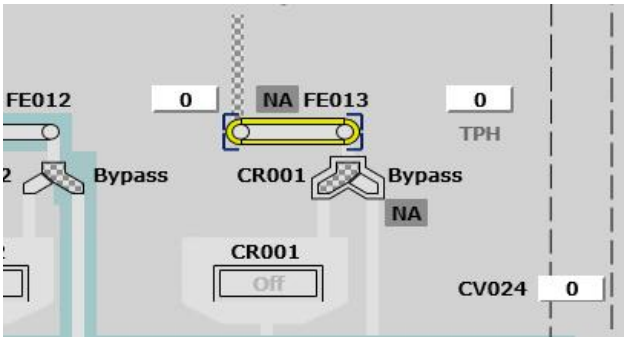
DTE Energy, Fossil Generation Department, High Performance Graphics

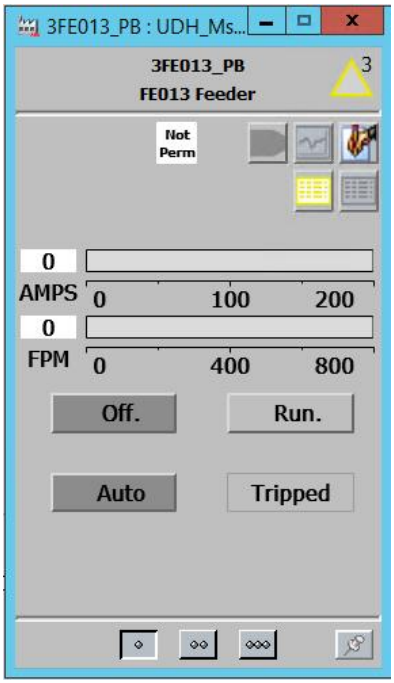
In an 800xA with Harmony Connect environment

1. Asset based objects
    a. PROBLEM: The 800xA's object-aspect based system is designed to and capable of managing assets. However, because the Symphony Plus (Harmony) system tags (objects) are based on a limited number of predefined exception reporting block object types, additional steps are necessary to create plant process assets that an area, system, or equipment operator can relate to. Without some solution to this problem, it is difficult to provide a high-performance operator HMI that promotes situational awareness, particularly from the perspective of alarms. A practical example of this would be an alarm generated from an AO/L type tag that represents a high pump discharge pressure condition. The "out of the box" solution would result in:
        i. From the perspective of a pump graphic element/symbol on a graphic:
            1. Typically, the pump prime mover would be governed by an MSDD, or perhaps RCM function code object type.
                a. Quite often the graphic symbol is based on an AO/L based tag reporting multiple logic states. The faceplate associated with that is disassociated with the MSDD, and can be a source of confusion.
            2. The graphic elements have no connection with the aforementioned AO/L based pump discharge alarm, so there will be no indication of the problem on the pump (MSDD based) graphic element.
                a. If the graphic is done reasonably well, the pump discharge pressure will be displayed near the pump object, and that AO/L could be configured to indicate an alarm on the graphic element.
                    i. Taking our systems into consideration, I would estimate that perhaps 75% of critical alarms will be displayed on the graphic where other tags reside where corrective action can be taken.
                    ii. I would additionally estimate that perhaps 10% of the total potential alarms use this "graphic based association" solution. It does take quite a bit of forethought.
                    iii. Analog based alarms, such as discharge pressure, that provide value to the operator tend to just happen. However, who likes to drop rows and rows of values on a graphic to account for this type of situation, especially when many or most are of the Boolean type?
        ii. From the perspective of the alarm:
            1. The default aspect is the discharge pressure AO/L faceplate, typically showing the pump discharge pressure value, in numeric form as well as a bar graph.
            2. All aspects are AO/L centric, in other words limited to the discharge pressure itself.
            3. There are no aspect link connections whatsoever to the actual pump or pump prime mover (motor or other)
            4. Depending on the tag name and description nomenclature standard, there should be on the alarm list as well as on the AO/L object faceplate clues as to which actual pump is associated with the alarm.
            5. The operator must manually navigate to the appropriate graphic to assess the situation in context, and then open the correct faceplate to take corrective action.

b. SOLUTION: Fortunately, the 800xA system has many tools that can be utilized to create a high-performance environment. Many will say that high performance is related to the use of color, the levels of graphics, ease of navigation, and the like. However, while all of that is true, I maintain that the results are based on the fundamental resolution of the Harmony tag association problem. This is the path we chose to solve the problem.
    i. From the perspective of a pump graphic element/symbol on a graphic:
        1. Graphical elements that are aspects of the parent object types are configured with an "alarm border" that shows the status of the parent and children tags, achieving the goal of situational awareness as it pertains to alarms for a complex piece of process equipment.
            a. The alarm & event lists identify all issues that are reported by the child objects.
            b. The operator is two clicks away from all alarms on any asset, and the desired context is achieved.
            c. Example: Feeder FE013 has one or more priority 3 alarms



            i. Clicking on the feeder launches the faceplate, which shows the status of the feeder:
                1. off, in auto, zero amps, zero feed per minute
                2. not permitted
                3. an operator note is available
                4. the alarm list icon is highlighted in yellow



ii. Clicking on the alarm icon brings up the 3FE013 specific alarm list, which includes alarms from the parent device and all of the children.
iii. Here is a view of the corresponding event list

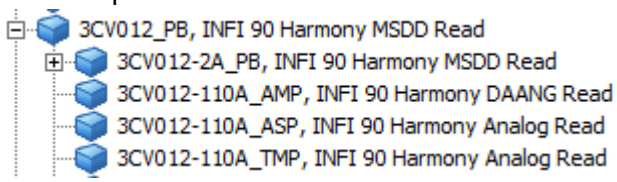
Alarm	Event Time	Object Name	Object Description
ACT	17-07-27 15:12:51:665	3FE013-BKR_TRPD	FE013 Tripped
RTN	17-07-27 15:12:51:665	3FE013-BKR_TRPD	FE013 Tripped
ACT	17-07-27 15:12:51:665	3FE013_SF02	FE013 Motor Overload
RTN	17-07-27 15:12:51:665	3FE013_SF02	FE013 Motor Overload
MBL	17-07-27 15:12:51:665	3FE013-BKR_TRPD	FE013 Tripped
RTN	17-07-27 15:12:51:665	3FE013_PF01	FE013 Side Travel
RTN	17-07-27 15:12:51:665	3FE013_PF04	FE013 Plugged Chute
ACT	17-07-27 15:12:51:665	3FE013_PF07	FE013 CR001-4A Bypass Plugged
RTN	17-07-27 15:12:51:665	3FE013_SF01	FE013 Pullcord
MBL	17-07-27 15:12:51:665	3FE013_SF02	FE013 Motor Overload
RTN	17-07-27 15:12:51:665	3FE013_SF04	FE013 Fire Shutdown CV017-18 Tail
RTN	17-07-27 15:12:51:665	3FE013_SF05	FE013 Fire Shutdown CV017-18 Head
RTN	17-07-27 15:12:51:665	3FE013_SF06	FE013 Fire Shutdown CV012 Head
RTN	17-07-27 15:12:51:665	3FE013_SF07	FE013 Fire Shutdown DC014
ACT	17-07-27 14:35:01:623	3FE013_PF01	FE013 Side Travel
ACT	17-07-27 14:35:01:623	3FE013_PF04	FE013 Plugged Chute
ACT	17-07-27 14:35:01:623	3FE013_SF01	FE013 Pullcord
MBL	17-07-27 14:35:01:623	3FE013_SF02	FE013 Motor Overload
ACT	17-07-27 14:35:01:623	3FE013_SF04	FE013 Fire Shutdown CV017-18 Tail
ACT	17-07-27 14:35:01:623	3FE013_SF05	FE013 Fire Shutdown CV017-18 Head
ACT	17-07-27 14:35:01:623	3FE013_SF06	FE013 Fire Shutdown CV012 Head
ACT	17-07-27 14:35:01:623	3FE013_SF07	FE013 Fire Shutdown DC014
ACT	17-07-27 14:34:49:482	3FE013-BKR_TRPD	FE013 Tripped

ii. From the perspective of the alarm:
    1. Our systems are currently configured as most are, in that the default aspect is a faceplate, and therefore lacks a direct connection with the graphic or parent faceplate where corrective action could potentially be taken.
    2. Faceplate redirect aspects. This is something we are currently testing.
        a. Test steps:
            i. Added the faceplate redirect aspect at the object level for a DO/L, AO/L, and DAANG tag type
            ii. Configured the aspect to use a relative path, pointing to the parent object.
            iii. Configuring the default aspect precedence list (library structure/preferences & customizations/aspect precedence lists/default precedence list) placing the faceplate redirect aspect on top, high-performance faceplate next.
        b. Test results:
            i. Works perfect for objects that have a valid Harmony parent object (MSDD, station, etc.)
            ii. Does not work for objects that roll up under an "area" object container.
                1. Example – some battery related alarms that are indication and alarm only, with no DCS control.

        c. Next steps:
            i. Asked ABB if there is a way to use an expression in the faceplate redirect; e.g. if there is a parent object with a faceplate, show that, if not, show the base device (child) faceplate.
            ii. Use BDM to override the faceplate redirect aspects for all parentless objects, pointing to their own faceplates.
                1. I don't think that the act of overriding is something that BDM can do, so this is either a manual effort or we go back to ABB to use their internal tools for this step.
            iii. Evaluate the effort involved with creating faceplates or graphics for parent areas. This is probably not at all practical.
    3. Alarm redirect aspects. This will be next on our list to evaluate.
    4. It is desirable that both the faceplate and alarm redirects work, and work in such a way that they are easy to configure and manage.
        a. The faceplate redirect should be the object-oriented solution that is resolved at the object level. This will also provide the link to the parent object faceplate when a graphic element is accessed. The alarm redirect will not take care of the latter.
        b. The alarm redirect would presumably be configured for objects that are more complex, and require a greater amount of information in order to assess the situation before taking corrective action.

iii. 800xA tools used

1. We use the location structure to create an equipment hierarchy using a parent-child tag relationship, which is the critical first step in creating assets.
    a. MSDD, station, RCM, and RMSC tag object types are usually parents, while DO/L, AO/L, and DAANG types are usually children. This is due to the fact that the former are tags that an operator can interact with to take action (start/stop, open/close, auto/manual, change setpoint, etc.)
        i. We use the Bulk Data Manager (BDM) Excel plug-in tool to create and manipulate the parent-child organization in the location structure.
            1. Example

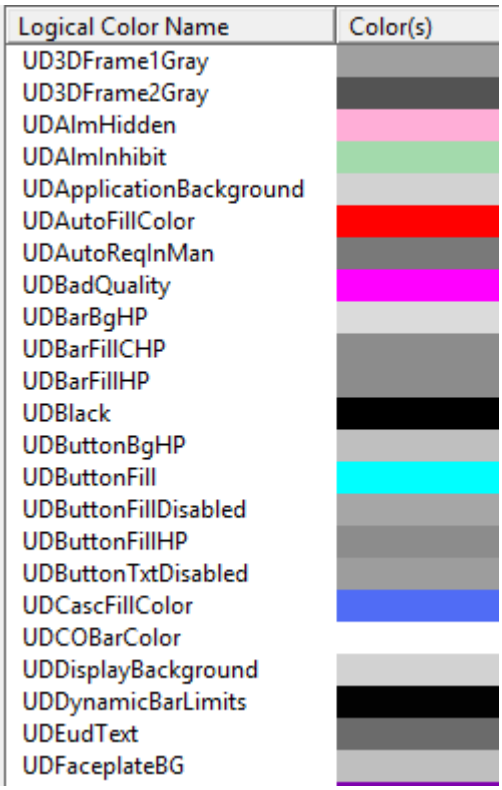


    b. Each object type has both an inherited alarm and event list, and they are configured to look at objects and descendants.
        i. No overrides required, something we strive for in order to make the system easier to manage, including during upgrades.
2. We also use general properties and property translations. These are discussed in detail further down where it is more appropriate.

DTE Energy, Fossil Generation Department, High Performance Graphics

In an 800xA with Harmony Connect environment

2. Colors and color palettes
    a. We make sure that everything displayed to the operator is on one of two color palettes
        i. Our standard palette that goes with every project
        ii. A site-specific palette that is used on a limited basis
    b. All logical colors have names that make sense (to us). We do not use logical color names of green, blue, etc. which would hamper our ability to change colors and not knowing the extent of the impact.



Logical Color Name	Color(s)
UD3DFrame1Gray	
UD3DFrame2Gray	
UDAlmHidden	
UDAlmInhibit	
UDApplicationBackground	
UDAutoFillColor	
UDAutoReqInMan	
UDBadQuality	
UDBarBgHP	
UDBarFillCHP	
UDBarFillHP	
UDBlack	
UDButtonBgHP	
UDButtonFill	
UDButtonFillDisabled	
UDButtonFillHP	
UDButtonTxtDisabled	
UDCascFillColor	
UDCOBarColor	
UDDisplayBackground	
UDDynamicBarLimits	
UDEudText	
UDFaceplateBG	

    c. Obviously one of the tenets of high-performance graphics is that they are largely gray scale based, and we do adhere to the concept so that abnormal conditions stand out in what would otherwise be a sea of color.
    d. As an aside, all of our high-performance aspects and objects begin with the letters “UD”, for User Defined. This allows us to find them all, export, and import on another system, or reimport after an upgrade.
    e. Even though we have streamlined our systems to be based on a one or two palette design, there is still an occasional need to figure out what colors are used – where, when, and how. There is no 800xA based reporting tool to assist in this evaluation, so here’s a plug to request just that.

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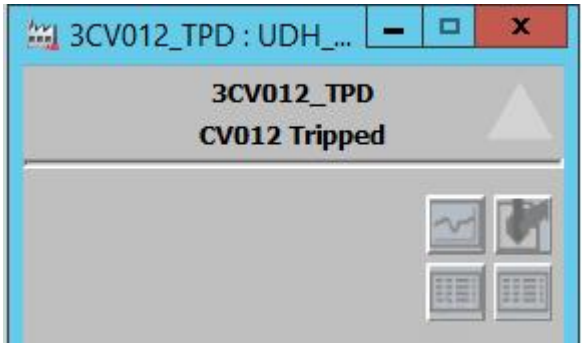
In an 800xA with Harmony Connect environment

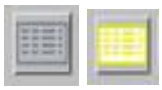
3. Faceplates
    a. Base



i. As with all 800xA faceplates, the top area contains tag (object) name and description, as well as an alarm indicator (triangle based)
    1. We have observed a high-performance version of the alarm indicator, but have not evaluated it yet.

ii. The area below that is reserved for icons. In every case, for all object types, the four shown above are exactly the same
    1. Upper left is a trend. Depending on the tag or tag type, there is a predefined trend history. This icon will not change.
    2. Upper right is the operator note. This will change from gray to color based when the note is not empty.

    3. Lower left is the alarm list. This will change from gray to color based when one or more alarms is active. The color will follow the priority of the highest priority alarm.

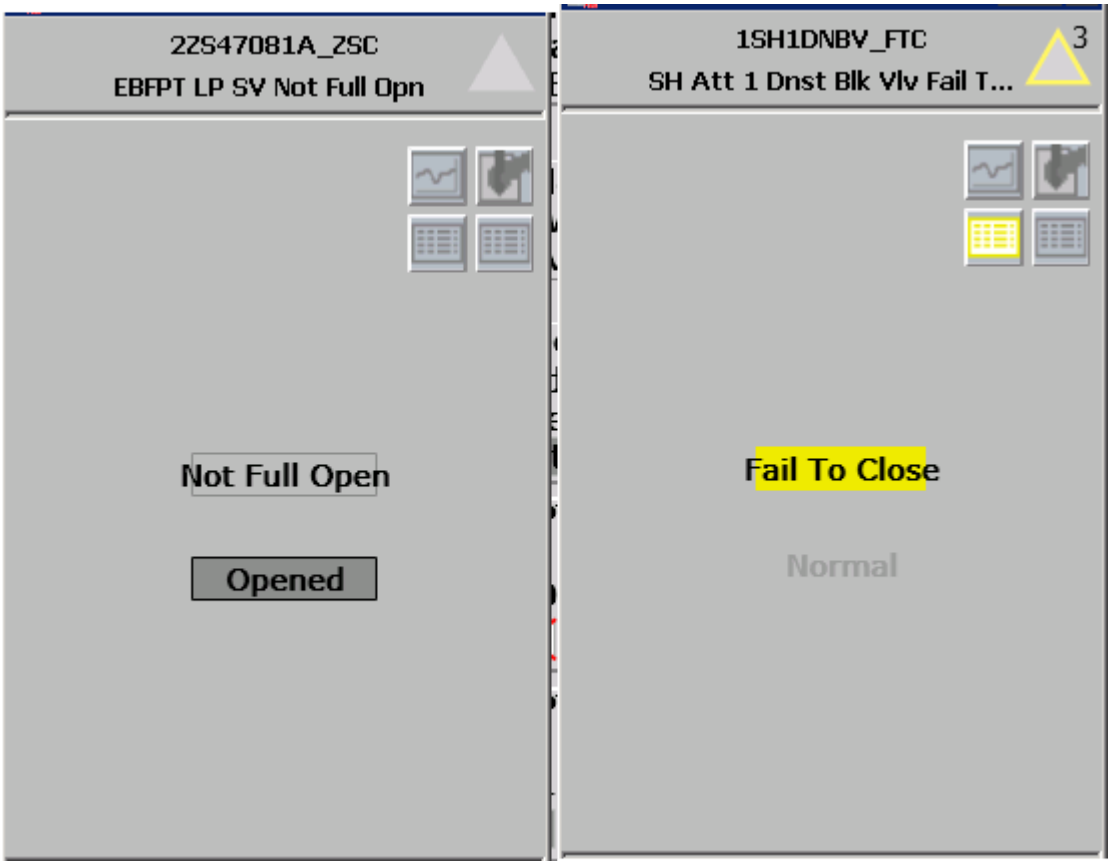


    4. Lower right is the event list. This icon will not change.

iii. In all cases we use the reduced (1 dot) faceplate as the default, with the normal (2 dot) and extended (3 dot) as optional to provide more detailed information.

b. DO/L

i. Not much going on with a simple DO/L



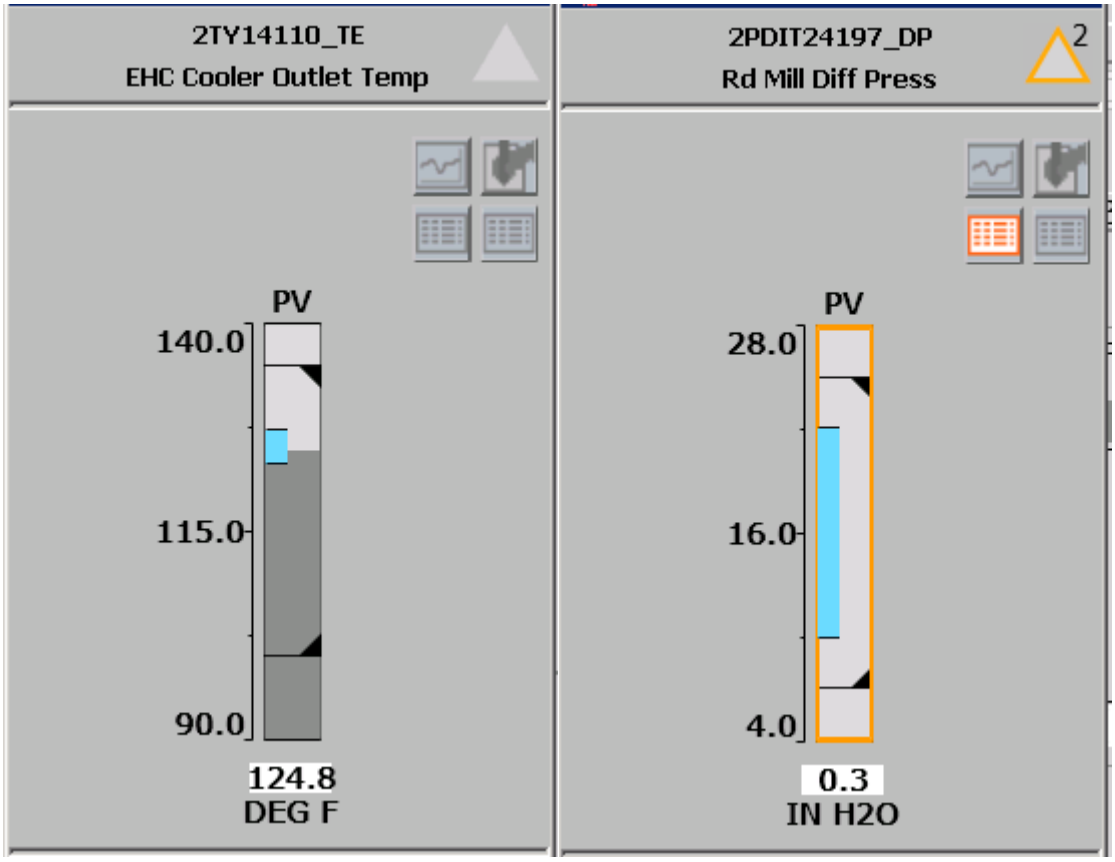
ii. Note that the logic state can be verbose to eliminate the need for the operator to interpret an acronym, and we need to stretch the background width.

iii. Alarms are displayed with the corresponding priority color. Alarms can of course be associated with either the zero state (lower indication) or one state (upper indication)

iv. We do not use the 3D raised button effect because there is no operator command possible. The icons in the upper right hand corner are, because they open up another window or view.

c. AO/L

i. Another simple object with “just” a floating point value



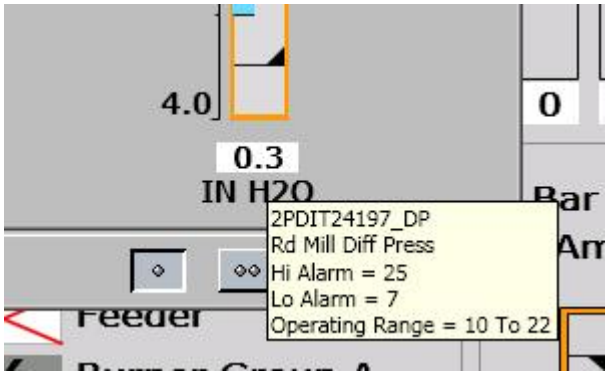
ii. Note that we are in a priority 2 alarm condition in this example on the right.

iii. Alarm setpoints are displayed, as well as the normal operating range.

iv. The range is centered around the alarm and normal operating range, does not start at zero.

v. The range, engineering units, and decimal control are all managed in the database that is exported from Composer and imported to 800xA. We have tools to manage in bulk.

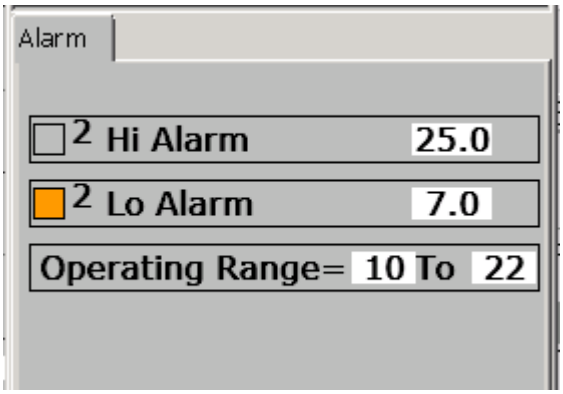
vi. We decided not to display the alarm setpoints, keeping the faceplate clean. When setting the mouse to hover over the value, we use the “tooltip” to display this type of information. The tooltip is configured at the object level, making it easy to deploy and manage.



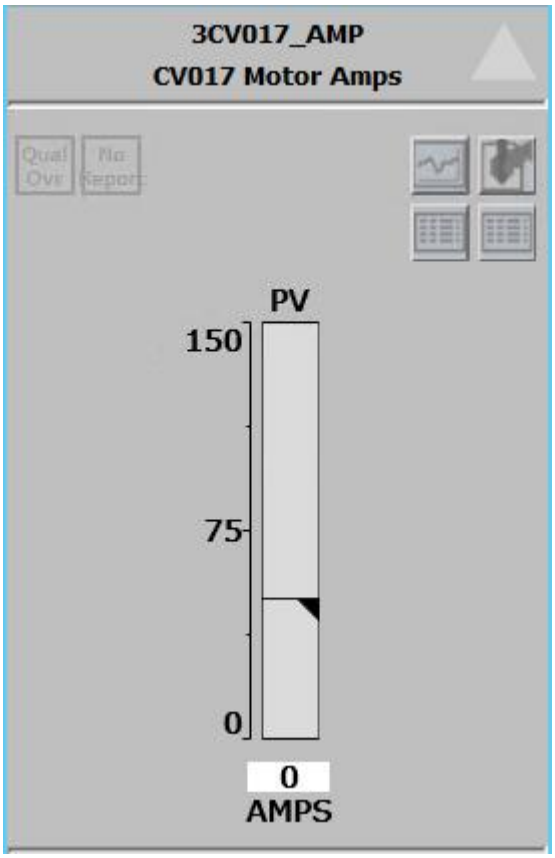
vii. The normal faceplate has one tab (called “alarm”) with additional information as well

DTE Energy, Fossil Generation Department, High Performance Graphics

In an 800xA with Harmony Connect environment



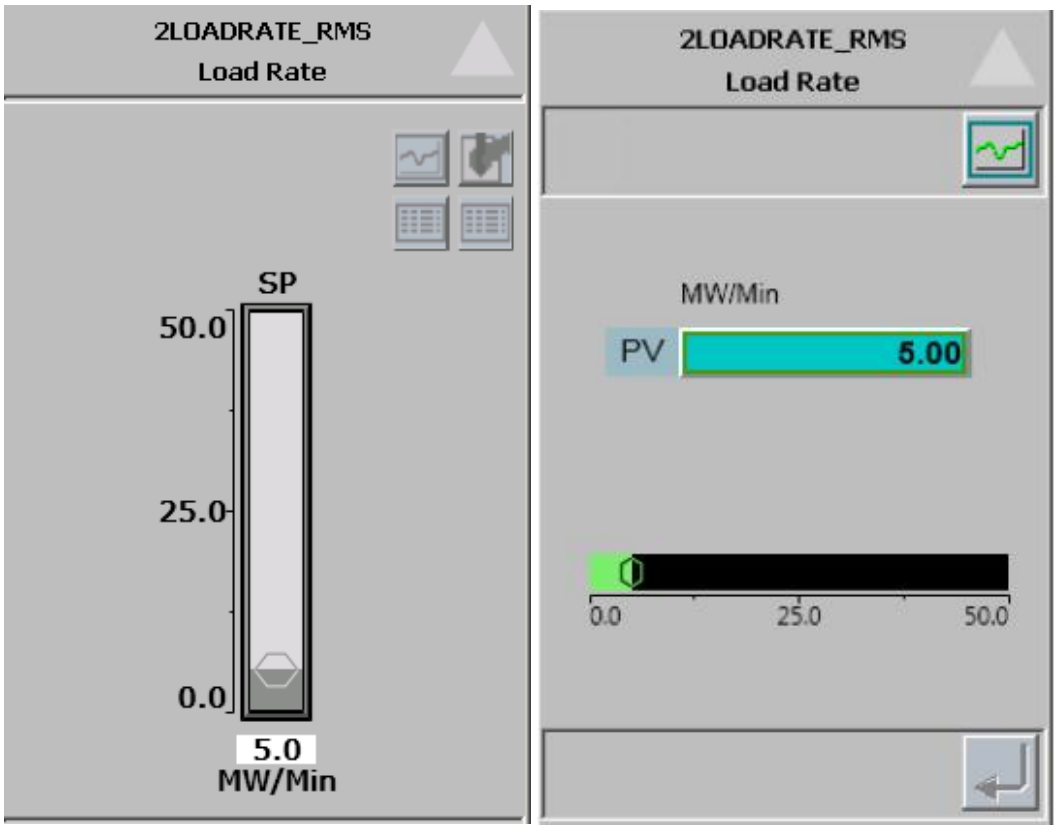
d. DAANG
   i. Taking the AO/L further with multiple alarm setpoints.
   ii. Looks the same as the AO/L but with additional alarm indications and icons



e. RMSC

i. This is a fairly simple setpoint entry object.

ii. The faceplate on the left is our version; the faceplate on the right is the system default.



iii. The bar is shown with the 3D raised effect because the operator can enter a setpoint

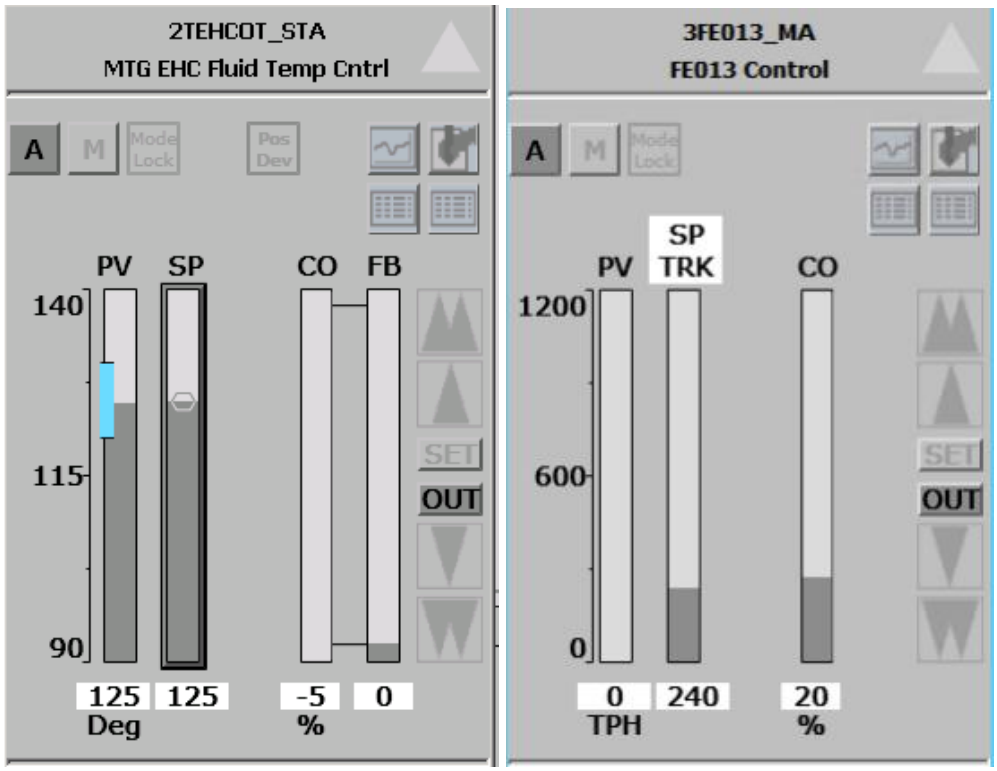
iv. Icons displaying tracking status are available, but hidden in this instance because it is not active.

v. Range, engineering units, and decimal control as is typical is managed in the database.

vi. The RMSC alone only has bad quality as an alarm. However, if there are child tags associated with the object, there can be other alarm conditions.

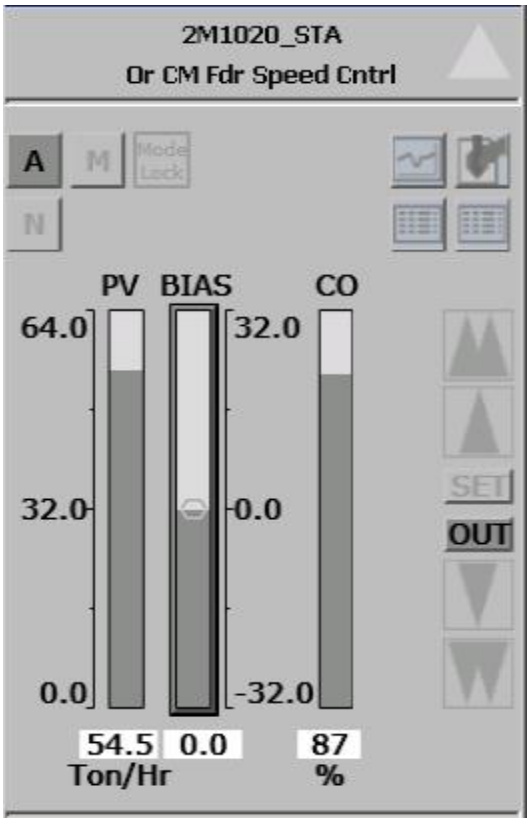
f. Station

i. This is a complex object type that has several iterations. The faceplate can accommodate them all.



ii. We don't bother to display the CO/FB range since it is 0-100 (actually -5 to 105). We display PV and CO units, no need to double up on SP and FB. PV range will suffice for SP range since this is not a bias type station.

iii. Additional icons are available that are pertinent to station objects.

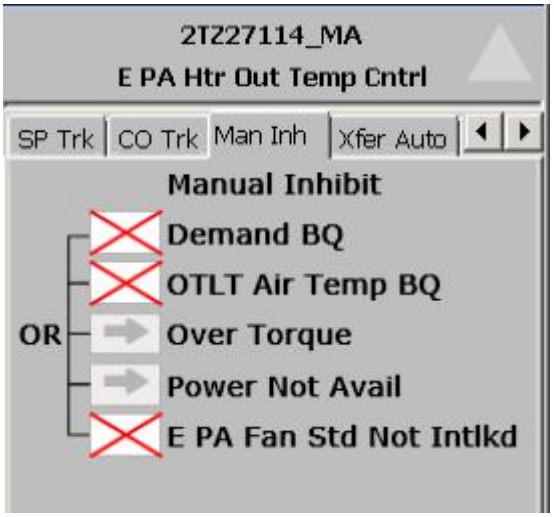


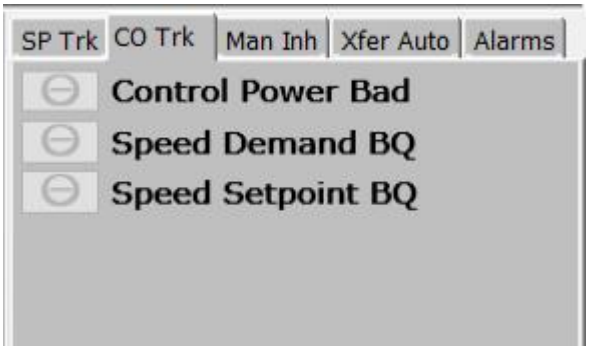
iv. In a bias station, shown above, we add the range for the SP.

v. In this example, when in auto the setpoint bar is raised indicating what the operator can manipulate. If manual is selected, the setpoint bar is flattened out and the control output bar is raised in 3D.

vi. There is position feedback from an AO/L. This faceplate is not overridden. How that is accomplished is discussed below.

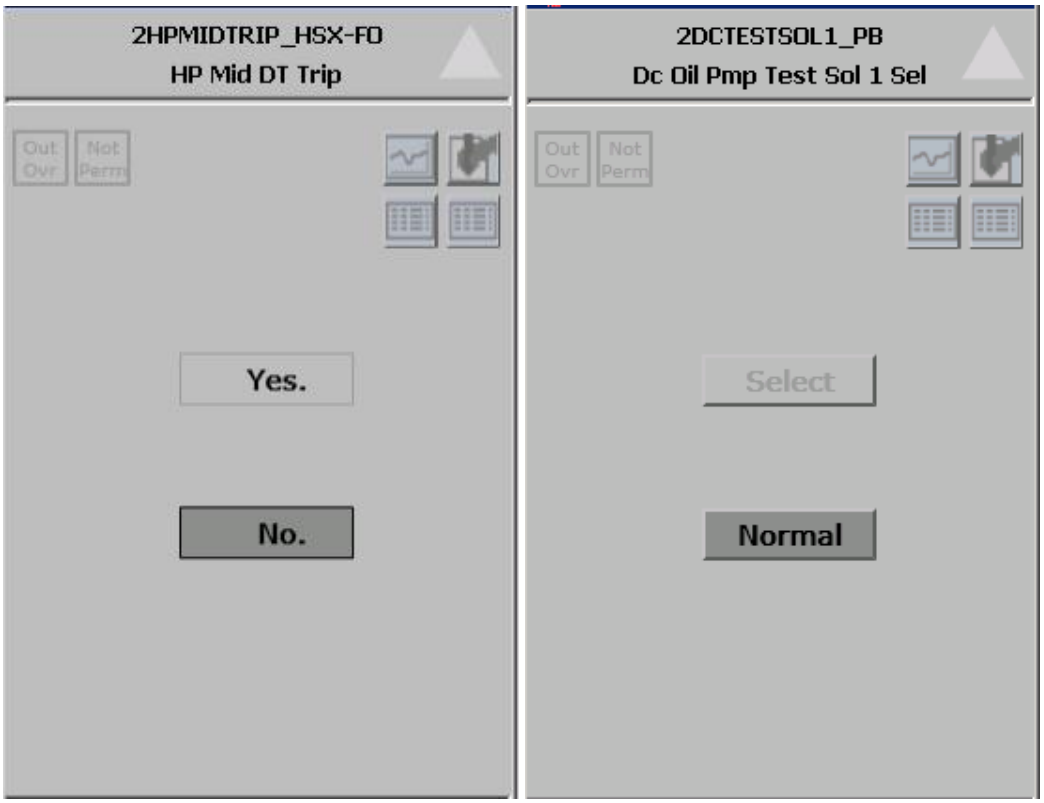
vii. In the normal faceplate view there are several tabs, one of which is pictured below. Due to the nature of the tabs, these are technically overridden graphics, customized to each instance where applicable.





g. RCM

i. The remote control memory is the simplest object that takes an operator select/boolean command.

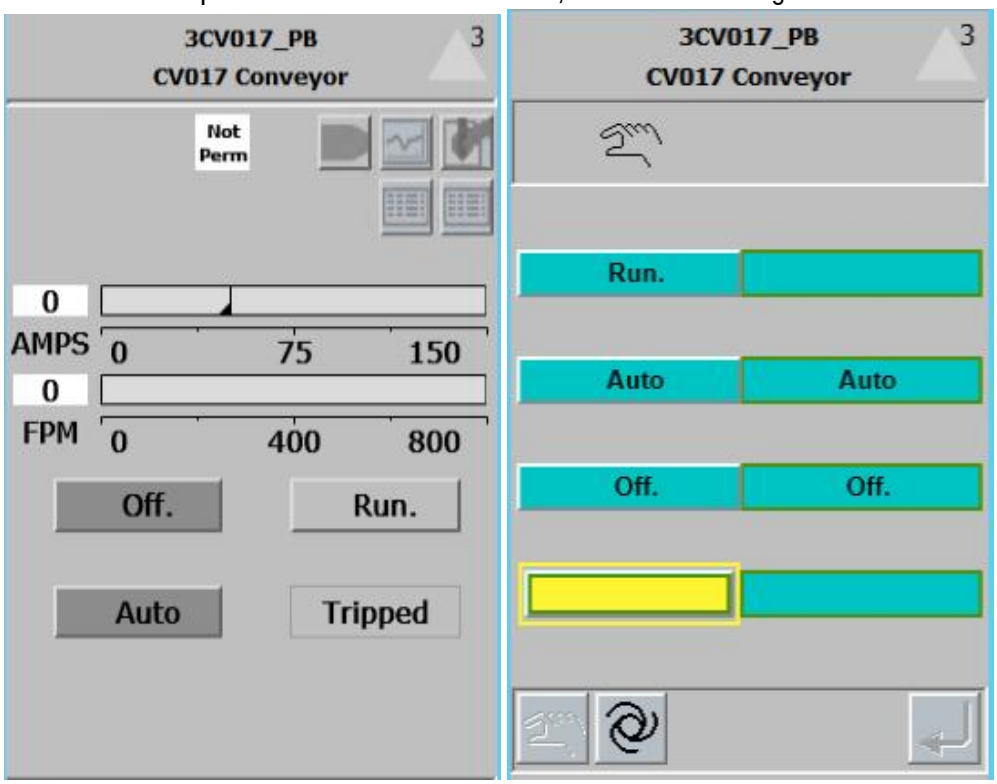


ii. In the example on the left, the RCM is used to latch a first out event, and does not take operator input, so the buttons are flat and this looks somewhat like a DO/L faceplate. The example on the right accepts operator input, so has 3D effect buttons. This is done automatically based on the output logic states.

h. MSDD. Due to the varied use of the MSDD, there are several iterations.

i. Motor

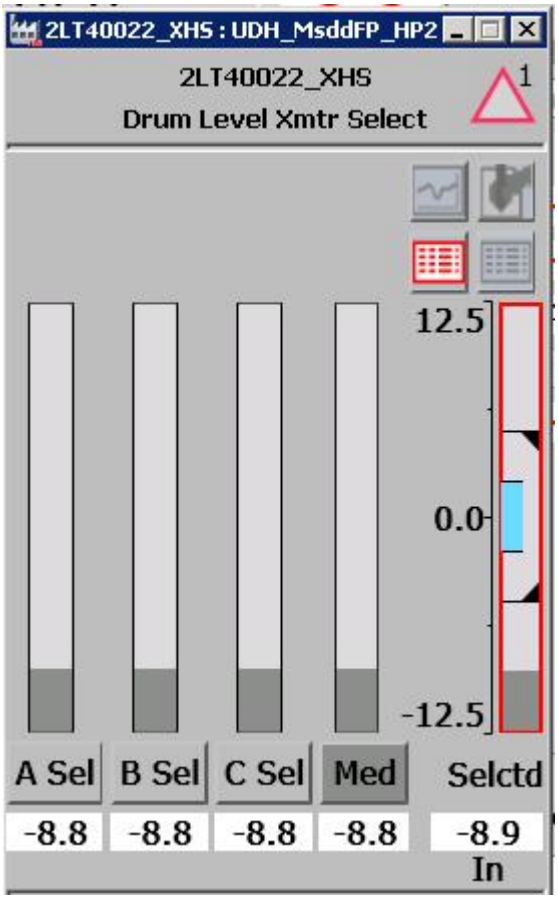
1. MSDD feedback and outputs are represented by the four button areas.
    a. The faceplate on the left is our version; the one on the right is default.



2. In the example above there are two associated analog values. Depending on the device, there can be none, one, or two analogs with our faceplate design. The discussion on how this is accomplished without a faceplate override is discussed next.
3. Two additional icons shown above are the “not permitted” icon, as well as a “lockout-tagout” icon.
4. The trend is configured to show the digital as well as analog indications.

ii. Transmitter Select

1. In this case the MSDD feedback and output buttons are displayed below each analog bar.



2. There are five different analog values displayed
3. Note that the selected value provides indication of:
    a. The “normal operating range” in cyan
    b. The alarm setpoints
4. The trend will be configured to show all of the analog values

DTE Energy, Fossil Generation Department, High Performance Graphics

In an 800xA with Harmony Connect environment

i. Station, MSDD, and other faceplates displaying values from other tags <u>without overrides</u>!
    i. In order to provide for easy deployment and maintenance, as well as smoother system upgrades, we have settled on these aspects in order to achieve our goals.
    ii. General properties
        1. MSDD
            a. These are high level settings that define how the MSDD is used, and in turn are used to control how the faceplate looks and feels.

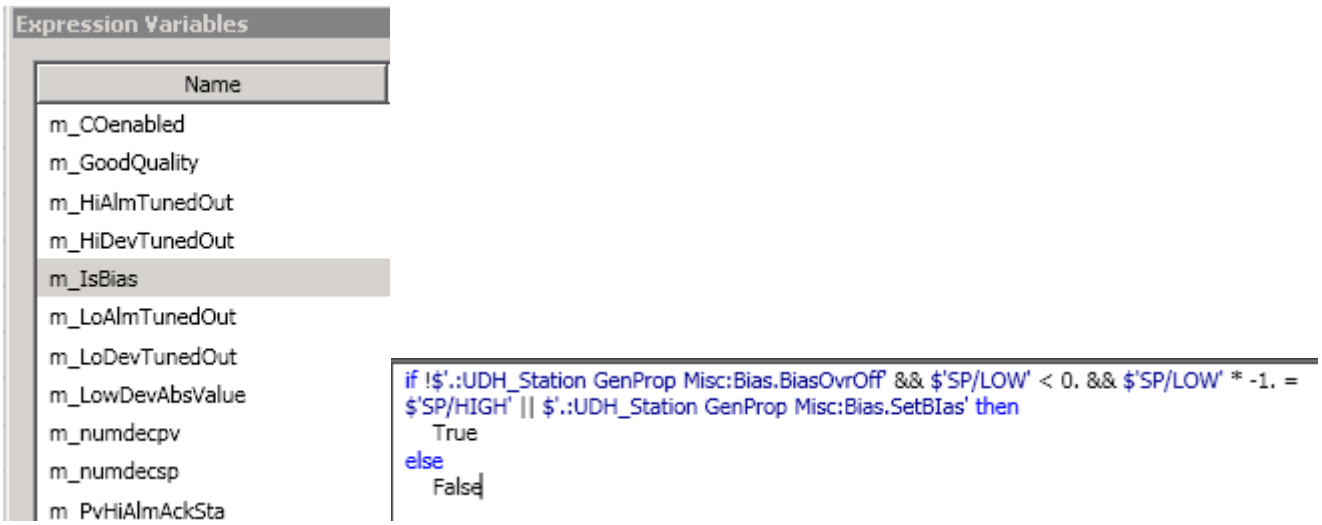
Name	Value	Typ	Description
PermitType	1	I	0=No perm defined, 1=Start/Open permit only, 2=Stop/Close permit Only, 3=Start/Open & Stop/Close permits defined
AnalogDefined	True	B	False = No analog bar on faceplate, True = show analog bar on faceplate
AutoManMode	Fals	B	Does device use Auto/Manual mode of Msdd? (No = False, Yes = True)
DeviceType	1	I	0 = Generic msdd, 1 = MCC, 2 = Valve, 3 = 2 Xmtr Select, 4 = 3 Xmtr Select, 5 = CMC Switch, 6 = Diverter Gate (Closed/Opene
Analog02Defined	Fals	B	False = No 2nd analog signal, True = 2nd analog signal available
LocalPanelDef	Fals	B	0=No local panel inputs, 1=local panel inputs available

            b. Additional DeviceTypes since the list was truncated
, 7 = Breaker, 8 = Diverter gate (Opened/Closed), 9=Jog Valve (msdd/rmsc)
            c. This must be manually overridden and filled out for each device. BDM can be used to fill out or edit the general property data, but can't be used to override the inherited object. That must be done manually, unfortunately.
                i. We prefer to inherit these types of items which enables us to make improvements at the object level, when new ideas emerge.
            d. Since we have one MSDD faceplate, with no overrides, for several iterations, we use the General Property "DeviceType" to show/hide graphic elements in the faceplate.

2. Station
    a. This is a list of general properties for the Station. It is primarily used to effect the look and feel of the faceplate.
    b. This must be manually overridden and filled out for each device. BDM can be used to fill out or edit the general property data, but can't be used to override the inherited object. That must be done manually, unfortunately.
        i. We prefer to inherit these types of items which enables us to make improvements at the object level, when new ideas emerge.

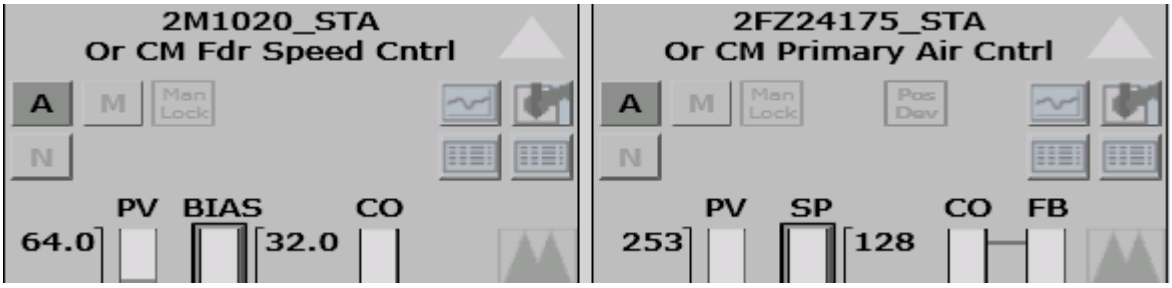
Name	Value	Type	Description
OperatingRange			
OpRangeHigh	100.000000	Real	
OpRangeLow	0.000000	Real	
Defined	False	Boolean	
Basic			
CombOpt	False	Boolean	
RevAct	False	Boolean	
Type	OSP	String	
Bias			
BiasOvrOff	False	Boolean	Turn off bias for stations where pv range matches sp but is not a bias
SetBias	False	Boolean	Set as bias if sp range is not uniform around 0
Position			External position feedback
Position04	False	Boolean	Enable position04
Position03	False	Boolean	Enable position03
Position02	False	Boolean	Enable position02
Position01	False	Boolean	Enable position feedback01

    c. The faceplate is configured to recognize the application. One example is a bias station.
        i. We use an expression variable as shown below to make the station faceplate "self-aware" to whether or not it is a bias type.



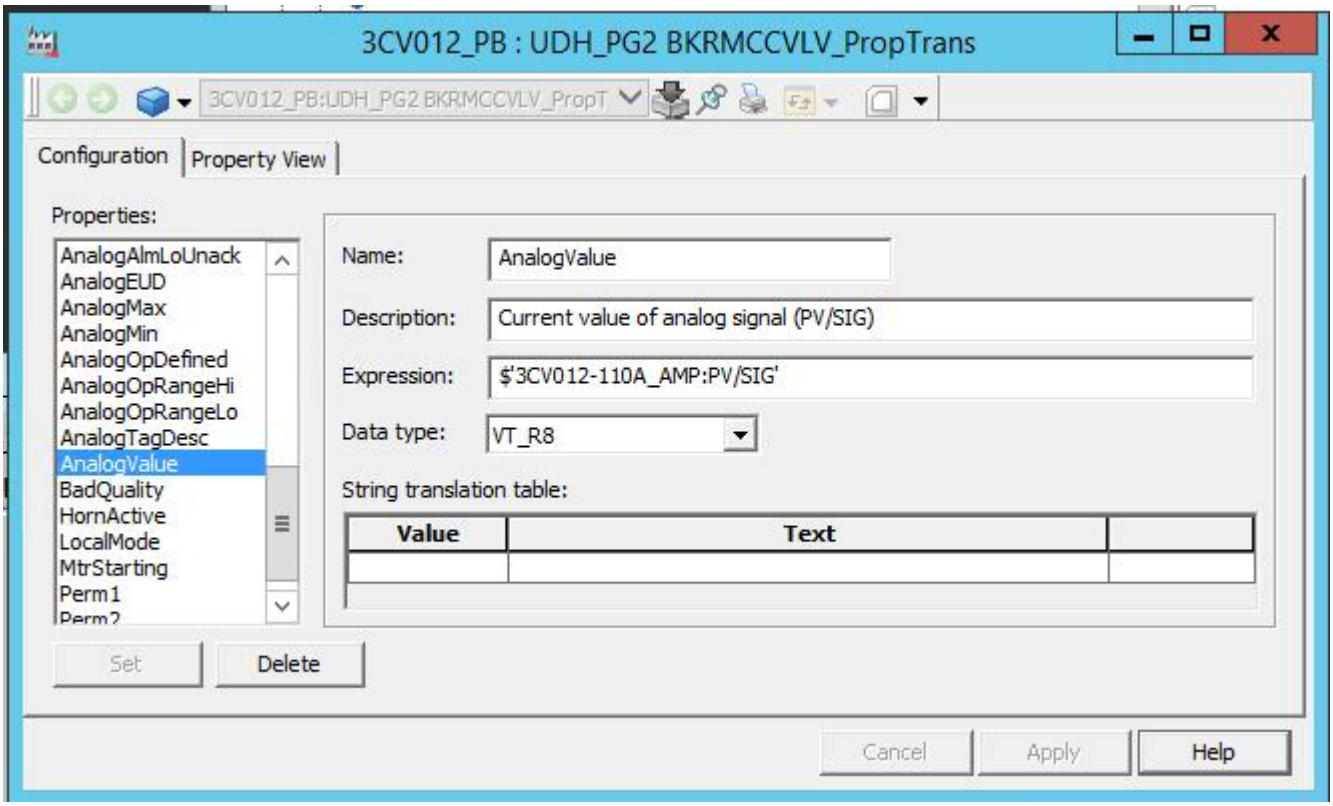
ii. The result of the expression is used in determining the text displayed above the setpoint bar.

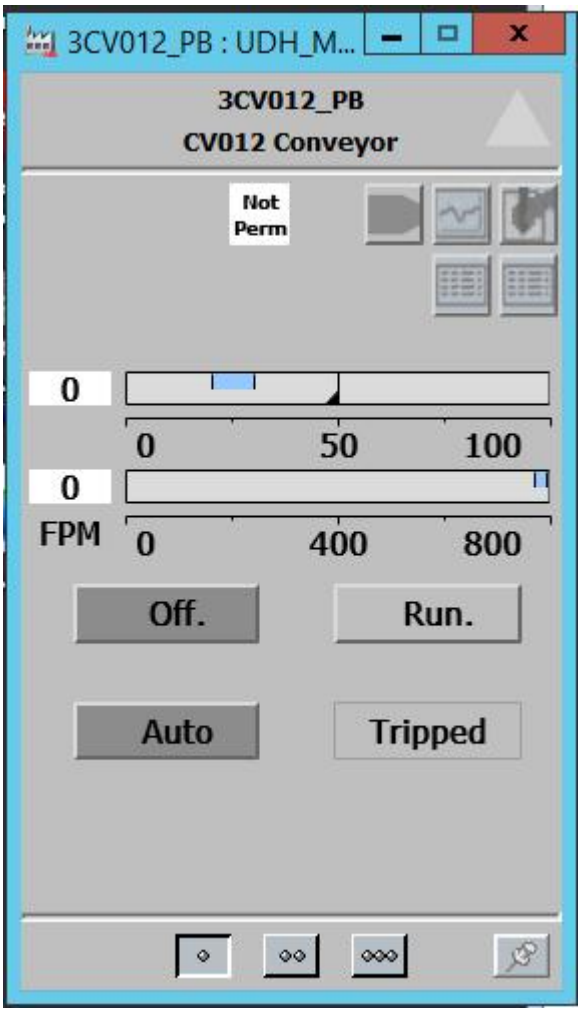
```
if SPTRACKING && m_IsBias then
    "BIAS\nTRK"
else if SPTRACKING && !m_IsBias then
    "SP\nTRK"
else if m_IsBias then
    "BIAS"
else
    "SP"
```



iii. Property Translations

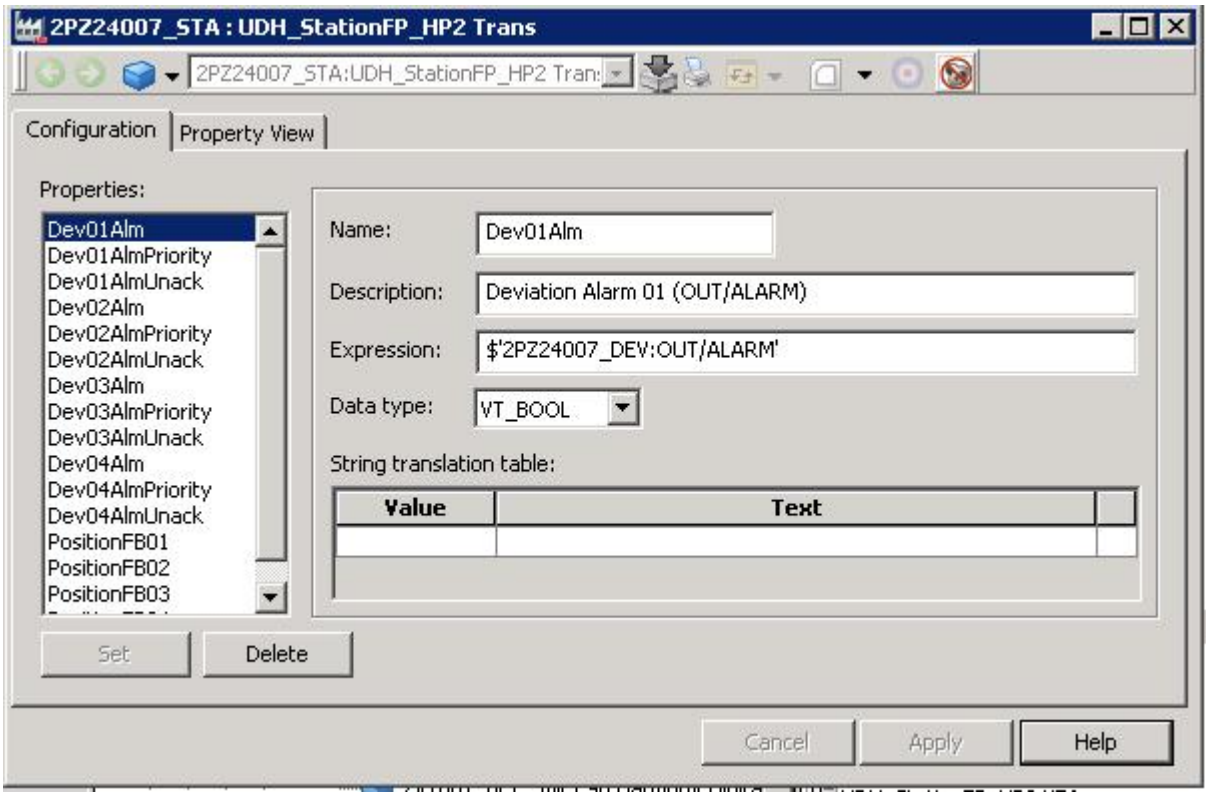
1. MSDD
    a. This is where the magic happens. There are 38 individual properties that can be configured. Pictured below is where we define the source of the base analog value for the corresponding MSDD. In this case we are using the AO/L tag for motor amps (3CV012-110A_AMP) and associating it with the parent MSDD.
    b. Other property translation functions include:
        i. Permissive met/not met tag.properties
        ii. Local/remote mode





c. Unfortunately, the task of defining the association in spreadsheet form is real work. If the tag name convention was done well, it makes the job easier.
d. Worse than that, the editing of the property translation configuration is a manual effort, unless you employ ABB to utilize internal tools at their disposal. It would be nice to make this “BDM-able”.

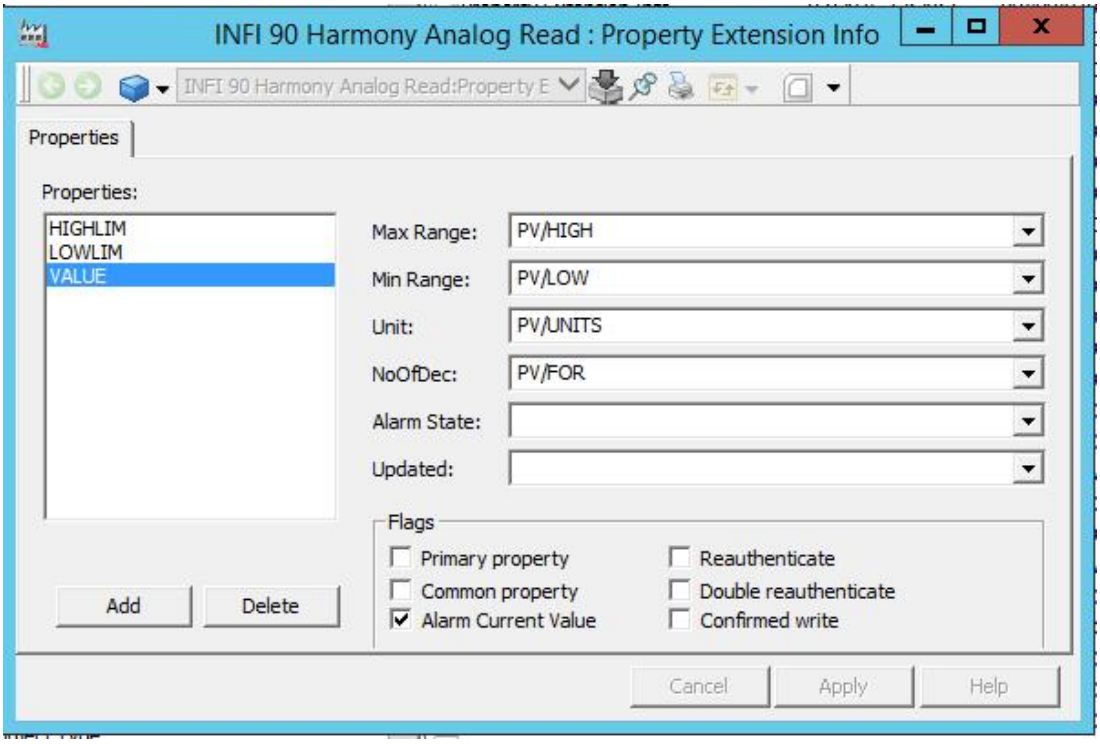
2. Station
    a. This is where we associate deviation alarms (DO/L based) as well as position feedback(s)



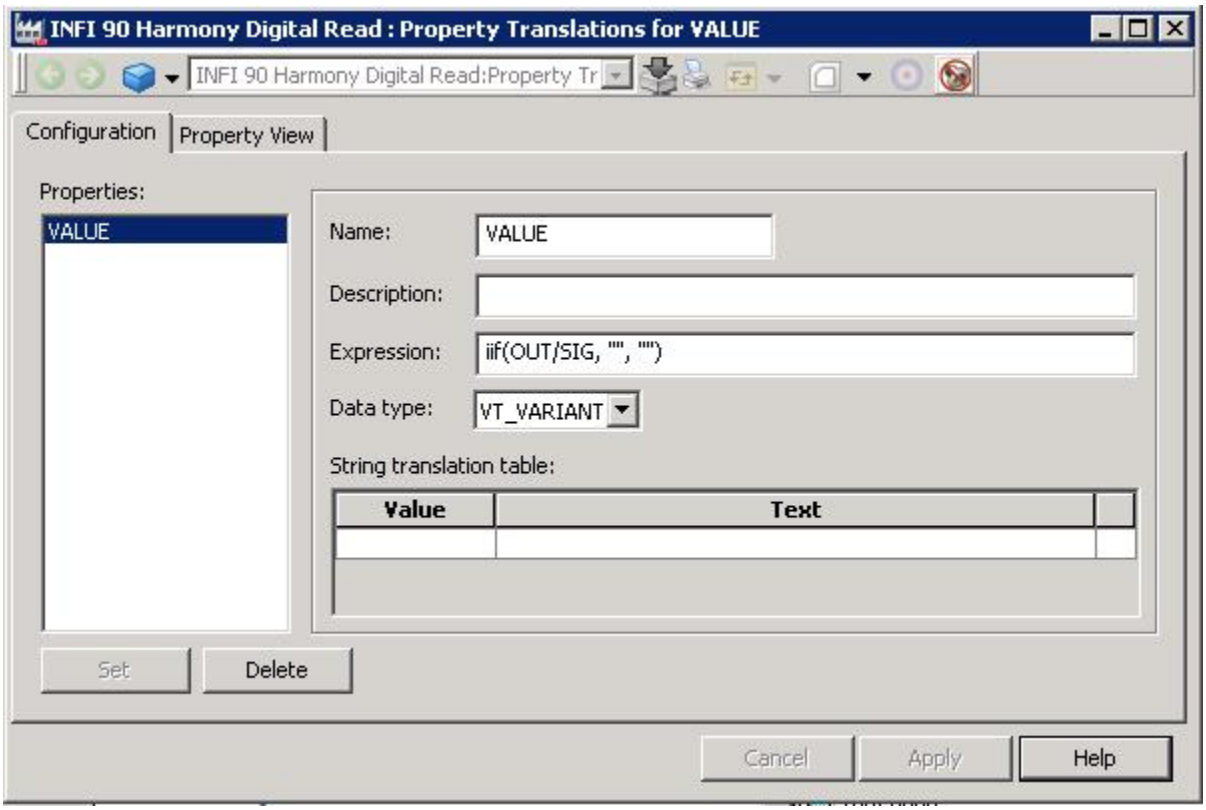
4. Alarm Lists
    a. We do follow the recommendation of three alarm priorities. These colors are not used for any other typical display element, except for trend pen colors.
    b. We prefer to use analog based alarms whenever possible, because of the additional situational awareness provided for by both the violated limit field as well as the current value, which over the course of a few seconds can provide an indication of rate and direction of change.
        i. Note that the violated limit and engineering unit columns (as well as others not discussed here) are "Harmony only" fields. In an 800xA system that also has third party OPC, AC800M, and/or Foundation Fieldbus object type based alarms, these fields do not apply. The real world alarm list that results has those fields blanked out for the non-Harmony based alarms.
        ii. ABB could do us a lot of good by providing the ability to "map" the fields based on various object types and their available properties, so that we can provide a consistent (high-performance) alarm list.

ObjectDescription	CurrentValue	ViolatedLimit	EngUnit	EventTime
SH Att 1 Dnst Blk Vlv Fail To Cls		1		08/31 14:42:03
WBFPT Speed Signal Deviation		1		08/31 14:42:02
SH Att 1 UPSt Blk Vlv Fail To Cls		1		08/31 14:42:02
MTG Freq Corr Governor Trbl		1		08/31 14:41:45
Air Crosslimited By Fuel		1		08/31 14:41:45
Bl CM Mtr Amps	0.00000	55.00	AMPS	08/31 14:41:45
Rd CM Mtr Amps	10.6728	55.00	AMPS	08/31 14:41:45
Ye CM Mtr Amps	114.000	55.00	AMPS	08/31 14:41:45
Boiler Master Tripped To Manual		1		08/31 14:41:45

    c. The current value decimal control is regulated by a property extension info aspect we created for the AO/L and DAANG object types



d. For DO/L based alarms, we modified the default Property Translation for Value aspect by adding the expression below. This will effectively "blank out" the current value field for DO/L based alarms.
    i. Why do this? The default will display "true" or "false" in the current value field. For DO/Ls that alarm on a zero state, the value would be "false". We have had operators ask why the alarm is active if the value is false. The reason for doing this is to eliminate confusion – the operator does not need to know whether an active alarm is based on a zero or one state.



e. We use alarm shelving to allow the operator to temporarily (up to 1 shift in duration) disable a nuisance alarm.
    i. We do not allow the operator to manually inhibit (disable) an alarm, nor to suspend and substitute values.
f. Alarm hiding in 6.0.3 has been modified to allow the system to be configured to hide alarms that were active before the hiding rule went true. With this recent improvement, we will be using this feature in lieu of the Harmony based alarm inhibit tag, as well as control logic based inhibiting when done on more than one tag object.

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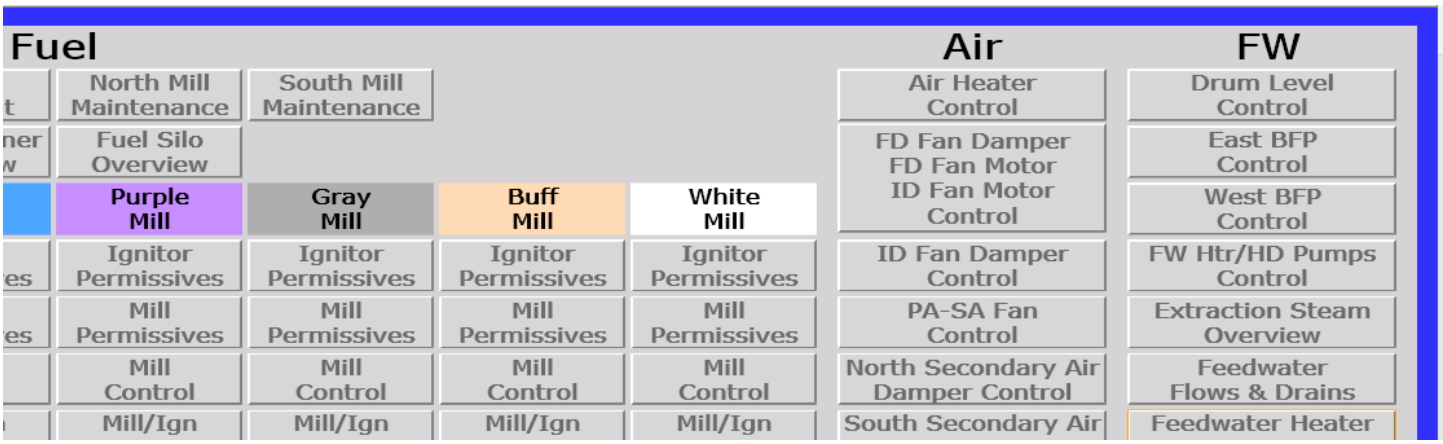
In an 800xA with Harmony Connect environment

5. Navigation
    a. We have not yet changed our methods of graphics navigation. We have evaluated a few, but the other work has provided more value thus far.
    b. We typically have three types of navigation:
        i. Left/Up/Right arrows in the lower left hand corner of each graphic.
            1. Left and right scroll through the graphics associated with an area
            2. Up launches the parent graphic
        ii. Specific jump buttons at the bottom of and customized to each graphic, related to the functions on the graphic.

        iii. A “main menu” with direct links to all level 1 and 2 type graphics.



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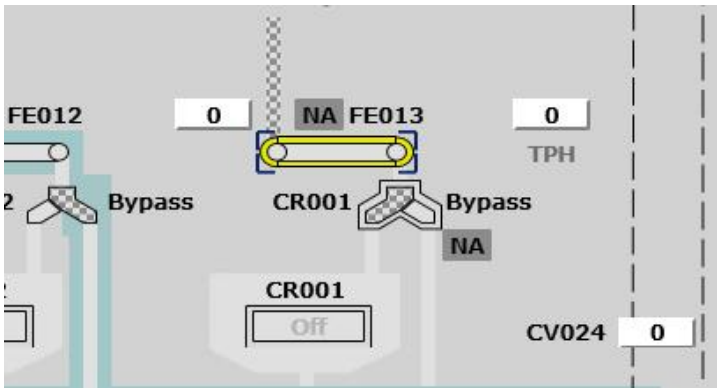
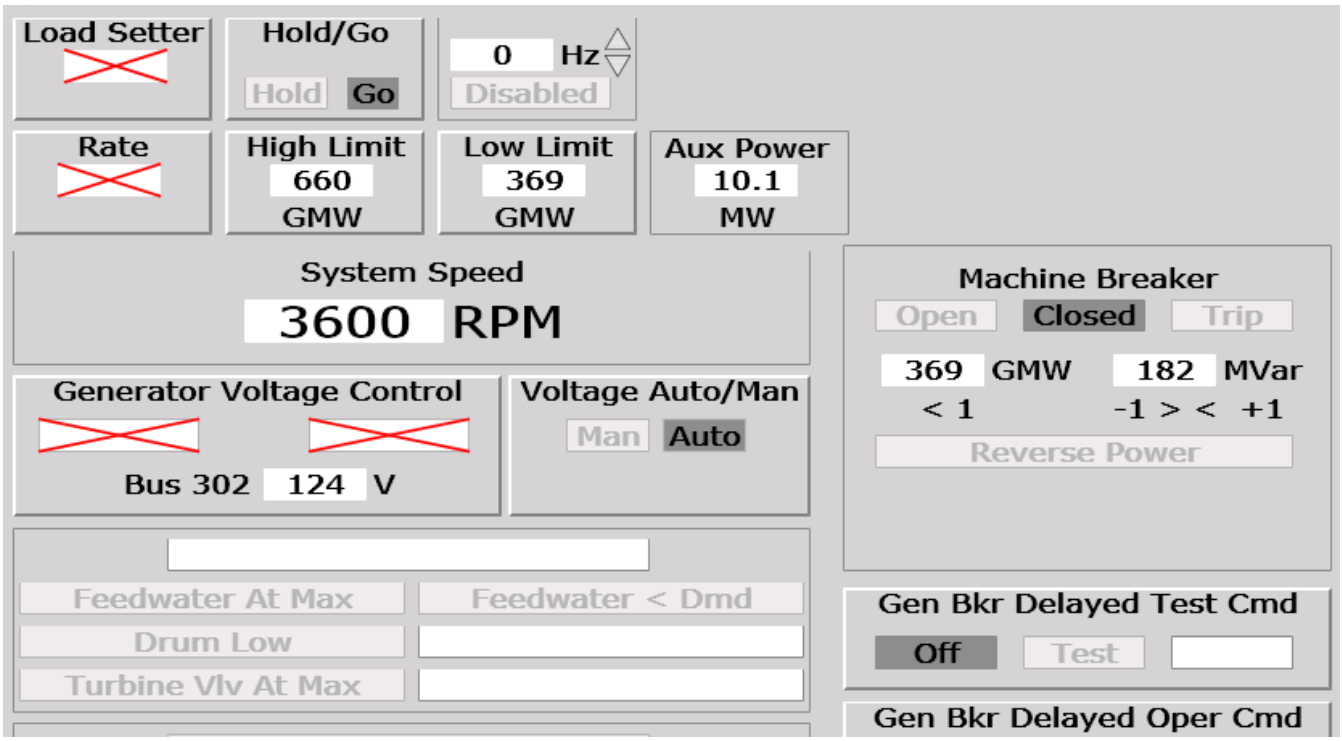
6. Graphics
    a. Alarm borders
        i. All graphic elements include a border that is hidden if there is no alarm, and activated when there is one or more alarms.



        ii. The highest priority unacknowledged alarm will determine the color(s), followed by the highest priority acknowledged alarm.
    b. Values and font
        i. Analog values are always black on white background for the highest acuity.
        ii. Font type and size was determined based on demonstrations to a group of operators.
    c. Raised 3D effect and lines of demarcation
        i. The use of the 3D effect is strictly limited to items that, if clicked upon with a mouse, will result in action. The action could be to change displays, call up another window, or send a command to a controller or field device.
        ii. Lines of demarcation are used when necessary to create functional groups of graphic elements together on a busy graphic. If the graphic can be arranged to make these areas clear without the additional lines, that is the approach used.



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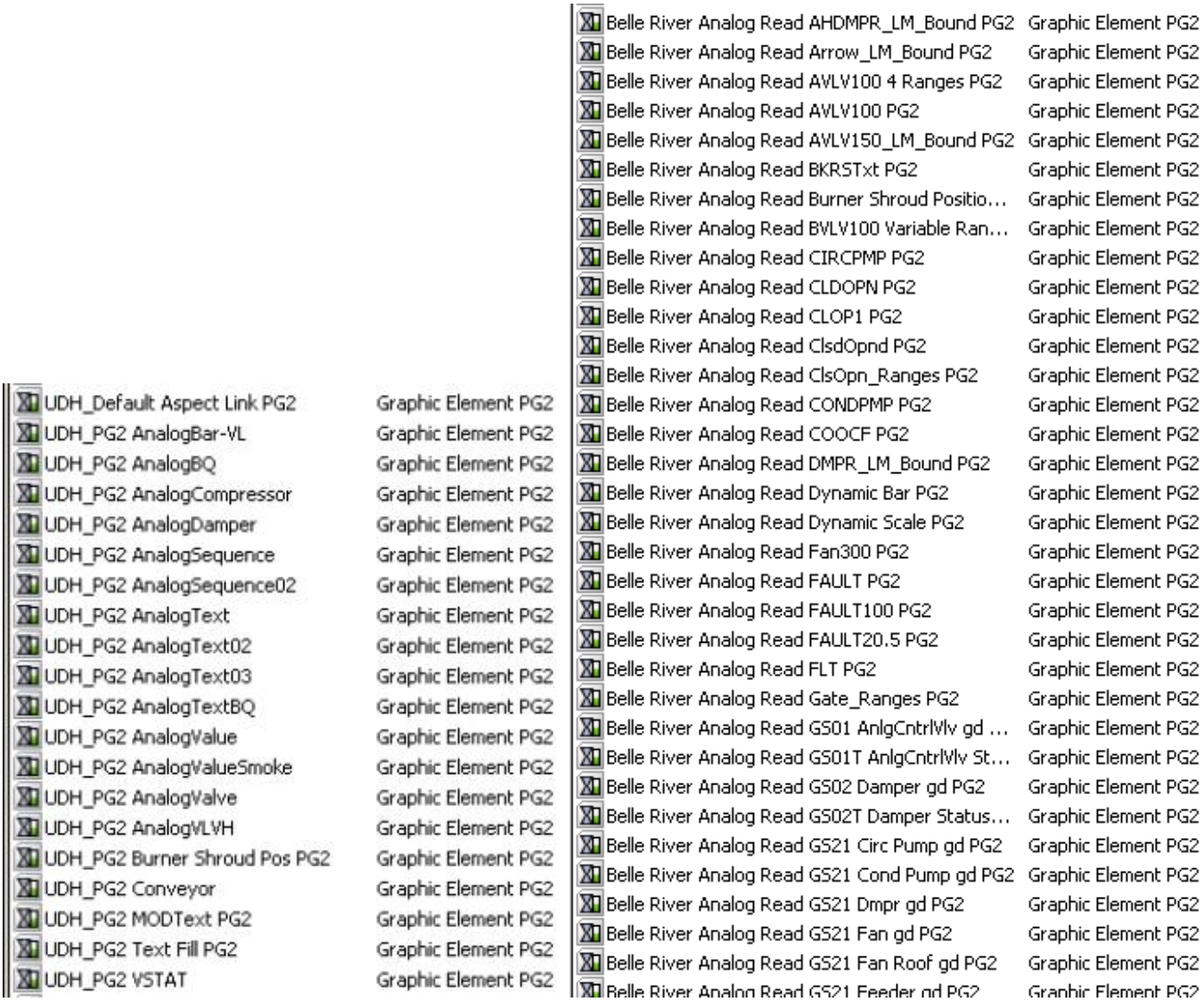
In an 800xA with Harmony Connect environment

7. Efficiency in engineering
    a. In order to speed up the process, lower the cost to create/maintain/upgrade, and to have a better product in the end, efficiency in engineering matters.
    b. For a particular large project (with 20,000 tags), we need 20 different graphic elements for the AO/L tag type, all pictured below. The previous iteration (non high-performance) required a quantity of 100! Only a subset are pictured below.
        i. If we want to make an improvement or correction that affects every aspect, which system would you prefer to fix?



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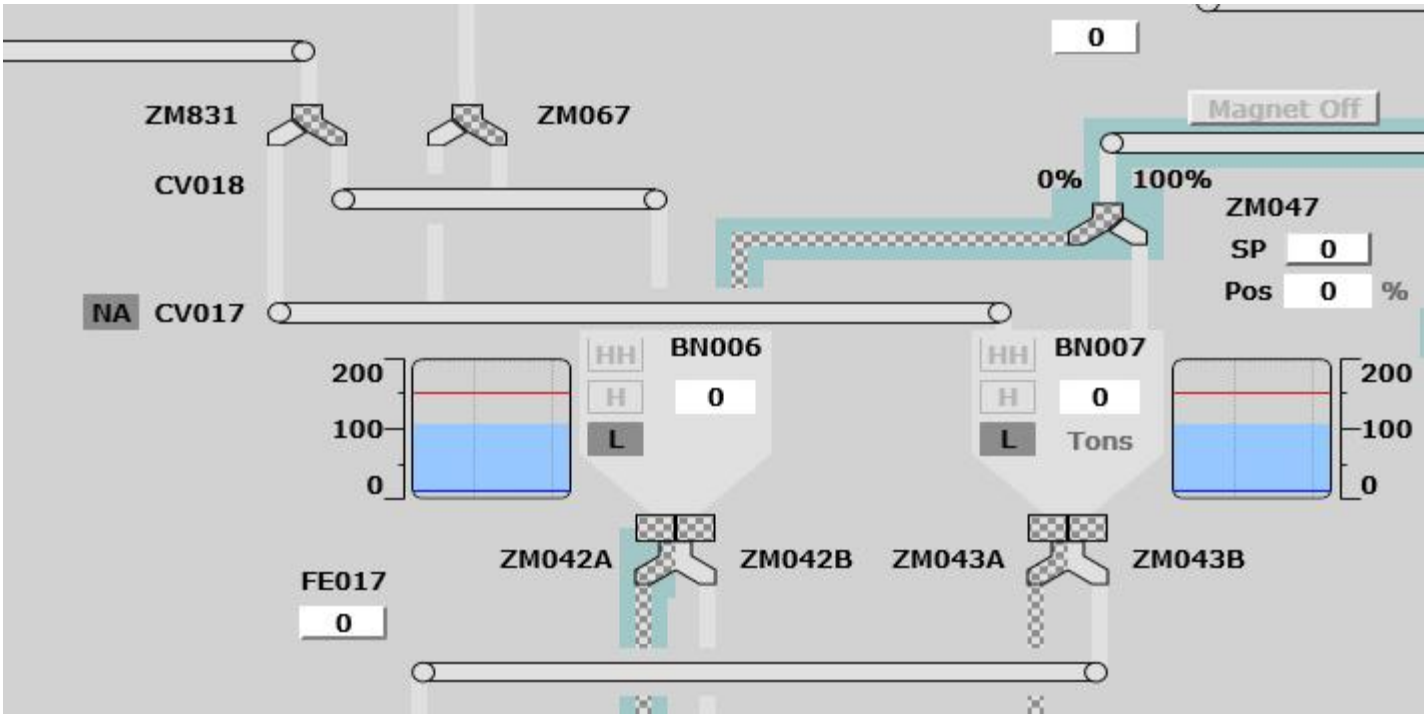
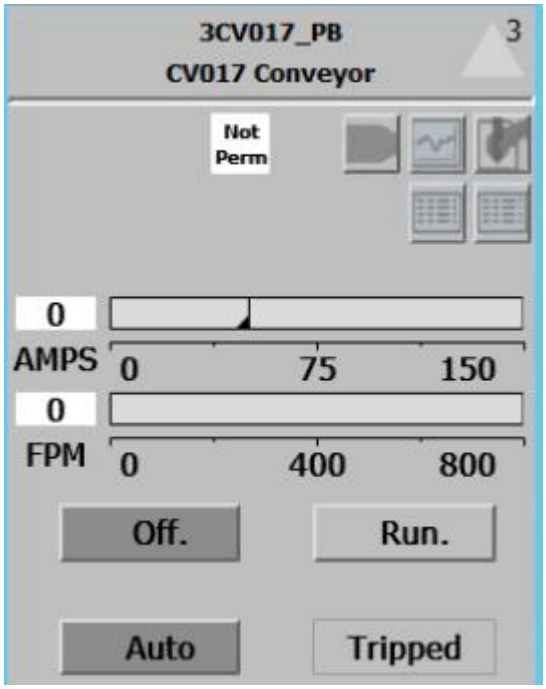
In an 800xA with Harmony Connect environment

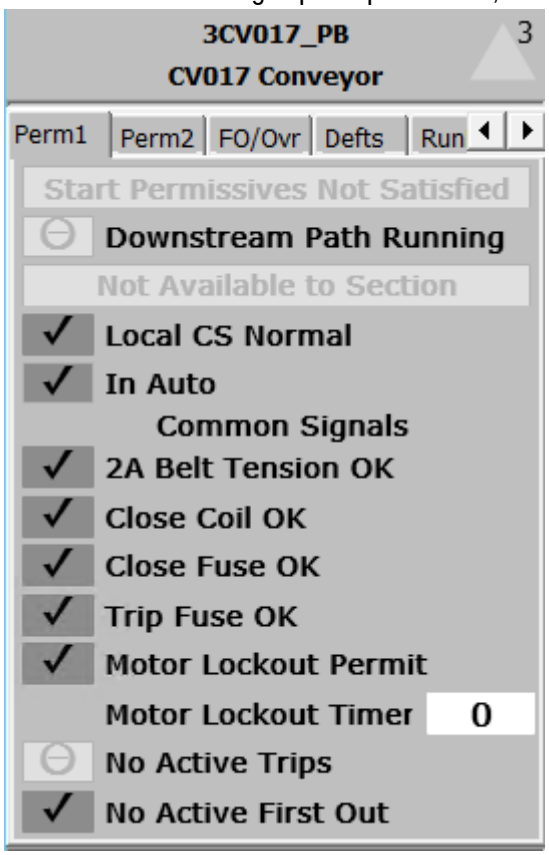
8. Additional concepts
    a. Off-normal operation
        i. We have not fully explored improvements to make in this area.
        ii. Device not available.
            1. In the example below, conveyor CV017 is not available. All of the other devices ARE available, because the corresponding “NA” icons are not displayed. In other words, we display what is not normal, but hide what is normal. Less is more.



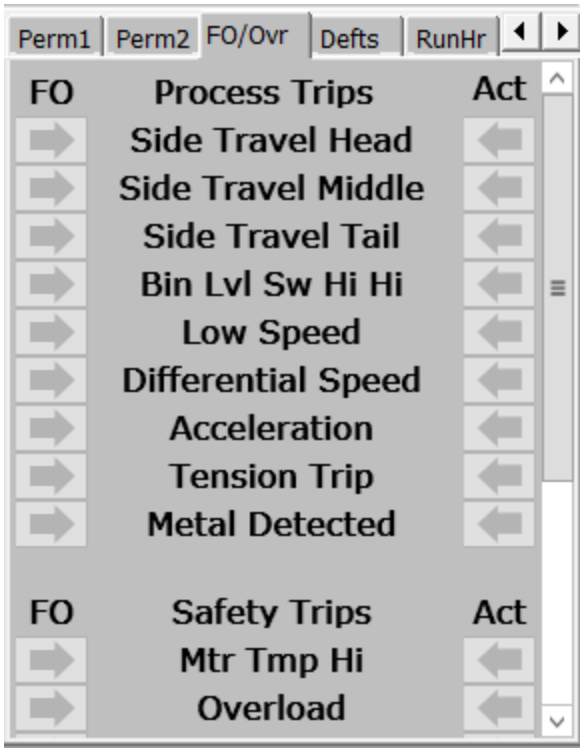
            2. The details can be found by clicking on the conveyor, which brings up the parent faceplate



3. The second click brings up the permit tab, which indicates that there is an active trip.

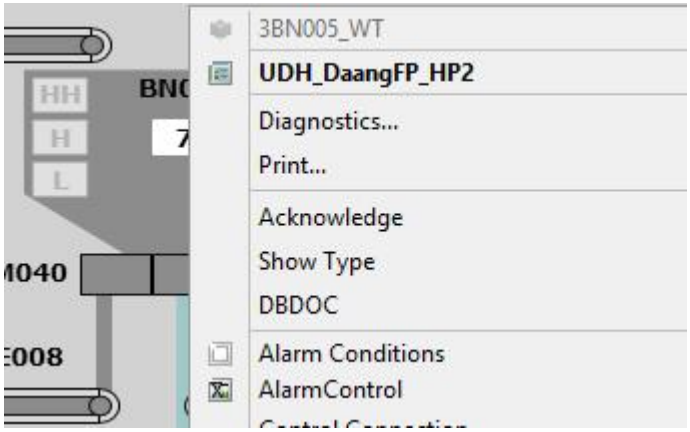


4. The third click calls up the first out tab which should indicate all active trips.
    a. In this case the simulator was halted and the active state was not highlighted.



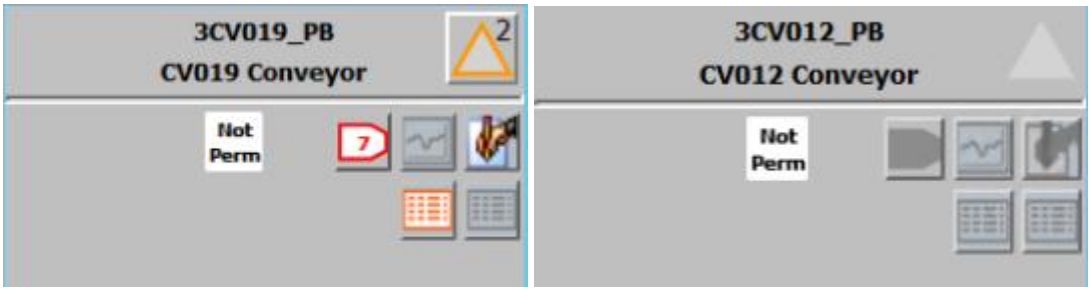
iii. Things on the list of "off normal operation" items to look into include:
1. Operator based trip defeats/overrides. These are currently handled as alarms
2. A device that should normally be in automatic but is currently in manual mode.
3. Backup equipment that is running
4. Equipment running in local/test mode

b. DBDOC
i. For our Harmony tags, we have aspects that will automatically
1. Launch Hyperview
2. Open the M14 file
3. Search for the tag that was clicked on



ii. This allows the operator to view and monitor the logic, in the spirit of "we have no secrets" mindset.

c. External applications
i. Lockout-Tagout
1. The ABB application is configured to data mine the lockout-tagout database every 15 minutes. Devices that have associated "red" tags will display the quantity. Those that have none will be grayed out.



2. Clicking on the icon will result in the lockout-tagout application (browser) being launched, and the device searched, and results shown. Refer to the example below.
3. We are not displaying this information on any graphic, but are limiting it to the faceplate view.

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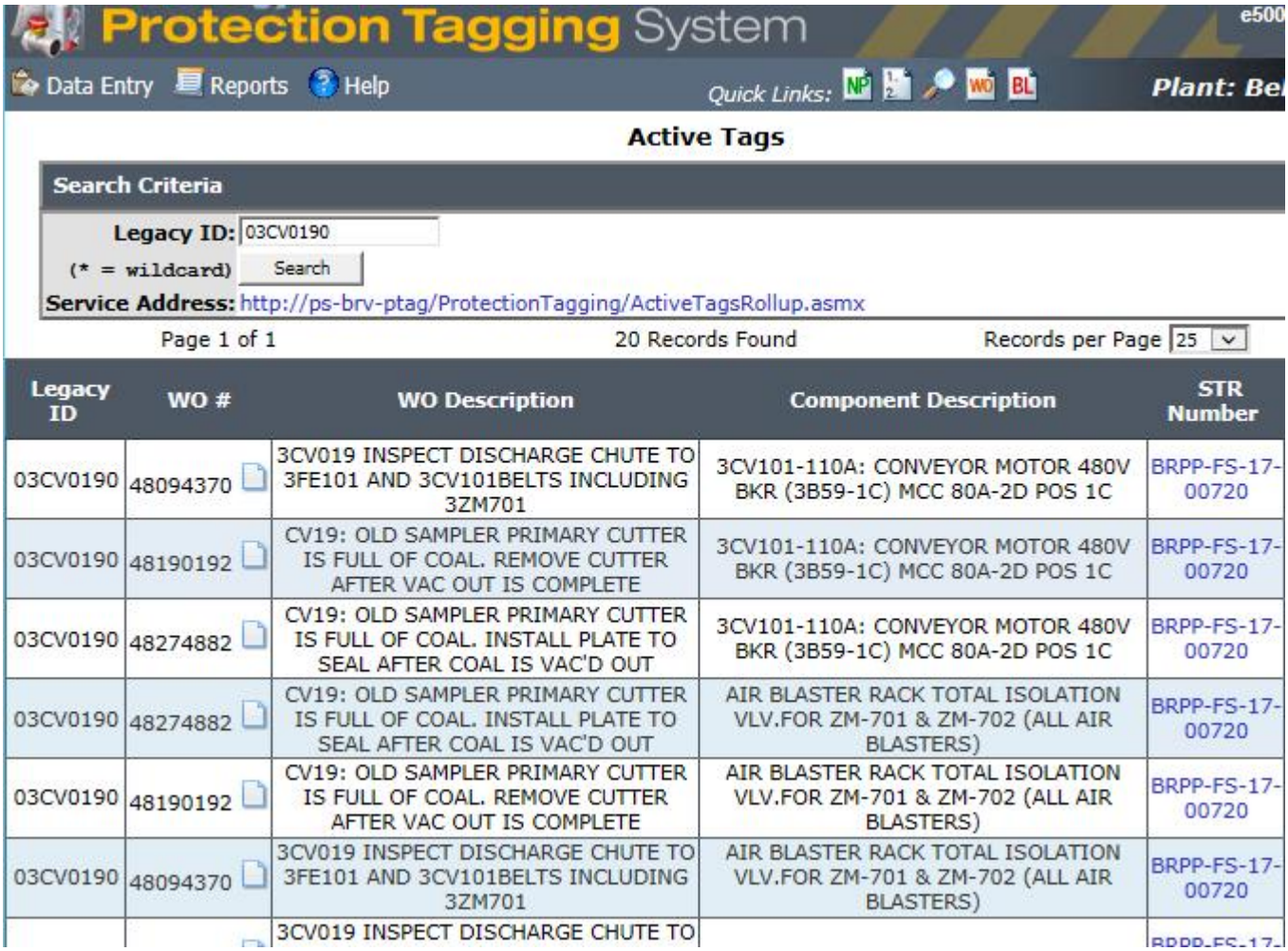


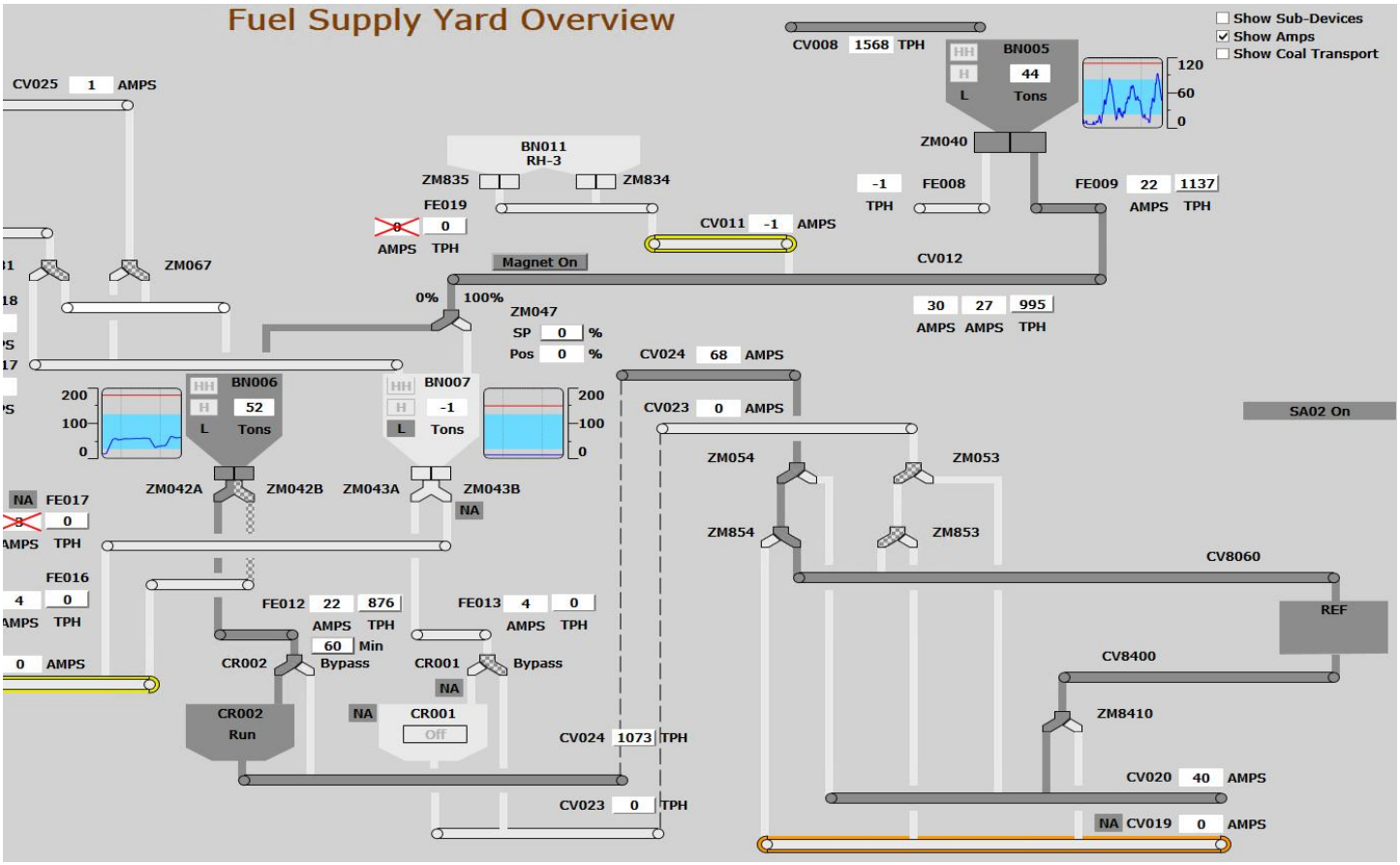
Legacy ID	WO #	WO Description	Component Description	STR Number
03CV0190	48094370	3CV019 INSPECT DISCHARGE CHUTE TO 3FE101 AND 3CV101BELTS INCLUDING 3ZM701	3CV101-110A: CONVEYOR MOTOR 480V BKR (3B59-1C) MCC 80A-2D POS 1C	BRPP-FS-17-00720
03CV0190	48190192	CV19: OLD SAMPLER PRIMARY CUTTER IS FULL OF COAL. REMOVE CUTTER AFTER VAC OUT IS COMPLETE	3CV101-110A: CONVEYOR MOTOR 480V BKR (3B59-1C) MCC 80A-2D POS 1C	BRPP-FS-17-00720
03CV0190	48274882	CV19: OLD SAMPLER PRIMARY CUTTER IS FULL OF COAL. INSTALL PLATE TO SEAL AFTER COAL IS VAC'D OUT	3CV101-110A: CONVEYOR MOTOR 480V BKR (3B59-1C) MCC 80A-2D POS 1C	BRPP-FS-17-00720
03CV0190	48274882	CV19: OLD SAMPLER PRIMARY CUTTER IS FULL OF COAL. INSTALL PLATE TO SEAL AFTER COAL IS VAC'D OUT	AIR BLASTER RACK TOTAL ISOLATION VLV.FOR ZM-701 & ZM-702 (ALL AIR BLASTERS)	BRPP-FS-17-00720
03CV0190	48190192	CV19: OLD SAMPLER PRIMARY CUTTER IS FULL OF COAL. REMOVE CUTTER AFTER VAC OUT IS COMPLETE	AIR BLASTER RACK TOTAL ISOLATION VLV.FOR ZM-701 & ZM-702 (ALL AIR BLASTERS)	BRPP-FS-17-00720
03CV0190	48094370	3CV019 INSPECT DISCHARGE CHUTE TO 3FE101 AND 3CV101BELTS INCLUDING 3ZM701	AIR BLASTER RACK TOTAL ISOLATION VLV.FOR ZM-701 & ZM-702 (ALL AIR BLASTERS)	BRPP-FS-17-00720
		3CV019 INSPECT DISCHARGE CHUTE TO		

ii. Maximo CMMS
    1. Similar to the lockout-tagout database, we are data mining the Maximo computer based maintenance management system
    2. We will have an icon that displays the number of work orders signed on.
    3. Clicking on the icon will launch Maximo in a browser, and display the record for the specific equipment.
    4. The operator will also be able to right click and generate a service request.

d. Dynamic flow

i. Using gray scale allows for a very effective “dynamic flow” graphic as depicted below. From this far out we can determine:

1. What is running, and what isn’t
2. What devices are in alarm
3. The level in key bins, along with recent history



ii. The dynamic flow fill is based on rules:

1. If equipment is starting up (takes time to establish full speed), the fill is a cross hatch pattern.
2. If equipment is running (usually an MSDD feedback state), in test with no downstream equipment running, the fill is also a cross hatch pattern.
3. If we determine that there is potential flow, based on equipment running, gate status, etc. the fill color is a dark gray.
4. The coding is done at the graphic level. The example below shows a logical “and” condition of a DO/L output and an MSDD feedback

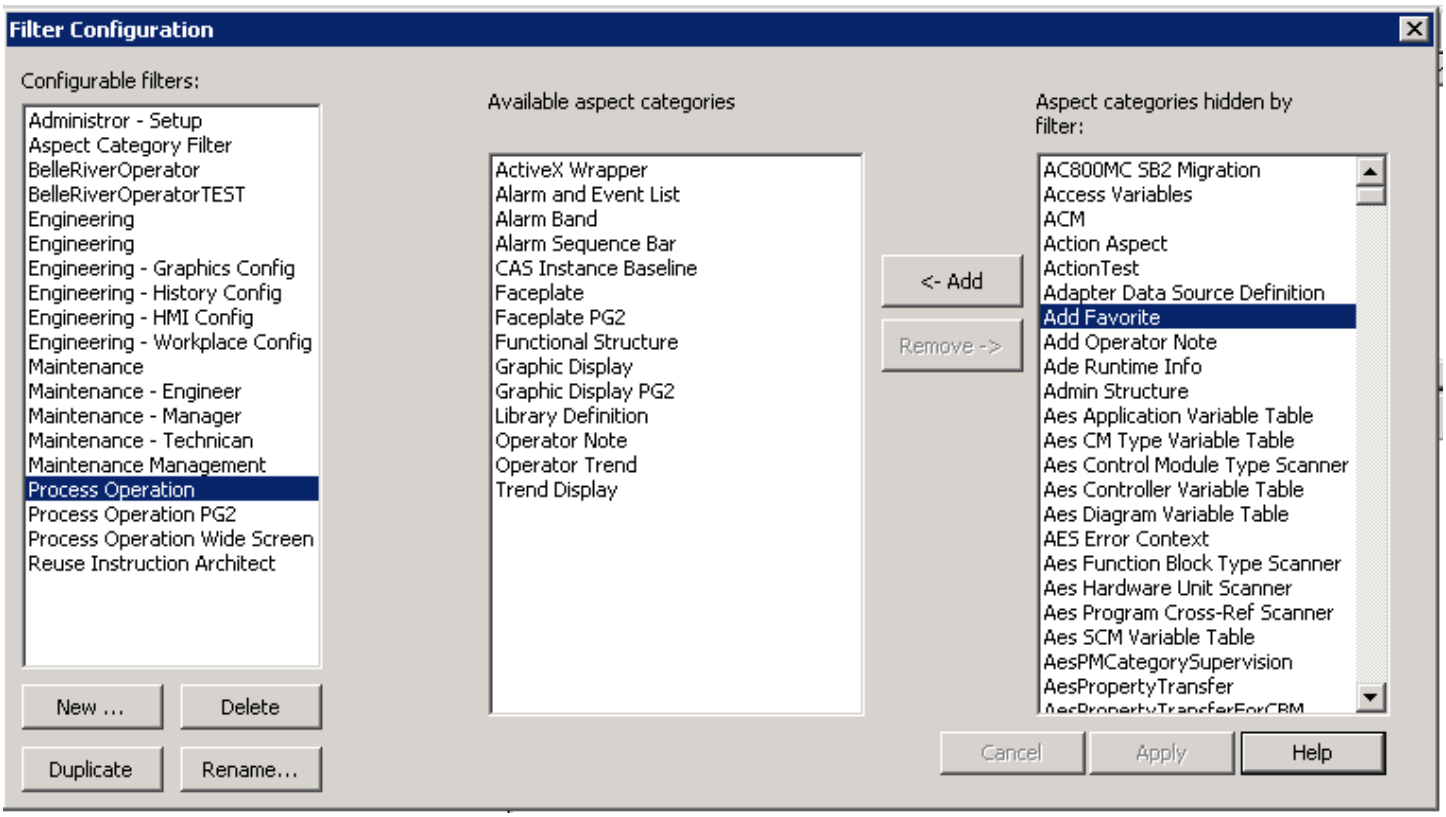
0a_Flowing	$'3FE009_OP:OUT/SIG'
0b_Signal01	$'3FE009_PB:FB1/SIG'
0c_Signal02	True
0d_Signal03	True
0e_Signal04	True
0f_Signal05	True

e. Operator mouse interactions

i. Right click aspect filtering

1. In the plant explorer or engineering workplace, click on the funnel icon

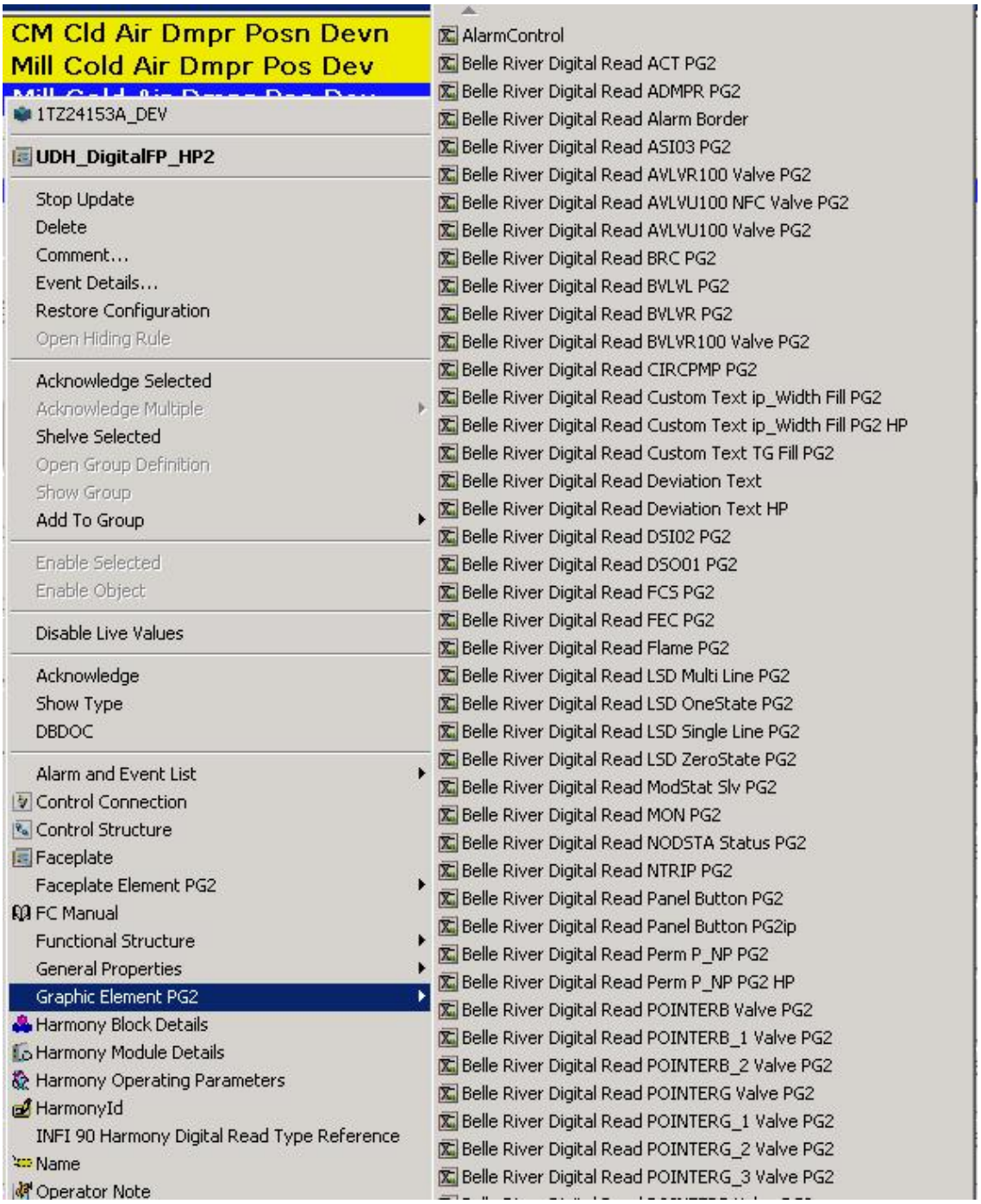
2. Select the filter associated with the operator group



3. Highlight the aspect(s) you want to remove, then click the remove button. Likewise click on aspect(s) you want to add, then click the add button.
4. We have streamlined the operating group filter down to those things that they need to do their job, eliminating the potential for confusion or human error.

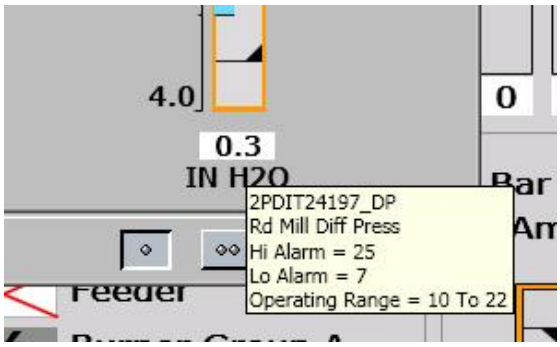
ii. For the engineering folks, we tend to want to see everything. However, the list can be awful long and require scrolling. Everything that I need tends to be at the bottom of the list. You can configure the system to group aspects and display on demand, as shown below.

1. Object Type Structure\ABB System\System Administration\User
    a. Add an aspect of type “Profile Values”
    b. Configure “Group Aspects”
        i. Change Datasource to “local”
        ii. In the “base rule” select “On Demand” in the pull down selector
        iii. Apply.

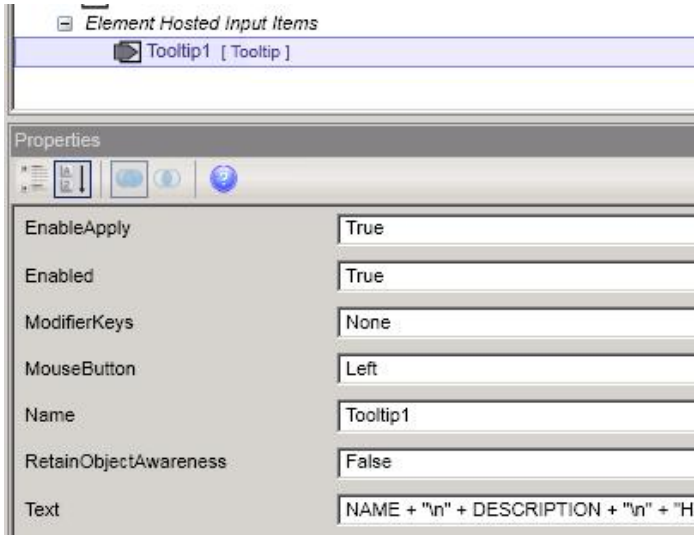


iii. Hover display “tooltip”

1. As stated previously we use the tooltip function to display secondary and tertiary information to declutter graphics.



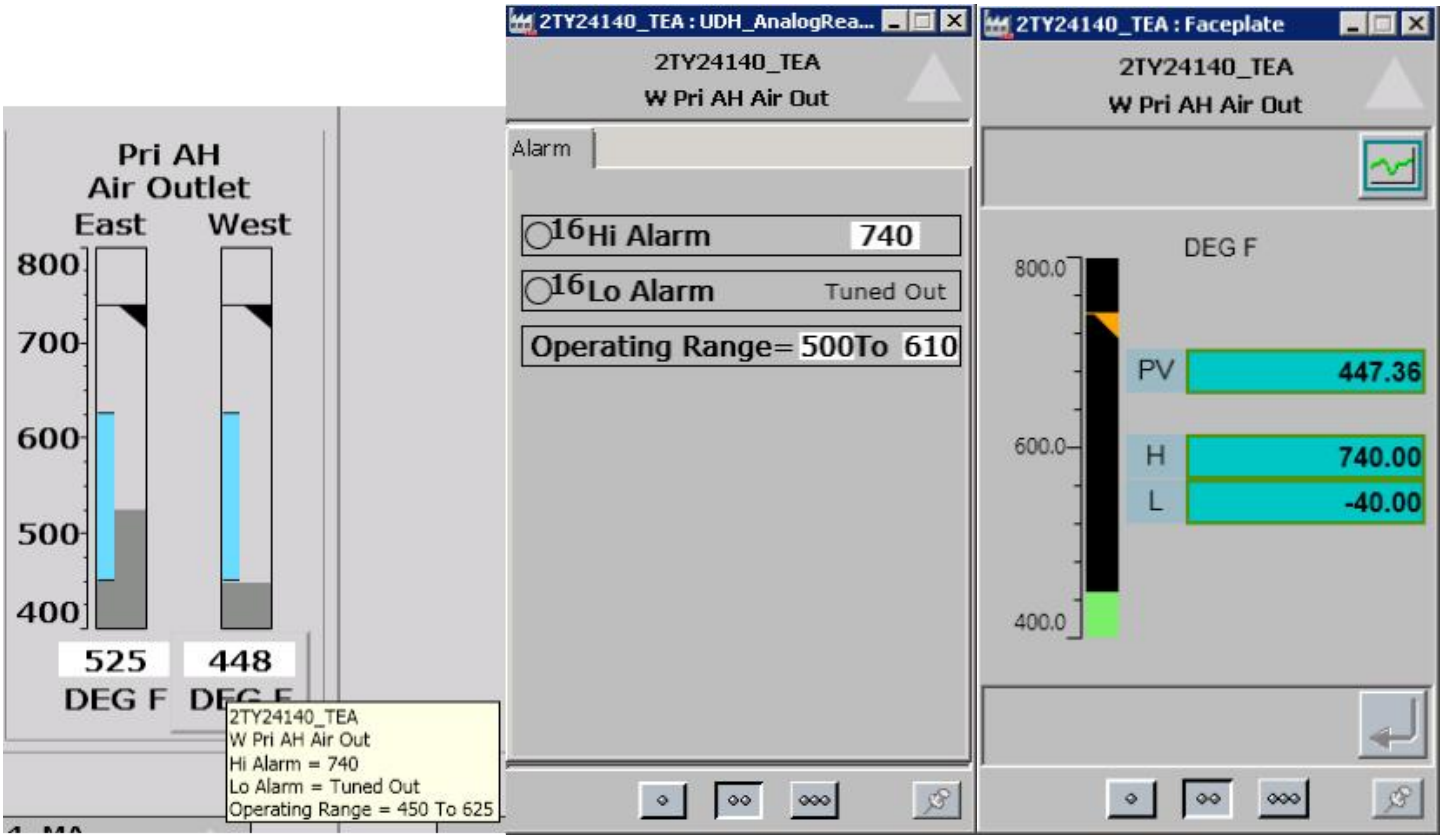
2. These are configured in each graphic element, another reason why “efficiency in engineering” resulting in a minimal number of graphic elements is important.
3. Here is an example of the tooltip “text” configuration for the graphic element above




```
NAME + "\n" + $'.:Control Connection:DESCRIPTION' + "\n" + "Hi Alarm = " +
m_HiAlm_Limit + "\n" + "Lo Alarm = " + m_LoAlm_Limit + "\n" + "Operating
Range = " + (if $'.:UDH_AnalogFP_HP2 GP:OperatingRange.Defined' then String
($'.:UDH_AnalogFP_HP2 GP:OperatingRange.OpRangeLow') + " To " + String
($'.:UDH_AnalogFP_HP2 GP:OperatingRange.OpRangeHigh') else "Tuned Out")
```

   a. Note that we concatenate several properties, and properties include default AO/L properties as well as custom general properties.

b. Also note that when an alarm setpoint and/or normal operating range value is out of range, we display the text “Tuned Out” rather than displaying the actual value. By default (extreme right) the actual values are shown, even when they don’t apply.



f. Alarm Management
    i. Alarm management is a different topic that takes a lot of effort, but is really tied at the hip to high-performance graphics.
    ii. High-performance graphics will not provide complete value in a system that has mediocre alarm management performance.
    iii. A poorly managed alarm system in a traditional graphics environment has its trouble fairly contained to the various alarm lists. However, in a high-performance environment, the alarms are now proudly displayed all over the graphics.
    iv. Talk to ABB about the tools and services available.