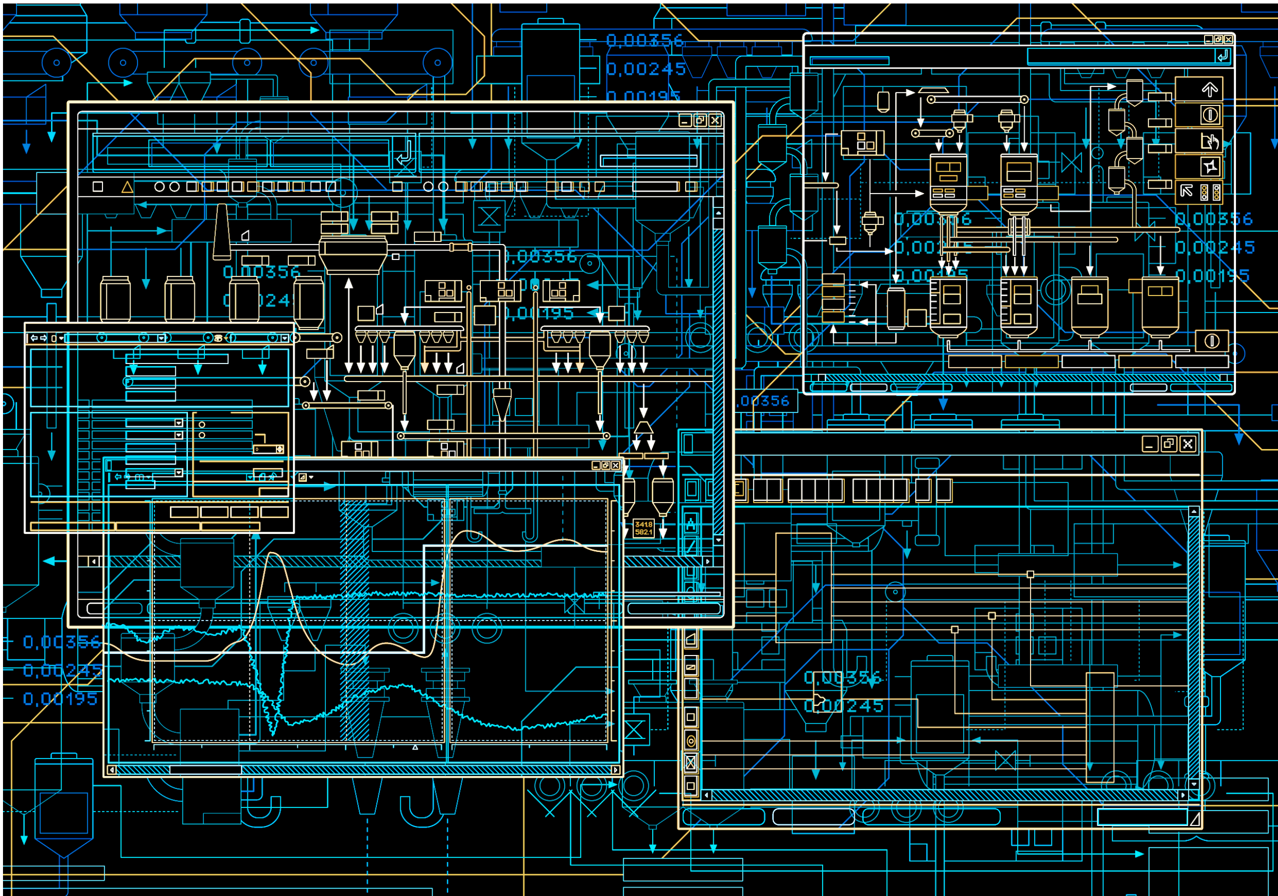

System 800xA Asset Optimization

Configuration

System Version 5.1

Power and productivity
for a better world™

System 800xA Asset Optimization

Configuration

System Version 5.1

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About This User Manual

General

Any security measures described in this User Manual, for example, for user access, password security, network security, firewalls, virus protection, etc., represent possible steps that a user of an 800xA System may want to consider based on a risk assessment for a particular application and installation. This risk assessment, as well as the proper implementation, configuration, installation, operation, administration, and maintenance of all relevant security related equipment, software, and procedures, are the responsibility of the user of the 800xA System.

This User Manual describes setup and configuration activities for Asset Optimization Asset Monitoring, Maximo Integration, SAP/Plant Management (SAP/PM) Integration, Device Calibration Integration, the Control Loop Asset Monitor (CLAM), and the Generic (HXAM-G) and Shell and Tube (HXAM-ST) Heat Exchanger Asset Monitors. This product functionality consists of system extensions to the 800xA System product.

User Manual Conventions

Microsoft Windows conventions are normally used for the standard presentation of material when entering text, key sequences, prompts, messages, menu items, screen elements, etc.

Feature Pack

The Feature Pack content (including text, tables, and figures) included in this User Manual is distinguished from the existing content using the following two separators:

Feature Pack Functionality

<Feature Pack Content>

Feature Pack functionality included in an existing table is indicated using a table footnote (*) :

* Feature Pack Functionality

Unless noted, all other information in this User Manual applies to 800xA Systems with or without a Feature Pack installed.

Warning, Caution, Information, and Tip Icons

This User Manual includes Warning, Caution, and Information where appropriate to point out safety related or other important information. It also includes Tip to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

Electrical warning icon indicates the presence of a hazard that could result in *electrical shock.*

Warning icon indicates the presence of a hazard that could result in *personal injury.*

Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard that could result in *corruption of software or damage to equipment/property.*

Information icon alerts the reader to pertinent facts and conditions.

Tip icon indicates advice on, for example, how to design your project or how to use a certain function

Although Warning hazards are related to personal injury, and Caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, fully comply with all Warning and Caution notices.

Documentation of Third Party Software

This User Manual describes third party software to the extent that it applies to Asset Optimization. Specific information relating to the installation, setup, configuration, and operation of third party software can be found in the manufacturer's documentation.

Terminology

A complete and comprehensive list of terms is included in *System 800xA System Guide Functional Description (3BSE038018*)*. The listing includes terms and definitions that apply to the 800xA System where the usage is different from commonly accepted industry standard definitions and definitions given in standard dictionaries such as Webster's Dictionary of Computer Terms.

Released User Manuals and Release Notes

A complete list of all User Manuals and Release Notes applicable to System 800xA is provided in *System 800xA Released User Manuals and Release Notes (3BUA000263*)*.

System 800xA Released User Manuals and Release Notes (3BUA000263)* is updated each time a document is updated or a new document is released. It is in pdf format and is provided in the following ways:

- Included on the documentation media provided with the system and published to ABB SolutionsBank when released as part of a major or minor release, Service Pack, Feature Pack, or System Revision.
- Published to ABB SolutionsBank when a User Manual or Release Note is updated in between any of the release cycles listed in the first bullet.

A product bulletin is published each time *System 800xA Released User Manuals and Release Notes (3BUA000263*)* is updated and published to ABB SolutionsBank.

Section 1 Introduction

Product Overview

System 800xA - Asset Optimization consists of system extensions to the 800xA Base System. Asset Optimization functionality includes Asset Condition Reporting, Asset Monitoring, CMMS (Computerized Maintenance Management System) Integration, and a separate engineered solution for calibration integration to the 800xA System. This optimizes the use of plant equipment and processes. When integrated with SMS and e-mail Messaging, Asset Optimization provides a method for sending messages based on alarm and event information through SMS and e-mail. When integrated with Device Management FOUNDATION Fieldbus or Device Management PROFIBUS & HART, Asset Optimization provides a method to detect and notify problems with field devices.

Product Scope

The Asset Optimization software provides the following functionality:

- Maintenance Workplace and Asset Structure.
- Asset Health Condition Reporting.
  - Asset Viewer.
  - Asset Reporter.
- Asset Monitoring.
  - Basic Asset Monitors.
  - Process Asset Monitors (includes Control Loop Asset Monitor (CLAM), Heat Exchanger Asset Monitor - Shell and Tube (HXAM - ST), and Heat Exchanger Asset Monitor - Generic (HXAM - G).
  - System Status Asset Monitor.

  - HART Asset Monitoring.
  - FOUNDATION Fieldbus Asset Monitoring.
  - PROFIBUS Asset Monitoring.
- Seamless Interaction Between Process and Maintenance.
  - Maximo Integration.
  - SAP/PM Integration.
- Engineered solution for Calibration Integration.
- Asset Optimization Reporting.

Figure 1 shows the interaction between the various functional components of Asset Optimization.

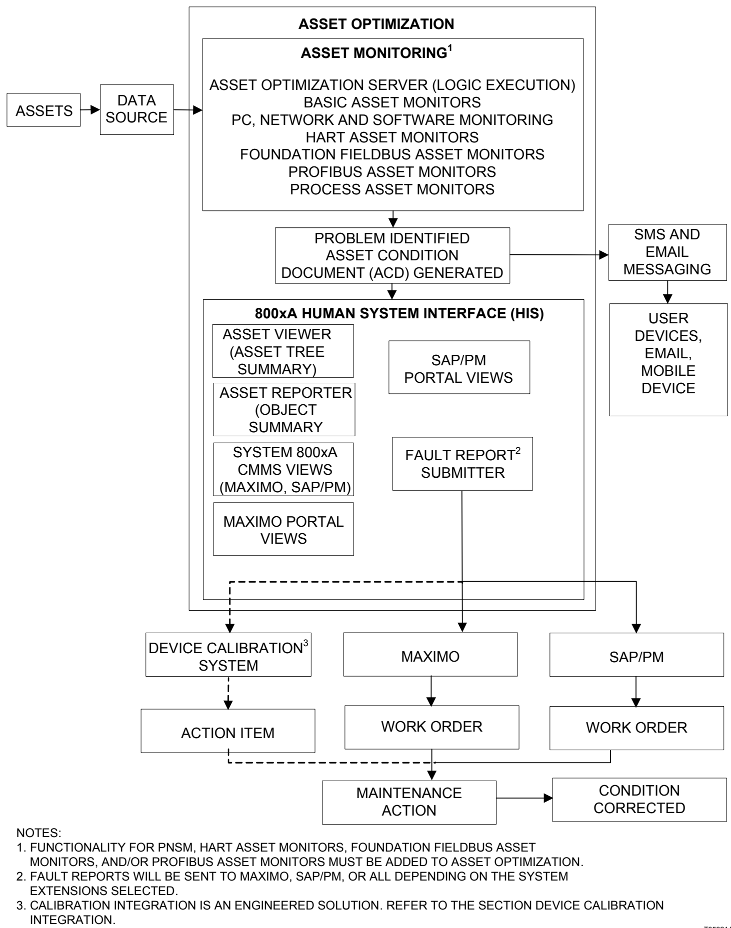


Figure 1. Asset Optimization Functionality

Section 2 System Setup

Introduction

This section contains procedures for the following:

- Setting Up Aspect Defaults.
  - Asset Monitor Startup Parameters.
  - Connecting to a Process Portal B Node.
  - Maximo Server Connection Properties.
  - SAP/PM Server Connection Properties.
  - Mapping between the 800xA System and the CMMS.
  - Alarm Behavior upon Fault Report Submittal.
- User Privileges.
  - Maximo User Credentials.
  - SAP User Credentials.
  - Primary Structures.
- Primary Structures.
  - Managing Data Source Connections.

This section contains system setup procedures applicable to all system extensions; however, procedures specific to PC, Network and Software Monitoring are located in *System 800xA PC, Network, and Software Monitoring Configuration (3BUA000447*)*.

When creating aspects, it is possible to add a description and name the aspect as desired. If the aspect is not named, the aspect category name is used and displayed in the Aspect List Area. Unless otherwise noted, the procedures in this User Manual use the aspect category name.

Setting Up Aspect Defaults

The following procedures must be performed to set up the aspects in the Aspect System Structure:

- Asset Optimization Server Configuration.
- Loading Asset Monitor Configurations to an AO Server.
- Asset Monitor Startup Parameters.
- Connecting to a Process Portal B Node.
- Maximo Server Connection Properties.
- SAP/PM Server Connection Properties.
- Mapping between the 800xA System and the CMMS.
- Alarm Behavior upon Fault Report Submittal.

Setting up these aspects in the Aspect System Structure provides default values for each instance of that aspect applied to individual objects in the Primary Structures.

Asset Optimization Server Configuration

Each AO Server Object should be added under the Asset Optimization Object in the Control Structure.

An AO Server object in the Control Structure represents one AO Server that provides the following services:

- **AssetMonitoring Service:** This service collects the Asset Condition Documents (ACDs) generated by Asset Monitoring Engines and publishes them in the 800xA platform as OPC-DA properties, Soft Alarms, Asset Tree node status, and Fault Reports.
- **AssetTree Service:** All information displayed in the Asset Viewer is provided by the AssetTree Service. Asset Reporter OPC properties are provided by this service as well. There should be one and only one AssetTree service per 800xA System. This service collects severity, quality, and Fault Report availability for all assets in all AssetMonitoring Services and calculates the propagated values based upon 800xA structures. The AssetTree Service also publishes the composite and propagated values of the object in the 800xA platform as OPC-DA properties. No configuration is required for this service. It will be started automatically when the first AssetMonitoring Service is started.

- **Asset Monitoring Engine:** Provides the execution environment for the Asset Monitors. For each Asset Monitor loaded in this engine it provides the required runtime data through the connected OPC Servers and exposes the generated ACDs to the related AssetMonitoring service.
- **Fault Reports Repository Manager:** Maintains the Fault Reports generated by the Asset Monitoring Engines and exposes them to the user for further processing.
- **AO Internet Information Service Webs:** Exposes Asset Optimization data to Web Clients.
- **Third Party Asset Monitoring Engine:** The AO Server can also process ACDs generated by third party Asset Monitoring Engines.

A virtual AO Server can be created and configured on an existing AO Server. It is recommended to load and configure the Control Loop Asset Monitors on the Virtual AO Server. For detailed information refer to Virtual AO Server Configuration on page 146

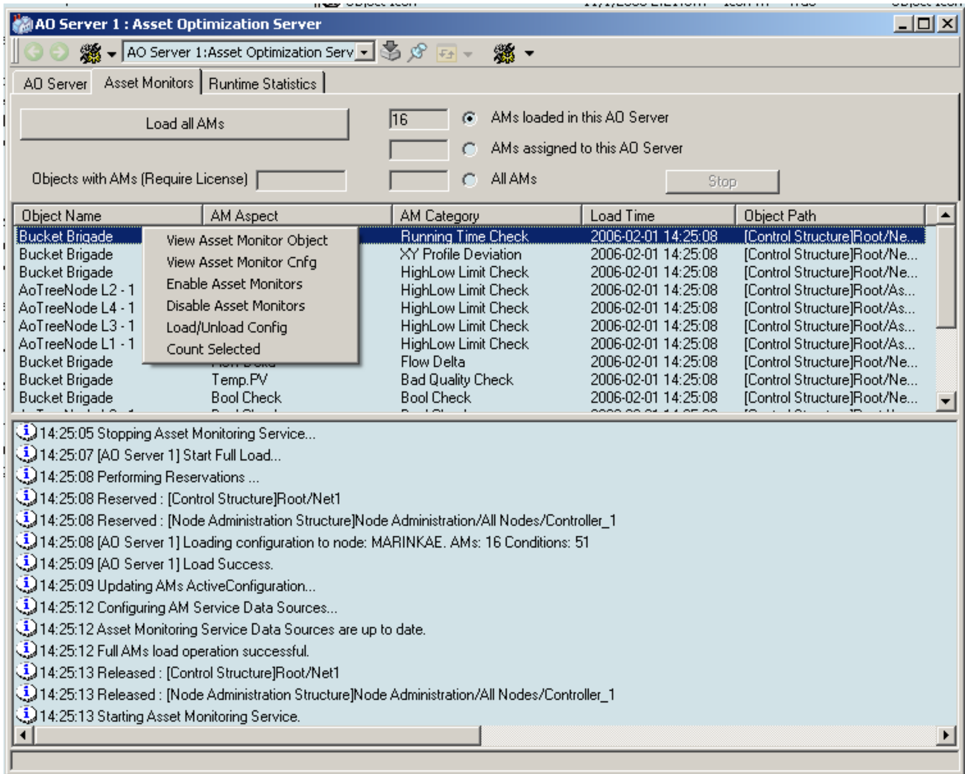
The AO Servers should have been configured as part of the post installation process. If they have not been configured, refer to the Asset Optimization section in *System 800xA Post Installation (3BUA000156*)*.

Loading Asset Monitor Configurations to an AO Server

1. Go to the Control Structure and navigate to:

   `Root, Domain > Asset Optimization, Asset Optimization > AO Server 1, AO Server`

2. Select `Asset Optimization Server` in the Aspect List Area.
3. Select the **Asset Monitors** tab in the Preview Area as shown in Figure 2.
4. Make sure that the Asset Monitor aspects to be loaded are assigned to the target Asset Optimization Server and that they are enabled.
5. To load the enabled Asset Monitor aspects to the Asset Optimization Server, click **Load all AMs**.
6. To load only selected Asset Monitor aspects:
   a. Select the **AMs Assigned to this AO Srv** option.



TC06062B

Figure 2. Asset Optimization Server Aspect

b. Select the desired Asset Monitors.

c. Right-click and select **Load/Unload Config** from the context menu that appears.

When a large number of Asset Monitor configurations are downloaded, the AO server will be busy updating the configuration. During this period the AO server aspect may show the following Status **"Unknown, Unable to connect to AO server"**. Refreshing the view subsequently will update the Asset Monitor configuration status.

Renaming an Asset Monitor object instance will not update the name of object in the list of loaded Asset Monitors in AO server. The Asset Monitor should be reloaded to address this problem.

After executing a Replace Unit in Control Builder, the Asset Monitor aspect on the replaced unit should be renamed. The renamed Asset Monitor must be reloaded to the Asset optimization server.

It is also possible to load a single Asset Monitor from the Asset Monitor aspect itself. Refer to Loading a Single Asset Monitor on page 74 for more information.

7. To verify the current Asset Monitor configuration status:
   a. Select the **Asset Monitors** tab.
   b. Select the **AMs Assigned to this AO Srv** option. This operation, which may take a few minutes, will populate the list of all the Asset Monitors in the system that are assigned to this AO Server.
   c. Each Asset Monitor in the list will display one of the current life cycle states listed in Table 1.

Table 1. Asset Monitor Life Cycle States

Life Cycle State	Description
Configuration error, object not in Control Structure	Object containing the Asset Monitor aspect is not inserted in the Control Structure. This is an invalid configuration and must be fixed by inserting the Object once in the Control Structure.
Not loaded, enabled	Asset Monitor aspect configuration is not loaded to an AO Server.
Loaded, not current	Asset Monitor aspect configuration was modified since last loaded to an AO Server.
Will not load, disabled	Asset Monitor aspect is not enabled; is not (and will not be) loaded to an AO Server.

Table 1. Asset Monitor Life Cycle States (Continued)

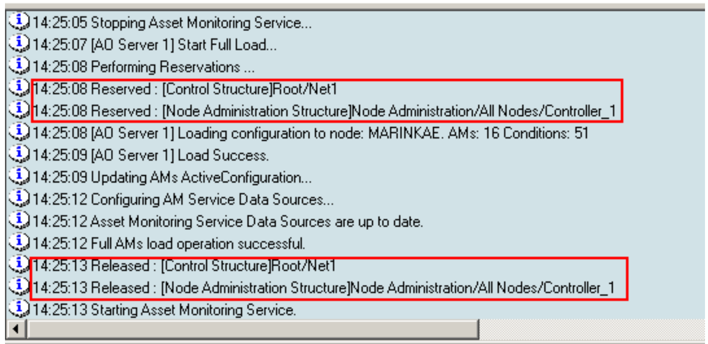
Life Cycle State	Description
Loaded, current	Current Asset Monitor aspect configuration has been loaded to an AO Server.
Unknown, unable to contact the AO Server	Unable to contact the AO Server. The call to the AO Server that is needed to assess the current Asset Monitor life cycle failed.

Asset Monitors not loaded or Asset monitors loaded to a disabled AO Server will have the quality of all of their conditions set to `Bad Not Connected`.

If an AO Server is assigned to a different AssetMonitoring Service group, or the default AO Server is reassigned, then a **Load all AMs** operation is required for each AO Server in the system.

Configuration changes to an Asset Monitor aspect (including Enable/Disable and assigning to a different AO Server) will become active after the Asset Monitor aspect is loaded.

8. When initiating a load operation of Asset Monitors belonging to an entity, such as an AC 800M Controller, the load procedure will attempt to reserve those entities before the configuration is loaded to the AO Server. After the load operation completes, all reserved entities will be released. Figure 3 provides an example.



TC08225A

Figure 3. Entity Reserve and Release Process Example

If an entity reservation fails as a result of an existing reservation by a different user then the load operation is aborted. If this happens, perform Step 9 and Step 10.

9. Request that the entities reserved by the other user (or users) be released.

10. Perform an incremental load of just the unreserved entities, or the entities already reserved by the user performing the load. To do so:

    a. Sort all Asset Monitors by the *Object Path* in the AO Server aspect.

    b. Select the group of Asset Monitors that belong to the same controller.

    c. Select **Load/Unload** from the context menu.

It is also possible to partition Asset Monitors in different AO Servers by grouping them by entity.

Asset Monitor Startup Parameters

Some Asset Monitors may use startup parameters to modify the behavior of the Asset Monitor, or to provide global configuration values (refer to Asset Monitor specific documentation for more information).

Startup parameters can only be modified under the Logic tab in the Config view of the Asset Monitor category in the Aspect System Structure. Configuration of the startup parameters applies to every instance of the Asset Monitor in the Primary Structures.

Connecting to a Process Portal B Node

Add the Process Portal B Provider aspect to 800xA System Objects to provide Process Portal B notification for them. Process Portal B alarm notification will not be enabled on an object in the 800xA System if the Process Portal B Provider aspect is not added to that Object.

800xA - Asset Optimization for Process Portal B adds Asset Optimization functionality to Process Portal B systems. Asset Monitoring information is available as a context menu on PPB TAGs and active Asset Conditions are reported into Process Portal B Alarm and Event systems. Furthermore, Asset Optimization enables the integration of Computerized Maintenance Management Systems and provides CMMS specific information through the context menu of a PPB TAG.

Refer to *Operate IT Process Portal 800xA Asset Optimization for Process Portal B (3BUA000423*)* for installation and Process Portal B node configuration.

To configure the Process Portal B Provider aspect:

1. Use the Structure Selector to open the Aspect System Structure.
2. Navigate to:

   `Asset Monitoring, Aspect System > Process Portal B Provider, Aspect Type > Process Portal B Provider, Aspect Category`

3. Right-click `Process Portal B Provider, Aspect Category` and select **Process Portal B Provider** from the context menu that appears. This opens the Process Portal B Provider shown in Figure 4.
4. Fill in the fields with the appropriate information:
   - **Name:** Name of the Process Portal B node on which Asset Optimization Process Portal B Connectivity is installed.
   - **Service Account:** Service account information on Process Portal B node.
   - **Password**: Password of the service account on Process Portal B node.
   - **Confirm Password:** Re-enter password entered in Password field.

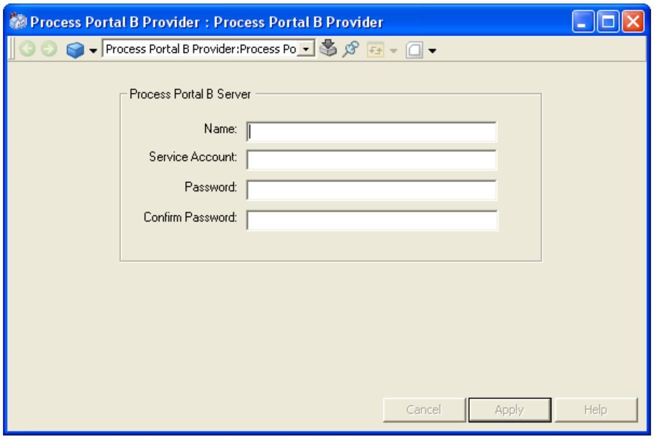


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Figure 4. Process Portal B Provider

5. Click **Apply** to save the entered information. This information will now appear in every Process Portal B Provider added to objects in the Primary Structures.

To connect to more than one Process Portal B system, create another Process Portal B Provider (naming it something other than the original) on the Process Portal B Provider Aspect Category in the Aspect System Structure and define its parameters.

Maximo Server Connection Properties

The Maximo Equipment ID contains the information needed to access the Maximo Server and must be set up in the Aspect System Structure to provide CMMS System identification information (Provider Properties). Each instance of the aspect applied to individual objects in the Primary Structures references this information.

The Maximo Equipment ID provides information for mapping the 800xA System object to the Maximo equipment in the CMMS database for a particular Maximo Server. Multiple Maximo Equipment IDs can be associated with the same asset, thus providing the ability to map to more than one piece of equipment defined in Maximo.

1. Use the Structure Selector to select the Aspect System Structure.

2. Navigate to:

   `Maximo Connectivity, Aspect System > Maximo Equipment ID, Aspect Type > Maximo Equipment ID, Aspect Category`

3. Click on `Maximo Equipment ID` in the Aspect List Area to produce the default view of the Maximo Equipment ID in the Preview Area

4. The Asset Information frame requires no action during setup. It is used when the Maximo Equipment ID is added to individual assets in the Primary Structures.

5. Table 2 lists and describes the properties in the CMMS Information frame and the Maximo Equipment ID Provider Properties.

Table 2. Maximo Equipment ID

CMMS Information Frame	Provider Properties	Default Value	Description
CMMS System	Does not appear	Maximo	The type of CMMS.
Does not appear	ServerName	None	Not used.
Maximo Server Version	ServerVersion	6.2	The version of the Maximo software used.
Maximo Server Version*	ServerVersion	7.1	The version of the Maximo software used.
Does not appear	AppServer	None	Not used.
Maximo WebServer	MROWebServer	MustDefine	The DNS/IP name/address of the server for the Maximo web interface.
Maximo Site Name	MROSite	None	Not used.
Maximo Site Name*	MROSite	None	The name associated with the data set to view on the specified Maximo Server.

Table 2. Maximo Equipment ID (Continued)

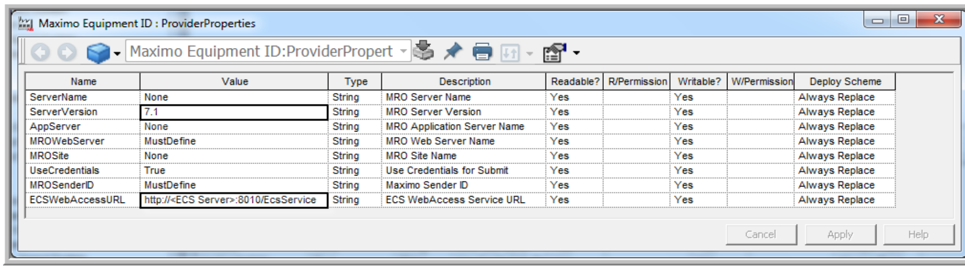
CMMS Information Frame	Provider Properties	Default Value	Description
Use Credentials	UseCredentials	True	Determines whether or not the Maximo Credentials configured on the current user are used to submit a Fault Report.
Maximo Sender ID	MROSenderID	MustDefine	Enter the Sender ID as configured in the Maximo Server.
ECS Interface	ECSWebAccess URL	http://<ECS Server>/ECS/EcsIntegration.asmx	Enter ECS WebService URL. Use default value if ECS Software is installed on the AO Server designated as AOWebServer. Else replace [ECS server] in URL with the ECS server IP address.
ECS Interface*	ECSWebAccess URL	http://<ECS Server>:8010/EcsService	Enter ECS WebService URL. Replace <ECS Server> in URL with the ECS Server IP address.

* Feature Pack Functionality

6. Click **Edit Category Data** and the view changes to access the Maximo Equipment ID Provider Properties shown in Figure 5.
7. Click in the **Value** column of the desired row to change the value.
   a. Change the **Value** column of the ServerVersion row to the Maximo Version 6.2.

Feature Pack Functionality

With reference to Step a, the Maximo Version is 7.1 for the System 800xA 5.1 Feature Pack release.



Name	Value	Type	Description	Readable?	R/Permission	Writable?	W/Permission	Deploy Scheme
ServerName	None	String	MRO Server Name	Yes		Yes		Always Replace
ServerVersion	7.1	String	MRO Server Version	Yes		Yes		Always Replace
AppServer	None	String	MRO Application Server Name	Yes		Yes		Always Replace
MROWebServer	MustDefine	String	MRO Web Server Name	Yes		Yes		Always Replace
MROSite	None	String	MRO Site Name	Yes		Yes		Always Replace
UseCredentials	True	String	Use Credentials for Submit	Yes		Yes		Always Replace
MROSenderID	MustDefine	String	Maximo Sender ID	Yes		Yes		Always Replace
ECSWebAccessURL	http://<ECS Server>:8010/EcsService	String	ECS WebAccess Service URL	Yes		Yes		Always Replace

Figure 5. Maximo Equipment ID Provider Properties

b. Change the **Value** column of the `MROWebServer` row to the DNS/IP name/address of the server for the Maximo web interface.

Feature Pack Functionality

c. Change the **Value** column of `MROSite` row to the Site name associated with the data set to view on the specified Maximo Server.

d. If required, change the **Value** column of the `UseCredentials` row from `True` to anything other than True (usually False). A value of True means that the configured Maximo Credentials on the current user is used for the submittal of Fault Reports. A value of False means that the server will not use the credentials stored in the User Credential aspect in the User Structure. In this case it is required to reauthenticate the submittal of Fault Report .

e. Change the **Value** column of the MROSenderID row to the Sender ID configured in the Maximo Enterprise Adapter.

Feature Pack Functionality

Ignore Step f and proceed to Step g for the System 800xA 5.1 Feature Pack release.

f. Change the **Value** column of the `ECSWebAccessURL` row to http://<ECS Server>/ECS/EcsIntegration.asmx, replacing <ECS Server> with the DNS/IP name/address of the ECS server.

Feature Pack Functionality

g. Change the **Value** column of the `ECSWebAccessURL` row to *http://<ECS Server>:8010/EcsService*, replacing <ECS Server> with the DNS/IP name/address of the ECS Server.

8. Click **Apply**.
9. Click the back arrow in the Preview Area to return to the initial Maximo Equipment ID aspect view and verify that the correct information appears in the CMMS Information frame.

The fields and values that appear in the Create Fault Report Form and Submit Fault Report view are dependent on the contents of MxDefMOMAppFR_Submit.xml Maximo Definition (MxDef) file. Refer to Mapping between the 800xA System and the CMMS on page 35 for information on accessing and editing the MxDef files.

SAP/PM Server Connection Properties

The SAP Equipment ID contains the information needed to access the SAP/PM Server and must be set up in the Aspect System Structure to provide CMMS System identification information (Provider Properties). Each instance of the aspect applied to individual objects in the Primary Structures references this information.

The SAP Equipment ID provides information for mapping the 800xA System object to the SAP/PM equipment in the CMMS database for a particular SAP/PM Server. Multiple SAP Equipment IDs can be associated with the same asset, thus providing the ability to map to more than one piece of equipment defined in SAP/PM.

Feature Pack Functionality

While updating SAP Equipment ID from SAP Server Version 4.7 to 6.0, delete the *Z<x>Proxy.dll* files, where *<x>* represents a set of characters. The *.dll* files are located at *<InstallDrive>:\Program Files\ABB Industrial IT\cpmPlus Enterprise Connectivity\Service* on ECS Server.

1. Use the Structure Selector to select the Aspect System Structure.

2. Navigate to:

   `SAP Connectivity, Aspect System > SAP Equipment ID, Aspect Type > SAP Equipment ID, Aspect Category`

3. Click on `SAP Equipment ID` in the Aspect List Area to produce the default view of the SAP Equipment ID in the Preview Area.

4. The Asset Information frame requires no action during setup. It is used when the SAP Equipment ID is added to individual assets in the Primary Structures.

5. Table 3 lists and describes the properties in the CMMS Information frame and the SAP Equipment ID Provider Properties.

Table 3. SAP Equipment ID

CMMS Information Frame	Provider Properties	Default Value	Description
CMMS Type	Does not appear	SAP-PM Module	The type of CMMS.
Server IP Address	ServerAddr	MustDefine1	The DNS/IP name/address of the SAP/PM Server node.
SAP Server Version	ServerVersion	MustDefine2	The version of the SAP/PM software being used.
SAP Router Address	ServerRouter	MustDefine3	IP address of an SAP/PM server that acts as a webfarm router and will direct request traffic to available SAP/PM server resources (SAP/PM server nodes). For single server SAP/PM systems, this is usually ( ).
SAP AOWebServer	SAPWebServer	[AoWebServer]	The DNS/IP name/address of the AO server for the SAP/PM web interface.
Use SAP Credentials	UseCredentials	True	Determines whether or not the SAP/PM Credentials configured on the current user are used to submit a Fault Report.

Table 3. SAP Equipment ID (Continued)

CMMS Information Frame	Provider Properties	Default Value	Description
ECS Interface	ECSWebAccess URL	http://<ECS Server>/ECS/EcsIntegration.asmx	Enter ECS WebService URL. Use default value if ECS Software is installed on the AO Server designated as AOWebServer. Else replace [ECS server] in URL with the ECS server IP address.
ECS Interface[*]	ECSWebAccess URL	http://<ECS Server>:8010/EcsService	Enter ECS WebService URL. Replace <ECS Server> in URL with the ECS Server IP address.

* Feature Pack Functionality

6. Click **Edit Category Data** and the view changes to access the SAP Equipment ID Provider Properties. Refer to Figure 6.

Feature Pack Functionality

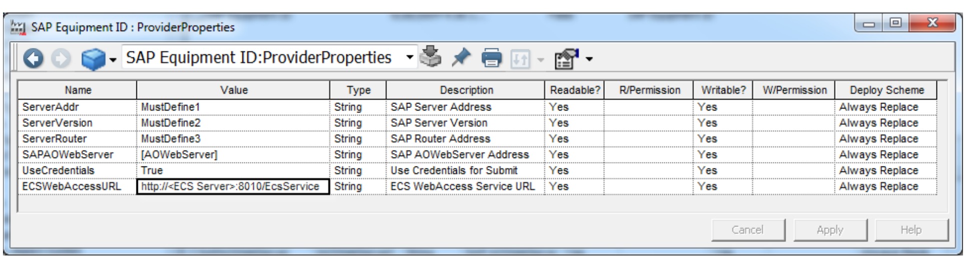


Figure 6. SAP Equipment ID Provider Properties

The value of `ECSWebAccessURL` is *http://<ECS Server>:8010/EcsService* for the System 800xA 5.1 Feature Pack release (see Figure 6).

7. Click in the **Value** column of the desired row to change the value.

a. Change the **Value** column of the `ServerAddr` row to the DNS/IP address of the SAP/PM Server node.

b. Change the **Value** column of the `ServerVersion` row to the SAP/PM version being used.

c. Information needed for SAP/PM Router Address

d. Change the **Value** column of the `SAPWebServer` row to the DNS/IP name/address of the server for the SAP/PM web interface.

e. If required, change the **Value** column of the `UseCredentials` row from `True` to anything other than True (usually False). A value of True means that the configured SAP/PM Credentials of the current user is used for the submittal of Fault Reports. A value of False means that the SAP/PM Credentials of the current user is not used and it is required to reauthenticate the submittal of the Fault Report. Additionally, it is also required to configure the client and SAP Language parameters

f. Change the Value column of the ECSWebAccessURL as per the ECS software installation.

8. Click **Apply**.

9. Click the back arrow in the Preview Area to return to the initial SAP Equipment ID aspect view and verify that the correct information appears in the CMMS Information frame.

The fields and values that appear in the Create Fault Report Form and Submit Fault Report view are dependent on the contents of SapDef_FaultReportView.xml SAP/PM Definition file. Refer to Mapping between the 800xA System and the CMMS on page 35 for information on accessing and editing the SAP/PM Definition files.

Mapping between the 800xA System and the CMMS

The MxDef files (Maximo) and SAP/PM Definition (SAPDef) files (for SAP/PM) provide the mapping between the 800xA System environment and the CMMS system.

Refer to Appendix A, CMMS Definition Files for an explanation of MxDef files and SAPDef files included with Asset Optimization.

Maximo Integration

The Maximo Integration information can be found on Asset Optimization Server nodes. Refer to the Service Structure for the Asset Optimization Server.

Deploying the Maximo Model

The Maximo Model is installed at the following directory:

```
<InstallDrive>\Program Files\ABB Industrial IT\Optimize
IT\AssetOptimization\AOECSConnector\EcsDefinitions
```

The Maximo Model File name to be used for the respective Maximo version is mentioned below.

Table 4. Maximo Model File Name and Maximo Version

Maximo Model File Name	Maximo Version
AOMaximoModel.xml	6.2
AOMaximo7Model.xml*	7.1

* Feature Pack Functionality

Feature Pack Functionality

Before deploying the Maximo Model using Process Definition Tool, observe if another version of Maximo Model is already deployed. If so, uninstall the ECS 4.2 version software and re-install it again.

Ensure to start the **ABB cpmplus Enterprise Connectivity** Services after restarting the node.

Ensure to set the Startup type for ABB cpmplus Enterprise Connectivity services as **Manual**.

Deploy the Maximo Model where ECS software is installed. Follow the steps as mentioned below:

1. From the desktop, double-click the Process Definition Tool or go to **Start > Programs > ABB cpmPlus connectivity** and click on the process definition tool. The **Process Definition Tool** displays.
2. Click **File > Open** and navigate to the ECS model installation directory.
3. From the installation directory, select the respective Maximo Model file name and click **Open**.
4. Click **Model > Deploy > Deploy to Production Environment**.
5. **Start/Restart** the ABB cpmPlus Enterprise Connectivity Windows Service from the Services MMC Snap-in.

Modifying Maximo Definition Files

The MxDef files for the basic CMMS views (Active Work Orders, Work Order History, Equipment Status, Preventive Maintenance Schedule, Spare. Parts, Availability of Spare Parts (supported only in Maximo systems)) provides the information on the data to retrieve and display.

Do not edit the MxDef files without consulting Maximo personnel to determine the required fields. Editing these files without the required knowledge and expertise may result in problems with the Maximo system and CMMS interface.

The MxDef files for the Fault Report Submitter provides the information on the data to display, defines the data inputs/edit characteristics, and the data destination for the creation of a Work Order in the Maximo system.

When Customizing the MxDef Files, it should be saved in a predefined folder name "CustomDef" created under the folder where the MxDef files are installed:
`...\Program Files\ABB Industrial IT\Optimize IT\Asset Optimization\AOECSConnector\MaximoDef\CustomDef`

In general, Asset Optimization software is configured to search the subdirectory created for the customized MxDef files before searching in the subdirectory for the default MxDef files.

The Maximo Definition XML Files are installed at the following directory:

`<InstallDrive>\Program Files\ABB Industrial IT\Optimize IT\Asset Optimization\AOECSConnector\MaximoDef`

The Maximo ECS Model is installed at the following directory:

`<InstallDrive>\Program Files\ABB Industrial IT\Optimize IT\AssetOptimization\AOECSConnector\EcsDefinitions`

Table 5. Modification Possibilities

Function	Description
Submit Fault Report	The Work order fields that are sent to Maximo can be customized.
View Active Work Order	The Columns and order can be customized.
View Equipment Status	The Columns and order can be customized.
View Prev Maint Schedule	The Columns and order can be customized.
View Spare Parts	The Columns and order can be customized.
View Spare Part Availability	The Columns and order can be customized.
View Work Order History	The Columns and order can be customized.

Perform the following steps to modify the MxDef file:

1. In the installed directory, create a folder with the name “CustomDef” under the “MaximoDef”. Asset Optimization will always check for the existence of MxDef file under the “CustomDef” folder and if exists, it will load the MxDef file from this directory.
2. Open the MxDef file and **Add/Remove** Maximo Field/AttrDef element as per the requirement and **Save** the file.
3. In the ECS Model, **Add/Remove** the Equipment Type Property.
4. In the ECS Model, update property assignment in the Submit Event with the changed Property.

5. Deploy the ECS Model and restart the ABB cpmPlus Enterprise Connectivity Windows Service.

Table 6. Asset Optimization Function, MxDef File, ECS Equipment Type mapping table

Function	MxDef file Name	ECS Equipment Type
Submit Fault Report	MxDefMOMAppFR_Submit.xml	AOWorkOrderSubmitter
View Active Work Order	MxDef_GetAWO.xml	AOWorkOrderList
View Equipment Status	MxDefGetEquipmentStatus.xml	AOEquipmentStatusList
View Prev Maint Schedule	MxDefGetMaintenanceSchedule.xml	AOPrevMaintScheduleList
View Spare Parts	MxDefSpareParts.xml	AOSparePartsList
View Spare Part Availability	MxDefAvailabilitySpareParts.xml	AOSparePartsAvailability
View Work Order History	MxDef_GetHWO.xml	AOWorkOrderList

1. The attributes that need to be added must be exposed by the Maximo Web service.

2. The attribute name is case sensitive between the AO MxDef file and ECS Model Equipment Type Property.

SAP/PM Integration

The SAP/PM Integration information can be found on Asset Optimization Server nodes. Refer to the Service Structure for the Asset Optimization Server.

1. The SAPDef files provide the mapping between the 800xA System environment and the SAP/PM system.

Do not edit the SAPDef files without consulting SAP AG personnel to determine the required. Editing these files without the required knowledge and expertise will result in problems with the SAP/PM system and CMMS interface to the SAP/PM system.

2. Assuming the default directory was selected during Asset Optimization installation, the default SAPDef files supplied with Asset Optimization are located in:

```
...\Program Files\ABB Industrial IT\Optimize IT\
Asset Optimization\AOECSConnector\SAPPMDef
```

These default SAPDef files are overwritten during an upgrade or reinstallation of the Asset Optimization software.

3. When Customizing the SAPDef Files, save them in a predefined folder name "CustomDef" created under the folder where the SAPDef files are installed:

```
...\Program Files\ABB Industrial IT\Optimize IT\
Asset Optimization\AoAIPSAPWebSrv\SAPXML\
<SAPSERVERIP>\\AOECSConnector\SAPPMDef\CustomDef
```

In general, Asset Optimization software is configured to search the subdirectory created for the customized SAPDef files before searching in the subdirectory for the default SAPDef files.

Deploying the SAP Model

Before proceeding further ensure that the ECS Software is installed and configured. Refer to *System 800xA Installation (3BSE034678*).*

Ensure to start the **ABB cpmplus Enterprise Connectivity** Services after restarting the node.

Ensure to set the Startup type for ABB cpmplus Enterprise Connectivity services as **Manual**.

The SAP Model is installed at the following directory:

```
<InstallDrive>\Program Files\ABB Industrial IT \OptimizeIT \
AssetOptimization\AOECSConnector\EcsDefinitions
```

The SAP Model File name is **AOSapModel.xml**

Deploy the model on AO Server node where ECS software is installed. Follow the steps as mentioned below:

1. From the desktop, double-click the Process Definition Tool or Go to **Start > Programs > ABB cpmPlus connectivity** and click on the process definition tool. The Process Definition Tool displays.
2. Click **File > Open** and point the ECS model install directory.
3. Select the AOSAPModel.xml and click **Open**.
4. Click **Model >Deploy > Deploy** to Production Environment.
5. **Start/Restart** the ABB cpmPlus Enterprise Connectivity Windows Service from the Service MMC Snap-in.

Alarm Behavior upon Fault Report Submittal

The Fault Report Submitter must be set up in the Aspect System Structure to provide default values for each instance of it applied to individual objects in the Primary Structures.

1. Use the Structure Selector to select the Aspect System Structure.
2. Navigate to:

   CMMS Views, Aspect System > Fault Report Submitter, Aspect Type > Fault Report Submitter, Aspect Category

3. Click on `Fault Report Submitter` in the Aspect List Area to produce the config view of the Fault Report Submitter in the Preview Area

4. The only setup required is to enable or disable the **Automatically dismiss Fault Report after successful submittal** check box. This check box controls the default setting in the Submit Fault Report view. Enabling the check box (and leaving it enabled in the Submit Fault Report view) deletes the current condition from the system when it is successfully submitted. It also acknowledges the alarm in the Alarm and Event List and dismisses it if the Alarm and Event List is configured to do so.

This function will not acknowledge alarms in Process Portal B.

User Privileges

The User Structure holds the defined users and user groups allowed to work in the system. Adding users and defining user roles is performed using the Configuration Wizard. All users must have a related Windows user account. The User object contains information about a user and what the user is allowed to do within the system. It also contains data specific to the user, such as profile configuration values.

The User Structure contains two levels under the root object: the first level holds User Groups, and the second holds Users. The Everyone - IndustrialITUser User Group contains all Users. Users can be added to the system and to User Groups using the Configuration Wizard.

Refer to the appropriate 800xA System documentation for detailed information on creating User Groups, adding Users, and the User Structure.

An authenticated web user (usually the logged on Windows user) must also be an 800xA user to access the Asset Optimization web-enabled views (e.g. from the Process Portal B Asset Optimization context menu).

Maximo User Credentials

Each User can contain Maximo Credentials. The Maximo Credentials contains the Maximo user credentials used to access the Maximo Server by the specific 800xA System user.

This procedure describes how to set up Maximo Credentials on a user.

1. Create a Maximo Credentials aspect on the desired User in the user Structure.

2. Right-click on the desired user and select **Maximo Credentials** from the context menu that appears. This opens the Maximo Credentials aspect shown in Figure 7.

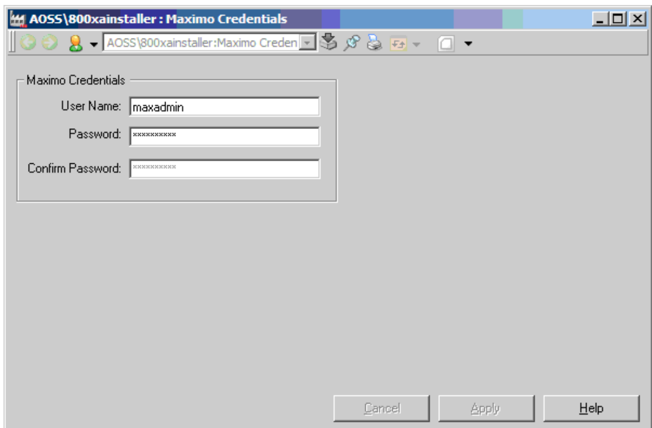


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Figure 7. Maximo Credentials Aspect

3. Enter the user name and password information for the selected user for access to the CMMS.
4. Click **Apply**.

SAP User Credentials

Each User can contain SAP Credentials. The SAP User Credentials contains the SAP user credentials used to access the SAP/PM Server by the specific 800xA System user.

This procedure describes how to set up SAP Credentials on a user.

1. Create a SAP Credentials aspect on the desired User in the User Structure.
2. Right-click on the desired user and select **SAP Credentials** from the context menu that appears. This opens the SAP Credentials shown in Figure 8.
3. Enter the user name and password information for the selected user for access to the CMMS.
4. Enter the SAP System Number.

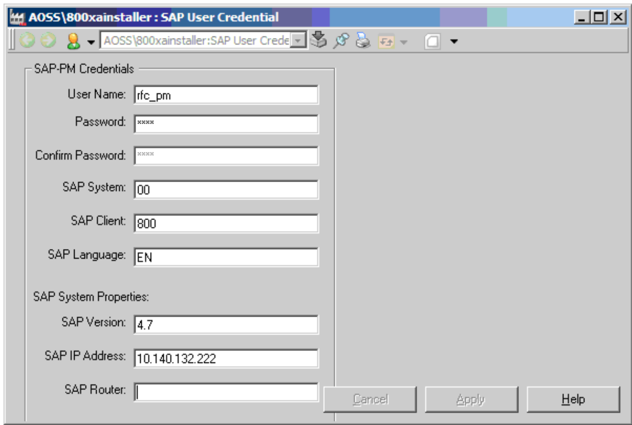

Figure 8. SAP Credentials Aspect

5. Enter the SAP Client Number.
6. Enter the desired user interface language (must be loaded onto the SAP server previously by the SAP Administrator).
7. Enter the SAP Version used.
8. Enter the IP address of the SAP server.
9. Enter the address of the SAP router ( ). Null means use the main SAP server address.
10. Click **Apply**.

Primary Structures

The following structures are called Primary Structures, because it is assumed that most operators and application engineers will perform the majority of their work within these structures.

- Asset Structure.
- Control Structure.
- Functional Structure.
- Location Structure.

- Object Type Structure.
- User Structure.
- Workplace Structure.

These structures are built by placing objects into the structures according to their hierarchical relations.

The object is a key concept in the Plant Explorer Workplace. The Plant Explorer Workplace is where the most basic elements of the system are created. These are the simple objects. Simple objects can be placed directly into a structure, but they can also be parts of other objects called composite objects. Simple objects can be pipes or valves or other basic elements used to build a more complex unit.

Composite objects, which can contain several other simple objects, are called parent objects. They are composed of a number of subordinate objects, called children or descendents. When a new object is created, the parent object can be selected, to which the new object will be a child.

Building the various structures is beyond the scope of this User Manual. Refer to the appropriate System 800xA documentation for detailed information and definitions of the various structures.

When the various structures are set up as desired, it may become necessary to move some Asset Optimization aspects to other areas in the structures by using the drag-and-drop method.

Do not move Asset Monitor Data Source aspects since all aspects referencing a moved Asset Monitor Data Source point to invalid Global Unique Identifiers (GUIDs).

Managing Data Source Connections

Asset Monitoring Engines manage connections to the OPC-DA servers required by the Asset Monitor Input Records. The data sources are specified during Asset Monitor configuration under the Input Records Tab.

Each OPC-DA server is defined by one Asset Monitor Data Source aspect that identifies its connection parameters. It is recommended that Asset Monitor Data

Source aspects be located in the Asset Optimization Object in the root of the **Control Structure**.

Renaming an Asset Monitor Data Source aspect to the same name as an existing Asset Monitor Data Source aspect is not a valid configuration.

After Asset Optimization installation, the Asset Optimization Object in the root of the Control Structure contains the default Afw OPC-DA Asset Monitor Data Source. This data source points to the 800xA System OPC Server located in the same node where the Asset Monitoring Engine is running (OPC Sever Node = localhost).

This procedure provides access to the Config view of the Afw OPC-DA Asset Monitor Data Source. Do not modify the values for this data source, since its configuration is shared by different Asset Monitors.

1. Use the Structure Selector to select the Control Structure.
2. Navigate to:

   `Root, Domain > Asset Optimization, Asset Optimization`

3. Select `Afw OPC-DA Asset Monitor Data Source` in the Aspect List Area to produce the Config view of the Afw OPC-DA Asset Monitor Data Source in the Preview Area as shown in Figure 9.

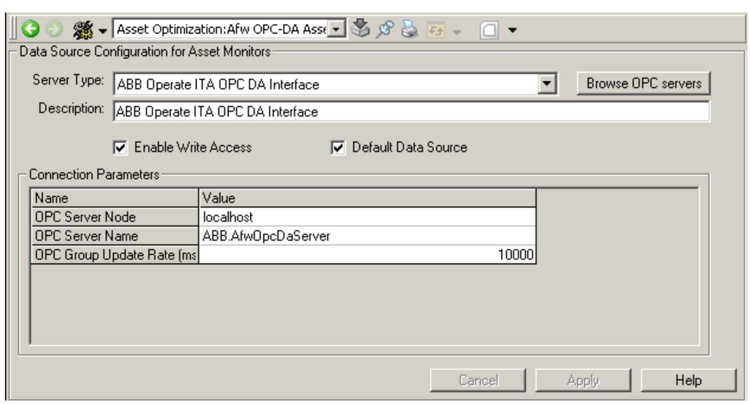

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Figure 9. Afw OPC-DA Asset Monitor Data Source Setup

The fields in the Asset Monitor Data Source are defined as follows:

– **Server Type:** Provides a list of preconfigured OPC-DA server templates.

- **Description:** Data source description.
- **Enable Write Access:** Global switch to control write permission. Makes it possible to write values from an Asset Monitor.
- **Default Data Source:** If enabled, marks the selected data source as the default one. For backward configuration compatibility, it is recommended to leave the Afw OPC-DA Asset Monitor Data Source as the designated default data source.
- **Browse OPC servers:** If the logon user has OPC browsing privileges on the selected OPC server node, clicking **Browse OPC servers** lists available OPC servers in the specified node.

The connection parameters for an OPC-DA server are:

- **OPC Server Node:** The hostname or address of the node hosting the OPC server.

If the OPC Server Name is `ABB.AfwOpcDaServer`, then the OPC Server Node must be set to **`localhost`**.

- **OPC Server Name:** The ProgID of the OPC server to connect to. Whenever possible the **OPC Server Name** should be set to **`ABB.AfwOpcDaServer`** since this OPC Server provides access to any other OPC servers integrated in the 800xA System.
- **OPC Group Update Rate (ms):** Used by the OPC server for performance/scalability tuning purposes. Refer to the specific OPC server documentation for more information.

If a different OPC Group Update Rate is needed (i.e., for `ABB.AfwOpcDaServer`) do not modify the default settings. Create a new Asset Monitor Data Source instead. This will avoid imposing the new settings on all Asset Monitors pointing to the default data source.

4. If changes have been made, click **Apply** to save the entered data.

   OPC connectivity to an OPC server located on a different node than the Asset Monitoring Engine uses DCOM protocol. Table 7 is a brief troubleshooting guide for typical OPC-DCOM connectivity problems. Refer to the specific OPC server documentation for additional troubleshooting.

Table 7. OPC-DCOM Connectivity Troubleshooting Guide

Problem	Solution
Incorrect network protocol	Use dcomcnfg.exe and make sure that TCP/IP is specified in the **Default Protocol** tab of both nodes. Ideally TCP/IP should be the first in the list unless other applications have different needs.
Incorrect Launch/Access user credential	Use dcomcnfg.exe to add the identity used by the 800xA Service Account in the Launch/Access lists (**Security** tab) for the OPC server.
Some OPC servers need to run under a specific user account (e.g. interactive user or a specific NT account)	Use dcomcnfg.exe to modify the OPC server application identity settings (**Identity** tab) and select the appropriate user.

Section 3 Configuration

Introduction

This section describes the configuration steps required to add Asset Optimization functionality to an 800xA System automation solution.

Asset Monitors provide automatic detection and reporting of changes in the monitored asset conditions.

From a configuration point of view, an asset is represented by an 800xA System object. This object can contain a number of Asset Monitors to assess relevant asset condition states.

Asset Monitors integrate seamlessly with the 800xA Alarm and Event system and SMS and e-mail Messaging, Asset Optimization CMMS Connectivity, and PC Network and Software Monitoring. It also provides integration capability with Device Calibration Integration.

> This section contains configuration procedures applicable to all system extensions; however, procedures specific to PC, Network and Software Monitoring are located in *System 800xA PC, Network, and Software Monitoring Configuration (3BUA000447*)*.

A library of Basic Asset Monitors is provided with the Asset Optimization Asset Monitoring functionality when this functionality is licensed. This library can be extended using the Asset Monitor Software Development Toolkit, which can be obtained from ABB Product Development.

This section provides procedures for configuring:

- Asset Monitors. Provides an overview of the tabs available for Asset Monitor configuration. Refer to Section 4, Basic Asset Monitor Library for detailed information on each Asset Monitor. Refer to *System 800xA PC, Network, and Software Monitoring Configuration (3BUA000447*)* for information on monitoring IT equipment and details on PC, Network and Software Monitoring.
- Configuration Macros. Can be used when configuring Asset Monitors. They provide parametric configuration capabilities that are useful when designing Object Types.
- Asset Condition Reporting including the Asset Reporter and Asset Viewer.
- Maximo Integration including Mapping the 800xA System Object to the Maximo Equipment and CMMS Views.
- SAP/PM Integration including Mapping the 800xA System Object to the SAP/PM Equipment and CMMS Views.
- Alarm Grouping.
- Repeat the procedure for all other Alarm and Event Lists..
- Automatic Fault Report Submitter

When creating aspects, it is possible to add a description and name to the aspect as desired. If the aspect is not named, the aspect category name is used and displayed in the Aspect List Area. Unless otherwise noted, the procedures in this User Manual use the aspect category name.

Asset Monitors

Asset Monitoring configuration can be performed on any 800xA System node.

To optimize the system engineering and minimize configuration effort, the 800xA System provides the capability to create object types that are used as templates to build the actual project configuration for the specific site.

Each Object represents a category of assets (e.g. a pump) used in the project specific configuration. The actual project configuration is composed of hierarchies of objects that are instances of previously defined Object Types. The following example shows an object type for a pump that may include the aspects shown in Figure 10.

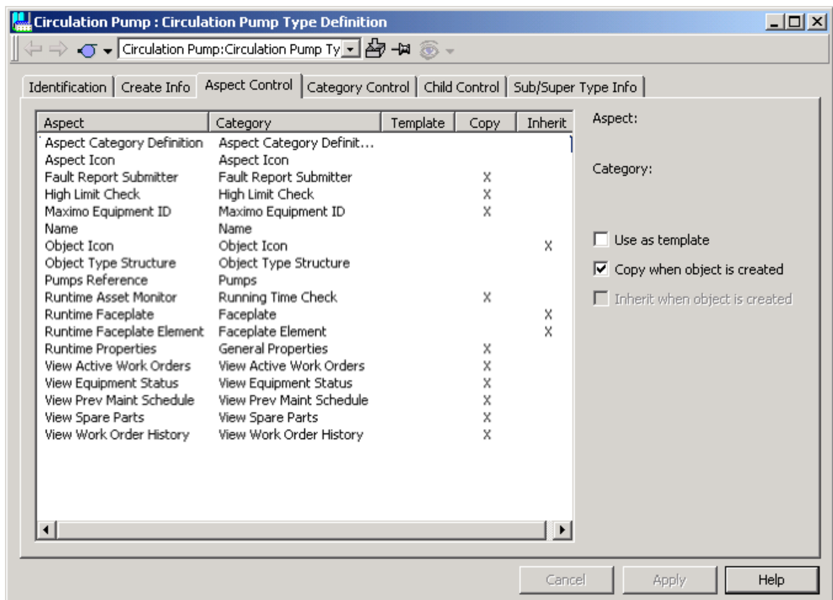

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Figure 10. Pump Object Type Definition

As shown in the figure, every object of this type will have:

- **Two Asset Monitors:** a Runtime Asset Monitor to monitor the pump hours of operation and a High Limit Check to monitor the lube oil temperature.

The Runtime Asset Monitor in this example has been renamed and does not match the category name of Running Time Check.

- **CMMS Views:** Active Work Orders, Work Order History, Equipment Status, Spare Parts, and Preventive Maintenance Schedule.
- **Maximo Equipment ID:** Defines the corresponding equipment ID in the configured Maximo system.
- **Fault Reporter Submitter:** To submit Asset Monitor generated Fault Reports or to create a new Work Order in the CMMS system.

- **Runtime Faceplate and Runtime Faceplate Element:** Constitute the faceplate. Used to reset the pump hours of operation when the pump is serviced (refer to *System 800xA Asset Optimization Operation (3BUA000150*)* for more information).

800xA provides inheritance for objects aspects so that changes on Object Types can be carried out automatically to all instances without the need to do the same change on all instances.

The default granularity of inheritance within the 800xA System is an aspect. If an aspect needs to be modified on the instance of that object, then its configuration inheritance is broken.

At times, customization of aspect configuration on instance level is necessary for Asset Monitor aspects. An example of such case would be:

An Object Type representing a type of pump having a Runtime Asset Monitor aspect may require adjusting the runtime limit at the instance level depending on the need of the particular pump instance.

Asset Monitor aspects provide a special inheritance behavior to allow modified aspect data on the instance level without stopping inheritance for other parts of the same aspect. It is possible to modify aspect configuration data for certain sections of an Asset Monitor aspect while still keeping inheritance for those configuration sections that do not need customization. This functionality increases the granularity of inheritance from the entire aspect to the following Asset Monitor configuration sections:

- **Asset Monitor Tab:** Execution Interval, Asset Monitor URL, and Logic Failure Severity.
- **Condition Tab:** For each Condition following SubCondition fields:
  - Subcondition Name.
  - Condition Label.
  - Description.
  - Severity.
  - Corrective Action Taken.
  - Possible Cause.
  - Suggested Action.
- **Asset Parameters Tab:** Asset Parameters Values.

- **A&E Filters Tab:**
  - Severity Range.
  - Source List.
  - Alarm Categories.
- **Input Records Tab:** Fields:
  - Data Source Aspect.
  - Trigger Execution.
  - Data Source Item.

Use of Asset Monitor aspects on Object Types is the preferred way of engineering if the customized object type with its Asset Monitor aspect will be used on several instances in the project. It is recommended for users to perform as much configuration as possible at the Object Type level to minimize or even eliminate the engineering effort for the Asset Monitoring aspect during instance-specific instantiation of the Object Type.

Configuration of Asset Monitor Aspects on Object Types

- Create the objects in the Object Type Structure and add the needed Asset Monitor aspects.
- Configure the Asset Monitor aspects on the Object Type as far as possible by disabling the **Inherit Configuration** check box and entering the Object Type specific information. Refer to Asset Monitor Tab on page 57 through Logic Tab on page 67 for specific instructions on configuring the items under the various tabs in the Asset Monitor aspect.
- By disabling the **Inherit Configuration** check box the information will not be inherited from the category anymore regardless of whether or not it was edited.
- It is possible to re-enable the **Inherit Configuration** check box if it is necessary to go back to the original information. The manually edited data will be overwritten.
- Open the Object Type Definition aspect on the new Object Type and select **Copy to all instances** in the **Aspect Control** tab for the newly added Asset Monitor aspects. This setting translates into copying the Asset Monitor aspects

to all of its object instances, but these instance Asset Monitors will, by default, inherit from the Object Type.

If the object type being extended with Asset Monitors belongs to an existing Library, then it is recommended to package the newly added aspects in a Library Extension. Refer to *System 800xA Configuration (3BDS011222*)* for more information.

- Whenever the Object Type gets instantiated, the Asset Monitors for this particular instance will inherit their information from the Object Type.
- An instance specific modification of an Asset Monitor aspect coming from an Object Type is still possible by disabling the **Inherit Configuration** check box on the specific TAB of the instance.

Configuration of Asset Monitor Aspects Directly on the Instances

In case there are only a few objects of the same type in a project or there is no object type available, Asset Monitor aspects can be directly added on Object instances in the Control Structure (inheritance from Category).

Add the Asset Monitor aspects to the object and configure the Asset Monitor aspect by disabling the **Inherit Configuration** check box and making required customization. Refer to Asset Monitor Tab on page 57 through Logic Tab on page 67 for specific instructions on configuring the items under the various tabs in the Asset Monitor aspect.

By disabling the **Inherit Configuration** check box the information will not be inherited from the category regardless of whether or not it was edited.

It is possible to re-enable the **Inherit Configuration** check box if it is necessary to go back to the original information. The manually edited data will be overwritten.

For each Asset Monitor available for configuration there is a corresponding Asset Monitor Aspect Category as shown in Figure 11.

Asset Monitors placed on an Object Type are not considered part of the active configuration. Their definition will not be loaded to the AO Server.

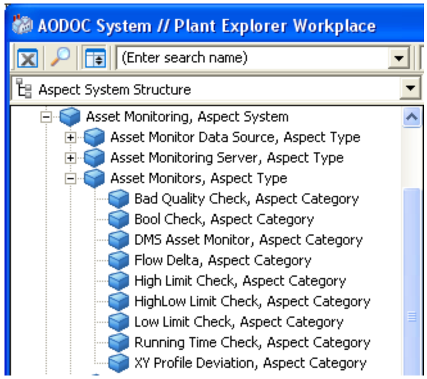


Figure 11. Asset Monitor Aspect Categories

The Config view of each category of Asset Monitor contains the same tabs. They are summarized in Table 8.

Table 8. Asset Monitor Config View Tabs

Tab	Description	Configurable
Asset Monitor	Allows selection of the AO Server assignment, Logic Execution Interval, Logic Failure Severity, and Asset URL. In Asset Monitor instances the **Asset Monitor** tab also provides information about Asset Monitor lifecycle such as: Configuration Last Modified time, Configuration Loaded to time, and Configuration Loaded to AO Server. The **Asset Monitor** tab also provides an indication of the source of inherited configuration: either *Asset Monitor Category* or *Object Type's Asset Monitor.*	Yes
Conditions	Contains a list of conditions monitored by the logic and a list of subconditions defining each condition.	Yes
Asset Parameters	Contains asset specific information needed by the condition assessment logic for execution.	Yes

Table 8. Asset Monitor Config View Tabs (Continued)

Tab	Description	Configurable
Input Records	Contains asset related measurement records needed by the condition assessment logic for execution, usually pointing to OPC items.	Yes
Output Records	Contains Output Records included in the ACD. If no Output Records exist on the Asset Monitor, this tab will not be shown.	No
A&E Filters	Contains the Alarm and Event filters, if any, identifying the Alarm and Event to which the Asset Monitor subscribes. If no Alarm and Event filters are specified, this tab will not be shown.	Yes
Logic	Contains monitoring logic definition and Asset Monitor startup parameters.	Yes (Asset Monitor category only)

Asset Monitor Configuration

Asset Monitor configuration can be local or inherited from its configuration parent. To customize Asset Monitor configuration (make it local) it may be required to selectively break configuration inheritance on those areas of configuration that need customization.

The configuration inheritance source, which can be ascertained by looking at the **Asset Monitor** tab in the Asset Monitor Config View, shows the source of the inherited configuration for a particular Asset Monitor.

The inherited configuration source is automatically selected as follows:

- The Asset Monitor aspect in Asset Monitor Category object never inherits configuration.
- An Asset Monitor aspect in an Object Type always inherits its configuration from the corresponding Asset Monitor Category: **Inherits from Asset Monitor category**.
- An Asset Monitors aspect defined in an object instance inherits configuration from either:

1. Corresponding Object Type: if the Asset Monitor was created by enabling the **Copy to all instances** check box on the Object Type > Type Definition Aspect > Aspect Control tab: **Inherits from Object Type's Asset Monitor**.
2. Corresponding Asset Monitor Category: if the condition in Step 1 is not met: **Inherits from Asset Monitor Category**.

The source of inherited configuration applies to the entire Asset Monitor Configuration, not just the **Asset Monitor** tab.

Asset Monitor configuration changes do not take effect in the AO Server until the Asset Monitor is explicitly loaded.

Asset Monitor Tab

The following sections explain how to configure each tab of an Asset Monitor aspect configuration view. These generic Asset Monitor configuration instructions should be used together with Asset Monitor specific documentation to provide insight on the actual meaning of the configuration parameters.

The first tab in the Asset Monitor Configuration view is the **Asset Monitor** tab. Figure 12 shows the **Asset Monitor** tab of the Bool Check Asset Monitor.

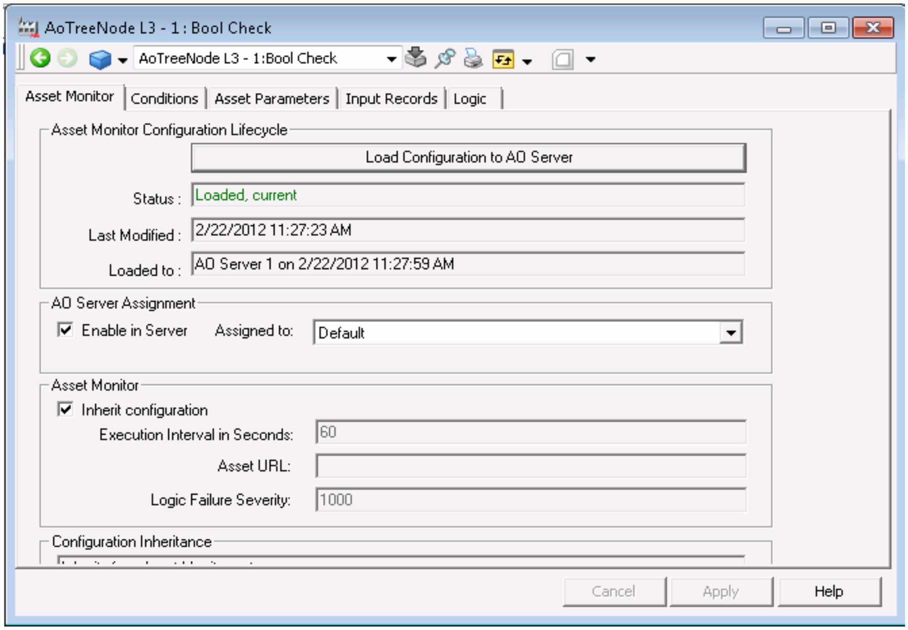


Figure 12. Asset Monitor Tab

To configure the **Asset Monitor** tab:

1. Server Assignment frame:

   a. Configure Server Assignment by selecting AO Server designated to execute the Asset Monitor logic from the **Assigned to** drop-down list box. If **Default** is selected, then the AO Server designated to be the default will be used upon configuration load.

   b. Enable the **Enable in Server** check box to include this Asset Monitor in the next AM Configuration Load to the specified AO Engine. If the **Enable in Server** check box is disabled then the next AM Configuration Load will remove (if previously loaded) this Asset Monitor from the specified AO Engine.

Server Assignment configuration is never inherited from the parent.

The AO Server that an Asset Monitor is assigned to is always the same for all Asset Monitors within one object. Upon creation of a new Asset Monitor on an object, the consensus AO Server value is assigned to it. If no other Asset Monitors exist on the object, then the copied value is used.

When a new Asset Monitor is created by Copy/Paste from an existing aspect, it will always be set to **Enable in Server**, no matter what this value was in the original aspect.

2. Asset Monitor frame:

   a. Enable the **Inherit configuration** check box to use the inherited configuration or disable it to customize the following configuration parameters.

   – **Logic Execution Interval:** The requested time interval in seconds between subsequent, evenly spaced Asset Monitor logic executions in the Asset Monitoring Engine.

The actual execution interval may be longer than the configured one on heavily loaded systems. Additionally, the actual execution interval may be shorter if any of the Asset Monitor Input Records or Alarm and Event filters have the **Trigger Execution** option enabled.

- **Asset URL:** Address of a web page providing asset relevant information. When this configuration parameter is specified the **Diagnostics** menu entry is enabled in the Asset Monitor and Asset Reporter views. Configuration macros can be used in the Asset URL. Refer to Configuration Macros on page 76 for more information.
- **Logic Failure Severity:** The alarm severity used in alarming the abnormal status of an Asset Monitor, such as bad configuration or bad Input Records values. These kind of alarms are of the category *Asset Monitoring Status Alarm* and do not generate a Fault Report when activated.

b. Click **Apply** to save the configuration changes.

3. Asset Monitor lifecycle frame: This section provides information about the current configuration state of the Asset Monitor as it relates to the one loaded in the designated AO Server:
   - **Load Configuration to AO Server:** Loads (or unloads if the Asset Monitor is disabled) this Asset Monitor to/from the configured AO Server. This operation can be performed even if the AO Server is not running.
   - **Last Modified:** Timestamp of when this Asset Monitor configuration, or the one of the parent it inherits from, was last modified.
   - **Loaded to:** Timestamp and AO Server name where this Asset Monitor configuration was last loaded to, if any.

Conditions Tab

The **Conditions** tab contains the definition of the condition or conditions that are assessed and reported by the specific Asset Monitor. The main functionality of the Asset Monitor is to monitor the operating parameters of an asset and report the current subcondition for each defined condition.

Each condition is defined by a set of subconditions. Subconditions for a given condition are mutually exclusive. Subcondition ENUM 0 always represents the normal condition state. A transition to the normal state will deactivate the associated Asset Condition published in the containing object by a running Asset Monitor.

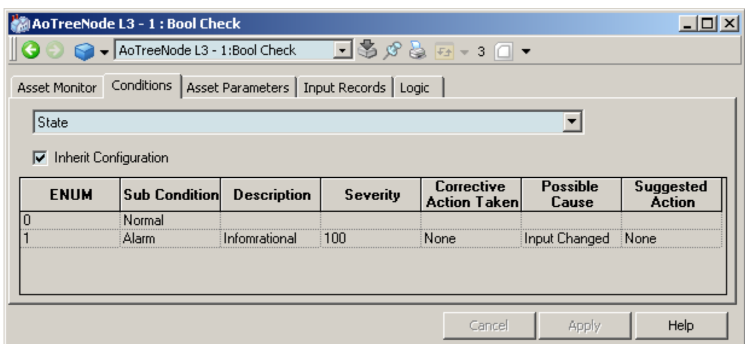
The only subconditions that generate a Fault Report in the Fault Report Submitter are those that are not normal with good quality status.

Asset Monitor conditions are defined in the Asset Monitor Category. However, it is possible to customize the Condition Labels at the Asset Monitor Category, Object Type, and instance level.

To customize the Condition Labels in Asset Monitors, it is necessary to break the selected Condition configuration inheritance by disabling the **Inherit configuration** check box.

After breaking inheritance (disabling the **Inherit configuration** check box) on one condition and modifying its data, first click **Apply** if it is intended to restore inheritance (enable the **Inherit configuration** check box) on the different condition. This step is necessary to avoid a loss of newly edited data on the first condition.

Figure 13 shows the **Conditions** tab of the Bool Check Asset Monitor with the **Inherit configuration** check box enabled.



TC05024E

Figure 13. Conditions Tab

To modify the Condition Label for each condition:

1. Click **Edit** (next to the **Condition** drop-down list box).
2. Enter the new text (next to the **Condition** drop-down list box) and click **Apply**.
3. The configuration for the subconditions of each condition is as follows:
   - **ENUM:** Integer that uniquely identifies the subcondition to the Asset Monitor logic. This field can not be customized.

- **SubCondition:** Subcondition Label. A non blank text string representing the subcondition state.
- **Description:** Subcondition description.
- **Severity:** Subcondition severity range 1 to 1000. This is also used when notifying the Alarm and Event List of a transition to this subcondition.
- **CorrectiveActionTaken:** The Asset Monitor may report an action that was taken by the system to reduce the effect of this state (e.g. emergency shutdown initiated).
- **Possible Cause:** Reports the diagnosis leading to this state (e.g. high vibration).
- **Suggested Action:** Provides hints on how to react (e.g. schedule maintenance) This is usually the most useful field when the related Fault Report is submitted in a CMMS as a Work Order.

Some Asset Monitors may dynamically provide the content of the subcondition fields and override user configured defaults.

It is possible to define configuration macros for the conditions definition. Refer to Configuration Macros on page 76 for more information.

Asset Parameters Tab

The **Asset Parameters** tab contains configuration parameters used to provide additional asset information required by the Asset Monitor algorithm. Refer to the specific Asset Monitor documentation for more information.

It is possible to define configuration macros for the Asset Parameter values. Refer to Configuration Macros on page 76 for more information.

Asset Monitor Asset Parameters are defined by the Asset Monitor category. However, it is possible to customize those parameter values at the Asset Monitor, Object Type, and instance level.

To customize Asset Parameter values in Asset Monitors, it is necessary to break the Asset Parameters configuration inheritance by disabling the **Inherit configuration** check box.

Figure 14 shows the Asset Parameters tab of the Bool Check Asset Monitor with the **Inherit configuration** check box enabled.

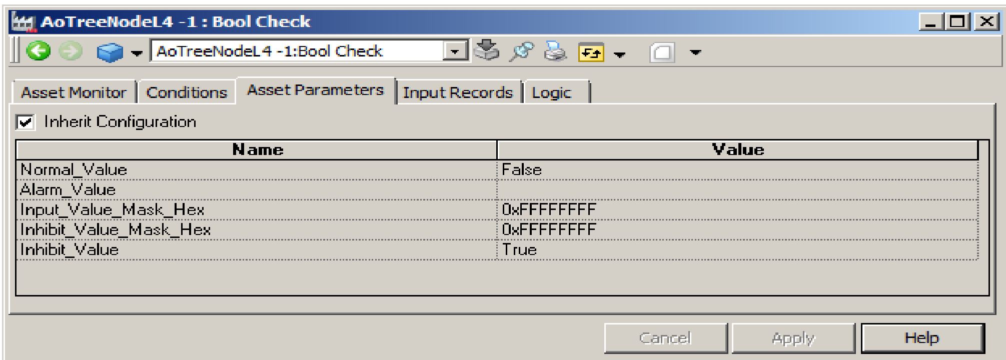
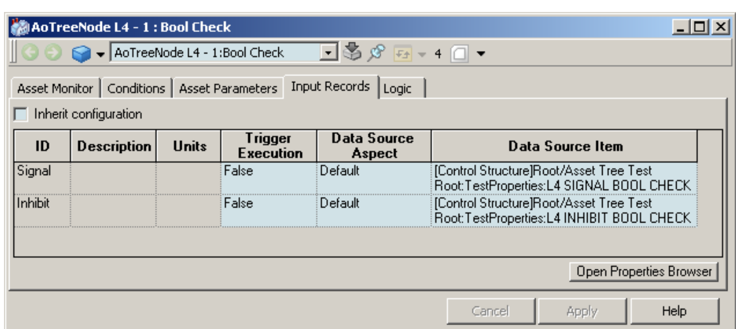


Figure 14. Asset Parameters Tab

Input Records Tab

The **Input Records** tab contains the definition of OPC-DA data items used by the Asset Monitor to assess the current asset condition.

Figure 15 shows the **Input Records** tab of the Bool Check Asset Monitor.



TC05038E

Figure 15. Input Records Tab

Asset Monitor Input Records are defined by the Asset Monitor category. However, it is possible to customize the Trigger Execution, Data Source Aspect, and Data Source Item fields at the Object Type, or instance level.

To customize Input Records in Asset Monitors it is necessary to break the Input Records configuration inheritance by disabling the **Inherit configuration** check box.

The columns in the **Input Records** tab are the same for all Asset Monitors and are defined as follows:

- **ID:** Input Record indentifier.
- **Description:** Input Record description.
- **Units:** Input record expected engineering units.
- **Trigger Execution:** When **True**, the Asset Monitor will be scheduled for immediate execution upon change notification of the subscribed OPC value. Thus setting this configuration parameter to **True** may increase the actual Asset Monitor execution frequency based on the Input Record's Data Source Aspect OPC Group Update Rate. Regardless of this setting the Asset Monitor will still be periodically executed based on the overall Execution Interval configuration parameter of the Asset Monitor.
- **Data Source Aspect:** Provides a pick list to select one of the available Asset Monitor Data Sources defining the OPC-DA server and related OPC group update rate sourcing the value.

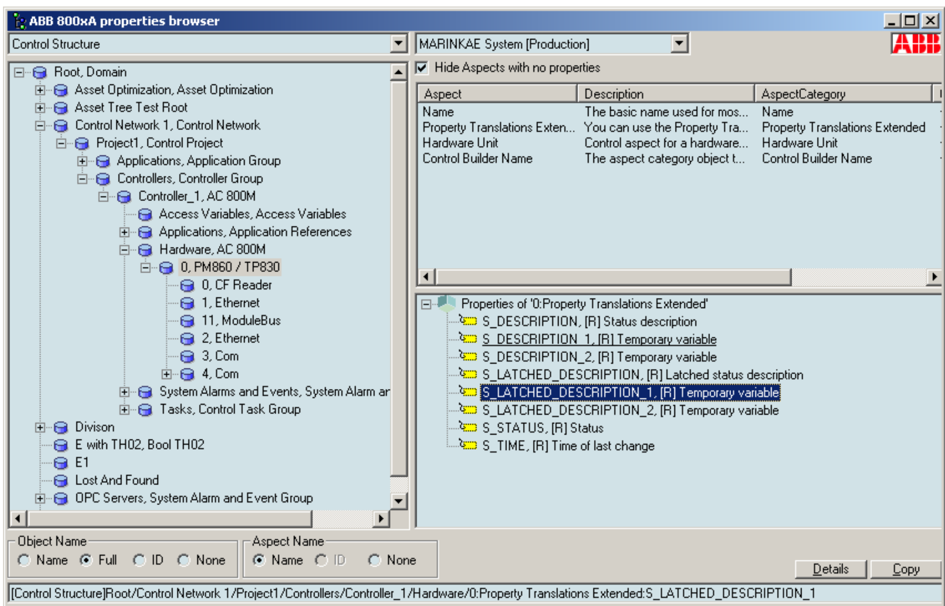
If `Default` is selected, then the Asset Monitor Data Source designated as the default will be selected upon configuration download to the Asset Optimization Server.

Multiple Asset Monitor Data Sources can be configured to point to the same OPC Server. Each Asset Monitor Data Source can have a different OPC Group Update Rate to optimize the load on the subsystem from which the data originates. Asset Monitor Data Source aspects are usually located in the Asset Optimization Object.

- **Data Source Item:** Identifies the OPC item ID in the data server from which to read the value.

If the Asset Monitor Data Source aspect points to the ABB.AfwOpcDaServer, the Data Source Item can be selected with the aid of the 800xA Properties Browser.

Click **Open Properties Browser** in the **Input Records** tab to open the 800xA Properties Browser similar to the one shown in Figure 16.



TC05352B

Figure 16. 800xA Properties Browser

To use the Object Properties Browser:

1. Navigate to the Process Portal Object containing the property that needs to be associated to the input record.
2. Select the aspect containing the property.
3. Browse the Aspect Properties in the bottom right frame and select the desired property.

4. Copy the name of the property from the 800xA Properties Browser into the Data Source Item of the appropriate Input Record.

By default the 800xA Properties Browser provides a property name preceded by the fully qualified object name. If the property resides in the same object as the Asset Monitor, it is recommended to replace the object name with the %ID% macro. Refer to Configuration Macros on page 76 for more information.

A&E Filters Tab

The **A&E Filters** tab Contains the Alarm and Event Filters, if any, identifying the Alarm and Event to which the Asset Monitor subscribes. If no Alarm and Event Filters are specified then this tab will not be shown.

Asset Monitor Alarm and Event Filters are defined by the Asset Monitor category. However, it is possible to customize those filters at the Asset Monitor Object Type, and instance level.

To customize an Alarm and Event Filter it is necessary to break its configuration inheritance by disabling the **Inherit configuration** check box. Figure 17 shows the **A&E Filters** tab with the **Inherit configuration** check box disabled.

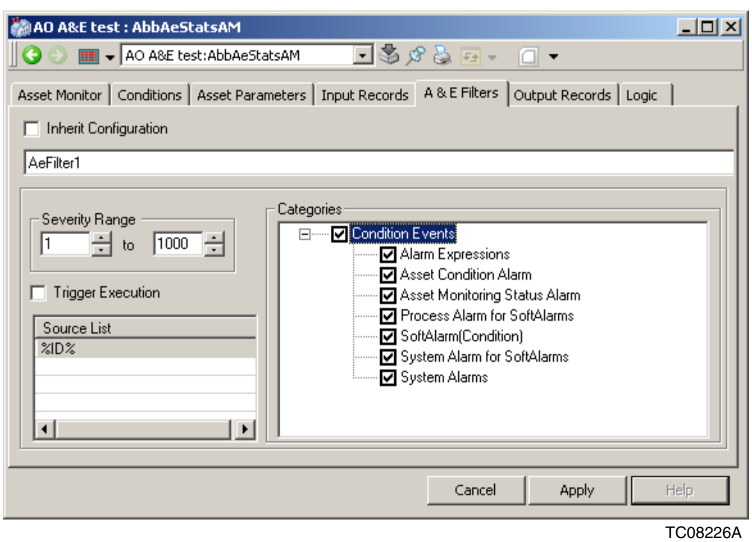


Figure 17. A&E Filters Tab

For each Alarm and Event Filter the following configuration parameters apply:

Severity Range: Specifies the severity range (inclusive) of the Alarm and Event of interest for the selected filter. Clients that wish to receive events of all severities should set the Low Severity to 1 and the High Severity to 1000.

Source List: A list of 800xA Object IDs or names sourcing the Alarm and Event of interest for the selected filter. Macros can be used in specifying a source; for example, %ID%. Refer to Configuration Macros on page 76 for more information.

An empty source list will translate into a *Filter All* filter.

Categories: The list of categories of the Alarm and Event of interest for the selected filter.

An empty categories list will translate into a *Filter All* filter.

Output Records Tab

The **Output Records** tab has no configurable values. The Output Records tab is only visible when the Asset Monitor has Output Records. It is for information only and shows the Output Records, if any, that will be included in an ACD. Output Records usually contain logic calculated values such as accumulated runtime and other defining information for the asset condition.

Output Record values are published in the object, where the Asset Monitor resides, by the AssetMonitorProperties Control Connection aspect.

Logic Tab

The **Logic** tab has no configurable values in the Primary Structures. It shows the monitoring logic definition and the Asset Monitor startup parameters.

The startup parameters of the **Logic** tab can be customized only in the selected Asset Monitor category object in the Aspect System Structure. Refer to the specific Asset Monitor documentation for more information.

Asset Monitor Bulk Data Manager Support

Asset Monitors can be Added/Deleted/Modified using the Bulk Data Manager (BDM) 800xA engineering Excel add-in.

When an Asset Monitor aspect is dragged into a BDM enabled Excel spreadsheet a pick list will expose all of the Asset Monitor configuration properties.

Asset Monitors of different categories may have a different set of configuration properties for Conditions, Asset Parameters, Input Records, A&E Filters, and Output Records.

Figure 18 shows a sample of Configuration properties for a Bool Check Asset Monitor.

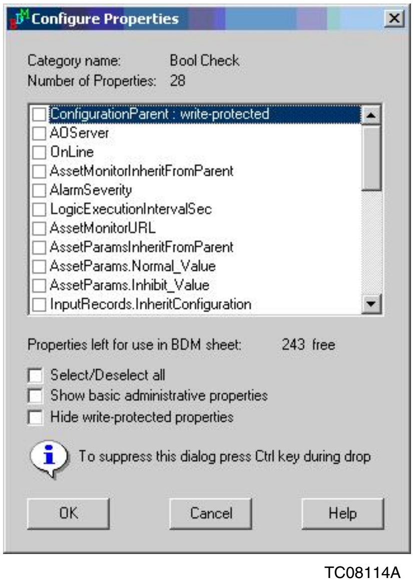


Figure 18. Bulk Data Manager Configuration Properties Example

Enable the **Hide write-protected properties** option to only show updatable configuration properties. If invalid values or values for Read-only fields are entered, BDM will not apply such values to the referenced Asset Monitor upon configuration save. Furthermore, an error message will be displayed in the Errors worksheet of Excel.

Asset Monitor Tab Data

The fields listed in Table 9, which represent properties in the **Asset Monitor** tab of the Asset Monitor aspect Config View are enabled in BDM.

Table 9. Asset Monitor Tab BDM Properties

Property Name	Notes	Access
AOServer	This field contains one of the following strings: • The name of an AO Server formatted as ObjectName:Aspect Name (e.g. AO Server1:Asset Optimization Server) • The string **Default** to reference the AO Server designated as the default in the system.	R/W
OnLine	Enable in Server. Values: **True**, **False**	R/W
ConfigurationParent	Inherited configuration source	R
AssetMonitorInheritFromParent	Inherit configuration switch. Values: **True**, **False**	R/W
AlarmSeverity	Range: integer 1 to 1000	R/(W)[1]
LogicExecutionIntervalSec	Logic Execution Interval in seconds. Range: integer greater or equal to 1	R/(W)[1]
AssetMonitorURL	Asset Monitor URL String	R/(W)[1]

NOTE:
1. This field is read only if AssetMonitorInheritFromParent is **True**.

Conditions Tab Data

The fields listed in Table 10, which represent properties in the **Conditions** tab of the Asset Monitor aspect Config View are enabled in BDM.

Table 10. Conditions Tab BDM Properties

Property Name	Notes	Access
<ConditionName>.InheritFromParent	Inherit configuration switch. Values: **True**, **False**	R/W
<ConditionName>.ConditionLabel	Condition Label. Must be a non blank string.	R/(W)[1]
<ConditionName>.<SubConditionEnum>.SubCondition	SubCondition Names. Must be non blank.	R/(W)[1]
<ConditionName>.<SubConditionEnum>.Description	SubCondition Description string	R/(W)[1]
<ConditionName>.<SubConditionEnum>.PossibleCause	SubCondition PossibleCause string	R/(W)[1]
<ConditionName>.<SubConditionEnum>.SuggestedAction	SubCondition SuggestedAction string	R/(W)[1]
<ConditionName>.<SubConditionEnum>.CorrectiveActionTaken	SubCondition CorrectiveActionTaken string	R/(W)[1]
<ConditionName>.<SubConditionEnum>.Severity	SubCondition Severity. Range: integer 1 to 1000	R/(W)[1]

NOTE:
1. This field is read only if <ConditionName>.InheritFromParent is **True**.

There can be one or more Conditions defined in an Asset Monitor. Each Condition can have two or more SubConditions defined.

Asset Parameters Tab Data

The fields listed in Table 11, which represent properties in the **Asset Parameters** tab of the Asset Monitor aspect Config View are enabled in BDM.

Table 11. Asset Parameters Tab BDM Properties

Property Name	Notes	Access
AssetParamsInheritFromParent	Inherit configuration switch. Values: **True**, **False**	R/W
AssetParams.<AssetParam Name>	Asset Parameter string Value	R/(W)[1]

NOTE:
1. This field is read only if AssetParamsInheritFromParent is **True**.

There can be zero or more Asset Parameters defined in an Asset Monitor.

Input Records Tab Data

There can be zero or more Input Records defined in an Asset Monitor.

The fields listed in Table 12, which represent properties in the **Input Records** tab of the Asset Monitor aspect Config View are enabled in BDM.

Table 12. Input Records Tab BDM Properties

Property Name	Notes	Access
InputRecords.InheritConfiguration	Inherit configuration switch. Values: **True**, **False**	R/W

Table 12. Input Records Tab BDM Properties (Continued)

InputRecords. <InputRecordName>.DataSource	This field contains one of the following strings: • The name of an Asset Monitor Data Source formatted as ObjectName:Aspect Name (e.g. Asset Optimization:Afw OPC-DA Asset Monitor Data Source) • The string Default to reference the Asset Monitor Data Source designated as the Default in the system. • The string None for unused optional Input Records.	R/(W)[1]
InputRecords. <InputRecordName>. TriggerAmExecution	True/False	R/(W)[1]
InputRecords. <InputRecordName>.DataItemID	Data Item ID string	R/(W)[1]

NOTE:

1. This field is read only if InputRecords.InheritConfiguration is **True**.

A&E Filters Tab Data

The fields listed in Table 13, which represent properties in the **A&E Filters** tab of the Asset Monitor aspect Config View are enabled in BDM.

Table 13. A&E Filters Tab BDM Properties

Property Name	Notes	Access
OpcAeFilters.InheritConfiguration		R/(W)
OpcAeFilters.<FilterName>. Description	Filter description text.	R/(W)[1]
OpcAeFilters.<FilterName>. HighSeverity	1 to 1000	R/(W)[1]
OpcAeFilters.<FilterName>. LowSeverity	1 to 1000	R/(W)[1]

Table 13. A&E Filters Tab BDM Properties (Continued)

OpcAeFilters.<FilterName>. EventTypes	This is not used if at least one category is defined in the filter. Refer to Table 14 for valid values.	R/(W)[1]
OpcAeFilters.<FilterName>. TriggersAmExecution	True/False	R/(W)[1]
OpcAeFilters.<FilterName>. Sources	XML string format example: <Sources><S Name="%ID%"/><S Name="{DA4F7E12-F04E-4B58-B659-462F80E6BB21}"/></Sources>	R/(W)[1]
OpcAeFilters.<FilterName>. Categories	ML string format example: "<Categories><Category ID="69781140" Name="Process Alarm for SoftAlarms" EventTypes="4"><Attrs/></Category></Categories>	R/(W)[1]

NOTE:
1. This field is read only if OpcAeFilters.InheritConfiguration is **True**.

Table 14 lists the A&E Filters tab EventTypes.

Table 14. A&E Filters Tab EventTypes

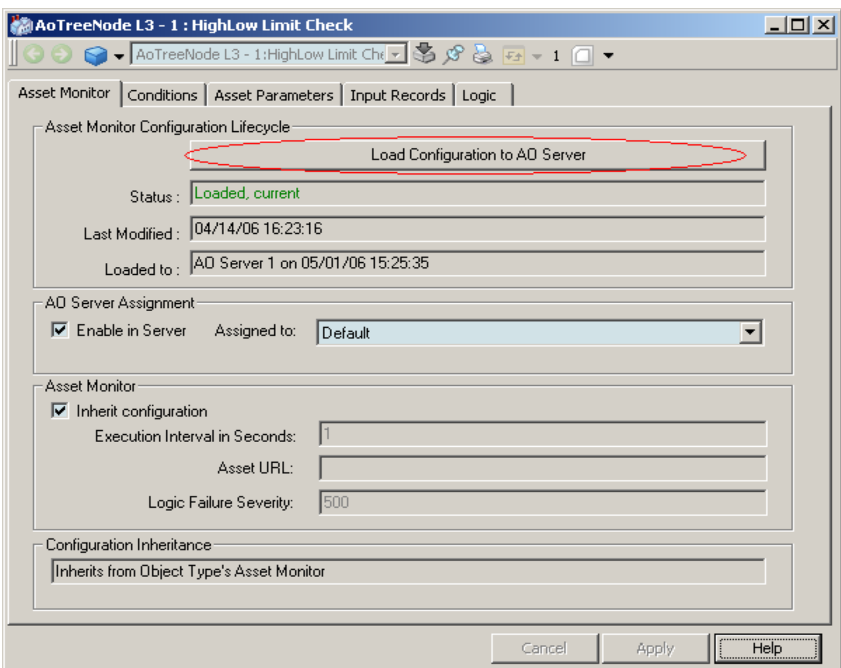
EventType	Value
Simple[1]	1
Tracking[1]	2
Condition	4
All[1]	7
Simple and Tracking[1]	3
Tracking and Condition[1]	6
Condition and Simple[1]	5

NOTE:
1. Not supported by the AO Server.

Loading a Single Asset Monitor

It is possible to incrementally load or unload a single Asset Monitor by clicking **Load Configuration to AO Server** in the **Asset Monitor** tab of its configuration view. This action will perform exactly the same operation as selecting a single asset monitor from the **Asset Monitors** tab in the Asset Optimization Server aspect (refer to Loading Asset Monitor Configurations to an AO Server on page 21.

Click Load Configuration to AO Server on the Asset Monitor tab of its configuration view (Figure 19).



TC07795D

Figure 19. Load AM Configuration

1. If the configuration of the Asset Monitor has not changed since the previous load, the message stating that the configuration is up to date appears. If the user chooses to continue, the selected Asset Monitor's configuration (the same as

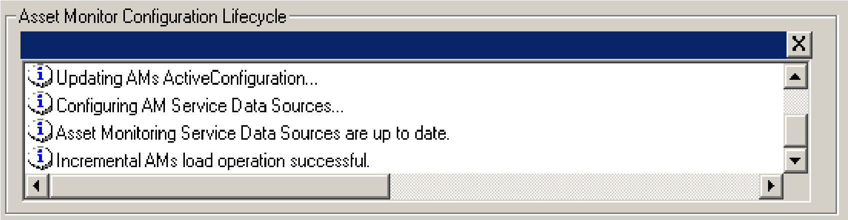
currently loaded) will be reloaded to the AO Server. Click **Continue** to load or **Abort** to quit.

2. If the configuration of the Asset Monitor has changed (excluding AO Server field) since the previous load, a message stating that the Asset Monitor will be updated appears. If the user chooses to continue, the selected Asset Monitor's new configuration will be reloaded to the AO Server. Click **Continue** to load or **Abort** to quit.

3. If the configuration of the Asset Monitor has changed, including AO Server, since the previous load a message stating that the Asset Monitor will be removed from one AO Server and added to the another AO Server appears. If the user chooses to continue, the selected Asset Monitor's new configuration, as well as all other enabled Asset Monitor aspects on the object, will be reloaded to the AO Server. Click **Continue** to load or **Abort** to quit.

4. If the Asset Monitor has been disabled since the previous load a message stating that the Asset Monitor will be removed appears. If the user chooses to continue, the selected Asset Monitor will be removed from the AO Server. Click **Continue** to remove the Asset Monitor or **Abort** to quit.

5. The Configuration Load information will be updated for the Asset Monitor aspect as shown in Figure 20.



TC07801B

Figure 20. Configuration Load Information

6. Click on the **X** on the upper right corner of the Configuration Load information area to show the AM load button and related Lifecycle information again.

Configuration Macros

Use the Configuration macros to configure Asset Monitors, CMMS Equipment ID. Configuration macros provides parametric configuration capabilities in designing the Object Types.

Macros are the strings delimited by the % character that can be used in the following fields during the Asset Monitor Configuration, Maximo Equipment ID, and SAP Equipment ID Configuration.

- Conditions definition (Conditions Tab).
- Asset Parameter Values (Asset Parameters Tab).
- Input Records Data Source Items (Input Records Tab).
- URL Definition (Asset Monitor Tab).
- Source List (A&E Filters Tab).
- Maximo Equipment value.
- SAP Equipment value.

If the % character is required in a field that accepts macros, enter using the %% characters sequence.

Macros contains the name of the 800xA System object property. The 800xA System object property value will be substituted during the Asset monitor configuration load to the Asset Monitoring Engine.

The following are examples of possible macro syntax:

```
%<PropertyName>%, example: %HighLow Limit Check.ProcessValue%

%<ObjectName>:<PropertyName>%, example:
%AMTestObject1:HighLow Limit Check.ProcessValue%

%:<AspectName>:<PropertyName>%, example:
%:General Properties:HighLow Limit Check.ProcessValue%

%<ObjectName>:<AspectName>:<PropertyName>%, example:
%AMTestObject1:General Properties:HighLow Limit
Check.ProcessValue%
```

```
%<QualifiedObjectName>:<PropertyName>%, example: %[Control
Structure]Asset Monitoring Server/AMTestObject1:General
Properties:HighLow Limit Check.ProcessValue%

%ID%/[Structure Name]ChildObjectName:AspectName:PropertyName,
example: %ID%/[Control Structure]child1:GeneralProerties:
CHILDPROPERTY

%..:<AspectName>:<PropertyName>%,
example: %..:Name:Description%

%...:<AspectName>:<PropertyName>%,
example: %...:CNGP:MX62%

where:
<ObjectName> is a placeholder for the name of a specific
object in the system.
<AspectName> is a placeholder for the name of a specific
aspect in the system.
<PropertyName> is a placeholder for a specific property in the
system.

%ID% (where %ID% is a special macro that returns the 800xA
System object Global Unique Identifier (GUID) on which the
Asset Monitor resides).

".." is used to return the property value one level up.

"..." is used to return the property value in the current
object and all parent object till the value is found.
```

The following are the examples of possible macros:

1. **`%Name%`** or **`%:Name:Name%`** - returns the object name on which the Asset Monitor resides.
2. **`%ID%:PV`** - returns `{69E932E4-2815-4D86-B235-DB226244705A}:PV`

%ID% can be used as a replacement of 800xA System object name when specifying OPC items in the 800xA System OPC server.

Follow the guidelines to avoid possible property name uncertainty in specifying the macros:

- If possible, use the %ID% to identify a Process Portal Object, else use the fully qualified object name.
- If possible, include the aspect name in addition to the property name.

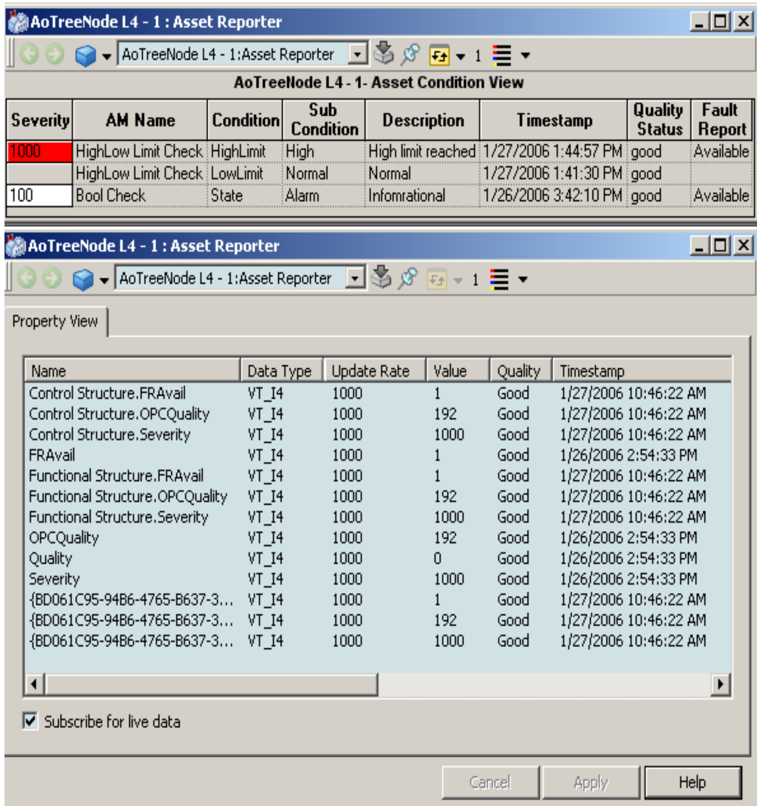
Asset Condition Reporting

Asset Optimization provides asset condition reporting and monitoring status through the Asset Viewer, Asset Reporter, Fault Report Viewer (refer to *System 800xA Asset Optimization Operation (3BUA000150*)* for information on the Fault Report Viewer), and the items accessible through their context menus.

Asset Reporter

The information in the Asset Reporter represents composite severity of an object and all children beneath it for the current structure. It is only necessary to insert an Asset Reporter on the object if access to the Asset Reporter view or the 800xA OPC properties is desired.

Figure 21 shows the Asset Reporter Main and Config views. All properties in these views are provided by the 800xA OPC server and can be used in faceplates, etc.



TC08228A

Figure 21. Asset Reporter Main and Config Views

Table 15 lists and describes the Asset Reporter composite values. Composite values are values calculated based only on the Asset Monitors in the object itself.

Table 15. Asset Reporter Composite Values

Property/Value	Description
Severity	Worst severity of all the Asset Monitors on the object.
-1	None of the Asset Monitors on the object are running or there are no Asset Monitors on the object.
0	All Asset Monitor Conditions on the object are in normal subcondition.
1 to 1000	Worst subcondition on the object.
Quality	Worst Asset Optimization quality on the object.
0	Good quality.
1	Uncertain quality.
2	Bad quality.
OPCQuality	Worst object OPC quality.
192	Good quality (OPC_QUALITY_BAD 0x00).
64	Uncertain quality (OPC_QUALITY_UNCERTAIN 0x40).
0	Bad quality (OPC_QUALITY_GOOD 0xC0).
FRAvial	Represents Fault Report availability on the object.
0 (FALSE)	No Fault Reports available on the object.
1	At least one Fault Report available on the object.
-1	No Fault Report aspect on the object

Table 16 lists and describes the Asset Reporter propagated values. Propagated values are values calculated based on all Asset Monitors in the object and its descendants in a particular structure.

Table 16. Propagated Values

Property/Value	Description
<Structure>.Severity	Worst severity of the Asset Monitors of all descendant objects in that <Structure> tree branch.
-1	None of the Asset Monitors in the branch are running or there are no Asset Monitors in this tree branch.
0	All conditions of the Asset Monitor in the <Structure> tree branch are in normal subcondition.
1-1000	Worst subcondition in the <Structure> tree branch.
<Structure>.OPCQuality	Worst OPC quality of all Asset Monitors of the descendant objects in that <Structure> tree branch.
192	Good quality (OPC_QUALITY_BAD 0x00).
64	Uncertain quality (OPC_QUALITY_UNCERTAIN 0x40).
0	Bad quality (OPC_QUALITY_GOOD 0xC0).
<Structure>.FRAvial	Represents Fault Report availability in the <Structure> tree branch.
0 (FALSE)	No Fault Reports available in the branch.
1	At least one Fault Report available in the branch.
-1	No Fault Report aspect on the object.

NOTE:

1. Propagated values are values calculated based on all Asset Monitors in the object and its descendants in a particular structure.

The Border around the Asset Reporter Main view (Table 17) represents the overall health of the Object Asset Monitors.

Table 17. Asset Reporter Main View Border Description

Border	Description
None	All Asset Monitors on the object are in the running state.
Orange	Corresponding Asset Monitoring Engine has not completed first execution cycle.
Red	Corresponding Asset Monitoring Engine is not in good state

If the object is inserted in one structure more than once, the second structure will be represented in the Asset Reporter OPC properties as {GUID} and not <Structure>.Property.

Create an Asset Reporter aspect on each object that requires an Asset Reporter. No further action is required to configure the Asset Reporter.

Asset Reporter with System Status

The Asset Reporter with System Status aspect, when added to an object, allows the Asset Reporter to participate in the System Status Viewer.

Only one aspect can expose System Status on an object. Do not instantiate an Asset Reporter with System Status aspect on an object that already exposes System Status properties (S_STATUS). Exposing the System Status properties more than once on the same object will cause the System Status Viewer/System Status Reporter to fail.

Perform the following procedure to enable the Details view on the System Status Viewer.

1. Create an Asset Reporter with System Status aspect on the desired object.
2. Right-click on the Asset Reporter with System Status aspect and select **Details** from the context menu to launch the Details dialog.
3. Click **Add** and select `System Status Details` in the dialog that appears.
4. Click **OK** in both dialogs to close them.

Asset Viewer

The Asset Viewer, when added to an object, allows the Asset Tree to be displayed. When displayed, the Asset Tree shows the condition of that object and all its descendants. Figure 22 shows an example of an Asset Viewer in various stages of Asset Tree expansion.

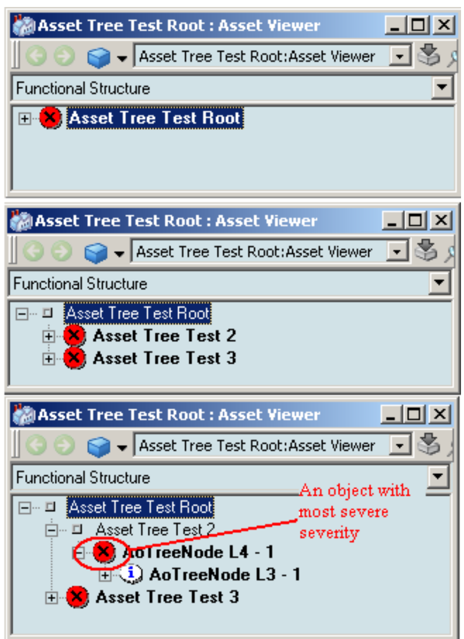


Figure 22. Asset Viewer

Create an Asset Viewer aspect on each object that requires an Asset Viewer. No further action is required to configure the Asset Reporter.

Maximo Integration

In order to make CMMS Connectivity operational, it is necessary to perform the following procedures:

- Mapping the 800xA System Object to the Maximo Equipment.
- CMMS Views.

Mapping the 800xA System Object to the Maximo Equipment

The Maximo Equipment ID aspect provides information for mapping the 800xA System object to the Maximo equipment in the CMMS database for a particular Maximo Server. Multiple Maximo Equipment IDs can be associated with the same asset, thus providing the ability to map to more than one piece of equipment defined in Maximo.

A given 800xA System object may map to many different Maximo Equipment IDs in the Maximo system. This may represent a breakdown/drilldown into a subassembly or what is called a crossover, in which a functional object is mapped into the subassembly/parts of a real machine which fulfills the specification for that functional location.

1. Create a Maximo Equipment ID aspect on the asset that requires a Maximo Equipment ID.
2. Right-click on the asset and select **Maximo Equipment ID** from the context menu that appears. This opens the Maximo Equipment ID like the one shown in Figure 23.

Feature Pack Functionality

For Feature Pack, refer Figure 24.

The items in the CMMS Information frame are grayed out and cannot be changed in this structure. For descriptions of, and the procedure to change this information, refer to Maximo Server Connection Properties on page 27.

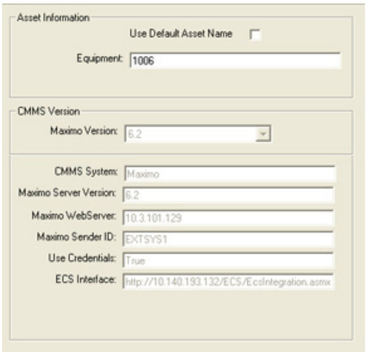


Figure 23. Maximo Equipment ID

Feature Pack Functionality

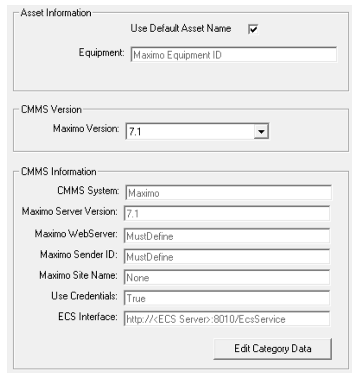


Figure 24. Maximo Equipment ID

3. If the Primary Structure was set up so that the asset name matches the Equipment Number in the Maximo Server, leave the Equipment field as it is. If the asset name does not match the Equipment Number in the Maximo Server, disable the **Use Default Asset Name** check box and change the Equipment field to match the Equipment ID in the Maximo Server. It is possible to define configuration macros for the Equipment ID definition. Refer to Configuration Macros on page 76 for more information.
4. If changes were made in Step 3, click **Apply**.
5. Repeat the procedure for each asset that requires a Maximo Equipment ID.

CMMS Views

The CMMS Views consist of:

- View Active Work Orders.
- View Work Order History.
- View Equipment Status.
- View Preventive Maintenance Schedule.
- View Spare Parts/View Availability of Spare Parts.

The Fault Report Submitter, which is part of the Asset Optimization Server system extension, makes it possible to submit Fault Reports to the CMMS System.

These aspects can be added to Object Types. This allows objects to be created with these aspects already added. Refer to the appropriate System 800xA documentation for information on creating Object Types.

Before any CMMS Views are added to a particular object, all of the views are available in the list in the New Aspect dialog. Each time one of these views is added to the particular asset, it is removed from the list. This ensures that the same view is not added to a single asset more than once. The exception to this general rule is the Equipment ID aspect. Many Equipment ID aspects are allowed on any one object to facilitate the many to one mapping of an 800xA System object to a subassembly or crossover.

The procedure for adding all CMMS Views is the same. Create the desired CMMS View aspects on all assets that require them. No further action is required to configure the selected views. Refer to *System 800xA Asset Optimization Operation (3BUA000150*)* for information on the operational capabilities of the CMMS Views.

Maximo Bulk Data Manager Support

The Bulk Data Manager (BDM) is 800xA System engineering Excel add-in. The Maximo Equipment ID aspect can be added, deleted, and modified using the BDM. All CMMS Maximo views can be added and deleted using the BDM as well.

When a Maximo Equipment ID aspect is dragged into a BDM enabled Excel spreadsheet, a pick list will expose all of the configuration properties (Figure 25). Table 18 lists and describes the properties.

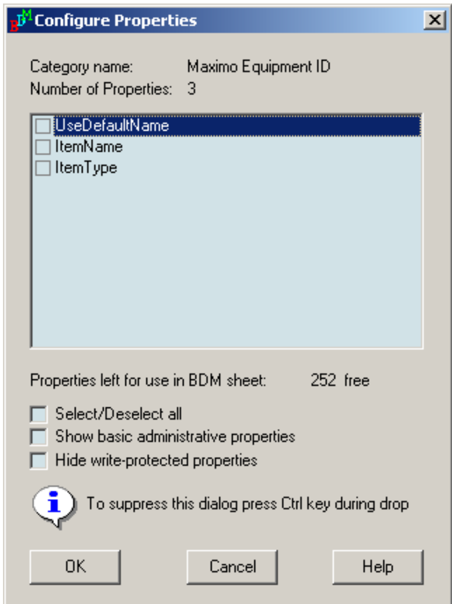


Figure 25. Bulk Data Manager for Maximo Equipment ID

Table 18. Maximo Equipment ID BDM Properties

Property Name	Notes	Access
UserDefaultName	True/false. True if the asset name matches the Equipment Number in the Maximo server.	R/W
ItemName	Equipment ID name in the Maximo server.	R/(W)[1]
ItemType.	Equipment type in the Maximo server.	R

NOTE:

1. Writable only if UseDefaultName is FALSE.

SAP/PM Integration

In order to make CMMS Connectivity operational, it is necessary to perform the following procedures:

- Mapping the 800xA System Object to the SAP/PM Equipment.
- CMMS Views.

Mapping the 800xA System Object to the SAP/PM Equipment

The SAP Equipment ID provides information for mapping the 800xA System object to the SAP/PM equipment in the CMMS database for a particular SAP/PM Server. Multiple SAP Equipment IDs can be associated with the same asset, thus providing the ability to map to more than one piece of equipment defined in SAP/PM.

A given 800xA System object may map to many different SAP Equipment IDs in the SAP/PM system. This may represent a breakdown/drilldown into a subassembly or what is called a crossover, in which a functional object is mapped into the subassembly/parts of a real machine which fulfills the specification for that functional location.

1. Create a SAP Equipment ID on an asset that requires a SAP Equipment ID.
2. Right-click on the asset and select **SAP Equipment ID** from the context menu that appears This opens the SAP Equipment ID like the one shown in Figure 26.

Feature Pack Functionality

For Feature Pack, refer Figure 27.

The items in the CMMS Information frame are grayed out and cannot be changed in this structure. For descriptions of, and the procedure to change this information, refer to SAP/PM Server Connection Properties on page 31.

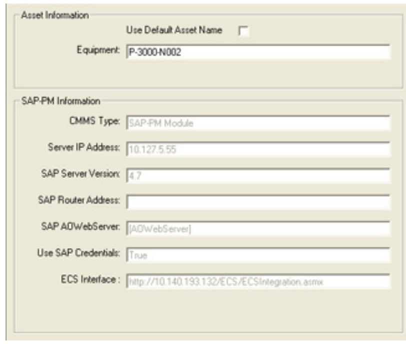


Figure 26. SAP Equipment ID

Feature Pack Functionality

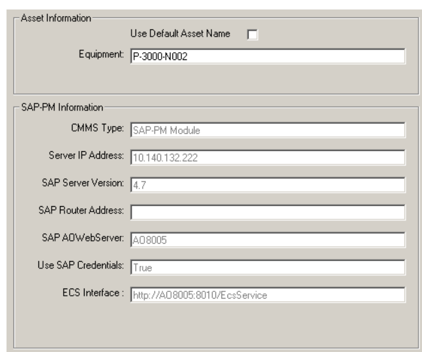


Figure 27. SAP Equipment ID

3. Set up the Primary Structure, so that the asset name matches the Equipment Number in the SAP/PM Server, leave the Equipment: field without modifying. If the asset name does not match the Equipment Number in the SAP/PM Server, disable the **Use Default Asset Name** check box and change the Equipment: field to match the Equipment ID in the SAP/PM Server. It is possible to define configuration macros for the Equipment ID definition. Refer to Configuration Macros on page 76 for more information.

4. If the changes were made in Step 3, click **Apply**.

5. Repeat the procedure for each asset that requires a SAP Equipment ID.

CMMS Views

The CMMS Views consist of:

- SAP View Active Work Orders.
- SAP View Work Order History.
- SAP View Equipment Status.
- SAP View Preventive Maintenance Schedule.

The Fault Report Submitter, which is part of the Asset Optimization Server system extension makes it possible to submit Fault Reports to the SAP/PM systems.

These aspects can be added to Object Types. This allows objects to be created with these aspects already added. Refer to the appropriate System 800xA documentation for information on creating Object Types.

Before any CMMS Views are added to a particular object, all of the views are available in the list in the New Aspect dialog. Each time one of these views is added to the particular asset, it is removed from the list. This ensures that the same view is not added to a single asset more than once.

The procedure for adding all CMMS Views is the same. Create the desired CMMS View aspects on all assets that require them. No further action is required to configure the selected views. Refer to *System 800xA Asset Optimization Operation (3BUA000150*)* for information on the operational capabilities of the CMMS Views.

SAP/PM Bulk Data Manager Support

The Bulk Data Manager (BDM) is 800xA System engineering Excel add-in. The SAP Equipment ID aspect can be added, deleted, or modified using the BDM. All CMMS SAP/PM views can be added or deleted using the BDM as well.

When a SAP Equipment ID aspect is dragged into a BDM enabled Excel spreadsheet, a pick list will expose all of the configuration properties (Figure 28). Table 19 lists and describes the properties

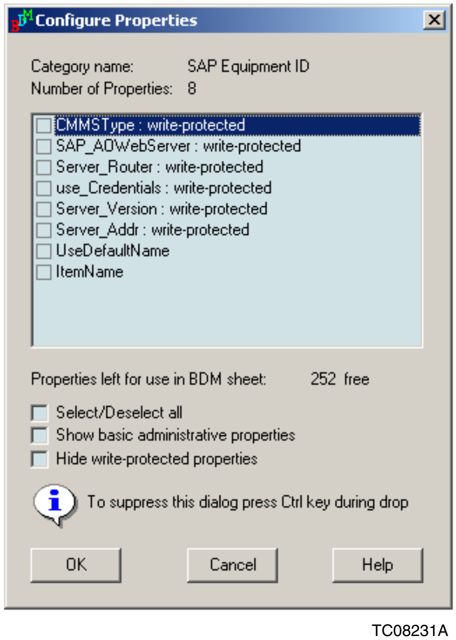


Figure 28. Bulk Data Manager for SAP Equipment ID

Device Calibration Integration

Device Calibration Integration is an engineered solution. The solution is based on standard technologies like DBMS, OPC, XML and Web Services and allows integration between System 800xA and a third party calibration application. The horizontal (across features) and vertical (details of a feature) level of integration is determined by the openness of the calibration application.

Important features of such integration are:

1. Access to third party calibration application within System 800xA
2. Mapping between an object in System 800xA and a device in the calibration application[1]
3. Exchange of calibration events between System 800xA and the calibration application
4. Calibration condition alarm notification to operator.
5. Generation of calibration work order.

For more information and integration solution, contact ABB technical support.

1. Level of integration is determined by the openness of the calibration application.

Authentication

To configure authentication, refer to the appropriate 800xA System documentation to enable log over features.

Table 19. SAP Equipment ID

Property Name	Notes	Access
UserDefaultName	True/false. True if the asset name matches the Equipment Number in the SAP/PM server.	R/W
ItemName	Equipment ID name in the SAP/PM server.	R/(W)[1]

NOTE:
1. Writable only if UseDefaultName is FALSE.

Authentication for the AO Server

1. Use the Structure Selector to open the Aspect System Structure.
2. Navigate to Asset Optimization Server object and enable appropriate authentication for all the required operations as shown in Figure 29.

Figure 29. Enabling Authentication

Alarm Grouping

Alarm and Event Lists are part of the base 800xA System and are added to objects when building the various structures. Building the various structures in the 800xA System is beyond the scope of this User Manual. Refer to the appropriate System

800xA documentation for detailed information on the various 800xA System structures.

The Alarm and Event Lists are used to group alarm points together. They define the group of events being sent to the same group of people. For ease of use, take advantage of the defined structures to group the assets. All child objects in the structure can be defined as being included.

Operators can view Alarm and Event Lists according to the selected filter and presentation settings. These settings can be changed. For example, a list can be sorted by clicking on a column header, resizing columns, or moving them by using drag and drop.

Filtering and presentation functions allow alarms to be viewed in dedicated ways. For example, a list can be configured to show all alarms or only those alarms relevant for the associated object and its descendents.

Acknowledging and silencing alarms can be done within a list, for one or more selected alarms, or for multiple alarms per page or entire lists. Object alarms can be acknowledged through process graphics displays. Refer to *System 800xA - Asset Optimization Operation*, and other appropriate 800xA System documentation for more information on acknowledging alarms.

Up to 1000 priorities can be defined with acknowledge and unacknowledged colors.

To configure an Alarm and Event List:

1. Use the Object Browser to navigate to an object with an Alarm and Event List to configure.
2. Select `Alarm and Event List` in the Aspect List Area.
3. Click the **View Configuration** button as shown in Figure 30 and the Alarm and Event List Configuration dialog shown in Figure 31 appears.
4. There are two categories of alarms that are used exclusively by Asset Optimization:

   Asset Condition Alarm: Generated by an Asset Monitor when an abnormal asset condition is detected. An example of an Asset Condition Alarm is when the hours of operation of an asset (equipment) has been

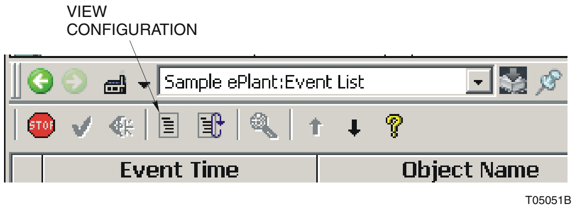


Figure 30. View Configuration

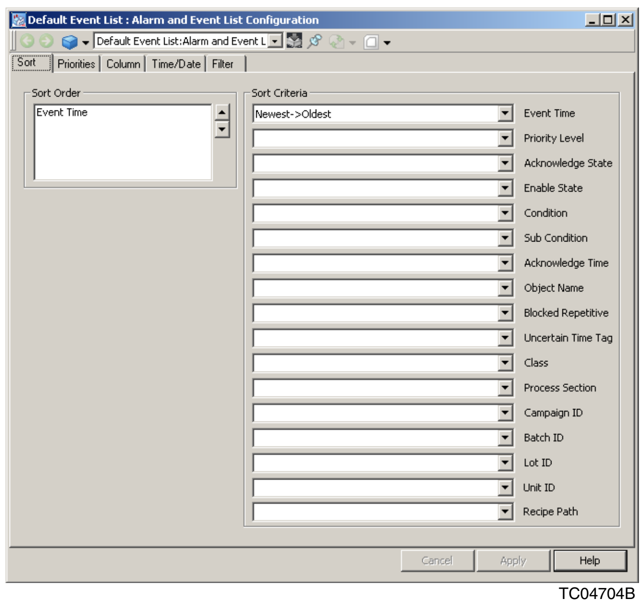
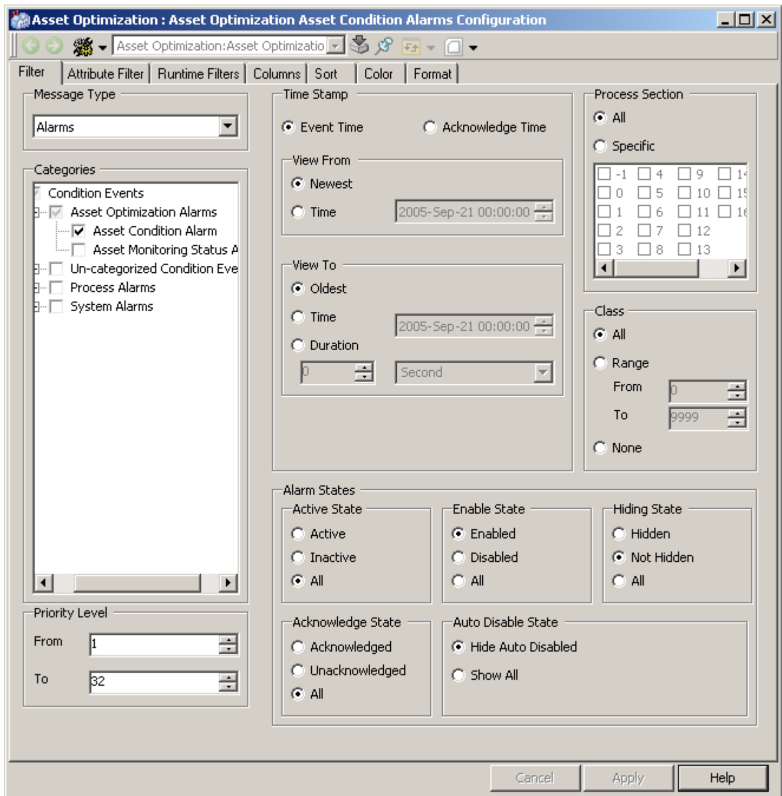


Figure 31. Alarm and Event List Configuration Dialog

exceeded. A suggested action might be some periodic preventative maintenance action.

Asset Monitoring Status Alarm: Generated when something is abnormal in the Asset Optimization execution environment. An example of an Asset Monitoring Status Alarm is when the Asset Monitoring Engine is unable to read OPC values. Another example is when a particular Asset Monitor is not properly configured and is unable to execute.

By using the **Filter** tab on an Alarm and Event List, it is possible to filter on these categories. Figure 32 shows the Asset Optimization Group in the **Filter** tab**.**



TC08235A

Figure 32. Alarm and Event List Filter Tab

5. Click **Apply** and then close the dialog.
6. Repeat the procedure for all other Alarm and Event Lists.

Asset Optimization Reporting Configuration

These procedures provide general guidelines for configuring Asset Optimization Reports. For detailed information, refer to the Creating Reports and Scheduling sections in *System 800xA - Information Management, Operation*.

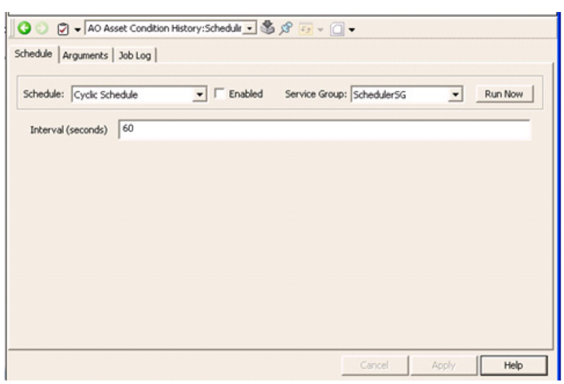
Asset Optimization Reporting provides a preconfigured Job Description for each of the Asset Optimization Report Templates in the system. Each Asset Optimization Report Job Description must be configured prior to reporting.

Asset Optimization Report Templates are configured in the Scheduling Structure.

1. Open a Plant Explorer Workplace.
2. Use the Structure Selector to open the Scheduling Structure in the Plant Explorer Workplace.
3. Use the Object Browser to navigate to:

   `Schedules and Jobs > Job Descriptions, Job Folder > AO Asset Condition History, Job Description`

4. Select `Scheduling Definition` in the Aspect List Area to produce the Scheduling Definition aspect view, with the **Schedule** tab selected, in the Preview Area as shown in Figure 33.

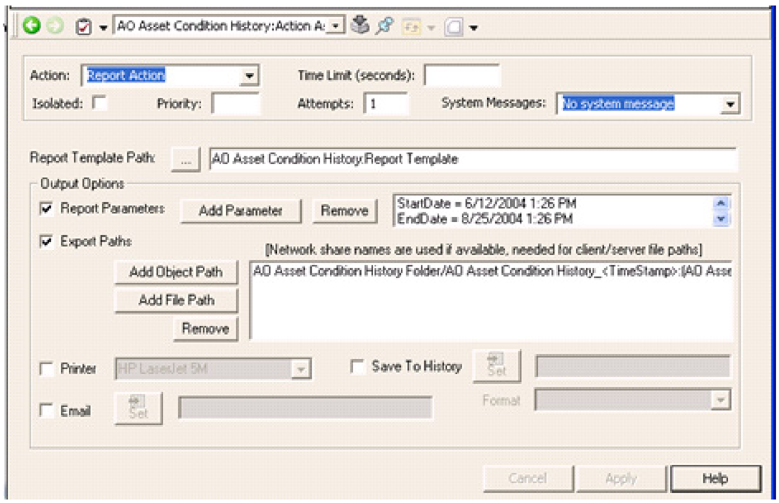


TC07774B

Figure 33. Scheduling Definition Aspect

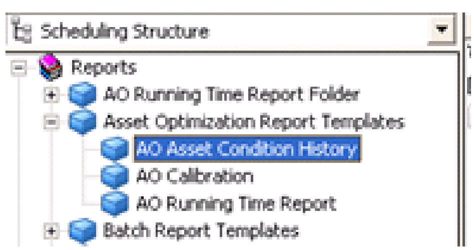
This procedure describes configuration to automatically run reports on a configured schedule. The **Run Now** button is used to run reports as desired. For more information on operator actions, refer to *System 800xA Asset Optimization Operation (3BUA000150*)*.

5. Select the type of schedule desired (cyclic, periodic, weekly, or monthly) in the **Schedule:** drop-down list box.
6. Depending on the schedule type selected, the bottom half of the aspect view will change. Fill in the fields as desired to complete the configuration for that schedule type.
7. Enable the **Enabled** check box. This check box must be enabled in order for reports to run automatically.
8. Select the server that will execute a given job in the **Service Group:** drop-down list box. The default is the primary service group which is the first service group created, not necessarily the first one listed in the Service Structure. To avoid unexpected results, it is recommended to specify a server where the report will run.
9. The Action Aspect must also be configured for each report type. This defines the input parameters for the report and how the report will be retained and optionally printed or archived using Information Management. Select Action Aspect in the Aspect List Area to produce the Action Aspect view in the Aspect Preview Area as shown in Figure 34.
10. Select **Report Action** from the **Action:** drop-down list box.
11. If desired, a timeout value may be specified in the **Time Limit (seconds):** field, but in most situations the default values for the **Time Limit (seconds)**, **Isolated:**, **Priority:**, **Attempts:**, and **System Messages:** fields should be used.
12. Select the report template to be used. Click **...** next to the **Report Template Path:** field and select the desired Asset Optimization Report template. The location of the templates is shown in Figure 35.
13. There are Report Parameters to configure for each report type. These are displayed after clicking **Add Parameter**. The parameters for each report type are described in the topics immediately following this procedure:



TC07776B

Figure 34. Action Aspect



TC07777B

Figure 35. Asset Optimization Report Template Location.

– AO Asset Condition History Report Parameters on page 101.
– AO Running Time Report Parameters on page 101.

14. Select the appropriate parameter to change and click **Modify** to edit the parameter in the **Value** column, leaving the parameter name in the **Name** column intact.

15. When the modifications to the desired reports are complete, click **Close** and continue to Exporting Reports on page 102.

AO Asset Condition History Report Parameters

The AO Asset Condition History Report Template (refer to Figure 36) requires configuration of the following parameters:

- **StartDate:** Start time (oldest event) in mm/dd/yyyy hh:mm am/pm format.
- **EndDate:** End time (newest event) in mm/dd/yyyy hh:mm am/pm format.
- **AEObjPath:** Path to object with the configured AO Asset Condition Event aspect (Alarm and Event aspect type) that is the source of the report data. The default Asset Condition Event List aspect is found under the AO Asset Condition Report Template object.
- **MaxRows:** Maximum number of rows to retrieve for this report.
- **ReportTitle:** Title to appear in the header of the printed report.

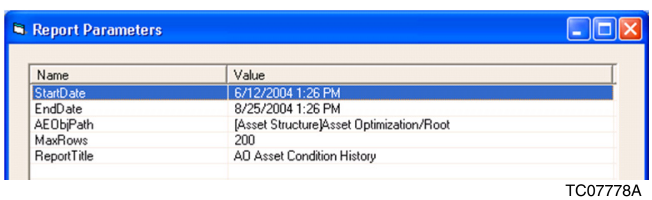


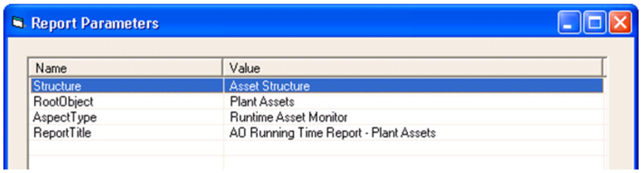
Figure 36. AO Asset Condition History Report Parameters

AO Running Time Report Parameters

The AO Running Time Report Template (refer to Figure 37) requires configuration of the following parameters:

- **Structure:** Name of the structure in which to start the object search (usually the Asset Structure).
- **RootObject:** Name of the root object under the structure to start the object search.
- **AspectType:** Objects with this aspect type to be included in the report, usually Running Time Check.

- **ReportTitle:** Title to appear in the header of the printed report.



TC07780A

Figure 37. AO Running Time Report Parameters

Exporting Reports

Reports are saved on the local system by exporting.

1. Enable the **Export Paths:** check box in the Action Aspect view in the Preview Area.

2. Click **Add Object Path** to save the reports in the Aspect system. These will be retained under:

   `Reports > `*`folder name`*

   in the Scheduling Structure. These may then be later reviewed and/or printed by any clients on the system that have Microsoft Excel installed locally.

3. If required, output reports can also be saved to a local file folder. Click **Add File Path** to configure the output folder and file name.

The print area is predefined in the Excel spreadsheet. This can be modified and saved in the template if required. This definition is used when the **Printer** check box is enabled and a printer selected from the drop-down list box in the Action Aspect.

A printer needs to be set up on the workstation that the AO Excel based reports are run. This is due to the Report Title being set. Excel requires that a default printer be set up to do this, whether or not the report is being printed.

Refer to *System 800xA - Asset Optimization, Operation* for information on reviewing reports, printing reports, etc.

Automatic Fault Report Submitter

The Fault Report Submitter is enhanced to allow Fault Reports to be automatically submitted to a CMMS with the user defined values when a specific Asset Monitor Condition and SubCondition become active. Auto submittal is managed through a new Aspect View on the Fault Report Submitter Aspect.

Configuring Fault Report Auto Submittal

To configure automatic submittal of Fault Reports, first configure a Fault Report Submitter Aspect (that is, CMMS integration must be properly configured and a Fault Report Submitter Aspect must be able to manually submit a Fault Report to the CMMS).

To enable a Fault Report to be submitted automatically, the default values must be specified. Select a Fault Report Submitter Aspect and change the Aspect View to the **Default View**.

After creating the Fault Report defaults, any changes to Equipment ID aspect or Asset Monitor aspect on the object is not reflected in the saved Fault Report default of the object. In such a scenario the Fault Report default should be re-created with the necessary changes..

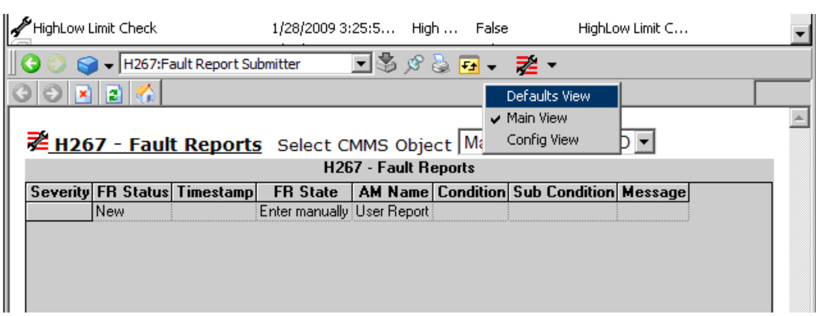


Figure 38. Select the Defaults View

The default view shows the familiar grid layout. This view lists all the configured Fault Report Defaults that may be automatically submitted.

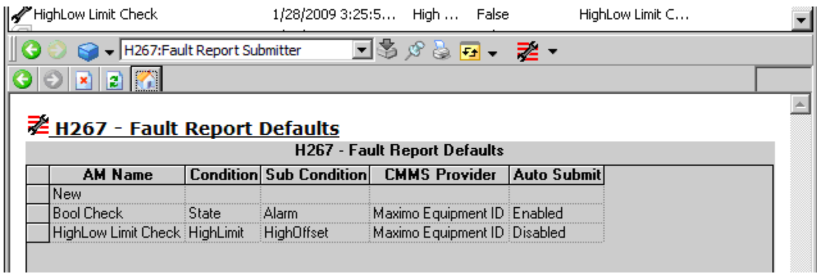


Figure 39. Default Views

Creating a new Fault Report Default

To create new Fault Report Defaults, right-click on the first row in the table (where the field shows **New**) and click **Create New.**

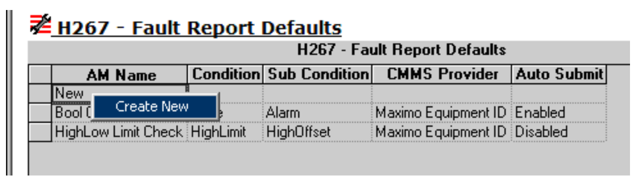


Figure 40. Create New Menu

The **Create Fault Report Default** page appears. Select the desired CMMS Provider, Asset Monitor, Condition, and SubCondition and click **Get Fault Report**

Fields. When the selected SubCondition becomes active on the selected Asset Monitor, the Fault Report Default will be automatically submitted by the AO server.

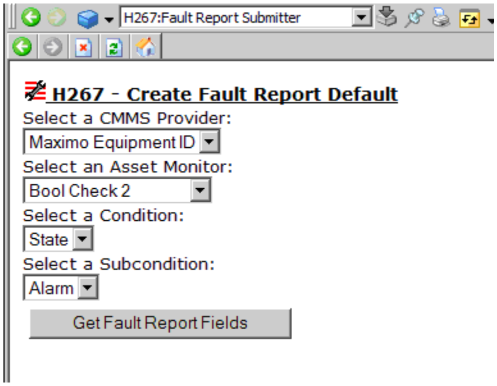


Figure 41. Create Fault Report Default Page

The **Edit Fault Report Defaults** page appears. Enter the desired values for the Fault Report. These values will be automatically submitted when the selected SubCondition becomes active. Automatic submittal is enabled by selecting the **Auto Submittal Enabled** check box. Once the editing is completed, click **Save Fault Report Defaults**. A confirmation message appears when the save process is completed. To return to the Defaults View again, click **Home** at the top of the Aspect window.

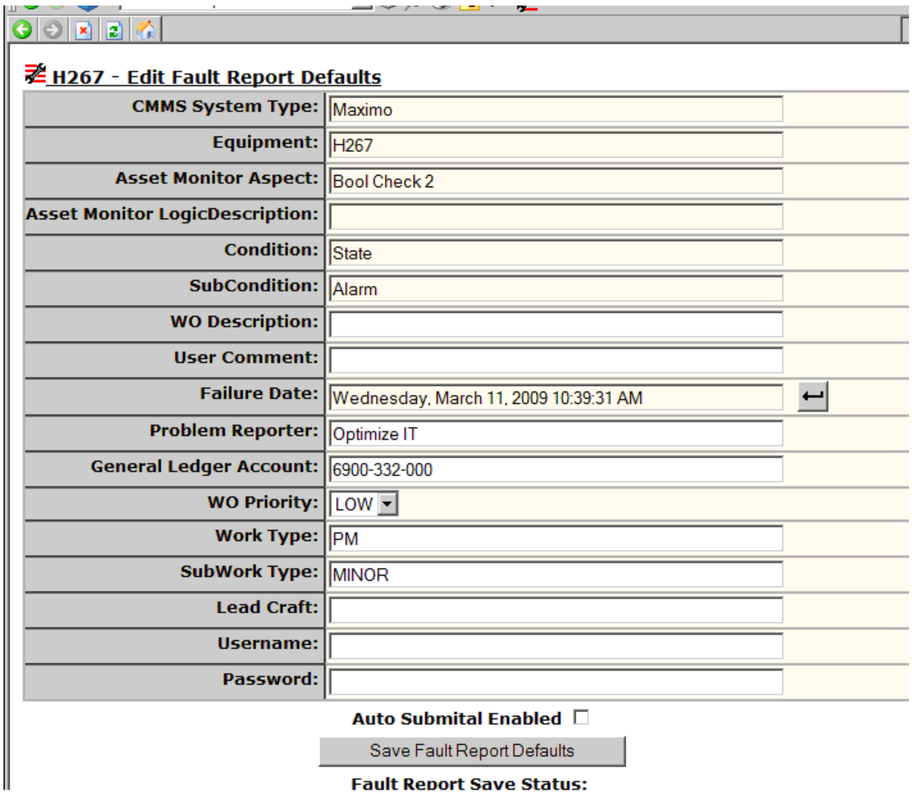


Figure 42. Edit Fault Report Defaults Page

If a new Fault Report Default is created with the same Asset Monitor, Condition, and SubCondition as an existing default, the new one will overwrite the existing one. This is due to the fact that defaults are uniquely identified by those three values, and therefore it is not possible to have two defaults with those same three values.

Modifying Existing Fault Report Defaults

From the default view, it is possible to edit and delete the existing **Fault Report Defaults**. Right-click the row for the desired Fault Report Default, a context-menu appears with the two options - **Edit** or **Delete**.

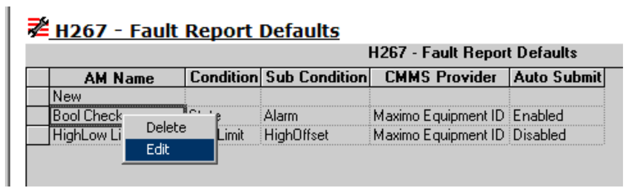


Figure 43. Modify Menu

Select the **Edit** option to display the Edit Fault Report Defaults page with the saved values of the selected Fault Report Default. Make any desired changes and click **Save** to save the changes.

Select the **Delete** option to delete the Fault Report Default from the system. The values stored in it will be lost and it will no longer be automatically submitted.

Automatically Submitting Fault Reports

Fault Report Defaults will be automatically submitted when the SubCondition specified by the Fault Report Default becomes active (provided that the Fault Report Default is enabled). It is possible to check the summary of the Defaults View of the Fault Report Submitter Aspect.

If the listed Auto Submit column is checked which indicates that Fault Report Default will be submitted automatically. If the listed Auto Submit column is unchecked, no changes will happen when the SubCondition for that Fault Report Default becomes active. It is possible to change the Auto Submit behavior by editing the Fault Report Default as described previously.

Automatic fault report must be sparingly used as there will be a performance impact with delayed execution of subsequent Asset Monitor.

Maintenance Workplace

Asset Optimization information can be accessed from any workplace in the 800xA System. The Maintenance Workplace is a default workplace for maintenance personnel.

Setting up the Maintenance Workplace Shortcut

Follow the steps mentioned below to use Maintenance Workplace:

1. Click **Start**, and click **All Programs** and then click **ABB Industrial IT 800xA System.**
2. Click **Workplace**, ABB Workplace login dialog appears.
3. Select **Maintenance Workplace / Maintenance Workplace 2** and then click **Create Desktop Shortcut** as shown in the Figure 44.

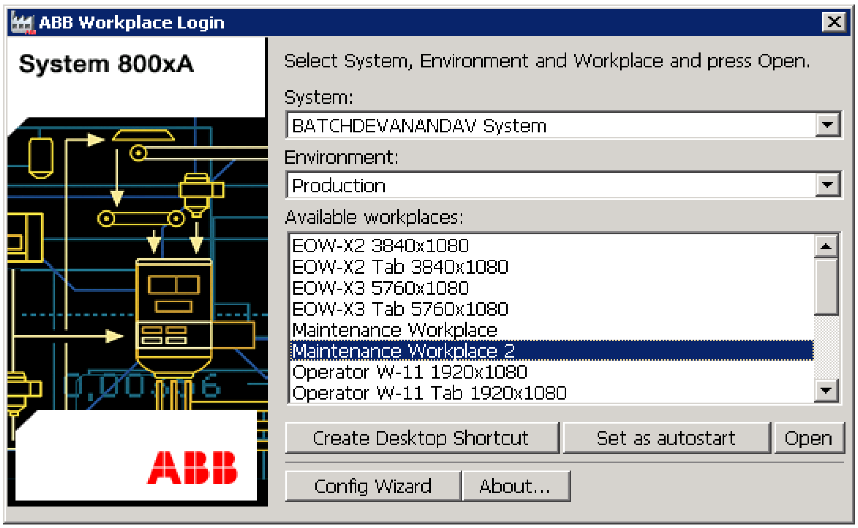


Figure 44. Workplace Selection Window

4. The new Maintenance Workplace / Maintenance Workplace 2 icon is placed on the Desktop.

Adding Assets to the Maintenance Workplace

All assets that are engineered in the system can be inserted into the Asset Structure. They can be grouped in a way that supports typical maintenance workflow in a more efficient way than in the Control, Location, or Functional Structures.

To add an asset to the Maintenance Workplace:

1. Select a dedicated Asset Group in the Asset Structure where it is desired to add an engineered asset.
2. Right-click on the selected Asset Group and select **Insert Object** from the context menu.
3. The Insert Object dialog appears. Navigate to and select the asset to insert.
4. Click **Insert**.

The selected Object will show up in the selected Asset Group. All Asset Alarms of the new inserted Object will show up in the Alarm Band of the Maintenance Workplace. They will appear in the Alarm Group of one of the five Root Asset groups.

When deleting the Object containing Asset Monitors that are inserted in any other Structure, delete the Object from the Control Structure before other Objects are deleted from all the other Structures.

Application specific modifications of the alarm band or the Maintenance Workplace are possible. Refer to *System 800xA Operations Operator Workplace Configuration (3BSE030322*)* for details.

The new workplace provides an easy, enhanced and efficient way for the user to view the Asset Monitor condition details in few clicks. The Maintenance Workplace 2 is based on the Asset Structure. All the assets that are engineered in the system has to be inserted into the Asset Structure.

For Operation information, refer to *System 800xA Asset Optimization Operation (3BUA000150*).*

Setting High Precedence for Asset Reporter Aspect Categories

Maintenance Workplace 2 is designed to display an Asset Reporter Aspect in the Aspect Preview by default when an Object is selected. The Asset Reporter preview will be loaded only when an Asset Reporter Aspect is evaluated as default Aspect on the selected Object.

In addition to the built-in Aspect Precedence List, a new Aspect Precedence List Asset Optimization APL can be found in the Library Structure which is valid for the entire system.

To make the Asset Reporter and the **Asset Reporter with System Status** Aspect as the default Aspect on the Object, the User level precedence should be configured to use Asset Optimization APL. To know more about User level Precedence refer to *Operator Workplace Configuration manual (3BSE030322*).*

Maintenance Management Filter

To make the Maintenance Management Filter as the default for the Maintenance users, the default filter should be set to the Maintenance Management in the Workplace Profile Values Aspect on the user Object as shown in the Figure 45.

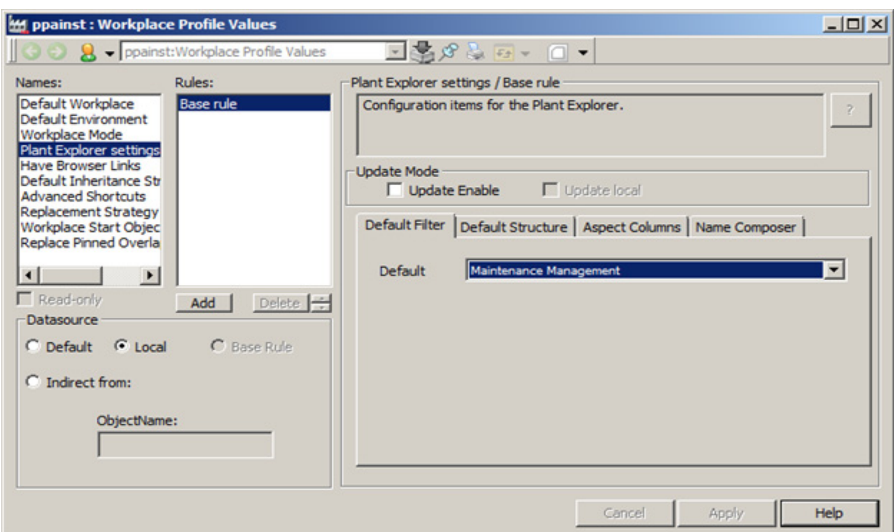


Figure 45. Workplace Profile Values Aspect

Once this configuration is performed, the Maintenance Management Filter is applied when the workplace is launched by this user.

NAMUR NE107

With this release, the icons used in Asset Viewer, Asset Condition details and colors used in Asset Reporter Aspect are based on the Namur NE107 recommended icons and colors. A new Color definition Object is available to make use of NAMUR NE107 recommended colors for the Alarms in the Alarm and Event List.

Restore Existing Icons and Colors

Users must be a part of the **Administrators - IndustrialITAdmin** User Group to perform this operation.

Users have an option to revert to the existing icons instead of Namur. To revert to the existing icons:

1. Open the **Plant Explorer Workplace.**
2. Go to Aspect System Structure. Click **Asset Tree Aspect System** and then click **Asset Viewer Aspect** Category.

3. Click on the **Icon Setting** Aspect as shown in the Figure 46.

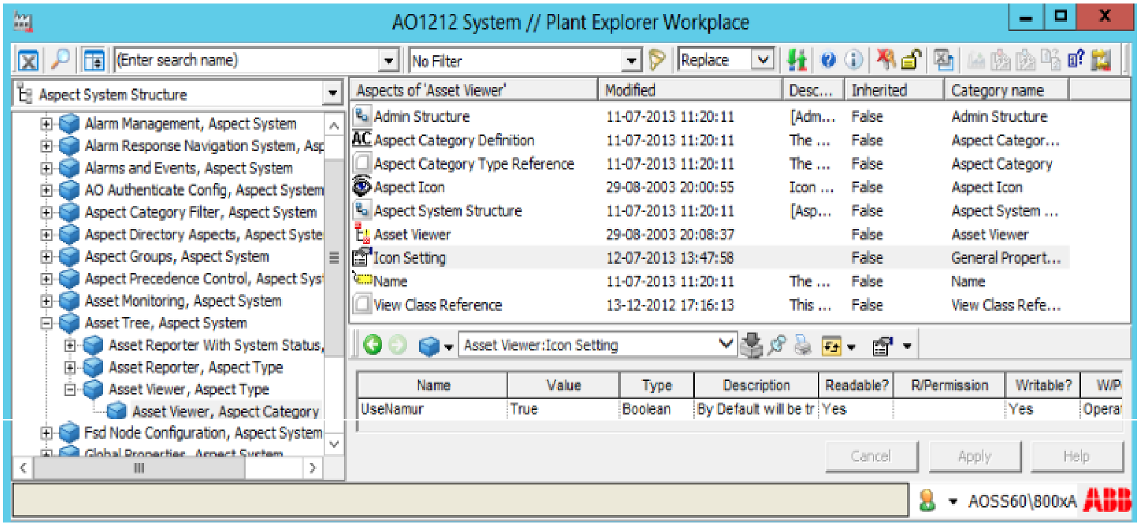


Figure 46. Icon Change Configuration Window

4. In the Main view of the Aspect, change the value from **True** to **False** and then click **Apply**.

5. Restart all the open **Workplaces**. Users will be able to see the old icons instead of Namur icons.

Alarm Color Definition

It is possible to use the Namur NE 107 recommended colors for Alarms in the Alarm and Event list. The Alarm Color DefinitionAspect is used to configure the colors of the Alarms. A new Alarm & Event Color Definition object name **NAMUR NE107 Alarm Color Definition** can be found in the Library Structure. To make use of the colors based on the Namur NE107 for Alarms, select **NAMUR NE107** Alarm Color Definition in the Color Defintion area of the Alarm and Event List Configuration Aspect.

Section 4 Basic Asset Monitor Library

Introduction

This section contains procedures for creating and configuring the Asset Monitors contained in the Basic Asset Monitor Library. The Basic Asset Monitor Library is provided with the Asset Optimization Asset Monitoring license feature. The Config view of each Asset Monitor has six tabs provided for configuration. These procedures contain only those tabs with configuration procedures that are unique to each Asset Monitor. Refer to Asset Monitors on page 50 for descriptions of all the tabs, and procedures for configuring those that are common to all Asset Monitors.

The Asset Monitors contained in the Basic Asset Monitor Library are:

- Bad Quality Check.
- Bool Check.
- Flow Delta.
- Limit Check (High, HighLow, and Low).
- Runtime.
- XY Profile Deviation.
- Counter Check.
- System Status.

Creation, Configuration, and Commissioning (Single Instance)

The following details the general steps for the creation, configuration, and commissioning of a single instance of an Asset Monitor. This procedure can be performed in object types or repeated for each object instance needing an additional Asset Monitor.

1. Create the desired Asset Monitor on an Object type or Object Instance needing an additional Asset Monitor.
2. Click on the newly added Asset Monitor in the Aspect List Area to produce the default view of the Asset Monitor in the Preview Area.
3. Click on the View Selector and select **Config** to open the Config View in the Preview Area.
4. The view appears with the **Asset Monitor** tab selected. If needed, customize the items in the **Asset Monitor** tab as described under Asset Monitor Tab on page 57.
5. If needed, configure the items in the **Conditions** tab as described under Conditions Tab on page 60.
6. If needed, configure the **Asset Parameters**, **Input Records**, and **A&E Filters Tabs** as instructed by the Asset Monitor specific documentation.
7. Click **Apply**.

To commission the configured Asset Monitor:

1. Perform an Incremental Load as described under Asset Monitor Tab on page 57.

   -or-

   Perform a Full AO Server Load as described in Loading Asset Monitor Configurations to an AO Server on page 21.
2. Verify that the AO Server to which the Asset Monitor was loaded is enabled; if not, enable it.
3. Select the newly loaded Asset Monitor default view.
4. Right-click on one of its conditions and select **Asset Monitor Status** from the context menu.

5. Verify that all the configuration parameters and input records have the expected data and runtime values.

Most Asset Monitors report Configuration Errors or Input Record bad quality value problems in the overall Asset Monitor status. When this happens an Asset Monitoring Status alarm is also generated. Refer to Asset Monitor Tab on page 57 for information on how to configure the severity for these kind of alarms.

Configuring Asset Monitor Inhibit functionality

Most Asset Monitors implement the standard inhibit functionality. This allows for conditionally inhibiting the Asset Monitor from reporting not normal conditions with their related alarm and fault report.

An Asset Monitor inhibited state is as follows:

- All of its conditions are set to the Normal State with a quality of goodLocalOverride and a description of *Inhibited*.
- The overall Asset Monitor Status quality is set to goodLocalOverride and the related status text to *inhibited*.
- All of the alarms related to the Asset Monitor are deactivated (set to normal).
- All of the Asset Monitor output records, if any, will have their quality set to *Bad Not Connected*.

The following details the general steps to configure an Asset Monitor for standard inhibit functionality:

1. Open the Asset Monitor aspect to be configured.
2. Click on the View Selector and select **Config** to open the Config View in the Preview Area.
3. Select the **Input Records** tab.
4. Configure the Inhibit Input Record as follows:
   – Trigger Execution = True.
   – Data Source Aspect: Select the appropriate data source providing the Inhibit value.

– Data Source Item: Select the appropriate OPC Item ID providing the Inhibit value.

5. Select the **Asset Parameters** tab.

6. Configure the `Inhibit_Value` asset parameter to a value that, when equal to the Inhibit Input Record runtime value, will set the Asset Monitor to its inhibited state. Inhibit_Value examples are `OFF`, `False, 1, 0x00000001` (32-bit hexadecimal notation).

7. If present, configure the `Inhibit_Value_Mask_Hex` asset parameter. A 32-bit hexadecimal notation integer. A value other than 0xFFFFFFFF represents a 32-bit mask that is applied (bitwise AND) to the `Inhibit` Input Record value before comparing it with the `Inhibit_Value` asset parameter.

When the `Inhibit_Value_Mask_Hex` is configured, it is necessary to specify the `Inhibit_Value` Asset Parameter using the hexadecimal notation.

If either the Data Source Aspect or Data Source Item fields of the Inhibit Input Record are left blank, the inhibit functionality is disabled.

Bad Quality Check

The Bad Quality Check Asset Monitor notifies if there is a bad or uncertain quality indication from a control system input. Refer to Creation, Configuration, and Commissioning (Single Instance) on page 113 for general background information.

1. To change the Asset Parameters for ***this instance*** of the Asset Monitor, click the **Asset Parameters** tab. The view shown in Figure 47 appears. All of the Asset Parameters listed can be changed.

   a. The values are used for the following:

   – **ExecutionsRequiredForTrigger:** Positive integer representing the number of subsequent executions required to recognize a change in the OPCQuality Input Record value. Tune this parameter to filter out momentary quality value changes. For example, the initial subscription to an OPC item may return a bad quality value.

   b. Change the fields to the desired values.

2. Click **Apply**.

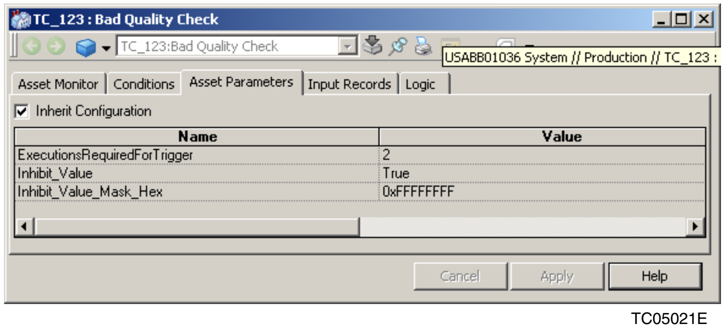


Figure 47. Asset Parameters Tab (Bad Quality Check)

3. Click the **Input Records** tab and the view shown in Figure 48 appears. The view shown has values configured.

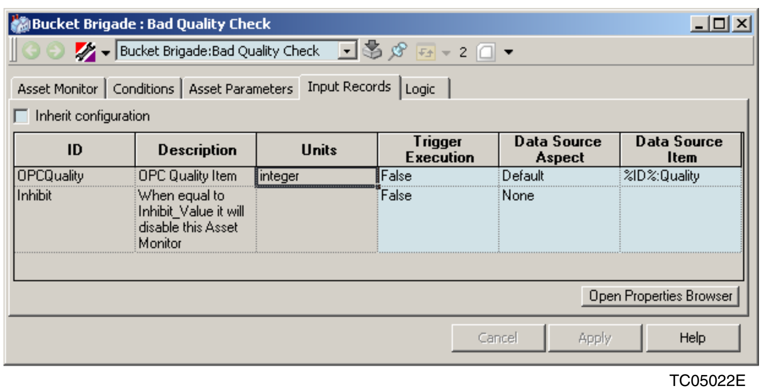


Figure 48. Configured Input Records Tab (Bad Quality Check)

4. Click on the **Data Source Aspect** column and select the OPC server from which to receive the data. This is a data source that was created in Managing Data Source Connections on page 45.

5. Fill in the **Data Source Item** column with the OPC item providing the value to be monitored.

6. Click **Apply**.

Refer to Configuring Asset Monitor Inhibit functionality on page 115 if inhibit functionality is needed.

7. The **Output Records** and **Logic** tabs are common to all Asset Monitors. Refer to Output Records Tab and Logic Tab on page 67 for more information.

Bool Check

The Bool Check Asset Monitor monitors a signal with two states: normal and alarm. Depending on the configuration, it notifies if the signal is in its alarm state, or if it is not in its normal state. Refer to Creation, Configuration, and Commissioning (Single Instance) on page 113 for general background information.

1. To change the Asset Parameters for ***this instance*** of the Asset Monitor, click the **Asset Parameters** tab. The view shown in Figure 49 appears. All of the Asset Parameters listed can be changed.

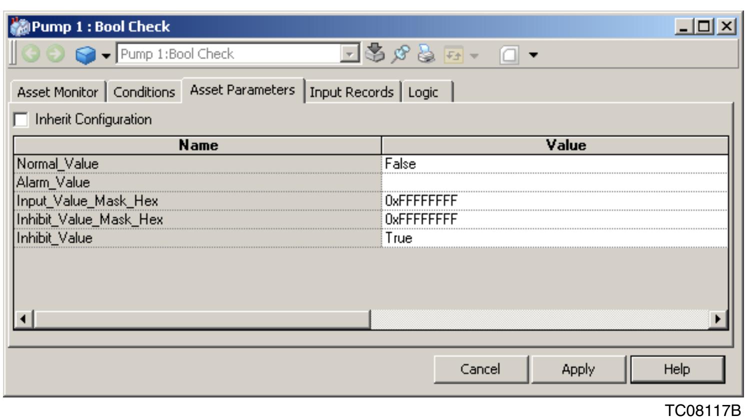


Figure 49. Asset Parameters Tab (Bool Check)

a. The values are used for the following:

– **Normal_Value** and **Alarm_Value:** These two Asset Parameters are mutually exclusive; if one is configured the other must be set to a blank value. These Asset Parameters can be configured with any of the following values: Numeric value (e.g. `1`, `1.123`, etc.), String Values (e.g. `Running`), 32-bit hexadecimal notation integers (e.g. `0X02`).

Boolean Value "True" or "False" is not allowed as it is a reserved OS keyword

– **Input_Value_Mask_Hex:** 32-bit hexadecimal notation integer. A value other than 0xFFFFFFFF represents a 32-bit mask that is applied (bitwise AND) to the Signal Input Record value before comparing it with the **Normal_Value** or **Alarm_Value** Asset Parameter. When the **Input_Value_Mask_Hex** is configured to a value other than `0xFFFFFFFF`, it is necessary to specify a 32-bit hexadecimal notation integer for the **Normal_Value** or **Alarm_Value** Asset Parameter.

Change the fields to the desired values.

2. Click **Apply**.
3. The Bool Check Asset Monitor logic is as follows:

```
If (Signal Input Record quality is not good) then
  State Condition is set the previously calculated
SubCondition with a quality of BadLastKnownValue
Else If Normal_Value asset parameter is configured then
  If (Signal Input Record AND Input_Value_Mask_Hex) =
Normal_Value then
    State Condition is set to the Normal SubCondition
  Else
    State Condition is set to the Alarm SubCondition
Else If Alarm_Value asset parameter is configured then
  If (Signal Input Record AND Input_Value_Mask_Hex) =
Alarm_Value then
    State Condition is set to the Alarm SubCondition
  Else
    State Condition is set to the Normal SubCondition
```

4. Click the **Input Records** tab and the view shown in Figure 50 appears. The view shown has values configured.

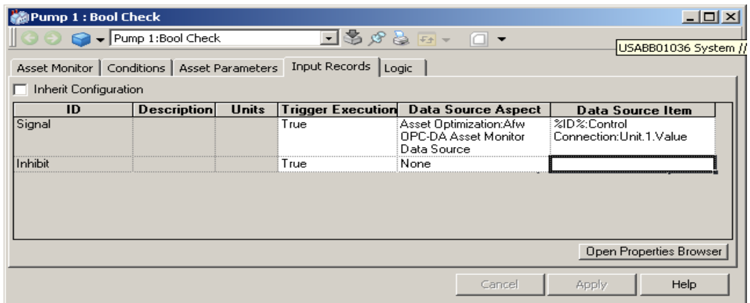


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Figure 50. Configured Input Records Tab (Bool Check)

5. Click on the **Data Source Aspect** column and select the OPC server from which to receive the data. This is a data source that was created in Managing Data Source Connections on page 45.

6. Fill in the **Data Source Item** column with the OPC items providing the value to be monitored.

7. Click **Apply**.

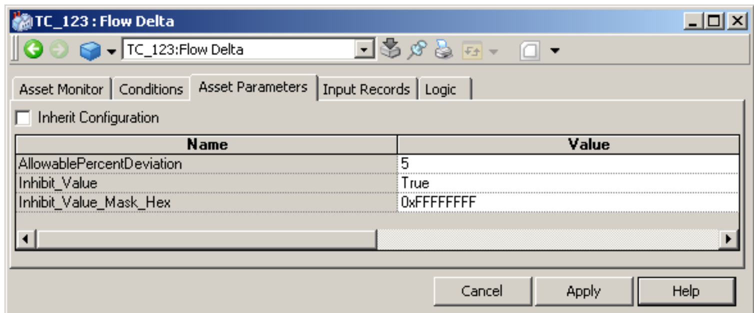
Refer to Configuring Asset Monitor Inhibit functionality on page 115 if inhibit functionality is needed.

8. The **Output Records** and **Logic** tabs are common to all Asset Monitors. Refer to Output Records Tab and Logic Tab on page 67 for more information.

Flow Delta

The Flow Delta Asset Monitor monitors the difference between two numeric values (i.e. steam flow and feedwater flow) and notifies if the difference exceeds a configured percentage of the first value. Refer to Creation, Configuration, and Commissioning (Single Instance) on page 113 for general background information.

1. To change the Asset Parameters for ***this instance*** of the Asset Monitor, click the **Asset Parameters** tab. The view shown in Figure 51 appears. All of the Asset Parameters listed can be changed.



TC05029E

Figure 51. Asset Parameters Tab (Flow Delta)

a. The values are used for the following:

– **AllowablePercentDeviation:** This value defaults to `5%` and is used to calculate the difference between the two Input Records: Feedwater Flow and Steam Flow. If the difference is more than five percent, or whatever is configured, an ACD and alarm are generated.

If:

$$|\text{Feedwater Flow} - \text{Steam Flow}| \times 100 > |\text{Feedwater Flow} \times \text{AllowablePercentDeviation}|$$

Then:

$$\text{SubCondition} = \text{LimitExceeded}$$

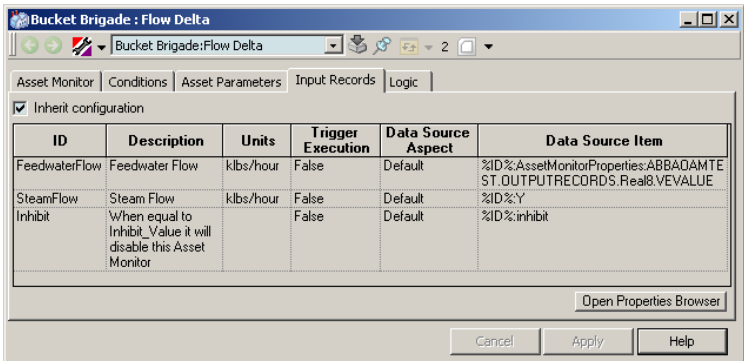
Else:

$$\text{SubCondition} = \text{WithinLimit (normal)}$$

Change the fields to the desired values.

2. Click **Apply**.

3. Click the **Input Records** tab and the view shown in Figure 52 appears. The view shown has values configured.



TC05030E

Figure 52. Configured Input Records Tab (Flow Delta)

4. Click on the **Data Source Aspect** column and select the OPC server from which to receive the data. This is a data source that was created in Managing Data Source Connections on page 45.

5. Fill in the **Data Source Item** column with the OPC item providing the value to be monitored.

6. Click **Apply**.

Refer to Configuring Asset Monitor Inhibit functionality on page 115 if inhibit functionality is needed.

7. The **Output Records** and **Logic** tabs are common to all Asset Monitors. Refer to Output Records Tab and Logic Tab on page 67 for more information.

Limit Check (High, HighLow, and Low)

The High Limit Check Asset Monitor monitors a process value and notifies if it exceeds configured limit values that include the high limit value and the high limit value plus a negative offset value. The HighLow Limit Check Asset Monitor monitors a process value and notifies if it exceeds configured limit values that include the high limit value, the high limit value plus a negative offset value, the low limit value, and the low limit value plus a positive offset value. The Low Limit Check Asset Monitor monitors a process value and notifies if it exceeds configured limit values that include the low limit value and the low limit value plus a positive offset value.

Refer to Creation, Configuration, and Commissioning (Single Instance) on page 113 for general background information.

1. To change the Asset Parameters for ***this instance*** of the Asset Monitor, click the **Asset Parameters** tab. The view shown in Figure 53 appears showing the default values. All of the Asset Parameters listed can be changed.

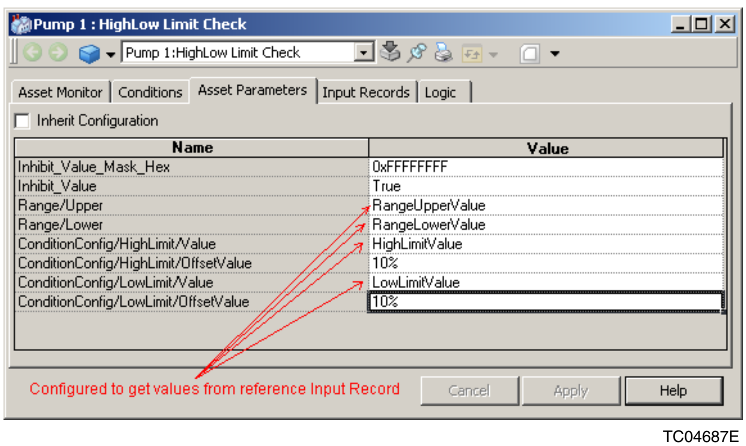


Figure 53. Asset Parameters Tab (HighLow Limit Check)

The Asset Parameter values shown in Figure 53 reflect the HighLow Limit Check Asset Monitor. The values for the High Limit Check and Low Limit Check Asset Monitors contain only those applicable to each.

a. By default the values for **Range/Upper**, **Range/Lower**, **ConditionConfig/HighLimit/Value** and **ConditionConfig/LowLimit/Value** are dynamically read from the Input Record specified in the **Value** column. Optionally, a fixed numeric value can be entered in the **Value** column; in this case the corresponding Input Record can be left unconfigured (select **None** for the Data Source Aspect).

b. The values for **ConditionConfig/HighLimit/OffsetValue** and **ConditionConfig/LowLimit/OffsetValue** can be defined as a percentage of range (by appending the % character to their numeric value), or a fixed numeric value. These offset values are evaluated in absolute value.

If a percentage is chosen, then the HighOffset subcondition limit is defined by:

$$\text{ConditionConfig/HighLimit/Value} - \frac{(\text{Range/Upper} - \text{Range/Lower}) \times \text{ConditionConfig/HighLimit/OffsetValue}}{100}$$

and the LowOffset subcondition limit is defined by:

$$\text{ConditionConfig/LowLimit/Value} + \frac{(\text{Range/Upper} - \text{Range/Lower}) \times \text{ConditionConfig/LowLimit/OffsetValue}}{100}$$

If a fixed numeric value is chosen, then the HighOffset subcondition limit is defined by:

$$\text{ConditionConfig/HighLimit/Value} - \text{ConditionConfig/HighLimit/OffsetValue}$$

and the LowOffset subcondition limit is defined by:

$$\text{ConditionConfig/LowLimit/Value} + \text{ConditionConfig/LowLimit/OffsetValue}$$

2. Click **Apply**.

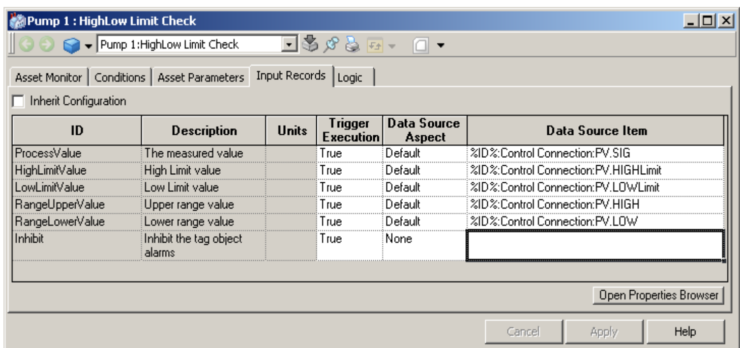
3. The HighLow Limit Check Asset Monitor logic is as follows:

```
If (ProcessValue Input Record quality is not good) then
   (High/Low) Limit Condition is set the previously calculated
SubCondition with a quality of BadLastKnownValue
Else
If (ProcessValue >= HighLimit) then
     High Limit Condition is set to the High SubCondition
   ElseIf (ProcessValue >= HighOffsetLimit) then
     High Limit Condition is set to the HighOffset
SubCondition
Else
     High Limit Condition is set to the Normal SubCondition
If (ProcessValue <= LowLimit) then
     Low Limit Condition is set to the Low SubCondition
```

```
   ElseIf (ProcessValue <= LowOffsetLimit) then
      LowLimit Condition is set to the LowOffset SubCondition
Else
      Low Limit Condition is set to the Normal SubCondition
```

4. Click the **Input Records** tab and the view shown in Figure 54 appears. The view shown has values configured.

The Input Records shown in Figure 54 reflect the HighLow Limit Check Asset Monitor. The values for the High Limit Check and Low Limit Check Asset Monitors contain only those applicable to each.



TC04689F

Figure 54. Configured Input Records Tab (HighLow Limit Check)

5. Click on the **Data Source Aspect** column and select the OPC server from which to receive the data. This is a data source that was created in Managing Data Source Connections on page 45.
6. Click **Apply**.
7. Fill in the **Data Source Item** column with the OPC item providing the value to be monitored.
8. Click **Apply**.

Refer to Configuring Asset Monitor Inhibit functionality on page 115 if inhibit functionality is needed.

9. The **Output Records** and **Logic** tabs are common to all Asset Monitors. Refer to Output Records Tab and Logic Tab on page 67 for more information.

Runtime

The Runtime Asset Monitor monitors the accumulated runtime hours of a device and notifies, for preventive maintenance, that the runtime has accumulated up to a configured limit. Refer to Creation, Configuration, and Commissioning (Single Instance) on page 113 for general background information.

1. To change the Asset Parameters for ***this instance*** of the Asset Monitor, click the **Asset Parameters** tab. The view shown in Figure 55 appears. All of the Asset Parameters listed can be changed.

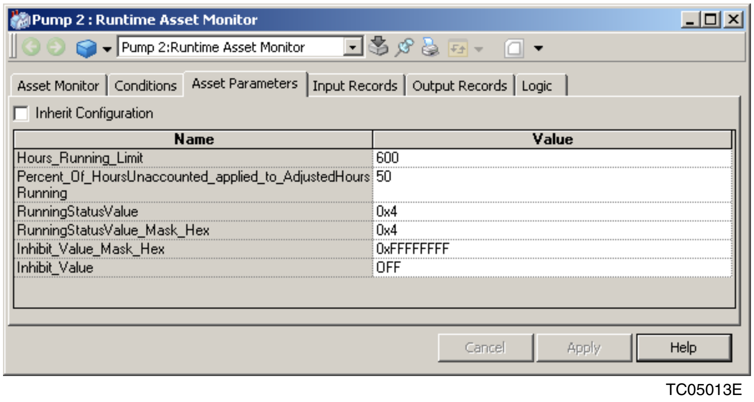


Figure 55. Asset Parameters Tab (Runtime)

a. The values are used for the following:

– **Hours_Running_Limit:** Positive numeric value in hours engineering units. When the **AdjustedHoursRunning** Output Record is greater or equal to **Hours_Running_Limit**, then the **RunTime Limit Reached** condition is set to the **Yes** subcondition.

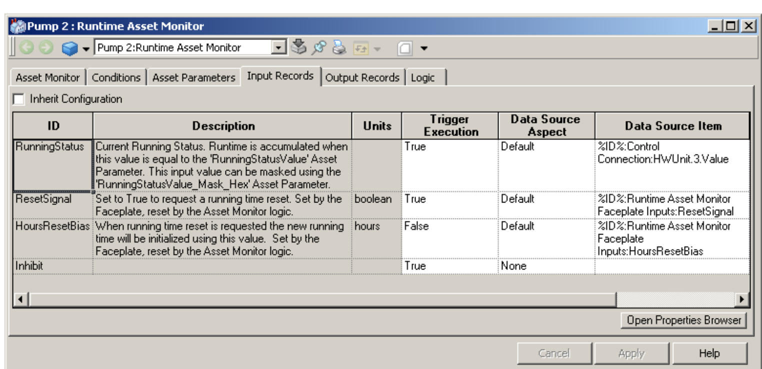
– **Percent_Of_HoursUnaccounted_applied_to_AdjustedHoursRunning:** Numeric value ranging from `0` to `100`. Used to account for time when the Asset Monitor is unable to monitor the running status of the asset; for example, if the Monitoring Server is shut down or if the **RunningStatus** Input Record is not in good quality.

– **RunningStatusValue:** This Asset Parameters can be configured with any of the following values: a Boolean value (**`True`**, **`False`**), numeric value (e.g. **`1`**, **`1.123`**, etc.), String Values (e.g. **`Running`**), 32-bit hexadecimal notation integers (e.g. **`0X02`**). The monitored asset running time is accumulated when the **RunningStatus** Input Record value (after the optional mask is applied) is equal to this **RunningStatusValue** Asset Parameter.

– **RunningStatusValue_Mask_Hex:** 32-bit hexadecimal notation integer. A value other than `0xFFFFFFFF` represents a 32-bit mask that is applied (bitwise AND) to the **RunningStatus** Input Record value before comparing it with the **RunningStatusValue** Asset Parameter. When the **RunningStatusValue_Mask_Hex** is configured to a value other than `0xFFFFFFFF`, it is necessary to specify a 32-bit hexadecimal notation integer for the **RunningStatusValue** Asset Parameter.

Change the fields to the desired values.

2. Click **Apply**.
3. Click the **Input Records** tab and the view shown in Figure 56 appears. The view shown has values configured. ResetSignal and HoursResetBias are configured by default.



TC05014E

Figure 56. Configured Input Records Tab (Runtime)

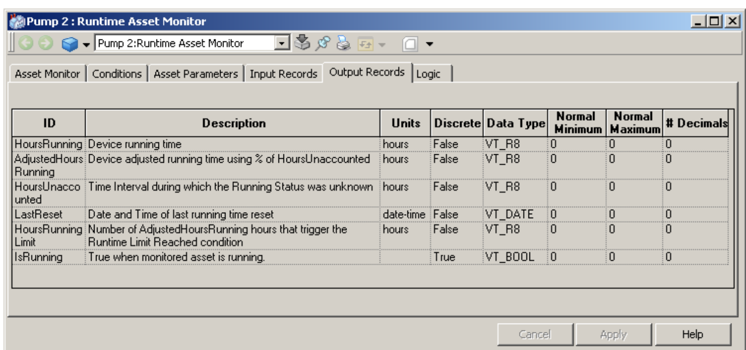
4. Click on the **Data Source Aspect** column and select the OPC server from which to receive the data. This is a data source that was created in Managing Data Source Connections on page 45.

5. Fill in the **Data Source Item** column with the OPC item providing the value to be monitored.

6. Click **Apply**.

This Asset Monitor requires write access to be enabled on the Data Source used for the ResetSignal and HoursResetBias Input Records.

The Runtime Asset Monitor generates six Output Records. The **Output Records** tab of a Runtime Asset Monitor instance is shown in Figure 57.



ID	Description	Units	Discrete	Data Type	Normal Minimum	Normal Maximum	# Decimals
HoursRunning	Device running time	hours	False	VT_R8	0	0	0
AdjustedHours Running	Device adjusted running time using % of HoursUnaccounted	hours	False	VT_R8	0	0	0
HoursUnacco unted	Time Interval during which the Running Status was unknown	hours	False	VT_R8	0	0	0
LastReset	Date and Time of last running time reset	date-time	False	VT_DATE	0	0	0
HoursRunning Limit	Number of AdjustedHoursRunning hours that trigger the Runtime Limit Reached condition	hours	False	VT_R8	0	0	0
IsRunning	True when monitored asset is running.		True	VT_BOOL	0	0	0

TC05039C

Figure 57. Output Records Tab (Runtime)

The Output Records are:

- **HoursRunning:** Provides the number of hours accumulated while the RunningStatus Input Record value, after the optional bit mask has been applied, matched the RunningStatusValue Asset Parameter.
- **AdjustedHoursRunning:** Provides an adjusted HoursRunning estimate based on the following function:

$$A = B + \left(\frac{C \times D}{100}\right)$$

Where:

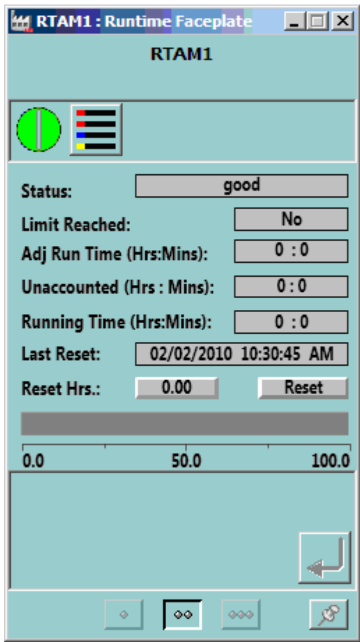
A = AdjustedHoursRunning
B = HoursRunning
C = HoursUnaccounted
D = Percent_Of_HoursUnaccounted_applied_to_AdjustedHoursRunning

- **HoursUnaccounted:** Provides the number of hours accumulated while the Asset Monitor was not able to monitor the RunningStatus Input Record value.
- **LastReset:** Date and time of the last HoursRunning reset.
- **HoursRunningLimit:** Number of **AdjustedHoursRunning** hours that trigger the **Runtime Limit Reached** condition.
- IsRunning: **True** when monitored asset is running.

Refer to Configuring Asset Monitor Inhibit functionality on page 115 if inhibit functionality is needed. When the Runtime Asset Monitor is inhibited it will not increment the **HourRunning** or **HoursUnaccounted** regardless of the **RunningStatus** input record value.

The Runtime Asset Monitor requires a user interface to reset the runtime. Therefore, a Runtime Asset Monitor Object Type is provided as an example of how to add a Runtime Asset Monitor, including the related faceplate, to an existing Object Type or instance representing the asset to be monitored. Figure 58 shows the Runtime

Asset Monitor faceplate.



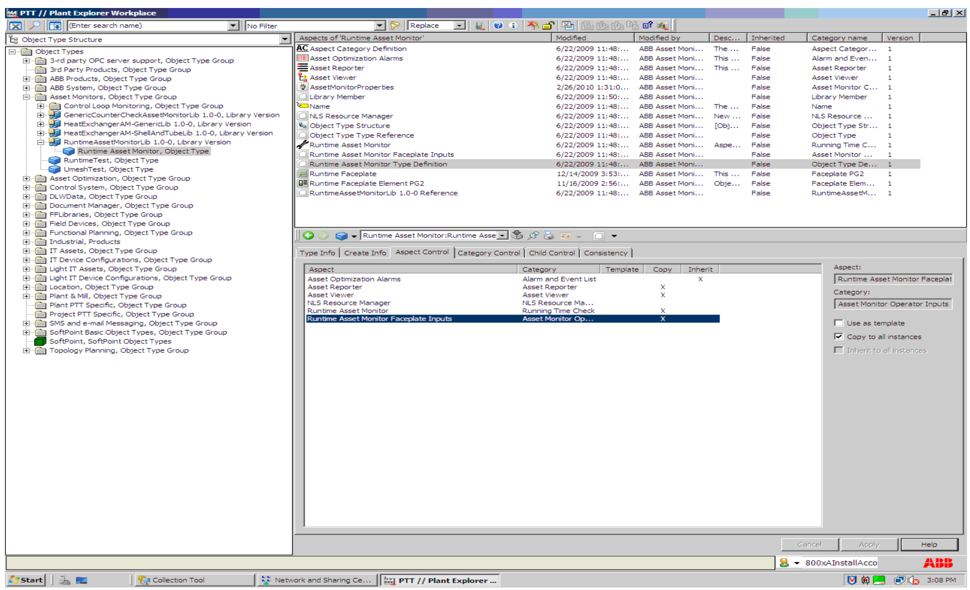
TC05034B

Figure 58. Runtime Asset Monitor Faceplate

To reset the runtime using the faceplate:

1. Click the button next to Reset Hrs.: to set the initial runtime hours.
2. Click **Reset**.
3. In order to add Runtime Asset Monitoring capability to an Object Type, the following five aspects are required to be added to that Object Type.
   a. Runtime Asset Monitor
   b. Runtime Asset Monitor Faceplate Inputs
   c. Runtime Faceplate
   d. Runtime Faceplate element
   e. Asset Reporter

For this purpose, it is recommended to copy and paste the required aspects from the Runtime Asset Monitor Object Type to the target Object Type. Once the aspects are copied, it is necessary to modify the Object Type Definition aspect, Runtime Asset Monitor should be approved from reference Tool and in element tab object should be pointed to the new target Object Type. Refer to Figure 59.



TC05033B

Figure 59. Runtime Asset Monitor Object Type

Where:

- **Runtime Asset Monitor:** Represents one Runtime Asset Monitor.
- **Runtime Faceplate and Runtime Faceplate Element:** Constitute the faceplate. The Runtime Faceplate Element needs to be deployed after it is copied in the target Object Type.
- **Runtime Asset Monitor Faceplate Inputs:** Contains two supporting properties (OPC items) used to link the faceplate runtime reset inputs to the Asset Monitor.

- **Asset Reporter:** Shows all the object conditions and provides access to the Fault Report Submitter, if configured on the object.

Renaming the Runtime Asset Monitor or Runtime Asset Monitor Faceplate Input aspects properties will break the links between such aspects and the related Runtime Faceplate Element. A new Runtime Faceplate Element can be deployed that points to the new aspect names.

Refer to *System 800xA Upgrade (3BSE036342*)* for backup and restore procedures for Runtime data.

XY Profile Deviation

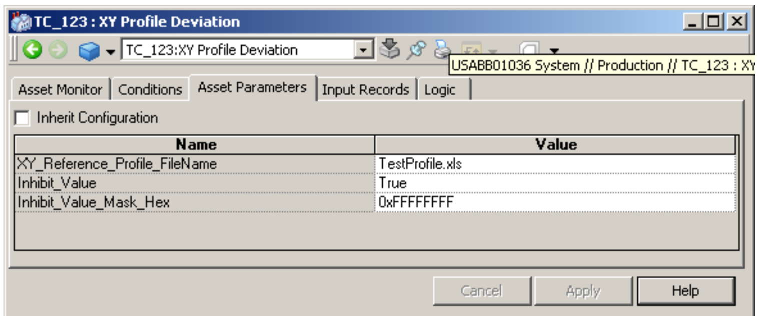
The XY Profile Deviation Asset Monitor compares a two-dimensional value (a point in a Cartesian plane) against a baseline function and notifies if the deviation from the baseline is less than or greater than the configured limit.

The XY Profile Deviation Asset Monitor uses an external Excel configuration file. This file contains the definition of a XY reference function and related High and Low profiles. When defining the XY reference profile function, the X values must be in ascending order with no duplicate X values.

When the operating point lies outside the defined reference profile (Xpoint is less than reference profile Xmin or Xpoint is greater than reference profile Xmax), the High and Low profiles will be set to be parallel to the extrapolated reference profile (same slope as the slope of the last defined reference profile segment).

Refer to Creation, Configuration, and Commissioning (Single Instance) on page 113 for general background information.

1. To change the Asset Parameters for ***this instance*** of the Asset Monitor, click the **Asset Parameters** tab. The view shown in Figure 60 appears. All of the Asset Parameters listed can be changed.



TC05017E

Figure 60. Asset Parameters Tab (XY Profile Deviation)

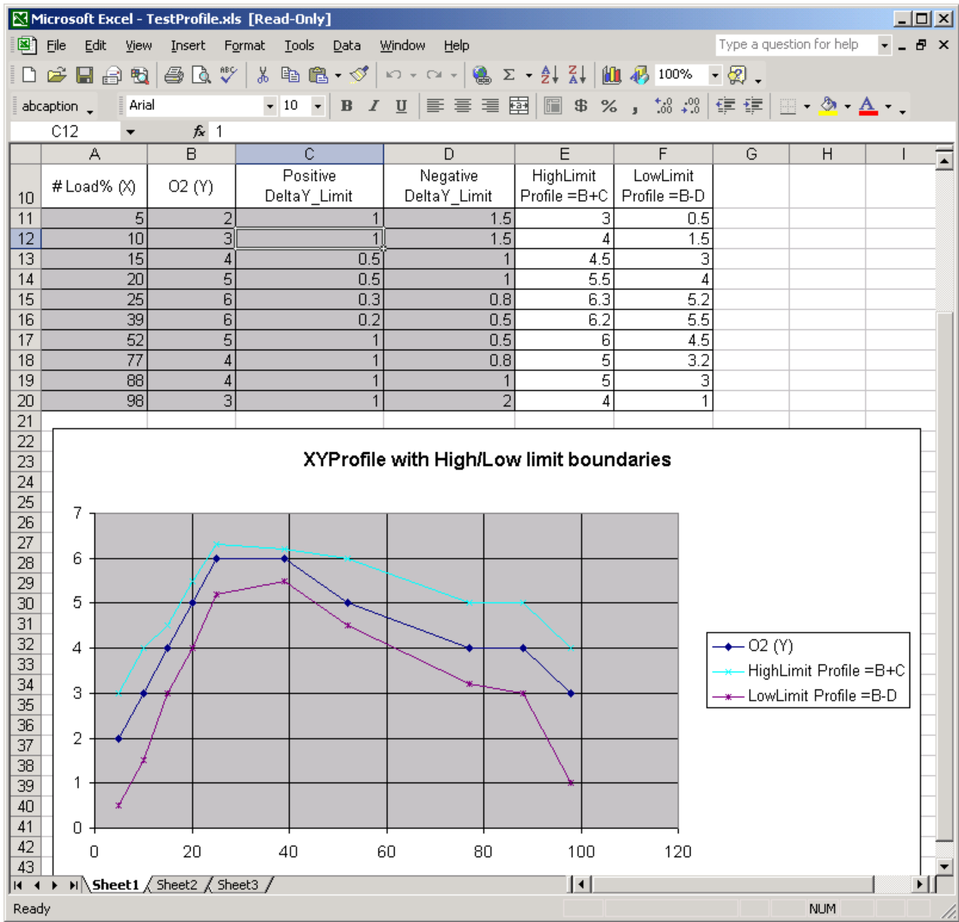
   a. The values are used for the following:

   – XY_Reference_Profile_FileName: This value contains the file name (without a path) of the Excel workbook containing the baseline XY profile with relative allowable deviations (High and Low Limit profiles).

The Excel files containing the XY profiles must reside in the following directory:

Installdrive:\Program Files\ABB Industrial IT\Optimize IT\Asset Optimization\AssetMonitorEnvironment\Bin\XY_Reference_Profiles

A sample XY profile is provided in the XY_Reference_Profiles directory. It is recommended to copy TestProfile.xls, rename it, and modify it as required. Figure 61 shows the sample XY profile.



# Load% (X)	O2 (Y)	Positive DeltaY_Limit	Negative DeltaY_Limit	HighLimit Profile =B+C	LowLimit Profile =B-D
5	2	1	1.5	3	0.5
10	3	1	1.5	4	1.5
15	4	0.5	1	4.5	3
20	5	0.5	1	5.5	4
25	6	0.3	0.8	6.3	5.2
39	6	0.2	0.5	6.2	5.5
52	5	1	0.5	6	4.5
77	4	1	0.8	5	3.2
88	4	1	1	5	3
98	3	1	2	4	1

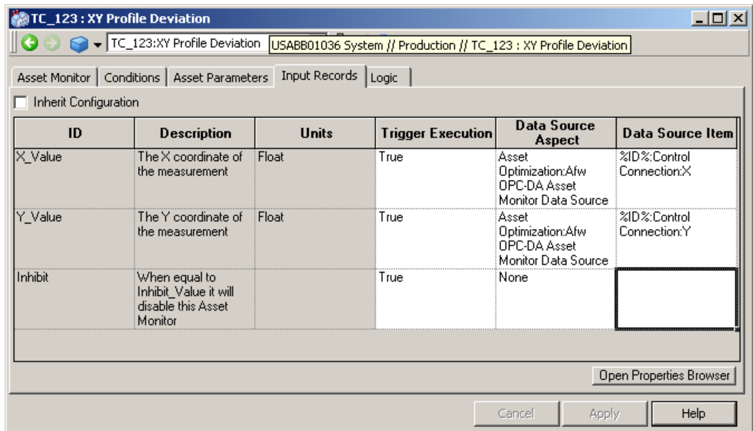
TC05040A

Figure 61. Sample XY Profile

Change the fields to the desired values.

2. Click **Apply**.

3. Click the **Input Records** tab and the view shown in Figure 62 appears. The view shown has values configured.



TC05018E

Figure 62. Configured Input Records Tab (XY Profile Deviation)

4. For each Input Record, click on the **Data Source Aspect** column and select the OPC server from which to receive the data. This is a data source that was created in Managing Data Source Connections on page 45.

5. Fill in the **Data Source Item** column with the OPC item providing the value to be monitored.

6. Click **Apply**.

Refer to Configuring Asset Monitor Inhibit functionality on page 115 if inhibit functionality is needed.

Refer to *System 800xA System, Upgrade* for backup and restore procedures for XY Profile Deviation data.

Counter Check

The Counter Check Asset Monitor counts the number of transitions of an input signal and generates an abnormal condition when the count exceeds the configured limits. The counter can be reset to an initial value through the provided faceplate. Refer to Creation, Configuration, and Commissioning (Single Instance) on page 113 for general background information.

1. To change the Asset Parameters for ***this instance*** of the Asset Monitor, click the **Asset Parameters** tab. The view shown in Figure 63 appears. All of the Asset Parameters listed can be changed.

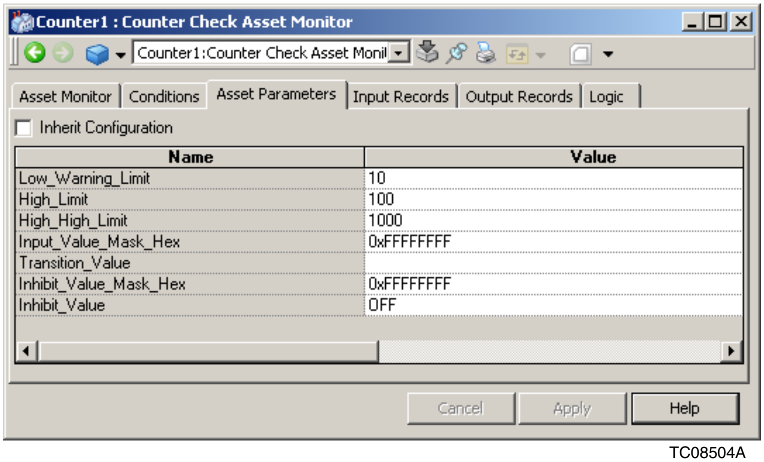


Figure 63. Asset Parameters Tab (Counter Check)

a. The values are used for the following:

– **Low_Warning_Limit:** Number of times the `Input_Signal` Input Record value has changed before the Asset Monitor reports a Low Warning Limit exceeded condition.

– **High_Limit:** Number of times the `Input_Signal` Input Record value has changed before the Asset Monitor reports a High Limit exceeded condition.

– **High_High_Limit:** Number of times the `Input_Signal` Input Record value has changed before the Asset Monitor reports a High-High Limit exceeded condition.

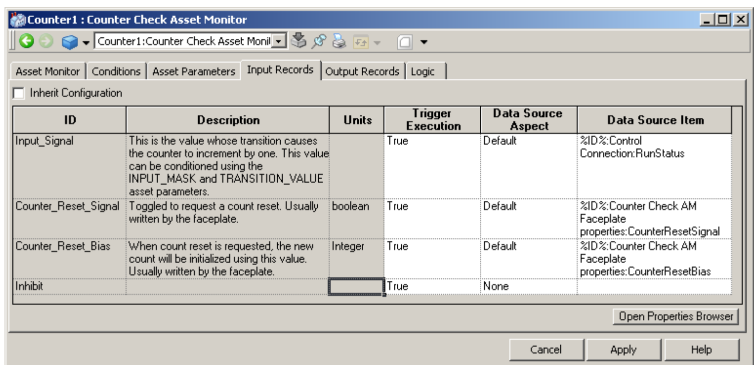
– **Input_Value_Mask_Hex:** A 32-bit integer in hexadecimal that is applied (bitwise AND) to the `Input_Signal` Input Record value before evaluation. If this mask is set to 0xFFFFFFFF it will be ignored.

– **Transition_Value (optional):** The counter is incremented only when the `Input_Signal` Input Record value (after the optional

Input_Value_Mask_Hex is applied) transitions to match this Asset Parameter value. If this value begins with `0x` it will be interpreted as a hexadecimal value. If this value is left empty it will be ignored.

Change the fields to the desired values.

2. Click **Apply**.
3. Click the **Input Records** tab and the view shown in Figure 64 appears. The view shown has values configured.



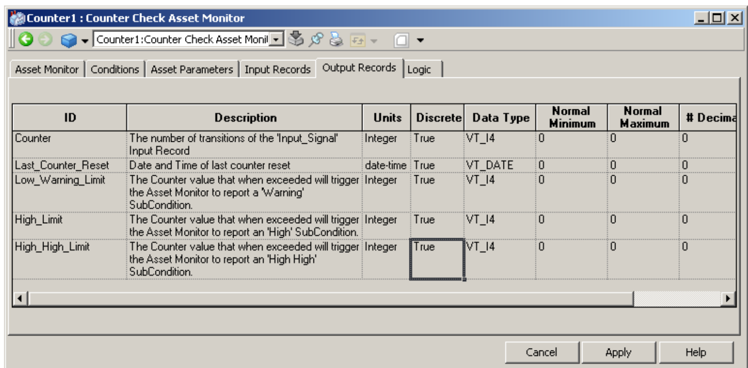
TC08505A

Figure 64. Configured Input Records Tab (Counter Check)

4. Click on the **Data Source Aspect** column and select the OPC server from which to receive the data. This is a data source that was created in Managing Data Source Connections on page 45.
5. Fill in the **Data Source Item** column with the OPC items providing the value to be monitored.
6. Click **Apply**.

Refer to Configuring Asset Monitor Inhibit functionality on page 115 if inhibit functionality is needed.

The Counter Check Asset Monitor generates five Output Records. The **Output Records** tab of a Runtime Asset Monitor instance is shown in Figure 65.



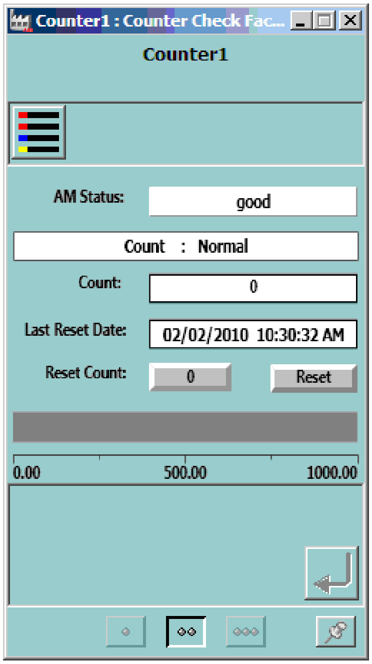
TC08506A

Figure 65. Output Records Tab (Counter Check)

The Output Records are:

- **Counter:** The number of transitions of the Input_Signal Input Record.
- **Last_Counter_Reset:** Date and time of last counter reset.
- **Low_Warning_Limit:** The counter value that when exceeded will trigger the Asset Monitor to report a Warning subcondition.
- **High_Limit:** The counter value that when exceeded will trigger the Asset Monitor to report an High subcondition.
- **High_High_Limit:** The counter value that when exceeded will trigger the Asset Monitor to report an High High Subcondition.

The Counter Check Asset Monitor requires a user interface to reset the counter. Therefore, a Generic Counter Check Asset Monitor Object Type is provided as an example of how to add a Counter Check Asset Monitor, including the related faceplate, to an existing Object Type or instance representing the asset to be monitored. Figure 66 shows the Counter Check faceplate.



TC08507A

Figure 66. Counter Check Asset Monitor Faceplate

To reset the counter using the faceplate:

1. Click the numeric button next to Reset Count: to set the initial count.
2. Click **Reset**.
3. In order to add Counter Check Monitoring capability to an Object Type or object instance, the five aspects shown in Figure 67 are required to be added to such object. For this purpose, it is recommended to copy and paste the required aspects from the Generic Counter Check Asset Monitor Object Type to the target object. If these aspects are copied to an Object Type then it is necessary to modify the Object Type Definition aspect by properly setting the newly

added Aspect Instantiation attributes as shown in Figure 67.

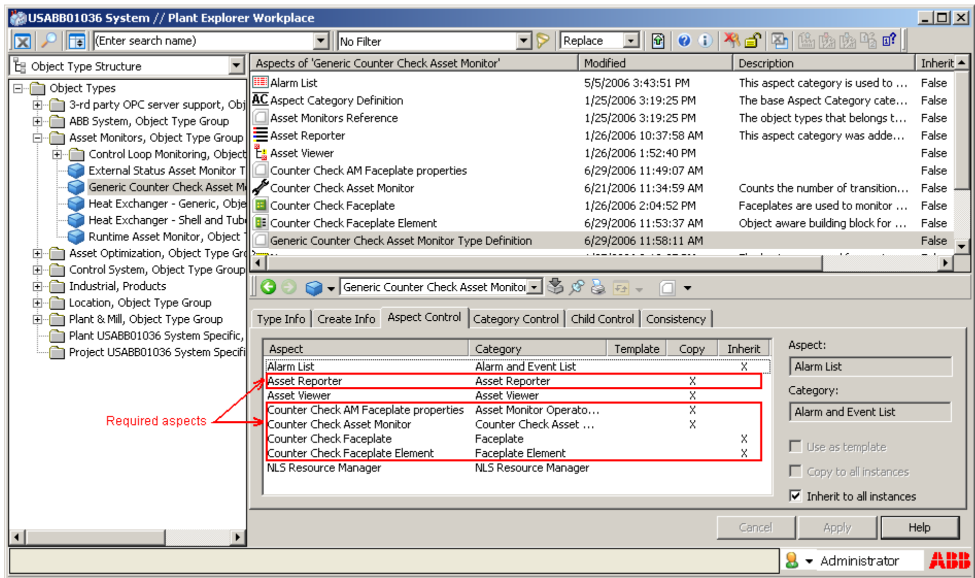


Figure 67. Generic Counter Check Asset Monitor Object Type

Where:

- **Asset Reporter:** Shows all the object conditions and provides access to the Fault Report Submitter, if configured on the object.
- **Counter Check AM Faceplate Properties:** Contains two supporting properties (OPC items) used to link the faceplate counter reset inputs to the Asset Monitor.
- **Counter Check Asset Monitor:** The Counter Check Asset Monitor.
- **Counter Check Faceplate:** Counter Check Asset Monitor Faceplate.

- **Counter Check Faceplate Element:** Counter Check Asset Monitor Faceplate Element.

Renaming the properties of the Counter Check Asset Monitor aspect or Counter Check Asset Monitor Faceplate properties aspect will break the links between such aspects and the related Counter Check Faceplate Element. If needed, a new Counter Check Faceplate Element can be configured and deployed using the names of the modified aspect properties.

Refer to *System 800xA Administration and Security (3BSE037410*)* for backup and restore procedures for Counter Check Asset Monitor data.

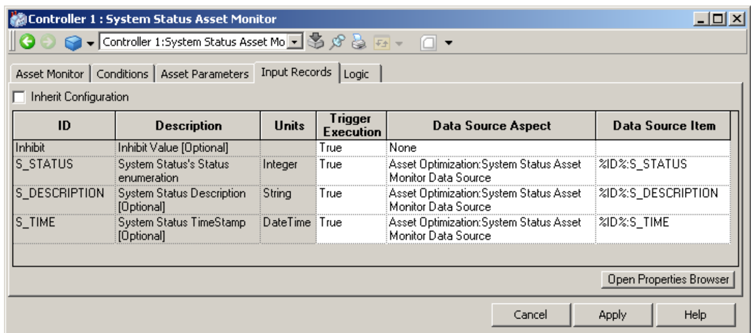
4. The **Logic** tab is common to all Asset Monitors. Refer to Logic Tab on page 67 for more information.

System Status

The System Status Asset Monitor subscribes to the information provided by the 800xA System Status properties and reports such information in the form of an Asset Condition Document.

The System Status Asset Monitor can be configured on any object that exposes the 800xA System Status properties. Refer to Creation, Configuration, and Commissioning (Single Instance) on page 113 for general background information.

1. Click the **Input Records** tab and the view shown in Figure 68 appears. The view shown has values configured.



TC08509A

Figure 68. Configured Input Records Tab (System Status)

2. Click on the **Data Source Aspect** column and select the OPC server from which to receive the data. This is a data source that was created in Managing Data Source Connections on page 45.

3. Fill in the **Data Source Item** column with the OPC item providing the value to be monitored.

4. Click **Apply**.

Refer to Configuring Asset Monitor Inhibit functionality on page 115 if inhibit functionality is needed.

5. The System Status condition/subcondition selection logic is documented in Table 20.

Table 20. System Status Condition - Subcondition Selection Logic

S_STATUS Input Record Value	System Status Subcondition Selected
OK = 0	0 OK. This is the normal condition (no alarm).
ERROR = 1	1 Error
WARNING = 2	2 Warning

Table 20. System Status Condition - Subcondition Selection Logic (Continued)

S_STATUS Input Record Value	System Status Subcondition Selected
NOT_VALID = 253	253 Not Valid
OUT_OF_SERVICE = 255	255 Out of Service
value not in good quality	Uses the last known subcondition and sets its quality to BadLast KnownValue.

6. The **Output Records** and **Logic** tabs are common to all Asset Monitors. Refer to Output Records Tab and Logic Tab on page 67 for more information.

Section 5 Control Loop Asset Monitor (CLAM)

Introduction

The Control Loop Asset Monitor (CLAM) is designed to monitor in real time the quality and performance of process control loops in control systems in order to bring actionable information on loop quality and performance to controls engineers where and when they need it most. By providing actionable information on control loops directly at the operator screen, information is delivered to plant operations and maintenance personnel in a timely manner.

CLAM is set up in the 800xA System to monitor process control loops in real time, displaying complex analysis of control loops in a clear and straightforward manner. Additionally, CLAM is independent of the type of controllers used in ABB systems, whether AC800M or any of the other controllers available from ABB.

Each Control Loop Asset Monitor is associated with its own control loop. The controllers continuously provide process value (PV), set point (SP), and control output (CO) data. This data is captured by the 800xA System as OPC data. The CLAM is configured using its input records to receive PV, SP, and CO data from its control loop through CLAM log Configuration (the historian data of these OPC properties).

The CLAM logic reads and collects SET of DATA of the process value (PV), set point (SP), and control output (CO) data from history. This data set collected is sent to the CLAM auditing logic. The auditing logic performs loop analysis and returns the results as the loop diagnosis. The loop diagnosis is then published by the "Control Loop Asset Monitor" aspect of the Control Loop Asset Monitor Ex object type instance.

The Control Loop Asset Monitor provides user friendly access to the control loop diagnosis information for a large number of controllers. This information is organized so that it is quick and easy to read and interpret. Multiple stages of loop failure modes are provided, so that a problem can be detected and rectified before it becomes too severe and affects plant operation.

Additional details are provided that are easy to access. These include the input data Trend Display to show the input data. The diagnostics are displayed in the output records as well as on the faceplate for easier and in-depth analysis of the loop condition.

This section describes CLAM configuration. It assumes that installation and post installation procedures are already complete. Deploying CLAM involves **Object Type Structure** configuration that applies to all new instances. It also involves instance based configuration in the **Control Structure**. Upon completing configuration, refer to *System 800xA Asset Optimization Operation (3BUA000150*)* for additional information on operation.

Enhancements to CLAM

As a constant endeavour towards improvement, the software has undergone some changes since the last release. Some of the important enhancements are the following:

1. New Names to User Interfaces:
   - The threshold values are given easily recognizable and contextual names.
   - Improved error messages and suggested action text of hypothesis.
2. Weights and Threshold Values Updated:
   - The default values for the weights and threshold are updated.
   - Ascending-order validation checks for the threshold values are performed. Unused Asset Parameters are removed.
   - Provision to configure Alarm threshold limits to monitor the condition.

Virtual AO Server Configuration

Control Loop Asset Monitor execution takes longer time than Basic Asset Monitors. It is recommended to load all control loop asset monitors on a separate Virtual AO Server. The Virtual AO Server is a second Asset Monitoring Engine running on existing AO Server node. The following steps describes how to create and configure a Virtual AO Server.

Creating and Configuring a Virtual AO Server

1. Select **Control Structure** in the Structure Navigator.
2. Navigate and select **Asset Optimization** object in the object list area.
3. Right-click and select **New Object** from context menu options.
4. Select AO Server from the New Object dialog.
5. Enter the name and click **Create** as shown in Figure 69.

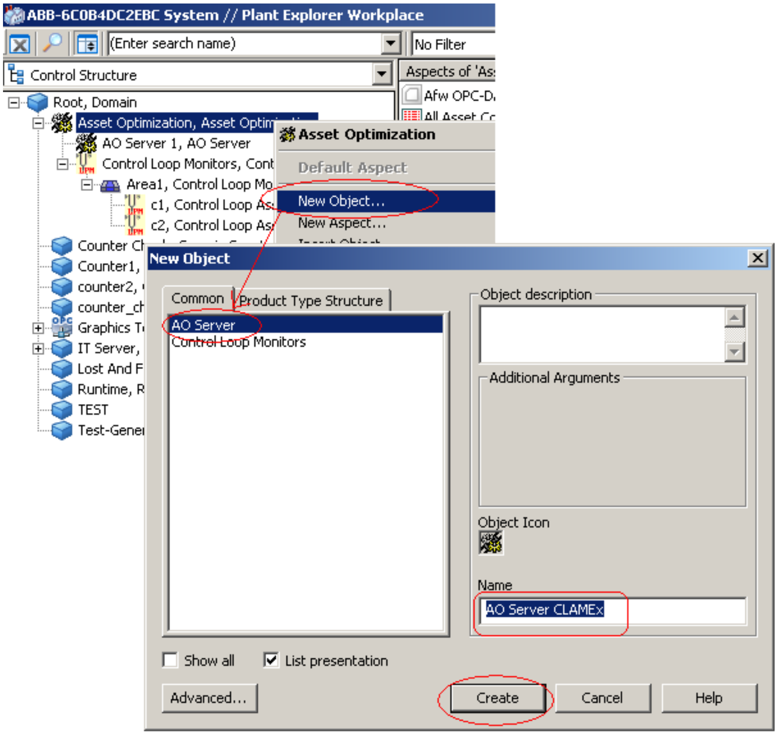


Figure 69. Create an instance of AO server

6. Select **Asset Optimization Server** Aspect on newly created object.
7. Right-click and select **Config View** from the context menu option.
8. Select AssetMonitoring SG_CLAMEx from **Service Group** drop down list as shown in Figure 70.

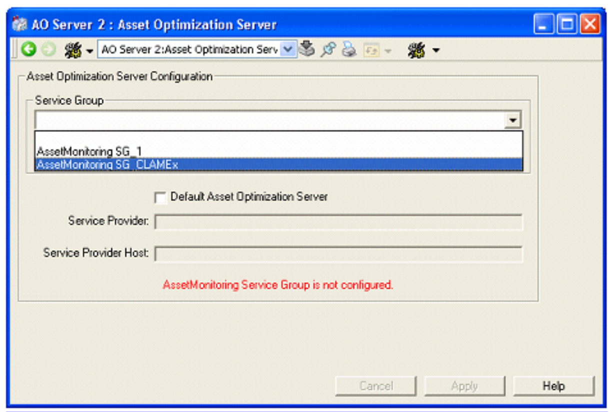


Figure 70. Select Service Group

Make sure the "**Default Asset Optimization Server**" is not checked.

9. Click **Apply**.
10. Click **View** button to open Service Group Aspect View.
11. Select AssetMonitoring SP_CLAMEx from the providers list and click **View** to open Service Provider Aspect View. The current state of Asset Monitoring Engine will be "Undefined".
12. Check **Enabled** option.
13. Select the **Node to run AO Server**.
14. Click **Apply**. The current state of Asset Monitoring Engine will change to Service.

15. After configuring the **Service Provider Definition**, navigate to the Control Structure and click on the newly created AO Server and verify that it is running as shown in Figure 71.

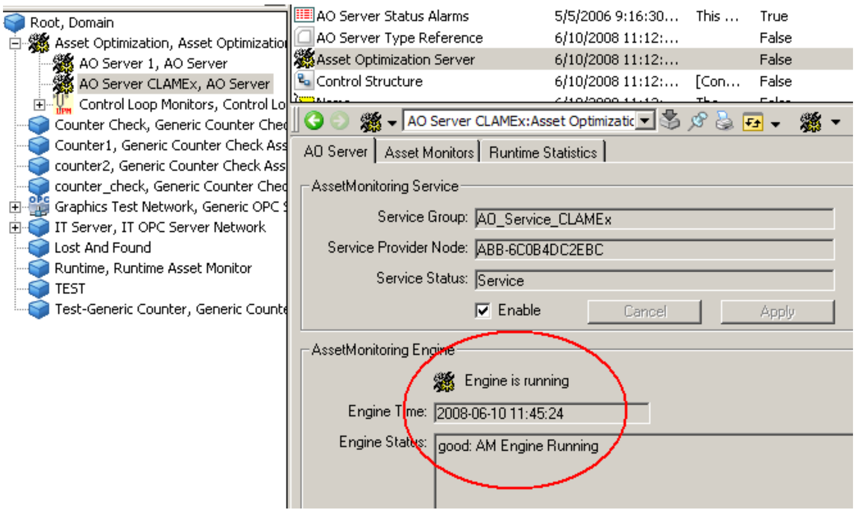


Figure 71. Verifying the AO engine is running

Create and Configure a new Service Group and Service Provider

1. Select **Service Structure** in the Structure Navigator.
2. Navigate and select **AssetMonitoring**, **Service** in the object list area.
3. Select **Service Definition** Aspect in the aspect list area.
4. To create new service group, click **Add** in the Aspect View.
5. Enter Service Group name and click **OK**.
6. Click **Apply** to add a new service group to AssetMonitoring Service.

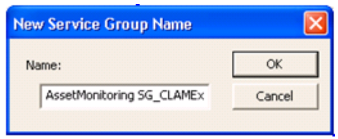


Figure 72. New Service Group Name

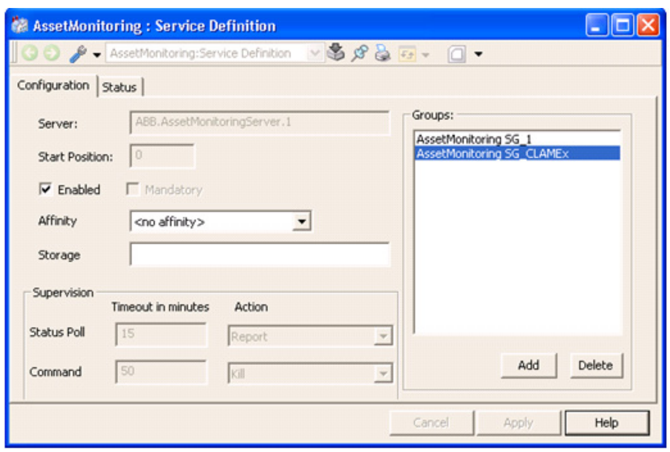


Figure 73. Asset Monitoring:Service Definition

7. Select **Service Group Definition** Aspect from the newly created Service Group.
8. To create new service provider, click **Add** in the Aspect View.

9. Enter Service Provider name and click **OK**.

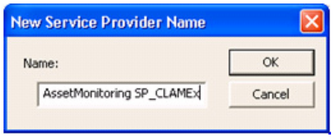


Figure 74. New Service provider name

10. Click Apply to add a new Service Provider to AssetMonitoring SG_CLAMEx Service Group

Licensing

There are two modes of operation of Control loop asset monitors:

- Basic Control Loop Monitoring mode (unlicensed).
- Enhanced Control Loop Monitoring mode (licensed).

The basic CLAM provides only the limited summary diagnosis for each control loop. This Basic Control Loop Monitoring mode is an unlicensed mode of operation. Additional license features, when purchased, provide more detailed diagnosis information.

Configuration in the 800xA System

The configuration of Control Loop Asset Monitors within the 800xA System consists of:

- Control Loop Asset Monitor Ex Object Types
- History Source Configuration
- Instance Configuration

Control Loop Asset Monitor Ex Object Types

The Asset Optimization installation generates a Control Loop Asset Monitor Ex Object Type in the Asset Monitors Object Type Group in the **Object Type Structure**.

This Object Type must be customized for the target control system configuration. First configure the Control Loop Asset Monitor aspect by selecting the config view of the aspect. Refer to Figure 75.

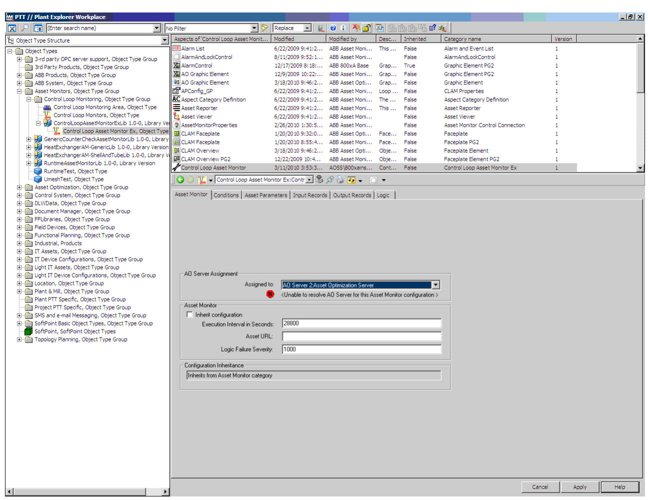


Figure 75. Configuring Control Loop Asset Monitor Parameters

Parameters such as Logic Execution Interval, Asset Parameters, Input Parameters, etc. can be changed in the **Control Loop Asset Monitor** aspect. The change will be automatically applied to all new instances of this object type. The changes will also be applied to existing instances unless it is decided to override the category in one or more of those instances. Overriding the category during Asset Monitor configuration can be used to modify individual instances. After any change, it is necessary to reload the Control Loop Asset Monitor instance so that the AO Server will read the change. All other associated aspects for Control Loop Asset Monitors are stored in this Control Loop Asset Monitor Ex Object Type in the **Object Type Structure**.

The Control Loop Asset Monitor Aspect Type makes the Control Loop Asset Monitor aspect available. The Control Loop Asset Monitor Object Type uses this Control Loop Asset Monitor aspect and also makes several other integrated aspects available to the user.

The Control Loop Asset Monitor has three Object Types associated with it:

- **Control Loop Monitors:** Root object used to hold all Control Loop Asset Monitor objects.
- **Control Loop Monitoring Area:** Used to hold several Control Loop Asset Monitor objects that should be grouped together, because they have similar functionality.
- **Control Loop Asset Monitor Ex:** Object Types that should be copied into new Object Types and custom configured so that their instances will require minimum configuration. This procedure is described later in this section.

All of these aspects are either Inherited or Copied for each CLAM object instance. Any change made in these aspects in the **Object Type Structure** will be applied to all new CLAM object instances. Changes are also applied to already existing CLAM objects where the aspects are Inherited.

If there is a common change that must be made available to the Control Loop Asset Monitors or in any other aspect included in the CLAM Ex Objects, then it should be made in the CLAM Ex Object Type. This way, all changes become automatically available to all CLAM instances.

Using these Object Types, the Control Loop Asset Monitor is organized in the **Control Structure** as shown in Figure 76.

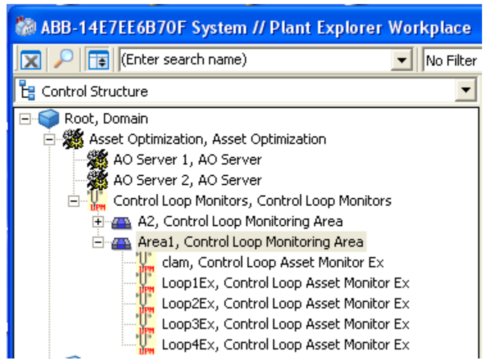


Figure 76. CLAM Organization in the Control Structure

The CLAM Object types can also be instantiated in the control structure near the location of the Source object providing PV, SP and CO data. Figure 77 shows configuration of CLAM instance below a control program object.

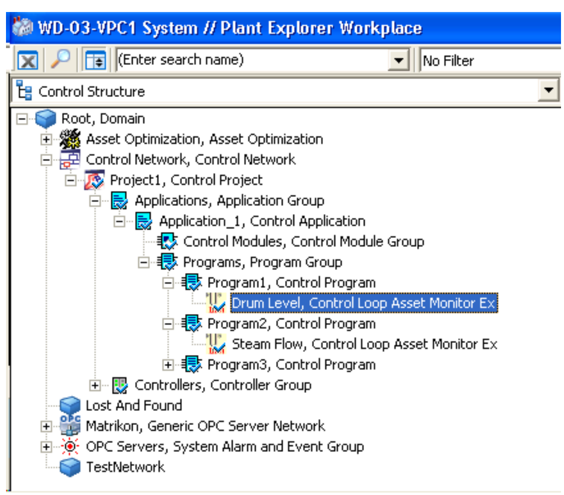


Figure 77. Creating CLAM instance directly under a control or program object

Configuring Input Data

Data inputs for each Control Loop Asset Monitor object are PV, SP, and CO data. These should be read as the controller data. There is also an INHIBIT input. The current value of all these data inputs are read each time the Control Loop Asset Monitor object is executed.

Each Control Loop Asset Monitor object is associated with a control loop. The Control Loop Asset Monitor has to receive PV, SP, and CO data from the controller associated with this control loop, into the **Input Records** tab of the Control Loop Asset Monitor aspect. This is typically accomplished by using one of the following options:

- Controllers and OPC Control Networks.

For testing purposes, the following 800xA System tools can be used:

- SoftPoint Control Network.
- Using Control Loop Asset Monitor Ex Objects.

The Data Source used for the Input Records is the Control Loop Data Source aspect located in the following object in the **Control Structure**:

Root, Domain > Asset Optimization, Asset Optimization

Controllers and OPC Control Networks

The 800xA System provides Controller and OPC Control Network objects for the data coming from Controllers and OPC Control Networks. The following steps summarize configuration procedures necessary so that PV, SP, and CO data can be used by the Control Loop Asset Monitor objects.

1. As an overall configuration (refer to Overall Configuration on page 156 for detailed information):

   a. Create an instance of the Object type Control Loop Asset Monitor Ex at the desired place as shown in Figure 76 or Figure 77.

   b. Verify the full path of the Controller object, using the Properties Browser, from where a Control Loop Asset Monitor object will receive PV, SP, and CO data.

   c. Using the Controller Configuration faceplate element in the newly created Control Loop Asset Monitor Object Type, change the object name, aspect name, and property name for PV, SP, and CO to appropriate names used by the controller in the Control Loop Asset Monitor aspect.

d. Make the same changes (as in Step c) in the Trend Display aspect and Log Configuration aspect, so that only minor modifications will be needed in these entries for each Control Loop Asset Monitor instance.

e. Copy the History Source aspect from the Asset Optimization object to the root level of the OPC Server Network in the **Control Structure**, if creating the instance as shown in Figure 77.

2. For each Control Loop Asset Monitor object (refer to Instance Configuration on page 162 for detailed information):

   a. Set the correct full path for Input Records **PV**, **SP,** and **CO** data in **Control Loop Asset Monitor** asset monitor aspect using the **Controller Configuration** faceplate element.

   b. Set Object, Aspect, Property, and LogName in the Control Loop Trend Display aspect.

Overall Configuration

The Control Loop Asset Monitor will receive PV, SP, and CO data directly from the controllers at the plant site (instead of Loop Input Data GP General Property that is used as a default). The three parameters then are configured into CLAM Log configuration as in Step c. Log Configuration data goes as input to the CLAM. Each controller type must be custom configured to communicate with the CLAM.

1. The following demonstrate the integration of Control Network AC800M controller program object with Control Loop Asset Monitor Loop objects in an 800xA System. This is an example and will not contain step-by-step procedures.

Figure 78 shows Plant Explorer navigation and configuration.

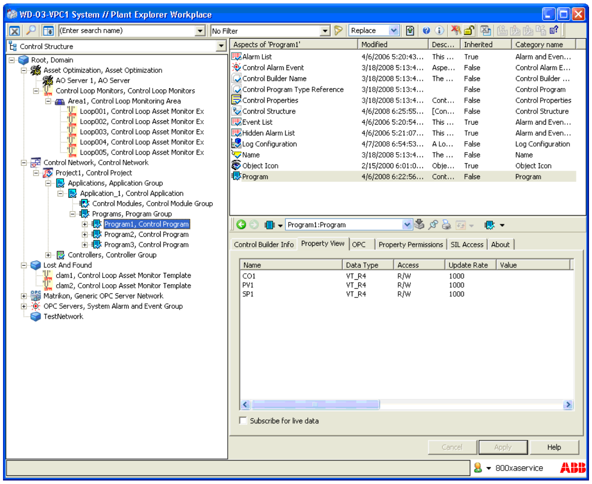


Figure 78. Receiving Controller Data in an AC800M control Network Read Object

2. Configure the corresponding Control Loop Asset Monitor object from the Object Type to receive data as shown in Figure 79. It requires specifying full path of Controller Object, Data Aspect, and PV, SP, and CO Property Tags in

the Control Loop Asset Monitor Object Type Controller Configuration faceplate element.

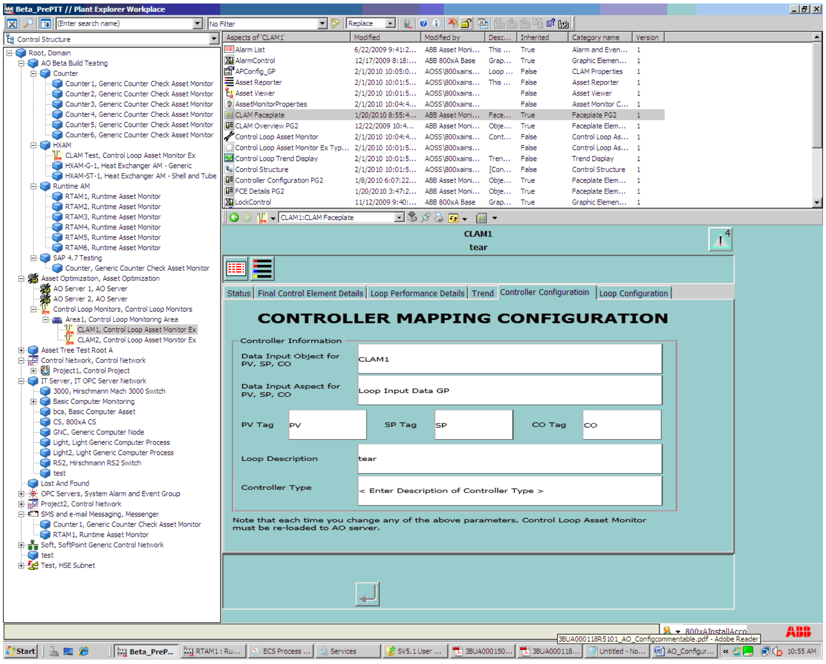


Figure 79. Controller configuration

3. The appropriate path for the controller signal (such as PV) can be read from the Properties Browser that can show the complete path for any aspect. Use the full path for the controller object by browsing to it using a Properties Browser as shown in Figure 80. Refer to Input Records Tab on page 63 for more

information about Properties Browser.

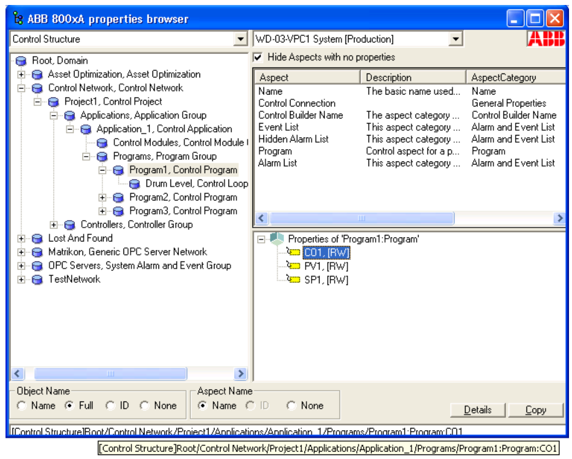


Figure 80. Object properties browser

4. Change the **Data Input Object for PV, SP, CO** field to an appropriate Controller object. An example of such a full path for the object is:

   [Control Structure] > Root > Asset Optimization > Control Loop Monitors > Area1 > Loop001

5. The default for the **Data Input Aspect for PV, SP, CO** field is `Loop Input Data GP`. The default property in the **PV Tag** field is `PV`. The Data Source Item macro from **Input Data** of the ABB CLAM aspect combines these three and reads the input for PV data from the property:

`[Control Structure]Root/Asset Optimization/Control Loop Monitors/Area1/Loop001:Loop Input Data GP:PV.` Refer to Figure 81 .

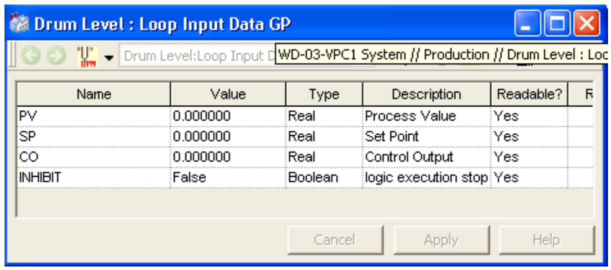


Figure 81. Loop Input Data GP

6. Add History Source aspect to the root level of OPC Server Network. In this example, it is added to **Control Network** to service log configuration of all child nodes. The History Source aspect can be copied from the Asset Optimization object. The Service Group can be Basic or anything available. Refer to Figure 82.

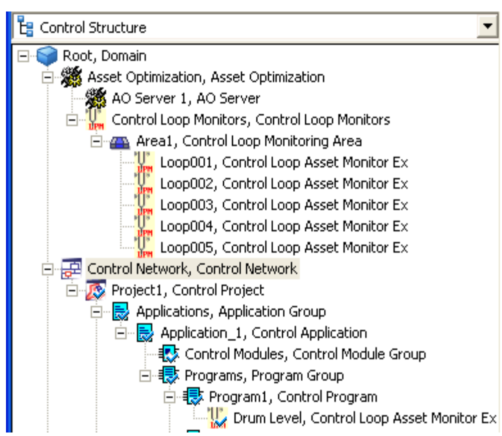


Figure 82. Adding history aspect on Control Network that will service all CLAMs in child objects

7. Add a Log Configuration aspect to Program1 object to store Trend Display plot data. The same Log is also read by CLAM aspect when configured. Make sure to select the proper logged properties such as CO1, PV1, SP1 by clicking **Add Property Log** to open the new Log dialogue as shown in Figure 83. Also, select log template type as CLAM Log Template.

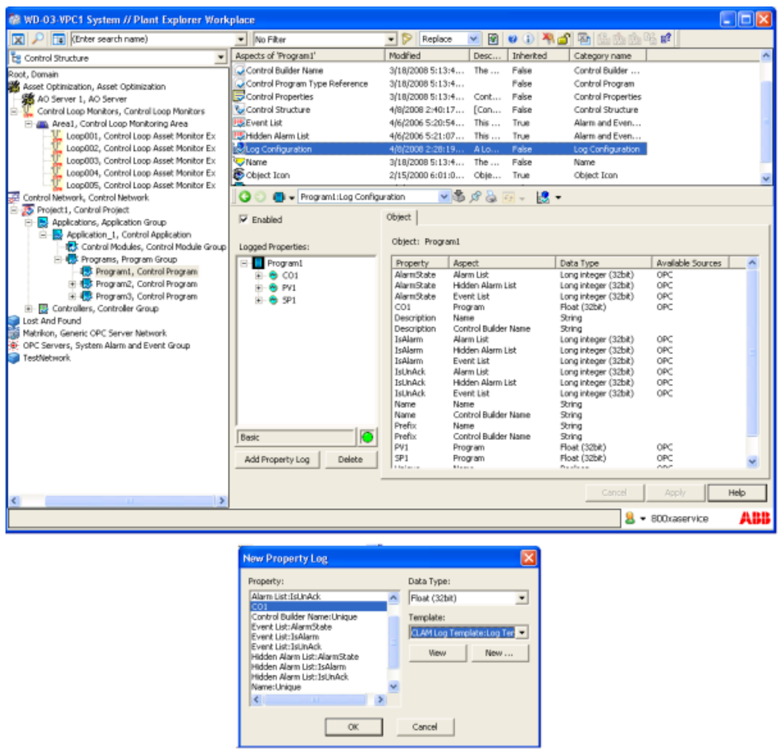


Figure 83. Log configuration for CLAM

History Source Configuration

To configure the History Source:

1. Open a Plant Explorer Workplace.
2. Use the Structure Selector to open the **Control Structure**.

3. Use the Object Browser to navigate to and select:

   Root, Domain > Asset Optimization, Asset Optimization > Control Loop Monitors

4. Create a History Source aspect in the object navigated to in Step 3.
5. Select **History Source** in the Aspect List Area.
6. Verify that the Service Group drop-down list box is not blank. If it is blank, select the available Service Group in the drop-down list box. The Basic History Service Group (`Basic`) on the AO Server node is preferred. Any available History Service Group can also be used.

If the Control Loop Asset Monitor objects are created under an object other than the Control Loop Monitors object, copy the default History Source aspect to the new object. The History Source aspect is available for insertion as a default aspect for the Control Loop Monitors object. It can also be inserted as a new aspect, enabling the **Show All** check box and then navigating to the History Source aspect.

Instance Configuration

1. For each instance of the Control Loop Asset Monitor in **Control Structure**, a modification is necessary in the Controller Configuration faceplate element. This enables each Control Loop Asset Monitor object to receive data from its corresponding Controller object. In each Control Loop Asset Monitor object instance in the **Control Structure**, only the object may have to be corrected to the appropriate Controller object. The object in this case should be the Program1 object that reads Controller data as shown in Figure 79.
2. Correct the Trend Display aspect of each instance of the Control Loop Asset Monitor in the Control Monitor Loop Asset Monitor Ex object instance or in the Trent tab of the Faceplate element of CLAM instance as shown in

Figure 84.

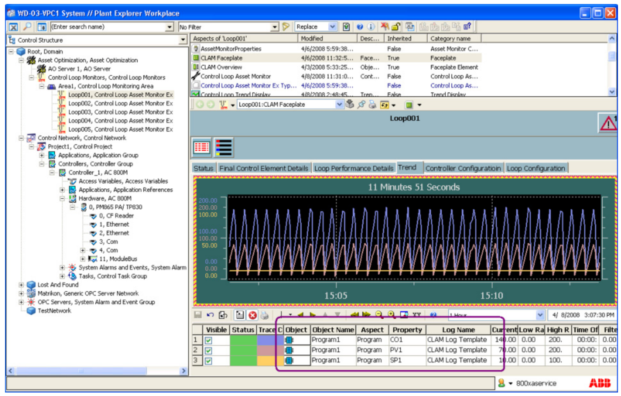


Figure 84. Trend aspect configuration from Faceplate

3. The Loop object should now be receiving data from the Program Aspect of AC800M, Program1 - controller object. Verify this by observing the Trend Display aspect. If data reception is fine, then load Loop object into AO Server and enable AO Server to perform Loop object execution.

SoftPoint Control Network

Loops can also receive PV, SP, and CO data from the SoftPoint Server. This option is particularly useful to receive non OPC data. The following example demonstrates the SoftPoint Server Generic Control Network integration with Control Loop Asset Monitor objects in the 800xA System.

It is assumed that the SoftPoint Server Generic Network is set up to organize data coming from plant objects. The User Manuals for installation and setup are available in *System 800xA Installation (3BSE034678*), System 800xA Post Installation (3BUA000156*), and System 800xA Information Management Configuration (3BUF001092*).*

1. Add/use Softpoint Generic Control Network objects to read data from plant objects as shown in Figure 85.

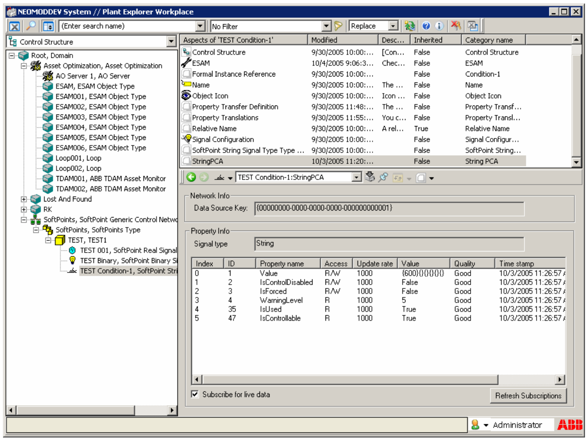


Figure 85. Receiving Controller Data in a SoftPoint Generic Control Network

2. Configure the corresponding Control Loop Asset Monitor object from the Asset Optimization tree to receive this data similar to that shown in Figure 79.

3. The Object Dialog aspect can be configured (Figure 86) to manually feed the Softpoint data for test. It can also be obtained automatically from the OPC

server or any generic source serving plant objects (Figure 87).

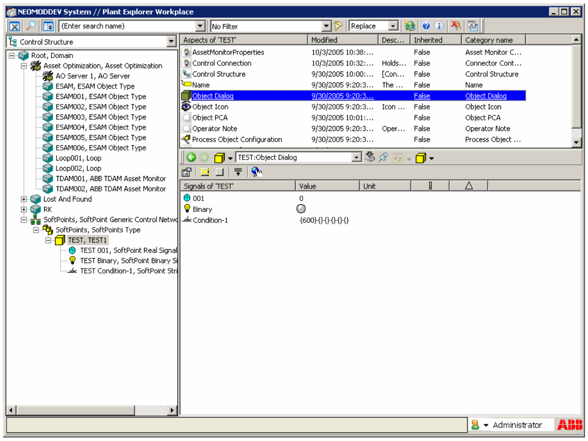


Figure 86. Manually Feeding SoftPoint Data for Test

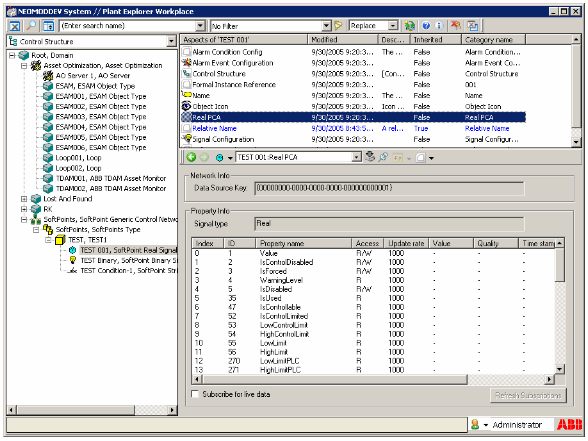


Figure 87. Signal Data for a SoftPoint Control Network

Using Control Loop Asset Monitor Ex Objects

Using Control Loop Asset Monitor consists of the following:

- Creating Control Loop Asset Monitor Ex Object instances.
- Control Loop Asset Monitor Controller Input Data Configuration.
- Control Loop Asset Monitor Input Data Storage and Display Configuration.
- Control Loop Asset Monitor Loop Analysis Configuration.

Creating Control Loop Asset Monitor Ex Object instances

Create new multiple Control Loop Asset Monitor objects from the Control Loop Asset Monitor object type. These are typically created as child objects of Control Loop Monitors Object in **Control Structure**. They will automatically have most of the desired configuration.

Each Control Loop should have its own Control Loop Asset Monitor object. Multiple Control Loop Asset Monitor objects are created from the Control Loop Asset Monitor object type by repeating this procedure. The Control Loop Asset Monitor objects can be organized under one common object such as Control Loop Monitors object in **Control Structure**. Figure 79 shows an example.

Aspect control for each Control Loop Asset Monitor aspect can be reviewed from the Type Definition aspect in **Object Type Structure**. All **Copy** type aspects can store their own structure. All **Inherited** type aspects must get their structure from the parent definition. It cannot be overwritten in an instance.

Figure 88 shows an example.

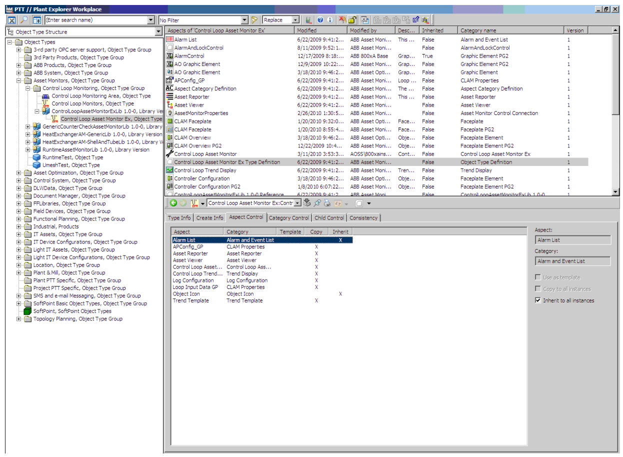


Figure 88. Using Copy vs Inheritance to Manage Control Loop Asset Monitor Objects

After any configuration changes, the **Inherited** instances will update automatically, but the **Copy** instances will not update. After any changes or updates, unload the object and delete the instance that was created by a **Copy** operation. Then switch to **Inherit** and switch back to **Copy**. This will generate an updated version of **Copy** aspects for Control Loop Asset Monitor Objects. Another option is to unload and delete the entire object and then create a new object from the LOOP object type.

Copy and Insert instances are used where structure for instances is expected to be unique. Otherwise all instances will have the same structure as in the original object type.

Control Loop Asset Monitor Controller Input Data Configuration

Four inputs are read by each Control Loop Asset Monitor object during each execution step. They are:

- **SP:** Set point input.
- **PV:** Process Value input.

- **CO:** Control Output input.
- **INHIBIT:** True or false input indicating if the execution should be paused.

Details of Control Loop Asset Monitor Controller Input Data Configuration are described in Configuring Input Data on page 155. It mainly applies to the configuration in the Control Loop Asset Monitor Object Type. Additional instance specific customization is necessary.

The inputs are constantly read from the **Input Records** tab of the Control Loop Asset Monitor. Input Records are configured to read the input according to **Data Source Item** entry. The source macros are:

- **SP:**
`%:APConfig_GP:DataInputObject%:%:APConfig_GP:DataInputAspect%:%:APConfig_GP:SPTag%,CLAM Log Template`
- **PV:** %:
`%:APConfig_GP:DataInputObject%:%:APConfig_GP:DataInputAspect%:%:APConfig_GP:PVTag%,CLAM Log Template`
- **CO:**
`%:APConfig_GP:DataInputObject%:%:APConfig_GP:DataInputAspect%:%:APConfig_GP:COTag%,CLAM Log Template`
- **INHIBIT:**
`%ID%:Loop Input Data GP:INHIBIT`

The default **Data Source Item** entries should work for most cases. The necessary **Data Source Item** entry may be changed in the **Data Source Item** field after disabling the **Inherit Configuration** check box. This allows necessary instance specific entry changes to be made for each Control Loop Asset Monitor object. Whenever possible, do not change the **Data Source Item** entries.

1. Use the Properties Browser to find the full path of the aspect that is receiving the controller PV, SP, and CO data. By default the input data PV, SP, CO, and INHIBIT is read from the Loop Input Data GP General Property as shown in Figure 89. Refer to Input Records Tab on page 63 for more about Properties

Browser.

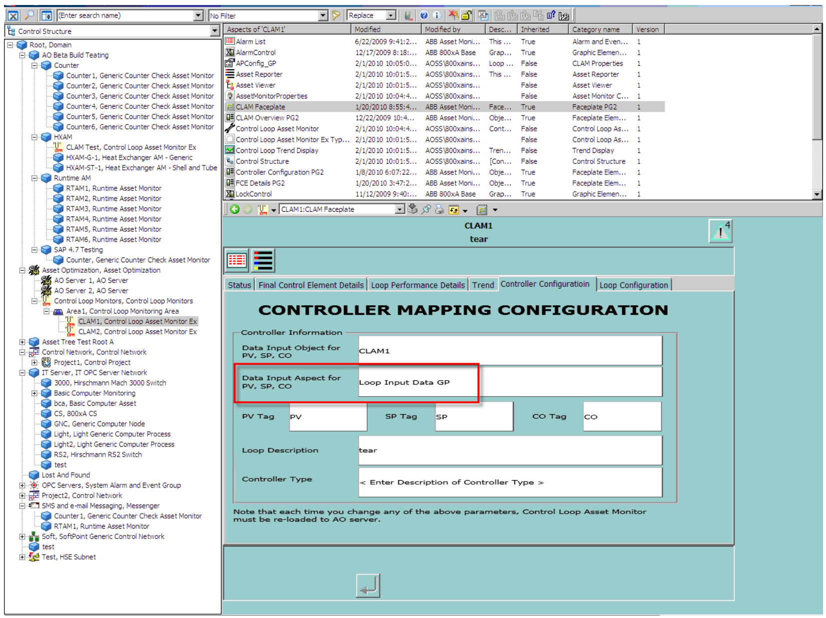


Figure 89. Default configuration of a CLAM instance

By default, it is possible to inhibit CLAM by changing the Inhibit Property value (in Loop Input Data GP Aspect, refer to **Figure 81**,) to **TRUE**. To configure the INHIBIT input record, see Configuring Asset Monitor Inhibit functionality on page 115.

Typical scenario to inhibit CLAM execution is when the control loop under CLAM monitoring is out of service. When inhibited, CLAM conditions are set to **GoodLocalOverride** and the CLAM stops loop analysis.

2. Enter the appropriate full path for the object, the aspect that receives PV, SP, and CO data, and property names for PV, SP, and CO data using Controller Configuration faceplate element. Generalized information should be entered in

the Object Type so that only a minor modification may be necessary in the object name.

Control Loop Asset Monitor Input Data Storage and Display Configuration

The PV, SP, and CO information is saved for each Control Loop Asset Monitor object and also displayed in the Trend Display.

1. If necessary, adjust the duration of the display durations in the Trend Template aspect. The default for the trend display is one hour. If the Control Loop Asset Monitor execution rate is changed from the default value of 8 hours, then also change the update rate in the Trend Template to match it. Figure 90 shows an example.

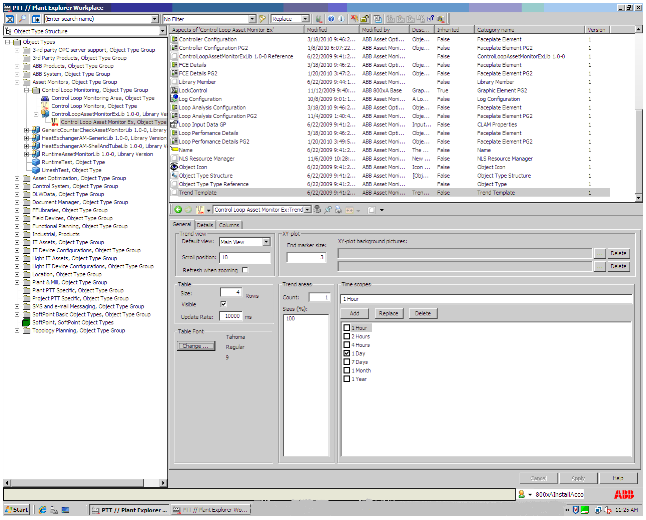


Figure 90. Controller Input Data from the Trend Template

2. If necessary, adjust the **save** duration in the Control Loop Asset Monitor Log Template aspect. The default storage size is four weeks. The Trend Display can only show data that is already saved by the Control Loop Asset Monitor Log Template. Figure 91 shows an example.

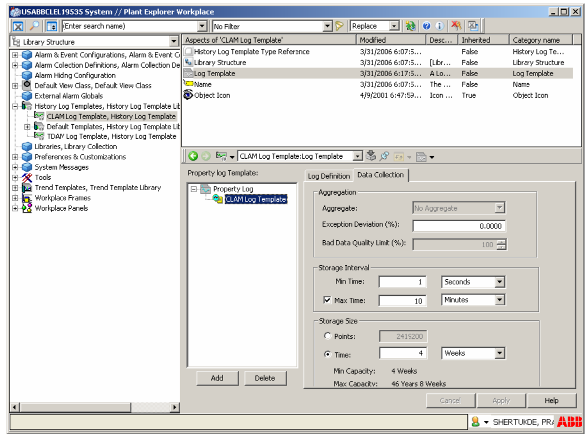


Figure 91. Controller Input Data from Control Loop Asset Monitor Log Template

The Control Loop Asset Monitor OPC data collection rate is automatically matched with the Control Loop Asset Monitor execution rate that reads the input PV, SP, and CO data.

Control Loop Asset Monitor Loop Analysis Configuration

Loop Analysis Configuration for all Control Loop Asset Monitor objects can be performed using the Loop Configuration Data aspect in the CLAM Object type instance (refer to Figure 92).

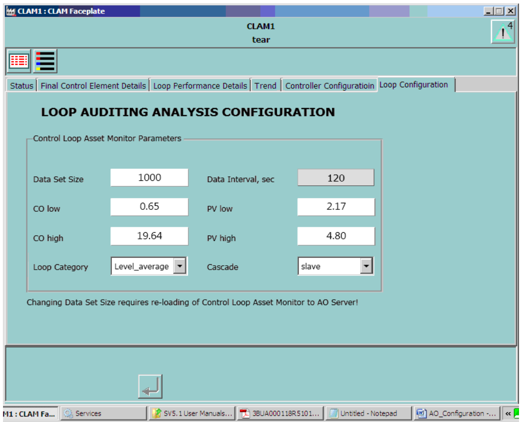


Figure 92. Loop Configuration Tab

1. Open a Plant Explorer Workplace.
2. Use the Structure Selector to open the **Control Structure**.
3. Use the Object Browser to navigate to:

   Root, Domain > Asset Optimization, Asset Optimization > Control Loop Monitors, Control Loop Monitors > Area Name, Control Loop Monitoring Area > Loop Name, Control Loop Asset Monitor Ex.
4. Select **Loop config Data** in the Aspect List Area.
5. Configure the Loop configuration tab in the CLAM Faceplate data as per requirement.
6. The loop analysis is performed internally, and results become available after reading PV, SP, and CO sample sets numbering in value of the **Data Set Size**, such as 1000 data sets. The upper limit for Data Set Size is 5,000 samples, and the lower limit is 400.
7. **Cascade** can be `master` for multiple loops or `slave` for a single loop.

8. **Loop Category** can be `Flow_liquid`, `Flow_other`, `Temperature`, `Composition`, `Pressure`, `Level_tight`, `Level_average`, `otherSRP`, or `otherNT` depending on the process variable controlled by the loop.

All string entries are case sensitive. For example, a Control Loop Asset Monitor object for a control loop controlling the flow of liquid should have `Flow_liquid` as the **Loop Category**.

It is extremely important to select the correct **Cascade** and **Loop Category** options for each Control Loop Asset Monitor object. The auditing analysis will be reliable only when these options are correctly specified for each loop.

9. The data interval field in the faceplate indicates the control loop monitor execution time. The default **Data Interval** value is `28800` seconds (8 hours) and should almost always work in all cases and usually not be altered. Sometimes, depending on the loop type, it may be necessary to change the data interval. As a general rule, the execution frequency slows down from fast to slow in the following order.

   – Pressure.
   – Level.
   – Flow.
   – Temperature.
   – Composition.

   This sequence is determined by the inherent response characteristics of the variable. The loop action causes the pressure to change at the fastest rate and the composition at the slowest rate.

10. Limits on CO and PV (SP limit is the same as the limit set for PV) can also be specified. Any data outside the limits is ignored during loop analysis. Also, **PV high** should ideally be twice as much as the highest value of the possible PV data. If PV exceeds this limit, then that data is ignored from analysis. The **PV high** value is also used for scaling by audit logic. So if **PV high** is much higher than the actual PV values, then the data fluctuations become less sensitive to analysis. The Audit may not be able to easily track problems. Conversely if **PV high** is a very low value, then the audit logic scaling makes data appear noisier and identifies diagnosis problems that may not really exist. The values **CO high =`100`, CO low = `0`**, and **PV low = `0`** will work in most cases.

11. Loop Analysis Configuration is accessed through Asset Parameters. This needs to be configured in each instance of control loop asset monitor. The data set size has to be configured as per requirement. Control Loop Asset Monitor logic uses Read Process method to retrieve historical data. Read Process calculates missing values between two points from history log that are further apart than ResampeIntervalSec by using Aggregate Function. Refer to Figure 93.

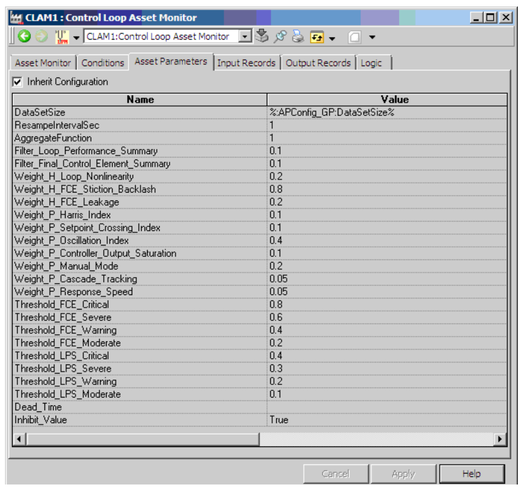


Figure 93. Loop Analysis Configuration Stored as Asset Parameters

12. Asset parameters with a prefix of `W` indicate weight for including history of diagnosis in the current diagnosis. The formula used after each loop execution is:

$$\text{DiagnosisCurrent} = W \times \text{DiagnosisCurrent} + (1 - W) \times \text{DiagnosisPast}$$

The default value for weight (W) of each diagnosis is 0.5. Use the following formula to determine weight (W):

$$W = 1 - \exp(-t/\tau)$$

Where t is the execution time multiplied by the number of new data points and τ is called the detection time arbitrarily chosen by the user. It is the time after which the effect of current diagnosis becomes prominent. The default for t is 10 multiplied by 100 or 1000 seconds. If the default weights of 0.5 are used, then the detection time is 1,442 seconds. This detection time is too fast and can lead to false alarms. To set the detection time to 24 hours or 24 multiplied by 3,600 seconds, weights should be set to:

$$W = 1 - \exp(-1{,}000/3{,}600/24) = 0.0115$$

This is a more reasonable value.

13. Reload the Asset Monitor after making any configuration changes in Loop Analysis Configuration, so that changes are read by AO Server. The Control Loop Asset Monitor will then restart analysis by making the current data point the starting data point.

CLAM Diagnostics

The available CLAM Diagnostics are:

1. Final Control Element Diagnostics.
2. Loop Performance Diagnostics.

Final Control Element Diagnostics include the following:

1. FCE Action.
2. FCE Leakage.
3. FCE Size.
4. FCE Stiction/Backlash.
5. Loop Nonlinearity.

Loop Performance Diagnostics include the following:

1. Loop Tuning.
2. SetPoint Oscillation.
3. External Disturbances.
4. Data Reliability.

5. Harris Index.
6. Setpoint Crossing Index.
7. Oscillation Index.
8. Controller Output Saturation.
9. Manual Mode.
10. Cascade Tracking.
11. Response Speed.

To calculate FCE/LPS summary the above diagnostics are used along with the Weight given by user for each hypothesis/precondition.

The subcondition of the FCE/LPS Summary does not depend on a single hypothesis, it is the cumulative of all hypotheses and their corresponding weights. It is not necessary that if one of the hypothesis is not okay then the subcondition will be abnormal. The subcondition also depends on the threshold defined by the user in Asset Parameter. If FCE/LPS summary value goes beyond the threshold, the subcondition will change accordingly. It means that one or more diagnostics related to FCE/LPS is not okay, and the user should check and take appropriate action as necessary.

Section 6 Heat Exchanger Asset Monitor (HXAM)

Introduction

Heat Exchanger Asset Monitors are intended to alert process and maintenance personnel when the operation of a Heat Exchanger indicates significant decline in performance. The decline in performance may be due to fouling or significant change in operating point. The Heat Exchanger Asset Monitors replace the current manual monitoring systems that require maintenance of paper records and manual interpretation of the data. When CMMS Integration is configured a work order for maintenance request can be generated.

The Heat Exchanger Asset Monitor application begins with the identification of Heat Exchanger Objects configured in the 800xA System Workplace. At the time of configuration, the user identifies process measurement inputs that allow the Heat Exchanger Asset Monitor to track the performance of the physical device. These Asset Monitors provide status and condition information to the user through the standard Asset Optimization interfaces and views.

The Heat Exchanger Asset Monitor does not require any specific data regarding the design or structure of the heat exchanger. It also does not require any configuration specific information related to the mathematical model of the heat exchanger.

There are two types of Heat Exchanger Asset Monitors:

Generic Heat Exchange Asset Monitor (HXAM_G)

Shell and Tube Heat Exchanger Asset Monitor (HXAM_ST)

Objective

The objective is to detect gross declines in heat exchanger efficiency, rather than minute changes. This is accomplished by taking baseline measurements of the critical readable process variables around the heat exchanger, and noting any trends in them which would be indicative of declining performance. The most important, by far, is declining heat transfer efficiency due to fouling. For each occurrence of the input variables which are a reasonable match for the baseline sets, heat exchanger performance can be compared to the baseline.

The basic approach of the HXAM is a proprietary analysis methodology, along with an understanding of the measurable boundary conditions, to create a basic Asset Monitor capable of alerting maintenance personnel to significant changes in heat exchanger Key Performance Indicators (KPI), such as:

Efficiency:

- Fouling, as indicated by:
  - Delta T profiles drifting at reference Hot and Cold flows.
  - Delta P across the exchanger increasing at reference (constant) flow for either Hot or Cold leg.
  - Low Flow or Low Delta T readings for either leg.
  - Significant changes in operating point which affect efficiency or heat-duty.

Instrumentation Errors:

- Delta T, Delta P, Delta F, or Heat Duty Error going into undefined/unreasonable values.

In addtion to the above, HXAM-ST supports the following:

Process Errors:

- Temperature Crossover.
- Low Shell-side Flow.
- Low Heat Transfer.
- High/Low Tube Velocity.
- Low Limiting Approach Temperature.

Terminology

Refer to Appendix B, Heat Exchanger Specific Terminology for specific Heat Exchanger Terminology used in this document.

Generic Heat Exchange Asset Monitor (HXAM_G)

This section describes the salient features of the Generic Heat Exchanger Asset Monitor operation.

Configuration

Configuration of the Generic Heat Exchanger Asset Monitor consists of:

- HXAM_G Aspect Configuration.
- HXAM-G Configuration Faceplate.
- HXAM-G Trend Display Aspect.

HXAM_G Aspect Configuration

From the Control Structure, the HXAM-G object can be created by calling the Heat Exchanger Object from the Asset Monitors list of Object Types. After the object has been created, the History Source aspect is added into the object. After creation of the History Source aspect, the Service Group of the History Source must be configured (typically set to Basic).

1. To start configuration, go to HXAM_G aspect as shown in Figure 94.

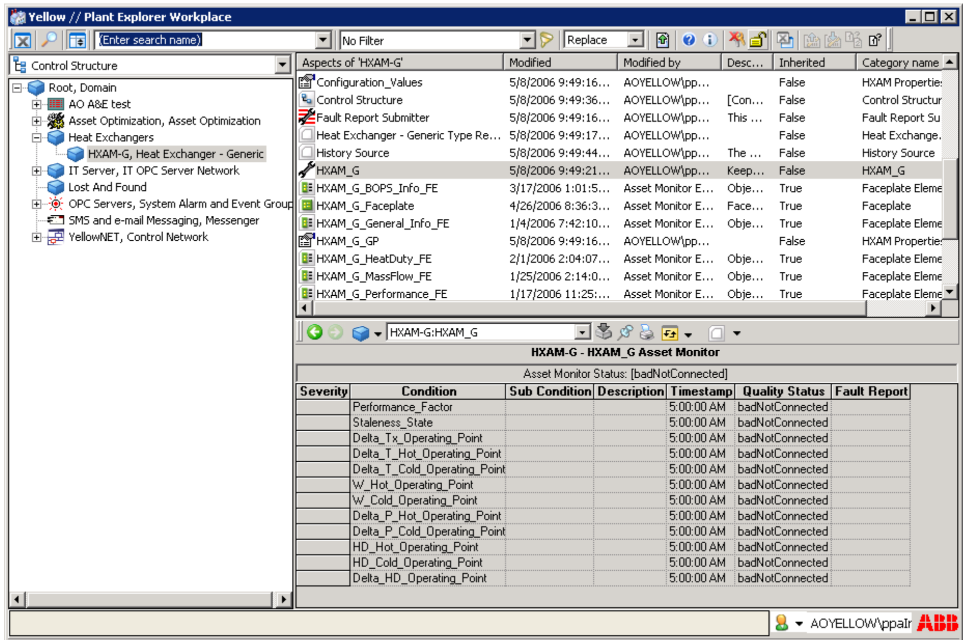


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Figure 94. Navigating to the HXAM_G Aspect

2. Switch to the Config View of the HXAM_G aspect as shown in Figure 95.

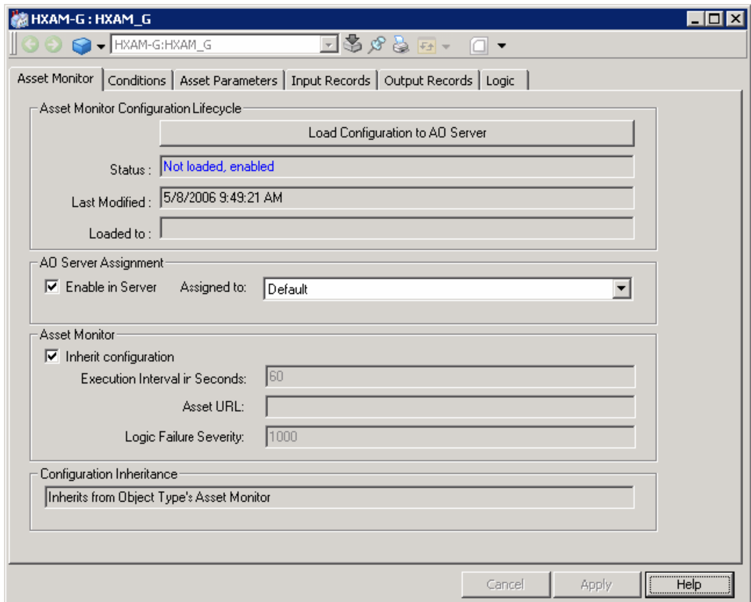

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Figure 95. Config View of HXAM_G Aspect

3. The Config View is divided into six tabs:
   - Asset Monitor Tab.
   - Conditions Tab.
   - Asset Parameters Tab.
   - Input Records Tab.
   - Output Records Tab.
   - Logic Tab.

Asset Monitor Tab

The data in the Asset Monitor tab consists of:

- **Asset Monitor Configuration Lifecycle frame:** This frame does not have any configurable values. No action is required.

- **AO Server Assignment frame:** The Enable in Server check box must be enabled for the Asset Monitor to execute. Set the appropriate Server Assignment (typically set to `Default`) in the Assigned to drop-down list box.
- **Asset Monitor frame:** The **Execution Interval in Seconds** field must be kept at 60 seconds. This defines how often the analysis logic will be executed.

The actual interval between subsequent executions may be longer than the specified interval on heavily loaded systems.

The **Asset URL** field is an optional parameter that can be used to point to the device web interface to get more information on the device status. If desired, this can be set to an application specific URL.

The **Logic Failure Severity** field should be left at 1000. This is the Asset Monitor alarm severity level. It is used to report Asset Monitor failures in the 800xA Alarm and Event system.

- **Configuration Inheritance frame:** This section does not have any configurable values. No action is required.

Conditions Tab

This tab does not have any configurable values, but reflects Condition/Subcondition information for the Asset Monitors, which are implemented.

The **Conditions** tab contains the definition of the conditions that are assessed and reported by the Heat Exchanger Asset Monitor. The main functionality of the Heat Exchanger Asset Monitor is to monitor the operating parameters of the heat exchanger and report the current subcondition for each defined condition.

Each condition is defined by a set of subconditions. The subconditions for a given condition are mutually exclusive. Subcondition ENUM 0 always represents the normal condition state. A transition to the normal state will deactivate the associated alarm in the Alarm and Event List.

If the Asset Monitor is not able to successfully assess the current subcondition for a given condition, it sets the quality status of that condition to a bad value.

The only subconditions that will generate a Fault Report in the Fault Report Submitter are those that are not normal with good quality status.

Asset Parameters Tab

No configuration is required. The **Asset Parameters** tab contains configuration parameters used to provide additional heat exchanger information required by the Heat Exchanger Asset Monitor algorithm.

The Asset Parameters values are read from Configuration_Values aspect by the use of macros. The Configuration_Values aspect is an intermediate aspect that gets written to, from the Configuration Faceplate aspect, which is then read by the Asset Parameters value in HXAM_G aspect by the use of macros. These macros **SHOULD NOT** be changed. The actual configuration of Asset Parameters is done in the Configuration Faceplate. Refer to Configuring HXAM_G Asset Parameters on page 207 for details on configuring the Asset Parameters.

Input Records Tab

The **Input Records** tab contains the definition of data items (i.e. OPC items) used by the Heat Exchanger Asset Monitor to assess the current heat exchanger condition. Figure 96 shows the **Input Records** tab.

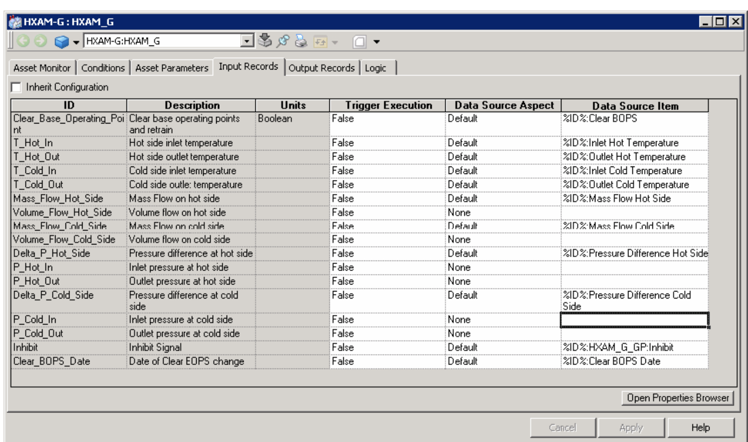

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Figure 96. Input Records Tab

The columns in the **Input Records** tab are defined as follows:

- **ID:** Input Record identifier.

- **Description:** Input Record description.
- **Units:** Input Record expected engineering units.
- **Trigger Execution:** When `True`, the Asset Monitor will be scheduled for immediate execution upon Input Record value change. Setting this configuration parameter to `True` may increase the actual Asset Monitor execution frequency based on the Input Record Data Source Aspect OPC Group Update Rate.
- **Data Source Aspect:** Provides a pick list to select one of the available Asset Monitor Data Sources defining the data server (i.e. OPC server) from which to read the value.
- **Data Source Item:** Identifies the item (i.e. OPC item) in the data server from which to read the value.

The Data Source Aspect for the Input Records must be configured to the Data Server that reads the value associated with that particular Input Record. The Data Source Item must refer to the property that contains the value of the Input Record. If an input record is not available, the Data Source Aspect is set to `None` and the Data Source Item is left empty. Input records `Clear_Base_Operating_Point` and `Clear_BOPS_Date` are manual inputs that uses macros `%ID%:Clear BOPS` and `%ID%:Clear BOPS Date` respectively to read its property from the HXAM_G_GP Aspect. These two macros **SHOULD NOT** be changed. The rest of the input records are field variables that must be configured accordingly. Refer to HXAM_G Asset Monitor Input Records on page 227 for a description of the Input Records.

Output Records Tab

The **Output Records** tab has no configurable values. It is for information only and shows the Output Records in the HXAM-G Configuration Faceplate for user information.

Logic Tab

The **Logic** tab has no configurable values.

HXAM-G Configuration Faceplate

The HXAM-G Configuration Faceplate includes nine tabs. These tabs are named Step-1 through Step-9. These nine tabs guide the user through each stage of configuration. The tabs in the Faceplate aspect are views of the nine Faceplate Element aspects. Figure 97 shows the view of the HXAM-G Configuration Faceplate aspect. Refer to Configuring HXAM_G Asset Parameters on page 207 for details on the properties seen in the Configuration Faceplate.

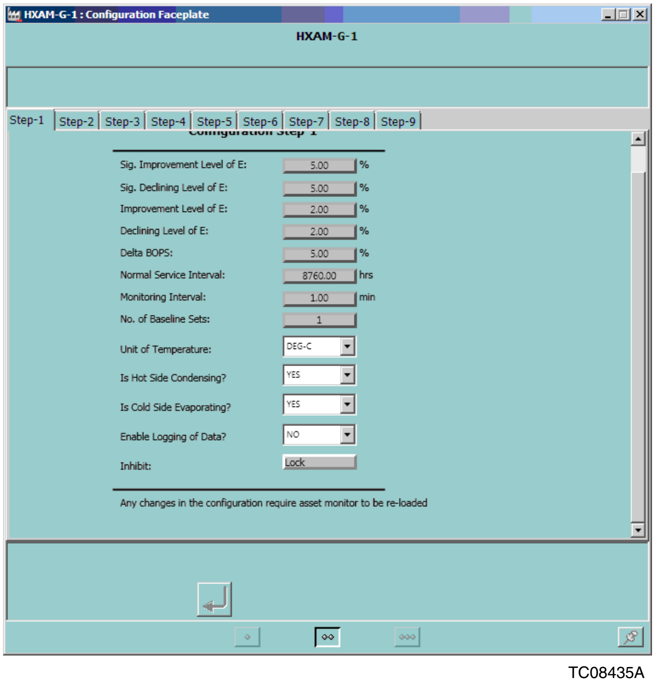

Figure 97. Step-1 Tab of HXAM-G Configuration Faceplate

Step-1 Tab

The **Step-1** tab is the view of Configuration_Step1_FE. Figure 97 shows the view of **Step-1** tab. Table 21 lists and describes the elements in the **Step-1** tab of the HXAM-G Configuration Faceplate.

Table 21. Step-1 Tab of HXAM-G Configuration Faceplate

Element	Description	Expected Value
Significant Improvement Level of E	Acceptable percentage difference between the COPS Performance Factor and the BOPS Performance Factor to consider the COPS Performance Factor to have significantly improved. If no value is entered a default of `5.00` will be taken. [Required]	Value greater than zero Default Value: 5.00
Significant Declining Level of E	Acceptable percentage difference between the COPS Performance Factor and the BOPS Performance Factor to consider the COPS Performance Factor to have significantly declined. If no value is entered a default of `5.00` will be taken. [Required]	
Improvement Level of E	Acceptable percentage difference between the COPS Performance Factor and the BOPS Performance Factor to consider the COPS Performance Factor to have improved. If no value is entered a default of `2.00` will be taken. [Required]	Value greater than zero Default Value: 2.00
Declining Level of E	Acceptable percentage difference between the COPS Performance Factor and the BOPS Performance Factor to consider the COPS Performance Factor to have declined. If no value is entered a default of `2.00` will be taken. [Required]	Value greater than zero Default Value: 2.00

Table 21. Step-1 Tab of HXAM-G Configuration Faceplate (Continued)

Element	Description	Expected Value
Delta BOPS	Acceptable percentage difference between COPS and BOPS to consider COPS as a new set of BOPS. If no value is entered, or if there is some error in entry, a default value of `5.00` will be taken. [Required]	Value greater than zero Default Value: 5.00
Normal Service Interval	Time interval between heat exchanger cleaning, rebuilds, etc. in hours [Required]	Value greater than zero
Monitoring Interval	Time interval between monitoring in minutes. [Required]	Any Integer greater than 0. Recommended values given in Table 31 on page 212.
No: of Baseline Sets	Number of Base Operating Point Sets expected [Required]	Minimum Integer value between 1 and 5
Unit of Temperature	Unit of Temperature [Required]	Select one from the drop down menu
Is Hot-Side Condensing?	Select **YES** if Hot side Flow is Condensing. [Required]	YES, NO
Is Cold-Side Evaporating?	Select **YES** if Cold Side is Evaporating [Required]	
Enable Logging of Data?	Select **YES** to enable data logging to a file [Required]	YES, NO
Inhibit	Any string value can be entered for inhibit. When the Input Record Inhibit equals the value entered, the Asset Monitor gets disabled.	Any string value except True/False

Step-2 Tab

The **Step-2** tab is the view of Configuration_Step2_FE. Figure 98 shows the view of **Step-2** tab and Table 22 lists and describes the elements in the **Step-2** tab of the Configuration Faceplate.

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Figure 98. Step-2 Tab of HXAM-G Configuration Faceplate

Table 22. Step-2 Tab of HXAM-G Configuration Faceplate

Element	Description	Expected Value
Hot Side: Is Mass Flow available?	Select **YES** if Mass Flow for Hot side is available [Required]	YES, NO
Hot Side: Is Volume Flow available?	Select **YES** if Volume Flow for Hot side is available [Enabled if Mass Flow for Hot side is not available. Required if enabled]	

Table 22. Step-2 Tab of HXAM-G Configuration Faceplate (Continued)

Element	Description	Expected Value
Hot Side: Density	Density of Hot side fluid. [Enabled if Volume flow for hot side is available. Required if enabled]	Value greater than 0.
Hot Side: Specific Heat	Specific Heat of Hot Side fluid [Required if either flow for hot side is available]	
Hot Side: Heat of Vap	Heat of Vaporization for hot side fluid. Enabled only if hot side is condensing. The unit of Heat of Vaporization is automatically filled based on the unit of Specific Heat selected. [Required if Hot side Condensing]	
Cold Side: Is Mass Flow available	Select **YES** if Mass Flow for Cold side is available [Required]	YES, NO
Cold Side: Is Volume Flow available	Select **YES** if Volume Flow for Cold side is available [Enabled if Mass Flow for cold side is not available. Required if enabled]	
Cold Side: Density	Density of Cold side fluid. [Enabled if Volume flow for hot side is available. Required if enabled]	Value greater than 0.
Cold Side: Specific Heat	Specific Heat of Cold Side fluid [Required if either flow for hot side is available]	
Cold Side: Heat of Vap	Heat of Vaporization for Cold side fluid. Enabled only if cold side is evaporating. The unit of Heat of Vaporization is automatically filled based on the unit of Specific Heat selected. [Required if Cold side Evaporating]	

Table 22. Step-2 Tab of HXAM-G Configuration Faceplate (Continued)

Element	Description	Expected Value
Unit of Mass Flow	Unit of Mass Flow [Required]	Select one from the drop down menu
Unit of Volume Flow	Unit of Volume Flow [Required if Volume Flow for any side is available]	
Unit of Density	Unit of Density. [Required if any Densities are provided]	
Unit of Heat Duty	Unit of Heat Duty. [Required if mass flow or volume flow for either side is available]	
Unit of Specific Heat	Unit of Specific Heat. [Required if mass flow or volume flow for either side is available]	
Unit of Pressure	Unit of Pressure. [Required if Pressure is available]	

NOTE:
Density relates to where the volumetric flow rate is measured - heat exchanger inlet or outlet.

Step-3 Tab

The **Step-3** tab is the view of Configuration_Step3_FE. Figure 99 shows the view of **Step-3** tab and Table 23 lists and describes the elements in the **Step-3** tab of the Configuration Faceplate.

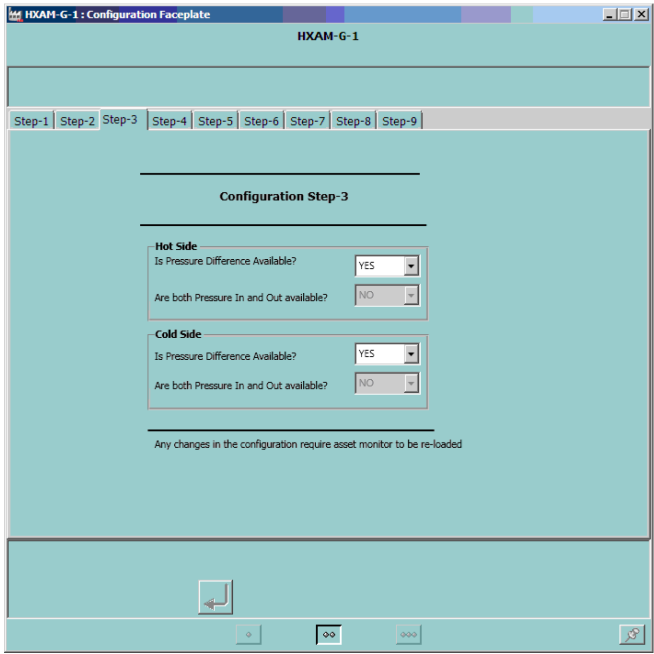

Figure 99. Step-3 Tab of HXAM-G Configuration Faceplate

Table 23. Step-3 Tab of HXAM-G Configuration Faceplate

Element	Description	Expected Value
Hot Side: Is Pressure Difference Available?	Select **YES** if Pressure Difference for Hot side is available [Required]	YES, NO
Hot Side: Is Pressure In and Out Available?	Select **YES** if alternative to calculate Pressure Difference for Hot side is available. Enabled only if **Is Pressure Difference Available?** for hot side is set to **NO** [Required if Pressure Difference for hot side is not available]	

Table 23. Step-3 Tab of HXAM-G Configuration Faceplate (Continued)

Element	Description	Expected Value
Cold Side: Is Pressure Difference Available?	Select **YES** if Pressure Difference for Cold side is available [Required]	YES, NO
Cold Side: Is Pressure In and Out Available?	Select **YES** if alternative to calculate Pressure Difference for Cold side is available. Enabled only if **Is Pressure Difference Available?** for cold side is set to **NO** [Required if Pressure Difference for cold side is not available]	

Step-4 Tab

The **Step-4** tab is the view of Configuration_Step4_FE. Figure 100 shows the view of **Step-4** tab and Table 24 lists and describes the elements in the **Step-4** tab of the Configuration Faceplate.

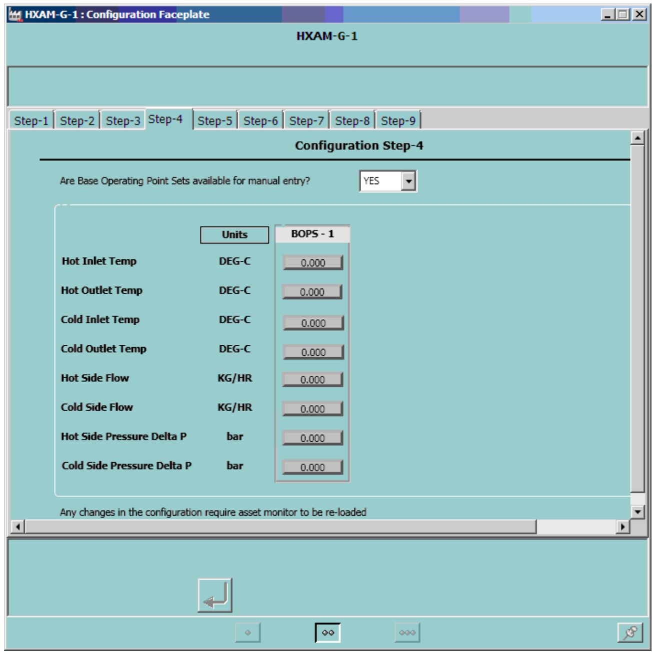

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Figure 100. Step-4 Tab of HXAM-G Configuration Faceplate

Table 24. Step-4 Tab of HXAM-G Configuration Faceplate

Element	Description	Expected Value
Are Base Operating Point Sets available for manual entry?	Select **YES** if BOPS are available for manual entry [Required]	YES, NO
Hot Inlet Temp	Hot side inlet temperature	(-459.67) and ≤ (5000) for Deg-F (0) and ≤ (5000) for Deg-K > (-273.15) and ≤ (5000) for Deg-C > (0) and ≤ (5000) for Deg-R
Hot Outlet Temp	Hot side outlet temperature	
Cold Inlet Temp	Cold side inlet temperature	
Cold Outlet Temp	Cold side outlet temperature	

Table 24. Step-4 Tab of HXAM-G Configuration Faceplate (Continued)

Element	Description	Expected Value
Hot Side Flow	Hot side Mass flow or Volume flow based on availability in **Step-2** tab.	Value greater than 0
Cold Side Flow	Cold side Mass flow or Volume flow based on availability in **Step-2** tab	
Hot Side Pressure Delta P	Hot side Pressure Difference	
Cold Side Pressure Delta P	Cold side Pressure Difference	

NOTES:

1. BOPS-1 to BOPS-5 are visible and required for manual entry only if:
   Are Base Operating Point Sets available for manual entry? is set to **YES**.
   Depending on the No: of Baseline Sets in **Step-1** tab.
2. Hot side flow, cold side flow, hot side pressure diff, and cold side pressure diff are visible based on their availability specified in the **Step-3** and **Step-4** tabs.

Step-5 Tab

The **Step-5** tab is the view of Configuration_Step5_FE. Figure 101 shows the view of **Step-5** tab and Table 25 lists and describes the elements in the **Step-5** tab of the Configuration Faceplate.

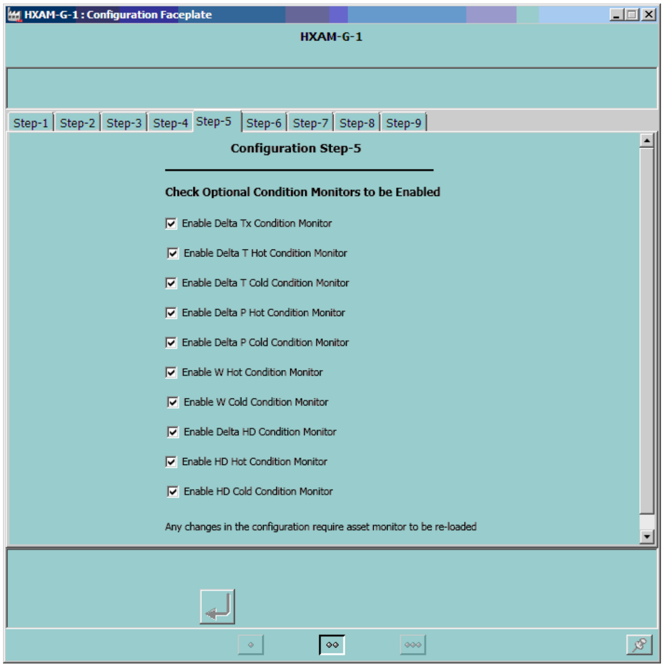

Figure 101. Step-5 Tab of HXAM-G Configuration Faceplate

Table 25. Step-5 Tab of HXAM-G Configuration Faceplate

Element	Description	Expected Value
Enable Delta Tx Condition Monitor	Enable check box if Condition Monitor is to be enabled [Optional]	Enable/disable check box
Enable Delta T Hot Condition Monitor		
Enable Delta T Cold Condition Monitor		

Table 25. Step-5 Tab of HXAM-G Configuration Faceplate (Continued)

Element	Description	Expected Value
Enable Delta P Hot Condition Monitor	Enable check box if Condition Monitor is to be enabled. Enabled only if Pressure Difference for hot side is available or if Pressure Difference can be calculated. [Optional]	Enable/disable check box
Enable Delta P Cold Condition Monitor	Enable check box if Condition Monitor is to be enabled. Enabled only if Pressure Difference for cold side is available or if Pressure Difference can be calculated. [Optional]	
Enable W Hot Condition Monitor	Enable check box if Condition Monitor is to be enabled. [Optional]	
Enable W Cold Condition Monitor		
Enable Delta HD Condition Monitor		
Enable HD Hot Condition Monitor		
Enable HD Cold Condition Monitor		

Step-6 Tab

The **Step-6** tab is the view of Configuration_Step6_FE. Figure 102 shows the view of **Step-6** tab and Table 26 lists and describes the elements in the **Step-6** tab of the Configuration Faceplate.

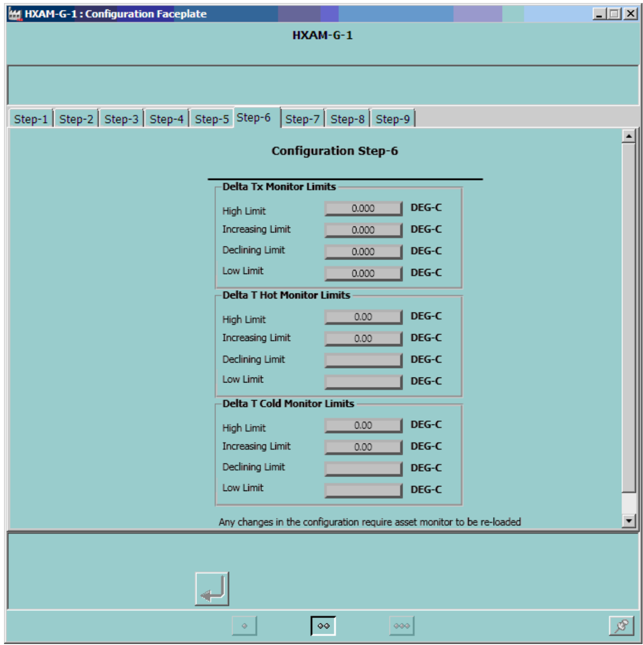

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Figure 102. Step-6 Tab of HXAM-G Configuration Faceplate

Table 26. Step-6 Tab of HXAM-G Configuration Faceplate

Element	Description	Expected Value
Delta Tx Limits: High Limit	Delta Tx High Limit. Enabled only if Delta Tx Condition Monitor is enabled. [Required if Delta Tx Condition Monitor is enabled]	Value greater than 0
Delta Tx Limits: Increasing Limit	Delta Tx Increasing Limit. Enabled only if Delta Tx Condition Monitor is enabled. [Required if Delta Tx Condition Monitor is enabled]	

Table 26. Step-6 Tab of HXAM-G Configuration Faceplate (Continued)

Element	Description	Expected Value
Delta Tx Limits: Declining Limit	Delta Tx Declining Limit. Enabled only if Delta Tx Condition Monitor is enabled. [Required if Delta Tx Condition Monitor is enabled]	Value greater than 0
Delta Tx Limits: Low Limit	Delta Tx Low Limit. Enabled only if Delta Tx Condition Monitor is enabled. [Required if Delta Tx Condition Monitor is enabled]	
Delta T Hot Limits: High Limit	Delta T Hot High Limit. Enabled only if Delta T Hot Condition Monitor is enabled. [Required if Delta T Hot Condition Monitor is enabled]	
Delta T Hot Limits: Increasing Limit	Delta T Hot Increasing Limit. Enabled only if Delta T Hot Condition Monitor is enabled. [Required if Delta T Hot Condition Monitor is enabled]	
Delta T Hot Limits: Declining Limit	Delta T Hot Declining Limit. Enabled only if Delta T Hot Condition Monitor is enabled. [Required if Delta T Hot Condition Monitor is enabled]. Configurable only if **Is Hot Side Condensing** is **NO**.	
Delta T Hot Limits: Low Limit	Delta T Hot Low Limit. Enabled only if Delta T Hot Condition Monitor is enabled. [Required if Delta T Hot Condition Monitor is enabled]. Configurable only if **Is Hot Side Condensing** is **NO**.	
Delta T Cold Limits: High Limit	Delta T Cold High Limit. Enabled only if Delta T Cold Condition Monitor is enabled. [Required if Delta T Cold Condition Monitor is enabled]	

Table 26. Step-6 Tab of HXAM-G Configuration Faceplate (Continued)

Element	Description	Expected Value
Delta T Cold Limits: Increasing Limit	Delta T Cold Increasing Limit. Enabled only if Delta T Cold Condition Monitor is enabled. [Required if Delta T Cold Condition Monitor is enabled]	Value greater than 0
Delta T Cold Limits: Declining Limit	Delta T Cold Declining Limit. Enabled only if Delta T Cold Condition Monitor is enabled. [Required if Delta T Cold Condition Monitor is enabled]. Configurable only if **Is Cold Side Evaporating** is **NO**.	
Delta T Cold Limits: Low Limit	Delta T Cold Low Limit. Enabled only if Delta T Cold Condition Monitor is enabled. [Required if Delta T Cold Condition Monitor is enabled]. Configurable only if **Is Cold Side Evaporating** is **NO**.	

Step-7 Tab

The **Step-7** tab is the view of Configuration_Step7_FE. Figure 103 shows the view of **Step-7** tab and Table 27 lists and describes the elements in the **Step-7** tab of the Configuration Faceplate.

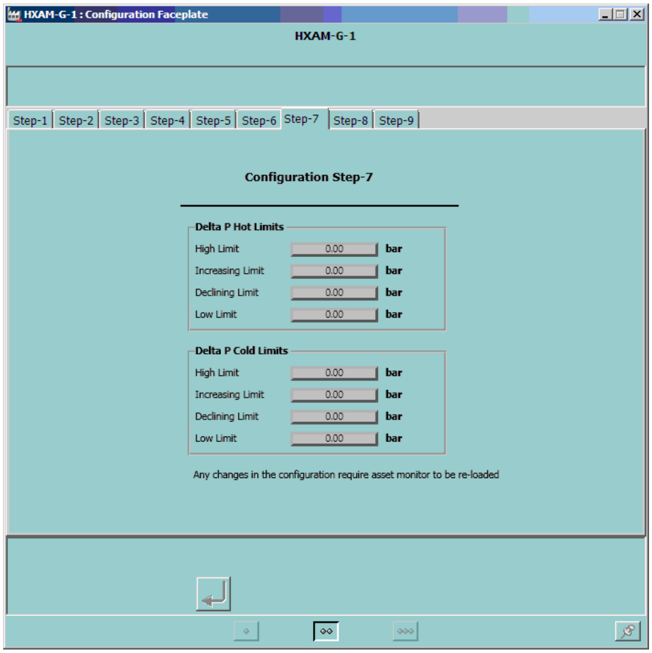

Figure 103. Step-7 Tab of HXAM-G Configuration Faceplate

Table 27. Step-7 Tab of HXAM-G Configuration Faceplate

Element	Description	Expected Value
Delta P Hot Limits: High Limit	Delta P Hot High Limit. Enabled only if Delta P Hot Condition Monitor is enabled. [Required if Delta P Hot Condition Monitor is enabled]	Value greater than 0
Delta P Hot Limits: Increasing Limit	Delta P Hot Increasing Limit. Enabled only if Delta P Hot Condition Monitor is enabled. [Required if Delta P Hot Condition Monitor is enabled]	
Delta P Hot Limits: Declining Limit	Delta P Hot Declining Limit. Enabled only if Delta P Hot Condition Monitor is enabled. [Required if Delta P Hot Condition Monitor is enabled]	
Delta P Hot Limits: Low Limit	Delta P Hot Low Limit. Enabled only if Delta P Hot Condition Monitor is enabled. [Required if Delta P Hot Condition Monitor is enabled]	
Delta P Cold Limits: High Limit	Delta P Cold High Limit. Enabled only if Delta P Cold Condition Monitor is enabled. [Required if Delta P Cold Condition Monitor is enabled]	
Delta P Cold Limits: Increasing Limit	Delta P Cold Increasing Limit. Enabled only if Delta P Cold Condition Monitor is enabled. [Required if Delta P Cold Condition Monitor is enabled]	
Delta P Cold Limits: Declining Limit	Delta P Cold Declining Limit. Enabled only if Delta P Cold Condition Monitor is enabled. [Required if Delta P Cold Condition Monitor is enabled]	
Delta P Cold Limits: Low Limit	Delta P Cold Low Limit. Enabled only if Delta P Cold Condition Monitor is enabled. [Required if Delta P Cold Condition Monitor is enabled]	

Step-8 Tab

The **Step-8** tab is the view of Configuration_Step8_FE. Figure 104 shows the view of the **Step-8** tab and Table 28 lists and describes the elements in the **Step-8** tab of the Configuration Faceplate.

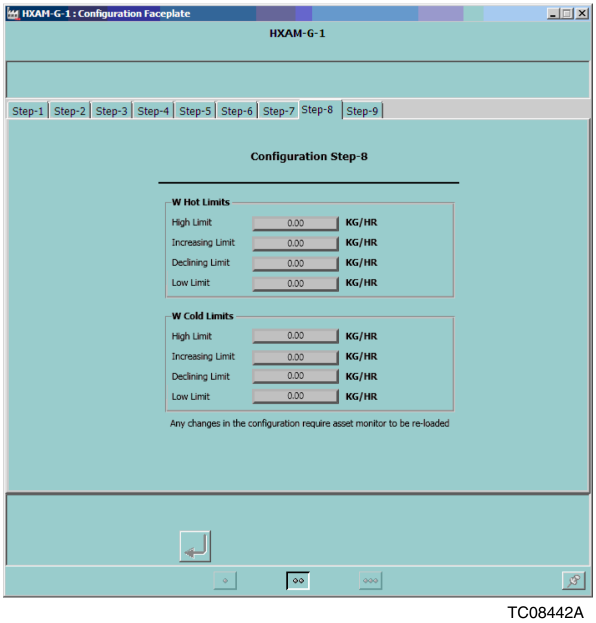

Figure 104. Step-8 Tab of HXAM-G Configuration Faceplate

Table 28. Step-8 Tab of HXAM-G Configuration Faceplate

Element	Description	Expected Value
Delta W Hot Limits: High Limit	Delta W Hot High Limit. Enabled only if Delta W Hot Condition Monitor is enabled. [Required if Delta W Hot Condition Monitor is enabled]	Value greater than 0
Delta W Hot Limits: Increasing Limit	Delta W Hot Increasing Limit. Enabled only if Delta W Hot Condition Monitor is enabled. [Required if Delta W Hot Condition Monitor is enabled]	Value greater than 0
Delta W Hot Limits: Declining Limit	Delta W Hot Declining Limit. Enabled only if Delta W Hot Condition Monitor is enabled. [Required if Delta W Hot Condition Monitor is enabled]	Value greater than 0
Delta W Hot Limits: Low Limit	Delta W Hot Low Limit. Enabled only if Delta W Hot Condition Monitor is enabled. [Required if Delta W Hot Condition Monitor is enabled]	Value greater than 0
Delta W Cold Limits: High Limit	Delta W Cold High Limit. Enabled only if Delta W Cold Condition Monitor is enabled. [Required if Delta W Cold Condition Monitor is enabled]	Value greater than 0
Delta W Cold Limits: Increasing Limit	Delta W Cold Increasing Limit. Enabled only if Delta W Cold Condition Monitor is enabled. [Required if Delta W Cold Condition Monitor is enabled]	Value greater than 0

Table 28. Step-8 Tab of HXAM-G Configuration Faceplate (Continued)

Element	Description	Expected Value
Delta W Cold Limits: Declining Limit	Delta W Cold Declining Limit. Enabled only if Delta W Cold Condition Monitor is enabled. [Required if Delta W Cold Condition Monitor is enabled]	Value greater than 0
Delta W Cold Limits: Low Limit	Delta W Cold Low Limit. Enabled only if Delta W Cold Condition Monitor is enabled. [Required if Delta W Cold Condition Monitor is enabled]	Value greater than 0

Step-9 Tab

The **Step-9** tab is the view of Configuration_Step9_FE. Figure 105 shows the view of the **Step-9** tab and Table 29 lists and describes the elements in the **Step-9** tab of the Configuration Faceplate.

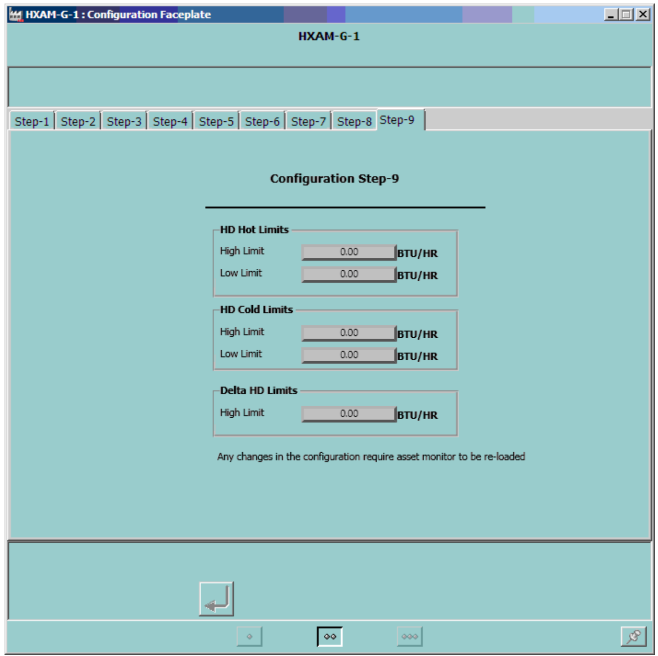

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Figure 105. Step-9 Tab of HXAM-G Configuration Faceplate

Table 29. Step-9 Tab of HXAM-G Configuration Faceplate

Element	Description	Expected Value
HD Hot Limits: High Limit	HD Hot High Limit. Enabled only if HD Hot Condition Monitor is enabled. [Required if HD Hot Condition Monitor is enabled]	Value greater than 0
HD Hot Limits: Low Limit	HD Hot Low Limit. Enabled only if HD Hot Condition Monitor is enabled. [Required if HD Hot Condition Monitor is enabled]	

Table 29. Step-9 Tab of HXAM-G Configuration Faceplate (Continued)

Element	Description	Expected Value
HD Cold Limits: High Limit	HD Cold High Limit. Enabled only if HD Cold Condition Monitor is enabled. [Required if HD Cold Condition Monitor is enabled]	Value greater than 0
HD Cold Limits: Low Limit	HD Cold Low Limit. Enabled only if HD Cold Condition Monitor is enabled. [Required if HD Cold Condition Monitor is enabled]	
Delta HD Limits: High Limit	Delta HD High Limit. Enabled only if Delta HD Condition Monitor is enabled. [Required if Delta HD Condition Monitor is enabled]	

HXAM-G Trend Display Aspect

The **Object Name** field of the Trend Display aspect must refer. If it does not:

1. Click on the field and the Select Object dialog appears as shown in Figure 106.
2. Select the desired object and click **OK**.
3. The **Aspect** field, **Property**, and **Log Name** fields should be filled in as a result. From the drop-down list box in the **Aspect** field, choose `AssetMonitorProperties`.
4. Once the aspect is selected, choose any property from the drop-down list box of the **Property** field. The properties shown here are the only properties available for trending
5. Choose `SEAMLESS` from the drop-down list box in the Log Name field.
6. Configure the Low Range and High Range to the desired values. The Low range is the lowest Y-axis value of the trace. This can be changed by typing another value and pressing Enter or by using the arrows. Similarly, the High Range is the highest Y-axis value of the trace.

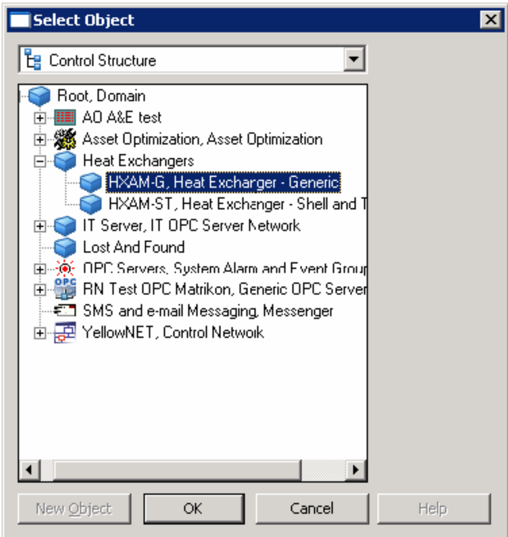

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Figure 106. Select Object Dialog

Configuring HXAM_G Asset Parameters

Macros used in HXAM_G aspect to configure the Asset Parameter values are shown in Table 30. These macros SHOULD NOT be changed.

Table 30. Macros Used in HXAM_G Aspect to Configure Asset Parameter Values

Asset Parameter Name	Asset Parameter Value
E_Improvement_Level	%:Configuration_Values:E_Improve%
E_Significant_Improvement_Level	%:Configuration_Values:E_Significant_Improve%
E_Decline_Level	%:Configuration_Values:E_Decline%
E_Significant_Decline_Level	%:Configuration_Values:E_Significant_Decline%
Asset_Monitor_Sampling_Interval	%:Configuration_Values:Asset_Monitor_Sampling_Interval%
Delta_BOPS	%:Configuration_Values:Delta_BOPS%
Hot_Side_Condensing	%:Configuration_Values:Is_Hot_Side_Condensing%

Table 30. Macros Used in HXAM_G Aspect to Configure Asset Parameter Values (Continued)

Asset Parameter Name	Asset Parameter Value
Cold_Side_Evaporating	%:Configuration_Values:Is_Cold_Side_Evaporating%
Normal_Service_Interval_In_Hrs	%:Configuration_Values:Normal_Service_Interval%
Number_Of_Baseline_Sets	%:Configuration_Values:Number_Baseline_Sets%
Inhibit_Value	%:Configuration_Values:Inhibit%
Inhibit_Value_Mask_Hex	0xFFFFFFFF
Enable_Logging_Data	%:Configuration_Values:Enable_Logging_Data%
Mass_Flow_Hot_Available	%:Configuration_Values:Mass_Flow_Hot_Available%
Volume_Flow_Hot_Available	%:Configuration_Values:Volume_Flow_Hot_Available%
Mass_Flow_Cold_Available	%:Configuration_Values:Mass_Flow_Cold_Available%
Volume_Flow_Cold_Available	%:Configuration_Values:Volume_Flow_Cold_Available%
Delta_P_Hot_Available	%:Configuration_Values:Delta_P_Hot_Available%
Delta_P_Hot_Alternative_Available	%:Configuration_Values:Delta_P_Hot_Alternative_Available%
Delta_P_Cold_Available	%:Configuration_Values:Delta_P_Cold_Available%
Delta_P_Cold_Alternative_Available	%:Configuration_Values:Delta_P_Cold_Alternative_Available %
Unit_Of_Temperature	%:Configuration_Values:Unit_Of_Temperature%
Unit_Of_Mass_Flow	%:Configuration_Values:Unit_Of_MassFlow%
Unit_Of_Volume_Flow	%:Configuration_Values:Unit_Of_VolumeFlow%
Unit_Of_Density	%:Configuration_Values:Unit_Of_Density%
Unit_Of_Specific_Heat	%:Configuration_Values:Unit_Of_Specific_Heat%
Unit_Of_Heat_Duty	%:Configuration_Values:Unit_Of_HeatDuty%
Specific_Heat_Hot_Fluid	%:Configuration_Values:Specific_Heat_Hot%
Specific_Heat_Cold_Fluid	%:Configuration_Values:Specific_Heat_Cold%

Table 30. Macros Used in HXAM_G Aspect to Configure Asset Parameter Values (Continued)

Asset Parameter Name	Asset Parameter Value
Density_Hot_Fluid	%:Configuration_Values:Density_Hot%
Density_Cold_Fluid	%:Configuration_Values:Density_Cold%
Heat_Of_Vaporization_Hot_Side	%:Configuration_Values:Heat_Of_Vaporization_Hot%
Heat_Of_Vaporization_Cold_Side	%:Configuration_Values:Heat_Of_Vaporization_Cold%
Enable_Delta_Tx_AM	%:Configuration_Values:Enable_Delta_Tx_AM%
Delta_Tx_Increasing	%:Configuration_Values:Delta_Tx_Increasing%
Delta_Tx_Declining	%:Configuration_Values:Delta_Tx_Declining%
Delta_Tx_Low	%:Configuration_Values:Delta_Tx_Low%
Delta_Tx_High	%:Configuration_Values:Delta_Tx_High%
Enable_Delta_T_Hot_AM	%:Configuration_Values:Enable_Delta_T_Hot_AM%
Delta_T_Hot_High	%:Configuration_Values:Delta_T_Hot_High%
Delta_T_Hot_Increasing	%:Configuration_Values:Delta_T_Hot_Increasing%
Delta_T_Hot_Declining	%:Configuration_Values:Delta_T_Hot_Declining%
Delta_T_Hot_Low	%:Configuration_Values:Delta_T_Hot_Low%
Enable_Delta_T_Cold_AM	%:Configuration_Values:Enable_Delta_T_Cold_AM%
Delta_T_Cold_High	%:Configuration_Values:Delta_T_Cold_High%
Delta_T_Cold_Increasing	%:Configuration_Values:Delta_T_Cold_Increasing%
Delta_T_Cold_Declining	%:Configuration_Values:Delta_T_Cold_Declining%
Delta_T_Cold_Low	%:Configuration_Values:Delta_T_Cold_Low%
Enable_Delta_P_Hot_AM	%:Configuration_Values:Enable_Delta_P_Hot_AM%
Delta_P_Hot_High	%:Configuration_Values:Delta_P_Hot_High%
Delta_P_Hot_Increasing	%:Configuration_Values:Delta_P_Hot_Increasing%
Delta_P_Hot_Declining	%:Configuration_Values:Delta_P_Hot_Declining%

Table 30. Macros Used in HXAM_G Aspect to Configure Asset Parameter Values (Continued)

Asset Parameter Name	Asset Parameter Value
Delta_P_Hot_Low	%:Configuration_Values:Delta_P_Hot_Low%
Enable_Delta_P_Cold_AM	%:Configuration_Values:Enable_Delta_P_Cold_AM%
Delta_P_Cold_High	%:Configuration_Values:Delta_P_Cold_High%
Delta_P_Cold_Increasing	%:Configuration_Values:Delta_P_Cold_Increasing%
Delta_P_Cold_Declining	%:Configuration_Values:Delta_P_Cold_Declining%
Delta_P_Cold_Low	%:Configuration_Values:Delta_P_Cold_Low%
Enable_W_Hot_AM	%:Configuration_Values:Enable_W_Hot_AM%
W_Hot_High	%:Configuration_Values:W_Hot_High%
W_Hot_Increasing	%:Configuration_Values:W_Hot_Increasing%
W_Hot_Declining	%:Configuration_Values:W_Hot_Declining%
W_Hot_Low	%:Configuration_Values:W_Hot_Low%
Enable_W_Cold_AM	%:Configuration_Values:Enable_W_Cold_AM%
W_Cold_High	%:Configuration_Values:W_Cold_High%
W_Cold_Increasing	%:Configuration_Values:W_Cold_Increasing%
W_Cold_Declining	%:Configuration_Values:W_Cold_Declining%
W_Cold_Low	%:Configuration_Values:W_Cold_Low%
Enable_HD_Hot_AM	%:Configuration_Values:Enable_HD_Hot_AM%
HD_Hot_High_Limit	%:Configuration_Values:HD_Hot_High%
HD_Hot_Low_Limit	%:Configuration_Values:HD_Hot_Low%
Enable_HD_Cold_AM	%:Configuration_Values:Enable_HD_Cold_AM%
HD_Cold_High_Limit	%:Configuration_Values:HD_Cold_High%
HD_Cold_Low_Limit	%:Configuration_Values:HD_Cold_Low%

Table 30. Macros Used in HXAM_G Aspect to Configure Asset Parameter Values (Continued)

Asset Parameter Name	Asset Parameter Value
Enable_Delta_HD_AM	%:Configuration_Values:Enable_Delta_HD_AM%
Delta_HD_High_Limit	%:Configuration_Values:Delta_HD_High%

Configuration of Asset Parameters uses an intermediate Configuration_Values aspect which is a General Properties aspect. The macros used in the HXAM_G Aspect/Asset Parameters/Values reads the property of the corresponding Asset Parameter from its corresponding variable in the Configuration_Values aspect.

There are two ways to configure Asset Parameters:

1. Write the values of the Asset Parameters in the Configuration_Values aspect against its corresponding variable. [Not Recommended].
2. Use the HXAM-G Configuration Faceplate that is a Graphical User Interface to assign values for the Asset Parameters. Any configuration done in the HXAM-G Configuration Faceplate gets automatically written to the Configuration_Values aspect, from where the Asset Parameters reads its value. [Recommended].

Table 31 shows the description and expected values of all the Asset Parameters and Table 32 shows the corresponding variables in Configuration_Values aspects and the HXAM-G Configuration Faceplate for every Asset Parameter.

Do not change the macros used in the **Asset Parameters** tab in the HXAM_G aspect. Do not change anything in the Configuration_Values aspect. The read/write permissions for all properties in the Configuration_Values aspect is set to **YES** and the names and data type of the properties are shown in Table 32.

Table 31. Description and Expected Asset Parameter Values

Parameter Name	Description	Expected Value
E_Improvement_Level	Improvement in Performance Factor in % [Required]	Value greater than zero. Default Value: 2.00
E_Significant_Improvement_Level	Significant Improvement in Performance Factor in % [Required]	Value greater than zero. Default Value: 5.00
E_Decline_Level	Decline in Performance Factor in % [Required]	Value greater than zero Default Value: 2.00
E_Significant_Decline_Level	Significant Decline in Performance Factor in % [Required]	Value greater than zero. Default Value: 5.00
Asset_Monitor_Sampling_Interval	Time interval between Monitoring [Required]	Any Integer greater than 0. Recommended values given in Table 24 on page 193.
Delta_BOPS	Acceptable percentage difference between COPS and BOPS to consider COPS as a new set of BOPS [Required]	Value greater than zero. Default Value: 5.00
Normal_Service_Interval_In_Hrs	Time interval between heat exchanger cleaning, rebuilds, etc. in hours [Required]	Value greater than zero.
Number_Of_Baseline_Sets	Number of BOPS expected [Required]	Minimum Integer value of 1 and no more than 5.
Enable_Logging_Data	Set to True/Yes if the Operating Point Set needs to be logged into a file [Required]	TRUE, FALSE, YES, NO
Hot_Side_Condensing	Set to True/Yes if Hot side Flow is getting Condensed. [Required]	TRUE, FALSE, YES, NO

Table 31. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Cold_Side_Evaporating	Set to True/Yes if Cold Side is getting Evaporated [Required]	TRUE, FALSE, YES, NO
Mass_Flow_Hot_Available	Set to True/Yes if Mass Flow for Hot side is available [Required]	TRUE, FALSE, YES, NO
Mass_Flow_Cold_Available	Set to True/Yes if Mass Flow for Cold side is available [Required]	TRUE, FALSE, YES, NO
Volume_Flow_Hot_Available	Set to True/Yes if Volume Flow for Hot side is available [Required if Mass Flow for Hot side is not available]	TRUE, FALSE, YES, NO
Volume_Flow_Cold_Available	Set to True/Yes if Volume Flow for Cold side is available [Required if Mass Flow for Cold side is not available]	TRUE, FALSE, YES, NO
Density_Hot_Fluid	Density for Hot side. [Required if Volume Flow for Hot side is available]	Value greater than 0.
Density_Cold_Fluid	Density for Cold side. [Required if Mass Flow for Cold side is not available]	Value greater than 0
Delta_P_Hot_Available	Set to True if Pressure Difference for Hot side is available [Required]	TRUE, FALSE, YES, NO
Delta_P_Hot_Alternative_Available	Set to True if Alternative to calculate Pressure Difference for Hot side is available [Required if Pressure Difference for hot side is not available]	TRUE, FALSE, YES, NO

Table 31. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Delta_P_Cold_Available	Set to True if Pressure Difference for Cold side is available [Required	TRUE, FALSE, YES, NO
Delta_P_Cold_Alternative_Available	Set to True if Alternative to calculate Pressure Difference for Cold side is available [Required if Pressure Difference for cold side is not available]	TRUE, FALSE, YES, NO
Specific_Heat_Hot_Fluid	Specific Heat of Hot Side fluid [Required if either flows for hot side is available]	Value greater than 0
Specific_Heat_Cold_Fluid	Specific Heat of Cold Side fluid [Required if either flows for cold side is available]	Value greater than 0
Unit_Of_Temperature	Unit of Temperature [Required]	DEG-K, DEG-C, DEG-F, DEG-R
Unit_Of_Mass_Flow	Unit of Mass flow [Required]	LB/DAY, LB/HR, LB/MIN, LB/S, KG/DAY, KG/HR, KG/MIN, KG/S KLB/DAY KLB/HR TONNE/HR

Table 31. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Unit_Of_Heat_Duty	Unit of Heat Duty [Required]	KCAL/S, KCAL/HR, BTU/S, BTU/HR, W, MW
Unit_Of_Volume_Flow	Unit of Volume Flow [Required if Volume Flow for any side is available]	CU.FT/DAY, CU.FT/HR, CU.FT/MIN, CU.FT/S, L/DAY, L/HR, L/MIN, US GAL/DAY, US GAL/HR, US GAL/MIN, US GAL/S, CU.M/DAY, CU.M/HR, CU.M/MIN CU.M/S
Unit_Of_Density	Unit of Density. [Required if any Densities are provided]	LB/CU.FT, LB/US GAL, KG/CU.M, G/L, G/CU.CM
Unit_Of_Specific_Heat	Unit of Specific Heat. [Required]	BTU/LB.DEG-F, KJ/KG.DEG-K, KCAL/KG.DEG-K, J/G.DEG-C

Table 31. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Unit_Of_Heat_Duty	Unit of Heat Duty [Required]	KCAL/S, KCAL/HR, BTU/S, BTU/HR, W, MW
Inhibit_Value	Any string value can be entered for inhibit. When the Input Record Inhibit equals the value entered, the Asset Monitor gets disabled.	Any string value except True/False
Enable_Delta_Tx_AM	Set to True if Delta_Tx Asset Monitor is Enabled [Optional]	TRUE, FALSE
Delta_Tx_Increasing	Delta_Tx Increasing Limit [Required if Delta_Tx AM Enabled]	Value greater than 0
Delta_Tx_Declining	Delta_Tx Declining Limit [Required if Delta_Tx AM Enabled]	Value greater than 0
Delta_Tx_Low	Delta_Tx Low Limit [Required if Delta_Tx AM Enabled]	Value greater than 0
Delta_Tx_High	Delta_Tx High Limit [Required if Delta_Tx AM Enabled]	Value greater than 0
Heat_Of_Vaporization_Hot_Side	Hot side Heat of Vaporization. [Required if Hot side Condensing]	Value greater than 0
Heat_Of_Vaporization_Cold_Side	Cold side Heat of Vaporization. [Required if Cold Side Evaporating]	Value greater than 0

Table 31. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Enable_Delta_T_Hot_AM	Set to True if Hot Side Temperature Difference AM Enabled [Optional]	TRUE, FALSE
Delta_T_Hot_High	Delta_T_Hot High Limit [Required if Delta_T_Hot AM Enabled]	Value greater than 0
Delta_T_Hot_Increasing	Delta_T_Hot Increasing Limit [Required if Delta_T_Hot AM Enabled]	Value greater than 0
Delta_T_Hot_Declining	Delta_T_Hot Declining Limit [Required if Delta_T_Hot AM Enabled]	Value greater than 0
Delta_T_Hot_Low	Delta_T_Hot Low Limit [Required if Delta_T_Hot AM Enabled]	Value greater than 0
Enable_Delta_T_Cold_AM	Set to True if Cold Side Temperature Difference AM is Enabled [Optional]	TRUE, FALSE
Delta_T_Cold_High	Delta_T_Cold High Limit [Required if Delta_T_Cold AM Enabled]	Value greater than 0
Delta_T_Cold_Increasing	Delta_T_Cold Increasing Limit [Required if Delta_T_Cold AM Enabled]	Value greater than 0
Delta_T_Cold_Declining	Delta_T_Cold Declining Limit [Required if Delta_T_Cold AM Enabled]	Value greater than 0
Delta_T_Cold_Low	Delta_T_Cold Low Limit [Required if Delta_T_Cold AM Enabled]	Value greater than 0

Table 31. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Enable_Delta_P_Hot_AM	Set to True if Hot Side Pressure Difference AM is Enabled [Optional]	TRUE, FALSE
Delta_P_Hot_High	Delta_P_Hot High Limit [Required if Delta_P_Hot AM Enabled]	Value greater than 0
Delta_P_Hot_Increasing	Delta_P_Hot Increasing Limit [Required if Delta_P_Hot AM Enabled]	Value greater than 0
Delta_P_Hot_Declining	Delta_P_Hot Declining Limit [Required if Delta_P_Hot AM Enabled]	Value greater than 0
Delta_P_Hot_Low	Delta_P_Hot Low Limit [Required if Delta_P_Hot AM Enabled]	Value greater than 0
Enable_Delta_P_Cold_AM	Set to True if Cold Side Pressure Difference AM is Enabled [Optional]	TRUE, FALSE
Delta_P_Cold_High	Delta_P_Cold High Limit [Required if Delta_P_Cold AM Enabled]	Value greater than 0
Delta_P_Cold_Low	Delta_P_Cold Low Limit [Required if Delta_P_Cold AM Enabled]	Value greater than 0
Delta_P_Cold_Increasing	Delta_P_Cold Increasing Limit [Required if Delta_P_Cold AM Enabled]	Value greater than 0
Delta_P_Cold_Declining	Delta_P_Cold Declining Limit [Required if Delta_P_Cold AM Enabled]	Value greater than 0

Table 31. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Enable_W_Hot_AM	Set to True if Hot Side Mass Flow AM is Enabled [Optional]	TRUE, FALSE
W_Hot_High	Hot Side Mass Flow High Limit [Required if W_Hot AM Enabled]	Value greater than 0
W_Hot_Increasing	Hot Side Mass Flow Increasing Limit [Required if W_Hot AM Enabled]	Value greater than 0
W_Hot_Declining	Hot Side Mass Flow Declining Limit [Required if W_Hot AM Enabled]	Value greater than 0
W_Hot_Low	Hot Side Mass Flow Low Limit [Required if W_Hot AM Enabled]	Value greater than 0
Enable_W_Cold_AM	Set to True if Cold Side Mass Flow AM is Enabled [Optional]	TRUE, FALSE
W_Cold_High	Cold Side Mass Flow High Limit [Required if W_Cold AM Enabled]	Value greater than 0
W_Cold_Increasing	Cold Side Mass Flow Increasing Limit [Required if W_Cold AM Enabled]	Value greater than 0
W_Cold_Declining	Cold Side Mass Flow Declining Limit [Required if W_Cold AM Enabled]	Value greater than 0
W_Cold_Low	Cold Side Mass Flow Low Limit [Required if W_Cold AM Enabled]	Value greater than 0
Enable_HD_Hot_AM	Set to True if Hot Side Heat Duty AM is Enabled [Optional]	TRUE, FALSE

Table 31. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
HD_Hot_High_Limit	Hot Side Heat Duty High Limit [Required if HD_Hot AM Enabled]	Value greater than 0
HD_Hot_Low_Limit	Hot Side Heat Duty Low Limit [Required if HD_Hot AM Enabled]	Value greater than 0
Enable_HD_Cold_AM	Set to True if Cold Side Heat Duty AM is Enabled [Optional]	TRUE, FALSE
HD_Cold_High_Limit	Cold Side Heat Duty High Limit [Required if HD_Cold AM Enabled]	Value greater than 0
HD_Cold_Low_Limit	Cold Side Heat Duty Low Limit [Required if HD_Cold AM Enabled]	Value greater than 0
Enable_Delta_HD_AM	Set to True if Heat Duty Difference AM is Enabled [Optional]	TRUE, FALSE
Delta_HD_High_Limit	Heat Duty Difference High Limit [Required if Delta_HD AM Enabled]	Value greater than 0

Table 32. Configuration_Values Aspect and HXAM-G Configuration Faceplate Values

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-G Configuration Faceplate
E_Improvement_Level	E_Improve **(Float)**	Improvement Level of E [Step-1]
E_Significant_Improvement_Level	E_Significant_Improve **(Float)**	Significant Improvement Level of E [Step-1]

Table 32. Configuration_Values Aspect and HXAM-G Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-G Configuration Faceplate
E_Decline_Level	E_Decline **(Float)**	Declining Level of E [Step-1]
E_Significant_Decline_Level	E_Significant_Decline **(Float)**	Significant Declining Level of E [Step-1]
Asset_Monitor_Sampling_Interval	Asset_Monitor_Sampling_Interval **(Integer)**	Monitoring Interval [Step-1]
Delta_BOPS	Delta_BOPS **(Float)**	Delta BOPS [Step-1]
Hot_Side_Condensing	Is_Hot_Side_Condensing **(String)**	Is Hot Side Condensing? [Step-1]
Cold_Side_Evaporating	Is_Cold_Side_Evaporating **(String)**	Is Cold Side Evaporating? [Step-1]
Normal_Service_Interval_In_Hrs	Normal_Service_Interval **(Float)**	Normal Service Interval [Step-1]
Number_Of_Baseline_Sets	Number_Baseline_Sets **(Integer)**	No: of Baseline Sets [Step-1]
Inhibit_Value	Inhibit **(String)**	Inhibit [Step-1]
Enable_Logging_Data	Enable_Logging_Data **(String)**	Enable Logging of Data? [Step-1]
Mass_Flow_Hot_Available	Mass_Flow_Hot_Available **(String)**	***Hot Side:*** Is Mass Flow Available? [Step-2]
Volume_Flow_Hot_Available	Volume_Flow_Hot_Available **(String)**	***Hot Side:*** Is Volume Flow Available? [Step-2]
Mass_Flow_Cold_Available	Mass_Flow_Cold_Available **(String)**	***Cold Side:*** Is Mass Flow Available? [Step-2]

Table 32. Configuration_Values Aspect and HXAM-G Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-G Configuration Faceplate
Volume_Flow_Cold_Available	Volume_Flow_Cold_Available **(String)**	***Cold Side:*** Is Volume Flow Available? [Step-2]
Delta_P_Hot_Available	Delta_P_Hot_Available **(String)**	***Hot Side:*** Is Pressure Difference Available? [Step-3]
Delta_P_Hot_Alternative_Available	Delta_P_Hot_Alternative_Available **(String)**	***Hot Side:*** Is Pressure In and Out Available? [Step-3]
Delta_P_Cold_Available	Delta_P_Cold_Available **(String)**	***Cold Side:*** Is Pressure Difference Available? [Step-3]
Delta_P_Cold_Alternative_Available	Delta_P_Cold_Alternative_Available **(String)**	***Cold Side:*** Is Pressure In and Out Available? [Step-3]
Unit_Of_Temperature	Unit_Of_Temperature **(String)**	Unit of Temperature [Step-1]
Unit_Of_Mass_Flow	Unit_Of_Mass_Flow **(String)**	Unit of Mass Flow [Step-2]
Unit_Of_Volume_Flow	Unit_Of_Volume_Flow **(String)**	Unit of Volume Flow [Step-2]
Unit_Of_Density	Unit_Of_Density **(String)**	Unit of Density [Step-2]
Unit_Of_Specific_Heat	Unit_Of_Specific_Heat **(String)**	Unit of Specific Heat [Step-2]
Unit_Of_Heat_Duty	Unit_Of_Heat_Duty **(String)**	Unit of Heat Duty [Step-2]
Specific_Heat_Hot_Fluid	Specific_Heat_Hot **(Float)**	***Hot Side:*** Specific Heat [Step-2]
Specific_Heat_Cold_Fluid	Specific_Heat_Cold **(Float)**	***Cold Side:*** Specific Heat [Step-2]
Density_Hot_Fluid	Density_Hot **(Float)**	***Hot Side:*** Density [Step-2]
Density_Cold_Fluid	Density_Cold **(Float)**	***Cold Side:*** Density [Step-2]

Table 32. Configuration_Values Aspect and HXAM-G Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-G Configuration Faceplate
Heat_Of_Vaporization_Hot_Side	Heat_Of_Vaporization_Hot **(Float)**	***Hot Side:*** Heat of Vap [Step-2]
Heat_Of_Vaporization_Cold_Side	Heat_Of_Vaporization_Cold **(Float)**	***Cold Side:*** Heat of Vap [Step-2]
Enable_Delta_Tx_AM	Enable_Delta_Tx_AM **(String)**	Enable Delta Tx Condition Monitor [Step-4]
Delta_Tx_Increasing	Delta_Tx_Increasing **(Float)**	***Delta Tx Limits:*** Increasing Limit [Step-5]
Delta_Tx_Declining	Delta_Tx_Declining **(Float)**	***Delta Tx Limits:*** Declining Limit [Step-5]
Delta_Tx_Low	Delta_Tx_Low **(Float)**	***Delta Tx Limits:*** Low Limit [Step-5]
Delta_Tx_High	Delta_Tx_High **(Float)**	***Delta Tx Limits:*** High Limit [Step-5]
Enable_Delta_T_Hot_AM	Enable_Delta_T_Hot_AM **(String)**	Enable Delta T Hot Condition Monitor [Step-4]
Delta_T_Hot_High	Delta_T_Hot_High **(Float)**	***Delta T Hot Limits:*** High Limit [Step-5]
Delta_T_Hot_Increasing	Delta_T_Hot_Increasing **(Float)**	***Delta T Hot Limits:*** Increasing Limit [Step-5]
Delta_T_Hot_Declining	Delta_T_Hot_Declining **(Float)**	***Delta T Hot Limits:*** Declining Limit [Step-5]
Delta_T_Hot_Low	Delta_T_Hot_Low **(Float)**	***Delta T Hot Limits:*** Low Limit [Step-5]
Enable_Delta_T_Cold_AM	Enable_Delta_T_Cold_AM **(String)**	Enable Delta T Cold Condition Monitor [Step-4]

Table 32. Configuration_Values Aspect and HXAM-G Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-G Configuration Faceplate
Delta_T_Cold_High	Delta_T_Cold_High **(Float)**	***Delta T Cold Limits:*** High Limit [Step-5]
Delta_T_Cold_Increasing	Delta_T_Cold_Increasing **(Float)**	***Delta T Cold Limits:*** Increasing Limit [Step-5]
Delta_T_Cold_Declining	Delta_T_Cold_Declining **(Float)**	***Delta T Cold Limits:*** Declining Limit [Step-5]
Delta_T_Cold_Low	Delta_T_Cold_Low **(Float)**	***Delta T Hot Limits:*** Low Limit [Step-5]
Enable_Delta_P_Hot_AM	Enable_Delta_P_Hot_AM **(String)**	Enable Delta P Hot Condition Monitor [Step-4]
Delta_P_Hot_High	Delta_P_Hot_High **(Float)**	***Delta P Hot Limits:*** High Limit [Step-6]
Delta_P_Hot_Increasing	Delta_P_Hot_Increasing **(Float)**	***Delta P Hot Limits:*** Increasing Limit [Step-6]
Delta_P_Hot_Declining	Delta_P_Hot_Declining **(Float)**	***Delta P Hot Limits:*** Declining Limit [Step-6]
Delta_P_Hot_Low	Delta_P_Hot_Low **(Float)**	***Delta P Hot Limits:*** Low Limit [Step-6]
Enable_Delta_P_Cold_AM	Enable_Delta_P_Cold_AM **(String)**	Enable Delta P Cold Condition Monitor [Step-4]
Delta_P_Cold_High	Delta_P_Cold_High **(Float)**	***Delta P Cold Limits:*** High Limit [Step-6]
Delta_P_Cold_Increasing	Delta_P_Cold_Increasing **(Float)**	***Delta P Cold Limits:*** Increasing Limit [Step-6]
Delta_P_Cold_Declining	Delta_P_Cold_Declining **(Float)**	***Delta P Cold Limits:*** Declining Limit [Step-6]

Table 32. Configuration_Values Aspect and HXAM-G Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-G Configuration Faceplate
Delta_P_Cold_Low	Delta_P_Cold_Low **(Float)**	***Delta P Cold Limits:*** Low Limit [Step-6]
Enable_W_Hot_AM	Enable_W_Hot_AM **(String)**	Enable W Hot Condition Monitor [Step-4]
W_Hot_High	W_Hot_High **(Float)**	***W Hot Limits:*** High Limit [Step-7]
W_Hot_Increasing	W_Hot_Increasing **(Float)**	***W Hot Limits:*** Increasing Limit [Step-7]
W_Hot_Declining	W_Hot_Declining **(Float)**	***W Hot Limits:*** Declining Limit [Step-7]
W_Hot_Low	W_Hot_Low **(Float)**	***W Hot Limits:*** Low Limit [Step-7]
Enable_W_Cold_AM	Enable_W_Cold_AM **(String)**	Enable W Cold Condition Monitor [Step-4]
W_Cold_High	W_Cold_High **(Float)**	***W Cold Limits:*** High Limit [Step-7]
W_Cold_Increasing	W_Cold_Increasing **(Float)**	***W Cold Limits:*** Increasing Limit [Step-7]
W_Cold_Declining	W_Cold_Declining **(Float)**	***W Cold Limits:*** Declining Limit [Step-7]
W_Cold_Low	W_Cold_Low **(Float)**	***W Cold Limits:*** Low Limit [Step-7]
Enable_HD_Hot_AM	Enable_HD_Hot_AM **(String)**	Enable HD Hot Condition Monitor [Step-4]
HD_Hot_High_Limit	HD_Hot_High **(Float)**	***HD Hot Limits:*** High Limit [Step-8]

Table 32. Configuration_Values Aspect and HXAM-G Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-G Configuration Faceplate
HD_Hot_Low_Limit	HD_Hot_Low **(Float)**	***HD Hot Limits:*** Low Limit [Step-8]
Enable_HD_Cold_AM	Enable_HD_Cold_AM **(String)**	Enable HD Cold Condition Monitor [Step-5]
HD_Cold_High_Limit	HD_Cold_High **(Float)**	***HD Cold Limits:*** High Limit [Step-8]
HD_Cold_Low_Limit	HD_Cold_Low **(Float)**	***HD Cold Limits:*** Low Limit [Step-8]
Enable_Delta_HD_AM	Enable_Delta_HD_AM	Enable Delta HD Condition Monitor [Step-4]
Delta_HD_High_Limit	Delta_HD_High **(Float)**	***Delta HD Limits:*** Low Limit [Step-8]

Recommended Asset Monitor Sampling Interval (AMSI) for HXAM_G

Table 33 lists the recommended Asset Monitor sampling interval (AMSI).

Table 33. Recommended Asset Monitor Sampling Interval (AMSI)

Normal Service Interval	Recommended AMSI Value (minutes)
1 day	1 or greater
2 days	
3 days	
4 days	
5 days	

Table 33. Recommended Asset Monitor Sampling Interval (AMSI) (Continued)

Normal Service Interval	Recommended AMSI Value (minutes)
6 days	2 or greater
1 week	
2 weeks	
3 weeks	5 or greater
4 weeks	
1 month	10 or greater
2 months	15 or greater
3 months	20 or greater
4 months	30 or greater
5 months	
6 months	60 or greater
1 year	120 or greater
2 years	240 or greater
3 years	300 or greater
4 years	480 or greater
5 years	

HXAM_G Asset Monitor Input Records

Input Records for HXAM-G Asset Monitor along with the expected data and explanations are given in Table 34.

Table 34. Input Records

Input Records	Explanation	Expected Data
Clear_Base_Operating_Point	Specifies if the Asset Monitor is to be retrained. This is read as an XML value, which includes a timestamp. Therefore any change from True to False, False to True, False to False, or True to True will trigger Retrain. On retraining, the Asset Monitor will erase all the trained BOPS and go back to *Training Phase*. This Input Record is a manual input that can be input by clicking a button from the HXAM-G Faceplate. [Required]	TRUE / FALSE
T_Hot_In	Hot Side Inlet Temperature. [Required]	Any numeric value
T_Hot_Out	Hot Side Outlet Temperature. [Required]	Any numeric value
T_Cold_In	Cold Side Inlet Temperature [Required]	Any numeric value
T_Cold_Out	Hot Side Outlet Temperature [Required]	Any numeric value
Mass_Flow_Hot_Side	Hot Side Mass Flow [Required if Asset Parameter **Mass_Flow_Hot_Available** is set to TRUE/YES]	Any numeric value
Volume_Flow_Hot_Side	Hot Side Volume Flow. [Required if Asset Parameter **Volume_Flow_Hot_Available** is set to TRUE/YES]	Any numeric value
Mass_Flow_Cold_Side	Cold Side Mass Flow. [Required if Asset Parameter **Mass_Flow_Cold_Available** is set to TRUE/YES]	Any numeric value
Volume_Flow_Cold_Side	Cold Side Volume Flow. [Required if Asset Parameter V**olume_Flow_Cold_Available** is set to TRUE/YES]	Any numeric value

Table 34. Input Records (Continued)

Input Records	Explanation	Expected Data
Delta_P_Hot_Side	Hot Side Pressure Difference. [Required if Asset Parameter **Delta_P_Hot_Available** is set to TRUE/YES]	Any numeric value
P_Hot_In	Hot Side Inlet Pressure. [Required if Asset Parameter **Delta_P_Hot_Alternative_Available** is set to TRUE/YES]	Any numeric value
P_Hot_Out	Hot Side Outlet Pressure. [Required if Asset Parameter **Delta_P_Hot_Alternative_Available** is set to TRUE/YES]	Any numeric value
Delta_P_Cold_Side	Cold Side Pressure Difference. . [Required if Asset Parameter **Delta_P_Cold_Available** is set to TRUE/YES]	Any numeric value
P_Cold_In	Cold Side Inlet Pressure. [Required if Asset Parameter **Delta_P_Cold_Alternative_Available** is set to TRUE/YES]	Any numeric value
P_Cold_Out	Cold Side Outlet Pressure. [Required if Asset Parameter **Delta_P_Cold_Alternative_Available** is set to TRUE/YES]	Any numeric value
Inhibit	Inhibit Signal. The value must match the Asset Parameter **Inhibit_Value**, if the Asset Monitor is to be inhibited. [Optional]	Any String
Clear_BOPS_Date	Date of Last Time BOPS change was made [Required]	String

For manual input of any input record, the Data Source Item should be configured using macros as shown in Table 35 and the actual values should be put in the corresponding variable in the HXAM_G_GP aspect. By configuring this way, the Input Record reads its data from the HXAM_G_GP aspect. The expected data for the Input Records are given in Table 34.

Table 35. Data Source Item Macros

Input Records	Macros Used	Corresponding Variable in HXAM_G_GP Aspect
Clear_Base_Operating_Point	%ID%:Clear BOPS	Clear BOPS
Inhibit	%ID%:Inhibit	Inhibit
T_Hot_In	%ID%:Inlet Hot Temperature	Inlet Hot Temperature
T_Cold_In	%ID%:Inlet Cold Temperature	Inlet Cold Temperature
T_Hot_Out	%ID%:Outlet Hot Temperature	Outlet Hot Temperature
T_Cold_Out	%ID%:Outlet Cold Temperature	Outlet Cold Temperature
Mass_Flow_Hot_Side	%ID%:Mass Flow Hot Side	Mass Flow Hot Side
Volume_Flow_Hot_Side	%ID%:Volume Flow Hot Side	Volume Flow Hot Side
Mass_Flow_Cold_Side	%ID%:Mass Flow Cold Side	Mass Flow Cold Side
Volume_Flow_Cold_Side	%ID%:Volume Flow Cold Side	Volume Flow Cold Side
Delta_P_Hot_Side	%ID%:Pressure Difference Hot Side	Pressure Difference Hot Side
P_Hot_In	%ID%:Inlet Pressure Hot Side	Inlet Pressure Hot Side
P_Hot_Out	%ID%:Outlet Pressure Hot Side	Outlet Pressure Hot Side
Delta_P_Cold_Side	%ID%:Pressure Difference Cold Side	Pressure Difference Cold Side
P_Cold_In	%ID%:Inlet Pressure Cold Side	Inlet Pressure Cold Side
P_Cold_Out	%ID%:Outlet Pressure Cold Side	Outlet Pressure Cold Side
Clear_BOPS_Date	%ID%:Clear BOPS Date	Clear BOPS Date

Table 35. Data Source Item Macros (Continued)

Input Records	Macros Used	Corresponding Variable in HXAM_G_GP Aspect
—	—	RetrainFE_TempVal

NOTES:

1. For all inputs that are not manually input or somehow stored into the HXAM_G_GP aspect, the macros shown in Table 35 will not work. The Data Source Item should be configured based on from where the property of the Input Record will be read. The Clear_Base_Operating_Point and Clear_BOPS_Date Input Records will always be manual inputs. The actual OPC data source items are obtained, from process variables available within the DCS, for the temperatures, flows, and pressures used by the monitor. Remember that the minimum inputs for operability of the Heat Exchanger Asset Monitor are the four leg temperatures of the heat exchanger being monitored.
2. The RetrainFE_TempVal property under HXAM_G_GP aspect in Table 35 does not have a corresponding Input Record. This property is only used for the working of the HXAM_G_BOPS_Info_FE aspect and is not an Input Record. This property is configured to take a string and it's Readable?/Writable? Are set to **Yes**. Do not make any changes to this property. If by any chance the value of this property gets erased, type in the following value: `So far received 0 Base Operating Point Set`. The value of this property should never be empty.

Shell and Tube Heat Exchanger Asset Monitor (HXAM_ST)

The following topics discuss Shell and Tube Heat Exchanger Asset Monitor operation.

Configuration

Configuration of the Generic Heat Exchanger Asset Monitor consists of:

- HXAM_ST Aspect Configuration.
- HXAM-ST Configuration Faceplate.
- HXAM_ST Trend Display Aspect.

HXAM_ST Aspect Configuration

From the Control Structure, the HXAM-ST object can be created by calling the Heat Exchanger Object from the Asset Monitors list of Object Types. After the object has been created, the History Source aspect is added into the object. After creation of the History Source aspect, the Service Group of the History Source must be configured (typically set to Basic).

1. To start configuration, go to HXAM_ST aspect as shown in Figure 107.

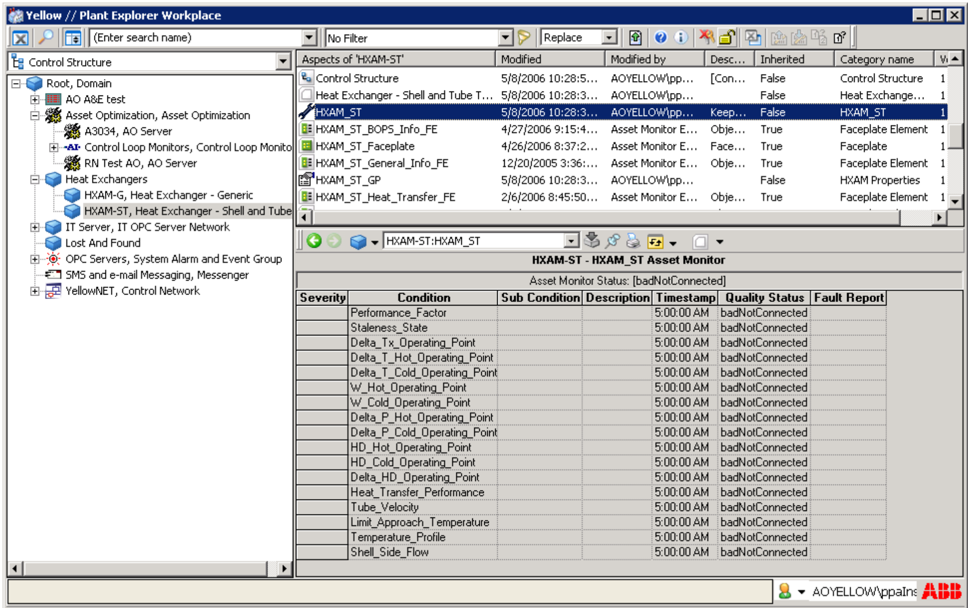

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Figure 107. Navigating to the HXAM_ST Aspect

2. Switch to the Config View of the HXAM_ST aspect as shown in Figure 108.

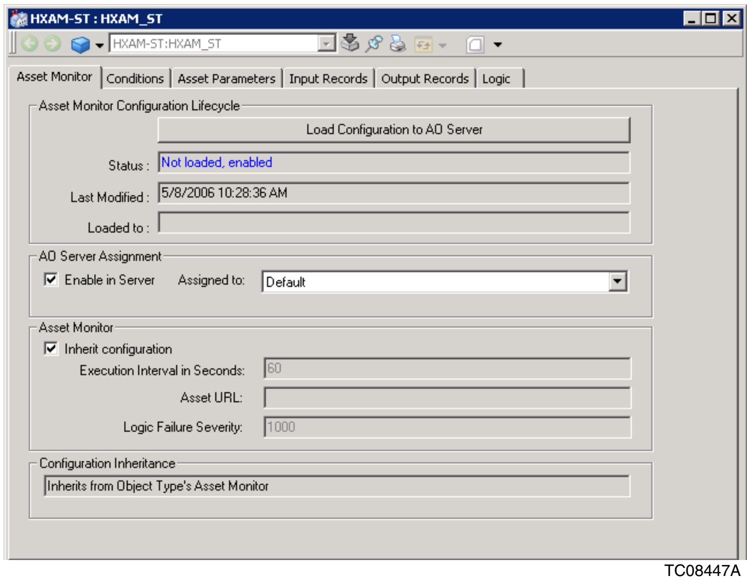


Figure 108. Config View of HXAM_ST Aspect

3. The Config View is divided into six tabs:

   – Asset Monitor Tab.
   – Conditions Tab.
   – Asset Parameters Tab.
   – Input Records Tab.
   – Output Records Tab.
   – Logic Tab.

Asset Monitor Tab

The data in the Asset Monitor tab consists of:

- **Asset Monitor Configuration Lifecycle frame:** This frame does not have any configurable values. No action is required.

- **AO Server Assignment frame:** The Enable in Server check box must be enabled for the Asset Monitor to execute. Set the appropriate Server Assignment (typically set to `Default`) in the Assigned to drop-down list box.
- **Asset Monitor frame:** The **Execution Interval in Seconds** field must be kept at 60 seconds. This defines how often the analysis logic will be executed.

The actual interval between subsequent executions may be longer than the specified interval on heavily loaded systems.

The **Asset URL** field is an optional parameter that can be used to point to the device web interface to get more information on the device status. If desired, this can be set to an application specific URL.

The **Logic Failure Severity** field should be left at 1000. This is the Asset Monitor alarm severity level. It is used to report Asset Monitor failures in the 800xA Alarm and Event system.

- **Configuration Inheritance frame:** This section does not have any configurable values. No action is required.

Conditions Tab

This tab does not have any configurable values, but reflects Condition/Subcondition information for the Asset Monitors, which are implemented.

The **Conditions** tab contains the definition of the conditions that are assessed and reported by the Heat Exchanger Asset Monitor. The main functionality of the Heat Exchanger Asset Monitor is to monitor the operating parameters of the heat exchanger and report the current subcondition for each defined condition.

Each condition is defined by a set of subconditions. The subconditions for a given condition are mutually exclusive. Subcondition ENUM 0 always represents the normal condition state. A transition to the normal state will deactivate the associated alarm in the Alarm and Event List.

If the Asset Monitor is not able to successfully assess the current subcondition for a given condition, it sets the quality status of that condition to a bad value.

The only subconditions that will generate a Fault Report in the Fault Report Submitter are those that are not normal with good quality status.

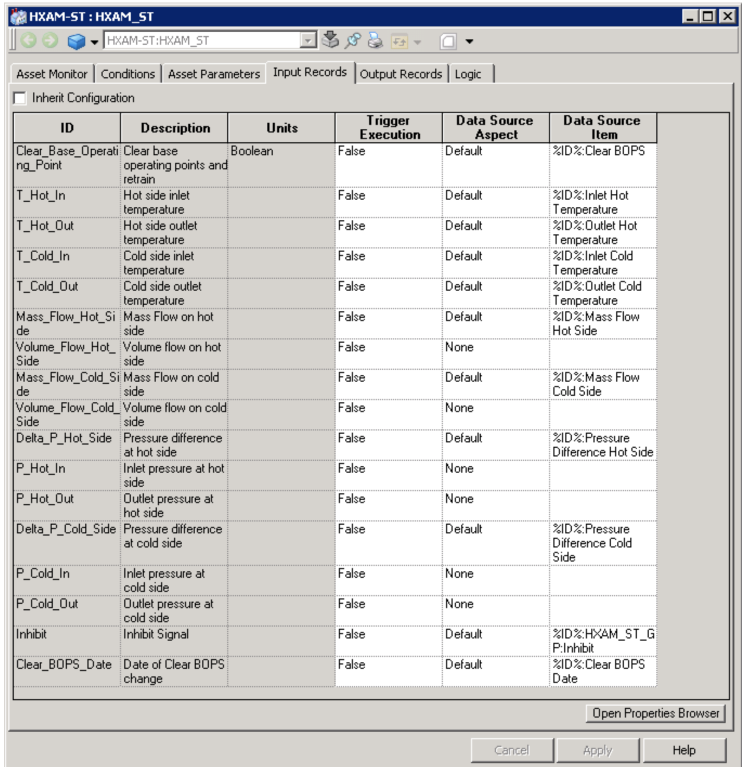
Asset Parameters Tab

No configuration is required. The **Asset Parameters** tab contains configuration parameters used to provide additional heat exchanger information required by the Heat Exchanger Asset Monitor algorithm.

The Asset Parameters values are read from Configuration_Values aspect by the use of macros. The Configuration_Values aspect is an intermediate aspect that gets written to, from the Configuration Faceplate aspect, which is then read by the Asset Parameters value in HXAM_ST aspect by the use of macros. These macros **SHOULD NOT** be changed. The actual configuration of Asset Parameters is done in the Configuration Faceplate. Refer to Configuring HXAM_ST Asset Parameters on page 266 for details on configuring the Asset Parameters.

Input Records Tab

The **Input Records** tab contains the definition of data items (i.e. OPC items) used by the Heat Exchanger Asset Monitor to assess the current heat exchanger condition. Figure 109 shows the **Input Records** tab.



ID	Description	Units	Trigger Execution	Data Source Aspect	Data Source Item
Clear_Base_Operating_Point	Clear base operating points and retrain	Boolean	False	Default	%ID%:Clear BOPS
T_Hot_In	Hot side inlet temperature		False	Default	%ID%:Inlet Hot Temperature
T_Hot_Out	Hot side outlet temperature		False	Default	%ID%:Outlet Hot Temperature
T_Cold_In	Cold side inlet temperature		False	Default	%ID%:Inlet Cold Temperature
T_Cold_Out	Cold side outlet temperature		False	Default	%ID%:Outlet Cold Temperature
Mass_Flow_Hot_Side	Mass Flow on hot side		False	Default	%ID%:Mass Flow Hot Side
Volume_Flow_Hot_Side	Volume flow on hot side		False	None	
Mass_Flow_Cold_Side	Mass Flow on cold side		False	Default	%ID%:Mass Flow Cold Side
Volume_Flow_Cold_Side	Volume flow on cold side		False	None	
Delta_P_Hot_Side	Pressure difference at hot side		False	Default	%ID%:Pressure Difference Hot Side
P_Hot_In	Inlet pressure at hot side		False	None	
P_Hot_Out	Outlet pressure at hot side		False	None	
Delta_P_Cold_Side	Pressure difference at cold side		False	Default	%ID%:Pressure Difference Cold Side
P_Cold_In	Inlet pressure at cold side		False	None	
P_Cold_Out	Outlet pressure at cold side		False	None	
Inhibit	Inhibit Signal		False	Default	%ID%:HXAM_ST_GP:Inhibit
Clear_BOPS_Date	Date of Clear BOPS change		False	Default	%ID%:Clear BOPS Date

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Figure 109. Input Records Tab

The columns in the **Input Records** tab are defined as follows:

- **ID:** Input Record identifier.
- **Description:** Input Record description.
- **Units:** Input Record expected engineering units.
- **Trigger Execution:** When `True`, the Asset Monitor will be scheduled for immediate execution upon Input Record value change. Setting this configuration parameter to `True` may increase the actual Asset Monitor

execution frequency based on the Input Record Data Source Aspect OPC Group Update Rate.

- **Data Source Aspect:** Provides a pick list to select one of the available Asset Monitor Data Sources defining the data server (i.e. OPC server) from which to read the value.
- **Data Source Item:** Identifies the item (i.e. OPC item) in the data server from which to read the value.

The Data Source Aspect for the Input Records must be configured to the Data Server that reads the value associated with that particular Input Record. The Data Source Item must refer to the property that contains the value of the Input Record. If an input record is not available, the Data Source Aspect is set to `None` and the Data Source Item is left empty. Input records `Clear_Base_Operating_Point` and `Clear_BOPS_Date` are manual inputs that uses macros `%ID%:Clear BOPS` and `%ID%:Clear BOPS Date` respectively to read its property from the HXAM_ST_GP Aspect. These two macros **SHOULD NOT** be changed. The rest of the input records are field variables that must be configured accordingly. Refer to HXAM-ST Input Records on page 292 for a description of the Input Records.

Output Records Tab

The **Output Records** tab has no configurable values. It is for information only and shows the Output Records in the HXAM-ST Configuration Faceplate for user information**.**

Logic Tab

The **Logic** tab has no configurable values.

HXAM-ST Configuration Faceplate

The HXAM-ST Configuration Faceplate includes 11 tabs. These tabs are named Step-1 through Step-11. These 11 tabs guide the user through each stage of configuration. The tabs in the Faceplate aspect are views of the 11 Faceplate Element aspects. Figure 110 shows the view of the HXAM-ST Configuration Faceplate aspect. Refer to Configuring HXAM_ST Asset Parameters on page 266 for details on the properties seen in the Configuration Faceplate.

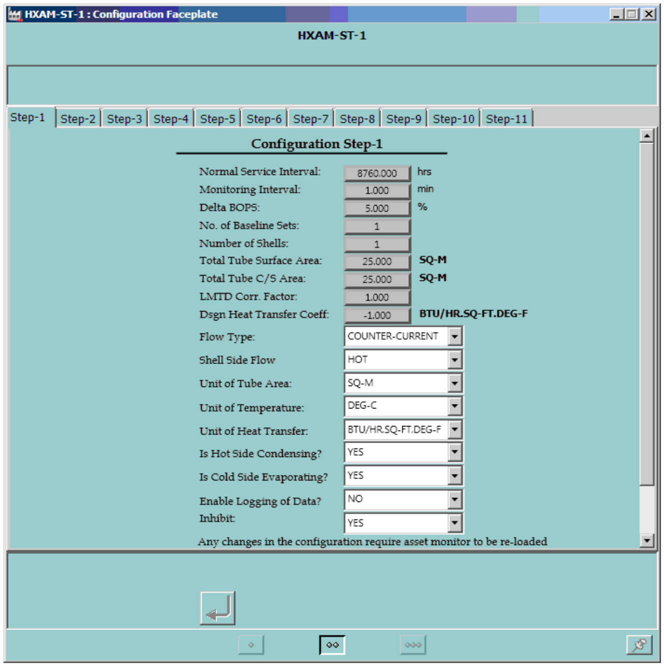

Figure 110. Step-1 Tab of HXAM-ST Configuration Faceplate

Step-1 Tab

The **Step-1** tab is the view of Configuration_Step1_FE. Figure 110 shows the view of **Step-1** tab. Table 36 lists and describes the elements in the **Step-1** tab of the HXAM-G Configuration Faceplate.

Table 36. Step-1 Tab of HXAM-ST Configuration Faceplate

Element	Description	Expected Value
Normal Service Interval	Time interval between heat exchanger cleaning, rebuilds, etc. in hours [Required]	Value greater than 0
Monitoring Interval	Time interval between monitoring in minutes. [Required]	Any Integer greater than 0. Recommended values given in Configuring HXAM_G Asset Parameters on page 207.
Delta BOPS	Acceptable percentage difference between COPS and BOPS to consider COPS as a new set of BOPS. If no value is entered or if there is some error in entry, a default value of 5.00 will be taken. [Required]	Value greater than 0 Default Value: 5.00
No: of Baseline Sets	Number of BOPS expected [Required]	Minimum Integer value of 1 and no more than 5
Number of Shells	Number of shells used. For most applications, one shell is the norm [Required]	
Total Tube Surface Area	Total surface area of tube [Required]	Value greater than 0
Total Tube C/S Area	Total cross sectional area of tube. Use tube ID as this information is used to determine tube velocity. [Required]	
LMTD Corr Factor	Log mean temperature difference correction factor. If no value is entered or if there is some error in entry, a default value of 1 will be taken. [Optional]	Value greater than 0 Default Value: 1
Design Heat Transfer Coeff Value	Design heat transfer efficiency. If not available, enter any negative value. [Required]	Value greater than 0

Table 36. Step-1 Tab of HXAM-ST Configuration Faceplate (Continued)

Element	Description	Expected Value
Flow Type	Flow type through the heat exchanger [Required]	CO-CURRENT, COUNTER-CURRENT
Shell-Side Flow	Flow at shell side [Required]	HOT, COLD
Unit of Tube Area	Unit of tube area [Required]	Select one from the drop-down list box
Unit of Temperature	Unit of temperature [Required]	
Unit of Heat Transfer Coeff.	Unit of heat transfer coefficient [Required]	
Is Hot-Side Condensing?	Select **YES** if hot side flow is condensing. [Required]	YES, NO
Is Cold-Side Evaporating?	Select **YES** if Cold Side is Evaporating [Required]	
Enable Logging of Data?	Select **YES** to enable data logging to a file [Required]	
Inhibit	Any string value can be entered for inhibit. When the Input Record Inhibit equals the value entered, the Asset Monitor gets disabled.	Any string value except True/False

Step-2 Tab

The **Step-2** tab is the view of Configuration_Step2_FE. Figure 111 shows the view of **Step-2** tab and Table 37 lists and describes the elements in the **Step-2** tab of the Configuration Faceplate.

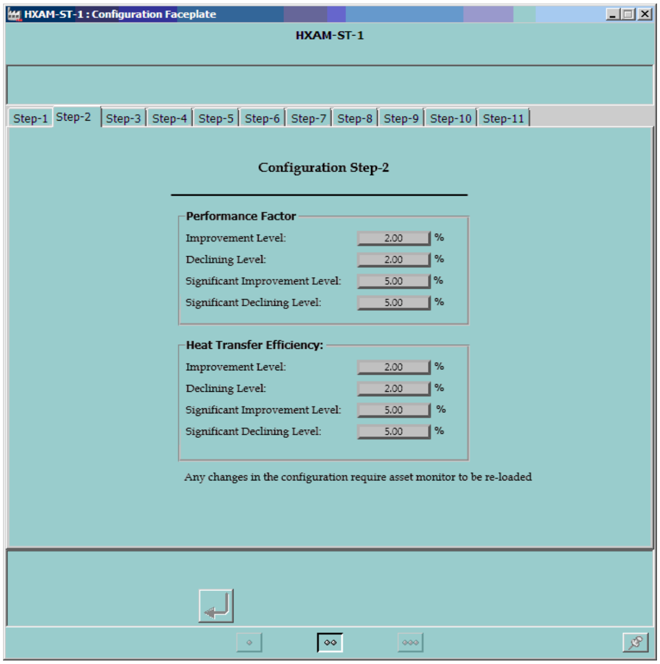

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Figure 111. Step-2 Tab of HXAM-ST Configuration Faceplate

Table 37. Step-2 Tab of HXAM-ST Configuration Faceplate

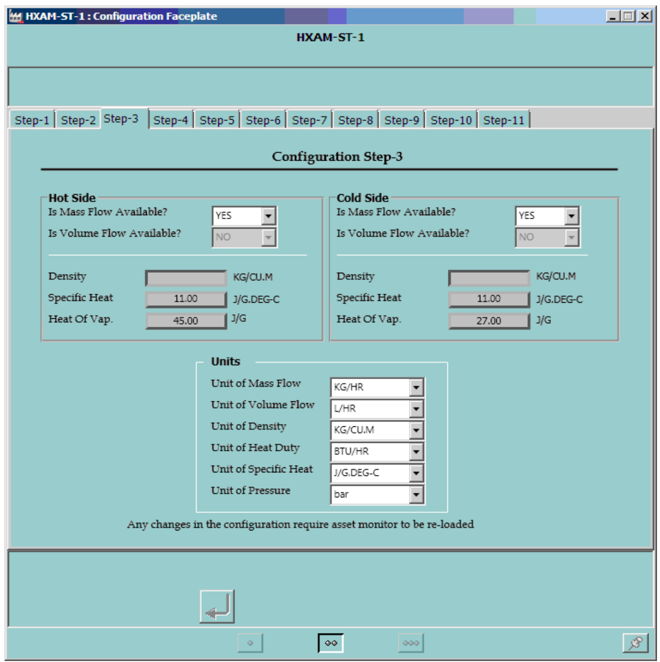
<table>
<tr><th>Element</th><th>Description</th><th>Expected Value</th></tr>
<tr><td>Performance Factor:
Improvement Level</td><td>Acceptable percentage difference between the COPS Performance Factor and the BOPS Performance Factor to consider the COPS Performance Factor to have improved. If no value is entered a default of 2.00 will be taken. [Required]</td><td>Value greater than 0
Default Value: 2.00</td></tr>
<tr><td>Performance Factor:
Declining Level</td><td>Acceptable percentage difference between the COPS Performance Factor and the BOPS Performance Factor to consider the COPS Performance Factor to have declined. If no value is entered a default of 2.00 will be taken. [Required]</td><td>Value greater than 0
Default Value: 2.00</td></tr>
<tr><td>Performance Factor:
Significant Improvement Level</td><td>Acceptable percentage difference between the COPS Performance Factor and the BOPS Performance Factor to consider the COPS Performance Factor to have significantly improved. If no value is entered a default of 5.00 will be taken. [Required]</td><td rowspan="2">Value greater than 0
Default Value: 5.00</td></tr>
<tr><td>Performance Factor:
Significant Declining Level</td><td>Acceptable percentage difference between the COPS Performance Factor and the BOPS Performance Factor to consider the COPS Performance Factor to have significantly declined. If no value is entered a default of 5.00 will be taken. [Required]</td></tr>
</table>

Table 37. Step-2 Tab of HXAM-ST Configuration Faceplate (Continued)

Element	Description	Expected Value
Heat Transfer Efficiency: Improvement Level	Acceptable percentage difference between the COPS Heat Transfer Efficiency and the BOPS Heat Transfer Efficiency to consider the COPS Heat Transfer Efficiency to have improved. If no value is entered a default of 2.00 will be taken. [Required]	Value greater than 0 Default Value: 2.00
Heat Transfer Efficiency: Declining Level	Acceptable percentage difference between the COPS Heat Transfer Efficiency and the BOPS Heat Transfer Efficiency to consider the COPS Heat Transfer Efficiency to have declined. If no value is entered a default of 2.00 will be taken. [Required]	Value greater than 0 Default Value: 2.00
Heat Transfer Efficiency: Significant Improvement Level	Acceptable percentage difference between the COPS Heat Transfer Efficiency and the BOPS Heat Transfer Efficiency to consider COPS Heat Transfer Efficiency to have significantly improved. If no value is entered a default of 5.00 will be taken. [Required]	Value greater than 0 Default Value: 5.00
Heat Transfer Efficiency: Significant Declining Level	Acceptable percentage difference between the COPS Heat Transfer Efficiency and the BOPS Heat Transfer Efficiency to consider the COPS Heat Transfer Efficiency to have significantly declined. If no value is entered a default of 5.00 will be taken. [Required]	

Step-3 Tab

The **Step-3** tab is the view of Configuration_Step3_FE. Figure 112 shows the view of **Step-3** tab and Table 38 lists and describes the elements in the **Step-3** tab of the Configuration Faceplate.



TC08451A

Figure 112. Step-3 Tab of HXAM-ST Configuration Faceplate

Table 38. Step-3 Tab of HXAM-ST Configuration Faceplate

Element	Description	Expected Value
Hot Side: Is Mass Flow available?	Select **YES** if mass flow for hot side is available [Required if volume flow for hot side is not available]	YES, NO

Table 38. Step-3 Tab of HXAM-ST Configuration Faceplate (Continued)

Element	Description	Expected Value
Hot Side: Is Volume Flow available?	Select **YES** if volume flow for hot side is available [Required if mass flow for hot side is not available or if hot side flows through the tube and Tube Velocity Condition Monitor is enabled]	YES, NO
Hot Side: Density	Density of hot side fluid. [Required if mass flow for hot side is not available or if Tube Velocity Condition Monitor is enabled and volume flow for this side is not available]	Value greater than 0.
Hot Side: Specific Heat	Specific heat of hot side fluid [Required]	
Hot Side: Heat of Vap	Heat of vaporization for hot side fluid. Enabled only if hot side is condensing. the unit of heat of vaporization is automatically filled based on the unit of specific heat selected. [Required if hot side condensing]	
Cold Side: Is Mass Flow available	Select **YES** if mass flow for cold side is available [Required if volume flow for cold side is not available]	YES, NO
Cold Side: Is Volume Flow available	Select **YES** if volume flow for cold side is available [Required if mass flow for cold side is not available or if cold side flows through the tube and Tube Velocity Condition Monitor is enabled]	
Cold Side: Density	Density of cold side fluid. [Required if mass flow for cold side is not available or if Tube Velocity Condition Monitor is enabled and volume flow for this side is not available]	Value greater than 0.
Cold Side: Specific Heat	Specific heat of cold side fluid [Required]	

Table 38. Step-3 Tab of HXAM-ST Configuration Faceplate (Continued)

Element	Description	Expected Value
Cold Side: Heat of Vap	Heat of vaporization for cold side fluid. Enabled only if cold side is evaporating. The unit of heat of vaporization is automatically filled based on the unit of specific heat selected. [Required if cold side evaporating]	Value greater than 0
Unit of Mass Flow	Unit of mass flow [Required]	Select one from the drop-down list box
Unit of Volume Flow	Unit of volume flow [Required if volume flow for any side is available]	
Unit of Density	Unit of density. [Required if any densities are provided]	
Unit of Heat Duty	Unit of heat duty [Required]	
Unit of Specific Heat	Unit of specific heat. [Required]	
Unit of Pressure	Unit of pressure. [Required if pressure is available]	

NOTE:
Density relates to where the volumetric flow rate is measured; heat exchanger inlet or outlet.

Step-4 Tab

The **Step-4** tab is the view of Configuration_Step4_FE. Figure 113 shows the view of **Step-4** tab and Table 39 lists and describes the elements in the **Step-4** tab of the Configuration Faceplate.

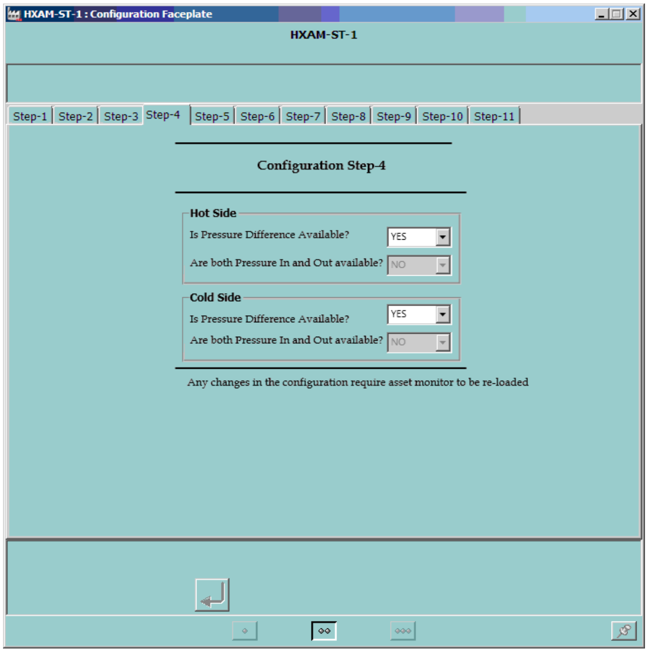


Figure 113. Step-4 Tab of HXAM-ST Configuration Faceplate

Table 39. Step-4 Tab of HXAM-ST Configuration Faceplate

Element	Description	Expected Value
Hot Side: Is Pressure Difference Available?	Select **YES** if pressure difference for hot side is available [Required if alternative to calculate pressure difference for hot side is not available]	YES, NO

Table 39. Step-4 Tab of HXAM-ST Configuration Faceplate (Continued)

Element	Description	Expected Value
Hot Side: Is Pressure In and Out Available?	Select **YES** if alternative to calculate pressure difference for hot side is available. Enabled only if **Is Pressure Difference Available?** for hot side is set to **NO** [Required if pressure difference for hot side is not available]	YES, NO
Cold Side: Is Pressure Difference Available?	Select **YES** if pressure difference for cold side is available [Required if alternative to calculate pressure difference for cold side is not available]	
Cold Side: Is Pressure In and Out Available?	Select **YES** if alternative to calculate pressure difference for cold side is available. Enabled only if **Is Pressure Difference Available?** for cold side is set to **NO** [Required if pressure difference for cold side is not available]	

Step-5 Tab

The **Step-5** tab is the view of Configuration_Step5_FE. Figure 114 shows the view of **Step-5** tab and Table 40 lists and describes the elements in the **Step-5** tab of the Configuration Faceplate.

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Figure 114. Step-5 Tab of HXAM-ST Configuration Faceplate

Table 40. Step-5 Tab of HXAM-ST Configuration Faceplate

Element	Description	Expected Value
Are Base Operating Point Sets available for manual entry?	Select **YES** if BOPS are available for manual entry [Required]	YES, NO
Hot Inlet Temp	Hot side inlet temperature	> (-459.67) and ≤ (5000) for Deg-F > (0) and ≤ (5000) for Deg-K > (-273.15) and ≤ (5000) for Deg-C > (0) and <= (5000) for Deg-R
Hot Outlet Temp	Hot side outlet temperature	
Cold Inlet Temp	Cold side inlet temperature	
Cold Outlet Temp	Cold side outlet temperature	
Hot Side Flow	Hot side mass flow or volume flow based on availability in **Step-2** tab.	Value greater than 0
Cold Side Flow	Cold side mass flow or volume flow based on availability in **Step-2** tab.	
Hot Side Pressure Delta P	Hot side pressure difference	
Cold Side Pressure Delta P	Cold side pressure difference	

NOTES:

1. BOPS-1 to BOPS-5 are visible and required for manual entry only if:
   Are Base Operating Point Sets available for manual entry? is set to **YES**.
   Depending on the No: of Baseline Sets in **Step-1** tab.
2. Hot side flow, cold side flow, hot side pressure diff, and cold side pressure diff are visible based on their availability specified in the **Step-3** and **Step-4** tabs.

Step-6 Tab

The **Step-6** tab is the view of Configuration_Step6_FE. Figure 115 shows the view of **Step-6** tab and Table 41 lists and describes the elements in the **Step-6** tab of the Configuration Faceplate.

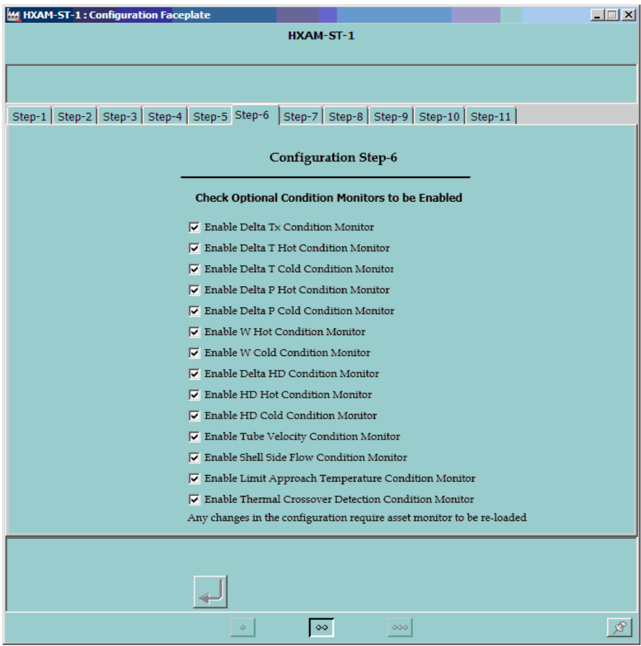

Figure 115. Step-6 Tab of HXAM-ST Configuration Faceplate

Table 41. Step-6 Tab of HXAM-ST Configuration Faceplate

Element	Description	Expected Value
Enable Delta Tx Condition Monitor	Enable check box if Condition Monitor is to be enabled [Optional]	Enable/disable check box
Enable Delta T Hot Condition Monitor		
Enable Delta T Cold Condition Monitor		
Enable Delta P Hot Condition Monitor	Enable check box if Condition Monitor is to be enabled. Enabled only if Pressure Difference for hot side is available or if Pressure Difference can be calculated. [Optional]	
Enable Delta P Cold Condition Monitor	Enable check box if Condition Monitor is to be enabled. Enabled only if Pressure Difference for cold side is available or if Pressure Difference can be calculated. [Optional]	
Enable W Hot Condition Monitor	Enable check box if Condition Monitor is to be enabled. [Optional]	
Enable W Cold Condition Monitor		
Enable Delta HD Condition Monitor		
Enable HD Hot Condition Monitor		
Enable HD Cold Condition Monitor		
Enable Tube Velocity Condition Monitor		
Enable Shell Side Flow Condition Monitor		
Enable Limit Approach Temperature Condition Monitor		

Table 41. Step-6 Tab of HXAM-ST Configuration Faceplate (Continued)

Element	Description	Expected Value
Enable Thermal Crossover Detection Monitor	Enable check box if Condition Monitor is to be enabled. [Optional]	Enable/disable check box

NOTE: If the heat exchanger is a condenser, enabling the Delta T Hot Condition Monitor or the P Hot Condition Monitor should not be selected as they will not provide any useful results. Similarly, if the heat exchanger is an evaporator, enabling the Delta T Cold Condition Monitor or the P Cold Condition Monitor should not be selected as they will not provide any useful results.

Step-7 Tab

The **Step-7** tab is the view of Configuration_Step7_FE. Figure 116 shows the view of **Step-7** tab and Table 42 lists and describes the elements in the **Step-7** tab of the Configuration Faceplate.

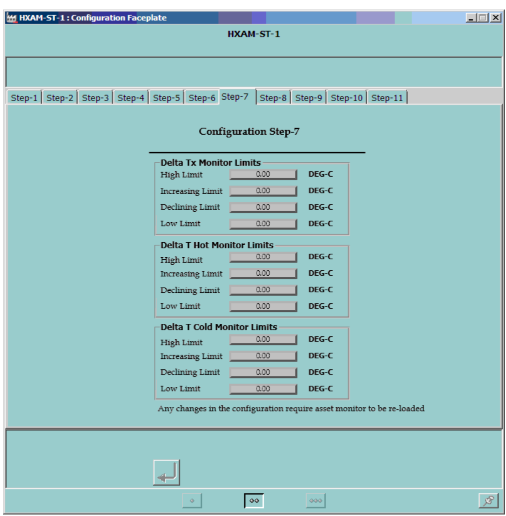

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Figure 116. Step-7 Tab of HXAM-ST Configuration Faceplate

Table 42. Step-7 Tab of HXAM-ST Configuration Faceplate

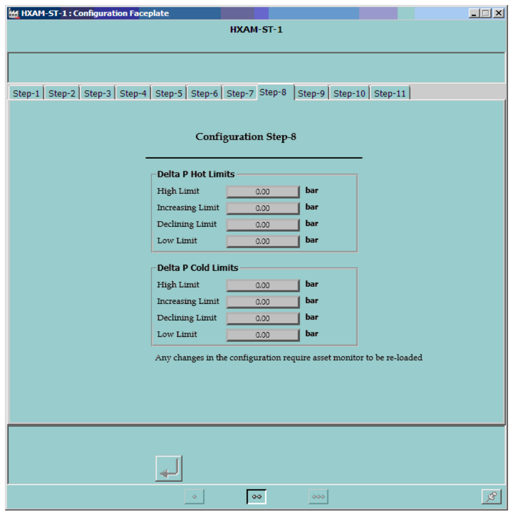
Element	Description	Expected Value
Delta Tx Limits: High Limit	Delta Tx High Limit. Enabled only if Delta Tx Condition Monitor is enabled. [Required if Delta Tx Condition Monitor is enabled]	Value greater than 0
Delta Tx Limits: Increasing Limit	Delta Tx Increasing Limit. Enabled only if Delta Tx Condition Monitor is enabled. [Required if Delta Tx Condition Monitor is enabled]	
Delta Tx Limits: Declining Limit	Delta Tx Declining Limit. Enabled only if Delta Tx Condition Monitor is enabled. [Required if Delta Tx Condition Monitor is enabled]	Value greater than 0
Delta Tx Limits: Low Limit	Delta Tx Low Limit. Enabled only if Delta Tx Condition Monitor is enabled. [Required if Delta Tx Condition Monitor is enabled]	
Delta T Hot Limits: High Limit	Delta T Hot High Limit. Enabled only if Delta T Hot Condition Monitor is enabled. [Required if Delta T Hot Condition Monitor is enabled]	
Delta T Hot Limits: Increasing Limit	Delta T Hot Increasing Limit. Enabled only if Delta T Hot Condition Monitor is enabled. [Required if Delta T Hot Condition Monitor is enabled]	
Delta T Hot Limits: Declining Limit	Delta T Hot Declining Limit. Enabled only if Delta T Hot Condition Monitor is enabled. [Required if Delta T Hot Condition Monitor is enabled]. Configurable only if **Is Hot Side Condensing** is **NO**.	

Table 42. Step-7 Tab of HXAM-ST Configuration Faceplate (Continued)

Element	Description	Expected Value
Delta T Hot Limits: Low Limit	Delta T Hot Low Limit. Enabled only if Delta T Hot Condition Monitor is enabled. [Required if Delta T Hot Condition Monitor is enabled] Configurable only if **Is Hot Side Condensing** is **NO**.	
Delta T Cold Limits: High Limit	Delta T Cold High Limit. Enabled only if Delta T Cold Condition Monitor is enabled. [Required if Delta T Cold Condition Monitor is enabled]	
Delta T Cold Limits: Increasing Limit	Delta T Cold Increasing Limit. Enabled only if Delta T Cold Condition Monitor is enabled. [Required if Delta T Cold Condition Monitor is enabled]	Value greater than 0
Delta T Cold Limits: Declining Limit	Delta T Cold Declining Limit. Enabled only if Delta T Cold Condition Monitor is enabled. [Required if Delta T Cold Condition Monitor is enabled]. Configurable only if **Is Cold Side Evaporating** is **NO**.	
Delta T Cold Limits: Low Limit	Delta T Cold Low Limit. Enabled only if Delta T Cold Condition Monitor is enabled. [Required if Delta T Cold Condition Monitor is enabled]. Configurable only if **Is Cold Side Evaporating** is **NO**.	

Step-8 Tab

The **Step-8** tab is the view of Configuration_Step8_FE. Figure 117 shows the view of the **Step-8** tab and Table 43 lists and describes the elements in the **Step-8** tab of the Configuration Faceplate.



TC08456A

Figure 117. Step-8 Tab of HXAM-ST Configuration Faceplate

Table 43. Step-8 Tab of HXAM-ST Configuration Faceplate

Element	Description	Expected Value
Delta P Hot Limits: High Limit	Delta P Hot High Limit. Enabled only if Delta P Hot Condition Monitor is enabled. [Required if Delta P Hot Condition Monitor is enabled]	Value greater than 0
Delta P Hot Limits: Increasing Limit	Delta P Hot Increasing Limit. Enabled only if Delta P Hot Condition Monitor is enabled. [Required if Delta P Hot Condition Monitor is enabled]	
Delta P Hot Limits: Declining Limit	Delta P Hot Declining Limit. Enabled only if Delta P Hot Condition Monitor is enabled. [Required if Delta P Hot Condition Monitor is enabled]	
Delta P Hot Limits: Low Limit	Delta P Hot Low Limit. Enabled only if Delta P Hot Condition Monitor is enabled. [Required if Delta P Hot Condition Monitor is enabled]	
Delta P Cold Limits: High Limit	Delta P Cold High Limit. Enabled only if Delta P Cold Condition Monitor is enabled. [Required if Delta P Cold Condition Monitor is enabled]	
Delta P Cold Limits: Increasing Limit	Delta P Cold Increasing Limit. Enabled only if Delta P Cold Condition Monitor is enabled. [Required if Delta P Cold Condition Monitor is enabled]	
Delta P Cold Limits: Declining Limit	Delta P Cold Declining Limit. Enabled only if Delta P Cold Condition Monitor is enabled. [Required if Delta P Cold Condition Monitor is enabled]	
Delta P Cold Limits: Low Limit	Delta P Cold Low Limit. Enabled only if Delta P Cold Condition Monitor is enabled. [Required if Delta P Cold Condition Monitor is enabled]	

Step-9 Tab

The **Step-9** tab is the view of Configuration_Step9_FE. Figure 118 shows the view of the **Step-9** tab and Table 44 lists and describes the elements in the **Step-9** tab of the Configuration Faceplate.

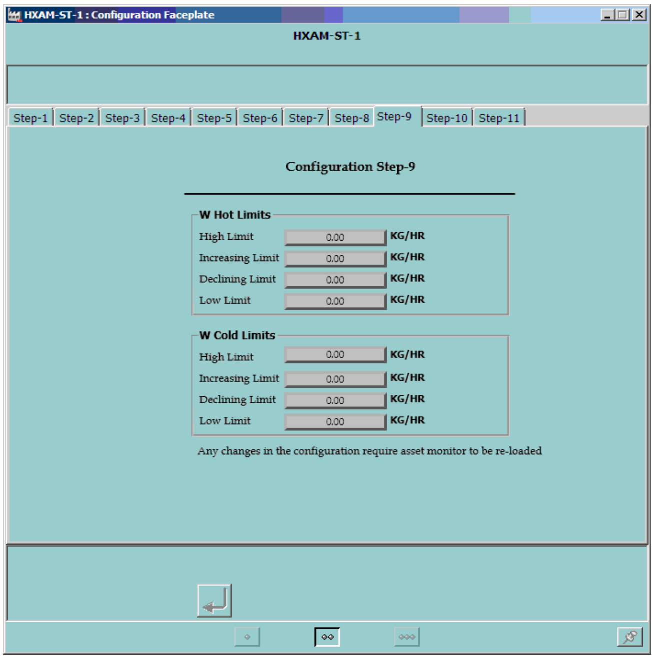


Figure 118. Step-9 Tab of HXAM-ST Configuration Faceplate

Table 44. Step-9 Tab of HXAM-ST Configuration Faceplate

Element	Description	Expected Value
Delta W Hot Limits: High Limit	Delta W Hot High Limit. Enabled only if Delta W Hot Condition Monitor is enabled. [Required if Delta W Hot Condition Monitor is enabled]	Value greater than 0

Table 44. Step-9 Tab of HXAM-ST Configuration Faceplate (Continued)

Element	Description	Expected Value
Delta W Hot Limits: Increasing Limit	Delta W Hot Increasing Limit. Enabled only if Delta W Hot Condition Monitor is enabled. [Required if Delta W Hot Condition Monitor is enabled]	Value greater than 0
Delta W Hot Limits: Declining Limit	Delta W Hot Declining Limit. Enabled only if Delta W Hot Condition Monitor is enabled. [Required if Delta W Hot Condition Monitor is enabled]	
Delta W Hot Limits: Low Limit	Delta W Hot Low Limit. Enabled only if Delta W Hot Condition Monitor is enabled. [Required if Delta W Hot Condition Monitor is enabled]	
Delta W Cold Limits: High Limit	Delta W Cold High Limit. Enabled only if Delta W Cold Condition Monitor is enabled. [Required if Delta W Cold Condition Monitor is enabled]	
Delta W Cold Limits: Increasing Limit	Delta W Cold Increasing Limit. Enabled only if Delta W Cold Condition Monitor is enabled. [Required if Delta W Cold Condition Monitor is enabled]	
Delta W Cold Limits: Declining Limit	Delta W Cold Declining Limit. Enabled only if Delta W Cold Condition Monitor is enabled. [Required if Delta W Cold Condition Monitor is enabled]	
Delta W Cold Limits: Low Limit	Delta W Cold Low Limit. Enabled only if Delta W Cold Condition Monitor is enabled. [Required if Delta W Cold Condition Monitor is enabled]	

Step-10 Tab

The **Step-10** tab is the view of Configuration_Step10_FE. Figure 119 shows the view of the **Step-10** tab and Table 44 lists and describes the elements in the **Step-9** tab of the Configuration Faceplate.

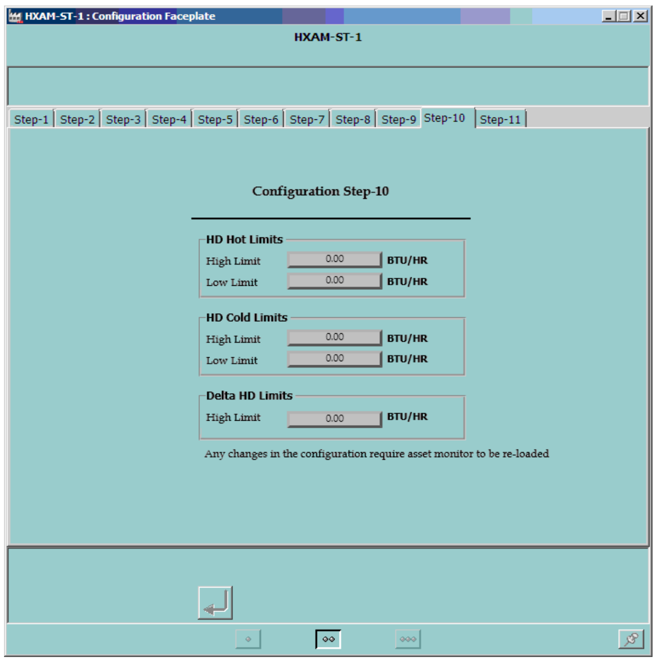


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Figure 119. Step-10 Tab of HXAM-ST Configuration Faceplate

Table 45. Step-10 Tab of HXAM-ST Configuration Faceplate

Element	Description	Expected Value
HD Hot Limits: High Limit	HD Hot High Limit. Enabled only if HD Hot Condition Monitor is enabled. [Required if HD Hot Condition Monitor is enabled]	Value greater than 0
HD Hot Limits: Low Limit	HD Hot Low Limit. Enabled only if HD Hot Condition Monitor is enabled. [Required if HD Hot Condition Monitor is enabled]	
HD Cold Limits: High Limit	HD Cold High Limit. Enabled only if HD Cold Condition Monitor is enabled. [Required if HD Cold Condition Monitor is enabled]	Value greater than 0
HD Cold Limits: Low Limit	HD Cold Low Limit. Enabled only if HD Cold Condition Monitor is enabled. [Required if HD Cold Condition Monitor is enabled]	
Delta HD Limits: High Limit	Delta HD High Limit. Enabled only if Delta HD Condition Monitor is enabled. [Required if Delta HD Condition Monitor is enabled]	

Step-11 Tab

The **Step-11** tab is the view of Configuration_Step10_FE. Figure 120 shows the view of the **Step-11** tab and Table 46 lists and describes the elements in the **Step-11** tab of the Configuration Faceplate.

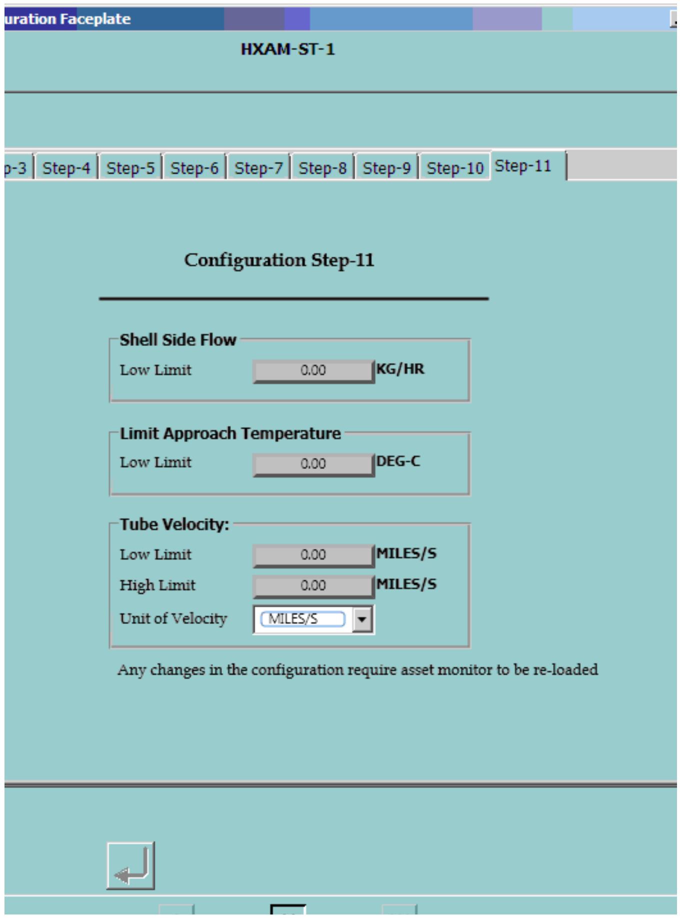

Figure 120. Step-11 Tab of HXAM-ST Configuration Faceplate

Table 46. Step-11 Tab of HXAM-ST Configuration Faceplate

Element	Description	Expected Value
Shell Side Flow: Low Limit	Shell Side Flow Hot High Limit. Enabled only if Shell Side Flow Condition Monitor is enabled. [Required if Shell Side Flow Condition Monitor is enabled]	Value greater than 0
Limit Approach Temperature: Low Limit	Limit Approach Temperature Low Limit. Enabled only if Limit Approach Temperature Condition Monitor is enabled. [Required if Limit Approach Temperature Condition Monitor is enabled]	
Tube Velocity: High Limit	Tube Velocity High Limit. Enabled only if Tube Velocity Condition Monitor is enabled. [Required if Tube Velocity Condition Monitor is enabled]	
Tube Velocity: Low Limit	Tube Velocity Low Limit. Enabled only if Tube Velocity Condition Monitor is enabled. [Required if Tube Velocity Condition Monitor is enabled]	
Tube Velocity: Unit of Tube Velocity	Unit of Tube Velocity. Enabled only if Tube Velocity Condition Monitor is enabled. [Required if Tube Velocity Condition Monitor is enabled]	Select one from drop-down list box

HXAM_ST Trend Display Aspect

The **Object Name** field of the Trend Display aspect must refer. If it does not:

1. Click on the field and the Select Object dialog appears as shown in Figure 121.

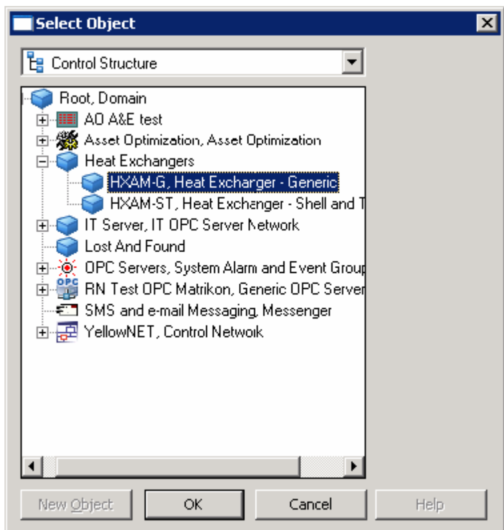

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Figure 121. Select Object Dialog

2. Select the desired object and click **OK**.
3. The **Aspect** field, **Property**, and **Log Name** fields should be filled in as a result. From the drop-down list box in the **Aspect** field, choose `HXAM_ST_Logging_GP`.
4. Once the aspect is selected, choose any property from the drop-down list box of the **Property** field. The properties shown here are the only properties available for trending
5. Choose `SEAMLESS` from the drop-down list box in the Log Name field.
6. Configure the Low Range and High Range to the desired values. The Low range is the lowest Y-axis value of the trace. This can be changed by typing

another value and pressing Enter or by using the arrows. Similarly, the High Range is the highest Y-axis value of the trace.

Configuring HXAM_ST Asset Parameters

Macros used in HXAM_ST aspect to configure the Asset Parameter values are shown in Table 47. These macros SHOULD NOT be changed.

Table 47. Macros Used in HXAM_ST Aspect to Configure Asset Parameter Values

Asset Parameter Name	Asset Parameter Value
E_Improvement_Level	%:Configuration_Values:E_Improve%
E_Significant_Improvement_Level	%:Configuration_Values:E_Significant_Improve%
E_Decline_Level	%:Configuration_Values:E_Decline%
E_Significant_Decline_Level	%:Configuration_Values:E_Significant_Decline%
U_Improvement_Level	%:Configuration_Values:U_Improve%
U_Significant_Improvement_Level	%:Configuration_Values:U_Significant_Improve%
U_Decline_Level	%:Configuration_Values:U_Decline%
U_Significant_Decline_Level	%:Configuration_Values:U_Significant_Decline%
Asset_Monitor_Sampling_Interval	%:Configuration_Values:Asset_Monitor_Sampling_Interval%
Delta_BOPS	%:Configuration_Values:Delta_BOPS%
Hot_Side_Condensing	%:Configuration_Values:Is_Hot_Side_Condensing%
Cold_Side_Evaporating	%:Configuration_Values:Is_Cold_Side_Evaporating%
Normal_Service_Interval_In_Hrs	%:Configuration_Values:Normal_Service_Interval%
Number_Of_Baseline_Sets	%:Configuration_Values:Number_Baseline_Sets%
Inhibit_Value	%:Configuration_Values:Inhibit%
Inhibit_Value_Mask_Hex	0xFFFFFFFF
Enable_Logging_Data	%:Configuration_Values:Enable_Logging_Data%
Number_Of_Shells	%:Configuration_Values:Number_Of_Shells%

Table 47. Macros Used in HXAM_ST Aspect to Configure Asset Parameter Values (Continued)

Asset Parameter Name	Asset Parameter Value
Shell_Side_Flow_Type	%:Configuration_Values:Shell_Side_Flow_Type%
Mass_Flow_Hot_Available	%:Configuration_Values:Mass_Flow_Hot_Available%
Volume_Flow_Hot_Available	%:Configuration_Values:Volume_Flow_Hot_Available%
Mass_Flow_Cold_Available	%:Configuration_Values:Mass_Flow_Cold_Available%
Volume_Flow_Cold_Available	%:Configuration_Values:Volume_Flow_Cold_Available%
Delta_P_Hot_Available	%:Configuration_Values:Delta_P_Hot_Available%
Delta_P_Hot_Alternative_Available	%:Configuration_Values:Delta_P_Hot_Alternative_Available %
Delta_P_Cold_Available	%:Configuration_Values:Delta_P_Cold_Available%
Delta_P_Cold_Alternative_Available	%:Configuration_Values:Delta_P_Cold_Alternative_Available %
Flow_Type	%:Configuration_Values:Flow_Type%
Total_Tube_Surface_Area	%:Configuration_Values:Tube_Surface_Area%
Total_Tube_CrossSectional_Area	%:Configuration_Values:Tube_CrossSectional_Area%
LMTD_Correction_Factor	%:Configuration_Values:LMTD_Corr_Factor%
Design_Heat_Transfer_Value	%:Configuration_Values:Design_Heat_Transfer_Value%
Unit_Of_Temperature	%:Configuration_Values:Unit_Of_Temperature%
Unit_Of_Mass_Flow	%:Configuration_Values:Unit_Of_MassFlow%
Unit_Of_Volume_Flow	%:Configuration_Values:Unit_Of_VolumeFlow%
Unit_Of_Density	%:Configuration_Values:Unit_Of_Density%
Unit_Of_Specific_Heat	%:Configuration_Values:Unit_Of_Specific_Heat%
Unit_Of_Heat_Duty	%:Configuration_Values:Unit_Of_HeatDuty%
Unit_Of_Heat_Transfer_Efficiency	%:Configuration_Values:Unit_Of_Heat_Transfer_Efficiency%
Unit_Of_Tube_Velocity	%:Configuration_Values:Unit_Of_Tube_Velocity%

Table 47. Macros Used in HXAM_ST Aspect to Configure Asset Parameter Values (Continued)

Asset Parameter Name	Asset Parameter Value
Unit_of_Tube_Area	%:Configuration_Values:Unit_Of_Tube_Area%
Specific_Heat_Hot_Fluid	%:Configuration_Values:Specific_Heat_Hot%
Specific_Heat_Cold_Fluid	%:Configuration_Values:Specific_Heat_Cold%
Density_Hot_Fluid	%:Configuration_Values:Density_Hot%
Density_Cold_Fluid	%:Configuration_Values:Density_Cold%
Heat_Of_Vaporization_Hot_Side	%:Configuration_Values:Heat_Of_Vaporization_Hot%
Heat_Of_Vaporization_Cold_Side	%:Configuration_Values:Heat_Of_Vaporization_Cold%
Enable_Delta_Tx_AM	%:Configuration_Values:Enable_Delta_Tx_AM%
Delta_Tx_Increasing	%:Configuration_Values:Delta_Tx_Increasing%
Delta_Tx_Declining	%:Configuration_Values:Delta_Tx_Declining%
Delta_Tx_Low	%:Configuration_Values:Delta_Tx_Low%
Delta_Tx_High	%:Configuration_Values:Delta_Tx_High%
Enable_Delta_T_Hot_AM	%:Configuration_Values:Enable_Delta_T_Hot_AM%
Delta_T_Hot_High	%:Configuration_Values:Delta_T_Hot_High%
Delta_T_Hot_Increasing	%:Configuration_Values:Delta_T_Hot_Increasing%
Delta_T_Hot_Declining	%:Configuration_Values:Delta_T_Hot_Declining%
Delta_T_Hot_Low	%:Configuration_Values:Delta_T_Hot_Low%
Enable_Delta_T_Cold_AM	%:Configuration_Values:Enable_Delta_T_Cold_AM%
Delta_T_Cold_High	%:Configuration_Values:Delta_T_Cold_High%
Delta_T_Cold_Increasing	%:Configuration_Values:Delta_T_Cold_Increasing%
Delta_T_Cold_Declining	%:Configuration_Values:Delta_T_Cold_Declining%
Delta_T_Cold_Low	%:Configuration_Values:Delta_T_Cold_Low%
Enable_Delta_P_Hot_AM	%:Configuration_Values:Enable_Delta_P_Hot_AM%

Table 47. Macros Used in HXAM_ST Aspect to Configure Asset Parameter Values (Continued)

Asset Parameter Name	Asset Parameter Value
Delta_P_Hot_High	%:Configuration_Values:Delta_P_Hot_High%
Delta_P_Hot_Increasing	%:Configuration_Values:Delta_P_Hot_Increasing%
Delta_P_Hot_Declining	%:Configuration_Values:Delta_P_Hot_Declining%
Delta_P_Hot_Low	%:Configuration_Values:Delta_P_Hot_Low%
Enable_Delta_P_Cold_AM	%:Configuration_Values:Enable_Delta_P_Cold_AM%
Delta_P_Cold_High	%:Configuration_Values:Delta_P_Cold_High%
Delta_P_Cold_Increasing	%:Configuration_Values:Delta_P_Cold_Increasing%
Delta_P_Cold_Declining	%:Configuration_Values:Delta_P_Cold_Declining%
Delta_P_Cold_Low	%:Configuration_Values:Delta_P_Cold_Low%
Enable_W_Hot_AM	%:Configuration_Values:Enable_W_Hot_AM%
W_Hot_High	%:Configuration_Values:W_Hot_High%
W_Hot_Increasing	%:Configuration_Values:W_Hot_Increasing%
W_Hot_Declining	%:Configuration_Values:W_Hot_Declining%
W_Hot_Low	%:Configuration_Values:W_Hot_Low%
Enable_W_Cold_AM	%:Configuration_Values:Enable_W_Cold_AM%
W_Cold_High	%:Configuration_Values:W_Cold_High%
W_Cold_Increasing	%:Configuration_Values:W_Cold_Increasing%
W_Cold_Declining	%:Configuration_Values:W_Cold_Declining%
W_Cold_Low	%:Configuration_Values:W_Cold_Low%
Enable_HD_Hot_AM	%:Configuration_Values:Enable_HD_Hot_AM%
HD_Hot_High_Limit	%:Configuration_Values:HD_Hot_High%
HD_Hot_Low_Limit	%:Configuration_Values:HD_Hot_Low%
Enable_HD_Cold_AM	%:Configuration_Values:Enable_HD_Cold_AM%

Table 47. Macros Used in HXAM_ST Aspect to Configure Asset Parameter Values (Continued)

Asset Parameter Name	Asset Parameter Value
HD_Cold_High_Limit	%:Configuration_Values:HD_Cold_High%
HD_Cold_Low_Limit	%:Configuration_Values:HD_Cold_Low%
Enable_Delta_HD_AM	%:Configuration_Values:Enable_Delta_HD_AM%
Delta_HD_High_Limit	%:Configuration_Values:Delta_HD_High%
Enable_Tube_Velocity_AM	%:Configuration_Values:Enable_Tube_Velocity_AM%
Tube_Velocity_High_Limit	%:Configuration_Values:Tube_Velocity_High%
Tube_Velocity_Low_Limit	%:Configuration_Values:Tube_Velocity_Low%
Enable_LAT_AM	%:Configuration_Values:Enable_LAT_AM%
LAT_Low_Limit	%:Configuration_Values:LAT_Low%
Enable_Shell_Side_Flow_AM	%:Configuration_Values:Enable_Shell_Side_Flow_AM%
Shell_Side_Flow_Low_Limit	%:Configuration_Values:Shell_Side_Flow_Low%
Enable_Thermal_CrossOver_ Detection_AM	%:Configuration_Values:Enable_TCOD_AM%

Configuration of Asset Parameters uses an intermediate Configuration_Values aspect which is a General Properties aspect. The macros used in the HXAM_ST Aspect/Asset Parameters/Values reads the property of the corresponding Asset Parameter from its corresponding variable in the Configuration_Values aspect.

There are two ways to configure Asset Parameters:

1. Write the values of the Asset Parameters in the Configuration_Values aspect against its corresponding variable. [Not Recommended].
2. Use the HXAM-ST Configuration Faceplate that is a Graphical User Interface to assign values for the Asset Parameters. Any configuration done in the HXAM-ST Configuration Faceplate gets automatically written to the Configuration_Values aspect, from where the Asset Parameters reads its value. [Recommended].

Table 48 shows the description and expected values of all the Asset Parameters and Table 49 shows the corresponding variables in Configuration_Values aspects and the HXAM-ST Configuration Faceplate for every Asset Parameter.

Do not change the macros used in the **Asset Parameters** tab in the HXAM_ST aspect. Do not change anything in the Configuration_Values aspect. The read/write permissions for all properties in the Configuration_Values aspect is set to **YES** and the names and data type of the properties are shown in Table 49.

Table 48. Description and Expected Asset Parameter Values

Parameter Name	Description	Expected Value
E_Improvement_Level	Improvement in Performance Factor in % [Required]	Value greater than 0 Default Value: 2
E_Significant_Improvement_Level	Significant Improvement in Performance Factor in % [Required]	Value greater than 0 Default Value: 5
E_Decline_Level	Decline in Performance Factor in % [Required]	Value greater than 0 Default Value: 2
E_Significant_Decline_Level	Significant Decline in Performance Factor in % [Required]	Value greater than 0 Default Value: 5
U_Improvement_Level	Improvement in Heat Transfer Efficiency in % [Required]	Value greater than 0 Default Value: 2
U_Significant_Improvement_Level	Significant Improvement in Heat Transfer Efficiency in % [Required]	Value greater than 0 Default Value: 5
U_Decline_Level	Decline in Heat Transfer Efficiency in % [Required]	Value greater than 0 Default Value: 2
U_Significant_Decline_Level	Significant Decline in Heat Transfer Efficiency in % [Required]	Value greater than 0 Default Value: 5
Asset_Monitor_Sampling_Interval	Time interval between Monitoring [Required]	Any Integer greater than 0. Recommended values given in Table 33.

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Delta_BOPS	Acceptable percentage difference between COPS and BOPS to consider COPS as a new set of BOPS [Required]	Value greater than 0 Default Value: 5
Normal_Service_Interval_In_Hrs	Time interval between heat exchanger cleaning, rebuilds, etc. in hours [Required]	Value greater than 0
Number_Of_Baseline_Sets	Number of BOPS expected [Required]	Minimum Integer value of 1 and no more than 5
Enable_Logging_Data	Set to True/Yes if the Operating Point Set needs to be logged into a file [Required]	TRUE, FALSE, YES, NO
Flow_Type	Flow Type through the heat exchanger [Required]	CO-CURRENT, COUNTER-CURRENT
Number_Of_Shells	Number of Shells used [Required]	Minimum Integer value of 1 and no more than 5
Shell_Side_Flow_Type	Flow at shell Side [Required]	HOT, COLD
Total_Tube_Surface_Area	Total Surface Area of Tube [Required]	Value greater than 0
Total_Tube_CrossSectional_Area	Total Cross Sectional Area of Tube [Required]	
LMTD_Correction_Factor	Log Mean Temperature Difference Correction Factor. [Optional]	Value greater than 0 Default Value: 1
Design_Heat_Transfer_Value	Design Heat Transfer Efficiency [Optional]	Value greater than 0.
Hot_Side_Condensing	Set to True/Yes if Hot side Flow is getting Condensed. [Required]	TRUE, FALSE, YES, NO

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Cold_Side_Evaporating	Set to True/Yes if Cold Side is getting Evaporated [Required]	TRUE, FALSE, YES, NO
Mass_Flow_Hot_Available	Set to True/Yes if Mass Flow for Hot side is available [Required if Volume Flow for Hot side is not available]	
Mass_Flow_Cold_Available	Set to True/Yes if Mass Flow for Cold side is available [Required if Volume Flow for Cold side is not available]	
Volume_Flow_Hot_Available	Set to True/Yes if Volume Flow for Hot side is available [Required if Mass Flow for Hot side is not available or if Hot side flows through the tube and Tube Velocity Condition Monitor is enabled]	
Volume_Flow_Cold_Available	Set to True/Yes if Volume Flow for Cold side is available [Required if Mass Flow for Cold side is not available or if Cold side flows through the tube and Tube Velocity Condition Monitor is enabled]	
Density_Hot_Fluid	Density for Hot side. [Required if Mass Flow for Hot side is not available or if Tube Velocity condition Monitor is enabled and Volume Flow for this side is not available]	Value greater than 0.

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Density_Cold_Fluid	Density for Cold side. [Required if Mass Flow for Cold side is not available or if Tube Velocity condition Monitor is enabled and Volume Flow for this side is not available]	Value greater than 0.
Delta_P_Hot_Available	Set to True if Pressure Difference for Hot side is available [Required if Alternative to calculate Pressure Difference for hot side is not available]	TRUE, FALSE, YES, NO
Delta_P_Hot_Alternative_Available	Set to True if Alternative to calculate Pressure Difference for Hot side is available [Required if Pressure Difference for hot side is not available]	
Delta_P_Cold_Available	Set to True if Pressure Difference for Cold side is available [Required if Alternative to calculate Pressure Difference for cold side is not available]	
Delta_P_Cold_Alternative_Available	Set to True if Alternative to calculate Pressure Difference for Cold side is available [Required if Pressure Difference for cold side is not available]	
Specific_Heat_Hot_Fluid	Specific Heat of Hot Side fluid [Required]	Value greater than 0

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Specific_Heat_Cold_Fluid	Specific Heat of Cold Side fluid [Required]	Value greater than 0
Unit_Of_Temperature	Unit of Temperature [Required]	DEG-K DEG-C DEG-F DEG-R
Unit_Of_Heat_Transfer_Efficiency	Unit of Heat Transfer Efficiency [Required]	BTU/HR.SQ-FT KCAL/HR.SQ-M KCAL/S.SQ-M W/SQ-M MW/SQ-M
Unit_of_Tube_Area	Unit of Area [Required]	SQ-M SQ-FT SQ-INCH SQ-CM
Unit_Of_Tube_Velocity	Unit of Velocity [Required if Tube Velocity Condition Monitor is Enabled]	M/S KM/S FT/S MILES/S
Unit_Of_Mass_Flow	Unit of Mass flow [Required]	LB/DAY LB/HR LB/MIN LB/S KG/DAY KG/HR KG/MIN KG/S KLB/DAY KLB/HR TONNE/HR

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Unit_Of_Heat_Duty	Unit of Heat Duty [Required]	KCAL/S KCAL/HR BTU/S BTU/HR W MW
Unit_Of_Volume_Flow	Unit of Volume Flow [Required if Volume Flow for any side is available]	CU.FT/DAY CU.FT/HR CU.FT/MIN CU.FT/S L/DAY L/HR L/MIN US GAL/DAY US GAL/HR US GAL/MIN US GAL/S CU.M/DAY CU.M/HR CU.M/MIN CU.M/S
Unit_Of_Density	Unit of Density. [Required if any Densities are provided]	LB/CU.FT LB/US GAL KG/CU.M G/L G/CU.CM
Unit_Of_Specific_Heat	Unit of Specific Heat. [Required]	BTU/LB.DEG-F KJ/KG.DEG-K KCAL/KG.DEG-K J/G.DEG-C

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Unit_Of_Heat_Duty	Unit of Heat Duty [Required]	KCAL/S KCAL/HR BTU/S BTU/HR W MW
Inhibit_Value	Any string value can be entered for inhibit. When the Input Record Inhibit equals the value entered, the Asset Monitor gets disabled.	Any string value except True/False
Enable_Delta_Tx_AM	Set to True if Delta_Tx AM is Enabled [Optional]	TRUE, FALSE
Delta_Tx_Increasing	Delta_Tx Increasing Limit [Required if Delta_Tx AM Enabled]	Value greater than 0
Delta_Tx_Declining	Delta_Tx Declining Limit [Required if Delta_Tx AM Enabled]	
Delta_Tx_Low	Delta_Tx Low Limit [Required if Delta_Tx AM Enabled]	
Delta_Tx_High	Delta_Tx High Limit [Required if Delta_Tx AM Enabled]	
Heat_Of_Vaporization_Hot_Side	Hot side Heat of Vaporization. [Required if Hot side Condensing]	
Heat_Of_Vaporization_Cold_Side	Cold side Heat of Vaporization. [Required if Cold Side Evaporating]	

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Enable_Delta_T_Hot_AM	Set to True if Hot Side Temperature Difference AM Enabled [Optional]	TRUE, FALSE
Delta_T_Hot_High	Delta_T_Hot High Limit [Required if Delta_T_Hot AM Enabled]	Value greater than 0
Delta_T_Hot_Increasing	Delta_T_Hot Increasing Limit [Required if Delta_T_Hot AM Enabled]	
Delta_T_Hot_Declining	Delta_T_Hot Declining Limit [Required if Delta_T_Hot AM Enabled]	
Delta_T_Hot_Low	Delta_T_Hot Low Limit [Required if Delta_T_Hot AM Enabled]	
Enable_Delta_T_Cold_AM	Set to True if Cold Side Temperature Difference AM is Enabled [Optional]	TRUE, FALSE
Delta_T_Cold_High	Delta_T_Cold High Limit [Required if Delta_T_Cold AM Enabled]	Value greater than 0
Delta_T_Cold_Increasing	Delta_T_Cold Increasing Limit [Required if Delta_T_Cold AM Enabled]	
Delta_T_Cold_Declining	Delta_T_Cold Declining Limit [Required if Delta_T_Cold AM Enabled]	
Delta_T_Cold_Low	Delta_T_Cold Low Limit [Required if Delta_T_Cold AM Enabled]	

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Enable_Delta_P_Hot_AM	Set to True if Hot Side Pressure Difference AM is Enabled [Optional]	TRUE, FALSE
Delta_P_Hot_High	Delta_P_Hot High Limit [Required if Delta_P_Hot AM Enabled]	Value greater than 0
Delta_P_Hot_Increasing	Delta_P_Hot Increasing Limit [Required if Delta_P_Hot AM Enabled]	
Delta_P_Hot_Declining	Delta_P_Hot Declining Limit [Required if Delta_P_Hot AM Enabled]	
Delta_P_Hot_Low	Delta_P_Hot Low Limit [Required if Delta_P_Hot AM Enabled]	
Enable_Delta_P_Cold_AM	Set to True if Cold Side Pressure Difference AM is Enabled [Optional]	TRUE, FALSE
Delta_P_Cold_High	Delta_P_Cold High Limit [Required if Delta_P_Cold AM Enabled]	Value greater than 0
Delta_P_Cold_Low	Delta_P_Cold Low Limit [Required if Delta_P_Cold AM Enabled]	
Delta_P_Cold_Increasing	Delta_P_Cold Increasing Limit [Required if Delta_P_Cold AM Enabled]	
Delta_P_Cold_Declining	Delta_P_Cold Declining Limit [Required if Delta_P_Cold AM Enabled]	

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Enable_W_Hot_AM	Set to True if Hot Side Mass Flow AM is Enabled [Optional]	TRUE, FALSE
W_Hot_High	Hot Side Mass Flow High Limit [Required if W_Hot AM Enabled]	Value greater than 0
W_Hot_Increasing	Hot Side Mass Flow Increasing Limit [Required if W_Hot AM Enabled]	
W_Hot_Declining	Hot Side Mass Flow Declining Limit [Required if W_Hot AM Enabled]	
W_Hot_Low	Hot Side Mass Flow Low Limit [Required if W_Hot AM Enabled]	
Enable_W_Cold_AM	Set to True if Cold Side Mass Flow AM is Enabled [Optional]	TRUE, FALSE
W_Cold_High	Cold Side Mass Flow High Limit [Required if W_Cold AM Enabled]	Value greater than 0
W_Cold_Increasing	Cold Side Mass Flow Increasing Limit [Required if W_Cold AM Enabled]	
W_Cold_Declining	Cold Side Mass Flow Declining Limit [Required if W_Cold AM Enabled]	
W_Cold_Low	Cold Side Mass Flow Low Limit [Required if W_Cold AM Enabled]	
Enable_HD_Hot_AM	Set to True if Hot Side Heat Duty AM is Enabled [Optional]	TRUE, FALSE

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
HD_Hot_High_Limit	Hot Side Heat Duty High Limit [Required if HD_Hot AM Enabled]	Value greater than 0
HD_Hot_Low_Limit	Hot Side Heat Duty Low Limit [Required if HD_Hot AM Enabled]	
Enable_HD_Cold_AM	Set to True if Cold Side Heat Duty AM is Enabled [Optional]	TRUE, FALSE
HD_Cold_High_Limit	Cold Side Heat Duty High Limit [Required if HD_Cold AM Enabled]	Value greater than 0
HD_Cold_Low_Limit	Cold Side Heat Duty Low Limit [Required if HD_Cold AM Enabled]	
Enable_Delta_HD_AM	Set to True if Heat Duty Difference AM is Enabled [Optional]	TRUE, FALSE
Delta_HD_High_Limit	Heat Duty Difference High Limit [Required if Delta_HD AM Enabled]	Value greater than 0
Enable_Tube_Velocity_AM	Set to True if Tube Velocity AM is Enabled [Optional]	TRUE, FALSE
Tube_Velocity_High_Limit	Tube Velocity High Limit [Required if Tube Velocity AM Enabled]	Value greater than 0
Tube_Velocity_Low_Limit	Tube Velocity Low Limit [Required if Tube Velocity AM Enabled]	

Table 48. Description and Expected Asset Parameter Values (Continued)

Parameter Name	Description	Expected Value
Enable_LAT_AM	Set to True if Limit Approach Temperature AM is Enabled [Optional]	TRUE, FALSE
LAT_Low_Limit	Limit Approach Temperature Low Limit [Required if LAT AM Enabled]	Value greater than 0
Enable_Shell_Side_Flow_AM	Set to True if Shell Side Flow AM is Enabled [Optional]	TRUE, FALSE
Shell_Side_Flow_Low_Limit	Shell Side Flow Low Limit. The limit will be for Mass flow if Mass flow is available else the limit will be for Volume Flow. [Required if Shell Side Flow AM Enabled]	Value greater than 0
Enable_Thermal_CrossOver_ Detection_AM	Set to True if Thermal Crossover Detection AM is Enabled [Optional]	TRUE, FALSE

Table 49. Configuration_Values Aspect and HXAM-ST Configuration Faceplate Values

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-ST Configuration Faceplate
E_Improvement_Level	E_Improve **(Float)**	Performance Factor: Improvement Level [Step-2]
E_Significant_Improvement_Level	E_Significant_Improve **(Float)**	Performance Factor: Significant Improvement Level [Step-2]
E_Decline_Level	E_Decline **(Float)**	Performance Factor: Declining Level [Step-2]

Table 49. Configuration_Values Aspect and HXAM-ST Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-ST Configuration Faceplate
E_Significant_Decline_Level	E_Significant_Decline **(Float)**	Performance Factor: Significant Declining Level [Step-2]
U_Improvement_Level	U_Improve **(Float)**	Heat Transfer Efficiency: Improvement Level [Step-2]
U_Significant_Improvement_Level	U_Significant_Improve **(Float)**	Heat Transfer Efficiency: Significant Improvement Level [Step-2]
U_Decline_Level	U_Decline **(Float)**	Heat Transfer Efficiency: Declining Level [Step-2]
U_Significant_Decline_Level	U_Significant_Decline **(Float)**	Heat Transfer Efficiency: Significant Declining Level [Step-2]
Asset_Monitor_Sampling_Interval	Asset_Monitor_Sampling_Interval **(Integer)**	Monitoring Interval [Step-1]
Delta_BOPS	Delta_BOPS **(Float)**	Delta BOPS [Step-1]
Hot_Side_Condensing	Is_Hot_Side_Condensing **(String)**	Is Hot Side Condensing? [Step-1]
Cold_Side_Evaporating	Is_Cold_Side_Evaporating **(String)**	Is Cold Side Evaporating? [Step-1]
Normal_Service_Interval_In_Hrs	Normal_Service_Interval **(Float)**	Normal Service Interval [Step-1]
Number_Of_Baseline_Sets	Number_Baseline_Sets **(Integer)**	No: of Baseline Sets [Step-1]
Inhibit_Value	Inhibit **(String)**	Inhibit [Step-1]

Table 49. Configuration_Values Aspect and HXAM-ST Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-ST Configuration Faceplate
Enable_Logging_Data	Enable_Logging_Data **(String)**	Enable Logging of Data? [Step-1]
Number_Of_Shells	Number_Of_Shells **(Integer)**	Number of Shells [Step-1]
Shell_Side_Flow_Type	Shell_Side_Flow_Type **(String)**	Shell Side Flow [Step-1]
Mass_Flow_Hot_Available	Mass_Flow_Hot_Available **(String)**	***Hot Side:*** Is Mass Flow Available? [Step-3]
Volume_Flow_Hot_Available	Volume_Flow_Hot_Available **(String)**	***Hot Side:*** Is Volume Flow Available? [Step-3]
Mass_Flow_Cold_Available	Mass_Flow_Cold_Available **(String)**	***Cold Side:*** Is Mass Flow Available? [Step-3]
Volume_Flow_Cold_Available	Volume_Flow_Cold_Availabl e **(String)**	***Cold Side:*** Is Volume Flow Available? [Step-3]
Delta_P_Hot_Available	Delta_P_Hot_Available **(String)**	***Hot Side:*** Is Pressure Difference Available? [Step-4]
Delta_P_Hot_Alternative_ Available	Delta_P_Hot_Alternative_ Available **(String)**	***Hot Side:*** Is Pressure In and Out Available? [Step-4]
Delta_P_Cold_Available	Delta_P_Cold_Available **(String)**	***Cold Side:*** Is Pressure Difference Available? [Step-4]
Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect along with Data Type	Corresponding Variable in Configuration_Faceplate Aspect

Table 49. Configuration_Values Aspect and HXAM-ST Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-ST Configuration Faceplate
Delta_P_Cold_Alternative_ Available	Delta_P_Cold_Alternative_A vailable (String)	***Cold Side:*** Is Pressure In and Out Available? [Step-4]
Flow_Type	Flow_Type **(String)**	Flow Type [Step-1]
Total_Tube_Surface_Area	Tube_Surface_Area **(Float)**	Total Tube Surface Area [Step-1]
Total_Tube_CrossSectional_Area	Tube_CrossSectional_Area **(Float)**	Total Tube C/S Area [Step-1]
LMTD_Correction_Factor	LMTD_Corr_Factor **(Float)**	LMTD Corr. Factor [Step-1]
Design_Heat_Transfer_Value	Design_Heat_Transfer_Valu e **(Float)**	Dsgn Heat Transfer Value [Step-1]
Unit_Of_Temperature	Unit_Of_Temperature **(String)**	Unit of Temperature [Step-1]
Unit_Of_Mass_Flow	Unit_Of_Mass_Flow **(String)**	Unit of Mass Flow [Step-3]
Unit_Of_Volume_Flow	Unit_Of_Volume_Flow **(String)**	Unit of Volume Flow [Step-3]
Unit_Of_Density	Unit_Of_Density **(String)**	Unit of Density [Step-3]
Unit_Of_Specific_Heat	Unit_Of_Specific_Heat **(String)**	Unit of Specific Heat [Step-3]
Unit_Of_Heat_Duty	Unit_Of_Heat_Duty **(String)**	Unit of Heat Duty [Step-3]
Unit_Of_Heat_Transfer_Efficiency	Unit_Of_Heat_Transfer_Effici ency **(String)**	Unit of Heat Transfer [Step-1]
Unit_Of_Tube_Velocity	Unit_Of_Tube_Velocity **(String)**	***Tube Velocity:*** Unit of Tube Velocity [Step-10]
Unit_Of_Tube_Area	Unit_of_Tube_Area **(String)**	Unit of Tube Area [Step-1]

Table 49. Configuration_Values Aspect and HXAM-ST Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-ST Configuration Faceplate
Specific_Heat_Hot_Fluid	Specific_Heat_Hot **(Float)**	***Hot Side:*** Specific Heat [Step-3]
Specific_Heat_Cold_Fluid	Specific_Heat_Cold **(Float)**	***Cold Side:*** Specific Heat [Step-3]
Density_Hot_Fluid	Density_Hot **(Float)**	***Hot Side:*** Density [Step-3]
Density_Cold_Fluid	Density_Cold **(Float)**	***Cold Side:*** Density [Step-3]
Heat_Of_Vaporization_Hot_Side	Heat_Of_Vaporization_Hot **(Float)**	***Hot Side:*** Heat of Vap [Step-3]
Heat_Of_Vaporization_Cold_Side	Heat_Of_Vaporization_Cold **(Float)**	***Cold Side:*** Heat of Vap [Step-3]
Enable_Delta_Tx_AM	Enable_Delta_Tx_AM **(String)**	Enable Delta Tx Condition Monitor [Step-5]
Delta_Tx_Increasing	Delta_Tx_Increasing **(Float)**	***Delta Tx Limits:*** Increasing Limit [Step-6]
Delta_Tx_Declining	Delta_Tx_Declining **(Float)**	***Delta Tx Limits:*** Declining Limit [Step-6]
Delta_Tx_Low	Delta_Tx_Low **(Float)**	***Delta Tx Limits:*** Low Limit [Step-6]
Delta_Tx_High	Delta_Tx_High **(Float)**	***Delta Tx Limits:*** High Limit [Step-6]
Enable_Delta_T_Hot_AM	Enable_Delta_T_Hot_AM **(String)**	Enable Delta T Hot Condition Monitor [Step-5]
Delta_T_Hot_High	Delta_T_Hot_High **(Float)**	***Delta T Hot Limits:*** High Limit [Step-6]

Table 49. Configuration_Values Aspect and HXAM-ST Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-ST Configuration Faceplate
Delta_T_Hot_Increasing	Delta_T_Hot_Increasing **(Float)**	***Delta T Hot Limits:*** Increasing Limit [Step-6]
Delta_T_Hot_Declining	Delta_T_Hot_Declining **(Float)**	***Delta T Hot Limits:*** Declining Limit [Step-6]
Delta_T_Hot_Low	Delta_T_Hot_Low **(Float)**	***Delta T Hot Limits:*** Low Limit [Step-6]
Enable_Delta_T_Cold_AM	Enable_Delta_T_Cold_AM **(String)**	Enable Delta T Cold Condition Monitor [Step-5]
Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect along with Data Type	Corresponding Variable in Configuration_Faceplate Aspect
Delta_T_Cold_High	Delta_T_Cold_High **(Float)**	***Delta T Cold Limits:*** High Limit [Step-6]
Delta_T_Cold_Increasing	Delta_T_Cold_Increasing **(Float)**	***Delta T Cold Limits:*** Increasing Limit [Step-6]
Delta_T_Cold_Declining	Delta_T_Cold_Declining **(Float)**	***Delta T Cold Limits:*** Declining Limit [Step-6]
Delta_T_Cold_Low	Delta_T_Cold_Low **(Float)**	***Delta T Hot Limits:*** Low Limit [Step-6]
Enable_Delta_P_Hot_AM	Enable_Delta_P_Hot_AM **(String)**	Enable Delta P Hot Condition Monitor [Step-5]
Delta_P_Hot_High	Delta_P_Hot_High **(Float)**	***Delta P Hot Limits:*** High Limit [Step-7]
Delta_P_Hot_Increasing	Delta_P_Hot_Increasing **(Float)**	***Delta P Hot Limits:*** Increasing Limit [Step-7]

Table 49. Configuration_Values Aspect and HXAM-ST Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-ST Configuration Faceplate
Delta_P_Hot_Declining	Delta_P_Hot_Declining **(Float)**	***Delta P Hot Limits:*** Declining Limit [Step-7]
Delta_P_Hot_Low	Delta_P_Hot_Low **(Float)**	***Delta P Hot Limits:*** Low Limit [Step-7]
Enable_Delta_P_Cold_AM	Enable_Delta_P_Cold_AM **(String)**	Enable Delta P Cold Condition Monitor [Step-5]
Delta_P_Cold_High	Delta_P_Cold_High **(Float)**	***Delta Cold Limits:*** High Limit [Step-7]
Delta_P_Cold_Increasing	Delta_P_Cold_Increasing **(Float)**	***Delta P Cold Limits:*** Increasing Limit [Step-7]
Delta_P_Cold_Declining	Delta_P_Cold_Declining **(Float)**	***Delta P Cold Limits:*** Declining Limit [Step-7]
Delta_P_Cold_Low	Delta_P_Cold_Low **(Float)**	***Delta P Cold Limits:*** Low Limit [Step-7]
Enable_W_Hot_AM	Enable_W_Hot_AM **(String)**	Enable W Hot Condition Monitor [Step-5]
W_Hot_High	W_Hot_High **(Float)**	***W Hot Limits:*** High Limit [Step-8]
W_Hot_Increasing	W_Hot_Increasing **(Float)**	***W Hot Limits:*** Increasing Limit [Step-8]
W_Hot_Declining	W_Hot_Declining **(Float)**	***W Hot Limits:*** Declining Limit [Step-8]
W_Hot_Low	W_Hot_Low **(Float)**	***W Hot Limits:*** Low Limit [Step-8]
Enable_W_Cold_AM	Enable_W_Cold_AM **(String)**	Enable W Cold Condition Monitor [Step-5]

Table 49. Configuration_Values Aspect and HXAM-ST Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-ST Configuration Faceplate
W_Cold_High	W_Cold_High **(Float)**	***W Cold Limits:*** High Limit [Step-8]
W_Cold_Increasing	W_Cold_Increasing **(Float)**	***W Cold Limits:*** Increasing Limit [Step-8]
W_Cold_Declining	W_Cold_Declining **(Float)**	***W Cold Limits:*** Declining Limit [Step-8]
W_Cold_Low	W_Cold_Low **(Float)**	***W Cold Limits:*** Low Limit [Step-8]
Enable_HD_Hot_AM	Enable_HD_Hot_AM **(String)**	Enable HD Hot Condition Monitor [Step-5]
HD_Hot_High_Limit	HD_Hot_High **(Float)**	***HD Hot Limits:*** High Limit [Step-9]
Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect along with Data Type	Corresponding Variable in Configuration_Faceplate Aspect
HD_Hot_Low_Limit	HD_Hot_Low **(Float)**	***HD Hot Limits:*** Low Limit [Step-9]
Enable_HD_Cold_AM	Enable_HD_Cold_AM **(String)**	Enable HD Cold Condition Monitor [Step-5]
HD_Cold_High_Limit	HD_Cold_High **(Float)**	***HD Cold Limits:*** High Limit [Step-9]
HD_Cold_Low_Limit	HD_Cold_Low **(Float)**	***HD Cold Limits:*** Low Limit [Step-9]
Enable_Delta_HD_AM	Enable_Delta_HD_AM	Enable Delta HD Condition Monitor [Step-5]

Table 49. Configuration_Values Aspect and HXAM-ST Configuration Faceplate Values (Continued)

Asset Parameter Name	Corresponding Variable Name in Configuration_Values Aspect and Data Type	Corresponding Variable in HXAM-ST Configuration Faceplate
Delta_HD_High_Limit	Delta_HD_High **(Float)**	***Delta HD Limits:*** Low Limit [Step-9]
Enable_Tube_Velocity_AM	Enable_Tube_Velocity_AM **(String)**	Enable Tube Velocity Condition Monitor [Step-5]
Tube_Velocity_High_Limit	Tube_Velocity_High_Limit **(Float)**	***Tube Velocity:*** Low Limit [Step-10]
Tube_Velocity_Low_Limit	Tube_Velocity_Low_Limit **(Float)**	***Tube Velocity:*** High Limit [Step-10]
Enable_LAT_AM	Enable_LAT_AM **(String)**	Enable Limit Approach Temperature Condition Monitor [Step-5]
LAT_Low_Limit	LAT_Low_Limit **(Float)**	***Limit Approach Temperature:*** Low Limit [Step-10]
Enable_Shell_Side_Flow_AM	Enable_Shell_Side_Flow_AM **(String)**	Enable Shell Side Flow Condition Monitor [Step-5]
Shell_Side_Flow_Low_Limit	Shell_Side_Flow_Low_Limit **(Float)**	***Shell Side Flow:*** Low Limit [Step-10]
Enable_Thermal_CrossOver_Detection_AM	Enable_TCOD_AM **(String)**	Enable Thermal Crossover Detection Condition Monitor [Step-5]

Recommended Asset Monitor Sampling Interval (AMSI) for HXAM_ST

Table 50 lists the recommended Asset Monitor sampling interval (AMSI).

Table 50. Recommended Asset Monitor Sampling Interval (AMSI)

Normal Service Interval	Recommended AMSI Value (minutes)
1 day	1 or greater
2 days	
3 days	
4 days	
5 days	
6 days	2 or greater
1 week	
2 weeks	
3 weeks	5 or greater
4 weeks	
1 month	10 or greater
2 months	15 or greater
3 months	20 or greater
4 months	30 or greater
5 months	
6 months	60 or greater
1 year	120 or greater
2 years	240 or greater
3 years	300 or greater

Table 50. Recommended Asset Monitor Sampling Interval (AMSI) (Continued)

Normal Service Interval	Recommended AMSI Value (minutes)
4 years	480 or greater
5 years	

HXAM-ST Input Records

Input Records for HXAM-ST Asset Monitor, along with the expected data and explanations are given in Table 51.

Table 51. HXAM-ST Input Records

Input Records	Explanation	Expected Data
Clear_Base_Operating_Point	Specifies if the Asset Monitor is to be retrained. This is read as an XML value, which includes a timestamp. Therefore any change from True to False, False to True, False to False, or True to True will trigger Retrain. On retraining, the Asset Monitor will erase all the trained BOPS and go back to *Training Phase*. This Input Record is a manual input that can be input by clicking a button from the HXAM-ST Faceplate. [Required]	TRUE / FALSE
T_Hot_In	Hot Side Inlet Temperature. [Required]	Any numeric value
T_Hot_Out	Hot Side Outlet Temperature. [Required]	Any numeric value
T_Cold_In	Cold Side Inlet Temperature [Required]	Any numeric value
T_Cold_Out	Hot Side Outlet Temperature [Required]	Any numeric value
Mass_Flow_Hot_Side	Hot Side Mass Flow [Required if Asset Parameter **Mass_Flow_Hot_Available** is set to TRUE/YES]	Any numeric value

Table 51. HXAM-ST Input Records (Continued)

Input Records	Explanation	Expected Data
Volume_Flow_Hot_Side	Hot Side Volume Flow. [Required if Asset Parameter **Volume_Flow_Hot_Available** is set to TRUE/YES]	Any numeric value
Mass_Flow_Cold_Side	Cold Side Mass Flow. [Required if Asset Parameter **Mass_Flow_Cold_Available** is set to TRUE/YES]	Any numeric value
Volume_Flow_Cold_Side	Cold Side Volume Flow. [Required if Asset Parameter V**olume_Flow_Cold_Available** is set to TRUE/YES]	Any numeric value
Delta_P_Hot_Side	Hot Side Pressure Difference. [Required if Asset Parameter **Delta_P_Hot_Available** is set to TRUE/YES]	Any numeric value
P_Hot_In	Hot Side Inlet Pressure. [Required if Asset Parameter **Delta_P_Hot_Alternative_Available** is set to TRUE/YES]	Any numeric value
P_Hot_Out	Hot Side Outlet Pressure. [Required if Asset Parameter **Delta_P_Hot_Alternative_Available** is set to TRUE/YES]	Any numeric value
Delta_P_Cold_Side	Cold Side Pressure Difference. . [Required if Asset Parameter **Delta_P_Cold_Available** is set to TRUE/YES]	Any numeric value
P_Cold_In	Cold Side Inlet Pressure. [Required if Asset Parameter **Delta_P_Cold_Alternative_Available** is set to TRUE/YES]	Any numeric value
P_Cold_Out	Cold Side Outlet Pressure. [Required if Asset Parameter **Delta_P_Cold_Alternative_Available** is set to TRUE/YES]	Any numeric value

Table 51. HXAM-ST Input Records (Continued)

Input Records	Explanation	Expected Data
Inhibit	Inhibit Signal. The value must match the Asset Parameter **Inhibit_Value**, if the Asset Monitor is to be inhibited. [Optional]	Any String
Clear_BOPS_Date	Date of Last Time BOPS change was made [Required]	String

For manual input of any input record, the Data Source Item should be configured using macros as shown in Table 52 and the actual values should be put in the corresponding variable in the HXAM_ST_GP aspect. By configuring this way, the Input Record reads its data from the HXAM_ST_GP aspect. The expected data for the Input Records are given in Table 51.

Table 52. Data Source Item Macros

Input Records	Macros Used	Corresponding Variable in HXAM_ST_GP Aspect
Clear_Base_Operating_Point	%ID%:Clear BOPS	Clear BOPS
T_Hot_In	%ID%:Inlet Hot Temperature	Inlet Hot Temperature
T_Hot_Out	%ID%:Outlet Hot Temperature	Outlet Hot Temperature
T_Cold_In	%ID%:Inlet Cold Temperature	Inlet Cold Temperature
T_Cold_Out	%ID%:Outlet Cold Temperature	Outlet Cold Temperature
Mass_Flow_Hot_Side	%ID%:Mass Flow Hot Side	Mass Flow Hot Side
Volume_Flow_Hot_Side	%ID%:Volume Flow Hot Side	Volume Flow Hot Side
Mass_Flow_Cold_Side	%ID%:Mass Flow Cold Side	Mass Flow Cold Side
Volume_Flow_Cold_Side	%ID%:Volume Flow Cold Side	Volume Flow Cold Side
Delta_P_Hot_Side	%ID%:Pressure Difference Hot Side	Pressure Difference Hot Side
P_Hot_In	%ID%:Inlet Pressure Hot Side	Inlet Pressure Hot Side
P_Hot_Out	%ID%:Outlet Pressure Hot Side	Outlet Pressure Hot Side
Delta_P_Cold_Side	%ID%:Pressure Difference Cold Side	Pressure Difference Cold Side
P_Cold_In	%ID%:Inlet Pressure Cold Side	Inlet Pressure Cold Side
P_Cold_Out	%ID%:Outlet Pressure Cold Side	Outlet Pressure Cold Side

Table 52. Data Source Item Macros (Continued)

Input Records	Macros Used	Corresponding Variable in HXAM_ST_GP Aspect
Inhibit	%ID%:Inhibit	Inhibit
—	—	RetrainFE_TempVal

NOTES:

1. For all inputs that are not manually input or somehow stored into the HXAM_ST_GP aspect, the macros shown in Table 52 will not work. The Data Source Item should be configured based on from where the property of the Input Record will be read. The Clear_Base_Operating_Point and Inhibit Input Records will always be manual inputs.
2. The RetrainFE_TempVal property under HXAM_ST_GP aspect in Table 52 does not have a corresponding Input Record. This property is only used for the working of the HXAM_ST_BOPS_Info_FE aspect and is not an Input Record. This property is configured to take a string and it's Readable?/Writable? Are set to **Yes**. Do not make any changes to this property. If by any chance the value of this property gets erased, type in the following value: **`So far received 0 Base Operating Point Set`**. The value of this property should never be empty.

Appendix A CMMS Definition Files

Introduction

This appendix contains an example of a ABB-supplied Maximo Definition (MxDef) file and a SAP/PM Definition (SAPDef) file. Assuming the default directory was selected during Asset Optimization installation, the default MxDef files and SAPDef files supplied with Asset Optimization are located in:

...\Program Files\ABB Industrial IT\Optimize IT\
Asset Optimization\AOECSConnector\MaximoDef

...\Program Files\ABB Industrial IT\Optimize IT\
Asset Optimization\AOECSConnector\SAPPMDef

Navigate to the desired file in Windows Explorer and double-click on it to view the xml code.

Follow these instructions when customizing the MxDef files and SAPDef files to prevent the custom MxDef files and SAPDef files from being overwritten during an upgrade or reinstallation of Asset Optimization.

Do not edit the MxDef files without an extensive knowledge of the ***Maximo SDK for Business Components*** documentation and a close consulting association with IBM Maximo personnel to determine what fields are required.

Do not edit the SAPDef files without a close consulting association with SAP, AG personnel to determine what fields are required. Editing these files without the required knowledge and experience may result in problems with the Maximo system, SAP/PM system, and the CMMS interface to them.

Refer to *System 800xA - System, Upgrade and Installation* for backup and restore procedures for the MxDef and SAPDef files.

The MxDef files and SAPDef files for the basic CMMS views (Active Work Orders, Work Order History, Equipment Status, Preventive Maintenance Schedule, Spare Parts, Availability of Spare Parts (supported only in Maximo systems)) provide the information on the data to retrieve and display.

The MXDef and SAPDef files for the Fault Report Submitter provides the information on the data to display, defines the data inputs/edit characteristics, and the data destination for the creation of a Work Order in the Maximo system or SAP/PM system. The <Attr>, <Caption>, and <type> XML tags are identical to those in the MxDef and SAPDef files for the basic CMMS Views.

Information in the MxDef and SAPDef files has the following structure and each attribute for display has a definition record:

```
<AttrDef>
     <Attr>description</Attr>
     <Caption>WO Description</Caption>
     <Map>ABBACD/Condition/SuggestedAction</Map>
     <DefaultValue></DefaultValue>
     <Type>string</Type>
     <FieldLen>50</FieldLen>
     <Edit>True</Edit>
</AttrDef>
```

- <Attr>**description**</Attr> tag: Defines the data field to retrieve from the Maximo system.
- <Caption>**WO Description**</Caption> tag: Defines the column heading for the view.
- <Map>ABBACD/Condition/SuggestedAction</Map> tag: The information token used to fill in the displayed field in the Create Fault Report and Submit Fault Report UI forms (browser-based UI forms/pages). This map is the method for making information existing in the Fault Reports available to the Fault Report Viewer/Fault Report Submitter visible in the submission displays (Create Fault Report and Submit Fault Report) and available to send to the CMMS in a Fault Report. The mapping is the <Attr> tag that represents a data element in a Fault Report object in the particular CMMS.
- <DefaultValue></DefaultValue> tag: A typed value that is used in the mapping functions if the token does not exist in the Fault Report data that is available to the Fault Report Viewer/Fault Report Submitter, or if the tokenized data does exist but is null or blank in the Fault Report data. Therefore, the DefaultValue is used if the token does not exist or supplies no

useful data. Thus, if in a configuration, one wishes to use the DefaultValue in place of the values that may be available from the Asset Monitors through the Fault Report Viewer/Fault Report Submitter, one could configure the <Map> tag as blank or to a token known to ***not*** exist in the Fault Report data, e.g. <Map>notused</Map>.

- <Type>**string**</Type> tag: Defines the data type being retrieved from the Maximo system.
- **<FieldLen>50</FieldLen>** tag: Field length tag used to truncate the data from the ACD to a length less than or equal to FieldLen. This restriction on field length is a result of the database storage size (in characters) of the fields in a Maximo Work Order (specifically in the Waiting for Approval state (WAPPR). Each Maximo field has its own attributes, so a knowledge of the Maximo Work Order is necessary in setting these limits (refer to Maximo documentation). A FieldLen of 0 is interpreted by the Asset Optimization web server as meaning no practical limit.
- <Edit>True</Edit> tag: Enables editing of particular fields as displayed on the various Fault Report submission UIs (Create Fault Report and Submit Fault Report).

The database attribute <Attr> AUFNR is used to link into the SAP/PM system and **MUST** be part of the request in the SAPDef xml definition file. AUFNR represents the Order number in the SAP/PM system.

When configuring the Active Work Order SAPDef file (SapDef_GetWONO.xml), the number of requested <Attr>s should be kept below 250 and there should be no duplication of requested <Attr>s. That is, the file should contain one and only one of each of the <Attr>s that are required.

Sample MxDef File

The Fault Report Submitter MxDef file is called:

MxDefMOMAppFR_Submit.xml

The .xml code is:

```
<MxActionDef>
  <Action>http://www.abb.com/AssetOptimization/2.0/
  MOM/MOMAppFR_Submit</Action>
  <AttrDefs>
    <AttrDef>
      <Attr></Attr>
      <Caption>CMMS System Type</Caption>
      <Map></Map>
      <DefaultValue>Maximo</DefaultValue>
      <Type>string</Type>
      <Edit>False</Edit>
    </AttrDef>
    <AttrDef>
      <Attr>eqnum</Attr>
      <Caption>Equipment</Caption>
      <Map>DestinationID/Asset/ItemName</Map>
      <DefaultValue></DefaultValue>
      <Type>string</Type>
      <Edit>False</Edit>
    </AttrDef>
    <AttrDef>
      <Attr></Attr>
      <Caption>Asset Monitor Aspect</Caption>
      <Map>ABBACD/Asset/AspectID/AspectName</Map>
      <DefaultValue>Create Fault Report/
      Notification</DefaultValue>
      <Type>string</Type>
      <FieldLen>50</FieldLen>
      <Edit>False</Edit>
    </AttrDef>
    <AttrDef>
      <Attr></Attr>
      <Caption>Asset Monitor LogicDescription</Caption>
      <Map>ABBACD/AssetMonitor/LogicDescription</Map>
```

```
        <DefaultValue>Create Fault 
Report/Notification</DefaultValue>
        <Type>string</Type>
        <FieldLen>50</FieldLen>
        <Edit>False</Edit>
      </AttrDef>
      <AttrDef>
        <Attr>description</Attr>
        <Caption>WO Description</Caption>
        <Map>ABBACD/Condition/SuggestedAction</Map>
        <DefaultValue></DefaultValue>
        <Type>string</Type>
        <FieldLen>50</FieldLen>
        <Edit>True</Edit>
      </AttrDef>
      <AttrDef>
        <Attr>description_longdescription</Attr>
        <Caption>User Comment</Caption>
        <Map>ABBACD/Condition/SuggestedAction</Map>
        <DefaultValue></DefaultValue>
        <Type>string</Type>
        <FieldLen>0</FieldLen>
        <Edit>True</Edit>
      </AttrDef>
      <AttrDef>
        <Attr>FAILDATE</Attr>
        <Caption>Failure Date</Caption>
        <Map>ABBACD/Condition/UTCTimeStamp</Map>
        <DefaultValue></DefaultValue>
        <Type>datetime</Type>
        <Edit>True</Edit>
      </AttrDef>
      <AttrDef>
        <Attr>reportedby</Attr>
        <Caption>Problem Reporter</Caption>
        <Map>ABBACD/Condition/ReportedBy</Map>
        <DefaultValue>Optimize IT</DefaultValue>
        <Type>string</Type>
        <Edit>True</Edit>
      </AttrDef>
```

```
<AttrDef>
  <Attr>GLACCOUNT</Attr>
  <Caption>General Ledger Account</Caption>
  <Map></Map>
  <DefaultValue>6900-332-000</DefaultValue>
  <Type>string</Type>
  <Edit>True</Edit>
</AttrDef>
<AttrDef>
  <Attr>WOPRIORITY</Attr>
  <Caption>WO Priority</Caption>
  <Map>USEDEFAULT</Map>
  <Select>
    <Option Value="1">HI</Option>
    <Option Value="2">MID</Option>
    <Option Value="3" Selected="true">LOW</Option>
  </Select>
  <Type>string</Type>
  <Edit>True</Edit>
</AttrDef>
<AttrDef>
  <Attr>WORKTYPE</Attr>
  <Caption>Work Type</Caption>
  <Map>USEDEFAULT</Map>
  <DefaultValue>PM</DefaultValue>
  <Type>string</Type>
  <Edit>True</Edit>
</AttrDef>
<AttrDef>
  <Attr>WOPM5</Attr>
  <Caption>SubWork Type</Caption>
  <Map>USEDEFAULT</Map>
  <DefaultValue>MINOR</DefaultValue>
  <Type>string</Type>
  <Edit>True</Edit>
</AttrDef>
<AttrDef>
  <Attr>LEADCRAFT</Attr>
  <Caption>Lead Craft</Caption>
  <Map>USEDEFAULT</Map>
```

```
            <DefaultValue></DefaultValue>
            <Type>string</Type>
            <Edit>True</Edit>
         </AttrDef>
         <AttrDef>
            <Attr>Username</Attr>
            <Caption>Username</Caption>
            <Map></Map>
            <DefaultValue></DefaultValue>
            <Type>string</Type>
            <Edit>True</Edit>
         </AttrDef>
         <AttrDef>
            <Attr>Password</Attr>
            <Caption>Password</Caption>
            <Map></Map>
            <DefaultValue></DefaultValue>
            <Type>password</Type>
            <Edit>True</Edit>
         </AttrDef>
      </AttrDefs>
   </MxActionDef>
```

Sample SAPDef File

The Fault Report Viewer SAPDef file is called:

SapDef_FaultReportView.xml

The .xml code is:

```
<Data>
  <Fields>
    <Field>
      <Attr>ABBSystemType</Attr>
      <Required>False</Required>
      <Caption>CMMS System Type</Caption>
      <Map>SAPService-Request/Asset/SystemType</Map>
      <Type>String</Type>
      <Edit>False</Edit>
      <Value>SAP-PM</Value>
    </Field>
    <Field>
      <Attr>EQUNR</Attr>
      <Required>True</Required>
      <Caption>SAP Equipment Number</Caption>
      <Map>SAPService-Request/Asset/ItemName</Map>
      <Type>String</Type>
      <Edit>False</Edit>
      <Value></Value>
    </Field>
    <Field>
      <Attr>ABBMonitoringServerID</Attr>
      <Required>False</Required>
      <Caption>Asset Monitor Aspect</Caption>
      <Map>SAPService-Request/ABBACD/Asset/
      AspectID/AspectName</Map>
      <Type>String</Type>
      <Edit>False</Edit>
      <Value>Create Fault Report/Notification</Value>
    </Field>
    <Field>
      <Attr>ABBMonitoringServerLogicDescription</Attr>
      <Required>False</Required>
      <Caption>Asset Monitor LogicDescription</Caption>
```

```
    <Map>SAPService-Request/ABBACD/AssetMonitor/
    LogicDescription</Map>
    <Type>String</Type>
    <Edit>False</Edit>
    <Value>Create Fault Report/Notification</Value>
  </Field>
  <Field>
    <Attr>IWERK</Attr>
    <Required>True</Required>
    <Caption>Maintenance Planning Plant</Caption>
    <Map></Map>
    <Type>String</Type>
    <Edit>True</Edit>
    <aValue>US01</aValue>
    <Value>3000</Value>
  </Field>
  <Field>
    <Attr>ILOAN</Attr>
    <Required>True</Required>
    <Caption>Location and account assignment
    for equipment</Caption>
    <Map></Map>
    <Type>String</Type>
    <Edit>True</Edit>
    <Value>Default Account</Value>
  </Field>
  <Field>
    <Attr>AUSVN</Attr>
    <Required>True</Required>
    <Caption>Date of start of equipment
    malfunction</Caption>
    <Map></Map>
    <Type>DateTime</Type>
    <Edit>True</Edit>
    <Value>2014-05-10</Value>
  </Field>
  <Field>
    <Attr>AUZTV</Attr>
    <Required>True</Required>
```

```
    <Caption>Time of start of equipment
    malfunction</Caption>
    <Map></Map>
    <Type>DateTime</Type>
    <Edit>True</Edit>
    <Value>120000</Value>
  </Field>
  <Field>
    <Attr>AUSBS</Attr>
    <Required>True</Required>
    <Caption>Date of end of equipment
    malfunction</Caption>
    <Map></Map>
    <Type>DateTime</Type>
    <Edit>True</Edit>
    <Value>20040520</Value>
  </Field>
  <Field>
    <Attr>AUZTB</Attr>
    <Required>True</Required>
    <Caption>Time of end of equipment
    malfunction</Caption>
    <Map></Map>
    <Type>DateTime</Type>
    <Edit>True</Edit>
    <Value>130000</Value>
  </Field>
  <Field>
    <Attr>AUSZT</Attr>
    <Required>True</Required>
    <Caption>Duration of breakdown</Caption>
    <Map></Map>
    <Type>DateTime</Type>
    <Edit>True</Edit>
    <Value>8</Value>
  </Field>
  <Field>
    <Attr>MAUEH</Attr>
    <Required>True</Required>
    <Caption>Breakdown unit</Caption>
```

```
    <Map></Map>
    <Type>String</Type>
    <Edit>True</Edit>
    <Value>H</Value>
  </Field>
  <Field>
    <Attr>BTPLN</Attr>
    <Required>True</Required>
    <Caption>Functional location affected</Caption>
    <Map></Map>
    <Type>String</Type>
    <Edit>True</Edit>
    <Value></Value>
  </Field>
  <Field>
    <Attr>BEQUI</Attr>
    <Required>True</Required>
    <Caption>Equipment affected</Caption>
    <Map></Map>
    <Type>String</Type>
    <Edit>True</Edit>
    <Value></Value>
  </Field>
  <Field>
    <Attr>AUSWK</Attr>
    <Required>True</Required>
    <Caption>Effect on operations</Caption>
    <Map></Map>
    <Type>String</Type>
    <Edit>True</Edit>
    <Select>
      <Option Value="3">STOP</Option>
      <Option Value="2">Unit</Option>
      <Option Value="1" Selected="true">No Effect</Option>
    </Select>
    <Value></Value>
  </Field>
  <Field>
    <Attr>QMTXT</Attr>
    <Required>True</Required>
```

```
    <Caption>Notification description</Caption>
    <Map>SAPService-Request/ABBACD/
    Condition/Description</Map>
    <Type>String</Type>
    <Edit>True</Edit>
    <Value>Test CFR</Value>
  </Field>
  <Field>
    <Attr>INSPK</Attr>
    <Required>True</Required>
    <Caption>Responsible person</Caption>
    <Map>SAPService-Request/ABBACD/AssetMonitor/
    LogicDescription</Map>
    <Type>String</Type>
    <Edit>True</Edit>
    <Value></Value>
  </Field>
  <Field>
    <Attr>DATAN</Attr>
    <Required>True</Required>
    <Caption>Date for technical inspection</Caption>
    <Map></Map>
    <Type>DateTime</Type>
    <Edit>True</Edit>
    <Value></Value>
  </Field>
  <Field>
    <Attr>QMART</Attr>
    <Required>True</Required>
    <Caption>Notification type</Caption>
    <Map></Map>
    <Type>String</Type>
    <Edit>True</Edit>
    <Select>
      <Option Value="M3">M3</Option>
      <Option Value="M1">M1</Option>
      <Option Value="M2" Selected="true">
      Notification:M2</Option>
    </Select>
    <Value>M2</Value>
```

```
</Field>
<Field>
  <Attr>ARTPR</Attr>
  <Required>True</Required>
  <Caption>Priority type</Caption>
  <Map></Map>
  <Type>String</Type>
  <Edit>True</Edit>
  <Value></Value>
</Field>
<Field>
  <Attr>PRIOK</Attr>
  <Required>True</Required>
  <Caption>Priority</Caption>
  <Map>SAPService-Request/ABBACD/
  Condition/Severity</Map>
  <Type>String</Type>
  <Edit>True</Edit>
  <Value>LOW</Value>
</Field>
<Field>
  <Attr>QMDAT</Attr>
  <Required>True</Required>
  <Caption>Date of notification</Caption>
  <Map></Map>
  <Type>DateTime</Type>
  <Edit>True</Edit>
  <Value></Value>
</Field>
<Field>
  <Attr>QMNAM</Attr>
  <Required>True</Required>
  <Caption>Name of person reporting</Caption>
  <Map>SAPService-Request/ABBACD/Condition/
  ReportedBy</Map>
  <Type>String</Type>
  <Edit>True</Edit>
  <Select>
    <Option Value="DLUM">Dave Lum</Option>
    <Option Value="JSCHUBERT">Joerg Schubert</Option>
```

```
        <Option Value="MHERMES">Martin Hermes</Option>
        <Option Value="SMATTONI">Samuel Mattoni</Option>
        <Option Value="DCURTIN">Deborah Curtin</Option>
        <Option Value="JROCHOW" Selected="true">
        Jeff Rochow</Option>
        <Option Value="RFC_PM">RFC_PM</Option>
      </Select>
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Appendix B Heat Exchanger Specific Terminology

Heat Exchanger Specific Terminology

Table 53 is a list of terms associated with heat exchangers.

Table 53. Heat Exchanger Specific Terminology

Term/Acronym	Description
AMSI	Asset Monitor Sample Interval. Time interval used by the Asset Monitor to sample heat exchanger instrumentation values. Typical values NSI/1000 or 60 seconds, whichever is greater.
BOPS	Base OPS. OPS read during the training period, which become the initial set used for all future comparisons.
COPS	Comparative OPS. OPS read during subsequent heat exchanger operation which will be used to compare against the BOPS of the heat exchanger.
Delta P Cold	Pressure difference at Cold Side (Cold-Side Inlet Pressure – Cold-Side Outlet Pressure)
Delta P Hot	Pressure difference at Hot Side (Hot-Side Inlet Pressure – Hot-Side Outlet Pressure)
Delta T Cold	Temperature difference at Cold Side (Cold-Side Inlet Temperature – Cold-Side Outlet Temperature)
Delta T Hot	Temperature difference at Hot Side (Hot-Side Inlet Temperature – Hot-Side Outlet Temperature)
Delta Tx	Temperature difference across the heat exchanger (Hot- Side Inlet Temperature – Cold-Side Inlet Temperature)
E	Performance Factor

Table 53. Heat Exchanger Specific Terminology (Continued)

Term/Acronym	Description
HD	Heat Duty
HD Cold	Cold-Side Heat Duty
HD Hot	Hot-Side Heat Duty
HeatX	Heat Exchanger
HeatX_G	Generic Heat Exchanger
HeatX_ST	Shell and Tube Heat Exchanger
HXAM-G	Generic Heat Exchanger Asset Monitor
HXAM-ST	Shell and Tube Heat Exchanger Asset Monitor.
LAT	Limit Approach Temperature
LMTD	Log Mean Temperature Difference
NBS	Number of Baseline Sets. This is the set of baseline operating point sets which will be taken during the training period.
NSI	Normal Service Interval. The time interval between heat exchanger cleanings, rebuilds, etc.
OPS	Operating Point Set. The full set of operating values read from process instrumentation relevant to the operation of the heat exchanger.
SP	Staleness Period. Maximum time interval for which a BOPS can go unreferenced. Typical value NSI/50 or 48 hours, whichever is greater.
T Hot In	Heat exchanger hot inlet temperature
T Hot Out	Heat exchanger hot outlet temperature
T Cold In	Heat exchanger cold inlet temperature
T Cold Out	Heat exchanger cold outlet temperature
TCD	Thermal Crossover Detection
TP	Training Period. Time interval in which all operating point sets should be gathered. Typical values NSI/100 or 200 hours, whichever is smaller.

Table 53. Heat Exchanger Specific Terminology (Continued)

Term/Acronym	Description
U	Heat Transfer Efficiency
W	Mass Flow
W Cold	Cold-Side Mass Flow
W Hot	Hot-Side Mass Flow

Index

Revision History

Introduction

This section provides information on the revision history of this User Manual.

The revision index of this User Manual is not related to the 800xA 5.1 System Revision.

Revision History

The following table lists the revision history of this User Manual.

Revision Index	Description	Date
-	First version published for 800xA 5.1	June 2010
A	Updated for 800xA 5.1 Rev A	May 2011
B	Updated for 800xA 5.1 Feature Pack 1	August 2011
C	Updated for 800xA 5.1 Rev B	June 2012
D	Updated for 800xA 5.1 Feature Pack 3	August 2012
E	Updated for 800xA 5.1 Feature Pack 4	February 2013
F	Updated for 800xA 5.1 Rev D and 800xA 5.1 FP4 Rev D.	December 2013
G	Updated for 800xA 5.1 Rev E and 800xA 5.1 FP4 Rev E.	July 2015

Updates in Revision Index A

The following table shows the updates made in this User Manual for 800xA 5.1 Rev A.

Updated Section/Sub-section	Description of Update
Section 3, Asset Parameters Tab	Updated with the new image for Figure 14 with refer to Bool Check - Asset Parameters Tab.

Updates in Revision Index B

The following table shows the updates made in this User Manual for 800xA 5.1 Feature Pack 1.

Updated Section/Sub-section	Description of Update
About this User Manual	Added a new section *Feature Pack* describing the user manual conventions used for indicating the Feature Pack content.
Section 2, Maximo Server Connection Properties	Updated the table and screenshot of Maximo Equipment ID and Maximo Equipment ID Provider Properties respectively.
Section 2, SAP/PM Server Connection Properties	Updated the table and screenshot of SAP Equipment ID and SAP Equipment ID Provider Properties respectively.
Section 2, SAP/PM Server Connection Properties	Added new information note on deletion of files from ECS Server.
Section 2, Mapping between the 800xA System and the CMMS	Deleted the content of Maximo Integration, Maximo Business Object, Caution information, and Information text.
Section 2, Mapping between the 800xA System and the CMMS	Updated the sub-section *Deploying the Maximo Model* with Feature Pack functionality.
Section 2, Mapping between the 800xA System and the CMMS	Added new information note on deploying Maximo Model using Process Definition Tool.

Updated Section/Sub-section	Description of Update
Section 3, Mapping the 800xA System Object to the Maximo Equipment	Updated the screen shot of Maximo Equipment ID.
Section 3, Mapping the 800xA System Object to the SAP/PM Equipment	Updated the screen shot of SAP Equipment ID.

Updates in Revision Index C

The following table shows the updates made in this User Manual for 800xA 5.1 Revision B.

Updated Section/Sub-section	Description of Update
Section 3 Configuration	Updated Figure 12: Asset Monitor Tab

Updates in Revision Index D

The following table shows the updates made in this User Manual for 800xA 5.1 Feature Pack 3.

Updated Section/Sub-section	Description of Update
Section 3 Configuration	Updated Figure 14: Asset Parameters Tab

Updates in Revision Index E

The following table shows the updates made in this User Manual for 800xA 5.1 Feature Pack 4.

Updated Section/Sub-section	Description of Update
Section 3 Configuration	New sub-section created for Maintenance Workplace and NAMUR NE107.

Updates in Revision Index F

The following table shows the updates made in this User Manual for 800xA 5.1 Rev D and 800xA 5.1 FP4 Rev D.

Updated Section/Sub-section	Description of Update
Section 3	References to Plant Explorer changed to Maintenance Workplace.

Updates in Revision Index G

The following table shows the updates made in this User Manual for 800xA 5.1 Rev E and 800xA 5.1 FP4 Rev E.

Updated Section/Sub-section	Description of Update
Section 2	Added information on ABB cpmplus Enterprise Connectivity services.

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