GRAPHICS

- Graphics files shall follow Caltech Controls Graphic Standard.
- Graphics files shall be placed on the BMS Supervisor in a folder provided and assigned by Caltech Controls. Figure 1 below shows the folder to use for a Building 16 graphics file.

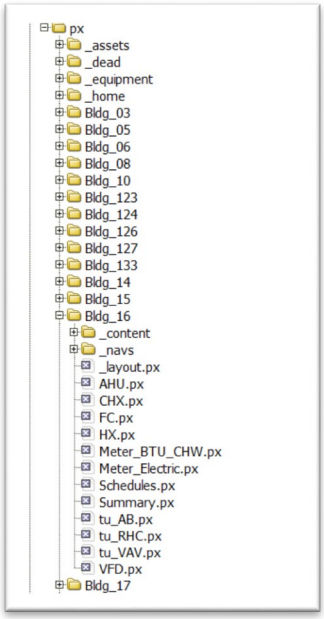


Figure 1 – Building 16 Graphics File Folder

- Graphics files shall use native Tridium Graphics Libraries if needed.

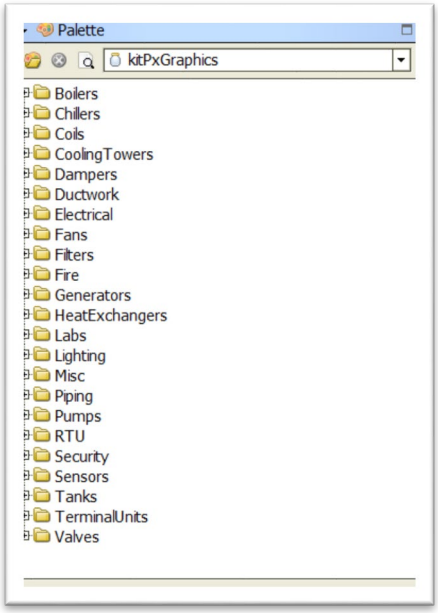


Figure 2 – Tridium Graphics Libraries

- Graphics pages are build using a framework that provides three areas: page header, left side navigation, and content area.

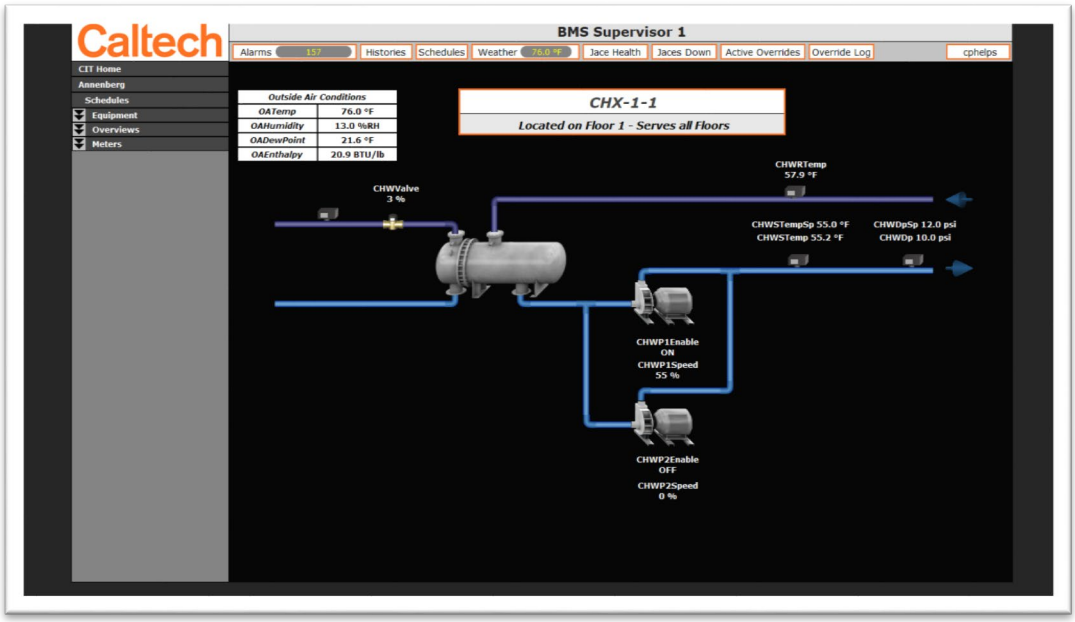


Figure 3 - Graphics Framework with Equipment Content

  - The graphic page header is common to all pages.

Figure 4 - Graphics Page Header

  - The graphic left side navigation is unique to each building and may include, but not limited to the following drop down groupings: Equipment, Floors, Overviews, and Meters.

Figure 5 - Graphics Left Side Navigation

- The graphic content area of a Graphic Framework page refers to an equipment template or custom content.

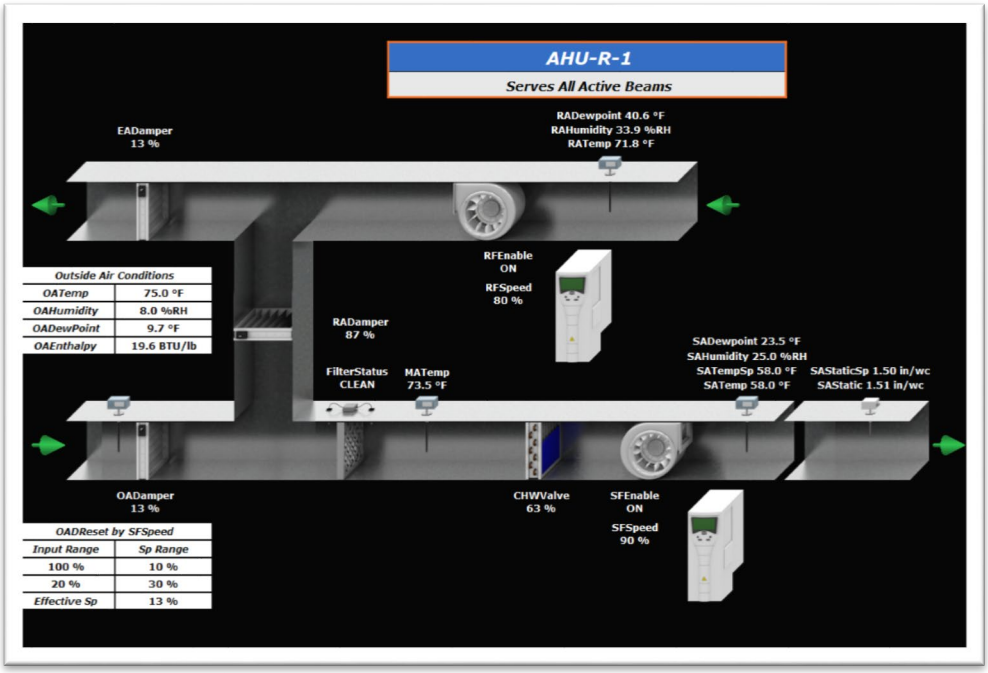


Figure 6 - Graphics Equipment Content

- Equipment graphics files shall use Caltech equipment templates if possible.

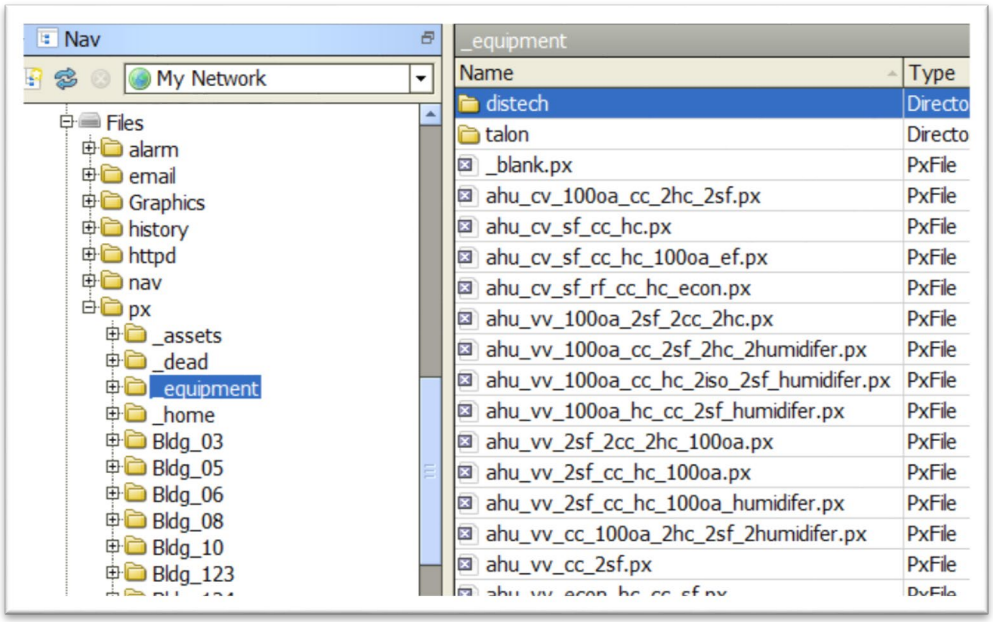


Figure 7 - Equipment Templates File Location

- Equipment templates and custom content shall be sized to 1200 by 800 pixels.
- Custom content background images if used shall be sized to 1200 by 800 pixels.

- Custom content background images if used shall be place at the lowest level of the Px file's Widget Tree on a layer named bgLayer and locked.

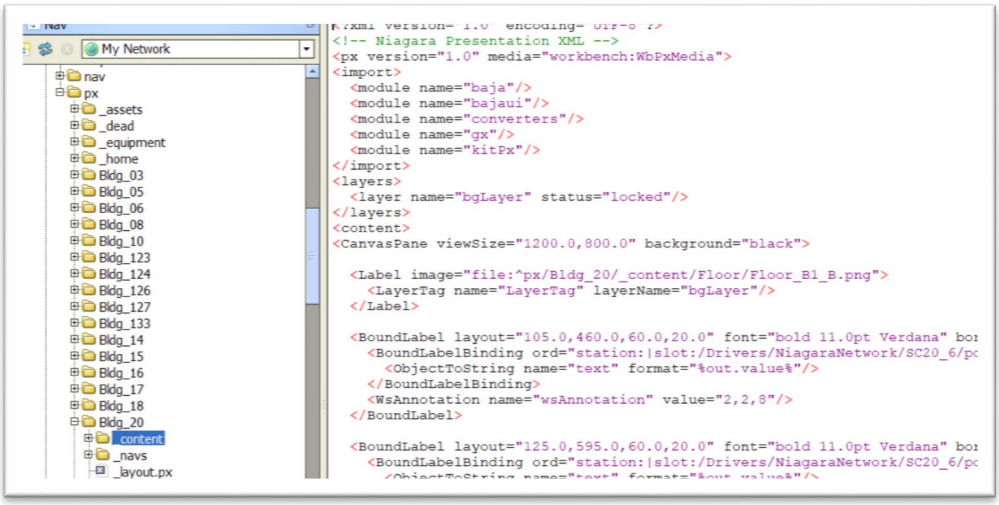


Figure 8 – Custom Content File Text showing bgLayer Locked and View Size

- Custom content Px files if used shall be place in the related buildings content folder.

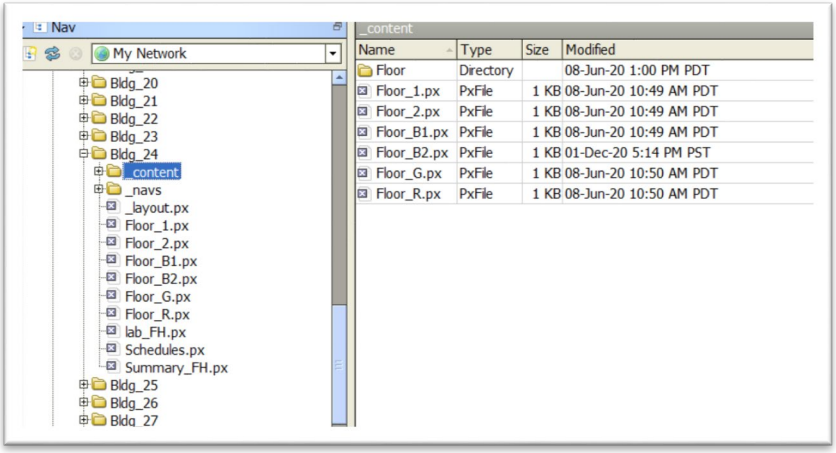


Figure 9 - Custom Content File Folder

- Graphics Px file names follow the form "name.px" and shall start with a letter and may only include the following characters (A-Z, a-z, 0-9, underscore).

- Graphics Px files shall be attached to a component Niagara Point Folder as a PxView.

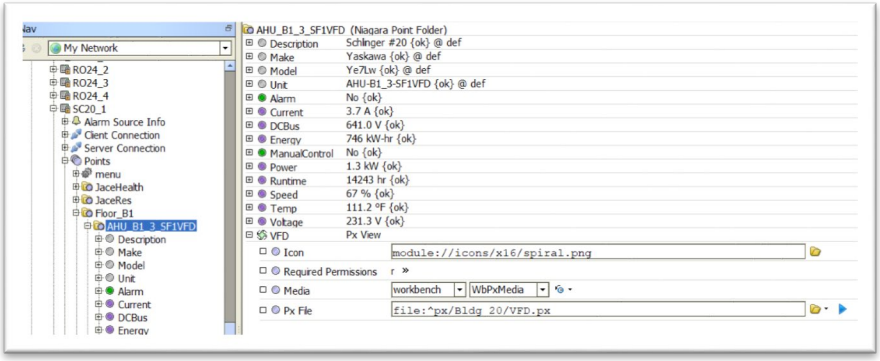


Figure 10 - Building 20 Component PXView

- Cross linking custom content to another building graphics folders or content is not allowed.

SCHEDULES

- Schedules shall be placed on the BMS Supervisor in a folder assigned by Caltech Controls.

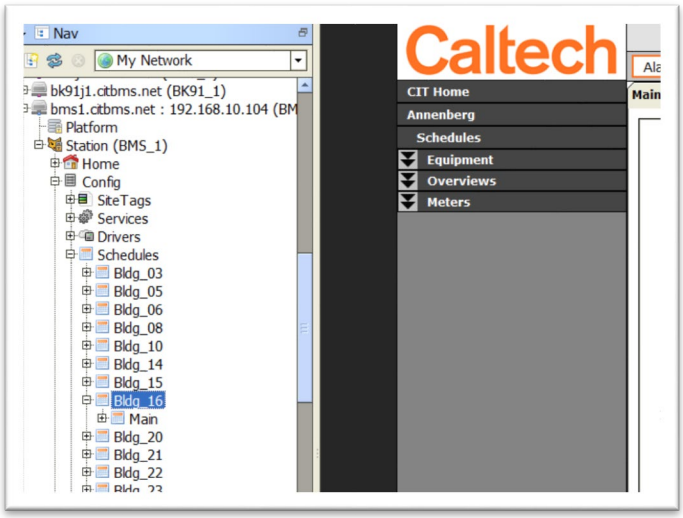


Figure 11 - Building 16 Schedule Folder

- Schedules shall be imported into Jaces as needed.

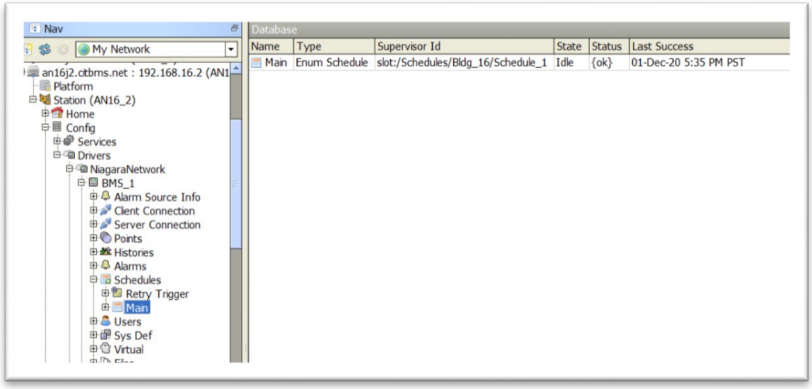


Figure 12 - Building 16 Schedule Import into Jace

- Schedules shall be use by reference if possible.

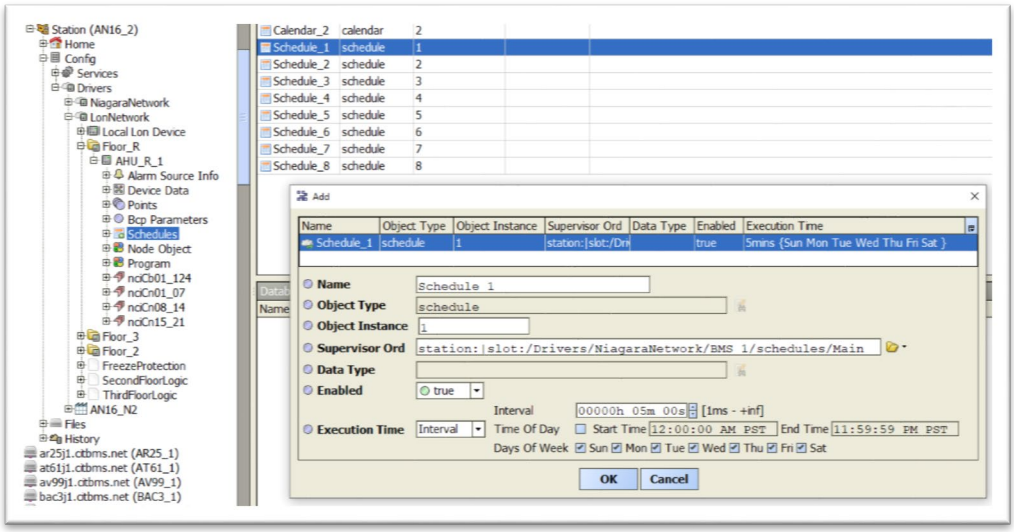
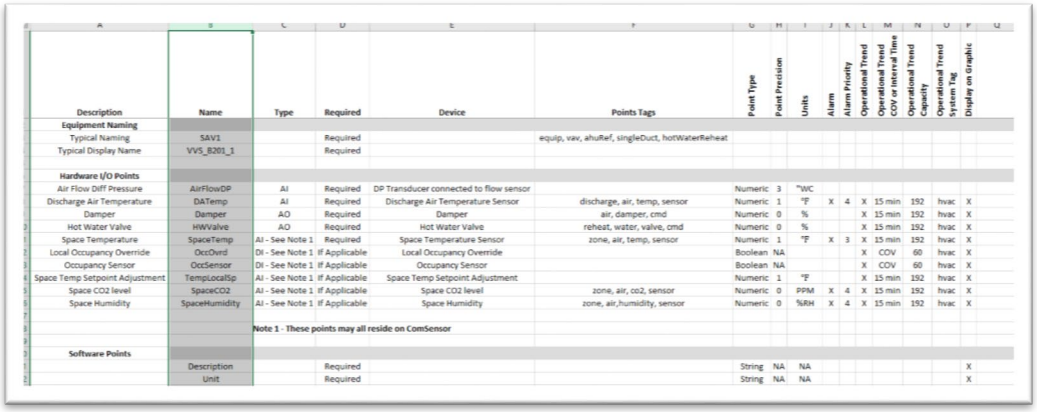


Figure 13 - Building 16 Schedule Reference

POINTS

- Points names shall be named per Caltech Point Naming Standard.



Description	Name	Type	Required	Device	Points Tags	Point Type	Point Precision	Units	Alarm	Alarm Priority	Operational Trend	Operational Trend COV or Interval Time	Operational Trend Capacity	Operational Trend System Tag	Display on Graphic
Equipment Naming															
Typical Naming	SAV1		Required		equip, vav, ahuRef, singleDuct, hotWaterReheat										
Typical Display Name	VVS_B201_1		Required												
Hardware I/O Points															
Air Flow Diff Pressure	AirFlowDP	AI	Required	DP Transducer connected to flow sensor		Numeric	3	"WC							
Discharge Air Temperature	DATemp	AI	Required	Discharge Air Temperature Sensor	discharge, air, temp, sensor	Numeric	1	°F	X	4	X	15 min	192	hvac	X
Damper	Damper	AO	Required	Damper	air, damper, cmd	Numeric	0	%			X	15 min	192	hvac	X
Hot Water Valve	HWValve	AO	Required	Hot Water Valve	reheat, water, valve, cmd	Numeric	0	%			X	15 min	192	hvac	X
Space Temperature	SpaceTemp	AI - See Note 1	Required	Space Temperature Sensor	zone, air, temp, sensor	Numeric	1	°F	X	3	X	15 min	192	hvac	X
Local Occupancy Override	OccOvrd	DI - See Note 1	If Applicable	Local Occupancy Override		Boolean	NA				X	COV	60	hvac	X
Occupancy Sensor	OccSensor	DI - See Note 1	If Applicable	Occupancy Sensor		Boolean	NA				X	COV	60	hvac	X
Space Temp Setpoint Adjustment	TempLocalSp	AI - See Note 1	If Applicable	Space Temp Setpoint Adjustment		Numeric	1	°F			X	15 min	192	hvac	X
Space CO2 level	SpaceCO2	AI - See Note 1	If Applicable	Space CO2 level	zone, air, co2, sensor	Numeric	0	PPM	X	4	X	15 min	192	hvac	X
Space Humidity	SpaceHumidity	AI - See Note 1	If Applicable	Space Humidity	zone, air,humidity, sensor	Numeric	0	%RH	X	4	X	15 min	192	hvac	X
		Note 1 - These points may all reside on ComSensor													
Software Points															
	Description		Required			String	NA	NA							X
	Unit		Required			String	NA	NA							X

Figure 14 - Caltech Points List for a VAV

- Point names shall not have the point type or channel imbedded in the name.

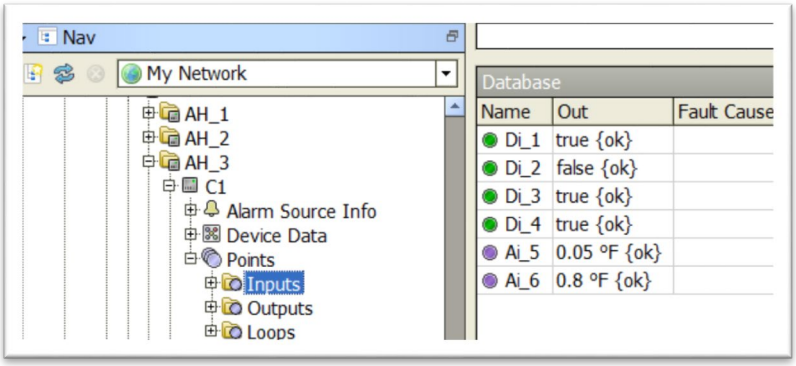
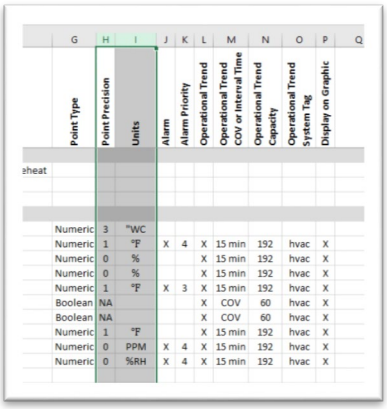


Figure 15 - Disallowed Point Naming

- The length of point names shall be no greater than 21 characters.
- Point names shall start with a letter and may only include the following characters (A-Z, a-z, 0-9, underscore).
- Point Display Names shall follow the same naming rules as point names.

- Points facets shall be set to display units per Caltech Point Naming Standard.
- Points facets shall be set to display precision per Caltech Point Naming Standard.

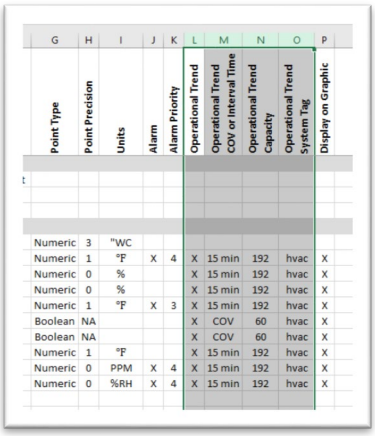


	Point Type	Point Precision	Units	Alarm	Alarm Priority	Operational Trend	Operational Trend COV or Interval Time	Operational Trend Capacity	Operational Trend System Tag	Display on Graphic
eheat										
	Numeric	3	"WC							
	Numeric	1	°F	X	4	X	15 min	192	hvac	X
	Numeric	0	%			X	15 min	192	hvac	X
	Numeric	0	%			X	15 min	192	hvac	X
	Numeric	1	°F	X	3	X	15 min	192	hvac	X
	Boolean	NA				X	COV	60	hvac	X
	Boolean	NA				X	COV	60	hvac	X
	Numeric	1	°F			X	15 min	192	hvac	X
	Numeric	0	PPM	X	4	X	15 min	192	hvac	X
	Numeric	0	%RH	X	4	X	15 min	192	hvac	X

Figure 16 - Caltech Point Naming Unit Details

HISTORIES

- Histories shall be placed directly on equipment points in JACES.
- Histories type, size, and system tag shall be assign per Caltech Point Naming Standard.



	Point Type	Point Precision	Units	Alarm	Alarm Priority	Operational Trend	Operational Trend COV or Interval Time	Operational Trend Capacity	Operational Trend System Tag	Display on Graphic
t										
	Numeric	3	"WC							
	Numeric	1	°F	X	4	X	15 min	192	hvac	X
	Numeric	0	%			X	15 min	192	hvac	X
	Numeric	0	%			X	15 min	192	hvac	X
	Numeric	1	°F	X	3	X	15 min	192	hvac	X
	Boolean	NA				X	COV	60	hvac	X
	Boolean	NA				X	COV	60	hvac	X
	Numeric	1	°F			X	15 min	192	hvac	X
	Numeric	0	PPM	X	4	X	15 min	192	hvac	X
	Numeric	0	%RH	X	4	X	15 min	192	hvac	X

Figure 17 - Caltech Point Naming History Details

- History extension names shall use the default Tridium Naming for Caltech Standard Histories.

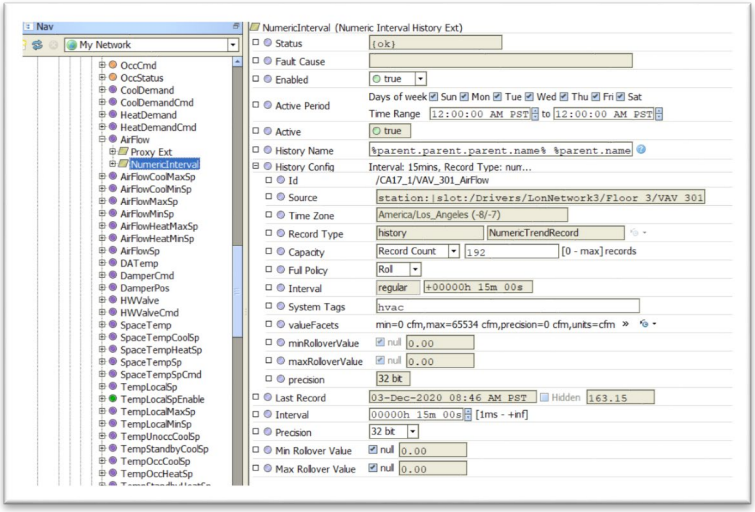


Figure 18 – Numeric History Extension Detail

- History names shall be build using Baja Format and hard coding (FAT fingering) is not allowed.

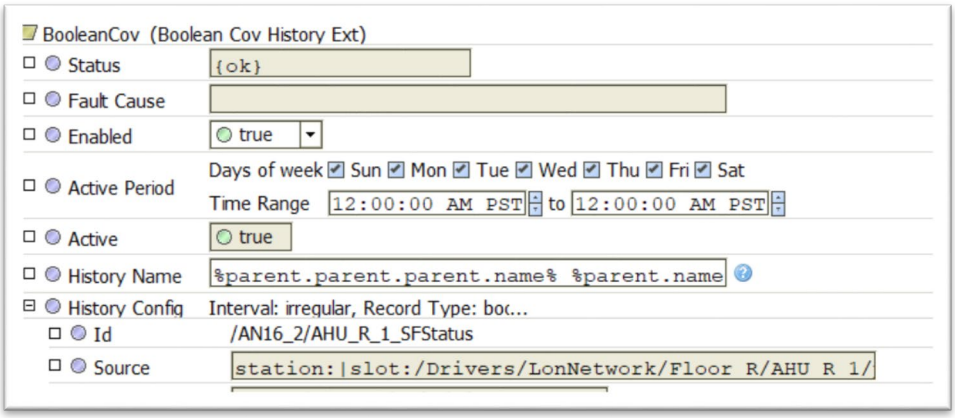


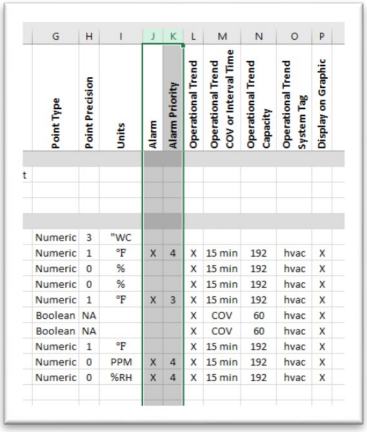
Figure 19 - History Naming using Baja Format

- The resulting history names shall start with a letter and may only include the following characters (A-Z, a-z, 0-9, underscore).

ALARMS

- Alarms shall be placed directly on equipment status points in JACES.
- Alarms from load devices shall be suppressed when the source equipment is down or in fault.

- Alarms shall be assigned Alarm Classes per Caltech Point Naming Standard.



	G	H	I	J	K	L	M	N	O	P
	Point Type	Point Precision	Units	Alarm	Alarm Priority	Operational Trend	Operational Trend COV or Interval Time	Operational Trend Capacity	Operational Trend System Tag	Display on Graphic
t										
	Numeric	3	"WC							
	Numeric	1	°F	X	4	X	15 min	192	hvac	X
	Numeric	0	%			X	15 min	192	hvac	X
	Numeric	0	%			X	15 min	192	hvac	X
	Numeric	1	°F	X	3	X	15 min	192	hvac	X
	Boolean	NA				X	COV	60	hvac	X
	Boolean	NA				X	COV	60	hvac	X
	Numeric	1	°F			X	15 min	192	hvac	X
	Numeric	0	PPM	X	4	X	15 min	192	hvac	X
	Numeric	0	%RH	X	4	X	15 min	192	hvac	X

Figure 20 - Caltech Point Naming Alarm Details

- Alarm Source Names shall be build using Baja Format and hard coding (FAT fingering) is not allowed.

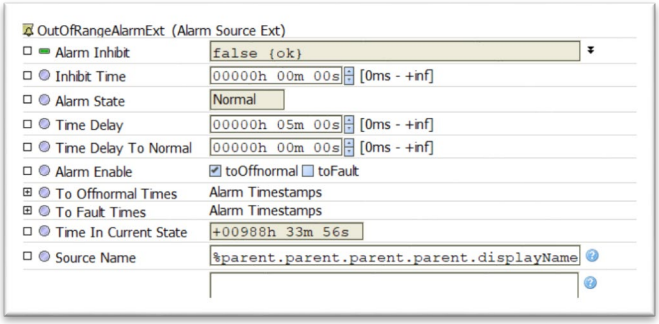


Figure 21 - Alarm Source Name using Baja Format

- The resulting Alarm Source shall start with a letter and may only include the following characters (A-Z, a-z, 0-9, underscore, /). The forward slash is to be used to form a file path layout (i.e. AHU_1/SATemp).
- No Alarm Extensions that appears in the Alarm Ext Manager view shall have an Alarm Class set to Default Alarm Class.

WIRE SHEET LOGIC PAGES

- Shall not be used except where no other options are present.
- Shall be layout to fit on one screen for easy viewing.
- Inputs and Set Points shall be place on the left side of page.
- Outputs shall be place on right side of page.
- Logic shall be layout to reduce wire connections from crossing.

- Each page should do one thing as imply by the page name (i.e. HWSTempReset).

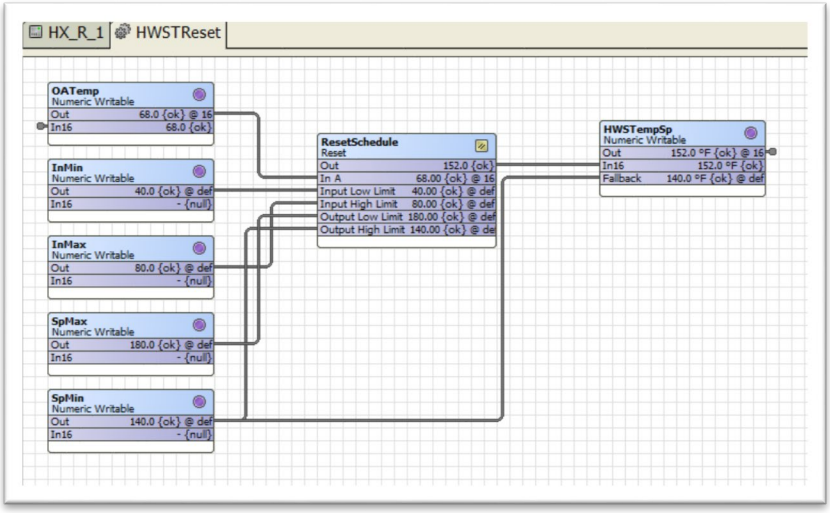


Figure 22 - Wiresheet Logic for HWSTempReset

- Page/Folder deep shall be limited.

GFX PROGRAMMING (DISTECH)

- All programming used shall be open and non-proprietary.
- Hardware points shall be managed using the Excel XpressgfxPoints Add-in provided by Distech.
- Programs shall be started by using the export feature of the Excel XpressgfxPoints Add-in.
- Program logic shall be added to new programming sheets for each functional group (i.e. Fan Control, SATemp Control, Damper Control and so on).
- Program sheets shall be arranged in Project tree by level of important.
- Input Tags and Set Points shall be place on the left side of page.
- Outputs tags shall be place on right side of page.
- Logic shall be layout to reduce wire connections from crossing.
- Custom Blocks are permitted if used to improves the readability of the resulting code.
- Custom Blocks shall be limited in scope to related tasks and should do one thing as imply by the blocks name (i.e. PumpStaging).
- All data shall be passed directly in and out of Custom Blocks.
- The use of Generic Blocks within Custom Blocks is not allowed.
- The use of non-Distech Controls Toolboxes is not allowed.
- All hardware inputs without devices connected shall have their Signal Interpretation set to disconnected.
- All hardware outputs without devices connected shall have their Signal Type set to Unassigned.
- All unused resources shall be deleted from code.
- All disconnected hardware inputs shall be deleted from code.

- All unassigned hardware outputs shall be deleted from code.
- Hardware Worksheets and GFX code files for every controller shall be included in Project O&M, on a readable digital format approved by Caltech Controls.