ABB Ability™ Symphony® Plus
S+ Engineering
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Over the last decade, new technologies have influenced immense changes in the process industries. These changes have led to significant advances in instrumentation, protection, controllers, I/O modules and other plant automation components.

Integrated control systems make it essential that engineers have a unified platform to engineer and manage all these subsystems. The Symphony® Plus S+ Engineering tool brings together these various automation aspects into one environment. It provides a single platform to manage data from multiple sources. Changes made at one point in the system are reflected throughout the system. This goes a long way in reducing the time spent in engineering and commissioning the control systems of today and the future.

Simultaneously, the industry has seen a sizable shift in the demographics of plant operators and engineers. Engineers in this age of everything mobile, need and expect intuitive navigation features for interacting with the system. Designed with such a futuristic user base in mind, S+ Engineering offers an ergonomic platform that engineers expect.

Market competitiveness in the process industries has squeezed delivery schedules tighter and tighter, changing the way projects are executed, and with it, the demands on the engineering tools. With the decentralization of engineering and project tasks, productivity features like streamlined work flows, multi-user access and flexibility to make changes during start-up and commissioning are critical to the successful execution of today’s projects. S+ Engineering, with its unified engineering workbench, provides the ultimate flexibility in efficient engineering, empowering EPC (Engineering, Procurement, and Construction) contractors and end users alike with the tools and methods to reduce project design cycles, shorten commission and start-up times, and minimize operational maintenance costs.

In summary, S+ Engineering offers all the necessary functionality needed to engineer, configure, administrate, secure, commission and maintain every component in your Symphony Plus Control System - from control and I/O, field instrumentation and electrical devices to network architecture, and operations, engineering, and advanced system applications.
S+ Engineering’s seamless tool integration, powerful workflow automation and comprehensive bulk import/export functions improve overall engineering efficiency. Integrated version control, version comparison and rollback framework offer progress tracking and significantly reduce commissioning time. Using intelligent bulk interfaces, S+ Engineering allows for full control of engineering data consistency in each phase of the project life cycle.

S+ Engineering allows for easy reuse and upgrade of previous generation Symphony, INFI 90 OPEN, INFI 90, and Network 90 control applications. In addition, the extensive reuse concept of S+ Engineering allows users to optimize plant design with field-proven solutions based on ABB’s in-depth experience in the power and water industries.

Intuitive engineering interface – for today and tomorrow

S+ Engineering’s workbench provides a comprehensive range of engineering tools. Through a single unified environment, S+ Engineering supports easy configuration and management of control system strategies, global configuration databases, system libraries and intelligent field devices.

User management

S+ Engineering workbench’s intuitive interface allows engineers to configure user information for the Windows and Engineering databases. It allows for creation of user profiles along with their roles and project access permissions.

In cases of multiple projects, entire or partial list of users along with their roles can be copied over from an existing project to streamline the workflow.

This is accomplished by automatically assigning individuals to one or more specific user groups for administration, engineering, monitoring, setting parameters, simulation, loading, library creation and viewing only. With S+ Engineering’s granular authorization management, one user may have edit rights but cannot put anything in operation, while another user may set parameters and simulate values but cannot make changes to function diagrams. When a user is logged in the engineering environment, the roles are automatically switched based on his/her activity and role assignments. This user authentication feature makes S+ Engineering very secure.
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S+ Engineering

Project administration
The newly integrated S+ Engineering tool allows a very simplistic way of managing automation projects. Users with their project administration privileges can perform the following activities in just few clicks.
• One shot project creation of System, Control, Device and Electrical engineering
• User assignments to projects
• Back-up and Restore of projects
• Project database maintenance
• Upgrade of projects from previous versions

Multi-user engineering
Multi-user engineering provides high level of flexibility and efficiency in system configuration, documentation, commissioning and maintenance. Engineering tasks can be accessed by multiple users at the same time. Engineers can reserve a complete application or parts of it for their exclusive access, enabling multiple users to work on the same project at the same time without interfering with each other’s work.

All engineering tasks can be performed concurrently in S+ Engineering; from definition of process points and loops to function design, system and cabinet layout and all the way to service, diagnostics and library processing. This enables different users to complete their engineering tasks without having to wait for others to complete theirs.

Audit trail
Effective change management enables users to meet evolving business needs in a safe and secure manner. Within the automation system, changes to system configurations must be carefully controlled to ensure all modifications are traceable and accountable. S+ Engineering provides complete audit trail support for those industries that require regulatory compliance. When deployed, S+ Engineering’s audit trail functionality tracks and archives user actions including system changes made at any engineering workstation onto a central database. These events can also be archived in the system’s historian for long term security audit purposes.

Intuitive navigation
The workbench’s graphical user interface, object-related context menus, navigator windows and many help functions provide intuitive user guidance. Within the engineering environment, users can freely navigate from a tag to its associated control logic documents (CLD). Cross navigation with S+ Operations Human Machine Interface (HMI) is also seamless. Users can right click CLDs to call-up a faceplate while operators in the HMI environment can right click on graphic to go to the associated logic document via the view and monitor interface. From here, the operator has access to the specific function code along with simulation via block detail utilities. Links to 3rd party documentation like PDF user manuals, excel reports, etc. are also easily established.

System Topology Engineering
The System Topology builder allows users to visually build the control project through simple drag and drop.

Features include:
• Logical and detailed network development
• Automatic diagram generation via wizard
• Automatic configuration of communication ports
• Topology information used to support central installation
• Configuration support for OPC UA server
• Shares topology information to S+ Operations
• Effortless documentation and report generation
Operations engineering

S+ Engineering includes fully integrated operations engineering for S+ Operations HMI. S+ Operations can be configured within the S+ Engineering environment, with seamless data exchange and integration with other S+ Engineering components such as Bulk Engineering, System Topology, Signal Manager, User Management, in a consistent user interface as HMI server. This allows automation of configuration processes by re-using the existing engineering or system data. Then all the configuration or modifications can be remotely deployed to the S+ Operations run-time servers. Parallel deploy, incremental deploy, and difference viewer functions are supported to make the remote deployment highly efficient and fully under control.

Besides traditional DCS application, S+ Engineering is also the ideal tool for S+ Operations SCADA application by seamless integration of all vertical communication protocols configuration, for example OPC (DA, AE, UA), IEC 61850, IEC 60870-5-104, Modbus TCP, and Object model based signal and tag data handling.

Multi-system support
S+ Engineering efficiently supports the configuration of multiple S+ Operation HMI systems - all from one engineering node or project. For example, consider an installation that includes stand-alone systems for online production and off-line testing. With S+ Operations multi-system support, these stand-alone systems can be developed and maintained from a central project and then deployed separately to the two system environments without need for additional or duplicate engineering efforts (tags, database, graphics, etc.).

HMI upgrade support
For our long-time customers considering evolving their existing HMI platform(s) to S+ Operations, there is a seamless path forward. S+ Engineering provides the tools necessary to directly re-use the existing console database and graphics from previous generation consoles like Conductor NT, Conductor VMS, PPB, PCView with S+ Operations. This minimizes the upgrade engineering effort and allows for the continued use of the existing knowledge base within your plant without requiring operator re-training.
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S+ Engineering

Integrating control engineering
S+ Engineering contains all the functionality necessary to develop and maintain Symphony Plus control system configurations, including support for HR Series, SD Series and 800 Series Turbine. S+ Engineering reduces the burden on engineers by making them more efficient. The ergonomic design is extremely valuable in day-to-day engineering environment.

Explorer is the primary application of S+ Engineering. It provides an intuitive way of interacting with system configuration information. The ability to associate documents with the system architecture saves a lot of time and complexity for the engineer. In the document view (Figure 5), critical documents like P&IDs, cabinet arrangement drawings, graphic displays, field wiring diagrams etc. are readily available without leaving the Explorer window.

Changes made to tag data from the data browser view (Figure 6) are saved on the S+ Engineering’s configuration server, which is the central repository for all tag information. This eliminates the need to replicate the same changes in multiple databases. The data browser window allows database filtering which makes configuration easier and faster by eliminating unnecessary information from the user’s view. Engineers are able to import and export tag data and perform automatic search and replace operations based on complex queries. The ergonomics of the software allow a user to navigate directly from a tag to its related configuration document.

The ability of the Automation Architect (Figure 7) to visually represent the control strategy greatly improves the decision making by the engineer. The time invested by engineers in creating a control strategy can be leveraged by saving it as a macro for future re-use. High level control strategies can be created by dragging and dropping standard function blocks or user defined function blocks from the library.

Intuitive features such as “Mouse over zoom”, FC Specification positioning, Cross reference description viewing, Specification tool tips, Configurable maximum number of CLD access simultaneously and Run time indication improve overall control engineering efficiency.
Every engineer can affirm that being able to start from a reliable and proven template can dramatically reduce the time and cost associated with implementing a control strategy. It also improves the quality of control strategy software by minimizing the risk of errors of starting from scratch. S+ Engineering allows users to define and maintain Control Logic Templates.

Control Logic Templates (CLTs) define reusable standard control strategies that are typically used to develop a process automation system. They can be thought of as blueprints that define the structure of a control strategy. They are maintained by object exchange and can be used to quickly define control logic documents.

The CLT linking functionality allows users to define logic that is controlled by the template or that can be modified on each configured instance. Any subsequent changes can then be spread to all linked instances. When a template updates its linked instances, it will preserve instance-specific configuration. These management features allow for efficient maintenance and utilization of reusable standard control logic.

Configurable Function Codes (CFCs)
Another such feature that allows engineers to create and re-use their expertise is the Configurable Function Codes (CFC). The CFC allows engineers to create specific control logic using standard Harmony function codes and then save it as a package. This package (CFC) can then be used in the rest of the control logic design as a standard Harmony function code. This eliminates the need to re-write the entire contents of this CFC every instance it is used in the control scheme. This CFC can be represented by a custom shape, control logic, defined inputs, defined outputs, defined tunable and non-tunable specifications, and tag mapping. Further, CFCs can make its control strategy contents visible to users or completely hidden from users in white box and black box respective options (Figure 8).

This ability to package the intellectual property and easily re-use it in same or different project greatly minimizes the chances of error, simplifies logic troubleshooting and results in overall improved quality of the configuration.

Libraries
Engineering libraries are the basis for all S+ Engineering applications. All components, devices, P&I diagrams, symbols, operation and control processing function blocks, I/O configuration, coding and dimensions are included in these libraries.

The object exchange (object library, Figure 08) window presents the user with a view of re-useable components (called objects) that can be used to create control system configurations. The standard ABB library consists of some predefined function codes and standard shapes/symbols. Users can use these objects in their control strategy but cannot delete them. However, users can also define their own objects such as function codes, macro logic, shapes/symbols or even control logic templates (CLTs) and save them in a separate folder.
To support re-use of the standard objects and the intellectual investment in the user defined objects, the library supports cut-copy-paste functionality. Users can share objects between different projects within the S+ Engineering system to save time, reduce errors and for best practice sharing.

**Bulk engineering**

The ability to efficiently manage large amounts of data is a crucial part of any automation system. S+ Engineering provides intuitive ways of bulk data handling.

Import process point or I/O spreadsheet to configure:
- Signal list and properties including HMI configuration
- Control hardware
- I/O assignment and I/O template instantiation
- Control Logic Template instantiation

Multiple revisions of Signal and I/O lists are handled by logical update of the engineering database to avoid re-importing of the entire list for every change made to the list. This allows the user to perform bulk configuration changes and editing in the familiar MS Excel environment and then import it into the configuration server seamlessly (Figure 10). Mapping of the columns in excel file to the fields in the I/O list management is done by dimple drag-and-drop of field names. This one-time mapping can be saved for use in subsequent lists for other areas of the plant or future use.

Re-engineering efficiency can be achieved through the data editor feature based on the customized query. The data editor tool also supports filtering with entity like tag, XREF, FC specifications, and CLDs.

**PROFIBUS/HART device integration**

S+ Engineering fully supports configuration, commissioning, maintenance and management of intelligent field and electrical devices (transmitters, actuators, motor control centers etc.) using PROFIBUS and HART communication protocols. The data or variables inside intelligent devices can be accessed by function blocks in a S+ Controller in a similar way as traditional IO channels data is accessed. This smart device data can be used in real-time control strategies.

The functionality extends beyond the function block access. The Field Device Tool (FDT) provides a graphical environment to configure and manage intelligent devices using device type manager (DTM) technology, in a similar way of configuring a printer by its Windows driver (Figure 11). Users can use the DTM to check basic information of device, set device parameters and characteristics, change device internal calculation mechanism, perform simulations for testing etc. all of this can be done in real time and within a user friendly graphical presentation environment.

For conventional device description files (GSD), a basic PROFIBUS DTM is available to allow standardized offline configuration. HART devices are configured and parameterized via standard HART protocols without the need for additional tools by using a standard HART DTM. The device integration feature also includes automatic net calculation and loading of process items by using the device-specific channel configuration generated from DTM.
Modbus TCP Interface
S+ Engineering supports SD and HR Series controller bi-directional, real-time communications with Modbus TCP devices, such as third-party PLCs, electrical devices, process panel, or HART wireless transmitters. The Modbus points can be used in the same manner as physical I/O points, either in the control application algorithm or HMI interaction. The plant operator can monitor and operate third-party system/device in an integrated way as native DCS I/O or data.

IEC 60870-5-104 and DNP 3.0 Integration
S+ Engineering supports IEC 60870-5-104 and DNP 3.0 protocols control connectivity to SD Series controllers. In support of the high performance communications interface between S+ controllers and IEDs or RTUs, S+ Engineering delivers fully integrated functionality. By launching the configuration application directly from the engineering environment and with familiar commands and user interface, intuitive configuration and minimal learning curves are realized.

Additionally, S+ Engineering supports HMI connectivity for IEC 60870-5-104 by using pre-defined templates or customizable excel worksheets to perform the signal and HMI engineering tasks.

Electrical (IEC 61850) Integration
The Symphony Plus system supports the control and supervision of intelligent electronic devices (IEDs) through the use of IEC 61850 communication protocol. Configuration and maintenance of this interface is performed from S+ Engineering (Figure 13). S+ Engineering supports configuration for both horizontal and vertical communication to the automation system. Horizontal communication to controller is supported through Generic Object Oriented Substation Event (GOOSE) and Manufacturing Message Specification (MMS) while Vertical communication to S+ Operations is by MMS. Re-import of SCD is possible and the changes in the configuration are handled safely.

Soft Controller
For new plant, upgrade, or expansion project, SD Series soft controllers can dramatically reduce commissioning and start-up time and costs by permitting thorough testing and pre-tuning of control loops prior to its implementation in the field. Managed within S+ Engineering, SD Series soft controllers uses the same control logic (i.e. Function Codes or Configurable Function Codes configuration) as the physical SD Series controller. With a couple of clicks, users can have the control logic running either in soft controller or physical controller, monitor the live data change, tune the parameters in the same manner.
Batch Data Manager

Batch Data Manager (BDM) is a family of engineering tools for creating, editing, managing, downloading and debugging batch, sequential and user-defined function code configurations.

It enables the engineer to create batch and sequential control applications using clear and concise natural syntax control statements. BDM programs can be used to change controller set points, turn discrete devices on and off, change modes and perform a host of other supervisory operations. In effect, function codes execute base regulatory and discrete device control while the BDM program performs supervisory control and process operation.

One of the components of BDM is Batch Tools for Batch Sequencing. Batch tools for batch sequencing include a full-featured text editor to create and compile batch, sequential and user-defined function code configurations.

control applications where the sequence is rarely modified.

Another key component is the User-Defined Function code (UDF) capability (Figure 15). UDF codes also include a full featured text editor to create and compile UDF programs using natural syntax control statements. UDF programs can be downloaded to UDF-specific function codes and incorporated into control strategies in the same manner as any other function code. The UDF program does not require a recipe or an operator’s input; it begins executing when the controller begins executing. This feature is especially useful for users who need to create function codes unique to their process, or for sequence control applications that execute continuously and do not require a recipe.

Troubleshooting for Batch 90 and UDF programs is made easy by the Dynamic Debugger tool. Dynamic debugger enables engineers to:

- Observe process data such as variables and set points, as well as intermediate computational values from the program including timers, ramps and integrators.
- Override normal operation of pumps, valves and control loops, and direct their activities from the debugger.
- Stop normal program operation and single-step the program to analyze data without affecting other programs or function block execution.
- Assign breakpoints. The program can be designed to run to a certain point and then stop execution, allowing engineers to systematically analyze logic.
- Perform online recipe parameter editing when used with the unit procedure editor or the master recipe editor.
Evolution without obsolescence

A DCS is a significant capital investment. Plant engineers add to this investment by enhancing the control system components, tuning and refining control application code and developing knowledgeable staff who operate and maintain the plant and control system. One of the results of these initial investments is the creation of site-specific control strategies and procedures that enable the plant to maintain high availability and excellent operational performance. S+ Engineering enables users to retain all this intellectual property built over years of experience and which is unique to the plant’s operations. S+ Engineering allows controller configurations from any Symphony Harmony, INFI 90™, INFI 90™ Open, or Network 90 controller to be re-used with some modifications.

Users can leverage the years of knowledge and time spent by their engineers instead of starting from scratch! S+ Engineering’s Automation Architecture functions in the same way as in previous versions of Composer. This eliminates the cost of re-training plant personnel.

Automation Sentinel, ABB’s control system software management and support program supports S+ Engineering throughout its life cycle. With this agreement, users can keep their control software up-to-date and maintain a flexible path forward to new system software technologies. It lowers support costs and provides users with predictable software management costs for annual budget planning. Automation Sentinel also provides users with access to the most current system documentation and the latest software updates.

In summary, S+ Engineering reduces deployment costs and reduces total life cycle costs associated with system evolution. It preserves decades of intellectual know-how specific to the plant by allowing the existing configuration to be re-used.