



System 800xA 5.1 FP4 System Guide Summary

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System 800xA – System Intro

System Guide Summary

800xA system guide summary is primarily intended to provide an overview of System 800xA and its capabilities. It thus summarizes the main 800xA System Guide. This summary describes the functionality and capabilities of System 800xA 5.1 including Feature Pack 4. For more detailed information please use the 800xA System Guide (3BSE038018-510)





System 800xA – System Intro

Power of Integration



Extended automation

System 800xA's 'xA' stands for Extended Automation and utilizes the system architecture which was built for application integration in a fully redundant, reliable environment. System 800xA extends the reach of traditional automation systems - beyond control of the process - to increase energy efficiency, asset utilization, energy savings and operator effectiveness.

The power of integration

In order to be competitive, various plant entities, departments and personnel have to work as one flexible, integrated, collaborative team. For this to be accomplished, an automation platform with comprehensive connectivity capabilities is necessary. Integration of systems and applications where all actionable information is available for use in the system can be provided to users in a variety of roles.

System 800xA Extended Automation is an integration platform with unparalleled connectivity to enterprise and plant systems, applications, and devices that improves operations, engineering, control and maintenance and provides a collaborative environment where real-time decision making is a reality. This is the Power of Integration.

For more information about System 800xA please visit our web:
www.abb.com/800xA

System 800xA – System Intro

Automation and Power Integration

Leaders in the process control industry have continually expressed the need for increased operational efficiency, reduced downtime, and reduced energy consumption. To meet these industry needs, a true integration platform is necessary in order to tie together the electrical control system, process control system, and maintenance equipment health information so managers and operators can make informed decisions on energy and lifecycle management.

Barriers and past attempts of Electrical Integration

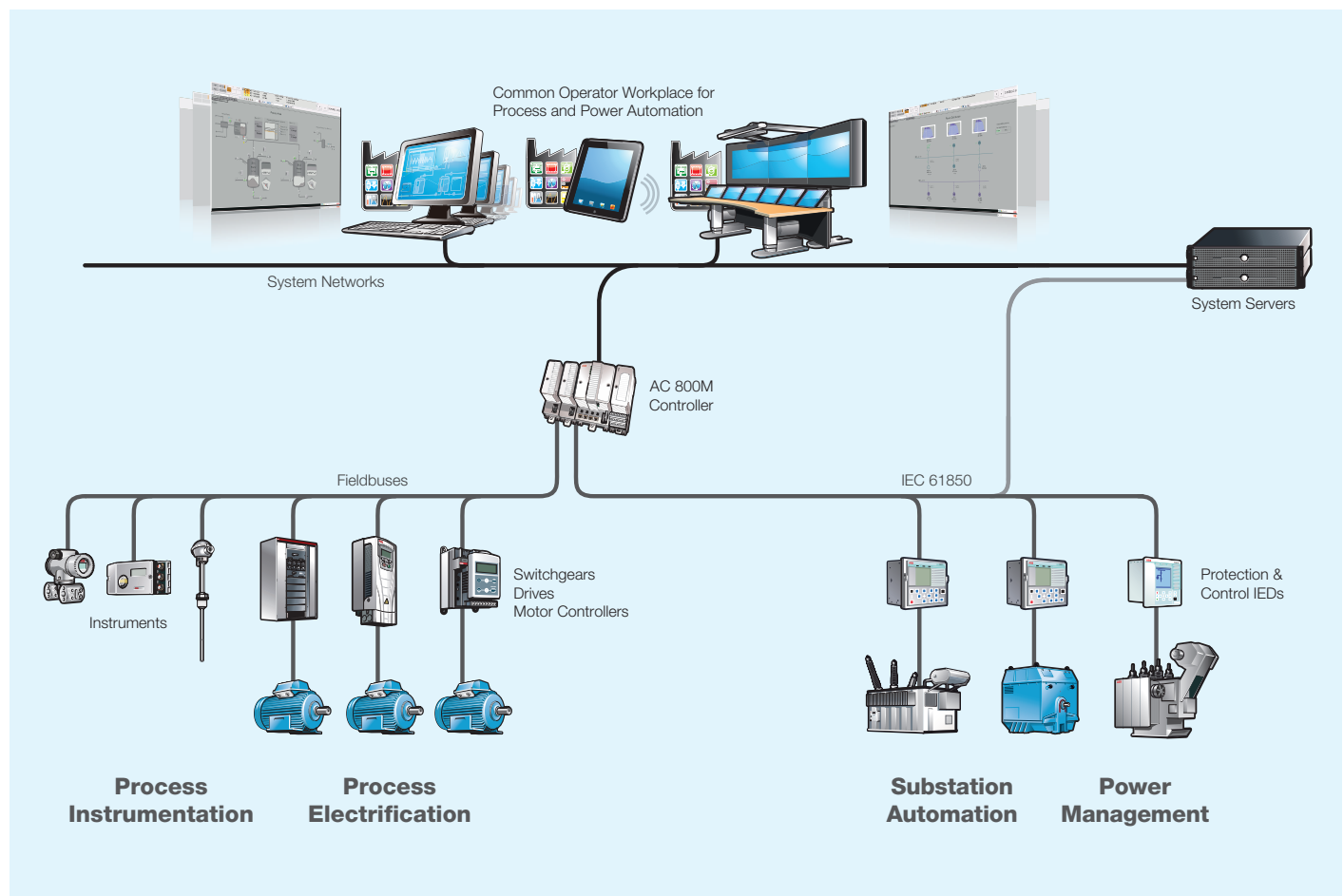
Electrical integration in the past has been hampered with lack of communication standards and architectural design resulting in high project execution and commissioning costs and high life cycle costs. There are too many protocols used in electrical scada systems. Some are proprietary while others are open standards. No one protocol has become dominant. As a result, the cost to engineer electrical scada systems is high when multiple vendors supply equipment that uses different communications protocols. The life cycle costs of a system with a hodgepodge set of communication links are also very high.

Electrical Integration is not new. It has been done in the past by hard-wiring signals between the electrical equipment and the process control system, as well as by building complex software gateways. The result is still two separate systems but they are awkwardly tied together. This traditional methodology has high integration costs, high project risks, and high life cycle costs.

Organizational barriers among departments within plants and suppliers have also hampered integration efforts. A new approach is needed to overcome these barriers.

What value does System 800xA provide?

With Integrated Process and Power Automation, ABB's System 800xA provides full plant integration. ABB's Electrical Integration is based on open standards. ABB offers a complete portfolio of DCS, process electrification, and substation automation solutions which reduces project costs and risks.



System 800xA – System Intro

Operator Effectiveness



Operator Effectiveness is the part of System 800xA that places the operator in focus. The operator needs to have a superior working environment to perform his tasks efficiently and successfully.

There's got to be a better way

Similar control room issues can be seen all over the world. Operators do not have an efficient and user friendly work environment. They are expected to handle larger areas of the plant and they may not get the opportunity to train on critical situations before they occur. Many operators do not have overview graphics on their HMI's, an ergonomic work environment or sufficient access to necessary data. What they do have is more responsibility and pressure to perform at very high levels.

Global trends across all industries show operators have more responsibility at the same time as processes become more complex. The control room operator is becoming a very skilled and valuable knowledge worker. But, in order to get there, companies need to focus on operator effectiveness to address:

- Losses due to poor abnormal situation management
- Ever changing requirements and regulations
- Diminishing knowledge base and operator experience
- More sophisticated control strategies
- More systems, data and information overload

Improving Operator Effectiveness through integrated information

With Operator Effectiveness we touch on more than just operator graphics or alarm management strategies. All aspects that impact operator performance be addressed to deliver true operator efficiency.

The four pillars of Operator Effectiveness that are addressed by ABB's control room solutions are defined as:

- Integrated systems and applications
- High performance design
- Attention to human factors
- Operator competency

System 800xA – System Intro

High Integrity Safety Automation

In the hierarchy of automation, safety automation is a tier above normal process control. Whether the process is continuous, discrete, or somewhere in between, safety automation can be found in most facilities and is critical to protecting people, the environment, and financial investment in the facility should the normal process control fail to keep the process within safe operating parameters.

What is safety automation?

Due to these demands, safety automation has special requirements related to how it must be addressed throughout the project lifecycle. IEC, ISA and other standards address the complete lifecycle of safety automation from equipment design and manufacturing to the complete project lifecycle that must be managed by the process owners.

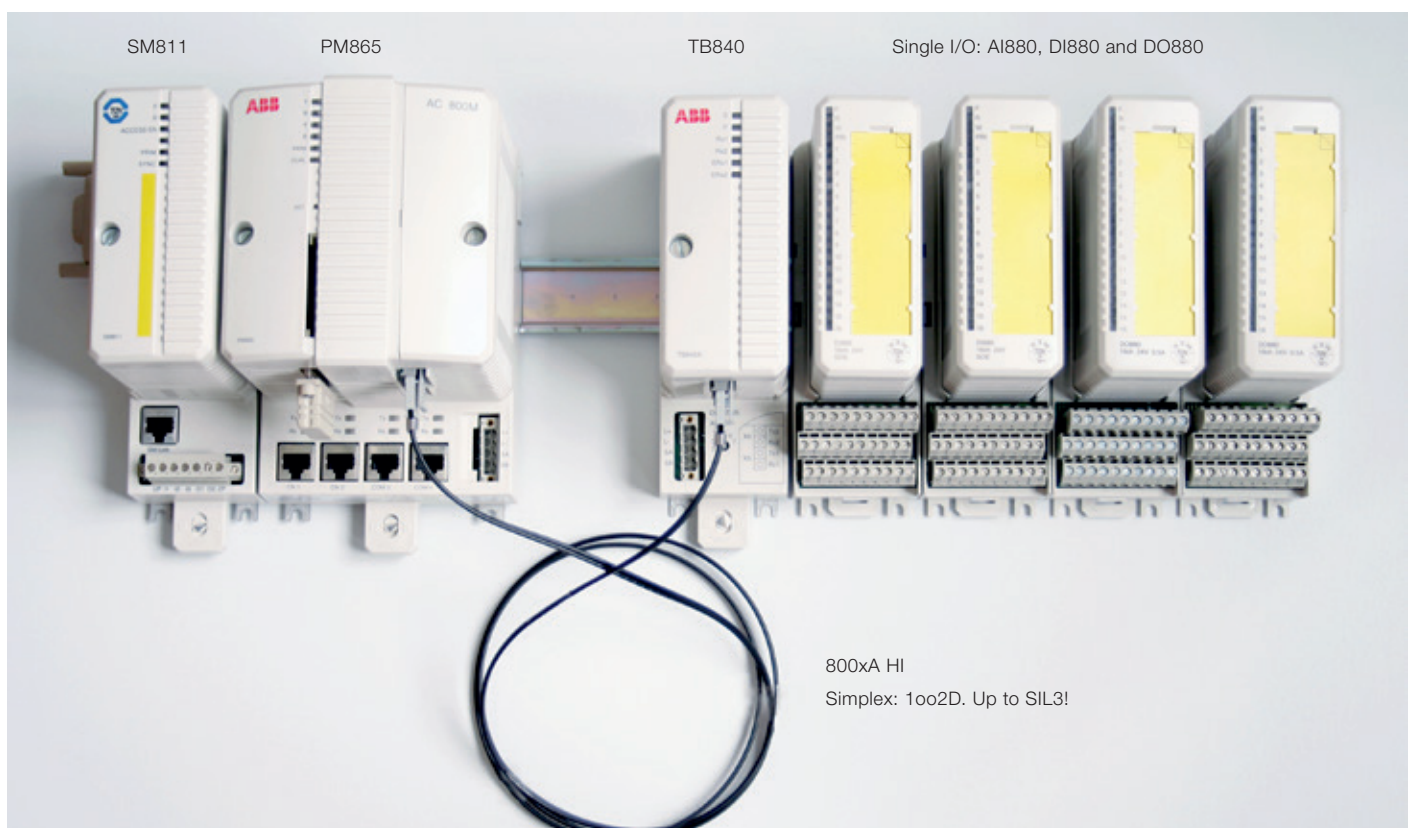
In the past, safety was always considered to be completely separate. Today, “integrated safety” is a hot topic that has many different meanings across both suppliers and customers.

800xA High Integrity – the Power of Integration

800xA High Integrity is an innovative development in safety automation and is a primary example of ABB's power of integration. 800xA High Integrity provides the opportunity to fully integrate safety automation into the process automation environment in ways unmatched by any other supplier.

800xA High Integrity allows the safety system designer to choose the degree of integration appropriate for a specific application and control philosophy. 800xA High Integrity can be deployed as a fully segregated solution, integrated at the same plant network level as the process automation, integrated into the process control system but using dedicated safety controllers on the same control level network, or fully integrated with both process control and safety automation executed simultaneously within the same controller hardware.

800xA High Integrity meets the most stringent requirements of IEC 61508 second edition for products to satisfy and increase the overall safety reliability for the safety integrity level (SIL) applications to a SIL3. 800xA High Integrity can also be used to meet safety requirements under NFPA , EN ISO 13849-1 (formerly EN 954-1) for machine safety, and most other safety standards. No other safety automation solution in the marketplace is more flexible than 800xA High Integrity.



System 800xA – System Intro

Enterprise Asset Management

Knowledge is the most precious commodity in business today. Production facilities employing real-time Plant Asset Management (PAM) systems significantly increase process uptime while reducing maintenance costs. The typical plant is teeming with information. The challenge, however, is having relevant information available at the right time, in the right form and to the right people.

ABB provides asset management solutions that present real-time asset information seamlessly and in the proper context, to operations, maintenance, engineering and management. As a result, continuous improvement initiatives such as Reliability Centered Maintenance (RCM) strategies, plant-wide adoption of proactive maintenance practices and autonomous maintenance minimize unscheduled shutdowns, optimize product quality and become more effective. These activities can be employed regardless of industry. The results are higher return on assets and greater profitability.

Your optimization strategy

An effective asset management strategy combines the needs of the production and maintenance organizations. It increases both equipment availability and production rate by providing insight into asset health, corrective action instructions and organizational visibility. It reduces time-to-decision and coordinates production and maintenance activities.

What ABB provides

ABB has a unified approach to Asset Management, with a portfolio of solutions that is unmatched in today's market. ABB has at least one solution (usually a few!) for every asset management need, regardless of industry or scope.

ABB offers solutions supporting the following asset management tools and strategies:

- Condition Based Monitoring
- Predictive Maintenance
- Instrumentation Health
- Process Optimization
- Energy Management
- Alarm Management
- Green Initiatives
- Operator / End-User Training
- Reliability Dashboards
- Historical Analysis
- Tracking Assets
- Lifecycle Cost Planning
- Best Maintenance Practices & Strategies
- Hazard and Risk Studies

- Health, Safety, and Environmental Issues
- Compliance Issues
- Asset Management Benchmarking Services
- Field Service
- Remote Diagnostic Services
- Service Reports
- Periodic Audits
- Remote Connections
- CMMS Capabilities
- Mobile Worker Concept
- Terminal Services
- Smart Client
- Back Office Maintenance Department Concept
- Risk Management
- Employee Health and Safety
- Collaborative Device Communities
- IT Security

ABB's answer to meeting the asset management needs of the process control industry is our Asset Management Portfolio (AMP). AMP includes the following:

- Engineering Excellence - Engineering Services Group
- Maintenance Methodology - Reliability Services Group
- Hands-on Expertise - Full Service Sites
- Implementation Capabilities - Consult IT & Projects Groups
- Remote Diagnostic Services - Service Group
- All Encompassing Asset Monitoring capabilities with System 800xA

The primary benefits of an asset management strategy are increased asset availability and performance, and maximized operations and maintenance effectiveness.

System 800xA – System Intro

Fieldbus Technologies

Fieldbuses have been around for more than two decades now. One key driver is the digital age; more and faster information. A second, and perhaps more important driving force has been cost reduction from the point-to-point 4-20 mA (or any other “amp” or “voltage” range) solutions that have existed since the beginnings of process instrumentation and automation.

In their quest to lower lifecycle costs while improving productivity, companies have integrated intelligent field devices via fieldbus technologies into their process automation solutions. Compared to traditional 4..20 mA technology, digital fieldbus solutions integrate and exploit embedded new levels of field device information in order to streamline work processes, improve process and product quality, and maximize availability.

System 800xA seamlessly integrates intelligent field devices as well as electrical equipment and makes the resident information available in the right manner to the right people and in the right context. System 800xA's power of integration makes information available not just within the control system itself, but throughout the plant. System 800xA supports users in managing their field devices.

Fieldbuses: many types and purposes

Fieldbuses are available in many types and serve many different purposes and applications. Many of the “older” fieldbuses like MODBUS and DeviceNet are now expanding from their RS232/RS485 origins onto ethernet media. The digital information that HART has provided for years is now becoming available with a networked infrastructure thanks to WirelessHART! Simple, low power devices can now be easily installed in hazardous areas with ASi bus. And high demand, complex requirements can be fulfilled with selections from FOUNDATION Fieldbus, PROFIBUS, and IEC 61850. In addition to the international standards, ABB has been addressing special needs throughout our history with proprietary fieldbus solutions for INSUM electrical and Drive integration as well as remote I/O solutions from previous generations of products that greatly simplify the evolution of those previous platforms to today's AC 800M controllers and all of the features available with System 800xA.



System 800xA Extended Automation The Power of Integration

System 800xA is designed to be the best system at integrating fieldbus solutions to meet the demanding requirements of our system owners. Each AC 800M controller can mix and match incoming information from any combination of up to 12 direct fieldbuses and with the use of gateways on our native PROFIBUS infrastructure, more can be used if necessary. Supporting fieldbuses delivers significant value to the end users in the form of both CAPEX savings (wiring, footprint, weight) and OPEX savings (asset management, heating and cooling, design flexibility, maintenance strategy)

System 800xA – System Intro Evolution

Our customers are looking to improve overall productivity from their installed system by getting more value from it, extending its useful life, and reducing maintenance costs while improving overall reliability. System 800xA offers solutions to these challenges and opportunities, but an existing installed system installation faces many modernization challenges which include: maintaining production and profitability, utilizing maintenance budgets rather than CAPEX, and ensuring maximum ROI and protecting assets - both physical and intellectual.

ABB's solution is evolution

Evolution is ABB's guiding lifecycle principle and is embedded within ABB's product offerings, policies, programs, and processes. Evolution allows our customers to achieve their business goals by both sustaining their automation system and extending it with new features and technology.

ABB's lifecycle programs

Our customers need to make informed decisions, better control lifecycle costs, remove uncertainty for predictable budgets, eliminate unplanned upsets and trips due to system interruption. ABB's Lifecycle Management policies fulfill these needs. They include:

- ABB Lifecycle Policy
- Core Control Commitment
- Product Lifecycle status and history
- System 800xA Software Support Policy
- Automation Sentinel

Why ABB is better than the competition

Only ABB, through evolution, addresses the complete automation system from operations through engineering, control and I/O. The competition may offer what appears to be point solutions, but in the end, the result is really a virtual rip and replace of the customer's system with no true protection of not only intellectual - but also physical assets.

Lifecycle planning

ABB's Lifecycle Planning process is a powerful method to engage with our customer throughout the system lifecycle. It is a formal and structured process with defined phases, tools and outcome. Its objective is to collaboratively work with the customer to construct a technical and commercial road map 3-5 years out in the future to achieve these objectives. The plan is reviewed yearly.



System 800xA Operations

The following sections describe System 800xA capabilities piece by piece, from the different functional areas, over system base functional, to key technical data and deployment alternatives. While this is an overview with a lot of detail still left out, please see the System Guide, references [3] and [4], for more information.



System 800xA Operations

Operator Workplace

This is the main work environment for operators, providing them with control and supervision of the underlying processes. Process data, as well as data from systems integrated in System 800xA, are all presented in the operator workplace. The Operator Workplace coordinates and manages toolbars, graphic displays, alarm lists, faceplates, etc., to give operators the best possible user experience. Built-in rules make sure that the information required is always visible or easily accessible.

Navigation concepts, mainly the context menu, provide operators with easy access to all information in the system. In addition, the Operator Workplace is highly configurable. Each workplace can be configured with up to four screens and several Operator Workplaces can be combined to one unit to create even better control possibilities for the operator. Operator Workplace also comes with a predefined layout with details of what to show on each screen and where on each screen the toolbars and displays will be presented. This predefined layout covers resolutions 1680x1050, 1920x1080 and 1920x1200.

Displays, e.g. graphic displays and alarm lists, can be viewed in a predefined workplace display area or placed on top in an overlap window. The tabbed workplace is a layout of the operator workplace where the views in the display area are organized under tabs that can be used for quick and easy navigation between displays.

Extended Operator Workplace

The Extended Operator Workplace consists of three System 800xA Operator Workplaces with three screens each mounted in an ergonomic and performance-enhancing environment.

The combination of one workplace feeding three large Full HD screens for overview graphics and two three-screen operator workplaces feeding into a total of six screens gives operators a perfect working environment. In the Extended Operator Workplace, screen resolution is standardized to Full HD (1920x1080).

Process Graphics

Process Graphics is integrated in the Operator Workplace to present graphic displays with live data to the operator. Live data is fetched via OPC and presented to the user in real time. Expressions in the graphic display can be used to calculate live data based on one or more OPC properties. Graphical libraries will provide standardized graphical elements that can be reused in different graphic displays, contributing to a clean and well thought out look and feel. A set of new High Performance HMI elements based on the best-practice principles in Human Machine Interfaces have been added to the graphics library.

Right clicking on an object in a graphic display will launch the context menu, allowing the operator to navigate within the operator workplace, launch the object's faceplate, acknowledge alarms, etc. Left clicking will launch the default aspect on the selected object – typically the faceplate.

Panel 800 Version 6 is one of the fastest, most powerful operator panels on the market

Harness the power and reliability of an industrial panel designed for all industries that demand cutting-edge technologies in an operator panel.

Solid functionality for all applications

Panel 800 Version 6 is a user-friendly, intuitive and ergonomic operator panel that combines slim, space-saving dimensions with a comprehensive range of advanced functions. It is equipped with advanced functionalities for process and equipment control accessible via touch-screen symbols. Panel 800's comprehensive HMI functionalities such as alarm management, trends, logging, recipes, schedulers, audittrail, among others, are used in all applications and industries today.





No more push buttons

With the new Panel 800 Version 6, having a fully deployable HMI application is always within reach. Simply mount a Panel 800 wherever it is needed. Replacing push buttons with a flexible, touch-screen panel HMI saves not only valuable space but also time and trouble of rebuilding connections. Now, one merely only reconfigure the software. Monitoring a process via Panel 800 graphics provides better supervision and control compared to relying on rigid buttons and text displays. Operators enjoy improved information as well as opportunities to interact with the process. This promotes fast and correct decision-making, which, in turn, increases productivity and reliability. The information available to plant operators also enables more accurate data collection and overviews. Current production statuses are more visible, and process analysis and follow-up are far more effective.

Key benefits

- Easy to use: A fully deployable HMI with comprehensive and integrated templates and libraries for every conceivable process. With ABB's user-friendly Panel Builder engineering tool, engineering becomes quick, easy and efficient. The tool supports multiple languages.
- State-of-the-arts graphics: Vector-based, high-resolution graphics in TFL/LED display, with icon-based interface navigation and control.
- Robust and reliable technology: Panel 800 is constructed in a strong yet lightweight die-cast, powder-coated aluminum housing. Its IP66 front casing withstands wet, dusty and demanding environments.
- Truly open platform: Built on open architecture and technologies that accompany the .NET framework, Panel 800 is capable of multi-brand controller connectivity. A multitude of connection options are available for local communication, expansion, remote access and more.

System 800xA Operations

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.

The faceplate framework, a part of the operator workplace, helps ensure that product-supplied faceplates are straightforward and intuitive.

Three standard sizes of faceplates (reduced, normal and extended) provide the operator with the number of details required.

Alarm & Event management

Alarm & Event management is supported at 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 that needs to be acknowledged).

Alarms are always presented to the operator in obvious and clear ways inside the Operator Workplace. In addition to alarm indications in graphic displays and on faceplates, the operator workplace can have:

- fixed alarm bands to provide the number of active and unacknowledged alarms in a summary display
- alarm lists to present current alarms in chronological order
- a sequence bar to present the number of alarms horizontally

An alarm list displays all alarms matching the predefined filter of the alarm list in chronological order. The operator can view details about the alarms and acknowledge individual or multiple alarms from this list. In addition, the operator can analyze the alarms by filtering the alarm list using expressions.

Events are presented in chronologically-ordered event lists (like the alarm lists) but without the possibility to acknowledge. Event lists display all events matching the configured filter for that list.



The operator can filter the event list columns with expressions to further analyze the events. Irrelevant alarms that do not require operator interaction can be hidden by using the Alarm Hiding function.

Operators can also choose to temporarily remove standing or nuisance alarms to handle at a later occasion by using Alarm Shelving. Alarms that require a similar response from the operator can be grouped and presented as one alarm. This reduces the number of alarm entries in the alarm list.

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.

Trend Display presents data seamlessly from both run-time and historical data.

A trend display can display several trend traces in the same display, e.g. one trace for the value and another for an alarm limit. Users can modify the time and time resolution on the display when working with the trend. Values can be presented in relation to each other in an XY-plot diagram.

SFC Viewer

The Sequential Function Chart (SFC) Viewer is a display type, that shows the Operator animated sequence overview displays as well as transition and action dialogs. Visualization does not require configuration tools to be started. The display is implicitly being created and updated by the configuration tools. Integration is available with the controller families AC800M, Freelance and Symphony Melody.



System 800xA Control

AC 800M – scalable process controller with choice of speed, memory and availability

Through its modular design, AC 800M controllers and associated I/O options contribute to lower costs, higher engineering quality and higher operating efficiency.

Equally effective for small hybrid systems as for large, integrated automation applications, the modularity of the sub-system results in higher return on assets by providing the flexibility to choose the specific functions required to meet actual requirements. Using the same base hardware, a wide variety of central processing units (CPUs), I/Os, communication modules, and power-supply options provides flexibility in terms of functionality, performance, and size.

For example, a basic controller may consist of a power supply module, a controller, and local I/O modules. A large system can consist of several AC 800M controllers that communicate over an Ethernet-based control network. These stations may employ sub-clustered I/O assemblies connected to their host controllers via cable, fiber-optic or wireless industry-standard fieldbuses.



Features and benefits:

- Scalable design for easy expansion. Simple to set up and easy to expand, AC 800M scales up as control needs grow. Just add the extra modules the application requires.
- From only a handful of I/O points to thousands, installed locally or remotely.
- Full modularity and flexibility for all environments. Many options make AC 800M exceptionally open. Its flexibility comes into its own when control applications change, expand or contract.
- Fault tolerance gives maximum availability. Robust design and redundancy options in all critical areas of the controller and its components eliminate single-point failures and secure maximum availability.
- Comprehensive maintenance features reduce downtime.
- Powerful control solutions and reusable libraries. The software offers a wide range of powerful control solutions for the AC 800M process controller. From basic logic to advanced regulatory control, or any mix of these two.
- Code re-use and libraries of ready-to-use functions promote efficient configuration.
- Low power consumption allows for installation in sealed enclosures without requiring fans, louvers, air filters or other forced cooling techniques.

Scalable design plus full modularity and flexibility for all environments

AC 800M is a modular process controller with a rich set of communication functions as well as full redundancy and support for a large range of I/O systems. Several fully compatible CPU modules vary in terms of processing power, memory size, and redundancy support - from low-cost, medium power to high-power, full redundancy.

Rail-mounted modules comprise CPUs, communication modules, power supply modules and accessories. Connectivity and expansion options make AC 800M exceptionally open and scalable; easy to connect and easy to adapt according to current control needs.

Fault tolerance gives maximum availability

Maximum availability is achieved when redundancy options are implemented. Redundancy is available in all critical areas of the AC 800M, affording maximum flexibility and availability. These include control networks, fieldbuses, internal buses, power supplies, CPUs and I/O. If a fault occurs in a primary circuit, bumpless transfer to the back-up ensures uninterrupted operation. Implementing all redundancy options eliminates single-point failures, thus helping secure maximum availability. The end result is seen in increased productivity and greater profit.

For harsh environments, all modules are compliant to G3 severity level of ISA-S71.04, Environmental Conditions for Process Measurement and Control Systems.

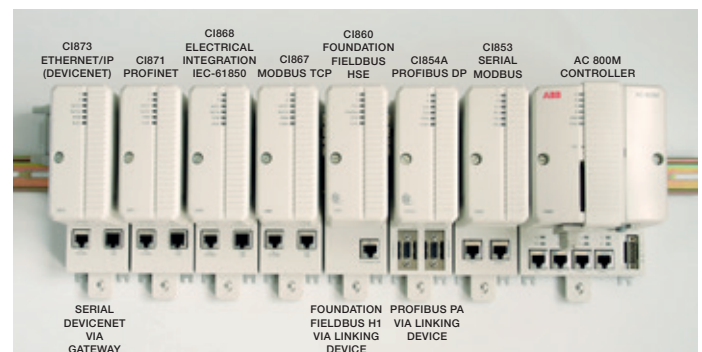
The AC 800M controller has received security certificates from Wurdtech (Achilles Level 1 certificate) and MuDynamics (MUSIC certificate).

CPU Redundancy

The AC 800M CPUs PM861A/PM864A/PM865/PM891 can be configured for CPU hardware redundancy. Here, two CPU modules will run in parallel, one as primary and the other as secondary. If the primary CPU fails, the secondary CPU automatically takes over.

Control Network Redundancy

Network redundancy is based on the ABB RNRP (Redundant Network Routing Protocol). This protocol is designed for rapid detection of network failure and instant switching to alternative paths. Network redundancy requires two independent IP networks, one primary and one secondary. Whenever the maximum number of lost messages is exceeded, the traffic switches to the secondary network.



System 800xA Control

Comprehensive maintenance features reduce downtime

Modules are equipped with self-diagnostics in the software. This reports 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, thus contributing to lower maintenance costs.

Modules can be replaced under power and are keyed to ensure replacement with the proper module types. The application and data can also be stored in a detachable Flash memory to secure its contents, e.g. after a power failure or during replacement or transportation.

AC 800M also supports on-line upgrading of the embedded firmware in redundant CPUs and communication modules to avoid downtime.

Control modules, applications and hardware settings may be changed on line, in real time and under power, resulting in maximum control availability.

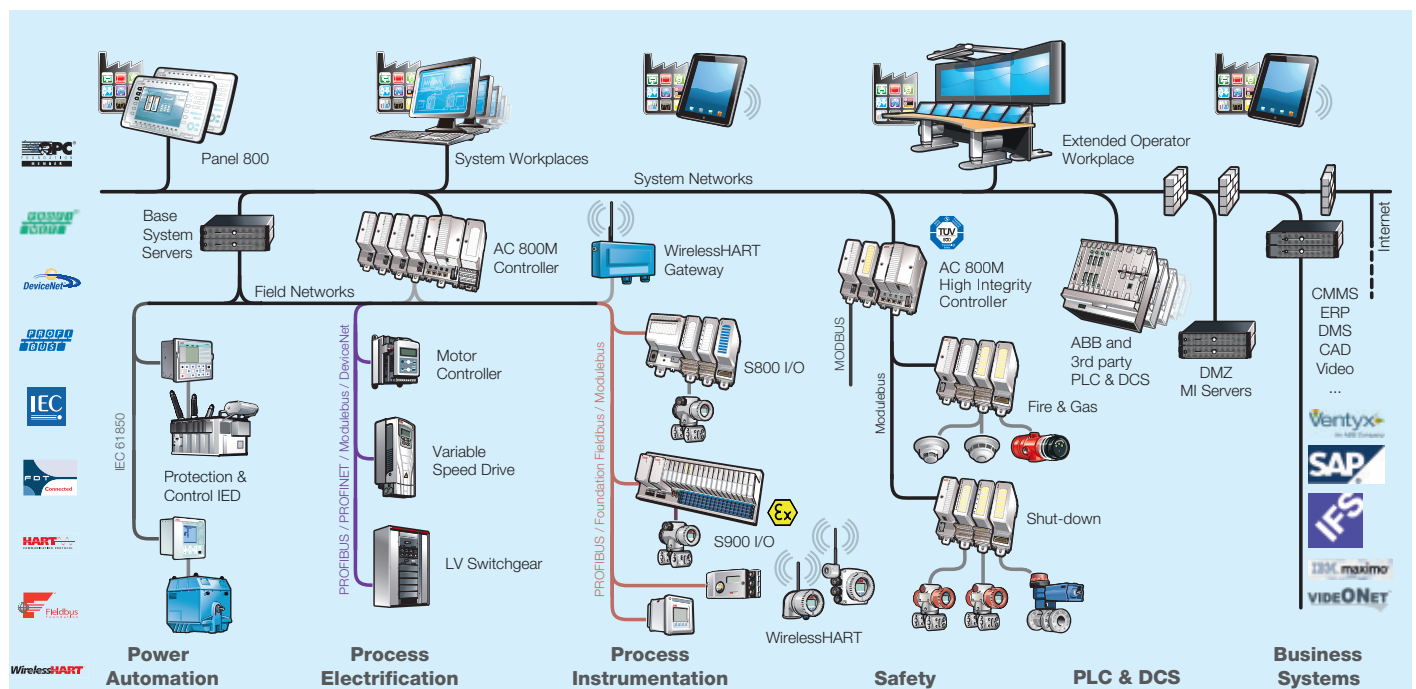
The ABB patented 'Load Evaluate Go' function takes this easy handling a step further by supporting actions such as Modify, Download and Evaluate, making it possible to download a new version of the running application to the controller without it interfering with the running version. The modified version is started in passive mode in parallel with the running version and an Evaluation Report tool shows any differences in real time.

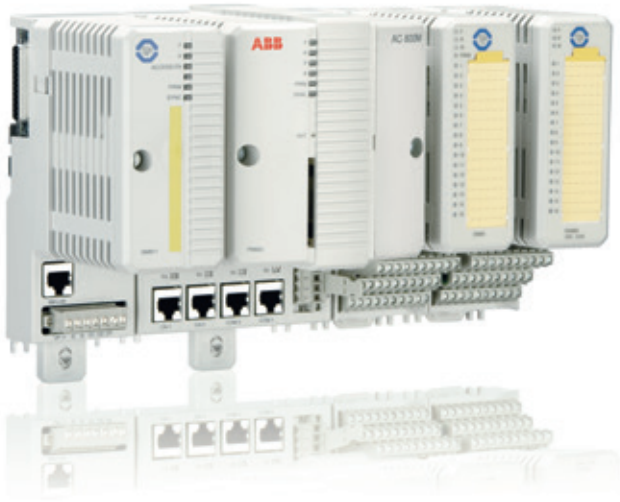
A Flash memory card can be inserted into a slot in the CPU module to store the application and data.

Powerful control solutions and reusable libraries

AC 800M supports logical, mathematical and time-based data processing. The functionality range for control applications is wide, from binary control to closed loop control, with advanced functions like auto-tuning and adaptive PID's, fuzzy control, etc.

Predefined process objects like motor objects, valve objects, etc. are available. It is possible to build user-defined function blocks and hide their content to protect intellectual property.





The AC 800M is fully integrated with the ABB INSUM and MNS iS switchgear technologies. INSUM (INtegrated System for User-optimized Motor control) is an ABB system for motor and switchgear control and protection. MNS iS is an ABB motor control center solution that is used in PROFINET networks.

There are four ways to connect and integrate ABB Drives to the AC 800M controller – ModuleBus, DriveBus, PROFIBUS-DP and PROFINET. Ready-made ABB Drives process objects allow easy and seamless integration.

Time synchronization

System-wide time synchronization of all nodes handling time related data is supported. The accuracy of the distribution to nodes performing 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.

Alarm and event handling

AC 800M handles alarms and events, including detection, notification or definition of alarm conditions. Function blocks monitor 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 better than 1 ms. Events are time stamped on the I/O module, and transferred through the controller, over the communication system, to the Alarm and Event system.



Events on I/O channels in one controller are differentiated down to a millisecond. Alarm and event text from the controllers supports National Language Support (NLS).

Network communication

Control Network is the standard network for AC 800M peer-to-peer communication and communication between AC 800M controllers and the 800xA system. The control network is based on Ethernet, TCP/IP, and the MMS protocol. Controllers use 10 megabit/second (with the exception of PM891, which uses 100 megabit/second).

Each AC 800M is equipped with two Ethernet ports for communication with other controllers and for interaction with operators, engineers, managers, and higher level applications.

These ports can be configured for redundancy in those cases where availability is of paramount importance. AC 800M is also equipped with two RS-232C ports that can be used for point-to-point communication with programming/debugging tools and with third-party systems and devices.

Inter Application Communication (IAC), uses Communication Variables for cyclic peer-to-peer communication. These variables can exist in the same application, same controller, or different controllers in the network.

System 800xA

Process I/O

The System 800xA Process I/O is a distributed, highly modularized and flexible I/O-system with an eco-efficient design that provides easy installation of I/O modules, process cabling and connections to drives systems. S800 I/O modules and termination units can be mounted and combined in many different configurations to fit user space requirements and suit many types of application.

By permitting installation in the field, close to sensors and actuators, 800xA I/Os reduce installation costs by cutting the cost of cabling. Thanks to features such as hot swap of modules, on-line reconfiguration and redundancy options, it contributes to keeping production up.

800xA I/Os contribute to lower maintenance costs through a comprehensive set of self-diagnostics. All modules are equipped with front-panel LED displays that show faults and degraded performance.

System 800xA Process I/O features include:

- Comprehensive coverage
- Flexible configuration and installation
- Easy set up
- Reliability and accuracy
- HART pass-through
- Redundancy also on I/O module level
- High Integrity I/O modules certified to IEC 61508 SIL3
- High accuracy time tagging
- Defined outputs at communication errors
- I/O modules with Intrinsic Safety interfaces

Comprehensive coverage

800xA has an extensive scope of Digital and Analog input/output modules. The I/O system provides a variety of I/O modules, covering analog and digital signals of various types, as well as interfaces for various types RTDs and TCs.

For positioning applications using incremental encoders, special interface units are available comprising a complete positioning loop. This allows flexible configuration and installation plus easy set up.

The I/O system is highly flexible and modular, permitting a virtually infinite number of installation arrangements for any application:

- small to large
- step-by-step expansion
- easy mounting on a DIN-rail

Online Configuration Changes

Hot configuration in run (HCIR). An S800 I/O station can be reconfigured while in full normal operation, i.e. without having to switch over to configuration mode.

Hot Swap of I/O Modules

All I/O modules can be replaced in a running system and will automatically be configured and initiated.

Redundancy

Redundancy options in all areas: power supply, fieldbus media, fieldbus interfaces and I/O modules.

I/O	Bus	SOE	HART pass-through	Redundancy			Remote I/O
				Master	Line	Slave	
S800	ModuleBus	Yes	Yes	Yes	Yes	Yes	Yes, up to 5000m
	PROFIBUS-DP	-	Yes	Yes	Yes	Yes	Yes
S900	PROFIBUS-DP	-	Yes	Yes	Yes	Yes	Yes
S100	-	Yes	-	-	-	-	-
S200	PROFIBUS-DP	-	-	Yes	-	-	Yes
	Satt ControlNet	-	-	-	-	-	Yes
Satt 19 inch rack I/O	Satt ControlNet	-	-	-	-	-	Yes
TRIO	TRIO LAN	-	-	Yes	Yes	-	Yes

High Accuracy Time Tagging

SOE (Sequence Of Events) is supported from S800 direct I/O. The I/O modules are synchronized to the controller real-time clock with accuracy greater than 1 ms. Events are time stamped on the I/O module. Following a trip, it is thus possible to determine the exact sequence of events that led up to it – regardless of the physical placement of the I/O signals.

Defined outputs at communication errors

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. To support the application, input modules have similar functionality.

HART pass-through

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

Supported ABB 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.
- S900 I/O, a remote I/O system for use in hazardous areas.
- S200 I/O and S200L I/O, two compatible, modular I/O systems (S200L I/O is the compact version)
- S100 I/O, a rack-based I/O system
- Satt 19 inch rack I/O, a rack-based I/O system
- TRIO, interface integrates TRIO/Genius I/O

Support for third-party I/O systems

AC 800M can connect to virtually any third-party I/O system on PROFIBUS-DP, PROFINET, DeviceNet and EtherNet/IP. All that's needed is a Device Capability Description File that details the relevant characteristics. A Wizard easily transforms third-party I/O systems into 800xA I/O objects.

The following files are supported:

- PROFIBUS-DP GSD files
- PROFINET GSDML files
- DeviceNet and EtherNet/IP EDS files

System 800xA Process I/O

S800 I/O family

The S800 I/O system is closely related to AC 800M, not only in appearance but also in features.

- Comprehensive: The S800 family of I/Os covers virtually all conceivable signal types and ranges, from basic analog and digital inputs and outputs to pulse counters and intrinsic-safety I/O.
- Flexible configuration: S800 I/O may be set up in a variety of ways, from directly connected to the host controller via sub-clusters (using fiber-optic cables), to PROFIBUS connected. Redundancy solutions available at all levels include power supply, communication interfaces and I/O circuits.

Flexible installation

Three mechanical designs are available:

- Compact (plug-in modules with a basic I/O signal termination area).
- Extended (plug-in modules with ample space for I/O cable termination, fuses, jumpering and field power distribution).
- S800L (all-in-one modules and bases with detachable screw terminal blocks for I/O signals) for installations not requiring hot-swap capability.

Easy set up

Once station numbers have been allocated and set, all other settings can be made from a network-connected engineering tool. A pass-through feature makes it possible to configure and examine all HART®-compliant field devices in a similar way.

Reliable

S800 I/O offers availability-improving features such as:

- Input/Output Set as Predefined (ISP/OSP). Each input/output can be set individually to default to a predefined value or freeze in case of communication loss.
- Hot swap of modules. A faulty I/O module can be replaced live, i.e. without powering down the station and without the rest of the station being affected. A hardware key ensures that only modules of the right type can be inserted.
- Hot configuration in run (HCIR). An S800 I/O station can be reconfigured while in full normal operation, i.e. without having to switch it over to configuration mode.
- Redundancy options in all areas: power supply, fieldbus media, fieldbus interfaces and I/O modules.

Accurate

S800 I/O modules can time-stamp events, i.e. input signal transitions, at source with millisecond accuracy. This provides the basis for meaningful sequence-of-events recording by the host system. In tightly interlocked processes, this is essential for finding the root causes of production disturbances.

For harsh environments, all control and I/O modules are compliant to G3 severity level of ISA-S71.04, Environmental Conditions for Process Measurement and Control Systems.

High Integrity

Within the S800 family, SIL3-certified modules can be used for safety-critical applications, see the section 'Safety' for more information.

High Density

S800 I/O saves cost and space by allowing up to 32 digital channels per module.



S900 I/O family

The S900 remote I/O system communicates with 800xA or other controllers over PROFIBUS. Suitable for applications in the chemical, pharmaceutical, oil and gas industries, S900 I/O can be installed in hazardous areas, thereby reducing marshalling and wiring costs. Further maintenance savings can be achieved through S900's extended diagnostics and the use of HART®-compliant field devices.

Three versions of S900 I/O are available

- **S-series** for applications in Zone 1 hazardous areas
- **B-series** for applications in Zone 2 hazardous areas
- **N-series** for applications in non hazardous areas

Additional solutions for specific applications

Series	Assembly	Field devices / signals	Hazardous area approval
S series	In Zone 1	In Zones 2, 1 and 0 (intrinsically safe signals)	ATEX Zone 1
B series	In Zone 2	In Zones 2, 1 and 0 (intrinsically safe signals)	ATEX Zone 2
N series	In safe areas	In safe areas	No

- **Field housing** – for wall mounting and field mounting in Zone 1 installations with system approval fully-certified in accordance with ATEX. The high-grade steel housing is prepared for wall-mounting with facilities for insulated screen rails or terminals.
- **CB220 compact box** – S900 in compact form (with up to 4 I/O modules). This variant is suitable for applications such as temperature multiplexers and solenoid valve circuits.

S900 components are based on a passive backplane suitable for mounting on a DIN rail or directly in a sub-distribution board. The passive backplane includes internal bus communication, terminals for field circuits, communication, and power supply. Function modules are plugged into the backplane in their appropriate slots. The redundant backplane has two slots for power supply units, two slots for communication interfaces, and 16 slots for function modules. Digital function modules have up to 8 channels, analog modules up to four. When using a redundant backplane, therefore, 128 digital or 64 analog channels can be connected per station. In the case of the S and B series, up to ten S900 stations can be connected on a single fieldbus line.

Key S900 benefits

- Intrinsically safe – can be installed in Zone 1 and Zone 2 areas.
- Good price/performance ratio because external barriers have been removed and costs reduced in terms of cabling, installation, hardware and maintenance.
- High reliability thanks to smooth automatic transfer of data and auto-diagnostics.
- Easy configuration using either FDT/DTM or GSD files, allowing easy integration with 800xA process control systems.
- High plant availability thanks to redundancy and hot-swap capability of all components during operation.
- Hot configuration in run (HCIR). An S900 I/O station can be reconfigured while in full normal operation.
- Full HART transparency with HART pass-through capability and ability to map secondary variables into process data.



System 800xA

Fieldbus support

Digital serial communication protocols provide access to a wealth of information contained in modern field devices

Compared to traditional 4-20 mA technology, digital fieldbus solutions integrate and exploit new levels of information embedded in field devices. This streamlines work processes, improves process and product quality, and maximizes availability. The fieldbus components of System 800xA make this information available to be used for more efficient process control or asset optimization.

The fieldbus protocols supported in System 800xA cover the broadest range of applications. This is very different from regional preferences or user-specific requirements determining which fieldbus is used. ABB's strength is to offer the freedom to choose what best fits the application needs from following range of protocols:

- PROFIBUS DP and PROFIBUS PA
- PROFINET
- FOUNDATION™ Fieldbus High Speed Ethernet and H1
- IEC 61850
- EtherNet/IP and DeviceNet
- Modbus TCP
- RS-232C

Supporting up to 12 (6 redundant) Communication Interfaces in one AC 800M Controller, data communicated through different fieldbus protocols can easily be mixed in the same application.

For critical applications, fieldbuses must meet the same fault-tolerant standards expected of traditional process control systems. System 800xA fieldbus options maximize field device availability with scalable redundancy schemes extending from full redundancy at all levels to options with application or media redundancy only, depending on the criticality of the equipment typically connected through the specific fieldbus protocol.

Field instruments are often mounted in hazardous areas. FOUNDATION™ Fieldbus, PROFIBUS PA, and the PROFIBUS DP iS layer extend the reach into the Ex-Zones so that field devices and remote I/Os can be easily deployed and operated in hazardous areas.

Highlights:

PROFIBUS is the most commonly used multi-purpose protocol for connecting field instruments, drives, low voltage electrical equipment, remote I/O, and various types of gateways to sensor/actor buses or proprietary communication. Accordingly, System 800xA offers a Device Management option to take full advantage of the wealth of functionality embedded in PROFIBUS devices. With communication speed up to 12 Mbit/s and a scalable redundancy scheme including ABB's RLM01 for connecting non-redundant PROFIBUS devices to two redundant lines, PROFIBUS provides unmatched flexibility for all types of process applications.

PROFINET carries forward the benefits of PROFIBUS to Ethernet-based communication. As a protocol now entering the process automation domain, it currently provides functionality for cyclic communication and redundancy limited to media redundancy. Currently, its main use is connecting low voltage equipment. Additional functionality is continuously being added and more field devices for process applications are becoming available.

FOUNDATION™ Fieldbus focuses on connecting field instruments. As a unique feature, FF provides deterministic scheduling of the bus communication plus the ability to execute control logic on the field devices (control-in-the-field). The integration of FF into System 800xA is based on High Speed Ethernet (HSE). Optionally redundant Linking Devices connect the low speed instrumentation bus lines (H1) to the high-speed backbone (HSE), thereby reducing fieldbus cabling and bringing high availability closer to the process. The backbone approach also facilitates electronic marshaling and late assignment of the instrumentation portion to the applications running in the controller. For configuring FF System, 800xA offers a corresponding Device Management.

IEC 61850 is the international standard for Ethernet-based interconnection of Intelligent Electronic Devices (IEDs) for substations and related electrical equipment. System 800xA's IEC 61850 communication interface is the basis for integrating the electrical part of a plant with process automation (see also the chapter Electrical integration).

System 800xA's combination of EtherNet/IP and DeviceNet connectivity provides a native interface to simple I/O and electrical equipment like that often used in the Americas. Cyclic data from DeviceNet devices can easily be integrated via the LD 800DN Linking Device. As more and more devices in this application domain start to support EtherNet/IP, this equipment can also be connected on the same network through the same communication interface.

Modbus (TCP or RTU) is the protocol of choice in cases where no higher-level protocol is available for connecting third-party equipment, e.g. for connecting third-party PLCs. As it is freely programmable, Modbus provides unmatched flexibility to support any kind of application. The Modbus TCP communication interface supports master and slave functionality and module redundancy. For Modbus RTU, System 800xA supports master functionality.

Another option for programmed multi-purpose connectivity is the RS-232C communication interface. It supports serial protocols and the corresponding services and libraries in the controller to set up device-specific data exchange.

The HART protocol is technically not a fieldbus. Nevertheless, HART devices support additional information via digital communication layered on the standard 4-20 mA process signals. The System 800xA I/O portfolio and connectivity for HART Multiplexers provide options that also take advantage of this data in Device Management for more efficient commissioning and maintenance. System 800xA supports the latest version of the HART protocol (HART 7).

With the support of WirelessHART, data from HART devices can now be retrieved and used in Control and Device Management independent of wiring and 4-20 mA signals. This enables temporary ad hoc measurement or measurements on rotating equipment difficult to fit with wired transmitters. Information on stranded in HART devices not connected to HART-enabled I/O can be effectively retrieved through WirelessHART with the ABB FieldKey Wireless Adapter. The meshed network topology of WirelessHART plus the built-in security features provide reliable communication for process monitoring applications.



System 800xA

Field device management

System 800xA Device Management

System 800xA Device Management is the application that turns raw data from field devices into actionable information for planning engineers, operators and maintenance personnel.

Device Management seamlessly integrates the intelligent field devices and makes the resident information available in the right manner to the right people and in the right context. This results in improved engineering efficiency, reduced time for repair, and optimized plant availability and performance, which ultimately leads to continuous productivity improvements.

Device Management options are available for the most commonly used protocols including HART, WirelessHART, PROFIBUS and FOUNDATION™ Fieldbus.

More than 1000 devices supported

Basic building block for easy and efficient engineering of field devices is ABB's comprehensive Device Library including more than 1000 tested Objects for ABB and 3rd party field devices. Selecting device objects from the ABB Device Library in Fieldbus Builder delivers all functions for easy configuration of network structures without the difficulty of manually integrating and testing 3rd party devices. All Aspects needed for managing the field devices throughout their lifecycle are automatically included without additional configuration hassles. The Device Library is maintained through new versions of System 800xA and continuously expanded as new devices or device revisions are released to the market or users request the integration of additional equipment.

Benefits during engineering

Fieldbus Builders, the integrated fieldbus configuration tools of Device Management, support engineers throughout the planning and configuration phase of a project.

Starting from System 800xA's Plant Explorer, all functions for topology design and device configuration are just a few mouse clicks away. Integration with System 800xA Bulk Data Manager allows fieldbus topologies to be efficiently created from project databases, device lists, or signal lists. Existing configurations can easily be duplicated and reused.

Device-specific graphical user interfaces, powered by Device Type Managers (DTMs) or Electronic Device Descriptions (EDDs), make device parameterization simple and intuitive. The DTMs and EDDs are provided by the device vendor to optimally support the functionality of the specific field devices. Integration testing during the creation of the ABB Device Library ensures interoperability between the system and the device drivers. As driver integration is based on open standards, integration is possible for basically every device. In cases where specific drivers are not available, System 800xA provides some generic configuration means like the BasicHART DTM that allows the basic configuration of a device.

The configuration features of System 800xA Device Management are available in both online and offline modes so that configuration and basic parameter settings can be done before the physical devices become available. When configuration is complete, additional features specific to the respective fieldbus support commissioning and installation of the networks and devices.

Bus timing and schedules are generated automatically. Device parameters can be displayed and modified individually online, or simply downloaded from the offline configuration database. The ability to tune device parameters from the control room through the system infrastructure reduces the need for trips to the plant floor and speeds up commissioning significantly. Data stored in the system's database and in field devices can be reconciled. For larger installations, Bulk Data Manager helps compare parameters in field devices with the settings planned in project databases, e.g. to track commissioning status.

When parts of the plant are already running and further fieldbus devices need to be added, System 800xA supports such additions with minimal impact on the running application and field devices.



Benefits during operations:

During plant operation, operators can take advantage of the fieldbus benefits. Status information coming with process values of fieldbus devices displayed on faceplates gives guidance about signal reliability based on the condition of the field device. Alarms & Events from field devices like that available with FOUNDATION™ Fieldbus help operators detect anomalous situations and take corresponding action immediately.

Maintenance Workplace is the maintenance department's interface to field devices. This workplace allows grouping and structuring of field devices and other plant assets according to maintenance needs, e.g. by device categories or maintenance teams. All device functionality brought to the system as part of the ABB Device Library is easily accessible via context menus. Users can take advantage of the sophisticated diagnostics functions in the device drivers (DTMs or EDDs) as well as the diagnostics built into the Fieldbus Builders. Diagnostics are first performed from the control room before the technician has to initiate his work permit and start the trip to the field. The device's manual, linked to the Object from ABB Device Library in electronic format, helps the technician to look up and understand the device's peculiarities.

Combining Device Management with 800xA Asset Optimization, make additional features available. These include displays that assess the plant's health at a glance based on continuous monitoring powered by Asset Monitors.

Asset Monitors quickly help track down root causes of failures by combining information from different sources, grouping this into maintenance-oriented categories according to Namur NE107 recommendations, or even giving hints regarding the potential cause of a problem and suggested actions to take.

Asset Monitors enable more efficient planning of preventive maintenance or predictive maintenance schemes by regularly scanning device status and internal parameters to detect upcoming maintenance conditions before a device actually breaks.

In addition to presenting such device health status in maintenance alarm groups on the system workplace, the system's SMS and e-mail messaging service can be used to notify key plant personnel via mobile telephones, e-mail accounts, and pagers in case of critical failures, e.g. during a weekend.

Comprehensive fault reports, including relevant operating procedures, can be created from Asset Monitors and automatically transmitted to a Computerized Maintenance Management System (CMMS) to initiate the work order process.



System 800xA

Electrical Integration

Integrated process and power automation, often referred to as Electrical Integration, is a unified architecture that combines process control, process electrification, and power management and distribution into one unified system.

A typical manufacturing plant can be divided into three areas: Process Control, Process Electrification, and Power Management and Distribution:

- Process Control – Includes instrumentation, safety systems and controllers. Devices communicate via a variety of fieldbus technologies, including PROFIBUS, FOUNDATION™ Fieldbus and HART.
- Process Electrification – Includes low-voltage (LV) drives, motors, switchgear and circuit breakers. Devices typically communicate with the control system via PROFIBUS or Modbus and lately PROFINET.
- Power Management and Distribution – Corresponds to Substation Automation (SA) systems. It hosts medium-voltage (MV) and high-voltage (HV) power equipment, including protective relays (also known as Intelligent Electrical Devices or IEDs), transformers, instrument transformers, power meters, drives and motors.

Traditionally, these areas are seen as different domains in a plant, maintained by different departments and monitored by different systems.

In the past, closer integration of these domains has been hampered by lack of communication standards and a common architectural design. There were simply too many communication protocols for substation equipment; integration involved many proprietary gateways or was only possible via hard-wiring certain crucial signals. This resulted in high project execution and commissioning costs, plus high lifecycle costs.

IEC 61850 standard overcomes technology hurdle

However, the introduction of IEC 61850 as a global communication standard for power distribution and substation automation overcame this technology hurdle. A wealth of information from substation equipment can now be made available with a standardized, Ethernet-based communication protocol.

System 800xA takes advantage of the new future-proof IEC 61850 standard by providing an integration architecture that creates a unified view in all areas of the plant. With medium-voltage and high-voltage equipment integrated into the control system through IEC 61850, and low-voltage equipment integrated through PROFIBUS with Device Management in the same way as smart instruments, the traditional barriers are removed.

True collaboration between all involved departments now becomes possible, which leads to informed decision-making and faster tracking of the root causes of problems. With their new insight into the electrical part of the plant, operators can quickly detect disturbances that actually originate there and immediately issue a clear and correct work order to the relevant maintenance team.

Supports both MMS and GOOSE communication

For different types of applications, System 800xA supports both types of communication services defined in IEC 61850 (MMS and GOOSE). With the IEC 61850 Connect option, IEDs can be directly accessed through the system servers from faceplates of the Substation Operation Library in order, for example, to turn on medium-voltage motors or to monitor or retrieve diagnostics data. Virtually all data from IEDs can be made available in the system. Such a wealth of information could never be accessed in an economic way by traditional hard-wiring.

In addition, alarm and events from IEDs can be shown in specific lists for electrical equipment as well as in common sequence of events lists together with all other events in the system. As the operator workplace of System 800xA is highly customizable, substation-related displays like single-line diagrams can be displayed in a fashion familiar to electrical operators.

A communication interface for the AC 800M controller is available for applications that require controlling IEDs from control logic, e.g. for interlocking medium-voltage motors. Even power management applications that require rapid signal exchange with IEDs can be implemented in the controller, since the interface supports fast GOOSE communication.

With up to 12 Communication interfaces per AC 800M acting as independent IEDs, the controller can act as a "Bridge IED", a unique feature in the industry.

Engineering IEC 61850-based integration strictly follows the engineering paradigms as defined in the IEC 61850 standard. The controller's Communication Interface is modelled in the IEC 61850 world as an IED. With the IED description for the Communication Interface (cid-file) easily created out of Control Builder, engineering of the substation can be done with the IEC 61850 tool of choice. The engineering results (scd-file) are later imported into the system so that access to the substation world becomes available without having to check the wiring of single I/O channels.

To fully leverage the benefits of electrical integration, low-voltage equipment also needs to become part of the equation. By combing all information in one system, this can now be monitored from the electrical or supply side, as well as from the traditional process automation side, where motors are the actuators, e.g. for mixers or pumps. Being connected through PROFIBUS (and in future even more often PROFINET) not only makes available data for turning a motor on or off, but for also additional measurements like voltage or current, or even

active power. This data can be utilized in power management applications to define load-shedding schemes or other applications to minimize power consumption.

Optimizes maintenance practices

Maintenance teams also benefit from extra diagnostic information. When using Device Management PROFIBUS together with Asset Optimization, for example, they gain additional insight into smart devices like ABB's Universal Motor Controller (UMC) that not only monitors itself but also the connected motor. This way of working optimizes maintenance practices for electrical equipment and instrumentation since the same tools are used in the same way.

Finally, integrated process and power automation architecture reduces costs for maintenance and spare parts by eliminating the need for separate components for electrical and process systems, as well as for extra gateways to interconnect electrical equipment.



System 800xA

History services

Secure, reliable and scalable data management is a key cornerstone of any Information Management solution. The Information Management capabilities of System 800xA secure data and seamlessly present historical information in the proper context to operations, maintenance and management. Information management services provide storage for process data, events, and lab data as well as production data for specialized applications such as Batch management.

System 800xA History Service capabilities can be categorized into the following areas:

- History Collection & Retrieval Services provide short and long-term data storage needs
- Archive Storage Services, provide offline data management of process data
- Reporting Services provide flexible reporting options for ad-hoc and production reports
- Presentation Services provide information access
- Application Services provide tools for development, data transformation and access

Collection and storage services

History Services are designed for flexibility, scalability and reliability. History data collection begins with a distributed series of short-term collection engines located close to the controller with high data availability for continuous operations. Short-term data storage is focused on providing operators with the information that they need now. Long-term centralized data storage is based on the short-term data engines insuring all users utilize the same information. Centralized data management allows a single location to manage report-intensive applications and offline data management such as archiving.

Seamless retrieval and configuration

Once collected, both short-term and long-term storage is an active part of the data retrieval process. History Services for 800xA provides seamless data retrieval for all system users and offers a wide variety of interfaces for data retrieval, thus insuring high availability for all users.

History Service uses the inherent 800xA system engineering, configuration and administration capabilities and inherits the power of aspect objects. This provides benefits both in terms of initial set-up and lifecycle cost as well as consistency. For example, configurations are properties of objects that already exist in the control system definition. Changes made in the control system database, e.g. ranges, alarm limits, etc., are automatically propagated to the historical tag configuration since this 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.

Logs are configured online using the Plant Explorer Workplace, or offline via the Bulk Log Configuration Import Export utility. 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.

Process data

History Services are configured for short-term storage, typically in System 800xA Connectivity Servers. Connectivity servers are designed for high availability and support backfill between connectivity server pairs. Typically, connectivity server short-term storage is implemented to support operators and is configured to directly collect the OPC properties from the controllers. Long-term storage is centrally managed and is designed to collect the data stored in the short-term storage. Short-term and long-term storage may be implemented at different times during a project, with long-term storage added at a later date.

Event data

All alarm and event messages for System 800xA, including Process, Operator, and audit trail messages, are collected and stored by the System 800xA Message Server. As with process data, the Message service meets the immediate needs for operations and long-term storage. Management and retrieval of events is managed by the long-term data storage.

Lab data logs for asynchronous user input

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.

Production data storage

When a product is being manufactured, the information relationships are often not time-based and cannot be preconfigured or anticipated. History Services has Production Data (PDL) capabilities built-in 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 the collection, storage, and retrieval of this production data for presentation in batch reports.



System 800xA

History services

Archive services

Archive services execute on the long-term history server. The archive function supports permanent offline storage for:

- Numeric process data
- Event messages (including audit trail events) and system messages generated by System 800xA applications stored in message logs.
- Production data from batch control applications stored in PDLs (Production Data Logs).
- Finished reports

Archiving may be scheduled to occur on a periodic or event-driven basis through the Scheduler or as a result of a batch action. Manual archive operations may also be executed on demand.

Archives are written to hard disk. The hard disk may be partitioned into multiple volumes sized to match CD-ROM, DVD media or relevant sizes for mirror network storage. As volumes become full, the archive backup function may be set up to write the contents of archive volumes to ISO Image files. 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 hard disk file copies 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. Archives are secured via Checksums.



Reporting and scheduling 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

Reporting services provide scheduling and ad-hoc capabilities to access real-time data, historical process data, lab data, batch information, and event information that can be incorporated into reports created in Microsoft® Excel, Crystal Reports, or other report packages that use 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 scheduled, 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

Scheduled reports can be made on time and on event

Reports can be developed using Microsoft® Excel, Crystal Reports or other third-party reporting packages. When developing reports using Microsoft® Excel, users can take advantage of a series of functions embedded and tightly integrated with System 800xA. In addition, they can use 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 open data interchange.

Presentation services for historical information

Different users require different means of accessing information. History services for System 800xA provide seamless views of real-time and historical information. Data is made available integrated into the environment that is most familiar to the targeted user.

For operators, data is integrated within the operator workplace for trending, event presentation and reporting. Ad-hoc using Microsoft® Excel extends the capabilities. For an engineer, manager or maintenance engineer requiring remote access, history services provide thin client desktop tools.

- KPI and dashboard views, including process graphics
- Ad-hoc trending displays
- ODBC data access for external tool integration
- Purpose built add-ins for Microsoft® Excel
- Event viewer and filter capabilities
- Purpose-built production data browsing and batch comparison tools for batch applications

System 800xA

Batch management

Increasing competitive pressures have forced batch manufacturers to demand greater flexibility from production facilities

Production managers are being challenged to achieve the seemingly incompatible objectives of increasing output and reducing the risk of regulatory non-compliance while still implementing cost-reduction initiatives. These pressures are driving the evolution of interoperability between distributed control systems, 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 an extension of System 800xA control system. The batch software extension provides a means of configuring, scheduling and managing batch operations.

800xA Batch management provides:

- Recipe Configuration
- Equipment Configuration
- Batch Operations
- Scheduling
- Resource Management
- Batch Production History
- Formulation
- Controller support for ABB and Third-Party Control Systems
- Schedule Interface for Enterprise Systems

Recipe Configuration

Batch Procedures are configured graphically using Procedure Function Charts (PFC) based on ISA88 standards. The PFC Editor tool can be enabled to strictly enforce adherence to the procedure levels specified by ISA88, or users can choose to model batch recipes using their own design standards.

The Batch PFC Editor tool lets users configure the following information for each recipe:

- Procedure
- Formula
- Equipment Requirements
- Header and other Information

Equipment configuration

Batch management supports network, multipath, and single path equipment configuration. This allows for support of complex batch production facilities. The batch manager can be configured with shared-use equipment modules, and exclusive-use equipment modules. Pseudo resources can also be configured and used to identify resources, such as an operator required at specified points in a procedure.



Batch Operations

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 and also offers the flexibility to manipulate the batches in the production schedule.

Batch Overview window options include:

- Scheduling a new batch
- Invoking the status window for a batch or sub-procedure
- Displaying the procedure function chart for a batch or sub-procedure
- Responding to pending messages for a batch

The graphically-based recipe procedure is available as a runtime Procedure Function Chart display without any further configuration to graphical displays. During control recipe execution, its progress can be monitored closely by expanding or collapsing the PFC views as needed. The user has runtime access to message prompts, parameters, and equipment status information. Operational regulatory requirements are met by system security, audit trails, log over, and single and double authentications.

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.

Scheduling

Batch Schedule and Batch Information status windows are accessible from the Batch Overview window. The schedule window enables the efficient addition of batches in a user-friendly manner. Batch Schedule window options include:

- Scheduling a new batch
- Scheduling a campaign of batches
- Duplicating an existing batch

Additionally, the batch manager provides a configurable graphic scheduling aspect. This aspect can be used in user-defined graphics to incorporate and simplify batch scheduling. Combine this with the batch spreadsheet scheduler aspect and you have fully-functional Scheduler and Parameter Manager within the user graphics.



System 800xA

Batch management

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.

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.)

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

Batch Production History

Batch is tightly integrated with System 800xA leveraging the system's ability to collect and organize data into a central location through 800xA Information Management.

Production Data Logs (PDL) provide batch management with the ability to store batch events through implicit or explicit actions. The PDL history function of 800xA Information Management provides hierarchical history of batch data and events. Built-in provisions for the organization, storage, archive and retrieval of batch information are part of Information Management.

Data records stored in 800xA Information Management are accessible to Microsoft® Access, Microsoft® Excel, and other popular reporting packages like Crystal Reports.

Formulation

Simple Batch and Parameter Management offers the user an optional way to schedule batches and manage formula parameter information without the need to access Batch Overview. With Microsoft® Excel, users can add and schedule batch recipe procedures within the batch manager. In addition, formula worksheets can be added to the Excel workbook to manage parameter lists.

Architectural characteristics

Feature	Characteristic/Value
Structure	Client/server.
System	System extension to 800xA.
Batch server	One 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 cannot 'share' with other applications.
Historian	Batch-related alarms and events are routed to the 800xA event system. These alarms and events, as well as non-batch server events (including attributes) and numerical trend data, are collected and organized by Information Management. Advanced production history, batch-to-batch analysis, reporting and archiving is enabled via Information Management.



800xA Batch management is aligned with industry standards such as ISA88, ISA95, IEC 61512, and IEC 62264.

Controller Support for ABB and Third-Party Control Systems

Batch management includes a standard phase interface to AC 800M controllers as well as all of the controllers from the ABB heritage process control systems (e.g. Symphony Plus Melody, Symphony Plus Harmony/INFI90, DCI System Six, Advant, MOD 300, AC 870/Melody, Freelance, Advant Master controllers).

Third-Party controllers can also take advantage of the Function Phase Driver. The Function Phase Driver is a user-configurable application that maps batch states, commands and parameters between the batch server and user-defined OPC points representing the interface to an equipment phase in a PLC or other process control system.

Schedule Interface for Enterprise Systems

800xA Batch management includes a schedule interface feature to facilitate the bi-directional transfer of data between 800xA Batch management and external applications. These batch-scheduling and data-transfer functions use standard Microsoft® Web Services that are easily integrated into enterprise resource planning systems, schedule optimization software or similar shopfloor applications.

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 recipe
- 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

System 800xA

Asset optimization

Asset Optimization

800xA Asset Optimization is a plant asset management solution that presents real-time information seamlessly and in the proper context to operations, maintenance engineering, and management. 800xA Asset Optimization provides real-time asset monitoring notification and maintenance workflow optimization of automation equipment, plant infrastructure, plant equipment, field devices, IT assets and production processes.

800xA Asset Optimization brings maintenance management to the operator environment to provide a single window interface for all asset management related operations. For maintenance personnel, Asset Optimization provides a default Maintenance Workplace that supports daily maintenance activities in a most efficient way.

800xA 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.

800xA 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 process control, maintenance, and calibration management system environments.

The functionality provided by 800xA Asset Optimization is described below:

Maintenance Workplace and Asset Structure

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

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



Asset Condition Reporting

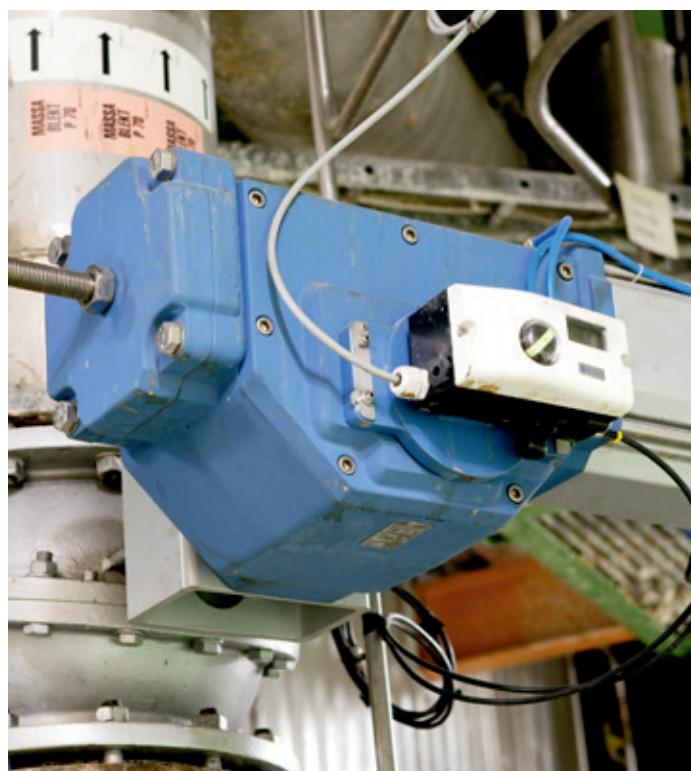
Asset Health Condition Reporting provides the infrastructure that reports asset status/condition information to notify operators and maintenance personnel when an abnormal condition calls for a maintenance action. Asset Optimization provides asset condition reporting via the Asset Viewer and Asset Reporter. The Asset Tree, visible in the Asset Viewer, shows the status of associated plant objects (assets) based on Plant Explorer hierarchies.

Asset Viewer

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. Indicators distinguish the level of severity using OPC and Asset Monitor severity range (values ranging from 1 to 1,000).

Asset Reporter

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



Asset Monitoring

The Asset Monitoring is responsible for retrieving data from and interacting with, multiple data servers, such as real-time data servers, OPC-DA servers, etc., analyzing the data, detecting a problem, and notifying the System 800xA.

An Asset Monitor is a diagnostic application. It can detect problems that may not affect the process variables, but do affect the maintenance status of an asset or process. The Asset Monitor provides detailed information about the fault conditions and offers correction possibilities.

The broad portfolio of asset monitors in System 800xA allows you to quickly and easily get started with integrated asset management. The portfolio covers basic functions like valve-stroke count, motor running time, X-Y deviations, flow delta, etc., field instruments (both ABB and 3rd party) like transmitters, control valves, etc., IT network devices, process & equipment monitors like control loop performance, heat exchanger etc. Additionally, you can request asset monitors specific to your needs. 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 that 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. Heat Exchanger Asset Monitors and Control Loop Asset Monitors contain faceplate objects that also require a tag license.
- IT Asset Monitors - Requires licensing for Asset Optimization Asset Monitoring and PC, Network and Software Monitoring.
- 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.

System 800xA

Asset optimization

CMMS Integration

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 integration is supported per 800xA System.

Plant personnel can create work orders in CMMS by submitting the fault report. Details in the fault report are automatically provided by the asset monitor conditions. Plant personnel can view the work order status and maintenance details. The following CMMS Views are supported with both Maximo and SAP integration:

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

The following CMMS View is support only with Maximo integration:

- View Spare Parts

Device Calibration Integration

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 a variety of third-party calibration systems. The horizontal (breadth of feature) 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 applications from within System 800xA
- Mapping between an object in System 800xA and a device in the calibration system database
- Information exchange such as 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. The templates are preconfigured as Microsoft® Excel (.xls) files. The reports require the Inform^{IT} - Scheduler function provided by 800xA Information Manager. Reports can be executed automatically according to a certain schedule or on demand. The two reports are described below:

For every asset, Asset Optimization Asset Condition History Report provides a detailed listing of all asset maintenance conditions that have been active over a time interval, and counts the number of faults per condition. 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.

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, an 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.

System 800xA

Heritage systems evolution support

Providing flexible evolution paths – through seamlessly integrated controller platforms

ABB's control systems are designed for continuous evolution. It is our goal to protect our customers' intellectual investment; therefore evolution services are available that provide competence and cost effective solutions for evolving the installed base of ABB to System 800xA. Not only do we provide an active path for all hardware and software, we have continued to invest in developing the libraries and tools that enable our customers to port their control code and graphics directly into the latest System 800xA controllers and HMI software, at your own pace incrementally, reducing risk and cost while preserving and enhancing your intellectual investment.

Once on the System 800xA architecture, all of the benefits and functionality of an integration system become available to the user, regardless of controller platform.

That's the Power of Integration.

Lifecycle Status

The Heritage System product lines follow the Lifecycle Policy defined for ABB control systems, meaning that the support for system products remain until a functional equivalent, or better, product is available. Lifecycle planning is an important process

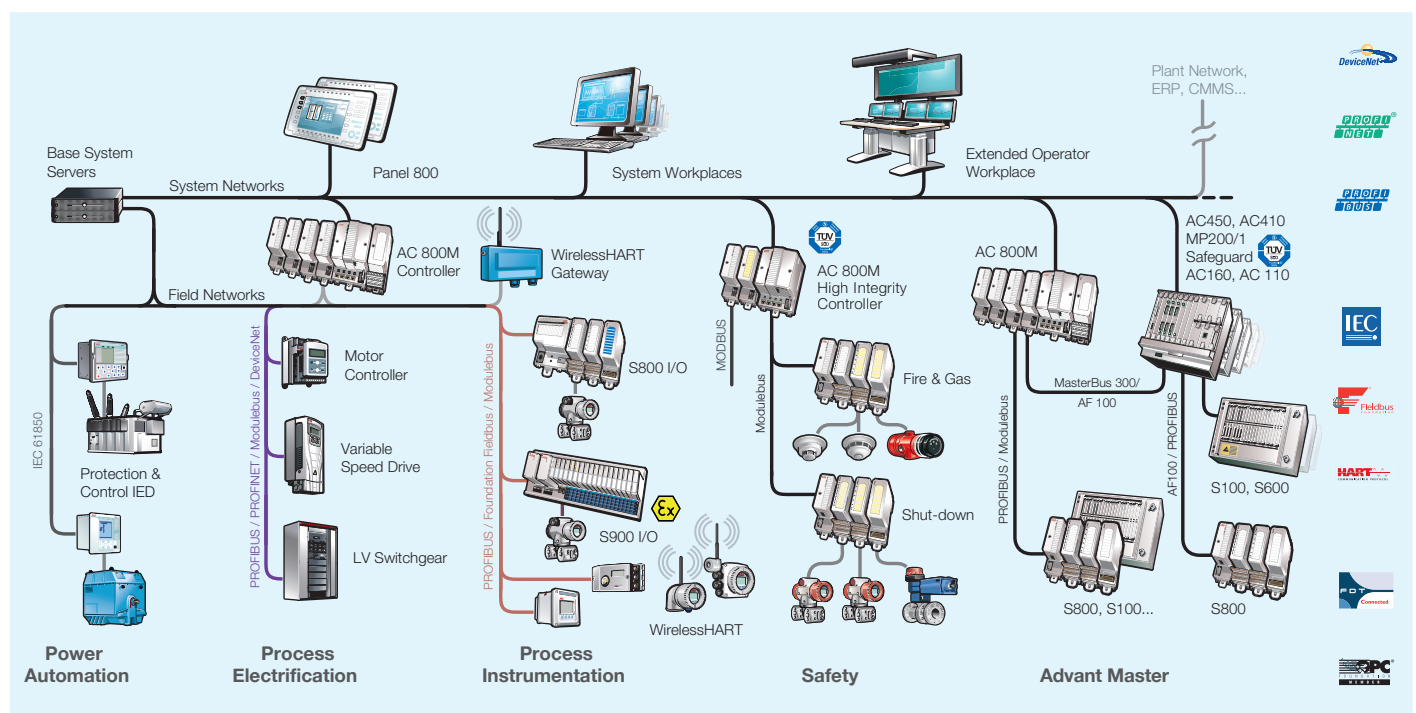
and tools are available to support this planning. ABB's Lifecycle policy is unique in the industry, and provides incredible value and peace of mind to our customers.

Lifecycle Support and Services

To further decrease the lifetime maintenance cost a large number of products and services are available to our Heritage customers. Lifecycle support is defined by a Lifecycle Policy and installations can be economically maintained using the Automation Sentinel control system Lifecycle program.

For all our Heritage Systems this program provides an increasing number of capabilities and support for the installed base through the regional Service Centers.

- Reuse of process graphics
- Reuse of control applications
- Reuse of history log data
- Spare part, repair and preventive maintenance kits
- Site analysis and fingerprints
- Support for extended lifecycle based on site analysis
- Minimal loss in production
- Protection of intellectual assets
- Lower project costs



System 800xA

Heritage systems evolution support

800xA for Advant Master

From the introduction of the early versions of System 800xA, evolution has been a vital part of the roadmap for Advant Master product line. Already in the beginning of the 21st century the integration package to Advant Controller 400 Series was developed as a so called “Connect” between System 800xA and the control network. Integration was introduced for controllers on the MasterBus 300 (MB300) as well as for controllers on the Advant Fieldbus 100 (AF100) network. Today System 800xA is used in more than 1800 Advant Master installations worldwide.

Evolution for Advant Master has developed over time and today comprise also peer-to-peer communication for both MasterBus 300 and Advant Fieldbus 100 using specific communication modules for the System 800xA controller AC 800M. The AC 800M controller also include connectivity to installed I/O systems providing the possibility for instant switch over using existing field and I/O wiring.

Current portfolio of products for Advant Master customers contains a mix of System 800xA and heritage products.

- Operations, Information Management, Asset Optimization and Batch as part of System 800xA
- Console integration to Advant Master control networks using 800xA for Advant Master, 800xA for Safeguard, 800xA for AC 100 and AC100 OPC Server for 3rd party clients
- AC 800M, Advant Controller 450, Advant Controller 160 and Safeguard 400 controllers
- S800, S100 and S600 I/O systems
- Control Builder A with Online Build engineering

Operations, Information Management and Asset Optimization

The Advant Master system is integrated into System 800xA using the 800xA for Advant Master, 800xA for Safeguard and 800xA for AC 100 integration packages. It supports full integration with System 800xA features and components such as Batch management, Information Management, and Asset Optimization along with leveraging the Aspect technology available in the System 800xA environment. Standard software and hardware interfaces are used to provide a connection into the Advant Master system for view and control. Predefined graphic elements, object displays and faceplates are provided for all the controllers' standard process objects.

800xA for Advant Master may be deployed in parallel with existing Advant Master system installations. Phased introductions of 800xA for Advant Master to existing customers will allow the customer to begin leveraging System 800xA benefits immediately. 800xA for Advant Master provides the Advant Master installed base the continued evolution of technology, while retaining existing control philosophy.

Key benefits of utilizing Advant Master integration to System 800xA:

- Complete infrastructure may be retained
- Upgrade can be on a step-by-step basis
- Parallel Advant and 800xA workplaces, enabling minimum downtime
- System 800xA extended automation

AC 450



Main features of Advant Master integration to 800xA:

- Faceplates, object displays and graphic elements with Advant look and feel
- Alarm and Event and Trend presentation
- TTD log and configuration support
- Status list and System status
- Drives and Switchgear Integration

Engineering

Advant Master engineering tools Control Builder A and Online Builder can be run in the 800xA client nodes using an RTA hardware unit in any of the 800xA Connectivity Servers as well as using a dedicated RTA unit installed in the 800xA Engineering Workplace or as a separate Advant Engineering Station.

Key benefits using latest version of Control Builder A:

- Minimal PC hardware cost with support for 19" RTA unit PU410
- Virtualization support
- Reduced start-up effort with single button install
- Licensing system harmonized with 800xA
- Single DVD media including additional tools and libraries
- Revitalized for extended lifecycle

Control Builder A Version 1.3 main features:

- Support for 64-bit versions of Windows 7 and Windows Server 2008
- Administration of nodes, Circuits and Type Circuits simplifying project startup and reuse
- Off-line editing with powerful cut/copy/paste
- On-line editing for rapid program modifications
- Target system control for easy testing of installed system
- Module diagnosis
- Expert Utilities with additional On-line Builder commands for extended fault tracing

19" external RTA unit PU410K01



Control, I/O and Communication

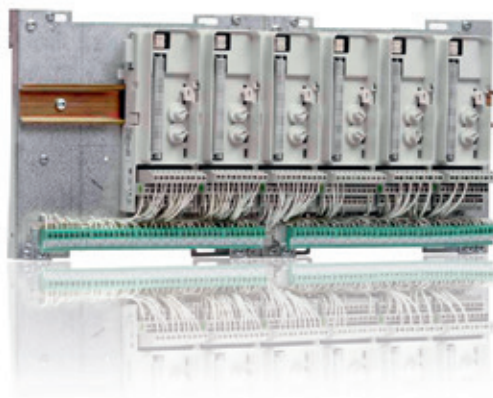
An Advant Master system with 800xA can benefit from a various and increasing number of evolution products. Advant Controller 450 and Advant Controller 160 are active products with extended lifecycle and can be efficiently used in evolution from obsolete ASEA/ABB Master products. In an 800xA system the Advant Master controllers can be integrated alongside AC 800M controllers realized with purpose made communication interfaces to AC 800M. A key benefit with the I/O integration is the possibility to reuse existing Advant Master I/O installations, including terminations and field wiring.

Lifecycle Support and Services

To further decrease the lifetime maintenance cost a large number of products and services are available. Lifecycle support is defined by a Lifecycle Policy and installations can be economically maintained using the Automation Sentinel lifecycle program. For Advant Master this program provides an increasing number of offerings and support for the installed base through the regional Service Centers.

- Reuse of process graphics
- Reuse of control applications based on ABB Master Programming Language (AMPL)
- Reuse of history log data
- Spare part, repair and preventive maintenance kits
- Site analysis and fingerprints
- Support for extended lifecycle based on site analysis

Baseplate for S400 I/O Evolution to S800 I/O



System 800xA

Heritage systems evolution support

800xA for DCI (System Six)

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 and standard off-the-shelf Ethernet NICs) to provide a connection for viewing and operation of the DCI system.

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.

The ECC MUX driver interface is used in 800xA for DCI servers when redundant DCU communication networks are required. ECC MUX 2.0 operates with standard off-the-shelf NICs.

Features

The following lists the set of features and functions included that are 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.
- Integration of CTK STG and VMC as aspects of 800xA 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 integrated OPC DA and AE Servers for DCI, which interface to the DCU controllers via Global Database Access. The OPC Servers 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.

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.

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.

800xA Batch Integration

800xA for DCI supports integration with 800xA Batch management.

800xA for Harmony (Infi90)

800xA for Harmony is the integration of the Harmony system into System 800xA. It supports full integration with System 800xA features and components such as Batch management, Information Management, and Asset Optimization along with leveraging the Aspect technology available in the System 800xA environment. 800xA for Harmony uses standard software and hardware interfaces to provide a connection into the Harmony system for view and control. Other features include: redundancy, flexible installation options, and high tag count support.

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

800xA for Harmony provides the Harmony installed base the continued evolution of technology, while retaining existing control philosophy.

Features

The set of 800xA for Harmony features and functions included that are specific to Harmony users are listed below:

- Advanced Harmony Control System Monitoring
- Enables Harmony control network monitors for diagnostic monitoring, reporting, and analysis
- Backup and Restore – A utility for Harmony configuration data
- Expanded mixed system support of 800xA for Harmony with other System 800xA connects
- Harmony Batch integration
- Harmony Bulk Configuration Manager
- Harmony Synchronizer – utility for upload and download of tag data from Harmony Configuration Server to the Aspect Directory
- Harmony System Diagnostic Displays
- Thin Client views of module/block/communication module details, loop/node topology, event counters, resettable event counters, etc.
- Harmony tag types faceplates, point displays, and select Web Aspects (Operating Parameters that is)
- Hot key support for Harmony tag objects
- Import and Export – XML and Composer (*.mdb) based file types

- InfiNet and Plant Loop support
- Multiple Harmony Configuration Server support with the ability to combine a Harmony Connectivity Server on the same node
- 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 Alarm Hiding function
- Support for Point of Control function

Engineering Workflow

The engineering workflow begins in Composer and ends in the 800xA Aspect Server and the Harmony Control System. Composer engineering 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 usable in the Harmony Configuration Server.

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 Harmony.

The objects in the Aspect Directory are kept in synch with the Harmony Server database by means of a number of components. These are included in the Harmony system extension that is a part of the installation. These components allow creation and updating of the Harmony objects in the Control Structure. Initially this will be accomplished using a manual synchronization process, but will occur automatically afterwards.

Control, I/O and Communication

Full and continued support of all available Harmony Modules (Controllers), I/O, and Communication Interfaces are available throughout your upgrade into System 800xA. This includes full support of the latest InfiNet interface, the IET800.

System 800xA

Heritage systems evolution support

800xA for Melody

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 redundancy as well as network redundancy.

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.

Engineering

The engineering workflow always starts in Industrial IT Composer and ends up in 800xA Operator Workplace and the control system. Composer 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 AC 870P/Melody business rules in means of consistency and integrity will be rejected. The life cycle of a Melody object starts and ends in Composer.

Aspects hosted by other than Melody Aspect Systems might extend Melody objects. When commissioning functionality that has been planned in Composer the 800xA Operator Workplace relevant information will be generated by Composer and automatically uploaded into 800xA Operator Workplace. Versioning of data is done according to the AC 870P/Melody life cycle model.

800xA Batch Integration

800xA for Melody supports integration with 800xA Batch management. It is a natural evolution path for the Maestro UX – SymBatch product. There is no need to modify the controller or control application when migrating from SymBatch to 800xA Batch management.



800xA for MOD 300

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

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.

Extended Automation Functions

The following extended automation operations functions are available for 800xA for MOD 300:

- Workplace Setup
- Single and Multiple Screen Setups
- Reports
- Log-over
- Audit Trail
- Digital Signature
- Multisystem Integration
- Server Node Virtualization

The following information summarizes the related 800xA for MOD 300 system functionality and integration.

Controller Integration

800xA for MOD 300 Provides the integration between System 800xA and Advant OCS/MOD 300 control network (DCN or eDCN).

- AC 460 Series
- AC 410 Series
- MOD 300 Controller Subsystem (SC Controllers and Model B)
- MOD 300 Multibus

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)

MOD 300 “traditional” Displays

Monitoring and control functions are provided in the same “traditional Group and Area” displays familiar to MOD users. This includes the Group Status and Group Trend displays, Group Alarm, Area Alarm and Area Status.

Predefined MOD 300 Objects for 800xA

Predefined object displays and faceplates are included in 800xA for MOD 300.

Taylor Control Language (TCL)

All necessary TCL displays that support monitoring and control functions for TCL are included.

Taylor Ladder Logic (TLL)

TLL displays are used to monitor TLL segments and data structures. All necessary TLL displays that support monitoring and control functions for TLL are included.

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)

Report and History Services Interfaces for Information Management

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.

Engineering Support

MOD Tag importer – Used to populate the Control Structure with object configuration using AdvaBuild information.

MOD Environment importer – Used to populate the Environment Structure using text file created from Environment Builder of MOD 300 CDP.

MOD Phase Importer – Use information from the MOD 300 Database to populate the Control Structure with MOD phase objects as a child of the MOD Unit.

800xA Batch Integration

800xA for MOD 300 supports integration with 800xA Batch management. Batch management can supervise the execution of MOD 300 Phase sequences.

System 800xA

Connectivity to third-party controllers

Evolve any plant. Become more successful

A newly-acquired automation system offers the best set of solutions to help your business be successful and stay competitive. That may no longer be the case. Now the risk of unplanned downtime is always present. Lengthy production stops cannot be ruled out. What's more, production gains via mere process control improvements are no longer enough to ensure peace of mind. The real answer lies in evolution of your installation.

Evolve third-party installations

Evolution solutions within ABB help you attain a state-of-the-art control system that seamlessly integrates all your business processes as well. This is true for ABB systems, but also for other, third-party, systems.

System 800xA provides the possibility of integrating the control layer of many DCS systems on the market today. This integration provides not only the possibility to transfer data.

In 800xA terms, this would not even be called integration, just 'connectivity'. Integrating a third-party controller means the object data from it can be displayed on the process graphic, together with data that comes from controllers, ABB or other. It also means alarms and events end up on the same lists as with any ABB Controller, and it means that face plates for the objects residing in those third-party controllers can be called up and the object controlled from them in the same way and with the same look and feel as if it was an ABB Controller.

Most importantly, a well-conceived evolution strategy protects the major hardware, software and intellectual property investments made when you purchased your current automation system. You can conveniently modernize the operator environment. Once done, you have the entry point to extend the plant with the full 800xA range of functions and features.

Contact ABB for detailed information about which third-party controllers can be integrated.



System 800xA

Connectivity to third-party PLC's

PLC Connect integrates ABB and third-party controllers with System 800xA

PLC Connect is a connectivity option for ABB's System 800xA. It tightly integrates all ABB and third-party controllers, PLCs and RTUs with the 800xA system, and provides typical DCS and PLC functionality in the same integrated system. PLC Connect enables the remote connection of controllers and PLCs in single as well as in redundant systems.

Uniform integration of different PLCs

PLC Connect integrates individual signals in any connected controller, PLC or RTU with the 800xA system. The operator receives process data in the same graphics regardless of the type of controller or the communication protocol used.

Objects and object types

PLC Connect provides a set of basic object types for PLC signals, as well as configuration tools for creating and editing PLC objects and a set of faceplate templates for PLC objects.

Real-time database (RTDB)

All dynamic process data from connected controllers, PLCs and RTUs is stored in a real-time database. Current values and status are always available and constantly updated, so there is no need to wait for the OPC server to set up subscriptions – values are available directly. A browser interface in third-party OPC servers is not required.

Communication

PLC Connect has a built-in communication server for traditional PLC and RTU protocols, including Modbus RTU, Comli, SattBus, SattBus-TCP/IP and a built-in OPC DA client. PLC Connect includes a dial manager for remote communication with PLCs. Dialed communication with controllers supports Modbus RTU or Comli protocols and includes scheduled dialing and local time stamping of dial-ins, plus local storage of historical data.

Alarm handling

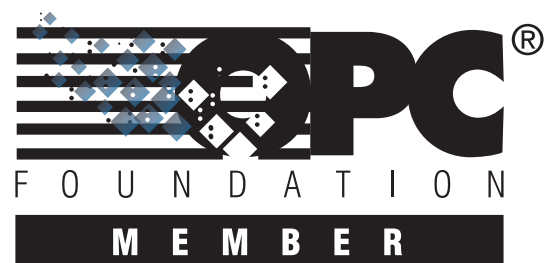
Alarms are generated in PLC Connect when a polled boolean variable from the controller changes state or when a polled analog value passes an alarm limit. The alarms can be time-stamped in the connected PLC.

Open interfaces

A number of open interfaces are available in PLC Connect for access by external applications. Real-time access for reading and writing process values is available through COM Methods. Application-specific pre-treatment calculations can be added for received process values as well as detected alarms and events. PLC Connect includes a COM interface for integrating an application that is to be executed on an event, an OLE DB provider for accessing logged events and alarms, and a COM interface for initiating and disconnecting calls handled by the dial manager for dialed communication with PLCs.

Engineering

The PLC Connect configuration aspect is used from the 800xA system Plant Explorer to create, organize and edit PLC-type objects in 800xA. Bulk Data Manager in Engineering Workplace can be used to create these objects in an efficient way for large applications. Engineering can be performed online or offline.



System 800xA Engineering

Overview

System 800xA Engineering provides real-time information integration for better and faster access. Working within a common engineering environment, 800xA Engineering supports a consistent information flow from design, through installation and commissioning, to operation and maintenance. It lays the foundation for continuous improvements in lifecycle and operational dimensions of information flow, resulting in efficient engineering and enhanced productivity.

800xA Engineering features:

- Engineering Workplace as a fully-integrated engineering environment for development and reuse of system standards, such as incorporating control logic, operator displays, field devices, asset monitoring and maintenance support
- Risk mitigation control optimization through impact analysis and user-controlled download by the Load Evaluate Go option
- Integration with third-party CAE tools by Process Engineering Tool Integration option

One workplace

The Engineering Workplace is a single workplace for all engineering tasks. For example:

- Graphic display configuration
- Control application design
- Safety application design
- Control system configuration
- Field device and instrumentation configuration
- Control system and field device maintenance
- Trend and history configuration

Information at your fingertip

Through the use of patented IndustrialIT[™] Aspect Object technology, System 800xA provides tight integration of plant devices and applications. System 800xA's platform provides a common portal to all system information required to install, operate, and maintain the system. This portal assimilates information traditionally contained in disparate applications into a single, intuitive user interface, while promoting the reuse of best practices.

800xA Engineering, coupled with this tightly-integrated environment, is designed to facilitate one-time data entry for all areas within the automation system, from field devices to asset optimization, while ensuring built-in data consistency. Providing a single source of accurate and real-time plant information results in maximum engineering performance, quality, and reliability. This integrated environment means fewer startup delays, reduced maintenance costs, and more effective engineering practices.

Easy navigation and consistent data

The single, intuitive user workplace brings together all plant information, allowing:

- Easy navigation via context menus
- One-time data entry
- A single source of accurate and current plant information
- Maximum engineering performance
- Better quality
- High reliability

State-of-the-art display editor

Graphics Editor is a fast and effective tool to create graphic displays. Highlights include:

- State-of-the-art editor providing functions such as undo, drag-and-drop, find, replace, zoom, docking windows, toolbars, etc.
- Comprehensive graphic symbol library containing device and factory symbols as well as charts, spreadsheets and trends
- Out-of-the-box predefined graphic elements delivered with function block and control module types
- Full-vector graphics that allow distortion-free scaling with maintained resolution
- Scalable and parameterizable graphic symbols that allow efficient adjustments such as orientation
- Intuitive and easy-to-use expression editor
- Display documentation tools for keeping a record of all engineered graphics
- Solution library that allows storage and retrieval of reusable solutions with drag-and-drop
- Migration tools for ABB and other vendors' displays

Engineering for process engineers

Function Designer

Function Designer is a graphical control application engineering tool designed for process engineers. It is intended for engineers desiring a functional approach of the control logic in line with the process graphics and all other aspects of a certain process section. It does not require software programming expertise and is intuitive to engineers in the plant design as well as in the maintenance phase.

Function Designer Configuration Scope

- Logic and control blocks as Functions, Function Blocks and Control Modules for AC 800M
- Sequences with Steps, Transitions and Actions
- I/O Signals representing configuration of devices and hardware channels
- Variables with automatic cross-referencing
- Automatically generated page connectors
- Graphical elements as text boxes and shapes

Powerful cross-referencing and navigation

- Connections between blocks on different pages automatically create page connectors with reference texts so that engineers can navigate between the pages using cursor keys
- Variable cross-references between diagrams are built up in the background letting users navigate via double-click or selection if more than one reference is available
- Aspect Objects provide the Engineering Workplace's context menu that can be used to navigate to all aspects of such objects, e.g., Faceplate, Trend, Event / Alarm list
- I/O Signals hold the configuration of the connected I/O or device channel, show the hardware reference, and allow navigation to the configuration and maintenance dialogs, especially FDT/DTM for device maintenance



System 800xA Engineering

Function designer documentation

Ready-to-print with built-in templates, this provides a background frame for different page sizes (e.g., Letter, DIN A4). User-defined templates can be added to customize the need to local and end-user requirements.

Simplified engineering for heterogeneous automation system architectures

Resource-independent function diagrams can be engineered and Controller and I/O allocation can be made in subsequent steps. Diagrams assigned to one controller can easily be moved to different resources to adjust to process separation and CPU resource optimization

Well integrated in Engineering Workplace

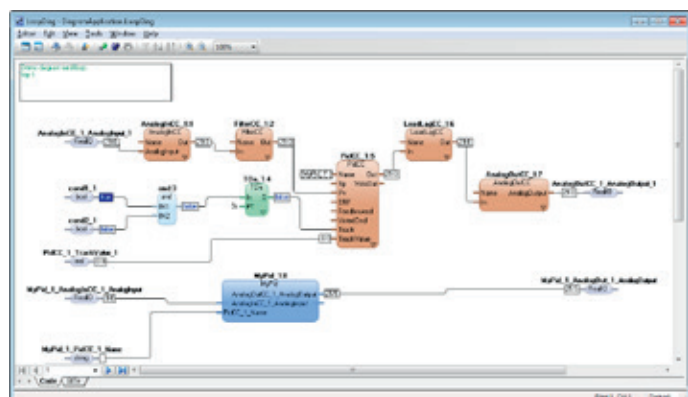
- Create, modify and delete diagrams utilizing ABB's Excel Add-in Bulk Data Management
- Integrate with CAE tools via Process Engineering Tool Integration (System 800xA Engineering PETI)
- Audit trail identifies who made a change when and where. Change Reports utilize data serialization tools
- Test and debug utilizing AC 800M Soft Controller technology

IEC 61131-3 engineering

Control Builder is a powerful tool for creating control and safety solutions including reusable control libraries for the AC 800M controller. It is also used for the hardware configuration. Everything is done in a Windows-based environment, offering a wide range of control functionality for ABB's industrial controller AC 800M. It supports all five programming 'languages' according to IEC 61131-3.

Supported programming languages are:

- Instruction List
- Structured Text
- Function Block Diagram
- Sequential Function Chart
- Ladder Diagram



Object oriented engineering

Control Diagram Editor is a graphical control application engineering tool. It combines the power of IEC 61131-3 languages with innovative and easy to use, user interaction design.

Control Builder also provides editors for object oriented control solutions with Control Modules. It's also possible to combine Structured text, Function Block Diagram and SFC together with Control Modules within Control Diagrams. It combines the power of IEC 61131 languages with innovative and easy to use, user interaction design.

Supported editors are:

- Control Module Diagram Editor
- Control Diagram Editor

Communication variables

Communication variables are available to simplify control application design and to reduce engineering effort. Once declared, those variables can be used in any controller in the system. Communication is automatically built up in the AC 800M compiler.

Test and debug

Beside the availability to execute the control application in a virtual 'Soft Controller' for test and debug, Control Builder offers a set of features for on-line testing, tuning and simulation:

- Status inspection: The status of I/O signals, variables, etc. can be inspected on-line. No manual tagging is required.
- Force: I/O signals can be selected and forced to a chosen state
- Overwrite: All variables can be overwritten on a single-cycle basis, after which the program takes over again
- Tasks: Single-scan executions can be selected in the Task Properties window

Workplace features – Object-oriented programming using Control Modules

Control Modules are available for scenarios where the plant design is driven by highly repetitive units. With Control Modules, user-defined types covering a unit like a reactor can be designed and efficiently parameterized and instantiated multiple times.

Bulk data management

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. Via a series of Excel add-ins, bulk data management features couple the full productivity benefits of Microsoft® Excel with System 800xA.

Audit trail and electronic signature

Audit trail events are generated for all changes made during the synchronization process. System 800xA provides complete audit trail and electronic signature support for those industries that require regulatory compliance. Details are described in the 800xA Batch Overview Documentation and difference report.

Configuration records can be created by printing or by exporting configuration in 'Afw' files. Such files can be archived in configuration management systems. 800xA Difference reports shows differences in configuration, especially for control applications configuration and process graphics.

Besides the option to print the configuration, it can be exported into 'Afw' files. Such files can be archived in third-party configuration storage systems and compared to the current system configuration. Difference reports show detailed differences, especially for control applications, system configuration and graphics.

Library and recipes versions

With the 800xA system, users are able to create their own library of user-defined blocks and elements. These libraries need to be maintained throughout the complete lifecycle of the installation. Configuration Management on Libraries is built into the system and supports features such as lifecycle (design, closed, released) and the capacity to have multiple versions online available in the system. Details of Recipe versioning can be found in the System 800xA Production Management Overview.

Distributed engineering

In order to work in a globally-distributed environment or to test and debug configuration changes, users can work in independent engineering systems. Such systems allow testing and debugging of configuration changes in a 'sandbox' prior to the deployment of such changes in a running control system.

Configuration Management

Within an automation system, changes to configurations must be carefully controlled to ensure all modifications are traceable; who has changed what, when and where.

If a history of configuration changes is required, the Application Change management can be added to the system. That will enable to save versions of changes the Configuration history Server, such as updated graphic displays, changed templates, updated control logic, edited libraries and so forth.

Application changes with minimal risk

The enhanced online download capability (Load-Evaluate-Go) allows users to evaluate modified AC 800M control application versions without interfering with running application versions.

A modified version of an application can be downloaded to the controller and will be executed passively. The user can evaluate the differences in output variables and alarm conditions prior toggling the active status between the two versions of the application. Once the application code optimization is proven to guarantee smooth activation the evaluation can be finalized and the session can be closed.

The evaluation tools is designed to be used for control application code optimization during plant uptime. It can be used complementary to simulation and test systems as it focuses on indicating potential changes in output variables at download. Test and simulations systems have a difference focus.

This function provides the following benefits:

- Reduced risk at application changes in continuous processes
- Reduced risk of creating process bumps at download
- Reduced risk of applying erroneous application changes to the process when in production

Process Engineering Tool Integration

Opportunities to improve operational performance begin early in the design phase when crucial design information is entered into engineering databases. Transfer of this data to a control system can require a significant amount of time and be prone to error. A key element of System 800xA's integrated engineering environment is the ability to efficiently exchange data with common process design engineering tools, such as Intergraph's SmartPlant® Instrumentation (SPI).

Through the use of 800xA's process-engineering tool integration, the 800xA system structure, I/O assignment, documentation links, and basic control configuration can be created directly from process design engineering databases. In addition, operational changes, such as ranges, units and settings, can be continually reflected back to the design database throughout the entire plant lifecycle. Summary of benefits of process engineering tool integration:

- Streamlined configuration and deployment
- Reduced discovery costs
- Information reuse
- Improved as-built cycle

System 800xA

Application libraries

Process Control Device Library

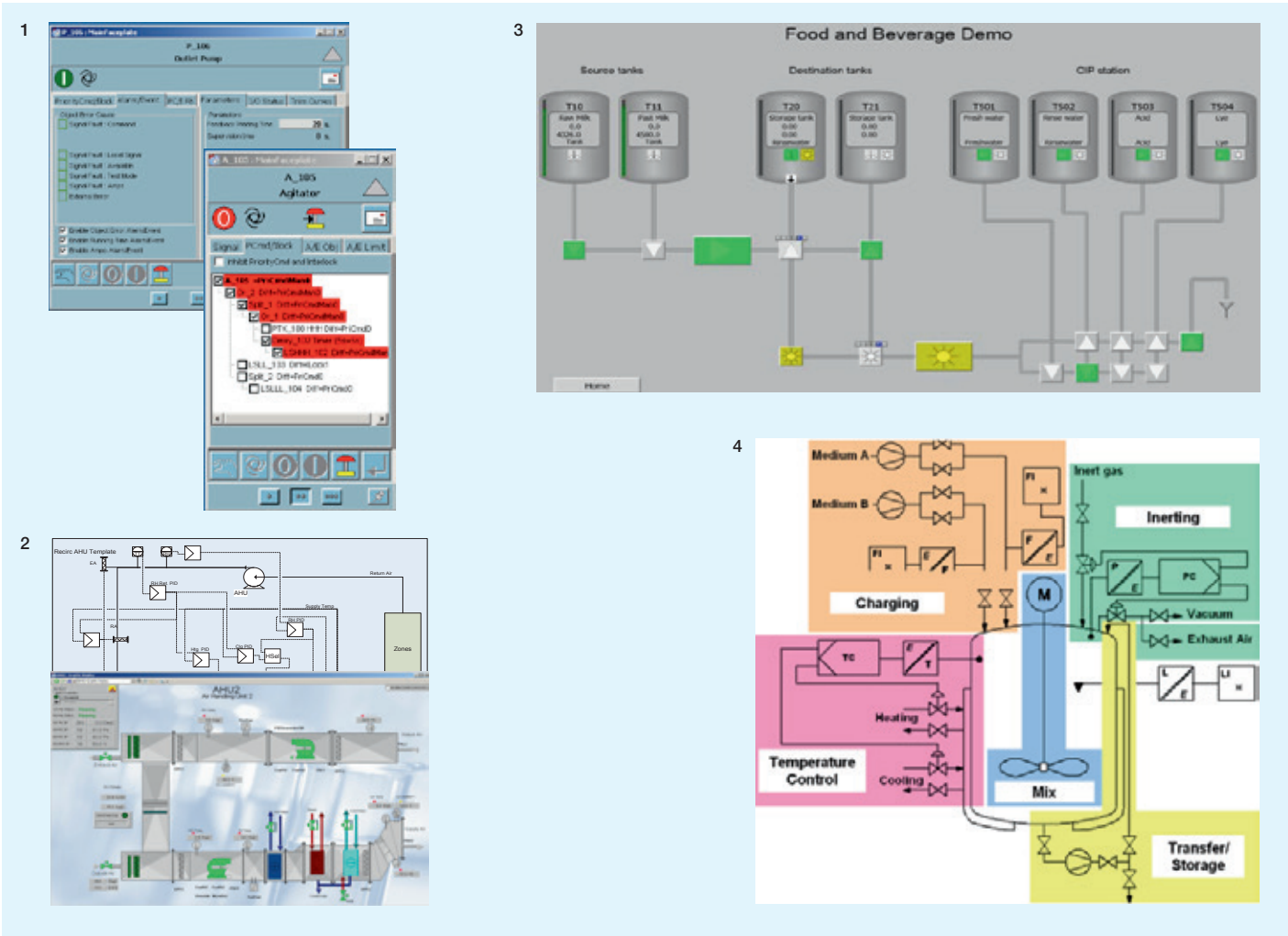
Process Control Device Library (PCDeviceLib/PCDL) is a comprehensive and proven-in-use application library for System 800xA. Part of a broad family of 800xA standard libraries, PCDeviceLib reduces overall project engineering and testing time by providing pre-built configurable control modules, faceplates, graphic display elements, alarm lists and other special aspects for the standard device objects like Valves, Motors, PID Controllers, etc. found in most process industries.

Using PCDeviceLib, automation engineers can create complex control applications and group control sequences simply and efficiently, while engineering to internationally recognized standards. PCDeviceLib completely automates the customization of faceplates and graphic display elements to match the configured options within the control logic. This ensures consistency of the information displayed to operators while greatly reducing engineering and testing time. The system

searches an application and then automatically builds the dynamic display elements to provide real-time root-cause analysis of trip and interlock conditions, both from the initiating 'cause' and to the 'effect' on the devices. In addition, the Drives, MCCs and Group Control sequence dynamic displays are automatically built. ABB's unique Aspect Objects technology makes this possible.

Controller code is written in IEC 61131-3 Structured Text in a System 800xA Control Builder control module type. The faceplates are context sensitive; they only show the functionality that is configured. The graphic display elements are ISA style and show the status of the device and whether alarms are active, inhibits are in use, etc. in accordance with EEMUA recommendations. Each device has operational modes such as auto, manual, group, local and test mode. Additional asset information such as running time, number of starts and current for motors, valve stroke times, etc. is calculated.

1. PCDeviceLib Object Faceplate and Interlock/Trip tree view. | 2. Air Handler type from Facility Automation library. | 3 Food and Beverage demo with production and CIP running. | 4. "Equipment Module (EM) grouping in a Process Unit".



Process Control Equipment Library

Process Control Equipment Library (PCEquipmentLib) is a comprehensive application library of generic Phases, Unit and Equipment Module templates, together with a toolkit of components for the Extended Automation System 800xA. Part of a broad family of System 800xA libraries, PCEquipmentLib is designed to optimize the specification and building of Batch Applications utilizing ISA 88 style Equipment Modules and customized Process Units.

Generic phases enable new products to be introduced by developing new recipes only, thus minimizing the scope and complexity of testing. Designed to 'plug-and-produce' with standard PCDeviceLib control objects, PCEquipmentLib shares common terminology, engineering principles, and naming conventions. This ensures consistency of information displayed to operators while greatly reducing engineering and testing time. PCEquipmentLib also includes Facility Automation functions like Air Handlers, Chillers, Zone Monitoring, Schedulers, Enthalpy Calculation, etc.

Equipment Modules provide a high level of re-use and consistency in control design. Encapsulating devices into Equipment Modules makes the reuse of complex packages of device control simple, accurate and repeatable. Equipment Modules combine one or more control devices into a common function such as ramp/hold temperature, pull/release vacuum, agitate, add medium, etc. These in turn can be used across several units to provide a high degree of re-use, ensure operating consistency through the plant, and reduce engineering and testing efforts.

Process Units are configured from PCEquipmentLib templates to represent the physical plant units. These comprise multiple Equipment Modules, associated process measurements and applicable process Phases. The units include the state model for handling process upsets and control device physical errors. They also provide a feature for monitoring quality critical process values.

PCEquipmentLib provides a library of generic Phases that require no code construction, no testing, and no validation. The set of generic Phases was selected to maximize re-use. Parameters define the actions to be taken by a phase to achieve a process action. All generic Phases are available to Operations under Batch Recipe control, and can be supervised by an operator from the Phase faceplate under manual control.

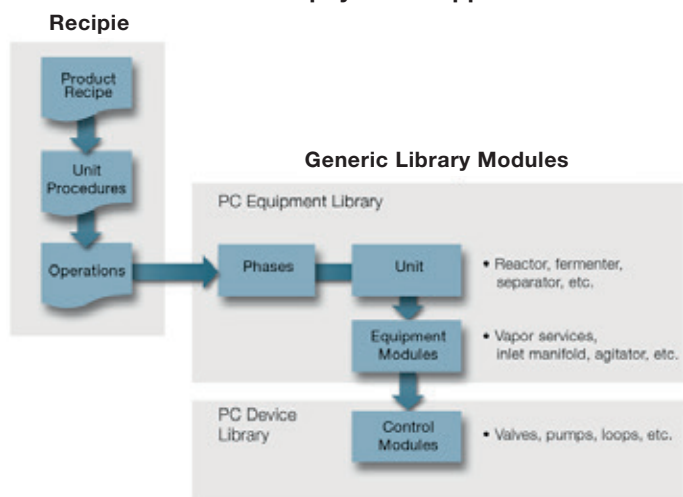
Probase Library

ProBase (Processing Solutions Base Package) is a complete automation solution for System 800xA. It can be used in any process where products are transported and/or stored or processed in tanks and lines, e.g. in chemical and pharmaceutical plants, tank farms, dairies, breweries, mills, fodder, powder manufacturing plants, etc.

ProBase includes functionality for advanced product transfer between process units like tanks and lines. Product transfer, called routing, includes all functionality for alarm handling and alarm propagation between different units, queue handling for online production changes, control and supervision of process objects, interlocks and transfer of product, and equipment settings like product codes, unit names and unit states.

ProBase contains all required functionality to handle CIP for industries like dairy and brewery. It includes CIP recipe handling and template objects for CIP lines, CIP circuits and CIP objects.

Philosophy of the approach



System 800xA Safety

System 800xA offers a complete SIS (Safety Instrumented System) solution, complying with the IEC 61508 and IEC 61511 standards and covering not only the 'logic solver' but the entire safety loop, consisting of SIL-rated field instruments, controllers and I/O modules, valve positioners, and actuators. Highly scalable, System 800xA SIS solutions provide the flexibility to match specific safety functions with actual plant needs.

800xA High Integrity controllers and I/O are highly modular, offering many interconnection options and making them suitable for all safety and business-critical process automation applications, from small to large and single to redundant. Redundant solutions for CPU and I/O will increase the availability.

800xA High Integrity features include:

- Qualified and certified
- Flexible integration
- Common engineering tools
- Extensive set of SIL-certified Library objects
- Access management

Qualified and certified

The AC 800M HI controller is qualified and certified by the German TÜV for use in industrial safety applications. It is compliant with SIL 1-3 requirements in IEC 61508 second edition.

Flexible integration

800xA High Integrity allows the safety system designer to choose the degree of integration appropriate for a specific application and control philosophy. 800xA High Integrity can be deployed as a fully-segregated solution, integrated at the same plant network level as the process automation, integrated into the process control system but using dedicated safety controllers on the same control level network, or fully integrated with both process control and safety automation executed simultaneously within the same controller hardware.

Common engineering tools

AC 800M HI controller is supported by 800xA common engineering tools, human system interface, historian, audit trail, asset and device management applications, and instruments, thereby improving the overall integrity and reliability of Basic Process Control Systems (BPCS) and Safety Instrumented Systems (SIS) operations. For instance, selecting the SIL level activates the relevant restrictions and limitations, such as only SIL marked elements being allowed to be used in SIL applications. Such an environment offers safe, instant, interaction between applications, which leads to a host of benefits from easier handling, through better technical solutions, to lower costs.

Users can choose between three IEC 61131-3 languages; Function Block Diagram, Text, and Sequential Function Chart.

In addition, the easy to use Diagram Editor is allowed to be used up to SIL3. Diagram is a graphical language that graphically interconnects functions, function blocks, control modules and embedded Structured Text and Sequential Function Chart code blocks on the same page.

Extensive set of SIL-certified Library objects

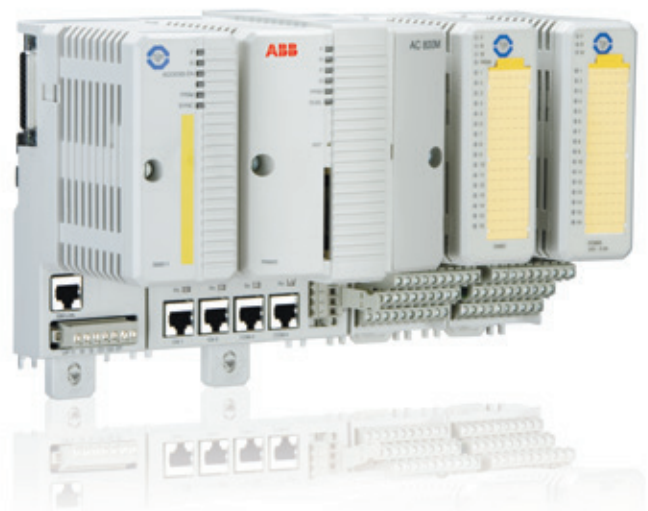
Inter Application Communication (IAC), uses Communication Variables for cyclic and reliable peer-to-peer communication up to SIL3. These variables can exist in the same application, same controller, or different controllers in the network. It is easy to set up inter application communication between different SIL, even from lower to higher SIL.

System 800xA includes a comprehensive library of standard reusable components that include extended automation entities such as faceplates, graphic elements, trends, document links, and alarm and events. In addition, ABB provides a broad family of industry-specific libraries that contain pre-configured Control Modules, Function Blocks, and graphic elements.

These pre-tested proven and SIL-certified libraries significantly reduce the time required to engineer, test and maintain control applications, while minimizing project risks.

Access management

Access management enables project/application-specific configuration of the appropriate level of restrictions regarding operation of the AC 800M HI controllers.



System 800xA Safety

AC 800M High Integrity controller

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 (PM865) used for the AC 800M HI controller is physically identical to other AC 800M controllers, which simplifies service and spares support and provides flexibility during the project build phase. Its high integrity functionality is enabled by the addition of SM81x, a diverse co-processor, and SIL-certified software. This enables non-critical control schemes to be upgraded to SIL-certified schemes by adding a plug-in SM81x, plus selecting the appropriate software. The basic unit for an AC 800M HI consists of PM865 and SM81x.

Redundancy

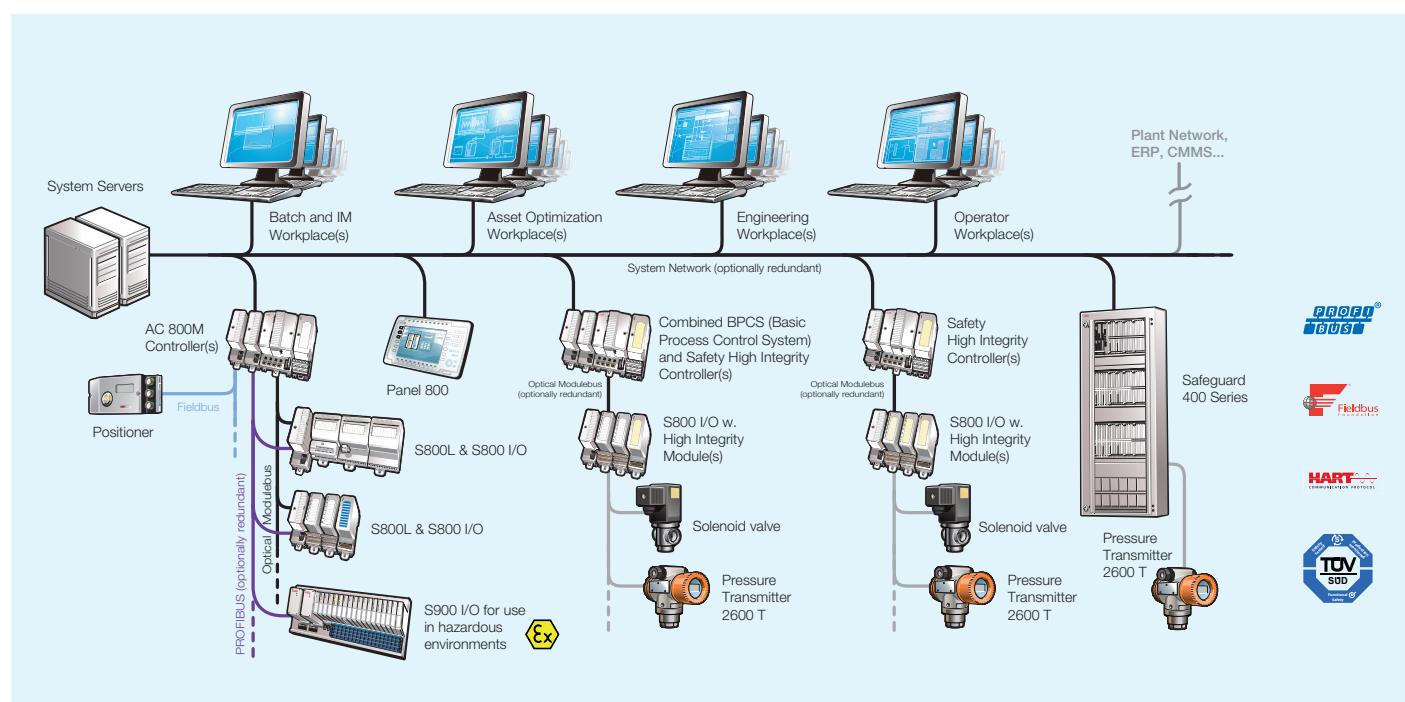
AC 800M HI controllers can be configured for PM/SM redundancy to increase the availability. Two PM modules and two SM modules run in parallel, one as primary and one as secondary. If the primary PM/SM fails, the secondary PM/SM automatically takes over. In addition to the redundant PM/SM, two BC810 CEXbus (Communication module EXpansion bus) Interconnection Units offer a way to section the CEXbus into two independent segments. This improves availability in systems with redundant communication interfaces.

High Integrity I/O

Within the S800 I/O family, SIL3-compliant modules can be used for safety-critical applications. These I/O modules include those for 4-20 mA analog inputs, 24 Vdc digital inputs and 24 Vdc digital outputs. The digital output module provides both Normally Energized (ESD) and Normally Deenergized (F&G) outputs.

Analog inputs support HART routing for easy calibration checking and diagnosis with configurable access, while digital inputs support local time tagging of signal changes for high accuracy sequence-of-events logging.

High Integrity I/Os can be configured on the ModuleBus as single or redundant. 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 6 redundant modules. The practical number of I/Os that can be used in a High Integrity Controller is 500.



System 800xA's high integrity architecture provides a unified environment for embedded safety and process control.



System 800xA – System functions

System security

800xA Security overview

The world of power and automation is changing in the face of new opportunities and challenges. ABB remains committed to helping plant owners take advantage of technology advances while minimizing exposure to risk in areas like cyber security.

As a leading provider of control and automation solutions for a wide spectrum of industries, ABB combines its technology strengths and domain expertise to provide a vast range of customer-focused solutions that enhance asset productivity and efficiency. Safety and reliability are given the highest priority in all of our products, systems and services. Cyber security, which is a key aspect of these efforts, is not viewed as a one-time activity, but as an integral and continuous part of the product lifecycle, from early design and development, through testing and commissioning, to life-time support service and future adaptations. While the reality of 100% security is not feasible, implementation of 'defense in depth' security measures, stringent software update policies and strictly enforced standards will significantly mitigate security risks.

Secure installation and operation of System 800xA is supported by user documentation and tools. When installed, the system assumes a secure default configuration, including hardening of operating systems, disabling unused functions, and automatic domain controller configuration. User documentation describes recommended security measures, such as network configuration and use of anti-virus software.

Security features provided in System 800xA include user authentication, access control, audit trail, protected network communication, and tools for backup and recovery. ABB is continuously working on increasing the integrity, availability and confidentiality of all system functions and help users take pro-active steps to mitigate the risk of unauthorized control system access.

The foundation for System 800xA user authentication 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 groups correspond to the Industrial^{IT} user groups.

Operations and actions in the system can be assigned different required permissions. This assignment defines what permission a user needs 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. At the ultimate level, 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.

Roles 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.

User groups can be 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 subordinate objects inherit this authority. It is also possible to set authority explicitly for any single aspect object.

System 800xA – System functions

System security

Advanced Access Control and Regulatory Agency Compliance Support

ABB has a thorough understanding of the regulatory and environmental requirements for regulated industries, including chemical, utility and life sciences, and specifically 21 CFR Part II. System 800xA regulatory compliance begins with engineering and continues throughout the entire system lifecycle.

System 800xA Advanced Access Control features include authentication, reauthentication, log over, advanced security permissions, digital signing, versioning, data retention and inactivity logout.

Audit trail 800xA 5.1 capabilities allow the monitoring and recording of operator actions. The system supports logging of security violations, configuration changes, operator actions, control logic editing and start/stop of servers.

The audit log contains:

- 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.

Digital Signing provides a secure method to insure that an application, configuration or other critical part of a validated application has not been modified.

Versioning is another method to insure that application configuration matches what is expected to be executed in the system.

Authentication and Double authentication services for System 800xA can be 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.

Two different re-authentication forms are supported:

- Re-authentication, which is used to guarantee that an operation is performed by the logged-in person. Reauthentication generates an audit event, and thus also serves as an electronic signature for the operation.
- Double authentication, which may be used for critical operations or when required by regulation. In this case an additional person must sign and thus approve the operation.

User log-over provides the ability to temporarily change user 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.

Data retention and reporting is the final part of any regulated system. 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. System 800xA History Services functions provide the reporting and archiving capabilities to insure long-term secure data support.



System 800xA – System functions

FDA 21 CFR Part 11 Support

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.

Supporting 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. Some chemical and other manufacturers who supply materials to the life science industry are also required to comply with this regulation.

The demands for System 800xA to enable compliance have been categorized. Several requirements identified in 21 CFR Part 11 require system owners to comply by having appropriate SOPs (Standard Operating Procedures) in place. Not all of the required SOPs are included with the 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/controls
- Sec 11.300 – Controls for identification codes/passwords

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)

System 800xA – System functions

External application interfaces

800xA OPC Client Connection

800xA OPC Client Connection is for use with third-party applications. All run-time 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 (Versions 1.0, and 2.0), OPC-HDA (1.20), as well as OPC-AE (1.1). Several OPC-clients can be connected simultaneously to the system to exchange data. The client connection provides an umbrella architecture that allows seamless access to OPC data exposed by System 800xA regardless of the physical location of the data.

800xA ODBC Client Connections

A set of ODBC data base connectors are provided as an extension to System 800xA History Service capabilities. ODBC connectors provide a client server connection between System 800xA and applications that must utilize standard commercial connection types yet do not understand the concepts of OPC. ODBC Clients are typically utilized by standard reporting tools and many third-party systems. The ODBC Client connection provides access to OPC properties (real-time data) as well as access to Historical process data and events when stored in the long-term storage of System 800xA.



System 800xA – System functions

System infrastructure

Time synchronization

800xA System supports time synchronization within the system to provide Sequence of Events (SOE) with a resolution below one millisecond. This enables accurate sequence of event recording. Time stamping is done at the I/O board or in the control application, depending on the accuracy required.

The time source can be internal or external. To achieve the best clock accuracy in the total system, distributing the time 'upwards' from the Control Network to the Client Server Network is recommended. Typically, a controller will act as time master for the Control Network and the rest of the system will be synchronized from this source.

An external time source should be used if it is important that time stamps in the system are to be compared to time stamps from other systems. In this case, the recommended method is to use an SNTP server with a GPS receiver. That SNTP server should preferably be connected to the Control Network and all controllers must be configured to receive the time via SNTP.

Redundancy

System 800xA provides redundancy at all levels. This includes the following:

- Redundant network
- Redundant field networks
- Redundant servers
- Redundant historians
- Redundant batch servers
- Redundant controllers
- Redundant process I/O
- Redundant power supplies

Redundancy at one place does not require redundancy at any other level. This means the system can, for example, run with redundant networks and redundant servers and have just selected controllers redundant. This gives the possibility to tune costs against availability requirements.

Localization

National Language Support (NLS) localizes the operator interface to the desired language. NLS contains a set of functions that are harmonized with the Windows regional settings to enable a multi-lingual environment for System 800xA.

The default language in System 800xA is English, and the system supports translations, mainly of the operator interface and the related operator manuals, in the following languages: Chinese, French, German, Russian, Spanish, and Swedish.

Multisystem Integration

800xA Multisystem Integration makes it possible to connect a subscriber system on top of a number of 800xA systems and supervise and operate several 800xA systems from one central operating room.

The supervising system is called the Subscriber and the supervised system the Provider.

Engineering provider systems is done locally in the provider system. The subscriber system is engineered by uploading objects and aspects from connected provider systems.

Objects and aspects in the subscriber system can be accessed as if they were local in the subscriber system, with data feed from the provider system.



System 800xA – System functions

Supporting functions

Calculations Services

Calculations can be performed on any object or value in the system and are supported by Windows Visual Basic scripting language. Calculations Service provides the ability to run mathematical expression on any available 800xA aspect property or attribute. This includes a special set of objects called softpoints. Calculations may also be applied to object types. Calculation operations can be triggered by changes to system point values, or scheduled to execute either cyclically or at a given date and time. In conjunction with Calculations, softpoints extend system capabilities and provide the ability to write a timestamp. A log provided to align calculations along with the inputs ensures 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 Services

SoftPoint services allow users to create and configure user-defined object types, and deploy them like any other object in System 800xA. A softpoint differs from other system signals as it is not directly connected to hardware system I/O or executed in a controller. Softpoints execute on an application or Connectivity Server. Once configured, a softpoint is managed and accessed just as any other point in the system. Softpoint values may be stored in system history, displayed and generate alarms. Data is driven into a softpoint by the use of calculations or other third-party applications.

Scheduling services

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

A scheduled job can be anything from report execution in Microsoft® Excel or Crystal Reports to an event trigger calculation or a maintenance backup. Scheduled tasks have a variety of parameters based on the type of scheduled activity and can be used to pass parameters into the scheduled activity. For example, with a report, input parameters can be included for the batch name, the type of report output (PDF, text, etc.), and the destination (file directory or report aspect). In addition, reports can also be mailed to a series of destination addresses.

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. SMS and e-mail Messaging employs three methods to notify users of alarm and event information. 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 telephone land line. The CPT sends the message to compatible devices of users configured to receive them.

Live Video integration support for 800xA

The VideONet Connect for 800xA is used to visualize and manage video cameras connected to the 800xA system through the VideONet Server. This enables the operator to have a live view of the process within the Operator Workplace.

It is also possible to include live video directly in Process Graphics and to view recordings. By associating a camera view with a process object the operator can easily access the live video stream via the context menu for the object.

System 800xA – System functions

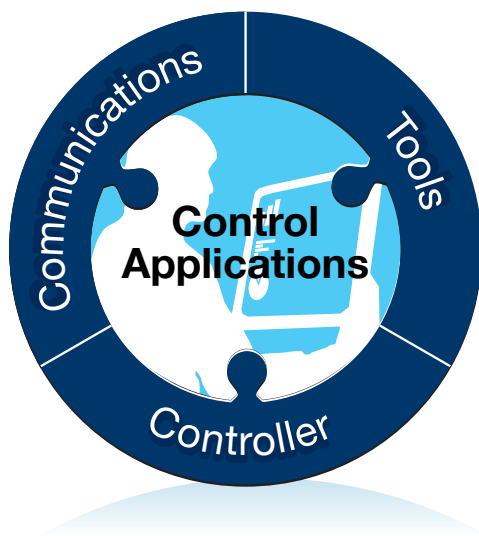
Lifecycle services

Life Cycle Policy

The 800xA Life Cycle Policy has three phases – Active, Classic, and Limited. Products in Active and Classic phase are supported in all respects. Corrections and updates are issued, security updates are validated, and hardware spares are ensured for ABB hardware as well as recommendations for third-party products needed for an installation.

In Limited phase, products are maintained on request and as far as applicable for each case. Recommended third-party components, such as the operating system that a system version is based upon, may have passed their end of life date. At this point, upgrading a plant to a newer system version is recommended.

The latest version of the system software, as well as the hardware, is in active phase until replaced by a successor version. At that time, the system software version or the hardware part enter the Classic phase. An 800xA system version is supported for at least seven years from its initial release date, and is normally supported for four years once it enters the Classic phase. Hardware parts are supported for 10 years from the day they enter the Classic phase. The support provided will depend on the volume of the part, hence the timing of the Classic-to-Limited transition will be individual for each part.



The following is the Life Cycle Policy Statement. It constitutes ABB's lifecycle commitment for 800xA:

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.

Update and Upgrade

Corrections to 800xA software are made available as system revisions. These releases focus on corrections only, as well as life cycle updates, but do normally not add functionality. The update of an installation is managed using a System Update Tool, which fully automates the update process.

Functions and features are added to a system version during its active life. These functions and features are released as Feature Packs, or as individual feature additions, depending on the case. A user can choose to install those features, or remain at the initially released version and only adopt the corrections released through the revisions. To add features to an installation, a Feature Pack Update Tool similar to the revision updates is used. This tool fully automates the process.

Upgrade from one system version to the latest is made when the new functions and features included in a newer system version are desired for use, but should be made at the latest when the installed system version enters Limited life cycle phase. Information about life cycle transition dates is available so that proper planning can be made.

All updates, installations of feature additions, as well as upgrades to newer system versions can be made on-line with the system continuously controlling the plant.

System 800xA – System functions

Lifecycle services

Security updates and virus protection

System 800xA is continuously verified with the latest security updates. Each time Microsoft® issues new updates, which usually happens every month, 800xA is immediately verified with these new updates. Within days, a compliance message is sent out confirming that the security updates can be installed.

Furthermore, the appropriate set of security updates compliant with 800xA is re-distributed together with an installation tool. This means the only action required is to regularly download the update kit and install it in the system. This keeps the operating system up to date.

System 800xA is verified with two virus engines – McAfee and Symantec. Not only it is verified with these virus engines at the release of a new version or revision, the system software is also continuously checked against the virus definition files issued by the vendors more or less on a continuous basis. In practice, this means a verification cycle is run each day where the latest update files are checked, primarily so that they don't find so-called false positives in software code known to be good. This prevents unwanted surprises like system shutdown due to the virus engine understanding correct code as a virus.



License management

System 800xA software is covered by a software license concept. All software is available for installation, but functions and features as well as size parameters are enabled via licenses. The license file, which matches the capabilities that have been purchased, is downloaded from an ABB server and installed in the system.

It is ABB's desire that licensing shall never prevent plant operation. Hence, enforcement is normally not explicit, i.e. it is possible to provisionally override the current licenses to overcome a problem without contacting ABB, and correct the actual license match later. In addition, enforcement is 'soft' in the sense that license violation messages are issued instead of shutting down or disabling the start of functions not covered by an appropriate license.

Automation Sentinel

Automation Sentinel is ABB's software support, maintenance and evolution program to support the continuous advancement of installed system software.

This program allows users to take advantage of the continuous enhancements that ABB makes to system software products. Under this program, users are offered support for their existing software, along with an evolution path to the latest system software. The program covers not only 800xA system software, including Operator Workplace and Engineering tool software, but also the Controller firmware code.

With the latest version of the Automation Sentinel offering, users can choose three levels of support in the program:

- Maintain. Access to support and corrections of the present software version.
- Maintain Plus. As above plus access to newer versions of the same product.
- Maintain & Evolve. As above with the added possibility to evolve installations with previous generation systems to System 800xA.

Automation Sentinel covers the entire installed base of system software including those systems that did not have licensable software. With a Sentinel subscription, we now provide an evolution path for the entire installed base.

System 800xA – System functions

Supervision and diagnostics

PC, Network and Software Monitoring

Standard workstations and network equipment are used extensively in automation systems. The optimal behavior of these parts of the system has a significant impact on the performance and reliability of the automation system as a whole. By looking out for indications of impending problems, via continuous monitoring of the equipment, plant personnel can proactively ensure optimum system availability.

The PC, Network and Software Monitoring (PNSM) solution tell users about software and hardware issues before they affect production. PNSM provides a set of predefined IT Assets that represent common devices and system processes associated with System 800xA, e.g. printers, computers, switches, and software programs. These IT Assets can identify the root cause of problems by assessing the conditions from the simple (e.g. 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, and inform the user of the problem.

The software integration is available for all IT Assets certified for use with System 800xA. It is available in the form of a library that can be downloaded from the ABB Solutionbank. This library includes the object types for servers, workstations, switches, software and other network equipment such as printers, UPS, etc.

Diagnostics Collection Tool

ABB Diagnostics Collection Tool (DCT) collects diagnostic information to use 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 troubleshooting purposes. Analysis of diagnostics data can be done directly in the system where the data is collected. Alternatively, the data can be sent to an ABB support organization for detailed analysis in the event of failure or strange behavior of a system. DCT has support for 800xA products 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 at end-user sites. This will help speed up problem resolution.



System 800xA

Key technical data

System Capabilities	
Tags	120 000
Aspect Objects	400 000
Total number of Clients (nodes with one or several workplaces)	80
Rich Clients	80
Operator screens per system	160
Operator screens per Operator Workplace	4
Operator Workplaces	80
Remote Operator Workplaces	30
Engineering Workplaces	20
Remote Engineering Workplaces	5
Information Management Workplaces	80
Desktop Displays for trends and events	150
Batch Workplaces	80
Nodes in one control network segment (excl. domain server and controllers)	100
Aspect Servers	1 (single, redundant 1oo2 or 2oo3)
Connectivity servers	12 (24 if redundant)
AC 800M Connectivity servers	8 (16 if redundant)
AC 800M controllers per connectivity server	48 (Application dependent)
AC 800M controllers per system	80 (Larger number application dependent)
I/O channels	From a few hundred to over 1,000 per controller depending on CPU type and application.

System Capabilities	
PROFIBUS Connectivity servers	8 (16 if redundant), 2,500 devices per server
HART Connectivity servers	8 (16 if redundant), 2,500 devices per server
Foundation Fieldbus Connectivity servers	8 (16 if redundant), 4,000 devices per server
PLC Connect servers	3 (6 if redundant), 25,000 signals per server
Multisystem Integration Subscribers	1
Multisystem Integration Providers	10
Application servers	10
Batch servers	1 (single or redundant 1oo2)
Information Management servers (used as single, redundant or consolidating servers)	6
Asset Optimization servers	4
Supported Fieldbusses	Foundation Fieldbus, PROFIBUS, PROFINET, HART
Electrical Integration	IEC 61850
Standard Serial Protocols	RS232C: MODBUS RTU/TCP, 3964R, Comli
External application communication	OPC, OLE-DB, ODBC
Network	Ethernet TCP/IP Redundant
Network device supervision	SNMP
Operating System	Server: Windows Server 2008 or Windows 7 Professional/Enterprise (32 and 64 bit US English Version), depending on node type Client: Windows 7 Professional/Enterprise (32 and 64 bit US English Version)

Performance and capacity	
Graphical displays	Unlimited (depending on available hard disk space)
Display exchange time	Standard Main Faceplate: ≤1 second Graphic display with 100 objects: ≤1 seconds
Command response time (order to indication)	<2 seconds
Reports	Unlimited
Alarm and event lists	100
X-Y plots	Unlimited
Active Batch Phases	300
Asset Monitors	20,000
History logs	180,000
Event burst capacity	1000 alarms/second for 3 seconds plus 10/s for 15 minutes
Event storage disc space requirements	Storage per numeric history value stored: 21 bytes Storage per message: 260 bytes
Stored OPC message/log	12,000,000
Alarm/Event throughput/sec	30
Number of concurrently updating data points per second (OPC items) per connectivity server (AC 800 OPC server)	30,000
Max number of softpoint signals	25,000
Max number of soft events	10 /second
Scheduling Service capacity	Max. 200 simultaneous jobs per scheduling server
Calculation Services	10
Calculations/second	100
Write transactions/second	The Calculation server can write up to 10 values/second to process (AC 800M) objects
Calculations that may be queued waiting to be executed	1000 calculations per Calculation server

This table is an extract from ref [4] and may be changed without notice. Note that a combination of functions may impact total capacity, and that conditions may apply for certain parameters. For explanations and further details, refer to the System 800xA System Guide.

System 800xA

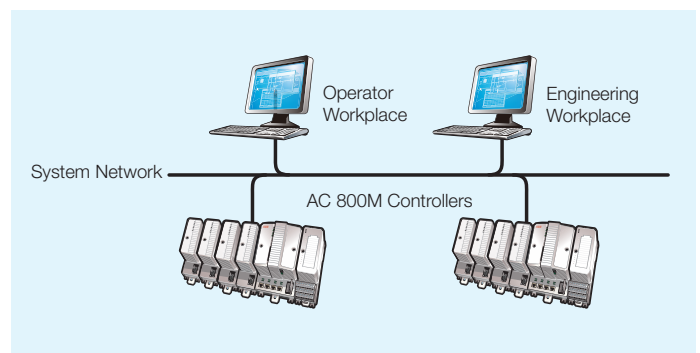
Deployment alternatives



System 800xA can be deployed very differently depending on the size of the application. The options available are determined by the number of operator workplaces needed, the size of the control application, as well as the other functions required, e.g. history logs, batch plant needs, asset management, the amount of data required for external clients, etc.

A central concept in determining the size of a system is tag count. A tag equals a control object in the system, and is usually referable to a real object in the plant, such as a valve or a pump. In other words, the valve or the pump is represented in the system as a tag. A tag can have from a few up to tens of attributes. When dimensioning a system, the tag count is an important size parameter, but equally important is how much data is requested, subscribed, from the control layer. This is determined by the number of operator workplaces, the amount of logs and their log interval, and the volume of external subscription required.

Generically, System 800xA consists of operator workplaces, engineering workplaces, controllers, and server nodes. Smaller systems (up to 5,000 to 10,000 tags) can be built with all server functionality running in the workplace nodes. In other words, the node count equals the number of workplaces needed.

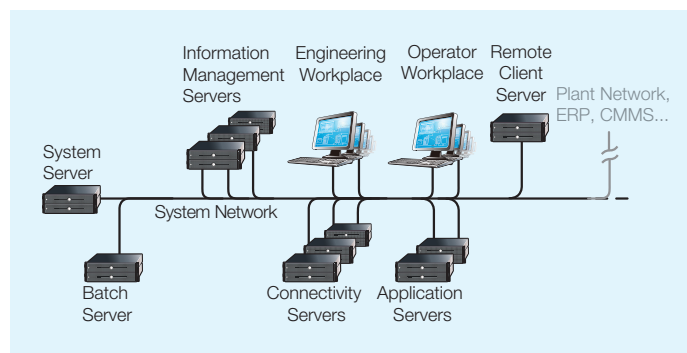


Larger systems require server functionality to run in separate server nodes. Depending again on the actual size, server functionality can be combined in different ways to optimally use the computer capacity.

Fieldbuses are connected through specific communication modules to the controllers. Normally the application run-time data is communicated to and from the control application through this interface. In particular for Foundation Fieldbus and IEC 61850 communication, acyclic data and service and configuration data is communicated through a connectivity function that bypasses the controller, and hence is installed in the server layer of the system. Data needed for object face plates, device configuration and asset management is routed through this communication.

A System 800xA installation can be configured either as a Windows Domain or as a Windows Workgroup. When configured as a domain, the Domain Controller and DNS can be installed either in separate Domain Servers or in an 800xA server node according to specific rules. For redundancy, two domain servers are used.

For installation as a production system, we recommended that the system forms its own domain. It should not be part of a larger domain, such as a corporate network domain.

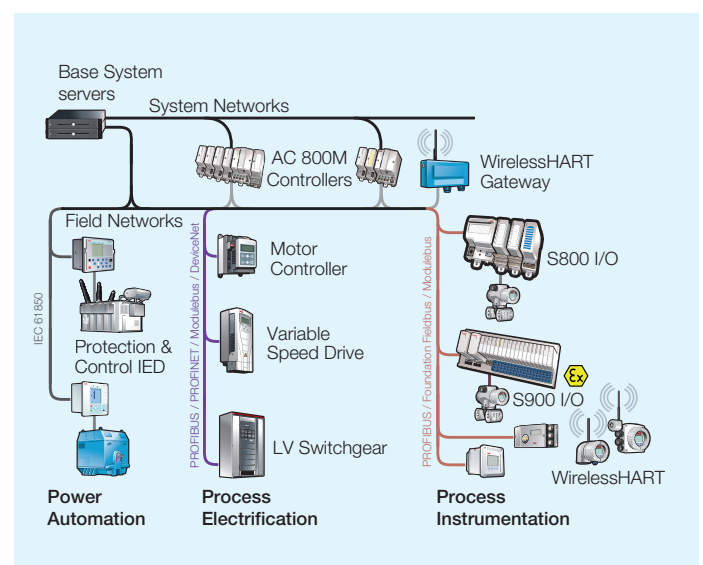


A workgroup becomes increasingly difficult to administrate as the number of users and computers grows. Therefore, workgroups should be considered only for small systems with few users.

Workplaces are installed on Windows 7 workstation PCs. The 800xA server functionality can run on Windows 7 as well as on Windows Server 2008.

Depending on Microsoft® licensing rules, system size is limited when Windows 7 is used for any server node, which means that larger systems always run server functionality on a server operating system.

Virtualization can be used to combine multiple 800xA features onto a single VMware ESX host computer. The total number of physical computers required in an installation is reduced significantly. This also reduces the required space for computers, hardware acquisition costs for computers and cabinets, and operating costs (such as energy expenditures). Operator workplaces can also be virtualized, in which case the 800xA workplace runs virtualized and the physical workplace is implemented by dedicated hardware, so-called thin client hardware from the PC vendors.



System 800xA

Deployment alternatives

Virtualization can be used for engineering systems as well as for production systems. Essentially the same configuration and dimensioning rules, as well as technical specification for an 800xA system, apply when the system is installed in a virtual environment.

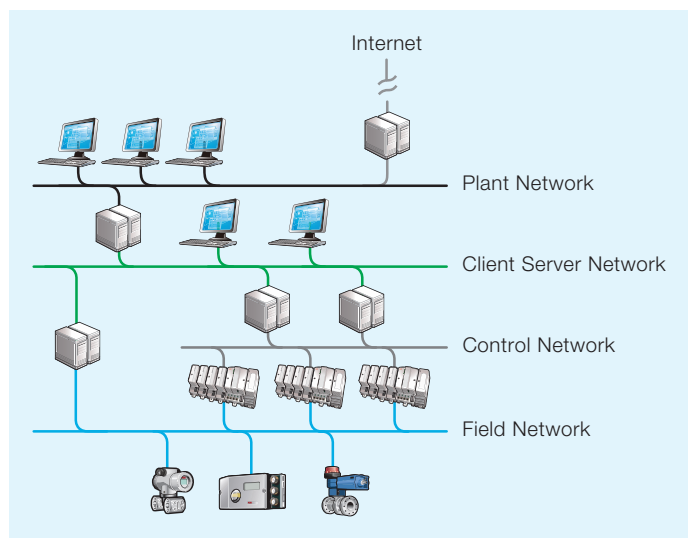
An engineering system is intended for engineering functions only, with no production or control operations. The same basic configuration rules apply to an engineering system as to systems intended for production.

Engineering results produced in an engineering system are transferred to the production system, or to other engineering systems, such as an on-site engineering system, using the Export/Import function.

The engineering system is used stand-alone in, for example, an engineering office. There are four alternatives regarding the domain membership:

- The engineering system can be added to an existing domain (in an office network domain).
- The engineering system can be defined as a new domain added to an existing Domain Controller.
- The engineering system can be defined as a new domain in a separate Domain Controller (isolated engineering system).
- The engineering system can be defined as a workgroup.

System communication in System 800xA is based on Ethernet and TCP/IP networks, which are functionally and, in most cases, also physically built in levels.



The different levels in the network are a logical definition of the different levels of communication. In an installation, several protocols can share the physical media, depending on how the system is deployed.

The Plant Network can be dedicated for process automation purposes or be part of the plant intranet already available on a site.

The Client/Server network is used for communication between servers and between client Workplaces and servers. This is a trusted network zone that should be protected by firewalls. It is a private IP network that uses static addresses.

The Client/Server Network supports network redundancy using the RNRP protocol (Redundancy Network Routing Protocol) and redundant Ethernet switches.

The Control Network is used for communication between Controllers and between Controllers and Connectivity Servers. Similar to the client/server network the Control Network is a trusted network zone that should be protected by firewalls. It is also a private IP network that uses static addresses. The Control Network is based on Ethernet using the MMS protocol on top of a TCP/IP protocol stack, plus additional services for time distribution, redundancy management, etc. The Control Network supports network redundancy using the

RNRP protocol and redundant Ethernet switches. Controllers connect to the control network via dual built-in network ports.

Building a system is done using the System Planner. This is a tool that allows the user to specify the various nodes and their function throughout a system. The result of the planning is used by a System Installer to install the appropriate software on each node, using the software media delivered as a software product box. The System Installer also does basic configuration of Windows as well as the 800xA software in order to facilitate the set-up.

System 800xA

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