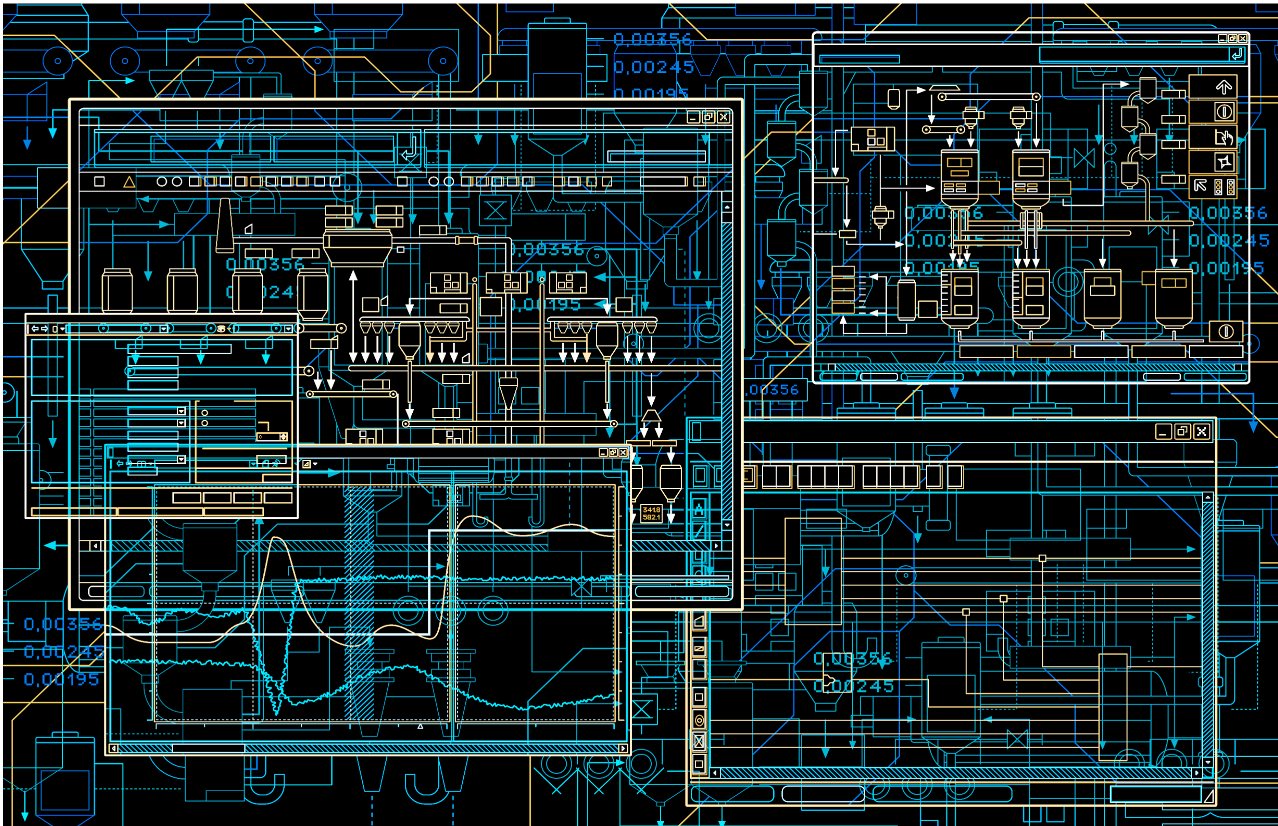

System 800xA

System Guide
Functional Description

System Version 6.0

Power and productivity
for a better world™

System 800xA

System Guide
Functional Description

System Version 6.0

NOTICE

TRADEMARKS

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About this System Guide

This document is primarily intended to provide an overview of the 800xA System and its capabilities. It forms an integral part of the 800xA System Guide. Performance and capacity data together with information about supported configurations and its relevant rules are described in [1] in Table 1 on page 30.

This document describes the functionality and capabilities of System 800xA as of release date. The information furnished in this document may be subject to adjustments due to changes made in revisions or rollups. Refer to the release notes for specific details.

Document Conventions

Microsoft Windows conventions as defined in the *Microsoft Manual of Style* are normally used for the standard presentation of material when entering text, key sequences, prompts, messages, menu items, screen elements, and so on.

Warning, Caution, Information, and Tip Icons

This publication 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 which could result in *electrical shock.*

Warning icon indicates the presence of a hazard which 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 which 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.

Terminology

Refer to Appendix J, Terminology for a complete and comprehensive list of terms. 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*****.**

Section 1 Introduction

This section introduces System 800xA, its architecture, and some of the new features introduced in this release.

Any security measures described in this document, for example, for user access, password security, network security, firewalls, virus protection, and so on, 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.

Related Documentation

Refer to [2] in Table 1 on page 30 for a complete list of all documents applicable to the 800xA System that are included on the Release Notes/Documentation media provided with the system or available from ABB SolutionsBank. This document is provided in PDF format and is also included on the Release Notes/Documentation media. This document is updated with each release and a new file is provided.

Specific documents referred to in this instruction are presented in Table 1.

The asterisk (*) appended to each document number is a wildcard character used in place of the document revision. The wildcard allows searches in ABB SolutionsBank to be independent of revision. All revisions of the document will be displayed in the search result.

Table 1. Reference Documents

Item	Document Title	Document Number
[1]	System 800xA System Guide Technical Data and Configuration	3BSE041434*
[2]	System 800xA Released User Documents	3BUA000263*
[3[1]]	Product Guide 800xA for Freelance	3BDD011861*
[4[1]]	Mapping Guide for SoftCare Upgrades of SB2 Products to Industrial IT System 800xA SV 4.1	3BSE038489*
[5]	System 800xA Operations Operator Workplace Configuration	3BSE030322*
[6]	System 800xA Administration and Security	3BSE037410*
[7]	System 800xA Operations	3BSE036904*
[8[1]]	AC 800M Controller Hardware Product Guide	3BSE036352*
[9]	AC 800M Controller Hardware	3BSE036351*
[10[1]]	S800 I/O Product Guide	3BSE015969*
[11[1]]	NDBU-85/95 DDCS Branching Units User's Manual	3BFE64285513*
[12]	AC 800M Communication Protocols	3BSE035982*
[13]	System 800xA Control AC 800M Binary and Analog Control	3BSE035981*
[14[1]]	Third Party HW products verified for IndustrialIT System 800xA	3BSE046579*
[15[1]]	System 800xA Third Party Software	3BUA000500*
[16]	System 800xA Control AC 800M Configuration	3BSE035980*
[17[1]]	Security for Industrial Automation and Control Systems	3BSE032547*
[18]	System 800xA Safety AC 800M High Integrity Safety Manual	3BNP004865*
[19]	800xA for Advant Master Configuration	3BSE030340*
[20[1]]	Automation Sentinel Mapping Guide - Advant Master	3BSE049620*
[21[1]]	800xA for Freelance Product Guide	3BDD011861*

Table 1. Reference Documents (Continued)

Item	Document Title	Document Number
[22[1]]	S800 I/O definition file instructions for Intergraph SmartPlant Instrumentation 7.0.2	3BSE042032*
[23]	System 800xA Maintenance	3BSE046784*
[24[1]]	System 800xA PNSM Integrated Devices List	2PAA103011*
[25]	800xA for Safeguard Configuration	3BNP004848*
[26]	System 800xA 5.1 Release Notes New Functions and Known Problems	2PAA106188*
[27]	System 800xA 6.0 Release Notes New Functions and Known Problems	2PAA111899*
[28]	System 800xA 6.0 Release Notes Resolved Issues	2PAA112277*
[29]	System 800xA Life Cycle	3BSE049081

NOTE:
1. Document is not supplied on the Release Notes/Documentation media provided with System 800xA. It is available from ABB SolutionsBank.

System 800xA

System 800xA is a comprehensive process automation system. System 800xA extends the scope of traditional control systems to include all automation functions in a single operations and engineering environment; enabling process plants to perform smarter and better at substantial cost savings.

The operation and configuration of continuous and batch control applications are also explained in this document.

The System 800xA products have been developed by incorporating information technology with the experience and know-how collected over decades of successful deliveries and customer installations.

The foundation of the System 800xA products and system solutions is the concept of Aspect Objects™, which enables enterprise wide information availability, browsing, and navigation in a unified way.The information resides in an integrated environment configurable for various user requirements. The user interface can be used with default settings or be customized providing user categories, such as operators, engineers, and maintenance personnel, all with an environment focused on their main tasks. As a result, the user can concentrate on the right actions, with a minimum of effort, resulting in increased productivity.

Within the System 800xA there are a number of functional areas. For details on functional areas, refer to Section 3, System 800xA Overview.

System 800xA can be implemented with ABB's controller offerings including AC 800M, AC 100, Advant/Master, Advant/MOD 300, DCI, Harmony/INFI 90, Melody, Freelance, and Safeguard. These options are described in separate appendices to this document. In addition to this, 800xA can be connected to more than 400 other controllers and communication links using the PLC Connect option.

Purpose, Scope and Intended Use

The scope of the System 800xA as described in this document is:

- Traditional process automation, as well as hybrid automation. The control level ranges from simple binary control to DCS (Distributed Control System) closed loop control, including advanced control.
- For wide area applications, including interface to the field, either through direct I/O or remote I/O or by means of fieldbus devices, and with Operator Interface options including History, Alarm & Event Management, etc.
- The Control and Automation configuration includes the MES (Manufacturing Execution Systems).
- Level of products and functions, such as Historian, Batch Management, Asset Optimization, Enterprise/Plant Optimization, etc.

Aspect Objects Architecture

The Aspect Objects architecture is a cornerstone of the System 800xA concept. It provides:

- A consistently, scalable concept that integrates Process Control & Automation, and Safety products.
- Information-centric navigation. A consistent way to instantly access all information without having to know which application handles the data.
- Integration of autonomous applications. Minimum awareness is required between applications.
- Easy integration of new aspect systems (new applications). A homogeneous base for all applications. Open standards make it possible for users to integrate new aspect systems.
- High level of engineering efficiency through data integration between aspect systems.
- Extensive reuse during the life cycle. For example copy/paste, definition of object types and solutions, etc.

A central problem in plant operations, as well as asset life cycle management, is the need to organize, manage, and have access to information for all different aspects of many plants and process entities. These entities, or real world objects, are of different kinds. They can be physical process objects, like a valve, or more complex, like a reactor. Other examples are products, materials, batch procedures, manufacturing orders, and customer accounts.

Aspect

Each of the real world objects can be described from several different perspectives. Each perspective defines information and provides a set of functions to create, access, and manipulate this information. These perspectives are called the aspects of the object. Figure 1 shows possible aspects of a sample object.

Aspect System

An aspect system is a software system that implements one or several such aspects of an object.

It is necessary to be able to implement these aspects using many different applications. This will take care of new and existing applications, furnished by ABB, third parties and customers for current and future requirements.

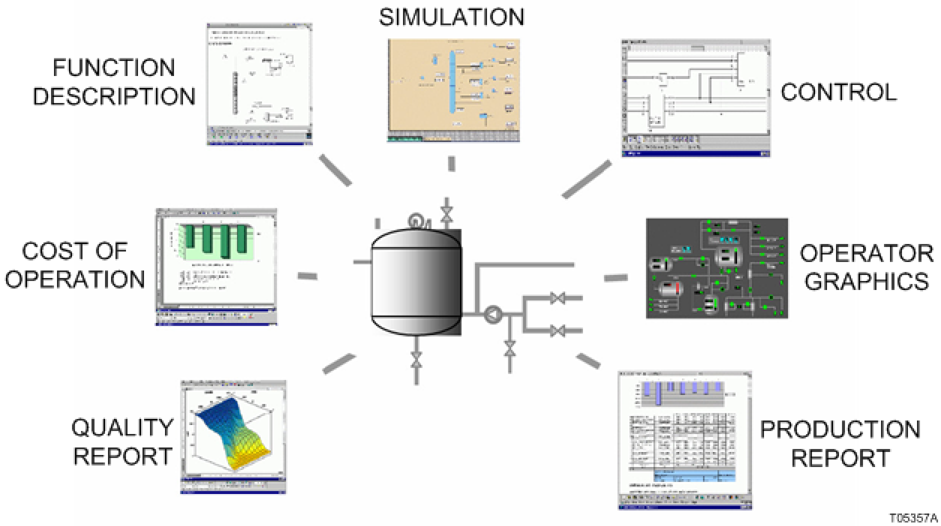


Figure 1. Aspects of an Object

It is desirable to be able to do this without changes to the applications. It is not logical to expect all of these different applications to be aware of each other. Still, these applications must cooperate to provide an integrated view and functionality of the object. Aspect Objects provide a solution to this problem.

Aspect Objects

In this concept each aspect is modeled separately, rather than creating a single object or data model in the system to represent the real world object. An Aspect Object is thus not an object in a strict sense (like a COM object for example) but rather a repository of references to implementations of the different aspects.

Refer to Appendix J, Terminology for a listing of the terminology used in this instruction.

Section 2 Functionality Changes

This section describes the functionality changes for the 800xA Base System, and the Functional Area software with changes in the current version of System 800xA 6.0.

Visual Basic Process Graphics (VBPG) is not supported in System Version 6.0. VBPG was replaced with Process Graphics in 5.0 SP2 RevA. Graphics migration must be done before upgrading to System Version 6.0.

Support for New Operating Systems

System Version 6.0 requires Windows 8.1 and Windows Server 2012 R2.

Improved Security

System 800xA supports Windows UAC (User Account Control) in default state. Installation and configuration needs administrator privileges whereas normal operation should be performed with standard user privileges to maintain a secure operation environment.

System 800xA 6.0 is compatible with Microsoft Windows DEP (Data Execution Prevention). DEP is a security feature preventing malicious code from executing in data memory, typically buffer overflow attacks storing instructions in data memory.

All executable are now digitally signed and carry ABB branding and copyright information.

Rename PC nodes

Renaming is not supported for 800xA system nodes in Configuration Wizard restore or the node objects in 800xA. In case of renaming a PC node, a new PC node has to be created and the old one needs to be deleted. The same is applicable when restoring an Afw Backup into a system with different PC node names.

Engineering Studio installation supported without Microsoft Office as a Pre-requisite

Prior to System Version 6.0 release, System 800xA and Engineering Studio required Microsoft Office as a pre-requisite for installation. From 6.0 onwards, System 800xA can be installed on an 800xA node, even if Microsoft Office is not installed. This reduces the 3rd party software footprint.

On System 800xA nodes, which do not have Microsoft Office installed, features integrated with Microsoft Office products like Control Builder M documentation, Excel Reports, Bulk Data Manager, Bulk SPL and Document Manager functionality are not available.

ABB Start Menu

The new ABB Start Menu is used in Windows 8.1 to display a Windows 7 style start menu for the ABB products. The start menu executes only in the desktop environment.

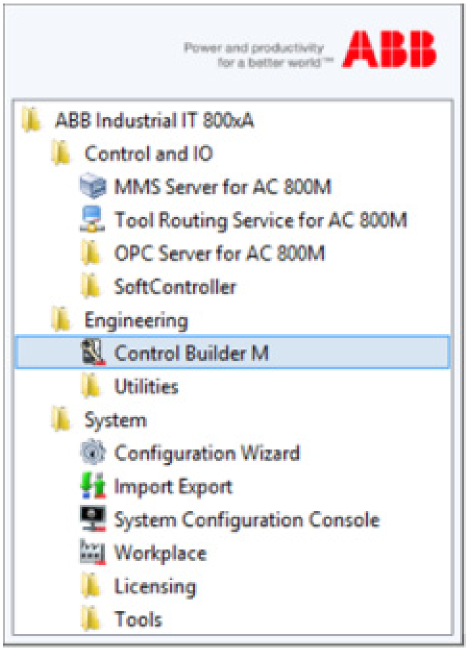


Figure 2. ABB Start Menu

Base System

Trends

The Trends feature is enhanced in this version with:

- The possibility to tilt the supporting lines using the slope function. This feature is useful to monitor a curve change for a ramped value.
- Automatic scaling function in trend displays.
- Coloring of trend curve in alarm state. When an object is in alarm state the curve is drawn in the alarm color.

Alarm List Readability

Alarm list readability has been improved by allowing color grouping of alarm lines in alarm list.

Advanced Graphical Elements

New advanced graphical elements are made available in graphics builder. The Grid element makes it possible to organize information or input as a grid on a graphic display. The Tab Content element can display tabs on a graphic display or element where each tab contains a tab page with content. The possibility to draw advanced geometries using new drawing functions in graphics builder.

New Video Server Version

The New Video Server version for System 800xA 6.0. has performance improvements for storing recorded videos and preparation for the new video formats.

Multisystem Integration

A High Integrity controller running version 6 or later can be operated using Safe Online Write from a Multi System Integration subscriber system. Refer to Safe Online Write with Multi System Integration on page 45.

System Services

This section includes the functionalities that are changed for System Services.

Diagnostics Collection Tool

The System 800xA Performance Data Plug-in tool used to collect the performance related data in the standard XML format and analyzed by My Control System, has been removed in the current version of System 800xA 6.0.

Central License System

SafeNet dongle is not supported in System 800xA version 6.0. Upgrade SafeNet dongle to Rocky dongle, if dongle is used for upgrading to 6.0.

Engineering Studio

This section includes functionalities changed for Engineering Studio.

- Simplified Upgrade step for Function Designer Diagrams.
  In cases, where application libraries have been modified, Function Designer Diagrams need to be updated. A system feature to perform that update has been introduced. The automated update process logs activities for later references.
- Support of Diagram Types in Function Designer introduced.
  Usage of Diagram Types is supported in Function Designer.
- Consolidated workflow on how to transfer Signal Parameter data.
  The additional option to "Automatic Write Allocation into CBM" has been removed.
- Advanced diagnostic for variable cross reference service.
  Function Designer checks the service state at call up. When the cross reference

server does not report proper state, an option is provided to user to close or continue opening the diagram without showing variable references.

- Function Settings are retained after upgrade
  Function Settings in Object Type Structure are retained after an system upgrade to 800xA 6.0.

Process Engineering Tool Integration

Support for *Intergraph SmartPlant Instrumentation- 2013 (Version 10.0).*

Process Engineering Tool Integration from System Version 6.0 supports data exchange with *Intergraph SmartPlant Instrumentation- 2013 (Version 10.0)*.

800xA for AC 800M

The following information characterizes the new functions in Control Software for AC 800M, version 6.0.0-0.

Engineering Environment

Hardware Licensing

The previous Control Software Licensing using Controller Capacity Points has been removed. Instead, it is now required to have one license for each present AC 800M and S800 module.

Multiple Soft Controllers on the same PC

It is now possible to run up to 25 Soft Controllers simultaneously on the same PC. Peer-to-peer communication using IAC is automatically set up between the soft controllers. The Soft Controller panel has been changed so it can be used to administer and monitor the different instances. Each running Soft Controller instance requires a separate license.

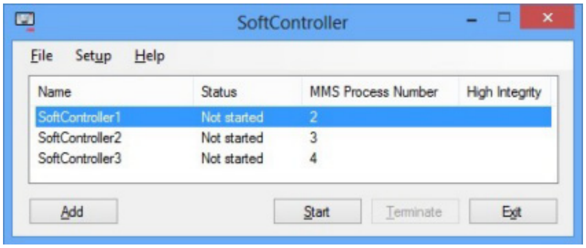


Figure 3. Multiple Soft Controllers on the same PC

Diagram Editor

The auto-routing of graphical connections in the Diagram editor has been improved. The diagram layout has been improved reducing the number of crossings, unnecessary bends and long connections. Multiple connections to the same port are handled in a better way, reducing the need for manual adjustments.
The below listed are the enhancements made to diagram editor.

- Connection dialogs will remember their last position, and reappear at the same position the next time they are launched.
- New Diagrams and Diagram types no longer generates error due to lacking FD code block.
- Enabling EN no longer result in bad layout of object ports.
- Enabling and then disabling EN no longer results in triangle symbol indicating that there are hidden ports.
- Using port visibility on a structured variable object with connected ports no longer disconnect ports.
- Auto complete functionality in connect dialog used to move the cursor last in text when text was modified, making it hard to modify the text.
- Long variable names were not shown in connect dialog since the drop down menu was too narrow.

- Auto complete functionality now shows automatically generated SFC variables like example, StepName.X.
- Direct connected variables now have menu commands for Search and References.
- Connection editor for a block now show the length of string parameters.
- Split page operation could generate internal compile error.
- Split page could result in incorrect data flow order numbers on the objects.
- Adding Split and Join blocks could cause the editor to crash if very short block names were used.
- Some menu bar and toolbar commands were not enabled for the Diagram Editor, example, Edit Parameter List.
- Find in Editor command now search inside block descriptions.
- Find and using Replace All could cause Control Builder to hang.
- Some problems with display of online values have been corrected.
- Project Documentation for Diagrams and Diagram types now include tables for hidden ports with connections, and for link variables.

Control Builder Project Explorer

In Control Builder, the alphabetic sorting order has been adjusted to comply with Windows standard and PPA. A number in an alphabetic string is considered lower if it has a leading zero.

The Type Usage dialog has been improved in several ways.

- It is now resizable, so the full paths can be viewed without scrolling.
- It is modeless, that is, it stays up after navigating to an instance.
- A separate button for navigation is added. Double-clicking still works as before.

FBD/LD Editor

I/O address and description is now displayed in the Information dialog launched from variables in FBD/LD online views.

SFC Editor

In Online mode, it is now possible to scroll an SFC transition code pane where the condition is too big to fit.

Simplified Upgrade

This release contains three new stand-alone tools aimed for simplifying an upgrade from earlier releases:

AC 800M Fingerprint automatically collects diagnostic data from all controllers on the network. The data is collected into tab-separated text files. It can be used in the existing system to verify load figures, hardware revisions and so on.

The **Start Values Analyzer** tool is used for verifying that cold retained variables are unchanged after the upgrade. It can, from version 6.0 and onwards, also pin-point variables holding settings that will revert back to initial value after the upgrade due to the wrong attributes. It can compare runtime values from different occasions and print out the differences.

The **Compiler Output File Helper** tool is used for extracting Control Builder compiler output files from an existing 800xA Aspect Server and store the files on a local disc. The tool can later restore the compiler output files from disc to an upgraded 800xA Aspect Server. The tool is useful if there is long period of time between the backup being made and the upgraded system being put into operation; the tool is required if there has been any controller downloads during this time.

New Compile Switch for Unresolved Communication Variables

There is now a configurable compile error when having unresolved communication variables.

Instance specific Initial Values

In the Control Properties aspects, it is now possible to define initial values for variables of data type time and date_and_time.

Task Analysis Tool

In the Task Analysis Tool, the warning limit for controller load at Load Evaluate Go has been increased from 70% to 90%.

Search and Navigation (minor error corrections)

It was not possible to navigate to hardware items when their names contained dots (‘.’).

Communication Variables was not always shown in Search and Navigation window even if they were used in code.

Searching and navigating to variables in Diagrams was not always working as expected.

Searching and navigating in online mode in Diagrams was not always working as expected.

Time Set Menu Command Removed

The menu command "Time Set" has been removed from the Tools menu in Control Builder.

AC 800M High Integrity

Engineering support for PM867 and SM812

This release adds engineering support for a more powerful High Integrity controller, the PM867/SM812.

The release of the PM867/SM812 software and hardware will be announced separately.

Support for PROFINET IO in AC 800M High Integrity Controller

CI871 is now available to be used in non-SIL applications in the AC 800M High Integrity.

Safe Online Write with Multi System Integration

A High Integrity controller running version 6 or later can be operated using Safe Online Write from a Multi System Integration subscriber system.

Variables in SIL Applications available as Access Variables

In the previous version, it was not possible to declare variables in SIL applications as communication access variables. In the new version it is possible for an external system or device to read SIL variables via for example MODBUS TCP.

Compile Warning if no SIL application exist in HI controller

A High Integrity controller must contain at least one SIL application. This is now checked during compilation, and a warning is issued otherwise.

Task Analysis Tool

The Task Analysis Tool no longer includes the VMT task when analyzing the task execution in an AC 800M HI controller. Hence it is no longer necessary to take into account the VMT tasks interval time of 900 ms when tuning tasks in an AC 800M HI controller.

Increased Timeout for MMSReadHI Control Module

The maximum communication Timeout for *MMSReadHI* control module has been extended from 10 to 30 seconds.

Control and I/O

Improved Security

The AC 800M Web-server password is now stored persistently and has to be changed by the user.

By default the Web-server is turned off and it has to be manually enabled four hours at the time.

Software support for PM862

This release adds software support for the new PM862 CPU. PM862 has 32 MB RAM, can be made redundant, and has half the execution performance of PM866.

Support for Distributed Redundancy using BC820

The new BC820 has the same function as BC810, but the distance between two BC820s can be up to 200m. The CPUs in a redundant controller can by that be physically separated. The connection between the BC820s consists of one electrical and one optical link. BC820 can be used with PM862 and PM866.

Support for CI854B

The CI854B is a new PROFIBUS-DP master that replaces CI854A in new installations. CI854B has the same functionality as CI854A and requires the AC 800M controller to be of version 6.0 or later.

Use of Essential Automation Hardware is Identified and Visualized

The AC 800M identifies and visualizes hardware units of type *-eA*.

Optimized Communication between AC 800M Controller and OPC Server

The MMS communication between the AC 800M controller and OPC Server has been optimized. The length of the telegrams has been extended up to 2.5 times which results in fewer telegrams and lower controller load. The maximum variable transfer rate is almost doubled.

Support for MODBUS RTU Slave

The AC 800M controller can now act as a point-to-point MODBUS RTU slave. The communication takes place via COM3 on the CPU, or via any serial channel on CI853. The same set of Function Codes as with CI867 slave is supported.

Support for 200-AENTR through CI873 EtherNet/IP

The new *S200CI873IoHwlib* adds support for the S200 I/O adaptor 200-AENTR to be used with CI873.

The new adaptor gives a simple and cost effective upgrade path for directly connected S200 I/O on SattCon 200, SattLine 200, Advant Controller 210, Advant Controller 250 and AC 800C.

200-AENTR has two Ethernet ports with an in-built switch, which means that the adaptors can be daisy-chained to the CI873 using cross-wired Ethernet-cables without the need for external switches.

The release of the 200-AENTR adaptor will be announced separately.

Automatic replacement of PROFINET IO devices

The CI871 supports an automatic configuration and restart of a PNIO device in case of device replacement. The configured station name is assigned automatically. No usage of the AC 800M web server is needed. This functionality is available for PNIO devices that have on the one hand active support for LLDP and on the other hand these devices are connected to a switched Ethernet network also having active support for LLDP.

UMC100 with PNQ22 and PROFINET IO

The new hardware library *ABBPNQ22CI871HwLib* adds support for ABB's universal motor controller UMC100 via CI871.

Acyclic Communication on PROFINET IO

The AC 800M controller now supports acyclic data access with connected PNIO devices.

The *IOCommLib* library contains the Function Blocks for acyclic read and write of the PROFINET device data. This provides access in the controller to all data of the PNIO device that is not provided via cyclic data.

Application libraries for analog control

PidCC and *PidAdvancedCC* have been enhanced to support controller types ‘ClassicERF’ and ‘ClassicERF+D’. *PidAdvancedCC* has additionally been enhanced for controller type ‘ABBERF’ and ‘ABBERF+D’. These changes affect the following libraries BasicLib, ControlSupportLib, SignalLib, ControlBasicLib, ControlObjectLib, ControlStandardLib, ControlAdvancedLib, ControlExtendedLib, and ControlFuzzyLib.

On control modules *PidAdvancedCC* and *PidCC*, the parameter *ERF* has changed name to *EBV*, External back value. The function is still the same if the *EBV* parameter is connected. If connected the *EBV* value is used instead of the backward value in the Control Connection in the controller output parameter.

Enhancement of *TapCC* and *TapRealCC*. A new node is added where the backward information is transferred in the forward direction. The addition is completely compatible with the present object. Backtracking to the new node is never possible.

Enhancement of *RealToCC*. A parameter UseBackwardRange has been added to make the selection to use the backward range as the forward one. The initial value follows the original functionality.

Enhancement of *BranchCC* and *Branch4CC*. A parameter Mode has been added to make the selection in backtracking strategy. The initial value follows the original functionality.

TCP Communication Library Improvements

The TCPRead Function Block has been improved by adding two new parameters:

- The RdOffset is an input parameter that defines an index in the receive-structure where the data should be put.
- The NoOfBytesLeft is an output parameter showing the number of bytes left in the buffer to be read.

Maintenance

It is now possible to insert a Backup Media card after a controller crash has occurred in order to save the content of the whole RAM memory. This is valid both for a single/primary PM and a backup PM and requires that the “Autorestart” function has not been enabled (default off). A halted controller without a Backup Media will indicate by fast flashing (10Hz) on the F(ault) LED. Insert a Backup media card and wait for slow flashing (0.5Hz) on the F(ault) LED indicating that the dump is ready and/or press INIT to restart.

Application Change Management

Application Change Management (ACM) is a part of Advanced Engineering Workplace feature.

It is a version control tool used for engineering solutions in 800xA System. Multiple versions of 800xA application configuration can be archived in the ACM host and can provide an integrated configuration management system utilizing .afw files technology.

This section includes functionalities changed for Application Change Management.

Shorter Check In time and optimized usage of ACM server space: All the entities which are not modified with respect to earlier checked in version will be skipped during subsequent check In which eventually improves the check In time and saves ACM server space.

Bulk Check In of Entities/Objects: Bulk check In intelligence has been implemented to optimize the memory usage during check in operation, which has made it possible to check In significantly large Control projects and entities in single operation.

Set Max number of versions: A new general setting is introduced to set the maximum number of versions of an entity/object in ACM server. If the number of checked in versions of a particular file exceeds the value set, then the first version of the file gets deleted from ACM server. This is a one-time setting, introduced to support database management and to have a control on the number of versions of an entity/object in ACM server.

For more information on ACM, refer to System 800xA Application Change Management.

PLC Connect

The new functionality supported by PLC Connect version 6.0 is:

- Integer signal can be changed from signed to unsigned

Device Management PROFIBUS and HART

Following new Features are implemented in this release of System 800xA 6.0

- Enhanced User Interface for License counting Tool for Fieldbus Builder PH.
- Enhanced User interface for Device Management Data Compression Tool.
- HART Multiplexer Connect Support for Digi PortServer.
- MTL4850 integration with 800xA Device Management HART.

Device Library Wizard: (DLW)

Following new Features and Enhancements are implemented in this release of System 800xA 6.0.

Synchronization of Device Types from Primary Aspect Server to DLW Clients:

Installed device types in Primary Aspect server will get copied to all connected client nodes when the user invokes DLW in Client node or initiates Synchronize Device types from Client nodes.

- Instead of installing Device types in all the nodes user shall identify the Client nodes where Device Types are required and can Synchronize with Primary Aspect Server.
- This avoids manual effort for Copying Device types / Extract Device types in each node and also avoids differences between Device types installed on Server and Client
- System Restore has to be performed only on Primary Aspect Server (DLW Server) and copy the installed Device Types to the identified DLW Clients where DTM operation is required using Synchronize Device Types feature.

Removed Dependency on MS OFFICE

MS OFFICE dependency has been removed Instead AccessDatabaseEngine will get installed along with DLW Client.

Device Management FOUNDATION Fieldbus

FOUNDATION Fieldbus is enhanced with the following new features in this release of System 800xA 6.0.

Fieldbus Builder FOUNDATION Fieldbus (FBBFF)

The following new features are implemented in the Fieldbus Builder FOUNDATION Fieldbus (FBBFF):

- Switch on/off of Web server from linking device
- System status viewer entry for usage of default passwords in linking device
- Alarms are generated if default passwords are used and Web server is active in linking device
- Hardware and firmware information of linking device in DCT

Linking Device

The following new features are implemented in the Linking Device:

- Web server is default switched off
- User login required on linking device Web pages
- New linking device hardware

800xA for Advant Master and 800xA for Safeguard

Advant Master Alarm Refresh

The Advant Master Alarm Refresh helps retrieve the latest alarm status from Advant Master and Safeguard 400 controllers. For example, after communication disturbance between Connectivity Server and Controller. Refer the 800xA for Advant Master 6.0 Configuration (3BSE030340*) for more information.

Enhanced RTA unit PU410 firmware

Cyber Security has been enhanced in the new firmware revision 1.0.4.0 for the RTA unit PU410. This new firmware revision is required when using PU410 together with 800xA for Advant Master 6.0. Refer the Safety Bulletin 3BSE080439 for more information about the new firmware revision, and how to get the new firmware revision for updating PU410 units that do not have the new firmware revision.

RTA board PU515A is no longer supported

800xA for Advant Master 6.0 does not support RTA board PU515A. Therefor also all PU515A needs to be replaced with PU410 when upgrading an 800xA system to 6.0.

Controller node objects defined as Entities

Starting with the 6.0 release controller node objects are handled as Entities in the system. Controller node object examples are AC 450 Controller, AC 410 Controller, SG 400 Controller. This means that objects and aspects that belong to a controller node object are treated as a unit. Hence, when importing or exporting all objects under the controller node are kept together as a unit. For more information on Entities refer the System 800xA, System Planning (3BSE041389*).

Advant Master Central Backup

Advant Master Central Backup is a licensed feature for backup and restore of ABB Master Programming Language (AMPL) controller applications. This feature was previously available only to users of System 800xA 5.1 Feature Pack 4. For more information on configuring Advant Master Central Backup, refer 800xA for Advant Master, Configuration (3BSE030340*).

800xA for Melody

This section describes the functionality changes for 800xA for Melody.

- Melody Controller PM 877 support.

- The limitation of 10 Controller pairs (*CMC 70, PM 8xx, or CCO 30*) per Connectivity Server is expanded to 20 Controller pairs per Connectivity server.

Batch Management

800xA Batch Management 6.0 is featuring improved capacity and performance.

- New batch system level changes allow for multiple batch manager processes running in the task manager. This improves the database read and write times. Also beneficial when several recipes are running at one time.
- Enhanced Batch Redundancy. Supported by SQL mirroring, provides improved system recovery.
- Batch Alarm Separation. Batch now supports the use of **Class IDs** for separating batch alarms. User will find this beneficial where process area information needs to be separated.
- Batch Overview Improvements. System level improvements to the batch overview provide efficient overview navigation and increased user access.

800xA History

The new features supported by 800xA History in the 6.0 release are:

- **High Availability History Servers** - Fault tolerant architecture to ensure seamless storage and retrieval of process data.
- **OPC Unified Architecture** - Provides support for DA and HDA.
- **DCN Trending** - Trends can now retrieve the data from the Embedded Data Collector Node when the 800xA History server is unavailable.
- **Event retrieval** - Allows the user to retrieve the events stored in History Server and make them available in 800xA system.
- **Event Archiving** - Allows the user to perform archive of historical event data using Archive Service of 800xA.
- **History Log List Aspect** - Allows user to perform activate and de-activate of 800xA History Logs in bulk from 800xA workplace.

800xA for Symphony Plus Harmony

800xA for Symphony Plus Harmony 6.0 contains the following enhancements:

- **Harmony Tag Configuration data is now stored directly in the Aspect Directory.** The SQL Server based Harmony Configuration Server Database is no longer needed and has been eliminated. A tool is provided for exporting the existing tag configuration data from the Configuration Server Database on existing 800xA 5.0 SP2 or 5.1 Systems. This exported data can then be uploaded into the Aspect Directory during the Upgrade process.
- **Uploader** - A new Uploader replaces the now obsolete Harmony Tag Importer Exporter and Harmony Synchronizer. The Uploader allows for importing or exporting Harmony Tag Configuration data directly to the Aspect Directory.
- **Backup/Restore** – Harmony Tag Configuration data is now included in Aspect Directory Backup and Restore operations, eliminating the need to perform independent Harmony Backups and Restores.
- **Bulk Data Manager Support** - Bulk changes to Harmony Tag Configuration can now be made using the standard 800xA Bulk Data Manager, eliminating the need for the separate Harmony Bulk Data Manager utility.
- **Engineering Environment and Versioning Support** - Harmony Tag Configuration changes can now be made in an Engineering Environment and later deployed to the Production Environment.
- Support for the following Symphony Plus hardware modules:
  - PNI800 Plant Network (PN800) Interface
  - HPC800 Controller
  - SPIEB800 INFI-Net to PN800 Plant Network Bridge

Section 3 System 800xA Overview

The 800xA System functionality is divided into a Base System and a set of options. The options represent functions that can be added to the system based on the needs of the process that should be controlled. The system functionality is grouped in a set of functional areas for an easier overview of the complete system functionality. Refer to Figure 4.

The System 800xA structure is summarized as follows:

- Base System is the system base software. It consists of:
  - DCS Base System Functionality.
  - Integration of ABB Controllers as well as other PLCs / RTUs.
  - System Options (for example, OLE-DB Real Time Data Client Connection, Audit Trail (Security Events and Configuration Changes), Advanced Access Control, SMS and e-mail Messaging, etc).
- System 800xA consists of the following Functional areas:
  - Operations.
  - Batch Management.
  - Information Management.
  - Control and I/O, including SIL (Safety Integrity Level) 3 Safety Control.
  - Engineering.
  - Asset Optimization.
  - Device Management.
  - Multisystem Integration.

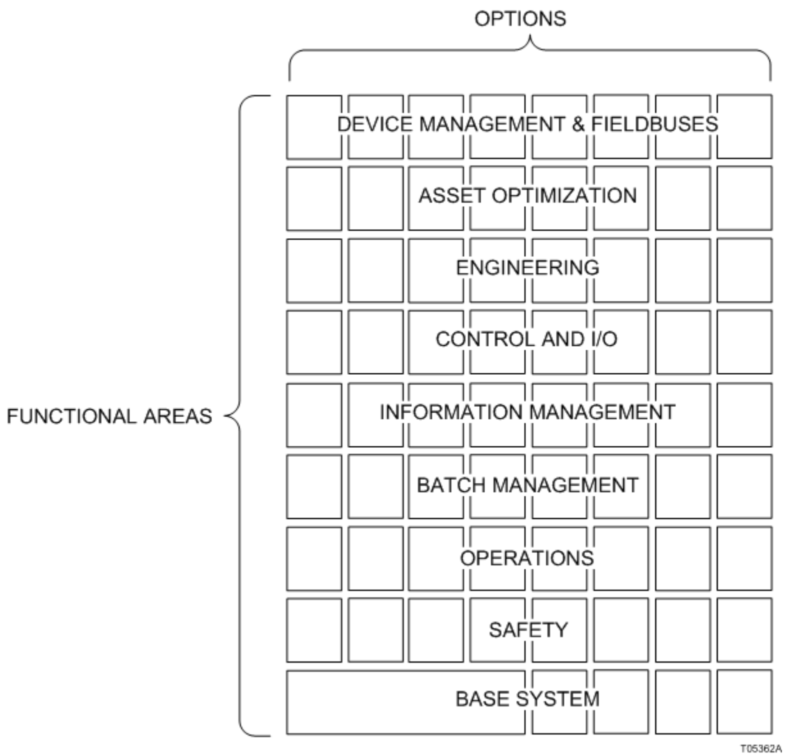


Figure 4. 800xA Functional Areas and Options

Additional supporting hardware and software components are:

- AC 800M Hardware.
- S800 I/O.
- PROFIBUS Network Components.
- FOUNDATION Fieldbus Network Components.
- HART Multiplexer Network Components.
- IEC 61850 Network Components.

- Instrument Calibration Management System for HART Instruments - Calibration Package for 800xA System using hardware and software from a variety of their party vendors.
- Integration of the Intergraph SmartPlant Instrumentation application.

These products are purchased separately.

DCS Base System

The 800xA System base functionality is comprised of the DCS Base System consisting of:

- Plant Explorer for creating and maintaining aspect objects and object structures.
- Alarm and event handling for detection, generation, and logging of alarms and events.
- Base history functions provide for event and trend data storage. Scalable options satisfy the information needs of all users.
- Security for handling of user permissions and authority in the control system.
- System time synchronization to synchronize the system time in the different nodes (PCs and controllers).
- Redundancy consisting of a number of redundancy schemes in the system.
- Language localization - The 800xA System is available in US-English. The DCS Base System has support for making the localization to other languages.
- Backup and restore handling. Back up and restore of both the Windows® system and the 800xA System.
- Import and export of application data.
- Multi-user and distributed application engineering to support several engineers developing parts of the same application at different geographical locations.
- Integration of multiple systems to support larger systems, increased integrity between systems, or simply partial installation and commissioning of systems.

Plant Explorer

The Plant Explorer is used to create, delete, and organize aspect objects and aspects within the 800xA System. It organizes the aspect objects in structures according to functionality, location, etc. You can also use it to browse and search the structures of the plant.

Plant Explorer is the main tool used by engineers for exploring and building hierarchically structured models of a plant or system. It is based on a structural hierarchy, similar to Windows Explorer. The structures represent different views of the plant. Structures can be built and improved at any time. Examples of different types of structures are:

- Functional Structure - Displays the plant from the process perspective. It is an overview of the functionality of items in the plant. It is used for operation of the plant.
- Location Structure - Displays the physical layout of what equipment is located where in the plant. It is primarily used for maintenance tasks.
- Control Structure - Displays the control network in terms of networks, nodes, fieldbuses, and stations.

All the entities included in a plant are represented as objects; for example, valves, motors, controllers, and tanks. These objects have relevant information stored in aspects, as shown in Figure 5. For example, process graphics, control dialogs, and alarm pages. In the figure the aspect object is in the left column and a list of the aspects connected to it is in the right column.

Aspects have the following features:

- The aspect can be viewed in a pop-up window, in the preview area or in a full screen window.
- Aspect filters decrease the amount of information to be viewed.
- A search facility for finding a particular aspect object in any structure.
- The aspect object can also be directly accessed from the 800xA System Operator Workplace.

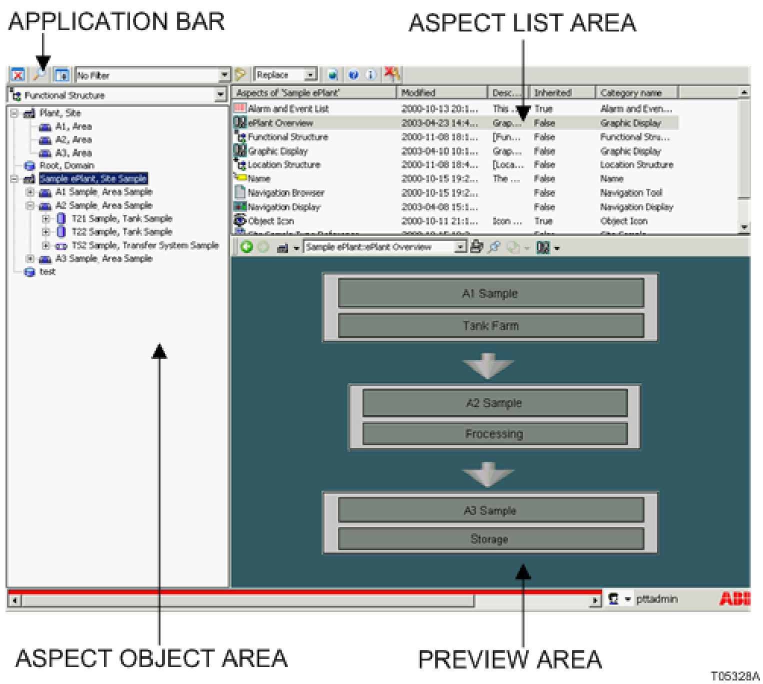


Figure 5. Plant Explorer Window

Alarm and Event

There is support for alarm & event management on several levels throughout the system. Alarms and events are treated in a consistent way (an alarm is an event that alerts the user of an abnormal state and needs to be acknowledged). The Base System supports management and logging of events.

Supported levels of alarm & event management can be described as:

- Event detection provided on controller, field, and application level.

  Examples of applications using alarms and events are Batch (messages, prompts, errors, security violations, etc.), and Asset Optimization (Asset Monitors). The system itself also generates alarms and events to raise attention to deviations from normal system behavior.

- The Base System supports storing and state management of events and alarms.
  - The Alarm Manager sets up subscription for alarms and events from event collectors in the Connectivity Servers. Events are sent to the System Message Server for retrieval purposes.
  - Redundancy is applied to the Alarm Manager, via several alarm servers that work in parallel, receiving the same alarms. One master exists which re-distributes alarms to the client. If the master goes down, another server becomes master. A synchronization of data with the current master takes place when a redundant Alarm server starts up after a failure.
- On the application level, Operator Workplace and history functions provide the presentation of alarms and events.
  - Alarm list to present current alarms.
  - Event list to give a chronological view of events.
  - Alarm logger for printer output.
  - Alarm bands to provide a number of active and unacknowledged alarms in a summary display for selected alarm lists.
  - The sequence bar displays a defined number of alarms horizontally. The alarms shown are the newest alarms from the defined list.
  - SMS and e-mail Messaging provides a method for sending messages based on alarm and event information to user devices such as mobile telephones, e-mail accounts.
  - All client applications are applying filters which are configured as part of the alarm or event list to determine which alarms or events from the system global alarm or event stream shall be included in the client functions.
  - Alarm list configurations can be shared between lists.
  - If an alarm is irrelevant it should not be shown in an alarm list. An alarm is irrelevant if it doesn’t require an action from the operator. A function called hiding will help the operator to clear the alarm lists from irrelevant alarms.

The functionality provided by the Operator Workplace is described in Section 4, Operations.

Figure 6 shows the overall flow of alarms and events, starting in the AC 800M controller. Buffering of events takes place at several levels in the system. Such buffers, or queues, are shown. Presentation and acknowledgement can be made in several ways as previously discussed.

History

The ability to store, view, and retrieve process data and historical information is an integral function of the automation system. To accomplish this, the system provides scalable options to satisfy the information needs of all levels of users, including process operators, engineers, maintenance personnel, and operations managers.

The history system functionality is divided into Base System History functions, Operator Workplace, and Information Management functions.

The system history functions are used to store and visualize process data in short to medium time range. Examples are Operator Trend Displays and the Event List. The Information Management functions add long term data storage and retrieval functions.

The basic history functions in the base system are:
- Event storage.
- Trend data storage.

Trend logs are used to define sample interval and storage time for process values to be visualized in a trend display.

The functionality provided by the Operator Workplace is described in Section 4, Operations.

Security

Operations and actions in the system can be assigned different required permissions. This assignment defines what permission a user needs to have in order to perform the operation or action. Examples of permissions are: Read, Configure, and Operate. To execute a setpoint change, for example, Operate permission may be required. Each attribute of a control object can have a different permission assigned, so that access rights can be differentiated down to a particular operation to an object.

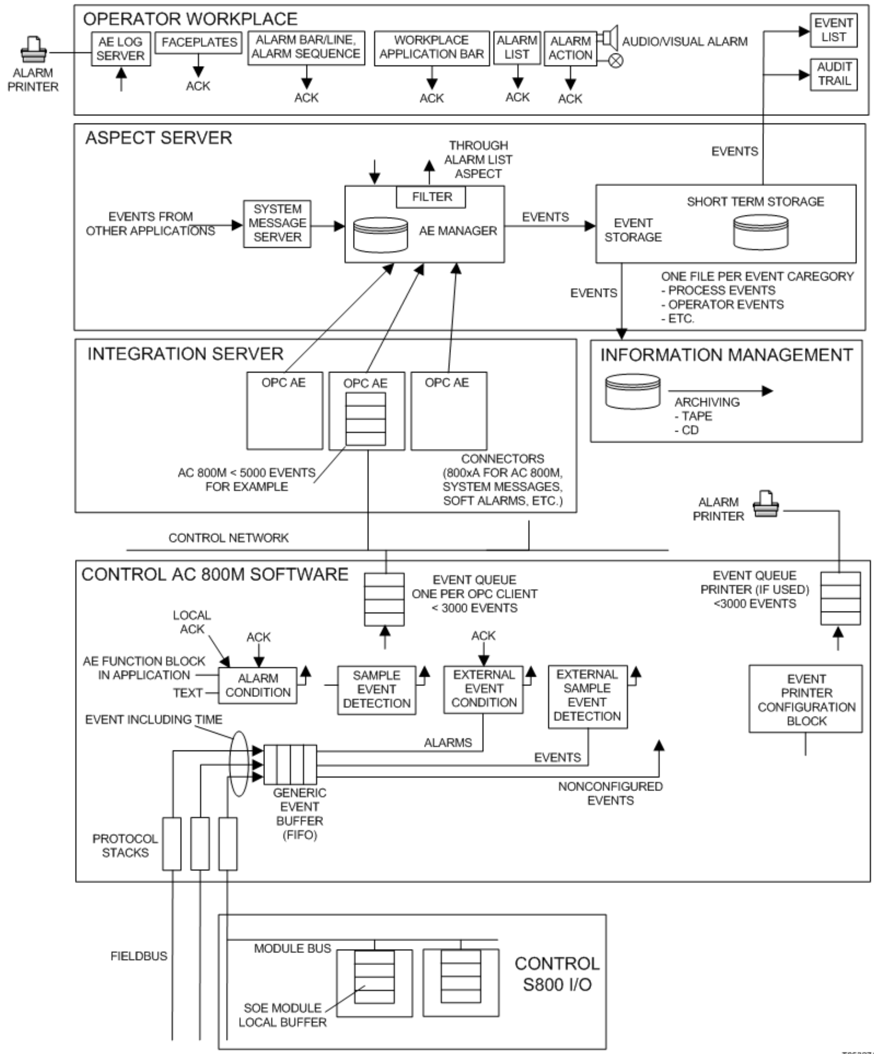


Figure 6. Alarm & Event Management

The foundation for System 800xA user administration is the Windows user administration. A user is registered in a domain, and can belong to one or more groups. The user group can be freely selected, but it may simplify user administration if the user groups correspond to the Industrial IT user groups.

Roles will control what is visible to a certain user group (here Industrial IT user groups apply). For example, controller limits in the faceplate can be made invisible for an operator.

In the finest granularity, the above-mentioned functionality gives the administrator the possibility to define exactly who can do what and from where. The functionality can be applied to each aspect in the system at the same time in order to provide basic security with minimum setup.

The user groups are assigned different permissions relative to substructures down to an individual object. This supports the concept of users/ user groups having different authority for different areas of the system. Authority is set at an aspect object in an arbitrarily selected structure, such as the functional structure. All sub-ordinate objects inherit this authority. It is also possible to set authority explicitly for any single aspect object.

Default configurations of security are available to reduce the system configuration work.

User log-over provides the ability to temporarily change users without a complete Windows logon/logoff sequence. This makes it much faster, for example, for another user to log in to perform tasks which require a higher authority level without logging off the current user. The information displays remain available.

User Log-over together with User Re-authentication and Double Authentication is an option called Advanced Access Control in the price list. Refer to Electronic Signature (Digital Signature) on page 88 for additional information.

System Time Synchronization

System-wide time synchronization of all nodes handling time related data is supported. Accuracy of time of the distribution to nodes doing the time tagging (controllers) is in the millisecond range (for AC 800M +/- 0.5 ms). The time stamp presentation (alarm and event presentation) has a resolution of 1 ms and an accuracy of 0.4 ms. This means that two events detected by the I/O channels in two different AC 800M controllers can be distinguished in time down to a few milliseconds. Time stamping, or SOE (Sequence Of Events), is supported for direct I/O.

For the control network and the client/server network, clock synchronization works in two different ways:

- From controllers. An AC 800M controller selected as clock master multicasts synchronization messages on the network.
- On workplaces, clock synchronization is performed between stations.

Clock Synchronization from Controllers.

Depending on the type of controller, it is possible to perform clock synchronization by four different protocols: CNCP (Control Network Clock Synchronization Protocol), SNTP (Simple Network Time Protocol), MB 300 Clock Sync, and MMS Time Service. The preferred protocol of service is chosen in the Hardware Editor of the Control Builder.

CNCP is the base protocol for clock synchronization on the control network. An AC 800M controller selected as Clock Master multicasts synchronization messages on the network. All nodes that have CNCP enabled are synchronized by this clock master. One or several nodes can act as a backup clock master. This means that if the current clock master is lost, one or several nodes are prepared to take over as Clock Synchronization Master. While a node is clock master backup it acts as clock slave and receives time from the active clock master.

AC 800M controllers that needs to be synchronized from an external time server are configured as SNTP clients. It is typically one or two GPS (Global Positioning System) Time Servers connected to the network. The SNTP time clients periodically request time updates from the time server.

If a redundant network is used the SNTP servers must be duplicated so that there is at least one on each network path (i.e. if the SNTP server does not support RNRP (Redundant Network Routing Protocol)).

CNCP and SNTP can both operate at the same time on the network.

MB 300 Clock Sync is a protocol for time distribution between the 800xA System and Advant/Master products on a MasterBus 300 network.

MMS Time Service is supported for small systems in which no AC 800M is used, for backward compatibility with older products.

If a GPS time source exists, time is sent from the GPS to all AC 800M controllers in the system. One of the AC 800M controllers then acts as a TimeSync Master for the rest of the controllers (other controllers than AC 800M and AC 800M controllers not on the same network) and distributes the time to them.

If no external time source exists, the controller which is set up as TimeSync Master gives the reference time for the system.

Clock synchronization of Workplaces

The AfwTime Service is used to synchronize the time on the server and client nodes defined in a system. This service can also be used to change the current time in the system.

The time service has two components:

- Time server.

  The time server component is the administrator of the clock synchronization. It receives and distributes the clock synchronization telegrams to/from other nodes, and it makes the final decision on which telegram to accept and broadcast to the network. The clock synchronization telegram comes from the Clock Master (normally an AC 800M controller).

  The time server is normally active in the Connectivity Servers.

- Time client

  A time client is responsible for keeping the date and time in its node updated and synchronized with the global time broadcast from the time server. It is also responsible for allowing or disallowing manual setting of date and time, according to how it is configured. A time client resides in all 800xA System nodes.

Daylight Savings Time is supported and handled as a presentation matter only. The system time, the event detection, and the storage of events are done in universal time (UTC) in order to keep track of the correct sequences and across any time changes.

Redundancy

The 800xA System provides the highest degree of fault tolerance to meet the most demanding application needs for maximum system uptime. Optional redundant I/O, controllers, control networks, Fieldbus, Domain Server, Connectivity Servers, Aspect Servers, Operator Workplaces, and Batch Severs with automatic switchover, and dual history logs in Information Management, provide the required functional integrity to meet the most demanding process needs.

The 800xA System redundancy is designed to reduce the consequences of hardware errors and it offers a range of possibilities to meet almost every need, including integrity, availability and safety.

The redundancy scheme is resistant to one error at a time in functions where redundancy is implemented. This means a fault needs to be repaired before the function is fully redundant again.

The following is a summary of the supported main redundancy schemes. Significant characteristics are listed, including a typical comparative figure for the expected lowered rate of serious failures when redundancy is introduced. The analysis will assist you in the selection of the best suitable mix of redundancy schemes.

Figure 7 provides an example configuration which references the offered redundancy schemes listed in Table 2.

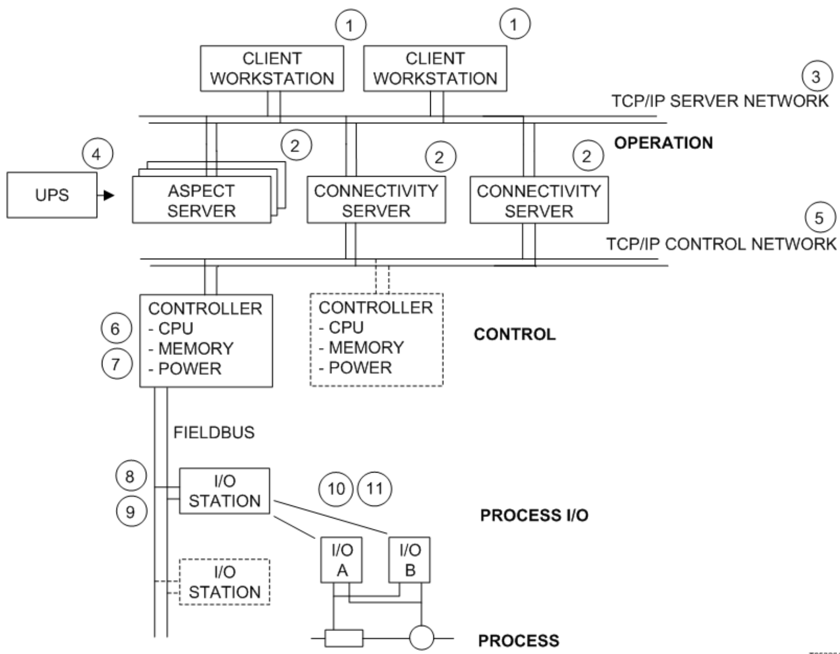


Figure 7. Example Configuration of Redundancy Schemes

Table 2. Descriptions of Redundancy Schemes

Module/Function (Redundancy Scheme)	No.	Characteristics	Decreased Failure Rate (Factor)
Domain Servers		Domain Servers can be duplicated, using Windows' mechanisms for DC (Domain Controller) and DNS (Domain Name Service) redundancy	
Operator Workplace	1	Redundancy means duplication of complete workstation.	25
Servers			25

Table 2. Descriptions of Redundancy Schemes (Continued)

Module/Function (Redundancy Scheme)	No.	Characteristics	Decreased Failure Rate (Factor)
(a) Aspect Server	2	Redundancy requires the Aspect Server function to be configured in 2 workstations (1oo2), or 3 workstations (2oo3)	
(b) Connectivity Server	2	Redundancy requires the Connectivity Server function to be configured in 2 workstations (1oo2).	
(c) Combined Aspect and Connectivity Server	2	Redundancy requires the Aspect and Connectivity Server function to be configured in 2 workstations (1oo2).	
Client/Server Network[1]	3	Redundant paths in the network area require duplication of cables and all network components such as Ethernet switches. Communication cards in workstations are also duplicated.	40
Power back-up for workstations[2]	4	Power back-up for workstations is implemented by UPSs (Uninterruptible Power Supplies). Third party products are used for this purpose.	
Control Network	5	Redundant paths in the Network area include duplication of cables and all network components such as Ethernet Switches. Communication cards in workstations to be duplicated. AC 800M is equipped with dual network ports.	20
Controller CPU	6	AC 800M uses a hot standby CPU module that is kept synchronized with the state of the primary CPU module. The method of synchronization is hardware based, fully transparent to all software, and includes automatic establishment of rollback points at least every millisecond, resulting in fail-over times of less than 10 ms.	20

Table 2. Descriptions of Redundancy Schemes (Continued)

Module/Function (Redundancy Scheme)	No.	Characteristics	Decreased Failure Rate (Factor)
Controller and I/O power supply	7	Dual power supplies can be used. The AC 800M supports supervision of dual power lines. Power voting arrangement is external to the CPU. The S800 I/O supports supervision of dual power lines.	28
Optical I/O Link	8	a. Controller to I/O station. The optical I/O link is closely integrated with the controller. Redundant links require redundant CPUs. Duplicated Cluster modems are applied as well. The comparison figure is relevant for a single I/O station. As the number of stations increase, the practical importance of redundancy will increase.	14
	8	b. Extension of I/O station. Redundant I/O links to additional clusters within the station require redundant FCIs and duplicated cluster modems.	14
PROFIBUS-DP Redundancy options offered for S800 I/O and S900 I/O	9	Controller to I/O Station. Full redundant application. All modules and cables are duplicated.	15
I/O Cluster Module Bus Relevant to S800 I/O	10	Redundant module bus is intended to be used with redundant I/O modules.	---
I/O module A range of redundant S800 I/O modules for standard signals is offered.	11	Requires a redundant ModuleBus. Comparison is made between typical module values that are weighed with respect to an average distribution between AI, AO, DI and DO signals in an installation.	20

Table 2. Descriptions of Redundancy Schemes (Continued)

Module/Function (Redundancy Scheme)	No.	Characteristics	Decreased Failure Rate (Factor)
Batch		Redundancy requires the Batch Server function to be configured in 2 workstations 1oo2.	---
IM log duplication		Availability of logs can be increased by duplicating them in different server nodes. The system handles dual logging, but does not replicate between the servers.	---

NOTES:

1. Do not apply hubs in redundant schemes. Use switches. Hubs cannot be supervised by network management tools.
2. Power backup is primarily used to lower the effect from mains supply drop out.

Localization

National Language Support (NLS) is intended for the localization of the operator interface to the desired language. NLS contains a set of functions that are harmonized with the Windows regional settings to enable a multilingual environment for the System 800xA.

The System 800xA supports translations, mainly the operator interface and the operator manuals as shown in Table 3 and Table 4.

Table 3. Supported Language Packages for Functional Areas

Language Packages	Functional Areas					
	Base System incl. Workplace	Safety	Asset Optimization	FOUNDATION FIELDBUS	Batch Management	Information Management
Chinese	Yes	Yes	Yes	Yes	Yes	Yes
French	Yes	Yes				

Table 3. Supported Language Packages for Functional Areas (Continued)

Language Packages	Functional Areas					
	Base System incl. Workplace	Safety	Asset Optimization	FOUNDATION FIELDBUS	Batch Management	Information Management
German	Yes	Yes	Yes		Yes	Yes
Russian	Yes	Yes				
Spanish	Yes	Yes				
Swedish	Yes	Yes				

Table 4. Supported Language Packages for Connectivity

Language Packages	Connectivity			
	800xA for AC 800M	800xA for Advant Master	PLC Connect	800xA for Melody
Chinese	Yes	Yes	Yes	
French	Yes			
German	Yes	Yes		Yes
Russian	Yes			
Spanish	Yes			
Swedish	Yes	Yes		

The translation, or Language Package, is implemented as a system extension and is possible to install without stopping the system.

The Localization of System 800xA by a Project instruction describes what and how localization can be performed by a project with or without an installed Language Package. The English version of the Windows Operating System is required.

System Checks

System checks include sequence enforcement such as ensuring that a PID loop must be in Manual mode prior to the user changing its controller output. Some of these types of checks are covered by the 800xA System product directly while others must be configured as part of the user specific application engineering.

System health monitoring is another form of system checks. The Service Structure provides an overview display including status of all 800xA System services including alarming capability for failed system components.

User access to the 800xA System optionally ensures that the user has the access rights, as defined for the specific workstation that the user is logged on to and actively working on.

Other connected devices such as weigh scales, PLCs, etc. provide data related to specific process equipment. The user specific application must ensure that the correct data source is configured. User's application must ensure the health of the device prior to using data provided by the device. The system provides data quality for each object property in order to enable this type of check.

The PNSM (PC, Network and Software Monitoring package) provides a set of predefined IT Assets that represent common devices and system processes within System 800xA (for example printers, computers, switches, and software programs). These IT Assets provide data from the simple (printer out of paper), to the sophisticated (detection of a slow memory leak in a computer). When problems are detected (or anticipated), the software can automatically generate alarms, informing the user of the problem.

Topology Status Viewer

The Topology Status Viewer serves as an overview of the status of components in the system, and as an entry point to more detailed status information, specific to the component type.

The Topology Status Viewer provides status information about the automation system, with regard to all communication links, stations, peripheral equipment, and process I/O boards.

Topology Status has the following features:

- Self configuring Topology Status, showing the actual status of the hardware, (controllers and I/O boards for example), and software (services for example).
- System diagnostics can be viewed in the Operator Workplace. Status of local networks and nodes are displayed.

Topology Status has connection to both alarm & events and system messages.

Property Transfer

The Property Transfer function is mainly used to transfer data between OPC DA servers. It can also be used as a calculation function, not only reading data from aspect object properties, but also entering these data into a suitable algorithm, delivering the results to aspect object properties. The data collection as well as the data delivery can be done from/to any public aspect object property (including the aspect properties from aspects such as the General Properties aspect).

Supported Controllers

Controllers are integrated with the system through integration functions (connectivity packages), which are offered as options to the 800xA System. Integration functions provide access to real-time data, historical data, and alarm and event data from different types of ABB controllers, the AC 800M as well as former generations of ABB OCS controllers.

The integration functionality is based on the functionality supported and available in the controller. The general description of 800xA System describes the functions that are available when the system is used together with the AC 800M controller. Any divergences in integration functionality to the other supported controller families are described per OCS controller.

Integration for AC 800M is included in the DCS Base System and is described in 800xA for AC 800M on page 74. Integration for AC 800F, AC 870P, and former generations of ABB controllers can be purchased as options. For a description, refer to the documents shown in the Terminology on page 28, and for an overview to the Integration of ABB OCS Controllers on page 77.

The system provides access to real-time data transparent to the application, that is, regardless of the integration package through which the data is accessed. The OPC attributes are automatically grouped together as object information used by the applications. Alarm and event information and historical data are supported in similar ways.

An integration function is a bundle of all the components that are needed to support the integration of a certain type of controller.

Please note that even though controller integration functions may be based on OPC servers in their implementation, access to controller data shall always be made via the system OPC interface. Access directly via the integration OPC server interface represents a security risk and will be prevented by the system.

800xA for AC 800M

The AC 800M controller is integrated into the system using the 800xA for AC 800M, which provides data and event access for the operator, Batch and Historian functions, or any other function that need access to data in the controller.

The 800xA for AC 800M consists of:

- The Aspect System for the AC 800M, which is the part used for integration. The AC 800M controller is connected to the 800xA System.

  The Aspect System is a representation of AC 800M Control Software and AC 800M controllers. It contains a number of control aspects which represent objects in the Control Builder. Some control aspects represent objects that can be downloaded to controllers, and have properties that can be subscribed to using OPC. Control aspects are used both during engineering and during runtime operation.

- Standard Object Type Library for AC 800M.

  A number of graphic aspects, such as display elements, faceplates and dialogs are available for use in the 800xA workplace. The Graphics Object Type Library can only be used by AC 800M. Display elements are displayed on the screen as part of the process view, where operators can click them to access the underlying faceplates.

- Tool Routing Service for AC 800M.

Tool Routing enables the access to field devices from a workplace by using a DTM (Device Type Manager). DTMs allows you to make use of the additional information from intelligent field devices efficiently in the 800xA System, such as operation, monitoring, maintenance, diagnosis, engineering and asset management. Refer to Figure 8. Preconfigured field device objects are included with the Device Integration packages, described in Section 7, Device Management.

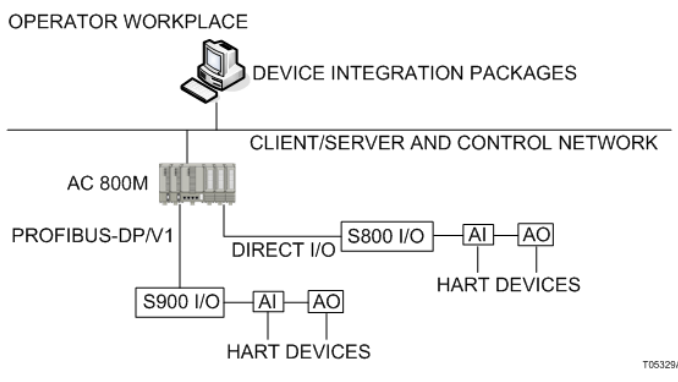


Figure 8. Example of tool routing via AC 800M

- OPC Server for AC 800M - The OPC server provides access to controller runtime data, making it possible for the 800xA System to access data for presentation.
- Time Adapter for AC 800M - The Time Adapter detects time settings on the control network and sets the time for the Base System.

Figure 9 illustrates the AC 800M integration.

PLC Connect

PLC Connect provides an integration of PLC controllers into the 800xA System. This function makes it possible to access PLC based control functionality in a similar fashion to other integrated DCS-controllers.

PLC Connect acts as an integrated controller integration towards System 800xA. As a result, integration into the Industrial IT concept is achieved. PLC Connect thus

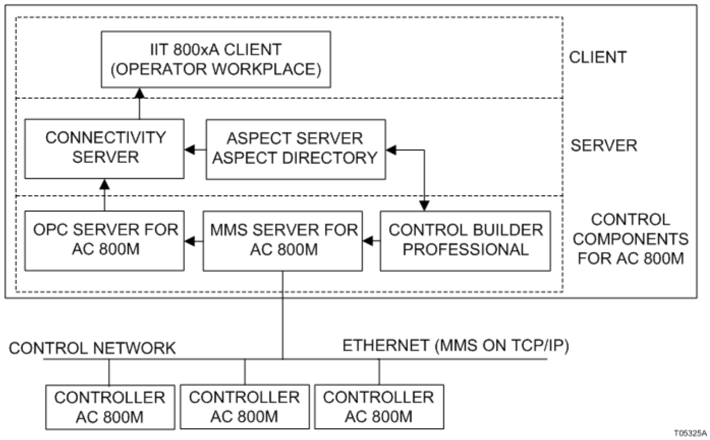


Figure 9. AC 800M Integration and Operator Workplace

makes it possible to configure the 800xA System as a hybrid DCS/PLC system or as a stand-alone PLC system.

ABB controllers that do not have a dedicated integration option available, are integrated into the System 800xA by means of PLC Connect.

PLC Connect adds traditional PLC type functionality as an integrated part of the Industrial IT concept. This means that traditional system capabilities, typically requiring a large number of process I/Os to be connected through a range of controllers from different manufacturers, can be realized with an System 800xA.

PLC Connect provides the following features:

- Basic object types for PLC type signals and softpoint signals.
- Configuration tools for creating and editing PLC type objects.
- A full set of faceplates for the PLC type objects.
- Integrated RTDB (Real Time DataBase) to keep an updated image of connected process points as well as calculated softpoints.
- Communication drivers.
- Dial Manager for remote communication.

- Alarms detection and OPC Alarms and Events generation for PLC binary signals.
- Alarm limit detection and OPC Alarms and Events generation for PLC integer and real signals.
- Open interface to PLC signals and softpoints from application programs in VB and C++.

PLC Connect is typically used in the following cases:

- For integration of AC800M/C Industrial IT Baseline 2 controllers when full DCS controller integration is not required.
- For integration of third party controllers and PLCs.
- When remote connection of PLCs and RTUs is required.

Refer to Section 11, PLC Connect for more information.

Integration of ABB OCS Controllers

The 800xA System supports integration for the following optional controllers:

- Advant Master AC 100 Series: Advant Fieldbus 100 based controllers AC70, AC110, and AC160
- Advant Master AC 400: MasterBus 300 based controllers MP200/1, AC410, and AC450
- Advant Master Safeguard 400 Series
- Symphony DCI System Six
- Symphony Harmony/INFI 90
- Symphony Melody, and AC 870P
- Freelance
- Advant MOD 300

These integration packages are described in separate appendices to this document.

Hardware, such as a communication board, is normally handled separately from the integration package option.

An integration package may limit the general specification of the 800xA System, such as limitation in system size, number of clients or servers, etc.

800xA for Advant Master

800xA for Advant Master provides integration of MasterBus 300 based controller node types MasterPiece 200/1 and Advant Controller 400 Series with Master software into System 800xA.

Integration of these controllers into System 800xA requires an OCS Integration Package, 800xA for Advant Master. This package typically provide access to real-time data, historical data, as well as alarm and event data, providing a high integration level with the OCS controller, transparent to the application.

Refer to Appendix B, 800xA for Advant Master for more information.

800xA for Symphony Plus Harmony

800xA for Symphony Plus Harmony is the integration of the Harmony/INFI90 system into System 800xA. It supports full integration with other technology products such as Information Management and Asset Optimization along with leveraging the Aspect technology available in the System 800xA environment.

800xA for Symphony Plus Harmony uses standard software and hardware interfaces to provide a connection into the Harmony system for view and control as well as redundancy and flexible installation options and high tag count support.

800xA for Symphony Plus Harmony may be deployed in parallel with existing Harmony system installations. Phased introductions of 800xA for Symphony Plus Harmony to existing customers will allow the customer to begin leveraging benefits immediately. The phased approach should be considered equally to a complete replacement of the current OCS HMI installation.

800xA for Symphony Plus Harmony provides installed Harmony/INFI90 systems the continued evolution of technology while retaining their current control philosophy. Refer to Appendix F, 800xA for Symphony Plus Harmony for more information.

800xA for Melody and AC 870P

800xA for Melody is the integration of the Melody controllers into System 800xA. This integration package also support the AC 870P controller.

800xA for Melody provides the following services:

- Object types for all Melody process objects.
- Configuration tools for editing the Melody process objects.
- Support for system status display monitoring.

800xA for Melody supports server and network redundancy. Full sets of faceplates are available for Melody process objects.

800xA for Melody includes system coupling modules, network components, servers, coupling modules and Operator Workstations.

800xA for Melody leverages the full power of aspect technology in an integrated System 800xA environment. Refer to Appendix G, 800xA for Melody for more information.

800xA for Freelance

The connectivity software 800xA for Freelance and standard OPC® provide integration between System 800xA and the control environment established with Freelance controllers. It enables Freelance installations to easily and efficiently draw benefits from the information integration delivered by the 800xA System.

Using interactive process graphics, the operator can monitor and control analog loops and digital devices interfaced to the network via Freelance AC 800F controllers. Furthermore it also serves maintenance personnel with the capability to globally monitor the operating status of the process and associated devices. Data from the controllers can be logged by the 800xA History and Information Management functions. Refer to Figure 10.

Upload of engineering data to System 800xA, and communication via standard OPC interfaces are the major features. A brief summary is:

- Provides object types for most Freelance function blocks and variables.
- Supports User defined Function Blocks (UFB) and structured variables.
- Various aspects for object types like faceplate, alarm list, event list, control connection and other.
- Faceplates for continuous control, drive control etc. are available by default.
- SFC Viewer for visualizing transitions, actions and steps in combination with a sequence control SFC function block.

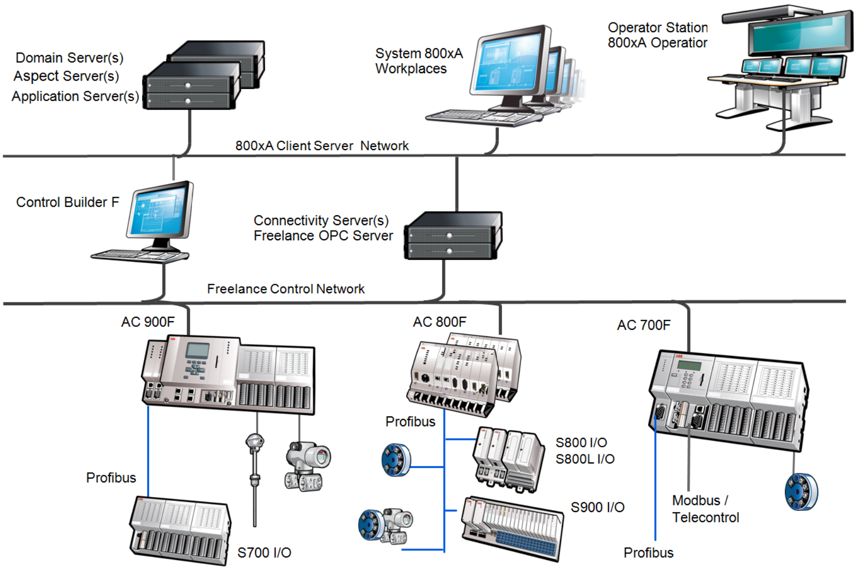


Figure 10. Example Freelance System with 800xA for Freelance

- Data access to process data and hand-over of alarms/events via OPC.
- Establishes an object tree within the control structure and functional structure.
- Arrangement of multiple OPC servers for redundancy and load sharing.
- Creation and grouping of plant areas in the functional structure.
- Enables fast delta upload and synchronize mode.
- Co-existence of Connect Services - 800xA for AC 800M, 800xA for Melody, and 800xA for Freelance connect services are allowed to co-exist simultaneously in the same 800xA system. Dedicated Connectivity Server are mandatory.
- The Connectivity software package provides a default set of faceplates with System 800xA look and feel.

Additional engineering effort and software may be needed in order to support Functional Areas other than 800xA Operations. Such areas are for instance Batch Management, Asset Optimization and Information Management.

When 800xA for Freelance is applied to a project, the project needs to contact Product Management for detailed discussion on functionality and applicability for the actual case.

Refer to [3] in Table 1 on page 30 and Appendix H, 800xA for Freelance for more information.

800xA for Safeguard

800xA for Safeguard is the integration of the Safeguard into the Industrial 800xA System.

Safeguard 400 Series controllers are based on Advant Master technology and provide most of the functionality found in AC 400 Series of controllers.

The 800xA for Safeguard is built on top of the 800xA for Advant Master and includes functionality that enables direct access to Safeguard controllers as well as Safeguard specific workplace features. Refer to Appendix C, 800xA for Safeguard for more information.

800xA for AC 100

800xA for AC 100 provides integration of Advant Fieldbus 100 based controller node types in Advant Controller 100 Series into System 800xA.

800xA for AC 100 provides predefined graphic elements, object displays, and faceplates for all the AC 100 Series controllers' standard process objects.

Refer to Appendix A, 800xA for AC 100 for more information.

800xA for MOD 300

800xA for MOD 300 is the integration of the MOD 300 into System 800xA.

800xA for MOD 300 uses the Operator Workplace for direct and fast access to MOD 300 specific functions. These functions include: preconfigured displays for monitoring and control of the MOD 300 system using familiar CCF, TCL, TLL and system displays and faceplates.

800xA for MOD 300 enables MOD 300 installations to easily and efficiently draw benefits from the information integration delivered by the 800xA System.

The following major functions are supported by the operator interface:

- Values of parameters from loops are displayed in numerical and graphic form.
- Operators can change certain parameter values such as setpoints, outputs, setpoint modes, output modes, and device commands from the console.
- Display and acknowledgment of alarm conditions.
- Operators can change (tune) some aspects of the configuration while the system is operating.

For more information Refer to Appendix E, 800xA for MOD 300 for more information.

800xA for DCI

800xA for DCI is the integration of the DCI system to the System 800xA. It supports full integration with other products such as Information Management, Asset Optimization, etc.

800xA for DCI is an integrated option using the standard software interfaces GDA (Global Database Access) and standard hardware interfaces ECCP (Ethernet Communications Controller for the PCI bus) and standard off-the-shelf Ethernet NICs (Network Interface Card) to provide a connection for viewing and operation of the DCI system. The initial release of 800xA for DCI is targeted primarily at expansions of current systems where hardware obsolescence and Limited Phase announcements have prompted a console replacement plan. It is targeted at phased introductions, to allow existing users to begin to make use of the 800xA System components and smaller scale systems. A maximum tag count is specified for up to four redundant pair of Connectivity Servers.

The set of 800xA for DCI features and functions are listed below:

- DCI tag types:
  - Aspect object definitions for all Controlware II object types.

- Faceplates for most Controlware II object types.
- Point displays (as extended faceplates).
- DCI-specific aspects (DCU (Distributed Control Unit) Status and Control, DCI System Status, DCI Alarm Review, DCI Event Review, and DCI Message Review).

- DCI Tag Importer - utility for uploading tag data from Composer CTK (Configuration Tool Kit) export file. Composer CTK version 5.1 or later is required for generating the tag data.
- DCI Export to 800xA - Composer CTK (*.xml) based file types.

System Options

The following system options are available:

- 800xA for IEC 61850.
- 800xA OPC Client Connection.
- Access Control.
- Archive.
- Audit Trail (Security Events and Configuration Changes).
- Authorization (User Re-authentication & Double Authentication).
- Calculation Engine.
- Electronic Signature (Digital Signature).
- FDA 21 CFR Part 11 Support.
- OLE-DB Real Time Data Client Connection.
- SMS and e-mail Messaging.
- Multi Core Support.
- Point of Control.
- Snapshot Reports.
- CAD Viewer License.
- 800xA for Industrial Defender.
- Whitelisting SE46.

800xA for IEC 61850

IEC 61850 connect package allows vertical integration of substation power applications into 800xA System using IEC 61850 network with Data Access, Alarm and Event handling. The solution is based on the Standard Connectivity functionality in 800xA where the subsystems are integrated to the 800xA system using the OPC Servers (Data Access and Alarm and Event). The IEC 61850 Connect uses the IEC 61850 OPC Server.

For more information about the IEC 61850 Connect, refer to *System 800xA IEC 61850, Configuration (9ARD171387*)*.

800xA OPC Client Connection

The 800xA OPC Client Connection is intended for use with third party clients.

All runtime data, and some configuration data in the system is available for other clients via OPC. The 800xA System acts as an OPC-server for OPC-DA (1.0, 2.0), OPC-HDA (1.20), and OPC-AE (1.1). Several OPC-clients can be connected simultaneously to the system to exchange data.

Access Control

Access to the 800xA System is controlled by the Base System's security function. Refer to Security on page 61.

Archive

Archiving is essential to ensure retrieval during the records retention period. Refer to Section 9, Information Management - Information Manager for additional information about archiving production record data.

Audit Trail (Security Events and Configuration Changes)

The system supports logging of security events, configuration changes, and operator actions to the process (included in base system). Refer to Figure 11.

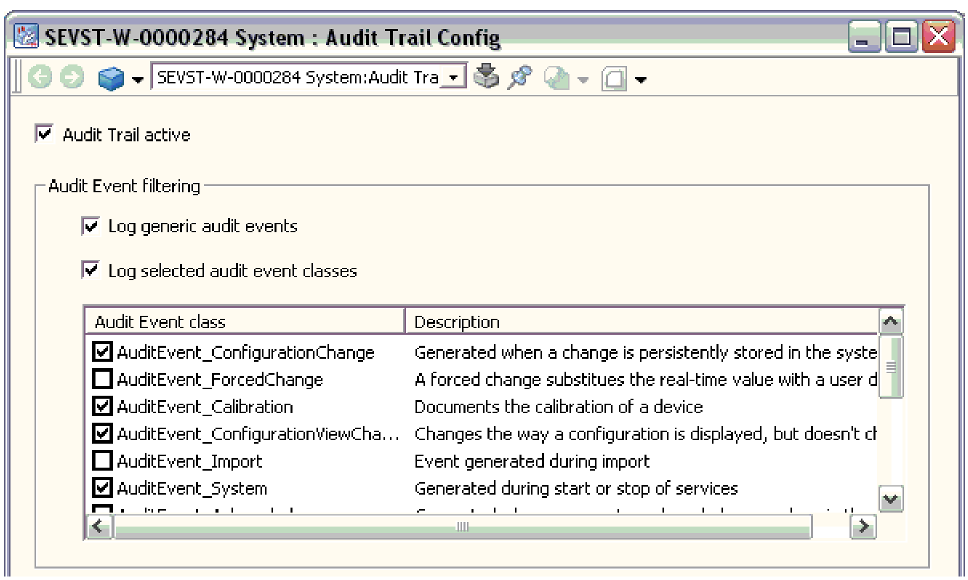


Figure 11. Audit Trail Configuration Window

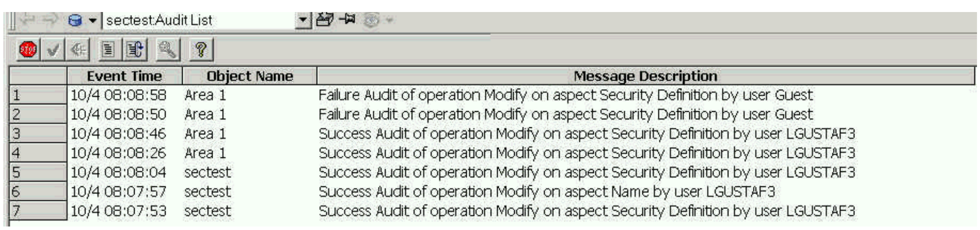
The audit logs can be viewed in the alarm and event list. This makes it possible to see the effect of an operation.

The audit log contains the following information:
- Date and time for the operation.
- Node from which the operation was performed.
- User name of the individual performing the operation.
- Type of operation.
- Object, property or aspect affected by the operation.
- Additional information from the involved aspect system.

The audit log is protected against modifications if the Aspect Servers via Windows login are configured with access restrictions.

As a complement to the audit logging available in the Windows system, the security and access control system in the 800xA System allows audit of more process control-specific activities.

The audit event list is user configurable to either show more information, or to filter out specific events from the complete event list. Refer to Figure 12.



	Event Time	Object Name	Message Description
1	10/4 08:08:58	Area 1	Failure Audit of operation Modify on aspect Security Definition by user Guest
2	10/4 08:08:50	Area 1	Failure Audit of operation Modify on aspect Security Definition by user Guest
3	10/4 08:08:46	Area 1	Success Audit of operation Modify on aspect Security Definition by user LGUSTAF3
4	10/4 08:08:26	Area 1	Success Audit of operation Modify on aspect Security Definition by user LGUSTAF3
5	10/4 08:08:04	sectest	Success Audit of operation Modify on aspect Security Definition by user LGUSTAF3
6	10/4 08:07:57	sectest	Success Audit of operation Modify on aspect Name by user LGUSTAF3
7	10/4 08:07:53	sectest	Success Audit of operation Modify on aspect Security Definition by user LGUSTAF3

Figure 12. Audit List

The audit list is stored on disc and the size of the storage is configurable.

Authorization (User Re-authentication & Double Authentication)

Re-authentication can be optionally used for critical operations such as writes to the control system, batch operations, and configuration changes in order to ensure that only authorized persons can take actions in the 800xA System. This option forces the user to re-enter his user credentials before the operation is executed. A double authentication may also be optionally used. In this case an additional person who has the respective secondary authentication authority has to give username and password in order to approve the operation.

User Re-authentication and Double Authentication together with User Log-over is an option called Advanced Access Control. Also refer to the user log-over information within Security on page 61.

Calculation Engine

Calculations can be performed on any object or value in the system and are supported by Windows Visual Basic scripting language. The calculation services application is an Aspect System and is included as an option to the base. The Calculations Services provide the ability to run mathematical calculations on any available 800xA aspect property or attribute. This includes a special set of aspect objects called Softpoints (refer to SoftPoint Server on page 87). Calculations may also be applied to system object types. This allows configuration reuse of calculations. Calculation operations can be triggered by changes to system point values, or can be scheduled to execute either cyclically or at a given date and time. The ability to write a timestamp to a Softpoint or a log is provided to align calculations along with the inputs so they have the same timestamp for retrieval. A calculation aspect may be applied to any aspect object such as a unit, vessel, pump, or softpoint. Inputs can be any aspect object property, and outputs can be any changeable point in the system. Data quality and alarm generation are supported. Calculation logic is written in VBScript. A Calculation Service Provider can exist in one or two Calculation Service Groups (single or dual configuration) or two providers can exist in one group (redundant configuration).

SoftPoint Server

SoftPoint services allow you to create and configure user defined object types, and deploy them like any other object in the base system. A softpoint is different from other system points because it is not directly connected to hardware system I/O. Softpoints execute on an application or Connectivity Server. Once configured, the softpoints is managed and accessed just as any other point in the system. Softpoint values may be stored in system history and displayed for operations. Reporting functions (such as Excel and Crystal Reports) may access softpoints for presentation in reports. In addition, softpoints can be displayed on Desktop Trends. Softpoint alarms can be configured and are directly integrated with minimum/maximum, limits and a unit descriptor. Data types supported are: Boolean, integer (32-bit), single precision floating point (32-Bit) and string. Also, double precision floating point (64-bit) is supported as an extended data type.

The Softpoints Service can be configured as a redundant service, however if the Softpoints Service is to be executed on the Information Manager, the other Information Manager history services should not be configured as redundant services.

Softpoint redundancy is supported on an Information Manager Server pair. This does not mean that the Information Manager server will be installed as redundant, but that Softpoints can be configured as redundant. When installed on a redundant connectivity server it should follow the rules as established in the connectivity for configuration.

For maximum efficiency between calculations and Softpoints, locate the Calculation Server on the same machine as the primary Softpoint Server.

Report Services

Reporting capabilities include the ability to schedule reports to execute cyclically, at specified times (e.g. the last Friday of the month), at a single time, and on event. Support for tools such as Excel and Crystal Reports is provided. In addition to reports, the integrated scheduler can be used to schedule other system operations.

Report scheduling capabilities include:

- Cyclic, event, and time based scheduling.
- Handling of finished reports, including e-mail, saving to file (and managing a number of instances of that report), saving to history, and printing.

Display to view status of reports scheduled.

Electronic Signature (Digital Signature)

Electronic signatures are supported as a Digital signature for all aspects of objects. A digital signature is generated and linked to an aspect. User verification via electronic method is performed by using Windows user ID and password in combination with a selected reason for signature and an optional comment.

FDA 21 CFR Part 11 Support

The US FDA (Food and Drug Administration) issued 21 CFR Part 11 in response to the pharmaceutical industry's request to utilize paperless record systems under the current GMP (Good Manufacturing Practice) regulations in parts 210 and 211 (21 CFR parts 210 and 211). Part 11 went into effect on August 20, 1997. The regulation does not require a manufacturer to maintain records electronically. However, it does provide the criteria under which the FDA will consider electronic records to be equivalent to paper records.

The support of compliance to 21 CFR Part 11 is an absolute, non-negotiable requirement for automation products sold into manufacturing environments subject to FDA regulation. This is primarily a concern for manufacturers in the life science industry, but can also include food, beverage, and cosmetics manufacturers as well. Also, some chemical and other manufactures who supply materials to the life science industry are required to comply with this regulation.

The requirements for 800xA System to enable compliance have been categorized in Table 5. Several requirements identified in 21 CFR Part 11 require the system owner to comply by having appropriate SOPs (Standard Operating Procedures) in place. Not all of the required SOPs are included with System 800xA product offering. However ABB engineering services for validation can provide assistance in creating the appropriate documentation on a project basis. The primary sections from Part 11 are listed below.

Subpart B – Electronic Records

Sec 11.10 – Controls for closed systems

Sec 11.30 – Controls for open systems

Sec 11.50 – Signature manifestations

Sec 11.70 – Signature/record linking

Subpart C – Electronic Signatures

Sec 11.100 – General requirements

Sec 11.200 – Electronic signature components and controls

Sec 11.300 – Controls for identification codes/passwords

Table 5. Feature Categories

Feature Category	Section References from 21 CFR Part 11 Regulation
Authorization	SubPart B, Sec 11.10: (g)
Access Control	SubPart B, Sec 11.10: (d)
Electronic Signature	SubPart B, Sec 11.50: (a) Subpart B, Sec 11.70 Subpart C, Sec 11.100: (a) Subpart C, Sec 11.200: (a),(1), (i), (ii), (3) Subpart C, Sec 11.300: (a), (b), (d)
Versioning	SubPart B, Sec 11.10: (a), (e)
Audit Trail	SubPart B, Sec 11.10: (a), (e) SubPart B, Sec 11.50: (a), (b)
Archive	SubPart B, Sec 11.10: (b), (c) SubPart B, Sec 11.50: (b)
System Checks	SubPart B, Sec 11.10: (f), (h)

OLE-DB Real Time Data Client Connection

External systems using OLE-DB queries can read DA and HDA (History Data Access) data handled by the OPC-DA and OPC-HDA servers. The clients making the queries must have the 800xA System installed. The OLE-DB Real Time Data Client Connection is a read-only provider, as data writing is not supported.

SMS and e-mail Messaging

SMS and e-mail Messaging provides a method for sending messages based on alarm and event information to user devices such as mobile telephones, e-mail accounts, and pagers. It is possible to control sending messages by configuring a message schedule for each user. The message schedule allows one active paging time interval for each day of the week.

Figure 13 shows and Table 6 lists the three methods SMS and e-mail Messaging employs to notify users of alarm and event information. The table also lists the devices that are compatible with each notification method, and which devices, using the SMS/GSM notification method, allow the user to confirm receipt of the message back to the 800xA System.

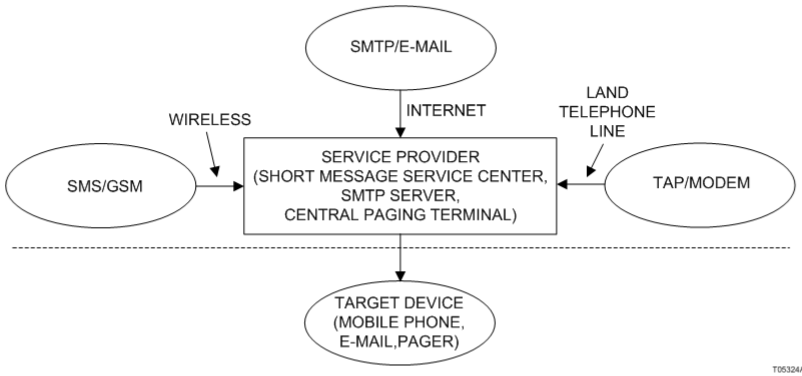


Figure 13. SMS and e-mail Messaging Notification Methods

Table 6. Notification Methods

Device[1]	**Notification Method**		
	SMTP/ E-mail	**TAP/ Modem**	**SMS/GSM**
Numeric Pager	—	—	—
Alphanumeric Pager	Notify	Notify	Notify
2-Way Pager - Fixed Reply	Notify	Notify	Notify
2-Way Pager - User Entered Reply	Notify	Notify	Notify/Confirm Receipt
2-Way GSM Pager	Notify	Notify	Notify/Confirm Receipt
Text Messaging Enabled Telephone	Notify	Notify	Notify/Confirm Receipt
Wireless Equipped PDA	Notify	Notify	Notify/Confirm Receipt
E-mail	Notify		Notify/Confirm Receipt

NOTE: 1. This table lists the capabilities of SMS and e-mail Messaging. The selected hardware and/or service provider may impose other limiting factors.

The notification methods work as follows:

- SMS (Short Message Service)/GSM (Global System for Mobile Communication) - is used to send messages based on alarm and event information to the GSM service provider's SMSC (SMS Center) over a wireless network. The SMSC sends the message to compatible devices of users configured to receive them. This method allows users of the compatible devices to confirm receipt of the message.
- SMTP (Simple Mail Transfer Protocol)/E-mail - is used to send messages based on alarm and event information to an SMTP server over the Internet. The SMTP server sends the message to e-mail accounts, or to compatible devices via e-mail accounts, of users configured to receive them.
- TAP (Telocator Alphanumeric Protocol)/Modem - is used to send messages based on alarm and event information to the pager service provider's CPT (Central Paging Terminal) over a land telephone land line. The CPT sends the message to compatible devices of users configured to receive them.

Multi Core Support

Enables the possibility to run 800xA on servers with more than 4 cores. Scaled on max numbers of cores in any server. Scaled in steps of 4 cores.

Point of Control

Collaboration based transfer of plant operation responsibility between locations and users.

Snapshot Reports

Makes it possible to create aspects that automatically executes a query and produces a report consisting of properties of objects in the system.

CAD Viewer License

View CAD drawings in DXF and DWG formats stored in aspects.

800xA for Industrial Defender

Industrial Defender monitoring is updated with 800xA security events.

Whitelisting SE46

Whitelisting SE46 provides advanced threat protection, through checks of executing software on clients and servers.

Life Cycle Services

This topic describes the life cycle services for 800xA 6.0.

System Upgrade

Refer to [29] in Table 1, for information on supported upgrade paths.

Support for upgrade to version 6.0 is subject to later release, and will be announced separately. At that time the reference given above will be updated too.

Offline upgrade, as well as online upgrade (i.e. upgrade controllers, workstations and servers while still controlling the plant) will be supported in a similar way as upgrades to version 5.1, however more efficiently and with less manual steps.

Rollups and revisions will be possible to install efficiently from a central location.

Contact Product Management when in doubt about upgrade and when the support becomes available.

Life Cycle Policy

The software for a system version is actively maintained as long as the system version is actively sold - the version is in an active phase. When a new version is released, the previous version is still supported for a number of years. This means critical errors will be corrected, revisions may be planned, and Microsoft security updates will be verified.

Each system version is explicitly ordered from its related price list. Price lists for older system versions are withdrawn a certain period of time after the release of the succeeding version. Older system versions can be delivered on request to the PA regional sales in Sweden, USA, or Germany.

ABB's control systems are designed for continuous evolution. It is ABB's goal to protect our customers' intellectual investment (i.e. application software) beyond the life cycles of the underlying platform products (i.e. hardware and software). ABB will not Remove from Active Sale any product or family of products until an equivalent replacement to those products is available. Once a product has been removed from active sale, ABB will continue to support the product for at least 10 years, although exceptions to this may occur if components or technologies needed are no longer available to ABB.

Within this support period ABB will announce a Last Buy opportunity at least 12 months prior to the end of manufacturing (except in cases where there is a direct form, fit and function replacement). It is ABB's intention to provide support for as long as there is significant customer needs after the “Manufacturing End” through field service, repair and by making replacement spares (new or refurbished modules) available.

For details contact the regional sales representative.

Section 4 Operations

The Operator Workplace is the 800xA System's operator interface. The key functions provided as part of the Operator Workplace are as follows:

- Presentation of process graphics.
- Execution of process faceplates.
- Presentation of trends.
- Presentation of alarms.

There are three types of Operator Workplace clients. They are:

- Operator Workplace - Client.
- Large Operator Workplace - Client.
- Operator Workplace - Remote Client.

A large operator workplace contains all the functionality of the operator workplace plus additional windows and more usable functionality. Initially workplaces with more than two windows and workplaces combine several windows into one large workplace window area as part of the large operator workplace functionality. A remote client enables access to System 800xA from a standard workstation without installing any specific ABB software.

Refer to [5] in Table 1 on page 30 for detailed information about the available workplace configurations and the licenses required.

This section also describes Multisystem Integration, which provides the ability to supervise and operate several 800xA Systems from one central location.

Operator Workplace - Client

The Operator Workplace provides efficient control and supervision of different kinds of processes in integrated systems.

The Operator Workplace uses client/server capabilities allowing both client and server applications to run in one workstation for a small configuration, or for larger configurations where server and client applications run in separate workstations. Functional overview:

- Graphic displays.
- Faceplates for process objects.
- Alarm and event management and presentation.
- Trend data, including trend presentation.
- Reports - Excel based reporting (scheduled and on demand).
- System Status Viewer.
- Topology Status Viewer.
- Sequential Function Chart (SFC) Viewer.

The Operator Workplace provides a number of configurable options which allow you to tailor the workplace to your needs. These configurable options are available for all users, such as, senior or junior operators, engineers, maintenance technicians, managers, supervisors, and system administrators.

Layout options

The workplace is subdivided into three main areas (Figure 14):

- An application bar area.
- A graphic display area.
- A status area.

The application bar area, located at the top of the screen, is divided into two parts – a fixed display part and a tools collection part. Both parts are fully configurable. Examples of information in the fixed display part are alarm group bar, alarm list, clock, company logo (any bitmap image), and user login name.

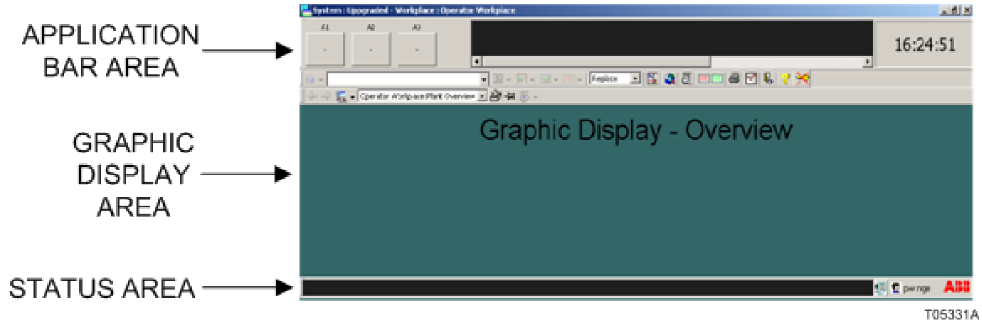


Figure 14. Operator Workplace Layout

Examples of information in the tools collection part are shortcuts to alarm and event lists, shortcuts to display graphics, help, silence external alarm, user favorites.

The graphic display area, located between the application bar and status areas, displays aspects. The aspects available for selection are determined by the user role and user security defined for the user currently logged onto the workstation. Depending on the Aspect View Class setting, it can be displayed to fully occupy the area or it can be displayed as an overlap in front of the graphic display area. User roles can be configured in such a way as to disallow one class of users from moving an overlap in front of the application bar or status area (for example an operator) while allowing others users (for example an engineer).

The status area, located at the bottom of the screen, is configurable and may include the following information:

- User login name.
- Operator message line.
- Operator link message line.
- Alarm list.
- Event list.
- Clock.

Figure 14 presents a workplace on one monitor. For information about the Multiple Monitor concept, refer to Large Operator Workplace - Client on page 110.

It is possible to divide the display area into four smaller areas, where each area can hold an individual display, so as to get a better overview of a process. You can maximize the content of each small area to cover the whole display area, and also minimize it back to the original quarter area. Refer to Figure 15.

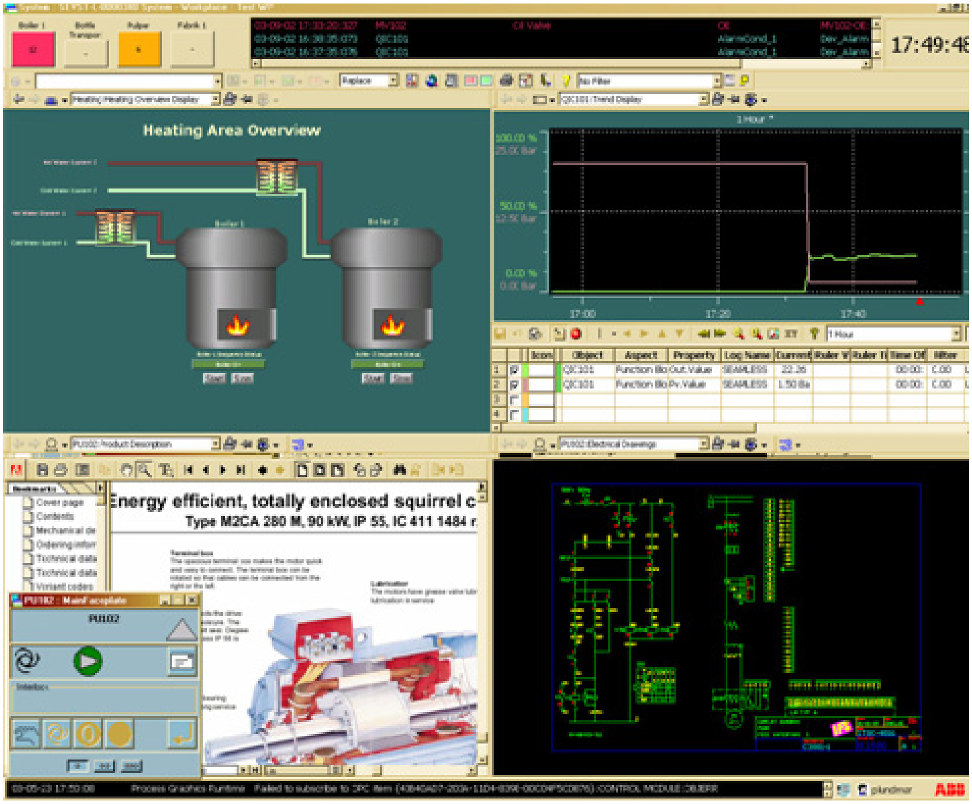


Figure 15. Operator Workplace Quad Display Layout

Faceplates

Faceplates are designed mainly for operators to monitor and control a process. Each object can have up to three different sized faceplates, depending on the needs of the object and the user (refer to Figure 16).

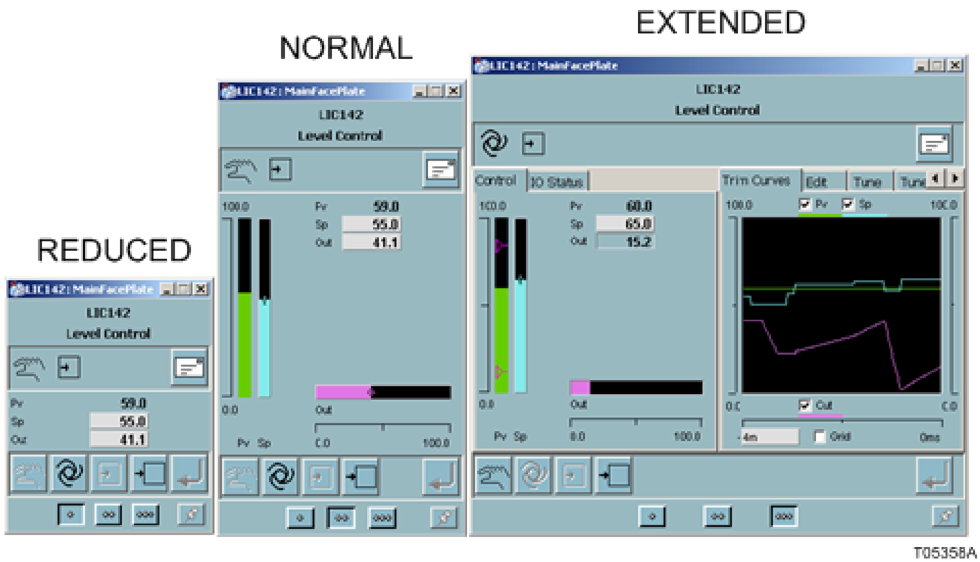


Figure 16. Faceplates

The Operator Workplace provides a flexible faceplate framework, making the creation and the customization of the product-supplied faceplates straightforward and intuitive. The faceplate framework is composed of five main areas, which are explained below.

At the top of the faceplate is the Header area. This includes the object name and description, as well as alarm state indication, acknowledgement button, and object in-use (or locked) indication.

Below the header area is the Status area. This includes object state indication (for example manual mode) and link buttons to other aspects (for example operator note).

At the bottom of the faceplate are the size selection buttons for reduced, normal, and expanded faceplate sizes. Above the faceplate size selection buttons, is the control button area. You can configure the status and button areas through fill-in-the blanks configuration, which provides the ability to link in button and status indicators.

Between the status and button area is a Faceplate Element Area. This is a free-form graphic that is configured in the same way as any process graphic.

You can view the online help for a faceplate by first selecting it and then pressing **F1.**

If a new faceplate is selected while another faceplate is being displayed, the selected faceplate replaces the first faceplate. However the user can configure the Operator Workplace to display several faceplates at the same time. Depending on the user's configuration, either of the following is possible:

- All selected faceplates are displayed separately. Each faceplate needs to be removed separately too. The maximum number of simultaneous faceplates is configurable and the default number is five. When the maximum number is exceeded, newer faceplates are replace older ones.
- Each faceplate contains a pin-button in the lower right corner. Pressing the pin-button will keep the faceplate pinned to the screen. If a faceplate is not pinned, it is replaced by the next faceplate selected.

Display Call-up

The Operator Workplace supports the ability to provide different aspect view behaviors depending on the type of aspect view being displayed.

The following aspect view behaviors are available:
- Initial call-up at cursor.
- Initial call-up at an offset relative to the cursor.
- Initial call-up at a pre-defined X-Y coordinate.
- Offset relative to previously called up window.
- Stacking Order to determine which displays are in front of other displays.
- Height and Width of a screen on initial call-up.
- Whether the screen size is fixed or not.
- Whether the screen can be pinned to prevent a user from closing it accidentally.
- Dedicated screen areas for alarm management functions (event/alarm bars).
- Dedicated screen areas for menus and tool bars.
- Pre-assigned direct access to user, object, and system related actions.
- Number of views/windows per workspace.

Users can also control the screen behavior to preserve a display, such that a new display call-up overlaps the existing one (thereby preserving the existing display), or to replace a display, such that a new display call-up replaces the existing one.

Navigation

The Operator Workplace supports right-clicking on any object to view and select available actions or display call-ups from a context menu. For a given user, the context menu is the same, no matter where the object is displayed. The configuration of an object automatically defines the possible selections available in the context menu.

The context menu is filtered based on the user log-in. This means that configuration-related actions accessible to an engineer may not be accessible to an operator. The context menu also contains a reference list of other graphics or displays in which the same object is used, thereby allowing the user to quickly navigate to them. This reference list is provided automatically without requiring the user to do any manual mapping.

Within the tool collection of the application bar, a number of navigational buttons and pull down menus are available which provide quick access to displays and information. Object and Aspect history lists, as well as Back and Forward buttons allow an operator to view and recall past selections quickly. Selecting Objects and Aspects, automatically enables shortcut buttons using which associated displays can be brought up.

The Operator Workplace also allows accessing any other display, from the current display, within a maximum of two mouse clicks. To manage this the user can specify the displays to which quick access is needed, similar to how Favorites are added in Internet Explorer. The user can add displays to folders as favorites. The user can also add folders to help classify the displays by function, by area, or by the plant structures. The favorites are user specific and are displayed depending on the user logged in.

Hot Keys

The Operator Workplace allows the user to map key strokes (for example, the F4 key) or key stroke combinations (for example, Alt-F4) to actions available on a selected object. The user can thus use such Hot Keys for actions such as alarm acknowledgement or calling-up a process graphic. The Operator Workplace provides default mappings for important actions such as alarm acknowledgement.

The Hot Keys facility provides ease in using prepared configuration menus, setting up of global operations (independent of workplace, display, or selected object), and other object sensitive operations. Refer to [6] in Table 1 on page 30 for more information regarding the Hot Keys.

Alarm List

The Alarm List (Figure 17) displays all events matching the configured alarm filter. Either all or a subset, of an event's attributes, along with the current value for those objects, can be displayed.

The Alarm List allows flexible views. The user can adjust the sort order by double-clicking on the headers. The user can also adjust the layout by dragging and dropping columns to suit their requirements. Clicking on the reset button displays the default layout.

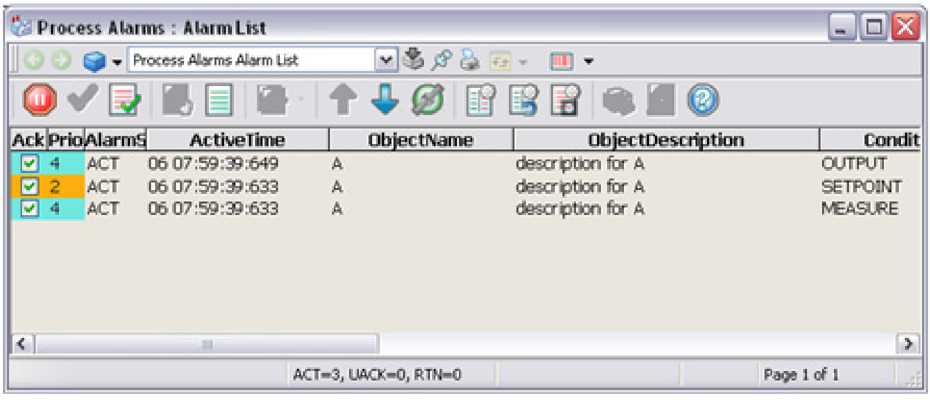


Figure 17. Alarm List Display

The user can acknowledge individual alarms, selected multiple alarms, or an entire page of alarms from the Alarm List. The run-time filter function enables the operator to filter the alarm list by any column using combined expressions.

In a graphic display, to acknowledge all the alarms for an aspect, users can click the **Acknowledge All Visible Alarms** icon on the display bar or right-click the graphic display and select **Acknowledge All Visible Alarms** from the context menu.

Alarm statuses for the alarm list such as number of active alarms, number of unacknowledged alarms etc. can be found at the bottom of the list.

The colors and blinking of alarms are configurable. It is also possible to define what columns to present, the time format, and the sorting order of the list.

The user can use the Hiding function to clear irrelevant alarms from the Alarm List. Irrelevant alarms are the ones which do not require an action from the operator. The user can thus choose to hide such alarms.

Alarm shelving allows the operators to temporarily remove standing or nuisance alarms from the main alarm list and places it on the shelve list.

Alarm Shelving is a license-protected function.

The users can use the Shelving function to shelve nuisance alarms for a specified time. A shelved alarm does not reappear on the main list until it is removed from the shelf. There are two modes available to shelve an alarm:

- Standard shelving - time limited shelving of an alarm and new occurrences (if any).
- One-shot shelving - indefinite shelving of the selected alarm occurrence. New alarms will appear in the alarm list.

Alarm Response Navigation

The Alarm Response Navigation feature allows the operator to navigate quickly through different aspects from an object. The following are the features of Alarm Response Navigation:

- Quick navigation to single or multiple aspects using the object context menu or through the Alarm and Event List.
- Configure only once to enable quick navigation for all types of objects, for an object, or object instance respectively.

Alarm Grouping

Alarm Grouping in the 800xA System allows grouping of several alarms that requires a similar response from the operator. It is recommended that the alarms to be grouped is to be in the same priority.

When an alarm group is configured:

- It reduces the number of individual alarm entries in the alarm list that are generated from a common cause in the system.
- The alarm list displays only the alarm group and not the individual alarm conditions. The alarm group is indicated separately in the alarm list.
- The individual alarm conditions are automatically acknowledged when the alarm group is acknowledged.

The group alarm will re-flash in the alarm list if the group alarm is acknowledged and a new alarm in the group becomes active.

Alarm Analysis

The Alarm Analysis function is an effective alarm management function that allows the operators to monitor the quality of the alarm system and help analyze problems in the alarm system.

The Alarm Analysis function is a license-protected function that is installed as part of the 800xA base system.

The key feature of the Alarm Analysis function is the easy and precise configuration. By pointing to an Alarm & Event list, the Alarm Analysis function calculates the KPIs accurately for this list without the need to setup complex and error-prone filter configurations. The graphic elements display the values of the KPIs provided by the Alarm Analysis functions.

Refer to [7] and [8] in Table 1 on page 30 for information about configuring and using the Alarm Analysis function.

Event List

The Event List display lists all events depending on the event filter configured. The Event List functionality is same as that of the Alarm List, except for the acknowledge feature.

Trend Display

Trend displays are one of the most important tools associated with operating and analyzing industrial processes. The Operator Workplace addresses this need by presenting the operator with an extensive set of trending features and functions.

The Trend Display (Figure 18) can present data seamlessly from both run-time and historical data. When a trend display for an object is selected, all available data for that object is shown. The user can move the time range back and forth. The user can also use the time-offset function to trace a signal in real time and compare it with previous values.

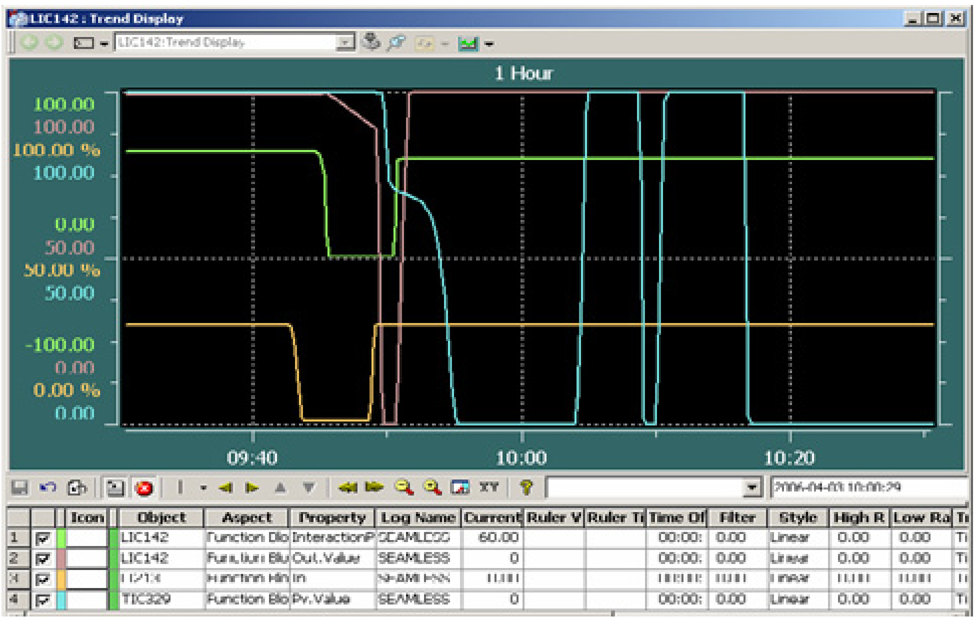


Figure 18. Trend Display

The Trend Display can hold a number of trend traces and the user can trend any attribute. Thus it is possible to trend both the value and the alarm limits for several objects in the same Trend Display. It is also possible to mark each trace in the trend display with a number and a color in order to easily distinguish between different traces. With a single click the user can hide or show traces and browse for new objects.

It is also possible to present trend relationship, between two values, in X/Y plots. The plot may be presented on a background display, like for example a JPEG picture. Two such displays can be dynamically selected. Various functionalities such as rulers, time zooming, magnifying glass etc. are also available.

Group Display

With the Group Display aspect it is possible to combine several faceplates in one display. The Group Display (Figure 19) is handled the same way as other aspect views regarding navigation etc.

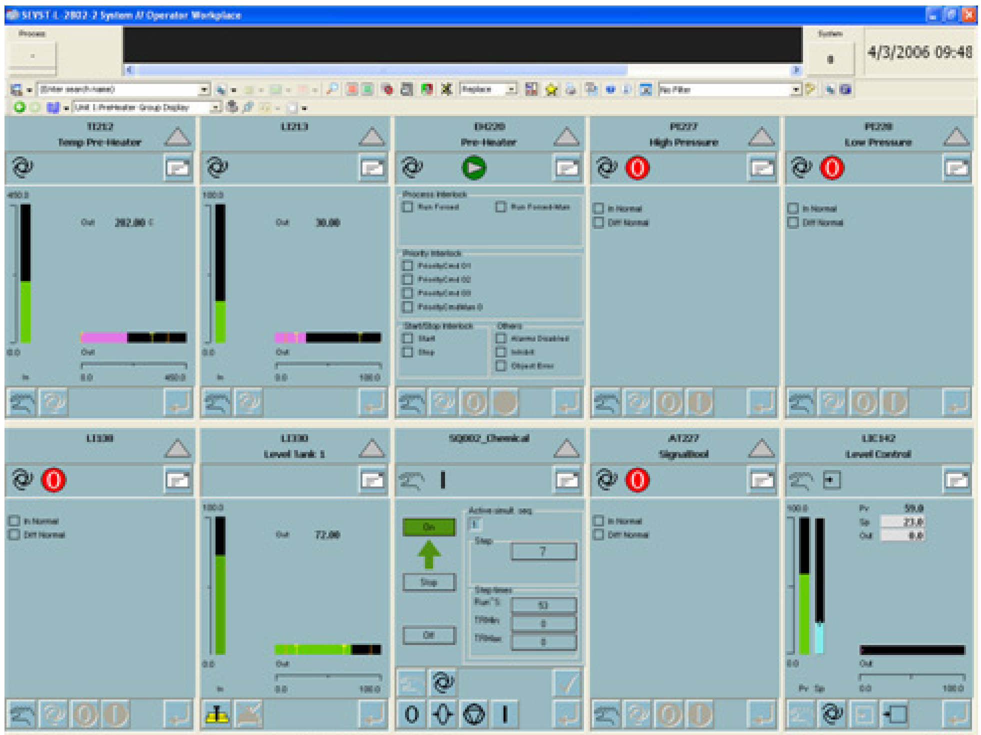


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Figure 19. Group Display Aspect - Main View

Log Over

The 800xA Security model is based on extensions to the Windows security model. The extensions make it possible to set permissions for users and user groups on an 800xA System, a structure or part of a structure, or an aspect object.

For example the ‘Operator’ permission provides only the rights necessary for the tasks of an operator, whereas an ‘Administrator’ permission gives full rights for all tasks.

The Log Over function enables a fast and temporary switch between users in a running workplace. For example if an operation requires a permission not held by an operator, then another user who holds the required permission, can log on to perform that operation. The Log Over functionality thus allows user role changes (thereby changing permissions) while maintaining all open windows with their current contents. This means that actions permitted in the open windows depend on the permissions of the logged over user.

Point of Control

Introduction

A plant structure is often divided into logical sections that can be operated individually by a set of designated users. In a distributed system, multiple users operating from different geographical locations can be responsible for different sections of the plant. In such situations, to avoid the risk of more than one user operating a section simultaneously, a strict security can be applied. Setting up a strict security can be challenging and a number of scenarios must be taken into consideration. The feature Point of Control is provided to simplify this process.

Point of Control is a concept that allows dividing the plant into sections. The Operator that is in control over a section is called the Responsible User. The Responsible User has security right granted that other users in the system lack for the same section. A typical scenario is that only the Responsible User will be able to control the process in this section.

Point of Control Features

The key features of the Point of Control functionality are:

- Improved System Security

  The Point of Control functionality enforces a strict security on the system to avoid the risk of many users operating a section at the same time.

- Transfer of responsibility between the users:
  - Request Responsibility
  - Grab Responsibility
  - Release Responsibility
- Alarm List Responsibility Filter

  Alarms can be filtered based on the current responsibility. The same filter will hide these alarms for other users.

- Audit Logging

  If audit is enabled for AuditEvent_OperatorAction, the responsibility transfer between different users and nodes will be logged.

- Point of Control Summary

  Displays an overview of the current status of each section.

- Security Report

  The Section Definition aspect and Security Definition aspect configurations are included in the Security Report.

- OPC Properties for Status

  The Point of Control status for a section is exposed as standard OPC properties. This makes it possible to create overview graphics that displays the Point of Control status for example, the currently responsible user for a section.

- Bulk Data Manager Support

  The Section Definition aspects supports configuration using the Bulk Data Manager.

Refer to [7] and [8] in Table 1 on page 30 for information about configuring and using the Point of Control functionality.

Sequential Function Chart (SFC) Viewer

The SFC Viewer is an aspect system that allows the Operator to display SFC structures with live data for active steps and transitions on Operator Workplaces. SFC is an IEC 61131-3 sequence control language.

The SFC Viewer is meant to be used on binary start-stop sequences. It is not recommended that it be used on advanced SFCs including complex analog expressions, calls to firmware functions and function blocks, etc.

The general SFC display is a network structure presentation of the sequence. The presentation is based on the IEC 61131-3 standards. Zoom levels to display further step-related information and detailed displays for transitions and actions are available (refer to Figure 20).

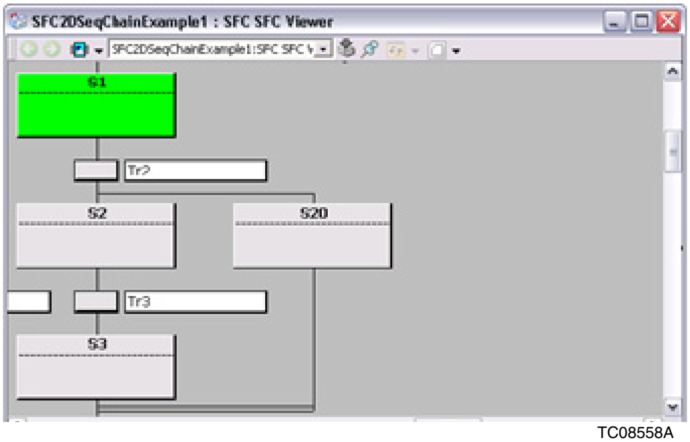

Figure 20. Structure Diagram

Complete identifiers for transitions and steps are shown in the detailed display. The display is updated automatically as the sequence continues to be processed. The currently active step always remains in the display. The transitions and steps are sensitive push buttons, which allow further detailed displays to be opened.

Jump labels are used wherever logical and graphical improvements to the clarity of a chain structure is required. The jump labels are set by the user in the SFC editor.

The transition display (Figure 21) shows the binary incoming stepping criteria for the selected transition. Depending on the status of the variable, criteria that are met are shown in green and those not met are shown in red. The transition display can be switched between a display from a function plan perspective and a display in list form.

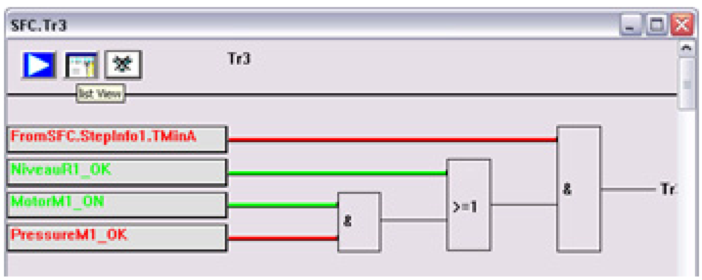

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Figure 21. Transition Display (Function Plan Perspective)

An Action display shows the command outputs for a step, or the use of an output signal, in list form. Up to eight branches and 16 transitions can work in parallel.

Large Operator Workplace - Client

Multiscreen Workplace

Using a workplace with up to two monitors is part of the Operator Workplace - Client. When using a workplace with three or four monitors, the Large Operator Workplace - Client is used.

Multiscreen workplace gives the user the possibility to attach often used displays, such as a plant alarm list, and a trend display to specific monitors, while using the other monitors as their main interface for changing displays. Using multiscreen workplace also means that applications can be moved from one monitor to another, or be displayed simultaneously on more than one monitor. If the need is to have many overlaps up at the same time, the multiscreen workplace gives more screen area to do that. It is also possible to have a process display on one monitor, faceplates, trend presentations, etc. on an other monitor. The application bar and status bar can also be individually configured per monitor.

Large Desktop

In the operators environment, the multiple monitors also support the usage of a large desktop and full screen mode (that is, the workplace covers up to four monitors in full screen mode and behaves as one single monitor).

Template for Multiple Screens

A set of preconfigured templates for multiscreen workplaces and large workplaces are available in the System 800xA. These are viable as import files in the installed system.

Operator Workplace - Remote Client

The remote client concept enables remote access to an 800xA System from a standard workstation, which does not have any ABB-specific software installed.

The remote client provides operation capabilities and access to historical information. Configuration capabilities are limited on the remote client. The same security concept utilized for a rich client will be used for the remote client, making it possible to define those actions that are permitted from a remote client.

The remote clients adhere to the access control concept generally supported by Operator Workplace clients.

The following functions are remote client enabled:

- Plant Explorer navigation.
- Operation graphics, alarm and event, trend, history logging, system status, and faceplates.
- Information Management.
- Batch client.
- Asset Optimization.

Remote clients are implemented using Microsoft Terminal Server or by using RDP into a single client workplace. MS terminal server is part of the Windows operating system, refer to Figure 22.

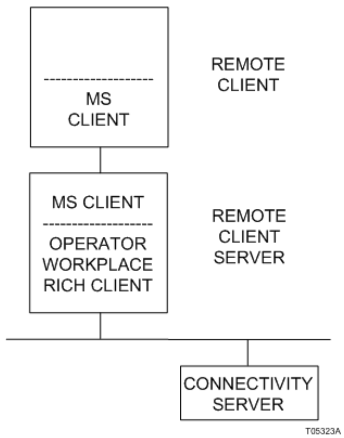


Figure 22. MS Client - Server

The Terminal Service concept also enables connections over, for example, a Virtual Private Network (VPN) spanning the internet. It is also possible for use with rather low bandwidth channels, like ISDN or dial-up lines.

To get the Remote Client Server functionality, the Windows Terminal Services must be enabled.

For information about the related licenses, please refer to the Microsoft website (www.microsoft.com).

Multisystem Integration

The 800xA Multisystem Integration makes it possible to supervise and operate several 800xA Systems from a central control room. These 800xA Systems may or may not be in the same Windows domain. The supervised system can be without any local workplaces, or be a complete system with its own local control room and is called the Provider because it provides the supervising system with data. The supervising system is called the Subscriber because it subscribes to the values from the provider. Two services implement the communication, namely, the Remote Access Server running in the provider system, and the Remote Access Client running in the subscriber system. A common setup is to have one subscriber and several providers, but each provider system can also serve multiple subscriber systems in order to share a common resource (provider).

The network between the subscribers and the providers can be anything from a high speed LAN to a modem connection with a speed of 512 kBit/s. Password protection and encryption can be used to secure the connection between the provider and the subscriber.

Configurations

Small configurations (typically containing a few hundred I/O points) can have the Remote Access Server running in the same node as the Connectivity and Aspect Directory servers (refer to Figure 23). Running workplace services on this node are not recommended. The Remote Access Server should be run in the Connectivity server node for medium and large configurations.

Certain other combinations of these three basic configurations can also be used. For example if the provider system is small, but the subscriber system is connected to a lot of provider systems, the configuration for a small system may be used on the provider side, and a medium/large configuration may be used on the subscriber side. For larger systems and to minimize the impact on the provider and subscriber systems, a separate node may be used for the Remote Access Server and Remote Access Client.

Operation

The Operation of a remote provider system is the same as the operation of a local system. The exception here is that the speed of operation may be slower if the connection towards the remote system is slow. With a connection speed of 10 MBit/s or higher the delay is hardly noticeable. The following topics show additions and deviations in Multisystem Integration operation compared to ordinary operation.

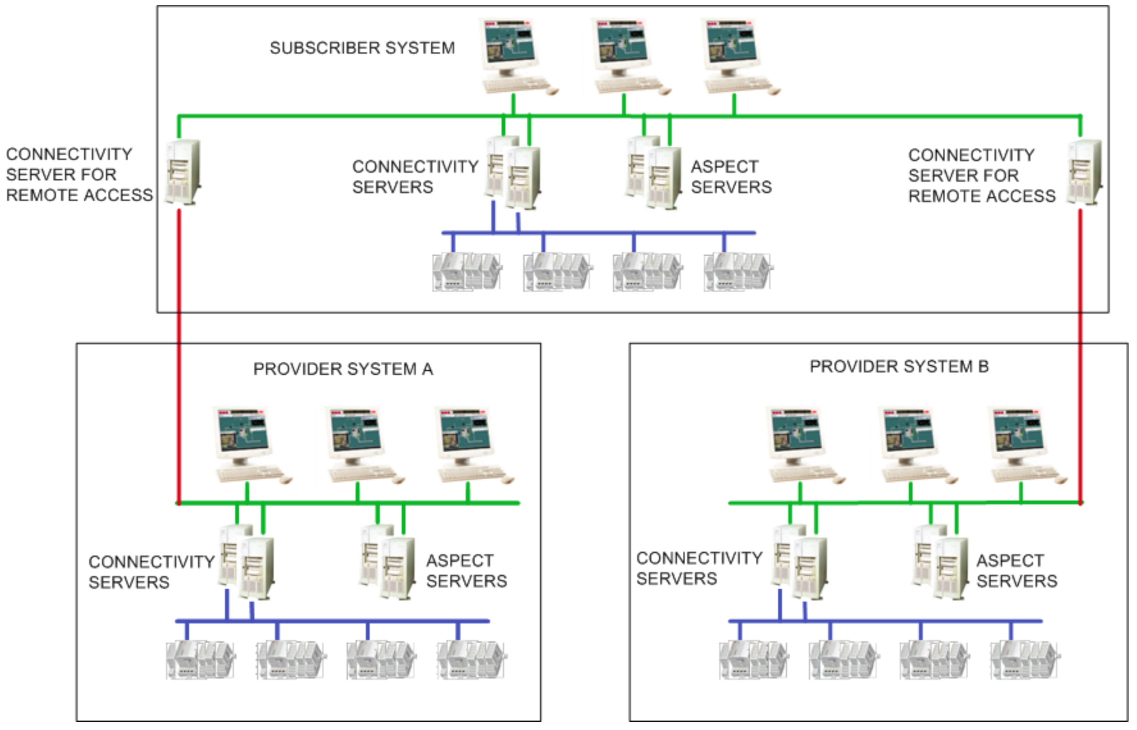


Figure 23. Multisystem Integration Configurations

Process Displays

Process displays within the process provider system work the same way as local process displays except that the name and tool-tip for objects include the system name. For example, the tool-tip for the object Remote object at provider system Water system will be Remote object@Water system.

Faceplates

Faceplates for a remote provider system work in the same way as faceplates for a local object. The name and the tool-tip will show the object name with the provider system name.

Trends

Trends for a remote provider system work in the same way as trends for local objects but with the name and the tool-tip changed the same way as in faceplates and process displays.

Alarm and Events

Alarm operations can be performed from the subscriber system or the provider system. Operations done in the provider system will also affect the subscriber system.

Alarm operations include:

- Acknowledge.
- Alarm comments.
- Enable/disable conditions.
- Global silence.
- Remove alarm (used with the Keep inactive-acknowledged alarms feature).
- Delete alarm.
- Alarm hiding.
- Alarm Shelving.
- Alarm Navigation.
- Group Alarm.

Alarm and event lists for a remote provider system works the same way as alarm and event lists for local object/structures except that Delete of an alarm is local to the provider and subscriber (that is, an alarm is not deleted in the subscriber when deleted in the provider, and vice-versa).

History Log Updates

History Log updates for a remote provider system work the same way as for local objects. Security checks are done both in the provider and subscriber system but audit events are generated and logged in the provider system only.

Point of Control

The System 800xA Multisystem Integration now supports Point of Control. Using Point of Control with Multisystem Integration, the responsibility can be taken locally on the provider system, and remote on the subscriber system. However, some differences are visible for an operator. In the subscriber all nodes in the provider is represented as the provider system name. The individual nodes of the provider are not visible in the subscriber. With the same principle all nodes on the subscriber is represented by the subscriber system name.

For more information about Point of Control support in Multisystem Integration, refer to *System 800xA Multisystem Integration* (*3BSE037076**).

AC 800M Status Monitoring

AC 800M Status Monitoring provides easy way to troubleshoot control system hardware by providing the detailed error(s)/warning(s) at each hardware unit.

AC 800M Status Monitoring provides the following features:

- Hardware Status, shows the errors and warnings for each hardware unit in a control project and additional information for I/O. Refer to Figure 24 and Figure 25.
- Tag Navigation, shows the associated tags information for I/O. Refer to Figure 24 and Figure 25.

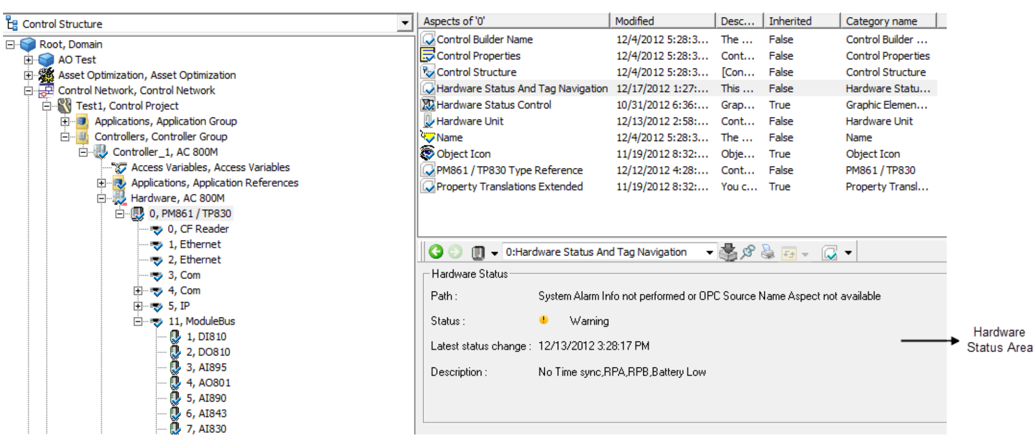


Figure 24. Hardware Status Window for a Hardware/Controller

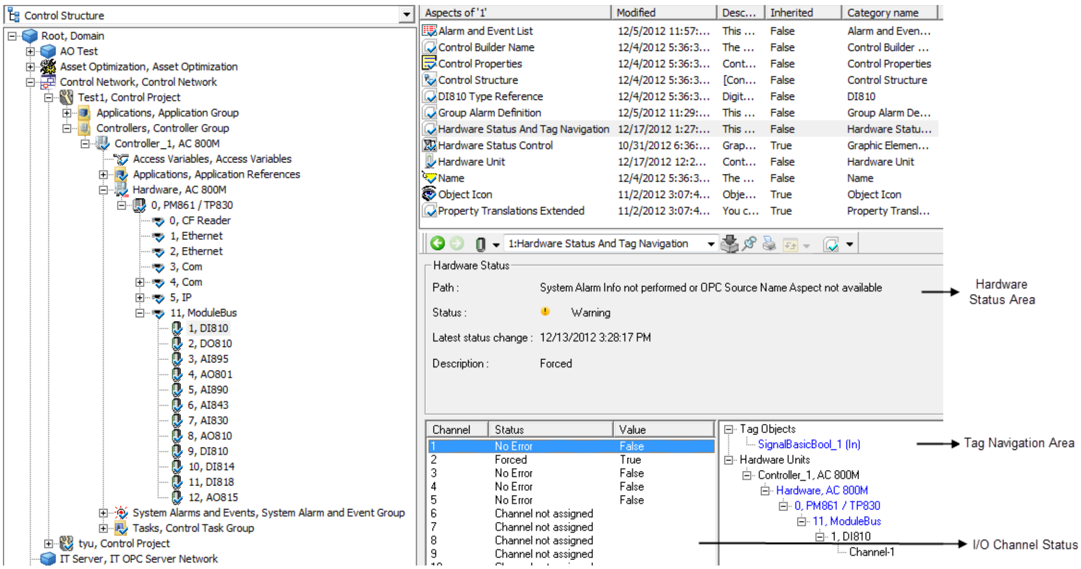


Figure 25. Hardware Status and Tag Navigation Window for an I/O module

Extended Operator Workplace

System 800xA Extended Operator Workplace (EOW) provides an interactive, high resolution display, full and easy-to-read information, an intuitive interface and ergonomics that ensures safety, comfort, and efficiency. EOW is a combination of the technology, best practice of physical operator environment and pre-configured 800xA multiple screen workplaces and tools.

The operator desk system is ergonomically designed for multiple console-mounted monitors with motorized height-adjustable console and large screens. Figure 26 shows the Extended Operator Workplace environment for the operators.

Figure 26. Extended Operator Workplace Environment

The Extended Operator Workplace is available in different designs and includes operating licenses (Table 7).

Table 7. EOW Designs

	EOW-x3	EOW-x2	EOW-f3	EOW-f2
Operator Console including ergonomic desk				
Motorized	x	x		
Fixed			x	x
Large screen area				
3 Monitors	x		x	

Table 7. EOW Designs

2 Monitors		x		x
2 Sets of wide screen monitors				
Motorized 3 monitors	x			
Motorized 2 monitors		x		
Fixed 3 monitors			x	
Fixed 2 monitors				x
Multi-client functional keyboard	x	x	x	x
Public speakers	x	x		
Directed sound shower speaker	x	x		
High frequency lighting	x	x		
Operator video camera	x	x		

Section 5 Engineering

The major objective for the System 800xA Engineering suite is to provide maximum engineering performance. To reach this goal, a suite of tools are offered. All tools are integrated and support the Aspect Objects architecture. The tools scale from simple standards-based control configuration tools to software development kits, which enable the use of custom tools to gain performance.

The tools can be applied throughout the plant lifecycle from the design phase into the operation phase maximizing the performance in design and maintenance.

The Engineering Tools are grouped into:

Standard Engineering Tools - Used by application and maintenance engineers implementing and servicing the control configuration.

Professional Engineering Tools - Intended to be used by system engineers optimizing reuse in a distributed environment and application developers working with VB Script and Visual Basic.

Engineering Workplace

The set of Standard Engineering Tool is called Engineering Workplace. It consists of the following features:

- Common features supporting Multi User and Distributed Engineering.
- Control Builder Professional including Function Designer.
- Engineering Platform including Bulk Data Manager.
- Graphics Builder.

The Engineering Workplace (client) requires the Microsoft Office Standard.

Multiuser Capabilities

Offline Multiuser - The control logic design tools allow and enforce reservation. A user can mark in a system, the following entities for exclusive modification:

- Control project (Control Structure).
- Control application (Control Structure).
- Function diagram (Control and Function Structure).
- Control library version (Object Type, Library and Admin Structure).
- Extension library version (selected aspects extending a given Library Version).
- Control module type (Object Type Structure).
- Function block type (Object Type Structure).
- Controller (Control Structure for AC 800M controller configuration).
- HSE Sub Net (Control Structure for FF configuration).
- Aspects that are not part of the previous entities (Graphic Display in Functional Structure for example).

Online Multiuser - Download and compile actions can be performed on a control application and its controller configuration.

Distributed Engineering/Remote Engineering Workplace

This workplace provides the same capabilities as the remote operator workplace. Refer to Operator Workplace - Remote Client on page 111 for more information.

It is possible to run Control Builder Professional and Function Designer Graphic Builder as a terminal session on a terminal server. Start the terminal session using the **Remote Desktop Connection** command in the normal **Start** menu (.../Accessories/Communications/Remote Desktop Connection). Some restrictions and recommendations are:

- There can be only one Control Builder session per interactive Windows user.
- It is not recommended that a Soft Controller be run on the terminal server.

Remote Session Indication

When dealing with support engineers it is important to know if the Control Builder is running as a remote session or as a local session A small visual indication together with the user name will be shown in the status bar of the Control Builder, if it is running as a remote session.

Remote Connection Unavailable

If a network connection can not be established, a separate engineering system can be introduced and entities can be copied between the systems using the Import Export tool:

- Control project (Control Structure).
- Control application (Control Structure).
- Function diagram (Control and Function Structure).
- Control library version (Object Type, Library and Admin Structure).
- Extension library version (selected aspects extending a given Library Version).
- Control module type (Object Type Structure).
- Function block type (Object Type Structure).
- Controller (Control Structure for AC 800M controller configuration).
- HSE Sub Net (Control Structure for FF configuration).
- Aspects that are not part of the previous entities (Graphic Display in Functional Structure for example).

The AC 800M related entities are structured as shown in Figure 27.

Enhanced Online Download (Load Evaluate Go)

The Load Evaluate Go is a feature that enables customers to modify, download, and evaluate a revised application without interfering with the running or current application. The revised application can then be evaluated, put online, further modified, or discarded. Load Evaluate Go sprang from the need of 7/24/365 industries with long periods between turnarounds. It provides many end user benefits by allowing configuration changes for process optimizations in running

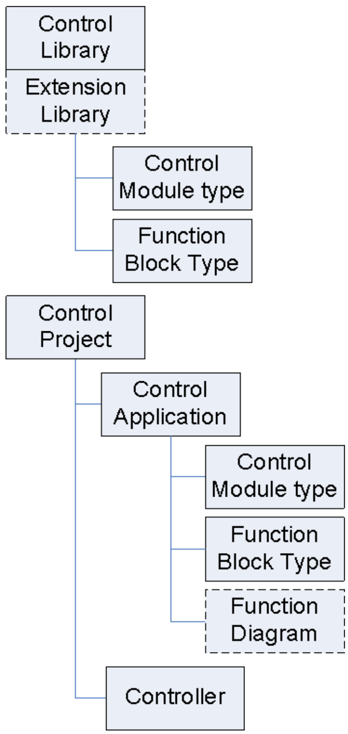


Figure 27. Structure of AC 800M Entities

plants, where plant shutdown is not an option. The Load Evaluate Go workflow reduces risk and eliminates unplanned downtime.

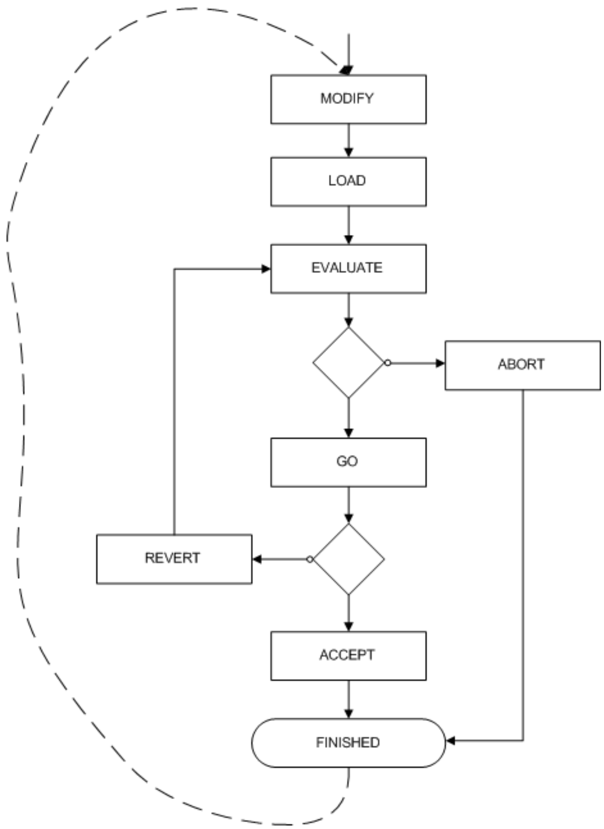


Figure 28. Load Evaluate Go Workflow

Control Builder Professional Including Function Designer

Control Builder is the tool used for configuration of controller code. This tool covers the control logic as well as the hardware configuration. The Control Builder editors compliant with the following IEC 61131-3 programming language standards:

- FBD (function block diagram).

- LD (ladder diagram).
- ST (structured text).
- IL (instruction list).
- SFC (sequential function chart).

The following additional tools are included to optimize the engineering performance:

- Function Designer.
- Control Module Diagram Editor.
- Control Diagrams Editor.

These tools are complementary and are provided to optimize the control logic configuration process.

Control Builder has features to quickly test the logic. For more comprehensive tests the simulation mode is offered, which requires a SoftController License. The programming tool and the hardware configuration tool are both integral parts of the Control Builder.

The managing of libraries is enhanced by the Version/Revision management functionality. This is a system wide function that allows the user to run several different versions of the same library in different applications, even within the same controller.

The Search and Navigation feature in Control Builder allows the user to search for usage of symbols (for example, variables). All symbols matching the search criteria are shown together with definitions where the symbols are declared. Double-clicking to navigate to the editor in the Control Builder, where the symbol is declared or used, is a standard feature.

Control Builder Professional is fully integrated into the 800xA System and supports all system wide functions (Backup/Restore and Import/Export, for example).

Configuration changes can be traced using the Audit Trail functionality. The Audit Trail functionality is a system wide function, provided by the system and supported by the Control Builder Professional tool.

Control Builder Professional also supports the Integrated Batch functionality mentioned in the batch part of this document.

Function Designer (Figure 29) is used to engineer the automation system configuration from a process perspective. It is embedded in Control Builder and is a comprehensive editor, which allows engineering of a complete control loop on a single diagram comprising of functions, function blocks, control modules, sequences, and I/O channels. It supports design and online debugging. Function diagrams can be nested in multiple levels and the signal interconnections between function diagrams are automatically documented and provide built-in navigation.

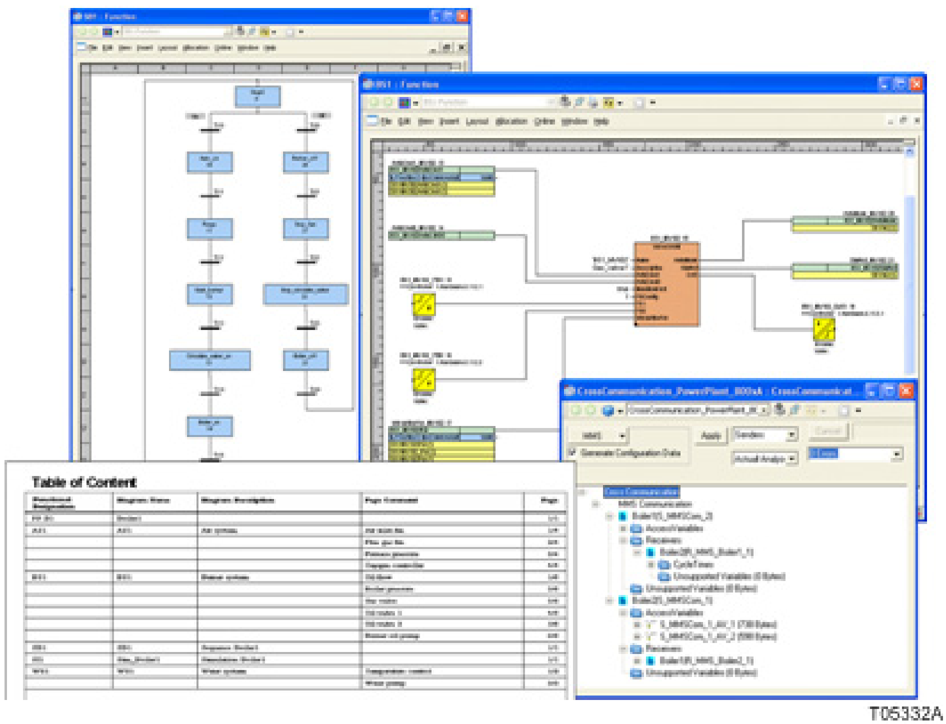


Figure 29. Function Designer

Engineering Platform Including Bulk Data Manager

The Engineering Platform offers the following functionality.

- Use of a powerful designation handling with self adapting designations.

- Create and maintain your documentation by the integrated Document Manager. The data reference function of Document Manager provides actual data from other applications or actual values of central parameters in Word, Excel, and AutoCAD documents. Different versions of documents can be stored. Document packages can be created.
- Efficiently manage, view, report and store common plant parameters with the integrated Parameter Manager.

The ability to efficiently manage large amounts of data is a crucial part of any automation system. The 800xA System meets these requirements through a tight integration with Microsoft® Excel. By using a series of Excel add-ins, the bulk data management features couple the full productivity benefits of Microsoft Excel with System 800xA.

The basic bulk data management functionality allows users to configure a worksheet to read and write aspect and object properties, supporting an iterative analysis and design process. In addition, the bulk data management features allow the import and assignment of external data such as signal lists, tag names or documents. System data can be exported at any time to simplify data validation and modification. The track changes function provides the ability to compare two sets of data in order to identify changes. This function allows users to check for and introduce changes in a controlled manner.

Graphics Builder

Graphics Builder (Figure 30) is a tool that enables configuration of graphic aspects (for example, graphic displays, graphic elements, and faceplate elements). Graphics Builder provides several features for configuring graphic aspects, and writing expressions. The configuration of graphic displays of graphic elements does not require programmer skills since it is very intuitive and easy to learn.

The following features are specific to the Graphics Builder:

- Expression Builder that allows you to assign expressions (that is, to specify subscriptions and specify the relationship between the process data and the data that is to be displayed).
- Graphic Libraries dialog which allows you to add Primitives and Sub-elements to your toolbox.

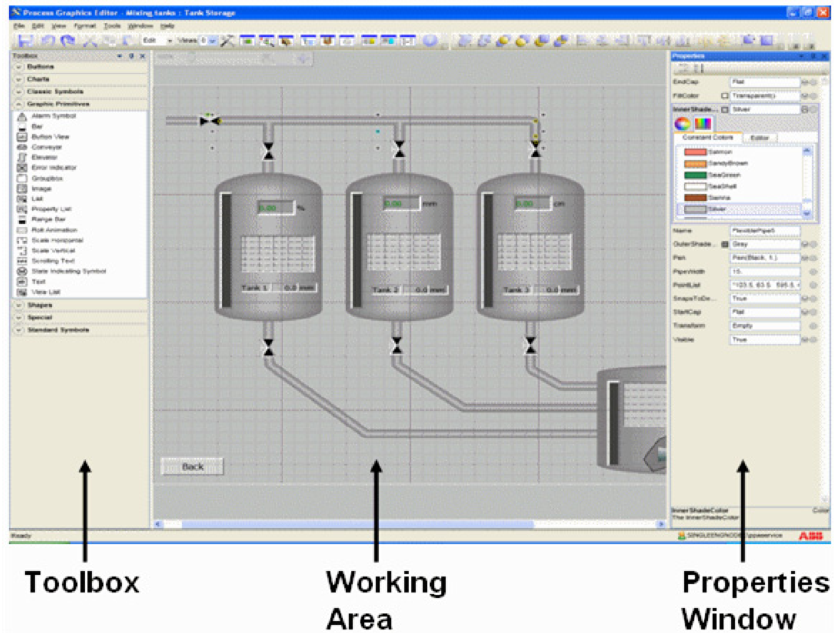


Figure 30. Graphics Builder

- Element Browser using which you can select appropriate graphic elements for inclusion.
- Design and Test function that enables you to build graphic aspects in design mode and then check their behavior in test mode. A test data provider is also included.
- Solution library where user-defined graphic solutions can be stored (using drag and drop) for reuse.
- Help function that offers you access to Online Help.
- Functions that allows you to add properties, methods, and events to a graphic element.

The finding and replacing of references enables efficient copying and modification of graphics.

Script Manager Professional

The Script Manager Professional offers advanced editing and debugging capabilities in addition to the built-in capabilities for script language programming. The functionalities available are:

- An editor to create and edit scripts.
- Dialogs to specify trigger conditions for scripts.
- A debug environment.
- VBScript language extensions to access aspect objects and structures easily.
- A dialog for specifying general script settings.
- A Type Library browser.
- A script trace window environment.
- Simpler programming to 800xA System Automation Interface.

Application Change Management

Application Change Management (ACM) is a version control tool used for engineering solutions in 800xA System. Multiple versions of 800xA application configuration can be archived in the ACM host and provide an integrated configuration management system utilizing proven in use .afw files technology. The most common actions such as archiving new snapshots of configuration artifacts (For example: Process Displays, Control Libraries, Control Applications, or Controllers) can be accessed through Engineering Workplace context menu. Extended features as browsing through the configuration history and creating baselines of configuration artifacts are accessible through ACM Client Application. All ACM actions changing the content of the ACM archive are being logged in the ACM system in parallel to 800xA audit trail, which logs any change to the 800xA configuration.

Multiple 800xA systems can be connected to the same ACM host in order to share configuration artifacts effectively. Redundant servers in different security zones can be build up utilizing Microsoft Sharepoint Server technology, where connection can be a limited to a dedicated server to server link.

Application Change Management features are as follows:

- Check-in (archive version), check-out (mark a version in ACM host as checked out with or without retrieving it to the 800xA system) and compare on various levels.
- Baseline for system in ACM host and roll back to required older baseline.
- Supports multiple versions of the configuration artifacts.
- Supports Activity log.
- Supports different access control privilege levels.
- Displays various error reports.
- Support for connecting more than one engineering system.

For more information on ACM, refer to *System 800xA Application Change Management (2PAA108438*)*.

Professional Engineering Tools

The Reuse Assistant is a knowledge-based question and answer wizard for reusable solutions. The Reuse Assistant works in two modes, the Architect mode and Build mode).

The Architect mode, is for expert users, to prepare standard solutions for reuse purposes. Within this mode, it is possible to design a guided tour by help of questions followed by answers and the operations. It offers extensive documentation features supporting the project engineer to understand the solution and to choose the right answer to a question. These standard solutions can be deployed to different locations to create the automation solution in Build mode.

The project engineer uses the Reuse Assistant in Build mode to apply a standard solution in a particular project context. In Build mode, the Reuse Assistant provides a user-interface showing the guided tour with its preconfigured questions. They can be answered with a single choice of preconfigured answers and supplying some technical data values. The chosen answers and the supplied technical values form a reuse instruction, containing operations in a determined order. The reuse instruction can be executed within the Aspect Integrator Platform, performing different tasks, (for example, creating new aspect objects, creating new aspects, instantiating aspect object types etc.) automatically. The result is then a solution adapted to the project context, e.g. a valve control with actual data for the valve, designations, flow, diameter, article number of the valve, assembly documentation, and so.

Process Engineering Tool Integration

ABB's objective is to help its customers achieve superior performance from their assets, through the application of appropriate products, solutions and services. Process Engineering Tool Integration for SmartPlant Instrumentation has been released with ABB's System 800xA to enable customers, both epcs (engineering, procurement and construction) and owner-operators, to exploit their investment in the SmartPlant Instrumentation product. For owner-operators, there is the additional opportunity to exploit the investment made in the design content within SmartPlant Instrumentation during operations.

By providing the ability to have direct, online, bidirectional exchange of information between SmartPlant Instrumentation and the 800xA System, ABB provides the basis to improve performance during the engineering phase of an asset and improve operational performance of the asset during its lifetime.

Features and Benefits

- **Integrated Engineering Process**

Efficient exchange of design between EPC and automation engineering teams – focus on value-adding tasks.

Improved risk management

Operator, EPC and automation teams work to a common, consistent design basis – no surprises.

- **Streamlined deployment**

System 800xA core solution automatically configured from the SmartPlant Instrumentation design – no error prone re-keying or costly translation of data formats.

- **Accelerated commissioning**

Consistent, context relevant design documentation available to speed up commissioning – no waiting for missing information.

- **Improved as-built cycle**

Design and automation system configuration are kept in sync during the project – costly, time consuming as-built tasks no longer necessary.

- **Improved operating decisions**

Accurate design data such as loop diagrams, specifications, etc., are directly available to operations and maintenance personnel – helps quicker decision and action.

- **Information concordance**

Single point data entry means documentation is in sync with the actual state of the asset – no more paper-chase for the right design document.

- **Reduced discovery costs**

When the time comes to extend or de-bottleneck the asset, the design is consistent with the actual asset – no need to carry out extensive, costly and time-consuming discovery tasks.

- **Information assets reused**

Investment in extensive design content is reused in the System 800xA solution.

Typical Use Case

Typical project life cycle considerations

Typical participants in any reasonable size automation project include the following:

- Owner-operator (the client asset owner that is).
- Client's selected EPC who will be involved in the wider project and will have an instrument and control group concerned with automation.
- Automation supplier and/or contractor.

The people in these roles are likely to be geographically separated. Often there are focused centers of excellence supported by low cost engineering centers and deployment of new assets in developing regions. On top of this, the key locations for tasks and the primary players change throughout the project life cycle.

- Process Engineering Tool Integration for SmartPlant Instrumentation is able to deal with the earlier project phases where SmartPlant Instrumentation may be deployed in one or more locations of the EPC, such as a center of excellence and a low cost engineering center. During this phase, early dialogue may be underway with the selected automation contractor who may be located in the same city or in another continent. To make things easier, the Process Engineering Tool Integration for SmartPlant Instrumentation provides facilities to access the design online and in real-time, consistent with the constraints of the engineering procedures in place. The design content can be accessed using Process Engineering Tool Integration for SmartPlant Instrumentation before the targeted 800xA control platform is ready for staging. The design can be reviewed in place or acquired for review offline. Process Engineering Tool Integration for SmartPlant Instrumentation manages information of this sort in XML form, for maximum portability and reusability.

- During the project process, the focal point will switch to the automation supplier for solution development and staging. By this time Process Engineering Tool Integration for SmartPlant Instrumentation may possibly have been used to configure the core 800xA structures and there may have been bidirectional updates carried out to maintain design/development in sync. In any event, when EPC and client personnel interact with the automation supplier for solution development, staging, testing, etc., they have direct access to the primary design content in SmartPlant Instrumentation, residing in the relevant EPC locations.
- When the assets are commissioned and handed-over, the client may wish to acquire the electronic design content, either for information management or for use in operations and maintenance. The design can be re-hosted on a SmartPlant Instrumentation server on the client's network. The design content can now be used in operational support and routine operational changes so that the control solution is reflected back into the design.
- The typical project data which is exchanged between SmartPlant Instrumentation server and System 800xA includes definition of Control hardware, I/O, control loops, placement of control loops into 800xA applications, insertion of control loops into Functional Structure, grouping of I/O signals under control loop and links to relevant documentation such as control loop diagrams.
- Subsequently, in the event of a plant extension or removal of bottle necks or a performance assessment study, the operational design platform can be re-hosted back to an EPC as a high quality starting point for reuse of design on the brown-field project. This gives fast-tracking, de-risking and cost-optimizing to the associated project for all parties.

Refer to Appendix I, Process Engineering Tool Integration for additional information.

Section 6 Control and I/O

The Control and I/O functional areas comprise:

- AC 800M Hardware.
- S800 I/O.
- S900 I/O for Hazardous Environments and Intrinsic Safety.
- AC 800M Control Software.
- AC 800M Control Software Integration.

In addition, the Control and I/O also includes a SoftController. It is a simulation tool that runs with Base Software for SoftControl in a workstation. The SoftController is intended for testing and simulation purposes and not for production applications. No connections to I/O are available.

AC 800M Hardware

Controller

The AC 800M controller (Figure 31) is a modular and scalable industrial controller belonging to the 800xA System. It is configured and programmed with Engineering tools (For example, Control Builder, a fully Windows integrated application).

The AC 800M is a powerful controller which is well suited to a wide range of applications, thanks to its modularity.

- From basic logic to advanced regulatory control, or any mix of these two.
- From only a handful of I/O points to thousands, installed locally or remotely.

The AC 800M controller is also communicative as it supports industry standard fieldbuses and communication protocols, such as RS-232C, Ethernet, PROFIBUS, FOUNDATION Fieldbus, HART, IEC 61850, PROFINET IO, MODBUS TCP, EtherNet/IP via embedded or external communication interfaces. The external communication interfaces are connected to the AC 800M processor via its CEX bus. The CEX bus is located on the left-hand side of the processor module.

HART data is only routed through the controller, thus it is not possible to use that data in the controller application. Using HART data in the controller application is only possible with the S900 I/O.

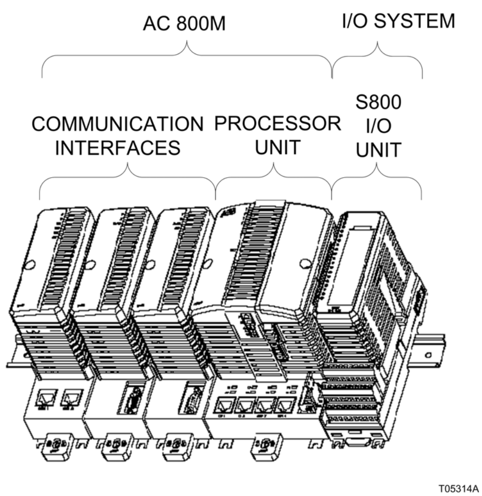


Figure 31. AC 800M

The modules are mounted on a DIN rail and interface directly with the S800 I/O system, and other I/O systems as well, including all PROFIBUS DP/DP-V1 and FOUNDATION Fieldbus proficient systems.

Refer to [9] in Table 1 on page 30 for more information about the AC 800M hardware.

Support for Removable Media Cards

The controller application in the Control Builder can be stored on a Compact Flash (CF) card or a Secure Digital (SD) card, depending on the type of controller. This feature helps to reload the application from these removable media at the restart of the controller after a failure (either by a reset, loss of power, or out of battery).

The CF/SD memory card helps to store a compiled controller configuration to the card and then install it into the controller by inserting the CF/SD card. This makes it easy to distribute new software upgrades to controllers in different locations which are not networked. The control software is installed without requiring any tool.

There is no automatic update facility for the controller application to the removable media, or retrieval to the Control Builder. However, if the variable data is marked with the *Cold Retain* attribute in the Control Builder application, then the controller can, during runtime, periodically store the data either on command from a function block in the controller application, or via a setting in the Control Builder.

There is no support for Cold Retain storage of runtime data in a redundant CPU configuration. However it is possible to use Compact Flash to restart the controller. In an AC 800M High Integrity controller, the backup media can **only** be used to collect log files and dump information, which helps in diagnosing and debugging. It cannot be used to save or restore configuration data and firmware data. Applications split over several controllers (Distributed Applications) are not supported by the Compact Flash backup function.

Online Replacement of Controller and Communication Modules

Modules are equipped with self-diagnostics in the software that report faults to superior system stations where alarms are raised and forwarded to production supervisors and maintenance engineers. All modules are equipped with LEDs on the front, indicating functions and malfunctions in real time.

Most modules can be replaced online (without switching the power off). The modules are keyed to prevent accidental replacement of a faulty module with the wrong type.

Refer to [10] in Table 1 on page 30 for more information before interfering with a running installation. Table 8 lists the modules that support online replacement.

Table 8. Modules Supporting Online Replacement

Module	Description
PM861, PM861A, PM862, PM864, PM864A, PM865, PM866, PM866A, PM867, PM891	Controller modules. (Online replacement only supported for redundant controller configurations.) Remember to switch off power on the CPU unit before replacement.
BC810	CEXbus Interconnection Unit
BC820	CEX-Bus and RCU-Link Interconnection Unit
SM810, SM811, SM812	Supervisory Module
CI853	RS-232 serial communication interface for MODBUS RTU, COMLI, and Siemens 3964R
CI854, CI854A, CI854B	Communication interface for PROFIBUS-DP
CI855	Communication interface for MasterBus 300 for AC 800M
CI856	Communication interface for the S100 I/O system for the AC 800M.
CI857	Communication interface for INSUM for the AC 800M
CI858	DriveBus supports Hot Swap
CI860	FOUNDATION Fieldbus communication interface for FOUNDATION Fieldbus HSE
CI862	TRIO I/O
CI865	Satt I/O interface
CI867	MODBUS TCP to AC 800M interface
CI868	IEC 61850 interface to AC 800M interface
CI869	Advant Fieldbus 100 to AC 800M interface
CI871	PROFINET IO to AC 800M interface

Table 8. Modules Supporting Online Replacement (Continued)

Module	Description
CI872	Communication interface for MOD5
CI873	EtherNet/IP to AC 800M interface, DeviceNet to AC 800M interface through LD 800DN

AC 800M Communication

The AC 800M controller supports:

- Fieldbus Communication.
- Network Communication.
- Serial Communication.
- Modem Communication.
- Self-defined Protocols.

Fieldbus Communication

The AC 800M controller supports FOUNDATION Fieldbus, PROFIBUS, PROFINET, DriveBus, and Advant Fieldbus 100. These protocols cover a broad range of applications and are highly recognized internationally. Very often regional preferences or customer specific requirements influence the decision regarding which fieldbus has to be used.

PROFIBUS DP is a high speed multipurpose bus protocol (up to 12Mbit/s) for interconnecting field devices, like remote I/O, drives, low voltage electrical equipment, and controllers. PROFIBUS DP can be connected to the AC 800M via the CI854A/CI854B communication interface.

The CI854A/CI854B includes two PROFIBUS ports to realize line redundancy and it also supports PROFIBUS master redundancy.

PROFIBUS PA devices, which are process instruments and actuators that can be mounted in explosion hazardous areas, are connected to PROFIBUS via the Pepperl+Fuchs PROFIBUS Power Hub Linking Device. It is the successor to the former LD 800P.

The PROFIBUS Redundancy Link Module RLM01 (Redundancy Link Module01), converts a non-redundant PROFIBUS line into two redundant PROFIBUS lines (RS485) or vice versa.

Control applications access fieldbus data through application variables (S800 I/O).

PROFINET IO uses Ethernet communication to integrate simple distributed I/O and time-critical applications. PROFINET IO describes a device model oriented to the PROFIBUS framework, which consists of places of insertion (slots) and groups of I/O channels (subslots). The technical characteristics of the field devices are described by the General Station Description (GSD) on an XML basis.

The PROFINET IO is interfaced to the AC 800M, using the PROFINET IO module CI871. PROFINET IO uses Ethernet, TCP, UDP, and IP as the basis for communication. It is designed to work with other IP-based protocols on the same network. The transmission of time-critical process data within the production facility, occurs in the Real-Time (RT) channel.

EtherNet/IP devices interfaces with the AC 800M controller, through the CI873 communication interface module. CI873 acts as an EtherNet/IP I/O scanner class device. It originates connections to EtherNet/IP enabled devices and exchanges real time I/O data with them.

The Industrial Ethernet Protocol (EtherNet/IP) is the combination of traditional Ethernet and an industrial application layer protocol, called the Common Industrial Protocol (CIP). EtherNet/IP is used in industrial automation applications.

CI873 supports logical segment Class 1 connection for reading and writing data to EtherNet/IP devices, and it originates Class1 for tag reading and Class 3 for tag writing to Allen Bradley Logix 5000 series PLCs.

EtherNet/IP redundancy is supported by using two CI873s.

DeviceNet is a low-level industrial application layer protocol, based on the Common Industrial Protocol, for industrial automation applications. DeviceNet is built on the standard Controller Area Network (CAN).

The linking device LD 800DN functions as an EtherNet/IP target on the EtherNet network. It acts as a gateway device by forwarding the content of the messages from CI873 networks to DeviceNet networks and vice-versa, without acting on the content of the messages.

FOUNDATION Fieldbus architecture with HSE subnets and H1 links is supported by AC 800M. Its major application is the integration of process instruments and actuators. The interface between the AC 800M controller and the FOUNDATION Fieldbus HSE subnet is the CI860 FOUNDATION Fieldbus HSE Communication module. It handles the data communication between the control application running on an AC 800M controller and FOUNDATION Fieldbus field devices. Up to 12 CI860s can be placed at one AC 800M and each of them can create a separate FOUNDATION Fieldbus HSE subnet. A redundant pair of CI860s consumes two of the maximum 12 possible.

The Linking Device LD 800HSE / LD 800HSE EX acts as a gateway between the H1 links and the HSE subnet. It provides four separate H1 links LAS (Link Active Scheduler) independent for each H1 link.

DriveBus protocol is used to communicate with ABB Drives and ABB Special I/O units. DriveBus is connected to the controller via a CI858 communication interface unit.

Advant Fieldbus 100 (AF 100) is a high performance fieldbus, which is used for:

- Communication between Advant Controllers.
- Communication between Advant Controllers and S800 I/O Stations, AC 800M controllers, AdvaSoft for Windows, and the equipment developed and sold by other ABB companies.

The CI869 communication interface that is attached to the AC 800M controller provides connectivity to other AC 800M, AC 160 or a connectivity server over AF 100. An AC 800M controller with the communication interface CI869 behaves as an AF 100 station, receiving data from other AF 100 stations/devices. The CI869 has integrated twisted pair modems. CI869 does not support S800 I/O connectivity in this release.

Network Communication

Control Network is the standard network for AC 800M peer-to-peer communication and communication between AC 800M controllers and the connectivity servers. The control network is based on Ethernet, TCP/IP, and the MMS protocol. Controllers use 10 megabit/second (with the exception of PM 891 which uses 100 megabit/second). Refer to Communication Network on page 340 for more information.

Inter Application Communication (IAC), which is supported by the MMS protocol, uses Communication Variables for cyclic communication between diagrams, programs, and top level single control modules. These variables can exist in the same application, same controller, or in different controllers in the network.

IEC 61850 for Substation Automation System (SAS) defines communication between intelligent Electronic Devices (IED) in the substation and other related equipment. The IEC 61850 standard itself defines the superset of what an IEC 61850 compliant implementation might contain.

The IEC 61850 standard contains definitions of a number of logical nodes. A logical node is defined by the data objects that it contains. An IEC 61850 data object is similar to a process signal. The data objects are chosen to be represented on the hardware units that represent logical nodes as I/O channels and the logical node as I/O units.

SattBus is a network standard for controller communication available on Ethernet TCP/IP for peer-to-peer communication with the installed base of Satt controllers.

MasterBus 300 (MB 300) network protocol can be used with both AC 400 and AC 800M controllers. AC 800M controllers can be connected to both control network and MB 300 simultaneously. The MB 300 network supports both network redundancy and time synchronization (with the accuracy offered by MB 300). Refer to Appendix B, 800xA for Advant Master.

CI855 is the communication interface in AC 800M to MasterBus 300.

MasterBus 300 and control network must use separate physical networks.

MODBUS TCP is an open industry standard widely spread due to its ease of use. It is a request response protocol and offers services specified by function codes. MODBUS TCP combines the MODBUS RTU with standard Ethernet and universal networking standard TCP. It is an application-layer messaging protocol, positioned at level 7 of the OSI model.

CI867 is the communication interface from MODBUS TCP to AC 800M controllers.

MODBUS TCP communicates via the CI867 communication interface unit. CI867 is a dual channel Ethernet unit; Ch1 and Ch2. Ch1 supports full duplex with 100 Mbps speed and Ch2 supports half duplex with 10 Mbps speed. Both master and slave functionality are supported. A maximum of 70 slave and 8 master units per CI867 (on Ch1 and Ch2 together) can be used.

Function Blocks are used for master communication and Access Variables are used for slave communication.

A number of MODBUS TCP commands are supported. Protocol functions are accessible through function blocks. The following protocol commands are supported (Table 9).

Table 9. Supported MODBUS TCP Protocol Commands

Protocol	Description	Protocol	Description
FC 1	Read coil status	FC 8	Diagnostic
FC 2	Read input discreet	FC 15	Force multiple coils
FC 3	Read multiple registers	FC 16	Write multiple coils
FC 4	Read input register	FC 20[1]	Read file record
FC 5	Write coil	FC 21[1]	Write file record
FC 6	Write single register	FC 23[1]	Read Write file record
FC 7	Read exception status		

NOTE:
1. Supported in Master only.

Serial Communication

MODBUS RTU is a wide-spread communication protocol that can be used with a variety of media, such as wire, fiber optics, radio, and telephone. MODBUS is an asynchronous serial master/slave protocol in half-duplex.

AC 800M supports both master and slave functionality.

A number of MODBUS commands are supported. Protocol functions are accessible through function blocks. Table 10 lists the protocol commands that are supported.

Table 10. Supported MODBUS Protocol Commands

Protocol	Description	Protocol	Description
FC1	Read coil status	FC6	Preset single register
FC2	Read input status	FC7	Read exception status
FC3	Read holding registers	FC8[1]	Diagnostic request
FC4	Read input registers	FC15	Force multiple coils
FC5	Force single coil	FC16	Preset multiple registers

NOTE:
1. Some slaves do not understand FC8. To avoid problems, set Poll Time to zero (0).

COMLI is an ABB protocol for data transmission between controllers. It is designed for asynchronous master/slave communication in half-duplex. COMLI can be used for serial communication (RS-232C) or SattBus on TCP/IP. COMLI protocol supports dial-up modem controlled from the application.

AC 800M supports both **master and slave** functionality.

The following COMLI services are supported for RS-232C:

Master

- COMLI ReadPhys (Read Physical Values) (message G).
- COMLI WriteDT (Write Date and Time) (message J).
- Read and Write in registers and bits (message 0,2,3,4).
- Read and Write in high registers (message <, =).

Slave

- COMLI WriteDT (Write Date and Time) (message J).
- Read and Write in registers and bits (message 0,2,3,4).
- Read and Write in high registers (message <, =).

The following COMLI services are supported for SattBus:

Master

- COMLI ReadPhys (Read Physical Values) (message G).
- COMLI WriteDT (Write Date and Time) (message J).
- Read and Write in registers and bits (message 0,2,3,4).

Slave

- Read and Write in registers and bits (message 0,2,3,4).

Siemens 3964R is a standard serial, point-to-point master/slave protocol. It can be used on any RS-232C channel. It is suitable for communicating with controllers and devices with Siemens 3964R support. Communication requires installation of the RK512 interpreter in the slave system.

Control Software for AC 800M supports only the Siemens 3964R **master** protocol (no support for slave protocol). The serial communication transfer rate is limited to 19.2 kb/s. Table 11 list the Siemens 3964R services that are supported.

Table 11. Supported Siemens 3964R Services

Service	Direction	Comment
"E" message, data type D	AC 800M to Siemens PLC	Request for data, register
"E" message, data type E, A, M	AC 800M to Siemens PLC	Request for data, byte
"E" message, data type E, A, M	AC 800M to Siemens PLC	Request for data, bit
"E" message, data type D, E, A, M	Siemens PLC to AC 800M	Answer to request for data
"A" message, data type D	AC 800M to Siemens PLC	Transfer of data, register

Table 11. Supported Siemens 3964R Services

Service	Direction	Comment
"A" message, data type D	AC 800M to Siemens PLC	Transfer of data, bit
"A" message, data type D	Siemens PLC to AC 800M	Answer to transfer of data

Modem Communication

There are two types of modems that can be used with AC 800M Control Software:

- **Short-distance modems** for point-point private links (copper or fiber optic cable) which can be used with twisted pair Ethernet, COMLI, Siemens 3964R, MODBUS RTU, or PROFIBUS-DP.
- **Dial-up modems** using public telephone system. COMLI is the only protocol that supports dial-up modems. This means that the dial up is controlled by the controller application.

For other protocols ordinary modems are used and the dial-up function is handled outside the controller.

It is still possible to set up serial modem communication using a phone line between, for example, Control Builder M and a controller, or between an external system and a controller (using AutoConnect).

The two main reasons for using modem communication are:

- Permitted increase of the allowed maximum length of RS-232C, RS-485, and twisted pair Ethernet connections.
- Elimination of the risk of electromagnetic interference and unauthorized intrusion by use of fiber optic modems.

Self-defined Protocols

The following are the Self-defined Protocols:

Self-defined Serial Protocol

Function blocks in SerialCommLib allows implementation of a personal character-oriented protocol on a serial port. It supports writing an application that both controls the characters sent and checks that the correct answer is received by using various checksum algorithms. The serial protocol can only be executed in half duplex. Accordingly it can not send and receive simultaneously. The following function block types are available:

- SerialConnect.
- SerialSetup.
- SerialWriteWait.
- SerialListenReply.
- SerialWrite.
- SerialListen.

A maximum of 140 characters is supported. ASCII telegrams are recommended, since binary telegrams are difficult to implement.

Self-defined UDP Communication

The UDP Communication library (UDPCommLib) contains function block types for AC 800M controller communication with external devices through Ethernet, using UDP.

It is similar to the Self-defined Serial Communication, but on Ethernet.

Some of the examples of usage are:

- Communication with different road-infrastructure network nodes as variable speed signs, traffic direction and information signs.
- Vision Cameras: Many implement the Telnet protocol (ASCII TCP communication over standard port number 23).
- Information Server: The controller may act as both client and server on the network. Example of server use is a SCADA application where a supervisory system connects to different servers and collects information periodically.

The UDPCommLib library supplies IEC 61131-3 function blocks that make it possible to read and write a struct of dints or dwords from/to controller's on-board Ethernet channels, CN1 and CN2.

Network redundancy is handled by RNRP.

The following function block types are available:

- **UDPConnect**: The UDPConnect function block is used to open and close a defined UDP communication channel.
- **UDPWrite**: Writes a struct of dints or dwords.
- **UDPRead**: Receives a struct of dints or dwords.

Self-defined TCP Communication

The TCP Communication library (TCPCommLib) contains function block types for AC 800M controller communication with external devices through Ethernet, using TCP.

It is similar to the Self-defined Serial Communication, but on Ethernet.

The typical application areas are the following:

- Communication with different road-infrastructure network nodes such as variable speed signs, traffic direction and information signs.
- Vision Cameras: Many implement the Telnet protocol (ASCII TCP communication over standard port number 23).
- TCP is used in Information server. The controller may act as both client and server on the network. Example of server use is a SCADA application where a supervisory system connects to different servers and collects information periodically.

The TCPCommLib library supplies IEC 61131-3 function blocks that make it possible to read and write a struct of dints or dwords from/to controller's on-board Ethernet channels, CN1 and CN2. Network redundancy is handled by RNRP.

The following function block types are available:

- **TCPServerConnect**: The TCPServerConnect function block is used to let the controller become a TCP server waiting for connection requests initiated by other TCP clients on the network.
- **TCPClientConnect**: The TCPClientConnect function block is used to open and close a TCP connection to a remote TCP server on the network.
- **TCPWrite**: Writes a struct of dints or dwords.
- **TCPRead**: Receives a struct of dints or dwords.

Supported I/O Systems

AC 800M controller supports the following common ABB I/O systems and families:

S800 I/O, a distributed modular I/O system for communication via PROFIBUS-DP or directly connected to an AC 800M Controller. This is the most common I/O. Refer to S800 I/O on page 151 for more information.

S900 I/O, a remote I/O system for use in hazardous areas that can be connected to AC 800M via PROFIBUS-DP. Refer to S900 I/O for Hazardous Environments and Intrinsic Safety on page 153 for more information.

S200 I/O and S200L I/O, two compatible, modular I/O systems (S200L I/O is the compact version) can be connected to AC 800M via PROFIBUS-DP or ControlNet (via CI865) to all supported controllers.

S100 I/O, a rack-based I/O system, can be connected to AC 800M using the CI856 interface module or EtherNet/IP (through CI873).

Satt 19 inch rack I/O, a rack-based I/O system, can be connected to AC 800M using the CI865 interface module.

TRIO, interface integrates TRIO/Genius I/O as a native AC 800M I/O. The TRIO interface to the AC 800M is via the CI862 CEX module. This module supports direct connection for one TRIO LAN and provides a port for the Hand Held Monitor. The AC 800M controller supports up to four CI862 CEX modules and 1,000 TRIO/Genius I/O points. TRIO supports CEX module redundancy.

Refer to [1] in Table 1 on page 30 for a complete list of supported I/O modules.

S800 I/O

The S800 I/O is a distributed, highly modularized and flexible I/O system, providing easy installation of I/O modules, process cabling and interfacing to ABB drives. The S800 I/O modules and its termination units can be mounted and combined in many different configurations to fit your space requirements and suit many types of applications. A comprehensive assortment of I/O modules and accessories are also available.

Fully Integrated with AC 800M. S800 I/O is a predefined device in AC 800M, both as direct I/O using the built-in AC 800M ModuleBus connections, and as remote I/O via PROFIBUS.

Output/Input Set as Predetermined (OSP/ISP). All output I/O modules have an internal watchdog providing logic to set each output to a predefined value in case of communication loss. Each output channel can either be set to keep the current value or a specific value. Input modules have the similar functionality as support to the application.

Online Configuration Changes. Online configuration changes are supported when S800 is connected as direct I/O to AC 800M or as remote I/O using the PROFIBUS-DPV1 adapters CI840 or CI801. CI840 and CI801 support HCIR (Hot Configuration in Run).

Local Time Stamping. The I/O modules DI825, DI830, DI831, DI840, DI880, and DI885 support local time stamping. This function is available when the modules are connected as Direct I/O to an AC 800M controller.

HART Pass-through. The I/O modules AI815, AI845, AI880A, AI895, AO815, AO845, and AO895 have HART pass-through functionality. Refer to Device Management PROFIBUS & HART on page 181 for more information. A remote I/O station can also run in Extended HART mode making it possible to transfer HART frames up to 227 bytes long. The number of I/O modules on that remote I/O station is then limited to about 12 modules. The longest HART frame in a normal configuration is 64 bytes.

Hot Swap of I/O Modules. All S800 I/O modules can be replaced in a running system and will automatically be configured and initiated. S800L modules do not support hot swap.

Communication Redundancy. Communication redundancy is available for PROFIBUS using a pair of CI840s mounted on a common termination unit. TU847 is used when connecting to non-redundant S800 I/O and TU846 to redundant S800 I/O.

A pair of TB840 optical modems for ModuleBus are used to connect S800 I/O to redundant AC 800M controllers. The Termination Unit TU841 is used by TB840 to connect to non-redundant S800 I/O and TU840 to redundant S800 I/O.

I/O Module Redundancy. I/O module redundancy is made by pairs of I/O modules on a common termination unit.

The I/O modules AI843, AI845, AO845, DI840, DO840, and DP840 support redundant I/O configuration as direct I/O and as remote I/O on the base cluster.

AI880A, DI880, and DO880 support redundant configurations as direct I/O to PM862, PM865, PM866A, PM867 and PM891. TB840 is required as an optical modem for this configuration.

Refer to [11] in Table 1 on page 30 for more information about S800 I/O.

S900 I/O for Hazardous Environments and Intrinsic Safety

The S900 I/O is a process I/O intended for placement in a hazardous area, in different ways and classifications. In cases when a low volume of standard I/O in addition to Ex-I/O is required, S900 I/O can be used also for non-hazardous areas.

The system consists of a passive mounting termination unit accommodating the power supply units, the communication interfaces, and the I/O modules. The communication interfaces (CI920/CI920A) can also be used in redundancy mode (line redundancy and redundancy).

Zone 1 field mounting in hazardous areas requires approved field housings with increased safety (Ex e) to ensure explosion protection.

The mounting termination unit and the power supply unit(s) ensure intrinsically safe power supply of the communication interfaces and up to 16 I/O modules. Also, hot swapping of the communication interfaces, power supplies, and I/O modules is possible, i.e. these units can be connected or removed during operation.

S900 I/O always connects as Process I/O to the AC 800M controllers via PROFIBUS DP. In case the S900 I/O is connected to IS field signals or mounted in a hazardous area, the PROFIBUS DP network connected to the S900 FCI must also be intrinsically safe.

The support for S900 is fully integrated in 800xA, and engineering is done from the Control Builder.

S900 Process I/O provides specific I/O modules which allow full HART transparency up to the AC 800M, that is, HART data can be used in the controller application.

Configuration of the S900 I/O communication interface CI920/CI920A and the corresponding I/O modules is done in Control Builder and Fieldbus Builder PROFIBUS/HART. Fieldbus Builder PROFIBUS/HART allows connecting a HART field device with the corresponding DTM to the HART capable I/O module of S900 I/O (HART Pass-through).

Refer to [1] in Table 1 on page 30 for information about supported S900 I/O units.

Process Devices

AC 800M supports INSUM and MNS iS switchgear technology, and UMC100 Universal Motor Controllers.

INSUM

INSUM (INtegrated System for User-optimized Motor control) is an ABB system for motor and switch gear control and protection. AC 800M controllers can be integrated with INSUM via a CI857 interface module and a TCP/IP gateway. Refer to Figure 32.

INSUM and control network must use separate physical networks.

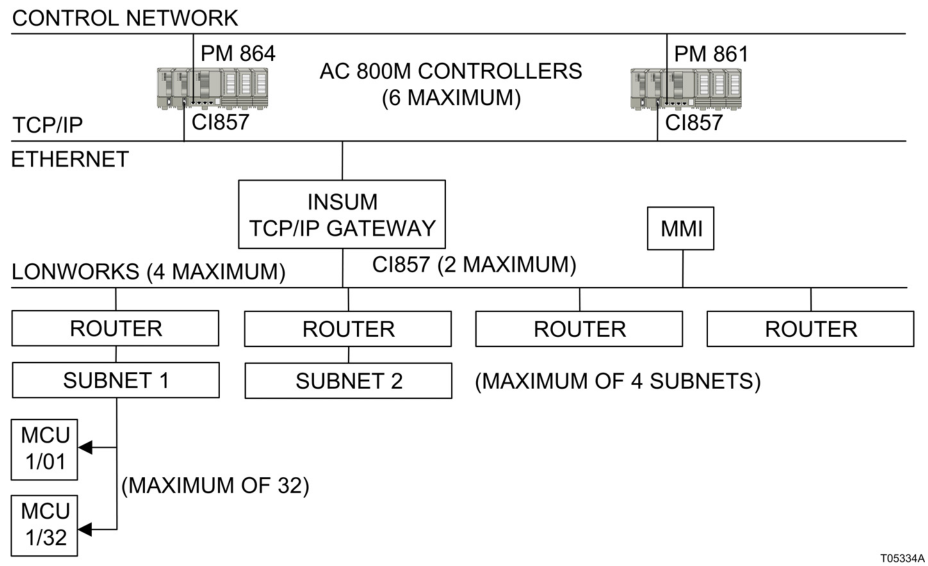


Figure 32. INSUM Integration with AC 800M Controllers

INSUM integration into AC 800M supports higher functionality integration, multi drop configurations, time distribution and time stamping in the switchgear, and utilizes standard Ethernet technology for longer communication distances.

The speed of this solution is typically 500 ms for one closed loop (indication from one motor until operation of another, assuming 250 ms cycle time in control execution). Typically five to eight seconds for sequential operation of 64 motors.

AC 800M controllers access the INSUM functions through function blocks in the INSUM Communication Library.

The TCP/IP gateway connects controllers to the LON (Local Operating Network) fieldbus. MCUs (Motor Control Units) are grouped into subnets accessed through a number of routers.

INSUM applications handle motor and switch gear control. They can also be set to send alarm and event information to the AC 800M through the TCP/IP gateway.

Each motor has an MCU located in the motor starter module. The INSUM devices (such as MCUs) are arranged in up to four subnets, each one supporting up to

32 units at 78 kb/s transfer rate. A network (LonWorks) transfers messages at 1.25 Mbps between the subnet units via routers. One INSUM MMI (Man-Machine Interface) can be connected to the LonWorks.

The following options are given:

- Maximum number of MCUs (or other INSUM devices) per AC 800M.
  - 256 MCUs (or other INSUM devices) per AC 800M with PM864 or PM866.
  - 128 MCUs (or other INSUM devices) per AC 800M with PM861.
- Maximum 6 CI857 per AC 800M.
- Maximum 128 MCUs (or other INSUM devices) per CI857.
- Maximum 2 INSUM TCP/IP Gateways per CI857.
- Maximum 128 INSUM devices per INSUM TCP/IP gateway.
- Four LonWorks subnets per INSUM TCP/IP gateway.
- Maximum 32 devices per LonWorks subnet.

MNS *i*S

MNS *i*S is a motor control center solution that is used in PROFINET IO network. MNS *i*S delivers all the functions for control, protection and monitoring of motors and motor starters using software and hardware modules for the specific tasks.

MNS *i*S consists of the interface module, MLink, that serves as the serial gateway interface to higher level systems which communicate to all modules through PROFINET IO.

MNS *i*S is handled as one PROFINET IO device having 60 motor starters. Each motor starter is handled as one I/O module. The functionality of each motor starter can be a configured instance specific and it is scalable. Subfunctions for each motor starter type are defined by different types of submodules below the I/O module. The submodules and the functionality of the motor starter can be configured on the instance level.

Several applications running in different controllers can get access to different motor starters belonging to the same MNS iS like shown in Figure 33.

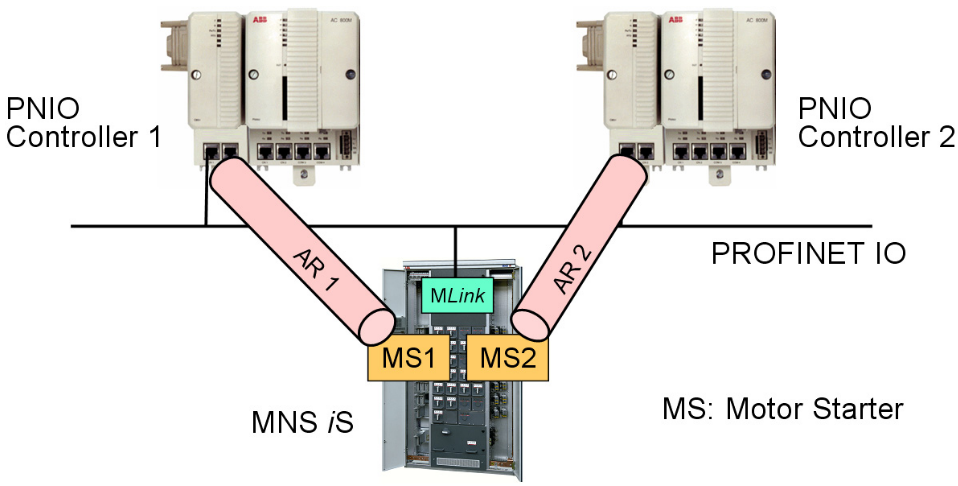


Figure 33. MNS iS Integration to AC 800M

UMC100 Universal Motor Controllers

The PNQ22 Ethernet adapter module provides PROFINET IO connectivity for the ABB Universal Motor Controller UMC100 and ABB soft starters PST and PSE. The PNQ22 allows the connection of four devices to CI871.

ABB Drives

There are five ways to connect/integrate ABB Drives to the AC 800M series of controllers:

- Via the S800 optical ModuleBus directly connected to the AC 800M controller.
  - This is the standard way to connect single drives.
  - Low cost integration of single drives.
  - For both engineered drives and standard drives.
- Via the S800 I/O ModuleBus connected to CI801/CI840 that is connected via PROFIBUS to the controllers.

  - Engineering via process objects (function blocks and faceplates). Access to the drive data via the process object.
  - Only for standard drives.
- Via PROFIBUS DP and the specific adapters NDBU-12, RPBA-01 or FPBA-01.
  - For both engineered drives and standard drives.
  - One NDBU-12, RPBA-01 or FPBA-01 is required per drive.
    ABB Drives supplies the NDBU-12, RPBA-01 or FPBA-01.
  - Engineering via process objects (function blocks and faceplates). Access to the drive data via the process object.
- Via DriveBus using the DriveBus communication module CI858.
  - The DriveBus interface is used for communication between ABB drives and AC 800M controller.
  - The DriveBus communication is especially designed for sectional drive applications for ABB rolling mill drive systems, and ABB paper machine control systems.
- Via PROFINET IO and the specific adapter RETA-02 or FENA-11.
  - For both engineered drives and standard drives.
  - One RETA-02 or FENA-11 is required per drive. ABB Drives supplies the RETA-02 or FENA-11.
  - Engineering via process objects (function blocks and faceplates). Access to the drive data via the process object.

Considerations

Optical ModuleBus.

Max 12 ABB drives can be connected to the same cluster via the optical ModuleBus. It is possible to connect up to 7 clusters to AC 800M, but the performance and CPU load may limit the numbers. S800 I/O and ABB Drives cannot be combined on the same cluster.

PROFIBUS via CI854A/CI854B and CI801/CI840A.

The number of connected ABB drives via PROFIBUS is limited by the parameters PROFIBUS-DP can handle. Refer to [11] in Table 1 on page 30 for detailed information.

DriveBus via CI858.

A maximum of 24 ABB drives can be connected to one CI858 and a maximum of two CI858 can be connected to an AC 800M controller. If more than one ABB drive is connected to the CI858, a branching unit NDBU is needed, which enables the construction of a logical bus with physical star topology. The branching units can be chained. Refer to Figure 34. Refer to [12] in Table 1 on page 30 for more information about the NDBU branching unit.

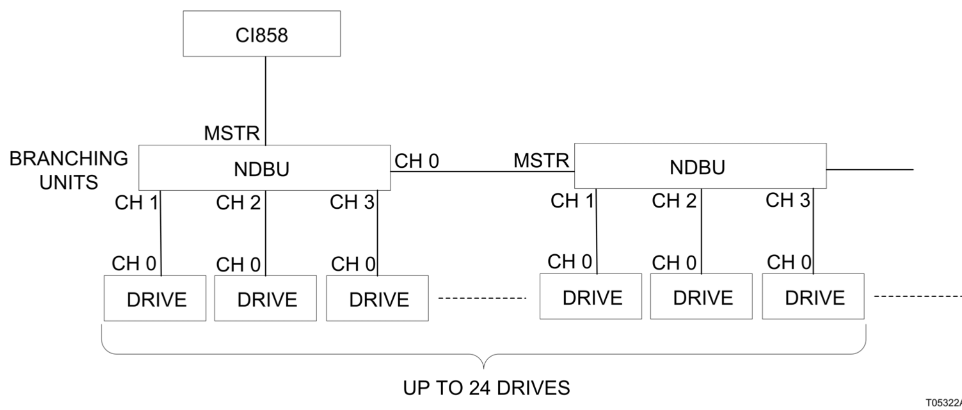


Figure 34. Drivebus via CI858

Refer to the appropriate vendor documentation for information regarding the ABB Standard Drive and ABB Engineered Drive.

Refer to the Control and I/O section in [1] in Table 1 on page 30 for a complete list of supported ABB Standard Drives and ABB Engineered Drives.

AC 800M Redundancy

The redundancy concepts discussed here are independent of each other. There is no single point of failure. Figure 35, Figure 36, and Figure 37 show the redundancy concept.

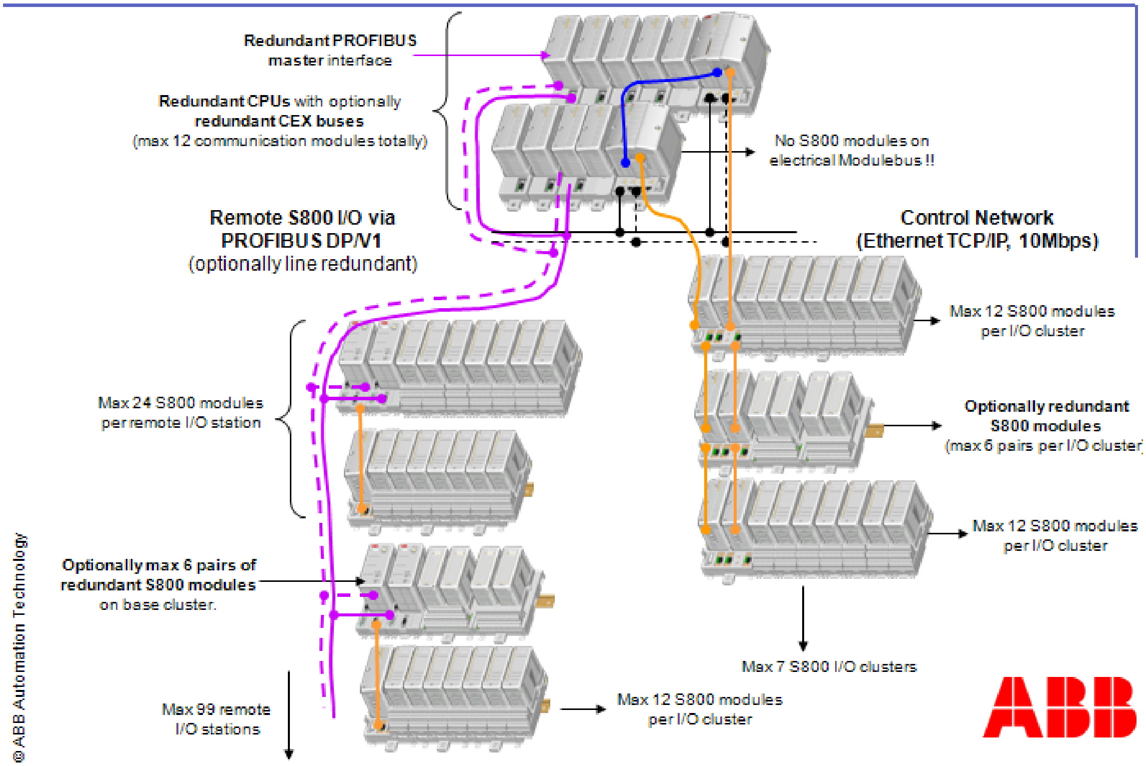


Figure 35. Full Redundancy

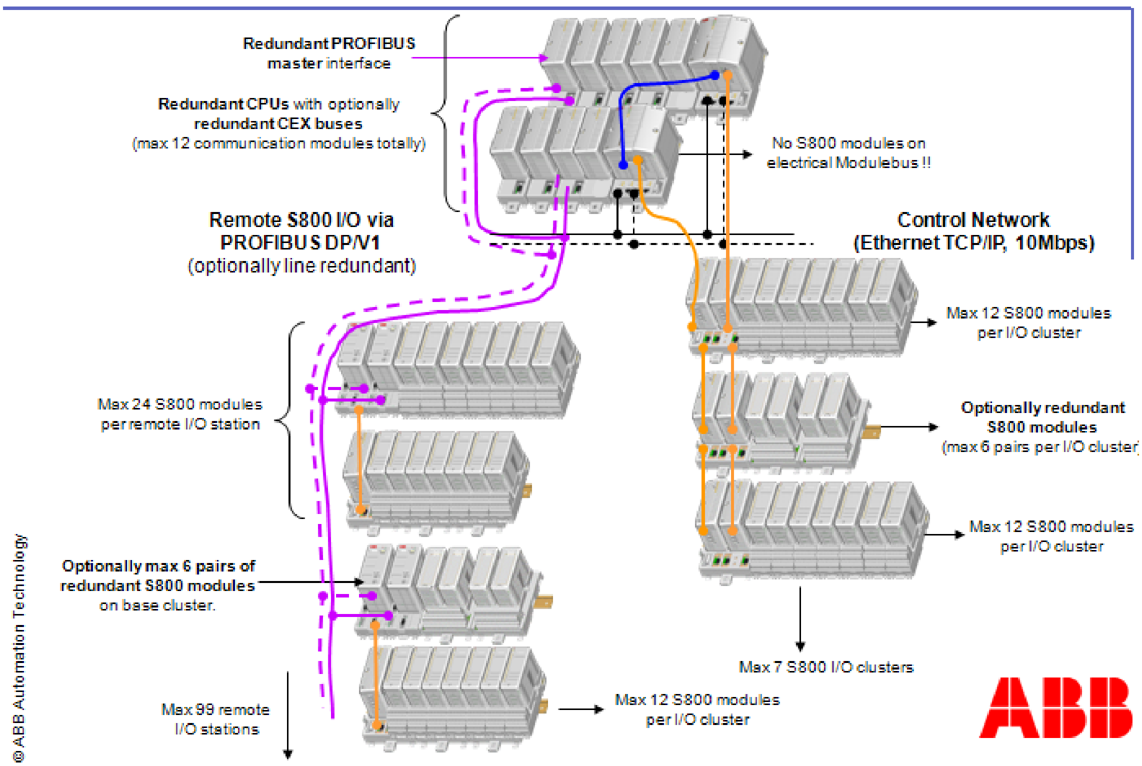


Figure 36. AC 800M CPU Redundancy

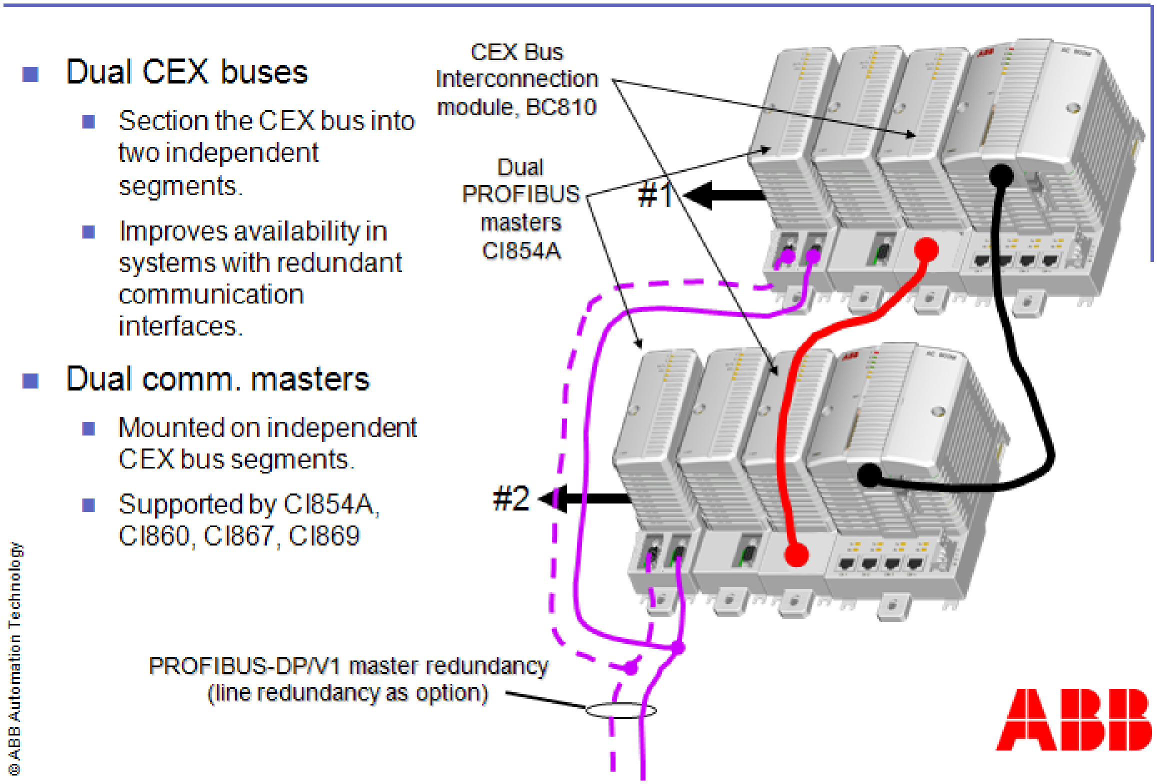


Figure 37. Redundant Communication Masters and CEX Buses

The following forms of redundancy are discussed:

- CPU.
- Control network.
- Fieldbus.
- Line.
- Communication master.
- Communication slave.

CPU Redundancy

AC 800M controllers PM861(A)/PM862/PM864(A)/PM865/PM866(A)/PM867/PM891can be configured for CPU hardware redundancy. Here, two CPU modules will be running in parallel, one as primary and the other as secondary. If the primary CPU fails, the secondary CPU automatically takes over. Figure 38 shows a redundant CPU configuration.

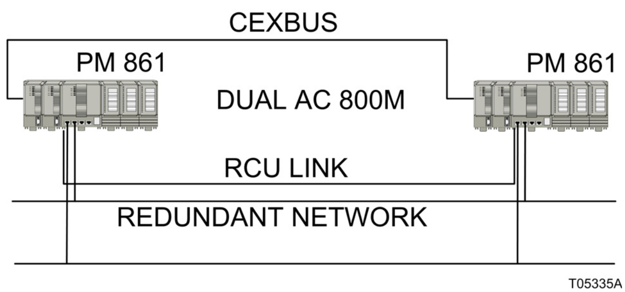


Figure 38. Example Redundant CPU Configuration

The BC810 CEXbus Interconnection Unit provides a method to section the CEXbus into two independent segments. This improves availability in systems with redundant communication interfaces. Figure 39 shows a redundant CPU configuration using the CEXbus interconnection unit.

BC820 has the same function as BC810, but the distance between two BC820s can be up to 200m. The CPUs in a redundant controller can by that be physically separated. The connection between the BC820s consists of one electrical and one optical link. BC820 can be used with PM862, PM866 and PM866A.

Control Network Redundancy

Network redundancy is based on the RNRP (Redundant Network Routing Protocol). This protocol is designed for rapid detection of network failure and instant switching to alternative paths. Figure 40 shows a redundant control network.

Network redundancy requires two independent IP networks, one primary and one secondary. Whenever the maximum number of lost messages is exceeded, then the traffic is switched to the secondary network.

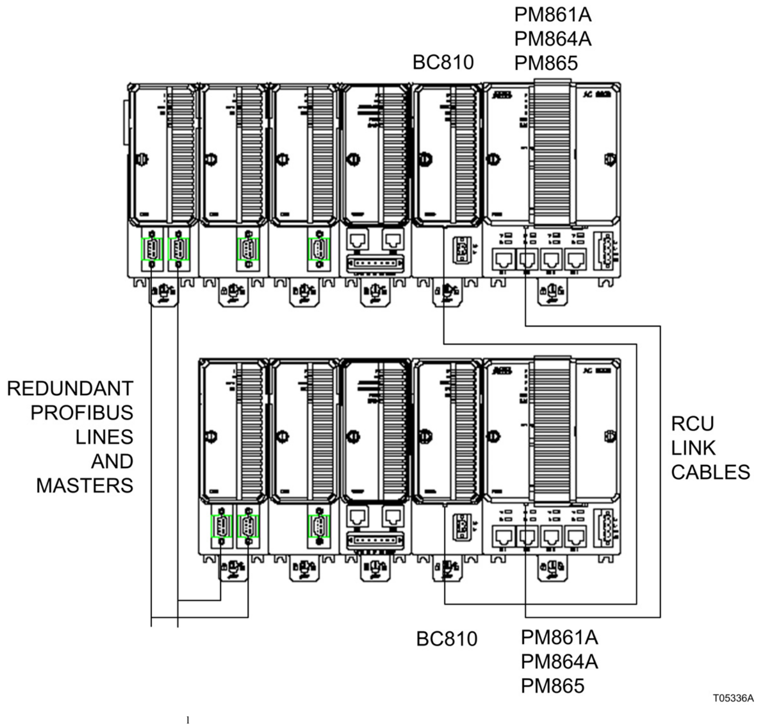


Figure 39. Redundant CPU Configuration with CEXbus Interconnection Unit

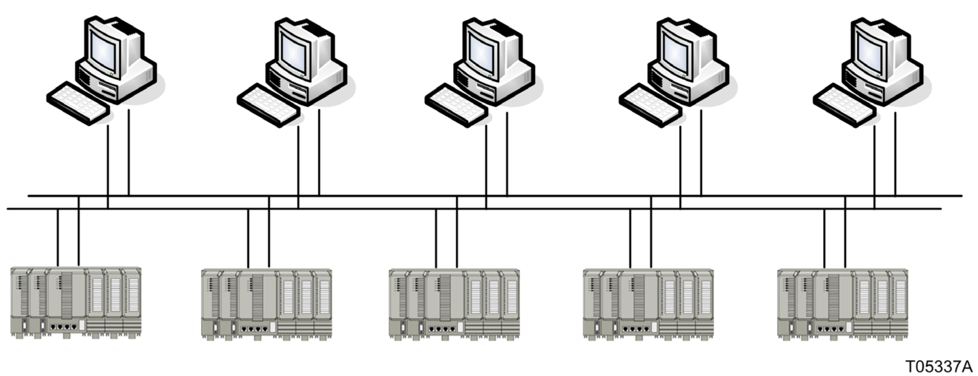


Figure 40. Redundant Control Network

All devices with network redundancy must be connected to both networks. The node number must be identical in both networks.

Network redundancy can be implemented in all or in only some part of the network. Nodes with one connection only must be connected to the primary network.

Fieldbus Redundancy

AC 800M Control Software supports the following redundancy functions:

- Line redundancy (CI854, CI854A, CI854B or RLM01).
- Communication master redundancy (CI854A/CI854B).
- Communication slave redundancy (CI840, CI920s/CI920As).
- Advant Fieldbus 100 (CI869).

Line Redundancy

Line redundancy support is built into PROFIBUS-DP communication, through dual ports on the CI854/CI854A/CI854B interface module. Line redundancy may be achieved for other communication by adding extra equipment.

Field devices equipped with only a single PROFIBUS interface, can be integrated in the redundant PROFIBUS network by using ABBs Redundancy Link Module RLM01. RLM01 provides redundant lines of communication to the PROFIBUS protocol. Acting like an active switch, it can make two redundant lines out of one PROFIBUS-DP line or it can join two redundant lines to one, depending on the situation. The RLM01 amplifies the signal form and amplitude of the incoming data and monitors activities and error statuses of all three lines.

For line redundancy for MasterBus 300 communication, the CI855 interface is used.

Communication Master Redundancy

Master redundancy is supported in PROFIBUS-DP communication by using two CI854A/CI854B communication interface modules. The master redundancy can be combined with CPU redundancy and CEXbus redundancy (BC810).

FOUNDATION Fieldbus communication redundancy is supported by using two CI860s. High availability on HSE media level can be achieved by fault tolerant Ethernet ring topologies.

Master redundancy is supported by MODBUS TCP by using the CI867 interface. Refer to [13] in Table 1 on page 30 for more information on MODBUS TCP redundancy.

Advant Fieldbus 100 redundancy is supported by using two CI869s.

EtherNet/IP redundancy is supported by using two CI873s.

Communication Slave Redundancy

Slave, Master, and Communication Line redundancy is supported in PROFIBUS-DP communication by using two CI840s for S800 I/O and two CI920s/CI920As for S900 I/O.

AC 800M Control Software

The AC 800M Control Software consists of:

- Firmware - to be downloaded to controllers.
- Libraries - Control software libraries to use when creating control applications.
- Control application.

Firmware

Certain hardware is delivered with installed firmware (embedded software) while other hardware is delivered without any installed firmware. Required firmware can be downloaded from Control Builder M.

If Ethernet is used for the download, the controller IP address must be set before any download. The IP address can be set using the IP Configuration tool.

Firmware is downloaded to both CPUs and communication modules from Control Builder M, through Ethernet or directly through serial communication. The application program in a non-redundant controller must be stopped before the new firmware can be downloaded. After the firmware is updated the application program has to be downloaded again and a cold start of the CPU must be performed.

Online upgrade of the controller is supported for **redundant** CPUs and communication modules. This means that the application program in the CPU does not have to be stopped before the new firmware can be downloaded. This is valid only for firmware version 5.0 and higher.

The CI858 DriveBus interface does not support firmware download via the AC 800M controller. The download requires a local connection of the drives tool.

Standard Library Objects Overview

Table 12 gives an overview of available standard object type libraries. Refer to [14] in Table 1 on page 30 for more information.

Table 12. Library Overview

Library Group	Library	Description
System	System	Contains IEC 61131-3 data types and functions together with extended functionality designed by ABB.
Basic Library	BasicLib	Basic library for the Control Builder. It contains data types, function block types, and control module type, with extended functionality.
Communication Libraries	MMSCommLib	Uses MMS function block types and control modules to communicate with a system supporting the MMS protocol.
	ModemCommLib	Contains function block types to establish modem communication.
	COMLICommLib	Contains function block types to establish COMLI protocol communication.

Table 12. Library Overview (Continued)

Library Group	Library	Description
Communication Libraries (continued)	ModBusCommLib	Contains function block types to establish MODBUS communication.
	MB300CommLib	Contains function block types to establish MasterBus 300 communication.
	S3964RCommLib	Contains function block types to establish communication supporting the Siemens 3964R protocol.
	SattBusCommLib	Contains function block types supporting SattBus.
	SerialCommLib	Contains function block types supporting communication with external devices via serial channels with user-defined protocols.
	UDPCommLib	Contains function block types that are used for self-defined UDP communication. These function blocks are used when the controller needs to communicate with external equipment. The used protocol is UDP, running on Ethernet.
	TCPCommLib	Contains function block types that are used for self-defined TCP communication. These function blocks are used when the controller needs to communicate with external equipment. The used protocol is TCP, running on Ethernet.
	INSUMCommLib	Contains function block types for communication with INSUM devices.

Table 12. Library Overview (Continued)

Library Group	Library	Description
Communication Libraries (continued)	FFHSECommLib	Provided for communication with FOUNDATION Fieldbus HSE devices.
	ModBusTCPCommLib	Contains function block types that establish communication with a system that supports the MODBUS TCP protocol.
	MTMCommLib	Contains function block types to establish communication with MOD5 controllers.
Alarm and Event Library	AlarmEventLib	Contains function block types and control module types for alarm and event handling.

Table 12. Library Overview (Continued)

Library Group	Library	Description
Control Libraries	ControlBasicLib	Contains predefined function block types.
	ControlSimpleLib	Contains function blocks for simple control loops.
	ControlStandardLib	Contains control module types to be used when designing your own standard control loops.
	ControlExtendedLib	Contains control modules for arithmetic and signal processing for continuous control.
	ControlAdvancedLib	Contains control module types for advanced continuous control (PID loops for example).
	ControlFuzzyLib	Contains control module types used for building blocks for fuzzy controllers.
	ControlSolutionsLib	Contains closed loop solutions (single loop, cascade loop, override loop, feedforward loop, and midrange loop for example).
	ControlObjectLib	Contains module types for cross coupled signals in control loops. The library is based on templates where you can create your own solutions based on object types with the Control Connection datatype (CC-component).

Table 12. Library Overview (Continued)

Library Group	Library	Description
Batch Libraries	BatchLib	Contains a general template for an ISA 88 equipment procedure. It is intended to be copied to the user's own batch library and used to create procedural elements, like phases and operations. It also contains a general ISA 88 state machine.
	BatchAdvTemplatesLib (Installed with Batch)	Contains modules to represent Units, EquipmentModules and Phases in the ISA 88 standard models. These modules are templates, i.e. to be copied to the user's own library and modified to describe the user's application.
	ProduceITBatchLib (Installed with Batch)	Contains general functions for state handling according to ISA 88 and information exchange for example.

Table 12. Library Overview (Continued)

Library Group	Library	Description
Process Object Libraries	ProcessObjBasicLib	Contains basic core function block types for valve and motor control functions.
	ProcessObjExtLib	Contains types based on protected core functions available in ProcessObjBasicLib. (Unprotected code added to the core.)
	ProcessObjDriveLib	Contains function block types and control module types to use to control and supervise ABB Standard and Engineered Drives.
	ProcessObjInsumLib	Contains function block types and control module types to control and supervise the standard INSUM devices MCU (Motor Control Unit) and trip unit for circuit breakers.
Supervision Libraries	SupervisionLib	Consists of modules for detector input, system control and monitoring, overview presentation and output handling.
	SupervisionBasicLib	Contains the function blocks intended for safety (shutdown) logic, which have one normal condition and one safe condition. The boolean activation signal is set, when an input object detects an abnormal condition.
Fire Gas Library	FireGasLib	Contains control module types for monitoring and control of protection systems typically used in a Fire and Gas system.

Table 12. Library Overview (Continued)

Library Group	Library	Description
Signal Libraries	SignalLib	Contains function block types for analog and digital inputs and outputs.
	SignalBasicLib	Contains user function block types suitable for safety applications. All objects in this library are without alarm and event handling. These simple function block types are used for overview and forcing of boolean and real signals. The easy design makes these function block types perform fast with low memory consumption.
Synchronized Control Libraries	GroupStartLib	Contains control module types used to control and supervise process objects in a controller.
	SeqStartLib	Contains control module types used for Sequence Start.
OCS Evolution Libraries	MOD300CCFLib (installed as an optional system extension)	Contains function block types of the most frequently used FCMs from MOD 300.
	INFI90FCLib (installed as an optional system extension)	Contains function block types of the most frequently used function codes from Harmony/INFI 90.

Alarm and Event Handling

The Alarm and Event library contains function blocks for handling alarms and events, including detection, notification or definition of alarm conditions. The Signal Libraries contain function blocks for monitoring of signals, both internally and between applications.

System alarms and events are created in a particular controller, but can be read and acted upon by the operators. The alarm or event has its origin attached to it.

SOE (Sequence Of Events) is supported from S800 direct I/O. The I/O modules are synchronized to the controller real-time clock with an accuracy of better than 1 ms. Events are time stamped on the I/O module, refer to S800 I/O on page 152, and transferred through the controller, over the communication system, to the Alarm and Event system.

SOE is supported on S800 I/O modules mounted through direct I/O (on the ModuleBus).

Events on I/O channels in one controller are differentiated down to a millisecond. For events in two different controllers, the synchronization accuracy between controllers must be considered. For more details, refer to System Time Synchronization on page 63.

Alarms and events are collected and forwarded by the AE (Alarm and Event) part of the OPC server. Alarm and event information can be read by other OPC clients, such as the Operator Workplace.

National Language Support (NLS)

Alarm and event text from the controllers supports NLS.

Control Applications

Control applications can be created and then be downloaded to controllers using the Control Builder. Control Builder supports five different programming languages according to IEC 61131-3. They are Function Block Diagram, Structured Text, Instruction List, Ladder Diagram and Sequential Function Chart. In addition to these, Control Builder supports creation of logic using Diagrams (which use the Function Diagram (FD) language) and Control Module Diagrams. Control applications can be distributed and executed on several controllers and can communicate with each other on the control network using named variable communication. Parts of the application can be downloaded to different controllers.

If Ethernet is used, the controller IP address must be set before downloading. This is carried out with the IP Configuration tool.

The functionality range for control applications is wide, from binary control to closed loop control, with advanced functions like auto tuning PIDs, fuzzy control, etc. Predefined process objects like motor objects, valve objects, etc. are available. It is possible to build user-defined function blocks, and also to hide their content in order to protect intellectual property. User-defined serial protocols can be developed in structured text with the support of special functions needed (for example, checksum calculation).

Control modules extend the IEC 61131-3 language to an object-oriented configuration method. The control module concept raises the abstraction level of engineering by hiding details in predefined control blocks. This enables reuse to a higher degree, making repetitive engineering very efficient.

The AC 800M Control Software is the environment in which the IEC 61131-3 control applications are executed. Execution of applications is supported by a number of functions such as:

- Task Management gives programmers the control over the execution order of different parts of the code, as well as priorities between different programs and modules. It is also possible to set an offset for a task.
- Code Distribution facilitates simultaneous execution of different parts of an application on several controllers.
- Access Variables and Communication Variables allow for named communication between applications running on different controllers.

AC 800M Control Software Integration

The AC 800M Control Software is available on the 800xA System distribution media to build applications.

When using the applications together with the 800xA System, an AC 800M Control Software Integration license is needed.

Section 7 Device Management

Field devices are an integral part of the system. They provide seamless integration from the field level to the boardroom supporting functionalities like Asset Optimization.

Integration of Fieldbuses into System 800xA is based on well-defined standards such as OPC (OLE for Process Control) and FDT (Field Device Tool), EDDL (Electronic Device Description Language), and the fieldbus protocols - FOUNDATION Fieldbus and PROFIBUS/HART. These protocols cover a broad range of applications and are highly recognized at the market (refer to Figure 41). Very often, regional preferences or customer specific requirements determine which fieldbus has to be used. The strength of System 800xA is the freedom of choice it offers.

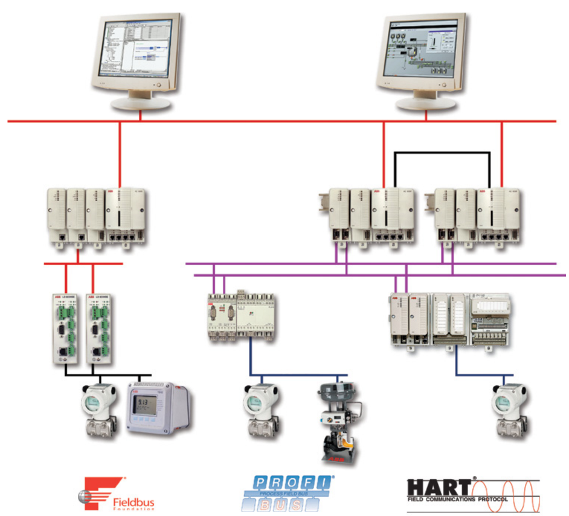


Figure 41. Integrated 800xA System Environment

The fieldbus integration also covers HART devices (although HART is not exactly a fieldbus). However, HART devices support access to information via digital communication, superimposed to the standard 4-20 mA signals. With the introduction of WirelessHART, this data can now also be accessed via radio in Wireless HART-enabled devices. Similar to fieldbus data, this information can be exploited by system applications.

The following Device Management packages are available in System 800xA:

- Device Management PROFIBUS.
- Device Management HART.
- Device Management FOUNDATION Fieldbus.

Device Management HART and PROFIBUS are combined together into one installation package. The functionality is enabled depending on the Device Management HART or PROFIBUS licenses used.

Depending on the fieldbus protocol, different topologies are used to connect field devices.

Integrated System Environment

Each Device Management Package supports the user during the life cycle of a plant, from planning phase to operation/maintenance of the plant. The packages include all the means necessary for a complete integration of smart field devices (as illustrated in Figure 42).

The integration effort required from the user of the field devices is kept to a minimum. The integration work and necessary tests have been done in advance by ABB. Pre-integrated field device object types, provided by Device Libraries, contain all fieldbus aspects. This means that the fieldbus aspects are just one mouse click away for every use case, such as engineering, operation, maintenance etc.

Fieldbus Builders enable System 800xA to engineer the fieldbus topology down to the field devices. They also enable application planning as well as device parameterization, commissioning and diagnosis.

Fieldbus OPC Servers, provided along with the Device Management Packages, provide field device data to Asset Optimization applications.

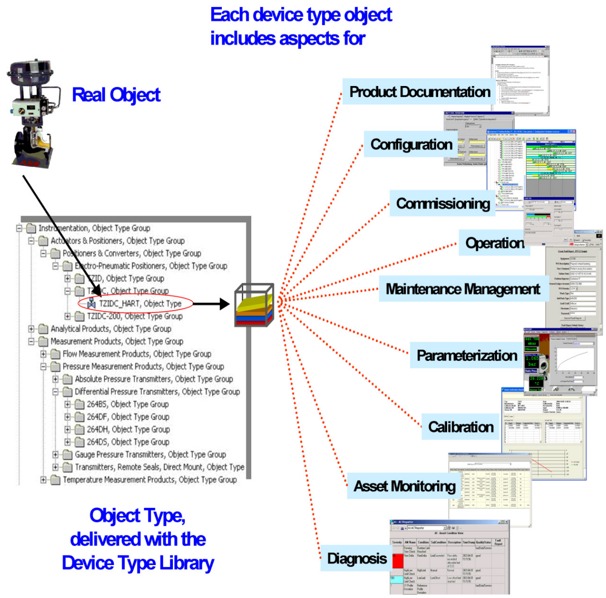


Figure 42. Field Device Object with Preconfigured Aspects

Device Libraries Ensure Efficient Engineering

Beside engineering tools and OPC Servers, the Device Management packages include Device Libraries containing a large portfolio of field device types. Interoperability of devices included in the library has been tested and proven with System 800xA.

Device libraries allow the user, to insert a device from the library into the relevant structure, and use it in all its aspects. Device libraries contain both ABB and third party device types enhanced with the essential aspects for:

- Configuration.
- Parameterization.
- Commissioning/diagnosis.
- Device documentation.
- Asset monitoring.
- Maintenance management (CMMS connectivity).

For asset monitoring and maintenance management, Asset Optimization installation and corresponding licenses are required.

Device object types for PROFIBUS contain, in addition, hardware libraries for efficiently using PROFIBUS devices with the Control Builder M. These hardware libraries provide all necessary settings to easily configure and commission the PROFIBUS communication with CI854/CI854A in AC800M.

Unique for FF (FOUNDATION Fieldbus) is that the function blocks can run on field devices to execute logic in the field. Therefore these function blocks (AI/AO, MAI, DI/DO and PID) have their own faceplates which are provided by the FF device object types. Thereby, after configuration of the function block the appropriate faceplate is immediately available for operator and maintenance procedures.

Devices included in the library have been tested for their interoperability with System 800xA and are released for use with the system. It is not recommended to apply devices, which have not been either proven as interoperable with or released for 800xA.

System 800xA media also contains device libraries for the three supported protocols and these device libraries reflects the status of device integration at the date of issue. It will be continually extended by ABBs Device Integration Center (DIC). Newer device object types can be downloaded from the ABB Library as well as from the ABB SolutionsBank.

The current list of devices can be checked at www.abb.com > Product Guide > Control Systems > 800xA > Device Management... > Device Integration Center. Please let the DIC know, in case of missing devices in the lists, by sending a mail to DIC@in.abb.com.

Device Object Types can be brought into the system as required for the application at any point in time. An Object Type package can be retrieved from the device libraries available in System 800xA media or downloaded from the ABB SolutionsBank. The Device Library Wizard imports the package into the system and creates the Device Object Types with all aspects according to the system options installed.

Device Management PROFIBUS & HART

PROFIBUS is an international standardized communication protocol for the manufacturing and process industries. Two different Fieldbus types are supported for the 800xA System (illustrated in Figure 43). They are:

- PROFIBUS DP, a high speed, multipurpose bus with scalable transmission rates up to 12 Mbit/s and optimized for interaction with field devices such as remote I/O, drives, motor controller.
- PROFIBUS PA, a serial 2-way communication bus with 31,25 kbit/s, designed for connection of bus-powered 2-wire field devices such as transmitters and actuators. It can be also applied in explosion hazardous applications.

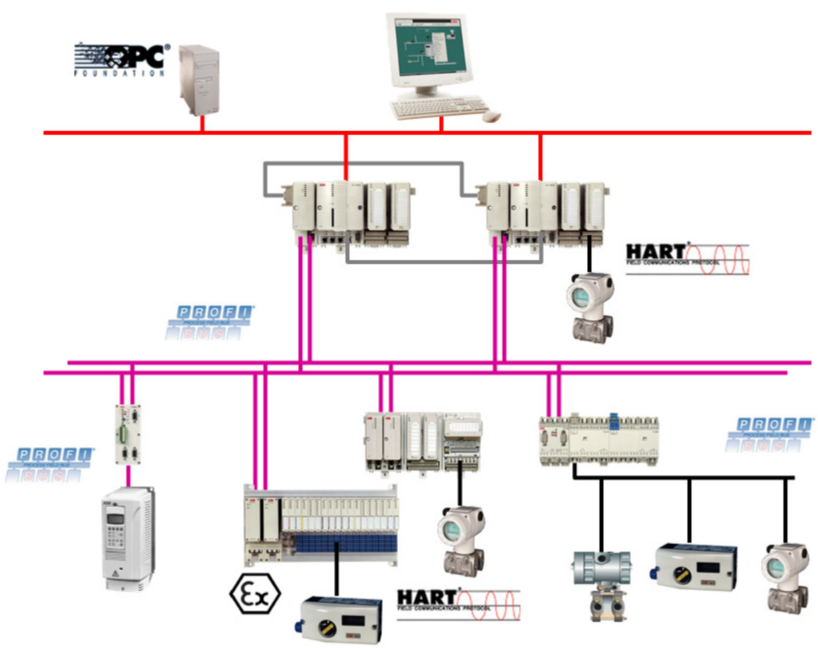


Figure 43. PROFIBUS Fieldbus Architecture with DP, PA, and HART Devices

HART field communications protocol is widely accepted in the industry as a standard for digitally enhanced 4-20mA communications with smart field instruments. A wide range of products is available today. HART preserves the

4-20mA signal and enables two-way digital communications to occur without disturbing the integrity of the 4-20mA signal. The HART protocol is field proven, simple to implement, use and maintain. HART field devices can be connected to ABB Remote I/O S800 and S900 as well as to the S800 local I/O, placed direct to the AC 800M controller.

The advantages of Device Management HART are also available for plants without HART capable I/O modules. In this case it works together with ABB HART Multiplexer Connect solution without any AC 800M controller.

The newly introduced WirelessHART protocol is integrated into System 800xA by means of the Pepperl+Fuchs WirelessHART Gateway. Using this gateway and a Modbus TCP connection, the HART data can be read into the controller application. In addition, a communication path into the Device Management is available so that the parameters and diagnostics of WirelessHART devices can be treated in the same way, just like data from traditional HART devices.

PROFIBUS Communication Interface CI854A/CI854B

A PROFIBUS network is set up with the PROFIBUS interface module CI854A/CI854B. The module supports DPV0 and DPV1 services. DPV0 service is necessary for cyclic communication with field devices for continuous process data. DPV1 service is necessary for communication with field devices to access contained data through FDT/DTM or EDDL technology. High availability can be achieved to access contained data through redundant PROFIBUS lines and optional redundancy of the CI854A/CI854B itself.

DP/PA Linking Device PROFIBUS Power Hub

Linking Devices enable the connection between the PROFIBUS DP network with the PROFIBUS PA subnets (Figure 44).

PROFIBUS Power Hub is an efficient solution for connecting PROFIBUS PA devices to the process control system. The modular PROFIBUS Power Hub consists of a gateway module, converting the PROFIBUS DP signal to PROFIBUS PA, and redundant power conditioner modules or galvanically isolated power supply modules driving the PROFIBUS PA segments. Field barriers can be used to connect devices in hazardous areas up to zone0, div1/class1.

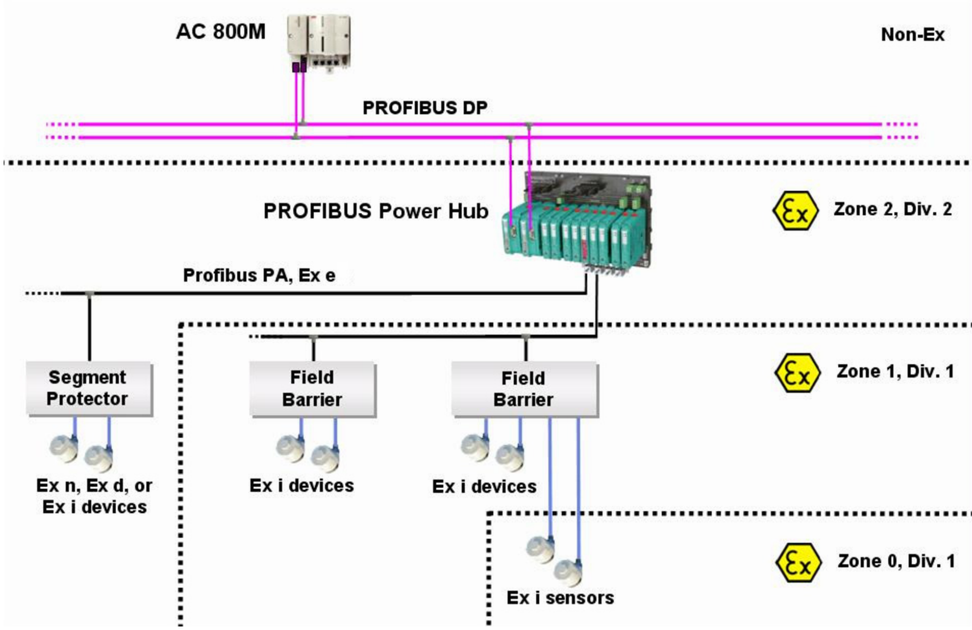


Figure 44. PROFIBUS Power Hub Usage

The linking device is fully transparent in the DP network and supports all baud rates up to 12Mbaud without extra configuration or parameterization. The demand for higher availability of the communication network is met by the optionally redundant gateways and power modules. Also, a new advanced diagnostic module (HD2-DM-A) offers extensive analytical and monitoring possibilities for the PROFIBUS PA fieldbus installation.

Redundancy Link Module RLM01

Field devices equipped with only a single PROFIBUS interface, can be integrated in the redundant PROFIBUS network by using the Redundancy Link Module RLM01. Acting like an active switch, it converts two redundant lines to one PROFIBUS line or vice versa. The RLM01 amplifies the signal form and amplitude of the incoming data and monitors activities and error statuses of all three lines.

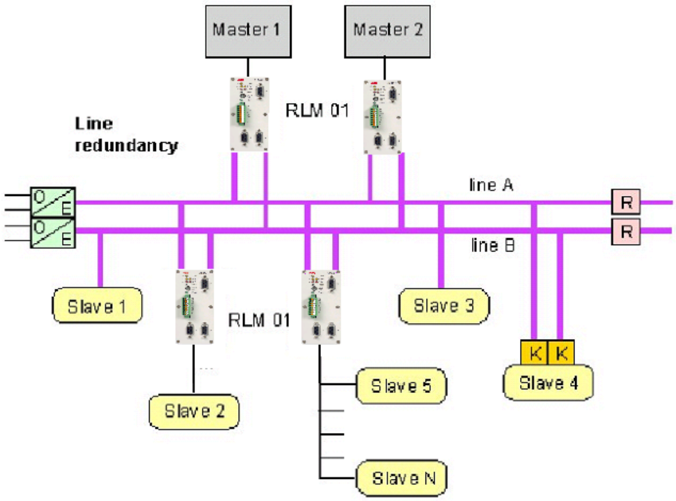


Figure 45. Line Redundancy with RLM01

Device Management Configuration for PROFIBUS and HART

The Device Management configuration tool, Fieldbus Builder PROFIBUS/HART, allows to make use of the additional information from intelligent field devices efficiently in the various aspects of System 800xA. This will be achieved by installing a DTM (Device Type Manager), comparable with a device driver, for each device type from the various manufacturers.

The DTM, which is hosted by the Fieldbus Builder, is the configuration and management component for a field device. It is familiar with all of the device's rules to ensure correctness of the device configuration which simplifies the download of device parameters. The DTM contains graphical user dialogs essentially for device configuration, parametrization, diagnostics, and maintenance. Device parameters can be set in online mode when the device is connected or in offline mode without device connection to prepare for later download of larger sets of devices. Refer to Figure 46.

Fieldbus Builder PROFIBUS/HART supports Import Export functionality and allows reuse of predefined device configuration.

Using Fieldbus Builder PROFIBUS/HART:

- Eliminates additional wiring for field device access, enables operation and engineering access to field devices from the control room.
- Allows full integration of third party devices using FDT/DTM technology (Device Descriptions for HART and enhanced Device Descriptions for PROFIBUS are hosted in DTMs).
- Simplifies field device configuration, commissioning and diagnosis - Speeds up localization of device failures and reduces down time by taking advantage of sophisticated diagnostics in DTMs.

Different users in System 800xA can take advantage of the device driver functionality in combination with the Aspect Object architecture. For example, right-clicking on a device object in a maintenance alarm list easily navigates to vendor specific DTM displays without additional engineering.

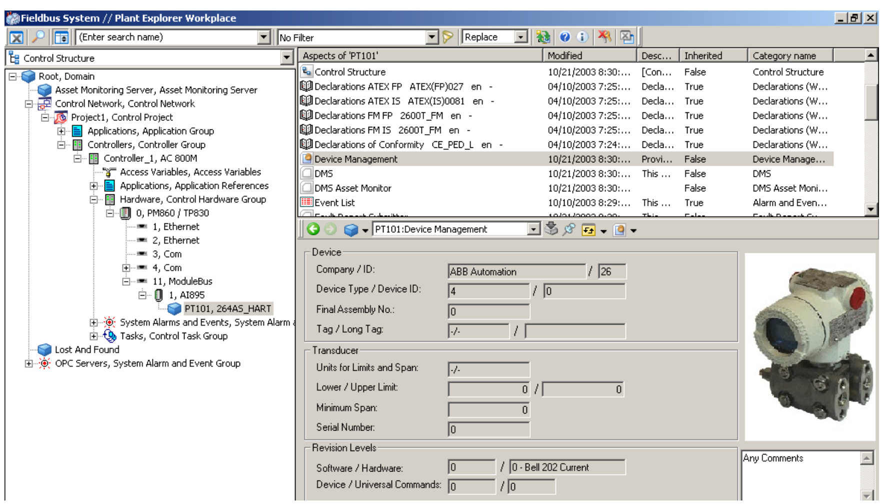


Figure 46. Field Device Configuration via DTMs

Fieldbus OPC Server PROFIBUS/HART

The OPC Server PROFIBUS/HART included in the Device Management PROFIBUS & HART package is designed to provide device data to the Asset

Optimization application. It enables access to PROFIBUS and HART field devices without additional field wiring. It will be used to access specific field device data to read the device status and diagnostic data for asset monitoring purposes to make decisions about device health and asset management.

Basic HART and PROFIBUS DTMs

If device-specific DTMs are not available for specific HART or PROFIBUS devices, the Basic HART DTM and Basic PROFIBUS DTM can be used for basic configuration and parameterization.

For HART devices, standardized Universal and Common Practice HART commands are used. If preconfigured HART devices are used, this functionality is sufficient to commission a wide range of available HART devices. The Basic HART DTM also allows reading out additional process variables and diagnostics information of HART devices as well as setting the device’s output to constant current mode, e.g. for simulating a certain measurement value. All devices using the Basic HART DTM are presented with the same look and feel.

The Basic PROFIBUS DTM is based on the device-specific GSD file for cyclic communication. ABBs Device Integration Center (DIC) takes this DTM to build device-specific applications based on the DPV1 information provided by the device vendor.

Basic HART DTM natively supports HART 7 for wired and wireless HART devices. The enhanced set of Universal and Common Practice commands is supported working with LongTAG, enhanced device identifiers, and additional secondary variables.

HART Multiplexer Connect

HART Multiplexer Connect enables communication between HART devices, connected to different DCS/PLC than 800xA, and the 800xA System. This offers the possibility to integrate HART devices into the 800xA System and allows use of 800xA System features such as asset monitoring, device configuration, calibration, and diagnosis.

HART Multiplexer Connect is a separate option to the HART Device Management and needs to be ordered from the price list.

HART Multiplexer Connect integrates specific DTMs for multiplexers, OPC communication components and HART Multiplexer networks into the 800xA System. The integration allows to scan, configure, calibrate and diagnosis HART devices, connected to controllers (e.g. other than AC 800M), which do not allow routing of HART data through the system. Following standard HART multiplexer hardware can be used:

- Pepperl&Fuchs: KFD2-HMM-16.
- MTL: MTL4840.
- Elcon: Series2700-F and Series 2700-G.
- Stahl: Series 9192.

As a result the benefit of the HART Device Library and its aspect functionality can also be used for HART Multiplexer networks, refer to Figure 47.

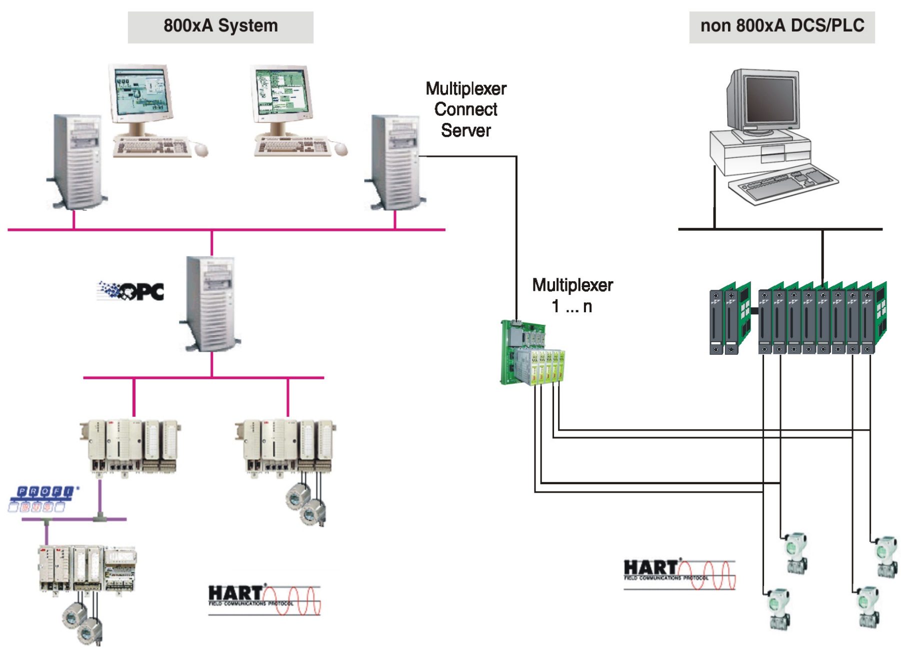


Figure 47. HART Multiplexer Network

Wireless HART Connectivity

Wireless HART connectivity is a managed release functionality and it requires approval from ABB before it can be used. Contact the ABB support center for further details.

Wireless HART connectivity to System 800xA is a newly introduced functionality in 800xA 6.0. This functionality enables communication between HART Revision 7 devices or HART revision 5 devices via an adapter to the System 800xA. The connection between wireless devices and System 800xA is achieved by Pepperl and Fuchs wireless HART Gateway.

With this release it is possible to access HART device variables and device status using MODBUS connectivity (TCP/IP and RS232) into AC 800M Controllers via Pepperl and Fuchs Wireless HART Gateway. An additional communication path into the Device Management is available so that the parameters and diagnostics of WirelessHART devices can be treated in the same way like data from traditional HART devices.

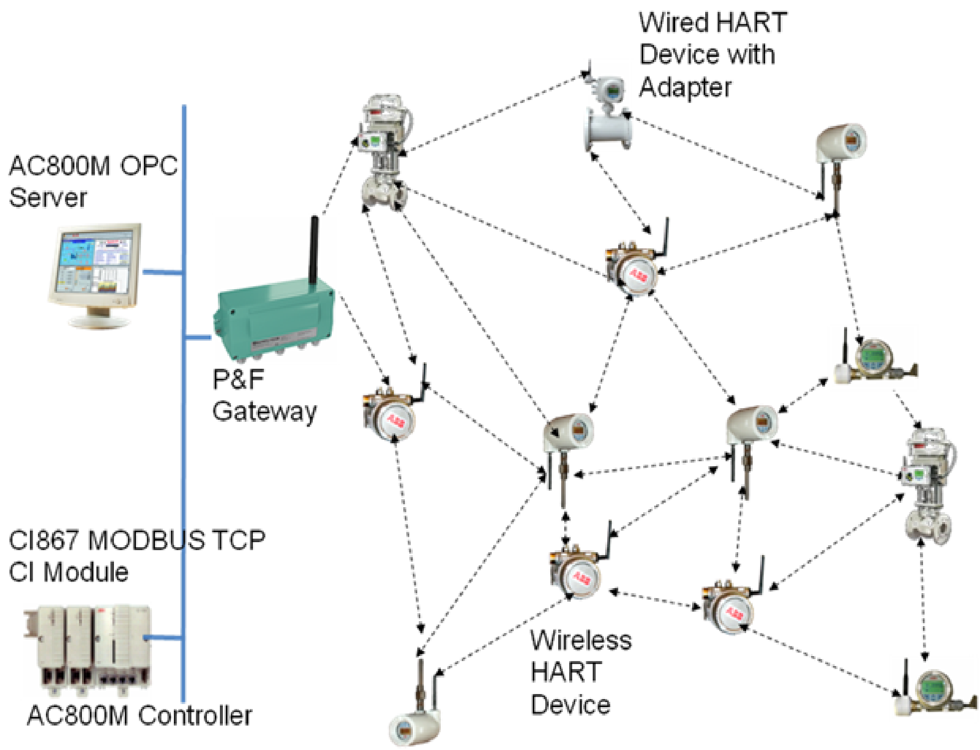


Figure 48. Wireless HART Connectivity

Device Management FOUNDATION Fieldbus

FOUNDATION Fieldbus is an open architecture for information integration. It provides an open standard for process automation applications and is supported by all major control and automation product manufacturers. Two different fieldbus types, H1 and HSE, are defined.

FF H1 is an all-digital, serial, two-way communication bus with 31.25 kbit/s designed for connection of bus-powered 2-wire field devices such as transmitters and actuators.

FF HSE is a high speed Ethernet backbone bus operating at 100 Mbit/s and providing for optimized network design and integration of H1 subsystems via linking devices.

Generally, FOUNDATION Fieldbus is designed for distribution of control applications across the network and the devices. Refer to Figure 49.

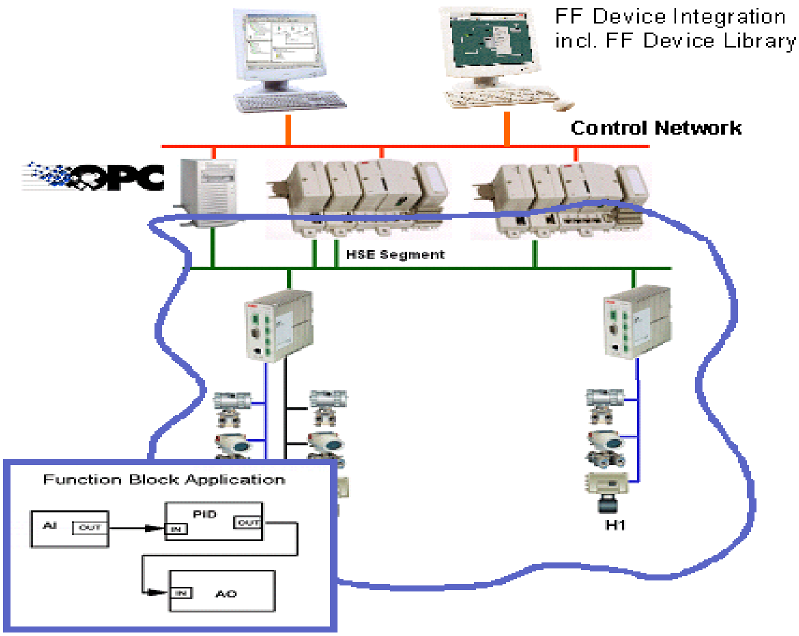


Figure 49. FOUNDATION Fieldbus Architecture

FOUNDATION Fieldbus Integration into 800xA System Structure

Within a typical 800xA System structure as shown in Figure 50 FOUNDATION Fieldbus subsystems (the HSE subnets) are linked to the client server network through FF Connectivity Server, which can be deployed in redundant mode. HSE Subnets use standard Ethernet physical layer. Nevertheless, HSE Subnets are considered as Fieldbuses so that the parallel operation of HSE and other protocols on the same Ethernet is not supported.

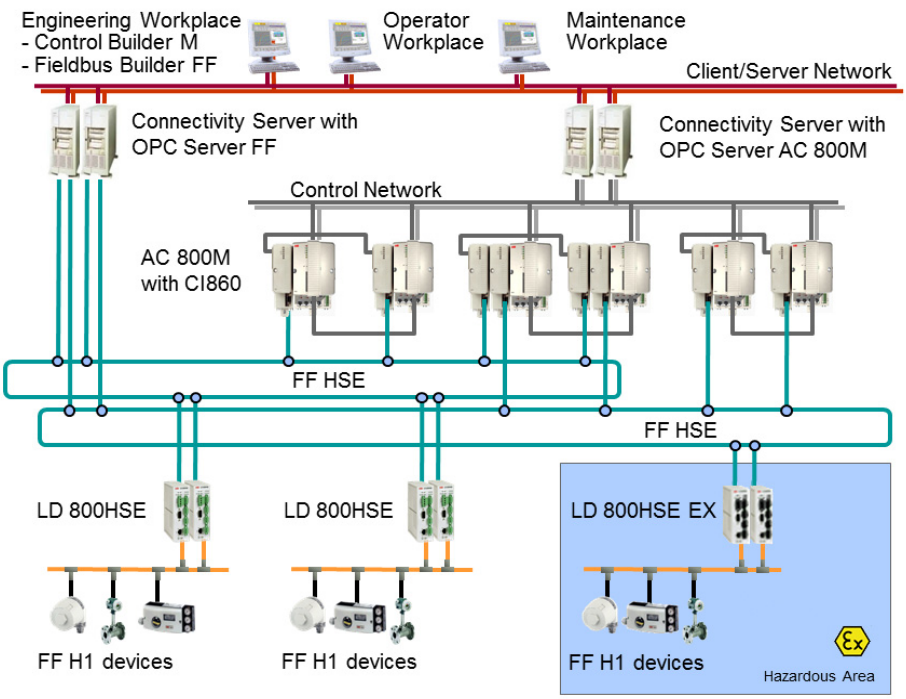


Figure 50. LD 800HSE / LD 800HSE EX in FF Topology

The Linking Devices LD 800HSE / LD 800HSE EX serve as gateways between the field devices connected at the subsidiary H1 links and the HSE subnets. The configuration is done with the Fieldbus Builder FF located at the 800xA Engineering Workstation accessing the HSE subnet via the FF Connectivity Server. The operation is performed via the 800xA Operator Workstation where faceplates have access on OPC variables delivered by the FF OPC Server located at the FF Connectivity Server. Device alarms and events are also routed through the FF OPC Server without affecting the AC 800M controller. This architecture allows for unmatched scalability of FF applications reaching from a pure Control-in-the-Field application with no controller connected to topologies where several controllers are connected to the same HSE Subnet supporting Electronic Marshalling of singles from devices.

HSE Communication Interface CI860

If there is the need to have access to FF process variables in the AC 800M controller, connectivity between the HSE subnet and the controller is established with the CI860 - the Communication Interface FOUNDATION Fieldbus HSE. Then FOUNDATION Fieldbus process data on HSE can be accessed from the IEC 61131 applications in the AC 800M controllers. For this purpose, the CI860 module maps the value and status parts of the FF signals to the IEC 61131 application and vice versa. This is typically necessary if the FOUNDATION Fieldbus subsystem is used for example as simple I/O bus for IEC 61131 control logic or in an enhanced control strategy with simple loops on the FF and more complex logic on controller side.

The CI860 can be used in redundant mode. Up to twelve CI860 modules can be placed at one AC800M also in redundant mode, and each of them can be connected to the same or to a separate FF HSE subnet (Figure 50).

HSE/H1 Linking Device LD800HSE/LD 800HSE EX

The ABB FOUNDATION Fieldbus Linking Device LD800HSE/LD 800HSE EX acts as a gateway between the HSE subnet and up to four separate H1 links. It provides the LAS (Link Active Scheduler) functionality for each connected H1 link and can bidirectionally forward (republish) process data between the HSE subnet and H1 links, as well as between different H1 links. LD800HSE / LD 800HSE EX can be deployed in redundant mode by connecting two LD 800HSE / LD 800HSE EX through a serial redundancy link. Refer to [1] in Table 1 on page 30 for the maximum number of Linking Device that may be connected to one HSE subnet. The
LD800HSE/LD 800HSE EX is compatible with the well-established types of FF Power Conditioners available on the market that are needed to power the H1 links and connected field devices.

LD 800HSE is intended to be installed in non-hazardous areas only, whereas LD 800HSE EX is also suitable to be mounted in hazardous areas of Class 1, Division 2, Groups A/B/C/D according to the Division Model and Zone 2, Groups IIA/IIB/IIC according to Zone Model.

Device Management Configuration for FOUNDATION Fieldbus

The configuration of the FOUNDATION Fieldbus application is done with the Fieldbus Builder FOUNDATION Fieldbus (Figure 51).

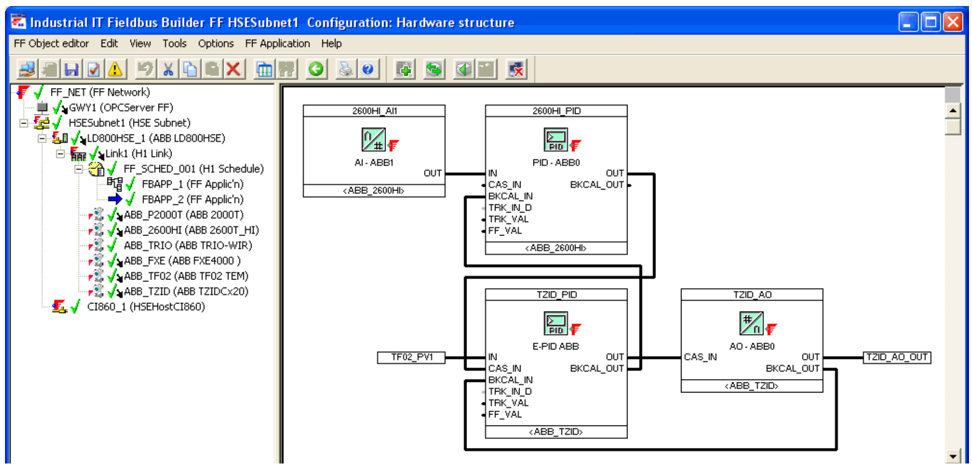


Figure 51. FOUNDATION Fieldbus Application Diagram Editor

The Fieldbus Builder FF performs configuration, commissioning, and maintenance of the FF network with HSE subnets and H1 links. Function block application diagrams are used to specify the distributed control logic and can be created using the drag and drop mechanisms out of the FF Device Library. The available function blocks of each device are listed and are ready for use. Signals can be published on the HSE subnet and H1 links. The required LAS (Link Active Schedule) is generated automatically with the possibility for manual adaptations. Using the FF device descriptions (DD) and capabilities files of the corresponding field devices enables topology and control strategy configuration without the necessity to have the specific devices available online. The engineering workflow is supported by Bulk Data Manager and smart integrated tools for reusing typical solutions to enable efficient engineering, also of large FF installations.

Plausibility checks and automatic link setting optimization ensure the correctness of the network and application configuration. This early verification does significantly simplify the subsequent configuration download into the field devices.

The new Device List provides a condensed view on H1 segments displaying its engineering status and simplifies the commissioning workflow.

Enhanced link diagnostics with runtime error statistics for each node helps to identify problems with devices or field wiring during commissioning and operation.

Incremental download ensures fast and secure download without unnecessary process interruptions. The download of configuration changes is optimized towards minimum impact on the existing device configuration leading to fast commissioning. Smart filter and compare mechanisms support reconciliation of data in devices with data stored in the database in a very effective way. Signal values including status can be displayed for each device and its function blocks (Figure 52).

The dialogs to manage parameters in function blocks, resource and transducer blocks are based on enhanced Device Description Technology supporting methods, for example, for device setup and calibration. By this configuration, commissioning and diagnostics of field devices are handled effectively during the different stages of the lifecycle of a field device.

Fieldbus OPC Server FOUNDATION Fieldbus

The OPC Server FF, included in the Device Management FF package, is designed to provide field device data to other 800xA applications during plant runtime, for example, 800xA Operation or Asset Optimization.

Device alarms and events will be communicated through the OPC Server FF to the Operator Workstations without the need for routing through the controller. OPC Server FF is configured via the Fieldbus Builder FF.

For an FF application process displays can be created in the same way as for non-FF applications. These may for example fetch data cyclically or on demand from the FF segment by reading the signal values or parameter values from the OPC server FF.

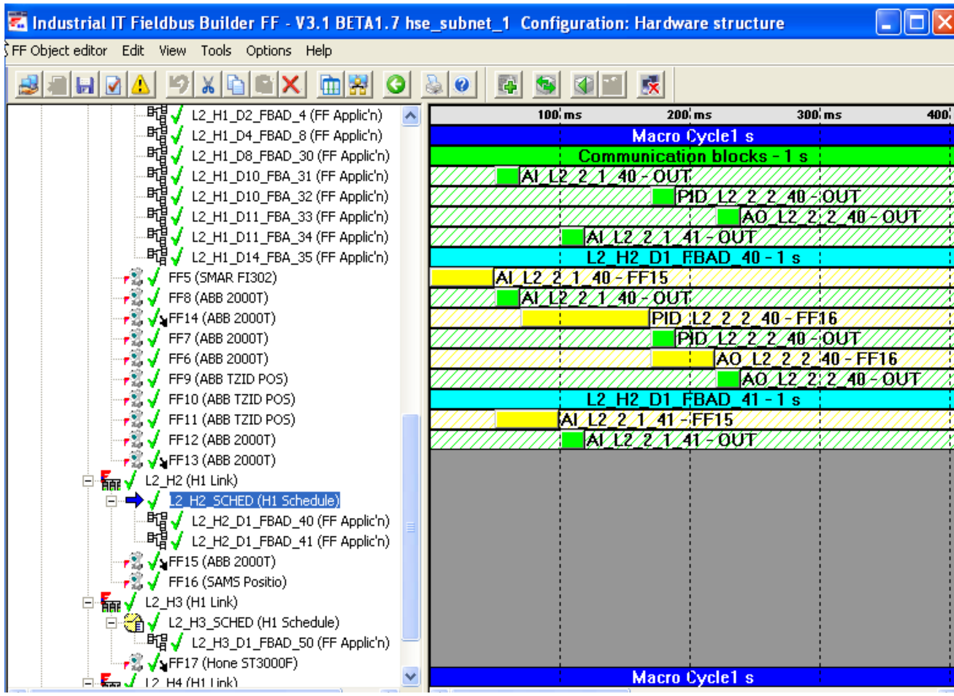


Figure 52. FOUNDATION Fieldbus Scheduling

Section 8 Asset Optimization

System 800xA Asset Optimization consists of system extensions to the 800xA System product. The Asset Optimization software provides for the following functionality:

- Maintenance Workplace and Asset Structure.
- Asset Health Condition Reporting.
  - Asset Viewer.
  - Asset Reporter.
- Asset Monitoring.
  - Basic Asset Monitors.
  - Process Asset Monitors which include a Control Loop Asset Monitor, Generic Heat Exchanger Asset Monitor, and Shell and Tube Heat Exchanger Asset Monitor.
  - IT Asset Monitors Generated by PNSM.
  - FOUNDATION Fieldbus Asset Monitors.
  - HART Asset Monitors.
  - PROFIBUS Asset Monitors.
- Seamless interaction between operation and maintenance.
  - Maximo Integration.
  - SAP/PM Integration.
  - Device Calibration Integration.
  - Asset Optimization Reporting.
  - Configuration.

When integrated with SMS and e-mail Messaging, Asset Optimization provides a method for sending messages based on alarm and event information to user devices such as:

- Mobile telephones.
- E-mail accounts.

Asset Optimization brings maintenance management to the operator environment to provide a single window interface for all asset management related operations. This allows plant personnel to collect, compare, and monitor asset data to accurately assess equipment conditions in real time. For maintenance personnel, Asset Optimization provides a default Maintenance Workplace that supports daily maintenance activities in a most efficient way.

The combination of innovative automation architecture plus advanced information technologies, including integrated fieldbus solutions, allows Asset Optimization to monitor and optimize all plant assets in real time. This includes field devices, control systems, and automation elements, as well as major assets such as heaters and generators.

This architecture provides the required infrastructure to monitor and record asset performance over the entire life span of the asset. Information can then be used to set future performance and profitability goals and to assist managers in making these decisions.

Asset Optimization significantly reduces costly production interruptions by enabling predictive maintenance. It records the maintenance history of an asset and identifies potential problems to help avert unscheduled shutdowns, maximize uptime, and operate closer to plant design limits. Plant managers have the opportunity to collect, compare, and monitor data on field devices and larger equipment to accurately assess equipment operating performance in real time.

As a result, faltering performance can be uncovered before breakdowns occur, and maintenance can be scheduled accordingly.

Figure 53 shows the interaction between the various functional components of Asset Optimization.

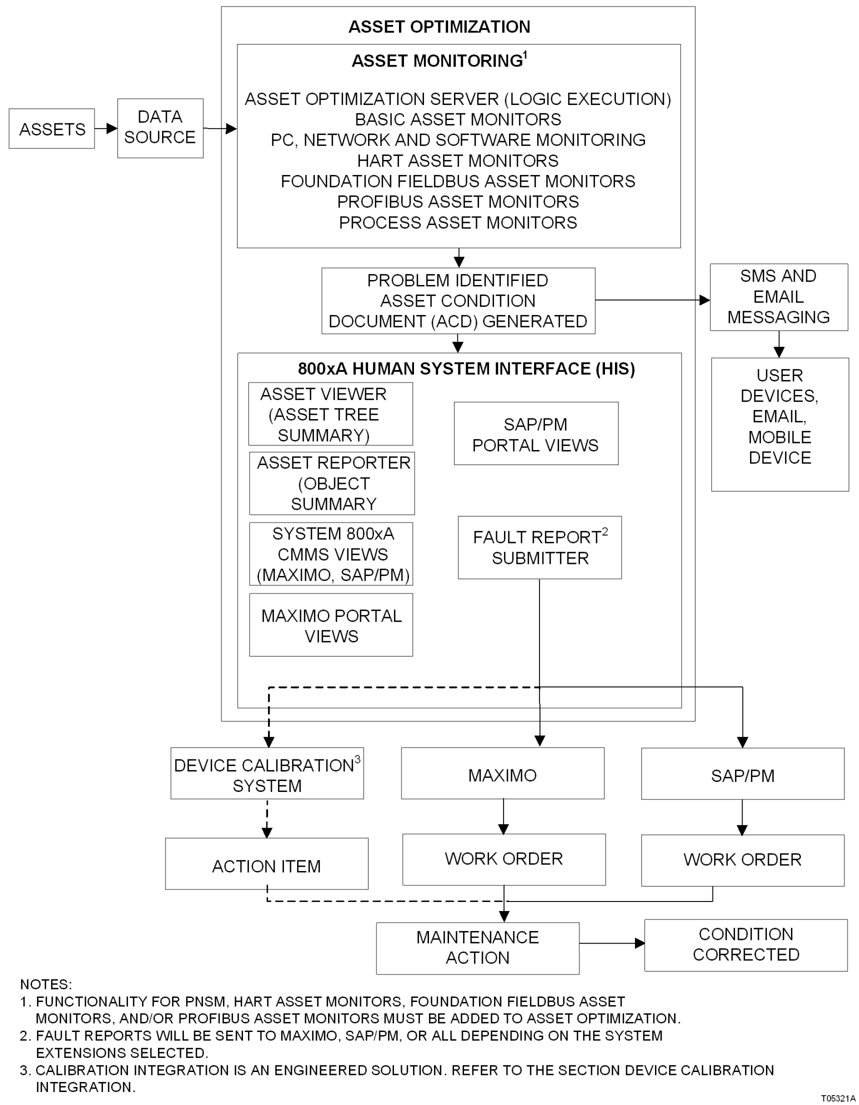


Figure 53. Asset Optimization Functionality

Maintenance Workplace and Asset Structure

Asset Optimization information can be accessed from any workplace in the 800xA System. The Maintenance Workplace (Figure 54) is a default workplace for maintenance personal. It is basically a plant explorer workplace with an alarm band that shows asset monitoring alarms for default asset groups.

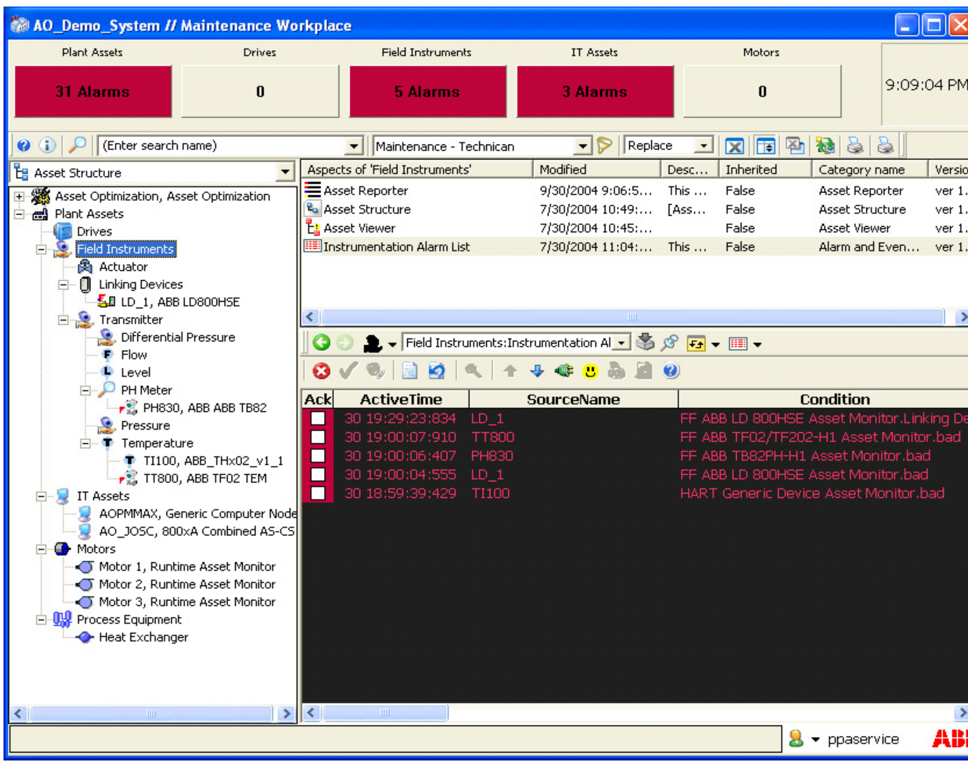


Figure 54. Maintenance Workplace with Alarms

The Asset Structure provides the possibility for maintenance personnel to group and arrange plant assets that will facilitate to efficiently manage the daily work. Control topology constraints can be overcome and even devices with different fieldbus protocols can be grouped together if they required similar maintenance procedures.

The Asset Structure comes by default with five major groups of assets (Drives, Field Instruments, IT Assets, Motors, and Process Equipment).

Maintenance Workplace 2

The new workplace provides efficient way for the user to view the Asset Status and Asset Monitor condition details in few clicks and it is based on the Asset Structure. Refer to Figure 55.

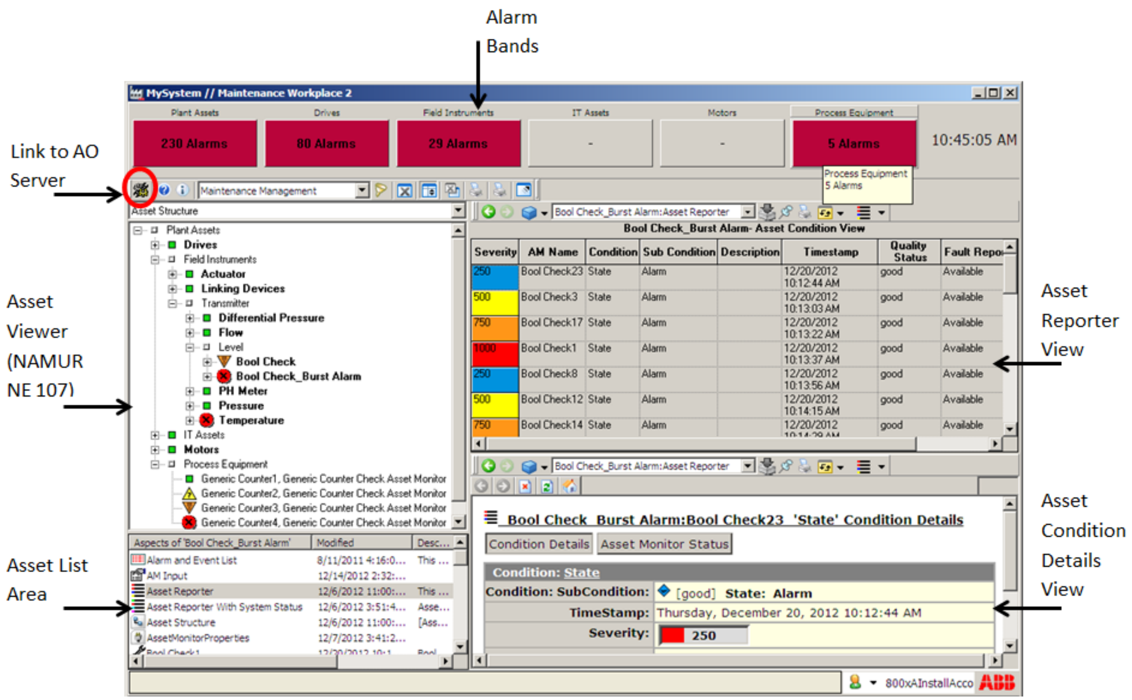


Figure 55. Maintenance Workplace and Asset Viewer

NAMUR NE107 Icons and Colors

NAMUR NE107 recommended icons are introduced to display the Asset Status in Asset Viewer Aspect. Asset Reporter, Asset Reporter With System Status, Fault Report Submitter and Asset Monitor aspects uses colors based on NAMUR NE107 to indicate the Severity of the Asset Conditions. Refer to Figure 55.

Asset Health Condition Reporting

The Asset Health Condition Reporting system provides the infrastructure that reports asset status/condition information to notify operators and maintenance personnel when an abnormal condition calls for a maintenance action.

Asset Optimization provides asset condition reporting via the Asset Viewer and Asset Reporter. The Asset Tree, visible in the Asset Viewer, shows the status of associated plant objects (assets) based on Plant Explorer hierarchies. Assets can be control system hardware components, control system networks, control system devices, fieldbus networks, fieldbus components, machines, pumps, motors, process equipment (boiler, reactor), etc.

Condition Monitoring systems can report accessed asset conditions into the Asset Health Condition Reporting infrastructure, Asset Viewer, and Asset Reporter. The Condition Monitoring system includes Asset Monitoring.

Asset Viewer

The Asset Viewer is accessible within the Plant Explorer Workplace, Operator Workplace, and Maintenance Workplace on 800xA System nodes. It is also accessible as a web-enabled view on non-800xA Systems. When the Asset Viewer is active in the 800xA clients, the status of the assets in the view update automatically when values change. Web-enabled views require a manual refresh to update the view.

The Asset Viewer aspect, when added to an object, allows the Asset Tree to be displayed. Asset Tree severity indicators propagate the most severe condition up the Asset Tree. The indicators distinguish the level of severity using OPC and Asset Monitor severity range (values ranging from 1 to 1,000).

When the Asset Tree is collapsed, (Figure 56) it provides the propagated severity, quality, and Fault Report availability of an object, and all of the children beneath it in the current structure. When the Asset Tree object is expanded, (Figure 57) it provides composite severity, quality, and Fault Report availability for all Asset Monitors of that object. Fault Report availability is indicated by bold text. Context menus permit Fault Report submission directly from within the Asset Viewer.

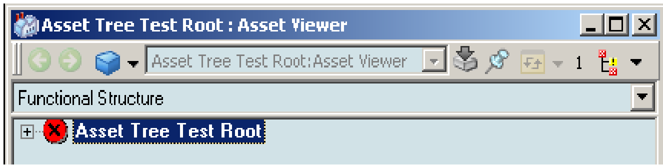


Figure 56. Collapsed Asset Tree

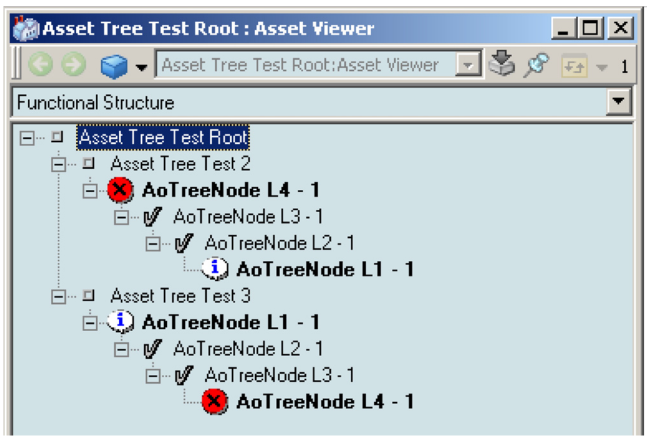


Figure 57. Expanded Asset Tree

A colored frame (refer to Table 13) may appear around the Asset Viewer to indicate its current status. No frame indicates that the current status is accurate.

Table 13. Asset Viewer/Asset Reporter Status

Frame	Status
None	All Asset Optimization Servers running fine
Orange	Some Asset Optimization Servers not enabled, not in service, or Asset Monitoring Engine has not completed first execution cycle
Red	All Asset Optimization Servers or Asset Monitoring Engine not running and/or the Asset Tree Service is not enabled.

Asset Reporter

The Asset Reporter is accessible within the Plant Explorer Workplace, Operator Workplace, and Maintenance Workplace on 800xA System nodes. It is also accessible as a web-enabled view on non-800xA Systems. When the Asset Reporter is active in the 800xA clients, the status of the assets in the view update automatically when values change. Web-enabled views require a manual refresh to update the view.

The Asset Reporter is a detailed view of all Asset Monitor conditions for an asset. It displays the severity indicator for an object itself. It displays information available to it from all Asset Monitors and their corresponding current subconditions. For each condition, the Asset Reporter will provide information about current subconditions, severity, Asset Monitor status, Fault Report availability.

All information in the Asset Monitor will be automatically propagated to the Asset Tree in the Asset Viewer (refer to Asset Viewer on page 202). It is not necessary to add Asset Reporter aspects to an object unless detailed information is needed about that object.Right-clicking on the item of interest provides a context menu such as the one shown in Figure 58.

A colored frame (refer to Table 13) may appear around the Asset Reporter to indicate its current status. No frame indicates that the current status is accurate.

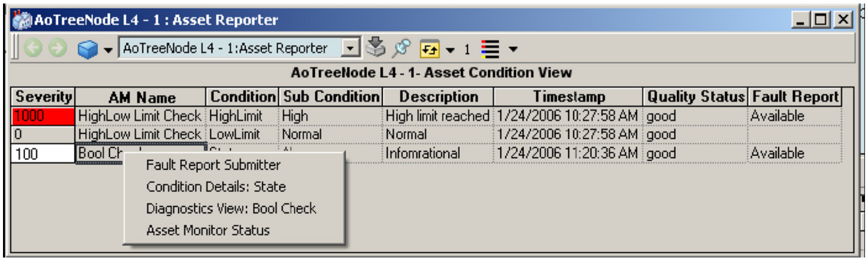


Figure 58. Asset Reporter

Asset Reporter with System Status

The Asset Reporter with System Status aspect adds a System Status property to an object and allows object participation in the System Status Viewer.

Asset Monitoring

An Asset Monitor is an application responsible for retrieving data from, and interacting with, multiple data servers, such as real-time data servers, OPC-DA servers, etc. It analyzes the data and when necessary, issues an ACD (Asset Condition Document) and notifies the System 800xA of the detected condition. An ACD contains all information necessary to describe an asset condition, that in turn may be used to generate a Work Order for maintenance purposes.

Asset Monitors can detect problems that may not affect the process variables, but do affect the maintenance status of an asset or process. They support the diagnosis of problems to identify and locate the problem source and to offer correction possibilities.

Asset Monitors can exist in any part of the plant hierarchy, such as the device, loop, equipment, area, process, plant, or enterprise. They can be written for higher level assets (parents) that are themselves composed of many subassets (children). Asset Monitors need not be associated with a single physical asset. They can acquire data from many sources to implement predictive maintenance functions. Therefore, Asset Monitors may require access to multiple data sources in the system.

Asset Monitoring consists of the following:

- **Basic Asset Monitors** - Requires licensing for Asset Optimization Asset Monitoring functionality. The Running Time Check Asset Monitor and Counter Check Asset Monitor contain faceplate objects which also require a tag license.
- **Process Asset Monitors** - Requires specific licensing for Heat Exchanger and Control Loop Asset Monitoring functions. The Basic mode of Control Loop Monitoring requires licensing for Asset Optimization Asset Monitoring functionality. The basic mode provides limited summary diagnosis for each control loop. The Control Loop Asset Monitor license feature, when purchased, provides detailed diagnosis information. The Heat Exchanger Asset Monitors and Control Loop Asset Monitors contain faceplate objects which also require a tag license.
- **IT Asset Monitors Generated by PNSM** - Requires licensing for Asset Optimization Asset Monitoring and PC, Network and Software Monitoring. The PC, Network and Software Monitoring software can independently

monitor the status of IT (Information Technology) Assets. The IT Assets contain faceplates which also require a tag license. Refer to PC, Network and Software Monitoring on page 229.

- **HART Asset Monitors** - Requires licensing for Asset Optimization Asset Monitoring and HART Device Management system functionality.
- **FOUNDATION Fieldbus Asset Monitors** - Requires licensing for Asset Optimization Asset Monitoring and FOUNDATION Fieldbus Device Management system functionality.
- **PROFIBUS Asset Monitors** - Requires licensing for Asset Optimization Asset Monitoring and PROFIBUS Device Management system functionality.

Basic Asset Monitors

Asset Optimization Asset Monitoring provides the following Basic Asset Monitors:

- **Bad Quality Check** - Reports the quality status (good, bad, uncertain) represented by the value of the monitored Input Record.
- **Bool Check** - Monitors a signal with two states: normal and alarm. Notifies if the signal is in alarm state.
- **Flow Delta** - Monitors the difference between two numeric values (e.g. steam flow and feedwater flow) and notifies if the difference exceeds a configured percentage of the first value.
- **High Limit Check** - 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.
- **HighLow Limit Check** - 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.
- **Low Limit Check** - 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.

- **Running Time Check** - Monitors the accumulated runtime hours of a device and notifies, for preventive maintenance, that the runtime has accumulated up to a configured limit.
- **XY Profile Deviation** - Compares a two-dimensional value against a baseline function and notifies if the deviation from the baseline is less than or greater than the configured limit.
- **Counter Check Asset Monitor** - Counts the number of transitions of an input signal and notifies, for preventive maintenance, that the count exceeds a configured limit.
- **System Status Asset Monitor** - Reports information provided by the 800xA System Status properties for preventative maintenance.

Process Asset Monitors

- **Control Loop Asset Monitor** (CLAM) - Provides a summary analysis of control loop and final control element performance. An unlicensed version providing minimal information is available. However, an enhanced licensed version is available which can deliver diagnostic information on the following conditions:
  - Final control element (FCE) Action
  - FCE Leakage
  - FCE Size
  - FCE Stiction/Backlash
  - Loop Non-linearity
  - Loop Tuning
  - Setpoint Oscillations
  - External Disturbances
  - Data Reliability
  - Harris Index
  - Setpoint Crossing Index
  - Oscillation Index
  - Controller Output Saturation
  - Manual Mode
  - Cascade Tracking
  - Response Speed

- **Heat Exchanger Asset Monitors** (HXAM) - Monitors relative performance of heat exchangers compared to that obtained during an initial training phase, or from manually preset operating point sets. One version of the HXAM is generic (HXAM-G) and one version is specifically for Shell & Tube Heat Exchangers (HXAM-ST).

IT Asset Monitors

Asset Monitoring with PC, Network and Software Monitoring functionality provides fault detection and reporting for Information Technology Assets like PCs, network switches, software, etc. Basic Asset Monitors and IT Asset Specific Monitors together add Asset Monitoring capabilities to IT Asset type objects.

HART Asset Monitors

Asset Optimization Asset Monitoring with HART Device Management system functionality provides two types of HART Device Asset Monitors:

- **HART Generic Device Asset Monitor** - Reads, via OPC-DA, HART_RESPONSE_BYTE1 to assess the following conditions:
  - Device malfunction.
  - Configuration changed.
  - Cold start.
  - More status available.
  - Analog output current fixed.
  - Analog output saturated.
  - Non-primary variable out of limits.
  - Primary variable out of limits.
- **HART Device Specific Asset Monitors** - Extend the functionality of the HART Generic Device Asset Monitor by assessing device specific conditions. Refer to the device-specific release notes for details.

The existing device library will be continually extended by ABB Device Integration Center. The current list of devices can be checked at: www.abb.com > Product & services > ABB Product Guide > Control Systems > 800xA > Device Management and Fieldbus > Device Integration Center (DIC).

FOUNDATION Fieldbus Asset Monitors

Asset Optimization Asset Monitoring with FOUNDATION Fieldbus Device Management system functionality provides two types of FOUNDATION Fieldbus Device Asset Monitors:

- **FOUNDATION Fieldbus Generic Device Asset Monitor** - Reads, via OPC-DA:
  - Resource Block: MODE_BLK.Actual and BLOCK_ERR.
  - Transducer Blocks: BLOCK_ERR.

  to assess the following conditions:
  - Device out of service or initializing.
  - Blocks out of service or powering up.
  - Input or output failure.
  - Block configuration error or link configuration error.
  - Data or memory error.
  - Device requires maintenance.
  - Fault state set.
  - Readback check failed.
  - Unspecified error.
- **FOUNDATION Fieldbus Device Specific Asset Monitors** - Extend the functionality of the FOUNDATION Fieldbus Generic Device Asset Monitor by assessing device specific conditions. Refer to the device-specific release notes for details.

The existing device library will be continually extended by ABB Device Integration Center. The current list of devices can be checked at: www.abb.com > Product & services > ABB Product Guide > Control Systems > 800xA > Device Management and Fieldbus > Device Integration Center (DIC).

PROFIBUS Asset Monitors

Asset Optimization Asset Monitoring with PROFIBUS Device Management system functionality provides three types of PROFIBUS Device Asset Monitors:

- **PROFIBUS PA Channel Asset Monitor** - Reads, via OPC-DA:
  - PROFIBUS_StatusByte1.

  to assess the following conditions:

  - Signal quality.
  - Block alarm
  - Limit.
- **PROFIBUS DPVO Generic Device Asset Monitor** - Read, via OPC-DA, the PROFIBUS standard diagnosis defined in the PROFIBUS PA profile 3 specification to access the following conditions:
  - Hardware status.
  - Measurement status.
  - Temperature status.
  - Device status.
  - Configuration error.
  - General warning.
- **PROFIBUS Device Specific Asset Monitors** - Extend the functionality of the Channel and DPV0 Device Asset Monitors by assessing device specific conditions. Refer to the device specific release notes for more information.

The existing device library will be continually extended by ABB Device Integration Center. The current list of devices can be checked at: www.abb.com > Product & services > ABB Product Guide > Control Systems > 800xA > Device Management and Fieldbus > Device Integration Center (DIC).

Seamless Interaction

Asset Optimization uses CMMS Integration and Device Calibration Integration to make information within the CMMS system and Device Calibration System database software transparently accessible to users in the process control, maintenance, and calibration management system environments.

CMMS Integration

CMMS (Computerized Maintenance Management Systems) Integration establishes the link that removes the barrier to information exchange between the CMMS and the process control system environments. One of the issues that traditionally inhibits free interchange between these functional areas is their different naming conventions: an asset often has one name in the operations environment and another in the maintenance environment. This is because these systems have vastly different focuses, purposes, and needs that their naming conventions must satisfy. CMMS Integration removes these barriers by pointing to the right context, regardless of the naming convention.

CMMS Integration brings maintenance management to the operator environment to give a single window interface for multiple systems. Context menus on process graphics, the Alarm and Event List, etc. provide access to several views and actions for the specific CMMS item. This allows plant personnel to collect, compare, and monitor field device data to accurately assess equipment conditions in real time.

System 800xA supports two CMMS, Maximo and SAP/Plant Maintenance. Only one CMMS system is supported per 800xA System.

Maximo Integration

Maximo Integration includes a Maximo Equipment ID aspect, a Maximo Credentials aspect, and CMMS Views aspects. The Fault Report Submitter aspect, which is part of the Asset Optimization Server system extension, makes it possible to submit fault reports to the Maximo system.

The Maximo Equipment ID provides information for mapping the System 800xA 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.

Maximo Credentials contains the Maximo user credentials used to access the Maximo Server by the specific 800xA user.

The CMMS Views consist of the following:

- View Active Work Orders
- View Work Order History
- View Equipment Status
- View Preventive Maintenance Schedule
- View Spare Parts

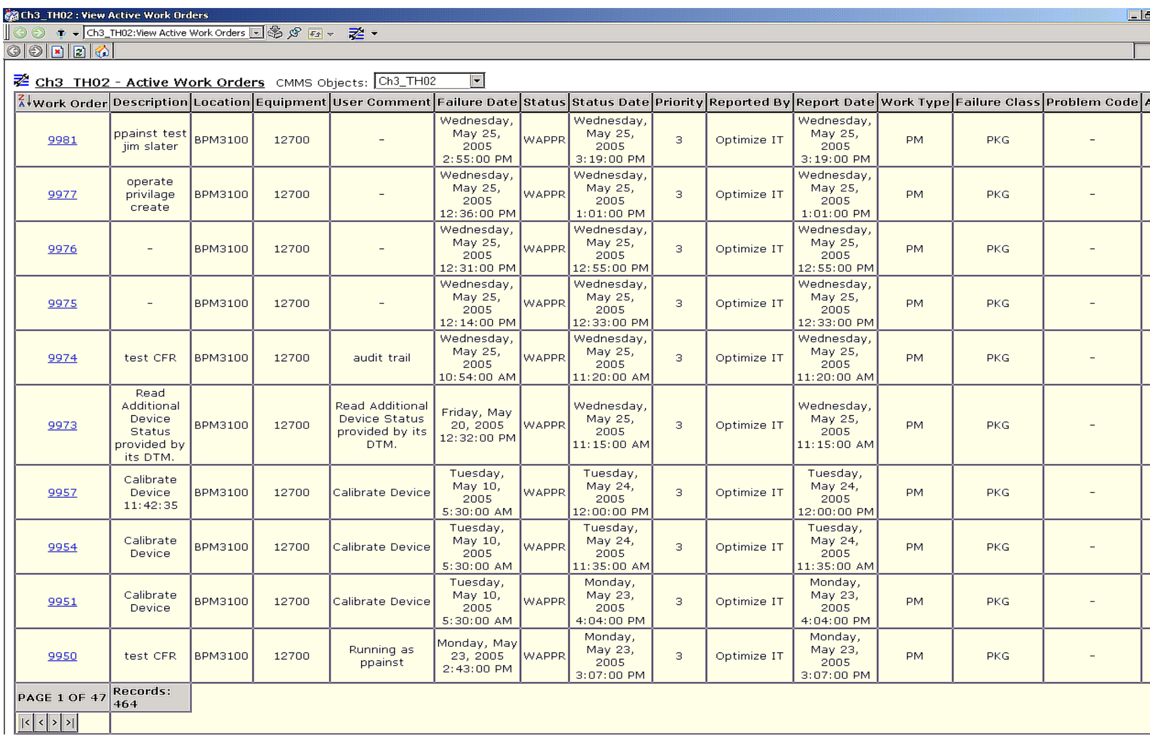
The Fault Report Submitter consists of the following:

- Create Fault Report Forms/Submit Fault Report/Dismiss Fault Report.
- Automatic Fault Report Submitter.

- Fault Report Viewer/Submit Fault Report.

The Asset Optimization integration with Maximo version 6.2 or 7.1 requires the administrator to install and configure the Maximo Business Objects. Obtain the Maximo components from vendor. Refer to *System 800xA Asset Optimization Configuration Manual (3BUA000118*)* for more information on the Maximo integration.

View Active Work Orders. The Active Work Orders view lists all active Work Orders in the CMMS for a particular asset or group of assets. Figure 59 shows the System 800xA Active Work Orders view. Clicking a column header sorts the list with respect to that header topic.



Ch3_TH02 : View Active Work Orders

Ch3_TH02 - Active Work Orders CMMS Objects: Ch3_TH02

Work Order	Description	Location	Equipment	User Comment	Failure Date	Status	Status Date	Priority	Reported By	Report Date	Work Type	Failure Class	Problem Code	Ac
9981	ppainst test jim slater	BPM3100	12700	-	Wednesday, May 25, 2005 2:55:00 PM	WAPPR	Wednesday, May 25, 2005 3:19:00 PM	3	Optimize IT	Wednesday, May 25, 2005 3:19:00 PM	PM	PKG	-	
9977	operate privilage create	BPM3100	12700	-	Wednesday, May 25, 2005 12:36:00 PM	WAPPR	Wednesday, May 25, 2005 1:01:00 PM	3	Optimize IT	Wednesday, May 25, 2005 1:01:00 PM	PM	PKG	-	
9976	-	BPM3100	12700	-	Wednesday, May 25, 2005 12:31:00 PM	WAPPR	Wednesday, May 25, 2005 12:55:00 PM	3	Optimize IT	Wednesday, May 25, 2005 12:55:00 PM	PM	PKG	-	
9975	-	BPM3100	12700	-	Wednesday, May 25, 2005 12:14:00 PM	WAPPR	Wednesday, May 25, 2005 12:33:00 PM	3	Optimize IT	Wednesday, May 25, 2005 12:33:00 PM	PM	PKG	-	
9974	test CFR	BPM3100	12700	audit trail	Wednesday, May 25, 2005 10:54:00 AM	WAPPR	Wednesday, May 25, 2005 11:20:00 AM	3	Optimize IT	Wednesday, May 25, 2005 11:20:00 AM	PM	PKG	-	
9973	Read Additional Device Status provided by its DTM.	BPM3100	12700	Read Additional Device Status provided by its DTM.	Friday, May 20, 2005 12:32:00 PM	WAPPR	Wednesday, May 25, 2005 11:15:00 AM	3	Optimize IT	Wednesday, May 25, 2005 11:15:00 AM	PM	PKG	-	
9957	Calibrate Device 11:42:35	BPM3100	12700	Calibrate Device	Tuesday, May 10, 2005 5:30:00 AM	WAPPR	Tuesday, May 24, 2005 12:00:00 PM	3	Optimize IT	Tuesday, May 24, 2005 12:00:00 PM	PM	PKG	-	
9954	Calibrate Device	BPM3100	12700	Calibrate Device	Tuesday, May 10, 2005 5:30:00 AM	WAPPR	Tuesday, May 24, 2005 11:35:00 AM	3	Optimize IT	Tuesday, May 24, 2005 11:35:00 AM	PM	PKG	-	
9951	Calibrate Device	BPM3100	12700	Calibrate Device	Tuesday, May 10, 2005 5:30:00 AM	WAPPR	Monday, May 23, 2005 4:04:00 PM	3	Optimize IT	Monday, May 23, 2005 4:04:00 PM	PM	PKG	-	
9950	test CFR	BPM3100	12700	Running as ppainst	Monday, May 23, 2005 2:43:00 PM	WAPPR	Monday, May 23, 2005 3:07:00 PM	3	Optimize IT	Monday, May 23, 2005 3:07:00 PM	PM	PKG	-	

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TC04852B

Figure 59. Active Work Orders View

The Work Order column contains links to the CMMS. Clicking on a link opens a portal that contains a CMMS view of the selected Work Order (Figure 60).

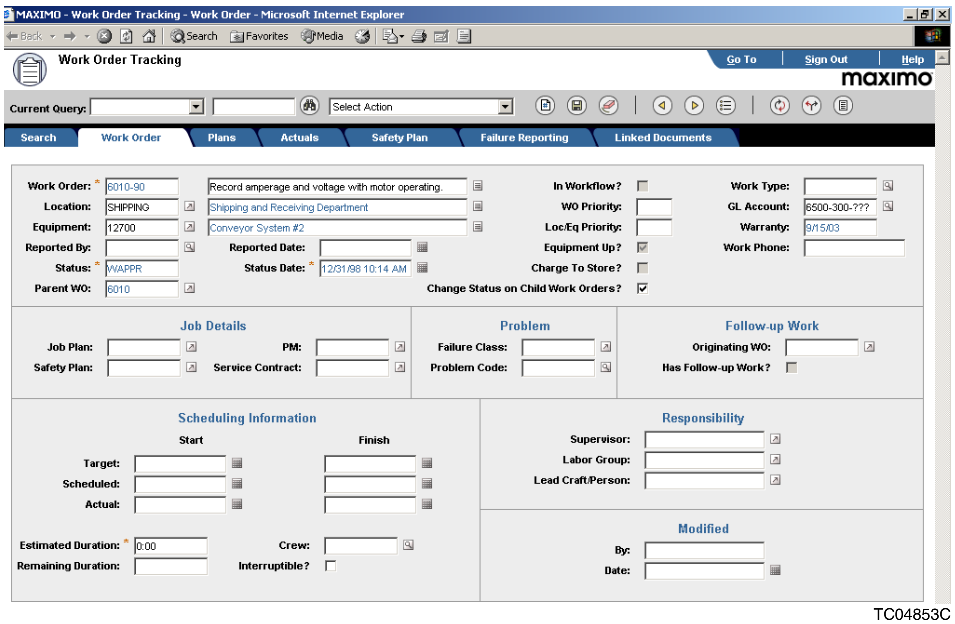


Figure 60. Active Work Order Portal

View Work Order History. The Work Order History view lists the history of all Work Orders in the CMMS for a particular asset or group of assets. Figure 61 shows the System 800xA Work Order History view. Clicking a column header sorts the list with respect to that header topic.

The Work Order column contains links to the CMMS. Clicking on a link opens a portal that contains a CMMS view of the selected Work Order (Figure 62).

View Equipment Status. The Equipment Status view allows viewing of data returned from a status assessment of an asset or group of assets. Figure 63 shows the System 800xA Equipment Status view. Clicking a column header sorts the list with respect to that header topic.

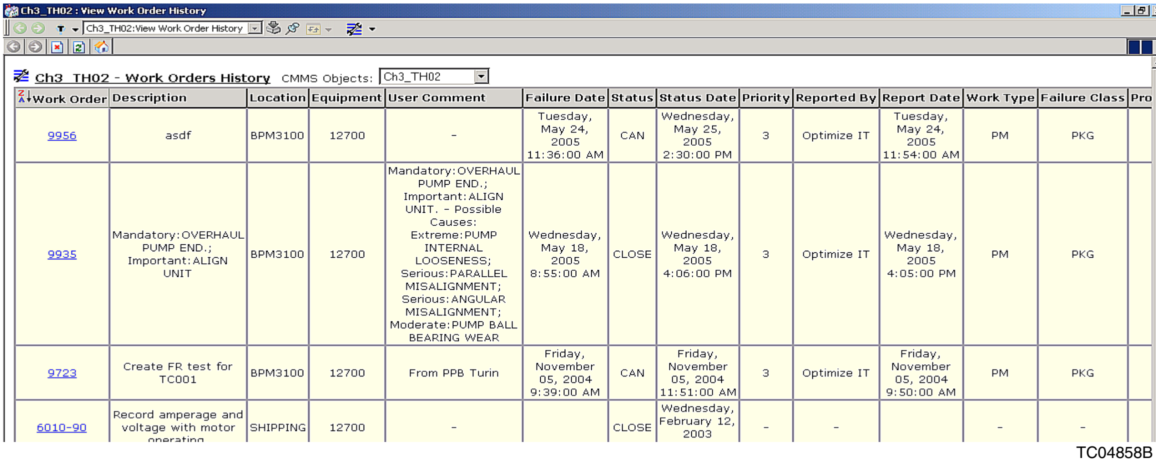


Figure 61. Work Order History View

View Preventive Maintenance Schedule. The Preventive Maintenance Schedule view lists the preventive maintenance schedule for an asset or group of assets. Figure 64 shows the System 800xA Preventive Maintenance Schedule view. Clicking a column header sorts the list with respect to that header topic.

View Spare Parts. The Spare Parts view lists spare parts in the CMMS for a particular asset or group of assets. Figure 65 shows the System 800xA Spare Parts view. Clicking a column header sorts the list with respect to that header topic. The Item Number column contains links to the Availability of Spare Parts view that shows the location, quantity available, measurement unit, and cost of the selected spare part. Clicking on a link produces an Availability of Spare Parts view such as the one shown in Figure 66. Clicking a column header sorts the list with respect to that header topic.

Create Fault Report Forms/Submit Fault Report/Dismiss Fault Report. These functions are made possible by the Fault Report Submitter. The Create Fault Report Form makes it possible to create a new Fault Report for the selected asset without an ACD (Asset Condition Document) being generated by an Asset Monitor. After filling in the fields with the appropriate information and clicking **Submit Fault Report**, the Submit Status: field indicates whether or not submission of the Fault

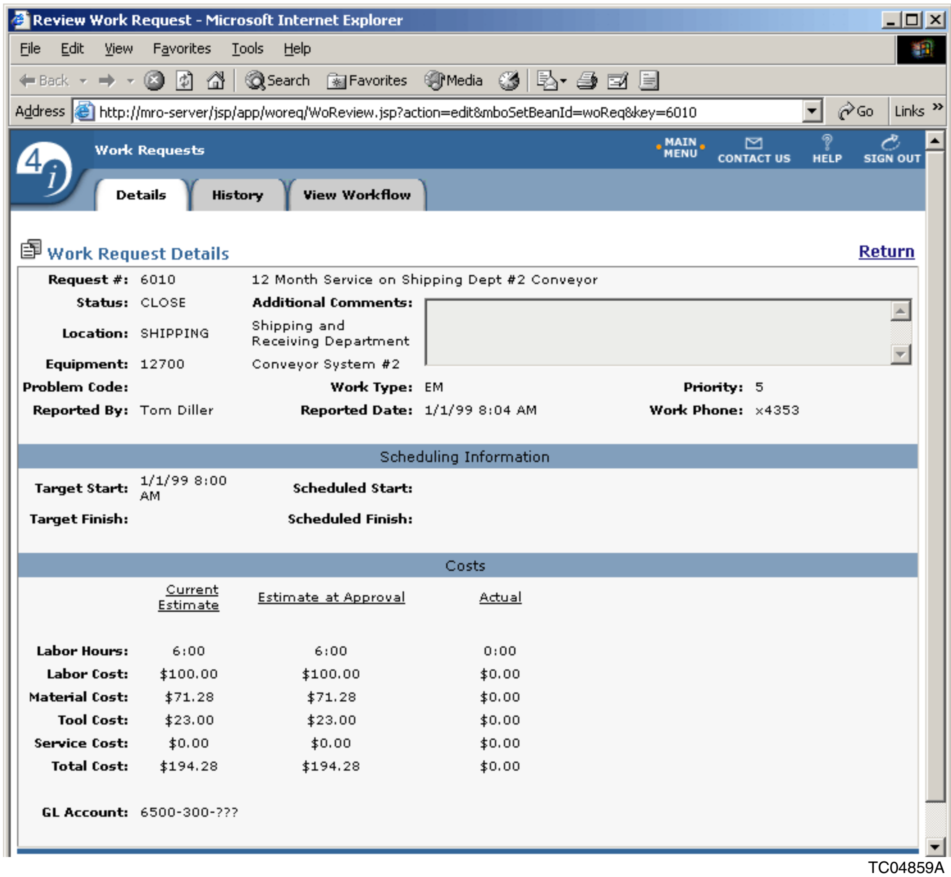


Figure 62. Work Order History Portal

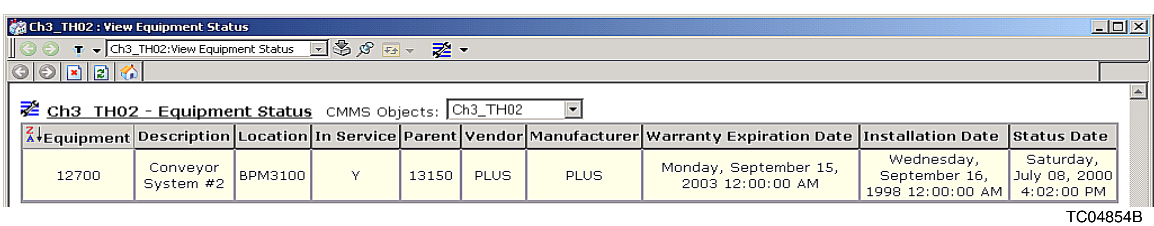


Figure 63. Equipment Status View

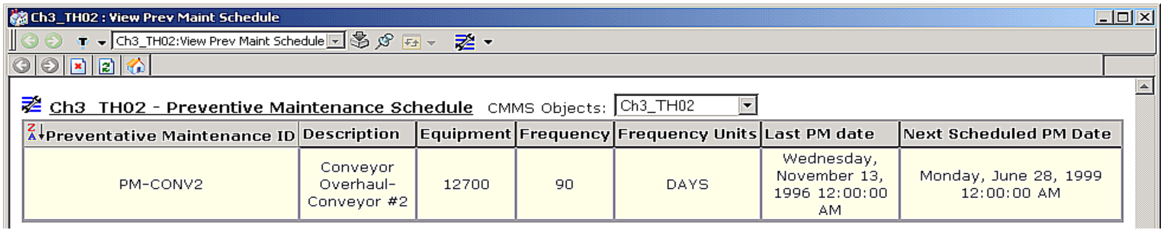


Figure 64. Preventive Maintenance Schedule View

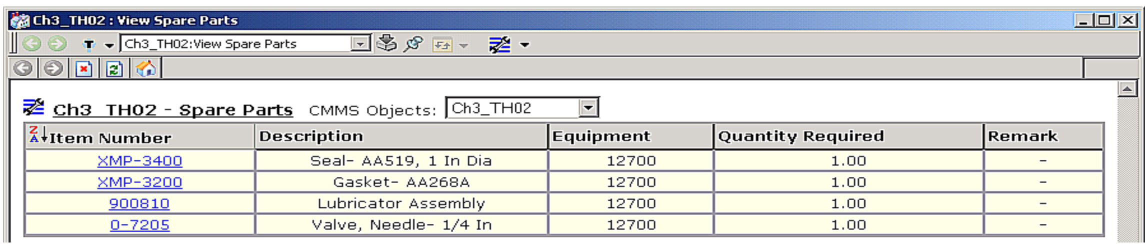


Figure 65. Spare Parts View

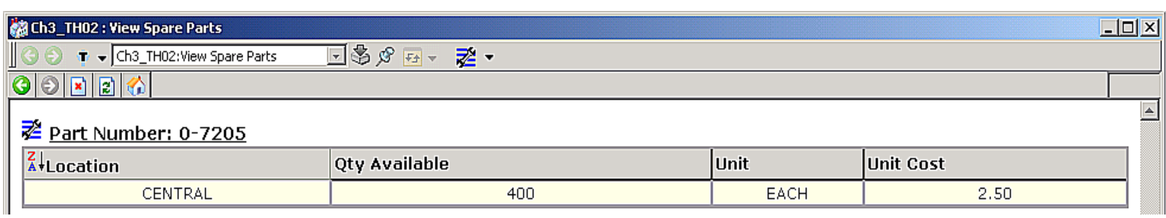
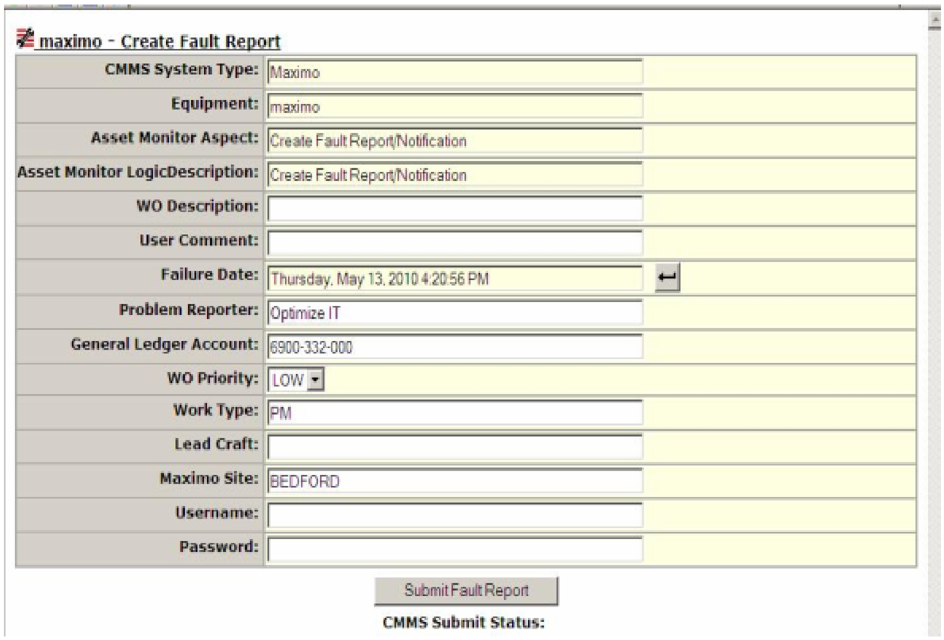


Figure 66. Availability of Spare Parts View

Report succeeds. If it is unsuccessful, an error message will appear in the Submit Status: field. Upon successful submission, a Work Order is created in the CMMS. The Create Fault Report Forms is for submission to the Maximo system only. The example in Figure 67 shows the Create Fault Report Form for submission to the Maximo system.



maximo - Create Fault Report

CMMS System Type:	Maximo
Equipment:	maximo
Asset Monitor Aspect:	Create Fault Report/Notification
Asset Monitor LogicDescription:	Create Fault Report/Notification
WO Description:	
User Comment:	
Failure Date:	Thursday, May 13, 2010 4:20:56 PM
Problem Reporter:	Optimize IT
General Ledger Account:	6900-332-000
WO Priority:	LOW
Work Type:	PM
Lead Craft:	
Maximo Site:	BEDFORD
Username:	
Password:	

Submit Fault Report

CMMS Submit Status:

Figure 67. Create Fault Report Form (for Submission to Maximo System)

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.

Fault Report Viewer/Submit Fault Report. These functions are made possible by the Fault Report Submitter. When an Asset Monitor generates an ACD, a Fault Report is created automatically. The Fault Report Viewer (Figure 68) makes it possible to see all fault reports for a selected object.

The FR Status column shows the status of the fault report at any instance in time. Since asset monitors can report on multiple conditions for each asset, the FR State column can either be the current conditions of the asset, or the MSU (Most Severe Unacknowledged) conditions of the asset. If a condition of lesser severity than the

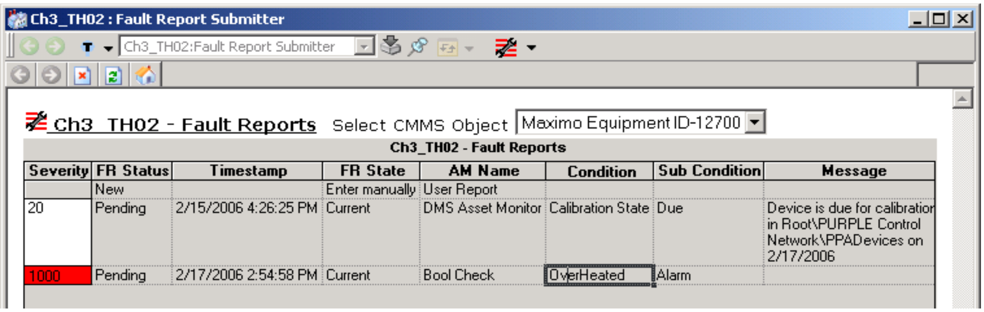


Figure 68. Fault Report Viewer

current is received then the current condition remains MSU. If a condition of greater severity than the current is received then the new condition replaces the current condition which becomes the MSU. If there is no current condition fault report, the asset is normal or has bad (or uncertain) quality.

The Dismiss after successful submittal check box in the Submit Fault Report view is a configurable option. If it is unchecked, the fault report is retained with a Fault Report status of submitted faults. It can be dismissed later or automatically replaced with subsequent fault reports.

Right-clicking anywhere in a fault report row produces a context menu with the option to dismiss the fault report or submit it. Selecting **Dismiss** deletes the selected fault report from the Asset Optimization system. It also acknowledges the alarm in the Alarm and Event List.

Selecting **Submit** launches the Submit Fault Report view for submission to the Maximo system only. The example in Figure 69 shows the Submit Fault Report View for submission to the Maximo system.

SAP/PM Integration

SAP/PM Integration includes a SAP Equipment ID aspect, a SAP Credentials aspect, and CMMS Views aspects. The Fault Report Submitter aspect, which is part of the Asset Optimization Server system extension, makes it possible to submit Fault Reports to the SAP system.

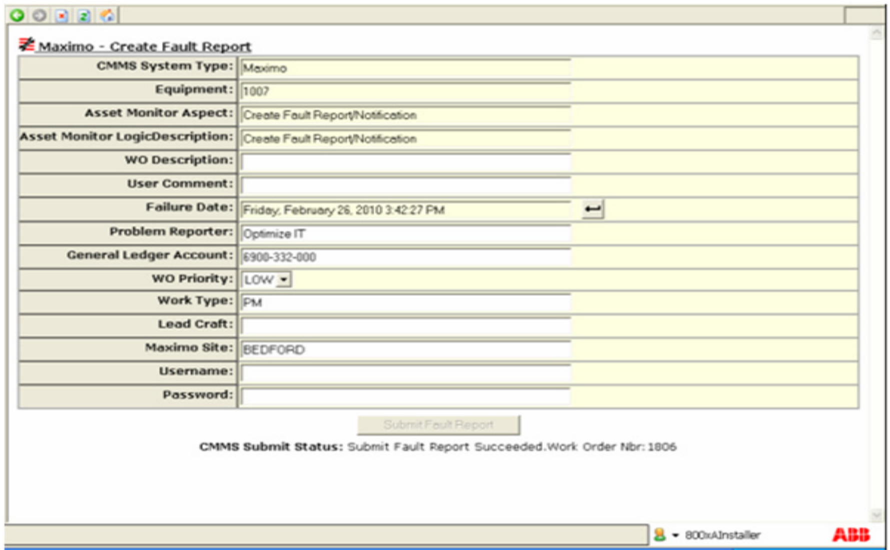


Figure 69. Submit Fault Report View (for Submission to Maximo System)

The SAP Equipment ID provides information for mapping the System 800xA object to the SAP equipment in the CMMS database for a particular SAP 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.

SAP Credentials contains the SAP user credentials used to access the SAP Server by the specific 800xA user.

The CMMS Views consist of the following:

- SAP/PM Integration.
- SAP/PM Integration.
- SAP/PM Integration.
- SAP/PM Integration.

The Fault Report Submitter consists of the following:

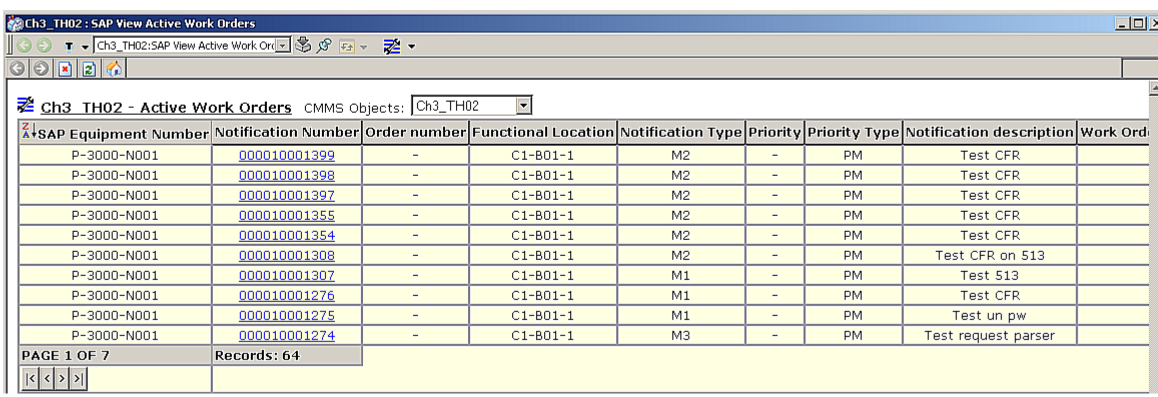
- SAP/PM Integration.
- Automatic Fault Report Submitter.
- SAP/PM Integration.

The CMMS views shown here consist of System 800xA views.

The Asset Optimization integration with the SAP PM module requires that your SAP administrator install ABAP code on the SAP production server where the PM module is installed. The ABB's ABAP integration code and documentation that describes the ABAP code integration is available on the System 800xA Media. See your SAP Basis and ABAP integration personnel for details involving the addition of ABAP-enabled interfaces in SAP-PM.

SAP/PM Integration requires SAP software version 4.7 or SAP ERP Central Component 6.0. Obtain the SAP components from SAP.

SAP View Active Work Orders. The Active Work Orders view lists all active Work Orders in the CMMS for a particular asset or group of assets. Figure 70 shows the System 800xA Active Work Orders view. Clicking a column header sorts the list with respect to that header topic.



SAP Equipment Number	Notification Number	Order number	Functional Location	Notification Type	Priority	Priority Type	Notification description	Work Ord
P-3000-N001	000010001399	-	C1-B01-1	M2	-	PM	Test CFR	
P-3000-N001	000010001398	-	C1-B01-1	M2	-	PM	Test CFR	
P-3000-N001	000010001397	-	C1-B01-1	M2	-	PM	Test CFR	
P-3000-N001	000010001355	-	C1-B01-1	M2	-	PM	Test CFR	
P-3000-N001	000010001354	-	C1-B01-1	M2	-	PM	Test CFR	
P-3000-N001	000010001308	-	C1-B01-1	M2	-	PM	Test CFR on 513	
P-3000-N001	000010001307	-	C1-B01-1	M1	-	PM	Test 513	
P-3000-N001	000010001276	-	C1-B01-1	M1	-	PM	Test CFR	
P-3000-N001	000010001275	-	C1-B01-1	M1	-	PM	Test un pw	
P-3000-N001	000010001274	-	C1-B01-1	M3	-	PM	Test request parser	
PAGE 1 OF 7	Records: 64							

Figure 70. Active Work Orders View

The System 800xA Active Work Order view provides an interface to the SAP/PM Notification portal view (Figure 71) using the Notification Number link.

SAP View Work Order History. The Work Order History view lists the history of all work orders in the CMMS for a particular asset or group of assets. Figure 72

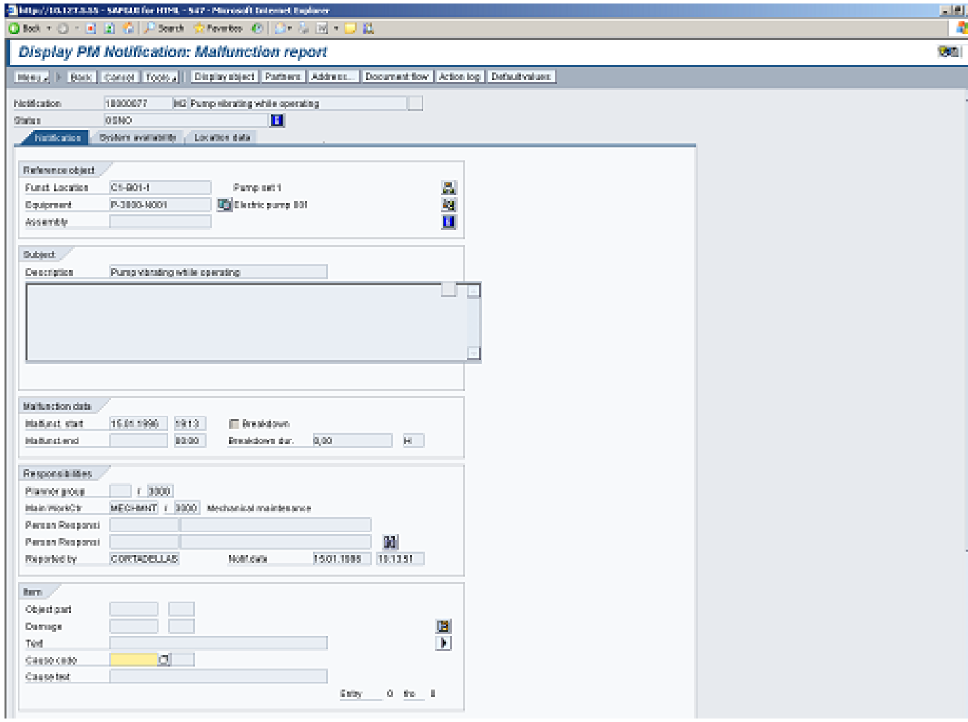


Figure 71. Notification Portal View

shows the System 800xA Work Order History view. Clicking a column header sorts the list with respect to that header topic.

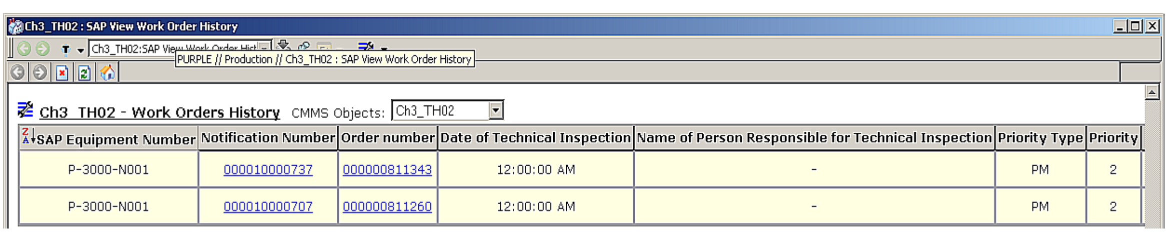


Figure 72. Work Order History View

The System 800xA Work Order History View provides an interface to the SAP/PM Order Number portal view (Figure 73) using the Order Number link.

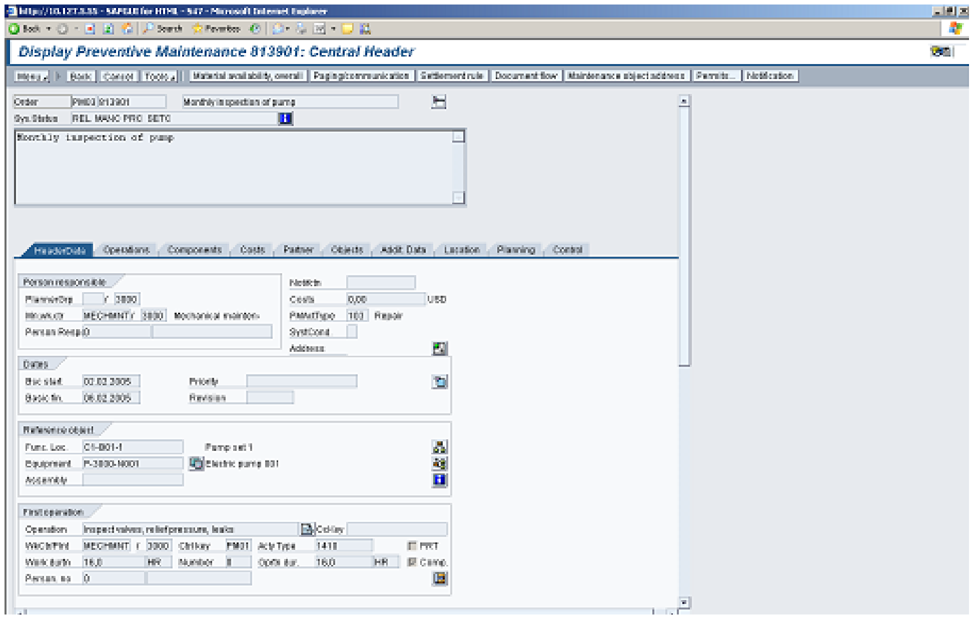


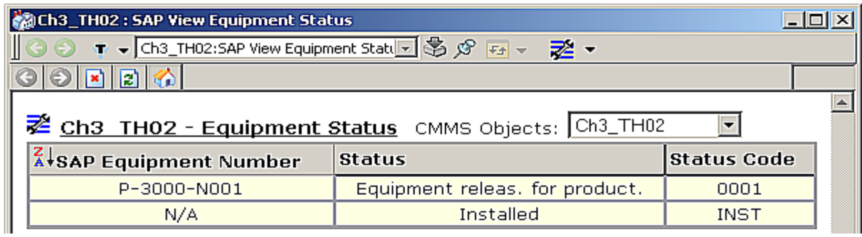
Figure 73. Order Number Portal View

SAP View Equipment Status. The Equipment Status view allows viewing of data returned from a status assessment of an asset or group of assets.

Figure 74 shows the System 800xA Equipment Status view. Clicking a column header sorts the list with respect to that header topic.

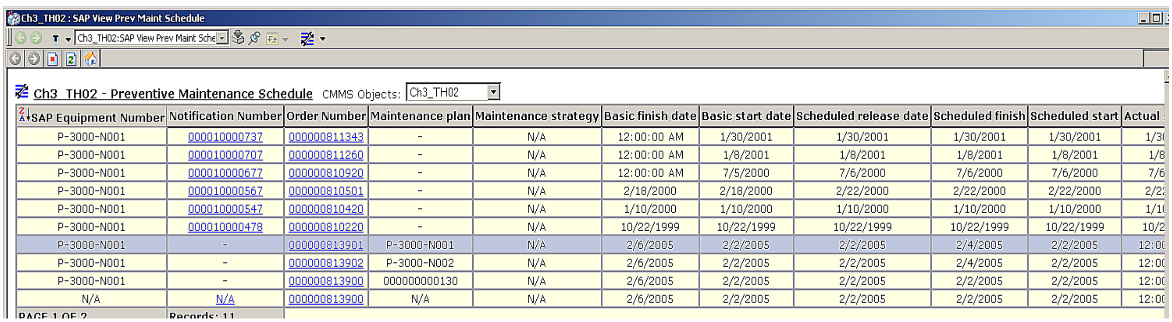
SAP View Preventive Maintenance Schedule. The Preventive Maintenance Schedule view lists the preventive maintenance schedule for an asset or group of assets. Figure 75 shows the System 800xA Preventive Maintenance Schedule view.

Create Fault Report Form/Submit Fault Report/Dismiss Fault Report. These functions are made possible by the Fault Report Submitter. The Create Fault Report Form makes it possible to create a new fault report for the selected asset without an



SAP Equipment Number	Status	Status Code
P-3000-N001	Equipment releas. for product.	0001
N/A	Installed	INST

Figure 74. Equipment Status View

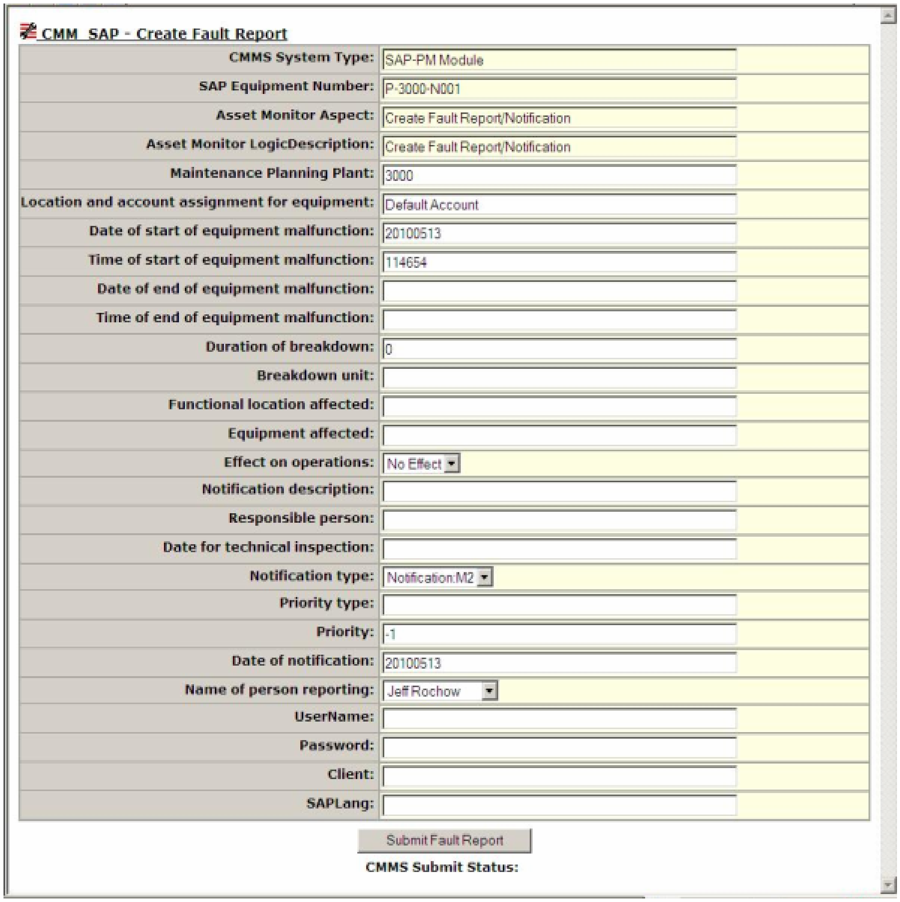


SAP Equipment Number	Notification Number	Order Number	Maintenance plan	Maintenance strategy	Basic finish date	Basic start date	Scheduled release date	Scheduled finish	Scheduled start
P-3000-N001	000010000737	000000811343	-	N/A	12:00:00 AM	1/30/2001	1/30/2001	1/30/2001	1/30/2001
P-3000-N001	000010000707	000000811260	-	N/A	12:00:00 AM	1/8/2001	1/8/2001	1/8/2001	1/8/2001
P-3000-N001	000010000677	000000810920	-	N/A	12:00:00 AM	7/5/2000	7/6/2000	7/6/2000	7/6/2000
P-3000-N001	000010000567	000000810501	-	N/A	2/18/2000	2/18/2000	2/22/2000	2/22/2000	2/22/2000
P-3000-N001	000010000547	000000810420	-	N/A	1/10/2000	1/10/2000	1/10/2000	1/10/2000	1/10/2000
P-3000-N001	000010000478	000000810220	-	N/A	10/22/1999	10/22/1999	10/22/1999	10/22/1999	10/22/1999
P-3000-N001	-	000000813901	P-3000-N001	N/A	2/6/2005	2/2/2005	2/2/2005	2/4/2005	2/2/2005
P-3000-N001	-	000000813902	P-3000-N002	N/A	2/6/2005	2/2/2005	2/2/2005	2/4/2005	2/2/2005
P-3000-N001	-	000000813900	000000000130	N/A	2/6/2005	2/2/2005	2/2/2005	2/2/2005	2/2/2005
N/A	N/A	000000813900	N/A	N/A	2/6/2005	2/2/2005	2/2/2005	2/2/2005	2/2/2005

Figure 75. Preventive Maintenance Schedule view

ACD being generated by an Asset Monitor. After filling in the fields with the appropriate information and clicking **Submit Fault Report**, the Submit Status: field indicates whether or not submission of the fault report succeeds. If it is unsuccessful, an error message will appear in the Submit Status: field. Upon successful submission, a Work Order is created in the CMMS. The example in Figure 76 shows the Create Fault Report Form for submission.

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.



CMM SAP - Create Fault Report

CMMS System Type:	SAP-PM Module
SAP Equipment Number:	P-3000-N001
Asset Monitor Aspect:	Create Fault Report/Notification
Asset Monitor LogicDescription:	Create Fault Report/Notification
Maintenance Planning Plant:	3000
Location and account assignment for equipment:	Default Account
Date of start of equipment malfunction:	20100513
Time of start of equipment malfunction:	114654
Date of end of equipment malfunction:	
Time of end of equipment malfunction:	
Duration of breakdown:	0
Breakdown unit:	
Functional location affected:	
Equipment affected:	
Effect on operations:	No Effect
Notification description:	
Responsible person:	
Date for technical inspection:	
Notification type:	Notification:M2
Priority type:	
Priority:	-1
Date of notification:	20100513
Name of person reporting:	Jeff Rochow
UserName:	
Password:	
Client:	
SAPLang:	

Submit Fault Report

CMMS Submit Status:

Figure 76. Create Fault Report Form (for Submission to SAP)

Fault Report Viewer/Submit Fault Report. These functions are made possible by the Fault Report Submitter. When an Asset Monitor generates an ACD, a fault report is created automatically. The Fault Report Viewer (Figure 77) makes it possible to see all fault reports for a selected object.

The FR Status column shows the status of the Fault Report at any instance in time. Since asset monitors can report on multiple conditions for each asset, the FR State column can either be the current conditions of the asset, or the MSU (Most Severe

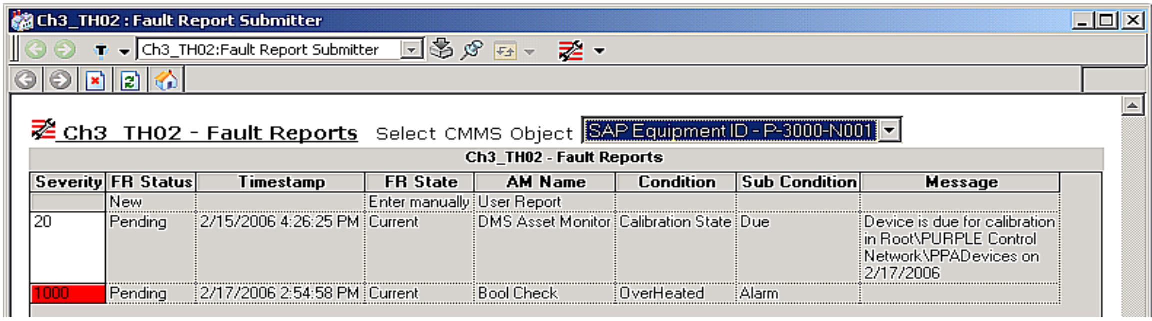


Figure 77. Fault Report Viewer

Unacknowledged) conditions of the asset. If a condition of lesser severity than the current is received then the current condition remains MSU. If a condition of greater severity than the current is received then the new condition replaces the current condition which becomes the MSU. If there is no current condition fault report, the asset is normal or has bad (or uncertain) quality.

The Dismiss after successful submittal check box in the Submit Fault Report view is a configurable option. If it is unchecked, the Fault Report is retained with a Fault Report status of submitted faults. It can be dismissed later or automatically replaced with subsequent Fault Reports.

Right-clicking anywhere in a fault report row produces a context menu with the option to dismiss the fault report or submit it. Selecting **Dismiss** deletes the selected fault report from the Asset Optimization system. It also acknowledges the alarm in the Alarm and Event List.

Selecting **Submit** launches the Submit Fault Report view for submission to the SAP/PM system. The example in Figure 78 shows the Submit Fault Report View for submission to the SAP/PM system.

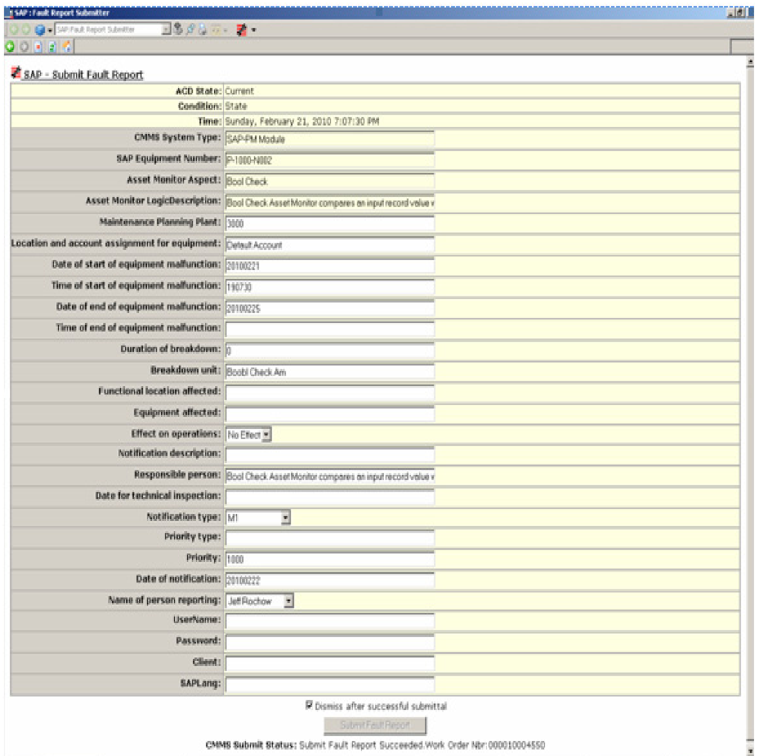


Figure 78. Submit Fault Report View (for Submission to SAP Systems)

Device Calibration Integration

Calibration management is an important facet of the plant maintenance strategy. By streamlining calibration workflow, quality of the process/product is improved while cost is reduced. In many cases, calibration is a manual operation that is scheduled haphazardly, through trial and error. Assessing field device data to determine the optimal schedule eliminates problems of late or unnecessary calibrations.

Information such as historical data, fault analysis, process analysis, and the calibration strategy can be used to create a calibration trigger, which initiates a calibration work order.

Calibration Integration is an engineered solution. This solution is based on standard technologies like ODBC, OLEDB, OPC, XML and Web Services. It allows integration between System 800xA and variety of third party calibration systems. The horizontal (breadth of features) and vertical (depth of feature) level of integration is determined by the openness of the calibration application.

The Calibration Integration solution features the following:

- Access to third party calibration application from within System 800xA.
- Mapping between an object in System 800xA and a device in the calibration system database.
- Information exchange like calibration events between System 800xA and the calibration system.
- Calibration due alarm notification to operator.
- Generation of calibration work order.

Asset Optimization Reporting

System 800xA provides two Asset Optimization Report Templates that summarize important maintenance information to provide maintenance engineers with comprehensive data to make decisions.The Asset Optimization Report Templates are preconfigured as Microsoft Excel spreadsheet (.xls) files. These spreadsheets are used as templates for the Asset Optimization Reports and contain logic for extracting the Alarm and Event data and properties from the specified Asset Optimization objects. After the report data is read, it is formatted in the spreadsheet using Excel functions (pivot table) and sorted appropriately. To execute the reports, the Scheduling Definition and Action aspects must be configured. The reports can be executed automatically according to a certain schedule or on demand by clicking **RUN NOW** in the Scheduler Definition aspect.

The Asset Optimization Report Templates are:

- Asset Condition History Report
- Running Time Report

These reports are implemented as a Microsoft Excel (.xls) files. The templates are used in conjunction with the Inform IT Scheduler system extension. Reports are run manually and can be scheduled periodically as defined in the Scheduling Definition aspect. Report data is retrieved through DataDirect macros or by using custom macros written in Visual Basic. All report parameters are defined in a second configuration sheet. If Information Management is installed and appropriately configured, then once data is collected and formatted, the reports can be optionally printed or historized.

The Asset Optimization Report Template implementation requires that the following System 800xA features be installed on the target aspect system:

- Asset Optimization: required as a source for the report data.
- Scheduler: required for the report template to be triggered, run, and stored.
- DataDirect (Excel add-in): required for retrieving data from the aspect system.
- Information Management: required if long term archiving of reports is required.

Asset Condition History Report

The Asset Optimization Asset Condition History Report provides, for every asset, a detailed listing of all asset maintenance conditions that have been active in a time interval, and counts the number of faults per each condition. This report is based on an Alarm and Event list (Event type) configured to display asset conditions. The Asset Optimization Asset Condition History Report identifies repeating asset condition offenders and highlights critical assets with high failure rates. This report can be used to define a proactive maintenance strategy.

Running Time Report

The Asset Optimization Running Time Report lists all assets in a given structure with a Runtime Asset Monitor. It shows, per asset, the configured runtime limit value, the hours of operation, indication that the runtime limit is active, and the date of the last Asset Monitor reset. Furthermore, it calculates the remaining time of operation until the runtime limit is reached based on the current calculated average runtime rate. The Asset Optimization Running Time Report allows sorting by tag, object type, runtime limit, and alarm active.

PC, Network and Software Monitoring

Standard workstations and network equipment are used extensively in automation systems. The correct behavior of these parts of the system has a significant impact on the performance and reliability of the automation system as a whole. Watching for indications of impending problems, via continuously monitoring of the equipment, makes it possible to be proactive and ensure optimum system availability.

The PC, Network and Software Monitoring (PNSM) package provides a set of pre-defined IT Assets that represent common devices and system processes within the 800xA System (for example printers, computers, switches, and software programs). These IT Assets provide data from the simple (printer out of paper) to the sophisticated (detection of a slow memory leak in a computer). When problems are detected (or anticipated), the software can automatically generate alarms, informing the user of the problem. By default, the status of the IT Asset are viewable via the System 800xA Status Viewer, or through the standard faceplates provided with each of the pre-defined IT Asset types. When used in conjunction with Asset Optimization Asset Monitoring, alarms can be generated based on error conditions, and IT Asset status is viewable via the Asset Viewer and Asset Reporter.

IT Assets are also available as library items that can be downloaded from ABB SolutionsBank.

Once PNSM is installed in the 800xA System, the data from IT Assets can be used to:

- Generate alarms.
- Produce historical reports.
- Update live trends and graphics.

PNSM uses the following concepts to define its structure:

- IT assets:
  - Represent real things such as computers, routers, switches, printers, etc.
  - Typically specified using an IP address.
- IT devices:
  - Components of IT assets. Parts of the IT asset that have information to monitor.

  - May be a physical device (network card for example) or a software component (Operator Workplace for example).IT assets typically consist of multiple IT devices.
  - The same IT device may exist in different types of IT assets (for example, the same process may run on different computer configurations).
- Properties:
  - Individual monitorable data elements on an IT device (error state on a particular port on a particular switch for example).
  - Many properties may exist on a single IT device.
- Basic Computer Monitoring
  - Basic Computer Monitoring builds upon this framework to simplify the process of monitoring the workstation nodes in an 800xA System. Workstation nodes are monitored for key health indicators and alarms are generated if monitored values deviate from expected limits.
  - Basic Computer Monitoring consists of a set of predefined 800xA System objects and a configuration tool that together provide the functionality required for automatic configuration and monitoring.

Configuration

Every PC, Network, and Software Monitoring (PNSM) installation must have at least one IT OPC Server Network object. This object has the following functions:

- Manage the connectivity to the PNSM Server.
- Manage the link between the PNSM system and Asset optimization Asset Monitoring.
- Provide IT asset regeneration capabilities.

The following items require set up in the PNSM system:

- OPC Data Source Definition aspect - The OPC Data Source Definition must have the appropriate server provider assigned to it.

- Asset optimization Asset Monitoring aspects - If Asset Optimization has been loaded and PNSM is going to communication with it, the Asset Optimization Server and AM Service Data Source Definition aspects must be configured.
- IT General Setup aspect -
  - Assigning predefined IT assets - Refer to Table 14 for a list of predefined IT assets provided by PNSM.

Table 14. Predefined IT Asset Functionality

Type	Monitored
Network Assets	Generic network interface
	Hirschmann switch
	Cisco switch
	Generic printer
	Network monitor
Computer Assets	Dell Power Edge 29xx
	HP Proliant DL380 G5
	HP Proliant ML350 G5
	IBM BladeCenter S
	IBM x3650
Software Assets	Generic workstation process

  - Editing IT aspects - Once a predefined IT Asset has been assigned, it then has to be configured to access the correct PC or network equipment. This is done by editing the IT General Property and IT Device aspects.
  - Activating changes to IT Aspects - After the IT asset has been configured, the changes must be activated. This is done by using the IT Device Manager aspect and selecting the Populate and/or Generate buttons. Activation accomplishes the following:

- Rebuilds the list of properties available from the IT Asset, making them available to other applications within the Operator Workplace.

- Recreates the structures required for Asset Optimization to function.

- Passes new alarm limit parameters to the alarm detection logic.

- Reconnects the Asset Optimization Server to the assets being monitored.

To create and configure the Basic Computer Monitoring (BCM) functionality, the BCM Configuration Tool must be run on the workstation where the PNSM Complete installation was done. This is where the menu selection will be available. Click **Start** to create the BCM Assets and the application will automatically close. Normally only minor configuration changes are required after the software is installed and the BCM Configuration Tool is run. The default alarm limits are expected to be suitable in most situations. In some cases it may be necessary to modify the hard drives that require monitoring or if new 800xA System workstation nodes are added or removed after the BCM Configuration Tool has been run, then it will be necessary to run the BCM Configuration Tool again to ensure that the correct assets are being monitored.

BCM IT Assets can also be added manually, but they must not be added into the BCM subdirectory, since this is controlled by the BCM Configuration Tool. Manually added nodes will be removed from this subdirectory if the BCM Configuration Tool is run again.

Operation

PC, Network and Software Monitoring contains pre-configured IT faceplates. The IT Faceplate shows the status of each monitoring signal. The different states of the IT assets are:

- Normal - Green
- Alarm - Red

PNSM uses the 800xA System Status Viewer aspect to view the status of all workstation nodes being monitored in a single display. This aspect is found in the Control Structure under the IT Server object. Selecting this aspect calls up the viewer.

IT Asset Alarms

Asset Optimization Asset Monitoring uses these properties to access the data, and determine if alarm conditions exist by using user specified configuration data. If any assets are in alarm, Asset Optimization Asset Monitoring generates alarm messages and sends them back to the Operator Workplace where they are integrated into the normal alarm stream and displayed using the standard alarm display tools.

IT Asset Application

Basic Computer Monitoring automatically monitors all 800xA System workstation nodes and alerts the operator to potential workstation resource problems through alarm messages.

When a workstation goes into a low resource state, an alarm will appear on the Alarm and Event list. This alarm indicates the workstation that has the problem and a Computer Problem of the type Resource Alarm.

The operator will then need to call up the IT faceplate for the specific asset to see the exact cause of the problem.

While a workstation is in the low resource alarm state, the faceplate will indicate the type of resource problems and the actual value of the resource in red. Depending on the resource, it will indicate the amount free (memory and disk space) or the amount used (non-paged pool and CPU load).

The details of the alarm are also sent to the Event Viewer -> Application log. The event contains the time the error occurred, workstation node name, and resource that caused the alarm. The source for the events in the log is VBRuntime.ed Management Task Force (DMTF).

Additional IT Assets are continuously developed to support recommended hardware. These IT Asset objects are detailed in [26} in Table 1 on page 30.

Section 9 Information Management - Information Manager

System 800xA has scalable offering for Information Management. The base system provide simple trending support for operations, as you extend the System Offering for additional features, System 800xA provides different means to achieve the capabilities required. Information Manager is one option and provides long term support for historical data collection storage and analysis based on the basic history available in System 800xA.

Both Information Manager, which is discussed in this section and 800xA History take advantage of core System 800xA Services, such as calculations, Excel Data Access, Smart Client and Reporting capabilities found in the system.

ABB's 800xA Information Management is composed of a series of logically linked history services. These services offer short term data storage (included as part of the 800xA base system) close to the controller with high data availability for operations and long term data storage centralized for data management. History Services for 800xA provides seamless data retrieval for all users of the system. Information Management functionality can be applied to a single ABB control system, or across multiple control systems from different vendors. Extended long term storage and advanced capabilities are included when the Information Manager is added to the system. Refer to Summary on page 263 to identify basic and extended capabilities.

Information from all applications in the extended automation system is readily available in a variety of standard presentation tools for views and reports, which can be customized by operators, engineers, maintenance personnel, and managers to utilize precisely the information they need to run their business better.

Information Management functions are embedded in the 800xA System and use the inherent system engineering, configuration and administration that provides benefits both in terms of initial set-up and life cycle cost, and consistency. For example, configurations are properties of objects that already exist in the control system definition. Changes made in the control system database such as ranges, alarm limits, etc. are automatically propagated to the historical tag configuration, because it is an extension of the control system tag configuration.

The storage, transformation and presentation functions are unique in their flexibility and offer versatile applications for a variety of industries. Information Management services can be broken into the following categories:

- History Services, provides for collection and short and long term data storage.
  - Refer to History Services Information Storage on page 236.
- Archive Services, provides for offline data management of process data.
  - Refer to Archive Services on page 241.
  - Refer to Security on page 244, for dependable data availability.
  - Refer to Regulatory Agency Compliance Support on page 244, for reliable and secure electronic records.
- Reporting Services, provides for flexible reporting options for ad-hoc and production reports.
  - Refer to Reporting Services on page 245.
- Information Presentation Services, provides for information access.
  - Refer to Information Presentation Services on page 247.
  - Refer to Integration with External Systems using SQL on page 257.
- Application Services, provides tools for application development.
  - Refer to Scheduling on page 259.
  - Refer to Data Transformation on page 261.

History Services Information Storage

When information is viewed, analyzed and acted upon, its source must be reliable and secure. 800xA System functions provide both secure storage configurations and a variety of common and specialty data structures.

An open distributed architecture supports storage of process, event and production data in more than one place for added reliability. Refer to Summary on page 263 to identify basic and extended capabilities.

- The base system provides a short-term storage facility.

- History Services provides a long-term storage facility.
- Dual history servers provide an additional level of fault tolerance by storing the same data in two different servers.
- Consolidated data storage functions collect data from multiple History Servers and store it in a single location. This provides a common history repository for viewing and reporting.

Data can be saved offline for long-term storage. Archiving functions support the copying of data to various archive media for extended data storage and security. Media supported includes MO (Magnetic Optical) media, CD, DVD, USB stick, and hard disk (either local or remote).

Process Data Storage

Process data collection may be implemented on two levels in the 800xA System. The basic system offering supports operator trend data storage via trend logs. Adding the Information Management History Server function extends historical storage and permanent offline storage (archive) via history logs.

The trend log collects directly from an OPC data source. It supports plant operations and typically stores data for several days or weeks. The Information Manager provides additional history service capabilities to extend online data storage and data availability from weeks to months and years. Redundancy is also supported when parallel connectivity servers are configured.

The Information Management History Server function connects history logs in hierarchical fashion to the direct trend log. These history logs support extended historical data storage, historical data consolidation, and offline storage.

For example, in Figure 79, the trend log stores high resolution data for a short time span, while the history log stores the same high resolution data for a much longer time span.

As an option you may configure a dual log where the same trend log feeds two history logs on two different History Server nodes (Figure 80). This may be required when your application cannot wait for history data to be back-filled in the event that a History Server goes offline. For example, you may require shift reports to be executed at the end of each 8-hour shift, and cannot wait days or weeks for the data to be back-filled.

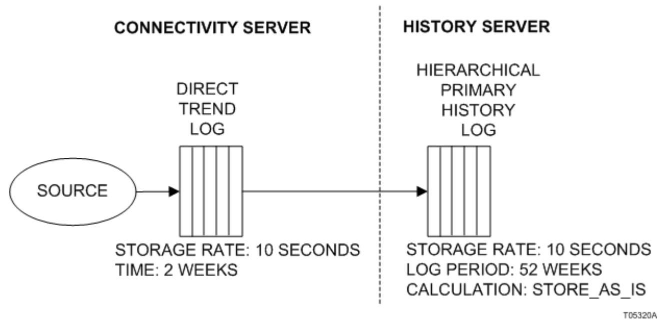


Figure 79. Property Log Hierarchy

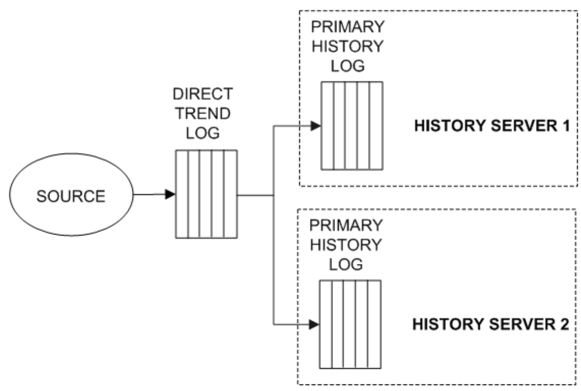


Figure 80. Dual Log Configuration

History Configuration

You can configure logs online using the Plant Explorer Workplace, or offline via the Bulk Log Configuration Import Export utility. The Plant Explorer Workplace provides a graphical user interface for history configuration. The Bulk Log Configuration Import Export utility lets you use Microsoft Excel to create a list of object properties, and then match object properties with their respective log templates. This method is much quicker than using the Plant Explorer when you have a large number of object properties that will use the same log template.

Data Compression

If process variables have little or no changes over time, the user can choose to compress the data to conserve disk space. However, certain applications require the raw uncompressed data for application or documentation purposes. The STORE_AS_IS option lets you use the OPC server's exception-based reporting as a deadband filter. This effectively increases the log period so the same number of samples stored (as determined by the log capacity) cover a longer period of time.

Lab Data Logs for Asynchronous User Input

The lab data log is a special type of property log. This log type is used to collect asynchronous data entered manually, or by an external application.

Event-driven Data Collection

Data collection for property logs may be event-driven. Event-driven collection causes the history logs to collect from their respective basic history trend logs for a time period specified in minutes before and minutes after this action is executed.

Event Data Storage

All alarm and event messages for the 800xA System, including Process, Operator, and audit trail messages, are collected and stored by the 800xA System Message Server. Refer to Figure 81. This provides a short-term storage facility for messages. The messages can be organized into filtered lists for viewing.

If your system has been extended with the Information Manager options installed, the messages stored by 800xA System Message Server may be forwarded to an Information Management message log for extended online storage and improved query capabilities. The History Server can also be a consolidation server for multiple 800xA Systems.

Three types of message logs are available, depending on where the events occur and what functionality is needed:

- The OPC_MESSAGE log type stores events which are buffered in the 800xA System Message Service. This type of storage is modeled after the data definitions in the OPC/Alarm and Event specification. This includes process, system and audit events generated by System 800xA. The Audit Trail function

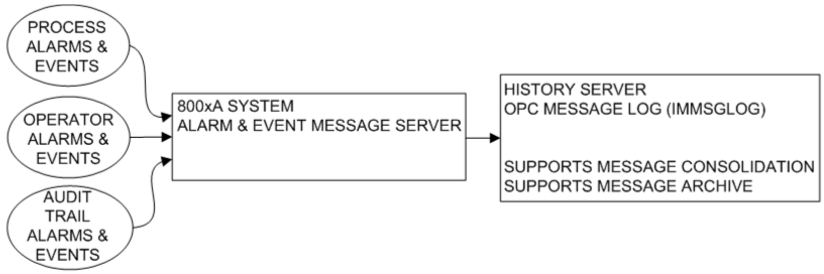


Figure 81. Alarm/Event Message Logging Overview

of the 800xA System tracks operator and engineering changes. The message log stores the identification of the person that made the change, time that the change was made, previous and new value for the data being changed, as well as other information.

- The PDLMSGLOG log type is a special implementation of the OPC_MESSAGE log type for storing batch events related to 800xA Batch Management application.
- The DCS_MESSAGE log type is provided to support consolidation of Advant OCS messages from earlier Enterprise Historian nodes (version 3.2/1 or earlier).

The messages can be read via interactive dialogs in DataDirect and Desktop Trends. DataDirect also lets you specify re-executable functions for implementing reports. Message log data is stored in an Oracle database.

Alarm and Event List aspects let you view messages stored in the 800xA System Message Service. You can configure these aspects to read messages from the Information Management message log which lets you browse further back in time.

Message logs and PDLs on one or more Information Management History Servers (or Enterprise Historian nodes) can be consolidated on one central Information Management Consolidation Server. This is done by creating a consolidation-type job to run on the target consolidation server.

Alarm/event messages from multiple server nodes may be consolidated onto a dedicated consolidation node. This functionality is configured using the Scheduler and Information Management Consolidation action plug-in.

Finished Report Storage

The purpose of a report log is to hold the finished output from reports scheduled and executed via the report actions configured and scheduled via the Scheduler.

Reports stored in a report log can be archived to a removable media on either a cyclic or manual basis. When reviewing a restored report log, it will be presented in the tool appropriate for the type of file the report was saved as (that is, Internet Explorer will be launched if the report was saved in html format).

Production Data Storage

Often when a product is being manufactured, the information relationships are not time-based and cannot be preconfigured or anticipated. PDL have built-in provisions for the organization, storage and retrieval of this type of information. PDL organizes critical process data such as operator interventions, alarm and events, equipment usage and task start/stop and duration times. PDLs are history logs that store production data such as batch start/end times, batch variables, and recipe data. PDL supports collection, storage, and retrieval of this production data for presentation in batch reports (Figure 82).

Messages (including alarms and events) from standard control loop processing, operator control functions, control applications, batch programming or user-defined applications are supported in PDL.

PDL data is stored in a relational database and is accessible by standard SQL queries. The information is available to Crystal Reports, other network-based report packages, and applications such as Microsoft Access and Excel. Excel Data Access supports form-driven requests to PDL data for easy information retrieval. Information from PDL is used as the data source for batch-to-batch displays and for standard batch reports.

Archive Services

The archive function supports permanent offline storage for:

- Numeric process data stored in history logs.
- Finished reports scheduled and executed via Scheduler, and stored in report logs, or stored as File Viewer aspects.

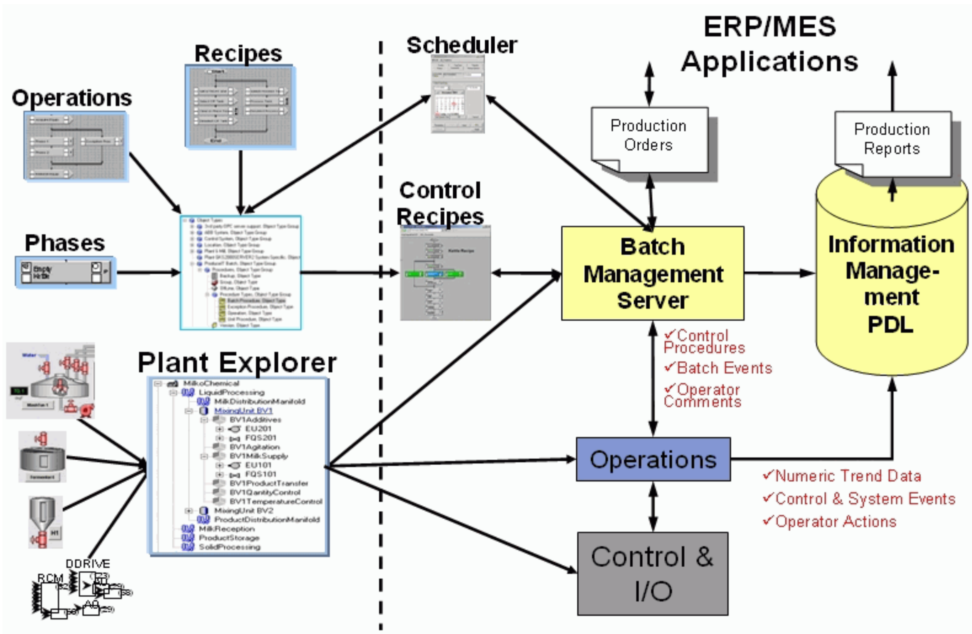


Figure 82. Engineering for Batch Configuration

- Production data from batch control applications and stored in PDLs (Production Data Logs).
- Event messages (including audit trail events), and system messages generated by 800xA System applications and stored in message logs.

Archive media supported:

- Hard disk - The hard disk may be partitioned into multiple volumes which are sized to match CD-ROM, DVD media or relevant sizes for mirror network storage.
  - The archive backup function may be set up to write the contents of archive volumes to ISO Image files as volumes become full. The ISO image files may be burned onto CD-ROM or DVD media for permanent storage. As files are saved on the CD or DVD media, the file copies on hard disk must periodically be purged to make room for new archive entries.

– As an alternative, you may specify the archive backup function to create shadow copies of filled archive volumes on network file servers. You may use both ISO image files and shadow copies.

Archive Configuration

Archiving is managed by one or more archive device aspects as part of the System 800xA configuration. An archive device is a logical entity that defines where and how archive data is written.

A single drive may have several archive device aspects configured for it to satisfy several different archive requirements. For example, more sensitive data may be archived through a separate device which is configured to prevent automatic overwriting of stored data.

Archiving may be scheduled to occur on a periodic or event-driven basis through the Scheduler, or you may execute manual archive operations on demand. Manual archiving may be done on an ad hoc basis (selecting the logs to archive on demand), or on an archive group basis.

Accessing Archived Data

Archive volumes support viewing of archive data (through the corresponding archive volume aspect). The hard disk media can be partitioned into any number of archive volumes. Archive volumes are automatically created for all removable disk drives to support viewing of archive data on DVDs and CDs which contain archive files. Further, you can create additional read-only volumes for reading archive volumes that have been copied to a mapped network drive, or for viewing archive files that have been copied to the local drive.

Archived historical data may be viewed via desktop applications such as DataDirect, Desktop Trends, and 800xA System tools. Archived data may also be incorporated into reports.

In order for client applications to access archived log data, the archived logs must be restored from the archive media to the restored history database, or the applicable archive volume must be published.

Numeric Log data can be published, event data and production data must be restored. Message log data stored on the published volume is also published. This provides access to the message log data via alarm/event lists.

Archive retrieval for Enterprise Historian data

The Information Manager has the capability to read historical archives which are produced by the Enterprise Historian HP-UX and Windows products. These archives can be published much like archives which were collected directly by the Information Manager. Some system pre configuration is required to provide temporary objects to hold the log configuration aspects. Archives created to tape for Enterprise Historian HP-UX must be converted to disk based archives. This is a capability of the current Enterprise Historian products (HP-UX and Windows).

Security

The dual and consolidated data configurations, along with offline storage provided by Information Management contribute to dependable data availability. Additionally, the system architecture, which supports redundant communications and buffering, provides inherent fault resiliency.

It is also important to protect data from malicious or accidental modification. To this end the system provides user access restrictions to the control system, operating system, database and ABB applications.

Remote desktop views allow you to provide information for non-operations personnel while protecting the control system against unauthorized actions.

Regulatory Agency Compliance Support

ABB has a thorough understanding of the regulatory and environmental requirements for the chemical, utility and life sciences industries. The 800xA System was designed with those requirements in mind and provides built-in integrated data security options. The regulations require that electronic record keeping be reliable and secure. They also dictate how process information, alarms and events and reports must be maintained electronically.

Information Management functions provide the following electronic data management features:

- Digital signature.
- System-wide authority and access functions for change control.
- Audit trail.

- Versioning.
- Archiving.
- Easy to use standard reports.

The standard system features and functions provided help manufacturers meet stringent regulatory requirements. The FDA (Food and Drug Administration), GAMP (Good Automated Manufacturing Practices), EPA (Environmental Protection Agency), worker safety and other local and national organizations set forth the requirements.

Standard reports that are easy to customize are provided to help users meet the regulated reporting requirements. These reports reduce engineering time and help provide the information needed to document the process and products manufactured.

The Batch Management and Information Management functions are tightly integrated for the batch industry.

Reporting Services

Manufacturing environments dictate a wide variety of reporting requirements. Typical reporting requirements include:

- Production status reports for managers.
- Compliance reports for regulatory agencies such as EPA and FDA.
- Status reports for operations.
- Ad hoc reports.

Report Capabilities

Within the system, real-time data, historical values, lab data, batch information, and event information can be incorporated into reports created in Microsoft Excel, Crystal Reports, or another report package that uses ODBC data access.

Operators can view reports from their Operator Workplaces by simply browsing report archives via the Plant Explorer. Other personnel can create reports at their desktops with familiar applications to extract relevant information from the automation system, as they need it. Reports are also viewable via a web browser.

Reports can be automatically generated and sent to multiple output destinations:

- Plant Explorer structure (File Viewer aspects).

- Printers.
- E-mail distribution lists.
- Historical storage.
- Local or network disk storage.

Report archive management is provided and it is possible to specify the maximum number of stored reports. In a regulated environment or when otherwise required, digital signatures and version control may be applied to reports.

The following report templates are supplied with the system:

- Trip (pre-trip and post-trip values).
- Trend (hourly, shift, daily, monthly).
- Event.
- Snapshot.
- Batch Report (refer to Table 15).
- Asset Optimization Reports (Calibration Overview report, Running Time Asset Monitor report, Asset Condition History report).

These templates can be modified by users to meet their specific reporting requirements.

Implementing Reports

Reports can be developed using the Microsoft Excel, Crystal Reports or other third party reporting packages. When developing reports using Microsoft Excel, the user can take advantage of a series of functions embedded and tightly integrated with Information Management. In addition the user can take advantage of standard ODBC SQL capabilities, found standard in Microsoft Excel and Information Management. When developing in Crystal Reports or other third party reporting tools, ODBC SQL capabilities are provided to allow for open data interchange.

The architecture for reporting is illustrated in Figure 83. Crystal Reports and Microsoft Excel (without DataDirect add-ins) require the Open Data Access option to access process and historical data.

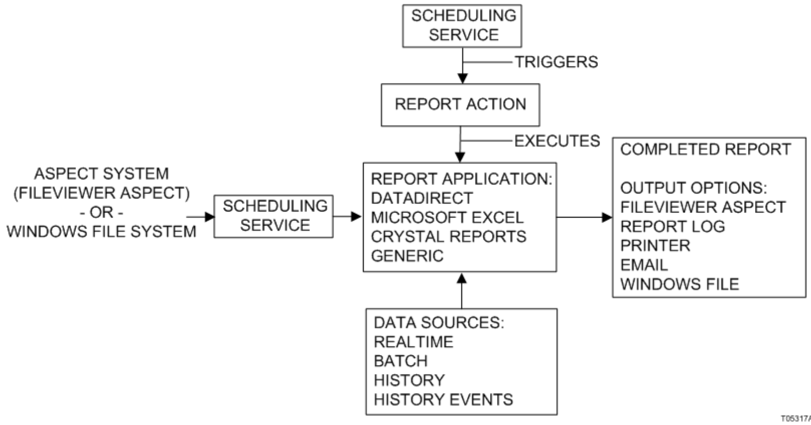


Figure 83. Report Services Architecture

Scheduler

Reports are scheduled via the 800xA System Scheduler. The scheduling instructions are specified in a Job Description object (refer to Job Description on page 261) as part of application services. The Scheduler provides the rules as to what and when it will execute a report, and the destination of the finished report.

Information Presentation Services

Seamless views of real-time and historical information are key components to the system. Data can come from multiple History Servers and other systems, and be combined on comprehensive displays. Information Management functions provide data access for operations, management, and engineering.

Data Access for Operations

Data access for operations consists of:

- Integrated Operator Workplace for historical data and other data sources.
- Comprehensive Trend Displays for real-time and historical data.
- Alarm and Event Viewer and flexible filtering.
- Integrated real-time and historical data via Excel Data Access.
- File Viewer.

Integrated Operator Workplace

Information Management functions are flexible so that operators, engineers, managers, maintenance supervisors, and others are optimally supported in their decision making. They are given access to the specific data they need, from the place where they work, and in the format they find easiest to interpret. All displays are able to seamlessly present both real-time and historic trend data.

Trend Displays

Operator Workplace users can see all real-time and historical data using the standard operator trend displays.

Alarm and Event Viewer

The Operator Workplace Alarm and Event viewer provides access to all alarms and events in the system. From the viewer, lists can be defined for history events. The view allows filtering based upon various categories of events. In addition to predefined default event views, it is also possible to configure a view based upon a user defined filtered list.

The Alarms and Events dialog provides the ability to retrieve alarm and event messages for a selected alarm/event list. These lists are user configurable.

Excel Data Access

Excel Data Access provides a set of ABB Add-ins for Microsoft Excel (Figure 84) to enable operators and other personnel to run queries for data, or create and execute standard reports on demand. These Add-ins provide access, to process variables, historical values, messages and production data. Subject to user authority, it is also possible to input data (for example, lab data), to update data (for example setpoints), and to modify values that are already stored (Figure 85).

DataDirect functions may be used to create re-executable reports with Microsoft Excel. The functions provide the same data retrieval capabilities as the dialogs, except that the functions can be re-executed by running the spreadsheet. The results can be saved, archived, printed and then re-run. The DataDirect functions can be embedded in VBA macros, as an alternative to inserting them directly in an Excel spreadsheet.

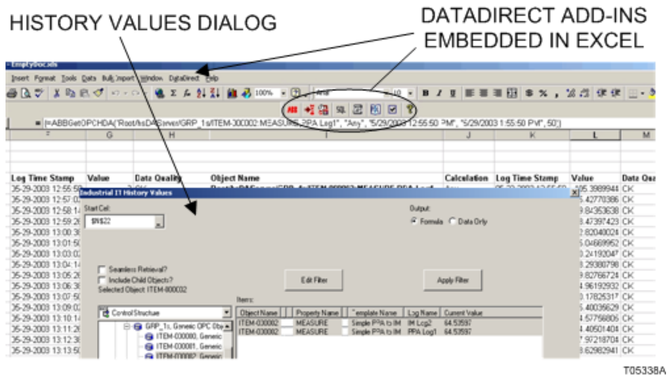


Figure 84. Using DataDirect Add-in Tool for Historical Data Access

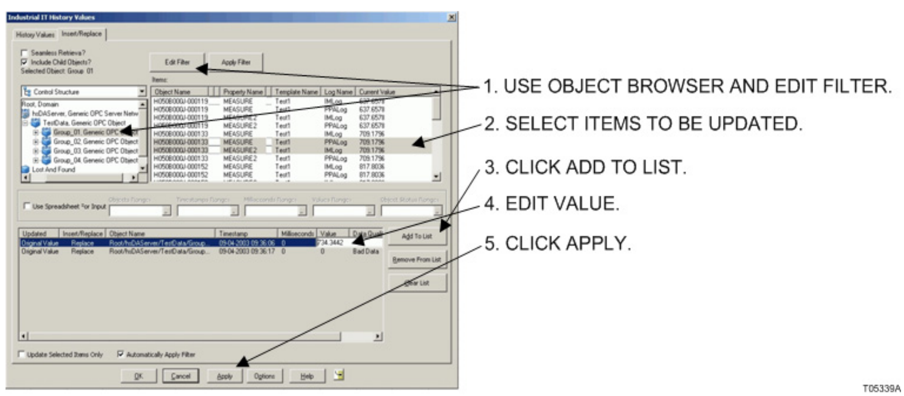


Figure 85. Selecting Items to Update

File Viewer

The files that you create for reports may be saved in the Windows file system or attached to File Viewer aspects in the system aspect directory. This lets you browse for report files via the Plant Explorer, and also lets you apply version control and electronic signatures to report files.

Data Access for Management and Engineering

Data access for management and engineering consists of:

- Web Based Data Viewing of information.
- Desktop Trend Displays.
- Viewing data using Microsoft Excel reports.
- Desktop Data Management Utility.
- Event Browser.
- Production Data Log Browser.
- Batch to Batch Display.
- Retrieving Production Data.
- Remote Display Clients for custom displays.

Web Based Data Viewing

Internet and intranet access is supported by web-based technology. Custom displays are available as ActiveX controls and can be accessed from Internet Explorer. Displays can also be called up at an Operator Workplace.

Desktop Trend Displays

The Trend display is an ActiveX control, hosted inside of Internet Explorer, which exposes control system trend data as graphic traces (Figure 86). The Trend display can have from one to eight trended tags. The trend data is retrieved from property logs configured in History Services. The trend definitions are html files that support navigation via Internet Explorer conventions.

In addition to well known trending functionality (scope, zooming, ruler and so forth) a unique active zoom functionality is implemented. Active zoom lets you magnify a portion of the current scope, without changing the overall scope. In this way a specific part of the scope can be enlarged without losing the overview. The Trend display also lets you:

- Zoom in to see greater detail, and zoom out to see a wider time scope.
- Use a ruler to select a point on the graphical view, and then read the corresponding times and values for each trace.
- Apply filtering to a trace to reduce the percentage of samples.
- Apply a time offset for comparing traces at different times.

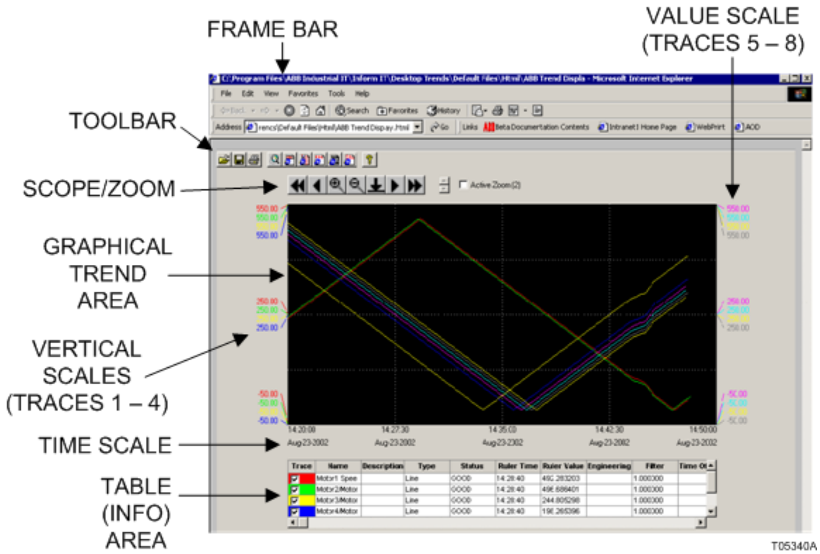


Figure 86. Trend Display

- Monitor the status for each trace.
- Capture data from either the graphical or table view, and then paste the data in a third party application such as Microsoft Excel.

Desktop Data Management Utility

- **User Tag Management Utility**

  The User Tag Management display includes a tag explorer view, a search view and a HDA (History Data Access) browser. The explorer has a primary system configuration group that automatically gets a log configuration and trend tags and displays them in the structure used in the base system. Additional public and private groups of tags can also be established. This utility is also accessible from a trend display button or using the Configure Tags menu for ticker and tag explorer.

- **Ticker**

The Ticker shows a repeating stream of real-time data for selected tags, similar to a stock market ticker (Figure 87). It is an ActiveX control displayed within Internet Explorer. Colors can be used to show when a value is outside of its limits, has bad data quality and a number of other conditions.

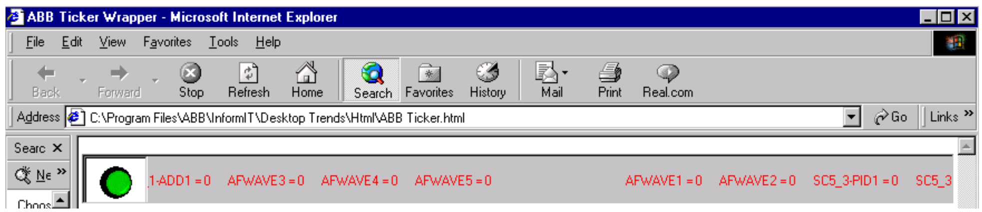


Figure 87. Trend Ticker

- **Tag Explorer**

  The Tag Explorer provides a graphical interface for navigating the tag database and displaying real-time data in tabular format (Figure 88).

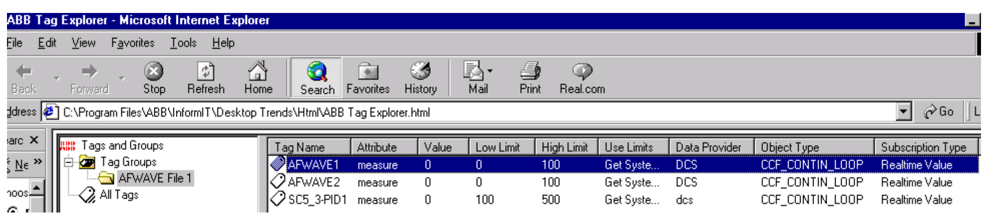


Figure 88. Tag Explorer

Event Browser

The Event Browser (Figure 89) lets you retrieve the time stamp, source, and message from OPC and Audit Trail message logs configured in Information Management - History Services.

You can also launch the Trend Display from the Event Browser. This lets you display historical process data related to a specific event.

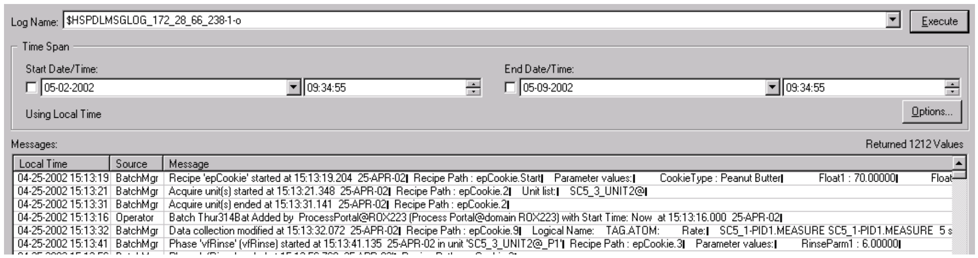


Figure 89. Event Browser

Production Data Log Browser

The PDL Browser (Figure 90) lets you query PDL tasks for production data. There are three main sections. The top section lets you specify search criteria to find the applicable PDL. This includes the task type, task name, and time range. The middle section displays the search results and lets you drill up or down in the task hierarchy. The bottom section displays five categories of information for the selected task - Variables, Resources, Messages, History, and the Next Level. History data can be automatically plotted on the Desktop Trend providing convenient batch-to-batch comparisons.

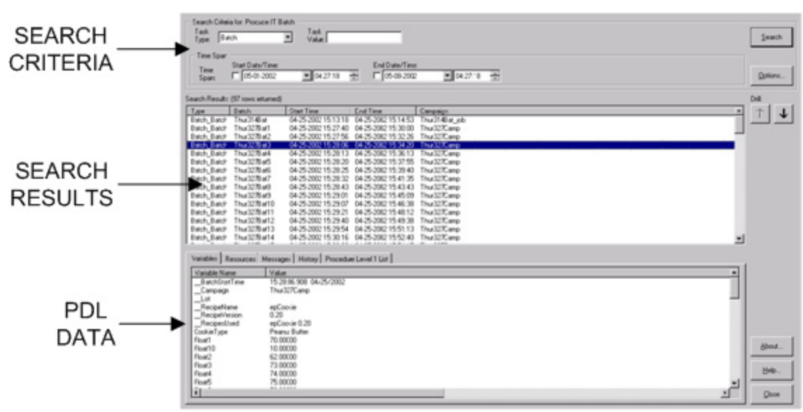


Figure 90. PDL Browser

Batch to Batch Display

This display combines the functionality of the Trend Display (Figure 86) with the PDL Browser (Figure 90). The PDL Browser provides easy navigation of the PDL structure to find and display historical trends for different batches (Figure 91).

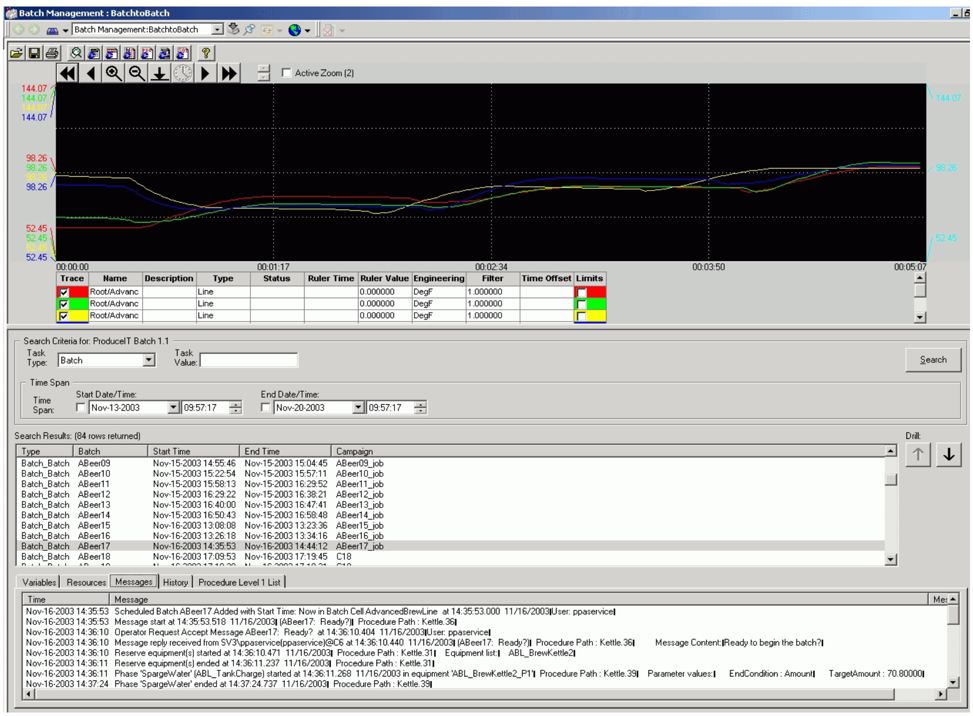


Figure 91. Batch to Batch Display

Retrieving Production Data

The Batch Data dialog (Figure 92) lets you retrieve production data for a selected batch. The data is organized in twelve preconfigured views which are described in Table 15. These views simplify data retrieval from batch applications for viewing on the Excel spreadsheet, and for integrating into reports built either with DataDirect, or third party report building applications such as Crystal Reports.

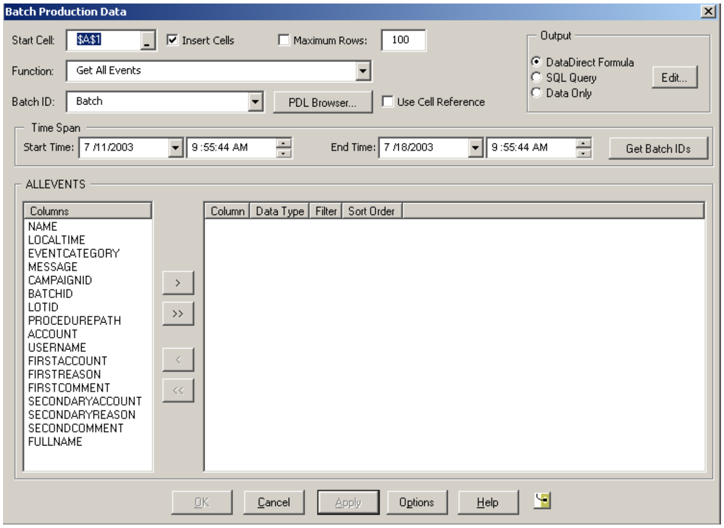


Figure 92. Batch Data Dialog

Table 15. Batch Views and Reports

View/Report Name	Description
Batch Audit Events	Return all batch audit events for a batch (events generated by operator actions associated with a batch)
Batch Manager Events	Return all batch manager events for a batch (events generated by batch manager)
Batch Comment Events	Return batch audit comment events (comments entered using block status dialog) for a batch
Batch Equipment	Return equipment transactions for a batch
Batch Events	Return all batch audit, batch manager and batch process events for a batch
Batch_Header (No Report)	Return the batch header (basic batch information)
Batch Procedures	Return list of procedures executed by a batch

Table 15. Batch Views and Reports (Continued)

View/Report Name	Description
Batch Process Events	Return all events generated by sources external to the batch server and associated with a batch (does not include batch audit events)
Batch System Events	Return all system events (events not associated with a batch) for the time frame that a batch executed
Batch Trend	Return continuous data recorded for a batch
Batch Variables	Return variables recorded for a batch
Batch Variables Matched Pair	Return matched pairs of variables recorded for a batch

The output of this dialog may be specified to be:

- **DataDirect Formula** - Creates a re-executable DataDirect formula based on dialog specifications including filters and sorting information.
- **SQL Query** - Creates an SQL query based dialog specifications including filters and sorting information. The query is executed once, and may also be copied-and-pasted into another SQL-based application such as Crystal Reports.
- **Data Only** - Executes the query on a one-time basis.

Display Clients

Remote Display Clients allow you to create custom graphics, such as process mimic displays or status overviews, and view them from the client desktop. A wide range of display elements are available for creating these displays such as bar charts, pie charts, edit boxes, and gauges as well as traditional process elements like pumps, motors and vessels. Displays can be viewed in a web browser or other container that supports navigation. Manual data entry and interactive query capabilities are built in. Data can be included from any part of the system including real-time and historical values. Displays can also write data to the History server if the user has the appropriate authority.

The Display IE component supports access to displays as ActiveX controls. Using the display as an ActiveX control also lets you use the display from Operator Workplace either as a standalone web page, or embedded in a graphic. Refer to Figure 93 for an example.

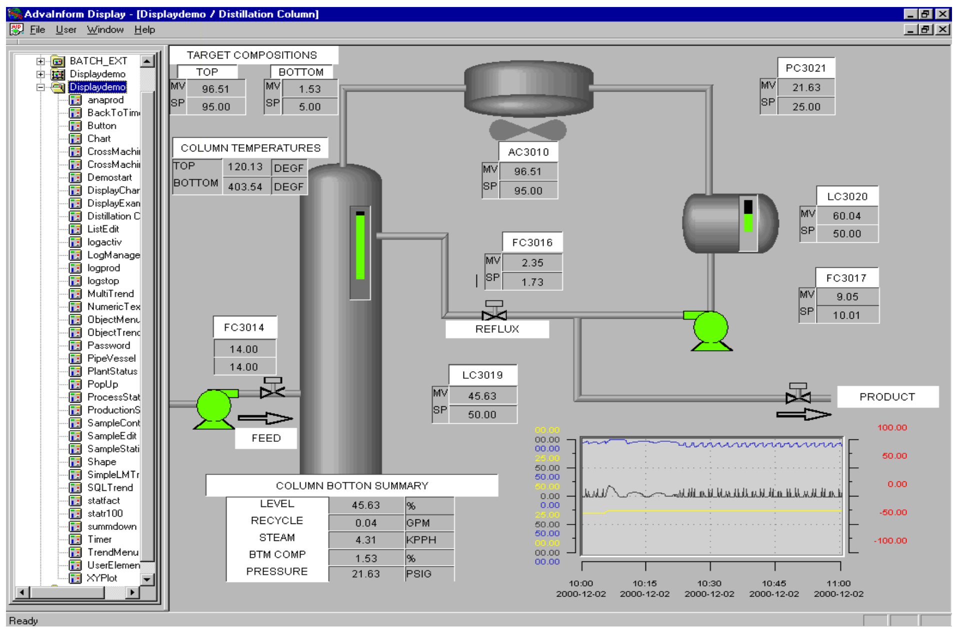


Figure 93. Display Services Graphical Display

Integration with External Systems using SQL

Open Data Access is used when you have Batch Management or when you need to use ODBC from a remote client.

Open Data Access

ODA (Open Data Access) supports real-time and historical data access for third party applications including Crystal Reports, Microsoft Excel (when used without

DataDirect add-ins), and user applications developed in C++ or Visual Basic. ODA is a general term that refers to ODBC access.

ODA access is supported by the ODA database. This is a virtual database which merges the predefined numericlog and generic_da tables (current values from the control system) with user-configured real-time database tables. This makes one complete database which supports access to both historical and real-time data, for example DatabaseZ in Figure 94. To support different database views for different users you can configure multiple ODA databases, each connecting to a different real-time database. The client application can then connect to the appropriate ODA database.

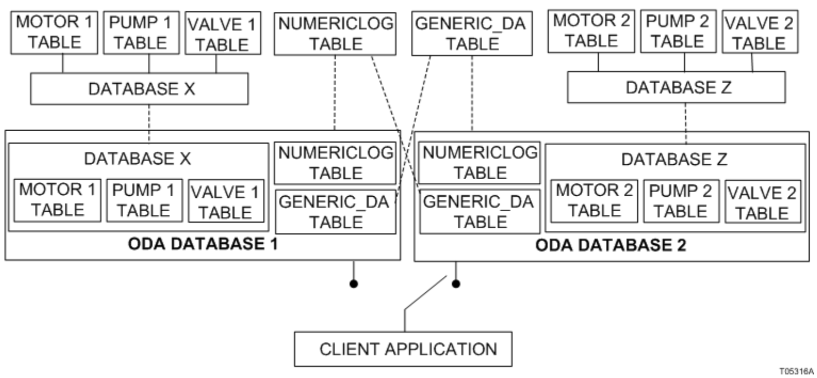


Figure 94. ODA Database Architecture

Real-time Data Access via the ODA Server

The mapping required to support real-time access via the ODA server is implemented in two parts: ODA Table Definition aspects and Database objects.

ODA Table Definition aspects expose selected object properties as columns in a database table. These aspects also specify whether each column (property) is writable, and whether there will be additional columns for each property's OPC data quality and timestamp. ODA Table Definition aspects may be added to object types in the Object Type Structure, or to instantiated objects in any other structure. Some object types, for example the AC 800M Control Program, do not permit you to add ODA Table Definition aspects. To expose object properties under these circumstances, you must add the ODA Table Definition aspects to the instantiated objects. ODA table definitions are assigned to one or more Database objects to create real-time databases. Tables may be reused in more than one database.

Figure 95 shows the relationship between database objects and table definitions. DB1 exposes properties for three object types. DB2 provides a different view that exposes one object type, and also exposes an instantiated object. Multiple databases can be configured to expose different sets of properties for different users. Client applications can connect to one real-time database at a time.

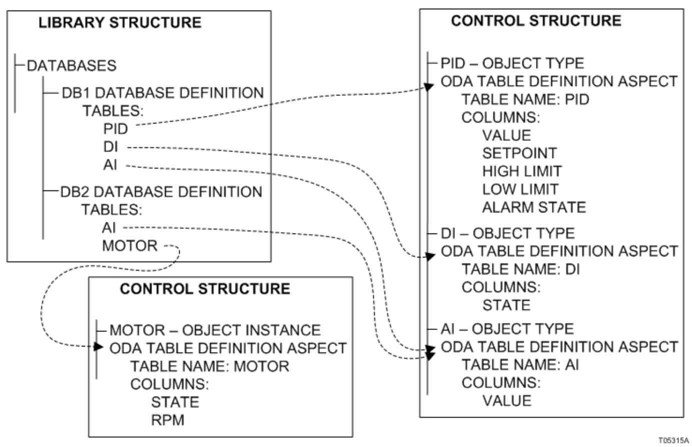


Figure 95. Object Structure for Databases and Database Table Definitions

Application Services

Application services consist of:

- Scheduling.
- Data Transformation.

Scheduling

Versatile scheduling within the system makes it possible to automate not only repetitive jobs, but also to initiate reactions to exceptional circumstances without the need of manual intervention.

A variety of scheduling techniques are provided:

- Event-driven.
- Cyclic.
- Time-based.
- On-demand.

The Scheduler lets the user schedule and run a variety of tasks, as described below.

Data Collection

Data collection can be triggered by system events. Event-driven collection causes the primary history logs to collect data for the time period specified before and after the trigger event. This is especially valuable for root cause analysis as it enables the user to have a clear view of activities preceding an event.

Calculations

The Scheduler also provides a full range of scheduling options for calculations, which can be used to automate key actions. Such reusable application specific functions, can be used to improve both productivity and quality.

Reports

The Scheduler supports scheduling of reports built with compatible applications such as Crystal Reports and Microsoft Excel. A typical example would be time based or cyclic scheduling of shift and production reports.

Archiving

Archiving can be automated by use of the scheduler to secure data without manual intervention.

Message Log and PDL Consolidation

Message logs and Production Data Logs on one or more History Servers can be consolidated on one central server. This is done by creating a consolidation job, which is scheduled to run on the target History Consolidation Server.

Job Description

You can create a Job Description object in the Scheduling Structure. As an option you can add and configure one or more start condition aspects to specify any conditions that must be met before the job will be allowed to run.

You can create an action aspect that defines the function that the job will perform. Five standard actions are supported:

- Reports.
- Archive.
- Event-driven data collection.
- Consolidation of PDLs and message logs.
- Calculations.

A Running Job object is inserted under the Running Jobs branch for any job that is currently running (Figure 96).

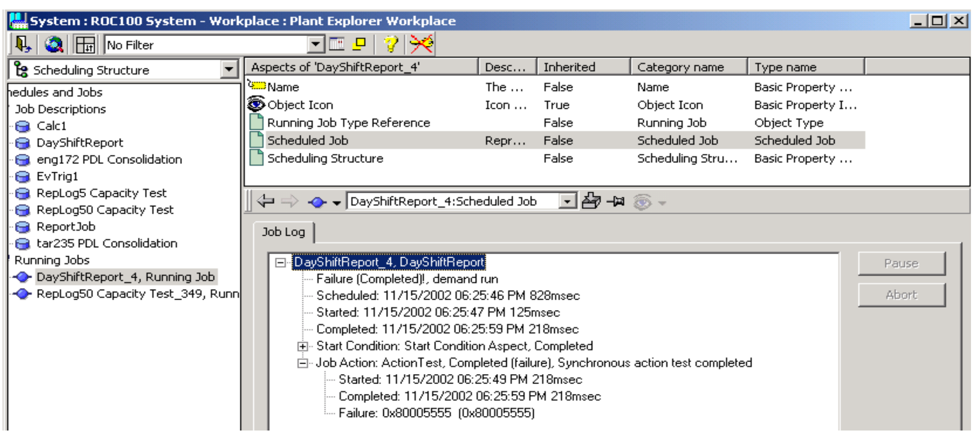


Figure 96. Running Jobs

Alarms and events for running jobs may be viewed via the Alarm and Event aspect (Figure 97).

Data Transformation

Softpoint and Calculation functions within the system add value to data by transforming it into actionable information.

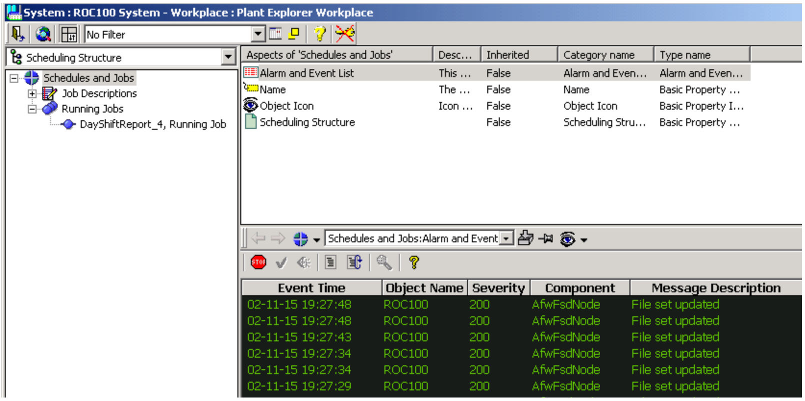


Figure 97. Alarm and Event List

Softpoint functions facilitate the integration of user-configured data points that do not exist as physical process signals. Calculation functions support definition of a calculation script with user definable inputs and outputs. These inputs and outputs can come directly from process or Softpoint values. Together, these features provide powerful reusable algorithms. They are also used as mechanisms for integrating external application data into the system.

Softpoints

Softpoints are user-defined data points that do not directly connect to physical I/O. Softpoints include various data types such as Boolean, integer, single and double precision, floating point and string.

Softpoint data is fully integrated and treated in the same manner as any other value in the system. Engineering unit definitions, descriptor text, and alarm limits are part of softpoint configuration. Softpoint alarms are fully integrated with system wide alarms and events. Softpoints are accessible everywhere in the system including displays, historical recording and reports. Desktop Trends and Excel Data Access can read from and write to Softpoints.

The Softpoint Services software may run on any number of servers within a system. Softpoint Server redundancy is also supported.

Calculations

With Calculations, a calculation script is created using user-defined inputs and outputs. Inputs can be any Aspect Object property (that is, mode, measured value, etc.) of an actual process tag or a Softpoint, and outputs can be any update-able point in the system. Calculations redundancy is also supported.

Calculations can be triggered by input changes, scheduled to execute cyclically or scheduled at a given date and time. Data quality information is maintained within all calculations.

Uses for Softpoint and Calculation functions include:

- Calculations required for regulatory reporting.
- Preventive maintenance monitoring.
- Process analysis.

The following is an example of a calculation that calculates the average value for up to four input variables (Figure 98).

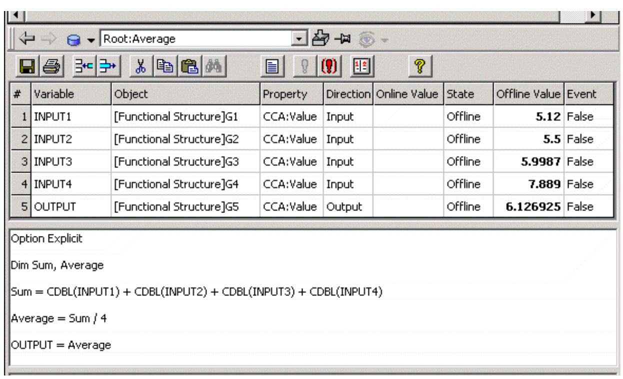


Figure 98. Calculation for Average

Summary

Information Management functions included in the base 800xA System:

- Short-term history services for process and event data collection. Data retention is for weeks or months. Archiving is not required.

- Reporting services include: Excel add-ins, Scheduling, and Templates. Data presentation focus is on 800xA Workplaces, operations and engineers using standard workplace presentations, trending, events and reports. Reporting is based on Microsoft Excel and is not complex.
- Application services include: Softpoints, and optional Calculation engine.
- Fewer number of connectivity servers are required. Central data management is not required.

Base system extended with the Information Manager:

- Provides long-term storage for process information for process data, event storage and reports. Centralized storage management of process, production, event and report data. Extended online data availability.
- Provides structured storage for batch production data using Production Data Log.
- Archive services consist of data archiving and archive management of process, event, production data and reports.
- Reporting services includes Excel and Crystal Reports. Centralized reporting services offers: complex reporting; off-loading of complex CPU intensive work to a dedicated server; use of ODBC connection for process, event and historical data access; archived data and report log use restored or published data with the ability to manage and store reports to archive.
- Desktop tools supporting: Excel, ODBC, trending, and data browsing. Relational access using SQL to the historical data.

Section 10 Information Management - 800xA History

System 800xA has scalable offering for Information Management along with associated tools and software. 800xA History provides near real-time storage of current values, events, and support operations with seamless trend and event integration, high availability servers and scales to the Decathlon Services architecture.

Both 800xA History, which is discussed in this section and Information Manager take advantage of core System 800xA Services, such as calculations, Excel Data Access, Smart Client and Reporting capabilities found in the system.

800xA History

800xA History is an integrated long term process data historian for System 800xA. Various components of 800xA History allows to seamlessly configure, collect and store the essential plant information like process data values and Alarms & Events. It is designed to be a high-performance and reliable control system historian to serve large volumes of data. It easily scales to meet the needs of various size of control systems. 800xA History organizes the data and helps to quickly locate it to optimize plant operations. It allows you to convert real-time data and events into actionable information to measure and improve your control system's operations and performance. It provides view of operational information inside System 800xA and external applications like excel reports.

Purpose, Scope and Intended Use

The purpose of 800xA History is as follows:

- Traditional historian with RDBMS functions.

- Provides the advantages of third party Historian without losing the advantages of ABB's System 800xA.
- Provides long term on-line data storage for System 800xA and non-System 800xA data sources.
- Allows control system life cycle and information system life cycle to move independently800xA History can be used as a long term history for the System 800xA.

The existing key features of 800xA History are:

- Collect and Forward - Facilitates secure collection of data from OPC DA and AE servers and forward for storage.
- Data History - Facilitates long term storage of data and short term storage with back-fill.
- Find - Facilitates fast binary search of recorded information.
- Data Transformation - Facilitates transformation of raw data using pre-calculated aggregates and .NET C# based calculation framework.
- Delivery - Facilitates secure access to history data through OPC and ODBC interfaces.
- Visualization - Facilitates operator trending and excel reporting.
- Backup and Archive - Facilitates online backup of history and archiving of numeric data.

The key features for 800xA History in this release are:

- High Availability History Servers - Fault tolerant architecture to ensure seamless storage and retrieval of process data.
- OPC Unified Architecture - Provides support for DA and HDA.
- DCN Trending - Trends can now retrieve the data from the Embedded Data Collector Node when the 800xA History server is unavailable.
- Event retrieval - Allows the user to retrieve the events stored in History Server and make them available in 800xA system.
- Event Archiving - Allows the user to perform archive of historical event data using Archive Service of 800xA.

- History Log List Aspect - Allows user to perform activate and de-activate of 800xA History Logs in bulk from 800xA workplace

800xA History Overview

Software Components

- **800xA History High - Availability Server**: This is the main component of 800xA History. It securely and seamlessly stores the real time-data (process values, events) from one control systems. The servers run additional functions such as calculation engine for data transformation and online backup utility for database administration. It is possible to configure the main server in High availability mode to ensure faulty tolerance at server level.
- **800xA History Embedded Data Collector**: This is the link between the control system (OPC data source) and 800xA History server. It collects the data from the OPC source and forwards it to the 800xA History Server. The collector prevents any loss of data, when the server is temporarily unavailable, through data buffering and backfill mechanism. It also prevents any loss of data through fault tolerant dual configuration.
- **800xA History Connectivity**: This is the interface between system 800xA and 800xA History Embedded Data Collector. It provides integration between 800xA History and System 800xA for integrated engineering and data access.
- **800xA History Archiving**: This is used to archive numeric data stored in 800xA History Server. Along with 800xA History Connectivity, it provides an integration between 800xA History and System 800xA for the data archiving and data publishing. This section describes the software components of 800xA History: This section defines the combinations and rules for 800xA History along with definition of software components and configurations.

  800xA History can be deployed in many different ways. The deployment depends on the business requirements of the end user and maximum capacity of the software.

The typical 800xA History Deployment architecture is provided in Figure 99 below.

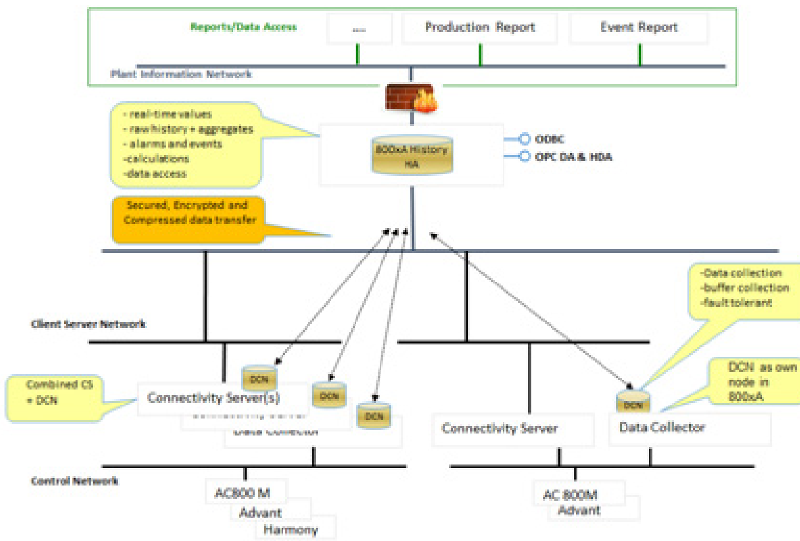


Figure 99. 800xA History Deployment architecture

800xA History provides redundancy at the Embedded Data Collector level as well as History Server level.

The Embedded Data Collectors can be deployed in a parallel redundant configuration in system 800xA. In this configuration, both the Data Collectors will collect the data from system 800xA and forwards the data to 800xA History server. If any of the server of the redundant pair is not available, another will continue to collect and send the data up to 800xA History Server.

In an event of unavailability of 800xA History server, the Data Collector node buffers the data up to 7 days and once the 800xA History Server is available, the data collectors will backfill the data from the time the History server was unavailable to current time.

800xA History Server can be deployed as either a Single Server or a redundant High Availability server. The High availability is achieved by a set of replication services running on the History Server and by means of a dedicated network for the replication called Consistency Control Network.

In a High Availability configuration, both the history servers shares the replication services and monitors and ensures the data integrity between them.

In an event of unavailability/failure of any of the servers, the remaining server takes over all the replication services.

Once the server which was unavailable resumes, replication services ensures to replicate and backfill all the data during the time the server was unavailable.

800xA History requires two specific networks apart from the typical 800xA Client Server and Control networks.

Network Load Balancing (NLB): This network is required only when 800xA History server is being deployed in High Availability configuration. This network is responsible to ensure seamless data transfer between the Embedded Data Collector and the 800xA History Servers.

Consistency Control Network (CCN): This network is required only when 800xA History server is being deployed in High Availability configuration. This network is responsible for ensuring replication and backfill between the History Servers.

Introduction of 800xA History Engineering, Operations and Reporting

Engineering with 800xA History

800xA History Logs: Engineering of 800xA History Logs can be done as a seamless engineering activity from System 800xA. You can configure logs online using the Plant Explorer Workplace, or offline via the Bulk Log Configuration Import Export utility. The Plant Explorer Workplace provides a graphical user interface for history configuration by creating a Log Template and Log Configuration aspects.

The Bulk Log Configuration Import Export utility lets you use Microsoft Excel to create a list of object properties, and then match object properties with their respective log templates. This method is much quicker than using the Plant Explorer when you have a large number of object properties that will use the same log template.

800xA History Log configuration is defined using the aspect object concepts. Templates are created in the library structure, the template includes update rates, aggregates, Data Compression options and other basic parameters. Once a template has been defined it can be used to configure property signals for storage. Once a property is selected the configuration and collection of the data is automatic.

Data Compression: If process variables have little or no changes over time, the user can choose to compress the data to conserve disk space. However, certain applications require the raw uncompressed data for application or documentation purposes.

800xA History Log Template allows to select weather to enable the compression and the dead band in percentage. A Log Template can then be used to create the Log configurations. User can create multiple templates based on the compression needs.

800xA History Logs can be activated or deactivated for optimization of the disk space. Once you deactivate the log, it pauses the storage, however, the previous data and configuration remains. Once you activate the log, it resumes the storage. 800xA History Log List aspect can be used to activate and deactivate logs in the bulk.

Alarms and Event Storage: All alarm and event messages for the 800xA System, including Process, Operator, and Audit trail messages, are collected and stored by the 800xA System Message Server.

If your system contains 800xA History, the messages stored by 800xA System Message Server may be forwarded to 800xA History via Event Collector Service running on Embedded Data Collector node for extended storage. The disk size of the 800xA History server is the only limitation on duration and number of Events that can be stored.

Archiving

800xA History uses the same function of Archiving from Information Management. Refer Information Management section for Archive Services**.**

Operation of System 800xA using 800xA History

800xA History is integrated to the basic operation of the 800xA Operator workplace. Trending and event retrieval are defined using standard system 800xA trending displays and data is seamlessly transferred from the 800xA History server to the System 800xA Trending and event displays.

Trend Display: Operator Workplace users can see all real-time and historical data using the standard operator trend displays.

Alarm and Event viewer: Alarm and Event List aspect can be configured to read messages from the 800xA History which lets you browse further back in time.

The events stored in 800xA History can also be read via **DataDirect**, which also allows to specify reusable queries for reporting purposes.

Reporting

The 800xA Scheduling Server and 800xA Excel data access functions can be used for reporting purpose with 800xA History. A report can be defined in system 800xA using the Excel data access function and scheduled using the 800xA Scheduler. Refer Information Management - Information Manager section for more details on Excel Data Access and Scheduling features.

Section 11 PLC Connect

This section describes PLC Connect, the general controller integration for PLCs (Programmable Logic Controllers), RTUs (Remote Terminal Units) and other similar devices towards System 800xA.

Controller integration towards other Industrial IT controllers than AC 800M requires a connectivity option which, from a functional point of view, can be a plain OPC server. The option can be more advanced, with object support and integration capabilities.

Controllers are connected through connectivity components. They provide access to real time data, historical data, and alarm and event data, from different types of controllers, such as Industrial IT controllers, and ABB controllers from earlier system offerings. Different connectivity package options allow system functions such as operator graphics, history, and so on, to access many and varying types of control systems and devices.

The system provides access to real time data transparent to the application - that is, regardless of the connectivity package through which the data is accessed. Alarm and event information and historical data are supported in similar ways.

PLC Connect acts as an integrated controller connectivity towards System 800xA. As a result, integration into the Industrial IT concept is achieved. PLC Connect thus makes it possible to configure the System 800xA as a hybrid DCS/PLC system.

Also, ABB controllers that do not have a dedicated connectivity option available, are integrated into System 800xA by means of PLC Connect.

PLC Connect adds traditional PLC type functionality as an integrated part of the Industrial IT concept. This means that traditional system capabilities, typically requiring a large number of process I/Os to be connected through a range of controllers from different manufacturers, can be realized with System 800xA.

PLC Connect provides the following:

- Object-oriented PLC Server with alarm detection for boolean, integer and real values, data processing and scaling functions. Object types include composite process object types and extended signal types.
- Basic integration of connected PLCs and RTUs.
- Built-in protocols for Comli, SattBus, MODBUS Serial and MODBUS TCP/IP.
- Dial-up communication (Option) for Comli and MODBUS Serial.
- OPC DA (1.0 and 2.05a) client functionality.
- Upload of OPC server configuration.
- Configuration data stored in Aspect Directory.
- Support for Bulk Data Manager.
- Support for multiple control networks, that is, multiple connectivity servers in separate workplaces in one system.
- Support for redundant connectivity servers with PLC/OPC Server communication surveillance.
- Handling of calculated softpoints.
- Open interface to PLC signals and softpoints from application programs in VB and C++.

PLC Connect is typically used in the following cases:

- For integration of 3rd party controllers and PLCs.
- For integration of ABB legacy controllers that do not have a dedicated controller integration available.
- For integration of AC 800M and AC 800C controllers when full DCS controller integration is not required.
- When remote connection of PLCs and RTUs is required.

Benefits

With PLC Connect added to the System 800xA, typical DCS and PLC functions are available in the same integrated system.

PLC Connect acts as a tightly integrated connectivity towards the System 800xA for loosely connected controllers and PLCs by adding a layer of functionality between the System 800xA and the connected controllers and PLCs. This layer adds the following capabilities to the System 800xA offering when integrating 3rd party and ABB legacy controllers into the System 800xA:

- User definable and reusable PLC composite object types.
- Mapping a flat PLC signal structure on a user defined PLC object structure.
- Automatic upload and configuration of OPC server contents.
- True inheritance from user defined PLC object types to PLC objects.
- Mapping of uploaded OPC structures to process object types.
- Configuration work done in Plant Explorer.
- No double engineering for signal/object mapping.
- Entire configuration can be made with the Bulk Data Manager.
- Online/offline engineering.
- Does not require any browse interface from 3rd party OPC Servers
- PLC signals as well as softpoints signals.
- Supervisory control of multiple PLCs.
- Alarms as Boolean conditions on PLC signals and arithmetical limit conditions, detection and alarm generation.
- Alarms as arithmetical limit conditions on PLC signals, detection and alarm generation.
- Logic calculations and assignments to PLC signals and softpoint signals.
- Numerical Calculation and assignments to PLC signals and softpoint signals.

- RTDB is continuously updated. No need to wait for OPC server to set up subscriptions for instance at picture change in the system, as values are available directly.
- Transform low bandwidth communication to tight controller integration via RTDB.
- Dialed communication with automatic or manual scheduling of calls, PLC initiated calls, local time stamp and locally stored history data.
- Advanced redundancy options with parallel executing slave node.

Description

The following topics describe how PLC Connect functions:

- Signal Mapping.
- PLC Connect Characteristics vs. DCS Characteristics.
- Scaling and Options.
- Configurations.
- Functionality.
- Support for Redundancy.
- Engineering an Application.

Signal Mapping

PLC Connect is a generic connectivity for PLCs, that exposes individual signals in any connected Controller or PLC to the System 800xA.

A flat signal structure in the controller is mapped onto an application specific object structure thus allowing the information to be handled by the process or plant operator in a uniform way with other information in operator graphics. Refer to Figure 100.

An object oriented representation approach is thus achieved even for third party controllers. The operator view of the process status is uniform without any regard to the controller model or communication protocol used.

The communication with controllers can take place over built in drivers or through OPC to connected third party OPC Servers. Remote low bandwidth communication is supported through dialed lines for MODBUS Serial and Comli.

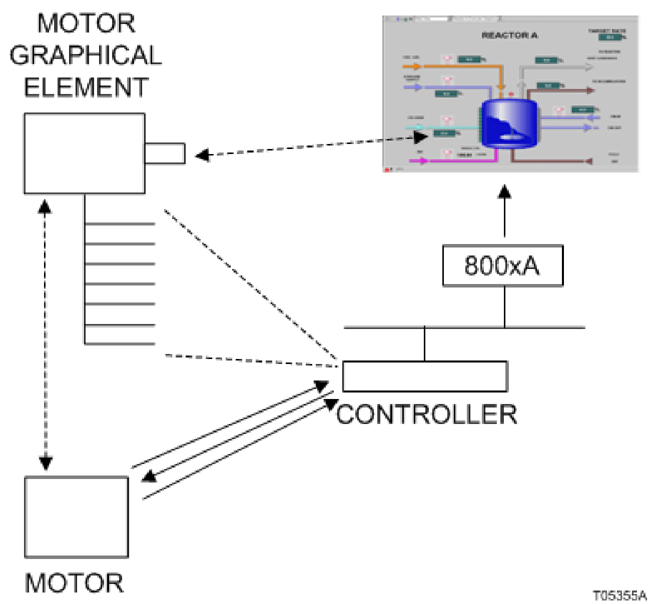


Figure 100. Mapping Flat Signal Structure to Object Structure in PLC Connect

Functionality, as alarm and event detection and limiter calculations for the connected signals, is added as part of the PLC connectivity. Communication with the connected controllers is handled by a communication server and an image of values is kept in an RTDB so that values are always available in an optimal way for good update performance with all types of protocols.

PLC Connect Characteristics vs. DCS Characteristics

Characteristics for PLC Connect:

- Loose integration means that an engineering work proportional to the number of connected signals must be done to define signal and object mapping.
- Alarms and events are configured and detected in PLC Connect.
- A connected OPC server with support for OPC alarms and events can also be connected and the alarms can be associated with PLC objects through name association.

- OPC servers for controller communication taking full benefit of the PLC Connect functionality.
- A real time image is kept of all connected signals so that a deterministic update rate can be achieved for HSI and supervisory applications also for low bandwidth communication channels.
- Upload of OPC server contents, possible to map to object types.

Characteristics for DCS connectivity in the System 800xA, for example, AC800M Connectivity:

- Very high engineering support level due to tight integration with reuse of control program solutions (controller module concept).
- Automatic upload of signal/object structure.
- Integrated synchronization of Aspect Object Structure to Control Builder Structure.

Scaling and Options

Note that the total number of Aspects Objects in one System 800xA is limited.

PLC Connect is a licensed feature in the System 800xA.

There is one additional licensed feature that can be added when PLC Connect is used. This is the Dialed Communication with controllers using Comli or MODBUS Serial protocols, including scheduled dialing, event controlled dial-in, remote historical primary logs.This license feature is scaled on number of used serial communication lines.

Logging of operator command in PLC Connect are tracking events that require the Audit Trail system feature.

Configurations

PLC Connect adds the following items to the System 800xA:

- One or more redundant or non-redundant PLC Connect Connectivity Servers.
- Configuration Aspects for PLC objects in the Aspect Server.

- A Process Control Aspect and Process Graphics libraries for PLC objects to be used in operator workplaces.

The PLC Connect product is installed on the Aspect Server, the PLC Connect Connectivity Server and all Clients in the System 800xA, refer to Figure 101.

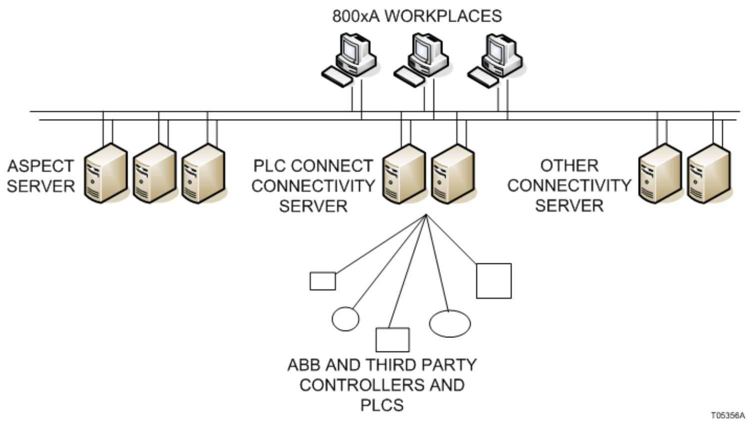


Figure 101. System 800xA with PLC Connect

Multiple PLC Connect Connectivity Servers can be installed in one system and PLC Connect can be used in parallel with other System 800xA connectivities.

Note that the total number of Connectivity Servers in one System 800xA is limited.

The PLC Connect Connectivity Server can run in the same node as the Aspect Server or in a separate node.

Functionality

PLC Connect handles all dynamic process data collected by a communication server from connected controllers/PLCs/RTUs and keeps them in an RTDB. Event and alarm detection is added for boolean conditions and numerical limit conditions. Real time values are fed to primary historical logs.

PLC Connect has the following functionality:

- Filtered upload of OPC server contents to the Control Structure. All objects and signals are created and connected automatically according to the OPC server structure. The uploaded objects can be mapped to PLC Connect composite object types to maintain type inheritance.

- The Communication Server has, besides protocol drivers for traditional communication protocols, also a built in OPC DA client driver, which makes it possible to communicate with any OPC DA server following the guidelines of OPC Foundation.
- Remote communication via dialed lines using MODBUS Serial or Comli is available as an option to PLC Connect. The function supports use of a modem pool and scheduled and manual dialing, possibility for event controlled dial in from controllers, local storing of history and update of central history logs.
- RTDB that holds an image of process values for process signals connected to the communication server, as well as an image of internally calculated softpoint values.
- A configuration aspect for configuring the PLC connectivity with configuration data for mapping and structuring of process signals onto PLC objects in the Aspect Directory. Object orientation is supported with PLC object types and PLC object instances. Signal properties are inherited from the object type or set individually on an object instance. Complex structures can be created due to the composite object types (a type can consist of one to several sub-types).
- A PLC object dialog is available automatically on each PLC object in the Plant Explorer. The dialog can be used to inspect and change value and status of any PLC signal or softpoint signal within the object.
- Alarm and event detection on process values and softpoint values. You can choose to trigger an event or an alarm whenever a boolean signal changes its state. This works for both positive and negative edges.
- Limiter supervision on numerical process values, which means you can choose to trigger an alarm if an integer or real value exceeds or falls below a preset value. You can also set a hysteresis for the limiter.
- Alarms can be acknowledged from the alarm list, via process graphics or via the PLC object dialog.
- Supplying process values and calculated values to historical logging.

- PLC Connect connects to the System 800xA through OPC DA (OPC for Data Access) and (OPC A&E (OPC Alarms and Events).
- COM interfaces are provided to give possibility to access (read and write) process values and softpoint values from, for example, a VB program. A program can run in any node and access multiple PLC Connect Connectivity Servers. Application specific pre-treatment calculations can be added for process values.
- Event logging can be conducted for operations that are performed on PLC objects in general, such as changing a setpoint, acknowledgement of an alarm, the occurrence of an alarm and so on. The event log keeps the following information: date and time for the operation, node from which the operation was performed, user identity of the individual performing the operation, type of operation, object, property and aspect affected by the operation.
- Redundant slave node executing in parallel to master, fail-over occur instantly.

Support for Redundancy

PLC Connect supports the concept of redundant Tags in the System 800xA.

One or more redundant pairs of PLC Connect Connectivity Servers are supported.

The PLC Connect Connectivity Server can run in the same node as the Aspect Server even in redundant systems. This is though only supported for small systems. As it can be hard to predict where the upper limit for such a system is, it is strongly recommended to run the Connectivity Server in a separate node.

Aspect Server

Redundancy for the Aspect Server is supported in the System 800xA. This covers also the following PLC Connect related data.

- PLC Connect configuration data stored in the Aspect Object Directory.
- Events and alarms generated by PLC Connect logged in the System 800xA message service.

Redundancy Settings

It is possible to configure a redundant connectivity server pair to failover in the event of a communication failure to a connected PLC. Refer to Figure 102.

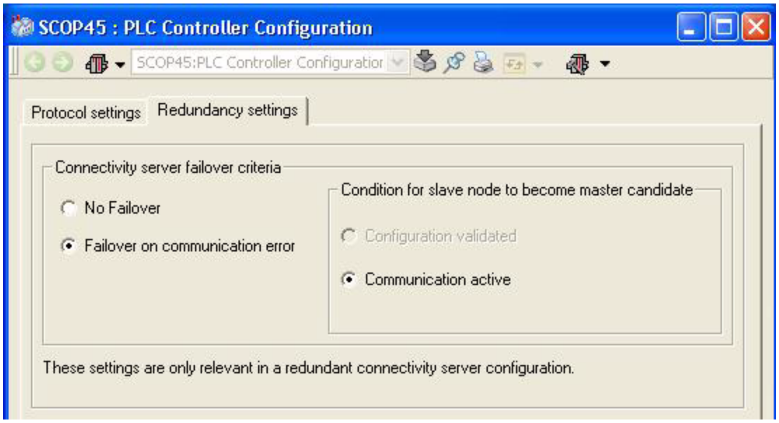


Figure 102. PLC Controller Configuration

This configuration will result in the protocol drivers for MODBUS and Comli being activated in both the PLC Connect Master and Slave node simultaneously. For such a configuration to work, it is also required that the connected PLC has two separate communication channels, one used for the PLC Connect Master, and the other one for the PLC Connect Slave.

PLC Connect Connectivity Server

PLC Connect supports 1oo2 (one out of two) Connectivity Server redundancy. A redundant pair of PLC Connect Connectivity Servers, in principle, support redundancy per service according to the redundancy concept of the System 800xA.This redundancy scheme also supports load balancing through the concept of affinity. This means that during normal conditions when both Connectivity Servers in a redundant pair is up and running, then both servers participate in running the configured PLC Connect application that is part of an 800xA automation solution. This concept distinguishes itself from more primitive redundancy concepts where one server is actively pursuing the control task while the other server is in hot-standby mode ready to take over the control task if the primary server fails.

A functional part of a service in one of the PLC Connect Connectivity Servers is in master mode when it performs the corresponding automation task, while the same functional part in the other Connectivity Server is in slave mode. Some system internal activities are performed in parallel in the two servers.

The PLC Connect services are connected to 800xA services in the connectivity server as shown in Figure 103.

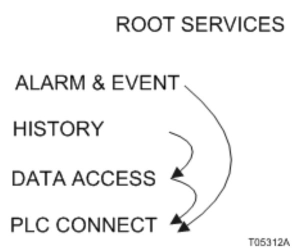


Figure 103. Services in a PLC Connect Connectivity Server

The interaction between the PLC Connect service and other services is described below as two parts. One for the PLC Connect Communication Server and RTDB (Real Time DataBase) and one for the PLC Connect Alarms and Events

PLC Connect Communication and Real Time DB

The 800xA Service Manager decides which instance of a specific service (PLC Connect service or system service) is master and which instance is slave (refer to Figure 104).

The PLC Connect service, acting as master performs, read and write communication with connected PLCs. All values in the RTDB along with other subscribable PLC Connect PCA properties, as quality, force status and control blocking status, are replicated to the slave PLC Connect service.

A PLC Connect Deploy operation is initiated by the application engineer to take configuration changes in the PLC Connect Configuration aspect online.

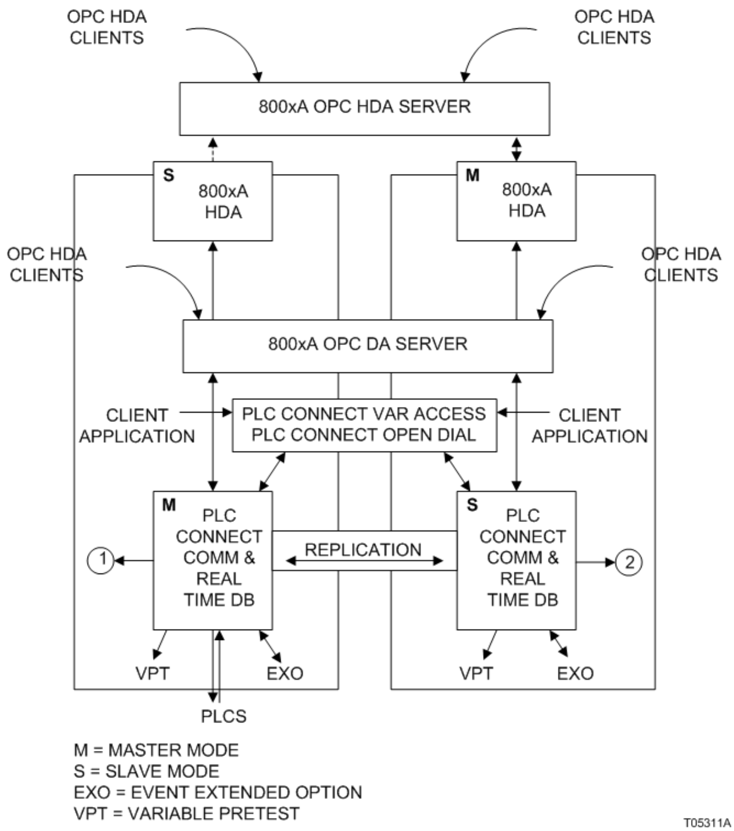


Figure 104. PLC Connect Service, Communication and Real Time DB Part

Configuration changes are deployed on both servers and a new global quick start file, that will be used the next time a server is restarted, will be stored through the system file set distribution service. If a fail-over occurs during the Deploy operation, then the slave will take over and complete the deployment.

The PLC Connect Deploy mechanism in a redundant system ensures that all configurable (static) PLC Connect properties are identical on both servers.

The warm start file, used when restarting the server to give initial values to all signals, is created in parallel on both servers.

The PLC Connect Variable Pre-Treat application plug-in is run in parallel on both servers.

The PLC Connect Variable Access COM interface, in both servers, is servicing application clients. A Read or Write will be directed through System Load Balancing to the server that is most suitable from a load perspective. A Read arriving at the master or slave will just be serviced with corresponding values, while a Write to PLC will be performed only in the master. A Write arriving in the slave, therefore, will be forwarded to the master.

A call to the PLC Connect Open Dial interface will be handled in a similar way as a call to write to a PLC. Changes detected on signals with Event property, will be sent on to the PLC Connect Alarms and Event servers simultaneously.

Both the master and the slave PLC Connect services are connected through OPC (OPC adapter) to the 800xA OPC DA Server. Load balancing will distribute traffic between the two connections.

The 800xA OPC DA Server is the source for the 800xA History Servers running in parallel on both servers. Load balancing will distribute traffic between the two connections. The 800xA History Server running as master will supply the 800xA OPC HDA Server with values.

The 800xA OPC DA Server and the 800xA OPC HDA Server are available in all 800xA nodes to serve OPC clients.

PLC Connect Alarms and Events

The PLC Connect Alarm and Event OPC server is running in parallel on both servers. Changes detected on signals with Event property is received from the RTDB in parallel in both servers. The PLC Connect Service running in master mode replicates all acknowledge and alarm disable operations to the slave service instance. Refer to Figure 105.

The warm start file, used when restarting the server to restore dynamic status to events and alarms, is created in parallel on both servers.

Event messages are sent to the System 800xA Message service from the PLC Connect OPC AE Server in master mode. The System 800xA Message Server is handled by the 800xA Aspect Server and is covered by redundancy mechanisms in the Aspect Server.

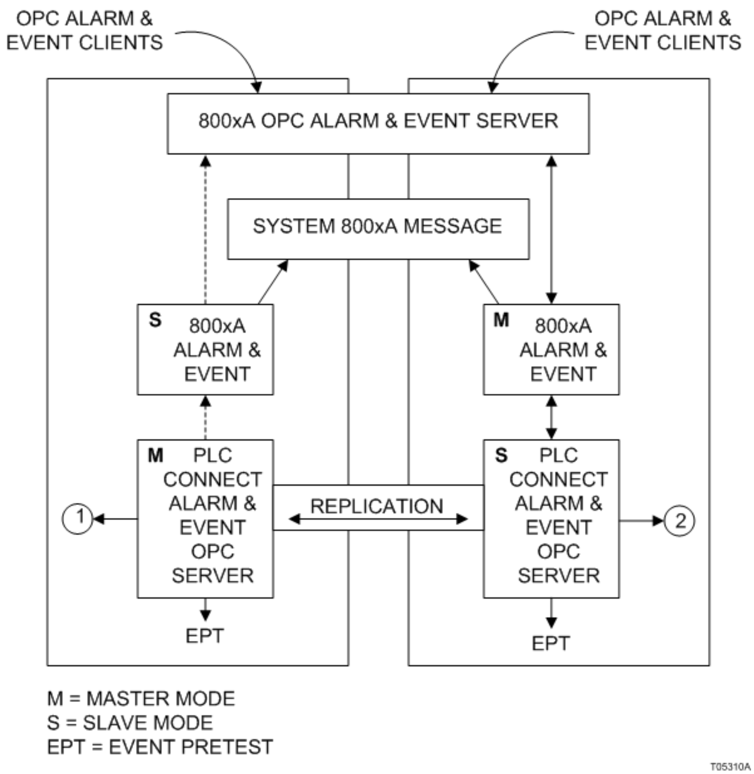


Figure 105. PLC Connect Service, Alarms and Events Part.

Both master and slave PLC Connect service is connected through OPC AE to the 800xA AE Servers running in parallel on both servers. The 800xA AE Server running as master will supply the 800xA OPC AE Server with values.

The 800xA OPC AE Server is available in all 800xA nodes to serve OPC clients.

Engineering an Application

PLCs are typically configured with a controller specific control builder tool for the control program and IO setup in the controller.

The communication protocol used between PLC Connect and a controller is typically a standard protocol such as MODBUS RTU where PLC Connect is master and the controller is slave. If an OPC Server is available for the controller in question, PLC Connect can act as OPC Client connected to the OPC Server.

The PLC Connect configuration aspect in Plant Explorer is used to create matching PLC object types in the Object Type Structure and PLC objects in the Control Structure. The Bulk Data Manager in Engineering Studio can be used to create/delete/append these objects in an efficient way for large applications.

Individual signals in the PLC objects are then connected to variables in the control program using the address syntax that is used for the corresponding communication protocol or OPC browsing if the OPC DA Client is used. For OPC servers an alternative highly automated method exists. Instead of populating the Control Structure manually (or via the Bulk Data Manager), a filtered upload of the OPC server content can be achieved. Still the object type inheritance can be used by mapping the uploaded structure to existing PLC Connect composite object types. Refer to Figure 106.

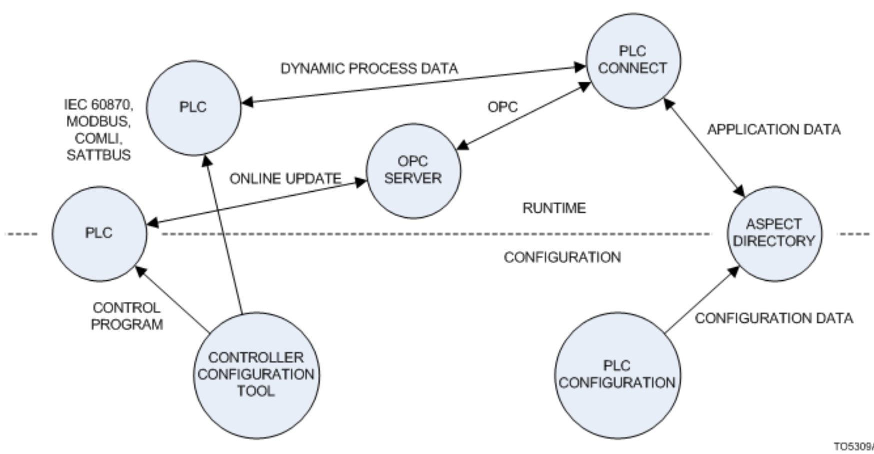


Figure 106. PLC Connect Used with Third Party PLC

The user can also use the Plant Explorer to add other required Aspects to the Object Type.

If a traditional communication protocol is used directly then, at run-time, PLC Connect will poll the controller and update an internal image, the RTDB, with values from the controller for variables that are referenced in PLC objects. Write operations will be initiated to the controller when so required.

When an OPC server is used then, at run-time, PLC Connect will subscribe to the OPC-Server using OPC Data Access for all variables that are referenced in PLC objects and write operations will be initiated to the controller when so required. The PLC server keeps updated values in the RTDB for all subscribed values.

Alarms are generated in PLC Connect upon detecting either of the following:

- A polled boolean variable from the controller changes state.
- A polled analog values passes an alarm limit.

Alarms can optionally be received by the System 800xA from a connected AE OPC Server and associated with PLC Connect objects through Name Association. This can be done either by naming the objects identically with the OPC tag or by adding an Aspect Name aspect on each alarm owner object.

Historical logging can be configured in the System 800xA to take place on any I/O point or Softpoint.

PLC Configuration Aspect

Fundamental concepts in PLC Connect are PLC Object Types, PLC Process Objects and PLC signals. A signal is used to represent the value of an individual I/O point. If no external signal is connected to a signal, then the signal acts as variable that is able to store a value (also called a Softpoint). A PLC Process Object is used to collect a number of signals that logically belong together. A PLC Object Type is a template for creating PLC Process Objects. It is possible to create complex object types, consisting of up to five levels of underlying object types. This is only possible with the Composite Process Object Type and not for the Basic Process Object Type.

A PLC Process Object typically represents a specific physical device of some kind in a process, such as a valve, a motor, a tank, a heat exchanger and so on, but may also be of an abstract nature, such as a recipe or a set of parameter values.

The signals contained in the object represent the physical I/O points of interest for the device, as well as any calculated or stored values associated with the device.

Signals are, for example, a temperature reading, the speed of a motor, the control signal for opening a valve, or a limiter value for a tank level and so on. PLC object types, PLC objects and PLC signals are all implemented as ABB Aspect Objects^{TM}.

Basic Types for the PLC Connect signals are of the simple data types binary (Boolean), integer (32-bit representation), real (32- or 64-bit precision) and string (max 140 characters).

The application specific PLC Object Types are templates for PLC objects, and are used for making the logical grouping of signals, and assigning the default characteristics to them, such as the engineering unit and range for a real value, or whether a Boolean signal should be controllable or not. The default assignments can be overridden when you configure an instantiated object. Figure 107 shows an example from the Object Type Structure.

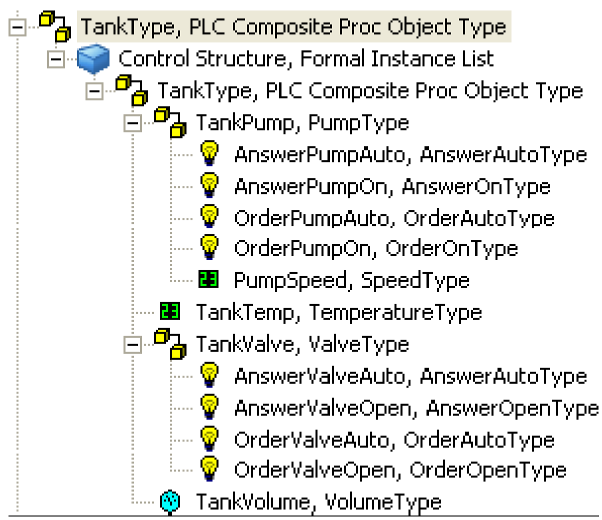


Figure 107. PLC Object Types

When creating a Controller Object with the OPC driver, it is also possible to upload the OPC server contents into the control structure instead of adding instances manually.

PLC Process Objects are created in the Control Structure in the Plant Explorer and normally correspond to physical devices in the process.

Before you can create PLC Process Objects, you must create a PLC Generic Network object corresponding to the PLC Connect Connectivity Server. When the generic network object is created, then a collection object and PLC Controllers are also automatically created under it. Under this collection object, add the PLC Controller object representing the physical PLC you want to connect. Under the controller object, instantiate process objects corresponding to the physical devices controlled by the PLC in question (refer to Figure 108).

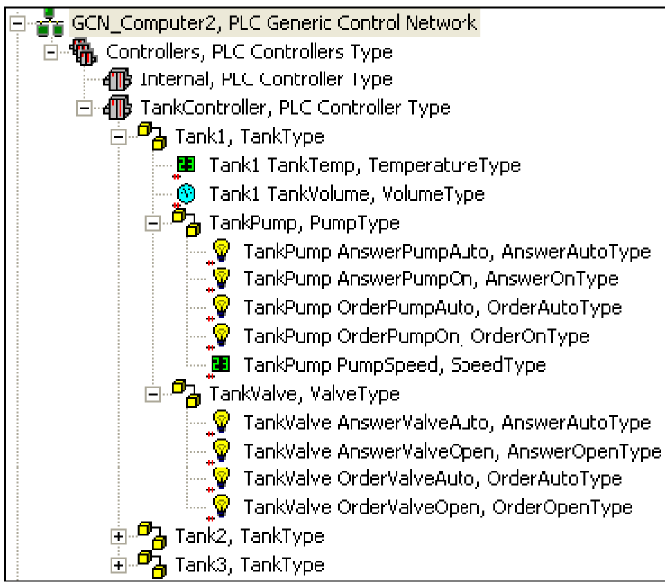


Figure 108. PLC Objects

One of PLC Connect's key features is the ability to communicate using a number of various protocols. When you create the PLC controller, you select which communication protocol to use and configure the communication driver parameters. Refer to Figure 109.

You can temporarily choose to use Internal driver, which means that all signals in process objects under this controller are treated as Softpoints.

When creating a process object, you need to specify which object type to instantiate. Once you have created the process object under a specific controller, you can

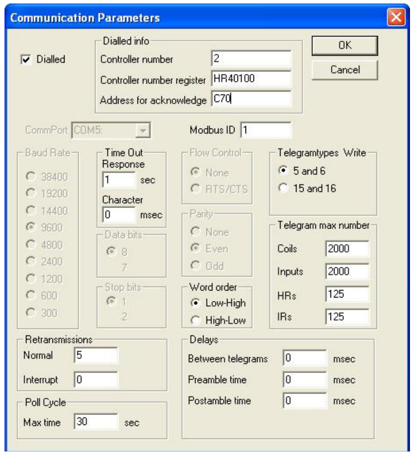


Figure 109. Controller Set Up with Dialed Communication (MODBUS Serial Protocol)

connect the object to the controller by assigning the physical I/O addresses to the signals. If you choose not to assign an I/O address to a PLC signal, then it will be regarded as a variable for storage.

For OPC servers, the automatic upload option is available (refer to PLC Uploader Aspect on page 295). Refer to Figure 110.

Properties are set up for the signals in the object type and for the object type itself. These properties will then be default properties in a process object created as an instance of the object type. You can choose to use the default settings or you can choose to make individual settings. For instance on the Alarm properties tab, you may choose settings that are individual for this process object instance.

When you make changes on the default settings in the object type, these changes will propagate to all instances of the object type. Refer to Figure 111 for an example with alarm settings on a binary signal in the object type and Figure 112 for another example with alarm settings on a binary signal in the process object instance.

Other examples of property settings in an instance with deviations from default setting are the following examples with Range settings on a real signal (Figure 113) and Authentication settings on a binary control signal (Figure 114).

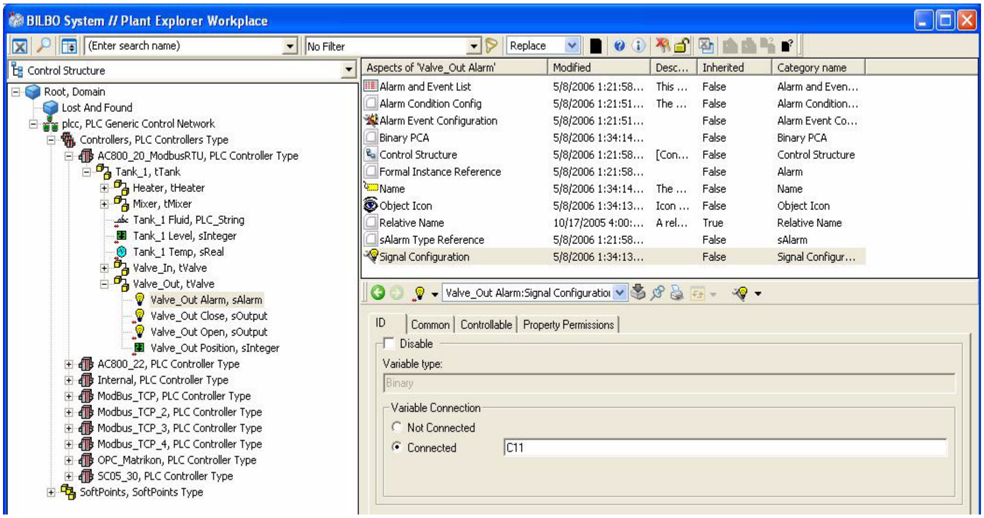


Figure 110. Connecting a Signal to MODBUS Address Coil 111

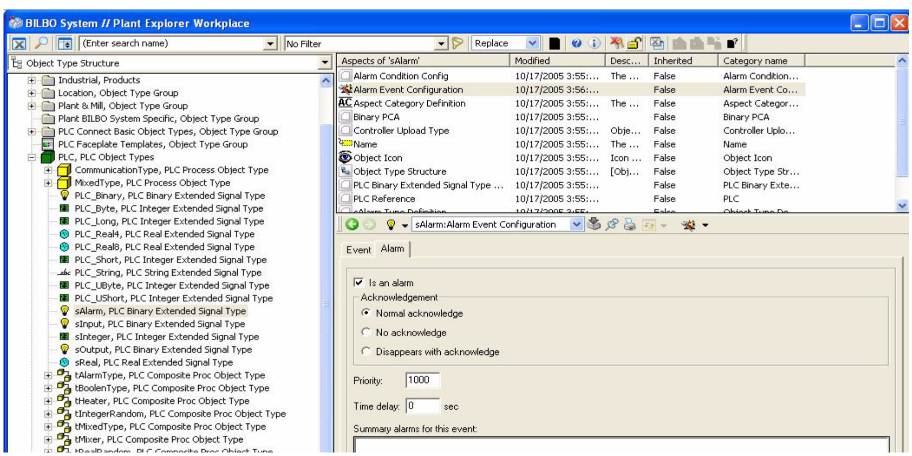


Figure 111. Alarm Properties on a Binary Signal in the Object Type

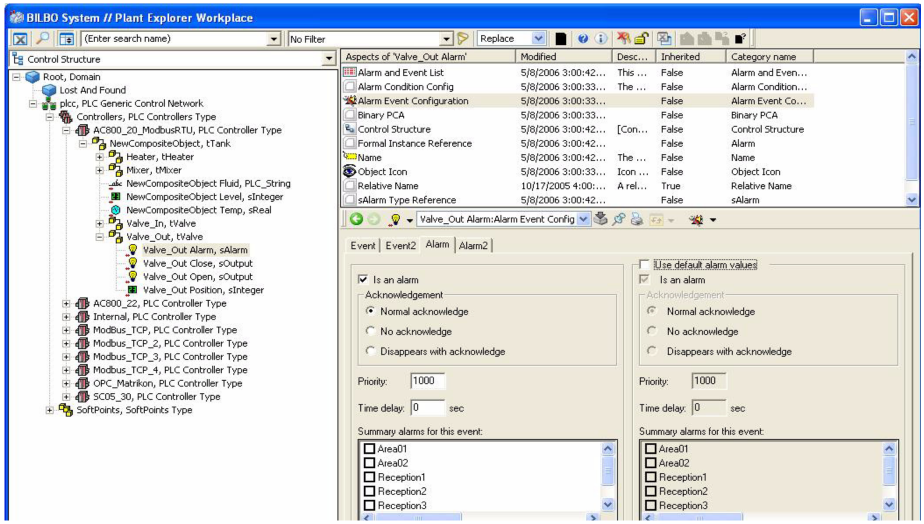


Figure 112. Alarm Properties on a Binary Signal in the Process Object.

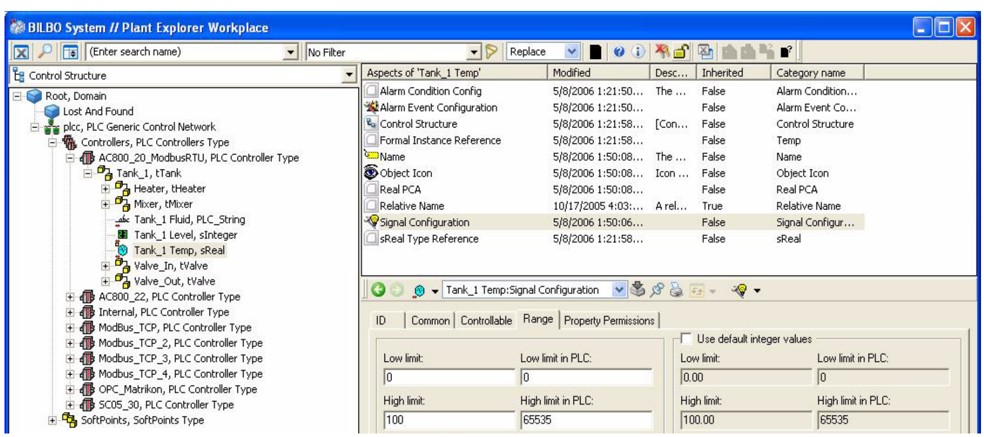


Figure 113. Range Tab Settings for a Real Signal in a Process Object

Some property settings are always done on the instance. Examples are event properties, such as event or alarm text (Figure 115), and delayed feedback signal for a binary control signal (Figure 116).

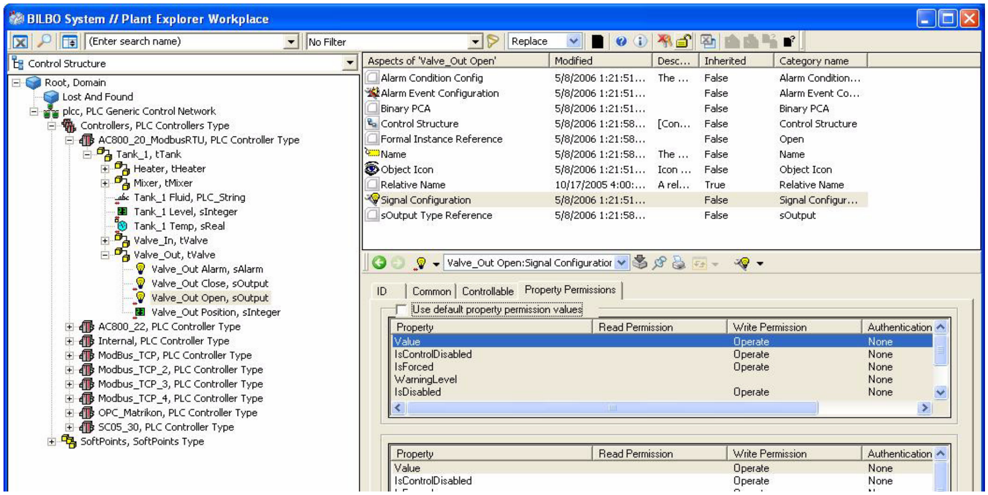


Figure 114. Property Permissions Tab Settings for a Boolean Signal in a Process Object

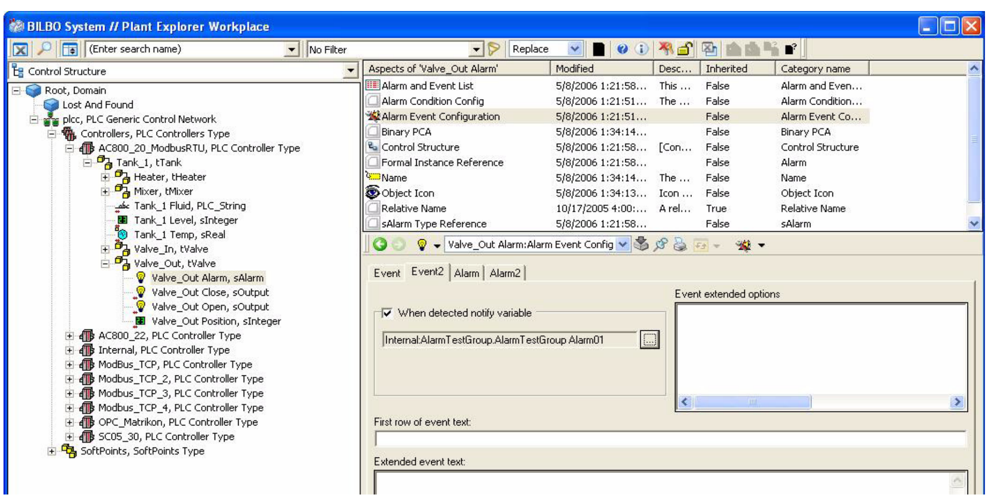


Figure 115. Event2 Tab Settings for a Binary Signal in a Process Object

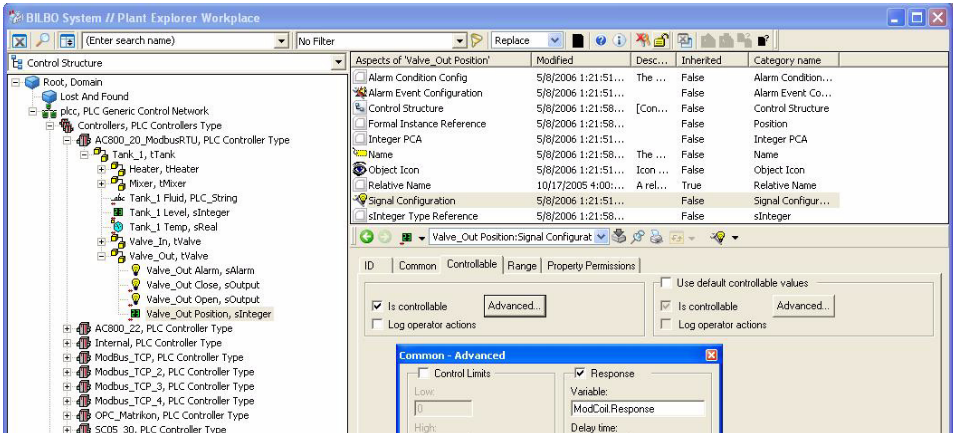


Figure 116. Controllable Tab Settings for a Binary Control Signal in a Process Object

For each process object, a default aspect called Object Dialog exists. Through this aspect you can view the status of any signal within the object. The control faceplate is displayed by clicking the “Properties” icon. The object dialog aspect is very useful during the engineering phase of a project and for debugging purposes. Refer to Figure 117.

The appearance of the dialog varies depending on the characteristics of the signal being displayed. Refer to Figure 118 and Figure 119.

Changes in object types and process objects are taken into use by making an online Deploy operation for the generic control network concerned. The Deploy performed includes a restart of affected communication drivers with updated communication telegrams. Refer to Figure 120.

If authentication is required for an operation, then a dialog appears when the operation is performed in a faceplate or in the object dialog. Refer to Figure 121.

PLC Uploader Aspect

The PLC Upload aspect is available from 800xA 5.0 and is used to retrieve the configuration of an attached OPC server and optionally create PLC Connect aspect

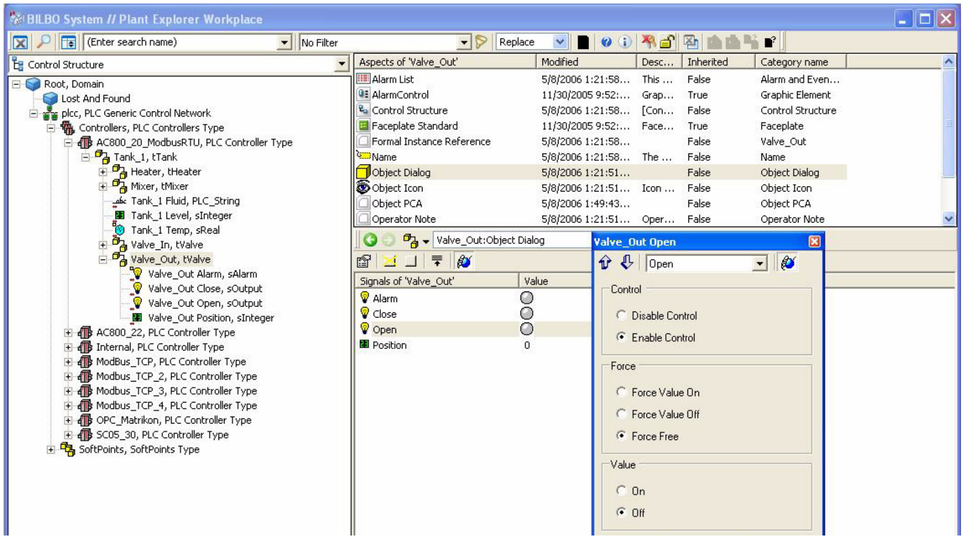


Figure 117. Object Dialog for a PLC Process Object with Control Faceplate for a Binary Signal of Input Type

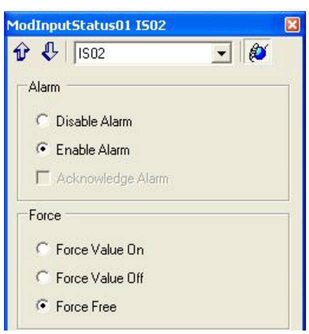


Figure 118. Control for a Binary Alarm Signal

objects in the control structure, that are automatically configured to the correct OPC item in the OPC server.

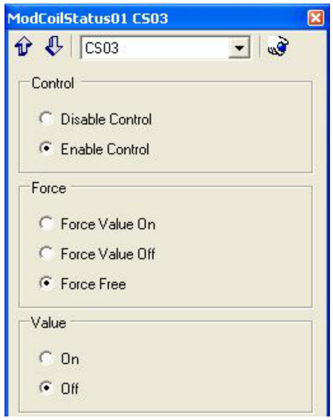


Figure 119. Control for a Binary Control Signal

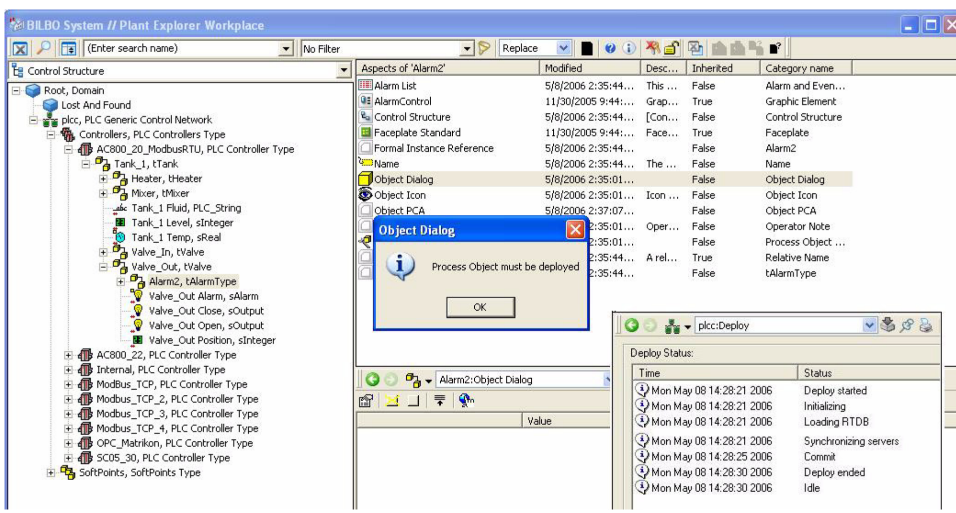


Figure 120. A New Signal Was Created, But Not Deployed

Figure 121. AuthenticatIon Dialog With Password For A Control Operation

The follow is a description of how this aspect can be used to upload an OPC server:

1. Click **Start** to initiate an unconditional Retrieve (OPC server data collection) and Append (creating PLC Connect aspect objects) operation. Refer to Figure 122.

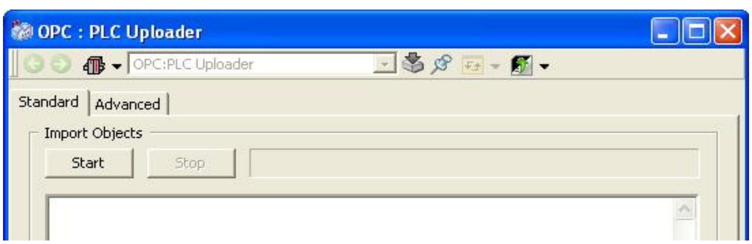


Figure 122. Start of PLC Uploader

2. Click **Stop** to abort this operation.
3. On the Advanced tab, the user can do a conditional Append after doing Retrieve by editing the Retrieve result in a Filter dialog. Refer to Figure 123.
4. Click **Retrieve Objects** to start the data collection from the connected OPC server. Refer to Figure 124.
5. The text window displays the Retrieve result. When the Retrieve operation is complete click the **Filter** button to edit the retrieved result. The list box allows

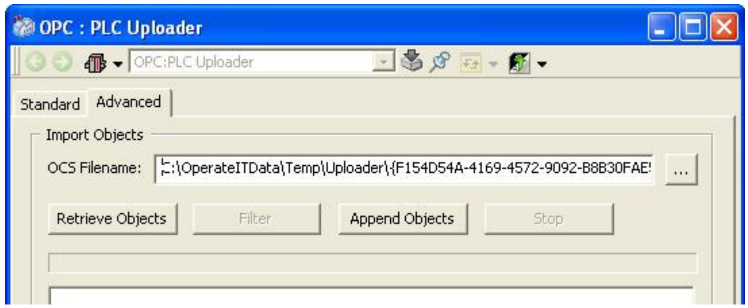


Figure 123. Advanced Tab

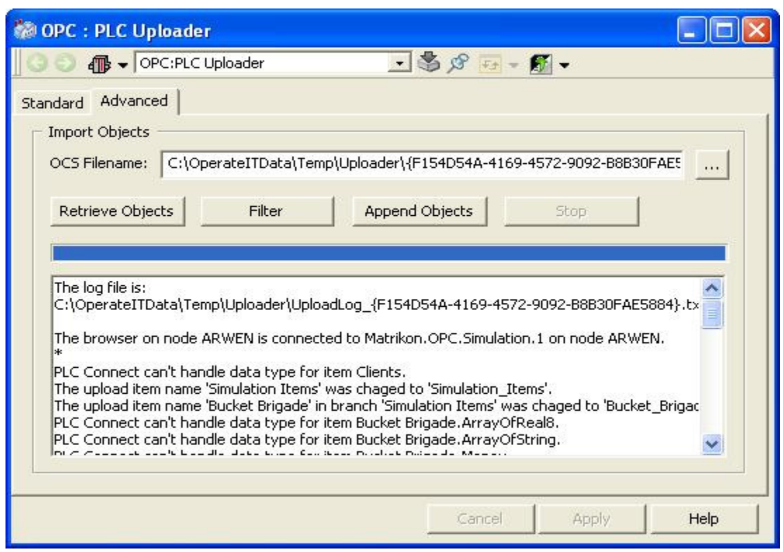


Figure 124. Retrieved Data

multiple select to edit several objects at the same time. In the context dialog it's possible to exclude, rename and map a retrieved object to an existing PLC Connect composite object type. All types with matching signal names, equal to the names on the OPC items on the retrieved object, will show up. The type will still show up if more signals are available on the type, than on the retrieved object. What happens then is that some signals remain unconnected which is ok. The rename function only changes the retrieved object name (in the Control

Structure), it will not affect the actual name of the OPC server object. Refer to Figure 125.

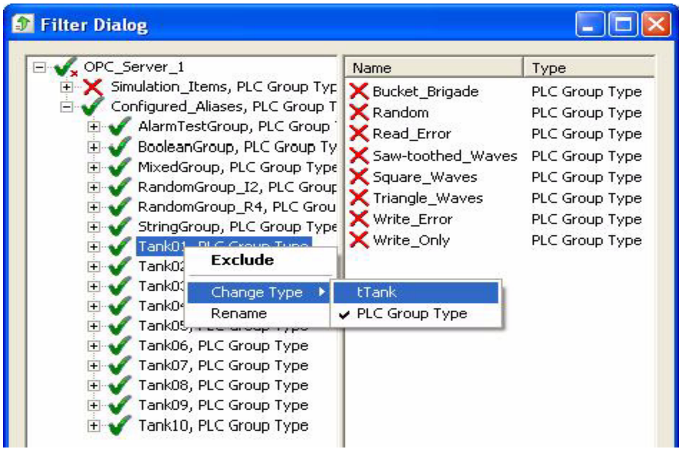


Figure 125. Filter Dialog

6. Click **Save** and close the window when editing is complete. Refer to Figure 126.
7. Click **Append Objects** to start adding PLC Connect aspect objects to the Control Structure.

Using PLC Connect with ABB Controllers

PLC Connect can be used with the following ABB controllers:

- AC 800M.
- AC 800C.
- Advant Controller 210 and 250.
- Advant Controller 31.
- Remote Terminal Unit 211.
- SattLine.
- SattCon/PBS PLC.

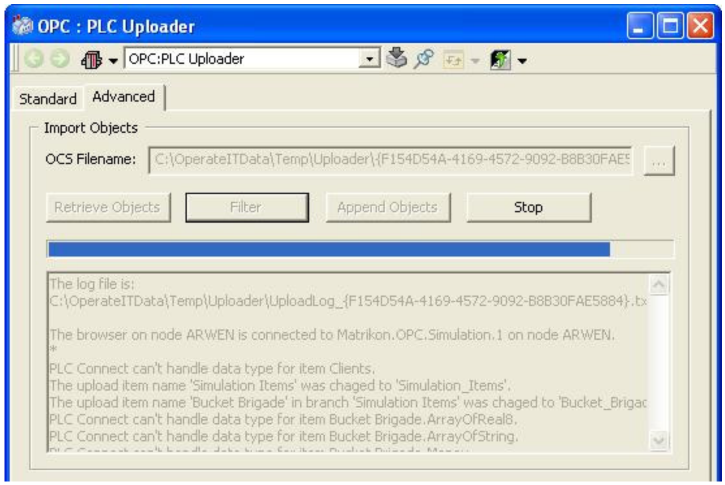


Figure 126. PLC Uploader

AC 800M

PLC Connect can be used to connect AC 800M to the System 800xA using the corresponding AC 800M OPC Server.

PLC Connect can also be used to directly connect AC 800M to the System 800xA using any of the following protocols with PLC Connect acting as master and AC 800M as slave.

- Serial connection and the Comli protocol. (Limited Comli).
- SattBus on TCP/IP (Ethernet).

AC 800C

PLC Connect can be used to directly connect AC 800C to the System 800xA using any of the following protocols with PLC Connect acting as master and AC 800C as slave.

- Serial connection and the Comli protocol. (Limited Comli).
- SattBus on TCP/IP (Ethernet).

Advant Controller 210 and 250

PLC Connect can be used to connect Advant Controller 210/250 to the System 800xA using any of the following protocols with PLC Connect acting as master and Advant Controller 210/250 as slave.

- Serial connection and the Comli protocol. (Limited Comli).
- SattBus on TCP/IP (Ethernet).

Advant Controller 31

The PLC Connect product together with the OPC Server for Advant Controller 31 can be used to connect an Advant Controller 31 to the System 800xA.

Alternatively, PLC Connect can be used to connect Advant Controller 31 using the MODBUS RTU protocol with PLC Connect acting as master and Advant Controller 31 as slave.

Remote Terminal Unit 211

PLC Connect can be used to connect Remote Terminal Unit 211 to the System 800xA using the serial connection and the MODBUS RTU protocol with PLC Connect acting as master and Remote Terminal Unit 211 as slave.

SattLine

PLC Connect can be used to connect a SattLine Workstation to the System 800xA using any of the following protocols with PLC Connect acting as master and SattLine as slave.

- Serial connection and the Comli protocol.
- SattBus on TCP/IP (Ethernet)(only to SattLine workstations).

SattCon/PBS PLC

PLC Connect can be used to connect a SattCon 200 Controller to the System 800xA using any of the following protocols with PLC Connect acting as master and the SattCon 200 Controller as slave.

- Serial connection and the Comli protocol.
- SattBus on TCP/IP (Ethernet).

PLC Connect can be used to connect any of the SattCon05, SattCon15, SattCon31, SattCon31-90, SattCon60, SattCon115 or SattCon125 controllers to the System 800xA using any of the following protocols with PLC Connect acting as master and the SattCon controller as slave.

- Serial connection and the Comli protocol (different limitations).

Section 12 Batch Management

Increasing competitive pressures have forced batch manufacturers to demand greater flexibility from production facilities. Production managers are being challenged to achieve seemingly incompatible objectives of increasing output and reducing the risk of regulatory noncompliance while implementing cost reduction initiatives. These pressures are driving the evolution of interoperability between distributed control systems and enterprise planning and information systems. System 800xA, Batch Management meets this challenge with the most advanced batch automation system available in the marketplace. 800xA Batch Management is a powerful application software package for configuring, scheduling and managing batch operations.

Batch Management

Batch Management supports the configuration of recipes and batch equipment, scheduling, monitoring and controlling both multi-product and multi-path batch production. Batch Management also supports other procedural control applications such as grade transition management for continuous processes and procedure based data collection where procedure context information is needed with process data.

Batch Management is seamlessly integrated with the 800xA System, through navigation within a Unified User interface, message integration through Alarm/Event Management and User Profile Recognition and configuration.

Controller Connectivity with Batch Management is achieved through the controller connectivity packages and the base system support for this function. Batch supports the native 800xA controller (AC 800M), controllers from the ABB heritage OCS families (Advant/MOD 300, Symphony Harmony/INFI 90, Symphony/Melody, and DCI System Six), and controllers/devices with an OPC server compatible with the 800xA System. Table 16 shows connectivity for the Batch Management functionality.

Table 16. Batch Management Controller Connectivity

System 800xA Connectivity	Description
AC 870P/Melody	Batch Management can supervise controller phase logic in AC 870P/Melody controllers when used in combination with 800xA for Melody Connectivity. The controller phase logic must be configured using either an SFC or SFC-Phase object in order to be compatible with Batch Management.
AC 800M	Batch Advanced Templates delivered with Batch Management are the preferred options for new projects due to improved engineering integration with Control Builder and greater flexibility and extendability when implementing batch control. The EPT (Equipment Procedure Template) from Batch Control Library is also supported.
Symphony Harmony/INFI 90	Batch Management can supervise controller phase logic in Harmony Bridge Controllers when used in combination with 800xA for Symphony Plus Harmony Connectivity. The controller phase logic must be configured in PHASEX function codes to be compatible with Batch Management.
Advant MOD 300	Batch Management can supervise controller phase logic, configured in TCL, resident in either AC460 or SC controllers when used in combination with 800xA for MOD 300 Connectivity. The TCL phase logic must be configured in accordance with the S88PHASE TCL template, available with 800xA Batch Management.
DCI System Six	Batch Management can supervise controller phase logic, configured in CCL, in DCU controllers when used in combination with 800xA for DCI Connectivity.
OPC control devices	Function Phase Driver is a user application which maps batch states, commands, and parameters between batch server and user defined OPC data points representing the interface to an equipment phase in a PLC or third party controller.

Batch Management is comprised of the following five primary functions:

- Batch operation.

- Resource management.
- Batch production history.
- Equipment configuration.
- Recipe management.

Batch Operation

The batch operation functions of Batch Management are accessed from the Batch Overview window. This window provides a summary of all the batches in the production schedule. This window also offers the flexibility to manipulate the batches in the production schedule. Figure 127 shows a Batch Overview window.

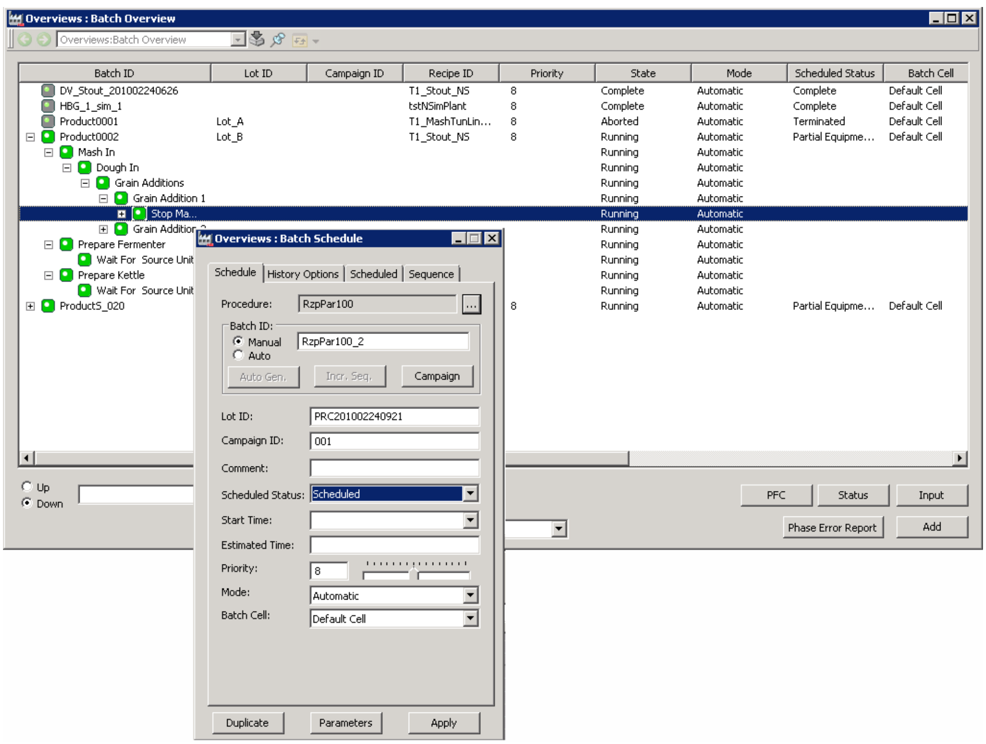


Figure 127. Batch Overview Windows

This window lists detailed information about each batch including:

- Batch, lot, and campaign ID.
- Recipe ID.
- Batch priority.
- Batch cell.
- Mode of operation (automatic, manual, or semiautomatic).
- State (running, aborted, stopped, etc.).
- Scheduled status (not scheduled, scheduled, active, input pending).
- Comments.
- Start and end times.
- Procedure hierarchy with direct access to desired procedure level.

The Batch Overview window options include:

- Scheduling a new batch.
- Invoking the status window for a batch or subprocedure.
- Displaying the procedure function chart for a batch or subprocedure.
- Responding to pending messages for a batch.

The Batch Schedule and Batch Information status windows are accessible from the Batch Overview window. The schedule window enables the addition of batches in an efficient and user friendly manner. The Batch Schedule window options include:

- Scheduling a new batch.
- Scheduling a campaign of batches.
- Duplicating an existing batch.

The Batch Information status window provides batch status information and the ability to issue batch commands.

The procedure function chart is based on ISA88 standards. Figure 128 shows the graphical representation of a typical procedure. The current status of each step is displayed by a unique combination of colors and symbols.

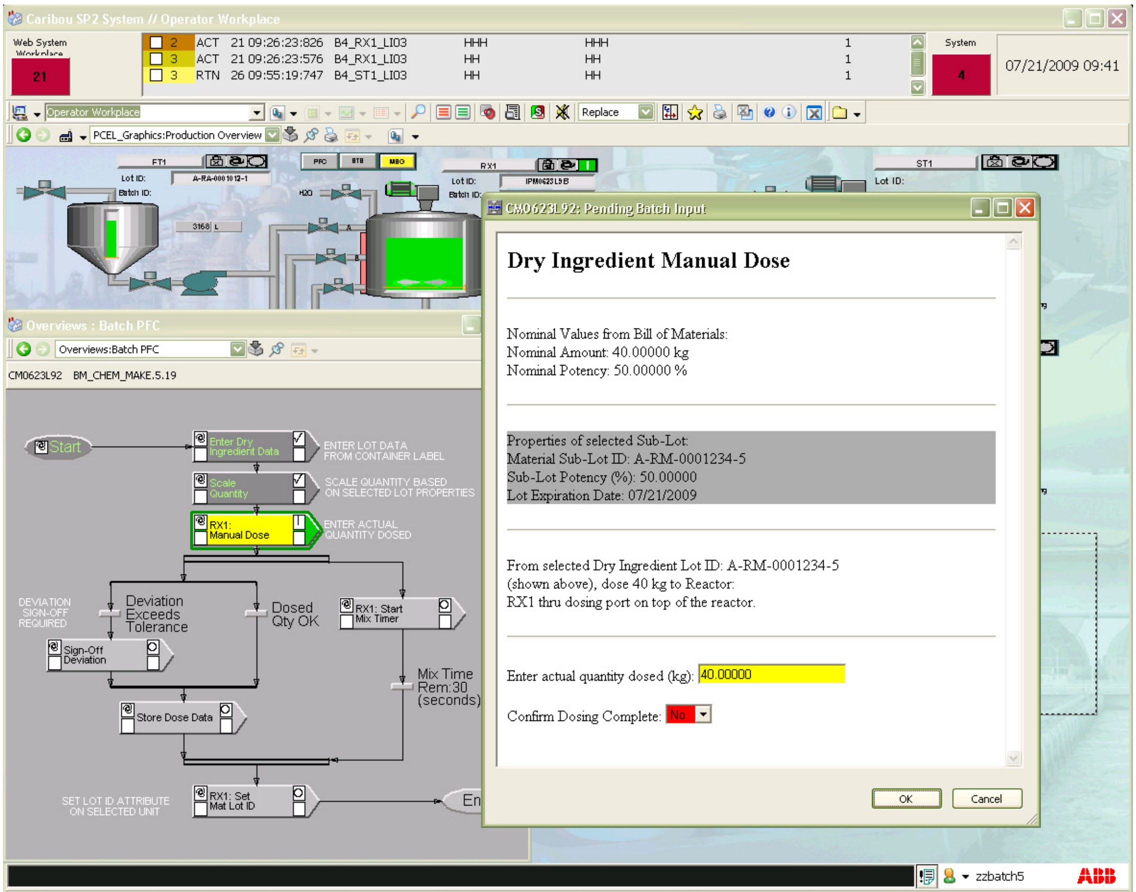


Figure 128. Procedure Function Chart Window

The procedure function chart window options include:

- Navigating to a higher or lower level of procedure function chart.
- Changing the operating mode (automatic, manual, or semiautomatic) at any level in the procedure.

- Changing state (running, aborted, stopping, etc.) of an active step at any level in the procedure.
- Responding to pending messages.
- Invoking the online procedure editor to make changes to the active batch control recipe.
- Selecting a procedure restart point.
- Changing the breakpoint or skip status of any step in the procedure.
- Viewing the header information.
- Viewing formula information.
- Viewing the standard operating procedure.
- Navigating to the active equipment phase aspects.

Resource Management

The resource management functions of Batch Management are accessed from the Equipment Overview window. This window displays the status of all batch equipment configured in the system as shown in Figure 129.

At the overview level, the following information is provided:
- Equipment name and status (available, busy, or reserved).
- Batch, lot, and campaign ID (if the equipment is in use).
- Operator status (normal, disabled, etc.).

The Equipment Information window is accessible from the Equipment Overview window. The Equipment Information window can be invoked for any equipment on the equipment overview.

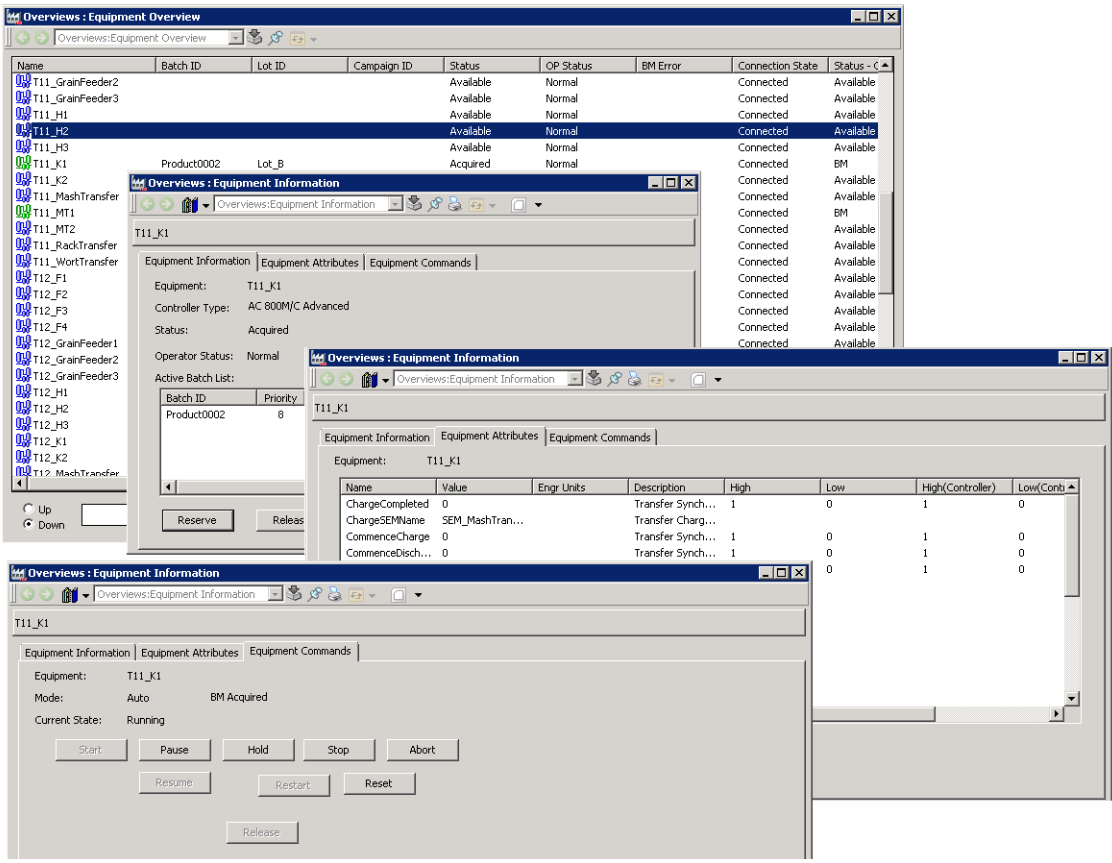


Figure 129. Equipment Overview Windows

From this window, the following additional details are presented:

- Controller type.
- Attributes of the equipment including name, value (configured and run-time), engineering units, and description.
- Pending batch list (if applicable) containing batch ID, priority, and reservation time.

Batch Production History

The batch related alarms and events are routed to the 800xA System event system for collection and organization by Information Management. The Batch History Overview will display batch status and tag data for completed batches. Alarms and events generated by Batch Management are accessible from this view while still buffered in the base system history event storage. The completed Procedure Function Chart, displaying the final procedure path that was executed is also accessible from this screen. Refer to Figure 130.

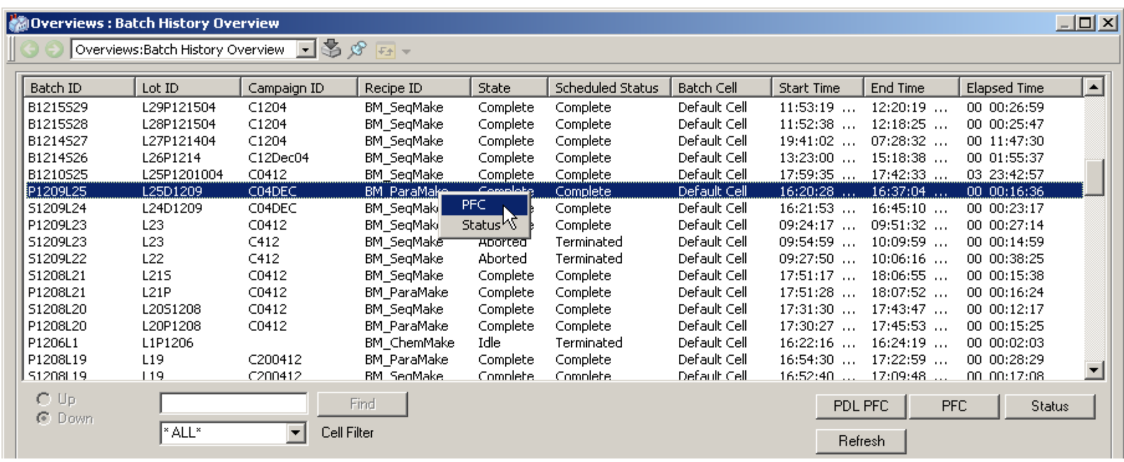


Figure 130. Batch History Overview

The PDL (Production Data Log) history component of Information Management provides hierarchical history logs of batch data and events. Often when a batch is being produced, the information associations are not time related and cannot be anticipated. Information Management has built-in provisions for the organization, storage, and retrieval of this type of information. Information Management also organizes critical process data such as operator interventions, alarms, events (batch, controller, and system), numeric trend data, equipment usage, and batch start, stop, and duration times.

The data records stored in Information Management are easily accessible to Microsoft Access, Microsoft Excel, and other popular reporting packages like Crystal Reports. Batch Management includes standard report templates that can serve as a basis for configuring detailed, application specific batch production reports.

With batch event data stored hierarchically in PDL, it is easy to perform batch to batch analysis of trend data. This is done by using associations to batch data for desired batches and trend variables for analysis.

Equipment Configuration

Batch Management supports network, multipath, and single path equipment configuration. This allows for support of complex batch production facilities. All units, shared-use equipment modules, and exclusive-use equipment modules must be configured. Pseudo resources can also be configured and used to identify resources, such as an operator, required at specified points in a procedure.

Equipment configuration contains equipment and other resources that are used during the execution of a batch. The following information can be defined for equipment:

- Description - Describes the equipment.
- Attributes - Defines specific characteristics of the equipment (operating temperatures, construction materials, etc.). Attributes include name, value, engineering units, and description.
- Capabilities - Specifies which phases can be processed by the equipment (heat, react, mix, etc.) and the parameters for those phases.
- Shared - Defines equipment as exclusive use or shared to multiple batches.
- Equipment Type Object Types- Identifies plant equipment as equipment module, unit, process cell, etc. including user defined functionalities.
- Controller Type - AC 800M, Harmony, MOD 300, DCI, Melody, and other ABB or third-party PLCs through OPC.

Recipe Management

The Batch Management procedure configuration tool (Figure 131) provides the ability to configure the following information for each recipe:

- Procedure.
- Formula.

- Equipment requirements.
- Header and other information.

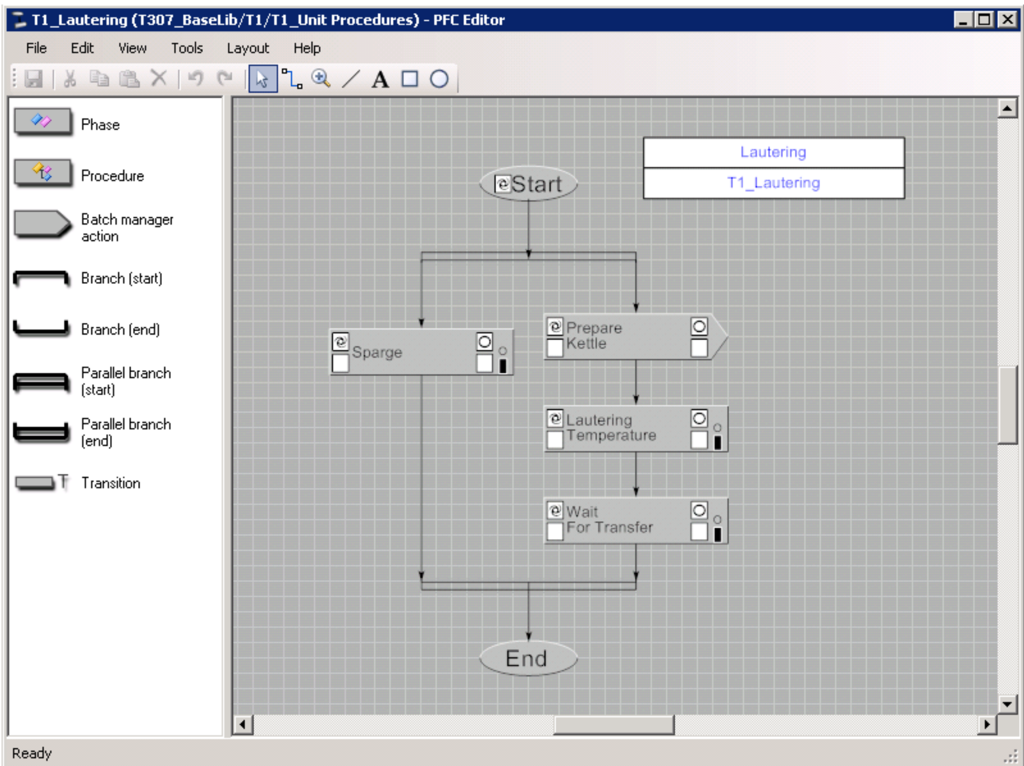


Figure 131. Procedure Configuration Window

The Batch Management procedure configuration tool is used when making runtime edits (online recipe edit) to the currently executing control recipe.

Procedure

The procedure is configured graphically through a specialized editor. The diagram is a procedure function chart based on ISA88 standards. The mandatory use of ISA88 procedure levels can be enforced, or full collapsibility and expandability can be used to provide additional flexibility. The procedure editor supports conditional transitions, logical branching, parallel branching, looping structures, and dynamic block labels for superior operational and control capabilities.

The procedure editor supports creation and modification of procedure building blocks. These building blocks can be used in multiple procedures. When a modification is made to a building block, all the procedures utilizing that block are updated. The procedure editor also supports the creation of exception procedures for enhanced exception handling at the procedure level in addition to controller based exception handling.

All procedures are version controlled with revision history for each version. In addition to maintaining the approved version online, a user configurable number of previous versions of the procedure are stored and are available online. A procedure revision history includes the User ID, full user name, workstation node name, date/time stamp, comments about the changes made and electronic signatures. The user is prompted to increment the version number each time a development procedure is promoted to an approved procedure. An online comparison of two versions of a procedure is available through the difference report feature.

Formula

Formula information includes input parameters, process parameters, and output parameters. Batch Management allows formula information to be assigned at any level of the procedure. Formula information includes the following data:

- Parameter values.
- Parameter descriptions.
- Actual and default values.
- Allowed ranges.
- Engineering units.
- User access levels.

Equipment Requirements

Equipment requirements are specified in the procedure through equipment allocation BMAs (Batch Manager Actions):

- Reserve equipment - Reserve one or more pieces of equipment for use within a batch.

- Unreserve equipment - Release equipment that was previously reserved.
- Acquire equipment - Acquire one or more pieces of equipment for a specific purpose during batch execution.
- Release equipment - Release equipment that was previously acquired.
- Select equipment - Select equipment from available equipment based on selection criteria and attributes.
- Deselect equipment - Release equipment that was previously selected.

Header and Other Information

Header and other information includes:
- Master recipe and version.
- Author, workstation name, and creation date.
- Description and header text (optional).
- SOP (Standard Operating Procedures) (optional).
- Other information attached as aspects (optional).

Standard operating procedures can be defined for the operator. They can be invoked during the execution of the procedure to display the SOP applicable to the current step in the procedure.

Online Recipe Editing

System 800xA provides unique online recipe editing flexibility during batch execution. Without stopping the batch, you can modify sequence and equipment assignments as well as recipe parameters. All changes made to the control recipe are automatically saved in the production record.

Batch Server Redundancy

Batch Management incorporates the high-availability practice of database mirroring to support batch server redundancy. The database is protected by the fact that a mirror copy or synchronized copy of the database is kept on a separate server. A witness node monitors the acting primary and secondary and provides the ability for automatic failover.

Batch Schedule Interface

Batch Management includes a schedule interface function to facilitate the bi-directional transfer of data between Batch Management and an external application. The interface function is deployed as a web service. Web services are technologies that allow applications to communicate with each other in a platform and programming language independent manner. A web service is a software interface that describes a collection of operations that can be accessed over the network through standardized XML messaging. It uses protocols based on the XML language to describe an operation to execute or data to exchange with another web service.

The interface provides pre-defined function calls to provide connectivity with Batch Management. Read function calls acquire real-time data from the batch system. Write function calls execute limited control over operations in the batch system.

Standard read function calls can be used to retrieve the following types of information:

- List of all active batches.
- Details from any batch listed in the batch overview.
- Details from any approved procedure.
- Tag key (batch) data associated with the batch.
- Details from any batch equipment.

Standard write function calls can be used to perform the following operations:

- Schedule a batch, including values for some or all top-level recipe parameters.
- Change a previously scheduled batch, including start time, priority, mode, and parameter values.
- Change attribute values on batch equipment.

The Batch Schedule Interface applications via Active Server Pages will also be supported to facilitate the migration of systems from previous versions.

Characteristics

Table 17 describes the architectural characteristics of Batch Management.

Table 18 describes various characteristics of the Batch Management user interface.

Table 17. Architectural Characteristics

Feature	Characteristic/Value
Structure	Client/server.
System	System extension to 800xA.
Batch server	1 primary batch server per 800xA System.
Batch server redundancy	One-to-one, optionally licensed; unshared dedicated hub between batch servers recommended when dual networks are not being utilized.
Batch Management server	The batch manager only runs on the Batch Management server. There is only one server (which can be redundant) in a system.
Batch in large systems	In large systems Batch should reside in its own application server. It can not “share” with other applications.
Historian	The batch related alarms and events are routed to the 800xA System event system. These alarms and events as well as non-batch server events (including attributes), and numerical trend data is collected and organized by Information Management. Advanced production history, batch to batch analysis, reporting and archiving is enabled through the use of Information Management.

Table 18. User Interface Characteristics

Feature	Characteristic/Value
Graphics system	800xA Batch Management Procedure Editor.
Standard windows, graphics, etc.	Batch Overview, Equipment Overview, procedure function chart.
Standard faceplates	Batch status, block status, equipment information.
Profile settings	User profile controls access rights, stores column arrangements and widths on list windows such as Batch Overview.

Simple Batch and Parameter Management

Simple Batch and Parameter Management offers the user an optional way to schedule batches and manage formula parameter information without accessing the Batch Overview.

This feature leverages the ability of the batch manager to schedule batch recipes from external sources. In this case we are using a Microsoft Excel spreadsheet (Figure 132) to host parameter information and schedule batches. The user defines the formula parameter sets within the spreadsheet. Each parameter set is associated with a specific recipe procedure. The user can simply select a recipe, select a parameter set, and schedule a batch.

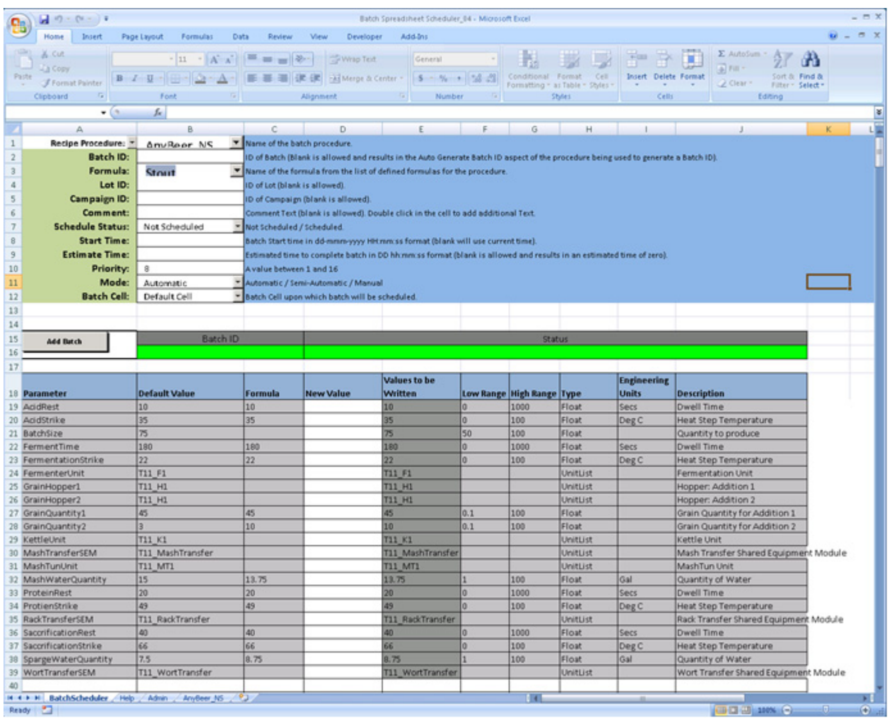
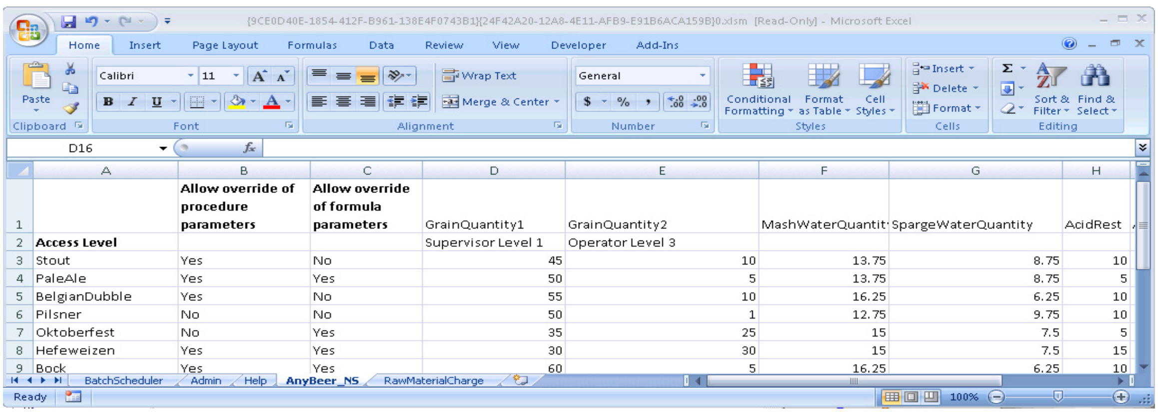


Figure 132. Scheduler Interface with a selected recipe

Batch scheduling is simplified by the ability to filter on all approved recipe procedures. The spreadsheet is secured through 800xA by being a File Viewer Aspect. Access for editing is limited and makes the spreadsheet a viable user interface that is used on any working environment.

The spreadsheet setup is simple. The Feature Pack installation loads the Batch Spreadsheet Scheduling Object in to the Library Structure. The user needs to copy the object into an object type or instance where it is used and applied to a graphic. Everything for scheduling is ready to go. Create parameter lists (Figure 133) and now users are ready for managing their formulations.



	A	B	C	D	E	F	G	H
1		Allow override of procedure parameters	Allow override of formula parameters	GrainQuantity1	GrainQuantity2	MashWaterQuantit	SpargeWaterQuantity	AcidRest
2	Access Level			Supervisor Level 1	Operator Level 3			
3	Stout	Yes	No	45	10	13.75	8.75	10
4	PaleAle	Yes	Yes	50	5	13.75	8.75	5
5	BelgianDubble	Yes	No	55	10	16.25	6.25	10
6	Pilsner	No	No	50	1	12.75	9.75	10
7	Oktoberfest	No	Yes	35	25	15	7.5	5
8	Hefeweizen	Yes	Yes	30	30	15	7.5	15
9	Bock	Yes	Yes	60	5	16.25	6.25	10

Figure 133. Parameter List

Security Options for Spreadsheet Scheduler

The spreadsheet scheduler provides features that allow the user to apply strict access controls. These access controls can be applied to group of parameters or to a individual parameter through the access level configuration.

A batch cell can be used to selectively grant additional permissions for the spreadsheet functionality without having to globally raise permissions of the user.

Non 800xA Spreadsheet Scheduler

The Excel Spreadsheet scheduler can be configured on non 800xA workplace. Users can add the Excel Scheduler application to their office machines and manage batch recipe schedules from their desktop. The application is simple to install and provides all the components necessary to connect the 800xA Batch Management System.

The desktop version of the Batch Spreadsheet scheduler does require licensing. One of two licenses options is available. The Batch Schedule interface provides an unlimited access. The Simple Parameter Management license provides a single use license.

Batch Graphic Aspect for Batch Scheduling

The batch scheduling aspect allows the scheduling dialog to be embedded directly into a PG2 graphic display or through a separate dialog activated from within a graphic (Figure 134). Additionally the scheduling aspect has an access field directly to the parameter list associated with the batch recipe. User formulations can be selected directly from the scheduling interface. A user can simply choose a recipe, select a formulation, and schedule a batch.

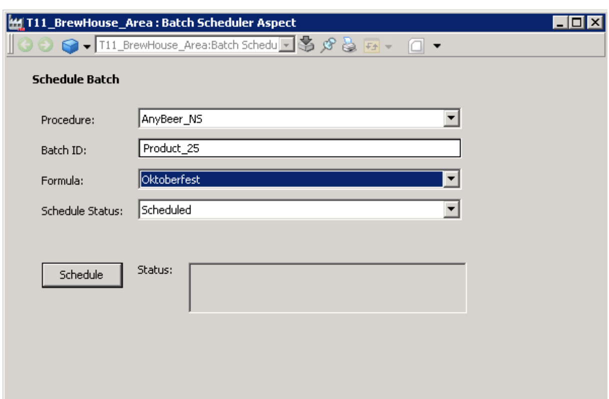


Figure 134. Batch Scheduler Aspect

The scheduling dialog is completely configurable (Figure 135). Fields can be reordered, enabled, or disabled as required.

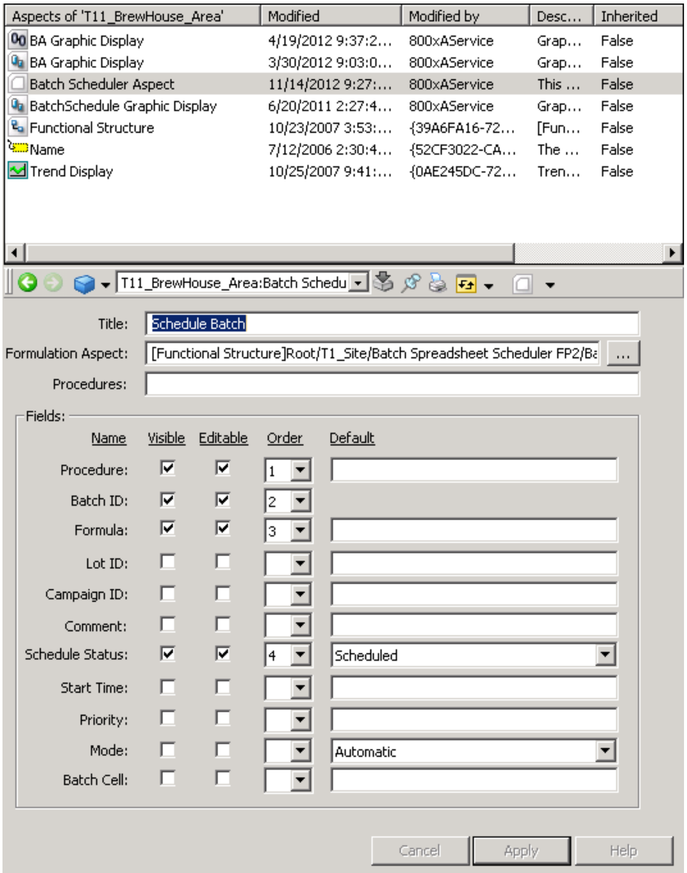


Figure 135. Batch Scheduler Aspect - Configured

Section 13 System Management

This section describes the management of the 800xA System software.

Product Installation

The 800xA System software is packaged in a System 800xA Media. The system installation is supported by the Automated Installation program. The Automated Installation program is a shell framework to ease the installation and configuration of your 800xA System.

Installation is possible without licenses, but licenses are required to unlock features for operating or engineering the system.

Updates and security related software from non-ABB companies must be downloaded and installed separately, as guided from the Automated Installation program.

The Automated Installation program is supplied on the System 800xA Media. The common part is to specify the system details of your system in the Automated Installation program System Planner and generate a unique setup package for each node (workstation) describing what should be installed from the System 800xA Media, or a file server, onto each node, and how it should be configured.

The 800xA System Installer is installed on each node, and then the following steps are executed to install and configure your node:

- Windows configuration.
- System Verifier tool.
- System installation.
- System configuration.

The setup-files may also reside on the file server.

Windows configuration configures the environment (IP address, hostname, Windows components, and Windows services) connect to the workgroup or domain. The System Verifier tool checks for the necessary third party software and finds out where installations are required. The System Installer installs all ABB software without user interaction. System configuration guides the user through configuration of the system using many automated steps such as creating system, software user settings, and loading of system extensions.

Workstation Hardware

Information about hardware requirements is available in [1] in Table 1 on page 30.

Information about recommended workstation hardware is available in [15] in Table 1 on page 30.

Third Party Software

The 800xA System and its features require that a number of third party software products are installed. The requirements are indicated per Functional Area or by node type, but are also summarized in [16]in Table 1 on page 30.

Diagnostics Collection Tool

The ABB Diagnostics Collection Tool (DCT) is used to collect diagnostics information for analysis from a local or remote node in a distributed LAN system. The data is packaged into compressed cabinet (.cab) files that are attached to the reported problem.

The information is primarily used for support and trouble shooting purposes. Analysis of diagnostics data can be done directly in the system where the data is collected. Alternatively, the data can be sent to ABB support organization for detailed analysis in the event of failure or strange behavior of a system, refer to Figure 136.

System Checker tool is now merged with the Diagnostics Collection Tool. These functions are available as different plug-ins.

Figure 136. ABB Diagnostics Collection Tool

DCT has support for the different 800xA products in the system as well as for Microsoft related functions.

The overall purpose of the tool is to unify, and make consistent, the information gathering process for all ABB Industrial IT products regarding necessary information from installations at customer sites. This will help speed up the problem resolution process.

The main functions of the tool are:

- Collect diagnostics data from nodes in a distributed system.

- Explore the contents of the collected data.
- Analyze relevant parts of the collected data.

Supported Diagnostics Information

A set of plug-ins supporting DCT collection capabilities are bundled with DCT. The plug-ins are separated into two categories, 800xA and Standard. Third party developers can create their own plug-ins using the provided DCT software development kit.

The following plug-ins are installed with DCT:

800xA Plug-ins

These plug-ins collects data from 800xA:

- BatchIT.
- OPC Server for AC 800M.
- Control Builder M.
- Harmony Connect.
- License Information.
- Process Portal A.
- Log File.
- Shared Memory Dump.
- System Extension Checksum.
- System Report.
- PLC Connect and SoftPoint Server.

Standard Plug-ins

These plug-ins are targeted at collecting information about the operating system:

- Diagnostics Collection Tool.
- DLL List.
- DNS Information.
- Environment Variables.
- WER.
- Event Logs.
- Handle List.
- Installed Software.

- Process Information List.
- Registry Dump.
- SQL Diagnostics.
- System Information.
- Task Manager.
- User Dump.

800xA Plug-ins

Batch^IT

This plug-in collects system log files generated by Batch^IT. Collection of current log files, old log files or both can be specified.

Control Builder M

This plug-in collects log files generated by the Control Builder M software.

Some of the log files are:

- System Logs.
- Session Logs.
- Start Logs.
- Heap Statistics Log.
- Controller System Logs.
- System Information Report.
- Profibus Logs.
- Crash Dumps.

The information gathered by this plug-in can be analyzed with the Analyze Tool.

Ensure that Control Builder M application is not running and the latest Controller log files are available before starting the collection of log files.

OPC Server for AC 800M

This plug-in collects log files generated by the OPC Server for AC 800M.

Refer to the Maintenance and Troubleshooting section in [17] in Table 1 on page 30.

Harmony Connect

Harmony Connect (ABBDiagnosticDump.exe) dumps the current state information maintained by the ABB Diagnostic Service for the server broker, datasync service, and RTDS servers.

License Information

The License Information plug-in gathers comprehensive report from the node which has the ABB Central Licensing System server installed. The report contains all the available features, their installed attributes and how they are currently being used. The plug-in also gathers the errors log file from the Licensing server, CLSErrors.log.

To view the log files directly, click on *View CSLSError.log* and **View Feature Usage**.

Log Files

This plug-in collects log files generated by 800xA Softwares and collects the data generated by Applog and System events.

Figure 137. Log Files

Config Wizard Log. Creates a *AfwConfigWizard.log* file that lists all the loaded files upon creation and startup of a system.

AppLog Messages. Application log (Applog) is the primary debug and diagnostics tool of PPA. This tool supports logging and states report operations.

To use Applog, enable it using the Configuration Wizard. Open the Configuration Wizard and select **Applog** to start the applog service. To configure it, start ApplogViewer and select the applications to trace log information from.

An Applog message contains the following attributes:

- Message Time.
- Application Name.
- Message Node.
- PID.
- Thread.
- Log.
- Log Level.
- Tag.
- Message Text.

System Logs. It collects all logs (System log, Exception logs) created by 800xA softwares installed on the node.

Active Port Information. It Collects Active port information about Afw and Adv processes.

Shared Memory Dump

This will collect the hex dump files for 800xA applications.

System Extension Checksum

This will collect the XML files that have information of checksum calculations and versions for all files of each system extension.

System Report

This plug-in generates a system wide report on System Extensions, Applications, Users, and so on.

The Aspect System must be UP for the DCT to generate the System Report, otherwise an Error log will be added in the DCT collection as follows:

```
Could not reach Aspect Directory
```

Execute this plug-in from an Aspect Server in the system.

Collect Data for this plug-in will generate the System Report.

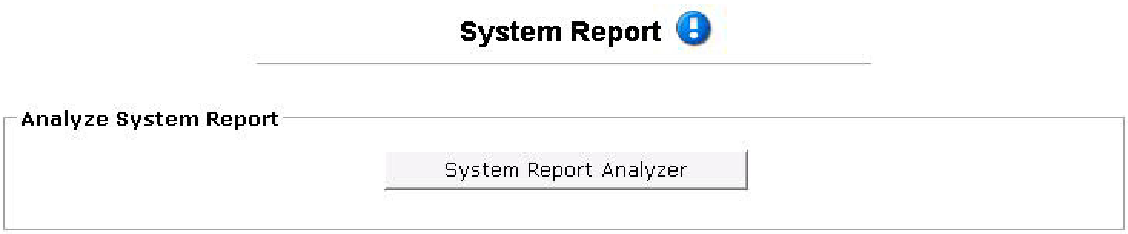


Figure 138. System Report

To analyze the System report, the **System Report Analyzer** button is provided with plug-in GUI, refer to Figure 138. This button will launch the Excel Tool that structures the report into a sheet per node.

System Report Error

DCT will log error as follows if Aspect System is not UP:

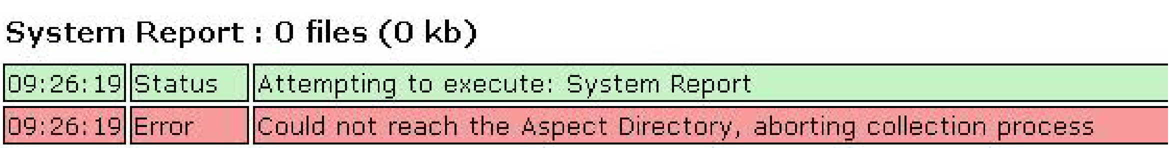


Figure 139. System Report Error

System Report generated by this plug-in consists of the following attributes:

System Wide

- System Name.
- System Extension.
- Affinity.

For each node in the System

- Type.
- Application.
- Network.
- Local Users.
- Node Services.

For the Domain Controller

- Domain Users.
- User Groups.
- User Roles.

PLC Connect and SoftPoint Server

This plug-in gathers the log files for the ABB PLC Connect and the ABB SoftPoint Server.Both share the same log files. PLC Connect is a connectivity option to System 800xA that makes it possible to connect and integrate any type of remote or locally installed PLC, RTU, or other type of device.

ABB PLC Connect and the ABB SoftPoint Server are two different products that are installed separately, one by one or both.

Standard Plug-ins

These plug-ins collect diagnostics information from the operating system running 800xA.

Diagnostics Collection Tool

This plug-in collects log files from DCT. Both the current log file (from the currently running DCT), and old log files are collected.

DLL List

Special characters are not allowed for process name in the DLL list plug-in.

DLL List plug-in (using Listdlls.exe) shows the full path names of loaded modules and not just their base names. In addition, DLL List will flag loaded DLLs having different version numbers from their corresponding on-disk files (which occurs when the file is updated after a program loads the DLL). It also can tell which DLLs were relocated because they are not loaded at their base address.

Use the options provided to specify the list to collect. It is also possible to view the DLL list directly, by clicking on the View DLL List button.

DNS Information

This plug-in collects DNS lookup table with connection verification and writes all information in a text file.

Environment Variables

This plug-in collects all Environment Variables of the node and writes this information in to text file.

Windows Error Reporting

Windows Error Reporting is an error-handling mechanism for Windows systems. It detects and diagnoses program errors and logs the resulting diagnostics information. WER creates the Crash Report for individual applications.

All reports will be added in collection with the name of the corresponding application. The user can see the applications that were crashed in that duration, attach these reports to a mail, and send it to the corresponding product owners.

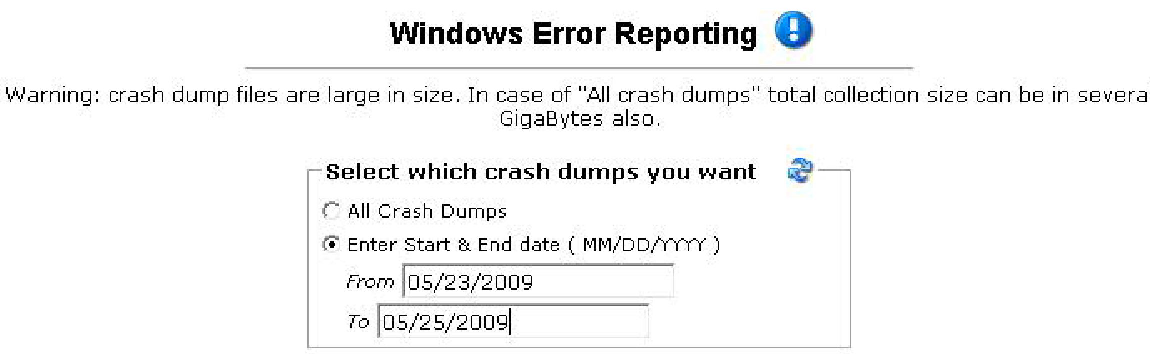


Figure 140. Windows Error Reporting

User has two options to collect the crash dumps:

- All crash dumps on the system.
- Crash dumps in between specific dates.

Event Logs

This plug-in contains the functionality of the two plug-ins, System Event Logs and Custom Event Logs. System Event Log (*eventvwr.exe*) records system and hardware events as log entries on a server. There are three logs that are created by the operating system and some additional logs created by individual applications. The three system logs are:

- Application Event Log.
- Security Events Log.
- System Even Log.

Application Event Log	The application log contains events logged by applications or programs.
Security Events Log	The security log can record security events such as valid and invalid logon attempts as well as events related to resource use such as creating, opening, or deleting files. An administrator can specify the events to be recorded in the security log.
System Event Log	The system log contains events logged by the Windows system components. For example, the failure of a device driver or other system component to load during startup is recorded in the system log. The event types logged by system components are predetermined by Windows.

This plug-in also collects custom event logs if they are available (and if specified in the configuration). If a software creates any event log, it will be displayed in the custom event log listing.

ABB Diagnostic Collection Tool Custom event log will be created for the first time when Autocollector is launched.

Handle List

Handle List is a utility that displays information about open handles for any process in the system. Use it to see the programs that have a file open, or to see the object types and names of all the handles of a program.

Installed Software

Installed Software Version Information is a small application that lists the installed products.

The information gathered by this plug-in can be analyzed with the Analyze Tool.

The installed software list may show GUID names instead of the display names. This is due to some hotfixes or software updates that may not have the display information.

Process Information List

Process List (`pslist.exe`) shows information from all the processes currently running on a system. This information includes the time of execution, execution time of the process in user and kernel modes, and the amount of physical memory the operating system has assigned to the process.

Check the box next to the name to view one or more of the following lists: Threads, Memory detail, Processes, Memory Threads, or Process ID.

Threads	Shows statistics for all active threads on the system.
Memory Detail	Shows memory-oriented information for each process, rather than the default of CPU-oriented information.
Processes, Memory, Threads	Shows CPU, memory and thread information for each of the processes specified.
Process ID	Instead of listing all of the running processes in the system, this parameter narrows the scan to those processes that begin with the name of the process or match a specific process ID. Process ID numbers can be obtained from the PID column of the Task Manager.

Registry Dump

Registry Dump plug-in dumps the registry data under either HKEY_LOCAL_MACHINE\SOFTWARE or HKEY_LOCAL_MACHINE\SOFTWARE \ABB. It can also be setup to dump any key in the registry if a full path is entered in the text box.

The information is reported as a text file (NT5 format).

SQL Diagnostics

SQL Diagnostics (sqldiag.exe) gathers diagnostics and current state information within a SQL server. This utility generates a file in the \Program Files\Microsoft\SQL Server\MSSQL\LOG directory called sqldiag.txt.

This utility can be run anytime, regardless of whether the SQL Server is started or not. If SQL Server is running, SQL Diagnostics gathers these items:

- Text of all error logs.
- Registry information.
- DLL version information.
- Output from:
- sp_configure.
- sp_who.
- sp_lock.
- sp_helpdb.
- xp_msver.
- sp_helpextendedproc.
- sysprocesses.
- Input buffer SPIDs/deadlock information.
- Microsoft Diagnostics Report for the server, including:
- Contents of <servername>.txt file.
- Operating System version Report.
- System Report.
- Processor List.
- Video Display Report.
- Hard Drive Report.
- Memory Report.
- Services Report.
- Drivers Report.
- IRQ and Port Report.
- DMA and Memory report.
- Environment Report.
- Network Report.
- The last 100 queries and exceptions.

System Information

Microsoft System Information (MsInfo32.exe) provides hardware and software information about system configuration and status gathered from the registry. Two different formats are offered. One is TXT and the other is NFO (uses standard Microsoft System Information format).

Since a full collection by msinfo32.exe is time and resource demanding, there is an option to specify exactly the type of data to collect.

Task Manager

Task Manager provides information about programs and processes running on the selected computer. It also displays the most commonly used performance measures for processes.

The information gathered by this plug-in can be analyzed with the Analyze Tool.

User Dump

User dump can capture the state of a process and can be very useful when troubleshooting servers that have stopped responding and unresponsive processes. The plug-in must be configured to collect from a specific process, either by giving it a name or by selecting a process in the supplied list. If no configuration is done, the plug-in will not collect anything. This is a security precaution.

Process dump files are very large. Depending on the process you are dumping, you can end up with dump files that are several hundreds of megabytes large.

Viewing Diagnostics Information

Once the diagnostics information is collected, it can be viewed from the Collection Explorer (Figure 141) or the *.cab* file directly. Text files can be viewed using any text editor but non-text files (.evt files for example) must be viewed from the .cab files using the appropriate editor.

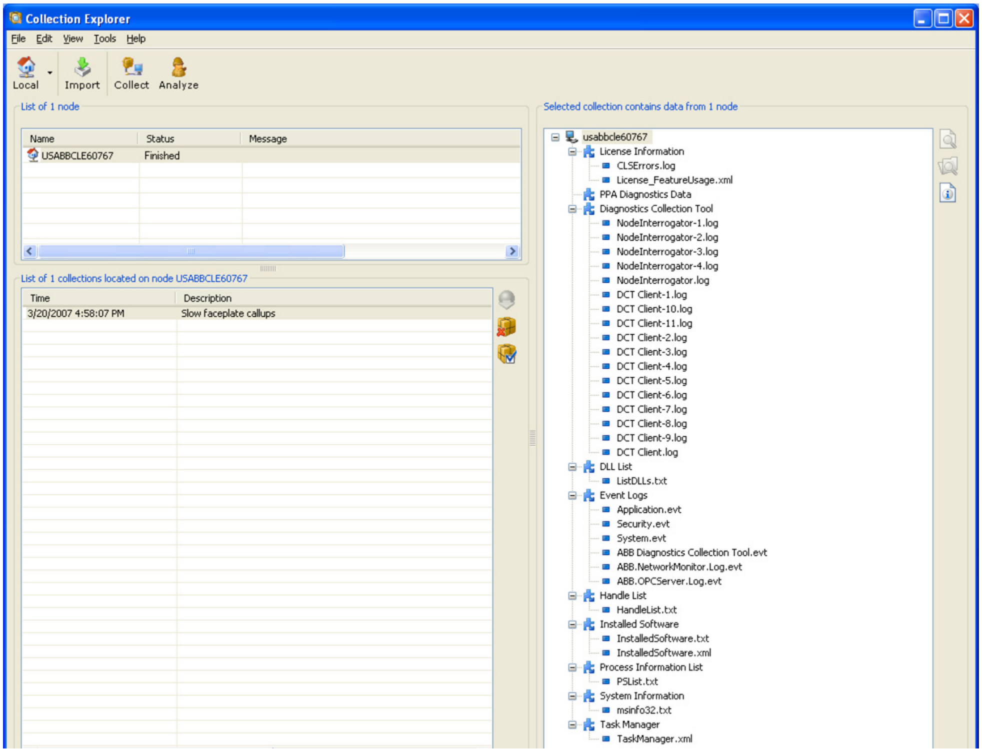


Figure 141. Collection Explorer

Analyzing Diagnostics Information

The Diagnostics Collection Tool can perform limited analysis of 800xA Systems. Figure 142 shows the opening window of the Collection Analysis tool.

The following analysis is supported:

- The software installed on nodes can be compared against the software on other nodes in the system and against previous collections on the same node.

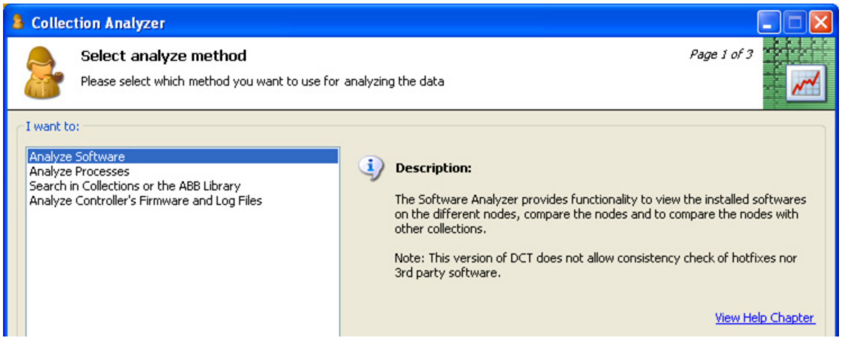


Figure 142. Collection Analyzer Tool

- Software processes running on a node can be compared to process information from other nodes and against process information from previous collections on the same node.
- Controller firmware and logs can be analyzed.

Details of the analysis are contained in the Diagnostics Collection Tool Operation instruction.

Communication Network

This topic describes the 800xA System network architecture. Different network security measures that should be considered when an 800xA System is connected to external networks of different kinds are also presented.

Overview

The 800xA System network architecture is illustrated conceptually in Figure 143.

The automation system network is used for communication between workplaces, servers and controllers. It is a LAN (Local Area Network) that is optimized for high performance and reliable real-time communication with predictable response. Servers run software that provides system functions. Workplaces run software that provides various forms of user interaction. Controllers are nodes that run control software.

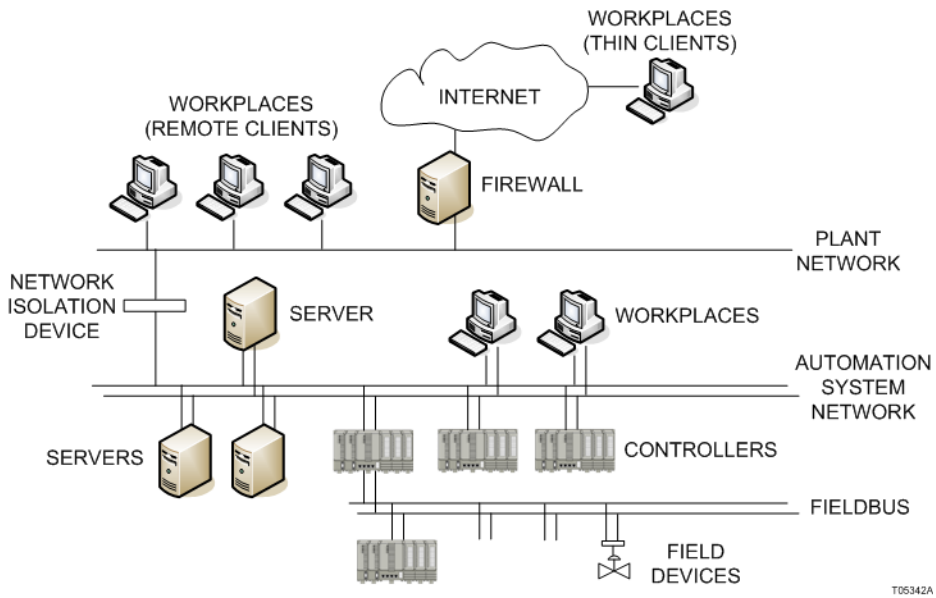


Figure 143. Communication Network Configuration

Fieldbuses are used to interconnect field devices, such as I/O modules, smart sensors and actuators, variable speed drives, PLCs, or small single loop devices, and to connect these devices to the system, either via a controller, as indicated in Figure 143, or directly to a server.

The automation system network can be connected to a plant network, such as an office or a corporate network, via some form of network isolation device. The nature of this device depends on the nature of the plant network and the level of security that is required for the automation system – it may actually be a set of interconnected computers and devices that cooperate to provide the level of security required in a particular installation.

Further connection of the plant network to the Internet or any other type of external network should be performed in accordance with adequate network security practices.

For larger systems, and for systems where network separation is desired (for system integrity reasons for example) the automation system network can be split into a client/server network and a control network as illustrated in Figure 144.

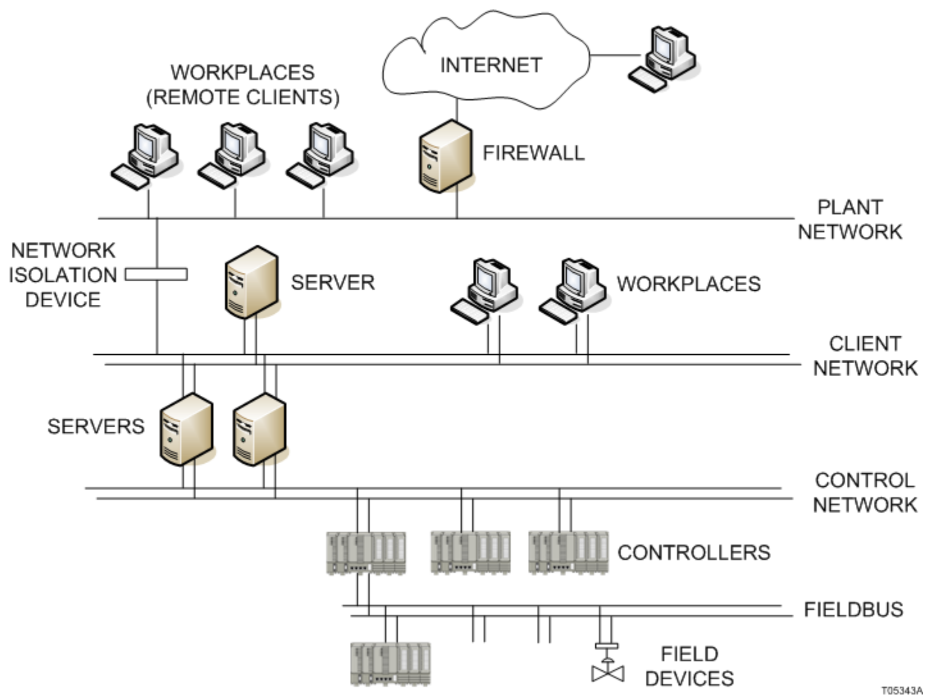


Figure 144. Separate Control and Client/Server Networks

Note that for performance and integrity reasons, direct connection of systems not based on Industrial IT to an automation system network should be avoided.

The network is continuously being monitored by the RNRP protocol. All network events, including configuration errors, are reported to the user.

Authority checking in the Industrial IT Integrated Automation System is based on Windows security. It is strongly recommended that the automation system network be defined as a separate Windows domain (that is it should not be part of a larger domain, such as a corporate network domain).

The automation system network is based on TCP/IP over Ethernet. The routing protocol that is used is RNRP (Redundant Network Routing Protocol). This protocol supports redundant network configurations based on standard network components.

Detection of a network failure and switch over to the redundant network typically takes about one second. TCP messages sent during this time are resent. A redundant network consists of two fully separate Ethernets. It works as a standard TCP/IP network, with the addition of RNRP, which works as described in Redundant Network Routing Protocol on page 343.

The two ethernet networks need to have the similar timing properties.The throughput on the primary and the secondary network must be similar, so that the network performance in case of a network error is the same as when both networks are operational. The message transport time between any two nodes must not differ more than 300ms between the primary and the secondary network.

Redundant Network Routing Protocol

Redundant Network Routing Protocol (RNRP) is an IPv4 routing protocol developed by ABB. It is specially designed for use in automation networks with limited topology but with high demands on network availability. The protocol has alternative paths between nodes to enable quick reaction on network failures. Change of active path can be triggered by interface error or network supervision time-out.

IP routes to all neighbor nodes and subnetworks are automatically updated in every node.

RNRP handles the node and network supervision. RNRP quickly detects if a node or remote network is down. This information is used to detect if a redundant server is down and whether a new server can be connected.

Each node cyclically sends a routing vector as a multicast message on both networks. The routing vector indicates which other nodes this node can see on the network. Each node uses received routing vectors to build a table, listing which nodes can be reached on which of the two networks. Routing vectors are normally distributed with a cycle time of 1 second.

One of the networks is designated as the primary network, the other as the back-up network. As long as the primary network works, all traffic is sent on that network – only routing vectors are sent on the backup network, verifying that it works.

The automation system network is a private IP network. IP addresses are static, and must be selected according to a scheme defined by RNRP. Each node has two IP addresses, one on the primary network, and one on the backup network. Refer to IP Address Use on page 350.

Advantages with the RNRP redundancy concept are that it works with standard network devices (hubs, switches or bridges), and that no special NIC (Network Interface Cards) are required.

Network Security Considerations

This topic gives a brief overview of network security considerations in relation to automation systems. More information is provided in [18] in Table 1 on page 30.

Information system security measures aim at protecting the confidentiality, integrity, and availability of a computer system from being compromised through deliberate or accidental attacks. This is accomplished by implementing and maintaining a suitable set of controls to ensure that the security objectives of the organization are met. These controls should include policies, practices, procedures, and organizational structures, as well as software and hardware implemented security functions.

The security measures that are applied to a specific installation should be proportional to the assessed risk in terms of probability of a successful attack and the potential consequences. For a small system with a few users controlling a non-critical process this risk is obviously smaller than for a large system spanning multiple sites with safety critical processes and hundreds of users.

Users of an automation system must assess the risks of their particular application and installation. The 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 automation system.

Protecting an automation system from intrusion and virus infection typically requires a range of security measures to be applied. Such measures may include (but are not necessarily limited to):

- Physically protect the automation system, including all nodes, network equipment and network cables, from access by any unauthorized personnel.
- Isolate the automation system from other networks, allowing access only through properly configured and sufficiently hardened firewalls.
- Restrict the number and types of services and information exchange that are allowed to pass through firewalls to the minimum that is needed to fulfill operational requirements.
- Harden the system by removing or disabling all unnecessary network connections, services, file shares, etc., and ensure that all remaining functions have appropriate security settings.
- Allow only authorized users to log on to the system and enforce strong passwords that are regularly updated. Limit the privileges of each user to the minimum that is required to do the job.
- Continuously maintain the definitions of authorized users, user groups, and access rights, to properly reflect the current authorities and responsibilities of all individuals at all times.
- Prevent the use of functions that are known as high risk infection routes, for example e-mail, instant messaging, and Internet browsing.
- Do not allow the installation of any unauthorized software in the system.
- Carefully scan portable computers and storage media for viruses and other malicious software before they are allowed to be connected to the system.
- Use a virus scanner on all workstations.
- Continuously monitor the system for intrusion attempts.
- Keep the system up to date with all relevant and qualified security updates, including updates to operating system, applications, and security related software.
- Define and maintain plans for incident response, including how to recover from potential disasters.

- Regularly review the organization as well as technical systems and installations with respect to compliance with security policies, procedures, and practices.

It is strongly recommended that the automation system network is defined as a separate Windows domain, that is, it should not be part of a larger domain, such as a corporate network domain.

Domains

It is strongly recommended that the process control system is configured as one (Windows) domain, which is not the same as the Windows domain used elsewhere in the company. A separate Domain management responsibility should also be assigned to a group that can act with the timeliness required for running the process. For example: assigning new authorities to operators, reconfiguring the network, changing servers and clients, etc.

The domains should be physically separated by a firewall system.

A possible configuration, (refer to Technical Data and Configuration Information instruction), specify that the domain controller run in a separate server, a domain server, which reflects the way the system is most commonly installed. This makes the system easier to install and maintain, especially with respect to backups and upgrades.

The domain server may be single or redundant.

Windows Workgroup

Small systems can run without a Domain Controller. In that case the workstations and users are not handled by a Windows Domain and instead a Windows Workgroup needs to be created.

A Windows Workgroup is not managed on a dedicated workstation. The workgroup configuration needs to be done on all workstations that belong to the workgroup. This includes handling the names and addresses of the workstations and definition of users and groups. The users and groups need to be created exactly the same way on all workstations in the workgroup and the host names are handled with a host-file that must be the same in all workstations.

There is no fixed limit for the number of nodes or number of users that can be handled within a workgroup, but systems with more than 10 workstations or five users are normally easier to manage in a domain.

System Servers

Different system functions are provided by different types of nodes in a System 800xA installation. The generic system configuration rules define basic server types. Some of these can be combined into combined server types to provide more optimal solutions for smaller systems. Clients are nodes that are used for user interaction.

The basic server types are:

- Domain Server - runs the Domain Controller and DNS (Domain Name System).
- Aspect Server - runs the central intelligence in the system, including the aspect directory and other services related to object management, object names and structures, security etc., and the Domain Controller and DNS, when separate Domain Servers are not used.
- Connectivity Server - runs connect services, providing access to controllers and other data sources.
- Application Server - runs various types of system applications.
  - Batch Server - runs Batch Management.
  - IM Server - runs Information Management.
  - Other applications - For example, Asset Optimization, Harmony and Melody Configuration Servers, large Softpoint and Calculation Server applications, integrated third party applications, etc.
- Remote Client Server - provides terminal server functionality to connect to remote workplaces.

All server node types except the Domain Server and Remote Client Server may include client functionality. These clients are referred to as server based clients.

In order to optimize the cost/performance ratio for a particular installation, certain server functions can be combined in the same node. Depending on what functions are combined there are different limitations to system sizes. Some examples are:

- AS + CS - Aspect and Connectivity.
- Batch + IM - Batch Management and Information Management.
- Single node engineering system.

Refer to [1] in Table 1 on page 30 for configuration rules.

In systems where the control network and the client server network are separated, the addresses on the networks must use different network areas. The connectivity servers that are connected to both networks will work as RNRP routers.

For best performance the network designer should try to keep the time-critical traffic within the same Network Area. The time to the change router node is always greater than the time to the change path within the Network Area.

Communication Hardware

Communication hardware and related issues are detailed in the following topics:

- Switches and Routers.
- Network Cables.
- Network Performance.
- IP Address Use.

Switches and Routers

The switch filters and forwards frames based on the destination address of each frame, it also eliminates most of the message collisions caused by several nodes transmitting at the same time. This is basically accomplished by queueing messages per port and by allowing several point-to-point messages to be transferred simultaneously, if they go between different pairs of ports. This means that a network using switches will allow a much higher throughput than a network using hubs and it does not have the same problem with non-deterministic response times.

Switches that only store and forward ethernet packets without being accessible as nodes on the network are called un-managed switches.

Switches that act as a node with an IP address on the network giving access to network management information are called managed switches. The network management information is for example configuration data for the different ports regarding port speed and status information about number of bytes transferred, check sum errors etc. The amount of management information may differ very much between different switch types.

The actual ethernet packet switching function is often the same for managed and un-managed switches. These are some advantages and disadvantages for managed and un-managed switches:

- Un-managed switches are typically cheaper.
- Managed switches give the possibility to supervise the network better.
- Managed switches may give possibilities to control the traffic better by address based traffic filtering for example.
- In a large network the additional features of a managed switch may be very useful.

You must decide what features you want to use in the switches.

It should be observed that most figures in this document show the network from a logical point of view. In the real world the network is made up of network cable segments connected to switches as shown in Figure 145.

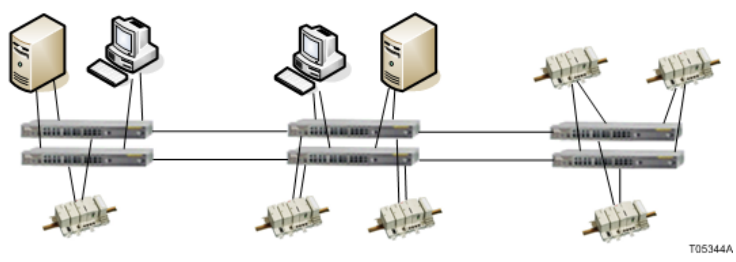


Figure 145. Physical View of Redundant Control Network

The TCP/IP networks can use most standard TCP/IP compliant equipment. For environmental reasons more capable devices specifically designed for use in industrial automation environments should be used.

Information about recommended network components is available in [15] in Table 1 on page 30.

Network Cables

In industrial environments optical Ethernet cables are preferred.

Switches having both optical and electrical interfaces can be used between the two media types.

Within a cabinet, or within a control room where there are no unsuppressed loads or other disturbances, shielded, twisted pair cables (category 5 or 6) can also be used.

Network Performance

The number of nodes in one control network segment is limited, as stated in the Technical Data and Configuration Information instruction, due to limited routing resources in the controllers, and to the load generated from RNRP in the controllers. RNRP provides a redundancy changeover time of approximately. 1 second.

For larger installations, the controllers should be placed on separate control network areas with the connectivity servers as routers.

It is recommended to use 100 megabits/second switched, fast Ethernet communication between clients and servers. Controllers use 10 megabit/second (with the exception of PM 891 which uses 100 megabit/second).

IP Address Use

The nodes (clients, servers and controllers) in the control network should preferably use the IP v4 private address range 172.16.x.x, and 172.17.x.x. Other addresses can be used but this leads to additional configuration work. The sub-net mask should be 255.255.252.0.

If connection and routing to a plant network is required using an other IP address range, a router should be used in between.

Section 14 Safety

Safety and business critical process control require qualified equipment that can offer extraordinary reliability with respect to functional safety and process control.

IEC 61508 is the worldwide recognized standard that is used for qualification of high integrity control equipment used for safety and critical control applications. This standard defines maximum reliability parameters that can be claimed for control equipment that is not explicitly qualified.

The AC 800M series of controllers offers a scalable range of control products for safety and process automation.

For HI (High Integrity) safety and process control, The TÜV certified AC 800M HI controller shall be used. AC 800M HI qualifies to the Safety SIL 3 (Safety Integrity Level 3) according to IEC 61508 for industrial safety applications.

The AC 800M HI Controller differs physically from other AC 800M controllers only by its extended Basic Unit that includes an additional Supervisory Module (SM81x).

SM810 is used in SIL 1-2 systems. SM811/SM812 is used in SIL 1-2 and SIL 3 systems.

AC 800M HI controllers offer the following control environment options:

- Safety control SIL1-3.
- Combined Safety and Process control.

For the options that combine safety and process control, the safety integrity is secured by certified protection mechanisms.

The AC 800M HI Controller can be used for a variety of safety and process automation applications when equipped with the specified control software. It acts as a controller performing local control tasks in a control network that may consist of many interconnected controllers.

This section describes functions that are specific to the AC 800M HI Controller when compared to the AC 800M Controller. Refer to Section 6, Control and I/O for more details.

Benefits

The primary benefits of the AC 800M HI Controller are:

- **Qualified and certified** - The AC 800M HI Controller is qualified and certified by the German TÜV for use in industrial safety applications. The AC 800M HI Controller is compliant with the SIL 1-3 requirements in IEC 61508.
- **Highly scalable** - The AC 800M HI Controller is created with an AC 800M Controller by upgrading the system software and adding an SM81x Supervisory Module.
- **Scalable functionality** - The AC 800M HI Controller can be optimized for a variety of safety and critical control applications by selecting appropriate software licenses.
- **High integrity critical control** - The AC 800M HI Controller offers a SIL 1-3 compliant redundant control environment for business critical process control. The whole application environment with all of the five languages of IEC 1131-3 is available (three of them for SIL-applications).
- **Combined safety and process control** - The AC 800M HI Controller offers a certified control environment for combining safety and process control in the same controller without compromising the safety integrity. The controller allows for the execution of SIL applications and non-SIL applications
- **Cost effective** - the AC 800M series of controllers offers a scalability that guarantees cost effective solutions for any combination of system size and functionality.

AC 800M HI Hardware

Controller

The AC 800M HI controller is supplied as a series of hardware building blocks that may be configured in alternative single and dual redundant architectures.

The processor unit used for the AC 800M HI controller is physically identical to other AC 800M controllers (PM865 or PM867), simplifying service and spares support and providing flexibility during the project build phase. The high integrity functionality is enabled by the addition of an SM81x and the SIL certified software. This enables non-critical control schemes to be upgraded to SIL certified schemes by the addition of a plug-in SM81x, plus selection of the appropriate software.

The basic unit for a AC 800M HI consists of PM865 or PM867 and SM81x (Figure 146).

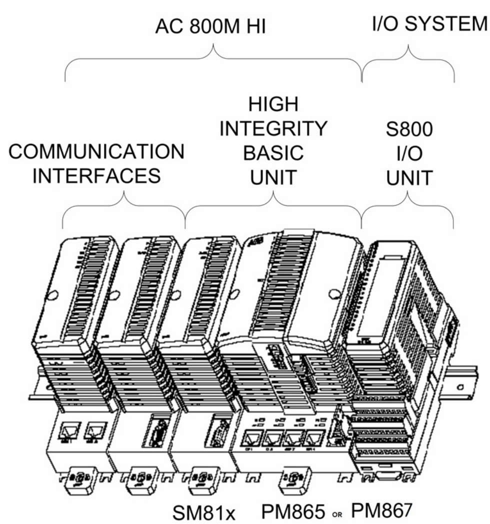


Figure 146. AC 800M HI Controller

Communication

The AC 800M HI Controller supports the following communication for non-safety critical functions (refer to Table 19). Refer to Section 6, Control and I/O for more detailed information about these protocols.

Table 19. Non-Safety Communication Supported in AC 800M HI Controller

Type	Interface Description	Comments
RS-232	CI853	MODBUS master, COMLI, Siemens 3964R
PROFBUS-DP	CI854, CI854A, CI854B	
MasterBus 300	CI855	
S100 I/O interface	CI856	
INSUM	CI857	
MODBUS TCP interface	CI867	
IEC 61850	CI868	
Communication interface for MOD5	CI872	
Advant Fieldbus 100	CI869	
PROFINET IO	CI871	
EtherNet/IP, DeviceNet through LD 800DN	CI873	

Inter Application Communication (IAC) is the variable communication between applications. In Control Builder, IAC is implemented using communication variables, which allow cyclic communication between POUs in different applications. The communication variables can be used in the IEC 61131-3 code blocks in top level single control modules and programs, and also in the code blocks in top level diagrams.

IAC is based on the client-server concept. In the server POU, the data is copied-out through the communication variable, after the execution of the code.

In the client POU, the data is copied-in through the communication variable, before the execution of the code.

SIL IAC (IAC involving SIL applications in HI controllers) conforms to the IEC 61508 standard.

SIL IAC fulfills all the requirements for transferring data over non-SIL media.

Redundancy

AC 800M HI controllers can be configured for PM/SM redundancy, to increase the availability. Two PM modules and two SM modules are running in parallel, one as primary and one as secondary. If the primary PM/SM fails, the secondary PM/SM automatically takes over. In addition to the redundant PM/SM, there are two BC810 CEXbus (Communication module EXpansion bus) Interconnection Units offering a way to section the CEXbus into two independent segments. This improves availability in systems with redundant communication interfaces. Refer to Figure 147.

S800 I/O

The S800 I/O is a distributed, highly modularized and flexible I/O-system, providing easy installation of I/O modules, process cabling and interfacing to ABB drives. The S800 I/O modules and their termination units can be mounted and combined in many different configurations to fit space requirements and suit many types of applications. A comprehensive assortment of I/O modules and accessories are available for safety critical and non-critical use.

I/O Modules

There are 3 SIL certified modules that can be used for safety critical applications in the S800 I/O family (Table 20). The SIL certified I/Os can only be used together with the PM865 or PM867.

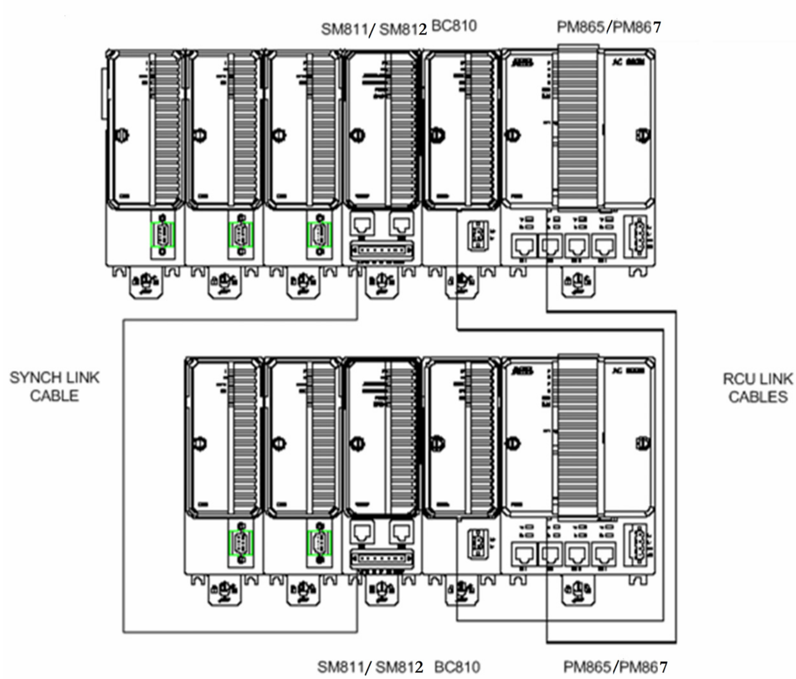


Figure 147. AC 800M HI Redundancy

Table 20. SIL Certified Safety Critical I/O

Type	Description
AI880A	High Integrity Analog Input module
DI880	High Integrity Digital Input module
DO880	High Interity Digital Output module

I/O Module Configuration

The High Integrity I/O can be configured as single or redundant on the ModuleBus. Redundancy is only available via the TB840 optical cluster modem and requires redundant MTUs. Each I/O cluster can contain 12 single I/O modules, or six redundant modules.

The number of S800 I/O channels are limited in an AC 800M HI Controller. Refer to [1] in Table 1 on page 30.

Redundant ModuleBus

A pair of TB840 optical cluster modems for ModuleBus are used to connect S800 I/O to redundant AC 800M controllers.

AC 800M HI Control Software

The AC 800M HI Control software consists of the firmware in the controller, the used library objects, and the actual applications.

Applications

The AC800M HI controller makes it possible to allow non-SIL and SIL classified functions to be programmed in the same AC 800M HI controller in different applications. The selection of the SIL level activates the relevant restrictions and limitations, such as only SIL marked elements being allowed to be used in SIL applications.

Diagrams is the ABB graphical language that graphically interconnects SIL-certified functions, function blocks and control modules on the same page.

It is also possible to choose between three IEC 61131-3 languages, Function Block Diagram, Structure Text, and Sequential Function Chart. For non-SIL, all five languages are available.

Library Objects Overview

The Control Builder Professional is supplied with predefined libraries that are certified for use in SIL marked applications. Refer to Table 21 (not all functions in the libraries are SIL-marked). Refer to [19] in Table 1 on page 30 for more detailed information.

Table 21. Certified Library Overview[1]

Library Group	Library	Description
System	System	Contains IEC 61131-3 data types and functions together with extended functionality designed by ABB.
Basic Library	BasicLib	Basic library for the Control Builder. It contains data types, Function Block types, and Control Module types, with extended functionality.
Icon Library	IconLib	Contains icons that are used in interaction windows and CMD graphics in most other libraries. The Icon library is automatically added to all control projects, through the control project template.
Signal Libraries	SignalLib	Contains function block types for analog and digital inputs and outputs.
	SignalBasicLib	Contains user function block types suitable for safety applications. All objects in this library are without alarm and event handling. These simple function block types are used for overview and forcing of boolean and real signals. The easy design makes these function block types perform fast with low memory consumption.
	SignalSupportLib	Contains sub control builder objects used in SignalBasicLib and SupervisionBasicLib. The function blocks are protected. They are used by SupervisionBasicLib objects for reuse of common code and to simplify code in these (parent) objects.

Table 21. Certified Library Overview[1] (Continued)

Library Group	Library	Description
Communication Library	MMSCommLib	Uses MMS Function Block types and control modules to communication with a system supporting the MMS protocol.
	SerialCommLib	Contains function block types for communication with external devices through serial channels with user-defined protocols; for example, printers, terminals, scanner pens, etc.
Alarm and Event Library	AlarmEventLib	Contains Function Block types and Control Module types for alarm and event handling.
Process Object Libraries	ProcessObjBasicLib	Contains basic core function block types for valve and motor control functions.
	ProcessObjExtLib	Contains types based on protected core functions available in ProcessObjBasicLib. (Unprotected code added to the core.)
Supervision Libraries	SupervisionLib	Consists of modules for detector input, system control and monitoring, overview presentation and output handling.
	SupervisionBasicLib	Contains the function blocks intended for safety (shutdown) logic, which have one normal condition and one safe condition. The boolean activation signal is set, when an input object detects an abnormal condition.

Table 21. Certified Library Overview[1] (Continued)

Library Group	Library	Description
Fire Gas Library	FireGasLib	Contains Control Module types for monitoring and control of protection systems typically used in Fire and Gas systems.

NOTE:

1. Refer [19] in Table 1 on page 30 for information on which function block or control module is SIL marked.

Access Management

Access Management is a set of functions that may be divided in two main branches:

- Access control.
- Override control.

Access Control

AC 800M HI Controllers need to be able to communicate with other safety controllers as well as with process control systems on the same network. This enables use of common HSI facilities and introduces the possibility of connecting external equipment used in the process operation and production monitoring also to the safety system. Undesired access is therefore necessary to avoid, by implementing an access control function.

Override Control

The use of override functions in safety related equipment introduces a potential hazard to the installation and to the people it is designed to secure. Any force of a safety critical input or output represents a degradation of the safety level and a possibility for failure on demand.

Nevertheless, such functions are necessary to gain a reasonable availability of the process. All field equipment needs maintenance or replacement at regular intervals and this is included, for example, in the design of the safety system regarding number, wiring, and location of field instruments. In these cases the safety level may be maintained by other measures, while necessary maintenance operations are carried out.

Access management enables project/application specific configuration of the appropriate level of restrictions regarding operation of the AC 800M HI controllers and have the following functionality:

- Setting forced I/O points in an application will be restricted by the access control mechanisms. The override control restricts the number of concurrent forced I/O points.
- User configurable maximum number of forced I/O points in the application when programming a SIL application in the Control Builder.
- The Access Management system software will keep track of the number of forced I/O points for each application as well as make the figures visible.
- If the maximum number of forced I/O points is reached, the user will be notified by a system event and the force will not be set.
- System event or alarm upon force (operator write actions).
- Audit trail.

AC 800M HI Control Software Integration

The AC 800M HI Control Software is available on the 800xA System distribution media.

There is one license option:

- Combined Control and Safety license scaled per AC800M HI controller (one license per AC 800M HI controller).

Appendix A 800xA for AC 100

800xA for AC 100 provides integration of Advant Fieldbus 100 based controller node types in Advant Controller 100 Series into System 800xA.

800xA for AC 100 provides predefined graphic elements, object displays, and faceplates for all the AC 100 Series controllers' standard process objects.

800xA for AC 100 has the following main functions:

- Faceplates, Object displays, Graphic elements, Alarm and Event, Trend presentation, and System status.
- Upload function for automatic upload of configuration from Control Builder A.
- Standard OPC Server for connection to Advant Fieldbus 100.
- Support of redundant OPC Server connection (hot stand-by) to Advant Fieldbus 100. After startup the backup OPC server will resynchronize with the currently active one during a warm-up time.
- 800xA for AC 100 consists of two software parts:
  - 800xA for AC 100
  - AC 100 OPC Server

  and requires CI527A for physical connection to Advant Fieldbus 100.

Benefits

800xA for AC 100 allows easy integration of existing and new Advant Controller 100 Series controller solutions into System 800xA by predefined Aspect Object Types with standard faceplates. The corresponding Aspect Objects are created and maintained during automatic upload started from Plant Explorer of System 800xA and based on the elements created in the controller configuration tool.

In case of using Advant Controller 100 Series with third party OPC clients, AC 100 OPC Server for third party clients can be used. It supports standard OPC interfaces including the OPC Browse Interface.

The AC 100 OPC Server, as part of 800xA fro AC 100, allow Function Chart Builder to communicate with Advant Controller 100 Series via Advant Fieldbus 100. Function Chart Builder is part of Control Builder A and is the main application configuration tool for Advant Controller 100 Series.

Operator Workplace Functionality

AC 100 Operator Workplace

The 800xA Standard Operator Workplace and the 800xA Plant Explorer Workplace enable access to 800xA for AC 100 specific functions, alarms and event lists, layout and color settings.

ABB Process Objects

The well-proven ABB process object model, used in the Advant system, contains all the needed process objects for efficient controlling of a process.

Predefined graphic elements, object displays and faceplates, for the following standard objects, are included in 800xA for AC 100 product.

Supported standards process object types are:

AIS, AOS, DAT_AI, DAT_AO, DAT_DI, DAT_DO, DAT_DAT, DIS, DOS, MB, MBS, MI, MIL, MR.

Faceplates

Predefined faceplates are used for manipulation of the process objects. There are three levels of faceplate views: reduced, normal and extended. See examples in Figure 148, Figure 149 and Figure 150.

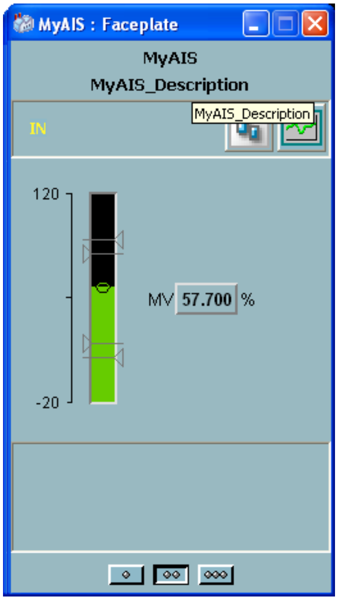


Figure 148. Example of normal faceplates for AIS

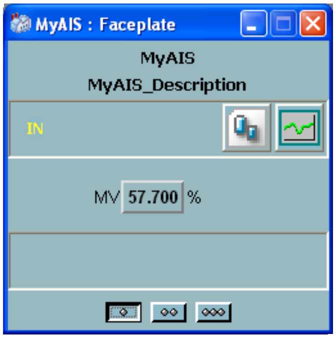


Figure 149. Example of reduced faceplates for AIS

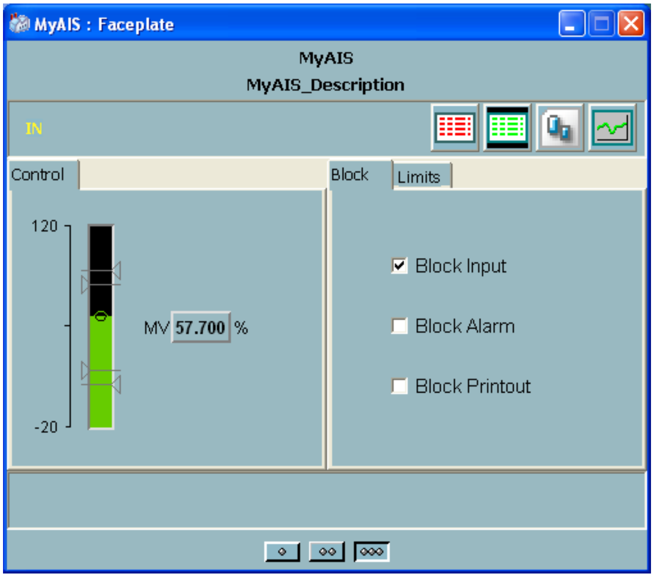


Figure 150. Example of extended faceplate for AIS

Object displays

Predefined object displays present all the information available about an object. See Figure 151

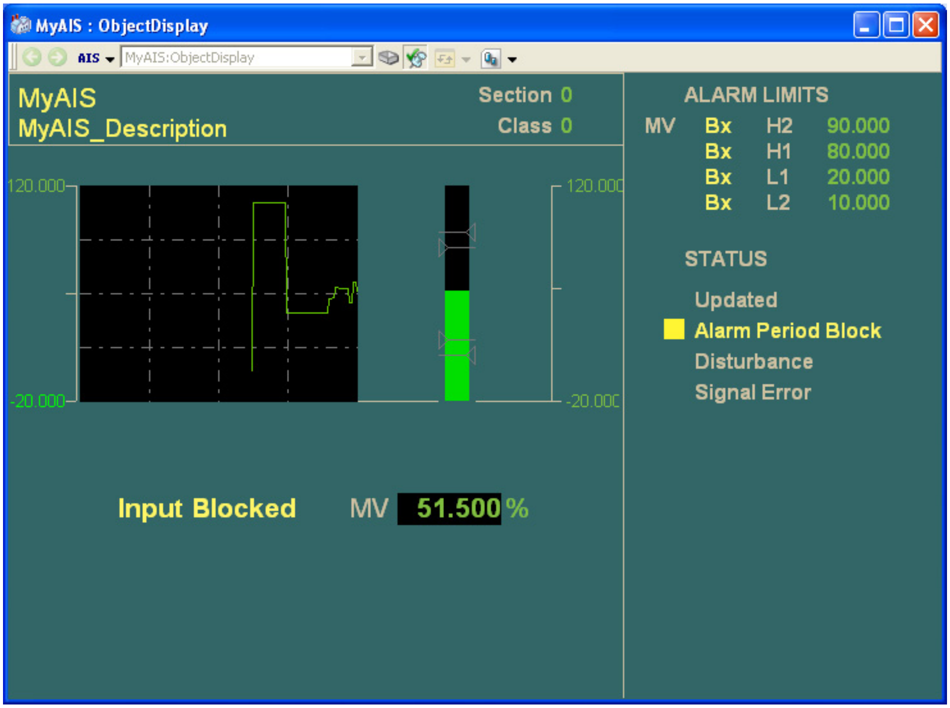


Figure 151. Example of Object display for AIS

Graphic Elements

The following graphic elements are included:

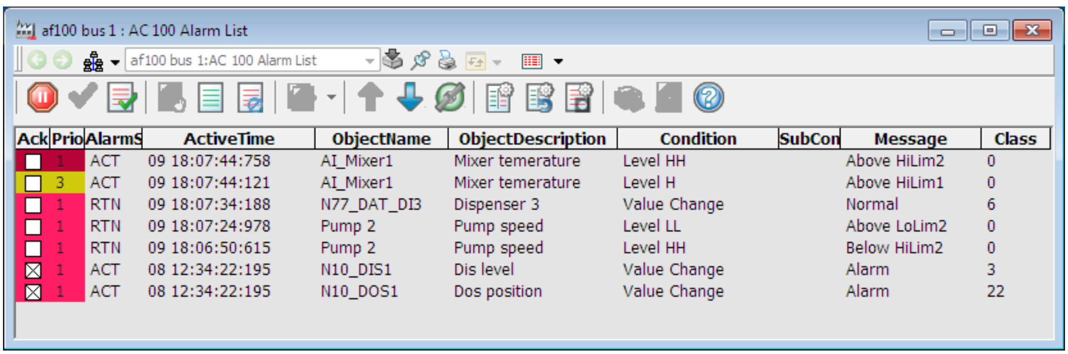
- Standard Graphic elements of all the AC 100 Series objects.
- Predefined graphic elements, showing different levels of information. These are ready for use in the Graphic Builder.

Alarm and Event

Process Alarms and Events are time-tagged in the controller as closely as possible to the source for best possible timing accuracy. Alarms and Events can be presented in many ways, so that only relevant events are brought to the operator's attention, such as:

- Alarm and Event lists stored in chronological lists.
- Process sectioning is done with the Security function.
- Default 800xA for AC 100 alarm presentation.

See an example in Figure 152.



Ack	Prio	AlarmS	ActiveTime	ObjectName	ObjectDescription	Condition	SubCon	Message	Class
☐	1	ACT	09 18:07:44:758	AI_Mixer1	Mixer temerature	Level HH		Above HiLim2	0
☐	3	ACT	09 18:07:44:121	AI_Mixer1	Mixer temerature	Level H		Above HiLim1	0
☐	1	RTN	09 18:07:34:188	N77_DAT_DI3	Dispenser 3	Value Change		Normal	6
☐	1	RTN	09 18:07:24:978	Pump 2	Pump speed	Level LL		Above LoLim2	0
☐	1	RTN	09 18:06:50:615	Pump 2	Pump speed	Level HH		Below HiLim2	0
☒	1	ACT	08 12:34:22:195	N10_DIS1	Dis level	Value Change		Alarm	3
☒	1	ACT	08 12:34:22:195	N10_DOS1	Dos position	Value Change		Alarm	22

Figure 152. Example of Alarm List

Redundant alarm servers are synchronized.

Trend Presentation

Each process object has its own pre-configured trend display, which can be reached from the faceplate and context menu. Trend curves show Time Tagged Data. See an example in Figure 153.

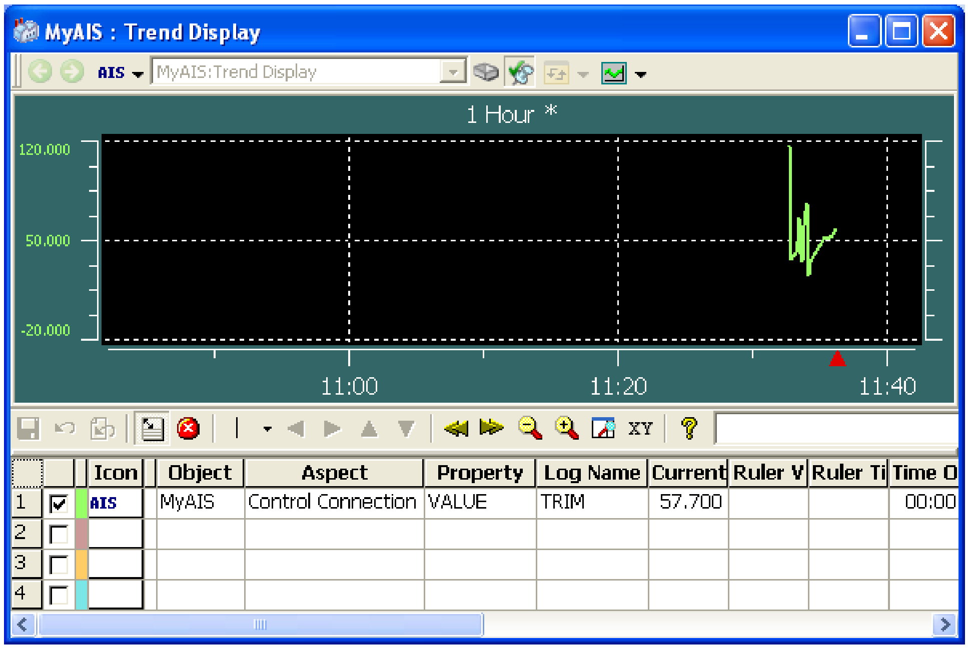


Figure 153. Example of a Trend Display for AIS (fragment)

System Status Presentation

The status of the control system can be presented in overviews and in detailed views. Figure 154 shows an example of the status presentation for an Advant Fieldbus 100 network.

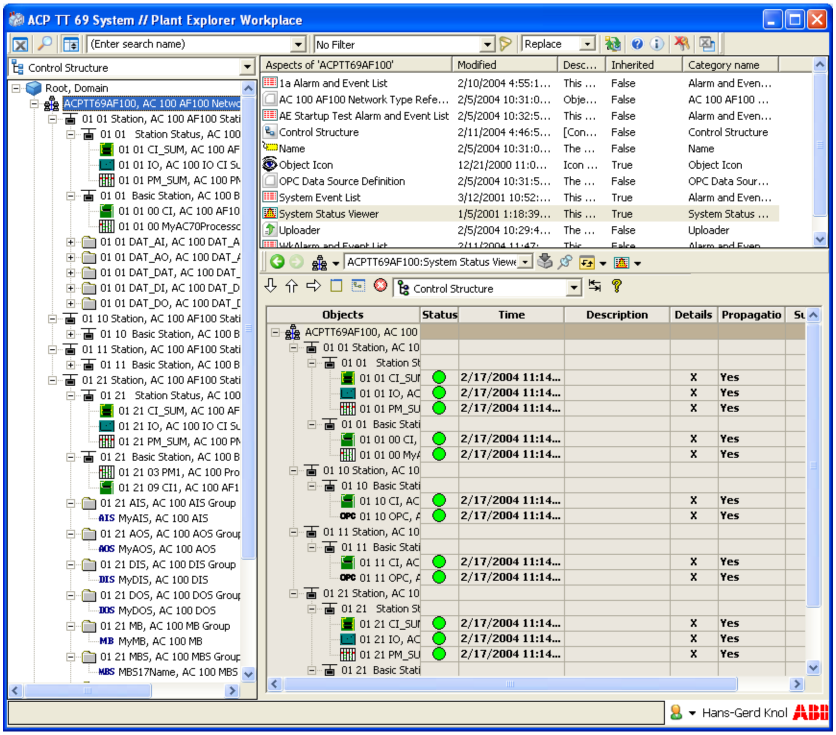


Figure 154. Example of a System Status for an Advant Fieldbus 100 network.

Security

Security is used to protect sections or objects within a plant from unauthorized access. It allows the following:

- Process sectioning for security and the ability to set permission for different users is done in the System 800xA Operator Workplace. The users are based on Windows User settings. This substitutes process sectioning of process objects in AdvaSoft 1.x / 2.x.

National Language Support

Faceplates and Graphic elements have NLS support for translation into several languages. Alarm and operator texts have default NLS support for English, Swedish and German characters, see the *800xA for AC 100, 5.1, Configuration and Operation* manual for more information.

AC 100 OPC Server

AC 100 OPC Server is a software component which enables data exchange between Windows OPC clients and stations on the Advant Fieldbus 100 network. Control Builder A uses the Advant Fieldbus Interface for communication with nodes on the Advant Fieldbus 100.

Introduction OLE for Process Control (OPC)

OLE for Process Control (OPC) is an established software technology standard that connects Windows based process control systems to hardware devices on the plant floor.

OPC is based on Microsoft’s COM/OLE technologies, a specification that defines how individual software components can interact and share data under Windows. There are two sets of interfaces, OPC Custom interfaces for high performance applications written in a compiled language such as C++, and the OPC Automation Interface for higher level applications developed in for example Visual Basic for Applications.

Introduction Advant Fieldbus 100

The Advant Fieldbus 100 is a high performance bus specially designed for real time applications. It features reliable, cyclic data transfer using DataSet Peripherals (DSP) as well as event driven background transfer of service data.

The AC 100 OPC Server Software and Hardware enables communication with the Advant Fieldbus 100 network. (The communication is invisible for the OPC clients).

There are two mechanisms for communication on the Advant Fieldbus 100:

- DataSet Peripheral (DSP)

DSPs are broadcasted cyclically to all stations on the Advant Fieldbus 100 network. The DSP communication is configured and handled by the CI527A board. The AC 100 OPC Server has functions to read and write data to these DSPs. The DSPs are used to transfer values for process objects on the Advant Fieldbus 100 network.

- Service Data Protocol (SDP)

  The SDP is used to transfer messages between applications in different stations on the Advant Fieldbus 100 network. SDP is used for service requests (command) to process objects and for receiving time tagged events (Event Sets). SDP is also used by Control Builder A when connecting to the Advant Controller 70/110/160 using the Advant Fieldbus 100 Interface.

OPC Interface

The AC 100 OPC Server software enables data exchange between Windows applications and stations on the Advant Fieldbus 100 network.

The AC 100 OPC Server can be used by any client application with support for the mandatory OPC Custom Interface, the OPC Automation Interface as well as the OPC Alarms and Events Interface according to the OPC Foundation standard.[1]

OPC Compatibility

- ☑ The OPC Data Access Custom Interface Specification 1.0a
- ☑ The OPC Data Access Custom Interface Specification 2.0
- ☑ The OPC Data Access Automation Interface Specification 2.0
- ☑ The OPC Alarms and Events Custom Interface Specification 1.01
- ☑ The OPC Alarms and Events Custom Interface Specification 1.02
- ☑ The OPC Alarms and Events Automation Interface Specification 1.01

Figure 155. OPC Compliance

OPC Data Access Custom Interface

1. OPC Compliance was implemented according to the specification but not tested.

The OPC Custom Interface is used for high-performance applications written in a compiled language such as C++.

OPC Data Access Automation Interface

The OPC Automation Interface for higher level applications developed in for example Visual Basic for Applications.

Alarms and Events Custom Interface

The Alarms and Events Interface is used for broadcasting alarm and event information from servers to clients.

Alarms and Events Automation Interface

The OPC Alarms and Events Automation Interface for higher level applications developed in for example Visual Basic for Applications is supported. Sample code for building such applications can be fetched from the OPC Foundation web site *www.opcfoundation.org*

The AC 100 OPC Server supports all the mandatory data access and alarms and events interfaces defined in the specifications above plus the optional interface IOPCBrowseServerAddressSpace.

You can find information about the specifications and the work of the OPC Foundation at the OPC Foundation home page: *www.opcfoundation.org*.

Functions

The AC 100 OPC Server provides the following functionality:

- Object Handling

  The AC 100 OPC Server supports two groups of objects, Extended DB Elements (AIS, DIS, ...) and DAT based objects (DAT_AI, DAT_DI, ...). The DAT based objects have limited functionality compared with Extended DB Elements. For these two groups of objects the AC 100 OPC Server provides the following object handling functions:

  – Data Subscription

Values for process objects are received from the Advant Fieldbus 100 network using cyclic DataSet Peripherals (DSP). Alarm Limits, for the Extended DB Elements only, are received from the Advant Fieldbus 100 network using Service Data Protocol.

Subscription of other object attributes such as object description, engineering unit, etc., is also provided. These attributes are not transferred via the Advant Fieldbus 100 network, but retrieved from the Bus Configuration Database in Control Builder A.

- Service requests

  Service requests (commands) can be sent from the application to change object attributes on the Advant Fieldbus 100 network. For DAT based objects the attribute Value can be changed in the controller and Acknowledge is processed by the OPC Server itself. For Extended DB Elements, the Value, Block, Deblock and Acknowledge are examples of attributes that are changeable in the controller.

- Event Handling

  The AC 100 OPC Server can be configured to receive time tagged events, via Event Set (EVS), from the Advant Fieldbus 100 network.

  The time tagged events contain object information such as the reason for the event and a time stamp. This information, together with user-defined object information such as object description, engineering unit, etc., can be used by the client application to generate events and alarms.

  For DAT based objects, alarm acknowledgment by the client application can be distributed on the Advant Fieldbus 100 network to other PCs equipped with the AC 100 OPC Server or AdvaSoft for Windows. This is done automatically for Extended DB Elements.

• Data Access Interface

  Object attributes can be read and written, if applicable, according to the OPC Access Specification from the OPC Foundation, see OPC Interface on page 372 for details.

• Alarms and Events Interface

Alarms and events are distributed on the AF100 bus and are accessible according to the OPC Alarm and Event Specification from the OPC Foundation, see OPC Interface on page 372 for details.

- Time Synchronization

  The AC 100 OPC Server can act as clock master, slave or master backup node on the Advant Fieldbus 100 bus.

- Support for Control Builder A

  All object configuration is done in the Control Builder A by means of DB Elements. The configuration data is stored in the Bus Configuration Database, where it is accessible by the AC 100 OPC Server via the Bus Configuration Interface. You only need to enter object configuration data once to configure both the controller and the AC 100 OPC Server.

  In addition AC 100 OPC Server, used together with the Function Chart Builder (FCB), provides remote engineering of nodes on the Advant Fieldbus 100 bus.

- Hardware Configuration and Diagnostics

  It is possible to view and change the configuration parameters for the CI527A communication board.

  The Mutual Lifesign Supervision function in the AC 100 OPC Server supervises the CI527A board and automatically tries to restart it in case of board failure. If the AC 100 OPC Server has an uncontrolled stop, the CI527A board goes to passive state and the DSP transmission stops.

- System Status

  The System Status function shows status information for controller and OPC nodes present on the AF100 bus. The status information is made available as status objects with attributes that may be subscribed for, and which generate events/alarms upon change of state.

  Station status reported from old controllers are not supported. This affects controller versions lower than AC 160 2.1, AC 110 2.3 and AC 70 1.2.

- System Messages

  System messages are presented in the Windows Event Viewer application log.

Available services for applications

Table 22. Supported AC 100 OPC Server Services

Object type	Demand(4)	Cyclic	Event	Command(5)
DAT_AI(1)/AIS(2)	yes	yes	yes	yes
DAT_AO(1)/AOS(2)	yes	yes	no / yes	yes
DAT_DI(1)/DIS(2)	yes	yes	yes	yes
DAT_DO(1)/DOS(2)	yes	yes	no / yes	yes
DAT_DAT(1)	yes	yes	no	yes
MB(3)	yes	yes	yes	yes
MBS(3)	yes	yes	yes	yes
MR, MI and MIL(3)	yes	yes	no	yes

(1) These are DAT Based Elements object types. They are mapped on DAT's and transferred with DataSet Peripherals (DSP) for subscription and Service Data Protocol (SDP) for commands and events.
(2) These objects are the Extended DB version of the AI, AO, DI and DO objects.
(3) These objects belong to the Extended DB Elements object group but function similar to DAT objects
(4) SDP read
(5) SDP write

The table below shows supported service requests (commands) via the AC 100 OPC Server for DAT based objects (DAT_AI, DAT_AO, DAT_ DI, DAT_ DO and DAT_DAT), for Extended DB Elements (AIS, AOS, DIS, DOS, DAT, MR, MB, MI and ML) and for System Status objects (PM, CI, IO and OPC).

Operation	AIS	AOS	DIS	DOS	DAT_ AI	DAT_ AO	DAT_ DI	DAT_ DO	DAT DAT(1)	Sys Status
Select/Deselect	no	no	no	no	no	no	no	no	no	no
Block/Deblock Alarm	**yes**	no	**yes**	no	no	no	no	no	no	**yes**
Block/Deblock Input	**yes**	no	**yes**	no	no	no	no	no	no	no

Operation	AIS	AOS	DIS	DOS	DAT_ AI	DAT_ AO	DAT_ DI	DAT_ DO	DAT_ DAT(1)	Sys Statu s
Block/Deblock Output	no	**yes**	no	**yes**	no	no	no	no	no	**yes**(2)
Man/Auto	no	**yes**	no	**yes**	no	no	no	no	no	no
Change Value	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	no

(1) The object types MR, MB, MI and ML supports the same commands as the DAT_DAT object.
(2) The System Status object attributes S_STATUS and S_TIME which show the overall status, and when this status was set, may be blocked.

Multiple OPC Server and Redundancy

Up to ten AC 100 OPC Server can be connected to one Advant Fieldbus 100. The limitation origins from the ability of the Advant Controller 100 Series to support maximal ten receivers of Event Sets.

Bus Cable Redundancy

AC 100 OPC Server supports bus cable redundancy. Please refer to AF 100 Interface Hardware for more information.

OPC Server Redundancy

Two OPC Servers can be selected to be redundant to each other. In this case the OPC client can attach to those OPC Servers and select one of them to deliver the information. In each case they will deliver the same information. If the selected OPC Server fails, the OPC client can switch to the other and continue the operation.

AF 100 Interface Hardware

Overview

The AC 100 OPC Server uses the CI527A communication board for connection to Advant Fieldbus 100. This item is also designated as AF100 Interface Hardware.

One PC can host one communication board and one AC 100 OPC Server. Connection can be a to a single bus or to two redundant busses. Two OPC Servers in redundant mode require 2 different PCs, everyone of them equipped with one communication board. If the PC is not equipped with a PCI slot, an external PCI to PCI Express conversion unit must be used.

CI527A Communication Interface

CI527A is a half length PCI module (see Figure 156). CI527A has a built-in modem for twisted pair connection to Advant Fieldbus 100 and supports single or redundant bus cabling.

In addition converter modems for switching between the different connection types are available.

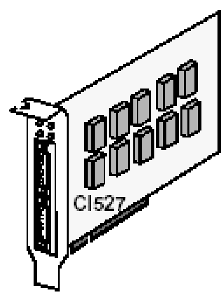


Figure 156. CI527A Communication Interface - PCI

Functional Description

The **AF100 Interface Hardware** CI527A serves as interface between Advant Fieldbus 100 and the software product

- AC 100 OPC Server 5.1

The **AF100 Interface Hardware** supports

- Configuration and handling of DSP (DataSet Peripheral) communication,
- Handling of SDP (Service Data Protocol) communication,
- Full redundant media support (bus cabling),
- Full time synchronization capability.

Please refer to Introduction Advant Fieldbus 100 on page 371 for more information about Advant Fieldbus 100 functionality.

CI527A has two integrated Twisted Pair modems. When CI527A is to be connected to coaxial media a TC513 repeater modem for each bus line is to be used for media conversion.

Hardware Components

CI527A - AF100 Communication Interface for PCI

In a twisted pair connection TC506K01 can be ordered optionally if a more structured connection or a capacitive decoupling is required:

- TC506K01 Connection kit 150 ohm consisting of a TC506 AF100 Trunk Tap, terminator TC501V150 and cable

Since the CI527A has a built-in twisted pair connection you need additional items for connection to a AF100 network with coaxial cables:

- TC513V1 AF100 Conv Modem with twisted pair/coax or coax/twisted pair cable.
- AF100K03 Connection Kit, single

The CI527A board uses a half length PCI slot in the personal computer (PC). If the PC is not equipped with a PCI slot, an external PCI to PCI Express conversion unit must be used.

Appendix B 800xA for Advant Master

800xA for Advant Master provides integration of MasterBus 300 based controller node types MasterPiece 200/1 and Advant Controller 400 Series with Master software into System 800xA.

800xA for Advant Master is used for upgrades and extensions in existing Advant Master installations as well as in new installations.

In upgrades from MasterView 800/1 and Advant Station with AdvaCommand for UNIX (AdvaCommand) the 800xA for Advant Master is the best choice in the market.

The 800xA for Advant Master appendix is divided into two sections:

- Advant Master functions in 800xA
  - Describes System 800xA functionality and system capabilities based on familiar terms and functionality in Advant Master products.
- 800xA for Advant Master - Extended Automation
  - Describes the extended functionality and system capabilities available in System 800xA.

Benefits

The key benefits of utilizing 800xA for Advant Master are:

- Upgrading the Advant Master OCS system to System 800xA while retaining the infrastructure controllers, I/O, engineering tools, control applications, information management data, desktop clients. The upgrade can be on a step-by-step basis and the appropriate steps are decided by the Advant user. Existing operator workplaces, AdvaCommand and MasterView can be kept in parallel to 800xA Workplaces, thus enabling maximum security and minimum downtime.

- Possible to mix System 800xA with the AC 800M controller with the 800xA for Advant Master, enabling the same operator interface to both controller families.
- The faceplates, object displays, graphic elements, and system status will make Advant users feel comfortable in the System 800xA environment thanks to an Advant look and feel.
- 800xA for Advant Master enables existing and new Advant Master installations to benefit from the extended automation functionality delivered by System 800xA. Integrated fieldbus technology through AC 800M, integration of maintenance system for asset optimization, and retrieving PLC information through PLC Connect are examples of this.

Operations

Advant Master Functions

800xA for Advant Master integrates MasterBus 300 control network, Advant Controller 400 Series with Master software and MasterPiece 200/1 controllers, with System 800xA.

800xA for Advant Master provides predefined graphic elements, object displays and faceplates for all the MP 200/1 and AC 400 Series controllers' standard process objects.

800xA for Advant Master has the following main functions:

- Faceplates, Object displays, Graphic elements, Alarm and Event, Trend presentation, TTD log and configuration support, Status list, System status, Drives Integration, and Switchgear Integration.

Figure 157 is an example of an AC 400 Control System connected to System 800xA.

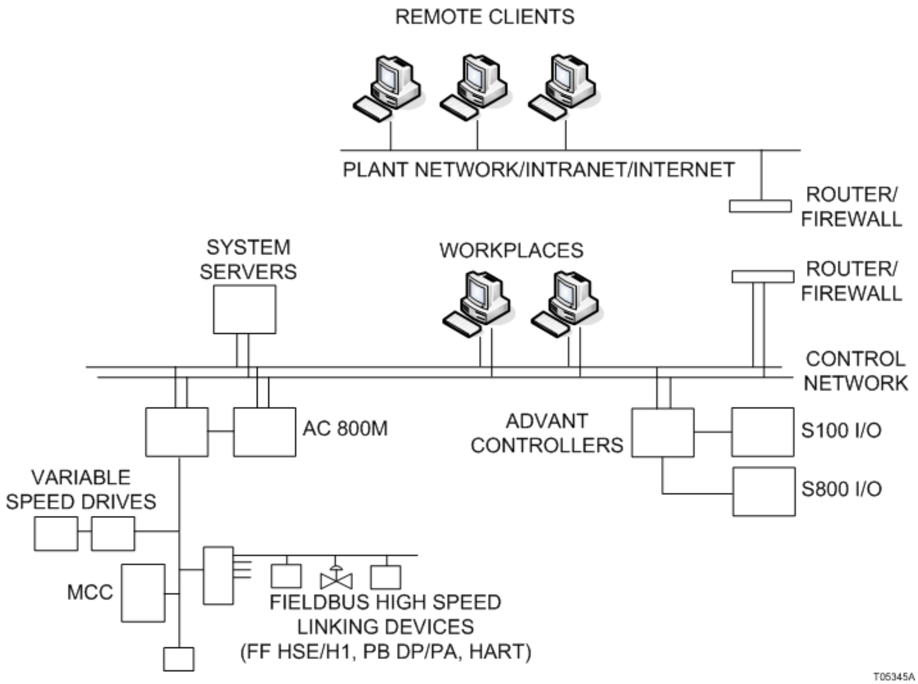


Figure 157. AC 800M, Advant Master, and MB 300 Control Network

800xA for Advant Master is the preferred product for:

- Upgrading and expanding current AdvaCommand and MasterView installations to System 800xA.
- Minimizing production risk by running the AdvaCommand or MasterView stations in parallel with 800xA Process Portal during evolution to 800xA.

Object Displays

Predefined object displays present all the information available about an object. Refer to Figure 158.

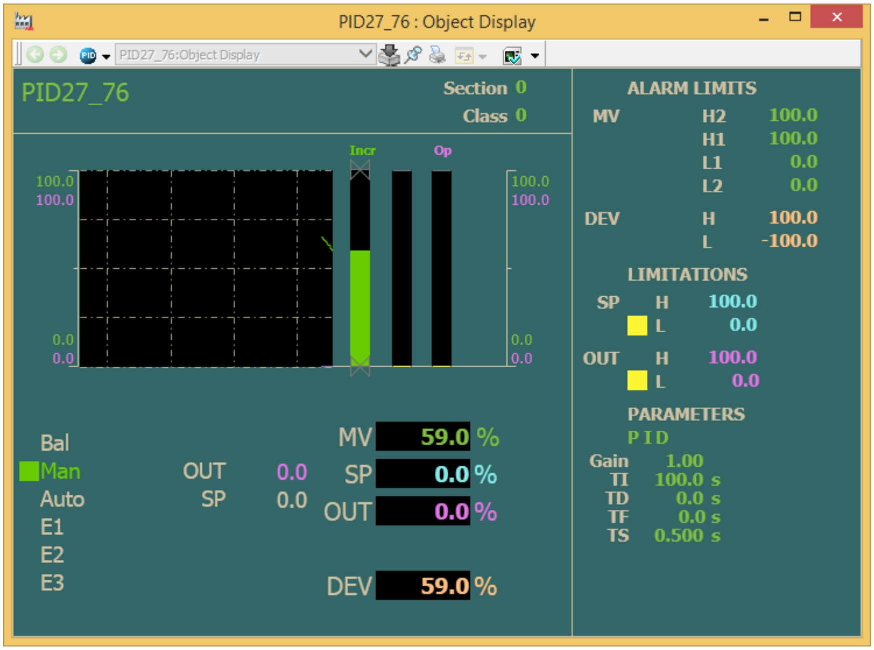


Figure 158. PIDCON Object Display

Graphic Elements

The following graphic elements are included:

- Standard graphic elements of all the AC 400 Series and MP 200/1 controller objects.
- Extended graphic library with graphic elements in addition to the standard graphic elements.
- Predefined graphic elements, showing different levels of information. These are ready for use in the Graphics Builder.

Process Dialog

Predefined faceplates are used for operation of the process objects. There are three levels of faceplate views: reduced, normal and extended. Refer to Figure 159 and Figure 160 for examples.

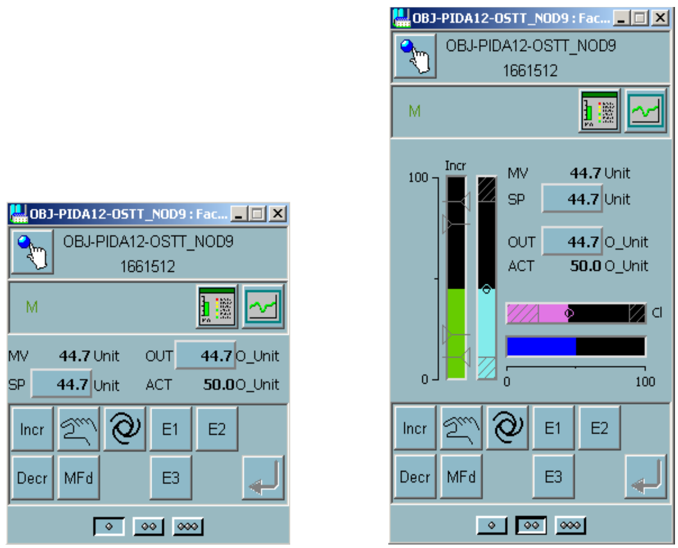


Figure 159. Reduced and Normal PIDCONA Faceplates

Group Display

Group displays can be composed in 800xA for Advant Master by inserting faceplates in a Group Display aspect. Apart from an object overview, the group display also allows operation of the included objects.

Display Menu

There exists no preconfigured display menu in the same sense as in AdvaCommand but the following functions can be configured to comply with the previous display menu and some functions also have additional functionality:

- The Aspect Menu (Favorites function) can be preconfigured or configured by the operator in runtime to include shortcuts to graphic displays, trend displays,

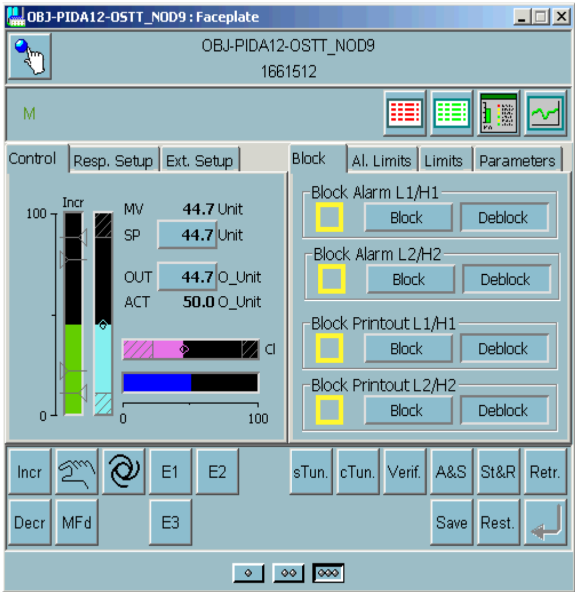


Figure 160. Extended PIDCONA Faceplate

group displays, or any other type of aspect. These shortcuts can be placed in different folders, or all on one level, similar to the Internet Explorer Favorites function.

- It is possible to build your own display menu by inserting aspect links in a graphic display.
- Display shortcuts in the display bar/application bar can be used for the most common displays.

Refer to Navigation on page 101 for more information.

Alarm and Event

Process alarms and events are time-tagged in the controller as closely as possible to the source for best possible timing accuracy.

The Alarm and Event list used by MB 300 Object Types are configured to use the Common Alarm & Event List Configurations located in the Library Structure.

Some Advant Master specific attributes, such as ProcessSection and UncertainTagTime, can be added to the Alarm or Event list. Refer to Figure 161.

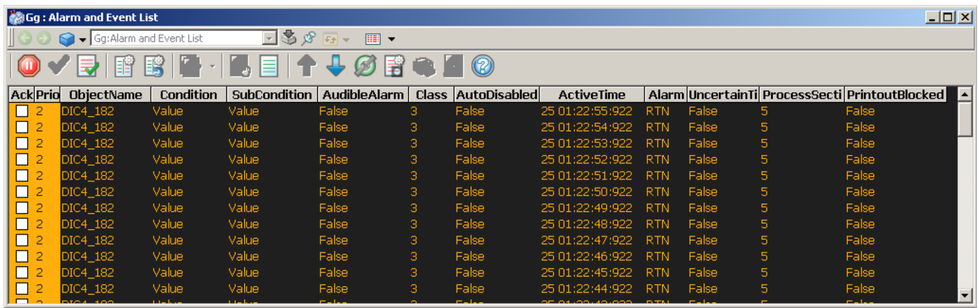


Figure 161. Process Alarm List

The Alarm Control in faceplates (Figure 162) indicates the alarm state and allows acknowledge of the object alarms from the faceplate.

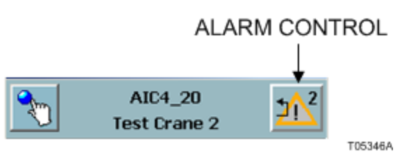


Figure 162. Alarm Control Example

The alarm list text colors and corresponding priority levels in 800xA for Advant Master are following the System 800xA standard. The seven alarm priority levels are mapped to the 800xA priority levels according to Table 23.

Table 23. Alarm Priority Levels

Advant Master Alarm Priority	800xA Priority Level
1	1
2	2

Table 23. Alarm Priority Levels (Continued)

Advant Master Alarm Priority	800xA Priority Level
3	3
4	4
5	4
6	4
7	4

It is possible to change this default configuration but then the priority levels may not be well coordinated in a combined 800xA System with both 800xA for Advant Master and another connectivity.

Event Filter on Node Level

It is possible to filter alarm and events to be sent from selected controllers on a MB 300 network to certain connectivity servers. This can be useful when;

- Multiple connectivity servers are connected to the same MB 300 network.
- Only a selection of controllers connected to a MB 300 network are included into an 800xA System.

Trend and History

Trend displays are preconfigured for the Advant Master process object types. The trend displays show seamlessly real-time data and trend/history data (if available) for the process objects. Refer to Table 24.

The recommended solution for Advant Master trend data storage, is to store TTD logs in the controllers. Direct logging of process values in the Process Portal is not recommended, but can be used for a limited amount of signals. Refer to [1] in Table 1 on page 30.

The trend log functionality in System 800xA enables creation of log hierarchies and extension of TTD logs. The Information Management History Server can be used

Table 24. Available Trend Displays

Process Objects with Preconfigured Trend Displays	Trend Curve Parameters
Analog Inputs (AI), Analog Outputs (AO), Digital Inputs (DI), Digital Outputs (DO), Digital Input Calculated (DIC), Digital Output Calculated (DOC), Analog Input Calculated (AIC), Analog Output Calculated (AOC)	VALUE
PID Regulator (PIDCON)	MV, WSP, POUT, PRES1, DEVIATION
General Binary Controller (GENBIN)	MV
PI Regulator, General Controller (GENCON), General User Defined Object (GENUSD)	MV, SP, OP
Data Set (DAT), Group (GROUP), Sequence Control (SEQUENCE), Text Data (TEXT)	-
Engineered Drives (DRICONE), Standard Drive (DRICONS),	REAL_C, REAL_RES, REAL_A, REAL_B
Manual Station (MANSTN)	MV, POUT, PRES1
Motor Control (MOTCON), INSUM MCC Control (MOTCONI)	REAL_RES
Adaptive Controller (PIDCONA)	WSP, OUT, DEVIATION
Ratio Station (RATIOSTN)	MV, WRATIO, POUT
Valve Control (VALVECON)	IND1_07

when extended historical storage, offline storage or archiving is requested. Refer to Information Management on page 408 for more information.

X-Terminal

System 800xA is a client-server based system. This means that all clients in the system have access to the information they are authorized to view. Multiple clients are connected to and use the same RTA Board/Unit in the Connectivity Server(s).

In addition, there are possibilities to add remote clients and desktop clients. Refer to Operator Workplace - Remote Client on page 111, Large Operator Workplace - Client on page 110, and Operator Workplace - Client on page 96.

In System 800xA it is possible to have a multi-monitor set up for each workplace. A workplace is an operator seat which is using one keyboard.

As many as four monitors can be used and set up according to the Windows large desktop concept (one common screen area) or as separate screens with dedicated operator usage. Refer to Large Operator Workplace - Client on page 110.

System Status

System Status provides status information about the automation system, with regard to all MB 300 control networks, controllers, stations, peripheral equipment, and process I/O boards. An overview of the communication status with other nodes on the MB 300 network is available via the Connectivity Server communication display.

Status List (Quick List)

It is possible to use Quick Lists for both temporary use (with new search keys every time) and for recurring use with permanent search keys. The search criteria is configured in aspects that can be saved and reused. Refer to Figure 163.

If scheduled or event driven status lists are requested, the System 800xA reporting capabilities can be used.

The operator can configure matching search parameters for process signals and objects. The search result will be presented in a Quick List. You can double-click on a row in the Quick List to display the object's Faceplate or right-click to display the object's context menu (Figure 164).

The search criteria is configured in aspects that can be saved and re-used. Consequently, status lists are used to find those objects that are in a certain state or have something in common.

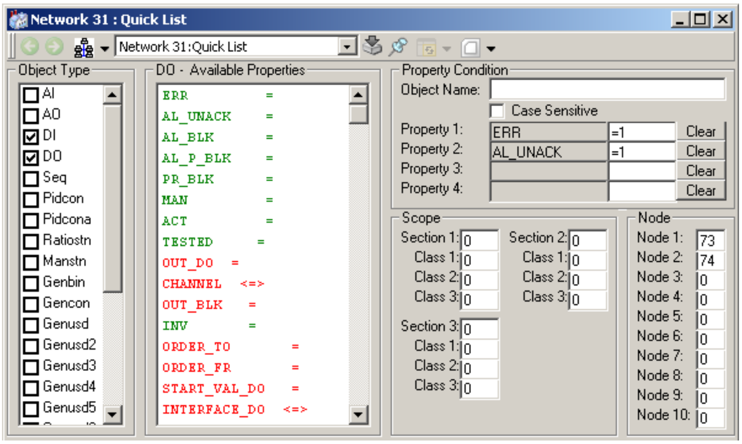


Figure 163. Quick List Main View

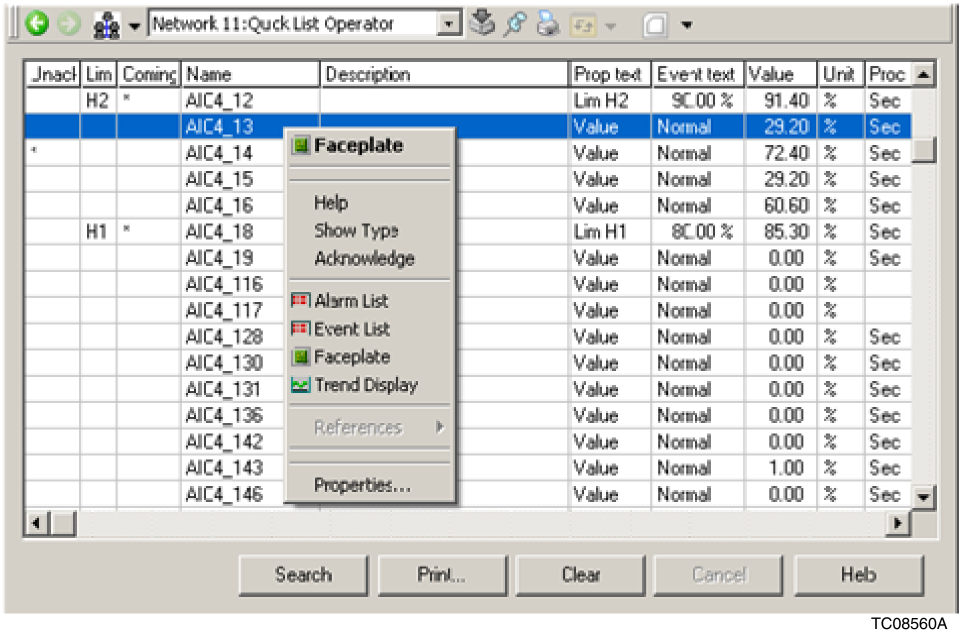


Figure 164. Quick List Main View with Context Menu

Process Sectioning

A process may be divided into several sections and each process object may be allocated to a particular section.

Process sectioning means:

- Operators having different operation rights within different sections.

  Different operator authorities, such as read only, limited access or full access, can be defined via 800xA security for the different sections. In connection with attempts to select objects for control or acknowledge alarms, the system checks whether the operator has the required authority. The operators are able to control and affect their own process section, but are also able to obtain information about the cause of alarms and events in other sections. In System 800xA, process sections are typically defined as process areas in the Functional Structure or by the controller in the Control Structure.

- Operators receiving only the alarms that are associated with the sections that are within their area of responsibility.

  In System 800xA this is accomplished by filtering out process sections that will supply their alarms into the alarm list for the process section.The alarm list filtering supports Advant Master controller defined process sections. In a mixed 800xA System environment where AC 800M controllers are combined with Advant Master controllers, the Class property in the controllers can be used for definition of the process sections. This property can be filtered in System 800xA alarm lists and is available for the control modules and function blocks in the AC 800M controllers as well as in the functional units in the Advant Master controllers. With the synchronized usage of class it will be possible to have a combined process section with Advant Master controllers as well as with AC 800M controllers.

- In addition to the process sectioning of alarms, 800xA for Advant Master also supports process sectioning of events. This means that either the Process Section parameter or the Class parameter in the Advant Master database can be used for filtering in the Event List Configuration, used for the 800xA for Advant Master event list.

Refer to the new function, Point of Control on page 107. This function implements a concept for having full control over process sections and alarm and event list filtering based on current responsibility.

Display Distribution Services

Display distribution is no longer needed since all displays belonging to one 800xA System are available on all workplaces connected to this system.

Operator Function Keyboard

The operator keyboard can be a standard computer keyboard in combination with a mouse or a trackball. It can in addition to the normal keys have dedicated hot keys for fast direct actions.

Hot key actions are preconfigured and available for several of the Advant Master process object types. These actions can be used when setting up a programmable keyboard as operator keyboard for the 800xA for Advant Master system.

Hot Keys

800xA for Advant Master hot key definitions works towards the highlighted process objects. Highlighting of Advant Master process object is indicated by a raised appearance in the process graphic display. Pointing the cursor at a process object, results in the raised object presentation, and to the presentation of a tool tip showing the process object name.

A hot key is a specific combination of keys or a single key on a computer keyboard or an additional keypad defined to perform a specific function.

It could be to start and stop a motor, increase or decrease value on selected or highlighted analog objects.

The hot keys operation can be global, and thus independent of selected or highlighted object, or having affect on the selected or the highlighted object.

The following functions for hot keys are defined. Different functions are defined for different objects. Refer to [21] in Table 1 on page 30.

- Acknowledge.
- On/Start/Open/True.

- Off/Stop/Close/False.
- Man.
- Auto.
- E1.
- E2.
- Small Increase.
- Small Decrease.
- Large Increase.
- Large Decrease.

Min/Max Dialog

Security settings are made on the process object type level, which is equivalent with Min/Max dialog. An operator logged in can have a permission assigned allowing process object operation compatible with either Min or Max dialog. Change of user is required to switch between Min and Max dialog, but the log-over function enables a switch-over to another user in run-time, without loosing the view of the process. Refer to Security on page 61 for more information regarding security functions.

Lock Function

In System 800xA locking of process objects is by default not required in order to operate. Manual locking of a process object is accomplished by clicking on the lock icon in the faceplate (Figure 165). This does not require any configuration. It is possible to configure auto-locking of Advant Master process objects upon bringing up the faceplate for the object in System 800xA.

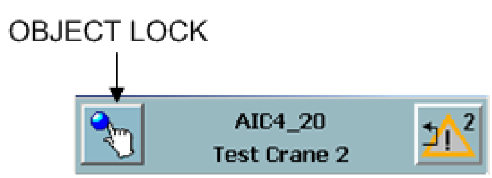


Figure 165. Faceplate Header

800xA for Advant Master does not support the 800xA lock server functionality.

Locking of a process object will be indicated by the lock icon in the faceplate and by a white frame around the presented object in the process graphic display. The locking can be viewed by all System 800xA clients where the object is presented.

Operator Log

The operator action log available in 800xA Systems where logging of all operator actions is possible. The name of the node from which the operation was made are also logged. Refer to Audit Trail (Security Events and Configuration Changes) on page 85.

Safeguard Handler

The 800xA for Safeguard is available as a software product used to connect Safeguard safety controllers to System 800xA. It includes object types, aspects and functions specific to the domain of safety applications and Safeguard system supervision.

800xA for Safeguard can be purchased as a part of the System 800xA. Refer to Appendix C, 800xA for Safeguard.

Drives Integration

The Drives Integration allows the operator to control and supervise different motor characteristics such as speed, current and torque. The function includes Drives-specific objects, group display elements, and faceplates, as well as specific process elements for process displays.

The Drive Integration Process Objects are:

- Standard Drives Object, DRICONS.
- Engineered Drives Object, DRICONE.

Switchgear Integration

The Switchgear Integration enables the integration of the MOTCONI object with INSUM motor control centers. The Switchgear Integration Process Object is MOTCONI.

Localization

Translation of Faceplates, Object Displays and Graphic elements are included in the scope for Language Packages into several languages. Default Advant alarm texts, customer defined alarm texts, event texts and operator messages have built-in localization for English, Swedish and German. The System 800xA Chinese localization support for alarms and events, can also be used for user defined alarm and event texts for translation into local language. Refer to Localization on page 70 for more information.

Extended Automation Functions

The following extended automation operations functions are available for 800xA for Advant Master:

- Workplace Setup
- Single and Multiple Screen Setups
- Reports
- Log-over
- Audit Trail
- Advanced Access Control
- Digital Signature
- Multisystem Integration
- Server Node Virtualization

Workplace Setup

The Operator Workplace is the environment from which the operator views and controls the plant process. The operator workplace may also be a remote client, e.g. over internet.

The operator workplace layout can be configured for best fit to the needs of different user groups or individual users. Examples of configurables are aspect favorites, aspect links, window handling etc. Refer to Operator Workplace - Client on page 96.

In AdvaCommand up to two workplaces with one keyboard is possible. For MasterView, up to three screens with the same keyboard is possible. In 800xA, it is possible to set up, up to four screens with one keyboard, enabling dedicated screens and more information availability for the operator.

Also the 800xA Extended Workplace is supported.

Single and Multiple Screen Setups

The workplace may have a single or a multi-screen setup. In the multi-screen setup, one screen can be dedicated to always show alarms and another to always present the trend display.

Several screens can also be configured according to the Windows large desktop concept. Refer to Large Operator Workplace - Client on page 110.

Reports

System 800xA includes an Excel based tool for configuring reports. Report templates are available for hourly-, shift-, daily- or monthly report, trip report, snap shot, alarm/event report and ad-hoc query. The reports can access both real-time and trend data (events and data).

It is also possible to make a user-defined report using the Excel plug-in for access to real-time or trend data. The data retrieval interface is using a Plant Explorer browser plug-in.

The reports can be scheduled or event driven and the output destinations can be printers, e-mail and files such as .pdf, .html, .xls.

It is also possible to configure web access for reports so that they can be opened and viewed using a web browser. Refer to Reporting Services on page 245.

Log-over

In System 800xA, it is possible to temporarily change a user. Some operations in the system may require a change of user.

The log-over function enables a fast and temporary switch between users in a running workplace. This can be particularly useful if an operation requires a permission not held by the current user. Refer to the user log-over information within Security on page 61.

Audit Trail

System 800xA allows the audit of operator actions and security. The system supports logging of security violations, configuration changes and operator actions to the process. Refer to Audit Trail (Security Events and Configuration Changes) on page 85.

Advanced Access Control

Engineering is required on the process object types to enable the Advanced Access Control function for Advant Master. Refer to Authorization (User Re-authentication & Double Authentication) on page 86.

Digital Signature

Refer to Electronic Signature (Digital Signature) on page 88.

Multisystem Integration

800xA for Advant Master supports multisystem integration. This means that several 800xA Systems can be operated from a central location. Refer to Multisystem Integration on page 112.

Server Node Virtualization

Using the external RTA unit PU410, 800xA for Advant Master supports server node virtualization. Virtualization can be used in 800xA Systems to combine multiple 800xA Server nodes into a single computer, thus reducing the total number of physical computers required in an installation.

Engineering

The Advant Master engineering tools Control Builder A and Online Builder can be run in the 800xA client nodes using the PU410 RTA Unit in the Connectivity Servers.

From 800xA System Version 6.0, the PU515A RTA Board is not supported.

Advant Master functions

In general the engineering in a System 800xA for Advant Master consists of two parts:

- Control engineering - PC-elements, DB-elements, type circuits etc.
- System 800xA engineering - Graphic elements, graphic displays, faceplates, trend displays, alarm and event lists etc.

Control Engineering

The control engineering part is handled by the Control Builder A and Online Builder tools. These can be used in a single node manner for both online or offline engineering. The tools can be installed in a System 800xA client. The RTA Unit in the Connectivity Server then serves as the communication link with the controllers.

System 800xA engineering

System 800xA engineering is described in the manuals for System 800xA Configuration and in 800xA for Advant Master Configuration. Since the 800xA engineering results in aspects in the Aspect Directory, the configuration and application data will then be treated with the System 800xA methods, import export, backup restore etc. Refer to Figure 166.

Both types of engineering work can be accomplished in engineering nodes where both the System 800xA and the Advant Master engineering tools are combined. These combined engineering nodes can work in either offline or online situations.

Process Objects

The well-proven ABB process object model, used in the Advant system, contains all the needed process objects for efficient controlling of a process.

Predefined graphic elements, object displays and faceplates, are included in 800xA for Advant Master, for the following supported standard process objects:

AI, AO, DAT, DI, DO, GENBIN, GENCON, GENUSD, GROUP ALARM(Group Alarm), GROUP (Group Control), MANSTN, MOTCON, PID, PIDCON, PIDCONA, RATIOSTN, SEQ, TEXT, VALVECON, DRICONE, DRICONS, and MOTCONI.

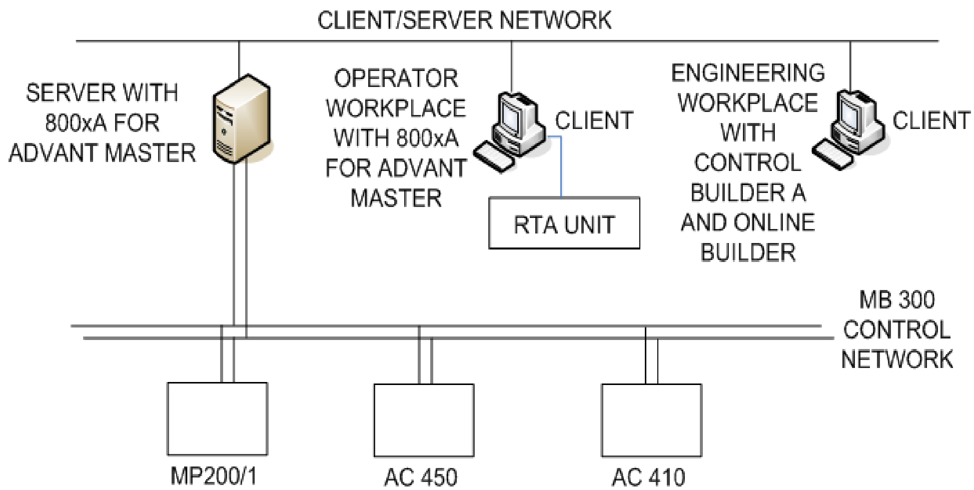


Figure 166. AC 400 and System 800xA Engineering Workplace System

Station Backup

The following backup and restore functionalities are available in System 800xA:

- Backup of the entire History data base including both configuration and the runtime data.
- Back up of the entire Event (System Messages) database including both configuration and the runtime data.
- Backup of the Aspect Directory containing the configuration data of the System 800xA.

Advant Master Central Backup

Advant Master Central Backup offers services for Backup and Restore of AMPL Applications of Advant Master Controller nodes (such as Advant Controller 410, MasterPiece 200/1, Safeguard 400, Safeguard 3000, and Advant Controller 450, Safeguard 9000) connected to the 800xA system through Master Bus 300.

Advant Master Central Backup is a license controlled system wide function available both for new users and as evolution from AdvaBuild Central Backup used in the Advant Station and AdvaCommand products.

Advant Master Central Backup is based on the 800xA framework for Service Backup. The backup data is stored on the same location as the other backup files in the 800xA system, that is, in an Aspect Server or a shared system connected to it. There may exist several versions of a backup. The format of backup files is the standard On-line Builder command DUAP format.

Create **Full Backup Definition** objects in the **Maintenance Structure**.

These objects define the scope of backup, that is, the controllers for which the backup must be taken. The Backup can then be invoked manually or scheduled at any time.

On starting the Backup operation, the **Full Backup** object is created. This object holds the information about the specific backup. Restore can then be invoked from the **Full Backup** object (Figure 167).

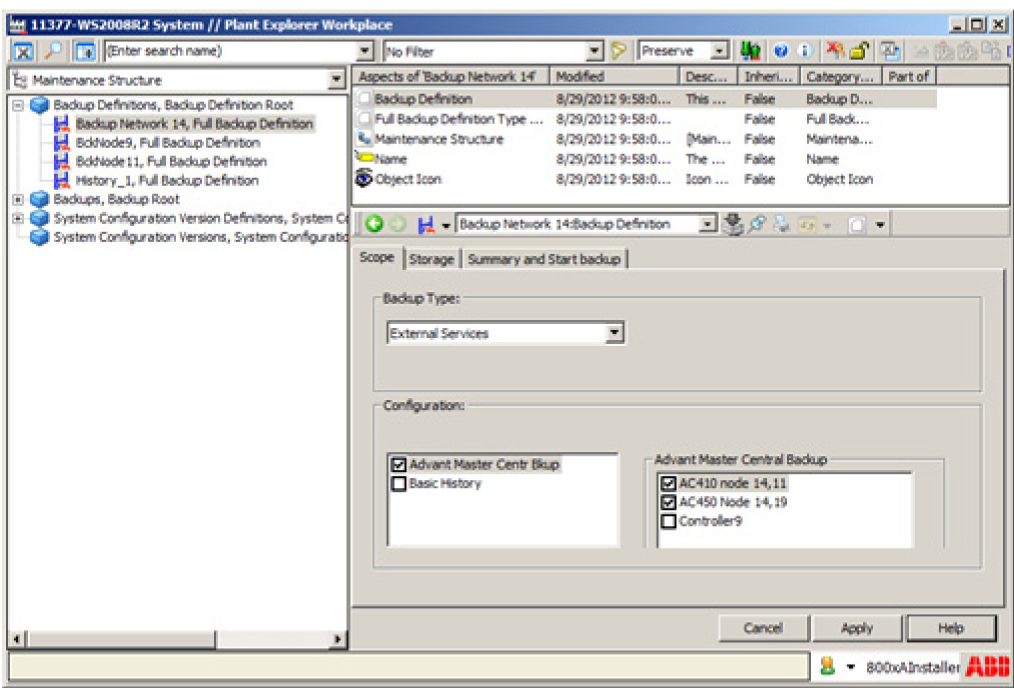


Figure 167. Advant Master Central Backup

Refer to [21] in Table 1 on page 30, for more information on configuration of Advant Master Central Backup.

Offline Engineering

Offline engineering can be done as follows:

- 800xA Single node engineering. Control Builder A and 800xA Engineering System installed on a single node engineering workstation.
  - Controller engineering via Function Chart Builder. The FCB will generate source code. The source code has to be moved to an 800xA client node connected to MB 300, with CBA/ONB installed and then downloaded to the controller.
  - Graphics building (graphic elements/faceplates) with objects using the same names as the real process objects, so called dummy objects.

Online Engineering

Online engineering is supported in the following way:

- 800xA for Advant Master online engineering.
  - 800xA client with Control Builder A/Online Builder installed in one or more 800xA clients.
  - Connectivity server(s) with RTA Units (PU410).
  - Graphics building (graphic elements/faceplates) after an MB 300 upload to the Control Structure.

Engineering Stations that are used in the Advant OCS system can continue to be used in the same way in the combined 800xA for Advant Master system.

Engineering can be performed on MB300 controller nodes with Control Builder A versions not supporting Windows 8.1 and Server 2012 R2, but must use a separate computer infrastructure.

Advant Engineering Workplace

In System 800xA the Advant Engineering Workplace is replaced by Control Builder A and Online Builder.

Extended Automation Functions

The following extended automation engineering functions are available for 800xA for Advant Master:

- User Defined Graphic Elements.
- 800xA Engineering Workplace.

User Defined Graphic Elements

It is possible to easily make variants of the standard Advant Master Graphic Elements. Make a copy of and modify a process object type element, using the same Graphics Builder as being used to build process displays. New graphic elements can also be developed, refer to Graphics Builder on page 128 for more information.

800xA Engineering Workplace

Bulk Data Manager and Parameter Manager can be used for System 800xA engineering but not for the controller parameters.

Document Manager works as in System 800xA. Document with dynamic data can have references to the Control Connection Aspect properties but also references to OPC properties. By using these document aspects on the object types it is easy to accomplish dynamically updated standard operating procedures, shut down instructions etc.

Control and I/O

Advant Master Functions

Support for Master Batch

800xA for Advant Master is supporting the Master Batch controller via the GENUSD object type. The GENUSD types used are GENUSD3, GENUSD4 and GENUSD6 (parameters OPCON, TANKCON, and SECCON). In order to see MasterBatch data in process graphics, your own graphical elements and faceplates must be made.

Reuse of S100 I/O

S100 I/O communication is realized in AC 800M by communication interface CI856, which is connected to the CEX-Bus through a base plate. The baseplate, TP856, houses a ribbon connector connecting to bus extender boards in S100 I/O racks and provides a simple DIN-rail mounting. Up to five S100 I/O racks can be connected to one CI856 where each I/O rack can hold up to 20 I/O boards.

A key benefit with the CI856 interface is the possibility to reuse the majority of the existing I/O installation, including terminations and field wiring in existing ABB Master and Advant OCS installations.

Functionality supported:

- Single connection to S100 I/O units located in up to five I/O racks.
- Code locking device to prevent mounting of incompatible components.
- Hot swap.

Supported S100 I/O bus extender boards.

Supported S100 I/O modules.

Reuse of S400 I/O

A third party MasterFieldbus - ModuleBus converter solution is available for reusing the S400 I/O on MasterFieldbus together with AC 800M. The converter is connected to ABB MasterFieldbus short-distance bus (RS485) on one side and to ABB DDCS protocol with optofibre communication on the other side. Contact your ABB sales representative for more information.

Reuse of S400 I/O Field Wiring

The S400 I/O and field wiring represent a huge investment. Therefore a solution is offered to enable an easy upgrade of existing S400 I/O to the latest I/O family, S800, retaining existing field wiring. The modules TU401, TU402, TU403, TU404, TU405, TU406 and TU407 are termination units specifically developed for this purpose, having the same footprint as existing S400 I/O modules, Refer to Table 25.

The real advantage with the TU40x series is to be able to use the existing S400 I/O field wiring. This is achieved by pretested cross connections between S800 I/O and the S400 I/O plug sockets. The connectors for the field wiring are also marked in the same way as for S400 I/O. Refer to Figure 168.

Table 25. S400 I/O to S800 I/O Termination Units

Type Designation and Ordering No.	Used for Migration from the Following S400 I/O Units
TU401[1] 3BSE035451R1	DSAX 452[2]
TU402[3,4] 3BSE035452R1	DSDX 452 DSDX 452L[5] DSDX 454 DSDX 454L[5]
TU403 3BSE035453R1	DSDI 452 DSDI 454
TU404 3BSE035454R1	DSDI 452+DSD I451 DSDI 454+DSDI 453
TU405[6] 3BSE035455R1	DSDX 452+DSDI 451 DSDX452L[5] +DSDI 451 DSDX 454+DSDI 453 DSDX 454L[5] +DSDI 453
TU406[6] 3BSE035456R1	DSDI 452+DSDX 451 DSDI 454+DSDX 453

Table 25. S400 I/O to S800 I/O Termination Units (Continued)

Type Designation and Ordering No.	Used for Migration from the Following S400 I/O Units
TU407[7] 3BSE035457R1	DSDX 452+DSDX 451 DSDX 454+DSDX 453 DSDX 452L[5] +DSDX 451 DSDX 452L[5] +DSDX 451L[5] DSDX 454L[5] +DSDX 453 DSDX 454L[5] +DSDX 453L[5]

NOTES:
1. 2 AI and 2 AO additional channels.
2. Unipolar ranges according to AI/AO810 and AI/AO845.
3. 16 DI available.
4. 4 DO additional channels.
5. Minimum load current according to DO820.
6. 12 DI and 4 DO additional channels.
7. 8 DI additional channels.

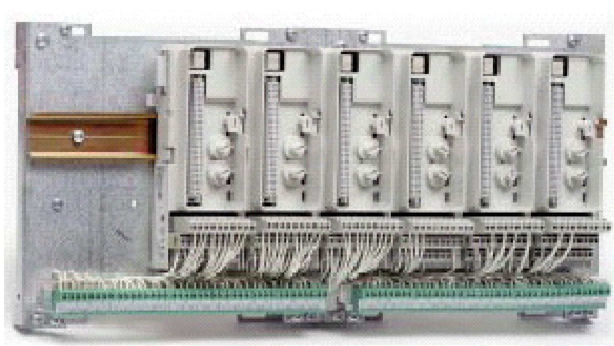


Figure 168. S400 I/O to S800 I/O Termination Unit.

Other benefits with this solution are:

- Shortest possible downtime. Just plug and produce.
- Enables HART® fieldbus support and thereby management of intelligent field devices from a central point.

The TU40x modules includes a base plate, S800 I/O MTU's and field wiring connectors and provide the same easy installation of the I/O modules as S800 I/O in combination with the S400 I/O features;

- Same mounting on DIN rail or mounting plane as S400 I/O.
- Same foot print dimensions as S400 I/O.
- Same field wiring terminations as S400 I/O.

Optional required units like FCI, Cluster Modem and Cable Adapters can be placed within the TU40x footprint.

External power supplies must be used to supply the TU40x termination units and additional communication interfaces. S400 I/O configurations using basic and expansion units are covered by TU404, TU405, TU406 and TU407, units that are divided in two groups that can be separately protected with fuses. For further information see S800 I/O product documentation.

Extended Automation Functions

The following extended automation control and I/O functions are available for 800xA for Advant Master:

- AC 400 Controller Manuals in 800xA.
- PLC Connect.

AC 400 Controller Manuals in 800xA

The AC 400 controller documentation covering all manuals needed for configuration, operation or maintenance of AC 450 or AC 410 controllers are included in 800xA for Advant Master. The manuals are available with object-type specific bookmarks in the control and object type structure. The complete set of manuals can be found on the AC 400 Documentation object in the Object type structure (Figure 169).

PLC Connect

Advant Masters customers have the possibility to combine PLC and DCS control data in the System 800xA. Refer to PLC Connect on page 75.

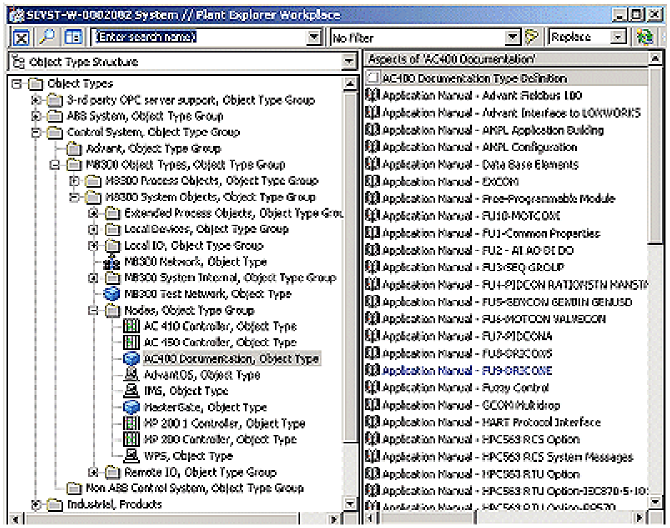


Figure 169. AC 400 Documentation Object

Information Management

Advant Master Functions

System that began as Advant Master may evolve in several different ways towards System 800xA. In addition, the data that is collected for both short term and long term storage may also evolve in different ways.

If the objective is a migration to System 800xA, its Information Management functions can replace the Enterprise Historian for trending, reporting and operation. Enterprise Historian version 2.2 can also be kept for use within the mixed 800xA for Advant Master system.

History data sources in System 800xA for Advant Master are:

- Trend data (short term storage, typically a couple of months, no archiving capability, cyclic storage).
- History data (long term storage, years, archiving capability, permanent storage), this is a data storage extension to the data stored for trending.

- TTD log data (history data stored in the Advant Master controllers for direct or hierarchical log access).
- Process Events and System messages.
- Archives of previously recorded data, this includes Information Manager archives as well as archives produced with Enterprise Historian, which can also be used to upgrade older AdvaInform History archive.

Possible Evolution Paths

For more information, refer to [22] in Table 1 on page 30.

- Mixed systems operation - This is a system which will operate with both System 800xA workplaces and Advant Master Operator workplaces.
- Total workplace replacement - In this configuration the I/O, controllers, and controller logic are maintained but the Advant Operator workplaces are replaced by 800xA workplaces.

The above evolution paths are important when it comes to deciding on how the data collection evolves with System 800xA.

As a general rule of thumb, if an Advant Operator workplace is required either an Advant Operator station including AdvaInform History must be preserved or an Enterprise Historian is required.

Information Management supports collection of TTD (Time Tag Data), current values and events. Connection is achieved by using 800xA for Advant Master.

Independent of the history data source, the data can seamlessly be displayed and analyzed in trend displays.

AdvaInform History

The AdvaInform History in the AdvaCommand station cannot be viewed in System 800xA, but if AdvaCommand stations are available in the system, AdvaInform History can be displayed in trend displays and process event presentation in the AdvaCommand stations.

Enterprise Historian or AdvaInform

The Enterprise Historian or Advant IMS software like the AdvaInform History option to an AdvaCommand workplace data can continuously be used in a mixed 800xA - Advant Master system. Like the AdvaInform History option for AdvaCommand, data can be supplied back to the operator workplace. Data collected using an Enterprise Historian can be consolidated in an 800xA Information Management, including process data as well as event data. Data consolidated from an Enterprise Historian can be used for trend presentation, reports and desktop access. Message events can also be consolidated, again they can be used for report presentation.

Other considerations when moving from AdvaInform to 800xA:

- User Objects developed with AdvaInform and Enterprise Historian can also be developed with System 800xA, using softpoints and calculations.
- UserAPI applications developed for AdvaInform can be replaced by applications developed with the OPC DA and HDA standards.
- SQL*Net capabilities supplied with Enterprise Historian is replaced with ODA (Open Data Access).
- DataDirect (Excel Data Access), Desktop Trends and Display Services (Multiscreen Display Interface) continue to be available as part of Information Management with 800xA.

A third party company has developed an integration package, IMS Connect which makes it possible to access user objects and history logs in an Advant IMS from System 800xA. Contact the sales organization in Sweden for more information.

Asset Optimization

Extended Automation Functions

System 800xA includes a number of Asset Monitors which can be used by the Advant Master customers to set up an automated and continuous monitoring of the health condition of assets like process objects or instruments. Examples of usage can be run-time checks, limit checks etc.

Asset status can be viewed with the Asset Viewer where the assets are displayed in a tree structure. For each branch, the Asset Tree indicators show the combined severity of an asset and the asset children beneath in the structure.

The Asset Reporter shows all Asset Monitor conditions (and sub-conditions) for an asset as well as the severity for each condition. If a CMMS integration is part of the System 800xA, it also shows the availability of fault reports and work orders in the CMMS system.

Technically it is possible to add Asset Optimization aspects to the 800xA for Advant Master object types, or to other objects created in the Functional Structure for example.

There are aspects available for:

- Asset monitors, pre-defined monitors for run-time, limit check etc. A number of them are included in the base system, and more can be purchased.
- Asset Reporter (included in base system).
- Asset Viewer (included in base system).
- Asset Optimization Workplace (purchase Asset Optimization).

PC, Network and Software Monitoring

800xA for Advant Master can use the automatically configured faceplates for printers & Hirschmann switches as well as the configurable faceplates for faceplates to other IT Assets. More details about the content in the pre-defined IT Assets and Device Libraries and the possibilities for network and device scanning as well as for network monitoring, can be found in IT Asset Monitors Generated by PNSM.

Integration of Fieldbus instruments, HART

In Advant Master systems, HART fieldbus instruments has become integrated via S100 I/O, using an Elcon Multiplexer and a 3rd party software, from Cornerstone for configuration of the instruments. Also for S800 I/O HART devices, a solution has become available using Cornerstone software with a special AC 400 HART Interface Library.

In 800xA for Advant Master another solution providing a better integration with the System 800xA is available. This solution is based upon using a supported HART

Multiplexer, and stripping off the HART signal directly from the field wiring, bringing this into the 800xA node with HART Device Management package, via a serial communication.

This solution requires:

- Supported HART Multiplexer.
- HART Multiplexer Connect (purchasable 800xA option) enables:
  - HART Device Management to be connected, to HART devices using HART Multiplexers.
  - Multiplexer support for Asset Optimization and Fieldbus Builder PROFIBUS/HART.
  - Communication DTMs for HART multiplexer.
- Device Management with Devices using Device Management HART:
  - HART Device Integration Library with ready to use objects for various field devices.
  - OPC Server PROFIBUS/HART.
  - Basic HART DTM, S800/S900 DTM.
  - Asset monitors for HART Field Devices.
  - Integration support, CMMS and Calibration system options need to be installed to make use of these aspects.

Refer to Figure 170.

Instrument Calibration Management

Instrument Calibration Management establishes a connection between the 800xA System and the instantiated HART device to the a variety of third party vendors for device calibration. This functionality is available for Advant Master customers when using the solution with HART Multiplexer Connect.

This feature offers a calibration management solution for HART and conventional 4-20 mA field devices.

More details can be found in the Device Calibration Integration on page 226.

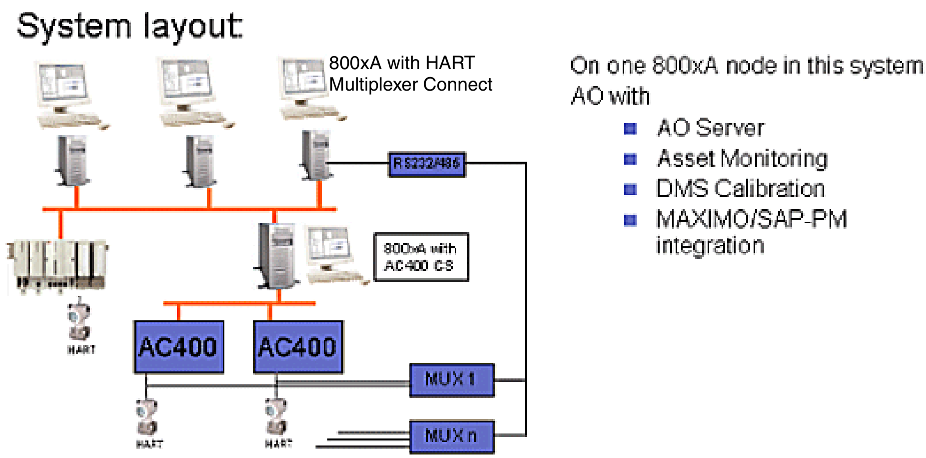


Figure 170. 800xA for Advant Master with HART Multiplexer Connect

CMMS Integration

Advant Master customers can benefit from the CMMS integration possibilities in 800xA. Fault reports can be generated via the Asset Reporter, based on work orders in Maximo or SAP/PM.

There are tag/object related views for work orders (active or history) as well as for equipment status and preventive maintenance schedule.

More details can be found in the CMMS Integration on page 210.

Communication Network

Advant Master Functions

MasterGate 230/1

To realize gateway functionalities previously supplied by the MasterGate 230/1, in the System 800xA the following solutions are available.

Cross Communication Between MB 300 Networks

Data Sets and clock synchronization messages can be transferred between two MB 300 networks using an AC 800M connected to both MB 300 networks via separate CI855 modules (Figure 171). Alarm and events will though not be transferred.

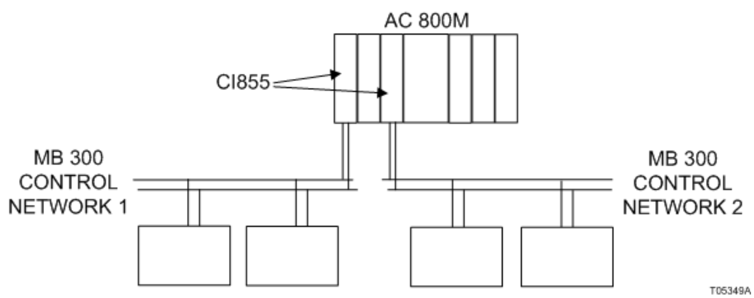


Figure 171. Data Transfer Between Two MB 300 Networks via an AC 800M

An alarm list including alarms from several MB 300 networks can be achieved in an Operator Workplace by connecting several MB 300 networks to the same 800xA System. Refer to [1] in Table 1 on page 30.

Peer-to-peer communication on AF 100 Network

Advant Fieldbus 100 (AF 100) is a high performance fieldbus, which can be used for peer-to-peer communication between AC 800M and other controllers on the AF 100 network using the communication interface CI869.

CI869 can not act as bus master and does not support communication to S800 I/O stations in this version.

In an AF 100 bus, it is possible to reach up to 80 stations within a total physical distance of up to 13300 meters (43300 feet). Advant Fieldbus supports three transmission media:

- Twisted pair (Twp)
- Coaxial (RG59 and RG11)
- Optical media.

An AF 100 bus can be built up with all the three media, where a part of one kind of media is a specific segment.

The following rules apply to the segments:

- To each twisted pair segment, 32 stations can be connected, and the maximum segment length is 750 meters (2500 feet).
- The coaxial segment can be:
  - 300 meters (1000 feet) with cable RG59 or
  - 700 meters (2300 feet) with cable RG11
- The optical media is only used in point-to-point communication, and it allows the total length of a bus segment to be up to 1700 meters (5500 feet).
- If back-to-back coupled optical segments are used, it is possible to reach up to a physical length of 13300 meters (43300 feet).

An Advant Fieldbus 100 may be installed with one or two physical bus lines (single or redundant media). Two bus lines are chosen when increased availability is required. The redundant bus line does not enhance the bus bandwidth when both the bus cables are operating.

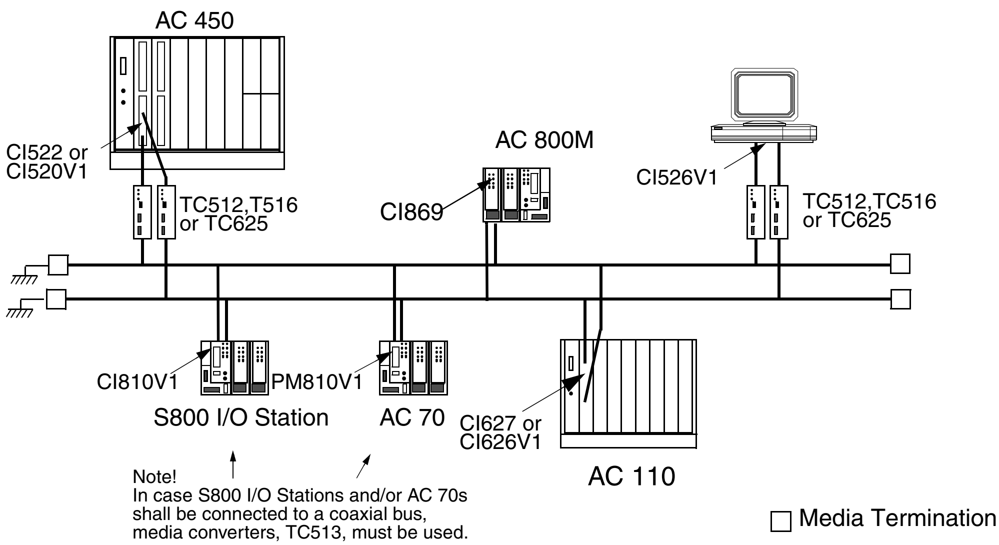


Figure 172. Advant Fieldbus 100 configuration using redundant media

Communication to External Systems via GCOM

Communication with external systems can be achieved with System 800xA functionality. Refer to Communication with External Systems on page 417 for more information.

Extended Automation Functions

The following extended communication network functions are available for 800xA for Advant Master:

- MasterBus 300 (MB300) Communication
- Controller Communication via MB 300
- Communication with External Systems

MasterBus 300 (MB300) Communication

The MasterBus 300 (MB300) communication protocol used in communication between controllers, operator stations in installations based on Advant OCS with Master software is also implemented in the 800xA controller AC 800M.

MB 300 communication is realized in AC 800M by communication interface CI855, which is connected to the CEX-Bus through a baseplate. The baseplate, TP853, houses RJ45 connectors for two Ethernet ports, for network redundancy and provides a simple DIN-rail mounting.

This peer-to-peer communication module is part of the realization of ABB's evolution for reuse of and integration with already installed equipment.

A key benefit with the CI855 interface is the possibility of having peer-to-peer communication between new plant sections with System 800xA using the AC 800M controller and existing sections with MB 300-based controllers like Advant Controller 410, Advant Controller 450 and MasterPiece 200/1.

Functionality supported are:

- MB 300 network redundancy.
- Clock synchronization.
- DataSet communication.
- Hot swap.

Controller Communication via MB 300

Data from an AC 800M on the Control Network can be transferred to a controller on the MB 300 network through the CI855 module by means of DataSet function blocks. Refer to Figure 173. MB 300 and Control Network must use separate physical network cables.

Communication with External Systems

Third party systems can access controller runtime process data or history data via 800xA for Advant Master using one of the following functions:

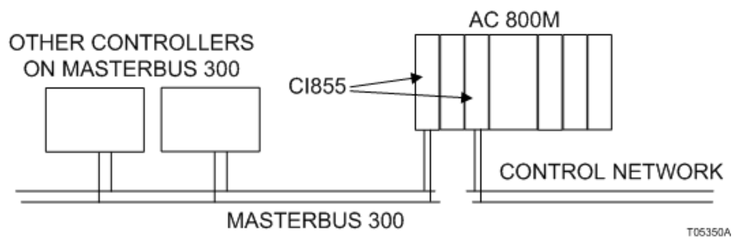


Figure 173. AC 800M Data Transferred to the MB 300 Network

- The 800xA OPC Client Connection requiring that the third party system supports OPC.

The 800xA OPC Client Connection can also be configured for supporting third party system access via OPC Alarm and Event.

- The OLE-DB Real time Data Client Connection using OLE-DB queries.
- The Property Transfer function to transfer data to an OPC server.

Refer to Section 3, System 800xA Overview for more details on these functions.

To avoid overload of the 800xA for Advant Master package, it is not recommended to perform multiple write operations cyclically via the RTA Board/Unit. To transfer data between controller nodes on the MB 300 network an AC 800M controller, connected to MB 300 using CI855 module, should be used.

System Upgrade and Compatibility

Advant Master Functions

Advant Master Evolution

Information about different evolution paths can be found in [22] in Table 1 on page 30.

800xA Functions Not Supported in Advant Master

In System 800xA some of the Professional Engineering tools are not applicable for 800xA for Advant Master:

- Re-Use Assistant (only for 800xA objects and aspects, not for Advant Master control application parameters).
- Library Assistant (for AC 800M).
- Function Designer (for AC 800M).
- Load Evaluate Go (for AC 800M). 800xA for Advant Master can not run in the same system as AC 800M where the Load Evaluate Go function will be used.

Support and Service

Advant Master Functions

OCS Evolution Services from INOPC

As a natural extension of ABB's control system support and focus for the vast OCS installation base, INOPC has a strategic initiative for Graphic Evolution Services for conversion of graphics from traditional OCS systems to System 800xA since 2006.

The INOPC graphic evolution team is helping global ABB units in their endeavor. This helps in retaining the existing customer base by:

- Providing the Human System Interface (HSI) upgrade services from many traditional OCS systems to System 800xA, using the Automated GeM tool (Figure 174).
- Opening a window for incorporating the enhanced features and functionality of System 800xA.

For more information contact ABB technical sales support.

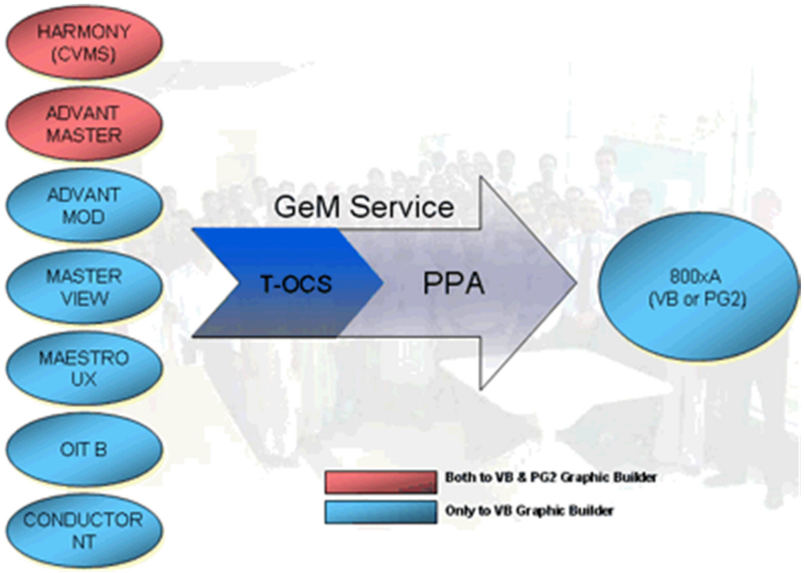


Figure 174. GeM Service

Conversion of Control Application (AMPL)

Control applications (AMPL) in MasterPiece 200 and Advant Controller 400 Series with Master software can be converted to System 800xA Control Software. Contact ABB Technical Sales Support for more information.

Appendix C 800xA for Safeguard

800xA for Safeguard provides integration of MasterBus 300 based Safeguard 400 Series controller node types into System 800xA.

Safeguard 400 Series controllers are based on Advant Master technology and provide most of the functionality found in AC 400 Series of controllers.

The 800xA for Safeguard is built on top of the 800xA for Advant Master and includes functionality that enables direct access to Safeguard controllers as well as Safeguard specific workplace features.

The reader of this section should be familiar with 800xA for Advant Master (refer to Appendix B, 800xA for Advant Master).

Benefits

Used together with System 800xA, 800xA for Safeguard enables existing and upcoming Safeguard installations to easily and efficiently draw benefits from the information integration delivered by the Aspect Objects technology within Industrial IT.

Operations

Operations-related items and activities associated with 800xA for Safeguard are:

- Safeguard Functions.
- Process Graphics.

Safeguard Functions

800xA for Safeguard depends on 800xA for Advant Master which must be installed and loaded in advance. 800xA for Safeguard provides predefined graphic elements, object displays and faceplates for all the Safeguard controllers' standard process objects.

In addition to functions described in Appendix B, 800xA for Advant Master, the 800xA for Safeguard has the following functions:

- Faceplates, object displays and graphic elements for Safeguard specific object types (FI, FD, GI, C&E Level) and typical safety applications.
- Safeguard system status and diagnostic Faceplate, Graphic element and Object Display.

Figure 175 is an example of a Safeguard connected to 800xA System.

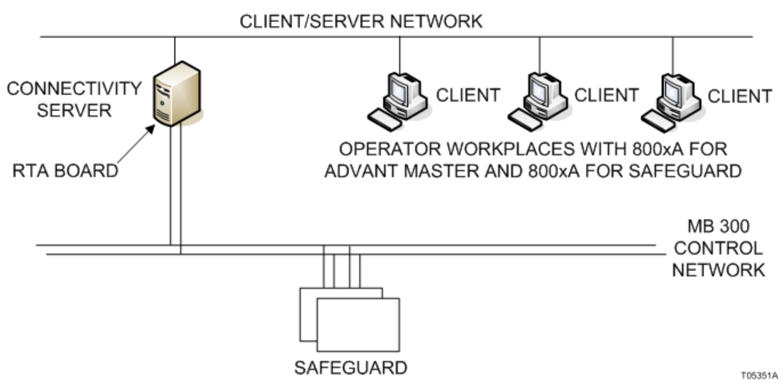


Figure 175. Example 800xA for Safeguard System

Process Graphics

The following is an overview of process graphics available for Safeguard in addition to graphics described in Appendix B, 800xA for Advant Master.

Object displays

Predefined object displays present all the information available about Safeguard controller status (Figure 176) and Safeguard specific MB300 objects.

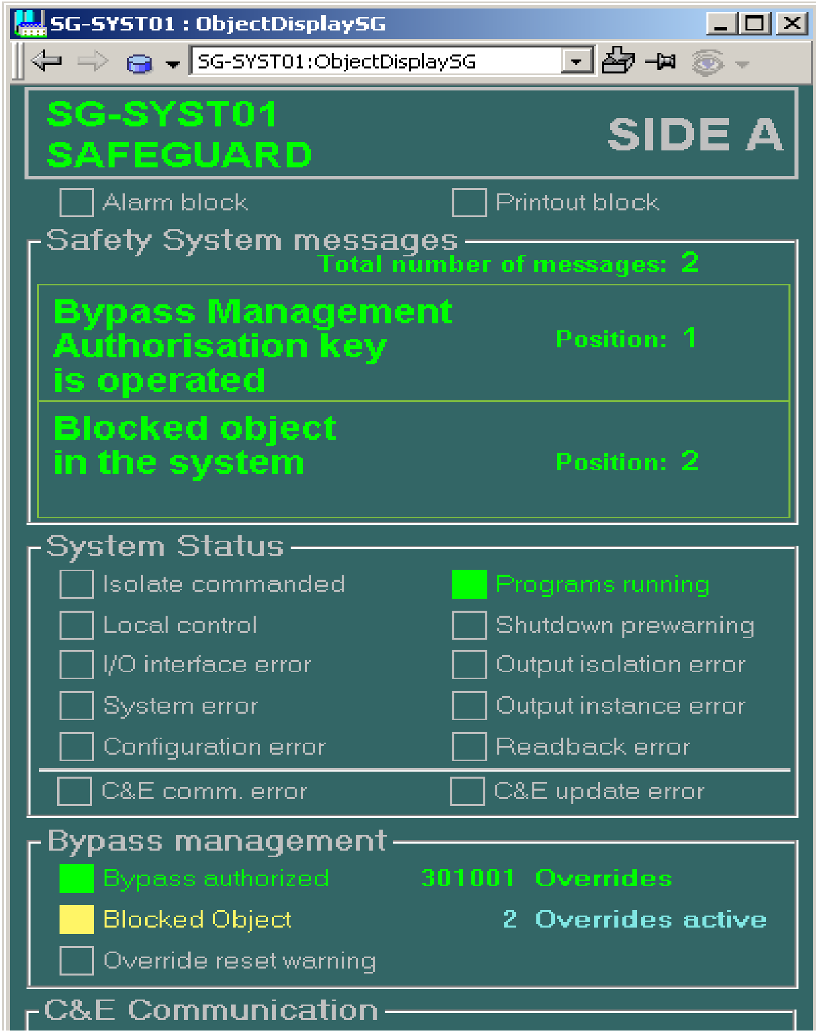


Figure 176. Safeguard Status Object Display

Graphic Elements

The following graphic elements are included:

- Diagnostic status display for a Safeguard system, single or dual.

- MasterVote 3000 units.
- FI, for Fire Input signals.
- FD, for addressable Fire Detector signals.
- GI, for non addressable and addressable Gas Detector signals.
- FG, diagnostic status display for Fireguard.
- C&E shutdown level group display.

Faceplates

Predefined faceplates are used for manipulation of the process objects. There are three levels of faceplate views: reduced, normal and extended. Refer to examples of Faceplates typical for Safeguard specific objects in Figure 177 and Figure 178.

Figure 177. Safeguard Status Faceplate

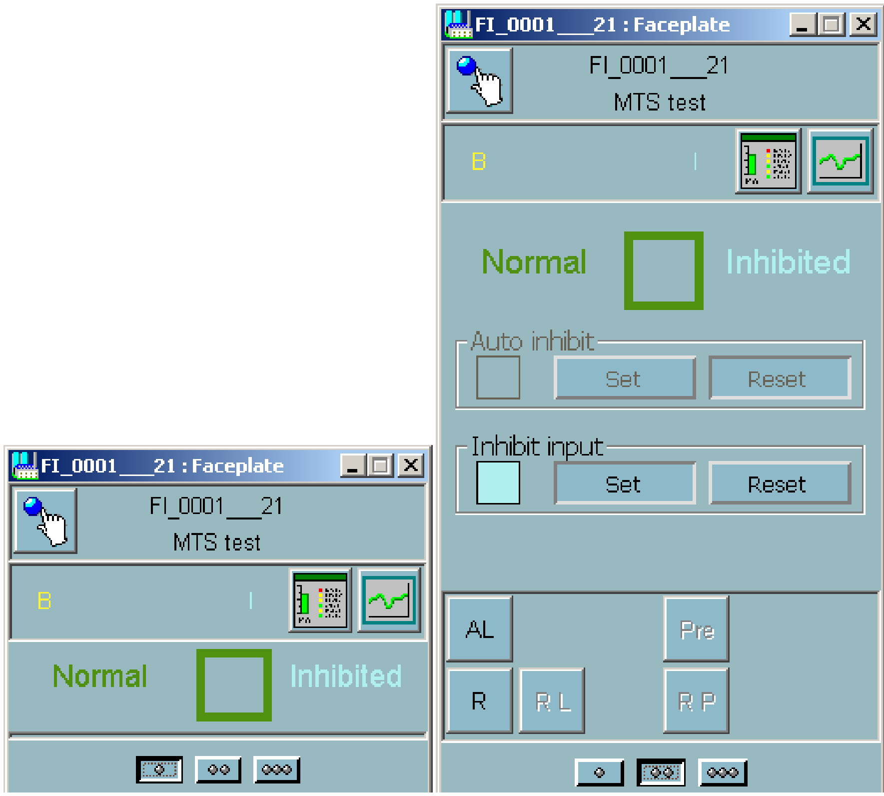


Figure 178. Reduced and Normal Faceplates for FI

Appendix D 800xA for DCI

800xA for DCI is the connectivity and integration of the DCI system to Process Portal and System 800xA. It supports full integration with Industrial IT technology products such as Information Management, Asset Optimization, etc. 800xA for DCI is an integrated connectivity option using the standard software interfaces (DCI Global Database Access) and standard hardware interfaces (ECC MUX software and standard off-the-shelf Ethernet NICs) to provide a connection for viewing and operation of the DCI system. The initial release of 800xA for DCI is targeted primarily at expansions of current systems where hardware obsolescence and Limited Phase announcements have prompted a console replacement plan. It is targeted at phased introductions, to allow existing users to begin to make use of the Industrial IT system components and smaller scale systems. A maximum tag count is specified for up to four redundant pair of Connectivity Servers. Our introduction strategy allows us to present the system in a manner conducive to receiving, managing, and responding to customer input.

The ECC MUX software interface is used in 800xA for DCI servers when redundant DCU communication networks are required. A server class workstation running the Server Operating System can be used when a single communication network is being utilized. ECC MUX 2.2 is available for 800xA for DCI. ECC MUX 2.2 operates with standard off-the-shelf NICs.

Features

The following lists the set of features and functions included for this release, specific to DCI users:

- DCI tag types.
  - Aspect Object definitions for all Controlware II object types.
  - Faceplates for all Controlware II object types.
  - Point displays (as extended faceplates).
  - DCI specific aspects (DCU Status and Control, DCI System Status, DCI Alarm Review, DCI Event Review, and DCI Message Review).
- DCI Tag Importer - utility for uploading tag data from Composer CTK export file. Composer CTK version 6.0 or later is required for generating the tag data.
- DCI Export to 800xA - Composer CTK (*.xml) based file types.
- 800xA Batch for DCI.
- New graphic elements for each Controlware Object Type. Allows for easy insertion of value elements onto a graphic display.

The set of 800xA features supported by 800xA for DCI is listed below:

- Workstation Operating System (clients) and Server Operating System.
- Licensing.
- Log-over - a fast temporary switch of the user running a workplace.
- Redundant Ethernet support.
- Native language support.
- Remote Client.
- Audit trail.
- Alarm hiding.
- Alarm Shelving.

Architecture

The 800xA for DCI architecture is supported through an integrated OPC Server for DCI, which interfaces to the DCU controllers via Global Database Access. The OPC Server for DCI included with 800xA for DCI provides full access to all Controlware II module types and atoms. The OPC Server provides the mechanism to communicate to the OPC Data Access and Alarm and Event interfaces of the 800xA System.

In the System 800xA architecture there are Aspect Server nodes, Connectivity Server nodes, Client nodes (or workplaces), and Remote Client nodes (or thin-client workplaces). When adding 800xA for DCI to the system, at least some portion of 800xA for DCI software must be installed on all of the 800xA nodes to provide the connectivity support to the system. The 800xA for DCI server application gets loaded and runs on an 800xA Connectivity Server node. Multiple Connectivity Server types cannot be loaded on the same node (i.e., if you have a mixed system, 800xA for AC 800M and 800xA for DCI, the server applications need to be loaded on separate nodes). Up to four 800xA for DCI server applications are supported in a system on separate workstations, and these can be made redundant. Up to 15.000 DCI tags can be supported by one 800xA for DCI server application (or redundant pair). The 800xA for DCI server application can be installed on workstations that are also installed as aspect servers or as operator client nodes, as long as the hardware meets specified requirements for System 800xA. Refer to Figure 179 for representation of an 800xA for DCI architecture drawing.

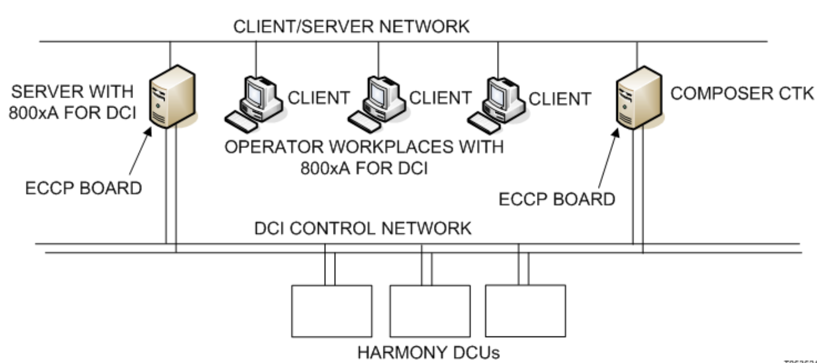


Figure 179. 800xA for DCI Architecture

The 800xA for DCI software provides the DCI Object Types with their associated Aspects. These are placed into the Object Type Structure of the Aspect Server, and are available for instantiation within the Control Structure. The instantiated Objects and Aspects associated to the DCI system provide specific support to the data accessed by the 800xA for DCI node.

Engineering Workflow

The engineering workflow begins in Composer CTK and finishes in the 800xA Aspect Server and the DCI Control System. Composer CTK engineering tools support configuring and editing of the project tag databases for DCU download. This same project tag database can then be used without alteration as a source file for creating the instantiated DCI objects in 800xA. This is done by a Composer CTK export function that generates an XML file that can be imported into 800xA aspect server using the DCI Tag Importer aspect.

Once objects are imported, it is possible to manually add or delete them within 800xA. However, these changes will not be reflected back to the Composer CTK export file. It is recommended that Composer CTK be used as the only method for instantiating tags (via the export - import method) in order to keep Composer CTK and the 800xA tag assignments in sync. Figure 180 shows a list of DCI Tags selected for export.

Figure 181 shows a list of 800xA for DCI objects in the Plant Explorer.

Tag Importer

The tag importer utility adds DCI objects to 800xA using the XML export file generated by the offline Composer CTK configuration tool. These objects are automatically populated with associated aspects such as faceplates, status and control, and status displays based on the object type definitions.

Specific Functions

Many specific functions combine to make 800xA for DCI. These specific functions are:

- Time synchronization.

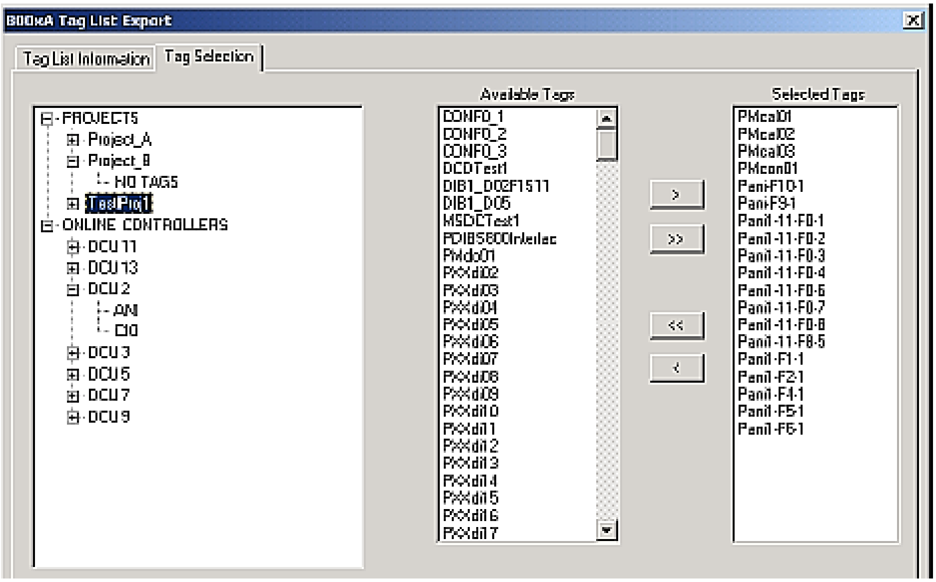


Figure 180. DCI Tags Selected for Export

- DCI Configuration.
- Backup and Restore.
- System Status display.
- Status and Control display.
- Faceplates.

Time Synchronization

Time Synchronization in 800xA is used to maintain consistency in historical data values, and alarm and event reporting. Timestamps of these values must agree across the various inter-connected systems.

The 800xA for DCI Connectivity Server must be the time master in the system as it performs time synchronization to the Symphony DCI nodes. This is required to ensure that time changes are only sourced from the DCI control system and not from other systems. Time changes cannot be made as a step change in the DCI system. The time synchronizer is responsible for synchronizing time with the DCU, Composer CTK, and Conductor NT/UX nodes on the same network.

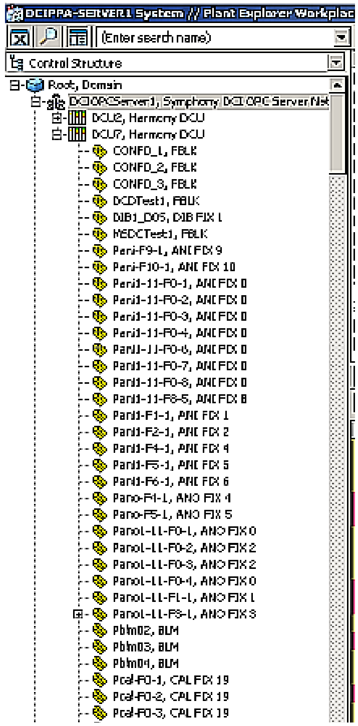


Figure 181. List of 800xA for DCI Objects

DCI Configuration

Composer CTK maintains the DCU Controlware configuration. Controlware modules are defined within 800xA as DCI objects. Each of these DCI objects is based upon an object type (or tag type) that relates to a type of Controlware module (e.g., CON, CAL, PAR). Each object type contains all aspects required to allow appropriate interaction and display. The DCI object types exist in the Object Type Structure under Object Types > Control System > Symphony DCI. All DCU Controlware modules are available as object types.

The DCI objects are typically created in 800xA by importing an XML file generated by Composer CTK. As part of the import operation, the Controlware modules identified in the XML file are associated to the appropriate DCI object type in 800xA. The other method for creating a DCI object in 800xA is by manually adding them within the Control Structure in a selected DCU. Whether done manually or by import, the instantiated objects are created using the object type definition that provides the needed aspects for interacting with the object.

Each tag type has a control connection definition aspect, and a faceplate aspect. Other DCI specific aspects, such as DCI System Status, and DCU Status and Control, are available. The control connection aspect has parameters defined for all the OPC items for the object.

Backup and Restore of Configuration

Standard 800xA Backup and Restore features allow the user to manually initiate a backup or restore that supports either the full backup or full restore of the 800xA configuration inclusive of the 800xA for DCI components. The backup or restore operation automatically sequences through all steps required to complete the operation requested.

DCI System Status Display

In the DCI system, the individual node devices (DCUs) report control system status. These are each represented as a DCU icon on the DCI System Status display and as a DCU module object in the Control Structure. The system status display viewer displays each DCU as a separate icon revealing the redundancy status and I/O board status as shown in Figure 182. Selection of the DCU icon calls up its DCU Status and Control Display.

DCU Status and Control Display

In the DCI system, each HDCU (Harmony Distributed Control Unit) reports status information about itself and can be issued operational commands by users with appropriate security. The display contains four tabs as shown in Figure 183. One includes identification information such as redundancy status, and processor type and name.

Another tab provides access to I/O board status information such as suspend switch position, board inserted, redundancy status, and cables connected. Two other display tabs are provided for control of a primary and of a redundant DCU processor. Commands can be issued to get program loads, to perform a hot, warm, or cold start,

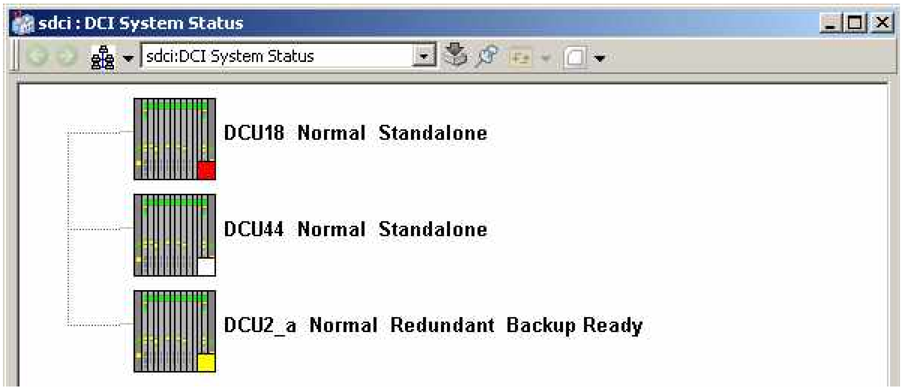


Figure 182. DCI System Status

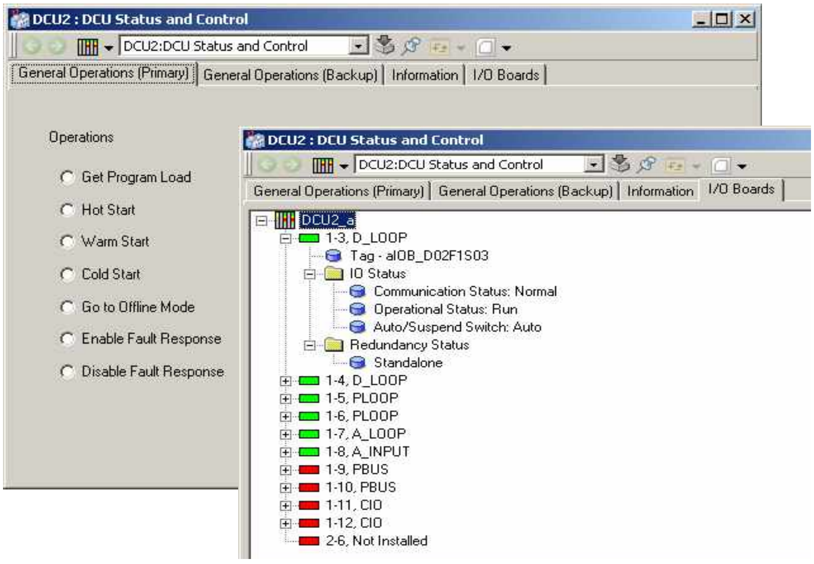


Figure 183. DCI Status and Control

to go offline, to copy primary database to the backup, or to enable / disable fault response mode.

Faceplates

The 800xA for DCI faceplates and associated extended faceplates as point displays are available as aspects of a DCI tag. Functionality of these 800xA for DCI faceplates and extended faceplates is designed to replicate the functionality available with faceplates and point displays in the current release of Conductor NT / UX. 800xA faceplates are provided for all DCU Controlware modules. Each of the following 800xA for DCI tags have faceplates and where noted in the following section, have extended faceplates:

- Analog Functions: ANI, ANO.
- Discrete Functions: DI, DO, DIB, DOB.
- Loop Control and Calculation Functions: CON, CAL.
- Timer / Counter and Totalizer Functions: TMR, TOT.
- Discrete Control and Boolean Functions: DCD, BLM, MSDC.
- Hardware Characterization Functions: PBUS, PSLV, IOB, CIO, DCU, PSB, SIM.
- Sequence Control Functions: PAR, PHS, PTB, CCM, SEC, DEV, PDEV, DTM, SEQ, MSEQ.
- Data Exchange Functions: PTP, MSG, XMSG, XFER, PMAP, XCON, AIOB, DIOB, AIO, REC.
- Logic Partitioning Functions: MSET, FBLK.
- Batch Functions: PSEC, STAT

Extended Faceplate Displays

800xA for DCI Extended Faceplate Displays are similar to Conductor styled point displays that include rudimentary trend elements. They display the trace of the process value or state for the current time during the previous two minutes (120 seconds) of operation. Extended faceplate displays occupy the extended slot of the faceplate control of those tag types that possess them.

Analog Functions

The available analog faceplates are:

Analog Input (ANI). Analog input faceplates are representations of 800xA for DCI analog input tags. An ANI module reports the current analog value, range, alarm levels, engineering units, filter constants, pulse rate, alarm status and quality that are presented in these faceplates. Figure 184 shows the layout of the ANI reduced, normal, and extended sized faceplates and its attributes.

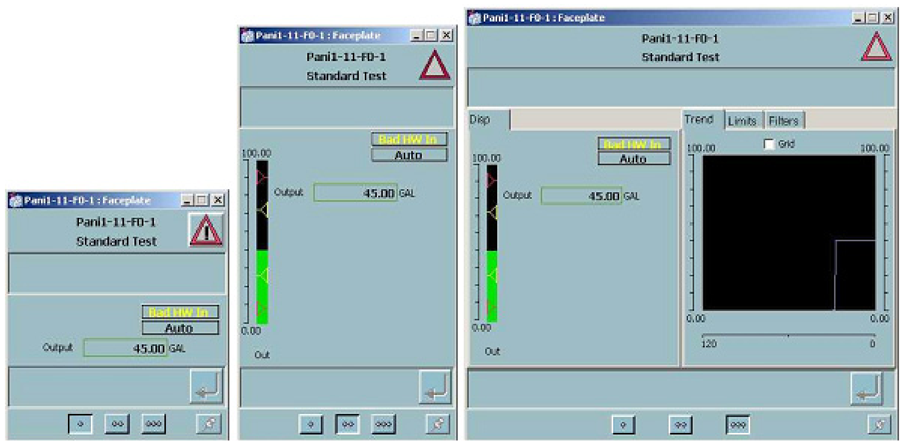


Figure 184. ANI Module

Analog Output (ANO). Analog output faceplates are representations of 800xA for DCI analog output tags. An ANO module reports the current input value, input range, engineering units, percent output, target manual output, alarm status and quality that are presented in these faceplates. Figure 185 shows the layout of the ANO reduced and normal sized faceplates and its attributes.

Discrete Functions

The available discrete faceplates are:

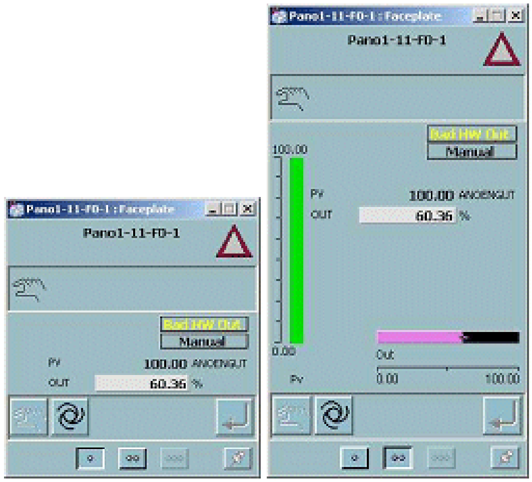


Figure 185. ANO Module

Discrete Input (DI / DIB). Discrete input and discrete input block faceplates are representations of 800xA for DCI discrete (or digital) input tags. A DI module reports the current discrete value, alarm status, and quality that are presented in these faceplates and the DIB module reports the current discrete value for 16 DI modules. Figure 186 shows the layout of the DI and DIB normal sized faceplates and their attributes.

Discrete Output (DO / DOB). Discrete output and discrete output block faceplates are representations of 800xA for DCI discrete (or digital) output tags. A DO module reports the current discrete value, input states for driving the output, alarm status, and quality that are presented in these faceplates and the DOB module reports the current discrete value for 8 DO modules. Figure 187 shows the layout of the DO and DOB normal sized faceplates and their attributes.

Loop Control and Calculation Functions

The available loop control and calculation faceplates are:

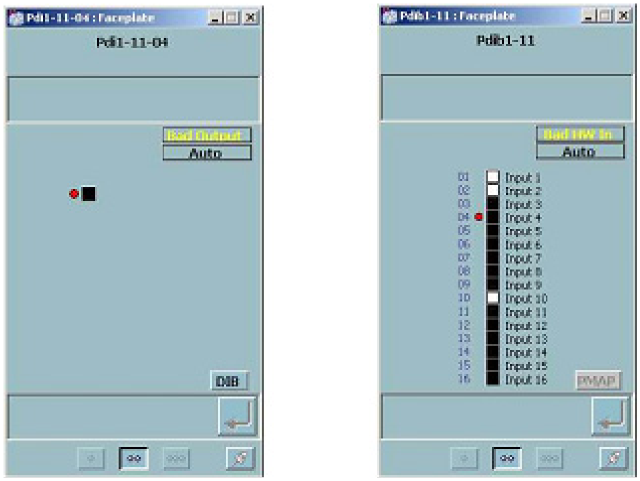


Figure 186. DI and DIB Module

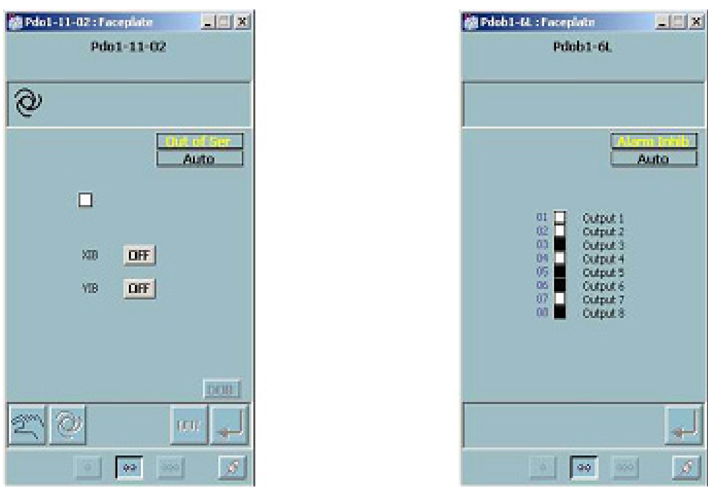


Figure 187. DO and DOB Module

Control (CON). A Control faceplate represents the 800xA for DCI loop control. The same functions that can be performed and the same values that can be displayed on a loop controller physically located in the plant are performed and displayed on the operator workspace using such a faceplate. The CON module faceplate presents a detailed online display of a single process loop. An 800xA for DCI CON tag is required to acquire process values from a CON module in a DCU controller. The tag is also required to direct control. The CON module function index determines the operations that can be performed from the operator workspace. This includes operations such as setpoint source (local, remote, or supervisory) and mode (manual or automatic) that are changeable from the operator workspace. A CON module reports the process value, setpoint value, output value, target setpoint, target output, alarm levels, range, engineering units, mode, control direction, tuning parameters, ratio constants, alarm status and quality displayed in a CON faceplate. Figure 188 shows the layout of the CON reduced, normal, and extended sized faceplates and their attributes.

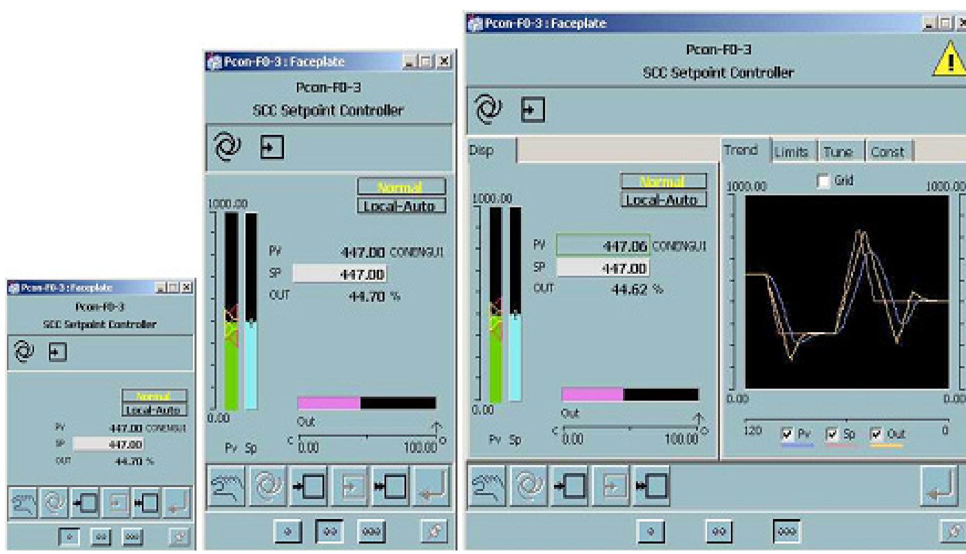


Figure 188. CON Module

Calculation (CAL). Calculation faceplates are representations of 800xA for DCI calculation tags. Each CAL module performs one of many available arithmetic functions including addition, subtraction, multiplication, division, flow compensation, value selection, square root extraction, log, power, lead and lag filters, and trig functions. The CAL module takes up to four analog signals from modules, performs arithmetic operations on the signals, and stores the results as engineering units in output. A CAL module reports the calculated value, range, engineering units, alarm levels, calculation constants, alarm status and quality that are presented in these faceplates. Figure 189 shows the layout of the CAL reduced, normal, and extended sized faceplates and their attributes.

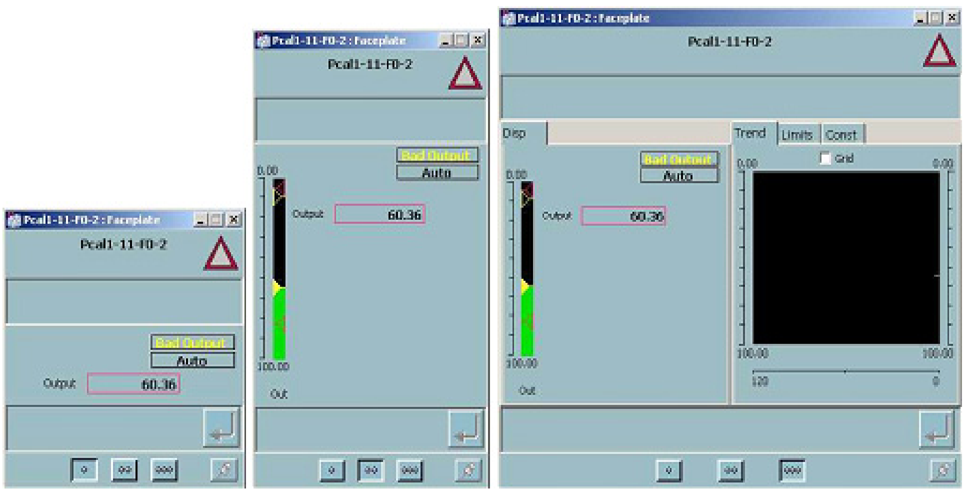


Figure 189. CAL Module

Timer/Counter and Totalizer Functions

The available timer, counter, and totalizer faceplates are:

Timer (TMR). Timer faceplates are representations of 800xA for DCI timer and counter tags. This module's operations consist of two functions: a timer and a counter. The timer counts the time interval specified by the scan file index (SCF) atom. The time interval is expressed in seconds (0.1 sec., 1.0 sec., 100 sec.), in minutes (1 min., 1.00 min., or 2000 min.), or in hours and minutes (1:03, 20:59, 1000:27). A counter simply counts the occurrence of events. A countdown timer is also provided. A TMR module reports the current and setpoint value, range, engineering units, alarm status and quality that are presented in these faceplates.

Figure 190 shows the layout of the TMR reduced, normal, and extended sized faceplates and their attributes.

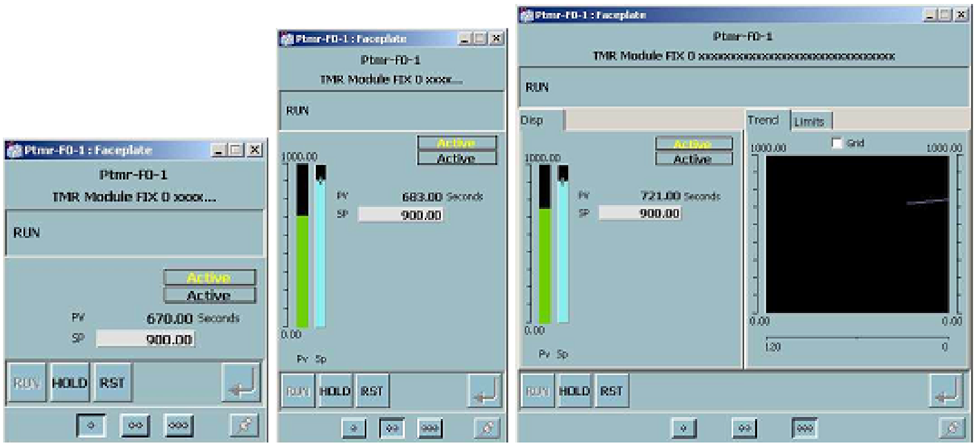


Figure 190. TMR Module

Totalizer (TOT). Totalizer faceplates are representations of 800xA for DCI totalizer tags. Depending on the function index, this module adds up or subtracts down an analog or pulse input value. A TOT module reports the current and setpoint value, engineering units, range, alarm status, and quality that are presented in these faceplates. Figure 191 shows the layout of the TOT reduced, normal, and extended sized faceplates and their attributes.

Discrete Control and Boolean Functions

The available discrete control and Boolean faceplates are:

Discrete Control Device (DCD). The Discrete Control Device module faceplate represents a device driver function block in an 800xA for DCI controller. The DCD module provides up to 2 On or Off signals (On = one, Off = zero) for controlling a process device. A DCD tag is required to both monitor and change the outputs provided by the module from the operator workspace. The DCD module reports the current states, two feedback states, interlock state, override status, mode, time delay constants, device state legends, alarm status, and quality used for display in the

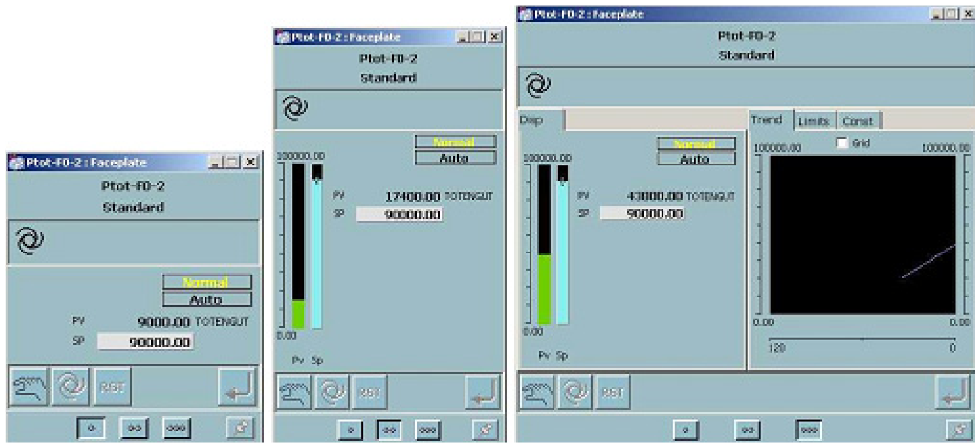


Figure 191. TOT Module

faceplate. Figure 192 shows the layout of the DCD reduced, normal, and extended sized faceplates and their attributes.

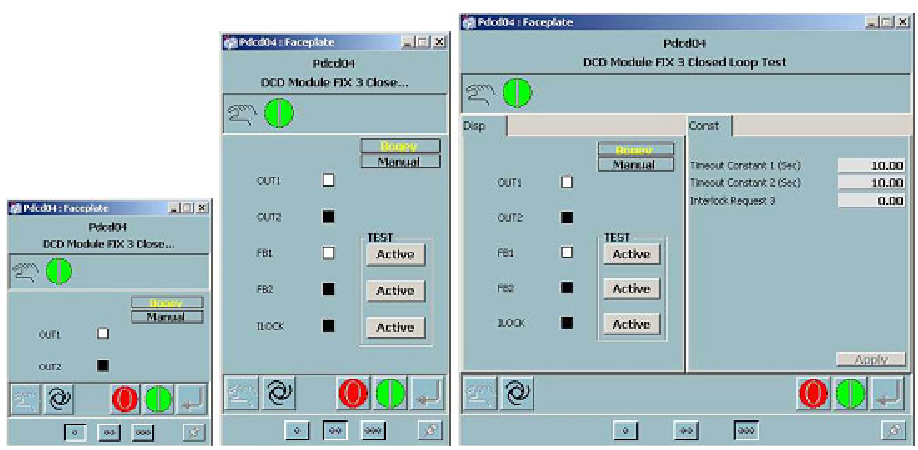


Figure 192. DCD Module

Boolean Logic Module (BLM). The Boolean Logic Module faceplate represents a Boolean logic function block in an 800xA for DCI controller. The BLM module provides up to 8 Boolean operations. Each operation can take inputs from field signals or from internal module results and generate output results for use by other operations in the same or different BLM or by other Controlware modules. A BLM tag is required to both monitor and change the outputs provided by the module from the operator workspace. The BLM module reports the current input and output states of each operation, the operation type, override values, input pointers and their values, mode, alarm status, and quality used for display in the faceplate. Figure 193 shows the layout of the BLM normal and extended sized faceplates and its attributes.

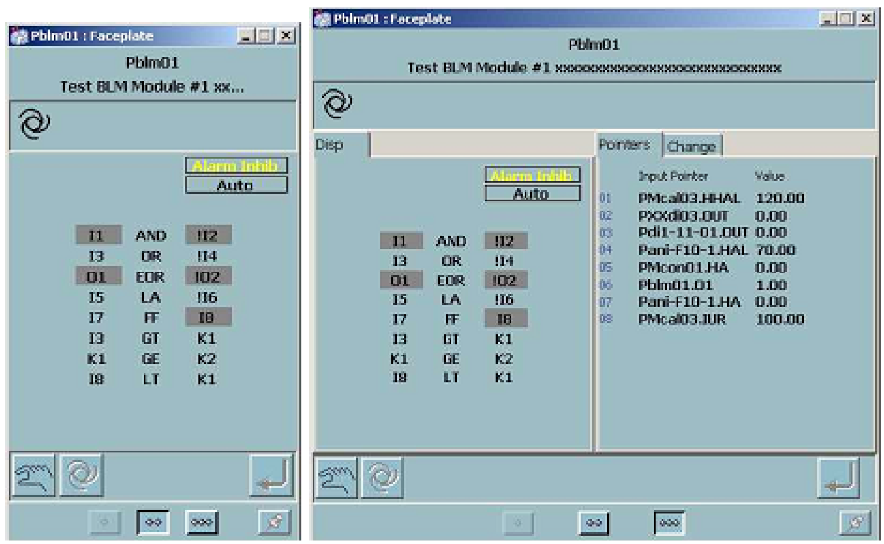


Figure 193. BLM Module

Hardware Characterization Functions

The available hardware characterization faceplates are:

Profibus Board (PBUS). The Profibus board module faceplate provides status information about the physical PBUS board mounted in a DCU frame. The PBUS module reports the run mode, backup mode, slot number, suspend switch position, board type, network slave device names and their quality status, and alarm status used for display in the faceplate. Figure 194 shows the layout of the PBUS normal and extended sized faceplate and its attributes.

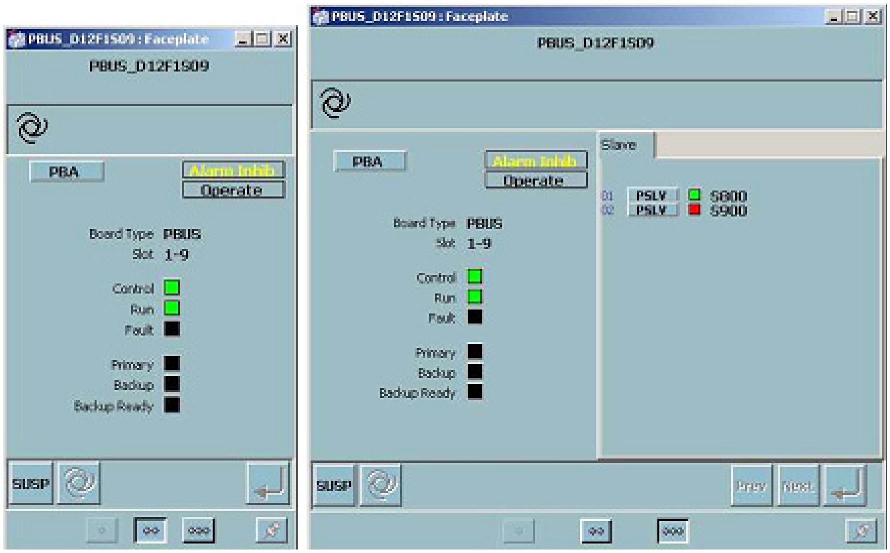


Figure 194. PBUS Module

Profibus Slave (PSLV). The Profibus Slave module faceplate identifies a physical Profibus slave device station and any hardware modules that make up the slave station. The PSLV module lists up to 16 physical device station names and their status, and alarm status used for display in the faceplate. Figure 195 shows the layout of the PSLV normal sized faceplate and its attributes.

Input/Output Board (IOB). The Input/Output board module faceplate provides status information about the physical I/O board mounted in a DCU frame. The IOB module reports the run mode, backup mode, slot number, suspend switch position, board type, and alarm status used for display in the faceplate. Figure 196 shows the layout of the IOB normal sized faceplate and its attributes.

Communications Input/Output Board (CIO). The Communications Input/Output board module faceplate provides status information about the physical

Figure 195. PSLV Module

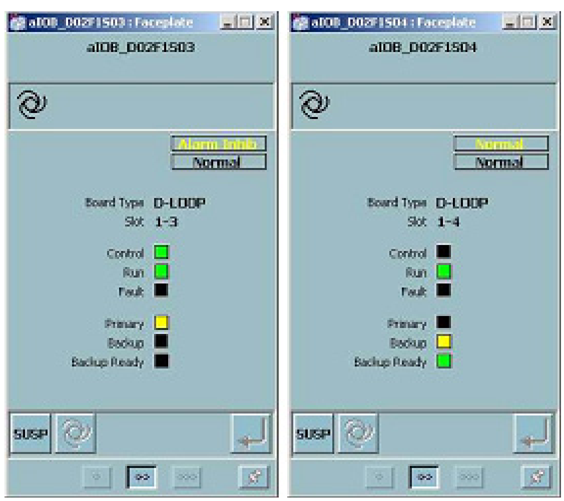


Figure 196. IOB Module (Primary) and Backup)

Communications I/O board mounted in a DCU frame. The CIO module reports the run mode, backup mode, slot number, suspend switch position, board type, and alarm status used for display in the faceplate. Figure 197 shows the layout of the CIO normal sized faceplate and its attributes.

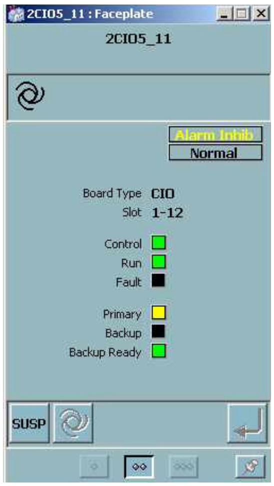


Figure 197. CIO Module

Distributed Control Unit (DCU). The Distributed Control Unit module faceplate provides status information about the DCU. The DCU module reports the time it was last downloaded with a database, the name of the database last downloaded, the current percent CPU load utilization, and alarm status used for display in the faceplate. Figure 198 shows the layout of the DCU normal sized faceplate and its attributes.

Power Supply Board (PSB). The Power Supply Board module faceplate provides status information about the power supply boards that are mounted in the DCU frame. The PSB module reports backplane voltages and currents, fan speed state, battery status, battery voltages, battery current, reference voltages, fan RPM, internal temperature, fault status, and alarm status used for display in the faceplate. Figure 199 shows the layout of the PSB normal and extended sized faceplate and its attributes.

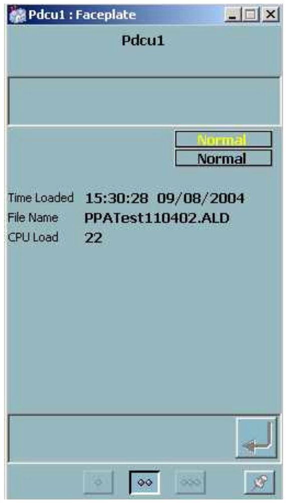


Figure 198. DCU Module

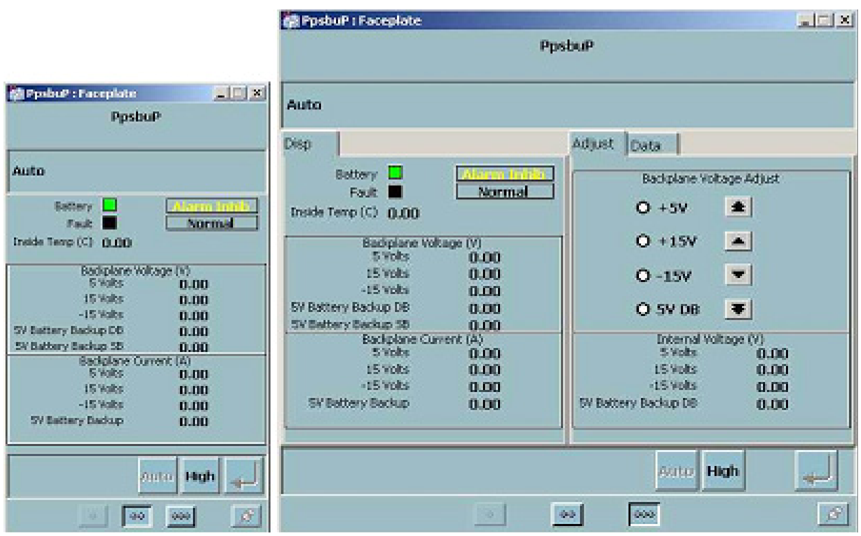


Figure 199. PSB Module

Sequence Control Functions

The available sequence control faceplates are:

Parameter (PAR). The Parameter module faceplate represents a parameter storage function block in an 800xA for DCI controller. The PAR module reports up to 16 values and names associated to each value, and alarm status used for display in the faceplate. Figure 200 shows the layout of the PAR normal sized faceplate and its attributes.

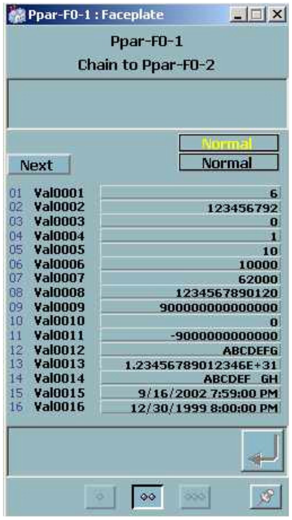


Figure 200. PAR Module

Phase (PHS). The Phase module faceplate represents a phase operation function block in an 800xA for DCI controller. The PHS module reports the phase ID, the CCL (Controlware Command Language) file currently associated to the phase module, and the pseudo device names and types used by the CCL file for display in the faceplate. Figure 201 shows the layout of the PHS normal sized faceplate along with a CCL pop-up and its attributes.

Pointer Table (PTB). The Pointer Table module faceplate represents a table of pointers function block in an 800xA for DCI controller. The PTB module reports up

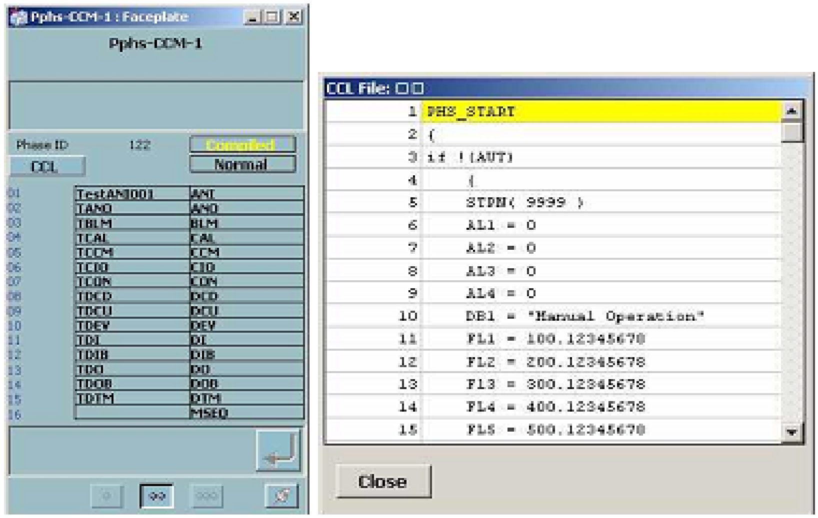


Figure 201. PHS Module (with CCL Pop-up)

to 16 pointer values and pointer names for specified attributes, and alarm status used for display in the faceplate. Figure 202 shows the layout of the PTB normal sized faceplate and its attributes.

Custom Control Module (CCM). The Custom Control module faceplate represents a flexible customized operation function block in an 800xA for DCI controller. The CCM can be used in situations where standard Controlware modules cannot meet the control needs of a process. The CCM module reports the operating mode, a step number, values of input signal attachments, storage registers, flags, constants, message indication, and output attachments that are available for use by CCL programs that are executed by the CCM and are used for display in the faceplate. It also identifies and links to CCL files and PTB, PAR and DEV Controlware modules that can source data into it. Figure 203 shows the layout of the CCM normal and extended sized faceplate with a CCL pop-up and its attributes.

Security (SEC). The Security module faceplate identifies the results of a bit wise comparison of 16 desired states versus actual states in an 800xA for DCI controller. The SEC is used for sequential operations where different steps or phases have

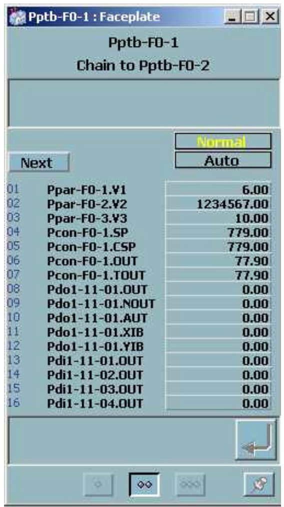


Figure 202. PTB Module

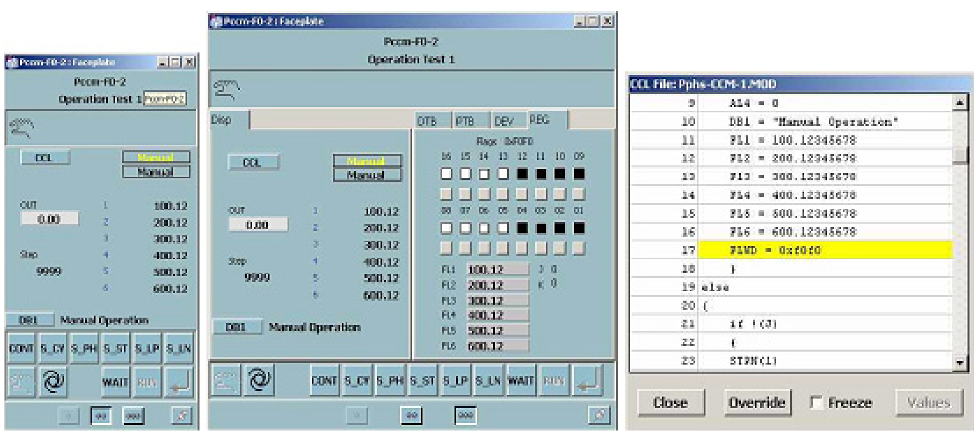


Figure 203. CCM Module (with CCL Pop-up)

different expected states for the same operational equipment. The SEC module reports 16 value names, their desired and actual states, the activation state for security, and alarm status that is used for display in the faceplate. Figure 204 shows the layout of the SEC normal sized faceplate and its attributes.

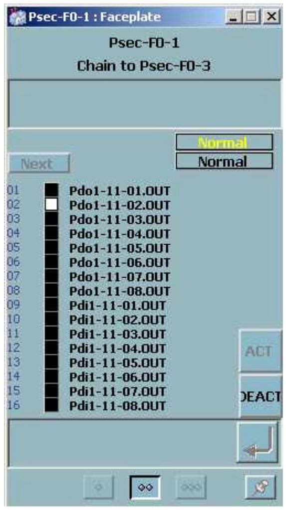


Figure 204. SEC Module

Device (DEV). The Device module faceplate represents a table of actual device names against a table of pseudo device names. The use of pseudo device names allows a phase CCL file to be written once using the pseudo device names so that it can be used for multiple trains of identical equipment. During phase execution, the selected pseudo device module will pull in the actual device data from the DEV module. The DEV module reports up to 16 pointer names for actual devices and 16 identically ordered names of an associated pseudo device module, and alarm status used for display in the faceplate. Figure 205 shows the layout of the DEV normal sized faceplate and its attributes.

Pseudo Device (PDEV). The Pseudo Device module faceplate represents a table of pseudo device names against a table of Controlware module types. The use of pseudo device names allows a phase CCL file to be written once using the pseudo device names so that it can be used for multiple trains of identical equipment. During phase execution, the selected pseudo device module will pull in the actual device data from the DEV module. The PDEV module reports up to 16 pseudo

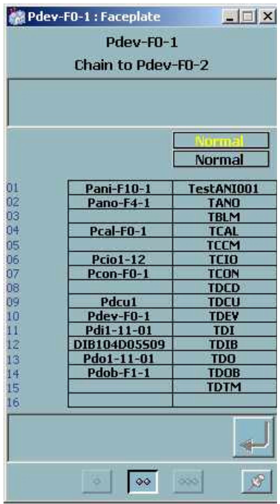


Figure 205. DEV Module

device names and 16 identically ordered Controlware module type identifiers, and alarm status used for display in the faceplate. Figure 206 shows the layout of the PDEV normal sized faceplate and its attributes.

Discrete Device Test Module (DTM). The Discrete Device Test module faceplate identifies multiple Discrete Control Devices used for fault state checking in an 800xA for DCI controller. The DTM is used for sequential operations where different steps or phases have different expected states for the same operational equipment. The DTM module reports 16 DCD names, the activation state for performing the test, and alarm status that is used for display in the faceplate. Figure 207 shows the layout of the DTM normal sized faceplate and its attributes.

Sequence (SEQ). The Sequence module faceplate represents a sequential operation function block in an 800xA for DCI controller. The SEQ can be used for processes that have multiple operations linked together in an ordered manner that follow a pre-defined sequence. The SEQ module reports the operating mode, the phase name in execution, the selected phase name to run, the phase number, the step number in execution, the selected step number to run, hold state cause, storage registers, flags, constants, and message indication that are available for use by CCL programs that

Figure 206. PDEV Module

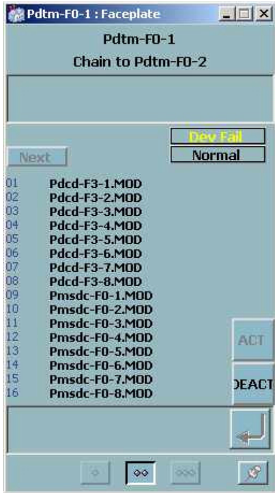


Figure 207. DTM Module

are executed by the SEQ via PHS triggering and are used for display in the faceplate. It also identifies and links to PHS names selected for the sequence, to CCL files running in the current selected PHS, to PAR modules that source and hold recipe data or batch results, to PTB and DEV modules that can source data into it, and to DTM and SEC modules that monitor the sequence run state. Figure 208 shows the layout of the SEQ reduced, normal and extended sized faceplate and its attributes.

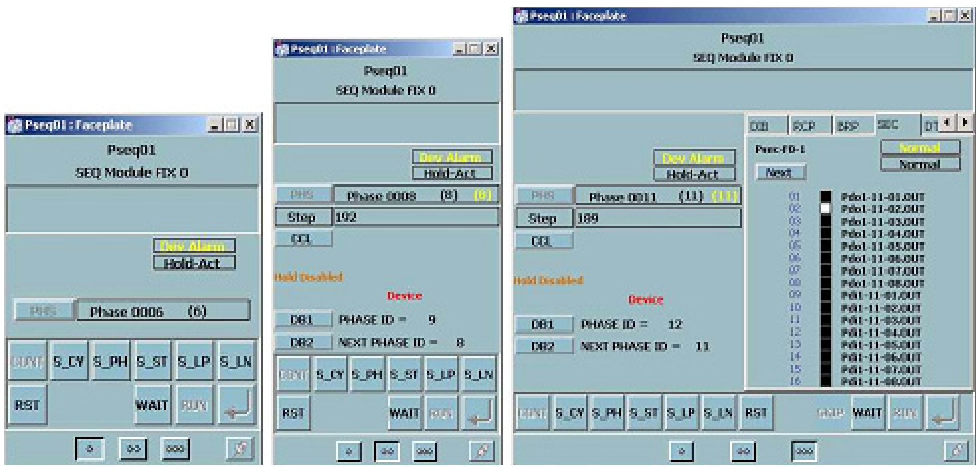


Figure 208. SEQ Module

Mini-Sequence (MSEQ). The Mini-Sequence module faceplate represents a sequential operation function block in an 800xA for DCI controller that is designed for use with 800xA batch management. The MSEQ can be used for processes that have multiple operations linked together in an ordered manner that follow a pre-defined, yet alterable, sequence. The MSEQ module reports the operating mode, the phase name in execution, the selected phase name to run, the phase number, the step number in execution, the selected step number to run, the batch unit mode, hold state cause, storage registers, flags, constants, and message indication that are available for use by CCL programs that are executed by the MSEQ via PHS triggering and are used for display in the faceplate. It also identifies and links to PHS names selected for the sequence, to CCL files running in the current selected PHS, to PAR modules that source and hold recipe data or batch results, to PTB and

DEV modules that can source data into it, and to DTM and SEC modules that monitor the sequence run state. Figure 209 shows the layout of the MSEQ reduced, normal and extended sized faceplate and its attributes.

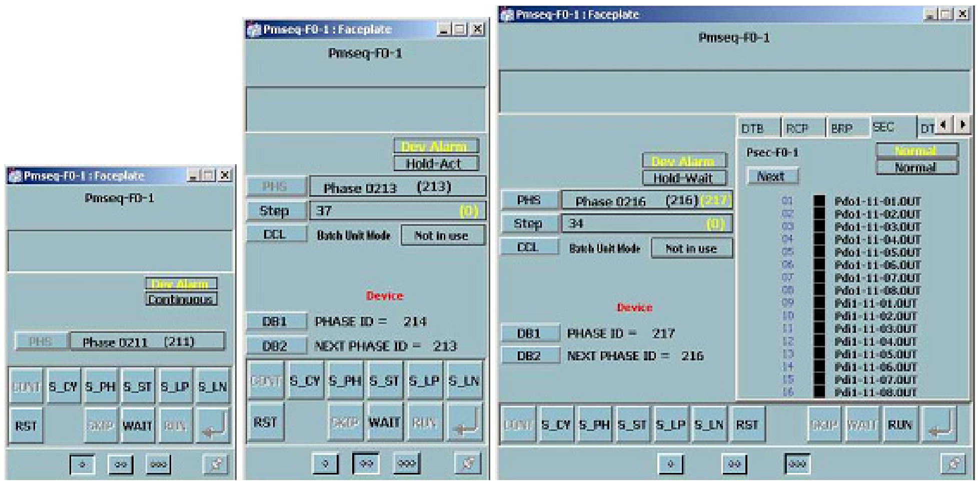


Figure 209. MSEQ Module

Data Exchange Functions

The available data exchange faceplates are:

Peer-to-Peer (PTP). The Peer-to-Peer module faceplate represents a request for sending or transmitting data from one 800xA for DCI controller to another. The PTP module reports the source or destination value name, the value in three formats (general, float, and count), operational mode, and alarm status used for display in the faceplate. Figure 210 shows the layout of the PTP normal sized faceplate and its attributes.

Message (MSG). The Message module faceplate represents a message issued from an 800xA for DCI controller to the system. The MSG module reports the message type and the message text, operational mode for manually triggering the message, and alarm status used for display in the faceplate. Figure 211 shows the layout of the MSG normal sized faceplate and its attributes.

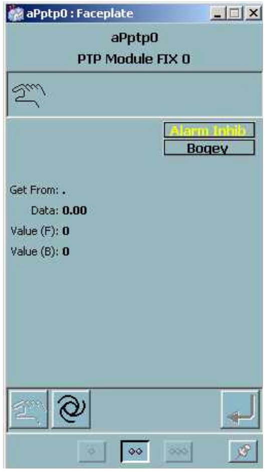


Figure 210. PTP Module

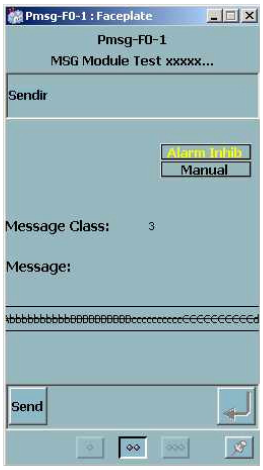


Figure 211. MSG Module

External Message (XMSG). The External Message module faceplate represents a message issued from a Micro DCI loop controller to an 800xA for DCI controller via a CIO board. The XMSG module reports the message text used for display in the faceplate. Figure 212 shows the layout of the XMSG normal sized faceplate and its attributes.

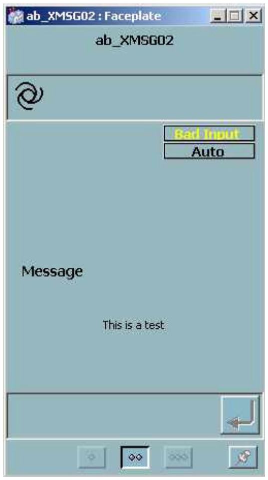


Figure 212. XMSG Module

Transfer (XFER). The Transfer module faceplate represents a data transfer function block within an 800xA for DCI controller. The XFER module reports up to 16 input values and tag names associated to each value, the status of each transfer, the enabling state of each transfer, the output tag name associated to each transfer, and alarm status used for display in the faceplate. Figure 213 shows the layout of the XFER normal and extended sized faceplate and its attributes.

Profibus Mapping (PMAP). The Profibus Mapping module faceplate represents mapping of Profibus data packs from a Profibus device to Controlware stored values in an 800xA for DCI controller. The PMAP module provides up to 16 stored values that can be set to different data types such as integer, double integer, string, etc. The PMAP module reports the 16 values, the data types of each value, the quality of each value, and alarm status used for display in the faceplate. Figure 214 shows the layout of the PMAP normal sized faceplate and its attributes.

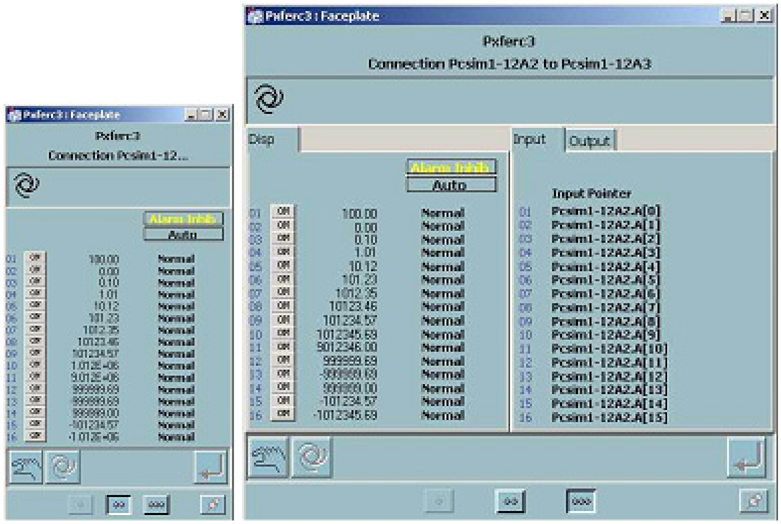


Figure 213. XFER Module

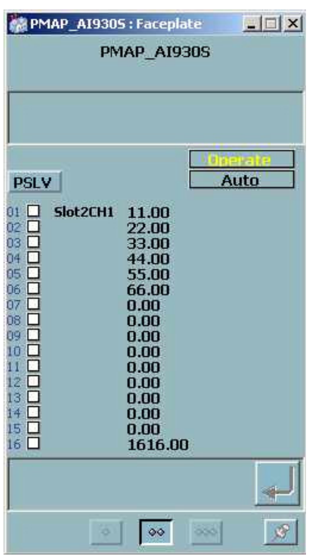


Figure 214. PMAP Module

External Control (XCON). The External Controller module faceplate represents a PID controller in a Micro DCI loop controller via a CIO board. The XCON module allows plant operators to monitor and control MICRO-DCI controllers from an 800xA for DCI operator station. Each XCON module provides space for storing the major PID control parameters associated with one loop of a MICRO-DCI controller in a CIO database module used for display in the faceplate. Figure 215 shows the layout of the XCON reduced, normal, and extended sized faceplate and its attributes.

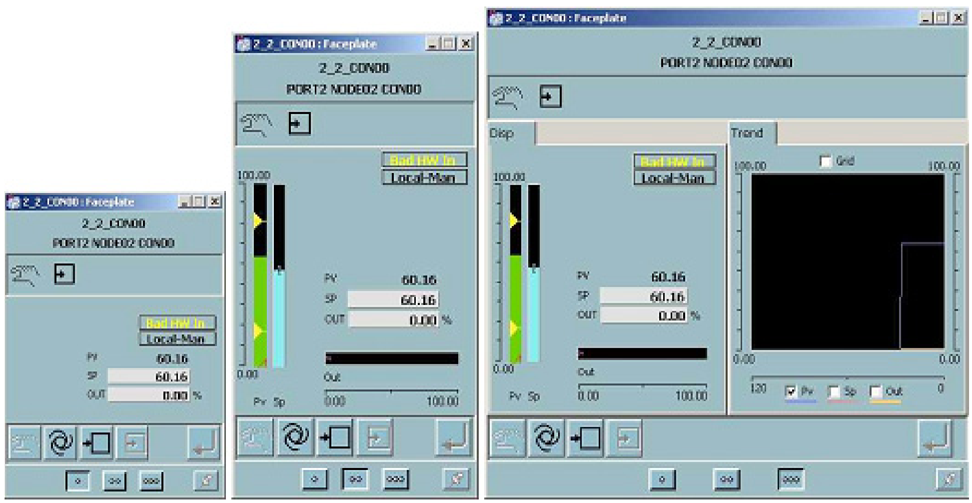


Figure 215. XCON Module

Analog Input Output Block (AIOB). The Analog Input Output Block module faceplate represents a group of 16 analog values sourced from a CIO board. Figure 216 shows the layout of the AIOB normal sized faceplate and its attributes.

Discrete Input Output Block (DIOB). The Discrete Input Output Block module faceplate represents a group of 16 discrete values sourced from a CIO board. Figure 217 shows the layout of the AIOB DIOB normal sized faceplate and its attributes.

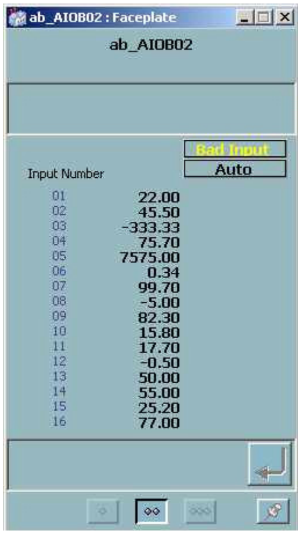


Figure 216. AIOB Module

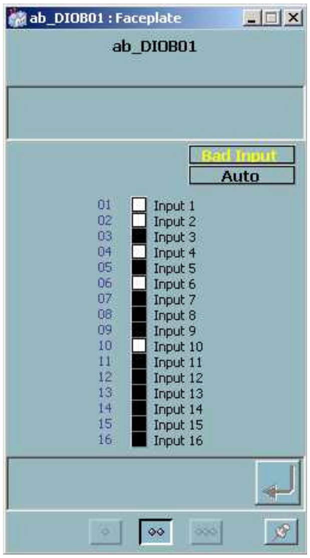


Figure 217. DIOB Module

Analog Input Output (AIO). The Analog Input Output module faceplate represents a single analog data item sourced from a CIO board. Figure 218 shows the layout of the AIO reduced, normal, and extended sized faceplates and its attributes.

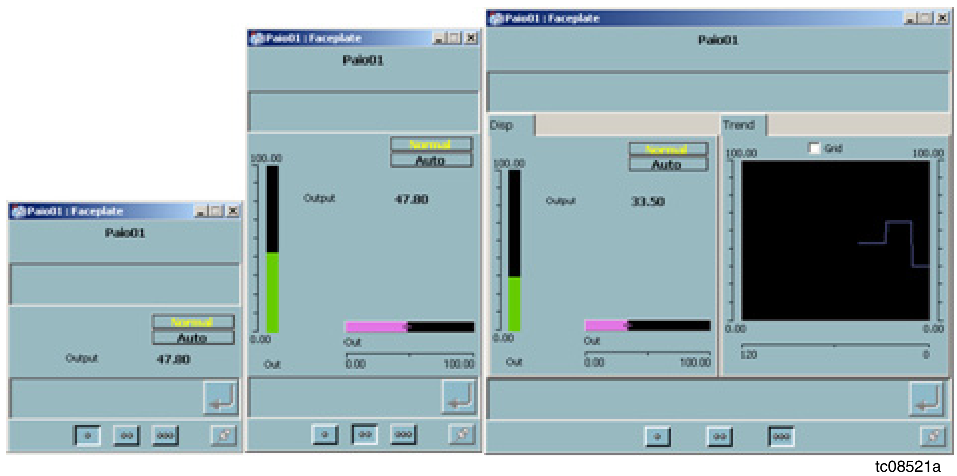


Figure 218. AIO Module

Logic Partitioning Functions

The available logic partitioning faceplate is:

Module Set (MSET). The Module Set module faceplate represents a definition for associating a logical grouping of Controlware modules in an 800xA for DCI controller. Entering the MSET number into the MSET atom of each Controlware module makes the logical grouping. The MSET allows single commands for locking, unlocking, or changing security access levels to be invoked across all modules in the group at once. The MSET module reports the lock state, the security levels for 3 data access types, the batch name currently in use (Note that 800xA batch management is not yet supported by 800xA for DCI), and alarm status are used for display in the faceplate. Figure 219 shows the layout of the MSET normal sized faceplate and its attributes.

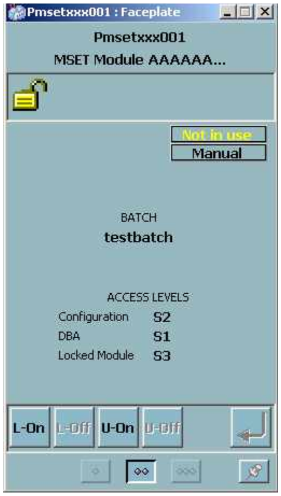


Figure 219. MSET Module

Appendix E 800xA for MOD 300

This appendix describes the MOD 300 integration into System 800xA.

800xA for MOD 300 uses the Operator Workplace for direct and fast access to MOD 300 specific functions. These functions include: preconfigured displays for monitoring and control of the MOD 300 system using familiar CCF, TCL, TLL, environment and system displays and faceplates.

Benefits

800xA for MOD 300 enables MOD 300 installations to easily and efficiently draw benefits from the information integration delivered by the 800xA System.

The MOD 300 control packages (CCF, TCL, and TLL) provide automatic control functions that may or may not involve operator interaction, depending upon the requirements of each particular application. When operator interaction is required, the operator interface is primarily supported by MOD 300 specific displays.

The following major functions are supported by the operator interface:

- Values of parameters from loops are displayed in numerical and graphic form.
- Operators can change certain parameter values such as setpoints, outputs, setpoint modes, output modes, and device commands from the console.
- Display and acknowledgment of alarm conditions.
- Operators can change (tune) some aspects of the configuration while the system is operating.
- 800xA for MOD 300 supports multisystem integration. Adhoc subscriptions and MOD 300 displays are not supported from subscribing systems. Refer to Multisystem Integration on page 112.
- Support for Alarm Shelving function.

- Support for Point of Control function.

Operations

Operations-related items and activities associated with 800xA for MOD 300 are:

- Controller Integration.
- Configurable Control Functions.
- Group Displays.
- Area Displays.
- Taylor Control Language (TCL).
- Taylor Ladder Logic (TLL).
- I/O Displays.
- Process Dialog.
- Standard Displays.
- Graphics.
- Alarm and Event.
- Loggers.
- Report and History Services Interfaces for Information Management.
- System Status.

Controller Integration

800xA for MOD 300 is a function within the complete ABB Industrial IT solution. It provides integration of the 800xA System and the Advant OCS/MOD 300 control network (DCN or eDCN). An external RTA (Real Time Accelerator) Unit allows the Connectivity Server to provide the physical connection to the DCN or eDCN and the following controllers:

- AC 460 Series.
- AC 410 Series.
- MOD 300 Controller Subsystem (SC Controllers and Model B).
- MOD 300 Multibus.

Standard MOD 300 displays are presented in an intuitive form using standard formats similar in features and functions to the Unix and Multibus based OCS system using the framework of the Aspect Object technology found in the 800xA System.

Configurable Control Functions

The CCF runtime support displays are:

- Loop Detail.
- Loop Faceplate.
- Loop FCM.
- Loop Template.
- Area Displays (Alarm, Status, and Graphic).
- Group Displays (Trend, Alarm, Status, and Graphic).

The Loop Detail Display, Figure 220 for example, provides the means to manipulate tunable parameters. The information available on this display varies according to the loop type: Control, Continuous, PID, and Device.

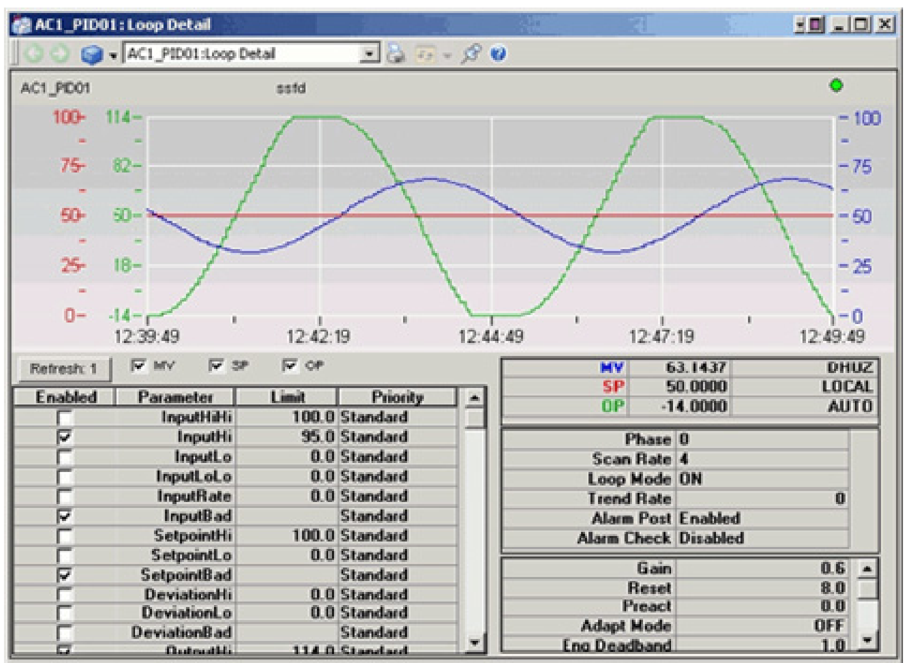


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Figure 220. Loop Detail Display for a PID Loop

These basic operational displays are supported by runtime versions of the Loop Definition and FCM Templates through the Loop FCM display. Continuous loops perform indication, and calculation functions. Control loops provide output control and PID loops provide output control with a setpoint. Device loops control discrete devices such as fans and motors.

Group Displays

A group is a collection of related loops. Generally, a group has up to 12 control loops or up to 36 indicator loops or a combination of both. Control loops assigned to indicator targets provide limited information and cannot be used for control.

Monitoring and control functions (control is enabled in the MOD Group Object) are provided in the Group Status and Group Trend displays. A custom graphic can be assigned to the Group Graphic display. The Group Alarm display is a filtered list of a selected event group page.

Area Displays

An area is a collection of up to three groups. As such, each area is composed of up to 108 loops (control loops, indicator loops, or a combination of both). This provides a broader view of the process from a single display. Each area supports monitoring and control functions using Area Alarm and Area Status displays. A custom graphic display can be assigned to the Area Graphic display.

Taylor Control Language (TCL)

TCL displays support monitoring and control functions for TCL. You can use the sequential operational displays for:

- Monitoring units and sequences.
- Activating and deactivating programs.
- Controlling program state, status, and mode.
- Manipulating steps.
- Changing recipe values.
- Changing tag parameters.
- Recovery from TCL Abnormal conditions for invalid ISA 88 state changes (batch).

Users with the proper access authority can also troubleshoot and debug programs under runtime conditions from a Sequence Debug Display as well as receive and respond to unit messages. Users who are not assigned to a particular unit can monitor programs on the unit; however, they cannot perform control functions or receive messages.

The MOD 300 TCL display aspects are:

- MOD 300 TCL Unit Overview.
- MOD 300 TCL Unit Detail.
- MOD 300 TCL Recipe Detail.
- MOD 300 TCL Sequence Debug.
- MOD 300 TCL Sequence Detail.
- MOD 300 TCL SFC.
- MOD 300 TCL Unit Message.
- MOD 300 TCL Unit Array Plot.

The Sequence Debug Display, Figure 221 for example, supports runtime troubleshooting and debugging of sequences. The troubleshooting and debug functions on this display are trace and breakpoint. Control functions supported by the sequence debug display are: sequence state, mode, and status changes.

Taylor Ladder Logic (TLL)

TLL displays are used to monitor TLL segments and data structures. Each data structure has its own type of display (Counter, Register, Timer, I/O Points, File and Sequencer). The Counter, Register, Timer and I/O Points displays all include a search feature.

The MOD 300 TLL display aspects are:

- MOD 300 TLL Counter.
- MOD 300 TLL Counter Faceplate.
- MOD 300 TLL File.
- MOD 300 TLL I/O Point.
- MOD 300 TLL I/O Point Faceplate.
- MOD 300 TLL Register.
- MOD 300 TLL Register Faceplate.
- MOD 300 TLL Segment.
- MOD 300 TLL Sequence.
- MOD 300 TLL Timer.

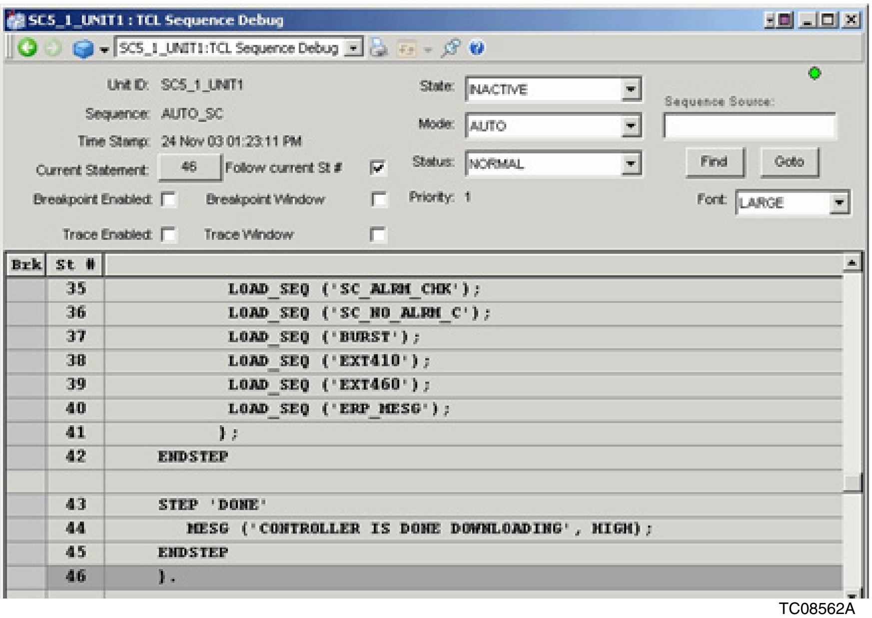

Figure 221. Sequence Debug Display

- MOD 300 TLL Timer Faceplate.

The Segment Display, Figure 222, is used to monitor and control the execution of Taylor Ladder Logic (refer to the TLL User's Guide). This display is accessed by selecting a Ladder Logic object and then selecting **Segment Display** from the context menu.

The Segment Display can be used to:
- Load and remove segments.
- Turn TLL scanning on and off.
- Debug segments by forcing the I/O points to specified conditions.
- Access displays for the TLL Data Structures (timers, counters, and so on).

The body of the display is a ladder logic diagram. In the left margin, the segment and rung numbers of each ladder rung are indicated. Line numbers are assigned according to the line number used in AdvaBuild. Some line numbers are without a rung because block instructions formerly used two lines for display purposes.

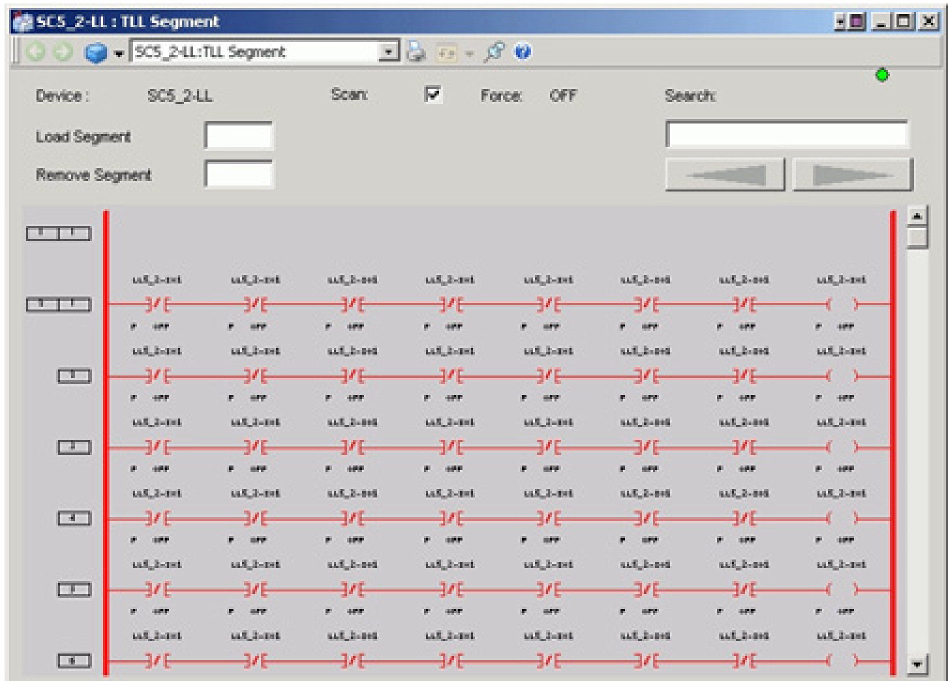

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Figure 222. Segment Display

I/O Displays

I/O displays contain information that allow you to identify detectable fault conditions, monitor general status and performance, change process outputs directly for testing, and control the status of redundancy. The I/O displays include:

- S800.
- S100.
- PROFIBUS.
- TRIO (SC and AC only).
- Direct I/O (Model B and SC only).

For example, the S800 Device display is started by selecting a configured I/O device from the S800 Station Display. The S800 Device display, Figure 223, shows information for the device and each channel configured for the S800 I/O module (device diagnostics are not displayed). Use the context menu to move up to the station and LAN displays. From this display you can:

- Change channel output value.
- Select loop CCF tag and start loop faceplate.
- Select TLL point tag and start TLL faceplate.
- Select S800 device configuration display.

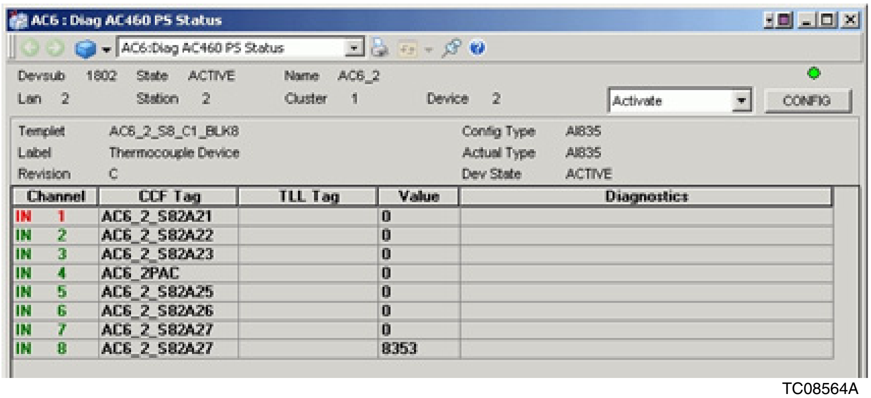

Figure 223. S800 Device Status Display

Process Dialog

Faceplates enable you to change the setpoint and output values displayed for the loop in the Loop Detail Display as well as other values and modes. Reduced size faceplates (Figure 224) provide the basic operator control actions without the process bar graphs of the standard size faceplate (Figure 225).

Standard Displays

Standard MOD 300 displays are automatically created when tags are imported from AdvaBuild and when environment groups and areas are imported. Graphics must be recreated.

Graphics

The MOD_DValue graphic provides a dynamic value graphic element to support MOD 300 data. The subelement is included in the Graphics Structure, Graphics

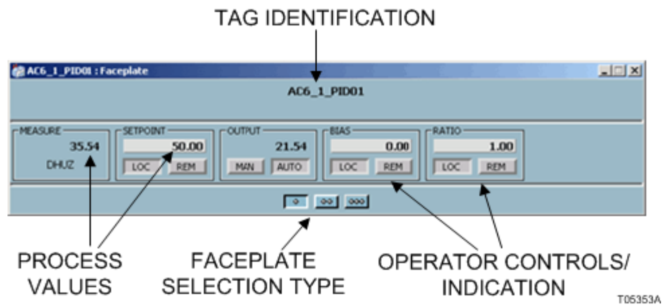

Figure 224. MOD 300 CCF PID Loop Reduced Faceplate

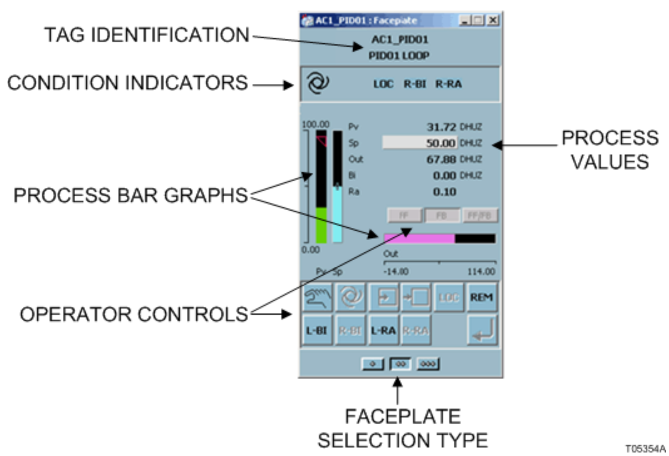

Figure 225. MOD 300 CCF PID Loop Standard Faceplate

Tools as an OCS Graphic Subelement. This provides the Graphic Builder the library support for OCS Graphic Subelements. Standard parameters are: FillColor, Min, Max, TextAlign, Visibility, ToolTip, ScientificFormat and StandardFormat.

Alarm and Event

MOD 300 has multiple alarm conditions per object (Measure, Setpoint, Output, Deviation and so forth). To handle these properties, a MOD Alarm/Event List is provided as an aspect. Alarm/Events are handled as follows.

Alarm/Event types with user action (acknowledgement):
- CCF (Measure, Setpoint, Output, Deviation, Device).
- TCL (Message, Reply, Error, Unit Alarm).
- Diagnostics.
- User Ack (outgoing).
- TCL Reply (outgoing).
- Global Ack broadcast (incoming).
- Global Ack broadcast (outgoing).

Event types with no user action required (for history/loggers only):
- Parameter Change (incoming).

Parameter change messages for template and faceplate changes always come through as Administrator.

- User Log On/Off (incoming).
- User Ack (incoming).

Loggers

The following MOD Alarm and Event Loggers are delivered as default aspects in the Library structure. The filters for the logger aspects are the same as for their equivalent list aspects.

- MOD CCF Alarm Logger (MOD CCF Alarm).
- MOD Diag Logger (MOD Diagnostic Operator).
- MOD Event Logger (MOD Parameter Change, MOD User Acknowledge, MOD User Log On/Off).
- MOD TCL Message Logger (MOD TCL Alarm, MOD TCL Billboard, MOD TCL Error, MOD TCL Reply).

Report and History Services Interfaces for Information Management

TCL statements that interface with Report Services and History Services functions in Information Management include: STARTBATCH…ENDBATCH structure, TRENDON…TRENDOFF statements, and RECORD statement. These statements provide the means to:

- STARTBATCH…ENDBATCH: Create a batch file where data for a specific batch is recorded.
- TRENDON…TRENDOFF: Mark the start and end of data collection.
- RECORD Reports: Record the current value of a local variable or parameter to Reports (PDL Interface).
- REPORT: Allows TCL to schedule reports through the 800xA System Scheduler.

System Status

Diagnostic/status displays contain system and subsystem level information that allow you to identify detectable fault conditions, monitor general status and performance, change process outputs directly for testing, and control the status of redundancy. The MOD 300 Diagnostic/Status display aspects are:
- MOD 300 System Status.
- MOD 300 AC410 CPS Status.
- MOD 300 AC460 CPS Status.
- MOD 300 Controller Subsystem.
- MOD 300 Message.
- MOD 300 Multibus.
- MOD 300 System Performance.

The System Status Display (Figure 226) shows the current status of all subsystems (nodes) recognized on the DCN. Each subsystem status icon lists the subsystem name, device address, device type, media state, device state, and controller status (Controller types only). The display has a large icon, small icon and a report view available through the context menu (shown). The Address and Type columns may be sorted by clicking on the column heading. Module message and performance displays can be viewed by right clicking in the Status column (shown).

Engineering

The engineering in a System 800xA for MOD 300 consists of two parts:

- Control engineering using AdvaBuild.

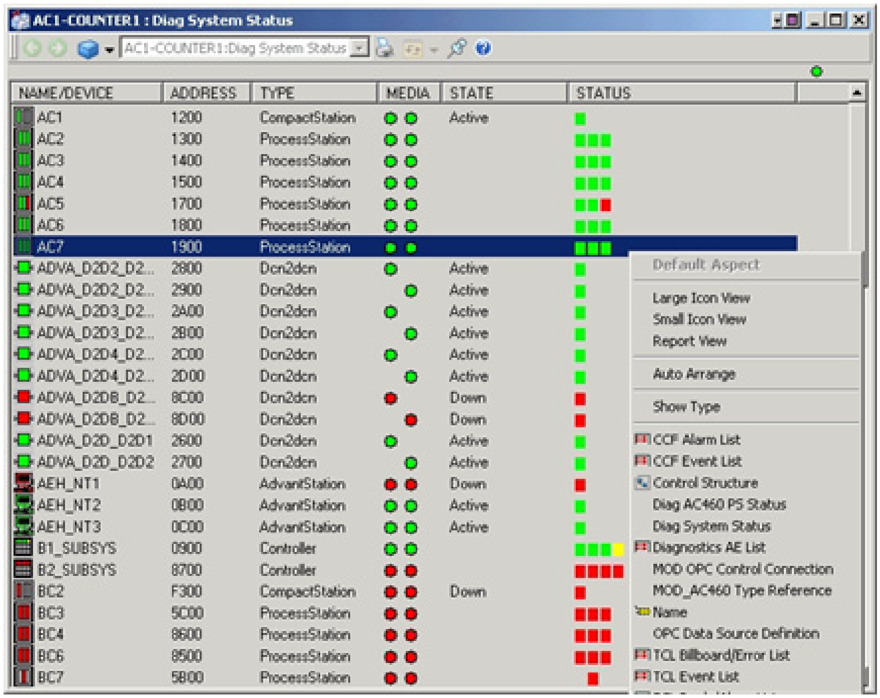

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Figure 226. System Status Display, Report View

- System 800xA engineering (import objects, configuration and graphic building).

MOD Tag Importer

The MOD Importer application is packaged with the 800xA for MOD 300 software and is used to populate the Control Structure of the Aspect Directory with object configuration data built using AdvaBuild. The application may be invoked from any 800xA for MOD 300 nodes. To use the MOD Importer, the system must meet the following requirements:

- All 800xA System software and 800xA for MOD 300 software must be loaded.
- An AdvaBuild for Windows 3.3/x project. Editing of MOD 300 Control configuration is done in AdvaBuild.

- Access to a working Aspect System is required.

Full or incremental additions to the Aspect Directory are supported. If an object already exists in the Aspect Directory it will not be overwritten. The importer application imports only applicable MOD tag object types.

MOD Environment Importer

The MOD Environment Importer application is packaged with the 800xA for MOD 300 software and is used to populate the Environment Structure of the Aspect Directory with environment area, group and block objects from a structured text file generated by the Environment Builder or MOD 300 CDP.

MOD 300 CDPs can take advantage of the ENVDUMP utility which generates a text file of the Environment. The Environment Builder can also be used to generate a print file (File > Print to File).

Objects that do not exist in the database will not be imported to the environment.

MOD_PHASE Importer

The MOD_PHASE Importer application is packaged with the 800xA for MOD 300 software and uses information from the MOD data base to populate the Control Structure with MOD Phase objects as a child of MOD_UNIT. The application may be invoked from any 800xA for MOD 300 nodes. The same system requirements as the Tag Importer must be met.

Process Objects

Predefined object displays and faceplates are included in 800xA for MOD 300, for the following supported standard process objects:

> MOD_AC410, MOD_AC460, MOD_AC460MOD, MOD_ADVANT_D2D, MOD_AREA, MOD_BUC, MOD_BUM, MOD_CCF, MOD_CCF_CONTIN_LOOP, MOD_CCF_CONTROL_LOOP, MOD_CCF_DEVICE_LOOP, MOD_CCF_PID_LOOP, MOD_CNTRLLER, MOD_CONSOLE, MOD_CONT_SS, MOD_CTRL_BLOCK, MOD_D2F, MOD_DB, MOD_DCN_DCN, MOD_GENERICD, MOD_LL_CNTR, MOD_LL_CNTR_GRP, MOD_LL_DEV, MOD_LL_I_O,

MOD_LL_IO_GRP, MOD_LL_REG, MOD_LL_REG_GRP, MOD_LL_TIMER, MOD_LL_TIMER_GRP, MOD_UNIT.

TLL ad hoc object support allows a TLL device to be imported and not the TLL elements that are contained by that device (no object is created). Timers, registers, counters and I/O are called as needed.

MOD 300 Utility

The MOD 300 Utility aspect provides a summary report that shows how many MOD tags are assigned to a MOD OPC Data Source and provides a total number of tags and logs assigned to a Connectivity Server. The MOD 300 Utility is an aspect of the MOD_DB object found in the Control Structure. The results of the report are displayed in the report window and can be copied using the context menu.

Included in the MOD 300 Utility report is a summary of the number of tags by type and total number of tags for each MOD OPC Data Source as well as a total for the Connectivity Server. The report shows totals for the following tags and logs:

- MOD_CCF_CNTRL_LOOP.
- MOD_CCF_CONTIN_LOOP.
- MOD_CCF_PID_LOOP.
- MOD_CCF_DEV_LOOP.
- MOD_UNIT.
- MOD_LL_DEV.
- Log Configuration.

MOD OPC Server Statistics Aspect

The MOD OPC Statistics aspect supports application development/system loading calculations by showing the number of Reads, Subscriptions, Updates and Writes as well as other related data (such as Update Rate, Value and Quality).

By using Subscribe for live data, the active numbers for information being handled by the MOD OPC Server are displayed. For example, an active PID faceplate may show 31 live subscriptions.

800xA Batch Integration

800xA for MOD 300 supports integration with 800xA Batch Management. 800xA Batch Management recipes supervise execution of MOD_PHASEs in the MOD 300

Control System. This is configured in MOD 300 by enabling the MOD 300 Batch OPC DA service for systems supporting 800xA Batch and running the MOD Phase Importer.

Within batch, the MOD Phase Sequence is a TCL Sequence adapted to provide ISA88 State Functionality. The MOD Phase Sequence is identified as a MOD_PHASE object in the Process Portal Control Structure. State, Mode, and Status is managed automatically as per the ISA88 State model.

System Configuration

The following topics provide 800xA for MOD 300 system and configuration information:

- 800xA for MOD 300 Configurations.
- MOD OPC.
- Configuration Guidelines.

800xA for MOD 300 Configurations

The 800xA for MOD 300 system configuration can consist of one, two or three Connectivity Servers (non redundant or redundant), an Aspect Server and up to 40 client workstations. In addition, there may be other Application Servers such as Information Management on the system. The Connectivity Server can not be combined with other server nodes or the Domain Controller.

MOD OPC

The MOD OPC DA and MOD OPC AE service providers are used to provide data access and alarm/event message handling. A service group is defined in the MOD_DB object using the OPC Data Source Definition aspect.

Configuration Guidelines

Consider these configuration guidelines before making changes to the default MOD 300 configuration.

- **MOD subelements/graphic symbols**
  The following aspects are supplied and maintained by ABB, they should not be updated or modified. Any changes made to these symbols will be lost when

upgrading to a newer version of 800xA for MOD 300. If changes are needed they need to be documented by the customer and reapplied after upgrading.
– Faceplates.
– MOD_DValue.
– Measure_DValue, etc.

- **Control Structure**
  The control structure must match the structure in AdvaBuild and can only contain MOD object types under the root level object MOD_DB. Additional objects or objects not in the proper location may cause problems with view/retrieving data.
- **MOD object types**
  All MOD objects must be based on the MOD object types. These object types may not be subclassed or superclassed.
- **MOD Environment Structure**
  The hierarchy of **MOD_ENV** -> **MOD_ENV_AREA** -> **MOD_ENV_GROUP** -> **MOD_ENV_BLOCK** -> **object** must be maintained in this structure. Additional objects of non MOD_ENV_* types may cause problems with viewing/retrieving data.
- **MOD configuration aspects**
  Templates, Colors, and Alarm pages aspects may be changed/updated but all changes should be documented in the event that these items are modified in a subsequent product release.

Appendix F 800xA for Symphony Plus Harmony

800xA for Symphony Plus Harmony is the integration of the Symphony Plus Harmony system into System 800xA. It supports full integration with Industrial IT technology products such as Batch Management, Information Management, and Asset Optimization along with leveraging the Aspect technology available in the System 800xA environment.

800xA for Symphony Plus Harmony uses standard software and hardware interfaces to provide a connection into the Symphony Plus Harmony system for view and control. Other features include: redundancy, flexible installation options, and high tag count support.

800xA for Symphony Plus Harmony may be deployed in parallel with existing Harmony system installations. Phased introductions of 800xA for Symphony Plus Harmony to existing customers will allow the customer to begin leveraging Industrial IT benefits immediately. The phased approach should be considered equally to a complete replacement of the current OCS HMI installation.

800xA for Symphony Plus Harmony provides the Harmony installed base the continued evolution of technology including Symphony Plus, while retaining existing control philosophy.

Features

The set of 800xA for Symphony Plus Harmony features and functions included in this release, specific to Harmony users is listed below:

- Advanced Harmony Control System Monitoring.
  - Enables Harmony control network monitors for diagnostic monitoring, reporting, and analysis.

- Expanded mixed system support of 800xA for Symphony Plus Harmony with other System 800xA connects. Refer to [1] in Table 1 on page 30 for System 800xA connect combinations.
- Harmony Batch integration.
- Harmony Uploader – utility for import and export of tag data from an exported (.mdb format) Composer Harmony to the Aspect Directory.
- Harmony System Diagnostic Displays.
  - Thin Client views of module/block/communication module details, loop/node topology, event counters, resetable event counters, etc.
- Harmony tag types faceplates, point displays, and select Web Aspects (Operating Parameters that is).
- Hot key support for Harmony tag objects.
- InfiNet and Symphony Plus support.
- Small system support - Combined AS+CS w/ 30k tags.
- SOE (Sequence Of Events) reporting.
- WEB-based Server Explorer – provides viewing of Harmony Server status and quality.
- Multisystem Integration - several 800xA Systems can be operated from a central location.
- Support for Alarm Shelving function.
- Support for Point of Control function.

Architecture

The System 800xA with 800xA for Symphony Plus Harmony architecture is supported through the and the Harmony Connectivity Server. This provides the mechanism to communicate to the Harmony control system via the OPC Data Access and Alarm and Event interfaces of the 800xA System.

In the System 800xA architecture there are Aspect Server nodes, Connectivity Server nodes, workplaces or client nodes, and thin clients. When 800xA for Symphony Plus Harmony is added to the system – the Harmony software is loaded on all of the 800xA nodes to provide the connectivity support to the system. The Harmony Server is loaded and runs on the 800xA Connectivity Server node. Multiple Connectivity Servers or server types cannot be loaded on the same node. For example, if you have a mixed system, AC 800M and Harmony, the servers need to be loaded on separate nodes. The Harmony software provides the Harmony Objects, which will be mirrored into the Control and Object Type Structure of the Aspect Directory Server. The Objects and Aspects associated to the Harmony system provide specific support to the data accessed by the Harmony node.

When planning the architecture to be utilized with 800xA for Symphony Plus Harmony, the Harmony control system architecture should be considered. The flexibility that 800xA for Symphony Plus Harmony offers allows either single or multiple Harmony control systems to be integrated into a single System 800xA. Figure 227 and Figure 228 offer possible logical architecture solutions to be considered.

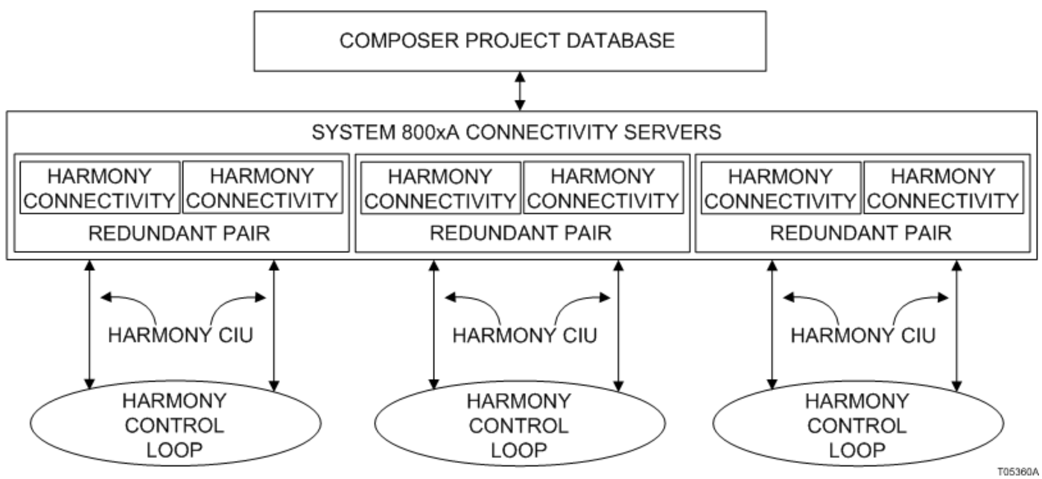


Figure 227. Harmony Aspect System

Engineering Workflow

The engineering workflow begins in Composer and ends in the 800xA Aspect Server and the Symphony Plus Harmony Control System. Composer engineering

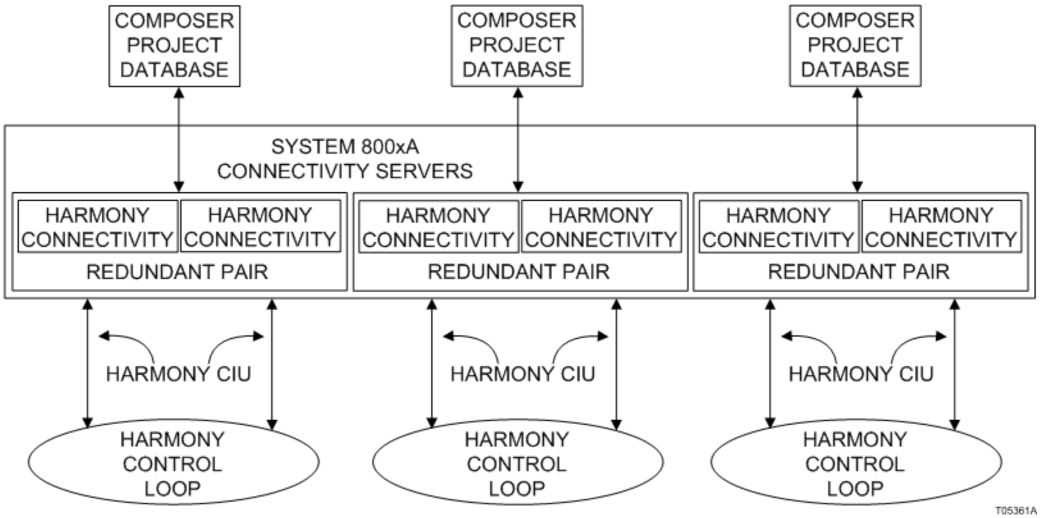


Figure 228. Harmony Aspect System with Separate Configuration Server

workstation supports configuring and editing of the project tag database and associated lists for Harmony (tag database, engineering units, alarm comments, and logic state descriptors.) These Composer based files are directly uploaded to the 800xA Aspect Directory. The following can be configured in the Composer project: area, unit, and equipment structures (these will be maintained in the Functional Structure of System 800xA). Other Composer console data such as Historian servers, group and trend displays are not usable in 800xA for Symphony Plus Harmony.

The Harmony system extension includes components that allow creation and updating of the Harmony objects in the Control Structure.

Figure 229 shows a configuration page of a Harmony object in the Plant Explorer.

Harmony Uploader

The Harmony Uploader Aspect imports Harmony configuration data from the offline configuration tool Composer Harmony. Configuration data consists of alarm

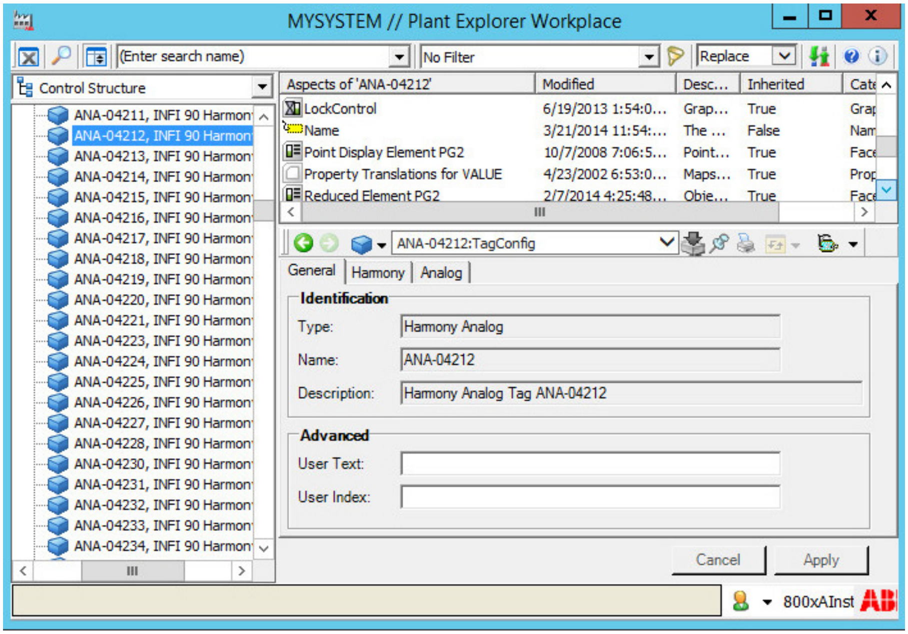


Figure 229. Harmony Workspace

comments, engineering unit descriptors, logic state descriptors, RMCB error code text sets, text selections, and tag definitions.

The Harmony Uploader Aspect can also export Harmony configuration data to a .mdb file compatible with Composer Harmony.

Bulk Data Manager

The 800xA Bulk Data Manager replaces the Harmony Bulk Configuration Manager for performing configuration changes through the Microsoft Excel.

Configuration Overview

Configuration data can be viewed and modified from any client in the system. User access rights grant or deny access to the configuration data.

All Harmony tag configuration data is maintained and stored centrally in the Aspect Directory. This insures that the configuration data of the system remains consistent and is in a central location for backup and restore purposes.

Time Synchronization

Time synchronization is used to maintain consistency in value, alarm and event reporting. Timestamps of these values must agree across the various interconnected systems.

800xA for Symphony Plus Harmony must be the time master in this system. This is required to ensure that time changes are only sourced from the Harmony control system and not from other systems. Time changes can be made by ramping the time up or down on the Harmony Server.

Harmony Configuration

The Harmony object configuration is maintained in the Aspect Directory. Harmony object types are used. These contain all aspects required to allow appropriate interaction and display.

The base Harmony types exist in the Object Type Structure under the Control System Object Type Group. The following types are defined:

- Analog.
- Data Acquisition Analog (DAANG).
- Enhanced Analog Input.
- Enhanced Analog Output.
- Digital.
- Enhanced Digital Input.
- Enhanced Digital Output.
- Data Acquisition Digital.
- Device Driver (DD).
- Multi-State Device Driver (MSDD).
- Remote Manual Set Constant (RMSC).
- Remote Control Memory (RCM).
- Remote Motor Control (RMCB).
- Station.
- Text Selector.
- ASCII Text.

- Server Tag.
- Module Status.
- PhaseX.

Each tag type has a control connection definition aspect, a faceplate aspect, a configuration page aspect, and Harmony specific aspects, such as Block Details, Module Details, and Operating Parameters.

The control connection aspect has parameters defined for all the OPC items for the object. Read/write and trend display parameters are also defined.

Backup and Restore of Configuration

The Harmony Backup or Restore utility is no longer required, all tag configuration information can now be backed up using the 800xA backup mechanism.

Sequence of Events Reporting

The SOE (Sequence of Events) in Harmony is intended for use by plant personnel to closely monitor critical digital points where the sequence of changes of state for points or groups of points are critical, and must be as accurate as possible. SOE lists all digital state transitions in time order and with one millisecond resolution.

SOE allows the collection of precise state transition event data originating in a SER (Sequence of Events Recorder), or a DSOE system in the control system. In the HSOE system, digital state transitions are recorded and time stamped to one millisecond resolution at the time of occurrence.

SOE reports can be created automatically based on a triggered valve of an object property. Report action parameters may be configured. These parameters include: Time Limit, Isolated Priority, Attempts, System Messages, report templates to be used, and export paths. This feature allows the flexibility to configure specific reports based on specific events.

SOE reports may be saved and later be reviewed and/or printed by any client on the system that has Microsoft Excel installed.

In conjunction with 800xA Information Management, reports may be archived for long term storage.

System Status Display

In the Harmony system, the individual node devices report control system status. These are represented as Harmony module status objects in the Control Structure. The system status display viewer displays a summary using input from system status reporters as shown in Figure 230.

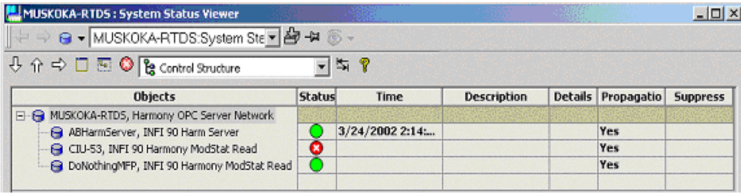


Figure 230. System Status Display

Harmony System Diagnostic Displays

The system diagnostic displays provided by 800xA for Symphony Plus Harmony are:

- Module Details.
- Block Details.
- Operating Parameters.
- Harmony Loop Topology.
- Node Topology.
- NIS Event and Error Counters.
- Module Exception Statistics.
- Communication Module Performance Statistics.
- Communication Module Details.
- Module General Information.

Module Details

The Module Details application provides detailed information about the operational status of a selected Harmony controller. The module details are presented in a series of tabs. The aspect is defined on each object type for convenience, and refers only to the source module. Figure 231 shows how the module details function appears on the display screen.

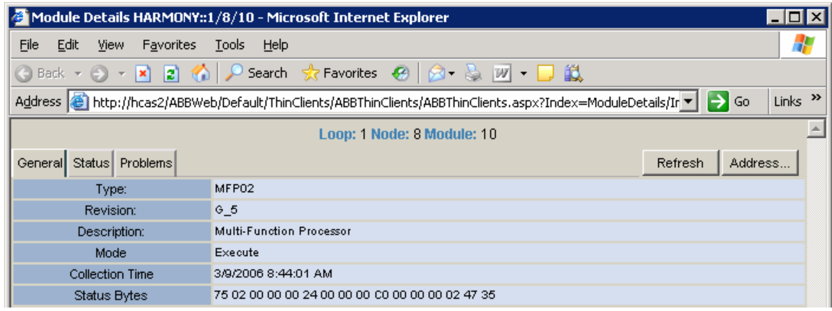


Figure 231. Module Status

Block Details

The Block Details function inspects function blocks that are within a selected controller. It displays specifications and the outputs of a selected function block and additional information related to the function code. Specifications of the selected function block are tunable. It also provides various methods for moving to other function blocks in the controller. Block details information is presented in a series of tabs. Figure 232 shows how the block details function appears on the display screen.

Operating Parameters

The Operating Parameters application allows tag monitoring and status changing of Harmony tags. The attributes of each tag are presented in a series of tabs. This application allows interaction with the tag object in Harmony including examination of key parameters, red tagging, inhibiting, and value substitution.

An important feature of the operating parameters application is the Manual Inhibit option of the General tab, as shown in Figure 233. This is used to disable event reporting for the tag in the same way as an automatic inhibit.

Another feature is the Substitute Value, used to enter a substitute value for the tag. When a substitution is applied, scan is automatically turned off. The value in the controller is unchanged. The substitute value is only performed at the Operator Workplace level. Only operators with the proper security level can access this substitute function. Figure 234 shows how the substitute function appears on the display screen.

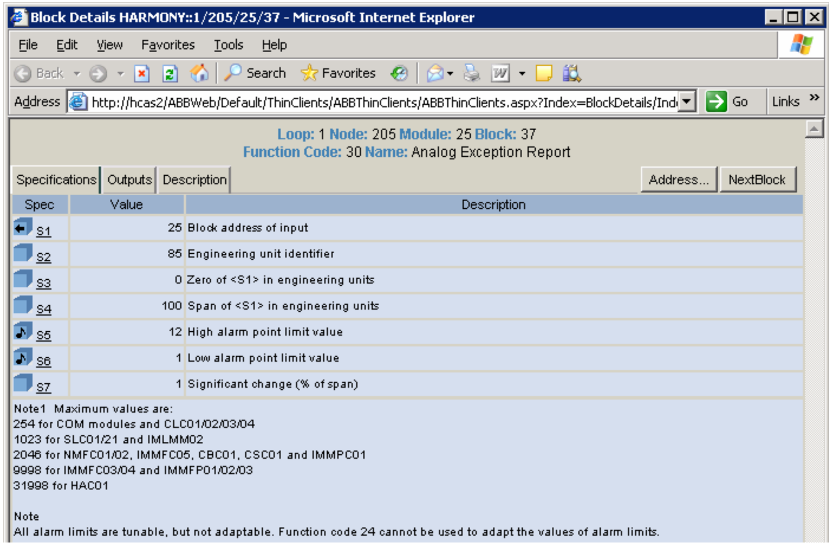


Figure 232. Block Details

The Red Tag feature (Figure 235) is available on controllable tag types that support red tagging.

Red tagging is a method used to place a tag out of service (for maintenance or other purposes) in a way that prevents it from being put back into service by unauthorized users. Typically only a limited number of users are permitted to implement this feature.

Harmony Loop Topology

The Harmony Loop Topology application provides a snapshot of the selected loop in a tabular overview. The address and node type are displayed in their relative position on the loop, not in numerical sequence. The **Refresh** button is used to update the current view. Refer to Figure 236.

Node Topology

The Node Topology application provides a snapshot of the selected node in a tabular overview. The node address, type, revision, and mode are displayed in numerical

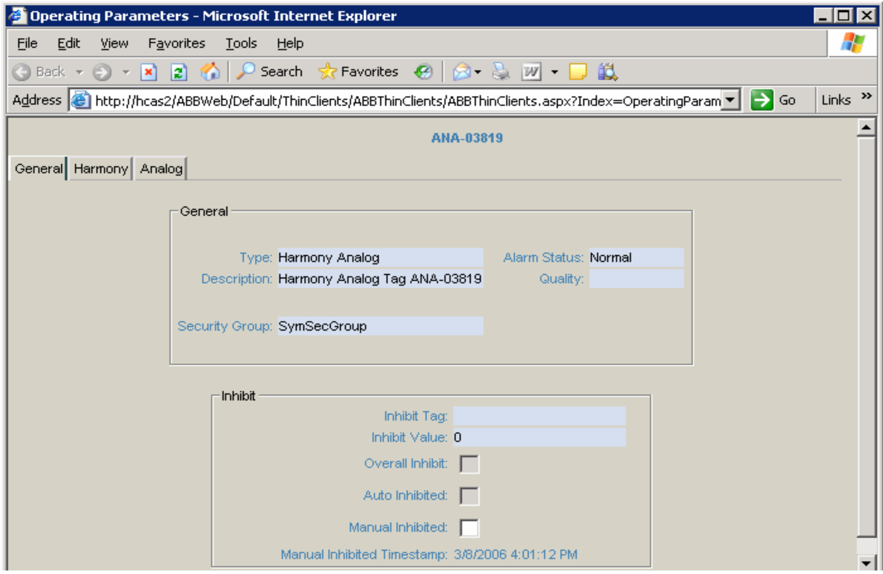


Figure 233. Operating Parameters - General Tab

Figure 234. Substitute Value

sequence. Only those nodes detected will be displayed. The **Refresh** button is used to update the current view. Refer to Figure 237.

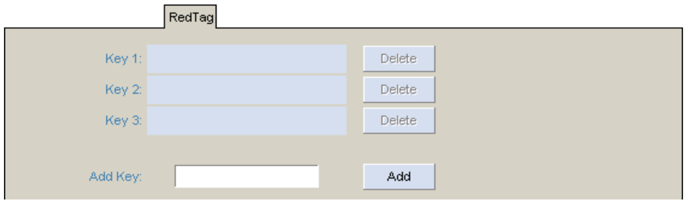


Figure 235. Red Tag

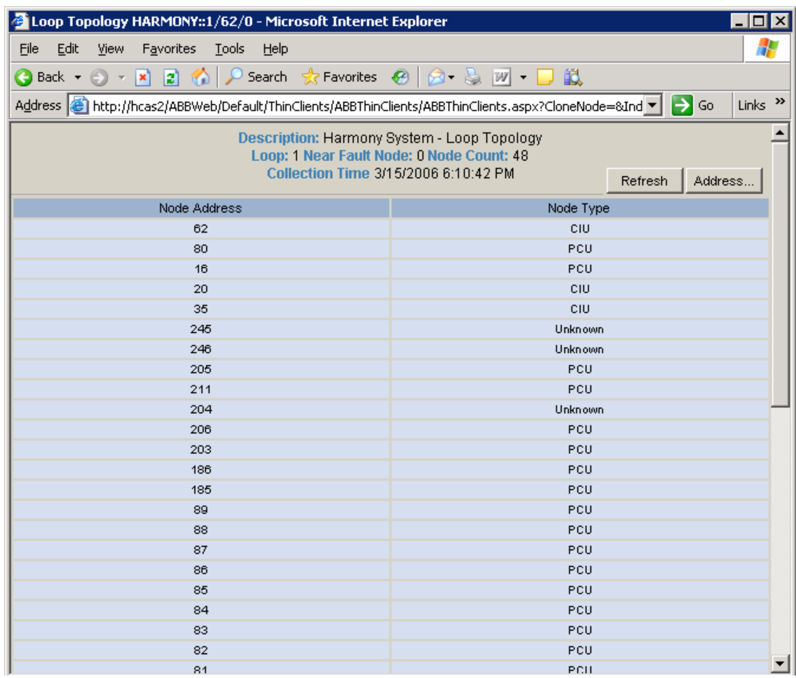
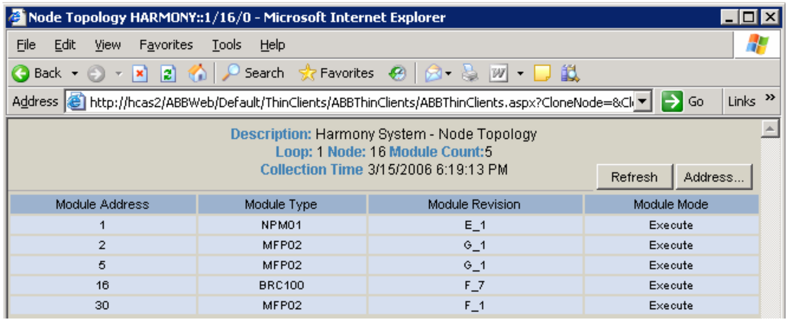


Figure 236. Loop Topology

NIS Event and Error Counters

The Event and Error Counters application contain a snapshot of event and error counters for a selected node. There are two different event and error counter



Module Address	Module Type	Module Revision	Module Mode
1	NPM01	E_1	Execute
2	MFP02	G_1	Execute
5	MFP02	G_1	Execute
16	BRC100	F_7	Execute
30	MFP02	F_1	Execute

Figure 237. Node Topology

applications; resetable and non-resetable. The **Refresh** button is used to update the current view. Refer to Figure 238.

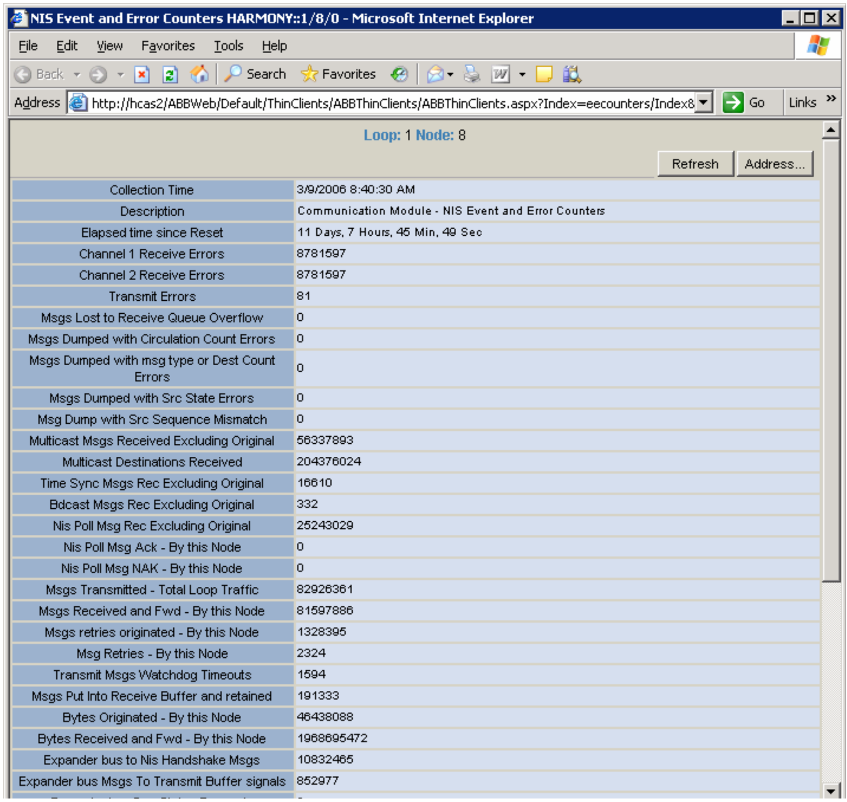
Resetable event counters are those values returned representing the number of events and errors that have occurred sin the most recent manual restart of the node or the most recent manual reset of the counters. Non-resetable event counters contain the number of events and errors that have occurred since the most recent manual restart of the node. Refer to Figure 239.

Module Exception Statistics

The Exception Statistics application provides a snapshot of the exception report precessing characteristics (load) for the selected node. The information displayed represents the number of events that have occurred since the most recent manual restart of the node or the most manual reset of the counters. The **Refresh** button is used to update the current view. Refer to Figure 240.

Communication Module Performance Statistics

The Communication Module Performance Statistics application provides a snapshot of the data precessing characteristics (load) for the selected node. The information displayed represents the communication data and rates the most recent manual restart of the node. The Refresh button is used to update the current view. Refer to Figure 241.



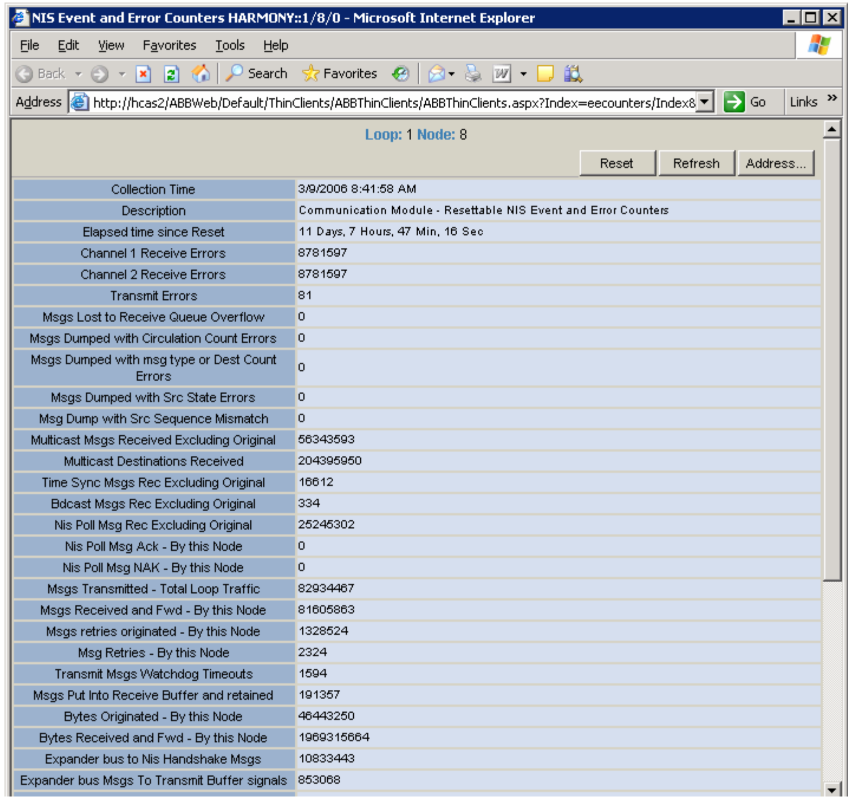
Loop: 1 **Node:** 8

Collection Time	3/9/2006 8:40:30 AM
Description	Communication Module - NIS Event and Error Counters
Elapsed time since Reset	11 Days, 7 Hours, 45 Min, 49 Sec
Channel 1 Receive Errors	8781597
Channel 2 Receive Errors	8781597
Transmit Errors	81
Msgs Lost to Receive Queue Overflow	0
Msgs Dumped with Circulation Count Errors	0
Msgs Dumped with msg type or Dest Count Errors	0
Msgs Dumped with Src State Errors	0
Msg Dump with Src Sequence Mismatch	0
Multicast Msgs Received Excluding Original	56337893
Multicast Destinations Received	204376024
Time Sync Msgs Rec Excluding Original	16610
Bdcast Msgs Rec Excluding Original	332
Nis Poll Msg Rec Excluding Original	25243029
Nis Poll Msg Ack - By this Node	0
Nis Poll Msg NAK - By this Node	0
Msgs Transmitted - Total Loop Traffic	82926361
Msgs Received and Fwd - By this Node	81597886
Msgs retries originated - By this Node	1328395
Msg Retries - By this Node	2324
Transmit Msgs Watchdog Timeouts	1594
Msgs Put Into Receive Buffer and retained	191333
Bytes Originated - By this Node	46438088
Bytes Received and Fwd - By this Node	1968695472
Expander bus to Nis Handshake Msgs	10832465
Expander bus Msgs To Transmit Buffer signals	852977

Figure 238. NIS Event and Error Counters

Communication Module Details

The Communication Module Details application provides a snapshot of the communication characteristics for the selected node. The information displayed represents the hardware address, type, revision level, memory utilization, and switch settings for the selected node. The **Refresh** button is used to update the current view. Refer to Figure 242.



Collection Time	3/9/2006 8:41:58 AM
Description	Communication Module - Resettable NIS Event and Error Counters
Elapsed time since Reset	11 Days, 7 Hours, 47 Min, 16 Sec
Channel 1 Receive Errors	8781597
Channel 2 Receive Errors	8781597
Transmit Errors	81
Msgs Lost to Receive Queue Overflow	0
Msgs Dumped with Circulation Count Errors	0
Msgs Dumped with msg type or Dest Count Errors	0
Msgs Dumped with Src State Errors	0
Msg Dump with Src Sequence Mismatch	0
Multicast Msgs Received Excluding Original	56343593
Multicast Destinations Received	204395950
Time Sync Msgs Rec Excluding Original	16612
Bdcast Msgs Rec Excluding Original	334
Nis Poll Msg Rec Excluding Original	25245302
Nis Poll Msg Ack - By this Node	0
Nis Poll Msg NAK - By this Node	0
Msgs Transmitted - Total Loop Traffic	82934467
Msgs Received and Fwd - By this Node	81605863
Msgs retries originated - By this Node	1328524
Msg Retries - By this Node	2324
Transmit Msgs Watchdog Timeouts	1594
Msgs Put Into Receive Buffer and retained	191357
Bytes Originated - By this Node	46443250
Bytes Received and Fwd - By this Node	1969315664
Expander bus to Nis Handshake Msgs	10833443
Expander bus Msgs To Transmit Buffer signals	853068

Figure 239. Resetable NIS Event and Error Counters

Module General Information

The Module General Information application provides a snapshot of the module (MFP/BRC) executive information for the selected module. The information displayed represents memory (RAM/NVRAM) and general configuration data (blocks/segments used) of the current loaded configuration. The **Refresh** button is used to update the current view. Refer to Figure 243.

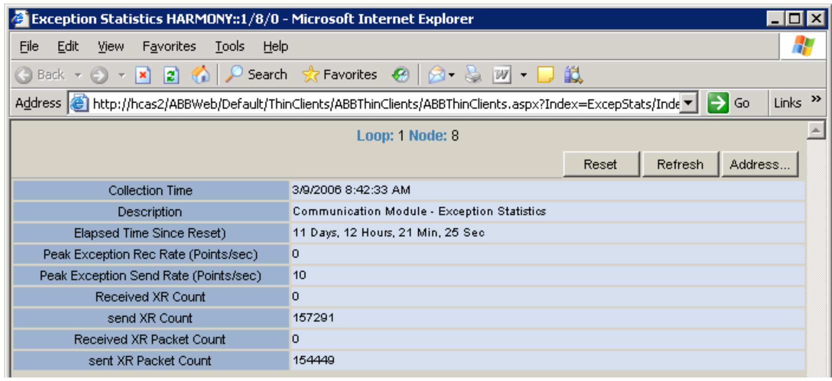


Figure 240. Module Exception Statistics

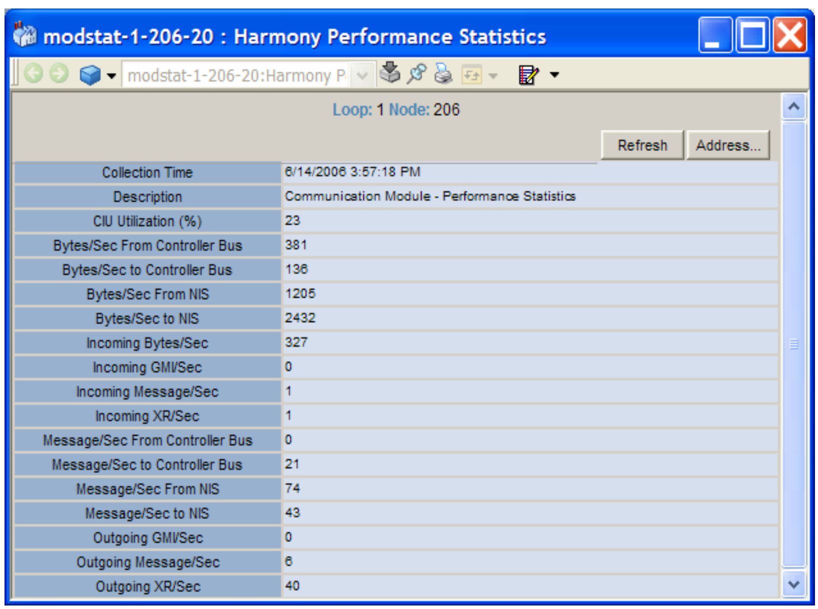


Figure 241. Communication Module Performance Statistics

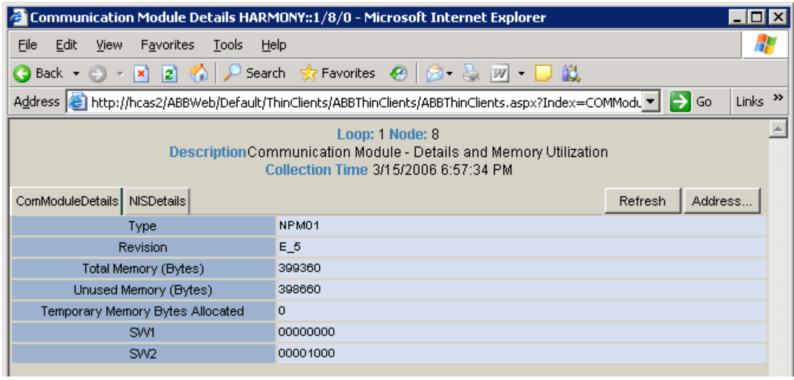


Figure 242. Communication Module and NIS Details

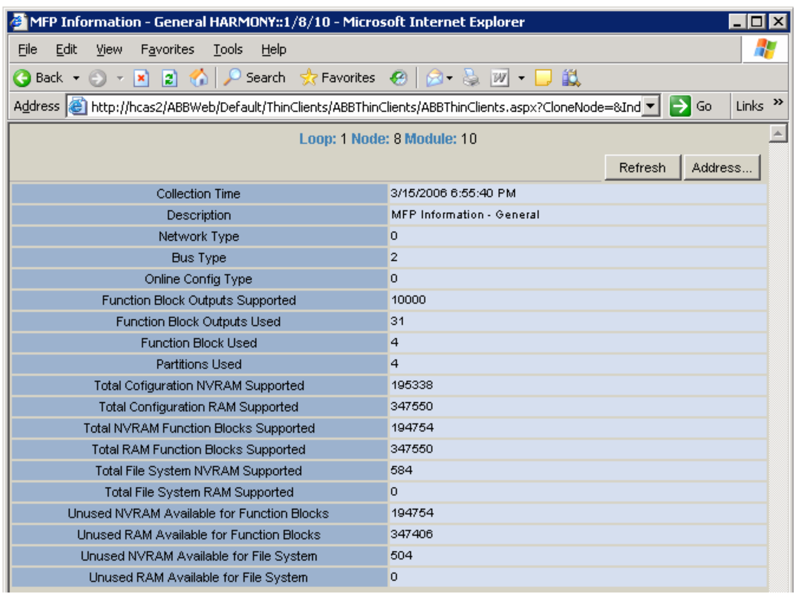
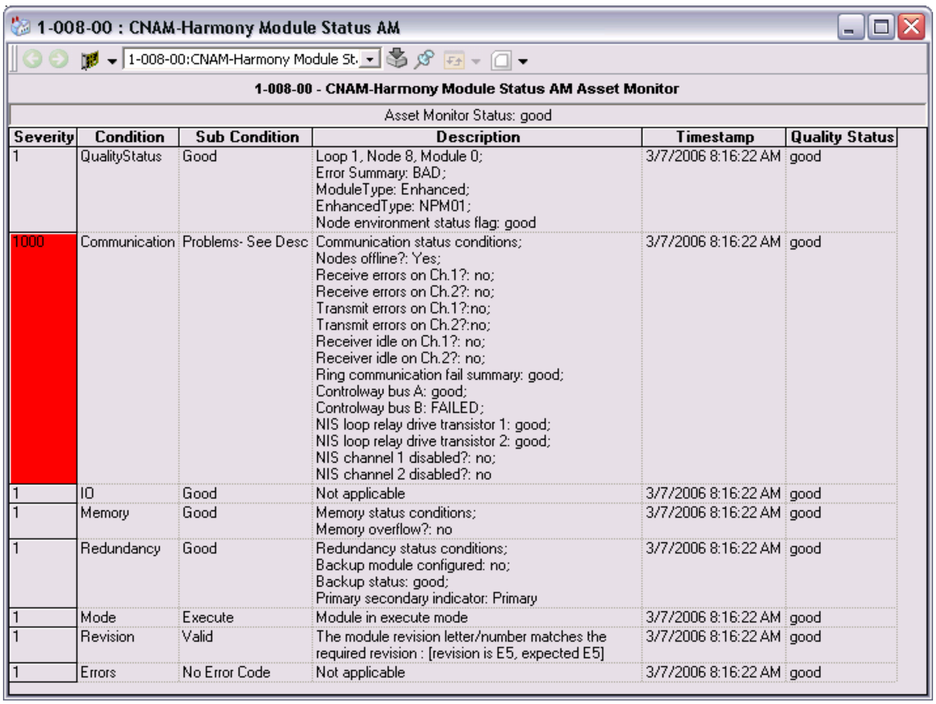


Figure 243. Module General

Advanced Harmony Control System Monitoring

The Advanced Harmony Control System Monitoring utilizes the System 800xA Asset Optimization to enable Harmony Control Network monitors for diagnostic monitoring, reporting, and analysis.

Harmony Control Equipment Asset monitors of Harmony Control equipment - (i.e. MFP/BRC, ICI, NIS, etc. from Module Status tags) for fault conditions that can be used as triggers in the Asset Optimization system. Refer to Figure 244.



Severity	Condition	Sub Condition	Description	Timestamp	Quality Status
1	QualityStatus	Good	Loop 1, Node 8, Module 0; Error Summary: BAD; ModuleType: Enhanced; EnhancedType: NPM01; Node environment status flag: good	3/7/2006 8:16:22 AM	good
1000	Communication	Problems- See Desc	Communication status conditions; Nodes offline?: Yes; Receive errors on Ch.1?: no; Receive errors on Ch.2?: no; Transmit errors on Ch.1?:no; Transmit errors on Ch.2?:no; Receiver idle on Ch.1?: no; Receiver idle on Ch.2?: no; Ring communication fail summary: good; Controlway bus A: good; Controlway bus B: FAILED; NIS loop relay drive transistor 1: good; NIS loop relay drive transistor 2: good; NIS channel 1 disabled?: no; NIS channel 2 disabled?: no	3/7/2006 8:16:22 AM	good
1	IO	Good	Not applicable	3/7/2006 8:16:22 AM	good
1	Memory	Good	Memory status conditions; Memory overflow?: no	3/7/2006 8:16:22 AM	good
1	Redundancy	Good	Redundancy status conditions; Backup module configured: no; Backup status: good; Primary secondary indicator: Primary	3/7/2006 8:16:22 AM	good
1	Mode	Execute	Module in execute mode	3/7/2006 8:16:22 AM	good
1	Revision	Valid	The module revision letter/number matches the required revision : [revision is E5, expected E5]	3/7/2006 8:16:22 AM	good
1	Errors	No Error Code	Not applicable	3/7/2006 8:16:22 AM	good

Figure 244. Harmony Control System Asset Monitor

Faceplates

The Harmony faceplates and associated point displays are available as aspects of a Harmony tag. Each of the following Harmony tags have faceplates and have point displays as extended faceplates except where noted:

- Device Driver (DD).
- Multi State Device Driver (MSDD).
- Remote Control Memory (RCM).
- Sequence of Events (SOE) Report Trigger Tag.
- Remote Manual Set Constant (RMSC).
- Remote Motor Control Block (RMCB).
- Station.
- Analog.
- Enhanced Analog In.
- Enhanced Analog Out.
- Digital.
- Enhanced Digital In.
- Enhanced Digital Out.
- Data Acquisition Analog (DAANG).
- Data Acquisition Digital (DADIG).
- ASCII Text String (no point display available).
- Text Selector (no point display available).
- Analog Export.
- Digital Export.
- Module Status (no point display available).
- Harmony Server Tag (no point display available).
- PhaseX (no point display available).

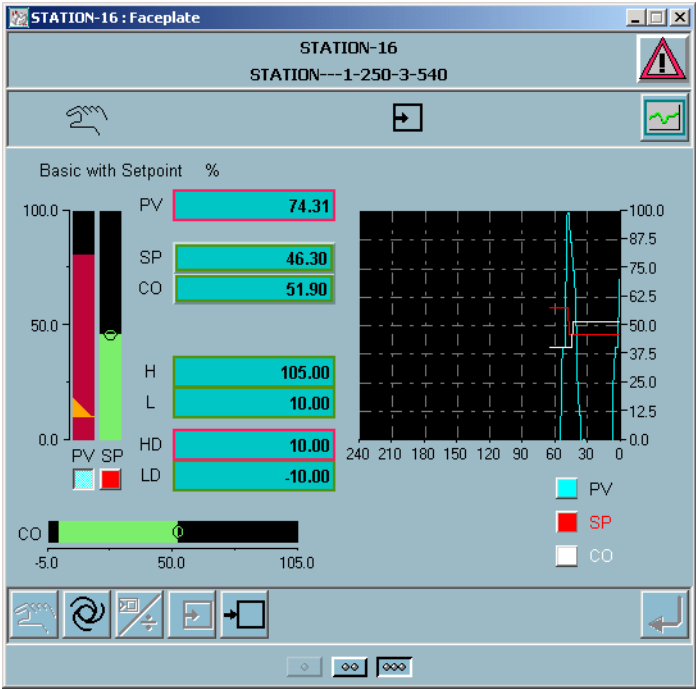
The following topics contain examples of a point display and some of the faceplates.

Point Displays

Harmony Point Displays are expanded faceplates that include rudimentary trend elements. They display the trace of the process value or state for the current time during the previous four minutes (240 seconds) of operation. Point displays occupy the extended slot of the faceplate control of those tag types that possess them. An example of a point display is the Control Station point display as shown in Figure 245.

Device Driver

The DD (Device Driver) faceplate represents a device driver function block in a Harmony controller. This function block provides an On or Off signal (On = one,



TC04471B

Figure 245. Control Station Point Display

Off = zero) to control a process device. A DD tag is required to both monitor and change the output provided by the block from the operator workspace.

The DD block exception reports the current state, two feedback states, override status, mode, alarm status and quality to be displayed in the faceplate.

Multi State Device Driver (MSDD)

The MSDD faceplate (Figure 246) represents the MSDD function block in a Harmony controller. This function block has three separate output conditions to provide three-state process device control.

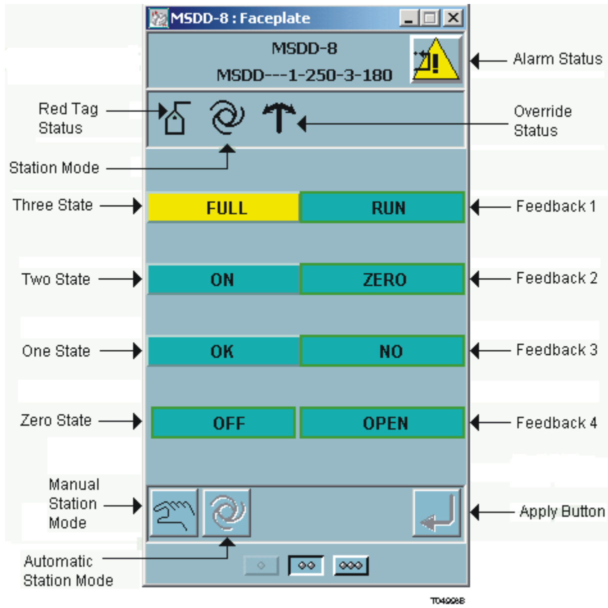


Figure 246. Multistate Device Driver Faceplate

Remote Control Memory (RCM)

The RCM faceplates represents an RCM function block in a Harmony controller. Such a function block provides a set/reset memory flip-flop to control a process device. An RCM tag is required to monitor and control the output of this function block.

The RCM block exception reports the current state, permissive state, override status, alarm status and quality to be presented in the RCM faceplate.

Sequence of Events (SOE) Report Trigger Tag

The SOE Report Trigger Tag faceplate represents an SOE trigger block in a Harmony controller. The SOE system monitors specific digital input points from the field, providing change of state data for such points (to one-millisecond resolution). An SOE report trigger tag is required to monitor and control the output of this block.

As with a standard RCM block, the SOE trigger block exception reports the current state, permissive state, override status, alarm status and quality to be presented in the SOE trigger report faceplate. However, there are three additional fields reported for SOE trigger tags: the read indicator, SOE report type and SOE recorder.

Remote Motor Control Block (RMCB)

The RMCB faceplate represents a remote motor control function block in a Harmony controller. Such a function block implements a start and stop logic sequence to direct the startup or shutdown of a process device. An RMCB tag is required to monitor and change the output provided by the block from the operator workspace.

The remote motor control block exception reports the current state, two feedback states, fault status, error code, alarm status and quality to be displayed in the RMCB faceplate. The following information explains the attributes that relate to an RMCB tag and its faceplate.

Station

A Station faceplate represents the Harmony stations. The same functions that can be performed and the same values that can be displayed on a station physically located in the plant are performed and displayed on the operator workspace using such a faceplate. The station presents a detailed online display of a single process loop. A station tag is required to acquire process values from a manual/auto (M/A) station block in a Harmony controller. The tag is also required for direct control.

The station block level (local or computer) and mode (manual or automatic, and basic, cascade or ratio) determine the operations that can be performed from the operator workspace. The level and mode are changeable from the operator workspace.

A Station function block exception reports the dynamic values, mode, alarm status and quality displayed in a Station faceplate. The following information explains the attributes that relate to the station tag type. Figure 247 shows the layout of the Station faceplate and its attributes.

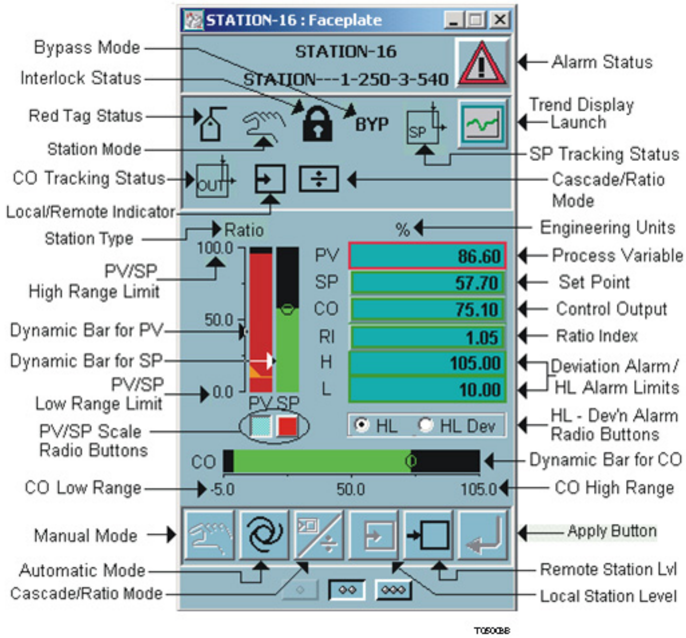


Figure 247. Station Faceplate

Data Acquisition

The Data Acquisition faceplates are used for the various data acquisition tag types.

Analog

Analog faceplates are representations of Harmony analog tags. An analog function block exception reports the current analog value, alarm status and quality that is presented in these faceplates. The following information explains the attributes that relate to the analog tag type. Figure 248 shows the location of the attributes to be included in the normal and reduced faceplates. Apart from alarm acknowledgement, these faceplates do not have any control capabilities.

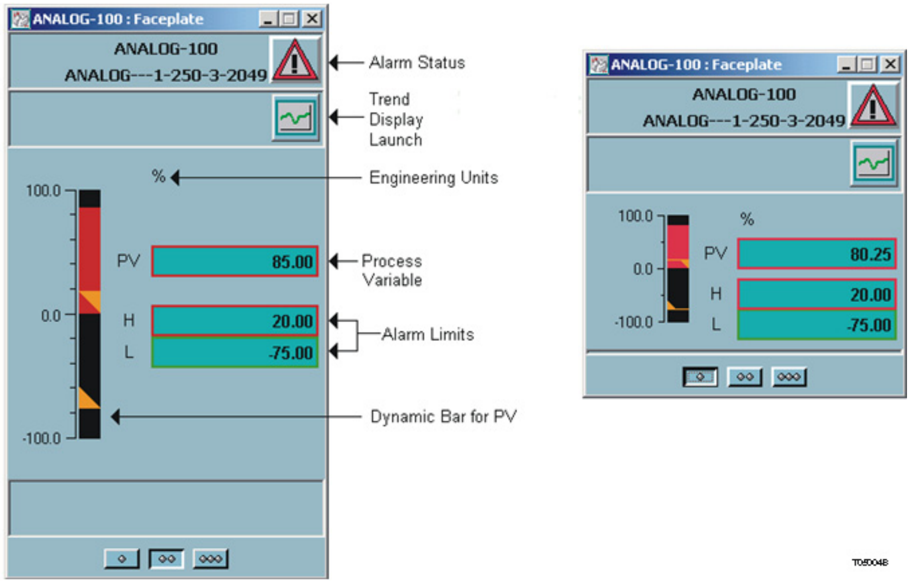


Figure 248. Normal and Reduced Analog Faceplates

Enhanced Analog

The Enhanced Analog faceplates are identical to the normal Analog faceplate, with some additional features. Enhanced Analog blocks have what are called the override status and override value. The Enhanced Analog faceplates allow these statuses to be changed. The override status indicates whether or not the current value is being overridden. These faceplates also show the I/O type, which is the type of enhanced analog block, input or output.

Digital

Digital Faceplates are representations of Harmony digital tags. A digital function block exception reports the current state, alarm status and quality that is presented in these faceplates. The following information explains the attributes that relate to the digital tag type. Figure 249 shows the location of the attributes to be included in the normal and reduced faceplates

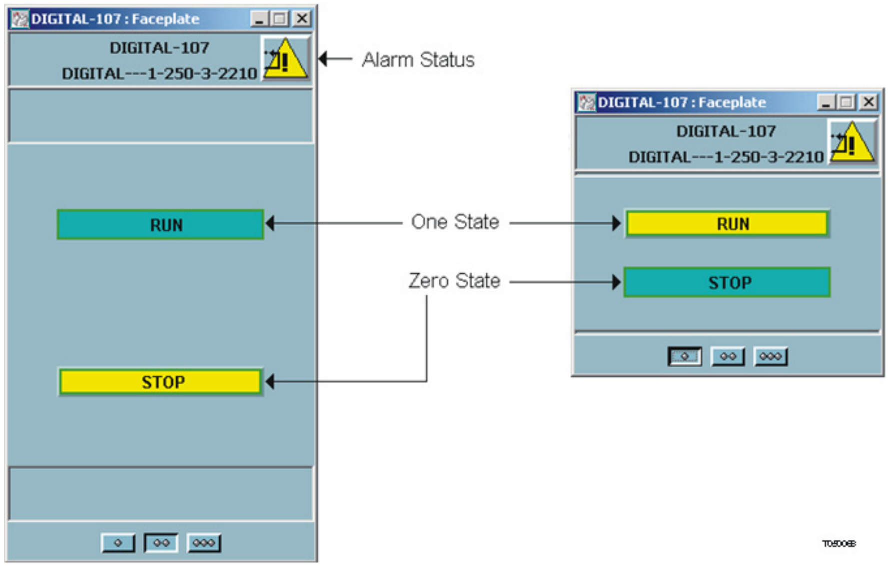


Figure 249. Normal and Reduced Digital Faceplates

Enhanced Digital

The Enhanced Digital faceplate is identical to the normal Digital faceplate, with some additional features. Enhanced Digital blocks have what are called the override status and override value. The Enhanced Digital faceplate allows the override status and override value to be changed. The override status indicates whether of not the current value is being overridden. These faceplates also show the I/O type, which is the type of enhanced digital block, input or output.

Data Acquisition Analog (DAANG)

A DAANG function code (FC 177) provides multilevel alarming, rate-of-change alarming and deviation alarming for an analog point. It also supports several time-based alarming options with time-based alarm filtering capabilities. It also allows interaction with the block in order to change input source, or to enter a user inserted value if desired. The block stores this user inserted value in non-volatile memory in the controller module.

The DAANG faceplate represents a data acquisition analog function block in a Harmony controller. A data acquisition analog tag is required to both monitor and control the operation of this function block.

The DAANG block exception reports the current analog value, input source mode, alarm status and quality to be displayed in the data acquisition analog faceplate. The following information explains the attributes that relate to such a tag and its faceplate. Figure 250 shows the location of the attributes described.

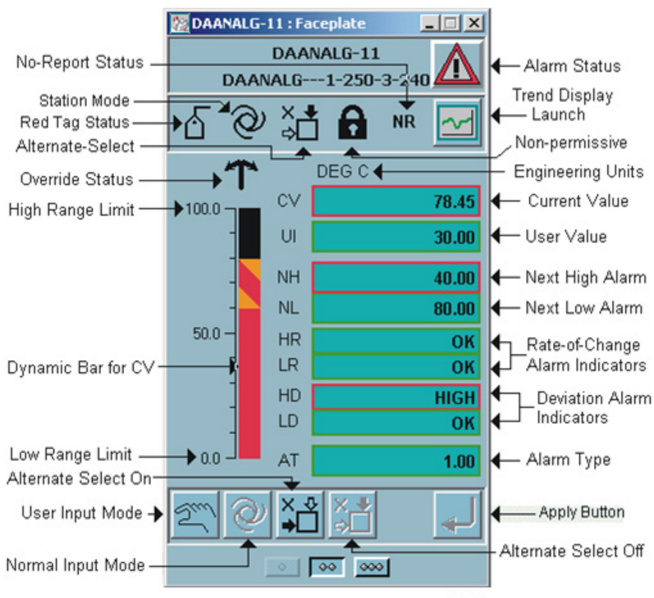


Figure 250. Data Acquisition Analog Faceplate

Data Acquisition Digital (DADIG)

A DADIG function code (FC 211) provides multilevel alarming capabilities for a digital point. Harmony allows interaction with the block in order to change the input source, or to enter a user inserted state, if desired. The block stores this user inserted state in non-volatile memory in the controller module. The DADIG faceplate represents a data acquisition digital function block in a Harmony controller. A data acquisition digital tag is required to both monitor and control the operation of this function block from the Operator Workspace.

The DADIG block exception reports the current state, input source mode, alarm status and quality to be displayed in the data acquisition digital faceplate. The following information explains the attributes that relate to such a tag and its faceplate.

ASCII Text String

The ASCII Text String faceplate allows interaction with an application program running inside a Harmony controller.

The user-defined data export block exception reports the ASCII string message, alarm status and quality that is displayed in an ASCII Text String faceplate. The attributes described below are incorporated into this faceplate.

Text Selector

The Text Selector (FC 151) sends message numbers to the Operator Workspace. The text selector can operate in one of two modes. The first mode uses the message number input to select the message to display. The second mode uses the value of a control status input to select one of three predefined messages. Control status reflects the current operating state of a device as good, bad or waiting. The text selector block references a control status output contained in function codes 123, 125, 129 and 136.

Analog Export

The analog export tag provides the ability to export an exception report value to the Harmony system through the Cnet-to-computer interface.

The appearance and behavior of the Enhanced Analog faceplate is identical to that of the normal Analog faceplate, except that the PV is user-changeable by way of a DEW from either the PV field or the PV dynamic bar.

Digital Export

The digital export tag provides the ability to export an exception report value to the Harmony system through the Cnet-to-computer interface.

The appearance and behavior of the Enhanced Digital Export faceplate is identical to that of the normal Digital Export faceplate, except that the state is user-changeable by selecting the appropriate state descriptor field (as with RCMs, DDs, MSDDs, etc.). There are two state change buttons in the button bar (similar to those of Enhanced Digitals and DADIGs) for the same purpose.

Module Status

Module status tags can be configured for every controller, process node, gateway, bridge and computer interface unit in a Harmony system. The module status faceplate shows the Harmony address, the type of controller or node, and the operating mode (configure, error, fail, or execute) for the tag.

Harmony Server

The Server faceplate (Figure 251) shows the Harmony address of the server. It also indicates whether the server is online or offline.

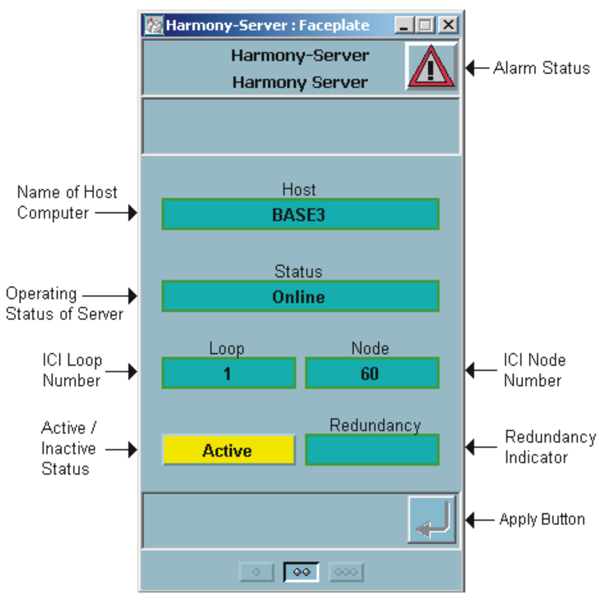


Figure 251. Harmony Server Faceplate

PhaseX

PhaseX blocks are used for the phase execution of Harmony Batch 90 programs running in a controller. A PhaseX block must be defined for each phase that runs concurrently in the same controller, even if such phases refer to the same Batch 90 program. PhaseX block control through a faceplate is not supported in this release.

The Aspect Objects types for PhaseX tags, which represent Harmony INFI 90 Phase Execution blocks and Harmony Phase Execution blocks are included.

Appendix G 800xA for Melody

This appendix describes the Controller integration of S+ Control & I/O: Melody into System 800xA.

800xA for Melody provides the following services:

- Object types for all S+ Control & I/O: Melody process objects.
- Configuration tools for editing the S+ Control & I/O: Melody process objects.
- Support for system status display monitoring.

800xA for Melody supports server redundancy as well as network redundancy.

Full sets of faceplates are available for Melody process objects. These faceplates can be ordered market specific via ABB AG Power Systems Division or ABB Process Industries.

Figure 252 shows redundancy options within 800xA and Melody based systems including coupling modules, network components, servers, coupling modules and operator workstations.

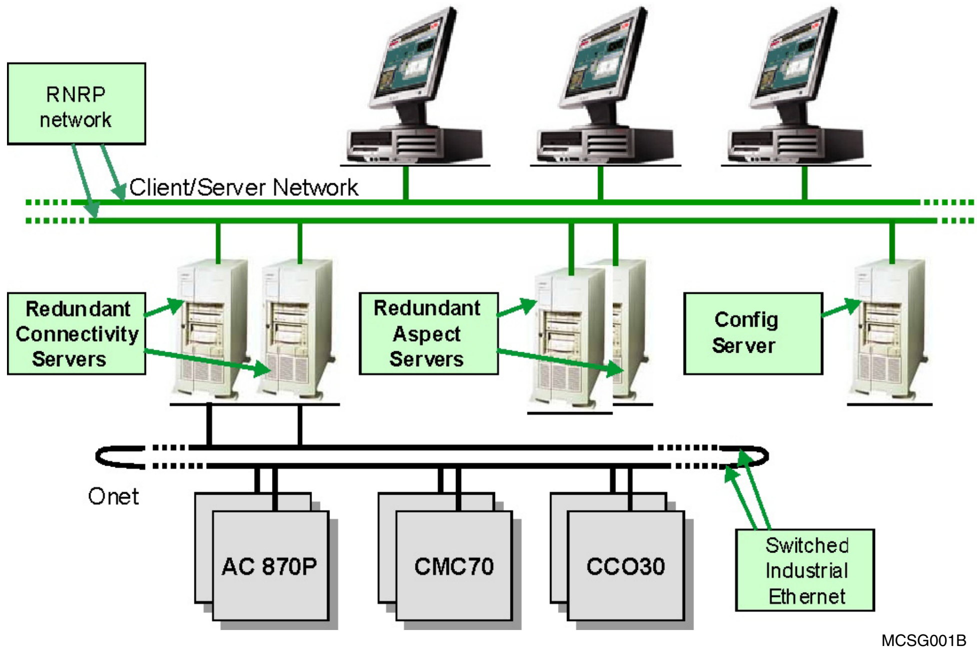


Figure 252. 800xA for Melody Redundancy Overview

The redundancy option is also available throughout the overall Melody system part.

The controller of type CMC 50 or CMC 60 may be connected to the coupling modules of type CCO 30 also in a redundant way.

The controller of type CMC 70, PM 875, PM876, PM876-1 or PM 877 can directly be connected in a redundant way.

Figure 253 shows an overview of System 800xA based on S+ Control & I/O: Melody.

Benefits

800xA for Melody leverages the full power of aspect technology in an integrated System 800xA environment.

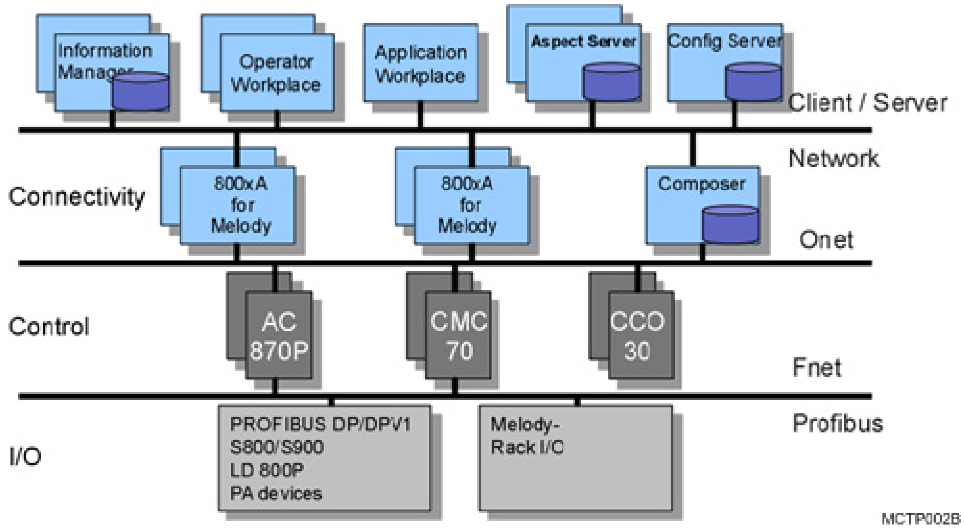


Figure 253. System 800xA with S+ Control & I/O: Melody

Description

Many features that Melody users are accustomed to having and others that are new for Melody users are available through use of this interface. These include:

- Process graphics with navigation buttons for access to other displays, dynamic representations of multi state devices including indication of alarm states and data quality, and direct call up of faceplates to take control of devices.
- Alarm lists filtered and sorted on various criteria including alarm priority and alarm categories.
- Trend displays with zoom, pan, data at a given ruler selection, X-Y plots, pen color adjustments, and one click trace hiding.
- Security based on user profiles.
- Configurable alarm banner that can remain in view at all times with support for group and sequence alarm bars.
- WAV file annunciation.

- System status display.
- Alarm inhibit.
- Redundant data server connection with automatic reconnection by client workplaces to an operational server.

In order to access data and alarms from Melody controllers the Melody Connectivity Server is used. An OPC adaptor/connector link allowing the Connectivity Server to interface with the existing unaltered OPC Client from the Operator Workplace is available. This allows the same OPC Client to be used with not only the S+ Control & I/O: Melody system part but with other OPC based control systems from ABB and others.

Engineering

The engineering workflow always starts in S+ Engineering for Melody and ends up in 800xA Operator Workplace and the control system. S+ Engineering for Melody supports bulk data actions and import of data reflecting the basic engineering like tag imports, signal lists, channel assignments and management of typicals to create instances of function charts by list based engineering.

Engineering activities in 800xA Operator Workplace colliding with Melody business rules in means of consistency and integrity will be rejected. The life cycle of a Melody object starts and ends in S+ Engineering for Melody.

Aspects hosted by other than Melody Aspect Systems might extend Melody objects.

When commissioning functionality that has been planned in S+ Engineering for Melody the 800xA Operator Workplace relevant information will be generated by S+ Engineering for Melody and automatically uploaded into 800xA Operator Workplace. Versioning of data is done according to the Melody life cycle model.

Bulk Data Management

S+ Engineering for Melody provides a lot of bulk data processing with very powerful business rules to save engineering effort in the project.

The S+ Engineering for Melody project database comprises:
- Function Block library representing explicit and implicit HSI functionality.
- Alarm/Event Typicals.

Typically each project sets up templates representing the standard solutions for the specific project. These templates are mainly designed by ABB project engineers and approved by customers. Using the list based engineering support of S+ Engineering for Melody the real function chart instances get automatically derived from the templates.

Using this approach all information relevant for faceplates, archive and control application events and alarms will be generated by the HSI code generation during release and commissioning in S+ Engineering for Melody.

Import Export

From a functional point of view S+ Engineering for Melody provides the Import Export functionality. 800xA for Melody uploads imported data to 800xA Operator Workplace.

S+ Engineering for Melody supports features to enable import / export of engineering data. S+ Engineering for Melody allows the import of basic engineering like tag list, signal list, process media information, I/O channel assignment lists etc. as well as it allows export / import of complete functional arrangements.

The functional arrangement may comprise function charts, functional areas described by a complete set of function charts, complete automation stations and more. All the import and export in S+ Engineering for Melody is realized by applying the life cycle management and its business rule to enforce data consistency.

Alarms and Events

Alarm/Event typicals are predefined in the S+ Engineering for Melody project library. By adding an Alarm/Event typical to a signal in the function chart, this signal is marked to fire an alarm/event when becoming true. Refer to Figure 254.

System messages are inherent part of the control system software and not part of project engineering.

Process application related messages have to be designed during project engineering. Event and alarming typicals are predefined in S+ Engineering for Melody. By assigning these event and alarm typicals to a signal on a function chart S+ Engineering for Melody performs the code generation for the control system as well as for the Connectivity Server.

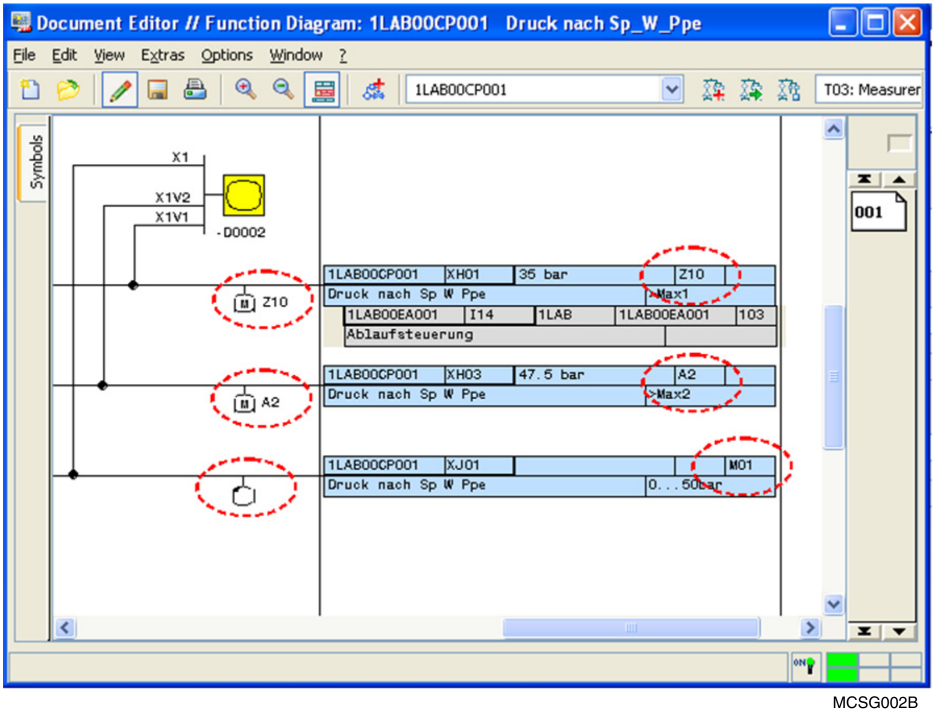


Figure 254. Alarm and Event Typical in S+ Engineering for Melody

Object Life Cycle

The configuration system allows making configuration changes in a way that the changes do not immediately take effect in the system. This provides the ability to make changes in preparation for future use and allows for distributed plant engineering and commissioning. Additionally, it provides a roll-back function that can be used to go back to a former version in case the latest changes lead to undesired behavior.

These capabilities are provided through life cycle management features. Life cycle management allows configuration data for an object to exist in multiple versions where each version is in a different life cycle. The life cycles are:

- Design. (Planning)
- Release.
- Running.

An object version in the Design or Release Life Cycle is not effective in the system. These life cycles are for configuration data being prepared for later use. Objects in the Design or Release Life Cycle are offline versions.

An object version in the Running Life Cycle is currently effective in the system. Objects in the Running Life Cycle are online versions.

Time Synchronization

Time synchronization in Connect products is used to maintain consistency in value, alarm and event reporting. Timestamps of these values must agree across the various interconnected systems.

The 800xA for Melody is the time master in this system. This is required to ensure that time changes are only sourced from the S+ Control & I/O: Melody system and not from other systems. Time changes may not be made in a step change.

Synchronization with the Aspect Directory

All configuration changes related to the Melody controllers and tag configuration are made in S+ Engineering for Melody. If configuration changes are deployed in S+ Engineering for Melody using the versioning facilities, then the changes will be downloaded into the controller and the Configuration Server and 800xA Operator Workplace will be updated automatically with the new configuration. As a result the Melody aspect objects in 800xA Operator Workplace represent the actual state of the controller configuration in both Control Structure and Functional Structure (refer to Figure 255 and Figure 256).

Control Structure View

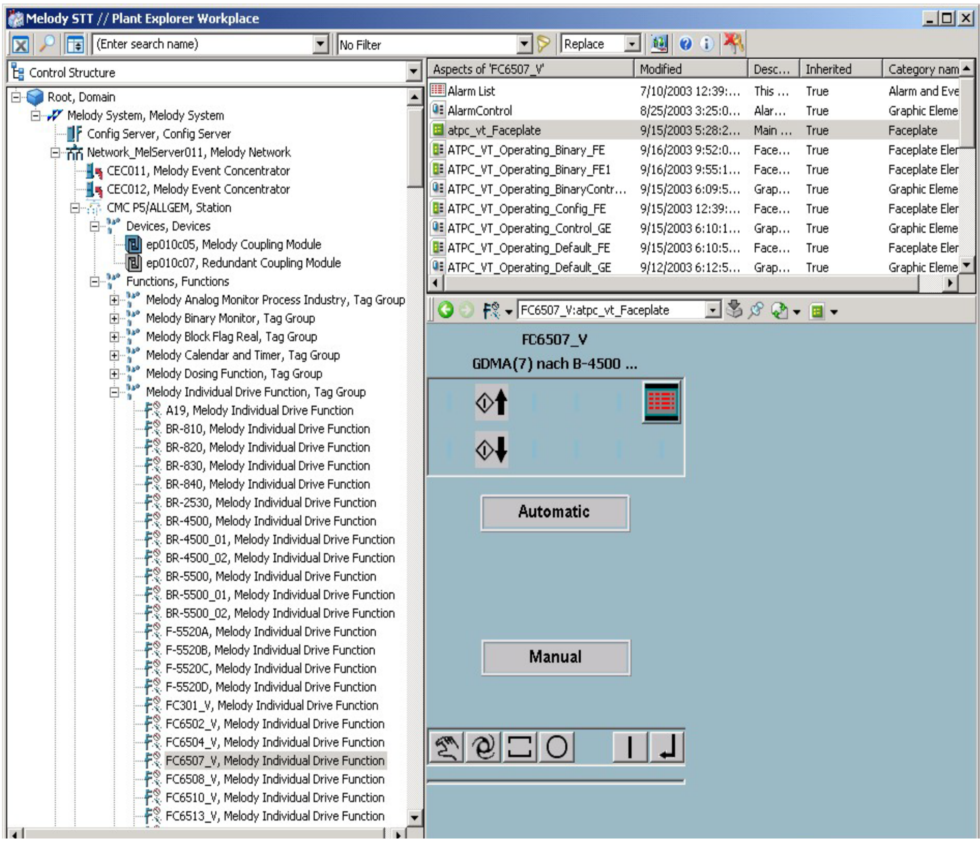


Figure 255. Control Structure

Functional Structure View

It is possible to apply changes to the Controller and Config Server even if the Aspect Server is temporarily unavailable. After the restart of the Aspect Server, 800xA for Melody recognizes outstanding changes and automatically performs a full synchronization.

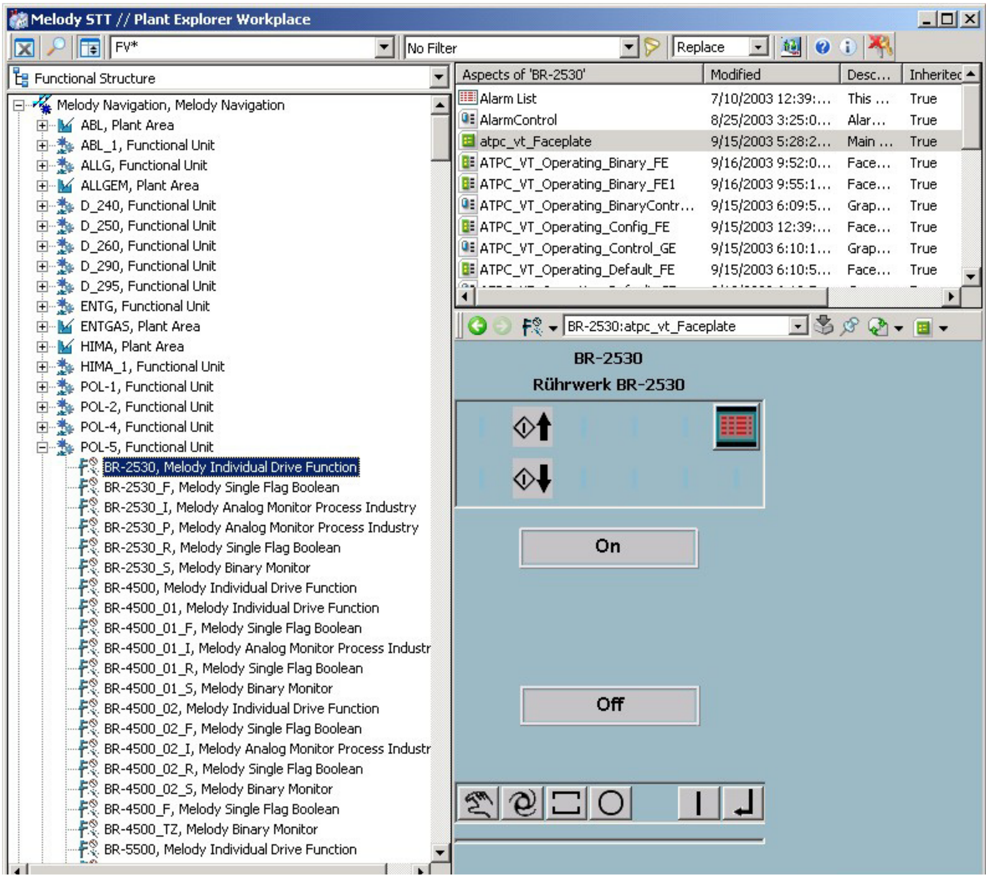


Figure 256. Functional Structure

Operating Parameters

All parameters operated via the 800xA Operator Workplace are written down to the Melody system.

The Melody objects provide the information on which data is accessible by an operator in the connectivity aspects assigned to the Melody object type definitions contained in the Melody system extension.

Parameter adjusted by the operators are downloaded into the S+ Control & I/O: Melody system and made persistent in the controller but not automatically included into the S+ Engineering for Melody project database. At certain points in time the current settings are automatically reloaded by S+ Engineering for Melody into the project engineering database as new default settings. This allows planning of revisions based on the approved plant settings. Refer to Figure 257.

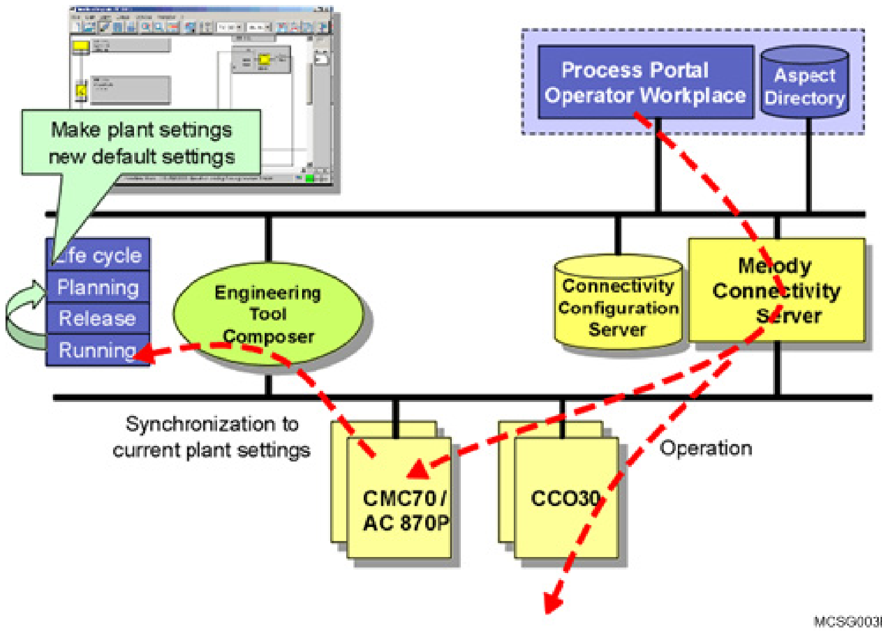


Figure 257. Operating Parameters

Sequence Control (SFC Viewer)

A sequence control is designed in S+ Engineering for Melody. The S+ Engineering for Melody provides the SFC Editor to design the entire network of the steps and transitions.

The overall behavior and the type of SFC application is defined in the SFC main control module. The corresponding engineering is done in the CFC Editor of S+

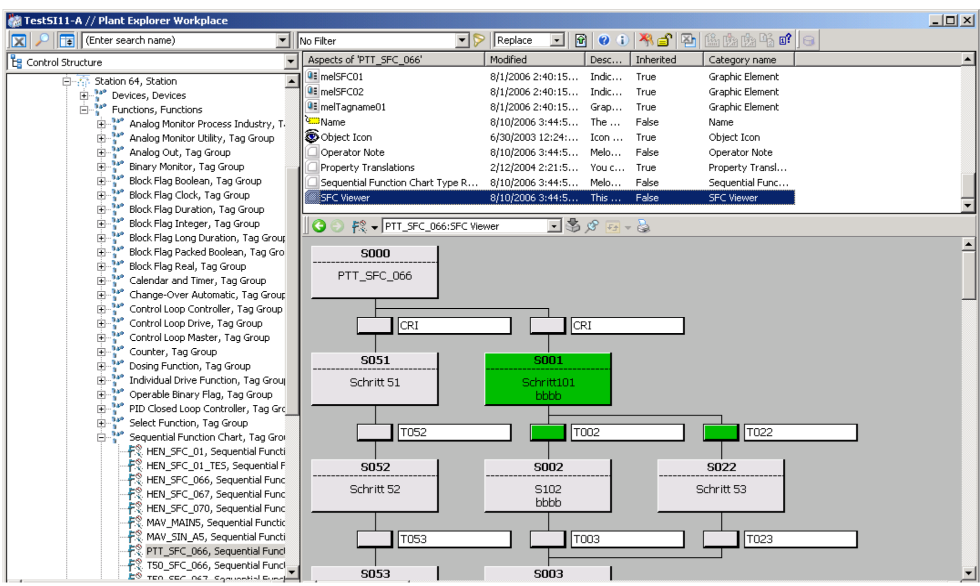
Engineering for Melody. Transitions and actions are designed in the S+ Engineering for Melody CFC function chart editor.

For displaying the SFC structures 800xA System provides a SFC Viewer. The SFC Viewer is an aspect system that allows the operator to displaying SFC structures with live data for active steps and transitions on operator workplaces without additional installation of a controller configuration tool. Figure 258 shows the SFC viewer aspect from operators point of view.

In addition to the standard 800xA SFC viewer functionality, the SFC viewer for Melody allows to enter links in the Action window.

Not supported with S+ Control & I/O: Melody is the use of the following 800xA SFC viewer functionality.

- Subsequences.
- Blocking transitions.



MCSFC41B

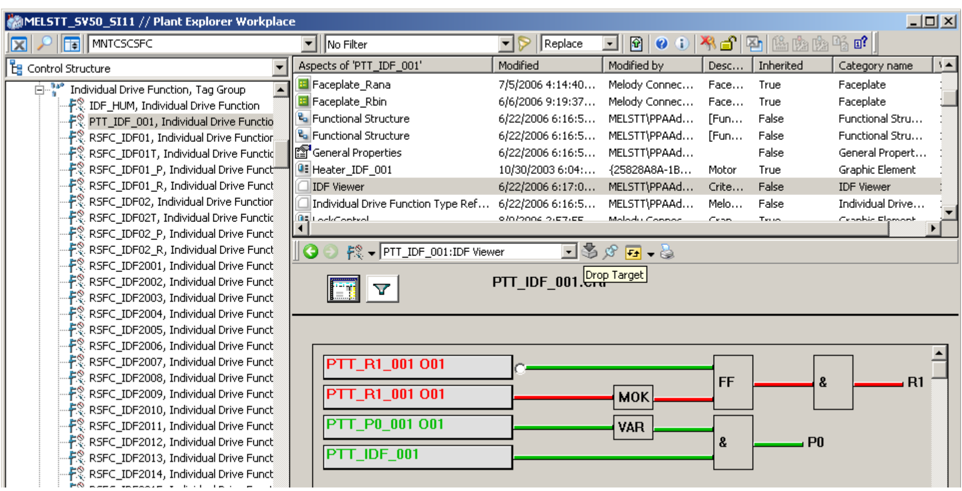
Figure 258. SFC Viewer Aspect to Open Diagram

IDF Viewer

For the Individual Drive Function automation class for Melody there is an own Aspect enabling IDF viewing. This IDF Viewer aspect is provided when adding the Individual Drive Function to the Control Structure.

When selecting the IDF Viewer aspect the current criteria of the IDF will be displayed (refer to example in Figure 259).

The default presentation of the criteria is the List form. The change between the list form and the Graph form can be done by selecting the **List/Graph** button. The button text shows either List or Graph (the alternative, selectable presentation form).



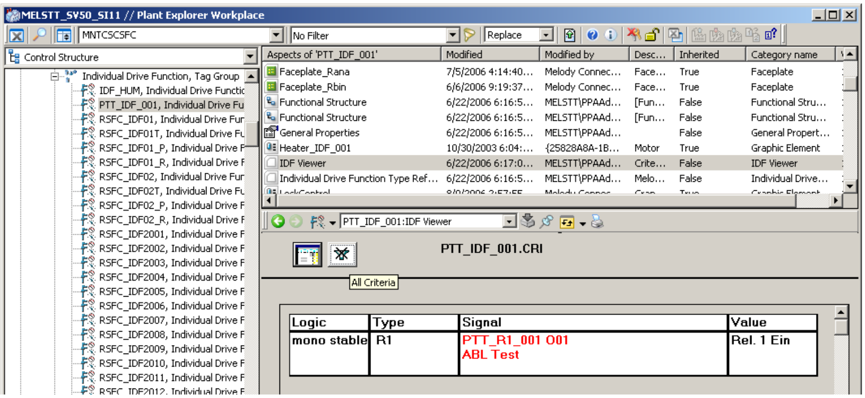
MCIDF01B

Figure 259. IDF Viewer Aspect

It is possible to select a release condition and by this means a filtered list appears showing all criteria missing at the moment (refer to Figure 260).

The usage of the object names opens the option of direct navigation.

This means, a double click on the criteria in the Description text field (List view) or a double click on the criteria in the Signal text field (Graphic view) leads to a call of the belonging object according to its default settings, normally the faceplate. The missing criteria can then directly be influenced via the object.



MCIDF03A

Figure 260. Display of Missing IDF Criteria

800xA Batch for S+ Control & I/O: Melody

800xA Batch for S+ Control & I/O: Melody is an evolution path for the Maestro UX - SymBatch product and supports the migration of the installed base towards 800xA solutions. The current state model of the SymBatch SFCs is compensated for on the 800xA Batch Manager level so there is no need to modify the controller or the control application when migrating from SymBatch to Batch Management.

For support of Batch Management in association with S+ Control & I/O: Melody, there is no explicit Melody Batch Extension necessary.

The configuration for the batch processing is created in S+ Engineering for Melody and is linked to the Batch environment by means of assignments. For each unit a Batch configuration file can generate in S+ Engineering for Melody and passed to the Melody uploader. This is the link between the Batch environment of Batch

Management and the S+ Control & I/O: Melody automation. Refer to Figure 261.

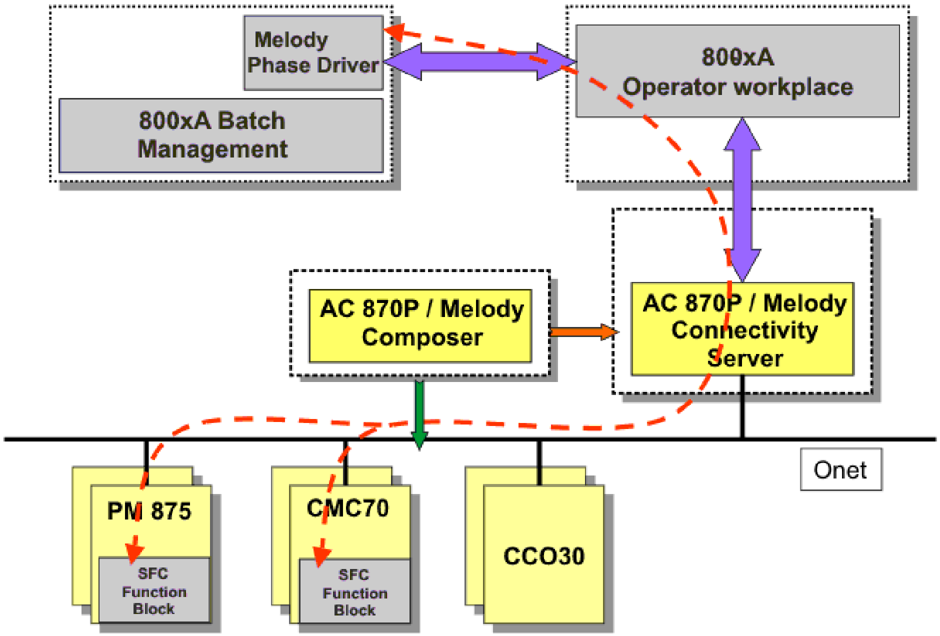


Figure 261. Melody - Batch Support

When Batch Management is used in conjunction with Melody, only the sequence control block SC02-01 is supported.

Asset Management for HART Devices

This feature integrates the S+ Control & I/O: Melody System into the common Asset Management capabilities of System 800xA. The implemented functionality provides the existing 800xA Field Device Management capabilities for HART devices connected to Melody via local Melody IO and S800/S900 IO. This can be done without additional communication, wiring or Hardware below the controller level.

The following Figure 262, Figure 263, and Figure 264 provides an overview about main features of HART asset management:

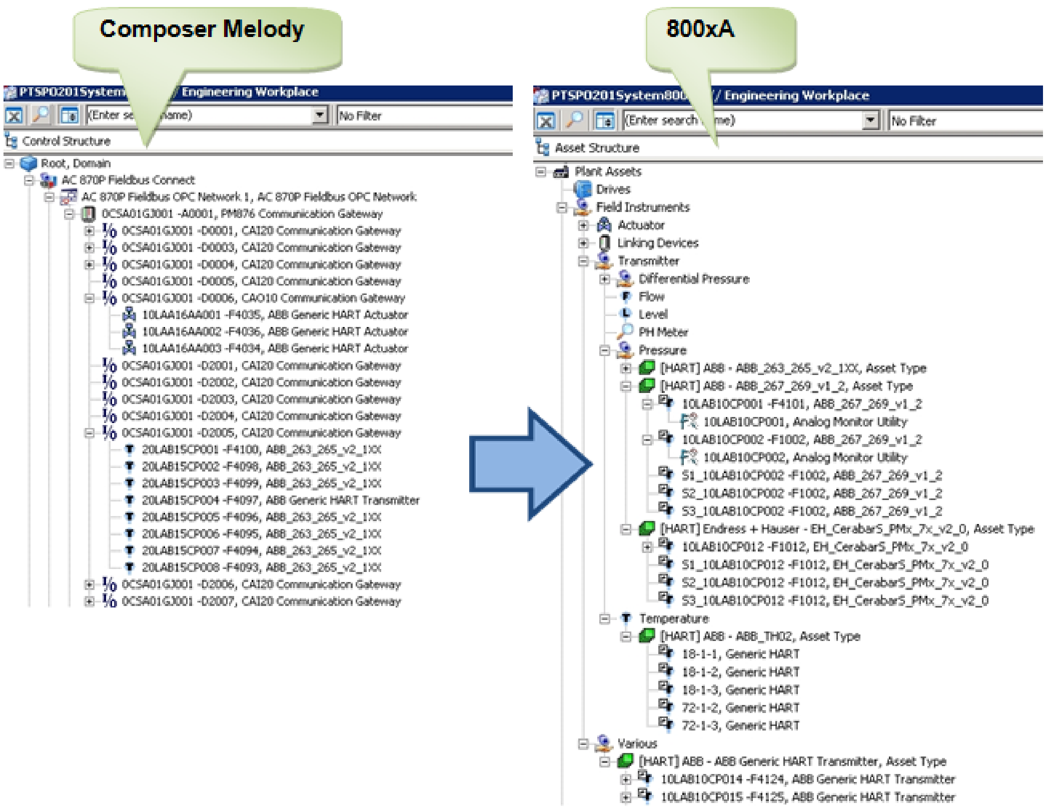


Figure 262. Asset Structure upload from S+ Engineering for Melody to 800xA

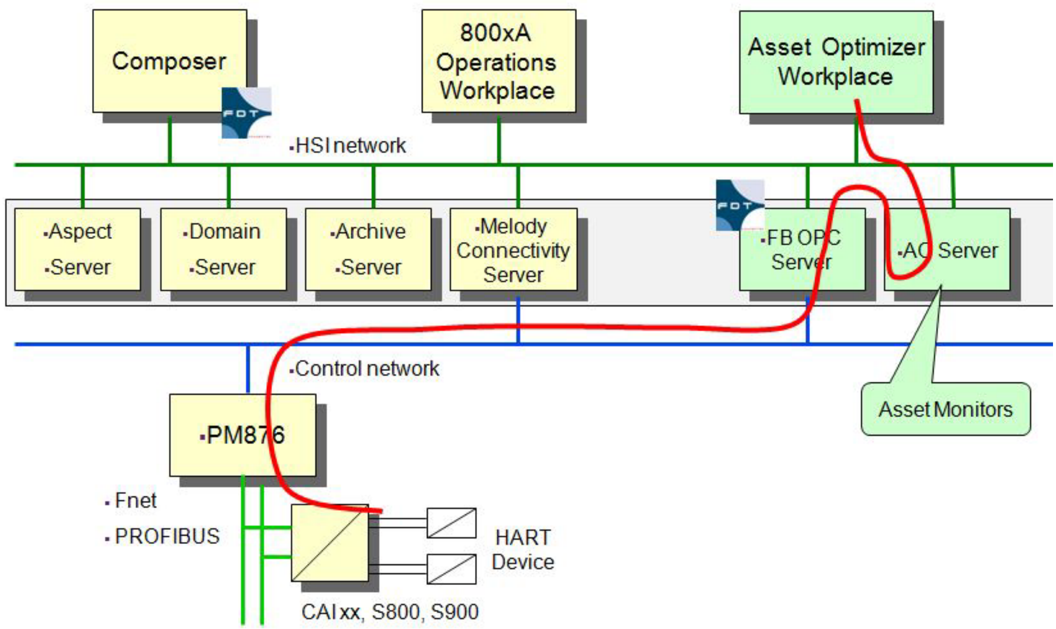


Figure 263. HART Asset Management - The Communication

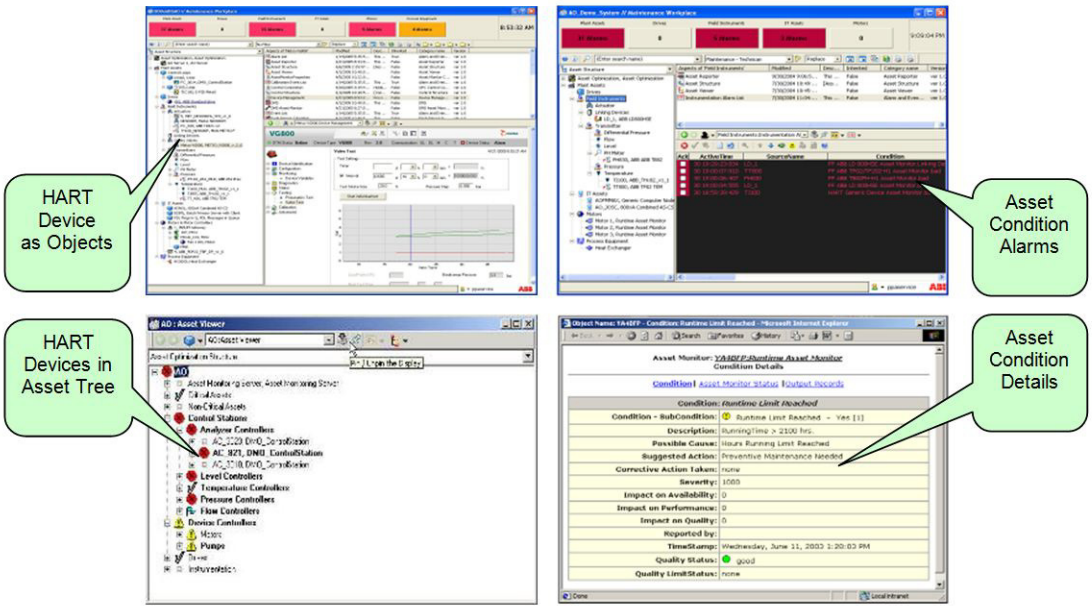


Figure 264. Asset Management Features

Melody Simulation Events

This component (Figure 265) enables a S+ Control & I/O: Melody system in conjunction with 800xA to automatically create events in 800xA when a Melody engineer creates or changes or removes a simulation for a variable in the melody controller (using the S+ Engineering for Melody). In other words, in 800xA it is visible and traceable which Melody variables are changed to simulation status or which are back from simulation.

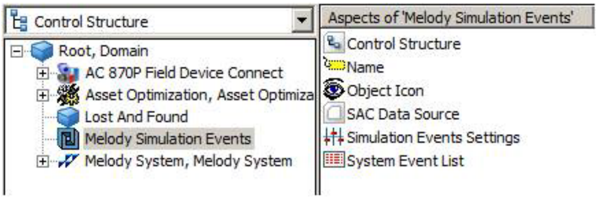


Figure 265. Melody Simulation Events

Automation Classes and Faceplates

Some features of the automation classes and faceplates are:

- Display of the automation function in Melody.
- Interface to operator data display (faceplate and parameter window).
- Interface to process operation (control).
- Interface for external control functions (high level application, recipe).
- Management of function-specific access rights.
- Management of function-specific display assignments.

The automation classes allow the display of an automation function and its process variables from Melody in System 800xA. The interface for process control by the operator is a faceplate. The status of the function is displayed in the faceplate. The operator can use the integrated action field to influence the process (operate, control). In addition to the operator, an external control function (e.g. high level application) can access the function in Melody via its automation class.

Access to the function is controlled by access rights.

The status of the function can be reported and archived.

For user-friendly navigation for 800xA for Melody, standardized faceplates tailored to the function and standard display types (trend display, graphic display, …) can be assigned to an automation function.

Overview of Automation Classes

Table 26 lists the automation classes in 800xA for Melody.

Table 26. Automation Classes

800xA for Melody Class Name	Descriptive Name
<MelAnalog>	Analog monitoring
<MelAnMon>	Analog monitoring
<MelAnOut>	Analog output
<MelAPID>	PID controller function
<MelBFlagB>	Boolean block flag
<MelBFlagC>	Clock block flag
<MelBFlagD>	Duration block flag
<MelBFlagI>	Integer block flag
<MelBFlagL>	LongDuration block flag
<MelBFlagP>	Packed Boolean block flag
<MelBFlagR>	Real block flag
<MelBinary>	Binary monitoring
<MelCLC>	Controller function – algorithm
<MelCLCD>	Controller function – drive
<MelCLCM>	Controller function – universal
<MelCOA>	Change over automatic
<MelCount>	Counter function
<MelDos>	Dosing circuit
<MelIDF>	Individual drive control
<MelOPA>	Binary memory
<MelSEL>	Preselection
<MelSFC>	SFC sequence control
<MelSFC Phase>	SFC sequence control
<MelSFlagB>	Boolean single flag
<MelSFlagC>	Clock single flag
<MelSFlagD>	Duration single flag
<MelSFlagI>	Integer single flag

Table 26. Automation Classes (Continued)

800xA for Melody Class Name	Descriptive Name
<MelSFlagL>	LongDuration single flag
<MelSFlagP>	Packed Boolean single flag
<MelSFlagR>	Real single flag
<MelSWClock>	Calendar and timing function
<MelTCount>	Time and pulse counter
<MelTotal>	Quantity value function

Audit Trail

S+ Engineering for Melody records audit events for all online changes started from S+ Engineering for Melody (download and parameterization for example).

800xA for Melody (Configuration Manager) creates audit trail events for configuration changes like creation, modification and deletion of tag objects.

All operator actions are logged by 800xA Operator Workplace event system.

Appendix H 800xA for Freelance

This appendix describes the Freelance controller integration into System 800x. The integration enables for operation, visualization and alarm handling of the Freelance control system via 800xA operator workplaces.

The connectivity software 800xA for Freelance and standard OPC provide integration between System 800xA and the control environment established with Freelance controllers. It enables Freelance installations to easily and efficiently draw benefits from the information integration delivered by the 800xA System.

Using interactive process graphics, the operator can monitor and control analog loops and digital devices interfaced to the network via Freelance AC 800F controllers. Furthermore it also serves maintenance personnel with the capability to globally monitor the operating status of the process and associated devices. Data from the controllers can be logged by the 800xA History and Information Management functions. Refer to Figure 266.

Upload of engineering data to System 800xA, and communication via standard OPC interfaces are the major features. Below a brief summary:

- Provides object types for most Freelance function blocks and variables.
- Supports UFB (User defined Function Blocks) and structured variables.
- Various aspects for object types like faceplate, alarm list, event list, control connection and other.
- Faceplates for continuous control, drive control etc. are available by default.
- SFC Viewer for visualizing transitions, actions and steps in combination with a sequence control SFC function block.
- Data access to process data and hand-over of alarms/events via OPC.

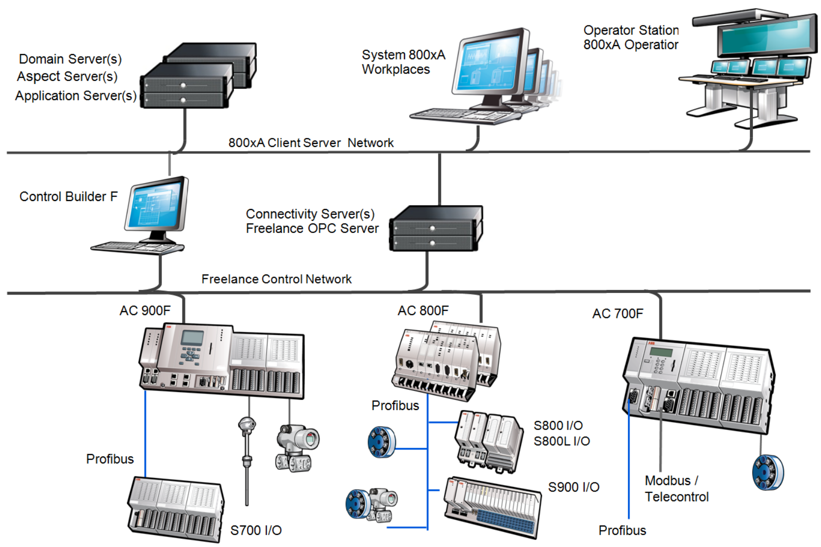


Figure 266. 800xA Functional Areas and Options

- Establishes an object tree within the control structure and functional structure.
- Arrangement of multiple OPC servers for redundancy and load sharing.
- Creation and grouping of plant areas in the functional structure.
- Enables fast delta upload and synchronize mode.

Additional engineering effort and software might be needed in order to support functional areas other than 800xA Operations. Such areas are for instance Batch Management, Asset Optimization, and Information Management.

When 800xA for Freelance is applied to a project, the project needs to contact Product Management for detailed discussion on functionality and applicability for the actual case.

Refer to [23] in Table 1 on page 30 for more information.

Appendix I Process Engineering Tool Integration

SmartPlant® Instrumentation from Intergraph PPM (Process, Power, and Marine) is the market leading process and instrumentation design tool. It provides support for development and maintenance of instrument indexes, associated specifications, wiring and control system connectivity. It provides features, which automate the creation of repetitive design such as cable termination, loop generation based on typical loop types. It provides comprehensive technical and management reports. It supports standards throughout its modules, for example national and international naming conventions for loop components.

SmartPlant Instrumentation is used by many of the world's leading EPC (Engineering, Procurement an3BSE038018-600d Construction) contractors where it is the tool of choice for effective instrumentation and automation system detailed design. As a part of Intergraph's SmartPlant Foundation range of engineering products, SmartPlant Instrumentation is also increasingly popular with major operating companies who use it to maintain their automation system design documentation.

ABB's goal is to help its customers achieve superior performance from their assets, through the application of appropriate products, solutions and services. Process Engineering Tool Integration for SmartPlant Instrumentation has been released with ABB's System 800xA to enable customers, both EPCs and owner-operators, to exploit their investment in the SmartPlant Instrumentation product. For owner-operators, there is the additional opportunity to exploit the investment made in the design content within SmartPlant Instrumentation during operations.

By providing the ability to have direct, online, bidirectional exchange of information between SmartPlant Instrumentation and the 800xA System, ABB provides the basis to improve performance during the engineering project process phase of an asset and to improve operational performance of the asset during its lifetime.

Features and Benefits

Integrated Engineering Process

Efficient exchange of design between EPC and Automation engineering teams – focus on value-adding tasks.

Improved Risk Management

Operator, EPC and Automation teams work to a common, consistent design basis – no surprises.

Streamlined Deployment

System 800xA core solution automatically configured from the SmartPlant Instrumentation design – no error prone re-keying or costly translation of data formats.

Accelerated Commissioning

Consistent, context relevant design documentation available to speed up commissioning – no waiting for missing information.

Improved As-Built Cycle

Design and automation system configuration are kept in synch during the project – costly, time consuming as-built tasks no longer necessary.

Improved Operating Decisions

Accurate design data such as loop diagrams, specifications, etc, directly available to operations and maintenance personnel – reduce time to decision and action.

Information Concordance

Single point data entry means documentation is in synch with the actual state of the asset – no more paper-chase for the right design document.

Reduced Discovery Costs

When the time comes to extend or de-bottleneck the asset, the design is consistent with the actual asset – no need to carry out extensive, costly and time-consuming discovery tasks.

Information Assets Reused

Investment in extensive design content is reused in the System 800xA solution.

Graphics Builder

Symbol Factory Controls is graphics library for graphics builder containing a set of symbols which can be used in graphic aspects, and from 800xA System Version 6.0 it requires an additional installation and license.

Typical Use Case

Typical players in any reasonable size automation project include the Owner - Operator, i.e. the Client asset owner, the Clients selected EPC who will be involved in the wider project and will have an instrument and control group concerned with automation and the automation supplier and/or contractor.

The people in these roles are likely to be geographically separated. Often there are focused centers of excellence supported by low cost engineering centers and deployment of new assets in developing regions. On top of this, the focal locations for tasks and the primary players change throughout the project lifecycle.

- Process Engineering Tool Integration for SmartPlant Instrumentation is able to deal with the earlier project phases where SmartPlant Instrumentation may be deployed in one or more locations of the EPC, for example a center of excellence plus a low cost engineering center. During this phase, early dialogue may be underway with the selected automation contractor who may be in the same city or on another continent. PETI for SmartPlant Instrumentation provides facilities to access the design online and in real-time, consistent with the constraints of the engineering procedures in place. The design content can be accessed using PETI for SmartPlant Instrumentation before the target 800xA control platform is ready for staging. The design can be reviewed in place or acquired for review offline. PETI for SmartPlant Instrumentation manages information of this sort in XML form, for maximum portability and reusability.
- In the project process the focal point will switch to the automation supplier for solution development and staging. By this time PETI for SmartPlant Instrumentation will likely have been used to configure the core 800xA structures and there may have been bidirectional updates carried out to

maintain design/development in synch. In any event, as EPC and Client personnel interact with the automation supplier for solution development, staging, testing, etc, they have direct access to the primary design content in INtools, which is still residing back in the relevant EPC locations.

- When the assets are commissioned and handed-over, the client may wish to acquire the electronic design content, either for information management or for use in operations and maintenance. The design may be re-hosted on an SmartPlant Instrumentation server on the client's network such that the design content can now be used in operational support and routine operational changes to the control solution may be reflected back into the design.
- The typical project data which is exchanged between SmartPlant Instrumentation server and System 800xA includes definition of control hardware, I/O, control loops, placement of control loops into 800xA Applications, insertion of control loops into Functional Structure, grouping of I/O signals under Control Loop and links to relevant documentation such as Control Loop Diagrams.
- Subsequently, in the event of a plant extension, de-bottle necking activity or a performance assessment study, the operational design platform may be re-hosted back to an EPC as a high quality starting point for reuse of design on the brown-field project, thereby fast-tracking, de-risking and cost-optimizing the associated project for all parties.

Process and Instrumentation Engineering

PETI (Process Engineering Tool Integration) for SmartPlant Instrumentation uses the content of the SmartPlant Instrumentation Instrument Index to automatically populate the 800xA Functional Structure where plant sectioning and major functional areas are described.

In addition to extensive tag information, SmartPlant Instrumentation maintains related document information. These include documents which have been produced external to SmartPlant Instrumentation using CAD tools, graphics packages, word processing tools, spreadsheets, etc.

They also include documents, which are dynamically rendered based on the data content in the SmartPlant Instrumentation database. It is worth noting that these do not exist as actual documents as they are not contained in a file on a disk drive; they are simply rendered on demand.

All of these aspects and objects are available to include on operator graphics. Associated information is available to use in reports and calculations. By clicking on the document links in the Document Association aspect, the actual documents can be launched in-context from within the 800xA System. Refer to Figure 267.

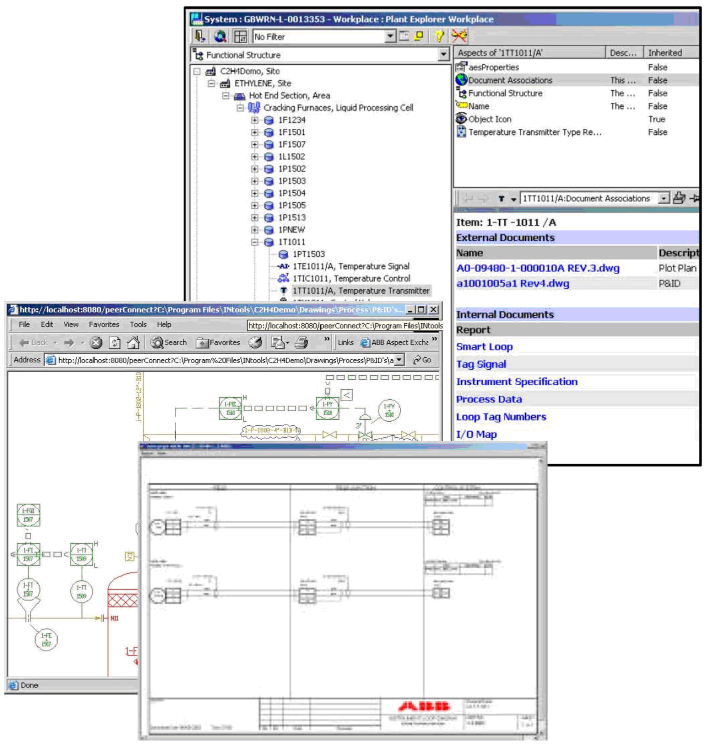


Figure 267. SmartPlant Instrumentation Documentation

A maintenance technician working on the above loop 1T1011 could pull up the associated loop diagram. It would be rendered dynamically based on SmartPlant Instrumentation live data and presented on the operator or maintenance workplace in 800xA.

The plant sectioning information, extended tag information and the related documents, both external and internal, are clearly a core source of information to the automation engineering team charged with configuring and commissioning a control system. PETI for SmartPlant Instrumentation provides direct access to this content and enables the 800xA structure to be populated automatically.

Changes to alarm settings or loop ranges can be synchronized back to SmartPlant Instrumentation database by Process Engineering Tool Integration without the technician being knowledgeable or entering the change a second time into SmartPlant Instrumentation.

Control Configuration

Process Engineering Tool Integration for SmartPlant Instrumentation uses the content of the SmartPlant Instrumentation Instrument Index and Wiring Modules to automatically populate application information in the 800xA Control Structure.

This integration uses SmartPlant Instrumentation loop structure information to determine appropriate Control Module and/or Function Block object types to instantiate in the 800xA Control Structure.

The control modules are instantiated from object types in the underlying control libraries. PETI supports the use of ABB standard libraries for conventional and advanced process control, as well as specialized industry specific libraries. In addition, PETI provides support for customer specific libraries through the use of a mapping function.

Function diagrams can be populated with the function blocks as defined by the object type. The function blocks will be dropped in sequence across the page then wrapping around to the next row of the Function Diagram page. The user would then need to arrange the function blocks in the desired logical arrangement to support easy to understand control logic diagrams and make connections between the function blocks.

A significant part of the application structuring is done automatically, giving the automation engineering team a fast track, error-free starting point from which to prepare the customized aspects of the solution. The workflow will vary based upon the 800xA library used (PC Device Library for example).

Mapping 800xA Object Types to SPI Instrument Function Types

The object types and their associated properties for 800xA standard libraries can be directly mapped to SPI Instrument Function Types. End users can modify this mapping or map object types from other libraries as part of their project execution activities. Refer toTable 268.

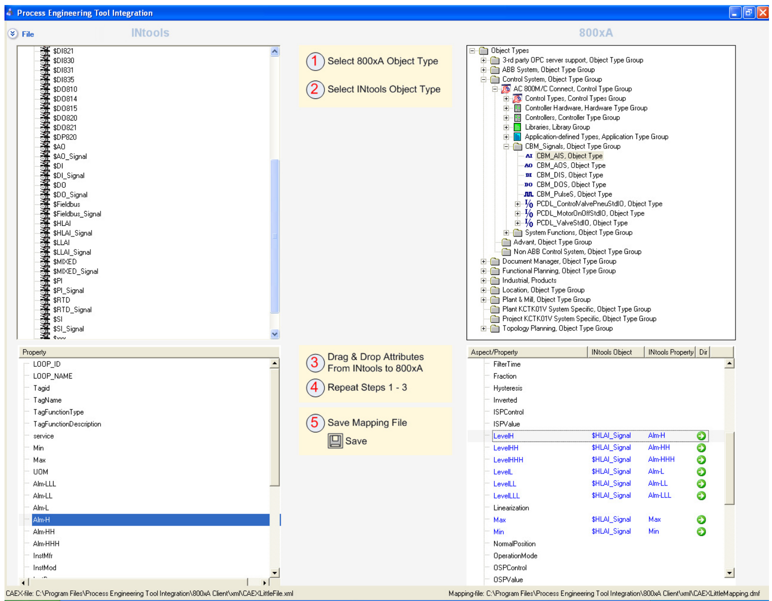


Figure 268. Object Type Property Mapping

The user can select additional User Defined Fields from SmartPlant Instrumentation database to be available to Process Engineering Tool Integration for mapping to 800xA. These fields are typically used for customer applications in addition to the standard database fields and their use typically varies from project to project.

In addition, Process Engineering Tool Integration also supports user defined fields in a Process Engineering Tool Integration supplied database external to SmartPlant Instrumentation. This function supports DCS engineers defining additional data independent from the EPC who is the owner of the SmartPlant Instrumentation database. In other words, the EPC can supply updated databases throughout the project lifecycle which will not affect these user defined data.

Control Hardware and Topology Information

The previous operations created the logical structure of the control solution, i.e. Control Modules and related parameters, etc.

For this to become a functional solution the logic needs to be connected with the I/O. PETI for SmartPlant Instrumentation uses the content of the SmartPlant Instrumentation Wiring Module to resolve this information.

Figure 269 shows the Wiring Module with some sample content. In the left hand pane, two Controllers have been modeled. The first has a digital input module plus an analog input module. The second has analog input and output modules plus a digital output module.

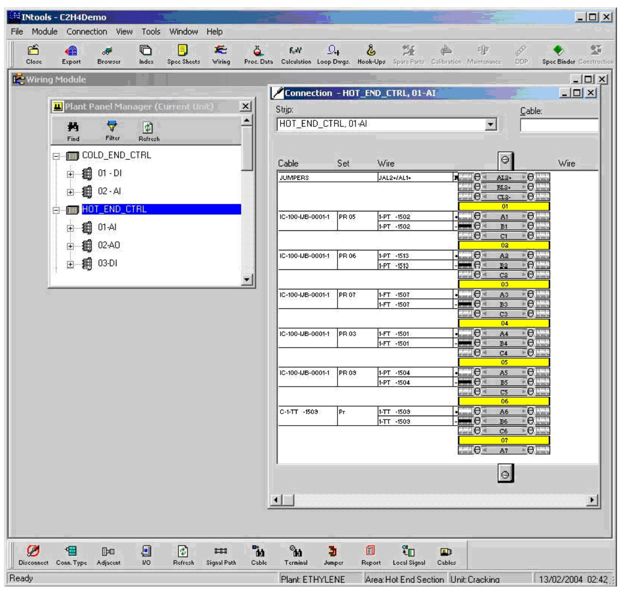


Figure 269. SmartPlant Instrumentation Wiring Module

PETI for SmartPlant Instrumentation uses the content of the SmartPlant Instrumentation wiring module to determine the connections between the loop logic, hardware and I/O. This allows the control hardware structure from SmartPlant Instrumentation to be directly created within the System 800xA Control Structure.

This includes entities such as named controllers, internal configuration details such as the CPU type, specific I/O module subsystem types, etc.

In addition, the underlying control properties, allocation of variables required for processing the loops in the physical controllers, and hardware and software connections are automatically created in 800xA.

This eliminates the repetitive and time consuming work of the automation team and dramatically reduces the potential for error brought on by re-keying or translating data from intermediate sources.

Users can download an I/O Definition file (3BSE042064*) supporting S800 I/O for SmartPlant Instrumentation from either ABB Library or Intergraph's web site for import into SmartPlant Instrumentation Catalog Manager. Instructions for using this file are also available for download (refer to [24] in Table 1 on page 30).

Synchronizing 800xA Objects with SmartPlant Instrumentation

Once SmartPlant Instrumentation objects have been created in System 800xA, the 800xA PETI provides the ability to automatically synchronize properties between the two systems. This data synchronization is bidirectional based on user's selection in the hierarchy. Refer to Figure 270.

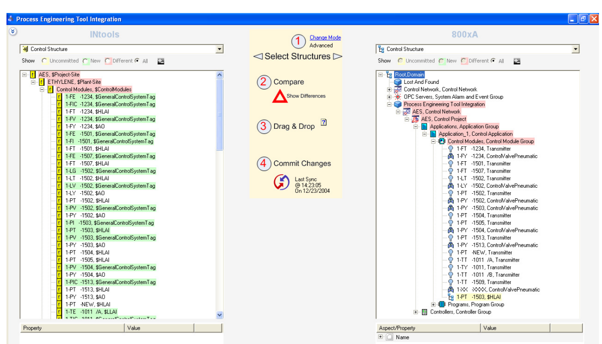


Figure 270. Data Transfer

The objects are highlighted to indicate the state of the data on one side with respect to the data value for the equivalent property on the other side. Refer to Figure 271.

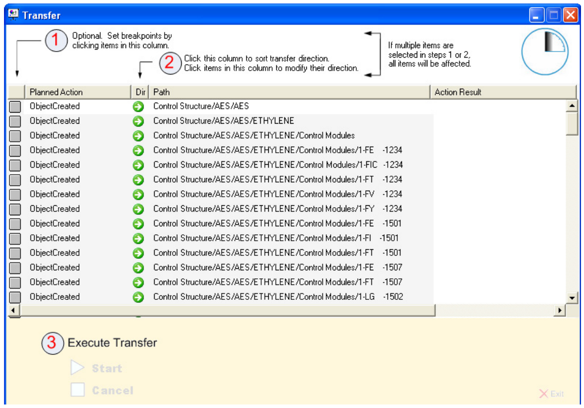


Figure 271. Data Transfer Confirmation Dialog

A list of planned actions that will be executed enables the user to review the list prior to confirming the changes and enables the user to single step through the changes in manual mode or execute the full list in automatic mode. A user with System Engineer security rights can override the synchronization direction which was specified in the mapping function.

Connection to SmartPlant Instrumentation Database

Process Engineering Tool Integration can connect to the database of SmartPlant Instrumentation via a web service for live connection over the plant network. Optionally the supplied import export utility installed on the SmartPlant Instrumentation server can be used to export using CAEX file format. This file can then be transferred by normal file transfer means to the workstation with Process Engineering Tool Integration on System 800xA for import. The file based interface as well as the web service support bidirectional data transfer.

Summary

The 800xA Functional Structure has been configured automatically, including dynamic access to associated documentation without coding relationships. This provides an immediate kick-start for configuration of process graphics and reports.

The 800xA control logic in the Control Structure has been automatically populated from the 800xA object types, providing an immediate kick-start for the application engineers to create the wider control application work.

The 800xA control hardware in the Control Structure has been automatically populated, providing an immediate kick-start for application engineers to carry out testing and related activities. Used in conjunction with dynamic loop diagrams results in rapid and consistent control application development.

These links are bidirectional meaning that changes to alarms, ranges, etc, made in 800xA by application engineering, can be reflected back to SmartPlant Instrumentation as part of a controlled process dictated by engineering and/or operational procedures. This dramatically reduces the build up of as designed to as built divergence which carries a significant cost as part of project closeout and provides the added benefit of maintaining as-built documentation during busy plant startups.

Licensing

800xA Process Engineering Tool Integration for SmartPlant Instrumentation licensing is based on the following 800xA licenses:

- Base for SmartPlant Instrumentation supporting property synchronization.
- New Object Creation Support for SmartPlant Instrumentation.

The 800xA Process Engineering Tool Integration Base license supports synchronization of properties between SmartPlant Instrumentation objects and existing 800xA objects that were created by Process Engineering Tool Integration for SmartPlant Instrumentation. It provides the ability to modify property map definitions but does not support the creation of SmartPlant Instrumentation objects in System 800xA.

The 800xA Process Engineering Tool Integration Base license is required for users who only require the ability to synchronize 800xA and SmartPlant Instrumentation project data. In addition this license can be used by an owner-operator to maintain property data synchronized between an SmartPlant Instrumentation database and the 800xA System but does not want to create new objects in SmartPlant Instrumentation to be synchronized with 800xA.

The 800xA Process Engineering Tool Integration New Object Creation Support license enables the initial creation of 800xA objects from SmartPlant Instrumentation objects. This license is typically used by engineering groups but may not be required by end-users who only wish to keep object properties and document links synchronized. This requirement will depend on the engineering workflow planned for the life of the system.

SmartPlant Instrumentation software licenses need to be purchased from Intergraph PPM or a licensed distributor according to Table 27.

Table 27. Intergraph PPM Product Compatibility with 800xA Versions

Part Number	**Description**	**800xA Version**
SEBY453AA-0600-A	SmartPlant Instrumentation, Version 6.0	5.0
SEBY498AGH0600A	SmartPlant® Instrumentation Application Programming I/F (API), Version 6.0. Supported when installed with one of these databases: Oracle 9i, SQL Server 2000 Supports viewing SmartPlant Instrumentation Documentation from 800xA Workplaces	5.0
SEBY453AA-0700A	SmartPlant Instrumentation, powered by SmartPlant Instrumentation, Version 7.0. Supported when installed with one of these databases: Oracle 9i, SQL Server 2000	5.0
SEBY498AGH0700A	SPI Application Programming Interface (25 users) Version 7.0 Supports viewing SmartPlant Instrumentation Documentation from 800xA Workplaces	5.0

Appendix J Terminology

This Appendix lists the Terms and acronyms used in the 800xA System.

Terminology

A complete and comprehensive list of Terms is included in Table 28. The listing includes terms and definitions as they 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*.**

Table 28. Terms/Acronyms

Term/Acronym	Description
ABB Drives	DC and AC drives by ABB
ABB Drive Template (basic / extension)	*ABB Drive Template* (*basic*) is a CI858 configuration option with eight dataset pairs. With *ABB Drive Template* (*extension*) the dataset pair number can be extended.
ABB Standard Drive	CI858 configuration option with two dataset pairs. Standard Drive option is used with Standard Application firmware.
ABB Engineered Drive	CI858 configuration option with eight dataset pairs. Engineered Drive option is used with *System Application* firmware.
ACD	*Asset Condition Document*. Contains all information necessary to describe an asset condition. Generated by the Asset Monitor.
AC 800M	ABB Controller 800M series, general purpose process controller series by ABB.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
AC 800M Controller	Any controller constructed from the units and units connected to the *AC 800M* hardware platform.
Adaptor	The data source dependent parts of the *Afw OPC*/DA *server*. An Afw OPC/DA Server consists of a connector, which includes common functionality, and an adaptor that provides the necessary adaptations for a particular data source. The connector is a shared component provided by the System 800xA platform. The adaptor is a specific component for each type of data source. Adaptors are easier to implement than OPC servers, because much of the required OPC functionality is provided by the connector and the service handler. For data sources where an OPC server is already available, a platform provided adaptor for OPC servers is used.
AE	Alarm and Event
Affinity definition	Defines how a specific group of *workplace*s shall connect to a specific group of servers, to control how the server capacity is utilized, e.g. to ensure that operators always have good response times. Affinity also describes how workplaces shall be reconnected to different servers in various failure situations.
Afw	*Aspect Framework*
Afw OPC server	An OPC server that unifies a client's access to all data sources, by splitting a request into separate requests for separate data sources, and merging the responses. Afw OPC servers are modeled after the *Afw Service* concept. The *System 800xA platform* provides OPC servers for OPC/DA, HDA, and AE.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Afw Service	A software component that provides a certain set of functions in the system, typically for use by various client applications. An *Afw Service* is designed to run around the clock. It can normally be portioned into several service groups, each group handling part of the scope of the service (e.g. part of the object space). For redundancy each group can contain several service providers running on different servers.
Afw Service handler	A COM object that a client application includes and runs as an in-process object to access an *Afw Service.*
AF 100	*Advant Fieldbus 100* is the communications bus between the S 800*I/O station*s and the Advant Controllers (FCI to CI52x).
Alarm	An *alarm* is an abnormal state of a condition associated with an Aspect Object. Typical conditions are: HighAlarm, HighHighAlarm, Normal, LowAlarm, and LowLowAlarm. An alarm is active as long as the abnormal state of the corresponding condition persists. An alarm is unacknowledged until a user has acknowledged it.
Alarm acknowledgement	A user action to confirm the recognition of an alarm. Acknowledgement changes the state of an alarm from unacknowledged to acknowledged.
Allocatable Group	Group of function component Aspect Object*s* and symbol object*s* which will be allocated together in the Control Structure, e.g. into a controller application.
Allocatable Group Aspect	*Aspect* that stores grouped function component and their order, e.g. the data flow order of functions and function blocks.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
(to) allocate	• To *allocate* an allocatable group within the Control Structure, e.g. in a Control Builder M application. • To allocate an I/O Signal to a I/O board channel.
Anchor	First selected *graphic component* of a multiple selection in a *Function Diagram*.
Annotation layer	Contains review comments of a *Function Diagram*.
AO	Asset Optimization.
AO Main Server	Refer to *AOWebServerNode*.
AO Server	A server that runs the *AO Server* services: *AssetMonitoring Service*, *Asset Monitoring Engine*, repository for Fault Reports document, and AO Internet Information Service webs.
AOWebServerNode	An *AO Server* designated to be the web server for AO Internet enabled views. This node is where the Maximo Connectivity software, if required, must be installed. One AO Server in the 800xA System must be designated to be the *AOWebServerNode*. This is referred to as the AO Main Server.
Application	See *System Application* and *User Application*.
Application Server	Server that runs system applications, such as the Information Management History Services, Batch Management, Asset Optimization, Process Optimization, Simulation, and also third party and user provided applications.
Application log (AppLog)	The application log is the primary debug and diagnostics tool. An AppLog message includes information on submitting process (name and PID), thread, node, time, component, log channel and level, plus a message text.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
ARD	*Absolute Reference Designation*. Hierarchical concatenation of relative *Aspect Object* names like Functional Designation or Location Designation within a structure.
Aspect	A representation of a facet of a real world entity, which entity is represented as an *Aspect Object*. An *aspect* defines a piece of information, and a set of functions to create, access, and manipulate the information.
Aspect category	A specialization of an *aspect type*. An aspect instance is created from an *aspect category*.
Aspect Framework (Afw)	Platform functionality that supports integration of *aspect system*s and connectivity components, including concepts, APIs, and tools.
Aspect Object™	*Aspect Objects* are representations of real world entities that a user interacts with, such as valves, reactors, products, material, production orders, batch procedures, customer accounts, etc. Different facets of these real world entities are modeled as aspects. An *Aspect Object* is not an object in a strict sense, e.g. like a COM object, but rather a container of references to implementations of its aspects.
Aspect Object Architecture	The *Aspect Object Architecture* defines the *Aspect Object* concept, the *System 800xA platform*, the *Aspect Framework*, the system topology, underlying technologies, and concepts and rules for development of *aspect systems* and for device integration.
Aspect Object structure	An organization of *Aspect Object*s in a hierarchical structure, based on some specific form of parent-child relationships between the objects.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Aspect Object type	An *Aspect Object type* defines certain characteristics that are shared between several *Aspect Object* instances, such as a basic set of common *aspects*. This makes it possible to create and efficiently re-use standardized solutions to frequently recurring problems.
Aspect Server	A server that runs the central functions of the *Aspect Object* architecture, such as Aspect Directory, Structure and Name Server, Cross Referencing, File Set Distribution, etc.
Aspect system	A software system, which implements one or several *aspect types* by providing one or several *aspect system objects*.
Aspect system object (ASO)	A COM object through which an *aspect system* provides (part of) the functionality associated with an *aspect type*. This COM object supports certain framework-defined interfaces, through which the application can initiate and participate in common operations on *Aspect Objects* and *aspects*.
Aspect type	An *aspect type* represents the implementation of a certain *aspect*.
Aspect view	An *aspect* can typically present its information in several different ways. These presentations are called *aspect views*.
Asset Monitoring Engine	Application responsible for retrieving data from, and interacting with, multiple data servers (real-time data servers, OLE for Process Control® (OPC®) Servers, etc.). It analyzes the data and when necessary, issues an *ACD* and notifies the 800xA System of the detected condition.
Asset Monitoring Service	Responsible for publishing *ACD*s generated by the built-in AO Engine and any other engines capable of generating *Asset Condition Document*s.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
(to) assign	To *assign* function components, e.g. controller functions, function blocks or control modules to allocatable groups.
Audit event	An *event* that is recorded in the *audit trail*.
Audit trail	An automatic record of all operator and engineering actions, showing who made the action and when. Actions include operator actions, such as opening a valve, starting a batch sequence, entering some data, acknowledging an *alarm*, etc., as well as entries, changes, moves or deletes of electronic records, system configuration data, and security settings. In the System 800xA, the *audit trail* is a subset of all *event*s, including those events that are classified as *audit event*s.
Authentication	The process by which the system validates the user's logon information. A user's name and password are compared against an authorized list. If the system detects a match, access is granted to the extent specified in the *permission*s list for that user.
AutoArrange	Function that recomputes the position of *graphic components*. The criteria for the computed positions may be individual for each application. If necessary, new pages will be inserted or empty pages may be deleted.
AutoInsert	Function that adds a *graphic component*, e.g. a *Function Component symbol* without affecting the position of existing components. If necessary, new pages will be inserted.
Background layer	Contains *graphic components* without any function related aspect data.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Backup	**800xA Backup:** Backup using the 800xA Backup Definition aspect. **Functional Area Backup:** Backup via defined tools or copy of Functional Area configuration and/or data to a safe media for items not covered by 800xA Backup. The specific operations called out for the Functional Area within the Backup/Restore procedure in [25] in Table 1 on page 30 for same version to same version backup and restore.
Base cluster	Consists of single or redundant *ModuleBus* masters plus I/O modules connected directly to the ModuleBus master.
Base library	Provides the foundation of a library, see *Library.*
Base System	Functionality of System 800xA without options.
Basic DTM	Delivered with the Device Management PROFIBUS & HART. Enables PROFIBUS and HART field devices without dedicated DTM to be operated in an 800xA System.
BMA	*Batch manager action*
CEB	*Communication Expansion Base Plate*
Check-out / check-in	When version handling is enabled, a *check-out/check-in* mechanism is active to ensure that two users do not work with the same aspect at the same time. At check-out a new version of the aspect is created, and the aspect is locked for change by other users.
CEM	*Communication Expansion Module*
CEX bus	*Communication Expansion Bus* (for communication units)

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Central I/O	Input/Output units, mounted onto a DIN-rail, and directly connected to the *AC 800M* controller via *ModuleBus*.
CIPB/CIPBA	S900 Communication Interface to PROFIBUS
Client application	*Client applications* are applications that utilize the functionality provided by one or more *Afw Services*, e.g. to present some information to a user.
Client/Server Library (CSLIB)	A component library with COM objects that implement client-server communication based on sockets.
Client/Server network	A *client/server network* is used for communication between servers, and between *workplace*s and servers.
CLS	*Central Licensing System* of 800xA
CNCP	*Control Network Clock Protocol*, an ABB protocol for time synchronization in Control Networks.
Cold retain	*Cold retain* variable values are maintained after a warm or cold restart. The Cold Retain attribute overrides the retain attributes in a structured data type.
Communication point	Label used to split up a connection line. Can either be created, attached to the signal and named automatically or be created by the user inside the function diagram.
Component	Graphical element such as a *Primitive* or a *Symbol.*
Component view	*View* on function aspect to display or edit the interface of a function component (inputs, outputs, type) and its *symbol* representation.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Composite Aspect Object	An *Aspect Object* instance that contains other object instances. This containment is implemented by having other objects as children in one or more structures where the composite object is placed. The set of objects placed under the composite object are the children of the composite object. Usually the term “composite object” means a composite object including all its children.
Composite Aspect Object type	A *composite Aspect Object type* describes a set of *Aspect Objects* organized in a structure, with a parent object and one or several child objects. The children in a composite object type are called formal instances, because they inherit from object types defined elsewhere in the Object Type Structure, but they are not actual instances. When a composite object is instantiated actual instances are created for these child objects.
Connection	See *Connection link* and *Connect string*
Connection link	Polyline between two connection ports or between a port and a connection point. In general, *connection link*s get automatically routed. Manual routing is possible by moving and freezing link vertices by mouse.
Connection network	Set of 1:1, 1:N, M:N *connections*. A *connection network* has 1..M sources and 1..N sinks, and is defined by its unique network name, a *connect string* of type variable. Connection networks are unique in a function diagram.
Connection port	Defined start/end point of a s*ymbol* for a *connection*.
Connectivity component	A *connectivity component* provides access to real time data, historical data, and/or alarm and event data, from a certain type of device.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Connectivity product	Connectivity components, *up-loader*, supporting *aspect system*s (e.g for the configuration), and *graphical element*s, *faceplate*s, *Aspect Object type*s, etc., bundled together to provide the integration of a certain type of devices into the 800xA System.
Connectivity Server	A server that provides access to controllers and other sources for real-time data, historical data, and alarm and event data. A *Connectivity Server* runs services related to OPC/DA, OPC/AE, OPC/HDA, and SysMsg.
Connect string	Defines the type of a *connection*: - Connection to constant, e.g. “1”, “3.14”, “’ConstString’” - Connection to variable/network, e.g. “link”, “abc”.
Connector	The generic part of an *Afw OPC*/DA *server*. See also *adaptor*.
Context menu	A menu that appears when you right-click on an *Aspect Object* or an *aspect*. The *context menu* lists aspect operations, actions, aspects, and global operations.
Contiguous linear multiple selection	The selected area on a diagram is determined by the *graphical order* of the *graphic components*.
Contiguous rectangular multiple selection	The selected area on a diagram is determined by a rectangle given from the coordinates of the selection-startpoint and the selection-endpoint (diagonal of the rectangle).
Control Builder M	The programming tool for *AC 800M*. Often referred to as Control Builder. *Control Builder M* Professional is integrated into System 800xA.
Control module (CM)	*Control module*s are program units that support object-oriented data flow programming with code sorting, free-layout graphical programming and static parameter connections. Instances of control modules are created from control module types.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Control network	A *control network* is a local area network (LAN) that is optimized for high performance and reliable communication with predictable response times in real time. *Control network device*s and servers are connected to the control network.
Control network device	Device connected through an Industrial^{IT} supported *control network*.
Control Software	ABB control software offering, including controller firmware, libraries and executable control applications.
DA	*Data Access*
Default action	The action that is initiated when you select (double-click) an *Aspect Object*. A typical action is to select a default *aspect*.
Device	An entity that in some form of dedicated environment provides part of the functionality of certain *aspect*s.
Device Management	Device Management PROFIBUS & HART and Device Management FOUNDATION Fieldbus provide a set of software components for efficient planning, operation, and monitoring of field devices within the 800xA System.
Device Management Library	Basic interface software for field device object types providing easy access to built-in system extensions.
Device Library Wizard	A tool used for adding separately delivered device object types to the Device Management Library of an 800xA System.
Device Object Types	Tested and pre-integrated field devices for PROFIBUS, HART and FOUNDATION Fieldbus, which can be used in connection with the Device Management software in the 800xA System.
DDCS	*Distributed Drives Communication System*
Diagram parameter	See *Off-diagram parameter.*

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Diagram view	*View* on function aspect to display or edit a function diagram.
Document reference	A reference from a *Function diagram* to document property values like actual page number, date, time.
Double authentication	The process of identifying two individuals, usually based on usernames and passwords. *Double authentication* is typically used to ensure that certain critical operations are performed by an authorized individual and approved by an additional individual, where the additional individual has the authority to approve such operations.
Downstream history server	A history server that provides its own collection and storage functions, but wants to make its data accessible through the unified OPC/HDA access mechanism that is provided by Afw OPC/HDA. See also History linked collector.
DPC	*Documenting Process Calibrator*. Portable intelligent field calibrator designed for in situ (field) calibration, reducing the time required to execute a calibration procedure. The *MFT 4000* is such a device.
Drawing page	Page of a function diagram you see on the screen. The drawing page size and thus the scroll range is defined via Edit > Measurements and Size. In contrast, the printer page is the paper in the printer. The printer page size is defined via File > Page Setup.
DriveBus	Communication link dedicated for *ABB drives*.
DriveDebug	Diagnostic Tool
DriveWindow	Commissioning and Maintenance Tool
Engineering Workplace	Provides tools for system wide engineering.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Entity	Collection of *Aspect Object*s and *aspect*s that a user treats as a unit with respect to various phases of engineering. An *entity* models containment.
Entity extension	An *entity extension* is a group of *Aspect Object*s and *aspect*s that can be added to an *entity*.
Environment	An *environment* allows work to be separated from another environment. Environments are supported for: Production Engineering Load-Evaluate-Go (LEG)
Event	An *event* is a detectable occurrence, which is of significance to an *Aspect Object*. An event may or may not be associated with a condition. OPC Clients may subscribe to be notified of the occurrence of specified events.
Extension library	Provides extensions to a base library, see *Library*
Faceplate	An *aspect* that provides a graphical representation of a certain *Aspect Object*, with presentation of certain properties related to the object, and mechanisms for operator interaction such as on/off, increase/decrease, etc. *Aspect Object type*s often include several different faceplate aspects, providing different presentation and interaction possibilities. See also *Object display*.
Faceplate element	Used both for presentation and modification of *object properties*. Faceplate elements are object aware.
FCI	The *Fieldbus Communication Interface* (*FCI*) device contains the interface to the fieldbus.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Fieldbus	A *fieldbus* is used to interconnect field devices, such as I/O modules, smart sensors and actuators, variable speed drives, PLCs, or small single loop devices, and to connect these devices to the 800xA System.
Fieldbus Builder FOUNDATION Fieldbus (FBB FF)	An 800xA System application that is part of Device Management FOUNDATION Fieldbus. It owns and stores all FOUNDATION Fieldbus relevant data and the business logic belonging to it.
Fieldbus Builder PROFIBUS/HART (FBB PH)	An 800xA System application that is part of Device Management PROFIBUS & HART. It enables PROFIBUS and HART field devices with dedicated DTM according to specification FDT 1.2 to be operated in an 800xA System.
Field device	Device connected through an 800xA supported *fieldbus*.
Field code	Defines dynamic text with a document reference or aspect property reference (parameter reference).
Free graphics	*Graphic components,* e.g. *primitives* on any layer without any function related aspect data.
Functional Area	Descriptive separation of System 800xA funtionality.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Function component	A *symbol* that has function-related aspect data to other *aspect systems*: *- 800xA for AC 800M / Control Builder M*: Function, function block, control module - Fieldbus Builder: Field device, function block - I/O Signal, Connector,... According to its type definition, it can either represent an object that is: a) NOT an Aspect Object, but a symbol object visible on a function diagram only. b) an Aspect Object both visible in the Functional Structure and on a function diagram.
Function component Aspect Object	Aspect Object with a function aspect visible both in Functional Structure and as *symbol* on a function diagram. Stored tree-persistent in the Functional Structure. (Can be switched to *Function component symbol object*.)
Function component symbol object	Function component visible as *symbol* on a function diagram only. NOT an Aspect Object. Stored diagram-persistent within a function diagram. (Can be switched to *Function component Aspect Object*.)
Function component template	*Symbol* serving as template for Function components with extensible/variable number of in/outputs. On instantiation, a Function component symbol is automatically created from the template, the XML type definition, and the actual number of in/outputs.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Function component type	Aspect Object type defined in Object Type Structure with a function aspect. Defines the interface of a function component (inputs, outputs, type) and its *symbol* representation. The creation info of the object type definition determines if a function component instance is either an Aspect Object or just a symbol object.
Function Designer	Engineering tool for configuration of *Function Diagram*s. Supports *800xA for AC 800M* / *Control Builder M* Professional and *Fieldbus Builder* PROFIBUS / HART.
Function diagram	Made up of function component *symbols, connectors, connections*, and *free graphics*, with up to four *layers*. Can be nested and represented as function component on the next higher level.
Function diagram template	Template for the *master page layer* of a Function diagram, e.g. A3/A4 portrait/landscape with headers/footers. The template can be copied or referenced in the diagram.
Function diagram type	Aspect Object type defined in Object Type Structure with a function aspect defining a *Function diagram*. Typically a *Control Module* type created by *Function Designer*.
Generic device	Device connected to an 800xA System through other means than 800xA supported control networks and fieldbuses.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Graphic component	Generic term for • *Graphic primitive* (rect, line, ... text, *port*, picture) • Group of *graphic primitives* • ActiveX Control • *Graphic Element* (made with Graphics Builder) • *Symbol* • *Link* A *Graphic Component* has (Graphic) Component Properties like line color, fill color etc. In general, Graphic Components can be sized and rotated.
Graphical order	*Graphic components* displayed in the drawing area of a *function diagram* are ordered by the top-left coordinates of their bounding rectangle in the sense of top to bottom and left to right.
Graphic display	An aspect that provides a visual presentation. It consists of static graphics representing an object and *graphic element*s that present dynamic information of this object. Graphic displays are often used to present the state of a process or a part of a process, but are useful in any context where dynamic graphical information needs to be presented.
Graphic element	A *graphic element* is an *aspect* that is associated with an *Aspect Object type*, to be used in *graphic display*s to present dynamic information for instances of that type. An object type may have several different graphic element aspects to allow the user to select among different visual presentations.
Graphic element browser	A tool used to select object aware (graphic) elements in *Graphics Builder*.
Graphic expression	Used to specify a data subscription and a relationship between process data and data to be displayed.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Graphic libraries	Libraries of primitive elements, and standard graphic elements.
Graphic primitive	Generic term for an atomic graphic object: line, polyline, polygon, rectangle, polycurve, closed curve, ellipse, text, *label*, *port*, picture.
Graphics Builder	Tool for configuration of graphic aspects: *Graphic display*s, *graphic element*s, *faceplate element*s, etc. It is built on Visual Basic.
Group Display	A display that shows several *faceplate*s for different process objects in the same window.
HART Multiplexer Connect	Enables to collect, configure, calibrate and diagnosis HART devices, connected to other DCS/PLC than 800xA System not having direct access to these specific device data.
HCIR	Hot Configuration in Run
Hidden Alarm	An *alarm* that is not included in the standard alarm list since it is irrelevant for the operator and therefore do not require any action from the operator.
History collector	Part of a connectivity package. Used by the *Afw OPC*/HDA *server* for collecting historical data from data sources that support some form of data streaming or other access means that are more efficient for collecting historical data than OPC/DA.
History linked collector	A linked history collector is an OPC/HDA sever that is linked as a downstream history server under the *Afw OPC*/HDA *server*. See also *Downstream history server*

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Hot removal	Units with *hot removal* support can be removed online, without any disturbance to other units connected to the *CEX-Bus*. This includes that the unit can be removed online if it becomes faulty.
Hot Standby	Definition for the redundancy behavior for the backup module. The backup module is configured and ready to take over in case of a failure of the primary module.
Hot swap	Units with *hot swap* (includes hot removal) support, can be replaced online, without any disturbance to other units connected to the CEX-Bus. In a redundant system, the backup unit can be replaced without any disturbances to the primary unit. This includes that the unit can be replaced online if it becomes faulty.
HWD File	*Hardware Definition file*, ASCII readable file describing the hardware *unit*. Used by *Control Builder M*.
Instance (Object Instance)	An individual object that behaves in accordance with the rules of the corresponding *(object) type.*
INSUM	*INtegrated System for User optimized Motor control.*
I/O cluster	An extension of the *I/O Station*'s *ModuleBus* connected to the ModuleBus master by fiber optic connections. Up to 12 *I/O device*s per cluster.
I/O device	A complete *I/O device* consists of one *MTU* and one *I/O module*.
I/O module	An active, electronic and signal conditioning unit. Can be a part of an *I/O device* or a S800L *I/O module*.
I/O Station	*FCI* with connected *I/O module*s.
ISP	*Input Set as Predetermined*. When the controller detects a communication failure with an input module, the application variables are set to predetermined values specified by *ISP* control.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Interaction Window	A graphical interface used by the programmer to interact with an object. Available for many control library types.
Layer	Kind of namespace for *graphic components*. Only graphic components of the active layer are accessible.
Link	See *connection link.*
Linking Device for PROFIBUS (Power Hub)	The Linking Device Pepperl+Fuchs Power Hub is the new interface between PROFIBUS DP and PROFIBUS PA (successor to LD 800P).
Library (Object type library)	A collection of *Aspect Object type*s that are kept together from a distribution and life cycle management point of view. A *Library* can consist of a *base library* and several *extension libraries*.
Load-Evaluate-Go (LEG)	A procedure for applying a new control application version, replacing an old version in the controller.
Locking	The function of reserving an object for exclusive or reduced use, allowing one user to exclusively use or update it during a time period. A lock is held until it is released by the user, or until it times out or is broken by a user with the appropriate authority.
Logic layer	Contains mainly function component*s*, *connectors*, and *connections* with function related aspect data. Also *free graphics* can be drawn on the *logic layer*.
Log over	Temporarily changing user, without first logging out the current user and without breaking the current context. This function is useful in cases were a certain operation requires higher authority than that held by the current user, in which case e.g. a supervisor may temporarily assume the responsibility, allowing his or her authority to be temporarily applied.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
(M)	Used to refer to function block type and a *control module* type with similar functionality, for example, MotorBi(M).
Maintenance Workplace	Provides a user interface for maintenance personnel to support their daily workflow most efficiently.
Master page layer	Contains header and footer definitions for all pages and defines the size of the drawing area. Can comprise dynamic text with text *field codes*, e.g. the actual page number.
MFT 4000	*Multifunctional Modular Calibrator* / HART Communicator (*DPC*).
MMS Server for AC 800M	Provides services to the MMS Client. Services provided are transfer of variable content and start of programs, etc.
ModuleBus master	Can be a controller (*AC 800M*) or a *FCI*. Contains a ModuleBus interface and power regulators. The FCI module can manage 24 *I/O device*s and the controller up to 96 *I/O module*s (up to 12 directly and to the others in 1 to 7 *I/O cluster*s).
(ModuleBus) Extension cable	Used when extending the electrical *ModuleBus* (within the max. 2 meters).
MSU	The *most severe unacknowledged condition* for the current object. Remains in Fault Report Viewer until acknowledged, dismissed, submitted with the **Dismiss after successful submittal** check box enabled in the Submit Fault Report view, or superseded by a more severe unacknowledged condition.
MTU	The *Module Termination Unit* is a passive base unit that contains the PROFIBUS and *CEX-Bus* connectors.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Object display	An *aspect* that provides a graphical representation of an *Aspect Object*, with a comprehensive presentation of the object's properties. Interaction mechanisms include support for tuning, calibration, etc., in addition to operator related interaction such as on/off, increase/decrease, etc. (cf. *Faceplate*).
Object trend	An *aspect* that provides a curve representation of historical values of certain *properties* of an *Aspect Object.*
OCS Integration Product	*Connectivity component*s, *up-loader*, supporting *aspect system*s (e.g for the configuration), and *graphical element*s, *faceplate*s, *Aspect Object Types*, etc., bundled together to provide the integration of a certain type of devices into the 800xA System.
Off-diagram parameter	Function component with labeled in/out *symbol* to represent an input/output parameter of a nested diagram on lower level.
Off-diagram reference	Function component with labeled cross-reference *symbol* to represent sink /source of a *connection* between different function diagrams.
Off-page connector	Labeled cross-reference *symbol* to represent sink / source of a *connection* between different pages of a function diagram.
On-page connector	Labeled *symbol* to represent sink / source of a *connection* on the same fixed page. This is an option that can be used instead of connection poly-lines to avoid too many crossings on a page.
OMF	ABB proprietary software that supports creation of and access to History and Process objects in the ABB OCS. For detailed information regarding *OMF* objects, refer to the *AdvaInform Object Types Reference Manual.*

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
OPC Server FOUNDATION Fieldbus	The OPC Server FF provides data and alarms from FOUNDATION Fieldbus devices to any OPC Clients.
OPC Server PROFIBUS/HART	The OPC Server PROFIBUS/HART provides specific field device data, device status, and diagnostic data to Asset Optimization Server.
Operation (Aspect Object operation)	The system defines a set of *operation*s that can be performed on *Aspect Object*s, such as Edit, Lock, Configure, Tune, View, etc. An *aspect system* (actually an *aspect type*) can define additional operations, as part of the registration done by every aspect system.
Operator Workplace	Provides a user interface for efficient control and supervision of processes.
OSP	*Output Set as Predetermined*. When an *I/O module* locally detects communication failure with the controller it automatically sets its output to the values specified by OSP control.
Permission	A *permission* (or access mask) groups a set of *operation*s that require the same authority. For each operation defined for an aspect, the *aspect category* specifies the permission needed to use that operation.
PDL	*Production Data Log* (add-on to Information Management)
PFC	*Procedure Function Chart*
Plant Explorer	A configuration of the Internet Explorer for creating the *Aspect Object* that you use to put together the plant. You can also use it to browse and search the structures of the plant.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Plant Explorer Workplace	Application that is used to create, delete, and organize objects and aspects within the 800xA System. The *Plant Explorer Workplace* organizes the objects in structures according to functionality, location, etc. Also used to browse and search the structures of the plant.
Port	See *Connection port*.
Primary Structures	Structures in which most operators and application engineers will perform most of their work. The *Primary Structures* include the Control, Functional, Location, Object Type, User, and Workplace Structures.
Primitive	See *graphic primitive*.
Primitive Type	Pattern for an atomic graphic object, e.g. line, circle, polyline, text field, and so on.
Process Portal	Collection of software that forms the basis for *Industrial^{IT}*, and provides the development and execution environment for 800xA System compliant products. Contains functionality for efficient control and supervision of an automated process. Key functions are presentation of graphics, process dialogs, and presentation of alarms and trends.
Project	Collects all data of an engineering project. They are administrated by the Configuration Wizard application of the System 800xA platform. System is a synonym for Project.
Project Explorer	The part of the *Control Builder M* user interface used to create, modify and navigate a project. All objects such as data types, functions and function block types can be selected and displayed in an editor. All software and hardware can be configured in the *Project Explorer*.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Property (Object property)	*Aspect Object*s can have properties. A *property* is a named data item that is related to an Aspect Object. Properties are typically owned and managed by *aspect system*s. An aspect system supplies information through framework-defined interfaces about the properties it exposes. These properties become accessible through Afw OPC/DA. A control aspect may expose properties such as VALUE, SETPOINT, and OUTPUT for a control function. The Name aspect provides the properties NAME and DESCRIPTION.
RCU	*Redundancy Control Unit*.
RCU Link	*RCU Link* Cable transfers data between Primary and Back-up CPU. The two CPUs are connected to the RCU Link Cable. An RCU Link Terminator is used on the RCU Link Connector in single CPU configuration.
Re-authentication	The process of re-identifying an individual previously identified through authentication. *Re-authentication* serves two purposes 1. It verifies that the individual trying to perform a certain *operation* is identical with the user that is currently logged on. 2. It means that the user electronically signs that he or she is performing the operation.
Real-Time Accelerator (RTA)	Interface to the MOD 300 control network (DCN/eDCN).
Real-Time Accelerator (RTA) Board	RTA used as a PCI form factor card to interface with the MOD 300 to interface to the DCN or eDCN.
Real-Time Accelerator (RTA) Unit	RTA used as a stand-alone hardware unit to interface with the MOD 300 to interface to the DCN or eDCN.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Remote I/O	Input/Output units connected to a controller via a *fieldbus*.
Reservation	Enforces exclusive modify access to the *entity* for a single the user. When *version handling* is enabled, reserve means that all *aspect*s within the entity are locked for check-out by other users.
Restore	**800xA Restore:** Restore via Configuration Wizard. **Functional Area Restore:** Restore via defined tools or copy of Functional Area configuration and/or data from a safe media for items not covered by 800xA Backup. The specific operations called out for the Functional Area within the Backup/Restore procedure in [25] in Table 1 on page 30 for same version to same version backup and restore.
RLM 01	*Redundancy Link Module* for PROFIBUS DP. The RLM 01 connects a non redundant PROFIBUS slave to the line redundant PROFIBUS.
RNRP	*Redundant Network Routing Protocol*, an ABB protocol for redundancy handling and routing in *Control Network*

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Security	Controls a user's authority to perform different *operation*s on *Aspect Object*s, depending on several parameters: - The user's credentials, as provided by Windows. - The node where the user is logged in. This makes it possible to give a user different authority depending on where he or she is located, e.g. close to the process equipment, in a control room, or at home accessing the system through Internet. - The operation the user wants to perform. - The Aspect Object that the user wants to perform the operation on.
Security definition aspect	An *aspect* that holds one or more *security descriptor*s.
Security descriptor	Includes an access control list, where each entry specifies a *permission* (access mask) and the users and/or user groups that are granted (or denied) access. The security descriptor also includes an audit control list, specifying which operations shall be logged for auditing purposes. See also relevant documentation on Microsoft Windows security functions.
SEM	*Shared Equipment Module*
Server	A node that runs one or several *Afw Services.*
Service	A software component that provides a certain set of functions in the system, typically for use by various client applications. See also *Afw Service*.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Service provider	A Windows process that runs on a specified server node using the Industrial IT service account. A service provider implements a part of a service for the 800xA System. Service providers may be redundant and all service providers within the same service group implements the same function. A service provider is configured in the Service Structure.
Shape	Instance of a *Shape Type*.
Shape Type	Pattern for a single or a group of *Primitives*. The shape has no relation to the domain model and no *connection*s.
Single Control Module	*Control Module* type that can be instantiated only once (singleton).
Single node engineering system	Supports engineering of *Process Portal*, *Asset Optimization*, Batch Management, Information Management and certain connectivities.
Single node system	Supports connectivity to *AC 800M* and either PROFIBUS/HART® or FOUNDATION™ Fieldbus devices.
Skeleton	Diagram in a library with predefined layout configuration. This means, that areas and insertion points for *symbol*s as well as connecting lines can be predefined to get a (semi-) automatic diagram generation.
Snap Point	Special *graphical element*, which provides the functionality to snap 2 *symbol*s in predefined way on each other.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Solution	A configuration of software and hardware components that can be applied to a certain class of problems. The design and functional scope of a *solution* should be optimized to make it re-usable in a practical way. A solution is built from other solutions and/or basic system functions. It consists of simple and composite *Aspect Object types*, with default parameter values and other configuration data for the aspects, e.g. control logic, process graphics, alarm and event specifications, reports, etc.
Structure	A hierarchical tree organization of *Aspect Objects* that describes the dependencies between the real objects. An Aspect Object can exist in multiple structures.
Symbol	Generic term for a single or a group of *graphic components*. A *symbol* graphically represents a function component. It can have an arbitrary number of *connection port*s with *connection*s. It is created/edited in Component view.
Symbol Type	Pattern for a single or a group of *Primitives*. The *symbol* has a relation to the domain model and can have an arbitrary number of connection ports with connections. It is created in *Function Designer* Component view.
System	Collects all data of an engineering project. They are administrated by the Configuration Wizard application of the *System 800xA platform*. *Project* is a synonym for *System.*
System Alarm	An *alarm* that is generated from the 800xA System, such as a network problem, a file system error or a server error.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
System application	A software component, based on the *Aspect Object architecture*, which provides functionality. System applications cooperate according to rules defined by the Aspect Object architecture. They are normally bundled into *system product*s or *system extension*s. System applications are implemented as client applications or services. To participate in *Aspect Object operation*s, an application must present itself as an *aspect system* (or possibly as several aspect systems). When there is no risk for confusion, the term “application” may be used instead of “system application”.
System Event	An *event* that is generated from the 800xA System, such as a network problem, a file system error or a server error.
System extension	Consists of one or more *system application*s that are bundled as an extension to one or several existing *system product*s. A system extension can only be installed if (one of) the corresponding system products has been installed previously.
System offering	A defined collection of Industrial^{IT} products that work together in verified configurations, with guaranteed function, capacity and performance, and behavior. A system offering defines the basis for version management, and for definition and verification of requirements.
System 800xA platform	A collection of software that forms the basis for an Industrial^{IT} system, and provides the development and execution environment for Industrial^{IT} compliant applications. The *System 800xA platform* includes the Aspect Framework.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
System product	Consists of applications bundled together with relevant parts of the *System 800xA platform*. Several system products can be installed on the same physical node.
System version	Defines the collection of specific versions of Industrial^{IT} products, as well as operating system and similar components, which constitute a system offering at a given point in time.
System product extension	Consists of one or more applications that are bundled as an extension to one or several existing *System Product*s. A System Product Extension can only be installed if (one of) the corresponding System products has been installed previously.
S800 I/O	A range of process *I/O module*s.
S900 I/O	A range of process *I/O module*s.
Tag	Any *Aspect Object* in the Control Structure which has a faceplate aspect attached.
Terminal Server for thin client access	Enables remote access to 800xA System functions from one or more PC clients that do not have 800xA System software installed.
Thin client	Web browser connected to the Internet (or intranet). Does not require any ABB-related preloaded software. Supports ActiveX controls, but communicates with 800xA System only through Internet technologies. Internet Explorer is used as browser.
Topology Component	A *symbol* that has topology -related aspect data to other *aspect system*s, e.g. *- 800xA for AC 800M*: Hardware *unit*s It represents an Aspect Object both visible in the Control Structure and on a *Topology Diagram.*

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
Topology Component Aspect Object	Aspect Object with a Topology aspect visible both in Control Structure and as *symbol* on a *Topology Diagram*. Stored tree-persistent in the Control Structure.
Topology Component type	Aspect Object type defined in Object Type Structure with a Topology aspect. Defines the interface of a *Topology component* and its *symbol* representation.
Topology diagram	A *Topology diagram* is made up of Topology component *symbols, connectors, connections*, and *free graphics*, with up to four *layers*. Can be nested and represented as *Topology component* on the next higher level.
Topology diagram template	Template for the *master page layer* of a *Topology diagram*, e.g. A3/A4 portrait/landscape with headers/footers. The template can be copied or referenced in the diagram.
TRS	*Tool Routing Service*, a service that allows the user to use Fieldbus Builder PROFIBUS/HART to configure HART devices, via *AC 800M.*
Unit	A hardware *unit*, with or without accommodated software.
Update	Adding revisions, rollups, or temporary corrections to an existing 800xA System.
Upgrade	Moving from one 800xA release to a later 800xA release, whether it be a major or minor release.
Up-loader (Uploader)	Used to import a configuration from devices, to read in and build a set of *Aspect Object*s from information present in the devices.

Table 28. Terms/Acronyms (Continued)

Term/Acronym	Description
User application	A configuration of software and hardware components that applies to a specific problem, e.g. a specific process control problem. A *user application* consists of a set of simple and composite *Aspect Object* instances, with parameter values and other configuration data for the aspects control logic, process graphics, alarm and event specifications, reports, etc. A user application is built from *solution*s and/or basic system functions. From a Control perspective: (Control) Applications contain program code to be compiled and downloaded for execution in a controller. Applications are displayed in both *Project Explorer* and *Plant Explorer*. When there is no risk for confusion with system application, the term “application” may be used instead of “user application”.
Version handling	Functionality that allows more than one version of an *aspect* to exist in the same system.
View	See also *Aspect View*.
Workplace	User interactive functions that are combined for a particular use case, for *Operator Workplace*, *Engineering Workplace*, etc. A node that runs one or several *workplace* applications.
Workstation	Physical hardware (node) to run *workplace* applications.
XY-plot	A trend that uses a trend variable instead of time on the X-axis. It draws one signal as a function of another signal (instead of plotting it as a function of the time).

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