problem is how to make sense of it. Today most operational data has poor semantic modeling and requires a manual, labor-intensive process to "map" the data before value creation can begin. Pragmatic use of naming conventions and taxonomies can make it more cost effective to analyze, visualize, and derive value from our operational data.

Vendor Specific Haystack/tagging Information

- Niagara AX/N4 (applies to any Niagara-based OEM controller).
  - Niagara AX and N4 can easily support Haystack tagging.
  - The tag dictionary from the “NHAYSTACK” module shall be used as the primary resource for all tagging. The module can be downloaded here.
  - When a tag or relationship type is required that does not currently exist in the NHAYSTACK library, a new tag dictionary shall be created by the contractor and named using the unique GSA building ID (i.e. NY0282).

- Honeywell EBI
  - Today, EBI does not have a tagging database to associate tags to objects in the database. This is currently being reviewed for inclusion in future updates of EBI.

- Schneider Electric
  - Schneider IA Series (AX and N4) adhere to the same Haystack tagging methods described above in the Niagara AX/N4 section.
  - SmartStruxure support and standards to be determined.

- Siemens
  - The current Siemens Insight and Desigo CC versions do not include any standards or guidelines for the usage of Haystack but these standards are currently in development for future releases of the software.
  - Siemens does support Haystack tagging through compatibility with the Niagara Framework.

- Alerton
  - Alerton is currently in the process of adding tagging capability in Compass. Once tagging support is added, Haystack will be supported by the Alerton Standard Applications.
  - Alerton dealers will also be allowed to configure custom applications related to tagging.

- Automated Logic
  - Currently, Automated Logic does not support tagging, but development plans include support for the BACnet Standard tagging scheme with semantic tagging that was recently adopted by the BACnet committee in 2017 (SSPC 135) and referenced above in the “Why Haystack” section.

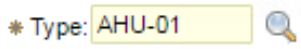
SECTION 7 - NCMMS ASSET MATCHING

The National CMMS naming convention is not configured in a fashion that completely aligns with typical BAS naming conventions. The way NCMMS defines an Air Handling Unit (AHU), for example, is not by AHU name (i.e. "AHU-01-LBY"), but rather by AHU "Type" (size in tonnage). A separate field is utilized to associate the NCMMS Asset with the BAS equipment name. Appendix C lists and defines all the available Asset options within NCMMS. To properly configure an NCMMS Asset, one would need to know some specific details about the equipment like, but not limited to:

- Equipment name as described in the Building Automation System
- AHU size (Tonnage)
- Chiller type (Absorption, Centrifugal, Screw, etc.)
- Chiller size (Tonnage)
- Boiler type (Gas, Oil, Electric, etc.)
- Boiler size (MBH)
- Use the table in Appendix C to determine the necessary assets for a given project

Among the many parameters within NCMMS that are required for proper asset management, there are two (2) parameters that require proper configuration to ensure asset matching and correct labeling within the system when associating NCMMS records with BAS labels.

- The first is the "***Type***" record. As discussed above and displayed in Appendix-B, the "Type" field is used to describe the type of equipment and sizing parameters. *This field is **not used** to display the equipment name as shown in the BAS*. The user cannot enter any value into this field, but must use the pre-defined values shown in the equipment list. This list can be viewed by clicking the Search button (magnifying glass) next to the field.



- The second is the "***Asset Tag***" record. This field is utilized for the equipment description as shown in the BAS. For example, a site may have several "AHU-01" *Types* (because the building has several AHUs sized 3 to 24 tons), but it will only have one "AHU-01-LBY" *Asset Tag* for the associated asset. This field is a large format alpha-numeric data field which means it allows both letters and numbers and will allow plenty of characters for proper description. The BAS equipment description as shown on the graphic pages should be entered in this field. Section 4 and Appendix-C describes the required naming convention and abbreviations for GSA equipment and point names.

A list of available "Type" records and the corresponding equipment description can be found in Appendix B - NCMMS Asset "Type" Option List. NCMMS manages more than just BAS assets, so there are many "Types" that will not be utilized when matching assets to BAS equipment.

APPENDICES

APPENDIX A - POINTS REQUIRED AT THE BAS SERVER LEVEL

The purpose of the required BAS Server Level Points is not to require additional equipment or sensors, but rather indicate the points that should be considered as value added monitoring points and be included in the Building Control System design. These points should be made accessible to third party systems over Open Protocol data sources (i.e. BACnet, SQL, etc.).

It should be stressed that the purpose of this point list is to influence system design and not to restrict the use or availability of control or monitoring points that exist in a system. As with all big data applications, the more data made available the greater value add to the analyses being performed. This list should be utilized to verify that the largest pool of data is available for fault detection and diagnostics.

The point list table below shows the points currently utilized in the GSAlink rules (highlighted) as well as an additional set of control points that have proven to bring value in fault detection and diagnostics.

#	Equipment Description	Point Type	Required If Available	Preferred
	AHU			
1	AHU Cold Deck Supply Temp	Physical	Yes	Yes
2	AHU Cold Deck Fan Status	Physical	Yes	Yes
3	AHU Hot Deck Supply Temp	Physical	Yes	Yes
4	AHU Hot Deck Fan Status	Physical	Yes	Yes
5	Building Air Pressure	Physical		Yes
6	Building Air Pressure Setpoint	Virtual		Yes
7	Bypass Damper Status	Physical	Yes	Yes
8	Chilled Water Pump	Physical	Yes	Yes
9	Chiller Plant Mode	Virtual	Yes	Yes
10	Cooling Lockout OA Temp	Virtual		Yes
11	Cooling Max Airflow	Virtual		Yes
12	Cooling Min Airflow	Virtual		Yes
13	Cooling Mode	Virtual	Yes	Yes
14	Cooling Valve Position	Physical		Yes
15	Cooling Valve Status	Physical	Yes	Yes
16	Dehumidification Mode	Virtual	Yes	Yes
17	Dehumidification Setpoint	Virtual		Yes
18	Dewpoint Setpoint	Virtual		Yes
19	Supply Fan Status	Physical	Yes	Yes

20	Supply Temp	Physical	Yes	Yes
21	Supply Temp Setpoint	Virtual	Yes	Yes
22	Duct Static Pressure	Physical		Yes
23	Duct Static Pressure Setpoint	Virtual		Yes
24	Economizer Enabled Command	Virtual		Yes
25	Economizer Enthalpy Disable Setpoint	Virtual		Yes
26	Economizer Mode	Virtual	Yes	Yes
27	Economizer Temp Disable Setpoint	Virtual		Yes
28	Economizer Temp Enable Setpoint	Virtual		Yes
29	Exhaust Air Damper Position	Physical		Yes
30	Free Cooling Temp Setpoint	Virtual		Yes
31	Global OA Temp	Physical		Yes
32	Heat Exchanger Valves	Physical	Yes	Yes
33	Heating Lockout OA Temp	Virtual		Yes
34	Heating Max Airflow	Virtual		Yes
35	Heating Mode	Virtual	Yes	Yes
36	Heating Valve Status	Physical	Yes	Yes
37	Hot Water Pump Command	Physical	Yes	Yes
38	Hot Water Pump Status	Virtual	Yes	Yes
39	Min Outside Air Damper Setpoint	Virtual		Yes
40	Min Outside Air Ratio	Virtual		Yes
41	Mixed Air Temp	Physical	Yes	Yes
42	Mixed Air Temp Setpoint	Virtual		Yes
43	Outside Air Airflow Sensor	Physical	Yes	Yes
44	Outside Air Damper Status	Physical	Yes	Yes
45	Outside Air Airflow Setpoint	Virtual	Yes	Yes
46	Outside Air Temp	Physical	Yes	Yes
47	Occupancy Mode	Virtual	Yes	Yes
48	Outside Air Damper Position/ Feedback	Physical		Yes
49	Outside Air Enthalpy	Virtual		Yes
50	Outside Air Damper Position	Physical		Yes
51	Return Air Damper Position	Physical		Yes
52	Return Air Fan Status	Physical		Yes
53	Return Air Temp	Physical	Yes	Yes
54	Static Pressure Sensor	Physical	Yes	Yes
55	Two Positon Outside Air Damper Command	Physical		Yes
56	Two Position Outside Air Damper Status	Physical		Yes
57	Zone Air Dewpoint Temp	Virtual		Yes
58	Zone Air RH	Physical		Yes

59	Zone Air Temp	Physical		Yes
60	Zone Air Temp Setpoint	Virtual		Yes
61	Zone Damper Position	Physical	Yes	Yes
62	Zone Damper Temp	Physical	Yes	Yes
63	Zone Supply Temp	Physical	Yes	Yes
Chiller				
64	Chilled Water Delta-T	Virtual		Yes
65	Chilled Water Return Temp	Physical	Yes	Yes
66	Chilled Water Supply Temp	Physical	Yes	Yes
67	Chiller Enabled	Virtual		Yes
68	Chiller Operation Mode	Virtual		Yes
69	Chiller Status	Physical	Yes	Yes
70	Chilled Water Diff Press Setpoint	Virtual	Yes	Yes
71	Chilled Water Differential Pressure	Physical	Yes	Yes
72	Chilled Water Pump Status	Physical	Yes	Yes
73	Chilled Water Supply Setpoint	Virtual	Yes	Yes
74	Compressor Refrigerant Supply Pressure	Physical		Yes
75	Compressor Refrigerant Supply Temp	Physical		Yes
76	Compressor Run Load	Physical		Yes
77	Compressor Start	Virtual		Yes
78	Compressor Voltage	Physical		Yes
79	Condenser Pump Command	Virtual		Yes
80	Condenser Refrigerant Pressure	Physical		Yes
81	Condenser Refrigerant Temp	Physical		Yes
82	Condenser Water Approach Temp	Physical		Yes
83	Condenser Water Delta-T	Virtual		Yes
84	Condenser Water Return Temp	Physical		Yes
85	Condenser Water Supply Temp	Physical		Yes
86	Cooling Mode	Virtual	Yes	Yes
87	Current Draw	Physical		Yes
88	Evaporator Approach Temp	Virtual		Yes
89	Evaporator Refrigerant Pressure	Physical		Yes
90	Evaporator Refrigerant Temp	Physical		Yes
91	Evaporator Water Return Temp	Physical		Yes
92	Evaporator Water Supply Temp	Physical		Yes
93	Expansion Valve Position	Physical		Yes
94	Heat Sink Temp	Physical		Yes
95	Lagging Chiller Enabled	Virtual		Yes
96	Lagging Chiller Enabled Setpoint	Virtual		Yes

97	Lead Chiller Enabled	Virtual		Yes
98	Lead Chiller Enabled Setpoint	Virtual		Yes
99	Lead Chiller Selection	Virtual		Yes
100	Occupancy Mode	Virtual	Yes	Yes
101	Primary Pump Command	Physical		Yes
102	Secondary Pump Command	Physical		Yes
Cooling Tower				
103	System Bypass Valve	Physical		Yes
104	Condenser Water Supply Temp Setpoint	Virtual		Yes
105	Condenser Water Return Temp Setpoint	Virtual		Yes
106	Condenser Water Supply Diff Press Setpoint	Virtual		Yes
107	Condenser Water Return Diff Press Setpoint	Virtual		Yes
108	Chiller Plant Enabled	Virtual		Yes
109	Condenser Pump Command	Physical		Yes
110	Condenser Pump Status	Physical	Yes	Yes
111	Cooling Tower Fan Enabled	Virtual		Yes
112	Cooling Tower Fan Feedback	Physical		Yes
113	Cooling Tower Return Temp	Physical	Yes	Yes
114	Cooling Tower Sump Temp	Physical		Yes
115	Cooling Tower Supply Setpoint	Virtual	Yes	Yes
116	Cooling Tower Supply Temp	Physical	Yes	Yes
117	Cooling Tower Water Level	Physical		Yes
118	Induction Loop Return Temp	Physical		Yes
119	Induction Loop Supply Temp	Physical		Yes
Terminal Units				
120	Average Space Temp	Virtual		Yes
121	Chilled Water Temp	Physical		Yes
122	Circulating Fan Command	Physical		Yes
123	Cooling Lockout Outside Air Temp	Virtual		Yes
124	Cooling Max Airflow	Virtual		Yes
125	Cooling Min Airflow	Virtual		Yes
126	Cooling Mode	Virtual	Yes	Yes
127	Cooling Temp Setpoint	Virtual	Yes	Yes
128	Cooling Valve Position	Physical		Yes
129	Dewpoint Setpoint	Virtual		Yes
130	Supply Fan Status	Physical	Yes	Yes
131	Fan Coil Enabled	Virtual		Yes
132	Fan Speed	Physical		Yes
133	Heating Lockout OA Temp	Virtual		Yes

134	Heating Max Airflow	Virtual		Yes
135	Heating Mode	Virtual	Yes	Yes
136	Heating Stage Command(s)	Virtual		Yes
137	Heating Temp Setpoint	Virtual	Yes	Yes
138	Electric Heating Coil Command	Physical		Yes
139	Hot Water Valve Position	Physical		Yes
140	Minimum Air Temp	Virtual		Yes
141	Occupancy Mode	Virtual	Yes	Yes
142	Return Air Temp	Physical		Yes
143	Room Temp	Physical		Yes
144	Room Temp Setpoint	Virtual		Yes
145	Supply Air Damper Position	Physical		Yes
146	Supply Airflow Limit	Virtual		Yes
147	Supply Air Temp	Physical		Yes
148	Supply Airflow	Physical		Yes
149	Supply Airflow Setpoint	Virtual		Yes
150	Ventilation Demand	Virtual		Yes
151	Zone Occupancy Status	Virtual		Yes
152	Zone Temp	Physical	Yes	Yes
153	Zone Temp Setpoint	Virtual	Yes	Yes
Boilers / Heat Exchangers				
154	Boiler Supply Temp	Physical	Yes	Yes
155	Boiler Runtime	Virtual		Yes
156	Boiler Start/Stop Command	Virtual		Yes
157	Boiler Status	Physical	Yes	Yes
158	Boiler Entering Temperature	Physical		Yes
159	Boiler Valve Command	Physical		Yes
160	Boiler Valve Status	Physical		Yes
161	HW Diff Press Setpoint	Virtual	Yes	Yes
162	HW Pressure Differential	Physical	Yes	Yes
163	HW Pump Status	Physical	Yes	Yes
164	HX Return Temp	Physical		Yes
165	HX Supply Temp	Physical	Yes	Yes
166	HX Mode	Virtual	Yes	Yes
167	HX Pump Status	Physical	Yes	Yes
168	HX Temp Setpoint	Virtual	Yes	Yes
169	HX Valve Status	Physical	Yes	Yes
170	Pump Override	Virtual		Yes
171	Pump Failure	Virtual		Yes

172	Pump Runtime	Virtual		Yes
173	Pump Start/Stop Command	Physical		Yes
174	Secondary Hot Water Return Temp	Physical		Yes
175	Secondary Hot Water Supply Temp	Physical		Yes
176	Secondary HW Pump	Physical	Yes	Yes
177	Zone Occupancy Status	Virtual		Yes
Roof Top Units				
178	Cooling Lockout Outside Air Temp	Virtual		Yes
179	Cooling Max Airflow	Virtual		Yes
180	Cooling Min Airflow	Virtual		Yes
181	Cooling Temp Setpoint	Virtual		Yes
182	Cooling Stage Command	Virtual		Yes
183	Dewpoint Setpoint	Virtual		Yes
184	Economizer Mode Enabled	Virtual		Yes
185	Economizer Enthalpy Disable Setpoint	Virtual		Yes
186	Economizer Temp Disable Setpoint	Virtual		Yes
187	Economizer Temp Enable Setpoint	Virtual		Yes
188	Energy Wheel Leaving Air Temp	Physical		Yes
189	Exhaust Fan Command	Virtual		Yes
190	Free Cooling Temp Setpoint	Virtual		Yes
191	Heating Lockout OA Temp	Virtual		Yes
192	Heating Max Airflow	Virtual		Yes
193	Heating Setpoint	Virtual		Yes
194	Heating Stage Command(s)	Virtual		Yes
195	Min Outside Air Damper Setpoint	Virtual		Yes
196	Min Outside Air Ratio	Virtual		Yes
197	Modulating Outside Air Damper	Physical		Yes
198	Outside Air Dewpoint	Virtual		Yes
199	Outside Air Enthalpy	Virtual		Yes
200	Outside Air Relative Humidity	Physical		Yes
201	Outside Air Temp	Physical		Yes
202	Return Air Temp	Physical		Yes
203	Supply Air Fan Command	Virtual		Yes
204	Supply Air Temp	Physical		Yes
205	Two Position Outside Air Damper	Physical		Yes
206	Unit Humidification Setpoint	Virtual		Yes
207	Unit Dehumidification Setpoint	Virtual		Yes
208	Zone Air Dewpoint Temp	Virtual		Yes
209	Zone Air Relative Humidity	Physical		Yes

210	Zone Air Temp	Physical		Yes
CRAC Units				
211	Cooling Coil Valve Position	Physical		Yes
212	Cooling Lockout OA Temp	Virtual		Yes
213	Cooling Max Airflow	Virtual		Yes
214	Cooling Min Airflow	Virtual		Yes
215	Dewpoint Setpoint	Virtual		Yes
216	Heating Lockout OA Temp	Virtual		Yes
217	Heating Stage Command(s)	Virtual		Yes
218	Humidification Enabled	Virtual		Yes
219	Minimum Outside Air Ratio	Virtual		Yes
220	Relative Humidity Setpoint	Virtual		Yes
221	Return Air Humidity	Physical		Yes
222	Return Air Temp	Physical		Yes
223	Return Air Temp Setpoint	Virtual		Yes
224	Supply Air Fan Command	Virtual		Yes
225	Supply Air Temp	Physical		Yes
226	Unit Cooling Status	Virtual		Yes
227	Unit Dehumidification Mode	Virtual		Yes
228	Unit Heating Status	Virtual		Yes
229	Unit Humidification Mode	Virtual		Yes
230	Unit Status	Virtual		Yes
Energy Meters				
231	Energy Meter Reading	Physical	Yes	Yes
232	Peak Energy Demand	Physical	Yes	Yes
233	Occupancy Mode	Virtual		Yes

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APPENDIX B - NCMMS ASSET "TYPE" OPTION LIST

#	Type	Description
1	ABL	Air Blower
2	ACC	Condenser, Air-Cooled
3	ACR-01	Computer Room Air-Conditioning Unit, Package: or Special Systems
4	ACR-02	Heat Pumps, Water Cooled (WSHP)
5	ACR-03	Air Conditioning Unit or Heat Pump Split System,
6	ACR-04	Air Conditioning Unit, Ceiling/Wall/Window Mounted
7	ACR-05	Air-Cooled Condenser
8	ACR-06	Evaporative Condenser
9	ACT	Air Curtain
10	ACU	Air Conditioner Package
11	ACW	Air Conditioner, Window
12	ADO	Audio System
13	ADR	Air Dryer
14	AER	Aerator
15	AGS-01	Tanks, Air, Refrigerant, LP Gas
16	AHU-01	Air Handling Unit, 3 ton thru 24 ton
17	AHU-02	Air Handling Unit, 25 ton thru 50 ton
18	AHU-03	Air Handling Unit, over 50 ton
19	AHU-04	Air Handling Unit, Computer Room
20	AHU-05	Packaged Air Handler, Predictive Maintenance
21	AHU-06	Air Washer or Wet Coil System
22	AHU-07	Application
23	AHU-08	AHU UV Treatment System
24	AIR-01	Air Dryer, Refrigerated or Regenerative Desiccant Type
25	AIR-02	Air Compressor
26	AIR-03	Glycol Dry Cooler, Special Purpose
27	AIR-04	After-Cooler/Separator
28	ALM	Fire Detection and Alarm System
29	ALM-01	Alarm Check Valves and Accessories
30	ALM-02	Fire Supervisory Signals - Testing
31	ALM-03	Automatic Fire Detection Smoke Detectors
32	ALM-04	Automatic Fire Detection Water flow Alarms
33	ALM-05	Automatic Fire Detection, Heat Detectors
34	ALM-06	Smoke Control Systems -Operational Testing
35	ALM-07	Fire Alarm Control Panel and Remote Annunciators
36	ALM-08	Fire Alarm Control Panel -Special Systems
37	ALM-09	Central Station Transmitter
38	ALM-10	Central Station - Receiver and Re-Transmission Equipment
39	ALM-11	Fire Alarm System - Recorder
40	ALM-12	Fire Alarm System - Event Printer
41	ALM-13	Fire Alarm System -Audio Control Panel
42	ALM-14	Fire Alarm System -Remote Controller
43	ALM-15	Fire Alarm System -Remote Amplifiers
44	ALM-16	Manual Fire Alarm Stations -Coded and Uncoded
45	ALM-17	Fire Life Safety Fire Alarm
46	APL	Appliance - Washer Dryer Etc.
47	ART	Artwork Sculptures Etc.
48	ASP	Air Separator
49	ATP	Automatic Trap Primer
50	ATS	Switch, Automatic Transfer
51	ATS-01	Automatic Transfer Switches
52	AWS	Air Washer

53	BAR-01	Security Bollards, Barricade
54	BAS-01	Building Automation System, DDC
55	BAS-02	Building Automation System, Pneumatic
56	BAS-03	Building Automation System, Terminal End Devices
57	BAT	Battery
58	BDT-01	Metal Enclosed Busways (Busduct)
59	BFP	Backflow Prevention Device
60	BLR-01	Boiler
61	BLR-02	Boiler, Application
62	BLR-03	Boiler, Burner, Gas
63	BLR-04	Boiler, Burner, Oil
64	BLR-05	Boiler, Instrument Controls
65	BLR-E	Boiler, Electric
66	BLR-HW1	Boiler, Hot Water, Oil/Gas/Comb, up to 120 MBH
67	BLR-HW2	Boiler, Hot Water, Oil/Gas/Comb, 120 to 500 MBH
68	BLR-HW3	Boiler, Hot Water, Oil/Gas/Comb, 500 to 1000 MBH
69	BLR-HW4	Boiler, Hot Water, Oil/Gas/Comb, over 1000 MBH
70	BLR-MOD1	Modular Boiler, 42 MBH
71	BLR-MOD2	Modular Boiler, 57 MBH
72	BLR-MOD3	Modular Boiler, 85 MBH
73	BLR-MOD4	Modular Boiler, 112 MBH
74	BLR-MOD5	Modular Boiler, 140 MBH
75	BLR-MOD6	Modular Boiler, 167 MBH
76	BLR-MOD7	Modular Boiler, 194 MBH
77	BLR-ST1	Boiler, Steam, Oil/Gas/Comb, up to 120 MBH
78	BLR-ST2	Boiler, Steam, Natural Gas, or Oil/Gas/Comb
79	BLR-ST3	Boiler, Steam, Oil/Gas/Comb, 500 to 1000 MBH
80	BLR-ST4	Boiler, Steam, Oil/Gas/Comb, over 1000 MBH
81	BNG	Burner, Gas Oil
82	BSB	Heater, Baseboard
83	BSB-01	Radiant Baseboards, Convectors (Steam, Hot Water, or Electric, per section)
84	BSD	Electric Buss Duct
85	BTC	Battery Charger
86	BUF	Floor Buffer
87	BWS	Bird Wire System
88	CAO	Can Opener
89	CAP-01	Capacitors
90	CAP-02	Reactors-Dry-Type, Thermographic Survey
91	CAP-03	Reactors, Liquid-Filled, Oil Leakage
92	CBL-01	Cables, Low Voltage 600 Volt Maximum, Thermographic Survey
93	CBL-02	Cables, Medium Voltage
94	CBS-01	Active Chilled Beam
95	CBS-02	Passive Chilled Beam
96	CDE	Clothes Dryer, Electric
97	CHF	Chemical Feeder
98	CHL-A1	Chiller, Absorption unit, up to 500 tons
99	CHL-A2	Chiller, Absorption unit, 500 to 5000 tons
100	CHL-CW1	Chiller, Centrifugal, water cooled, up to 100 tons
101	CHL-CW2	Chiller, Centrifugal, water cooled, over 100 tons
102	CHL-MB1	Magnetic Bearing Chiller, Less 500 Tons
103	CHL-MB2	Magnetic Bearing Chiller, 500-1000 Tons
104	CHL-MB3	Magnetic Bearing Chiller, over 1000 Tons
105	CHL-MOD1	Modular Chiller, 20-Ton
106	CHL-MOD2	Modular Chiller, 25-Ton
107	CHL-MOD3	Modular Chiller, 30-Ton
108	CHL-MOD4	Modular Chiller, 35-Ton

109	CHL-MOD5	Modular Chiller, 40-Ton
110	CHL-MOD6	Modular Chiller, 45-Ton
111	CHL-MOD7	Modular Chiller, 50-Ton
112	CHL-RA1	Chiller, Recip, Air Cooled, up to 25 tons
113	CHL-RA2	Chiller, Recip, Air Cooled, over 25 tons
114	CHL-S1	Chiller, Screw, Water Cooled
115	CHL-S2	Chiller, Screw, Water Cooled
116	CHL-W1	Chiller, Recip, Water Cooled, up to 50 tons
117	CHL-W2	Chiller, Recip, Water Cooled, over 50 tons
118	CHM-01	Chemical Storage Tanks
119	CKB-01	Circuit Breakers, Air, Insulated-Case, Molded-Case
120	CKB-02	Circuit Breakers, Air, Low-Voltage Power
121	CKB-03	Circuit Breakers, Air, Medium Voltage
122	CKB-04	Circuit Breakers, Oil, Medium-Voltage
123	CKB-05	Circuit Breakers, Vacuum, Medium-Voltage
124	CLK	Clocks
125	CLK-01	Clocks, Central System
126	CLR-01	Central Chilled Water Package Unit:
127	CLR-02	Rotary Screw & Scroll Chiller
128	CLR-03	Centrifugal Chiller
129	CLR-04	Refrigeration Machine, Absorption Unit
130	CLR-05	Chiller Control Panel
131	CLR-06	Refrigerant Monitor
132	CLR-07	Refrigerant Purge Units
133	CLR-08	Vibration Analysis, Chillers
134	CLR-09	Non-Destructive Tube Analysis (Eddy Current Analysis)
135	CLS-01	Coils Cooling, Heating, Preheat, Reheat, Etc.
136	CMD	Carbon-Monoxide Detection Sensors
137	CMI	Carbon Dioxide (CO2) Concentration Measuring Instrument
138	CMP	Air Compressor
139	CMP-R	Air Compressor, Recip
140	CND-01	Condensing Unit, Refrigeration
141	COF	Coffee Maker/Urn
142	COL	Coil, Heating/Cooling
143	CON	Control Panel
144	CPZ	Cathodic Protection Zinc
145	CRAC	Computer Room A.C.1 (CRAC Unit)
146	CRN-01	Crane, Electric
147	CTR	Cooling Tower
148	CUT	Cutter, Food
149	CVC	Video Control System
150	CWD	Clothes Washer, Domestic
151	DAV	Davits/Roof Anchors/Fall Protection
152	DAV-01	Davits
153	DCS-01	DC Battery System, Lead Acid
154	DCS-02	Primary Battery (Dry Cell)
155	DCS-03	Nickel Cadmium Battery
156	DCS-04	DC Battery System, Chargers
157	DCT	Switch, Disconnect
158	DDC-01	BAS Server
159	DDC-02	BAS Server Client Workstation
160	DDC-03	Network, Management Level
161	DDC-04	Network, Building Level
162	DDC-05	Field Panel
163	DDC-06	Controller
164	DDC-07	Sensors, Electronic

165	DDC-08	Alarm Maintenance
166	DDC-09	BAS Wireless Electronic, Pneumatic end devices (Thermostats)
167	DEA	Deaerator Tank
168	DES	De-aerating System
169	DET	Detector, Leak
170	DFB	Defibrillator
171	DFF	Fryer, Pressurized Broaster, Gas/Electric
172	DFS	Diffuser-Linear and Lay in
173	DKL	Dock Leveler
174	DMP-01	Motorized Dampers, Pneumatic or Electric
175	DMW-01	Dumbwaiter
176	DOR	Exterior Doors
177	DOR-01	Door, Power Operated
178	DOR-02	Door; Hydraulic, Electric or Pneumatic Operated
179	DOR-03	Door, Manual, Overhead
180	DOR-04	Door, Manually Operated Entrance
181	DPP	Damper, Powered
182	DPS	Differential Pressure Switch
183	DRD	Drink Dispenser
184	DRN	Drain
185	DRN-01	Roof Drains, Downspout, and Gutter Inspection
186	DRN-02	Drains: Areaway, Driveway, Storm
187	DSE	Duplex Sewage Ejector
188	DSH-01	Dishwashing Machine
189	DSH-1	Dishwasher - Elect
190	DSH-2	Dishwasher - Steam
191	DSH-3	Dish/Tray Busing Conveyor
192	DTT	Transformer, Dry
193	DWS-01	Domestic Hot Water Heater - Gas
194	DWS-02	Domestic Hot Water Heater - Electric
195	DWS-03	Hot Water Heater Steam Coil
196	DWS-04	Water Softener
197	DWS-05	Water Filter
198	DWV-01	Sewage Ejector (Pneumatic Tank Type Ejectors)
199	DWV-02	Sewage Ejector, Sump Type
200	DWV-03	Sump Pump
201	DWV-04	Emergency Wash
202	DWV-05	Emergency Shower
203	DWV-06	Septic Tank and Drain Field
204	EFP	Flagpole, Electric
205	EHC	Exhaust Hood, Commercial Kitchen
206	EHF	Exhaust Hood, Fume
207	ELT	Emergency Lighting
208	ELV-01	Elevators, Hydraulic
209	ELV-02	Elevators, Electric
210	ELV-03	Elevators, Electric or Hydraulic
211	ELV-1	Hydraulic Elevator
212	ELV-2	Electric Traction Elevator
213	EMG-01	Emergency Diesel Generator
214	EMG-02	Emergency Natural Gas Generator
215	EMS	Energy Management System
216	END-01	End Devices
217	EPB	Panelboard, Power Distribution
218	EPR-01	Emergency Generators, Gasoline, or Natural Gas Engines
219	EPR-02	Electric Emergency Generators, Diesel Engine Powered
220	EPR-03	Emergency Generators

221	EPR-04	Emergency Pumps and Ventilators
222	EPR-05	Fuel Oil Filter/Strainer
223	EPR-06	Fuel Oil Heater
224	EPR-07	Emergency Generator Steam Turbine Driven
225	EPR-08	Load Bank Testing
226	EQP-01	Child Care Equipment
227	ESC	Escalator
228	ESC-01	Escalator
229	EVP	Evaporative Cooler
230	EVP-01	Indirect Evaporative Cooling System
231	EVP-02	Direct Evaporative Cooling System
232	EVP-03	Humidification Systems
233	EWC	Drinking Fountain, Packaged
234	EXJ	Expansion Joint
235	EXS	Exit Signs
236	EXT	Expansion Tank
237	EYE	Eyewash/Shower Unit
238	FACILITIES	Facilities Assets
239	FAF	Furnace, Forced Air, Natural Gas
240	FAN-01	Fan, Axial
241	FAN-02	Fan, Centrifugal
242	FAN-03	Fan, Make-up
243	FAN-04	Fan, Utility Set
244	FCP	Food Cart, Process
245	FCU	Fan Coil Unit
246	FCU-01	Fan Coil Unit
247	FDR-01	Fire Door - Swinging
248	FDR-02	Fire Door - Sliding & Rolling
249	FEX	Fire Extinguishers
250	FEX-01	Fire Extinguishers - Inspection
251	FEX-02	Fire Extinguishers, Stored Pressure with Gauge
252	FEX-03	Fire Extinguishers - Non-rechargeable
253	FEX-04	Fire Extinguishers, Gas Cartridge, or Cylinder (No Gauge)
254	FEX-05	Water Spray Extinguishing Systems
255	FEX-06	Fire Extinguishing Systems - Inspection, Carbon Dioxide (High Pressure)
256	FHC	Cabinet, Fire Hose
257	FLEET	Fleet Assets
258	FLF	Filter, Fuel/Oil
259	FLT	Filter, Air
260	FLT-01	Filters, Throw Away
261	FLT-02	Filters, Roll, Disposable
262	FLT-03	Filters, Electrostatic
263	FLT-04	Filters, Viscous Type (Wire Mesh)
264	FLT-05	Filters, Charcoal
265	FLT-06	Filters, Special situations, or conditions.
266	FLT-1	Filter, OR
267	FLT-2	Filter, Sand
268	FLT-3	Filter, Water
269	FMT	Flow Meter
270	FNG	Fences and Gates
271	FOL-01	Tanks, Fuel Oil Storage
272	FPL	Fireplace
273	FPL-01	Fireplace
274	FPL-02	Incinerator
275	FPM-01	Fire Pump, Electric-Drive
276	FPM-02	Fire Pump, Diesel

277	FRG	Refrigerator unit/display case w/external condenser
278	FRY-01	Fryer
279	FRZ	Refrigerator/Freezer, walk-in box w/external condenser
280	FSD	Fire and Smoke Dampers
281	FSD-01	Fire and Smoke Dampers
282	FSP-01	Wet-Pipe Sprinkler Systems
283	FSP-02	Dry-Pipe Sprinkler Systems
284	FSP-03	Pre-action Sprinkler Systems
285	FSP-04	Clean-Agent Fire-Extinguishing Systems
286	FUR	Furniture
287	GAG	Gauge
288	GBG	Garbage Disposal
289	GDS	Fuel-Gas Detection Sensors
290	GET	Grounds Equipment, Lawn Tractor, Carts
291	GFS	Glycol Feed System
292	GND	Bench Grinder
293	GRD-01	Grounding Systems
294	GRL	Grill
295	GRL-01	Grill
296	GRR	Gear Reduction Unit
297	GTP	Grease Trap
298	GWS-01	Geothermal Well System, Vertical
299	GWS-02	Geothermal Well System, Horizontal
300	HCU	Heating/Cooling Unit
301	HDY	Hand/Hair Dryer
302	HPU	High Efficiency Purge Unit
303	HSE	Fire Hose/Hose Connections
304	HSE-01	Fire Hose, 1.5 inch. Racked in Buildings
305	HSE-02	Fire Department Hose Connections - Standpipe Outlets
306	HSE-03	Fire Department Pumper Connections - Standpipe or Sprinkler
307	HST	Hoist
308	HST-01	Chain Hoist and Trolley
309	HST-02	Hoist, Electric
310	HST-03	Hoist, Lighting
311	HTP-1	Heat Pump, Air Cooled
312	HTP-2	Heat Pump, Water Cooled
313	HUM	Humidifier, Evaporative Pan w/ Heating Coil
314	HVU	Heating & Ventilating Units
315	HWC	Hot Water Converter
316	HWS-01	Hot Water Converter Steam
317	HWS-02	Solar Heating System
318	HXR-01	Heat Exchanger, Flat Plate
319	HXR-02	Heat Exchanger, Tube (Shell and Tube)
320	HYD	Fire Hydrant
321	HYD-01	Fire Hydrant Flow Test-Dry Barrel and Wet Barrel
322	ICD	Ice Cream Dispenser
323	ICE	Ice Machine
324	ICE-02	Ice Maker
325	ICM-01	Ice Cream maker and Shake Maker
326	IEX	Intercom Exchange Unit
327	INC	Incinerator
328	IRG	Irrigation System
329	IT	IT Assets
330	ITR-01	Instrument Transformers
331	KCS	Keycard System/Access Control
332	KTL	Kettle, Steam

333	KTL-01	Kettle
334	LCP	Lighting Control Panel
335	LFT	Lift, Scissor/Fork
336	LFT-01	Lift, Electric, Stage Screen
337	LFT-02	Material Handling Equipment, Electric Lift Trucks
338	LFT-03	Loading Ramp, Adjustable
339	LFT-04	Lift, Automobile
340	LFV	Lift, Vehicle
341	LGD	Lighting, Dimmer Control
342	LGE	Lighting, Exterior
343	LGI	Lighting, Interior
344	LGU	Light, Ultraviolet
345	LND-01	Fountain, Memorial or Decorative
346	LND-02	Gates and Fences, Security, and Access
347	LND-03	Lawn Sprinkler Nozzles
348	LND-04	Flag Pole, Electric and Manual
349	LND-05	Lawn Mower and Edger
350	LOT	Parking Lots (Paving)
351	LPS	Lightning Protection System
352	LSP	Lawn Sprinkler
353	LTG-01	Dimmer and Control, Stage, and General Lighting
354	LTG-02	Fluorescent Lighting Fixture, Washing and Re-lamping
355	LTG-03	Lighting, Special Feature
356	LTG-04	Lighting, Outside Incandescent and Fluorescent
357	LTG-05	Spotlights, Fixed and Portable
358	LTG-06	Emergency Lighting, Closed Systems
359	LTG-07	Emergency Lighting, Wet Cell
360	MCC	Motor Control Center
361	MCC-01	Low Voltage Motor Starters
362	MCC-02	Medium Voltage Motor Starters
363	MCC-03	Low Voltage Motor Control Center
364	MCC-04	Medium Voltage Motor Control Center
365	MCW	Microwave, Commercial
366	MHL	Manhole
367	MHL-01	Manhole, Electrical
368	MHL-02	Manhole, Sewer
369	MHL-03	Manhole (Water, Steam, and Fuel Oil)
370	MIX	Mixer, Electric
371	MOT	Motor
372	MOT-01	Motor, Fan
373	MOT-02	Motor, Pump
374	MTR	Metering Devices
375	MTR-01	Metering Devices
376	MTR-02	Advanced Metering
377	NWP	Network Protector
378	NWP-01	Network Protectors, 600V Class
379	OIC	Oil Interceptor
380	OVM	Oven, Microwave
381	OVN-01	Oven
382	OVN-1	Oven, Convection, Gas or Elect
383	OVN-2	Oven, Rotary, Elect
384	OVN-3	Oven, Rotary, Gas
385	OZG	Ozone Generator
386	PAG	Parking Arm Gates
387	PCS	Pigeon Control System
388	PDR	Doors, Powered

389	PFC	Power Factor Converter
390	PGE	Playground Equipment
391	PHN	Telecommunication-Telephone-System
392	PKM	Popcorn Machine
393	PLB	Plumbing as a System, Sinks, Toilers, Urinals Etc.
394	PLB-01	Expansion Joints In Piping
395	PLB-02	Strainer, Y-Type
396	PLB-03	Strainer, Bolted Flange Type (Water and Steam)
397	PLB-04	Dual Strainer
398	PLB-05	Backwash Strainer
399	PLB-06	Steam Traps (High Pressure)
400	PLB-07	Distiller, Water, Laboratory use only
401	PMP	Pump
402	PMP-01	Pump, Centrifugal
403	PMP-02	Pump, Chilled Water
404	PMP-03	Pump, Condensate
405	PMP-04	Pump, Condensate Return
406	PMP-05	Pump, Condensate Return, Duplex
407	PMP-06	Pump, Condenser
408	PMP-07	Pump, Fuel Oil
409	PMP-08	Pump, In-line
410	PMP-09	Pump, Re-Circulation
411	PMP-10	Pump, Water, Boiler Feed
412	PMP-C	Pump, Circulating
413	PMP-CF	Pump, Chemical Feed
414	PMP-HW	Pump, Circulating, Hot Water
415	PMP-I	Irrigation Pump
416	PMP-V	Pump, Vacuum, Duplex
417	PNB	Panelboard, Lighting & Appliance
418	PNU-01	Control Air System
419	PNU-02	Receiver Controllers
420	PNU-03	Control Air Filter
421	PPB-01	Paper Baler
422	PRODUCTION	Production Assets
423	PRP	Press, Printing
424	PRW	Pressure Washer
425	PSP	Power Supply
426	PTC	Pneumatic Tube Carrier
427	PTD	Pressure Transducer
428	PVS-01	Photovoltaic Systems
429	PVT	Photovoltaic System
430	RAD-01	Radiator, Finned Tube
431	RAD-02	Radiator, Steam
432	REG-01	Step-Voltage Regulators
433	REG-02	Induction Regulators
434	REG-03	Load Tap-changers
435	REL	Relay
436	RFG-01	Walk - In Refrigerators, Freezers
437	RFG-02	Reach in, pass-thru Refrigerator, Freezers
438	RFM	Refrigerant Monitor
439	RFR	Refrigeration Machine
440	RFS	Roof System and Drains
441	RFS-01	Roof Inspection, Built Up Type
442	RFS-02	Roof Inspection, Shingle Type
443	RFS-03	Extensive and Intensive Vegetative Roof
444	RLY-01	Protective Relays, Electrical Service, All Types

445	RNG	Range, Gas
446	RNG-01	Range
447	RRS	Refrigerant Recovery System
448	RTU	Package Unit, Air or Water Cooled
449	SCB-01	Scrubbing Machine, Battery or Propane Powered
450	SCL	Scale, Weight
451	SCS	Security Control System
452	SCT-01	Key Card System
453	SCT-02	Parking Arm Gates
454	SDR	Shredder
455	SDS	Smoke Detection Sensors
456	SEC-01	Child Care secured perimeter systems
457	SHS	Humidifier, Steam
458	SMP	Sump Pump
459	SMS	Snow Melt System
460	SNK	Sink Heater
461	SNO-01	Snow Blower
462	SPC-01	Child Care Areas
463	SRG-01	LV Surge Arresters
464	SRG-02	Medium Voltage Surge Arresters
465	STM-01	Condensate or Vacuum Pump
466	STN	Strainer Y Type
467	STR	Steam Trap
468	STR-01	Lightning Protection
469	STS	Steam Station
470	SWB	Switchboard, Electrical
471	SWB-01	Switchgear and Switchboard Assemblies
472	SWM-01	Storm Water Management: Ponds (Dry and Wet)
473	SWM-02	Storm Water Management, Basins
474	SWM-03	Storm Water Management, Trenches
475	SWM-04	Storm Water Management, Dry Wells
476	SWM-05	Storm Water Management, Permeable Pavers
477	SWM-06	Storm Water Management, Hydrodynamic Structures (i.e. swales)
478	SWM-07	Storm Water Management, Biofiltration
479	SWP-01	Sweeper, Riding
480	SWT-01	Low-Voltage Air Switches
481	SWT-02	Switches, Air, Medium-Voltage, Metal-Enclosed
482	SWT-03	Medium- and High-Voltage Open Switches
483	SWT-04	Medium-Voltage Oil Switches
484	SWT-05	Medium-Voltage Vacuum Switches
485	SWT-06	Medium-Voltage SF-6 Switches
486	SWT-07	Cutout, Switches
487	TAB-01	Test-And-Balance
488	TCC	Trash Compactor, Commercial
489	TCP-01	Trash Compactor
490	THS	Temp/Humidity Sensor
491	TKT	Tank, Septic
492	TKW	Tank, Waste Storage
493	TMC	Time Clock
494	TMR	Timer
495	TMU	Terminal Unit
496	TMU-01	Terminal Units, Pneumatic or Electric
497	TMU-02	Terminal Units, Pneumatic or Electric, Predictive Maintenance
498	TNK-01	Tank, Fuel
499	TNK-02	Tank, Hot Water
500	TNK-03	Tank, Oil Storage

501	TNK-04	Tank, Water
502	TRC	Tractor
503	TRN	Transformer, Oil-Filled
504	TRN-01	Small Dry Transformers
505	TRN-02	Large Dry Transformers
506	TRN-03	Transformers, Liquid-Filled
507	TST	Thermostat
508	TTC	Toaster, Commercial
509	TUS	Turbine, Steam
510	TVC	CC TV, Camera
511	TVM	CC TV Monitor
512	TWR-01	Cooling Tower, Cleaning
513	UHH	Heat Trace
514	UHT-01	Space Heater
515	UHT-02	Unit Heater
516	UHT-03	Unit Heater, Cabinet
517	UPS	UPS (Uninterruptable Power Supply)
518	UPS-01	Uninterruptible Power System
519	UST	Underground Storage Tank (UST)
520	UST-01	Underground Storage Tanks
521	UVL	Under Voltage Relay
522	VAC-01	Vacuum Cleaner, Heavy Duty, Tank Type
523	VAC-02	Vacuum, Central System
524	VAN	Van
525	VAP	Vaporizer, Liquid Gas
526	VAV	VAV (Variable Air Volume Boxes)
527	VCC	Vacuum Cleaner, Central
528	VCP	Vacuum Pump
529	VFD	Variable Frequency Drive
530	VFD-01	Variable Frequency Drives
531	VHL-01	Material Handling Equipment, Engine Driven Vehicles
532	VHL-02	Carts and Scooters, Engine or Battery Powered
533	VLT	Voltage Regulator
534	VLV	Valves
535	VLV-01	Dry Pipe, Deluge, and Preaction Valves
536	VLV-02	Post Indicator Valves
537	VLV-03	Fire Control Valves
538	VLV-04	Valves, Fire System Pressure Regulating
539	VLV-05	Valve, Backflow Preventer
540	VRF-01	Air Cooled Heat Pump with Variable Refrigerant Flow, 2-Pipe
541	VRF-02	Air Cooled Heat Pump with Variable Refrigerant Flow, 3-Pipe
542	WAL	Exterior Walls
543	WCC	Condenser, Water-Cooled
544	WHT-01	Water Heater, Electric
545	WHT-02	Water Heater, Natural Gas
546	WIN	Exterior Windows
547	WIN-01	Window Washing Scaffold, Power Operated
548	WLD	Welder, Electric
549	WLF	Wheelchair Lift
550	XXX	Unknown – provided to create a new type

NCMMS "Type" Record List as of July, 2017

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APPENDIX C - NATIONAL BAS OBJECT NAMING & TAGGING STANDARD

The following drawing set of this document is a guideline specification for Building Automation System object naming, point naming, and tagging.

The language in Section-4 of this document is repeated on the “INTRO” page of the following drawings. This document shall be utilized while implementing the naming standard process for any GSA project.

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General Services Administration

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Appendix C – National BAS Object Naming & Tagging Standard

GSA PBS OFM – Building Automation System Object Naming & Tagging National Standard

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National BAS Object Naming & Tagging Standard

#	DATE	DESCRIPTION
1.3	7/24/2017	Added Tagging
2.0	8/8/2017	Release Version
2.2	10/4/2017	Added VRF Systems
2.3	1/5/2018	508 Compliance
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COVER

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4	ANATOMY	Object name anatomy
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7	LEGEND-1	Symbol legend, page 1
8	LEGEND-2	Symbol legend, page 2
9	POINTTAG	Point tag requirements
10	AHUVAV	VAV AHU
11	AHUMISC	Miscellaneous AHU control points
12	AHUTAG	AHU tag requirements
13	AHUMZ	Multi-zone AHU
14	AHUDD	Dual-duct AHU
15	AHUOA	100% outside air AHU
16	AHUHX	AHU heat recovery
17	AHUDX	AHU with DX
18	ZONE	Zone control points
19	ZONETAG	Zone tag requirements
20	VAV CV VVT	VAV, CV, VVT terminal units
21	VAVTAG	VAV tag requirements
22	FTU	Fan terminal units
23	FCU	Fan coil units, baseboard, radiant
24	UNITAG	Unitary equip. tag requirements
25	CHBEAM	Chilled beam units
26	CRAC	Computer room AC units
27	VRV	Variable refrigerant volume units
28	CHLR	Chillers
29	CHWS	Chilled water systems
30	CHW TER	Tertiary CHW systems
31	CHWPLNTTAG	Chilled water plant tag requirements
32	PMP	Pump systems
33	CHW ICE	Ice storage systems
34	CWS1	Condenser water systems (1)
35	CWS2	Condenser water systems (2)
36	WSHP	Water-source heat pumps
37	GEO	Geothermal systems
38	HWS1	Hot water systems (1)
39	HWS2	Hot water systems (2)
40	HX	Heat exchangers
41	STM	Steam boilers & heat exchangers
42	HWPLNTTAG	Hot water plant tag requirements
43	LAB	Laboratory controls
44	EXH	Exhaust systems
45	VLV	Valves
46	VFD	Variable frequency drives
47	VFDTAG	VFD tag requirements
48	VRF-2P	Variable Refrigerant Flow, 2-Pipe
49	VRF-3P	Variable Refrigerant Flow, 3-Pipe
50	VRFTAG	VRF Tag requirements
51	LGT	Lighting systems
52	LGTTAG	Lighting tag requirements
53	MTR	Metering devices
54	ENGYTAG	Energy tag requirements
55	ELEC	Electrical devices
56	MISC	Miscellaneous objects
57	NETTAG	Network tag requirements

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CONTENTS

INTRODUCTION

This GSA Smart Building Technology Device & Object Naming Standard is intended to standardize the names and tagging of BAS, Lighting, Metering, and other devices and control objects. Character limitations vary between BAS products.

The provided diagrams are intended to aid the technician in finding the appropriate names and tags for each object. The diagrams show generic HVAC, lighting, metering, and other equipment containing control points and objects, some of which may or may not be present in a particular application.

All device tagging and object naming shall be submitted to the GSA Regional Office of Facility Management (OFM) or the Facilities Management Division (FMD) for review and approval prior to implementation – any system objects implemented prior to OFM approval shall be corrected by the vendor at no additional cost to GSA.

Any control object, tag or point that is not represented in this standards document must be submitted to the OFM/FMD via RFI. A response will be generated identifying the name that should be used for the application. If the supplied name is not currently represented in the standard document, it may be added.

It is understood that the object names for some products cannot be modified (i.e. "canned application" or "pre-configured" controllers.) These devices/object names shall be submitted with an indication that the controller cannot be customized.

Object Units Descriptions

Object units are suggested in parentheses, such as: (°F)

For analog points, the engineering units are provided. Engineering units are standardized, and the OFM/FMD should be consulted where the standard units are inappropriate for the measurement or application.

Generally, analog outputs are expressed in percent (%, or pct). For valves and dampers, %open/%closed is used. 0% open would indicate that the control object is closed. 100% open would indicate that the control object is open. For mixing dampers, diverting valves, face/bypass dampers, etc., see unit indications where objects are found in diagrams in this document.

Binary outputs are generally expressed with (Off/On). Other binary units are provided depending on the application. The order of the state text labels is determined by the default position of the device. For example, a damper that is normally closed would use the units (Closed/Open), whereas a damper that is normally open would use (Open/Closed).

PROCESS

This Object Naming Standard shall be implemented according to the following process:

1) Engineer automation system to understand what objects are required.
2) Using the National Object Naming & Tagging Standard document (this document), identify and document the standardized names and tags for the control objects and devices.
3) Submit the proposed names to the OFM/FMD.
4) Receive comments back, correct errors, and resubmit. Repeat process until all issues are resolved.
5) Object naming and tagging is approved by the OFM/FMD.
6) Implement names and tags into the BAS database and programming.

Failure to follow and complete these steps in order may result in substantial re-work by and at the expense of the BAS contractor.

SCOPE

This Object Naming Standard covers all BACnet-discoverable devices and objects. These include:

- AI, AO, AV, BI, BO, BV, MO, & MV point types
- Calendar objects (Cldr)
- Schedule objects (Sched)
- Trend Log objects (Td)
- Event Enrollment objects (Evt)
- Notification Class objects (Not)
- File objects (File)
- Command objects (Cmd)
- Devices

This Standard also covers all points, registers, etc. (objects) that are mapped using a driver, integration device, or system (such as Niagara Framework), and any additional objects created in the integration device or system. For example, registers mapped from a 3rd-party Modbus device to a BAS controller or integration device using a driver must be named using this Standard.

UNDERSTANDING THE STANDARD

In order to properly implement this Object Naming Standard, it is important to understand the goal it is intended to accomplish, the design philosophy of the naming system, and the methodology used to meet those goals.

GOAL:
Ensure that the way the BAS devices and objects are named enables any user of the system or system data to instantly identify the device or object and understand the function of system objects, whether they are sensors, actuators, schedules, trend logs, etc. A user can be a human operator, but it can also be a computer that stores or processes information from the system.

PHILOSOPHY:
To allow a human to instantly identify a device or object simply by reading the name, at minimum the name must indicate which building it is in, what equipment or system it is associated with, what type of object it is, and what it does. These parts of the name must be human-readable using standardized abbreviations. These standardizations allow an operator or analyst to read, search, sort, group, and filter objects with ease.

A computer interpreter of a name would be able to use the building and equipment/system indications to group objects. To make the function of an object clear to a machine, the object type/function portion of the name is composed of standardized "camel-cased" abbreviations that a computer can break apart and use to automatically apply metadata tags. These tags allow applications, such as analytics engines or CMMS, to interpret information directly from the BAS or from a trend archive and create actionable responses and outputs.

METHODOLOGY:
To create names that are both human-readable and machine-readable, the structure and abbreviations of the names are standardized. Each name has three parts separated by underscores: Building Number, Equipment Designator, and Object Name. (See the "ANATOMY" page for technical details on structure standardization.) Building Numbers are provided by GSA in accordance with a pre-existing numbering system. The Equipment Designator is a free-form field; the mechanical drawings equipment schedule can be used as a guide. The Object Name is a camel-cased, standardized name for the object.

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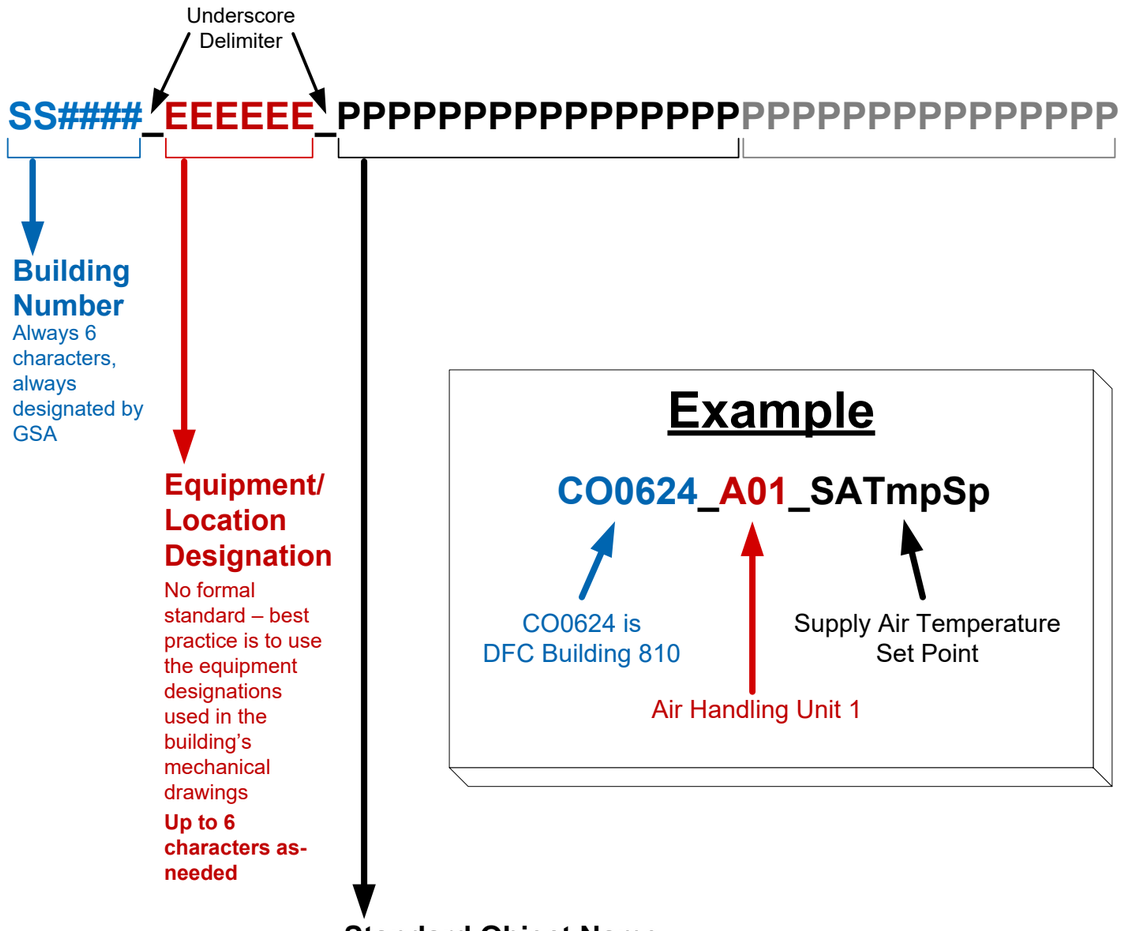
INTRO

Object Name Anatomy

Building_Equipment_Object



Number of characters available depends on BAS product limitations. At the beginning of a project, the BAS limitation should be considered to ensure that names can be accommodated within the characters available. Some adjustments may be required.

Always use standardized names found in this document.

IMPORTANT
NEVER EXCEED 45 CHARCTERS

See ABRV page for Standard Point Name abbreviations.

See MTR page for metering object naming standard – metering objects follow a modified naming standard

TYPICAL CONVENTIONS

SUFFIXES:

Ena
Usually applied to BV objects. An "Ena" point indicates that conditions have been met to allow a device to be commanded, but is not the actual command. Examples:

CHWSysEna	HHWSysEna
BlrEna	EconEna

Cmd
Usually applied to BO and AO objects, and sometimes BV and AV objects also. A "Cmd" point commands something – starts a motor, modulates a valve, etc. Examples:

SFCmd	ChlrCmd
MADmprCmd	BlrCmd
CCVlvCmd	CTDivVlvCmd

Sts
Usually applied to BI objects. Corresponds to the "Cmd" point. This is the actual status of the thing. Examples:

SFSts	ChlrSts
SFVFDSts	CHWPmpSts

Pos
Applied to AI objects, "Pos" is feedback from a device such as a valve or a VFD. Corresponds to "Cmd" in the case of a valve or damper, or "Spd" in the case of a VFD. Examples:

CCVlvPos	CTFPos
MADmprPos	SashPos

Sp
Applied to AV objects, "Sp" is shorthand for Setpoint. Used to indicate the setpoint that corresponds to a control variable.
Examples:

SATmpSp	CHWSTmpSp
SAStPrsSp	HWSFlwRatSp
CHWSysOATmpEnaSp	

Alm
Usually applied to BI or BV objects. "Alm" should only be used on objects that have a corresponding event notification. Examples:

BlrAlm	MATmpAlm
LowTempAlm	DAStPrsAlm
FireAlm	ServiceAlm

Td
Applied to the end of an object name to indicate that it is the trend object associated with the control point object.
Examples:

SATmpTd	SFStsTd
CCVlvCmdTd	MATmpSpTd

Sched
Applied to schedule objects.
Examples:

AHU01_Sched	IceSys_Sched
CHW_Sched	EF01_Sched

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ANATOMY

Standard Point Name Abbreviations (Page 1)

A	
A	Phase A
AcDn	Access Denied
AcGr	Access Granted
Act	Active
Adj	Adjustable, Adjust
ADR	Automatic Demand Response
AFMS	Air Flow Measuring Station
AHU	Air Handling Unit
Air	AIR
AirCond	Air Conditioning
AirDry	Air Dryer
Alm	Alarm (Off/On)
Alt	Alternate
Amp	Amperage/Current
AppPwr	Apparent Power (kVA)
Aprch	Approach
Asp	Aspirating
ATS	Automatic Transfer Switch
Auth	Authority
Auto	Automatic / Automatic Operation
Aux	Auxiliary
Avg	Average

B	
B	Phase B
Base	Baseline
Batt	Battery
Bb	Baseboard
Bldg	Building
Blr	Boiler
Box	Box
Brnch	Branch
Bstr	Booster
Btn	Button
BTU	British Thermal Unit
Buzz	Buzzer
Byp	Bypass

C	
C	Phase C
Cap	Capacity
CC	Cooling Coil
CD	Cold Deck
Cd	Condenser
CdPan	Condenser Pan
Cfctr	C-factor
CFM	Cubic Feet Per Minute
Chg	Change/Changeover/Switchover
Chlr	Chiller
CHW	Chilled Water
CHWP	Chilled Water Pump
CHWR	Chilled Water Return
CHWS	Chilled Water Supply
Cir	Circulating/Circulation
Ckt	Circuit
Clg	Cooling
Cls	Close
Clsd	Closed
Cmbs	Combustion
Cmd	Command (Off/On)
Cmn	Common
Cmp	Compressor
Cmpr	Compressor
Cnd	Condensate
CO2	Carbon Dioxide
Coeff	Coefficient
Comb	Combiner
Cond	Conditioning

C (continued)	
Cont	Contactor
Conv	Convector
Cplry	Capillary
CRAC	Computer Room Air Conditioner
CT	Cooling Tower
CtRatio	Current Transformer Ratio
Ctrl	Control
Cur	Current
CW	Condenser Water
CWP	Condenser Water Pump
CWR	Condenser Water Return
CWS	Condenser Water Supply

D	
DA	Unit Discharge Air
Day	Day
Db	Deadband
DC	Direct Current
DCV	Demand-Controlled Ventilation
Dec	Decrease
Deck	Deck
Det	Detector
Dew	Dewpoint (°F)
DHW	Domestic Hot Water
Dif	Differential
DirAct	Direct Acting
DirNorm	Direct Normal
Dis	Discharge
Div	Diverting
Dly	Delay
Dmd	Demand
Dmp	Damper
Door	Door
DR	Demand Response
DryB	Dry Bulb
Duct	Duct
DW	Domestic Water
Dwg	Drawing
DX	Direct Expansion

E	
E	East
Econ	Economizer
EDH	Electric Duct Heater
Eff	Effective
Elec	Electric
Enrg	Energy (kWh)
Elmt	Element
Emer	Emergency
Eject	Ejection
Ena	Enable
EVID	Electric Vehicle Identification
Ent	Enter/Entering
Enth	Enthalpy
ESS	Emergency Stop Switch
Ev	Evaporator
Exh	Exhaust
EA	Exhaust Air
EF	Exhaust Fan

F	
Fbyp	Face/Bypass
Fail	Failure
Fan	Fan
Fbk	Feedback
Freq	Frequency
Fclg	Free Cooling
FCU	Fan Coil Unit
FF	Flame Fail

F (continued)	
Flt	Filter
Flg	Flange
Flr	Floor
Fault	Fault
Flw	Flow
FPM	Feet Per Minute
Frst	Frost
Fast	Fast Fan Speed

G	
Gal	Gallon
Gas	Butane, Natural Gas, etc.
Gen	Generator
GH	Gas Heater
Glb	Global
Gly	Ethylene Glycol
GlyR	Glycol Return
GlyS	Glycol Supply
GPM	Gallons Per Minute
Grd	Ground
Grn	Green

H	
Hand	Manual
HC	Heating Coil
HD	Hot Deck
Hi	High
High	High Fan Speed
HL	High Limit
HOA	Hand/Off/Auto
Hor	Horizontal
HP	Horse Power
HPrs	High Pressure
Hr	Hour
HTCO	High Temp Cut Out
Htg	Heating
Htr	Heater
Hum	Humidifier
HW	Hot Water
HWP	Hot Water Pump
HWR	Hot Water Return
HWS	Hot Water Supply
HX	Heat Exchanger
Hz	Hertz

I	
IAQ	Indoor Air Quality
IEQ	Indoor Environmental Quality
IGV	Inlet Guide Vanes
In	Input
Inc	Increase
Ind	Indicator
Inf	Infectious
Inlet	Fan Air Inlet
Inv	Inverter
InvC	Invalid Card
INWC	Inches of Water Column
Irg	Irrigation
Irrad	Irradiance
Iso	Isolation

K	
Kfctr	K-factor
KVA	Kilo-Volt-Amperes
KVAR	Kilo-Volt-Amperes Reactive
Kw	Kilowatt
KwD	Kilowatt Demand
KwH	Kilowatt Hours

L	
Lb	Pound

L (continued)	
Lck	Lockout
Ldlg	Lead/Lag
Lkd	Locked
LL	Low Limit
Lmt	Limit
Lnk	Link
Lo	Low
Loop	Loop
Low	Low Fan Speed
LPrs	Low Pressure
LPrsStm	Low Pressure Steam
LTCO	Low temp Cut out
LtL	Line-to-Line
LtN	Line-to-Neutral
Lvg	Leaving
Lvl	Level
Lvr	Louver

M	
MA	Mixed Air
Man	Manual
Max	Maximum
MCDN	Morning Cool-Down
Med	Medium Fan Speed
Mf	Manifold
Mfr	Manufacturer
Min	Minimum
Misc	Miscellaneous
Mix	Mixing
Mod	Modulation, Modulating
Mode	Operating Mode
MPrs	Medium-Pressure
Mtr	Meter
MU	Make-Up
Multi	Multiple/Multi
MWUP	Morning Warm-Up

N	
N	North
Neg	Negative
Neut	Neutral
Nght	Night
NormClsd	Normally Closed
NormOpn	Normally Open
NR	Network Riser
Ntfcn	Notification

O	
OA	Outside Air
OAF	Outside Air Fan
Occ	Occupied
Off	Off
Offst	Offset
Oil	Oil
OL	OverLoad
On	On
Open	Open
Oper	Operation, Operator
OT	OverTime
OTL	Held Open Too Long
Out	Ouput
Ovrd	Override

P	
Par	Parallel
PC	Pre-Cool
Pct	Percent
PDU	Power Distribution Unit
Peak	Peak
Perf	Performance

P (continued)	
PH	Preheat
PhsRev	Phase Reversal
PID	Proportional/Integral/Derivative
PIU	Power Induction Unit
Plnt	Plant
Pls	Pulse, Pulses
Plt	Pilot
Pmp	Pump
Pneu	Pneumatic
Pnl	Panel
POA	Plane of Array
Pos	Position (%)
PPM	Parts Per Million
Precip	Precipitation
Prev	Previous
Pri	Primary
Prop	Proportional
Prop	Protective
Prs	Pressure (psi, inWC)
PtRatio	Potential Transformer Ratio
PVTS	Photovoltaic System
Pwr	Power (kW)
PwrFct	Power Factor

R	
RA	Return Air
Rad	Radiant
Rat	Rate
Rcl	Recool
RctPwr	Reactive Power (kVAR)
Rcv	Recovery, Recovered
Rec	Recovery
Rej	Rejection, Rejected
RelHum	Relative Humidity (%)
RelPwr	Real Power (kW)
Rem	Remaining
Req	Required
Rev	Reversing
RevAct	Reverse Acting
RF	Return Fan
Rfg	Refrigerant
RH	Re-Heat
Rlf	Relief
Rly	Relay
Rm	Room
Rmt	Remote
Rng	Range
RnTm	Run Time (hours)
RO	Relay Output
RPM	Revolutions Per Minute
Rptr	Repeater
Rst	Reset
RstH	High End of Reset Scale
RstL	Low End of Reset Scale
Rtn	Return
Rto	Ratio
RTU	Roof Top Unit
Run	Run

S	
S	South
SA	Supply Air
Sched	Schedule
Sct	Suction
Sec	Secondary
Sel	Select/Selection
Seq	Sequence
Ser	Series, Service

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ABRV-1

Standard Point Name Abbreviations (Page 2)

S (continued)	
Serial	Serial Number
SF	Supply Fan
Slow	Slow Fan Speed
Smk	Smoke
Snsr	Sensor
Snw	Snow, Snow-melt
Sp	Setpoint
Spd	Speed Control Command (%)
SqFt	Square Feet
SS	Start-Stop
Stby	Standby
Std	Standard
Stg	Stage
Stm	Steam
Stop	Stop
Str	Strainer
Strt	Start
Strts	Starts
Sts	Status (Off/On)
Sump	Sump
Sumr	Summer
Sup	Supply
Sw	Switch
Sys	System

T	
Td	Trend (History)
THD	Total Harmonic Distortion
Tm	Time
Tmp	Temperature (°F)
Tmpr	Tamper
Tmr	Timer (s)
Tnk	Tank
TOD	Time Of Day
Tons	Tons of Refrigeration
Tot	Total
Trk	Tracking
TWP	Tempered Water Pump
TWR	Tempered Water Return
TWS	Tempered Water Supply

U	
UL	Underwriters Laboratories
Ulkd	Unlocked
Unbal	Unbalanced
Unit	Unit
UnitHtr	Unit Heater
UnitVent	Unit Ventilator
Uoc	Unoccupied
UPS	Uninterruptible Power Supply
Util	Utility
UTC	Universal Time Clock
Usr	Zone Occupant (User)

V	
VA	Volt Amperes/ Variable Air
VAC	Volts Alternating Current
Val	Value
VAV	Variable Air Volume
VDC	Volts Direct Current
Vel	Velocity
Vib	Vibration
Vent	Ventilation
VFD	Variable Frequency Drive
Vlv	Valve
Vol	Volume
Vlt	Voltage
VOC	Volatile Organic Compounds

W	
W	West
Warn	Warning
Wtr	Water
WTS	Water Treatment System
WetB	Wet Bulb
Wntr	Winter
Wh	Wheel
WmCl	Warm/Cool
Wrls	Wireless

Z	
Zn	Zone

Standard Engineering Units & Unit Abbreviations

Temperature:	Degrees Fahrenheit (°F)
Water Pressure:	Pounds per Square Inch (psiG)
Water Pressure Differential:	Pounds per Square Inch Differential (psiD)
Air Pressure:	Inches of Water Column (inWC, "WC)
Air Pressure Differential:	Inches of Water Column Differential (inWCD, "WCD)
Relative Humidity:	Percent (%)
Modulating Command:	Percent (%open/ %closed)
Time:	Seconds (s)
	Minutes (m)
	Hours (h)
Water Volume:	Gallons (Gal)
Natural Gas Volume:	Cubic Feet (CF)
	Hundred Cubit Feet (CCF)
	Thousand Cubit Feet (MCF)
Thermal Energy:	British Thermal Unit (BTU)
	Thousand BTU (MBTU)
	Million BTU (MMBTU)
	Tons of Cooling (Tons)
Electrical Power (real):	Watt (W)
	Kilowatt (kW)
	Megawatt (MW)
	Gigawatt (GW)
Electrical Energy (real):	Watt-hour (Wh)
	Kilowatt-hour (kWh)
	MW-hour (MWh)
Electrical Power (apparent):	Volt-amperes (VA)
	Kilovolt-amperes (kVA)
Electrical Energy (apparent):	Volt-ampere-hour (VAh)
	Kilovolt-ampere-hour (kVAh)
Electrical Voltage:	Direct Current Volts (VDC)
	Alternating Current Volts (VAC)
	Millivolts (mV)
Electrical Current:	Amperes (A)
	Milliamps (mA)
Carbon Dioxide (CO2):	Parts per Million (ppm)
Carbon Monoxide (CO):	Parts per Million (ppm)
Volatile Organic Compound (VOC):	Parts per Million (ppm)
Air Flow Volume:	Cubic Feet per Minute (cfm)
Air Flow Velocity:	Feet per minute (fpm)

Min/Max/Hi/Lo/HL/LL Usage

Min = Lowest value in a set
Max = Highest value in a set

Avg = Average or mean of a set

Hi = Value is considered too high
Lo = Value is considered too low

HL = Highest allowable value – high limit
LL = Lowest allowable value – low limit

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Appendix-C

National BAS Object Naming & Tagging Standard

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1.3	7/24/2017	Added Tagging
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2.3	1/5/2018	508 Compliance
-	-	-
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ABRV-2

Boiler	Boiler
Condenser / Chiller / Evaporator	Water-Cooled Chiller
Cooling Tower	Cooling Tower
Chiller	Air-Cooled Chiller
Tank	Storage Tank
Fan or Pump	Fan or Pump
Ductwork	Ductwork

HX	Air-to-Air Heat Exchanger
Coil	Coil
VFD	Variable Frequency Drive
DX Compressor	DX Compressor
C / C	Cooling Coil
H / C	Heating Coil
D / X	DX Coil
G / H	Gas Duct Heater
RH / C	Reheat Coil

PH / C	Pre-Heating Coil
PC / C	Pre-Cooling Coil
H/C / C	2-Pipe Heating/ Cooling Coil
H / X	Heat Exchanger Coil
C / D	Condenser Coil
AFMS	Air Flow Measuring Station
Filter	Filter
Control Damper	Control Damper
Face/Bypass Damper	Face/Bypass Damper

Electric Duct Heater	Electric Duct Heater
Terminal Unit Damper	Terminal Unit Damper
Lab Fume Hood	Lab Fume Hood
Water-to-Water Heat Exchanger	Water-to-Water Heat Exchanger
Electric Vehicle	Electric Vehicle
Pulse Output (Z, Y, K)	Pulse Output
Open Collector Output (INPUT / OUTPUT)	Open Collector Output
Electric Meter	Electric Meter
Gas Meter	Gas Meter
Water Meter	Water Meter

Thermal Energy Meter	Thermal Energy Meter
Wireless	Wireless
Electric Meter	Electric Meter
Electric Meter	Electric Meter
Fuse	Fuse
Reversing Valve	Reversing Valve
3-Way Valve	3-Way Valve
2-Way Valve	2-Way Valve
Damper Actuator	Damper Actuator
Solenoid Valve	Solenoid Valve
Direct-Expansion Valve	Direct-Expansion Valve
Strainer	Strainer
Air Temperature Duct Sensor	Air Temperature Duct Sensor
Static Air Pressure Duct Sensor	Static Air Pressure Duct Sensor
Relative Humidity Duct Sensor	Relative Humidity Duct Sensor
Air Quality Duct Sensor	Air Quality Duct Sensor

T	Averaging Duct Temperature Sensor
SW	Averaging Duct Temperature Switch
SMK	Duct Smoke Detector
T	Well Temperature Sensor
P	Hydronic Pressure Sensor
P	Hydronic Pressure Differential Sensor
F	Hydronic Flow Sensor
SW	Air Pressure Differential Switch
SW	Air Pressure Differential Switch
T	OSA Temperature Sensor
RH	OSA Relative Humidity Sensor
IAQ	OSA Air Quality Sensor
Pyranometer	Pyranometer

Weather Station	Weather Station
T	Space Temperature Sensor
RH	Space Relative Humidity Sensor
IAQ	Space Air Quality Sensor
Space Occupancy Sensor	Space Occupancy Sensor
Lighting Load	Lighting Load
Lighting Level	Lighting Level
Wall	Wall
P	Air Pressure Differential Sensor
Calendar	Calendar
Schedule	Schedule
Refrigerant	Refrigerant
Delta	Delta
Compressor	Compressor

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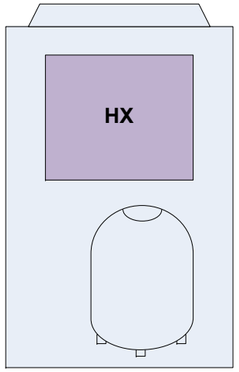
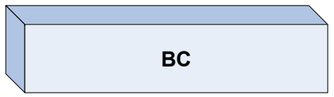
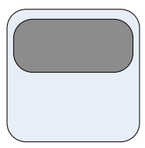
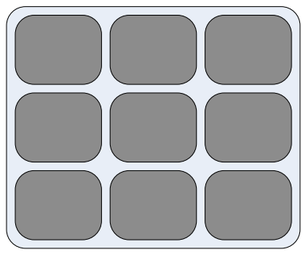
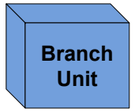
LEGEND-1

	Variable Refrigerant Flow (VRF) Outdoor Unit		
	Variable Refrigerant Flow (VRF) Indoor Unit		
	Variable Refrigerant Flow (VRF) Branch Controller		
	Variable Refrigerant Flow (VRF) Wireless Sensor		
	Variable Refrigerant Flow (VRF) Wired Sensor		
	Variable Refrigerant Flow (VRF) Central Remote Controller		
			VRF Separation (Y) Tube
			VRF Refrigerant Branch Unit

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LEGEND-2

Point Tag Requirements

Overview

Points are typically a digital or analog sensor or actuator entity (sometimes called hard points). Points can also represent a configuration value such as a setpoint or schedule log (sometimes called soft points). Point entities are tagged with the point tag.

All points are further classified as *sensors*, *commands*, or *setpoints* using one of the following three tags:

- sensor: input, AI/BI, sensor
- cmd: output, AO/BO, actuator, command
- sp: setpoint, internal control variable, schedule

All points must be associated with a site via the siteRef tag and a specific piece of equipment via the equipRef tag. If a point doesn't have physical equipment relationship, then use a virtual equip entity to model a logical grouping.

By convention multiple tags are used to model the role of a point:

- where: discharge, return, exhaust, outside
- what: air, water, steam
- measurement: temp, humidity, flow, pressure

Example of an AHU discharge air temperature input point:

id: @whitehouse.ahu3.dat
dis: "White House AHU-3 DischargeAirTemp"
point
siteRef: @whitehouse
equipRef: @whitehouse.ahu3
discharge
air
temp
sensor
kind: "Number"
unit: "°F"

Point Kinds

Points are classified as Bool, Number, or Str using the kind tag:

Bool: model digital points as true/false. Bool points may also define an enum tag for the text to use for the true/false states

Number: model analog ponts such as temperature or pressure. These points should also include the unit to indicate the point's unit of measurement.

Str: models an enumerated point with a mode such as "Off, Slow, Fast". Enumeraed points should also define an enum tag.

Point Min/Max

The following tags may be used to define a minimum and/or maximum for the point:

- minVal: minimum point value
- maxVal: maximum point value

When these tags are applied to a sensor point, they model the range of values the sensor can read and report. Values outside of these range might indicate a fault condition in the sensor.

When these tags are applied to a cmd or sp, they model the range of valid user inputs when commanding the point.

Point His

A "*historized*" point means that there is a time-series sampling of the point's value over a time range. History-enabled points are sometimes called *logged* or *trended* points. History-enabled points should be tagged with the his tag.

If a point implements the his tag, then it should also implement these tags:

- tz: all history points must define this tag with their timezone name (must match the point's site timezone)
- hisInterpolate: defined to indicate whether the point is logged by interval or change-of-value
- hisTotalized: defined to indicate if a point is collecting an ongoing or accumulated value

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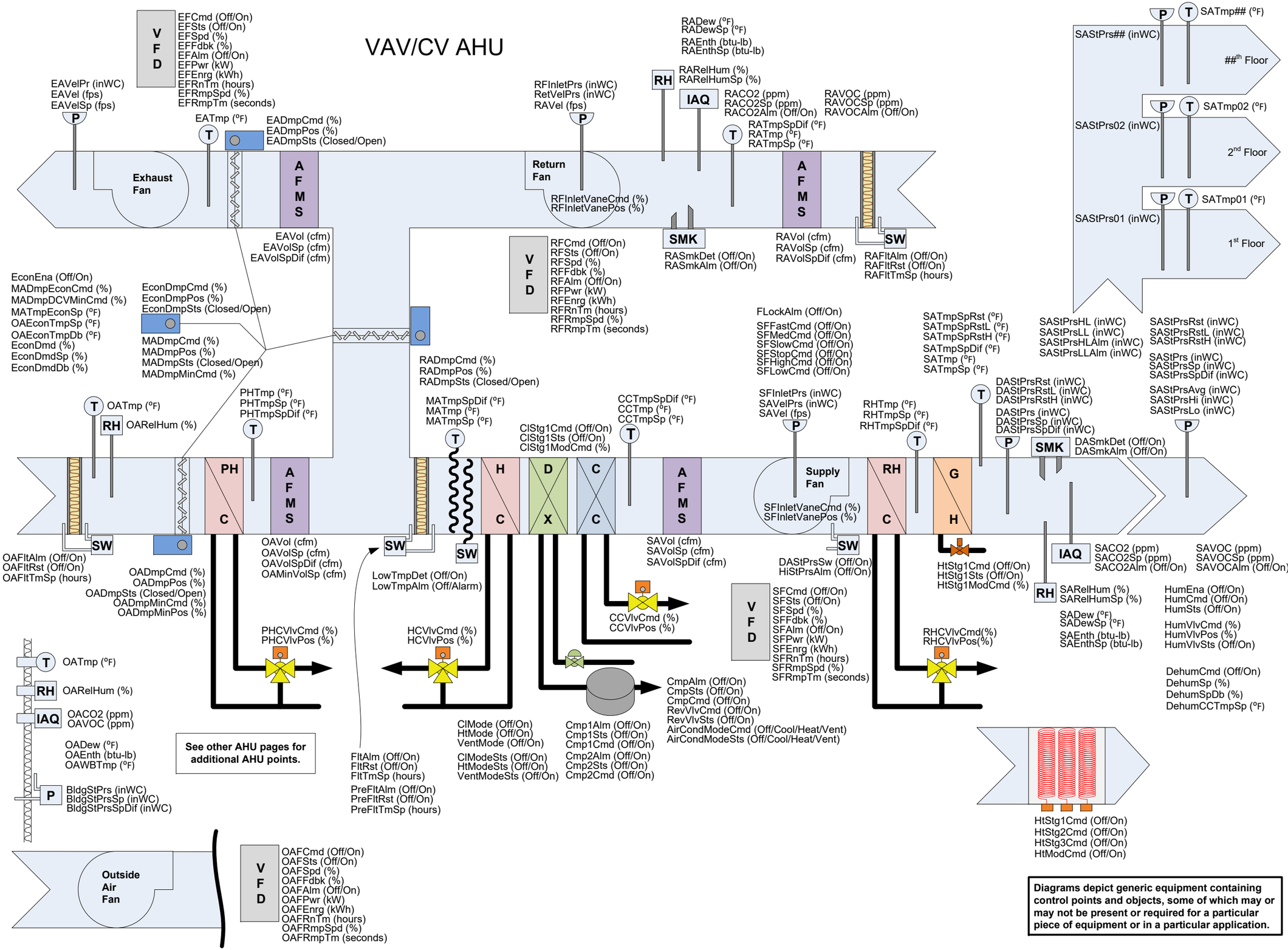
POINTTAG

VAV/CV AHU



Diagrams depict generic equipment containing control points and objects, some of which may or may not be present or required for a particular piece of equipment or in a particular application.

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AHUVAV

AHU Control Parameters

Equipment Enable

SysEna (Off/On)
Ena (Off/On)

Equipment Schedule

SchedCmd (Off/On)
SchedSts (Off/On)
SchedEna (Off/On)

Occupied Mode

OccCmd (Occ/Uoc)
OccSts (Occ/Uoc)
EffOcc (Occ/Uoc)

Override Mode

OvrdCmd (Off/Ovrd)
OvrdSts (Off/Ovrd)
ManOvrdCmd (Off/Ovrd)
ManOvrdSts (Off/Ovrd)
OvrdTmSp (sec, min, hours)
OvrdTmr (sec, min, hours)
OvrdCnt (count)

Overtime Hours

OTOccCmd (Occ/Uoc)
OTOccSts (Occ/Uoc)
OTOccTm (hours)

Misc

StartDelay (sec)
AuxContact (Off/On)
RemoteSp (use applicable units)

Equipment Runtime

Ideally equipment runtime objects should use hours for the engineering units and should not refer to the units in the name. However, where multiple objects are used to express runtime for a single piece of equipment with different time units, the following names should be used (SFRnTm is used as an example):

SFRnTm (hours)
SFRnTmSec (seconds)
SFRnTmHr (hours)
SFRnTmDay (days)

Cooling/Heating/Ventilating

ClEna (Off/On)
ClEnaSp (ºF)
ClDmd (Off/On)

HtEna (Off/On)
HtEnaSp (ºF)
HtDmd (Off/On)

VentEna (Off/On)

Lockout Points

ClLckCmd (Off/On)
ClLckSts (Off/On)
ClLckTmpSp (ºF)
ClLckTmpDb (ºF)

HtLckCmd (Off/On)
HtLckSts (Off/On)
HtLckTmpSp (ºF)
HtLckTmpDb (ºF)

StmLck (Off/On)
RHtLck (Off/On)
PHtLck (Off/On)

Warm-Up/Cool-Down Modes

CoolDnMode (Off/On)
CoolDnCmd (Off/On)
CoolDnSts (Off/On)
CoolDnSATmpSp (ºF)
CoolDnRmTmpSp (ºF)

WarmUpMode (Off/On)
WarmUpCmd (Off/On)
WarmUpSts (Off/On)
WarmUpSATmpSp (ºF)
WarmUpRmTmpSp (ºF)

Unoccupied Modes

UnocLLEna (Off/On)
UnocLLCmd (Off/LL)
UnocLLSts (Off/LL)

UnocHLEna (Off/On)
UnocHLCmd (Off/HL)
UnocHLSts (Off/HL)

Alarm/Safety Objects

UnitAlm (Off/On)
ServiceAlm (Off/On)
SmkAlm (Off/On)
FireAlm (Off/On)

FireAlmShutdown (Off/On)

ShutdownRelay (Off/On)

FltAlm (Off/On)
FltRst (Off/On)
FltTmSp (hours)
FltTm (hours)

PreFltAlm (Off/On)
PreFltRst (Off/On)
PreFltTmSp (hours)
PreFltTm (hours)

LowTmpAlm (Off/Alarm)

Loop Control Objects

Loop control variables, where they are being assigned using system objects, should use the following names:

[process]LpPv (use process variable units)
[process]LpCv (use control variable units)
[process]LpSp (use process variable units)
[process]LpPGain (pgain)
[process]LpIGain (igain)
[process]LpDGain (dgain)
[process]LpErr (use process variable units)
[process]LpTm (sec)
[process]LpBias (use control variable units)
[process]LpDb (use process variable units)
[process]LpCvHL (use control variable units)
[process]LpCvLL (use control variable units)

Example using a simple Supply Air Temperature control loop controlling a Cooling Coil Valve:

SATmpLpPv (ºF) ...or SATmp (ºF)
SATmpLpCv (%) ...or CCVlvCmd (%)
SATmpLpSp (ºF) ...or SATmpSp (ºF)
SATmpLpPGain (pgain)
SATmpLpIGain (igain)
SATmpLpDGain (dgain)
SATmpLpError (ºF)
SATmpLpTm (sec)...or 1
SATmpLpBias (%)...or 50
SATmpLpDb (ºF)
SATmpLpCvHL (%)...or 100
SATmpLpCvLL (%) ...or 0

Example using a Temperature control loop controlling a Cooling Coil Valve and a Heating Coil Valve, with multiple temperature inputs and set-points depending on mode:

TmpLpPv (ºF) ...SATmp during Occ, RATmp during Unoc
TmpLpCv (null) ...Cv controls CCVlvCmd & HCVlvCmd
TmpLpSp (ºF) ...SATmpSp during Occ, RATmpSp during Unoc
TmpLpPGain (pgain)
TmpLpIGain (igain)
TmpLpDGain (dgain)
TmpLpError (ºF)
TmpLpTm (sec) ...or 1
TmpLpBias (null) … or 0
TmpLpDb (ºF)
TmpLpCvHL (null) ...100, 0 through 100 is for the cooling coil valve
TmpLpCvLL (null) …-100, 0 through -100 is for the heating coil valve

Optimal Start Stop (OSS)

OSS Objects (SSTO/SSTOCO)

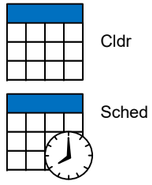
OptStZn (null)
OptStMode (null)
OptStNextStrtTm (min)
OptStNextStopTm (min)
OptStErlyStrtTm (min)
OptStLateStrtTm (min)
OptStNextOccTm (min)
OptStErlyStopTm (min)
OptStLateStopTm (min)
OptStNextUnocTm (min)
OptStAdjStrtTm (min)
OptStAdjStopTm (min)
OptStSeason (Summer/Winter)
OptStZnTmp (ºF)
OptStOATmp (ºF)
OptStClgSp (ºF)
OptStClgCoeff1 (hours)
OptStClgCoeff2 (hours)
OptStClgCoeff3 (hours)
OptStClgCoeff4 (hours)
OptStHtgSp (ºF)
OptStHtgCoeff1 (hours)
OptStHtgCoeff2 (hours)
OptStHtgCoeff3 (hours)
OptStHtgCoeff4 (hours)

OSS Objects (Zone Optimization)

OptStClgSp (ºF)
OptStHtgSp (ºF)
OptStDesOper (null)
OptStEffClgSp (ºF)
OptStEffHtgSp (ºF)
OptStMode (null)
OptStLastMode (null)
OptStNextMode (null)
OptStNextOccTmr (min)
OptStNextOccTm (min)
OptStNextStrtTmr (min)
OptStNextStopTmr (min)
OptStNextStopTm (min)
OptStNextStrtTm (min)
OptStNextUnocTmr (min)
OptStNextUnocTm (min)
OptStOATmp (ºF)
OptStOATmpStop (ºF)
OptStOATmpStrt (ºF)
OptStOccClgSp (ºF)
OptStOccHtgSp (ºF)
OptStLastOccTm (min)
OptStPhase (null)
OptStStopDrtn (min)
OptStStopMode (null)
OptStStopTm (min)
OptStStrtDrtn (min)
OptStStrtMode (null)
OptStStrtTm (min)
OptStStopTmpDif (ºF)
OptStStrtTmpDif (ºF)
OptStStopTGTmp (ºF)
OptStStrtTGTmp (ºF)
OptStAdjStrtTm (min)
OptStAdjStopTm (min)
OptStUnocClgSp (ºF)
OptStUnocHtgSp (ºF)
OptStUnocTm (min)
OptStZnTmp (ºF)
OptStZnTmpStop (ºF)
OptStZnTmpStrt (ºF)

Equipment Schedule

SchedCmd (Off/On)
SchedSts (Off/On)
SchedEna (Off/On)



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AHUMISC

AHU Tag Requirements

Overview

The ahu tag is used to model air handling equipment designed to heat or cool air. Packaged rooftop units are considered a special class of AHU. Packaged units use the ahu tag, but shall also specify the rooftop tag:

Equipment & Reference Tags

AHUs shall always be marked as ahu and equip. The following tags are also used:

- hvac: always specified to mark as an HVAC asset
- rooftop: if the AHU is a packaged rooftop unit (RTU)
- mau: if the AHU is a makeup air unit
- chilledWaterPlantRef: reference plant supplying chilled water
- hotWaterPlantRef: reference plant supplying hot water
- steamPlantRef: reference plant supplying steam

Heating & Cooling Method

AHUs shall always define their heating method using one of the following tags

- elecHeat
- hotWaterHeat
- steamHeat
- gasHeat

AHUs shall always define their cooling method using one of the following tags

- chilledWaterCool
- dxCool

Constant or Variable Volume

An AHU shall be tagged as either constantVolume or variableVolume based on its ability to adjust the volume of air flow. Typically, this distinction is based on whether the AHU's fan is single speed or a VFD.

Zone Air Delivery

A Variable Volume Temperature or VVT system is defined as a constant volume AHU with VAV terminal units. This is indicated by the presence of both the constantVolume and vavZone tags. The following tags define the system used to deliver air to the zones:

- directZone: AHU supplies air directly to the zone
- vavZone: AHU supplies air to VAV terminal units
- chilledBeamZone: AHU supplies air to chilled beam terminal units
- multiZone: air is split into a duct per zone

Ductwork

In multi-duct systems, the AHU discharges into multiple ducts for simultaneous cooling, heating, or neutral air:

- singleDuct: AHU uses a single duct
- dualDuct: the AHU discharges to two ducts which is some combination of hotDeck, coldDeck, or neutralDeck
- tripleDuct: the AHU discharges into three ducts which are the hotDeck, coldDeck, and neutralDeck

Sections

Most points in an AHU are associated with one of the following sections of the unit:

- discharge: air exiting the unit to be supplied to the zones/terminal units
- return: air returning from the zone back into the unit
- outside: fresh, outside air entering the unit for air quality and economizing
- exhaust: air exiting the unit back outside
- mixed: return and outside air mixed together before passing through the heating/cooling elements
- cool: cooling elements/coils
- heat: heating elements/coils
- zone: conditioned space associated with the unit

Points

The following list applies to point tags commonly used with an AHU and shall be applied appropriately:

Discharge
- discharge air temp sensor
- discharge air humidity sensor
- discharge air pressure sensor
- discharge air flow sensor
- discharge air fan cmd
- discharge air fan sensor

Return
- return air temp sensor
- return air humidity sensor
- return air pressure sensor
- return air flow sensor
- return air co2 sensor
- return air fan cmd
- return air damper cmd

Mixed
- mixed air temp sensor

Outside
- outside air temp sensor
- outside air humidity sensor
- outside air pressure sensor
- outside air flow sensor
- outside air flow sp
- outside air damper cmd

Exhaust
- exhaust air fan cmd
- exhaust air damper cmd

Conditioning
- cool stage cmd
- heat stage cmd
- humidifier cmd
- filter sensor

Misc
- freezeStat sensor
- heatWheel cmd
- faceBypass cmd
- bypass damper cmd

Zone (see also ZONETAG)
- zone air temp sensor
- zone air temp effective sp
- zone air temp occ cooling sp
- zone air temp occ heating sp
- zone air temp unocc cooling sp
- zone air temp unocc heating sp
- zone air temp standby cooling sp
- zone air temp standby heating sp
- zone air humidity sensor
- zone air co2 sensor
- zone air co2 sp

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2.3	1/5/2018	508 Compliance
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-	-	-

STATUS: Version 2.3

DRAWN BY: Mike Grush / Craig Payne

REV. DATE: **1/5/18**

SHEET TITLE & NUMBER:

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AHUTAG

Zone Control

Zn##OccCmd (Off/On)

Zn##EffTmp (°F)
Zn##EffSp (°F)
Zn##OccClgSp (°F)
Zn##OccHtgSp (°F)
Zn##UnoccClgSp (°F)
Zn##UnocHtgSp (°F)
Zn##StbyClgSp (°F)
Zn##StbyHtgSp (°F)

T
Zn##Tmp (°F)
Zn##TmpSp (°F)

RH
Zn##RelHum (%)
Zn##RelHumSp (%)
Zn##Enth (btu-lb)
Zn##EnthSp (btu-lb)
Zn##Dew (°F)
Zn##DewSp (°F)

IAQ
Zn##CO2 (ppm)
Zn##CO2Sp (ppm)
Zn##CO2Alm (Off/On)
Zn##IAQAlm (Off/On)
Zn##VOC (ppm)
Zn##VOCSp (ppm)
Zn##VOCAlm (Off/On)

General Zone Management

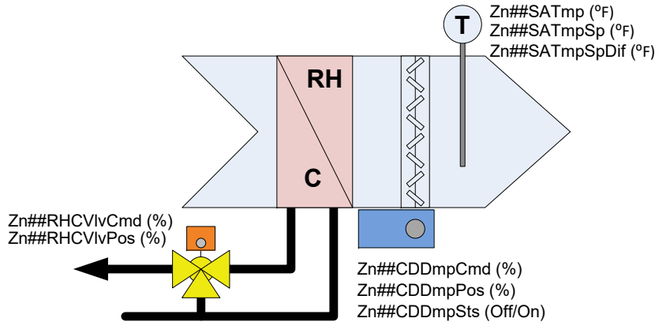
ZnDmpMax (%)
ZnDmpMin (%)
ZnDmpAvg (%)

ZnHDDmpMax (%)
ZnHDDmpMin (%)
ZnHDDmpAvg (%)

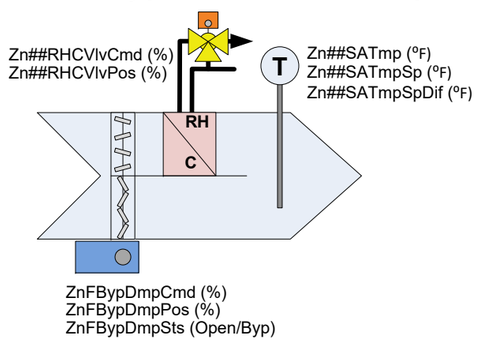
ZnCDDmpMax (%)
ZnCDDmpMin (%)
ZnCDDmpAvg (%)

ZnRHCVlvMax (%)
ZnRHCVlvMin (%)
ZnRHCVlvAvg (%)

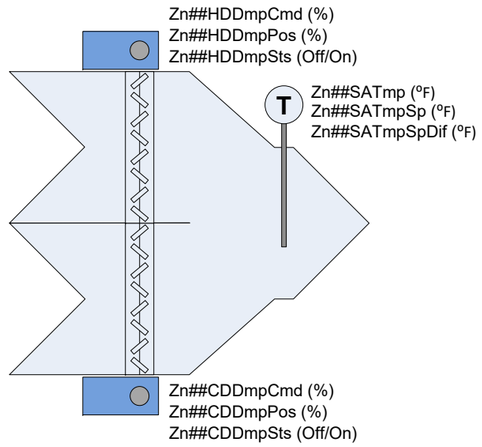
Single-duct Zone Damper



Face/Bypass Zone Damper



Dual-duct Zone Dampers



See other AHU pages for additional AHU points.

Diagrams depict generic equipment containing control points and objects, some of which may or may not be present or required for a particular piece of equipment or in a particular application.

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REV. DATE: **1/5/18**

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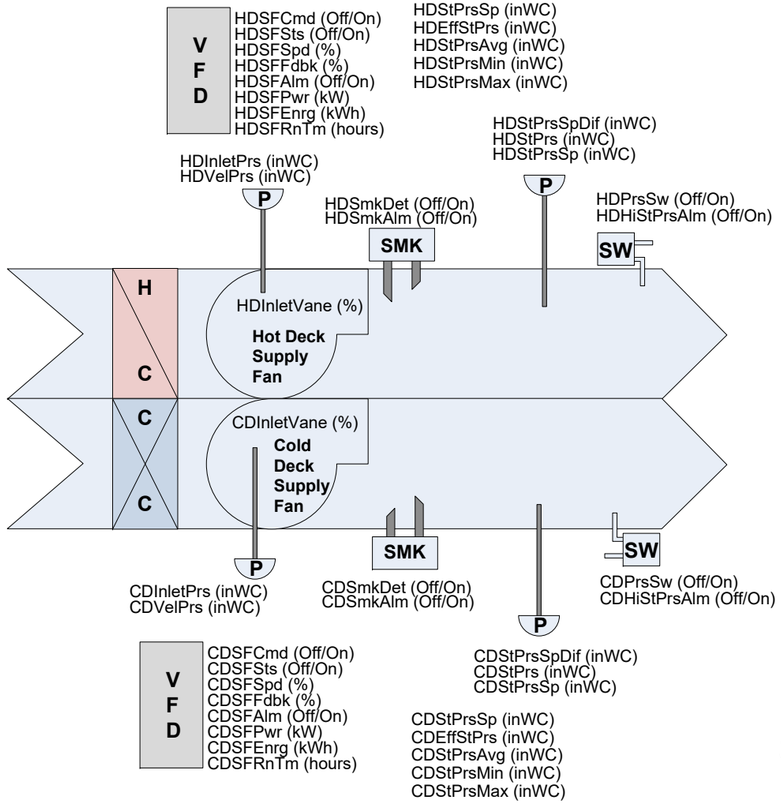
AHUMZ

Dual Supply Fan Dual Duct AHU



AHU Control Parameters

Unit Control Points

ManOvrdCmd (Off/On)

ScheduleCmd (Off/On)
ScheduleSts (Off/On)

OccCmd (Occ/Uoc)
OvrdCmd (Off/Ovrd)
OccSts (Occ/Uoc)
EffOcc (Occ/Uoc)
OTOcc (Occ/Uoc)
OTOccTm (hours)

NightLLCmd (Off/LL)
NightHLCmd (Off/HL)

ClEna (Off/On)
ClDmd (Off/On)
HtEna (Off/On)
HtDmd (Off/On)

RemoteSp (use applicable units)

StartDelay (sec)

Miscellaneous Points

AuxContact (Off/On)
ShutdownRelay (Off/On)
UnitAlm (Off/On)
ServiceAlm (Off/On)

SmkAlm (Off/On)
FireAlm (Off/On)

Lockout Points

ClLckCmd (Off/On)
ClLckSts (Off/On)
ClLckTmpSp (ºF)
ClLckTmpDb (ºF)

HtLckCmd (Off/On)
HtLckSts (Off/On)
HtLckTmpSp (ºF)
HtLckTmpDb (ºF)

StmLck (Off/On)
RHtLck (Off/On)
PHtLck (Off/On)

Zone Control Setpoints

OccCmd (Occ/Uoc)
UnocOvrdCmd (Uoc/Ovrd)
OvrdTimeSp (hours)

T
Tmp (ºF)
TmpSp (ºF)

EffTmp (ºF)
EffSp (ºF)
OccClgSp (ºF)
OccHtgSp (ºF)
UnocClgSp (ºF)
UnocHtgSp (ºF)
StbyClgSp (ºF)
StbyHtgSp (ºF)

UserSpAdjEna (Off/On)
UserSpAdjRng (ºF)
UserSpAdjHL (ºF)
UserSpAdjLL (ºF)
UserSpAdj (ºF)
EffUserSp (ºF)
OccSnsrSts (Off/On)

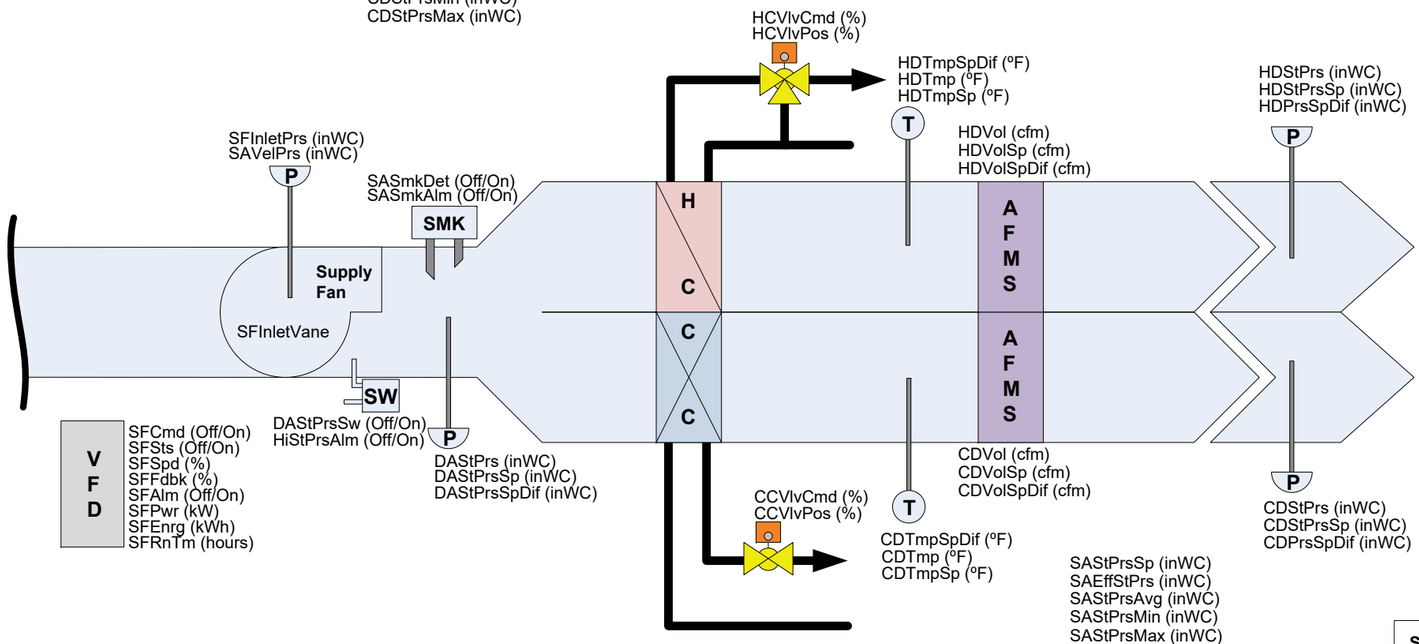
MinClVolSp (cfm)
MaxClVolSp (cfm)
MinHtVolSp (cfm)
MaxHtVolSp (cfm)
MinTotVolSp (cfm)
MaxTotVolSp (cfm)

AirFlowPct (%)
AirFlowPctSp (%)

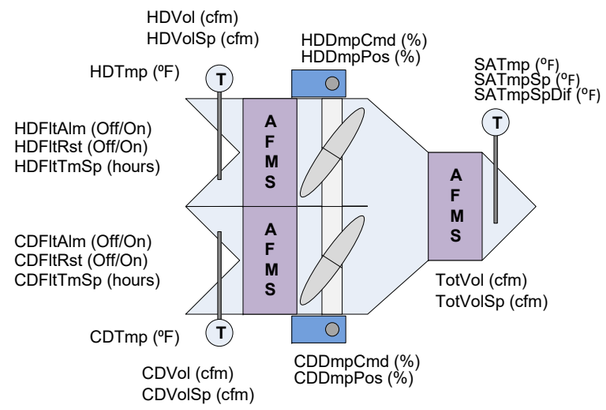
OccAirVolSp (cfm)
UnocAirVolSp (cfm)

HDDuctArea (sqft)
HDVolCoeff (coeff)
CDDuctArea (sqft)
CDVolCoeff (coeff)

Single Supply Fan Dual Duct AHU



Dual-Duct Terminal Unit



See other AHU pages for additional AHU points.

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-	-	-

STATUS: Version 2.3

DRAWN BY: Mike Grush / Craig Payne

REV. DATE: **1/5/18**

SHEET TITLE & NUMBER:

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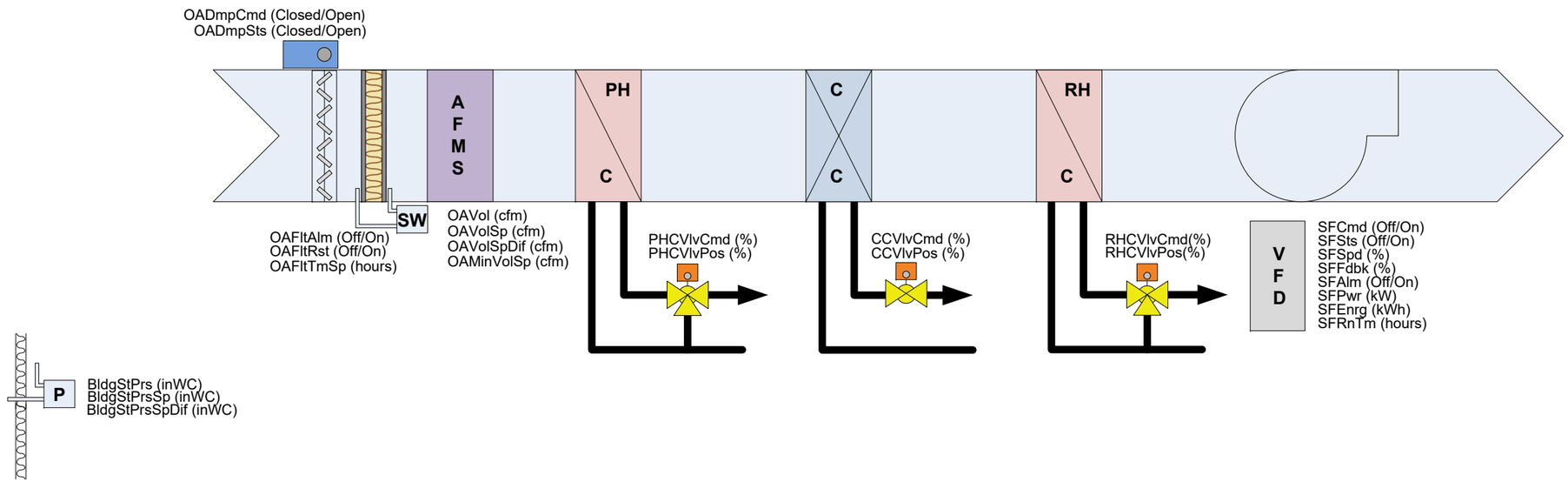
AHUDD

OSA AHU/MUA AHU



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STATUS: Version 2.3

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REV. DATE: **1/5/18**

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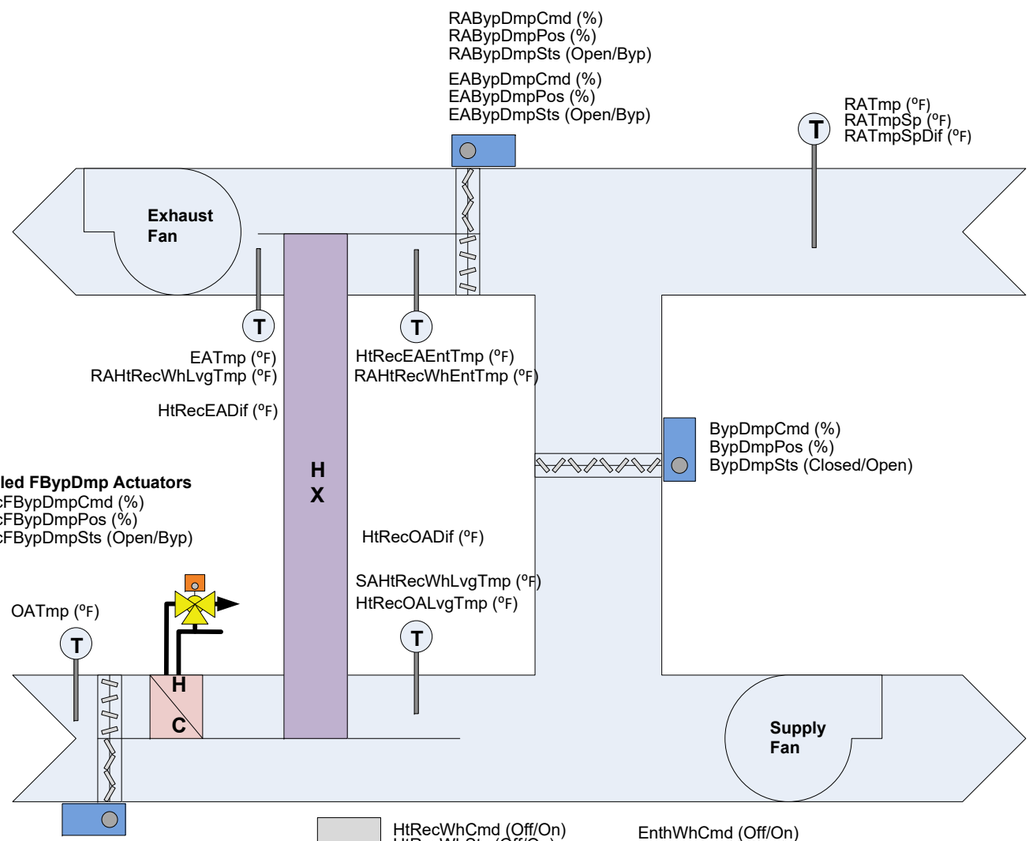
AHUOA

Air-to-Air Heat Recovery

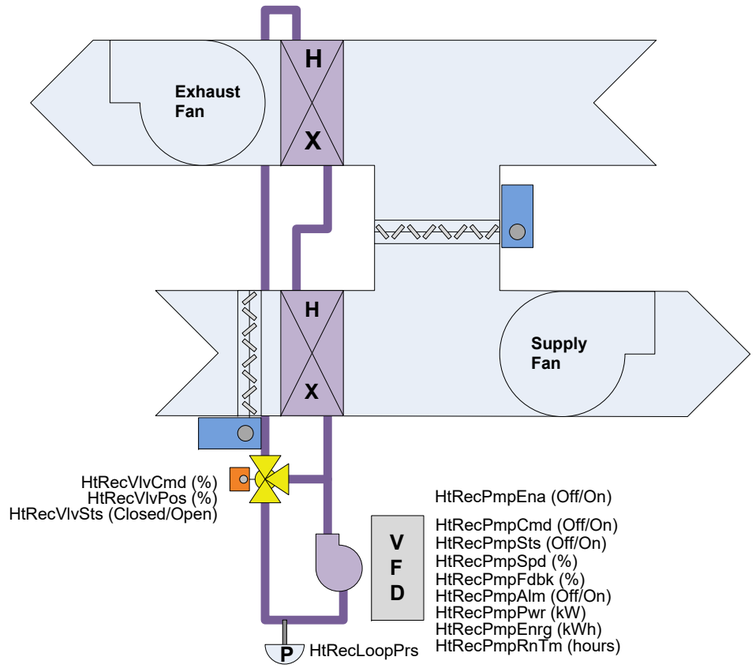


Heat Recovery Control Points

HtRecEna (Off/On)
HtRecMode (Recover/Reject)
HtRcvMode (Off/On)
HtRejMode (Off/On)
HtRecDif (ºF)
HtRecDifSp (ºF)
HtRecovered (btu)
HtRejected (btu)
HtRecEff (%)
HtRecEffBase (%)

HtRcvModeSp (ºF)
HtRejModeSp (ºF)
HtRcvModeDb (ºF)
HtRejModeDb (ºF)
HtRecOATmpSp (ºF)
HtRecOATmpDb (ºF)
HtRecDifSp (ºF)
HtRecDifDb (ºF)

Hydronic Heat Recovery



See other AHU pages for additional AHU points.

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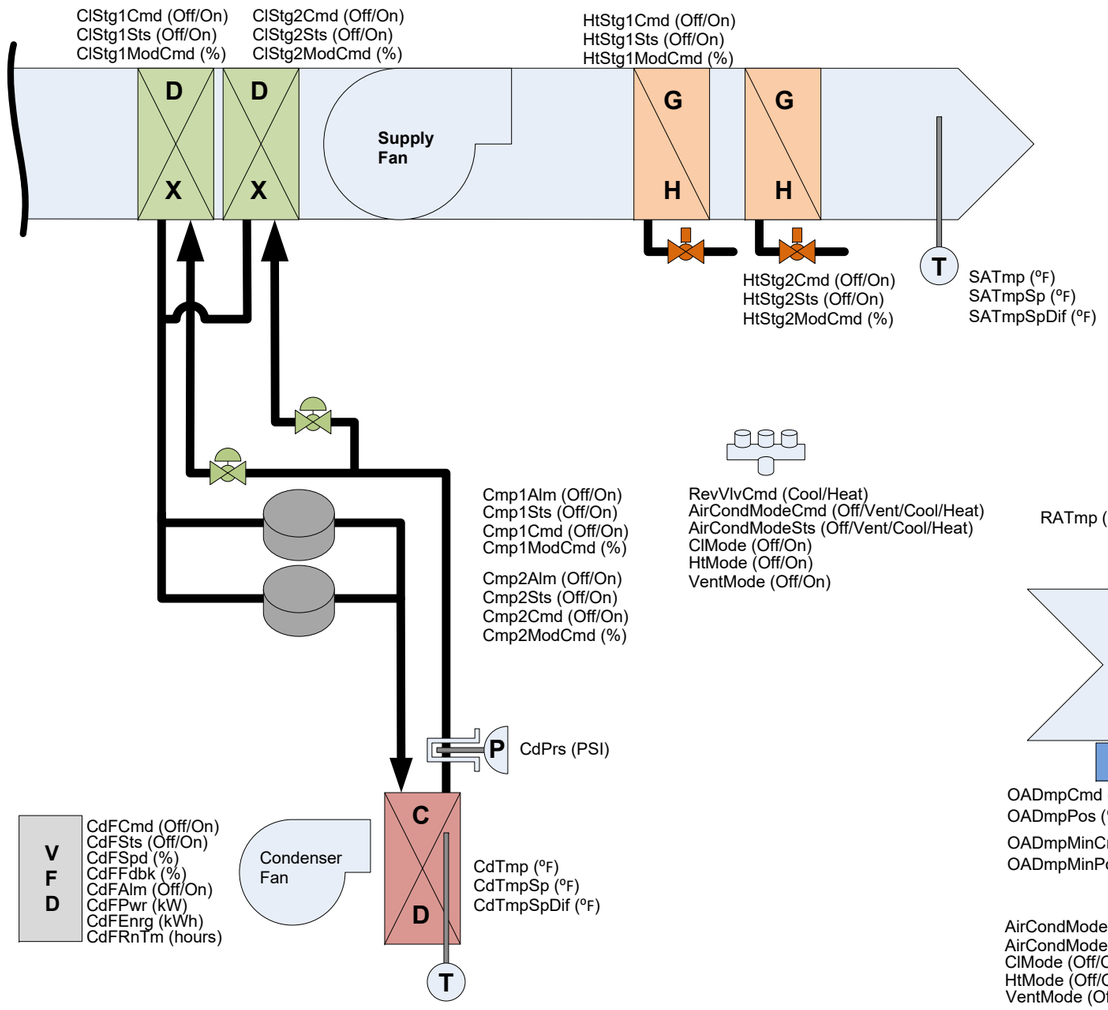
STATUS: Version 2.3
DRAWN BY: Mike Grush / Craig Payne
REV. DATE: **1/5/18**

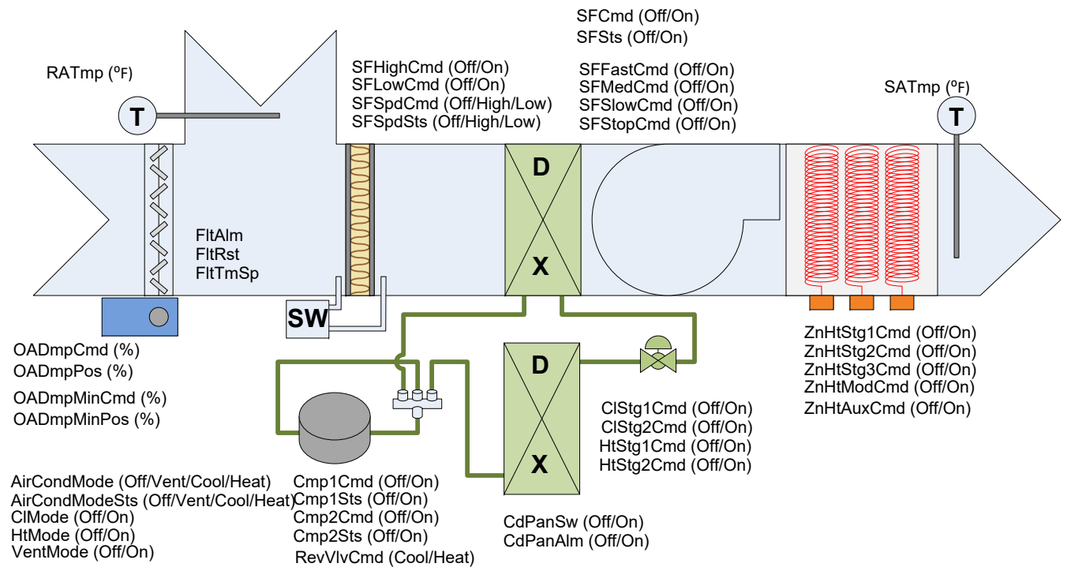
SHEET TITLE & NUMBER:

AHUHX

DX AHU w/ Gas Heat



Unit Ventilator/Heat Pump



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STATUS: Version 2.3
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REV. DATE: **1/5/18**

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AHUDX

Zone Control Points

OccCmd (Occ/Uoc)
UnocOvrdCmd (Uoc/Ovrd)
OvrdTmSp (hours)

OccRmTmpSp (ºF)
UnocRmTmpSp (ºF)

EffRmTmp (ºF)
EffRmTmpSp (ºF)
OccClgSp (ºF)
OccHtgSp (ºF)
UnocClgSp (ºF)
UnocHtgSp (ºF)
StbyClgSp (ºF)
StbyHtgSp (ºF)
EffHtgSp (ºF)
EffClgSp (ºF)

UserSpAdjEna (Off/On)
UserSpAdjRng (ºF)
UserSpAdjHL (ºF)
UserSpAdjLL (ºF)
UserSpAdj (ºF)
EffUserSp (ºF)
OccSnsrSts (Off/On)

OvrdEna (Off/On)
OvrdCmd (Uoc/Ovrd)
OvrdTmRem (min)

T

RmTmp (ºF)
RmTmpSp (ºF)
RmTmpSpHL (ºF)
RmTmpSpLL (ºF)

RH

RmRelHum (%)
RmRelHumSp (%)
RmEnth (btu-lb)
RmEnthSp (btu-lb)
RmDew (ºF)
RmDewSp (ºF)

IAQ

RmCO2 (ppm)
RmCO2Sp (ppm)
RmCO2Alm (Off/On)
RmIAQAlm (Off/On)
RmVOC (ppm)
RmVOCSp (ppm)
RmVOCAlm (Off/On)

AirCondModeCmd (Cool/Heat)
AirCondModeSts (Cool/Heat)
AirCondModeDb (ºF)
AirCondModeDly (sec)

ClgModeSts (Off/On)
HtgModeSts (Off/On)
VentModeSts (Off/On)
StbyModeSts (Off/On)

ClgVolSpLL (cfm)
ClgVolSpHL (cfm)
HtgVolSpLL (cfm)
HtgVolSpHL (cfm)

AirFlwPct (%)
AirFlwPctSp (%)

OccAirVolSp (cfm)
UnocAirVolSp (cfm)

InletDuctArea (sqft)
InletAirVolCoeff (coeff)

See other pages for additional terminal unit points.

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STATUS: Version 2.3
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ZONE

Zone Tag Requirements

Overview

The zone tag is used for points associated with a conditioned space in a building. Zone points are used consistently by any equipment used to condition the space including:

- directZone ahu
- vav
- fcu
- uv
- heatPump

Sections

Not applicable

Points

The following are the standardized zone points:

Zone

- zone air temp sensor
- zone air temp effective sp
- zone air temp occ cooling sp
- zone air temp occ heating sp
- zone air temp unocc cooling sp
- zone air temp unocc heating sp
- zone air temp standby cooling sp
- zone air temp standby heating sp
- zone air humidity sensor
- zone air co2 sensor
- zone air co2 sp

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STATUS: Version 2.3

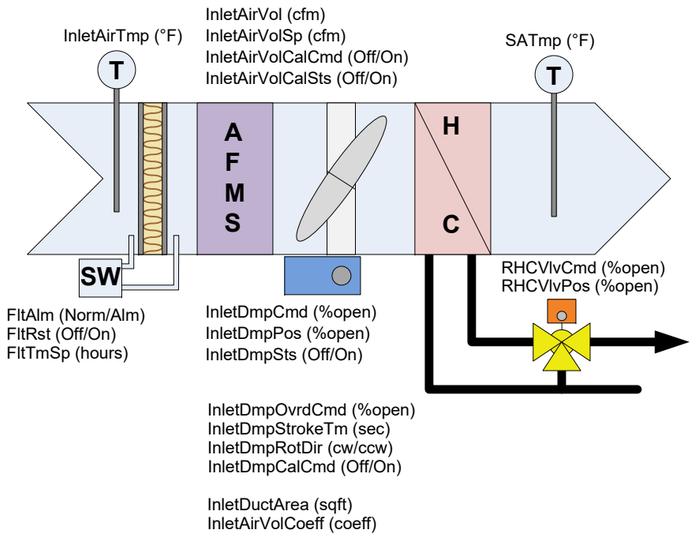
DRAWN BY: Mike Grush / Craig Payne

REV. DATE: **1/5/18**

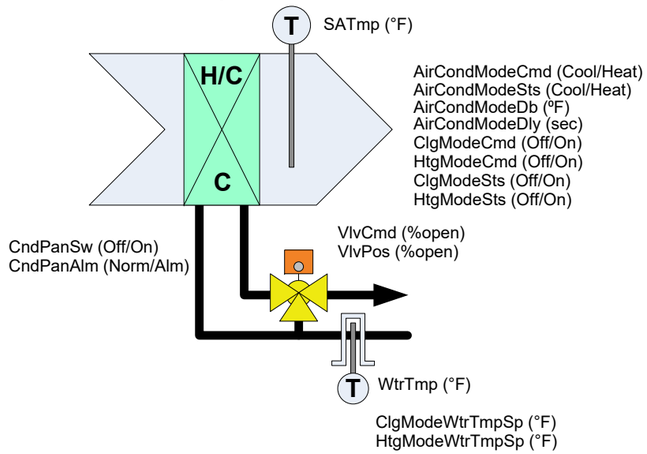
SHEET TITLE & NUMBER:

ZONETAG

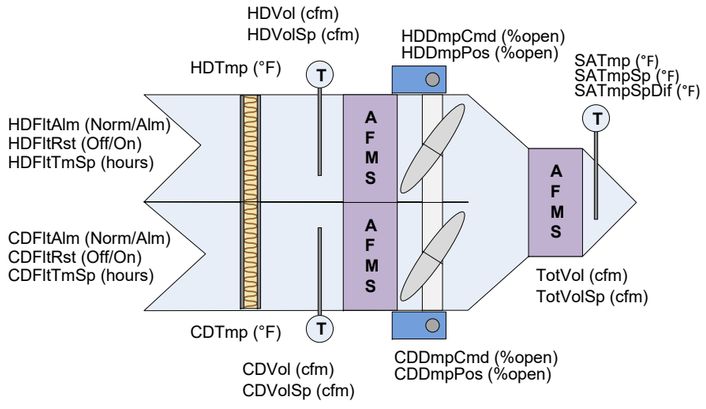
CV/VAV/VVT w/ HW Reheat



2-Pipe Coil



Dual-Duct Terminal Unit



See other pages for additional terminal unit points.

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STATUS: Version 2.3
DRAWN BY: Mike Grush / Craig Payne
REV. DATE: **1/5/18**

SHEET TITLE & NUMBER:
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VAV CV VVT

VAV Tag Requirements

Overview

The vav tag is used to model variable air volume assets. VAVs shall always be marked as equip.

Equipment & Reference Tags

VAVs shall be classified with the following type tags:

coolOnly
series fanPowered elecReheat
series fanPowered hotWaterReheat
parallel fanPowered elecReheat
parallel fanPowered hotWaterReheat

These additional equip level tags shall be defined for VAVs:

hvac: always specified to mark as an HVAC asset
singleDuct or dualDuct: ductwork configuration
ahuRef: supply AHU
chilledWaterPlantRef: plant supplying chilled water if applicable
pressureDependent or pressureIndependent: control based on duct static pressure
hotWaterPlantRef: reference plant supplying hot water
steamPlantRef: reference plant supplying steam

Sections

Since most points are not clearly associated with the entering or discharge section we omit a section tag for most points. Any points which would conflict with the zone points must be qualified with either discharge or entering tags. Associate points with sections of a VAV using these tags:

entering: air entering the unit from the AHU
discharge: air exiting the unit to be supplied to the zones
zone: conditioned space associated with the unit

Points

The following list applies to point tags commonly used with a VAV and shall be applied appropriately:

VAV Points Include Zone Tags

zone air temp sensor
zone air temp effective sp
zone air temp occ cooling sp
zone air temp occ heating sp
zone air temp unocc cooling sp
zone air temp unocc heating sp
zone air temp standby cooling sp
zone air temp standby heating sp
zone air humidity sensor
zone air co2 sensor
zone air co2 sp

Other Standardized Tags

discharge air temp sensor
entering air temp sensor
air pressure sensor
air flow sensor
air flow effective sp
air flow min sp
air flow max sp
air flow reheating max sp
air flow standby sp
air fan cmd
air fan sensor
air damper cmd
reheat cmd
vavMode sp
ductArea sp
perimeterHeat cmd

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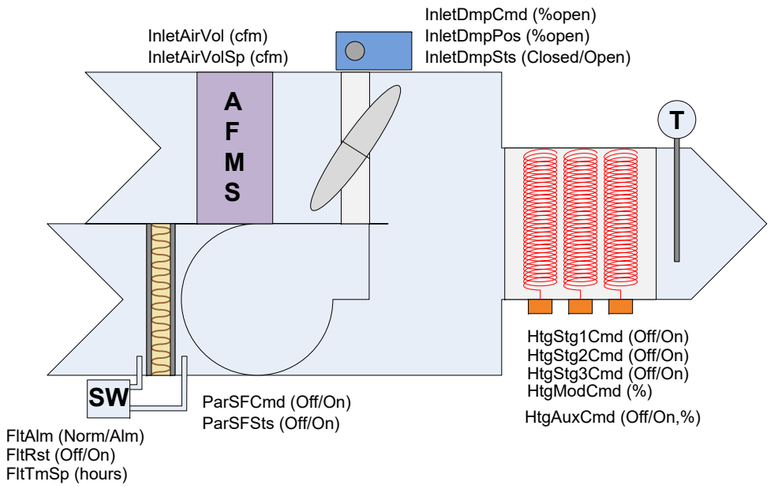
STATUS: Version 2.3
DRAWN BY: Mike Grush / Craig Payne
REV. DATE: **1/5/18**

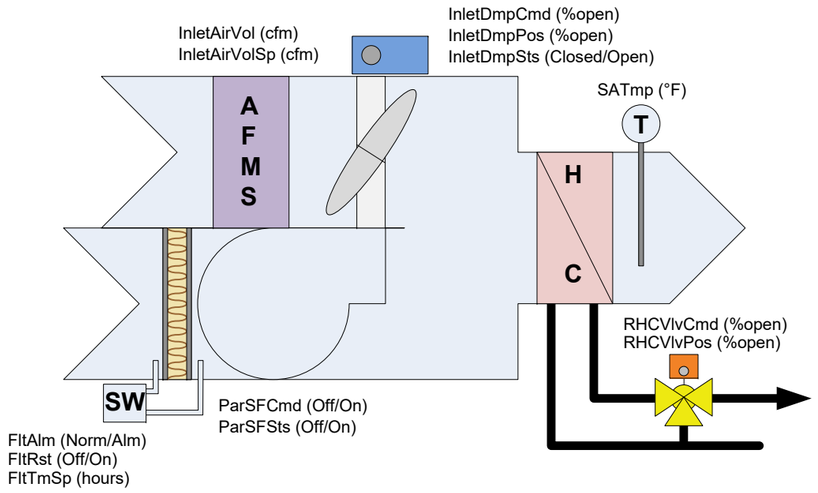
SHEET TITLE & NUMBER:

VAVTAG

VAV w/ Parallel Fan & Electric Reheat

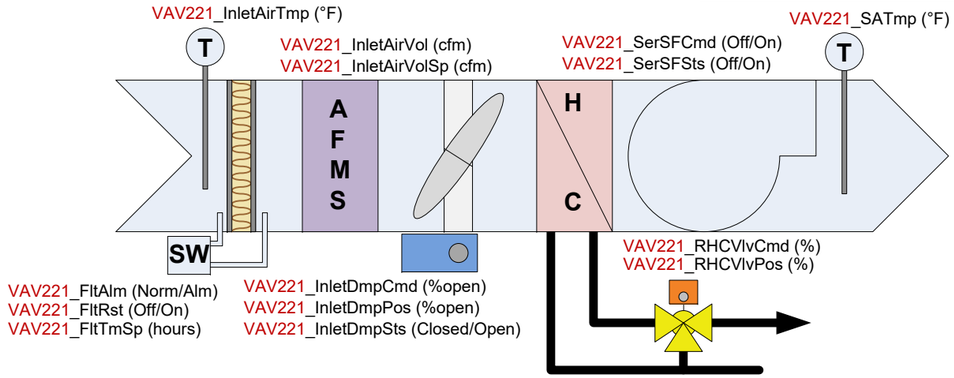


VAV w/ Parallel Fan & HW Reheat

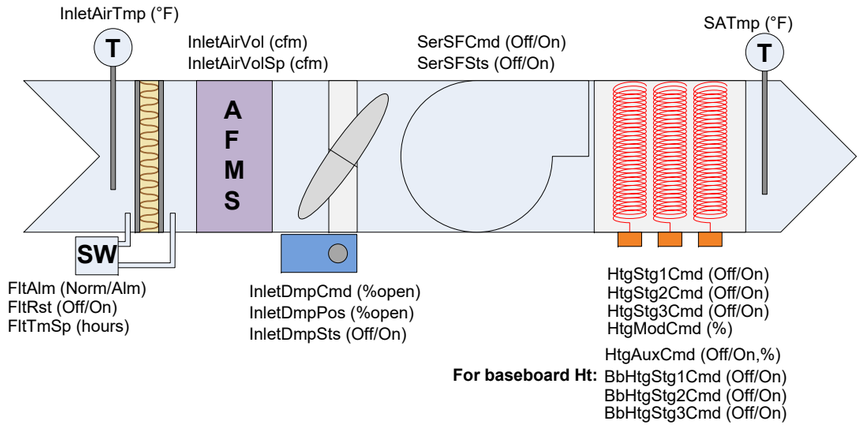


VAV w/ Series Fan & HW Reheat

In this example, "VAV221_" is the equipment designator.



VAV w/ Series Fan & Electric Reheat



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-	-	-

STATUS: Version 2.3
DRAWN BY: Mike Grush / Craig Payne
REV. DATE: **1/5/18**

SHEET TITLE & NUMBER:

FTU

Zone Control Points

OccCmd (Occ/Uoc)
UnocOvrdCmd (Uoc/Ovrd)
OvrdTmSp (hours)

OccRmTmpSp (ºF)
UnocRmTmpSp (ºF)

EffRmTmp (ºF)
EffRmTmpSp (ºF)
OccClgSp (ºF)
OccHtgSp (ºF)
UnocClgSp (ºF)
UnocHtgSp (ºF)
StbyClgSp (ºF)
StbyHtgSp (ºF)
EffHtgSp (ºF)
EffClgSp (ºF)

UserSpAdjEna (Off/On)
UserSpAdjRng (ºF)
UserSpAdjHL (ºF)
UserSpAdjLL (ºF)
UserSpAdj (ºF)
EffUserSp (ºF)
OccSnsrSts (Off/On)

OvrdEna (Off/On)
OvrdCmd (Uoc/Ovrd)
OvrdTmRem (min)

T
RmTmp (ºF)
RmTmpSp (ºF)
RmTmpSpHL (ºF)
RmTmpSpLL (ºF)

RH
RmRelHum (%)
RmRelHumSp (%)
RmEnth (btu-lb)
RmEnthSp (btu-lb)
RmDew (ºF)
RmDewSp (ºF)

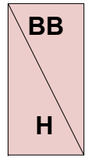
IAQ
RmCO2 (ppm)
RmCO2Sp (ppm)
RmCO2Alm (Off/On)
RmIAQAlm (Off/On)
RmVOC (ppm)
RmVOCSp (ppm)
RmVOCAlm (Off/On)

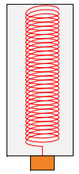
AirCondModeCmd (Cool/Heat)
AirCondModeSts (Cool/Heat)
AirCondModeDb (ºF)
AirCondModeDly (sec)

ClgModeSts (Off/On)
HtgModeSts (Off/On)
VentModeSts (Off/On)
StbyModeSts (Off/On)

Baseboard Heat Points

BbHtgEna (Off/On)
BbHtgOATmpSp (ºF)
BbHtgOATmpSpDb (ºF)





BbHtgVlvCmd (Off/On)
BbHtgVlvCmd (%)

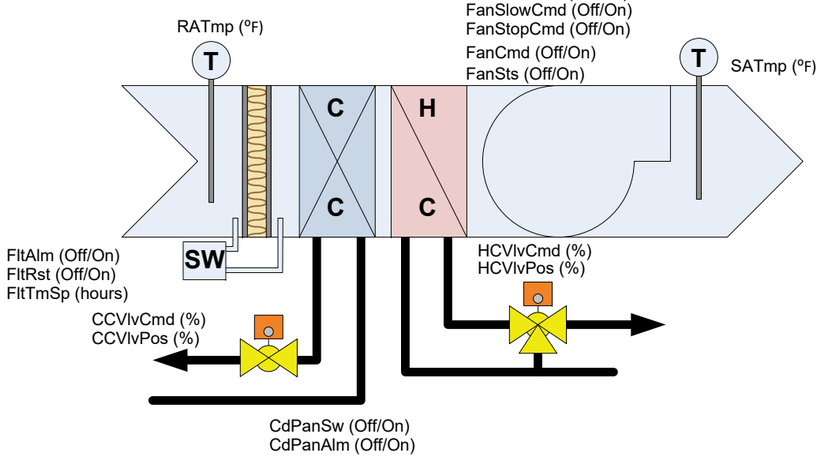
BbHtgCmd (Off/On)

Fan Coil Unit w/ 4-Pipe Cooling & Heating

FanHighCmd (Off/On)
FanLowCmd (Off/On)
FanSpdCmd (Off/Low/High)
FanSpdSts (Off/Low/High)

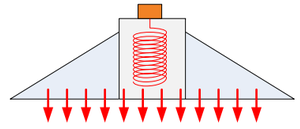
FanFastCmd (Off/On)
FanMedCmd (Off/On)
FanSlowCmd (Off/On)
FanStopCmd (Off/On)

FanCmd (Off/On)
FanSts (Off/On)



Radiant Heat Points

RadHtgEna (Off/On)
RadHtgOATmpSp (ºF)
RadHtgOATmpSpDb (ºF)



RadHtgCmd (Off/On)

See other AHU and Terminal Units pages for additional points.

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FCU

Unitary Equipment Tag Requirements

Overview

This section defines unitary HVAC equipment which combines heating and/or cooling into packaged units.

FCU Equipment & Reference Tags

The fcu and equip tag are used to model fan coil units. Fan coils are unitary equipment which use the zone for supply air.

hvac: always specified to mark as an HVAC asset

Unit Ventilator Equipment & Reference Tags

The uv tag is used to model unit ventilators. Unit ventilators differ from FCUs in that they have direct access to outside air.

hvac: always specified to mark as an HVAC asset

Heat Pump Equipment & Reference Tags

The heatPump tag is used to model heat pumps.

hvac: always specified to mark as an HVAC asset

Heating & Cooling Method

Like AHUs, unitary equipment shall always define their heating method using one of the following tags

elecHeat
hotWaterHeat
steamHeat
gasHeat

Like AHUs, unitary equipment shall always define their cooling method using one of the following tags

chilledWaterCool
dxCool

Sections

Like AHUs, unitary equipment points are associated with one of the following sections of the unit:

discharge: air exiting the unit to be supplied to the zones/terminal units
return: air returning from the zone back into the unit
outside: fresh, outside air entering the unit for air quality and economizing
exhaust: air exiting the unit back outside
mixed: return and outside air mixed together before passing through the heating/cooling elements
cool: cooling elements/coils
heat: heating elements/coils
zone: conditioned space associated with the unit

Points

The following list applies to point tags commonly used with unitary equipment and shall be applied appropriately:

Discharge
discharge air temp sensor
discharge air humidity sensor
discharge air pressure sensor
discharge air flow sensor
discharge air fan cmd
discharge air fan sensor

Return
return air temp sensor
return air humidity sensor
return air pressure sensor
return air flow sensor
return air co2 sensor
return air fan cmd
return air damper cmd

Mixed
mixed air temp sensor

Outside
outside air temp sensor
outside air humidity sensor
outside air pressure sensor
outside air flow sensor
outside air flow sp
outside air damper cmd

Exhaust
exhaust air fan cmd
exhaust air damper cmd

Conditioning
cool stage cmd
heat stage cmd
humidifier cmd
filter sensor

Misc
freezeStat sensor
heatWheel cmd
faceBypass cmd
bypass damper cmd

Zone (see also ZONETAG)
zone air temp sensor
zone air temp effective sp
zone air temp occ cooling sp
zone air temp occ heating sp
zone air temp unocc cooling sp
zone air temp unocc heating sp
zone air temp standby cooling sp
zone air temp standby heating sp
zone air humidity sensor
zone air co2 sensor
zone air co2 sp

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UNITAG

Zone Control Points

OccCmd (Occ/Uoc)
UnocOvrdCmd (Uoc/Ovrd)
OvrdTmSp (hours)

OccRmTmpSp (ºF)
UnocRmTmpSp (ºF)

EffRmTmp (ºF)
EffRmTmpSp (ºF)
OccClgSp (ºF)
OccHtgSp (ºF)
UnocClgSp (ºF)
UnocHtgSp (ºF)
StbyClgSp (ºF)
StbyHtgSp (ºF)
EffHtgSp (ºF)
EffClgSp (ºF)

UserSpAdjEna (Off/On)
UserSpAdjRng (ºF)
UserSpAdjHL (ºF)
UserSpAdjLL (ºF)
UserSpAdj (ºF)
EffUserSp (ºF)
OccSnsrSts (Off/On)

OvrdEna (Off/On)
OvrdCmd (Uoc/Ovrd)
OvrdTmRem (min)

T
RmTmp (ºF)
RmTmpSp (ºF)
RmTmpSpHL (ºF)
RmTmpSpLL (ºF)

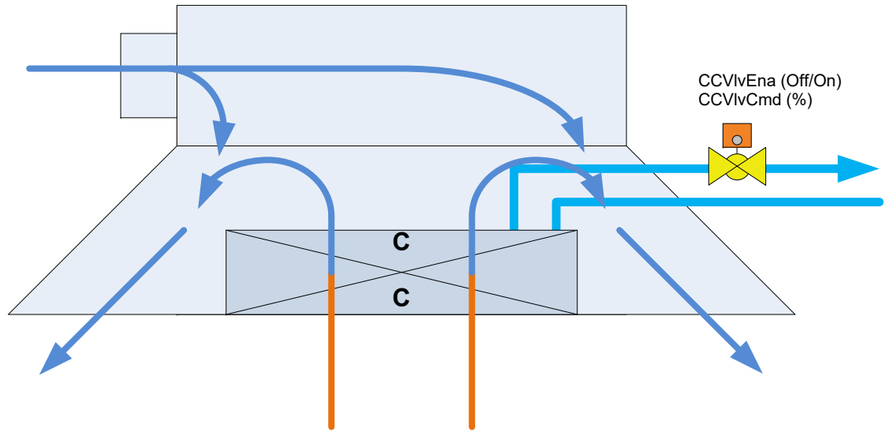
RH
RmRelHum (%)
RmRelHumSp (%)
RmEnth (btu-lb)
RmEnthSp (btu-lb)
RmDew (ºF)
RmDewSp (ºF)

IAQ
RmCO2 (ppm)
RmCO2Sp (ppm)
RmCO2Alm (Off/On)
RmIAQAlm (Off/On)
RmVOC (ppm)
RmVOCSp (ppm)
RmVOCAlm (Off/On)

AirCondModeCmd (Cool/Heat)
AirCondModeSts (Cool/Heat)
AirCondModeDb (ºF)
AirCondModeDly (sec)

ClgModeSts (Off/On)
HtgModeSts (Off/On)
VentModeSts (Off/On)
StbyModeSts (Off/On)

Chilled Beam Control Points



T
RmTmp (°F)
RmTmpSp (°F)

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CHBEAM

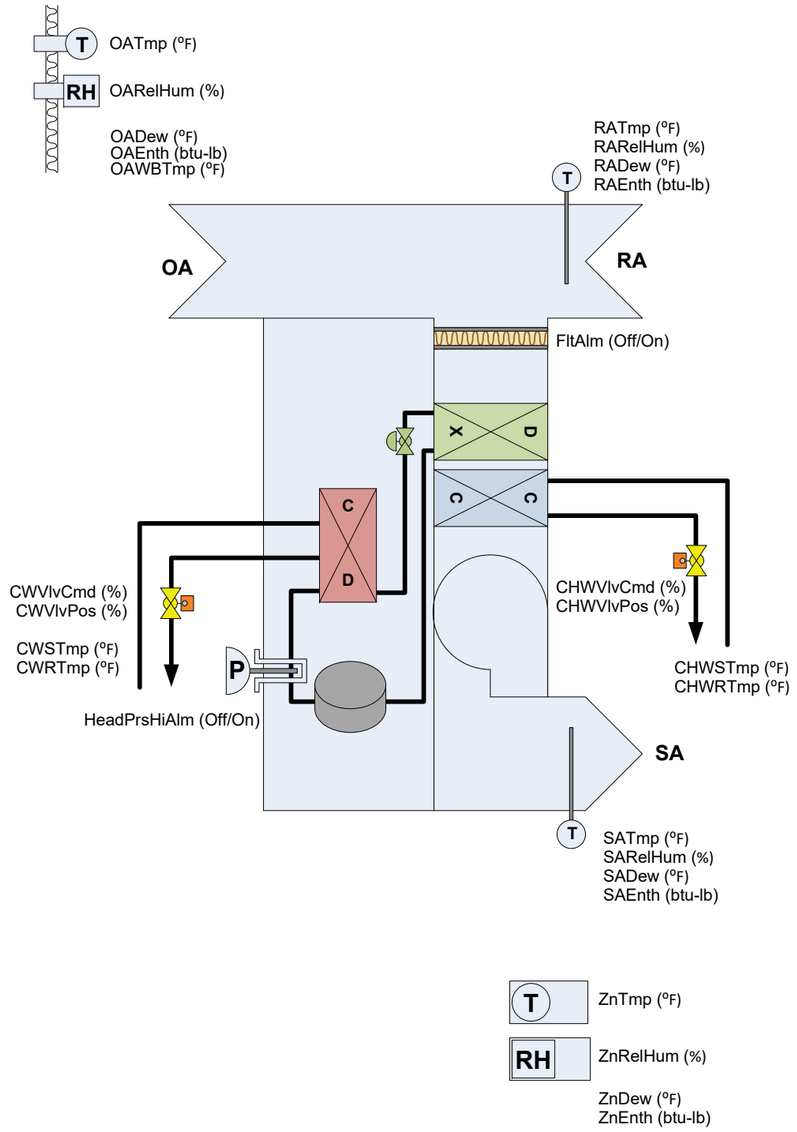
General Objects	Description
UnitStartCmd (Off/On)	Unit On/Off Command
SysSts (varies)	System Status
SysOpState (varies)	System Operating State
AutoMode (Manual/Auto)	System Operating State
Shtdn (Off/On)	Unit Shutdown
Stby (Off/On)	Unit Standby
SATmp (ºF)	Supply Air Temperature
RATmp (ºF)	Return Air Temperature
OATmp (ºF)	Outside Air Temperature
ZnTmp (ºF)	Zone Air Temperature
SARelHum (%)	Supply Air Relative Humidity
RARelHum (%)	Return Air Relative Humidity
OARelHum (%)	Outside Air Relative Humidity
ZnRelHum (%)	Zone Relative Humidity
SADew (ºF)	Supply Air Dew Point Temperature
RADew (ºF)	Return Air Dew Point Temperature
OADew (ºF)	Outside Air Dew Point Temperature
ZnDew (ºF)	Zone Air Dew Point Temperature
CHWSTmp (ºF)	Chilled Water Supply Temperature
CHWRTmp (ºF)	Chilled Water Return Temperature
CWSTmp (ºF)	Condenser Water Supply Temperature
CWRTmp (ºF)	Condenser Water Return Temperature
CHWFlwSw (Off/On)	Chilled Water Flow Switch
CWFlwSw (Off/On)	Condenser Water Flow Switch
CHWFlwRat (gpm)	Chilled Water Flow Rate
CWFlwRat (gpm)	Condenser Water Flow Rate
FanSts (Off/On)	Fan Status
CHWVlvPos (%)	Chilled Water Valve Position
CWVlvPos (%)	Condenser Water Valve Position
CmpSts (Off/On)	Compressor Status
PmpSts (Off/On)	Pump Status
ClMode (Off/On)	Cooling Mode
HtMode (Off/On)	Heating Mode
DehumMode (Off/On)	Dehumidification Mode
HumMode (Off/On)	Humidification Mode
EconMode (Off/On)	Economizer Mode
ActCapPct (%)	Active Capacity Percentage
ZnEnth (btu-lb)	Zone Enthalpy
SAEnth (btu-lb)	Supply Air Enthalpy
RAEnth (btu-lb)	Return Air Enthalpy
OAEnth (btu-lb)	Outside Air Enthalpy

Set Points	Description
ZnTmpSp (ºF)	Zone Temperature Set Point
ZnDewSp (ºF)	Zone Dew Point Temperature Set Point
ZnRelHumSp (%)	Zone Relative Humidity Set Point
ZnEnthSp (btu-lb)	Zone Enthalpy Set Point

Faults	Description
GeneralFlt (Off/On)	General Fault
CHWVFlt (Off/On)	Chilled Water Control Valve Failure
PwrFlt (Off/On)	Ext Power Source Failure
TmpFlt (Off/On)	Temperature Control Sensor Issue
AirFlwFlt (Off/On)	Airflow Sensor Issue
SATmpFlt (Off/On)	Supply Air Sensor Issue
RATmpFlt (Off/On)	Return Air Sensor Issue
ZnTmpFlt (Off/On)	Ext Air Sensor Issue
OATmpFlt (Off/On)	Outside Air Sensor Issue
RARelHumFlt (Off/On)	Return Air Relative Humidity Sensor Issue
FanFlt (Off/On)	Fan Failure
CmpFlt (Off/On)	Compressor Failure
FireAlm (Off/On)	External Fire Alarm Contacts
ExtDmpPosFlt (Off/On)	External Air Damper Position Issue
WtrLeakFlt (Off/On)	Water Leakage Detector Sensor Issue

Warnings	Description
MaintDue (Off/On)	Maintenance Due
ServiceReq (Off/On)	Service Required
SATmpHi (Off/On)	Supply Air Over Temperature
SATmpLo (Off/On)	Supply Air Under Temperature
RATmpHi (Off/On)	Return Air Over Temperature
RATmpLo (Off/On)	Return Air Under Temperature
ZnTmpHi (Off/On)	Ext Air Sensor Over Temperature
ZnTmpLo (Off/On)	Ext Air Sensor Under Temperature
RADewHi (Off/On)	Return Air Dew Point High
RADewLo (Off/On)	Return Air Dew Point High
RARelHumHi (Off/On)	Return Air Relative Humidity High
RARelHumLo (Off/On)	Return Air Relative Humidity Low
ZnDewHi (Off/On)	Zone Dew Point High
ZnDewLo (Off/On)	Zone Dew Point Low
ZnRelHumHi (Off/On)	Zone Relative Humidity High
ZnRelHumLo (Off/On)	Zone Relative Humidity Low
CHWSTmpHi (Off/On)	Supply Chilled Water Over Temp
ExtTmpHi (Off/On)	Ext Over Temperature
WtrUdrFlrFlt (Off/On)	Water Under Floor
SmokeAlm (Off/On)	Smoke Alarm
FltAlm (Off/On)	Filter Alarm
HeadPrsHiAlm (Off/On)	High Head Pressure Alarm

CRAC Unit



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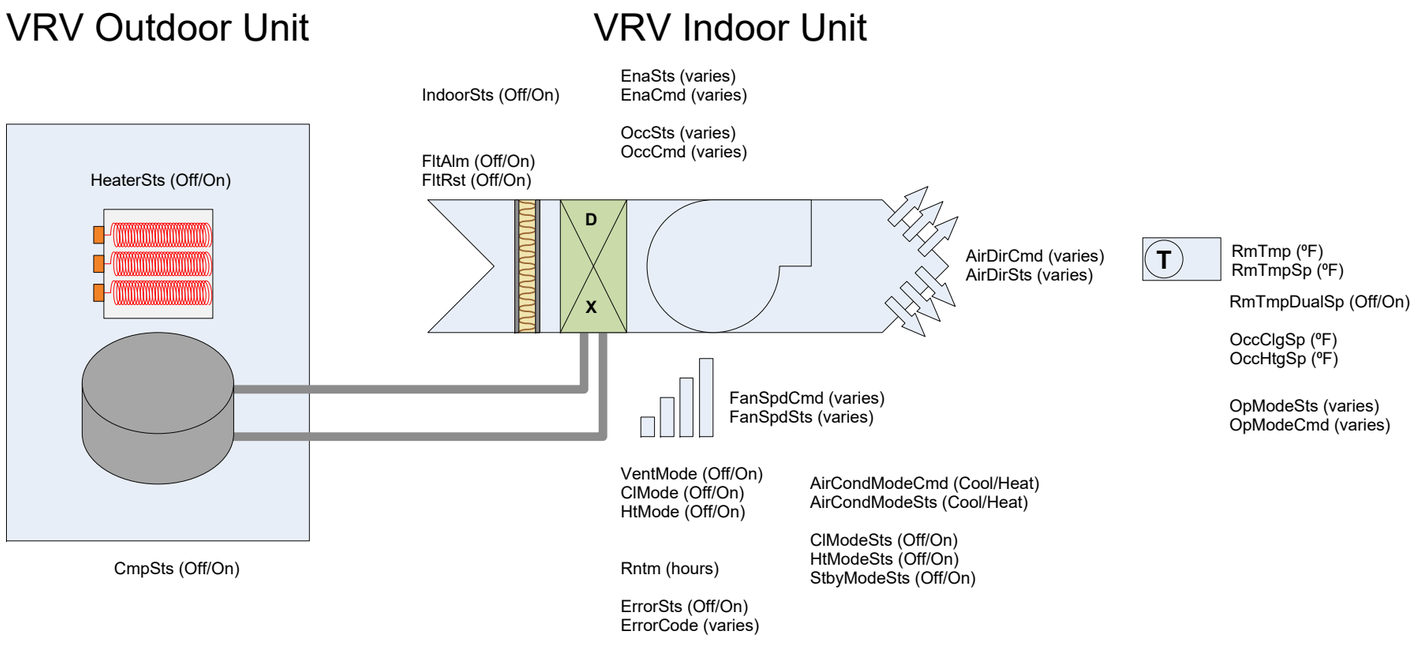
CRAC



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VRV

Chiller Objects

Objects shown for single- or dual-compressor centrifugal chiller.

"MT0046" is an example building number.

MT0046_CHL01_ChlrEna (Off/On)
MT0046_CHL01_ChlrCmd (Off/On)
MT0046_CHL01_ChlrSts (Off/On)
CHL01A_ChlrSts (Off/On)
CHL01B_ChlrSts (Off/On)
MT0046_CHL01A_ChlrAlm (Norm/Alm)
CHL01B_ChlrAlm (Norm/Alm)

"CHL01A" refers to the "A" compressor or circuit. "CHL01B" refers to the "B" compressor or circuit. Use this example for other objects as required.

Power, Energy, & Capacity

ChlrPwr (kW)
ChlrEnrg (kWh)
ChlrCur (Amps)

CHWLoad (tons)
CWLoad (tons)
ChlrNomCap (tons, btu, mbtu)
ChlrActCapPct (%) or ChlrRLA (%)

Water Temps & Pressures & Flows

CdDifPrs (psi)
EvDifPrs (psi)
EvLvgTmp (°F) or CHWSTmp (°F) or GlySTmp (°F)
EvEntTmp (°F) or CHWRTmp (°F) or GlyRTmp (°F)
CdLvgTmp (°F) or CWRTmp (°F)
CdEntTmp (°F) or CWSTmp (°F)
ChlrEvApproach (°F)
ChlrCdApproach (°F)

CdFlwSw (Off/On)
EvFlowSw (Off/On)

CdFlwRat (gpm)
EvFlowRat (gpm)

Refrigerant Temps & Pressures

EvRfgTmp (°F)
CdRfgTmp (°F)
CdSatRfgTmp (°F)

EvRfgPrs (psi)
CdRfgPrs (psi)

RfgLvl (ppm)
RfgWarn (Norm/Warn)
RfgAlm (Norm/Alm)

Chiller Control

ChlrRunMode (varies)
ChlrOperMode (varies)
ChlrOvrdMode (Off/On)

CHW Temperature Set Point Control

ChlrLocRem (Local/Remote)
ChlrSpCtrlEna (Off/On)
ChlrSpCtrl (Local/Remote)
LocEvLvgTmpSp (°F) or LocCHWSTmpSp (°F)
RemEvLvgTmpSp (°F) or RemCHWSTmpSp (°F)
EvLvgTmpSp (°F) or CHWSTmpSp (°F)
EffEvLvgTmpSp (°F) or EffCHWSTmpSp (°F)

Demand/Capacity Control

ChlrLmtSpActive (Off/On)
ChlrLmtSpPct (%)
ChlrLmtSpPwr (kW)

ChlrBaseLmtSpPct (%)
ChlrBaseLoadReq (Off/On)

Head Pressure Control

ChlrHeadPrs (psi)
ChlrHeadPrsLmt (psi)
ChlrHeadPrsAlm (Norm/Alm)

CWCtrlVlv (%open)
CHWCtrlVlv (%open)

Pump & Isolation Valve Control

CdPmpRqst (Off/On)
PriPmpRqst (Off/On)

CWIsoVlv (Off/On)
CHWIsoVlv (Off/On)
CdEntIsoVlv (Off/On)
CdLvgIsoVlv (Off/On)
EvEntIsoVlv (Off/On)
EvLvgIsoVlv (Off/On)

Staging Control

ChlrLeadEna (Off/On)
ChlrLagEna (Off/On)
ChlrSeq (seq)

CTAssigned (CT)

Mechanical Details & Diagnostics

OilTmp (°F)
OilPrs (psi)
OilPrsH (psi)
OilPrsL (psi)

PurgeSts (Off/On)
PurgeTm (sec)

CmpStrts (starts)
CmpRntm (hours)
CmpAvgRntm (min)
ChlrStrts (starts)
ChlrRntm (hours)
ChlrAvgRntm (min)

InletGuideVanePos (%open)

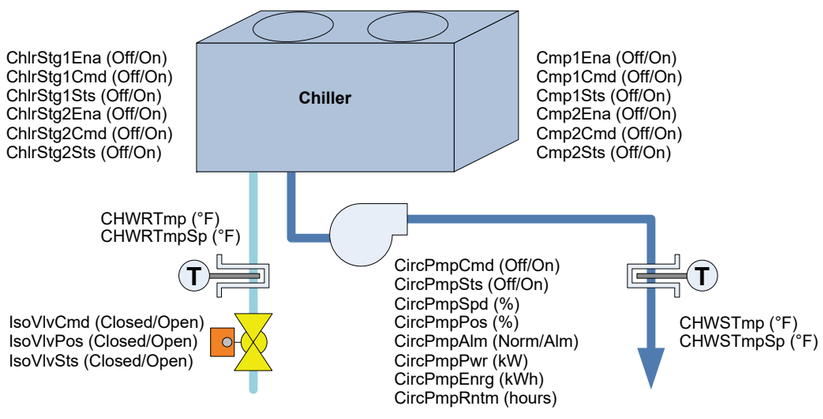
MinRnTmSp (sec, min)
MinRnTmRemain (sec, min)

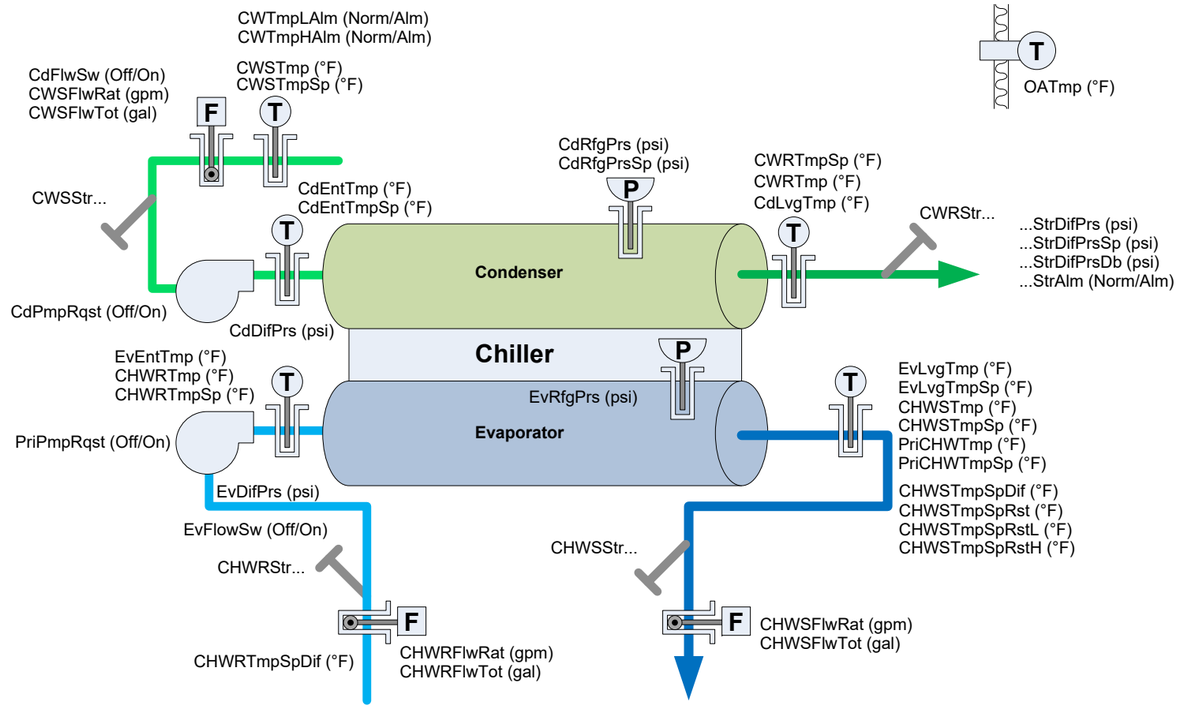
ChlrHotGasByp (Off/On)

ChlrIceRqst (Off/On)
ChlrIceTermSp (°F)

ManRstReq (Off/On)
AutoRst (Off/On)
DiagWarn (varies)

Air-Cooled Chiller





See other CHW pages for additional CHW points.

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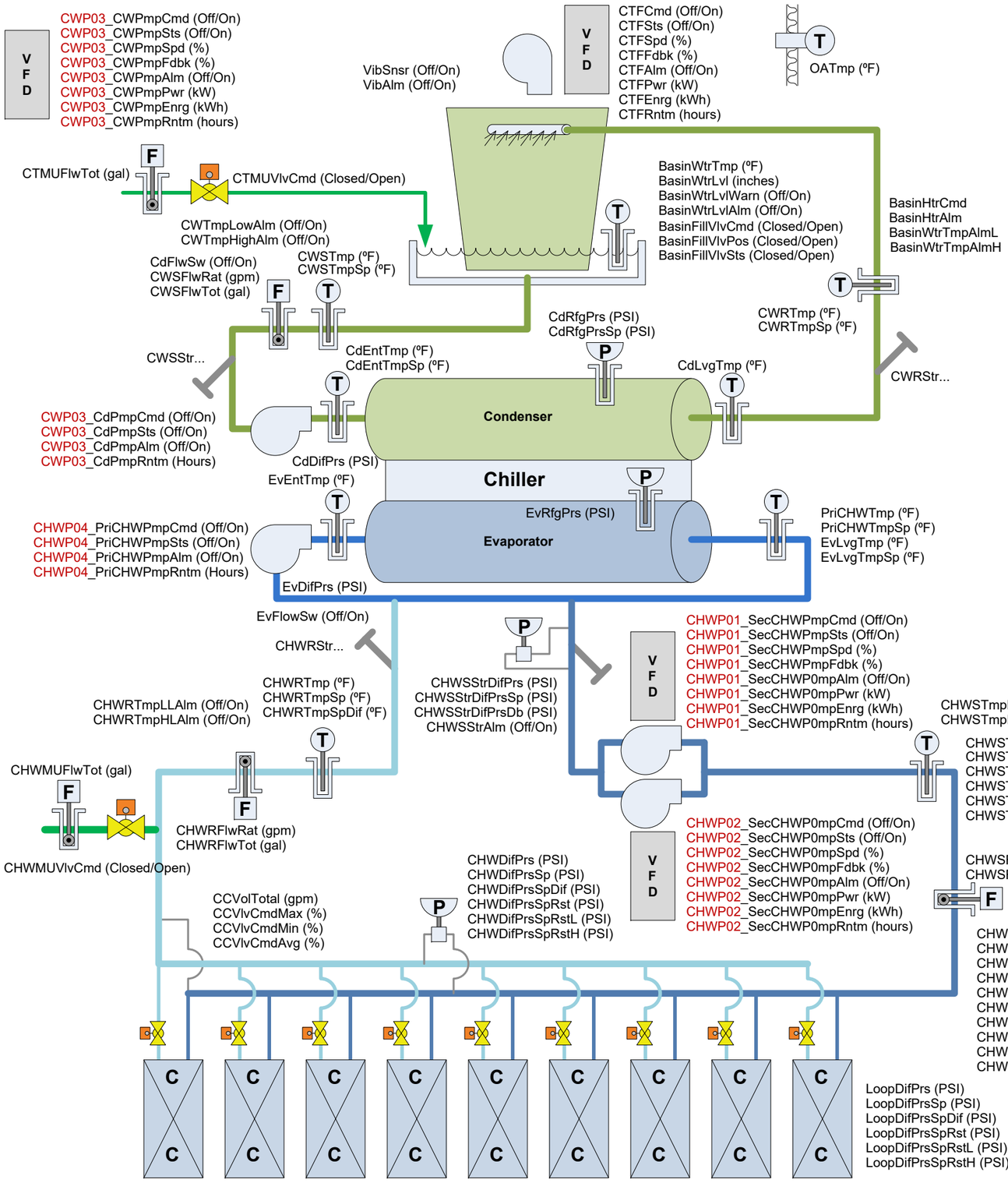
CHLR



Chillerplant Control Points

CHWSysEna (Off/On)
CHWSysLoad (tons,kbtu,Mbtu)
CHWSysCap (tons,kbtu,Mbtu)
CHWSysActCap (%)

ClgDmd (Off/On)
ClgLckCmd (Off/On)
ClgLckSts (Off/On)
OATmpLckSp (°F)
OATmpLckDb (°F)
OATmpLckDbL (°F)
OATmpLckDbH (°F)
OATmpSpRstL (°F)
OATmpSpRstH (°F)
OATmpSpRst (Off/On)

ChlrSeq (seq)
ChlrRotCmd (Off/On)
ChlrLead (chiller#)
ChlrLeadCmd (Off/On)
ChlrLagCmd (Off/On)
ChlrStgCmd (stage)
ChlrStg (stage)
ChlrStgDmd (stage)
ChlrRdyTot (chillers)
ChlrStsTot (chillers)

Refrigerant Monitoring
RfgAlm (Norm/Alm)
RfgLvl (ppm)
RfgLvlHL (ppm)
RfgWarn (Norm/Warn)
RfgLvlWarnSp (ppm)
RfgLvlAlmSp (ppm)

ChlrRotSched

FreeClgEna (Off/On)
FreeClgLck (Off/On)
FreeClgCmd (Off/On)
FreeClgOATmpSp (°F)
FreeClgOATmpSpDbH (°F)
FreeClgOATmpSpDbL (°F)
FreeClgOARelHumSp (%)
FreeClgOARelHumSpDbH (%)
FreeClgOARelHumSpDbL (%)
FreeClgOAWBTmpSp (°F)
FreeClgOAWBTmpSpDbH (°F)
FreeClgOAWBTmpSpDbL (°F)
FreeClgCap (tons,kbtu,Mbtu)
FreeClgCDWSTmpSp (°F)

MechClgEna (Off/On)
MechClgLck (Off/On)
MechClgCmd (Off/On)
MechClgOATmpSp (°F)
MechClgOATmpSpDbH (°F)
MechClgOATmpSpDbL (°F)
MechClgOARelHumSp (%)
MechClgOARelHumSpDbH (%)
MechClgOARelHumSpDbL (%)
MechClgOAWBTmpSp (°F)
MechClgOAWBTmpSpDbH (°F)
MechClgOAWBTmpSpDbL (°F)
MechClgCap (tons,kbtu,Mbtu)
MechClgCDWSTmpSp (°F)

HybrClgEna (Off/On)
HybrClgLck (Off/On)
HybrClgCmd (Off/On)
HybrClgOATmpSp (°F)
HybrClgOATmpSpDbH (°F)
HybrClgOATmpSpDbL (°F)
HybrClgOARelHumSp (%)
HybrClgOARelHumSpDbH (%)
HybrClgOARelHumSpDbL (%)
HybrClgOAWBTmpSp (°F)
HybrClgOAWBTmpSpDbH (°F)
HybrClgOAWBTmpSpDbL (°F)
HybrClgCap (tons,kbtu,Mbtu)
HybrClgCDWSTmpSp (°F)
HybrClgCHWRTmpSp (°F)

See other CHW pages for additional CHW points.

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2.3	1/5/2018	508 Compliance
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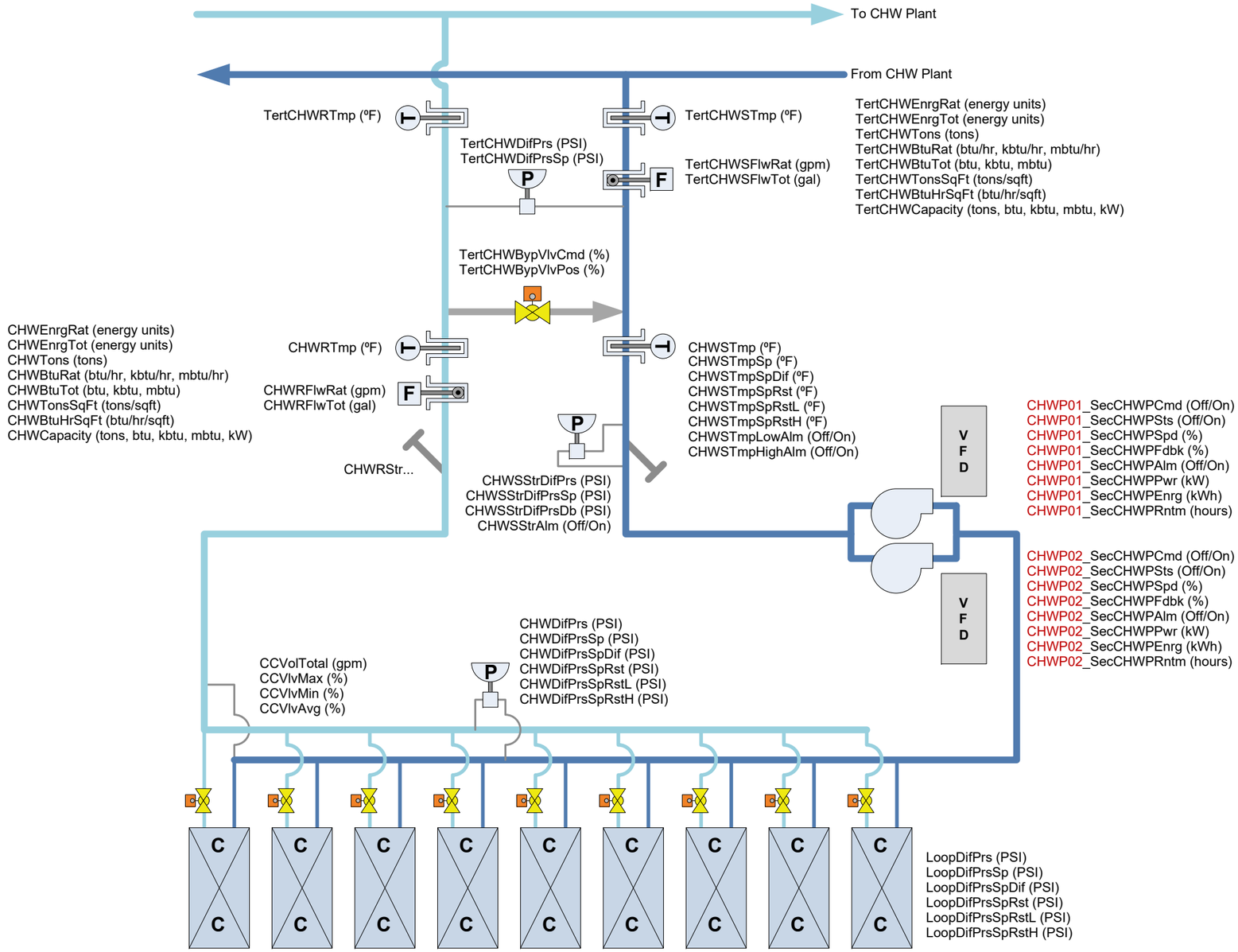
CHWS

Tertiary CHW



See other CHWS pages for additional CHWS points.

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CHW TER

Chilled Water Plant Tag Requirements

Overview

A chilled water plant is composed of multiple pieces of equipment used to generate chilled water. The entire plant is modeled as an equip with its own plant-level points. Sub-equipment such as chillers and cooling towers are also modeled as equip contained by the plant via the equipRef tag.

Note that the terminology for sensors/setpoints are based on the perspective of the equipment. The condenser water *leaving* the chiller, is the condenser water *entering* the cooling tower.

Chilled Water Plants

Model the entire plant using the chilledWaterPlant tag. The plant is modeled as an equip and it will define its own plant level points:

Pipework

Define the following tags for pipework and its associated equip and points:

primaryLoop: pipework within the plant
secondaryLoop: pipework from the plant to the building

Chillers

Chiller equipment shall be marked with the chiller tag. Equip level tags:

equipRef must reference parent chilledWaterPlant if associated with a plant
waterCooled or airCooled
absorption or if vapor compression: reciprocal, screw, or centrifugal
coolingCapacity

Cooling Towers

Cooling tower equipment is marked with the coolingTower tag. Equip level tags:

equipRef must reference parent chilledWaterPlant if associated with a plant
openLoop or closedLoop

Heat Exchangers

Heat exchangers are tagged with heatExchanger. Equip level tags:

equipRef must reference parent chilledWaterPlant if associated with a plant

Sections

Not applicable

Points

The following list applies to point tags commonly used with chiller plant equipment and shall be applied appropriately:

Run/Status

run cmd
run sensor
enable cmd
load cmd
load sensor
efficiency sensor
power sensor
energy sensor

Chilled water to/from AHUs

chilled water leaving temp sensor
chilled water leaving temp sp
chilled water leaving flow sensor
chilled water leaving pressure sensor
chilled water entering temp sensor
chilled water entering flow sensor
chilled water entering pressure sensor
chilled water delta temp sensor
chilled water delta flow sensor
chilled water delta pressure sensor
chilled water delta pressure sp
chilled water valve isolation cmd
chilled water bypass valve cmd

Condenser water to/from cooling towers

condenser water leaving temp sensor
condenser water leaving flow sensor
condenser water leaving pressure sensor
condenser water entering temp sensor
condenser water entering pressure sensor
condenser water entering flow sensor
condenser water valve isolation cmd
condenser water delta pressure sensor
condenser water bypass valve cmd

Miscellaneous Internal

condenser cmd
condenser refrig temp sensor
condenser refrig pressure sensor
evaporator refrig temp sensor
evaporator refrig pressure sensor

Cooling Towers

condenser water leaving temp sensor
condenser water leaving temp sp
condenser water leaving flow sensor
condenser water leaving pressure sensor
condenser water entering temp sensor
condenser water entering pressure sensor
condenser water entering flow sensor
fan cmd
fan sensor

Heat Exchangers

chilled water leaving temp sensor
chilled water entering temp sensor
condenser water leaving temp sensor
condenser water entering flow sensor

Note: not every combination of setpoint (sp) is listed, just the most common setpoints. Chillers share the same point modeling conventions as VFDs. Chillers which measure energy should model their points using the same conventions as elec meters or thermal meters.

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CHWPLNTTAG

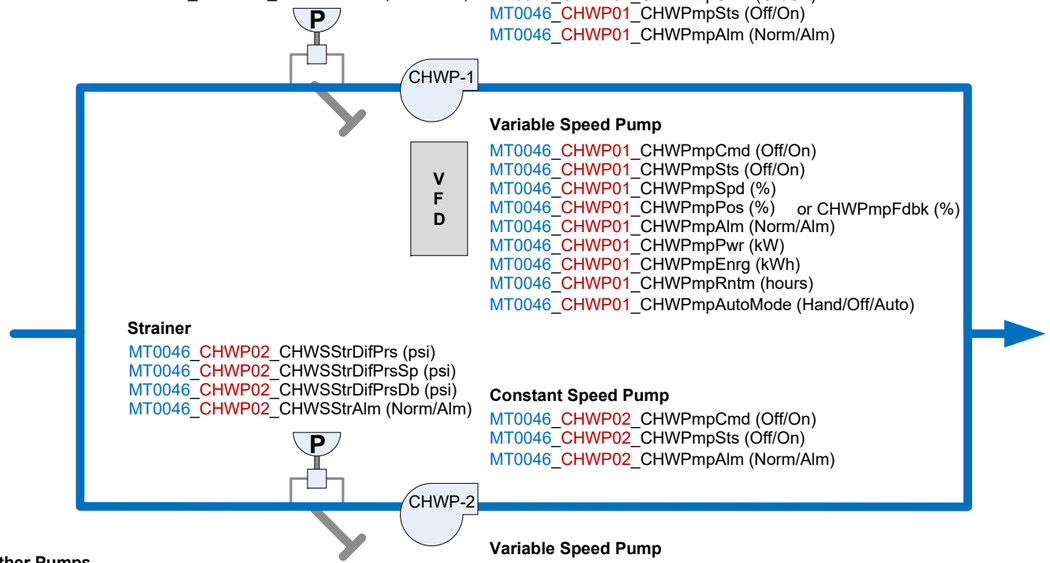
Pump Objects Example

"MT0046" is an example building number.
"CHWP01" and "CHWP02" are example equipment designations.

Pump Control Objects

CHWPmpSeq (seq)
CHWPmpRotCmd (Off/On)
CHWPmpRotSchedCmd (Off/On)
CHWPmpLeadEna (Off/On)
CHWPmpLagEna (Off/On)
CHWPmpEna (Off/On)
CHWPmpCmd (Off/On)
CHWPmpSts (Off/On)

CHWPmpRotSched



Strainer
MT0046_CHWP01_CHWSStrDifPrs (psi)
MT0046_CHWP01_CHWSStrDifPrsSp (psi)
MT0046_CHWP01_CHWSStrDifPrsDb (psi)
MT0046_CHWP01_CHWSStrAlm (Norm/Alm)

Constant Speed Pump
MT0046_CHWP01_CHWPmpCmd (Off/On)
MT0046_CHWP01_CHWPmpSts (Off/On)
MT0046_CHWP01_CHWPmpAlm (Norm/Alm)

Variable Speed Pump
MT0046_CHWP01_CHWPmpCmd (Off/On)
MT0046_CHWP01_CHWPmpSts (Off/On)
MT0046_CHWP01_CHWPmpSpd (%)
MT0046_CHWP01_CHWPmpPos (%) or CHWPmpFdbk (%)
MT0046_CHWP01_CHWPmpAlm (Norm/Alm)
MT0046_CHWP01_CHWPmpPwr (kW)
MT0046_CHWP01_CHWPmpEnrg (kWh)
MT0046_CHWP01_CHWPmpRntm (hours)
MT0046_CHWP01_CHWPmpAutoMode (Hand/Off/Auto)

Strainer
MT0046_CHWP02_CHWSStrDifPrs (psi)
MT0046_CHWP02_CHWSStrDifPrsSp (psi)
MT0046_CHWP02_CHWSStrDifPrsDb (psi)
MT0046_CHWP02_CHWSStrAlm (Norm/Alm)

Constant Speed Pump
MT0046_CHWP02_CHWPmpCmd (Off/On)
MT0046_CHWP02_CHWPmpSts (Off/On)
MT0046_CHWP02_CHWPmpAlm (Norm/Alm)

Other Pumps
MT0046_CWP01_CDWPmpCmd (Off/On)
MT0046_GP01_GlyPmpCmd (Off/On)
MT0046_CHWP01_PriCHWPmpCmd (Off/On)
MT0046_CHWP01_SecCHWPmpCmd (Off/On)
MT0046_CWP01_CdPmpCmd (Off/On)

Variable Speed Pump
MT0046_CHWP02_CHWPmpCmd (Off/On)
MT0046_CHWP02_CHWPmpSts (Off/On)
MT0046_CHWP02_CHWPmpSpd (%)
MT0046_CHWP02_CHWPmpPos (%) or CHWPmpFdbk (%)
MT0046_CHWP02_CHWPmpAlm (Norm/Alm)
MT0046_CHWP02_CHWPmpPwr (kW)
MT0046_CHWP02_CHWPmpEnrg (kWh)
MT0046_CHWP02_CHWPmpRntm (hours)
MT0046_CHWP02_CHWPmpAutoMode (Hand/Off/Auto)

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PMP

IceSys_IceBuildCmdSched (Off/On)
IceSys_IceMeltCmdSched (Off/On)
IceSys_IceBuildCmd (Off/On)
IceSys_IceMeltCmd (Off/On)
IceSys_IceInventory (%)

IceSys_IceMeltCapRat (tons)
IceSys_IceMeltCapRatSp (tons)
IceSys_UnloadChlrCmd (Off/On)
IceSys_Mode (Off/Auto/Chlr/Par)
IceSys_IceMeltLck (Off/On)
IceSys_IceMeltLckRst (Off/On)

IceSys_CHWTons (tons)
IceSys_GlyTons (tons)
IceSys_CDWTons (tons)

ChwSys_CHWSTmp (°F)
ChwSys_CHWSTmpSp (°F)

CHWP1_CHWPmpCmd (Off/On)
CHWP-1
CHWP2_CHWPmpCmd (Off/On)
CHWP-2
CHWP03_CHWPmpCmd (Off/On)
CHWP-3

CHL05_ChlrCmd (Off/On)
Condenser
Chiller-5
Evaporator

CHL01B_ChlrCmd (Off/On)
Condenser
Chiller-1B
Evaporator

ChwSys_CHWMUVlvCmd (Close/Open)
ChwSys_CHWMUFlwRat (gpm)
ChwSys_CHWMUFlwTot (gal)

ChwSys_CHWRTmp (°F)

CHL05_ChlrIsoVlvCmd (Off/On,%open)
CHL05_ChlrIsoVlvPos (Closed/Open,%open)

CHL01B_ChlrIsoVlvCmd (Off/On,%open)
CHL01B_ChlrIsoVlvPos (Closed/Open,%open)

ChwSys_CHWBypVlvCmd (%byp)

IceSys_ChlrBypVlvCmd (Off/On,%open)
IceSys_ChlrBypVlvPos (Closed/Open,%open)

IceSys_GlySTmpLL (°F)
IceSys_GlySTmp (°F)
IceSys_GlySTmpSp (°F)

IceSys_HXIsoVlvCmd (Off/On)
IceSys_HXIsoVlvPos (Closed/Open)

IceSys_HXHotCHWLvgTmp (°F)
IceSys_HXHotCHWLvgTmpSp (°F)

IceSys_HXColdBypVlvCmd (%byp)

HX01_VlvCmd (%open)
HX-1
HX-2
HX-3
HX01_HXHotCHWLvgTmp (°F)
HX01_HXHotCHWLvgTmpSp (°F)
HX01_HXHotCHWEntTmp (°F)
HX01_HXColdGlyEntTmp (°F)
HX01_HXColdGlyLvgTmp (°F)

IceSys_IceBypVlvCmd (Off/On,%byp)
IceSys_IceBypVlvPos (Closed/Open,%byp)

IceSys_IceIsoVlvCmd (Off/On,%open)
IceSys_IceIsoVlvPos (Closed/Open,%open)

IceSys_IceLvgTmp (°F)
IceSys_IceLvgTmpSp (°F)
IceSys_IceBuildLvgTmpSp (°F)
IceSys_IceMeltLvgTmpSp (°F)

IceSys_IceEntTmp (°F)
IceSys_IceEntTmpSp (°F)
IceSys_IceBuildEntTmpSp (°F)
IceSys_IceMeltEntTmpSp (°F)

IceSys_IceEntFlwRat (gpm)

IceSys_GlyPmpSpd (%)

GP01_GlyPmpCmd (Off/On)
GP-1
GP02_GlyPmpCmd (Off/On)
GP-2
GP03_GlyPmpCmd (Off/On)
GP-3
GP04_GlyPmpCmd (Off/On)
GP-4

Glyco
l Fill

IceSys_GlyRTmp (°F)
IceSys_HXIsoVlvCmd (%open)
IceSys_HXColdLvgTmp (°F)

IceSys_GlyRFlwRat (gpm)
IceSys_GlyRFlwRatSp (gpm)
IceSys_GlyRFlwRatEffSp (gpm)
IceSys_IceBuildGlyRFlwRatSp (gpm)
IceSys_IceMeltGlyRFlwRatSp (gpm)
IceSys_ChlrGlyRFlwRatSp (gpm)
IceSys_ParGlyRFlwRatSp (gpm)

HXLP01_HXPmpCmd (Off/On)
HXLP-1
HXLP02_HXPmpCmd (Off/On)
HXLP-2

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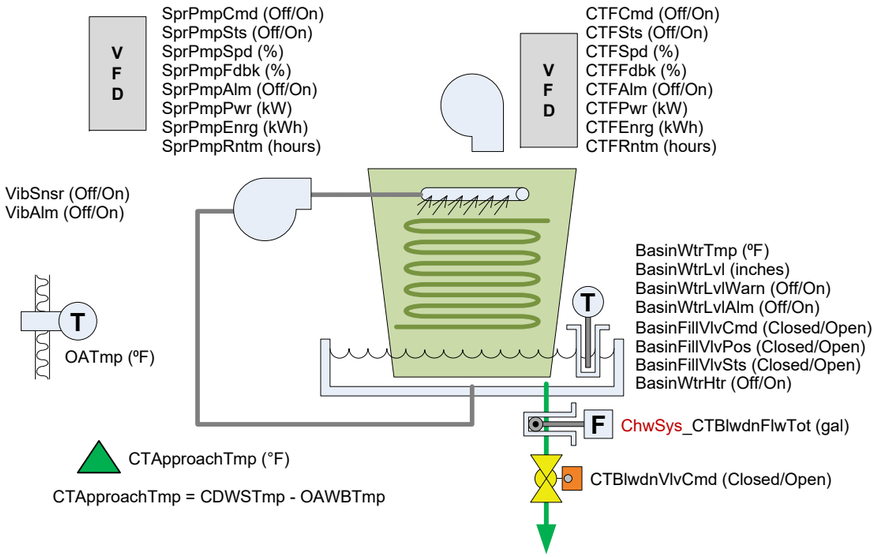
CHW ICE

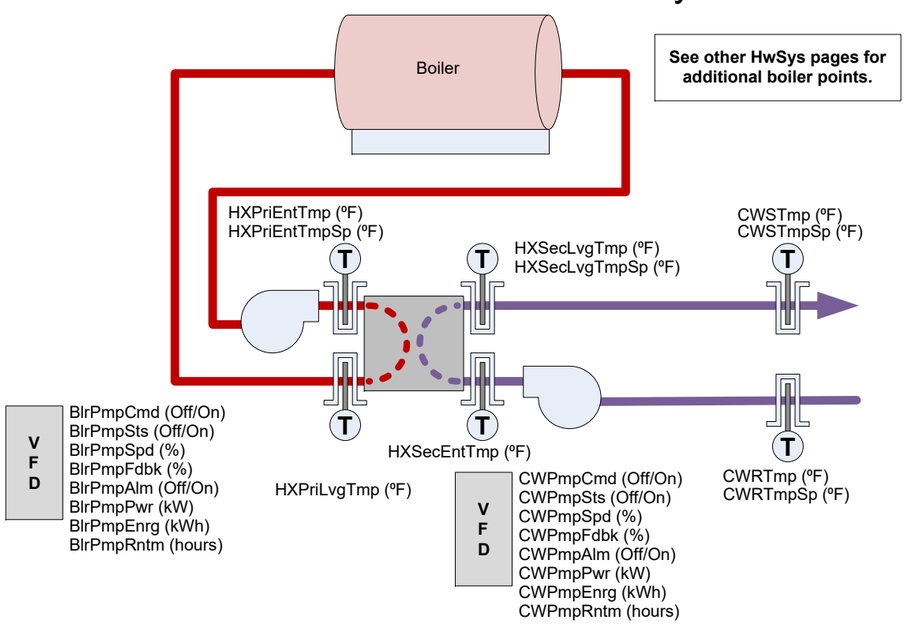
Closed-Loop Cooling Tower

For open-loop cooling tower, see ChwSys page.

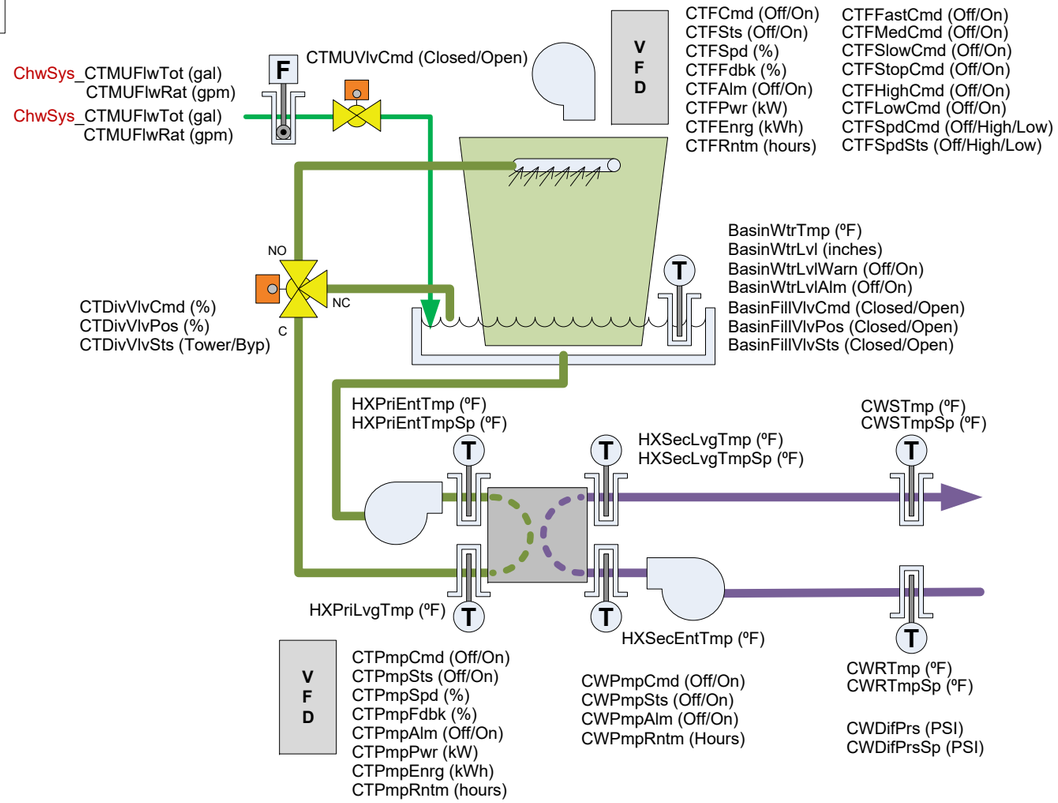


Condenser HW Water System

See other HwSys pages for additional boiler points.



Condenser Water System/ Evaporative Cooling System



Condenser System Energy

CWEnrgRat (energy units)
CWEnrgTot (energy units)
CWTons (tons)
CWkWTon (kW/ton)
CWBtuRat (btu/hr, kbtu/hr, mbtu/hr)
CWBtuTot (btu, kbtu, mbtu)
CWBtukWh (btu/kWh)
CWTonsSqFt (tons/sqft)
CWBtuHrSqFt (btu/hr/sqft)
CWCapacity (tons, btu, kbtu, mbtu, kW)

CTApproachTmp (°F)
CTCapacity (tons, btu, kbtu, mbtu, kW)

See other CWS pages for additional CWS points.

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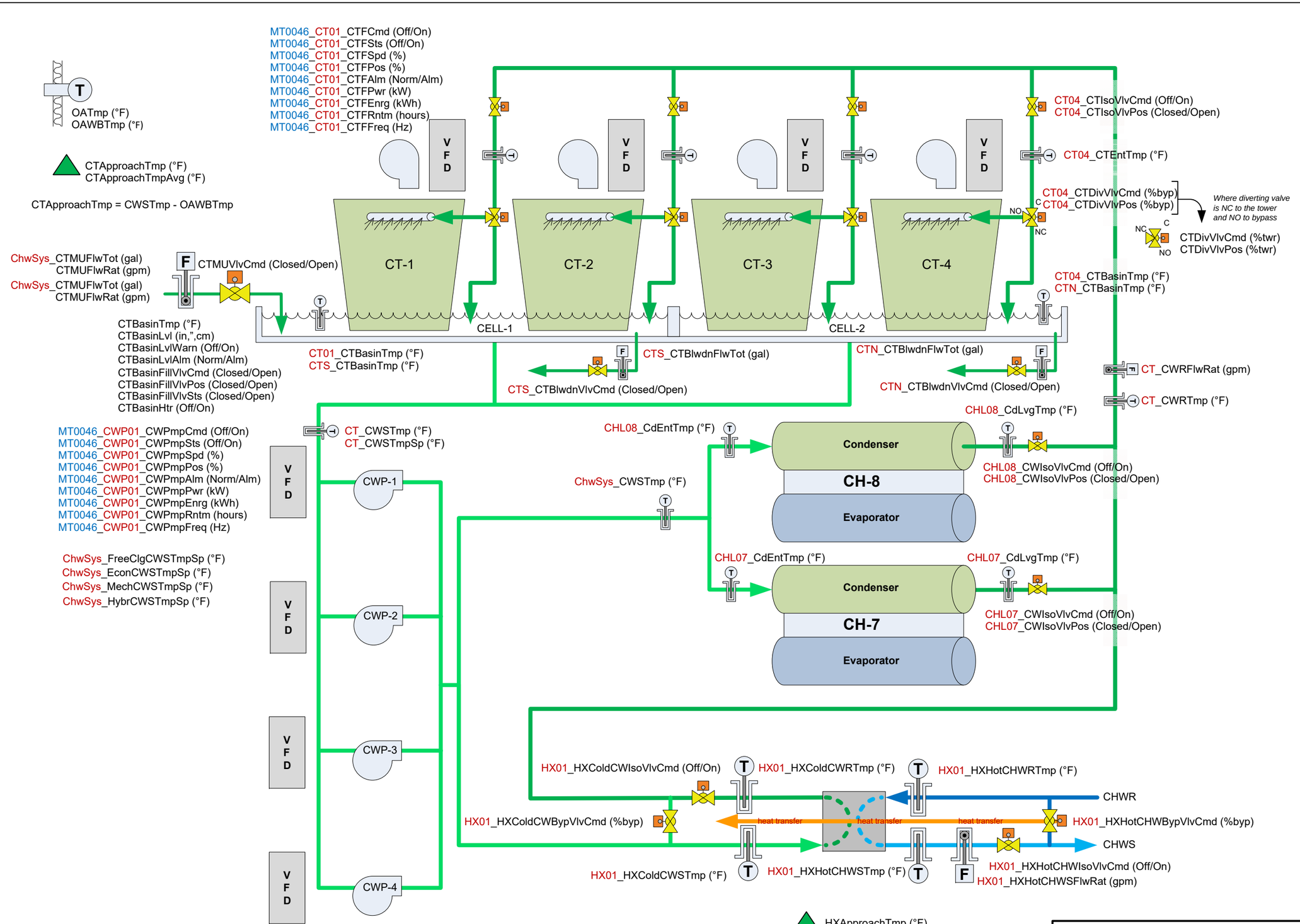
CWS1



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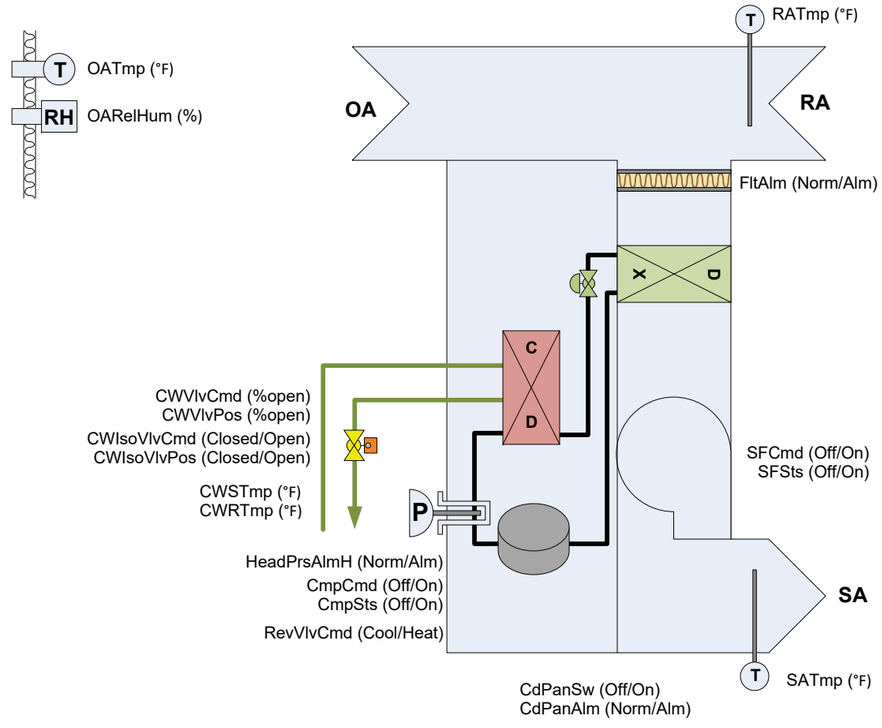
CWS2

Water Source Heat Pump



Room Control Setpoints

OccCmd (Occ/Uoc)
UocOvrdCmd (Uoc/Ovrd)
OvrdTimeSp (hours)

OccRmTmpSp (°F)
UocRmTmpSp (°F)

EffRmTmp (°F)
EffRmTmpSp (°F)
OccClgSp (°F)
OccHtgSp (°F)
UocClgSp (°F)
UocHtgSp (°F)
StbyClgSp (°F)
StbyHtgSp (°F)

UsrSpAdjEna (Off/On)
UsrSpAdjRng (°F)
UsrSpAdjHL (°F)
UsrSpAdjLL (°F)
UsrSpAdj (°F)
EffUsrSp (°F)
OccSnsrSts (Off/On)

AirCondModeCmd (Cool/Heat)
AirCondModeSts (Cool/Heat)
ClgModeSts (Off/On)
HtgModeSts (Off/On)
StbyModeSts (Off/On)
VentMode (Off/On)

T
RmTmp (°F)
RmTmpSp (°F)

RH
RmRelHum (%)
RmRelHumSp (%)

IAQ
RmCO2 (ppm)
RmCO2Sp (ppm)
RmCO2Alm (Norm/Alm)
RmIAQAlm (Norm/Alm)
RmVOC (ppm)
RmVOCSp (ppm)
RmVOCAlm (Norm/Alm)

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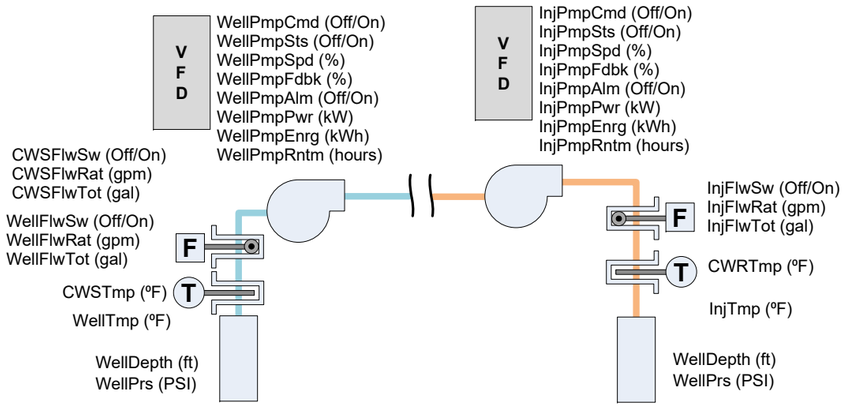
WSHP

Geothermal Condenser Water System



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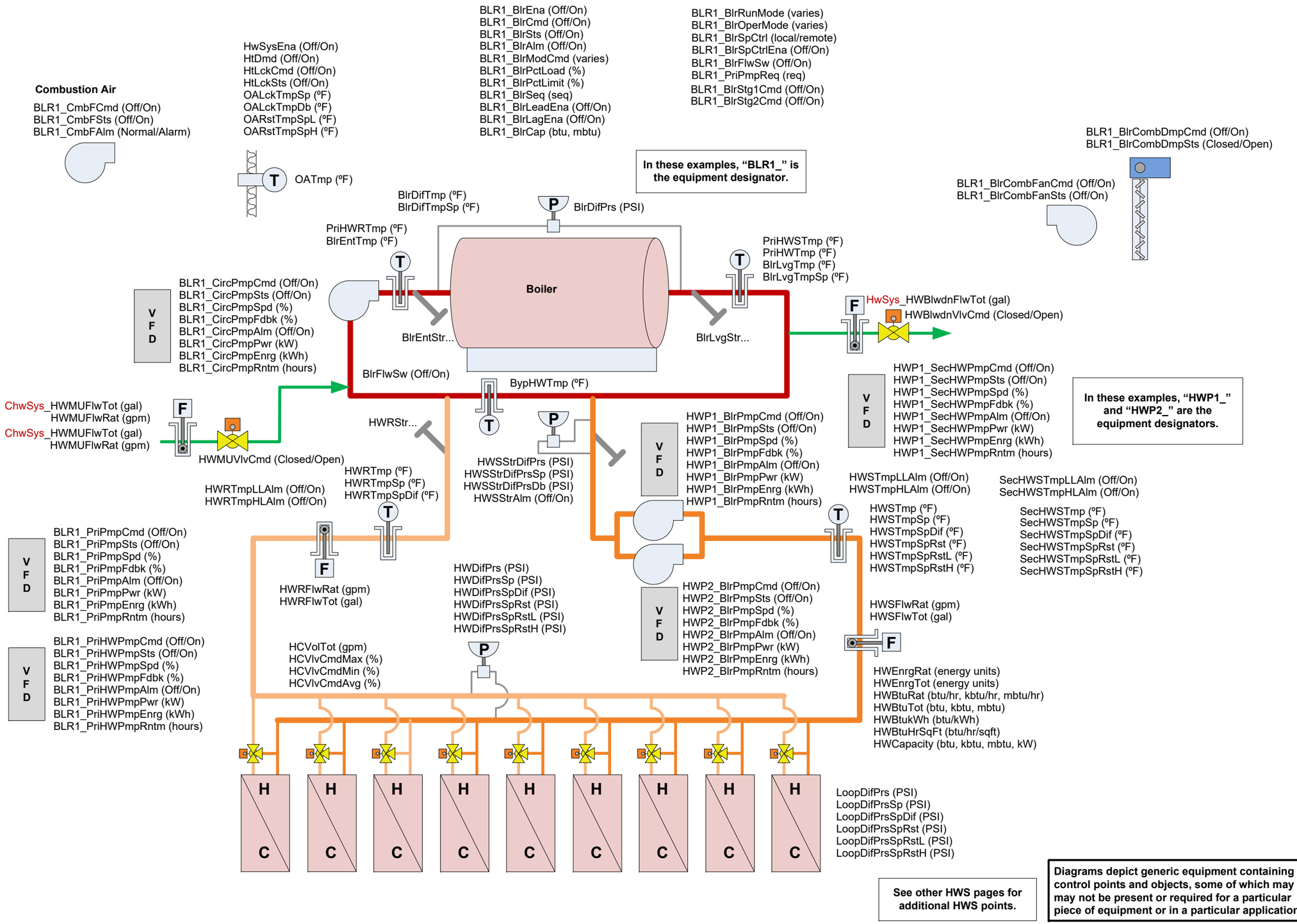
GEO



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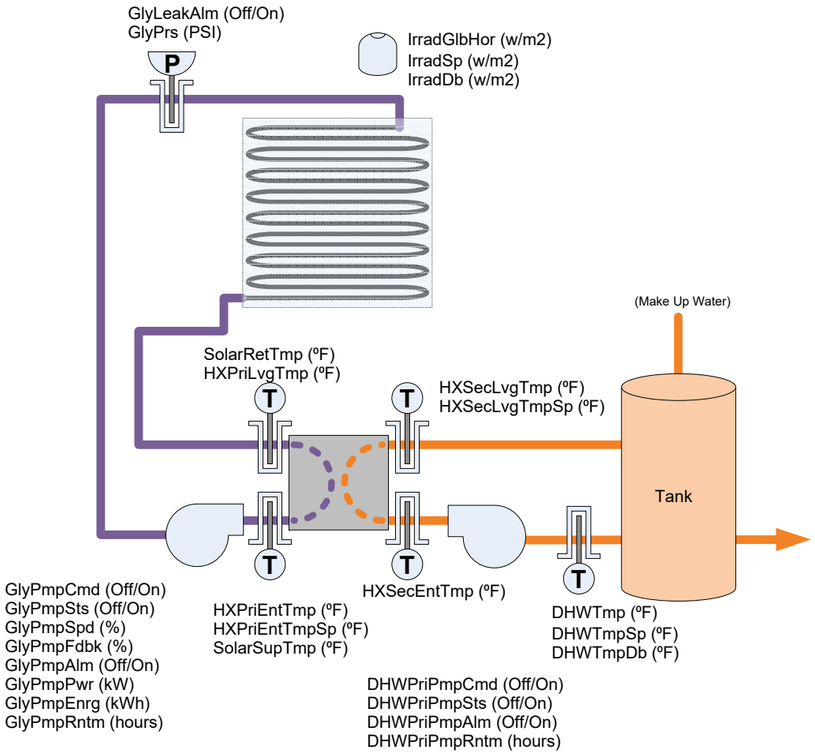
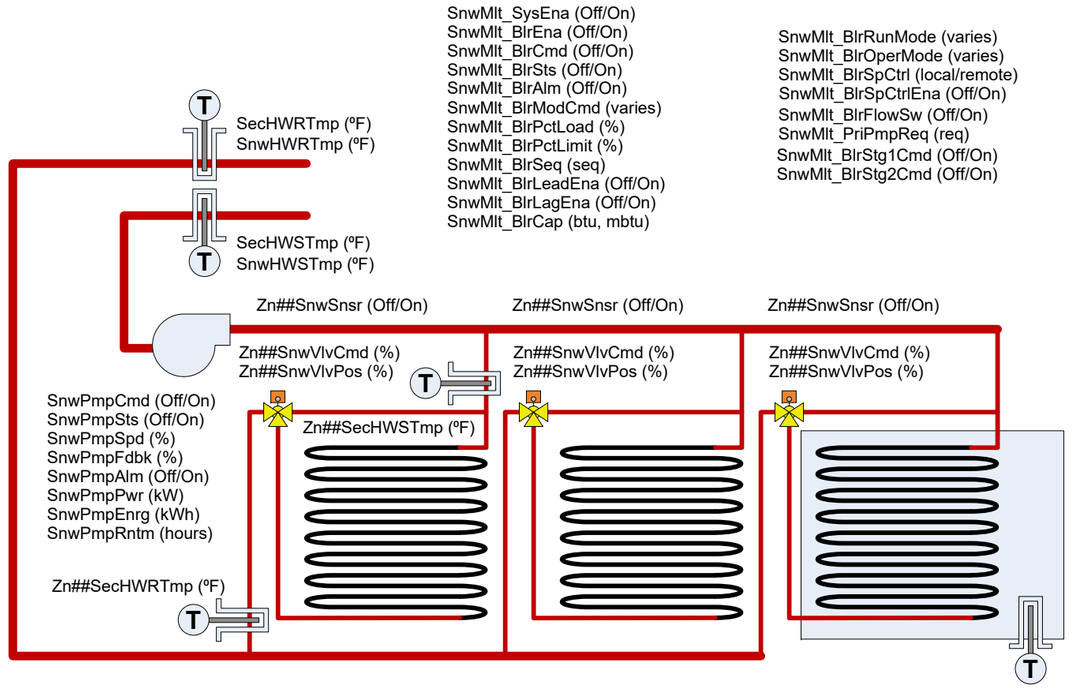
HWS1

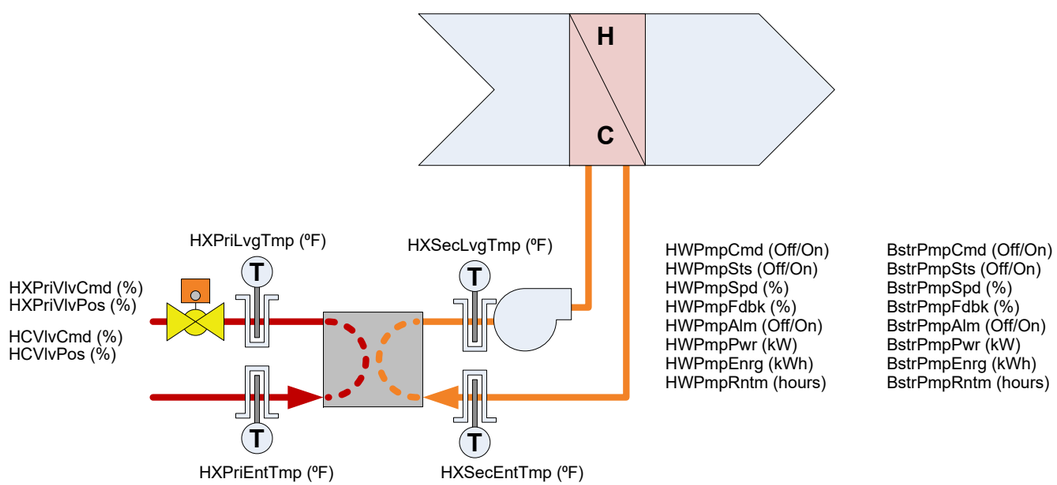
Solar Thermal Hot Water



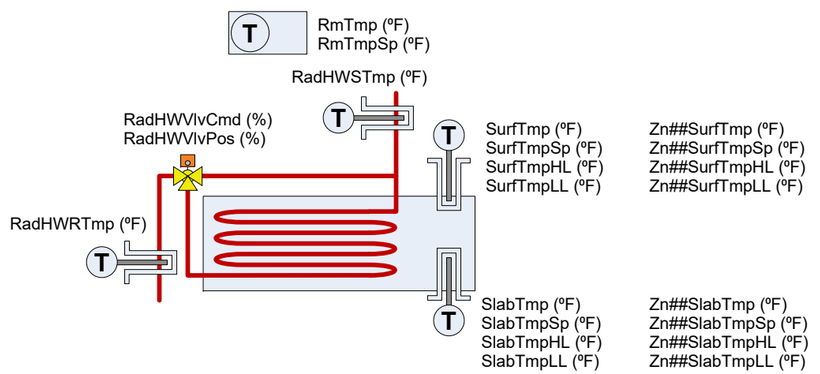
Snow Melt System



HW HX & Booster Pump



Radiant Floor Heat



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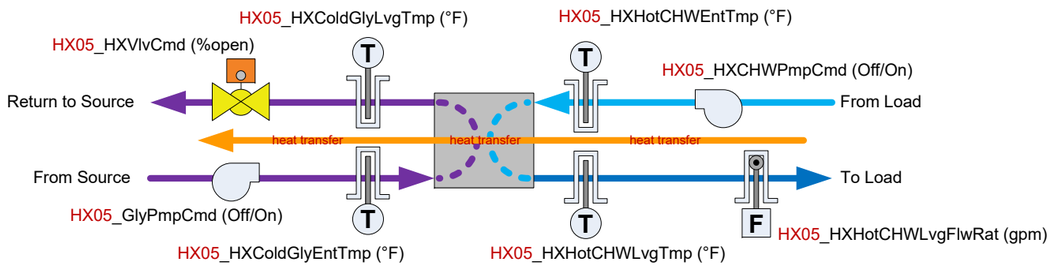
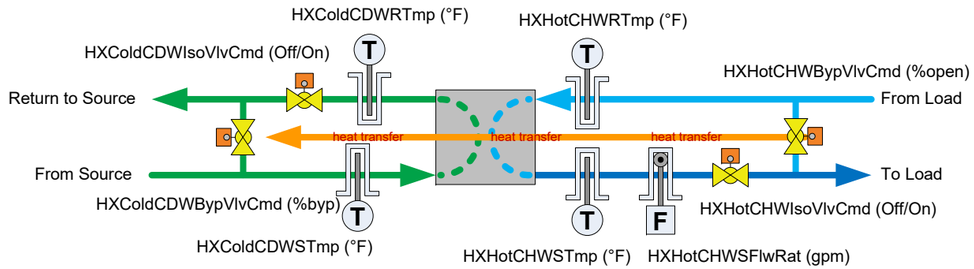
HWS2

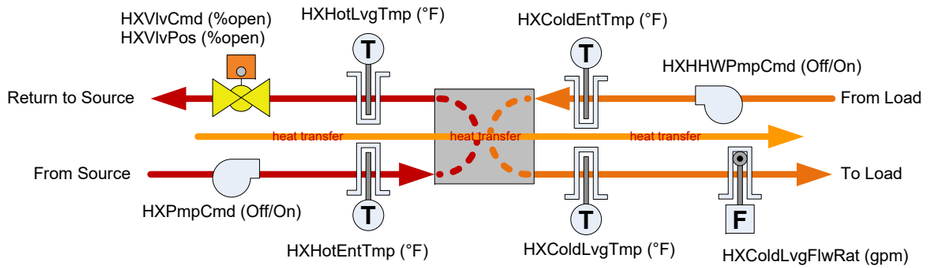
Glycol Cooling Application



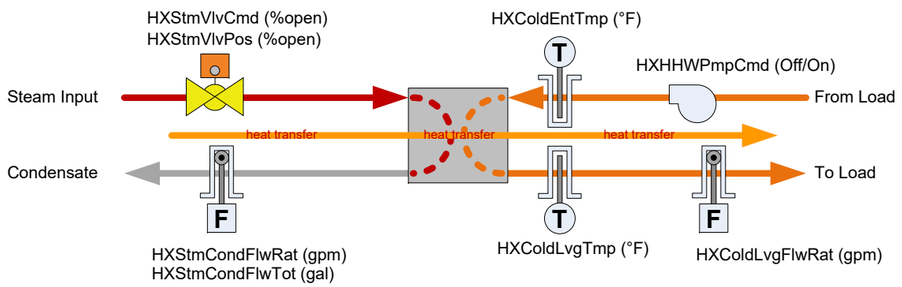
Free-Cooling Condenser Water Application



Hot Water Heating Application



Steam/Hot Water Heating Application



See CHW, HWS, and PMP pages for additional points.

Diagrams depict generic equipment containing control points and objects, some of which may or may not be present or required for a particular piece of equipment or in a particular application.

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National BAS Object Naming & Tagging Standard

#	DATE	DESCRIPTION
1.3	7/24/2017	Added Tagging
2.0	8/8/2017	Release Version
2.2	10/4/2017	Added VRF Systems
2.3	1/5/2018	508 Compliance
-	-	-
-	-	-

STATUS: Version 2.3
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REV. DATE: **1/5/18**

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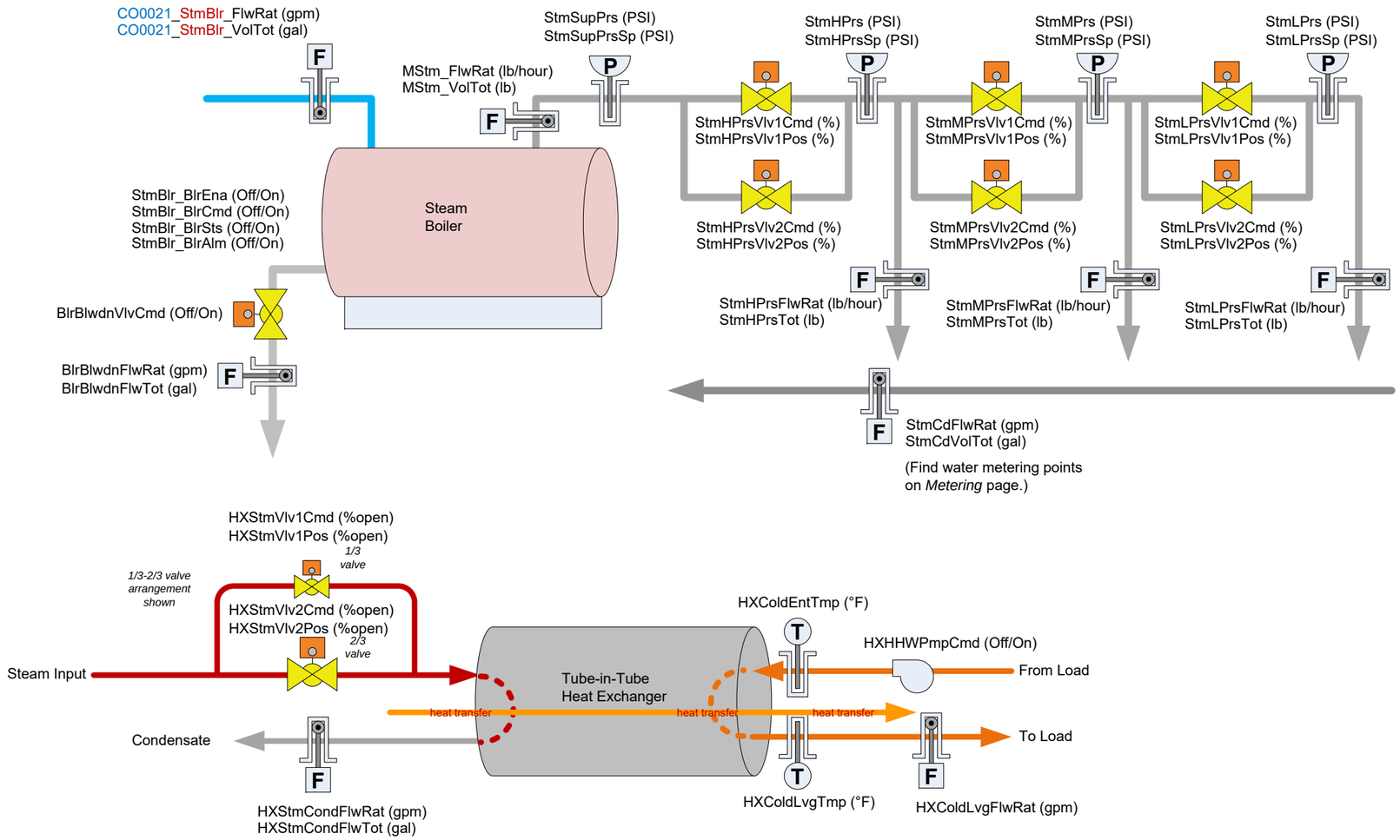
HX

In this example, "CO0021_" is the building number. The meter is a make-up water meter for the steam boiler.

Steam Reduction Station



See other HWS pages for additional HWS points.

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STM

Hot Water Plant Tag Requirements

Overview

A hot water plant is composed of multiple pieces of equipment and modeled based on their output of Hot Water or Steam. The entire plant is modeled as an equip with its own plant-level points. Sub-equipment such as Boilers, Heat Exchangers and Storage Tanks are also modeled as equip contained by the plant via the equipRef tag.

Note that the terminology for sensors/setpoints are based on the perspective of the equipment.

Hot Water Plants

The hotWaterPlant tag is used to model the plant and its system of equipment to generate hot water.

Pipework

Heating plants share the following terminology with chilled water plants:

primaryLoop: pipework within the plant
secondaryLoop: pipework from the plant to the building

Steam Plants

The steamPlant tag is used to model the plant and its system of equipment to generate steam.

Boilers

The boiler tag is used to model boiler assets as an equip. Equip level tags include:

equipRef must reference parent plant if associated with a plant
hot water or steam
oil or gas

Heat Exchangers

Heat exchangers are tagged with heatExchanger. Equip level tags:

equipRef must reference parent hot water or steam plant

The points for a heat exchanger will be based on the fluids between the two loops. In general, use primaryLoop and secondaryLoop to qualify the points.

Tanks

The tank tag models a storage tank. It is always paired with the equip tag. The following tags should be used to define what the tank stores:

hot water
domestic water
condensate water
gas
oil

Sections

Not applicable

Points

The following list applies to point tags commonly used with hot water plant equipment and shall be applied appropriately:

Plant Level

hot water leaving temp sensor
hot water leaving temp sp
hot water entering temp sensor
hot water leaving flow sensor
hot water leaving pressure sensor
hot water entering flow sensor
hot water entering pressure sensor
hot water delta pressure sensor
hot water delta flow sensor
hot water delta temp sensor
hot water bypass valve cmd
hot water mixing valve cmd
makeup water flow sensor
outside air damper cmd
flue temp sensor

Steam Plant

steam leaving temp sensor
steam leaving temp sp
steam leaving flow sensor
steam leaving pressure sensor
steam entering flow sensor
steam entering pressure sensor
steam delta pressure sensor
steam delta flow sensor
steam delta temp sensor
steam bypass valve cmd
steam mixing valve cmd
steam header pressure sensor
condensate entering temp sensor
makeup water flow sensor
outside air damper cmd
flue temp sensor

Boiler

run cmd
run sensor
enable cmd
circ pump cmd
circ pump sensor
condensate pump cmd
condensate pump sensor

Storage Tanks

temp sensor
pressure sensor
level sensor

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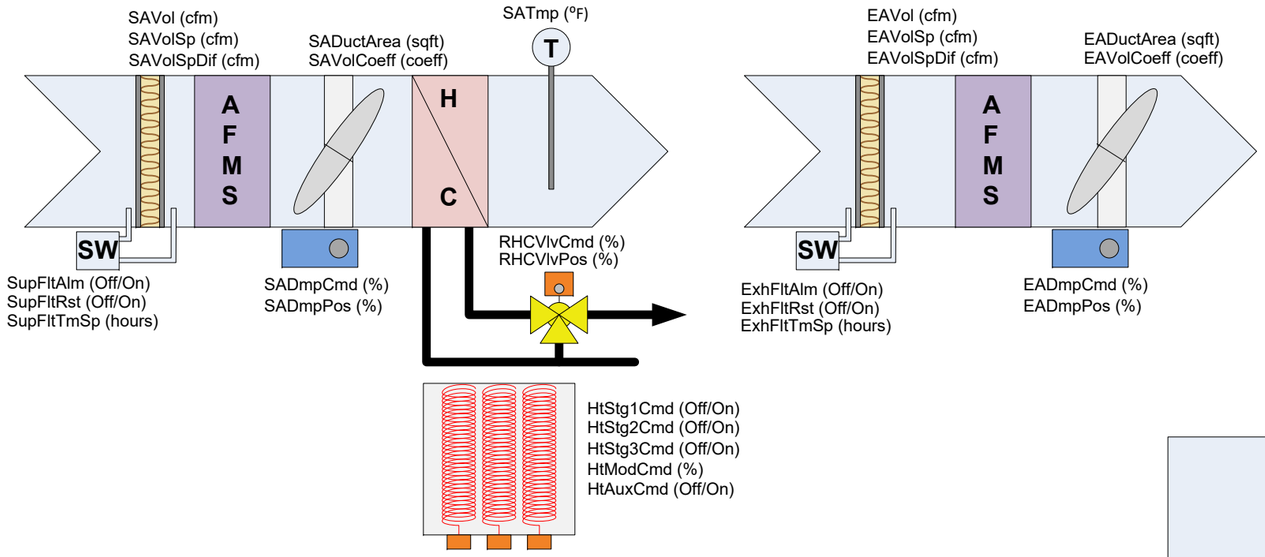
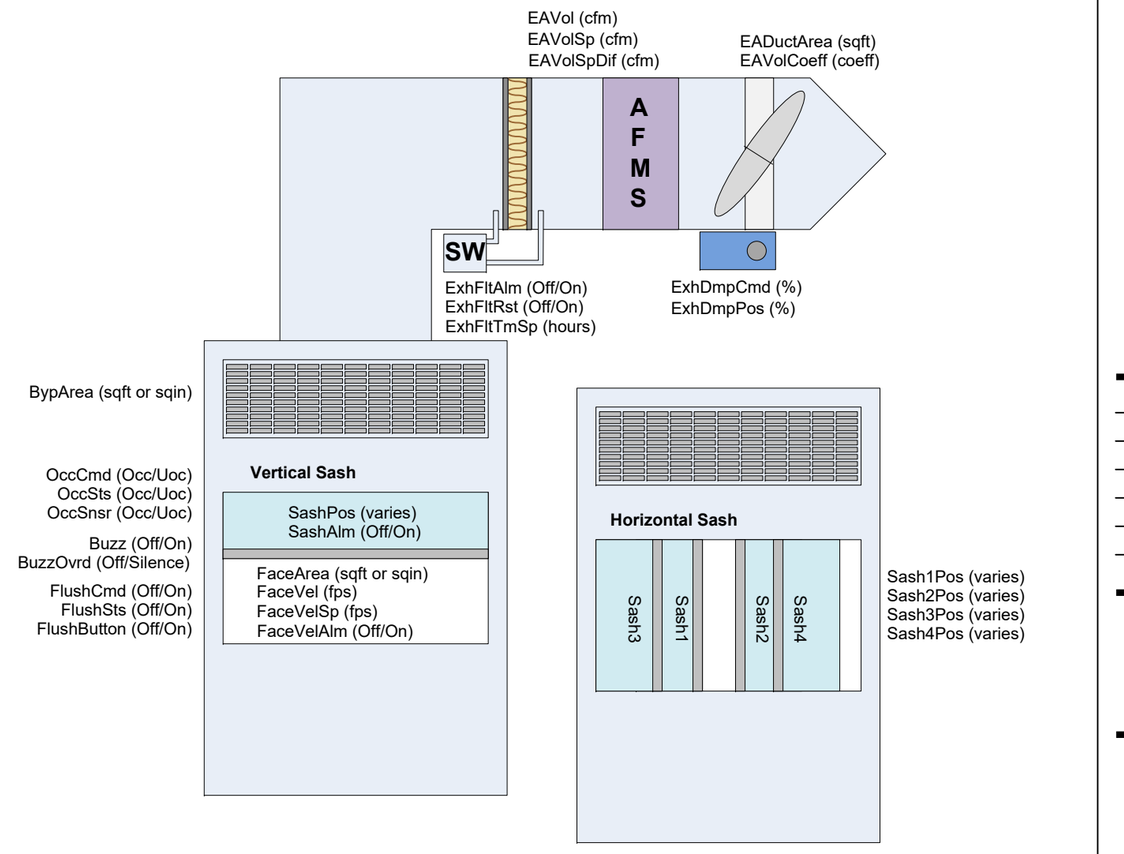
HWPLNTTAG

Lab Room Terminal Unit Points



Fume Hood Points



Lab Room Control System Points

OccSnsr (Occ/Uoc)
OccCmd (Occ/Uoc)
OccSts (Occ/Uoc)
OccOvrd (Uoc/Ovrd)
FlushCmd (Off/On)
FlushSts (Off/On)
FlushBtn (Off/On)
DifVolAlm (Off/On)
SAVolAlm (Off/On)
EAVolAlm (Off/On)
Buzz (Off/On)
BuzzOvrd (Off/Silence)
DoorSw (Closed/Open)
DoorAlm (Off/On)

IsoModeCmd (neut/pro/inf)
IsoModeSts (neut/pro/inf)
PrsModeCmd (neut/pos/neg)
PrsModeSts (neut/pos/neg)
PrsAlm (Off/On)
PrsWarn (Off/On)

RmTmp (°F)
EffRmTmpSp (°F)
OccRmTmpSp (°F)
UnocRmTmpSp (°F)
OccClgSp (°F)
OccHtgSp (°F)
UnocClgSp (°F)
UnocHtgSp (°F)

SupAirVolTot (cfm)
SupAirVolTotSp (cfm)
EAVolTot (cfm)
EAVolTotSp (cfm)
EAVolTot (cfm)
DifVolTot (cfm)
DifVolTotSp (cfm)
SAVolSpMax (cfm)
SAVolSpMin (cfm)
EAVolSpMax (cfm)
EAVolSpMin (cfm)
TmpCtrlVol (cfm)
TrkModeCmd (none/ETS/STE)
TrkModeSts (none/ETS/STE)
AirChgRat (cph)
AirChgRatSp (cph)
RmVol (cf)

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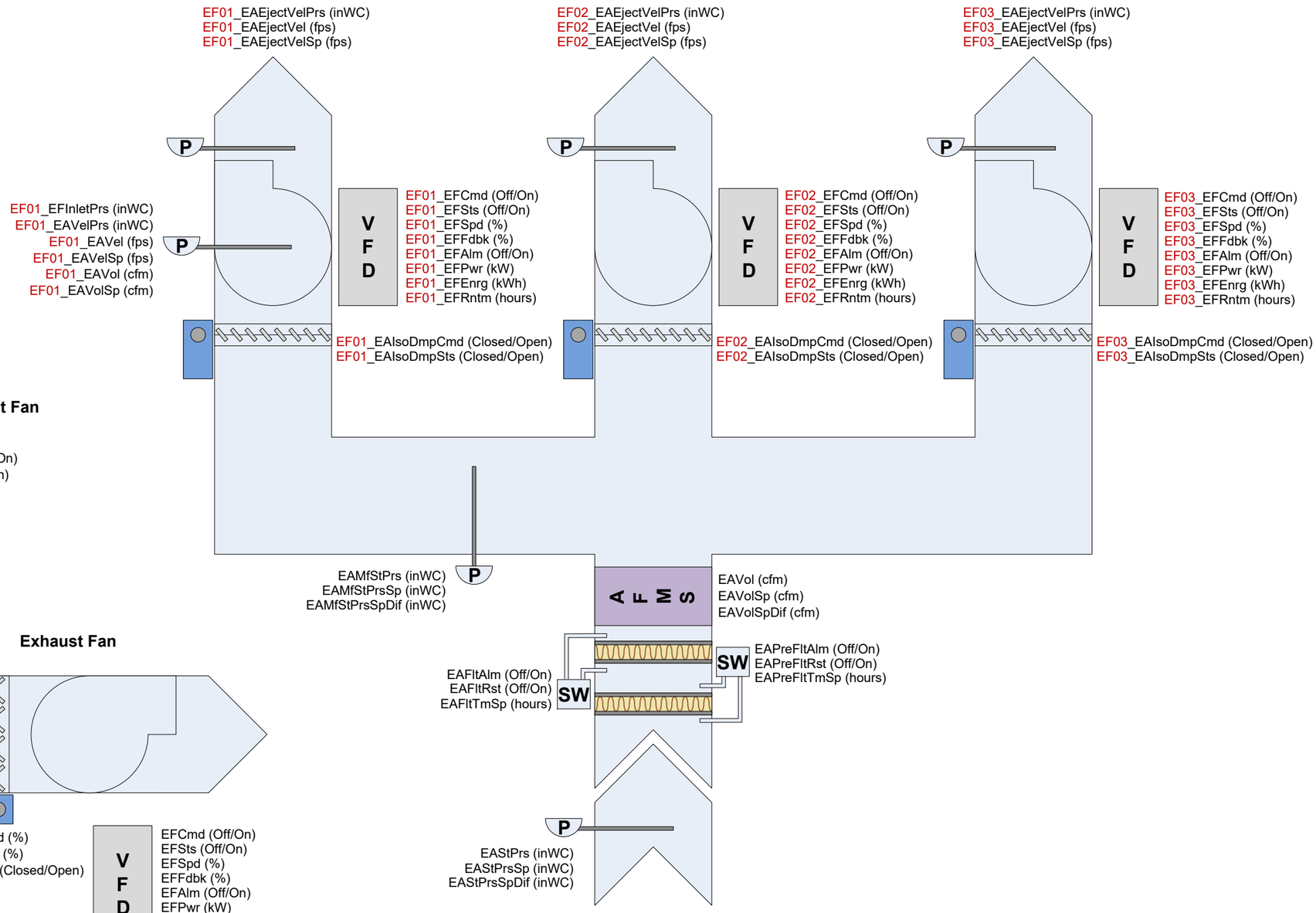
LAB

Exhaust System Control Points

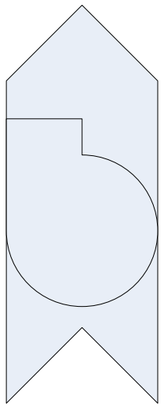
ExhSys_ExhEna (Off/On)
ExhSys_EFRotCmd (Off/On)
ExhSys_EFSeq (Seq)
ExhSys_EFLeadEna (Off/On)
ExhSys_EFLagEna (Off/On)

ExhSys_EFCmd (Off/On)
ExhSys_EFSpd (%)
ExhSys_EFPwr (kW)
ExhSys_EFEnrg (kWh)
ExhSys_EFRntm (hours)

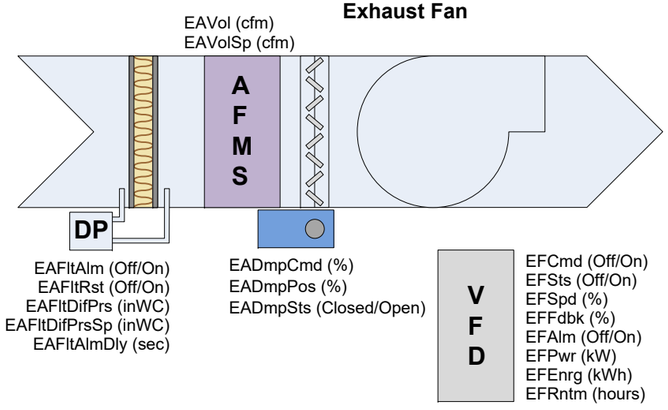
Exhaust Manifold System



Simple Exhaust Fan



Exhaust Fan



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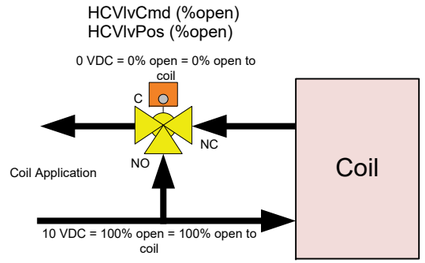
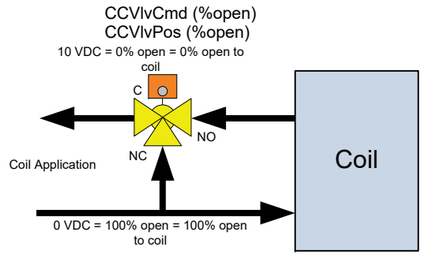
EXH

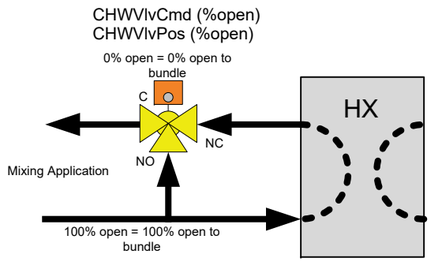
Normally Closed HW Valve



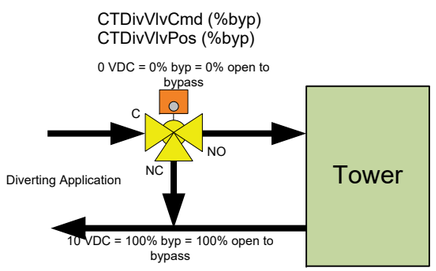
Normally Open CHW Valve



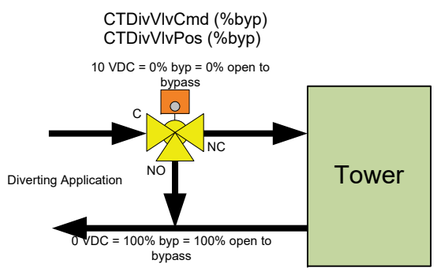
Normally Closed Mixing Valve



Normally Open Diverting Valve



Normally Bypassing Diverting Valve



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VLV

VFD

Common VFD Objects

"MT0046" is an example building number.
"CDWP01" is an example equipment designation.

MT0046_CDWP01_CDWPmpCmd (Off/On)
MT0046_CDWP01_CDWPmpSts (Off/On)
MT0046_CDWP01_CDWPmpSpd (%)
MT0046_CDWP01_CDWPmpPos (%) or CDWPmpFdbk (%)
MT0046_CDWP01_CDWPmpAlm (Norm/Alm)
MT0046_CDWP01_CDWPmpPwr (kW)
MT0046_CDWP01_CDWPmpEnrg (kWh)
MT0046_CDWP01_CDWPmpRntm (hours)
MT0046_CDWP01_CDWPmpFreq (Hz)
MT0046_CDWP01_CDWPmpAutoMode (Hand/Auto)
MT0046_CDWP01_CDWPmpCur (Amps)
MT0046_CDWP01_CDWPmpVltAC (VAC)
MT0046_CDWP01_CDWPmpVltDC (VDC)

Regenerative VFD Objects

MT0046_CDWP01_CDWPmpBrakeSts (Off/On)
MT0046_CDWP01_CDWPmpRegenSts (Off/On)
MT0046_CDWP01_CDWPmpRegenPos (%) or CDWPmpRegenFdbk (%)
MT0046_CDWP01_CDWPmpRegenFlt (Norm/Fault)
MT0046_CDWP01_CDWPmpRegenPwr (kW)
MT0046_CDWP01_CDWPmpRegenEnrg (kWh)
MT0046_CDWP01_CDWPmpRegenRntm (hours)
MT0046_CDWP01_CDWPmpRegenFreq (Hz)
MT0046_CDWP01_CDWPmpRegenCur (Amps)
MT0046_CDWP01_CDWPmpRegenVltAC (VAC)
MT0046_CDWP01_CDWPmpRegenVltDC (VDC)

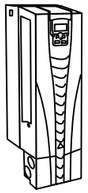


ABB ACH550 BACnet Object Map

"VFD" is used in place of the object name prefix.

Basic Commands

BV12 = VFDEna (Off/On)
BV10 = VFDCmd (Off/On)
AV16 = VFDRef1Spd (%) or VFDSpd (%)
AV17 = VFDRef2Spd (%)
BV11 = VFDDirCmd (Fwd/Rev)

Basic Feedback

BV00 = VFDSts (Stop/Run)
AV00 = VFDPos (%)
AV01 = VFDFreq (Hz)
AV05 = VFDTorq (lb-ft)
AV02 = VFDVltDC (VDC)
AV03 = VFDOutputVlt (VDC)
AV04 = VFDCur (Amps)
AV06 = VFDPwr (kW)
AV08 = VFDEnrg (kWh)
AV09 = VFDEnrgTot (MWh)
AV14 = VFDRnTm (hours)
AV15 = VFDMotorTmp (°C)
AV07 = VFDDriveTmp (°C)
BV01 = VFDDirSts (Fwd/Rev)
BV04 = VFDAutoMode (Auto/Hand)

Fault Feedback

BV02 = VFDFltSts (OK/Fault)
BV14 = VFDFltRst (Off/On)
AV18 = VFDFltLast (fault code)
AV19 = VFDFltPrev1 (fault code)
AV20 = VFDFltPrev2 (fault code)

Other Parameters

BV13 = VFDRefSelCmd (EXT1/EXT2)
BV03 = VFDRefSelSts (EXT1/EXT2)
BV05 = VFDAlmSts (OK/Alm)
BV06 = VFDMaintSts (OK/Maint)
BV07 = VFDReady (Not Ready/Ready)
BV08 = VFDAtSp (No/Yes)
BV09 = VFDEna (Off/On)
BV17 = VFDKeypadLck (Unlock/Lock)
BV18 = VFDBACnetCtrlCmd (Off/On)
BV19 = VFDBACnetCtrlSts (Off/On)
AV23 = VFDRampUpTm (sec)
AV24 = VFDRampDnTm (sec)
AV25 = VFD??? (???) *custom-programmable*
AV26 = VFD??? (???) *custom-programmable*
BV15 = VFD??? (???) *custom-programmable*
BV16 = VFD??? (???) *custom-programmable*

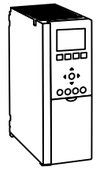
Drive I/O

BO00= VFDRO1Cmd (Off/On)
BO01 = VFDRO2Cmd (Off/On)
BO02 = VFDRO3Cmd (Off/On)
BO03 = VFDRO4Cmd (Off/On)
BO04 = VFDRO5Cmd (Off/On)
BO05 = VFDRO6Cmd (Off/On)
BI00 = VFDRO1Sts (Off/On)
BI01 = VFDRO2Sts (Off/On)
BI02 = VFDRO3Sts (Off/On)
BI03 = VFDRO4Sts (Off/On)
BI04 = VFDRO5Sts (Off/On)
BI05 = VFDRO6Sts (Off/On)

BI06 = VFDDI1Sts (Off/On)
BI07 = VFDDI2Sts (Off/On)
BI08 = VFDDI3Sts (Off/On)
BI09 = VFDDI4Sts (Off/On)
BI10 = VFDDI5Sts (Off/On)
BI11 = VFDDI6Sts (Off/On)

AO21 = VFDAO1Pos (mA)
AO22 = VFDAO2Pos (mA)

AI00 = VFDAI1 (varies)
AI01 = VFDAI2 (varies)



Danfoss VLT VFD BACnet Object Map

"VFD" is used in place of the object name prefix.

Basic Commands

BV01 = VFDCmd (Off/On)
AV01 = VFDRef1Spd (%) or VFDSpd (%)
AV02 = VFDRef2Spd (%)
BV25 = VFDDirCmd (CW/CCW)

Basic Feedback

BV33 = VFDSts (Stop/Run)
AV03 = VFDPos (%)
AV25 = VFDFreq (Hz)
AV26 = VFDTorq (%)
AV27 = VFDVltDC (VDC)
AV24 = VFDOutputVlt (VDC)
AV05 = VFDCur (Amps)
AV06 = VFDPwr (kW)
AV23 = VFDEnrg (kWh)
BV28 = VFDEnrgRst (Off/On)
AV22 = VFDRnTm (hours)
BV29 = VFDRnTmRst (Off/On)
AV28 = VFDDriveTmp (°C)
BV30 = VFDDirSts (Fwd/Rev)
BV06 = VFDAutoMode (Auto/Hand)

Fault Feedback

BV05 = VFDFltSts (OK/Fault)
BV03 = VFDFltRst (Off/On)
AV51 = VFDFltLast (fault code)
BV21 = VFDWarnSts (OK/Fault)
BV22 = VFDTripSts (OK/Fault)

Other Parameters

BV02 = VFDRefSelCmd (REF1/REF2)
AV01 = VFDRef1Pos (%)
AV02 = VFDRef2Pos (%)
BV27 = VFDRst (Off/On)
BV31 = VFDAtSp (No/Yes)

Drive I/O

BO00= VFDDO27Cmd (Off/On)
BO01 = VFDDO29Cmd (Off/On)
BO02 = VFDGPIOX306Cmd (Off/On)
BO03 = VFDGPIOX307Cmd (Off/On)
BO04 = VFDRO1Cmd (Off/On)
BO05 = VFDRO2Cmd (Off/On)

AI00 = VFDAI53 (%)
AI01 = VFDAI54 (%)

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REV. DATE: **1/5/18**

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VFD

VFD Tag Requirements

Overview

Fans, pumps, and compressors which use a variable frequency drive or VFD are typically sophisticated devices that expose many points. VFDs should be modeled as their own equip entity using the vfd tag. If the VFD is a sub-component of a larger piece of equip then it can be nested via the equipRef tag.

Standard points for VFDs

The standardized points for VFDs are:

- run cmd
- run sensor
- enable cmd
- speed cmd
- freq cmd

The primary on/off point of the equipment is always modeled with the run tag. Paired with cmd it models the on/off command point; paired with sensor it models the run status point. Many VFDs also include a secondary enable point which requires both run and enable to be commanded to true in order for the equipment to be on.

Speed of the VFD is commanded separately via the speed or freq point. The use of these points require that the equipment has already been commanded on.

Many VFDs will also provide many of the same points as an electric meter. Measurements such as electric demand, consumption, voltage, and current should follow the same conventions as elec meters.

Fans

Fans shall be defined as either an equip or a point. If the fan motor is a VFD then it is recommended to make the fan a sub-equip. However, in many cases a simple fan in a terminal unit such as a vav is better modeled as a point.

Pumps

Pumps shall be defined as either an equip or a point. If the pump is a VFD then it is recommended to make it an equip level entity. However if the pump is modeled as a simple on/off point as a component within a large piece of equipment such as a boiler then it is modeled as just a point. Pumps should follow the same point and equip level modeling conventions as fans.

Fan Equips

When the fan motor is a VFD it should be modeled as an equip entity using the standard VFD points described to the right. As a standard, model all fans as equip. Simple non-VFDs fans shall define their state via a run point.

Points

The following list applies to point tags commonly used with VFD, Fan and Pump equipment and shall be applied appropriately:

Fan Points

In simple cases where the fan is just a command and/or feedback sensor then it shall be modeled as a point.

If annotated as an output with the cmd tag, then the point models the command status of the fan:
- false (off) or true (on)
- if variable speed then it is 0% (off) to 100% (full speed)

If annotated as an input with the sensor tag, then the point models a sensor used to verify if the fan status:
- false indicated no air flow (off) or true indicates successful airflow (fan is on)
- if numeric, the point is differential pressure across the fan measured in "inH_2O" or "kPa"

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GSA Data Normalization for Building Automation Systems
Appendix-C

National BAS Object Naming & Tagging Standard

#	DATE	DESCRIPTION
1.3	7/24/2017	Added Tagging
2.0	8/8/2017	Release Version
2.2	10/4/2017	Added VRF Systems
2.3	1/5/2018	508 Compliance
-	-	-
-	-	-

STATUS: Version 2.3

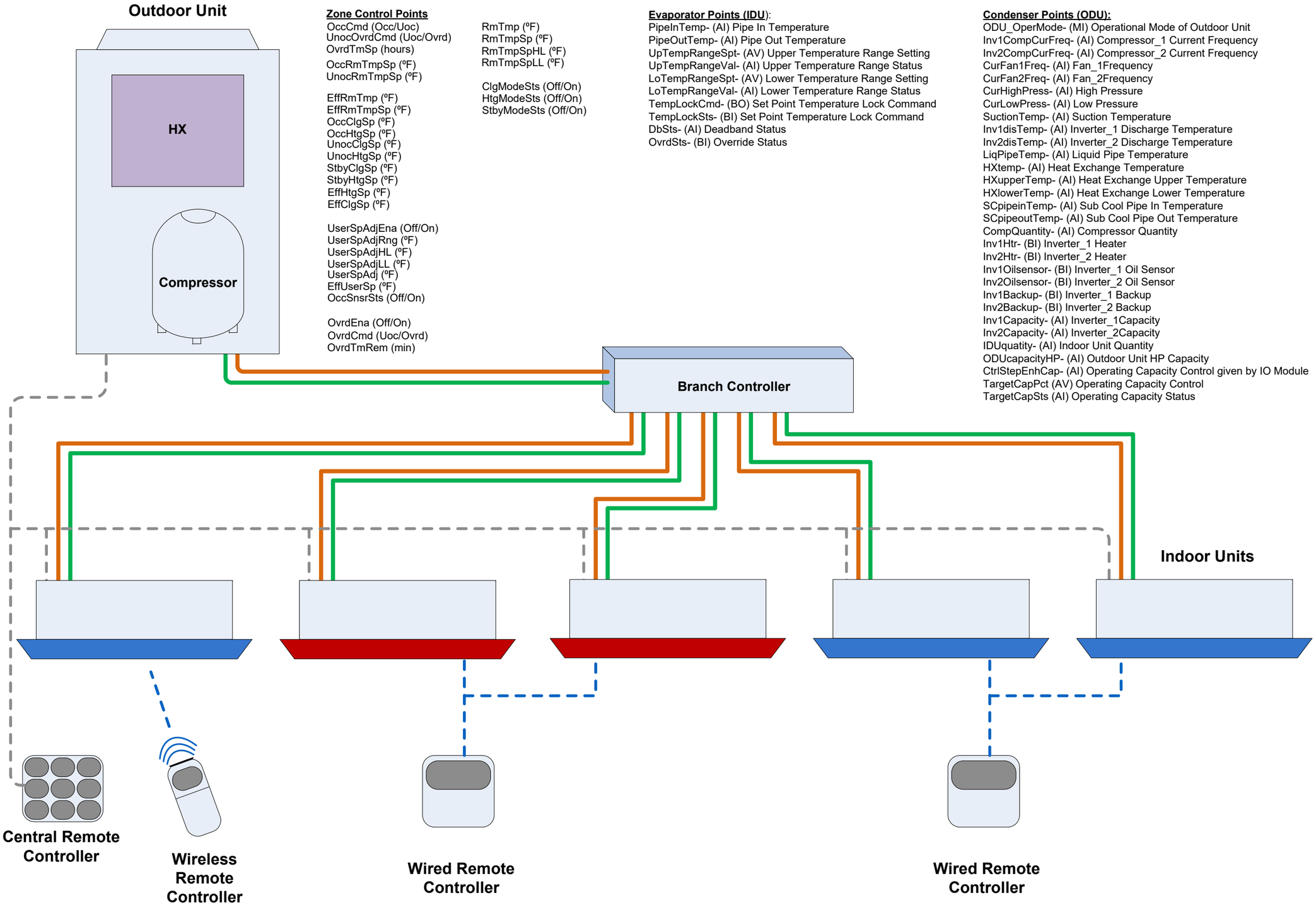
DRAWN BY: Mike Grush / Craig Payne

REV. DATE: **1/5/18**

SHEET TITLE & NUMBER:

VFDTAG

VRF – 2 Pipe System



Zone Control Points

OccCmd (Occ/Uoc)
UnocOvrdCmd (Uoc/Ovrd)
OvrdTmSp (hours)

OccRmTmpSp (ºF)
UnocRmTmpSp (ºF)

EffRmTmp (ºF)
EffRmTmpSp (ºF)
OccClgSp (ºF)
OccHtgSp (ºF)
UnocClgSp (ºF)
UnocHtgSp (ºF)
StbyClgSp (ºF)
StbyHtgSp (ºF)
EffHtgSp (ºF)
EffClgSp (ºF)

UserSpAdjEna (Off/On)
UserSpAdjRng (ºF)
UserSpAdjHL (ºF)
UserSpAdjLL (ºF)
UserSpAdj (ºF)
EffUserSp (ºF)
OccSnsrSts (Off/On)

OvrdEna (Off/On)
OvrdCmd (Uoc/Ovrd)
OvrdTmRem (min)

RmTmp (ºF)
RmTmpSp (ºF)
RmTmpSpHL (ºF)
RmTmpSpLL (ºF)

ClgModeSts (Off/On)
HtgModeSts (Off/On)
StbyModeSts (Off/On)

Evaporator Points (IDU):

PipeInTemp- (AI) Pipe In Temperature
PipeOutTemp- (AI) Pipe Out Temperature
UpTempRangeSpt- (AV) Upper Temperature Range Setting
UpTempRangeVal- (AI) Upper Temperature Range Status
LoTempRangeSpt- (AV) Lower Temperature Range Setting
LoTempRangeVal- (AI) Lower Temperature Range Status
TempLockCmd- (BO) Set Point Temperature Lock Command
TempLockSts- (BI) Set Point Temperature Lock Command
DbSts- (AI) Deadband Status
OvrdSts- (BI) Override Status

Condenser Points (ODU):

ODU_OperMode- (MI) Operational Mode of Outdoor Unit
Inv1CompCurFreq- (AI) Compressor_1 Current Frequency
Inv2CompCurFreq- (AI) Compressor_2 Current Frequency
CurFan1Freq- (AI) Fan_1Frequency
CurFan2Freq- (AI) Fan_2Frequency
CurHighPress- (AI) High Pressure
CurLowPress- (AI) Low Pressure
SuctionTemp- (AI) Suction Temperature
Inv1disTemp- (AI) Inverter_1 Discharge Temperature
Inv2disTemp- (AI) Inverter_2 Discharge Temperature
LiqPipeTemp- (AI) Liquid Pipe Temperature
HXtemp- (AI) Heat Exchange Temperature
HXupperTemp- (AI) Heat Exchange Upper Temperature
HXlowerTemp- (AI) Heat Exchange Lower Temperature
SCpipeinTemp- (AI) Sub Cool Pipe In Temperature
SCpipeoutTemp- (AI) Sub Cool Pipe Out Temperature
CompQuantity- (AI) Compressor Quantity
Inv1Htr- (BI) Inverter_1 Heater
Inv2Htr- (BI) Inverter_2 Heater
Inv1Oilsensor- (BI) Inverter_1 Oil Sensor
Inv2Oilsensor- (BI) Inverter_2 Oil Sensor
Inv1Backup- (BI) Inverter_1 Backup
Inv2Backup- (BI) Inverter_2 Backup
Inv1Capacity- (AI) Inverter_1Capacity
Inv2Capacity- (AI) Inverter_2Capacity
IDUquatity- (AI) Indoor Unit Quantity
ODUcapacityHP- (AI) Outdoor Unit HP Capacity
CtrlStepEnhCap- (AI) Operating Capacity Control given by IO Module
TargetCapPct (AV) Operating Capacity Control
TargetCapSts (AI) Operating Capacity Status

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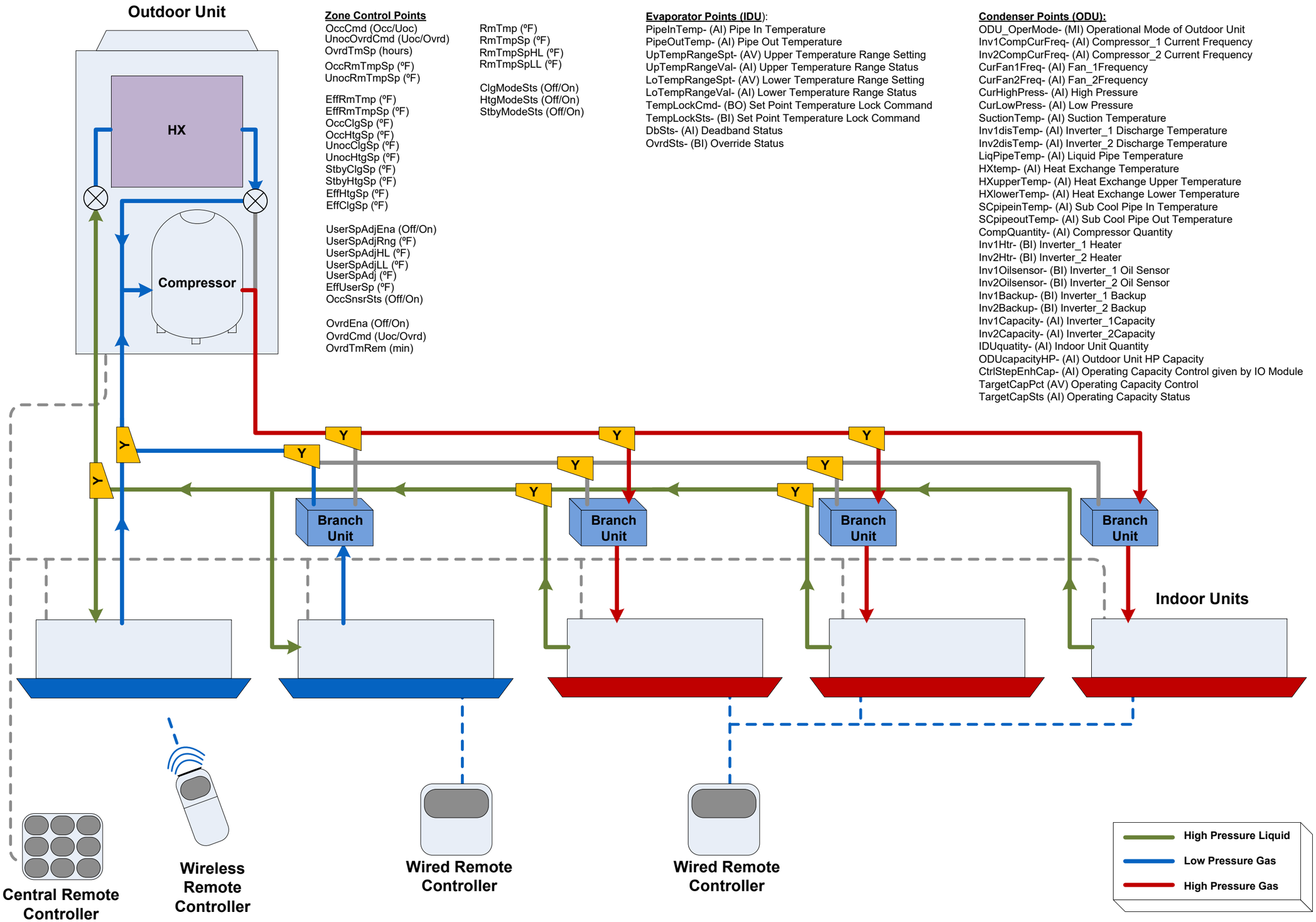
REV. DATE: **1/5/18**

SHEET TITLE & NUMBER:

VRF-2P

VRF – 3 Pipe System



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UnocOvrdCmd (Uoc/Ovrd)
OvrdTmSp (hours)

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UnocRmTmpSp (ºF)

EffRmTmp (ºF)
EffRmTmpSp (ºF)
OccClgSp (ºF)
OccHtgSp (ºF)
UnocClgSp (ºF)
UnocHtgSp (ºF)
StbyClgSp (ºF)
StbyHtgSp (ºF)
EffHtgSp (ºF)
EffClgSp (ºF)

UserSpAdjEna (Off/On)
UserSpAdjRng (ºF)
UserSpAdjHL (ºF)
UserSpAdjLL (ºF)
UserSpAdj (ºF)
EffUserSp (ºF)
OccSnsrSts (Off/On)

OvrdEna (Off/On)
OvrdCmd (Uoc/Ovrd)
OvrdTmRem (min)

RmTmp (ºF)
RmTmpSp (ºF)
RmTmpSpHL (ºF)
RmTmpSpLL (ºF)

ClgModeSts (Off/On)
HtgModeSts (Off/On)
StbyModeSts (Off/On)

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SHEET TITLE & NUMBER:

VRF-3P

Variable Refrigerant Flow (VRF) Tag Requirements

Overview

The vrf tag is used to model variable refrigerant flow assets. VRFs shall always be marked as equip.

Equipment & Reference Tags

VRFs shall be classified with the following type tags:

- twoPipe
- threePipe
- hvac: always specified to mark as an HVAC asset
- rooftop: any equipment in the outdoor unit

Sections

Since most points are not clearly associated with the entering or discharge section we omit a section tag for most points. Any points which would conflict with the zone points must be qualified with either discharge or entering tags. Associate points with sections of a VRF using these tags:

- entering: gas/fluid entering the unit from the zones
- discharge: gas/fluid exiting the unit to be supplied to the zones
- zone: conditioned space associated with the unit
- cool: cooling components
- heat: heating components

Points

The following list applies to point tags commonly used with indoor VRF equipment and shall be applied appropriately:

Indoor VRF Points Include Zone Tags

- zone air temp sensor
- zone air temp effective sp
- zone air temp occ cooling sp
- zone air temp occ heating sp
- zone air temp unocc cooling sp
- zone air temp unocc heating sp
- zone air temp standby cooling sp
- zone air temp standby heating sp
- zone air humidity sensor
- zone air co2 sensor
- zone air co2 sp

Equipment, Setpoint & Sensor Points

- leaving temp sensor
- leaving temp sp
- entering temp sensor
- leaving pressure sensor
- entering pressure sensor

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DRAWN BY: Mike Grush / Craig Payne

REV. DATE: **1/5/18**

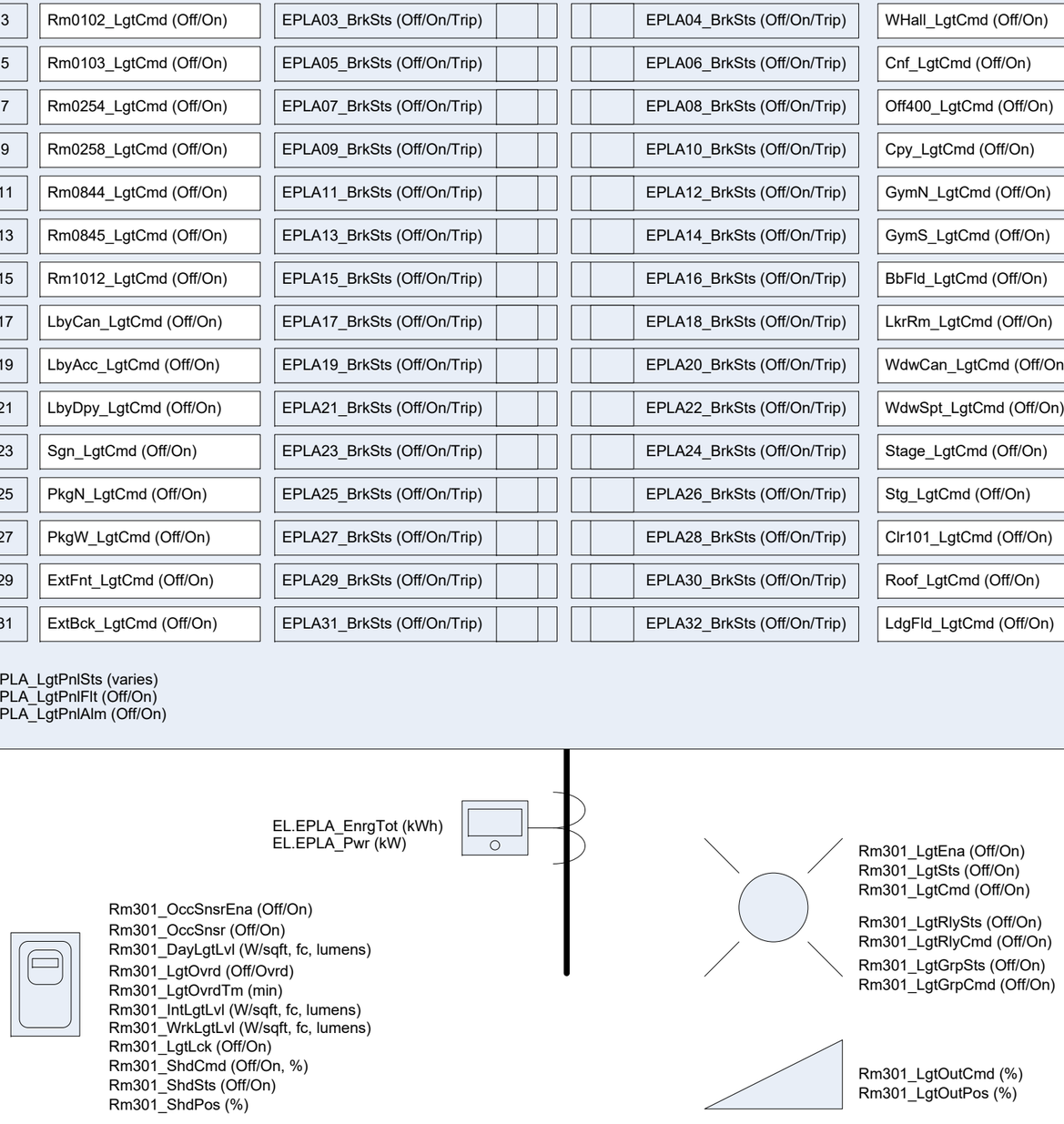
SHEET TITLE & NUMBER:

VRFTAG

Lighting Panel EPLA

1	Rm0101_LgtCmd (Off/On)	EPLA01_BrkSts (Off/On/Trip)		EPLA02_BrkSts (Off/On/Trip)	Zn12_LgtCmd (Off/On)	2
3	Rm0102_LgtCmd (Off/On)	EPLA03_BrkSts (Off/On/Trip)		EPLA04_BrkSts (Off/On/Trip)	WHall_LgtCmd (Off/On)	4
5	Rm0103_LgtCmd (Off/On)	EPLA05_BrkSts (Off/On/Trip)		EPLA06_BrkSts (Off/On/Trip)	Cnf_LgtCmd (Off/On)	6
7	Rm0254_LgtCmd (Off/On)	EPLA07_BrkSts (Off/On/Trip)		EPLA08_BrkSts (Off/On/Trip)	Off400_LgtCmd (Off/On)	8
9	Rm0258_LgtCmd (Off/On)	EPLA09_BrkSts (Off/On/Trip)		EPLA10_BrkSts (Off/On/Trip)	Cpy_LgtCmd (Off/On)	10
11	Rm0844_LgtCmd (Off/On)	EPLA11_BrkSts (Off/On/Trip)		EPLA12_BrkSts (Off/On/Trip)	GymN_LgtCmd (Off/On)	12
13	Rm0845_LgtCmd (Off/On)	EPLA13_BrkSts (Off/On/Trip)		EPLA14_BrkSts (Off/On/Trip)	GymS_LgtCmd (Off/On)	14
15	Rm1012_LgtCmd (Off/On)	EPLA15_BrkSts (Off/On/Trip)		EPLA16_BrkSts (Off/On/Trip)	BbFld_LgtCmd (Off/On)	16
17	LbyCan_LgtCmd (Off/On)	EPLA17_BrkSts (Off/On/Trip)		EPLA18_BrkSts (Off/On/Trip)	LkrRm_LgtCmd (Off/On)	18
19	LbyAcc_LgtCmd (Off/On)	EPLA19_BrkSts (Off/On/Trip)		EPLA20_BrkSts (Off/On/Trip)	WdwCan_LgtCmd (Off/On)	20
21	LbyDpy_LgtCmd (Off/On)	EPLA21_BrkSts (Off/On/Trip)		EPLA22_BrkSts (Off/On/Trip)	WdwSpt_LgtCmd (Off/On)	22
23	Sgn_LgtCmd (Off/On)	EPLA23_BrkSts (Off/On/Trip)		EPLA24_BrkSts (Off/On/Trip)	Stage_LgtCmd (Off/On)	24
25	PkgN_LgtCmd (Off/On)	EPLA25_BrkSts (Off/On/Trip)		EPLA26_BrkSts (Off/On/Trip)	Stg_LgtCmd (Off/On)	26
27	PkgW_LgtCmd (Off/On)	EPLA27_BrkSts (Off/On/Trip)		EPLA28_BrkSts (Off/On/Trip)	Clr101_LgtCmd (Off/On)	28
29	ExtFnt_LgtCmd (Off/On)	EPLA29_BrkSts (Off/On/Trip)		EPLA30_BrkSts (Off/On/Trip)	Roof_LgtCmd (Off/On)	30
31	ExtBck_LgtCmd (Off/On)	EPLA31_BrkSts (Off/On/Trip)		EPLA32_BrkSts (Off/On/Trip)	LdgFld_LgtCmd (Off/On)	32

EPLA_LgtPnlSts (varies)
EPLA_LgtPnlFlt (Off/On)
EPLA_LgtPnlAlm (Off/On)



Lighting Abbreviations

Acc = Accent lights
BbFld = Baseball Field
Brk = Breaker
Can = Can lights
Clr = Classroom
Cmd = Command
Cnf = Conference Room
Cpy = Copy Room
Dpy = Display
E = East
Ena = Enable
Ext = Exterior
FbFld = Football Field
Fld = Field/Flood lights
Grp = Group
Gym = Gymnasium
Int = Interior
Lby = Lobby
Lck = Lockout
Ldg = Loading
Lgt = Light/Lighting
Lkr = Locker Room
Lvl = Level
N = North
Occ = Occupancy
Off = Office
Out = Output
Ovrd = Override
Pos = Position
Pkg = Parking
Rly = Relay
Rm = Room
S = South
Sgn = Signage
Shd = Shade
Snsr = Sensor
Spt = Spot lights
Stg = Seating
Sts = Status
W = West
Wdw = Window
Wrk = Work
Zn = Zone

Diagrams depict generic equipment containing control points and objects, some of which may or may not be present or required for a particular piece of equipment or in a particular application.

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REV. DATE: **1/5/18**

SHEET TITLE & NUMBER:
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LGT

Lighting Tag Requirements

Overview

Lighting groups may model a single light switch, room, physical circuit, lighting panel, or logical grouping of lights. The lighting group's purpose is primarily to organize one or more lighting points to match the standardized site+equip+point model for navigation and analytics.

The lightsGroup tag is used to model the equip level of the lighting system and shall follow all the standard rules for equip entities.

Sections

Not applicable

Points

The following list applies to point tags commonly used with the lighting group and shall be applied appropriately:

Lighting

lights: primary actuator point indicating whether the lights are commanded on/off. The lights point must be either a binary point (on/off) or a numeric point if dimmable (0% to 100%). A lightsGroup must have one or more of these points.
lightLevel: sensor indicating current lighting level measured in "lux" or "lumen". A lightsGroup can have zero or more of these points.
occupancyIndicator: sensor indicating whether room is currently occupied. Point must be Bool where true indicates occupied and false indicates unoccupied. A lightsGroup can have zero or more of these points.

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LGTTAG

Meter Object Name Anatomy

Building_TYPE.Meter_Object

GSA Building Number
Always 6 characters, always designated by GSA

Meter Type
Always two characters - use standardized meter type abbreviations

Meter/Location Designation
No formal standard – best practice is to use the equipment designations used in the building's mechanical drawings

Standard Object Name
Always use standardized names found in this document

SS####_TT.EEEEEEEE_PPPPPPPPPPPPPPPPPPPPPPPP

- 6 characters always
- Underscore Delimiter
- 2 characters for standardized meter type
- Period Delimiter
- Up to 8 characters as-needed
- Underscore Delimiter
- 11-26 characters as-needed
- Number of characters available depends on BAS product limitations

IMPORTANT
NEVER EXCEED 45 CHARCTERS

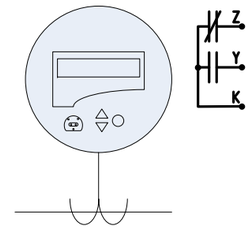
CO0624_EL.MSB1_Pwr

- CO0624 is DFC Building 810
- Electrical Meter MSB1
- Power

Standard Meter Type Abbreviations

CH = Chilled Water
CW = Condenser Water
DF = Diesel Fuel
DH = Domestic Hot Water
DW = Domestic Water
EL = Electricity
FO = Fuel Oil
GW = Gray (Reclaimed) Water
HW = Heating Hot Water
IW = Irrigation Water
MW = Make-up Water
NG = Natural Gas
PG = Propane Gas
PV = Photovoltaic Electricity
SH = Solar (Heat) Thermal Energy
ST = Steam
TE = Thermal Energy
TW = Tempered Water

Electric Meters



See ELEC page for additional electrical metering points.

EL.MSB_VltAC (VAC)
EL.MSB_Cur (Amps)
EL.MSB_Pwr (kW)
EL.MSB_Enrg (kWh)

EL.MSB_VltAB (VAC)
EL.MSB_VltBC (VAC)
EL.MSB_VltCA (VAC)
EL.MSB_VltLLAvg (VAC)
EL.MSB_VltLLMin (VAC)
EL.MSB_VltLLMax (VAC)
EL.MSB_VltLLMean (VAC)

EL.MSB_VltAN (VAC)
EL.MSB_VltBN (VAC)
EL.MSB_VltCN (VAC)
EL.MSB_VltLNAvg (VAC)
EL.MSB_VltLNMin (VAC)
EL.MSB_VltLNMax (VAC)
EL.MSB_VltLNMean (VAC)

EL.MSB_CurA (Amps)
EL.MSB_CurB (Amps)
EL.MSB_CurC (Amps)
EL.MSB_CurAvg (Amps)
EL.MSB_CurMin (Amps)
EL.MSB_CurMax (Amps)
EL.MSB_CurMean (Amps)

EL.MSB_Freq (Hz)

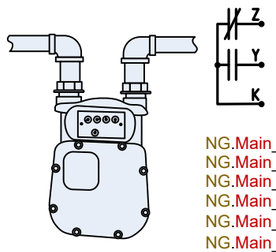
EL.MSB_EnrgRec (kWh) (imported from grid)
EL.MSB_EnrgDel (kWh) (exported to grid)

EL.MSB_PlsTot (pulses)
EL.MSB_PlsTotRst (Off/On)
EL.MSB_PlsGain (coeff)

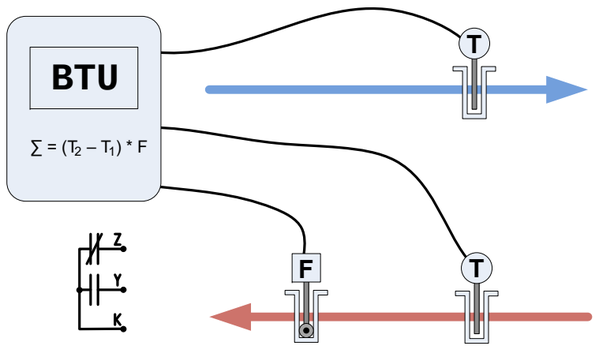
Water Meters

DW.Main_PlsTot (pulses)
DW.Main_PlsTotRst (Off/On)
DW.Main_PlsGain (coeff)
DW.Main_VolTot (gal)
DW.Main_FlwRat (gpm)
DW.Main_FlwRatMax (gpm)
DW.Main_VolTotNet (gal)
DW.CTMU_VolTot (gal)
DW.CTBlwDn_VolTot (gal)

Gas Meters



NG.Main_PlsTot (pulses)
NG.Main_PlsTotRst (Off/On)
NG.Main_PlsGain (coeff)
NG.Main_VolTot (cf, ccf)
NG.Main_FlwRat (cfm)
NG.Main_FlwRatMax (cfm)
NG.Main_VolTotNet (cf, ccf)
NG.Main_EnrgTot (btu, kbtu, mbtu, therms, kW, MW)
NG.Main_EnrgContent (btu/cf)



Thermal Energy (BTU) Meters

TE.CHW_FlwRat (gpm)
TE.CHW_FlwRatMax (gpm)
TE.CHW_CHWSTmp (ºF)
TE.CHW_CHWRTmp (ºF)
TE.CHW_DifTmp (ºF)
TE.CHW_DifTmpMax (ºF)
TE.CHW_EnrgFlwRat (btu/hr, kbtu/hr)
TE.CHW_EnrgTot (btu, kbtu, mbtu, kW)
TE.CHW_EnrgRatMax (btu/hr, kbtu/hr)
TE.CHW_EnrgTotRst (Off/On)

TE.CHW_PlsTot (pulses)
TE.CHW_PlsTotRst (Off/On)
TE.CHW_PlsGain (coeff)

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SHEET TITLE & NUMBER:
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MTR

Energy Tag Requirements

Overview

The general issues addressed by the energy tags are:
- modeling meters
- modeling submeters and their relationships
- modeling equip and point loads on meters

Meters

Meters are modeled as equip entities with the meter tag. The following meter types are defined:

elec meter
gas meter
domestic water meter
chilled water meter
condenser water meter
hot water meter
makeup water meter
blowdown water meter
condensate water meter
steam meter

All meters must additionally define one of these two tags:

siteMeter: marker applied to the main site level meter
submeterOf: Ref to parent meter

Meter Loads

Modeling the equip and point loads under specific meters can be used for analysis and visualization. Loads are modeled by applying a tag formatted as "{type}MeterLoad" on an equip or point. The meter load tag should be Ref to its associated meter. If modeling submeters, then the load should reference the closest submeter. Standardized load tags:

elecMeterLoad
gasMeterLoad
waterMeterLoad (no distinction between which type of water meter)
steamMeterLoad

Meter loads have the same types of points as their associated meters.

Electric Meters

Electricity meters are probably the most common type of meters modeled. They are tagged as elec meter. This model is designed to scale from very simple meters (just a power and energy point) up to a comprehensive point list for three-phase power quality meters.

Electricity meter points are described by combining tags from the lists given below. The tags in each set are mutually exclusive. (For example, a power point cannot be both active and reactive.)

The primary measured quantities in an electrical system are:

power: typically measured in "kW"
energy: typically measured in "kWh"
volt: typically measured in "V"
current: typically measured in "A"
freq: typically measured in "Hz"
pf: power factor

AC power measurements are further qualified by:

active: typically measured in "kW" (assumed as default)
reactive: typically measured in "kVAR"
apparent: typically measured in "kVA"

Voltage and current measurements are further qualified by:

mag: magnitude (assumed as default)
angle: phase angle, typically measured in "deg"
imbalance: imbalance between phases, measured in "%"
thd: total harmonic distortion, measured in "%"

Electrical Meters (cont.)

Three phase electrical measurements are qualified by:

phase: A, B, C, AB, BC, CA, N
avg: for current, voltage, and power factor (assumed as default)
total: for power and energy (assumed as default)

Energy exchange with the utility is qualified by:

import: energy imported from the grid
export: energy exported to the grid
net: net exchange (assumed as default)

In addition, define the following general-purpose tags:

ac: alternating current
dc: direct current

Flow Meters

Water and gas meters' measure flow rate and total volume consumed. Standardized points are:

flow: rate of volume flowing through the meter per unit time
volume: total volume consumption of the meter

Thermal Meters

Thermal meters measure energy as temperature differentials. Energy demand and consumption is modeled using the same tags as electric meters:

power: energy consumed per unit time such as "BTU/h"
energy: energy consumption such as "BTU"

Electrical Meter Points

The following list applies to point tags commonly used with electrical meters and shall be applied appropriately:

Power
power net sensor
power export sensor
power import sensor
active power total sensor
active power phase sensor
apparent power total sensor
apparent power phase sensor
reactive power total sensor
reactive power phase sensor

Energy
energy net sensor
energy export sensor
energy import sensor
energy total sensor
energy phase sensor

Voltage
volt mag avg sensor
volt mag phase sensor
volt angle avg sensor
volt angle phase sensor
volt thd avg sensor
volt thd phase sensor
volt imbalance sensor

Current
current mag avg sensor
current mag phase sensor
current angle avg sensor
current angle phase sensor
current thd avg sensor
current thd phase sensor
current imbalance sensor

Power Factor
pf avg sensor
pf phase sensor

Frequency
freq sensor

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ENGYTAG

Common Electric Smart Meter Points

Basic Meter

EL.[circuit]_VltAC (VAC)
EL.[circuit]_Cur (Amps)
EL.[circuit]_Pwr (kW)
EL.[circuit]_Enrg (kWh)

DC Systems

EL.[circuit]_VltDC (VDC)
EL.[circuit]_Cur (Amps)
EL.[circuit]_Pwr (kW)
EL.[circuit]_Enrg (kWh)

EL.[circuit]_VltAB (VAC)
EL.[circuit]_VltBC (VAC)
EL.[circuit]_VltCA (VAC)
EL.[circuit]_VltLLAvg (VAC)
EL.[circuit]_VltLLMin (VAC)
EL.[circuit]_VltLLMax (VAC)
EL.[circuit]_VltLLMean (VAC)

EL.[circuit]_VltAN (VAC)
EL.[circuit]_VltBN (VAC)
EL.[circuit]_VltCN (VAC)
EL.[circuit]_VltLNAvg (VAC)
EL.[circuit]_VltLNMin (VAC)
EL.[circuit]_VltLNMax (VAC)
EL.[circuit]_VltLNMean (VAC)

EL.[circuit]_CurA (Amps)
EL.[circuit]_CurB (Amps)
EL.[circuit]_CurC (Amps)
EL.[circuit]_CurAvg (Amps)
EL.[circuit]_CurMin (Amps)
EL.[circuit]_CurMax (Amps)
EL.[circuit]_CurMean (Amps)

EL.[circuit]_Freq (Hz)

EL.[circuit]_RelPwrA (kW)
EL.[circuit]_RelPwrB (kW)
EL.[circuit]_RelPwrC (kW)
EL.[circuit]_RelPwrTotal (kW)
EL.[circuit]_RelPwrMax (kW)

EL.[circuit]_EnrgRec (kWh)
(imported from grid)

EL.[circuit]_EnrgDel (kWh)
(exported to grid)

EL.[circuit]_EnrgRecNet (kWh)
EL.[circuit]_EnrgDelNet (kWh)

EL.[circuit]_AppPwrA (kVA)
EL.[circuit]_AppPwrB (kVA)
EL.[circuit]_AppPwrC (kVA)
EL.[circuit]_AppPwrTotal (kVA)
EL.[circuit]_AppPwrMax (kVA)
EL.[circuit]_AppEnrgRec (kVAh)
EL.[circuit]_AppEnrgDel (kVAh)

EL.[circuit]_RctPwrA (kVAR)
EL.[circuit]_RctPwrB (kVAR)
EL.[circuit]_RctPwrC (kVAR)
EL.[circuit]_RctPwrTotal (kVAR)
EL.[circuit]_RctPwrMax (kVAR)
EL.[circuit]_RctEnrgRec (kVARh)
EL.[circuit]_RctEnrgDel (kVARh)

EL.[circuit]_PwrFctrA (%)
EL.[circuit]_PwrFctrB (%)
EL.[circuit]_PwrFctrC (%)
EL.[circuit]_PwrFctrAvg (%)

EL.[circuit]_VltUnbal
EL.[circuit]_CurUnbal
EL.[circuit]_PhsRev (False/True)
EL.[circuit]_VltPhsSeq

EL.[circuit]_PlsOut1 (Off/On)
EL.[circuit]_PlsOut2 (Off/On)
EL.[circuit]_PlsOut3 (Off/On)
EL.[circuit]_PlsOut4 (Off/On)

EL.[circuit]_PlsIn1 (Off/On)
EL.[circuit]_PlsIn2 (Off/On)
EL.[circuit]_PlsIn3 (Off/On)
EL.[circuit]_PlsIn4 (Off/On)

EL.[circuit]_PlsTot1 (pulses)
EL.[circuit]_PlsTot2 (pulses)
EL.[circuit]_PlsTot3 (pulses)
EL.[circuit]_PlsTot4 (pulses)

EL.[circuit]_THDVltA (THD)
EL.[circuit]_THDVltB (THD)
EL.[circuit]_THDVltC (THD)

EL.[circuit]_THDCurA (THD)
EL.[circuit]_THDCurB (THD)
EL.[circuit]_THDCurC (THD)

EL.[circuit]_KfctrCurA (coeff)
EL.[circuit]_KfctrCurB (coeff)
EL.[circuit]_KfctrCurC (coeff)

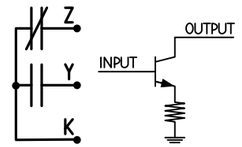
EL.[circuit]_CfctrCurA (coeff)
EL.[circuit]_CfctrCurB (coeff)
EL.[circuit]_CfctrCurC (coeff)

EL.[circuit]_CtRatio (Ratio)
EL.[circuit]_PtRatio (Ratio)
EL.[circuit]_Serial (SN)

EL.[circuit]_RO1 (Off/On)
EL.[circuit]_RO2 (Off/On)
EL.[circuit]_RO3 (Off/On)
EL.[circuit]_RO4 (Off/On)

Standard Electrical Meter Type Abbreviations

EL = Electricity
PV = Photovoltaic Electricity
WD = Wind Electricity



KYZ & Open Collector Pulses

EL.[circuit]_PlsTot (pulses)
EL.[circuit]_PlsTotRst (Off/On)
EL.[circuit]_PlsGain (coeff)

Common Photovoltaic System Points

PV System Points

Inverter

EL.INV1_ModuleTmp (ºF)
EL.INV1_IrradPOA (W/m^2)
EL.INV1_IrradGlbHor (W/m^2)
EL.INV1_GndFlt (Off/On)
EL.INV1_Perf (%)
EL.INV1_ModuleTmpCoeff (coeff)
EL.INV1_InvPwrMax (kW)
EL.INV1_InvPwrMax (kW)
EL.INV1_Comb###Cur (Amps)
EL.INV1_Comb###Vlt (VDC)
EL.INV1_Comb###Enrg (kWh)
EL.INV1_InvSts (varies)
EL.INV1_InvMode (varies)
EL.INV1_DCLnkVlt (VDC)
EL.INV1_DCBusVlt (VDC)

EL.Array1_ArrayPwrMax (kW)
EL.Array1_IrradPOA (W/m^2)
EL.Array1_IrradGlbHor (W/m^2)
EL.Array1_Perf (%)
EL.Array1_ModuleTmpCoeff (coeff)

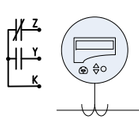
Common Generator Points

PwrCap (kW)
PwrPct (%)
BattVlt (VDC)
OilPrs (PSI)
OilTmp (ºF)
CoolantTmp (ºF)
FuelRat (gal/hr)
EngSpd (rpm)
EngStarts (starts)
EngRntm (hours)

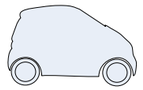
EngStartCmd (Off/On)
RstCmd (Off/On)
FltCode (varies)
WarnCode (varies)
FuelRem (gal)
RntmRem (hours)
ExhLvrCmd (Off/On)
ExhLvrSts (Off/On)
GenTest (Off/On)
AtsSts (Off/On)
GenAlm (Off/On)

Utility Pulse Points

EL.Util_PlsTot (pulses)
EL.Main_Enrg (kWh)



Common EV Charging Station Points



CurLmt (Amps)
StationMode (varies)
StationSts (varies)
StationEna (Off/On)
EnrgDel (kWh)
EnrgRec (kWh)
ChargeCur (Amps)
PwrPct (%)
PwrCap (kW)
PwrLmt (kW)
EVID (SN)

See MTR page for meter naming anatomy.

Diagrams depict generic equipment containing control points and objects, some of which may or may not be present or required for a particular piece of equipment or in a particular application.

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ELEC

Devices

Example Device Names

MT0046_ChwSys_SC4
MT0046_ChwSys_UC60012
MT0046_CHL01_UC800
MT0046_GP04_VFD
UT0174_ChwSys_SC5
UT0174_ChwSys_UC60021
UT0174_CHL06A_UC800
UT0174_CT1C1F_VFD
ND0205_ChwSys_SC1
ND0205_ChwSys_UC6001
ND0205_CHL01_UC800
ND0205_CWP04_VFD
SD0240_A01_CDCtlr
SD0240_A01_HDCtlr
SD0240_A01_SF1AVFD
SD0240_A01_SF1BVFD
WY0119_A04_GCM05
WY0119_A04_SFVFD
WY0119_A04_OAFMS
WY0119_RmS110_JACE7AX
WY0119_LGT_Zn01

Device

Generic Device Points

DevSts (OK/Fault)
DevAlm (Norm/Alm)
DevMfg (Manufacturer)
DevModel (Model)
DevHWVer (Version)
DevSWVer (Version)
DevFWVer (Version)
DevSerial (sn)
DevBootCount (boots)
ErrorCode (varies)
Uptime (sec, min, hours)
PcbTmp (°F)
DevFlt (Off/On)
PrevFltCode (varies)
ActiveFltCode (varies)
FltCount (faults)
RstCmd (Off/On)
RebootCmd (Off/On)
UTC (UTC)

Device Communications Points

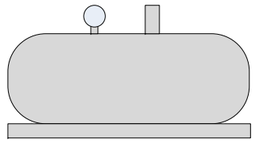
DevComSts (OK/Fault)
DevLink (varies)
DevMACAdd (MAC Address)
DevID (Device ID)
DevIPAdd (IP Address)
DevNetID (Network ID)
DevAdd (Device Address)

Wireless Device Points

Signal (%)
NodesTot (nodes)
NodesOnline (nodes)
RadioGrp (group)
RadioAdd (address)
RadioSts (Off/On)
NodeSts (Off/On)
BattSts (Off/On)
BattAlm (Off/On)
BattRem (%)

Weather Points

Wthr_OATmp (°F)
Wthr_OATmpMax (°F)
Wthr_OATmpMin (°F)
Wthr_OATmpAvg (°F)
Wthr_OARelHum (%)
Wthr_OADew (°F)
Wthr_OAPrs (inHg)
Wthr_OAEnth (btu-lb)
Wthr_WindChill (°F)
Wthr_HtIndex (°F)
Wthr_PrecipGauge (in)
Wthr_PrecipSts (Off/On)
Wthr_WindSpd (mph, fps)
Wthr_WindDir (deg)
Wthr_WindSpdMax (mph, fps)
Wthr_IrradGlbHor (W/m^2)
Wthr_IrradDirNorm (W/m^2)



Compressed Air – Control Air

CMP01_CtlAirCmpSts (Off/On)
CMP01_CtlAirCmpAlm (Normal/Alarm)
CMP01_CtlAirCmpFault (Normal/Fault)
CMP01_CtlAirStPrs (PSI)
CMP01_CtlAirStPrsSp (PSI)
CMP01_CtlAirStPrsLL (PSI)
CMP01_CtlAirStPrsAlmL (Normal/Alarm)

Compressed Air – Lab Air

CMP02_LabAirCmpSts (Off/On)
CMP02_LabAirCmpAlm (Normal/Alarm)
CMP02_LabAirCmpFault (Normal/Fault)
CMP02_LabAirStPrs (PSI)
CMP02_LabAirStPrsSp (PSI)
CMP02_LabAirStPrsLL (PSI)
CMP02_LabAirStPrsAlmL (Normal/Alarm)

Water Treatment Systems

WTS_pH
WTS_Conductivity
WTS_MConductivity
WTS_ORP
WTS_STmp
WTS_MTemp
WTS_WtrMtrTotVal
WTS_MCycles
WTS_CncntCycles
WTS_MtrFlwRat (per MIN)
WTS_ConductSp
WTS_Calibration

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MISC

Network Tag Requirements

Overview

Network level tagging includes devices, networks and communication connections between devices.

Devices

The device tag models a physical device. Devices include servers, area controllers, field controllers, etc.

Networks

The network tag models a network. Networks are used to setup logical connections between devices.

Connections

Device-to-device communication is modeled using a connection with the following tags:

- connection: marker tag
- protocol: string enumeration communications protocol
- device1Ref: first device end point
- device2Ref: second device end point
- networkRef: network used for the communication

As a general principle, if a device sits "higher" in the network architecture, then it should be tagged with device1Ref. For example, given a connection between a server and area controller, then the server should be device1Ref and the area controller should be device2Ref. In peer-to-peer networking, this distinction should not matter.

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NETTAG