# 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.

e 🗀 px	
assets	
ead dead	
equipment	
home	
Bldg 03	
Bldg 05	
Bldg 06	
Bldg 08	
🖶 🧰 Bldg_10	
🕀 🧰 Bldg_123	
🕀 🧰 Bldg_124	
🕀 🧰 Bldg_126	
🕂 🧰 Bldg_127	
🖶 🧰 Bldg_133	
🖶 🧰 Bldg_14	
🕆 🧰 Bldg_15	
🖻 🧰 Bldg_16	
🖻 🧰 _content	
enavs	
layout.px	
AHU.px	
CHX.px	
- FC.px	
HX.px	
Meter_BTU_CHW.px	
Meter_Electric.px	
Schedules.px	
Summary.px	
The RHC av	
- U_VAV.px	
Blda 17	
T	

### 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.

					BM	S Supervi	sor 1			
Alarms	176	Histories	Schedules	Weather	75.0 °F	Jace Health	Jaces Down	Active Overrides	Override Log	cphelps

#### 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.

a Nav 🕫	5	_equipment	
🖓 🍰 💿 🎑 My Network 🗖	7	Name	Туре
		🛅 distech	Directo
		🛅 talon	Directo
true anal		_blank.px	PxFile
		ahu_cv_100oa_cc_2hc_2sf.px	PxFile
⊕ istory		ahu_cv_sf_cc_hc.px	PxFile
🕀 🛅 httpd		ahu_cv_sf_cc_hc_100oa_ef.px	PxFile
🕀 🧰 nav		ahu_cv_sf_rf_cc_hc_econ.px	PxFile
₽ <mark>©</mark> px		ahu_vv_100oa_2sf_2cc_2hc.px	PxFile
triangle		ahu_vv_100oa_cc_2sf_2hc_2humidifer.px	PxFile
		ahu_vv_100oa_cc_hc_2iso_2sf_humidifer.px	PxFile
the home		ahu_vv_100oa_hc_cc_2sf_humidifer.px	PxFile
⊕ 🛅 Bldg_03		ahu_vv_2sf_2cc_2hc_100oa.px	PxFile
🖨 Bldg_05	Ξ	ahu_vv_2sf_cc_hc_100oa.px	PxFile
🕀 🧰 Bldg_06		ahu_vv_2sf_cc_hc_100oa_humidifer.px	PxFile
Bldg_08		ahu_vv_cc_100oa_2hc_2sf_2humidifer.px	PxFile
Bidg_10		ahu_vv_cc_2sf.px	PxFile
		D shu wy econ he ce ef ny	DyFile

### 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.

• IVdV	Krxmi Version- 1.0 encoding- OfF-0 22
🧟 💿 🞑 My Network 🔹	<pre><!-- Niagara Presentation XML--></pre>
	<pre><pre>version="1.0" media="workbench:WbPxMedia"&gt;</pre></pre>
🕀 🧰 nav 📫	<pre><import></import></pre>
E Dx	<module name="baja"></module>
B assets	<module name="bajaui"></module>
	<pre><module name="converters"></module></pre>
	<module name="gx"></module>
	<module name="kitPx"></module>
monome	
Bidg_03	<layers></layers>
e 🖸 Bidg_05	<layer name="bgLayer" status="locked"></layer>
@ 🖸 Bldg_06	
🕀 🧰 Bldg_08	<content></content>
🕀 🧰 Bldg_10	<canvaspane background="black" viewsize="1200.0,800.0"></canvaspane>
@ 🗀 Bldg_123	
@ 🔁 Bldg_124	<label image="file:^px/Bldg 20/ content/Floor/Floor B1 B.png"></label>
⊕ 🗀 Bldg_126	<layertag layername="bgLayer" name="LayerTag"></layertag>
Bldg 127	
Bldg 133	
P Bldg 14	<pre><boundlabel box<="" font="bold 11.0pt Verdana" layout="105.0,460.0,60.0,20.0" pre=""></boundlabel></pre>
P Dldg 15	SoundLabelBinding ord="station:/slot:/Drivers/NiagaraNetwork/SC20 6/pc
B Ddg 16	<objecttostring format="%out.value%" name="text"></objecttostring>
Didy_17	<pre><wsannotation name="wsAnnotation" value="2,2,8"></wsannotation></pre>
Bldg_18	
Biog_20	
e content	<boundlabel bor<="" font="bold 11.0pt Verdana" layout="125.0,595.0,60.0,20.0" td=""></boundlabel>
enavs	<boundlabelbinding format="Sout values" ord="station: slot:/Drivers/NiagaraNetwork/SC20 6/pc&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;ayout.px&lt;/td&gt;&lt;td&gt;(ObjectToCtring name=" tavt"=""></boundlabelbinding>

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.

Nav	8	_content			
🕄 🎯 🛞 My Network	-	Name 🗠	Туре	Size	Modified
	긝	🛅 Floor	Directory		08-Jun-20 1:00 PM PDT
		Floor_1.px	PxFile	1 KB	08-Jun-20 10:49 AM PDT
Bldg_21		Floor_2.px	PxFile	1 KB	08-Jun-20 10:49 AM PDT
Blda 23		Floor_B1.px	PxFile	1 KB	08-Jun-20 10:49 AM PDT
⇒ Blda 24		Floor_B2.px	PxFile	1 KB	01-Dec-20 5:14 PM PST
🕂 🛅 _content		Floor_G.px	PxFile	1 KB	08-Jun-20 10:50 AM PDT
🕫 🫅 _navs		Floor_R.px	PxFile	1 KB	08-Jun-20 10:50 AM PDT
-🖾 _layout.px					
Floor_1.px					
Floor_2.px					
Floor_B1.px					
Bloor G py					
Eloor B px					
ab FH.px					
Schedules.px					
Summary_FH.px	Ξ				
🖶 🧰 Bldg_25					
🖶 🧰 Bldg_26					
⊕ 🖾 Bldg 27		1			

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.

av e My Network - • My Netw	AHU_B1_3_SF1VF     Description     Make     Make     Make     Model     Unt     Aam     Current     DoBus     Current     ManuaControl     Serenty     RanuaRontrol     Serenty     Sered     Temp     Votage	(Nagara Pont Folder)           Schinger #20 (ok) @ def           Yaskawa (ok) @ def           Ye7.xv (ok) @ def           Ne (ok)           37.4 (ok)           6411.0 V (ok)           746 KeV+r (ok)           740 (ok)           7423 keV (ok)           74243 hr (ok)           67 % (ok)           11.2 keV (ok)           21.3 V (ok)           221.3 V (ok)	
E O Make	D O Icon	module://icons/x16/spiral.png	<u> </u>
⊕ © Unit	Required Per	missions r »	
🕀 🖲 Alarm	🗆 🔘 Media	workbench VWbPxMedia V 🐨	
⊕ ⊕ Current ⊕ ⊕ DCBus ⊕ ⊕ Enerav	D O Px File	file:^px/Bldg 20/VFD.px	📄 • 🕨

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.

: Nav 8	Databas					
🕄 🥵 💿 🎯 My Network 🔽	Name	Туре	Supervisor Id	State	Status	Last Success
	Name Main	Type Enum Schedule	Supervisor Id sbt:/Schedules/Bldg_16/Schedule_1	State Idle	Status {ok}	Last Success 01-Dec-20 5:35 PM PST
<ul> <li>● P Server Connection</li> <li>● Ports</li> <li>● Atms</li> <li>● Atms</li> <li>● Schedules</li> <li>● Retry Trigger</li> <li>⊕ Mann</li> <li>● Schedules</li> <li>● B Cetry Trigger</li> <li>⊕ Users</li> <li>● B Users</li> <li>● B Vys Def</li> <li>● C Vytual</li> <li>● C Vytual</li> </ul>						

## Figure 12 - Building 16 Schedule Import into Jace

• Schedules shall be use by reference if possible.

Station (AN16_2)	Calendar_2	calendar	2						
Reference Englished	Schedule_1	schedule	1						
Hall Conject	Schedule_2	schedule	2						
E Drivers	Schedule_3	schedule	3						
Windowski	Schedule_4	schedule	4						
🖻 🚇 LonNetwork 🗧 🛅	Schedule_5	schedule	5						
H Local Lon Device	Schedule_6	schedule	6						
P G Floor_R	Schedule_7	schedule	7						
E AHU_R_1	Schedule 8	schedule	8						
Alarm Source Info									
中國 Device Data	Add								
⊕ ♥ Points									
Bcp Parameters	Name	Obj	ect Type	Object Instance	Supervisor Ord	Data Type	Enabled	Execution Time	
Hild Schedules	- Sch	edule 1 sch	edule	1	station: Islot:/D	ri	true	Smins (Sun Mon Tue Wed Thu Fri Sat	3
B Node Object							1		<u> </u>
🕀 🐻 Program									
noCb01_124	Nar	me	Sched	ule 1					
0 7 noCn01_07	- Ohi	iact Tuno					16		
Na	me Obj	ett Type	scnea	are			3	9	
	Obj	ject Instanc	e 1						
THE FOOT S	O Sur	nervisor On	d stati	on·lelot·/D	rivers/Niac	araNetwo	rk/BMS	1/schedules/Main	
The Charles D			a bouch	011.   0200.70		Jul uno choi	LA, 0110	r/ senedures/marn	
Floor_2		1000							
B Floor_2 B FreezeProtection B Second Floor 4 price	O Dat	а Туре					1	9	
Filor_2     FreezeProtection     SecondFloorLogic     ThirdFloorLogic	O Dat	ta Type ibled	© true	-			6		
Figure 2     Foor 2     FreezeProtection     FreezeProtection     FindFloorLogic     ThirdFloorLogic	© Dat © Ena	ta Type Ibled	© true	-	00000	057 000	] [1mc	infl	
Big Floar_2	© Dat © Ena	ta Type ibled	© true	↓ Interval	00000h	05m 00s	[1ms - ·	+inf]	
	<ul><li>Dat</li><li>Ena</li><li>Exe</li></ul>	ta Type Ibled :cution Time	© true	Interval Time Of I	00000h Day 🗌 Start	05m 00s	[1ms	+inf] <u>₽ST</u> End Time <u>11:59:59 ₽М Р</u>	T
	<ul><li>Dat</li><li>Ena</li><li>Exe</li></ul>	ta Type Ibled :cution Time	Tinterval	Interval Time Of I Days Of	00000h Day 🗋 Start Veek 🗹 Sun 🗹	05m.00s Time 12:00 Mon ☑ Tue [	[1ms :00 AM	+inf] <u>₽ST</u> End Time <u>11:59:59 ₽М Р</u> Thu IZ Fri⊠ Sat	T
te For-2 te Fo	<ul><li>Dat</li><li>Ena</li><li>Exe</li></ul>	ta Type Ibled :cution Time	© true e Interva	▼ Interval ▼ Time Of I Days Of	00000h Day 🗋 Start Week 🗹 Sun 🗹	1 05m 00s Time 12:00 Mon 2 Tue [	[1ms - · : 00 AM	+inf] PSTEnd Time <u>11:59:59_PM_PS</u> Thu ଅFri⊠Sat	T
Files     Flor_2     Files	<ul> <li>Dat</li> <li>Ena</li> <li>Exe</li> </ul>	ta Type nbled :cution Time	© true	Interval     Time Of I     Days Of	00000h Day □ Start Veek ☑ Sun ☑ OK	1 05m 00s Time <u>12:00</u> Mon ☑ Tue [ Cancel	[1ms :00 AM	+inf] perEnd Time <u>11:59:59_PM_P</u> Thu ❷ Fn ❷ Sat	T

Figure 13 - Building 16 Schedule Reference

# POINTS

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

A	8	· ·	U	Ł	1	G	м	1	1	A	LM	N.	U	P U
Description	Name	Туре	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	VV5_8201_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	х	4	X 15 min	192	hvac	×
Damper	Damper	AO	Required	Damper	air, damper, cmd	Numeric	0	%			X 15 min	192	hvac	х
Hot Water Valve	HWValve	AO	Required	Hot Water Valve	reheat, water, valve, cmd	Numeric	0	%			X 15 min	192	hvac	х
Space Temperature	SpaceTemp	AI - See Note 1	Required	Space Temperature Sensor	zone, air, temp, sensor	Numeric	1	٩F	×	3	X 15 min	192	hvac	х
Local Occupancy Override	OccOvrd	DI - See Note 1	If Applicable	Local Occupancy Override		Boolean	NA				x cov	60	hvac	х
Occupancy Sensor	OccSensor	DI - See Note 1	If Applicable	Occupancy Sensor		Boolean	NA				X COV	60	hvac	х
pace Temp Setpoint Adjustment	TempLocalSp	AI - See Note 1	If Applicable	Space Temp Setpoint Adjustment		Numeric	1	۰F			X 15 min	192	hvac	х
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	х
Space Humidity	SpaceHumidity	Al - See Note 1	If Applicable	Space Humidity	zone, air, humidity, sensor	Numeric	0	%RH	×	4	X 15 min	192	hvac	x
		Note 1 - These p	oints may all r	reside on ComSensor										
Software Points														
	Description		Required			String	NA	NA						х
	Unit		Required			String	NA	NA						х

### 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.



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.



Figure 17 - Caltech Point Naming History Details

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

💲 💿 My Network	<ul> <li>Status</li> </ul>	{ok}
B OccCmd	Fault Cause	
⊕ O OccStatus	© Enabled	💿 true 💌
CoolDemand     CoolDemandCmd     Generate HeatDemand	C O Active Period	Days of week I Sun I Mon I Tue I Wed I Thu I Fri Sat Time Range 12:00:00 AM PSTE to 12:00:00 AM PSTE
HeatDemandCmd	C O Active	O true
Proxy Ext	G O History Name	%parent.parent.parent.name% %parent.name @
Image: State of the state	E O History Confin	Interval: 15mips, Record Type: pur
AirFlowCoolMaxSp		/CA17 1/VAV 301 AirFlow
AirFlowCoolMinSp	C Source	station:  slot:/Drivers/LonNetwork3/Floor 3/VAV 301
ArFlowMinSp	D O True Zene	America (Los Angeles (-8/-7)
AirFlowHeatMaxSp	C Time Zone	America/cos_Angeles (-0/-7)
AirFlowHeatMinSp	Record Typ	history Numeric I rendRecord 10 -
AirFlowSp	□ © Capacity	Record Count • 192 [0 - max] records
DATemp	Generation     Full Policy	Rol v
DamperCmd     B     DamperPos	O Interval	regular +00000h 15m 00s
⊕ ● HWValve		
🕀 🌑 HWValveCmd	d o System Ta	gs nvac
SpaceTemp	valueFacets	s min=0 cfm,max=65534 cfm,precision=0 cfm,units=cfm » * •
SpaceTempCoolSp	minRollover	Value 🗹 null 0.00
B SpaceTempSp	□   maxRolove	rValue Inul 0.00
SpaceTempSpCmd		32 bt
TempLocalSp	o o precision	32 DK
TempLocalSpEnable	Last Record	03-Dec-2020 08:46 AM PST Hidden 163.15
TempLocalMaxSp	Interval	00000h 15m 00s [1ms - +inf]
TempLocaMinSp	Precision	32 bt 💌
TempUnoccCoolSp	- o Precision	
er empstandbyCoosp	Min Rolover V	alue 🖾 nui 0.00
B TampOccLoosp	□ O Max Rollover \	/alue 🗹 null (0.00

#### Figure 18 – Numeric History Extension Detail

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

BooleanCov (Book	ean Cov History Ext)
🗆 🔘 Status	{ok}
🗆 🔘 Fault Cause	
🗆 🔘 Enabled	© true ▼
C O Active Period	Days of week ♥ Sun ♥ Mon ♥ Tue ♥ Wed ♥ Thu ♥ Fri ♥ Sat Time Range 12:00:00 AM PST + to 12:00:00 AM PST +
🗆 🔘 Active	© true
🗆 🔘 History Name	<pre>%parent.parent.name% %parent.name</pre>
History Config     O Id     Source	Interval: irregular, Record Type: bo /AN16_2/AHU_R_1_SFStatus
L Source	station: siot:/brivers/LonNetwork/Floor R/AHO R 1/

### 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.



#### Figure 20 - Caltech Point Naming Alarm Details

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

🗆 📟 Alarm Inhibit	false {ok}
🗆 🔍 Inhibit Time	00000h 00m 00s + [0ms - +inf]
🗆 🔘 Alarm State	Normal
🗆 🔍 Time Delay	00000h 05m 00s [0ms - +inf]
🗆 🔍 Time Delay To Normal	00000h 00m 00s + [0ms - +inf]
🗆 🔘 Alarm Enable	🗹 toOffnormal 🔲 toFault
	Alarm Timestamps
🗉 🔘 To Fault Times	Alarm Timestamps
🗆 🔍 Time In Current State	+00988h 33m 56s
Source Name	%parent.parent.parent.parent.displayName @

#### 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.